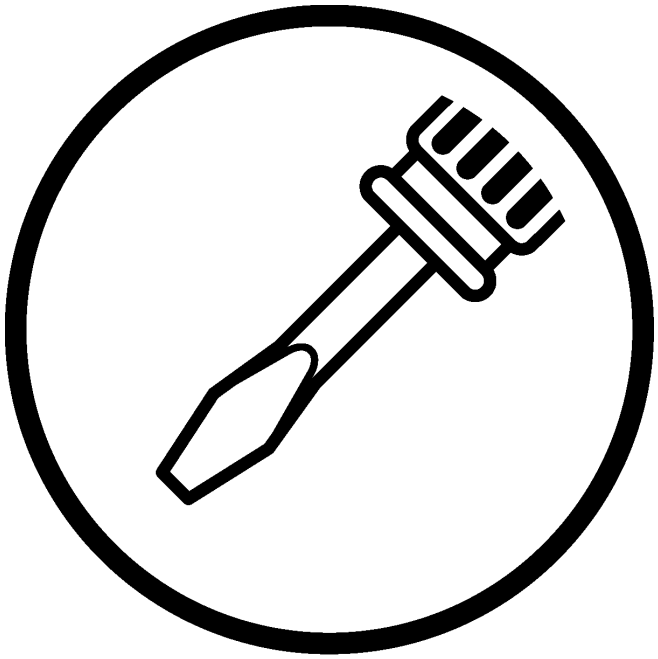
RH-9820

SERVICE MANUAL

Please read this manual before making any adjustments.

ELECTRONIC EYELET BUTTON HOLER



brother®

This service manual is intended for RH-9820; be sure to read the RH-9820 instruction manual before this manual.

Carefully read the “SAFETY INSTRUCTIONS” and the whole of this manual to understand this product before you start maintenance.

As a result of research and improvements regarding this product, some details of this manual may not be the same as those for the product you purchased.
If you have any questions regarding this product, please contact a Brother dealer.

SAFETY INSTRUCTIONS

[1] Safety indications and their meanings

This service manual and the indications and symbols that are used on the machine itself are provided in order to ensure safe operation of this machine and to prevent accidents and injury to yourself or other people.
The meanings of these indications and symbols are given below.

Indications

DANGER	The instructions which follow this term indicate situations where failure to follow the instructions will result in death or serious injury.
CAUTION	The instructions which follow this term indicate situations where failure to follow the instructions could cause injury when using the machine or physical damage to equipment and surroundings.

Symbols

 ····· This symbol (△) indicates something that you should be careful of. The picture inside the triangle indicates the nature of the caution that must be taken.
(For example, the symbol at left means “beware of injury”.)

 ····· This symbol (⃠) indicates something that you must not do.

 ····· This symbol (●) indicates something that you must do. The picture inside the circle indicates the nature of the thing that must be done.
(For example, the symbol at left means “you must make the ground connection”.)

[2] Notes on safety

⚠ DANGER

Wait at least 5 minutes after turning off the power switch and disconnecting the power cord from the wall outlet before opening the cover of the control box. Touching areas where high voltages are present can result in severe injury.

⚠ CAUTION

Environmental requirements

Use the sewing machine in an area which is free from sources of strong electrical noise such as electrical line noise or static electric noise.
Sources of strong electrical noise may cause problems with correct operation.

Any fluctuations in the power supply voltage should be within ±10% of the rated voltage for the machine.
Voltage fluctuations which are greater than this may cause problems with correct operation.

The power supply capacity should be greater than the requirements for the sewing machine's power consumption.
Insufficient power supply capacity may cause problems with correct operation.

The pneumatic delivery capability should be greater than the requirements for the sewing machine's total air consumption.
Insufficient pneumatic delivery capability may cause problems with correct operation.

The ambient temperature should be within the range of 5°C to 35°C during use.
Temperatures which are lower or higher than this may cause problems with correct operation.

The relative humidity should be within the range of 45% to 85% during use, and no dew formation should occur in any devices.
Excessively dry or humid environments and dew formation may cause problems with correct operation.

In the event of an electrical storm, turn off the power and disconnect the power cord from the wall outlet.
Lightning may cause problems with correct operation.

Installation

Machine installation should only be carried out by a qualified technician.

Contact your Brother dealer or a qualified electrician for any electrical work that may need to be done.

The sewing machine weighs approximately 120 kg.
Installation of the sewing machine and adjustment of the table height should be carried out by four or more people.

Do not connect the power cord until installation is complete. If this is not done, the sewing machine may operate if the start switch is pressed by mistake, which could result in serious injury.

Hold the machine head with both hands when tilting it back or returning it to its original position.
In addition, do not subject the machine head to extra force while it is tilted back.
If this is not observed, the machine head may become unbalanced and fall over (together with the table), and serious injury or damage to the sewing machine may result.

Be sure to connect the ground. If the ground connection is not secure, you run a high risk of receiving a serious electric shock, and problems with correct operation may also occur.

All cords should be secured at least 25 mm away from any moving parts. Furthermore, do not excessively bend the cords or secure them too firmly with staples.
If this is not observed, fire or electric shocks may result.

Install belt covers to the machine head.

If using a work table which has casters, the casters should be secured in such a way so that they cannot move.

Be sure to wear protective goggles and gloves when handling the lubricating oil, so that it does not get into your eyes or onto your skin.
If care is not taken, inflammation can result.
Furthermore, do not drink the lubricating oil. Diarrhea or vomiting may result.
Keep the oil out of the reach of children.

⚠ CAUTION

Sewing

This sewing machine should only be used by operators who have received the necessary training in safe use beforehand.

The sewing machine should not be used for any applications other than sewing.

Be sure to wear protective goggles when using the machine.
If goggles are not worn, there is the danger that if a needle breaks, parts of the broken needle may enter your eyes and injury may result.

Turn off the power switch at the following times. If this is not done, the sewing machine may operate if the start switch is pressed by mistake, which could result in serious injury.
- When threading the needle
- When replacing the needle
- When not using the machine and when leaving the machine unattended

If using a work table which has casters, the casters should be secured in such a way so that they cannot move.

Attach all safety devices before using the sewing machine. If the machine is used without these devices attached, injury may result.

Do not touch any of the moving parts or press any objects against the machine while sewing, as this may result in personal injury or damage to the machine.

If an error occurs in machine operation, or if abnormal noises or smells are noticed, immediately turn off the power switch. Then contact your nearest Brother dealer or a qualified technician.

If the machine develops a problem, contact your nearest Brother dealer or a qualified technician.

Cleaning

Turn off the power switch before carrying out this operation. If this is not done, the sewing machine may operate if the start switch is pressed by mistake, which could result in serious injury.

Be sure to wear protective goggles and gloves when handling the lubricating oil, so that it does not get into your eyes or onto your skin.
If care is not taken, inflammation can result.
Furthermore, do not drink the lubricating oil. Diarrhea or vomiting may result.
Keep the oil out of the reach of children.

Maintenance and inspection

Disassembly, assembly, maintenance and inspection of the sewing machine should only be carried out by a qualified technician.

Ask your Brother dealer or a qualified electrician to carry out any maintenance and inspection of the electrical system.

Turn off the power switch and disconnect the power cord at the following times. If this is not done, the sewing machine may operate if the start switch is pressed by mistake, which could result in serious injury.
- When carrying out inspection, adjustment and maintenance
- When replacing consumable parts such as the loopers and knife

Turn off the power switch before inserting or removing the plug, otherwise damage to the control box could result.

Disconnect the air hoses from the air supply and wait for the needle on the pressure gauge to drop to “0” before carrying out inspection, adjustment and repair of any parts which use the pneumatic equipment.

If the power switch and air need to be left on when carrying out some adjustment, be extremely careful to observe all safety precautions.

Hold the machine head with both hands when tilting it back or returning it to its original position.
In addition, do not subject the machine head to extra force while it is tilted back.
If this is not observed, the machine head may become unbalanced and fall over (together with the table), and serious injury or damage to the sewing machine may result.

Be sure to wear protective goggles and gloves when handling the lubricating oil and grease, so that they do not get into your eyes or onto your skin, otherwise inflammation can result.
Furthermore, do not drink the oil or eat the grease under any circumstances, as they can cause vomiting and diarrhea.
Keep the oil out of the reach of children.

Use only the proper replacement parts as specified by Brother.

If any safety devices have been removed, be absolutely sure to re-install them to their original positions and check that they operate correctly before using the machine.

Any problems in machine operation which result from unauthorized modifications to the machine will not be covered by the warranty.

[3] Warning labels

The following warning labels appear on the sewing machine.
Please follow the instructions on the labels at all times when using the machine. If the labels have been removed or are difficult to read, please contact your nearest Brother dealer.

1

⚠ 危 険	⚠ 危 険
高電圧部分にふれて、大けがをすることがある。電源を切り、5分たってからカバーをはずすこと。	触摸高压电部分，会导致受伤。在切断电源5分钟后，再开启盖罩。

⚠ DANGER	⚠ GEFAHR	⚠ DANGER	⚠ PELIGRO
Hazardous voltage will cause injury. Turn off main switch and wait 5minutes before opening this cover.	Hochspannung verletzungsgefahr! Bitte schalten sie den hauptschalter aus und warten sie 5 minuten, bevor sie diese abdeckung öffnen.	Un voltage non adapte provoque des blessures. Eteindre l'interrupteur et attendre 5 minutes avant d'ouvrir le capot.	Un voltaje inadecuado puede provocar las heridas.Apagar el interruptor principal y esperar 5 minutos antes de abrir esta cubierta.

2

⚠ 注 意

触摸运动部分,易造成受伤。所以在装上安全保护装置后,再进行缝纫操作。在切断电源后,进行穿线,更换梭芯,机针和做清扫,调整工作。

⚠ CAUTION

Moving parts may cause injury. Operate with safety devices. Turn off main switch before threading, changing bobbin and needle,cleaning etc.

3 Do not touch the knife or press any objects against the machine while sewing, as this may result in personal injury or damage to the machine.

Safety devices
Devices such as eye guard, finger guard, needle bar guard, needle guide cover and belt cover

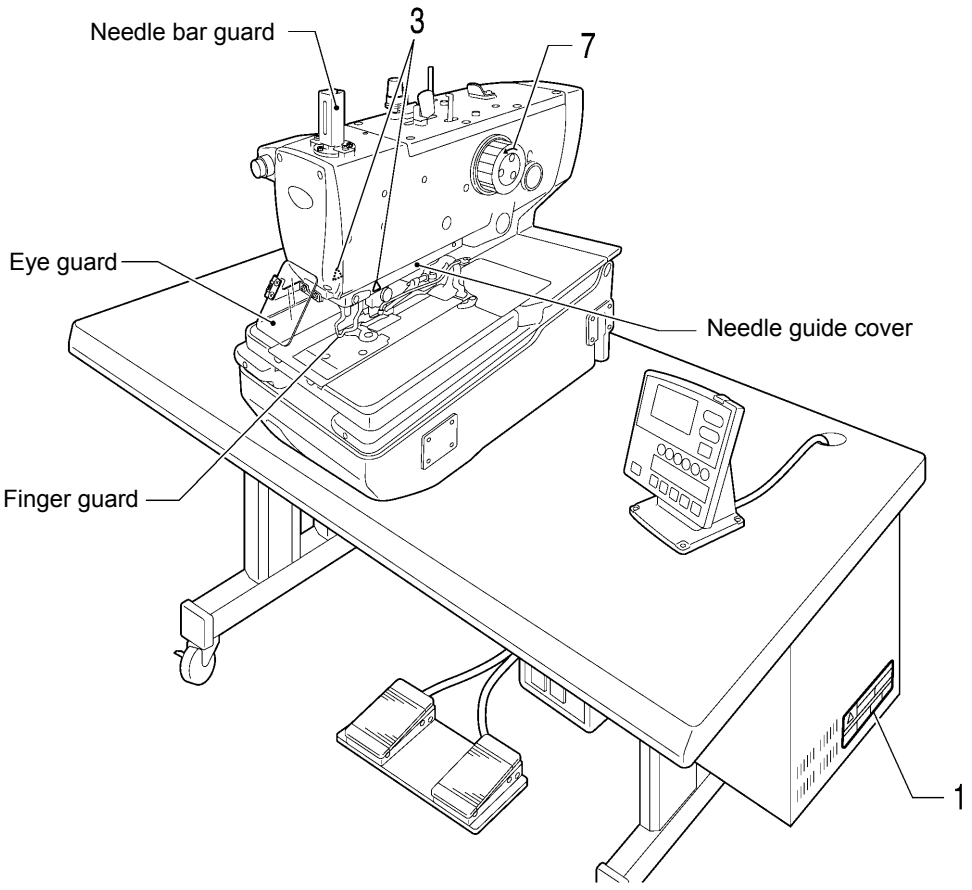
4 Be careful not to get your hands caught when returning the machine head to its original position after it has been tilted.

5 Be careful not to get your hands caught when moving the feed base backward.

6 Be sure to connect the ground. If the ground connection is not secure, you run a high risk of receiving a serious electric shock, and problems with correct operation may also occur.

7 Direction of operation

8 High temperature warning display



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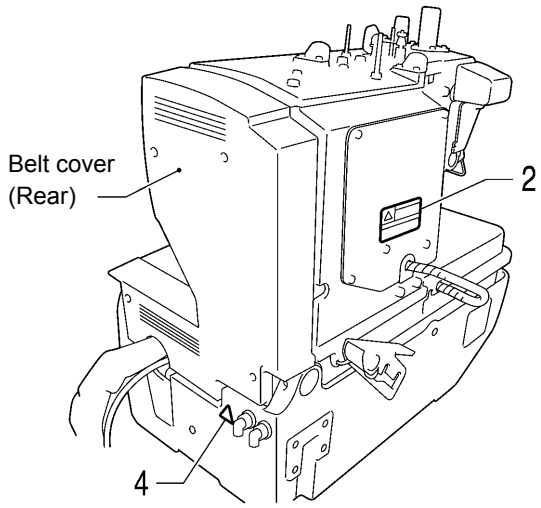

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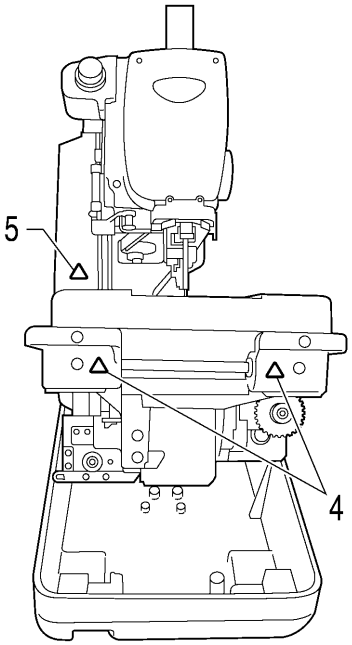

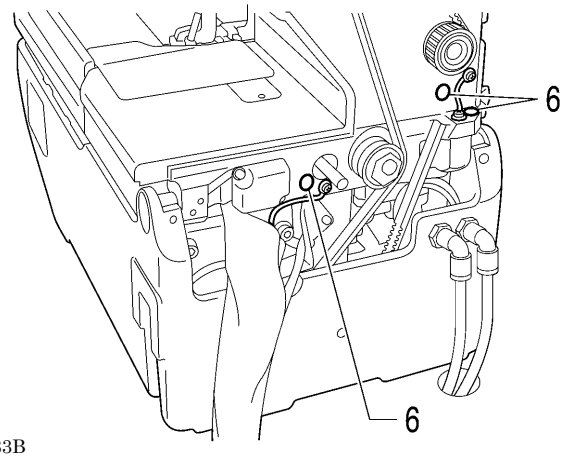

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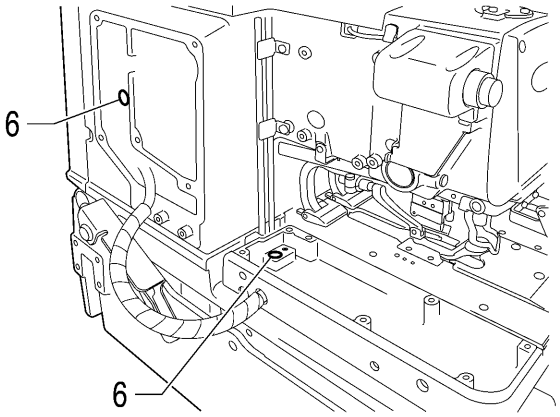

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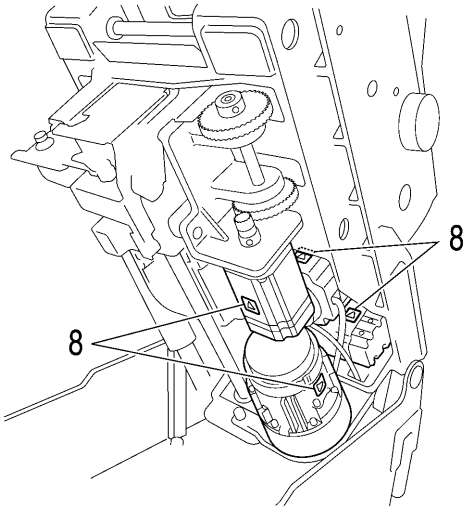

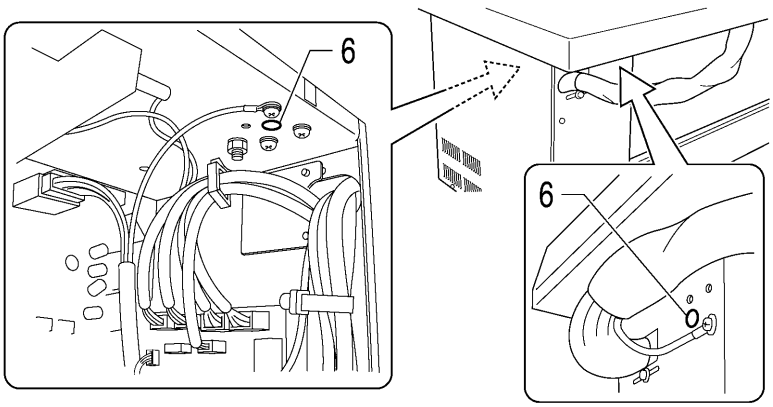

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CONTENTS

1. MACHINE SPECIFICATIONS

	Thread trimmer	Lower thread trimmer	
		Long type	Short type
-00	O	-	-
-01	O	O	-
-02*1	O	-	O

*1: -02 specifications are divided into L1422 to L3422 specifications depending on the sewing lengths, so please specify the sewing length when ordering.

*2: This is not covered by specification designations, but compatibility is possible by replacement of gauge parts. (Ask the place of purchase for details.)

SPECIFICATIONS	RH-9820-00	RH-9820-01	RH-9820-02
Use	Men's clothes, ladies' clothes		Jeans and work clothes
Sewing speed	1,000 - 2,500 rpm (Setting possible in units of 100 rpm)		
Sewing shape	Without bartack Taper bartack Straight bartack Round bartack Circular stitch	Without bartack Taper bartack Straight bartack Round bartack Circular stitch	Without bartack Taper bartack Straight bartack Round bartack
Sewing length	Eyelet buttonholes : 8 - 50mm Straight buttonholes : 5 - 50 mm	Eyelet buttonholes : 8 - 42mm Straight buttonholes : 5 - 42 mm	L1422: 14 - 22 mm *2 L1826: 18 - 26 mm L2230: 22 - 30 mm L2634: 26 - 34 mm *2 L3442: 34 - 42 mm *2
Stitch pitch	0.5 - 2.0 mm		
Zigzag width	1.5 - 5.0 mm (Max. 4.0 mm with mec hanism, Max. 1.0 mm with software)		
Taper bartack length	0 - 20 mm		
Work clamp height	Standard 12 mm (up to 16 mm possible)		16 mm
Starting method	Foot switch (treadle type, 2- pedal type) or hand start switch		
Feed mechanism	Intermittent feed by thr ee pulse motors (X, Y, θ)		
Needle	DO x 558 80 - 120 Nm (Schmetz 558)		
Safety devices	Built-in emergency stop function and automatic stopping device whic h stops the machine when the safety circuit is activated		
Upper shaft motor	AC servo motor (4-pole, 550 W)		
Air pressure	Main regulator: 0.5 MPa Hammer pressure regulator: 0.4 MPa		
Air consumption	43.2 l/min (8 cycles/min)		
Power supply	Single-phase 100V/220V, Three-phas e 200V/220V/380V/400V 400 VA		
Weight	Machine head: Approx. 120 kg, O peration panel: Approx. 0.6 kg Control box: 14.2 - 16.2 kg (Varies depending on destination)		

2. FUNCTION SETTINGS

2-1. List of special functions when power is turned on

This section contains a list of functions and the key operations which are used to call the setting mode for the functions.

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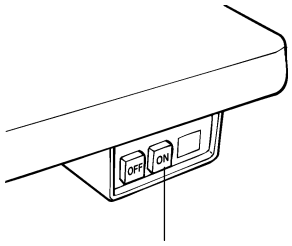
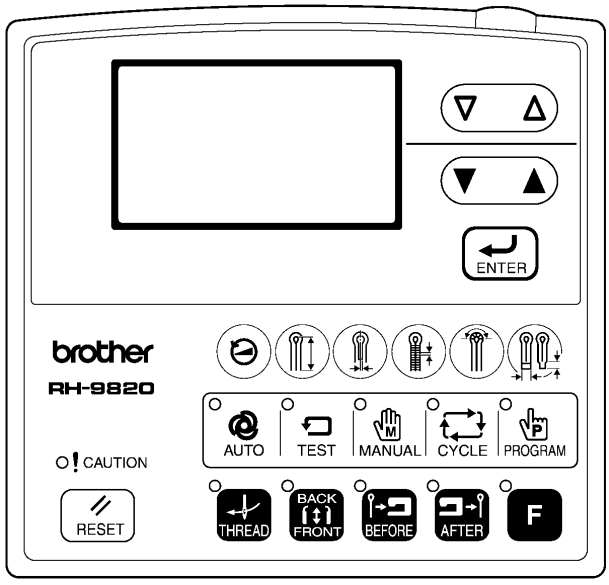


Push the power switch at the ON side to turn on the power.



5056Q

1	Memory switch setting mode (Standard) PROGRAM + ON Refer to the Instruction manual.	**6**	Output checking function ▽ + ON Refer to “2-7. Output checking method”.
2	Memory switch setting mode (Advanced) TEST + PROGRAM + ON Refer to “2-3. Memory switch setting method (Advanced)”.	**7**	Software version display function ▲ + ON Refer to “2-8. Software version checking method”.
3	Data initialization function RESET + ON Refer to the Instruction manual.	**8**	Data read/write mode TEST + F + ON Refer to “3-3. Data read/write mode”.
4	Error log display function ▼ + ON Refer to “2-5. Error history checking method”.	**9**	Home position adjustment mode ▼ ▲ + ON Refer to “7-33. Adjusting the looper base home position” “7-34. Adjusting the feed base X home position and Y home position”.
5	Input checking function △ + ON Refer to “2-6. Input checking method”.	**10**	Upper shaft stop position adjustment mode ▽ △ + ON Refer to “7-36. Adjusting the upper shaft stop position”.

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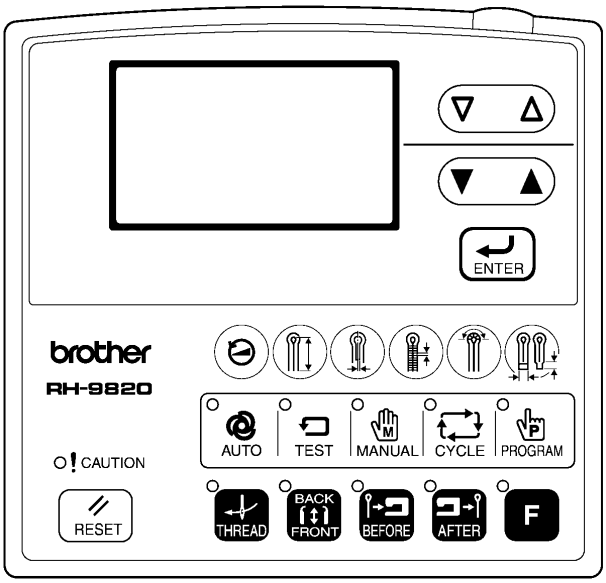
2-2. List of advanced functions

This section contains a list of advanced functions and the key operations which are used to call the setting mode for the functions.



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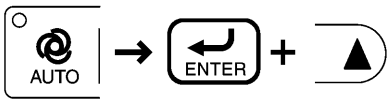
1	Production counter setting mode  Refer to the Instruction manual.
2	Data read/write mode  Refer to “3-3. Data read/write mode”.

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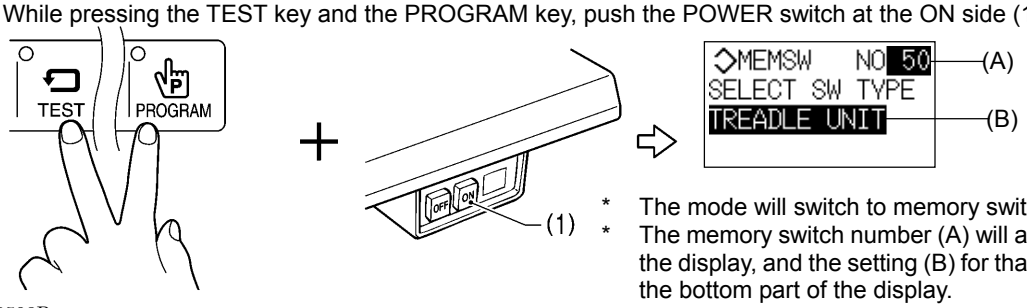
2-3. Memory switch setting method (Advanced)

The settings for the memory switches are valid for all programs.

1 While pressing the TEST key and the PROGRAM key, push the POWER switch at the ON side (1).



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* The mode will switch to memory switch mode.
* The memory switch number (A) will appear in the top part of the display, and the setting (B) for that number will appear in the bottom part of the display.

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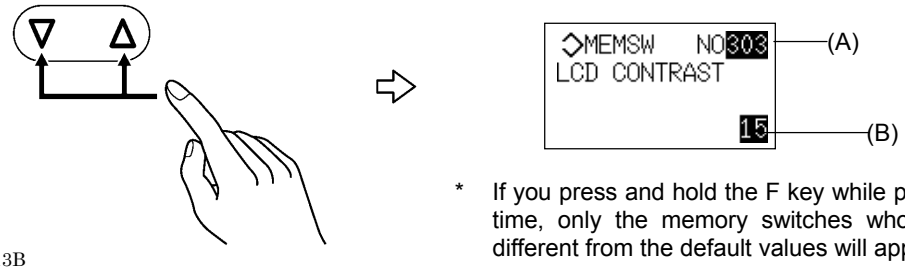
2 Select the number (A) for the memory switch that you would like to change the setting for.



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* If you press and hold the F key while pressing the △ or ▽ key at this time, only the memory switches whose current setting values are different from the default values will appear.

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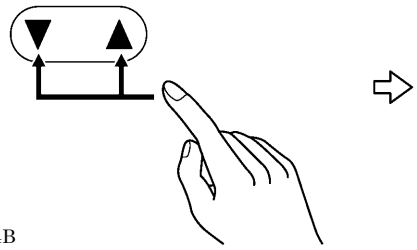
3 Change the memory switch setting (B).



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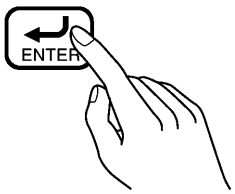
* If you would like to return the setting which is currently being displayed to the default value, press the RESET key.
* If the memory switch setting is different from the original setting, the display will flash.

4 Apply the changed setting.



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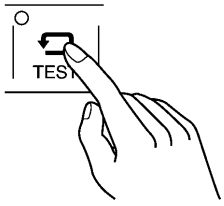
The setting for the memory switch will be stored and (B) will stop flashing and illuminate steadily.

NOTE:
The changed settings will be enabled after memory switch mode has been exited.

5 Repeat steps 2 to 4 above to change other memory switch settings.

6 **[To exit memory switch mode]**



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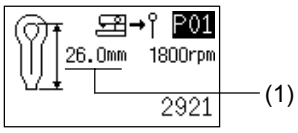
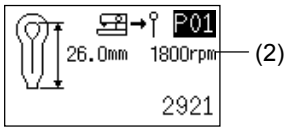
Normal sewing machine operation will then be possible.

2-4. List of memory switch settings

Memory switches which have a "*" in the default value column (050, 752, 850, 851, 852 and 853) are ignored when memory switch initialization is carried out.
The settings for these memory switches are only changed when the ENTER key is pressed in memory switch mode.

For operator

No.	Setting range	Setting items	Default value
001	Switching between 1-pedal and 2-pedal operation * Displayed when using a hand start switch or 2-pedal foot switch		2
	1	When the start switch is pressed, the work clamp is lowered and the sewing machine starts.	
	2	When the start switch is pressed, the work clamp is lowered. After that, the sewing machine starts operating when the start switch is pressed.	
300	F key assignment		OFF
	OFF	The Help screen is displayed while the F key is being pressed.	
	1 - 40	Operates as a 7th shortcut key. * The numerals indicate the parameter numbers.	
301	Parameter checking column (1) in automatic mode		1
	1	Shows the sewing length.	
	2	Shows the sewing pitch.	
302	Parameter checking column (2) in automatic mode		3
	3	Shows the sewing speed.	
	4	Shows the number of stitches.	
303	Display screen contrast		15
	0 - 30	The higher the value, the greater the contrast.	
500	Number of eyelet buttonholes when the fly indexer is used * This is displayed when the fly indexer is enabled.		2
	2 - 9	The number of eyelet buttonholes can be set. * If the number of buttonholes is 5 or more, a cloth feed bar (sold separately) is required.	
501	Fly setting position when the fly indexer is used * This is displayed when the fly indexer is enabled.		2
	1	The material (fly) setting position is always at the left edge. After sewing is finished, the cloth feed bar returns to the left edge.	
	2	The material (fly) setting position repeatedly alternates between the left and right edges.	

Work clamp settings

No.	Setting range	Setting items	Default value
050	Sewing machine starting procedure * This is not overwritten by CF card data.		*
		Hand start switch or 2-pedal foot switch	
		Treadle	
051	Delay time for 1-pedal operation when cutting before sewing is set (ms) * This is displayed when 1-pedal operation is being used.		0
	0 - 800	When carrying out automatic sewing with cutting before sewing, the hammer operates only after the set delay time has passed. Setting can be carried out in units of 50 ms.	
052	Work clamp operating position for treadle * This is displayed when treadle operation is being used.		115
	105 - 125	When a smaller value is set, the amount that the treadle is depressed to reach the work clamp operating position becomes smaller.	
053	Sewing machine starting position for treadle * This is displayed when treadle operation is being used.		155
	135 - 175	When a smaller value is set, the amount that the treadle is depressed to reach the sewing machine starting position becomes smaller.	
054	Work clamp raising operation position for treadle * This is displayed when treadle operation is being used.		75
	65 - 85	When a larger value is set, the amount that the treadle is depressed backward to reach the work clamp raising operating position becomes smaller.	
055	Work clamp operation standby for treadle * This is displayed when treadle operation is being used.		OFF
	OFF	After the work clamp has been lowered, the work clamp is raised when the treadle is moved to the neutral position.	
	ON	After the work clamp has been lowered, the work clamp is held in the lowered position even when the treadle is moved to the neutral position, and the work clamp is raised when the treadle is depressed backward.	
056	Work clamp down operation when feed base is forward		OFF
	OFF	When the feed base moves to the forward setting position after sewing is finished, the work clamp moves while it is still raised.	
	ON	When the feed base moves to the forward setting position after sewing is finished, the work clamp moves while being lowered at the same time, and once the work clamp finishes moving, it is raised.	
057	Work clamp raising allowed during test feeding		OFF
	OFF	Raising of the work clamp is not allowed during test feeding.	
	ON	The work clamp can be raised during test feeding when the following operations are carried out. (A) For hand start switch or 2-pedal foot switch operation: Press the work clamp switch. (B) For treadle operation: Depress the treadle backward. When test feeding is carried out again, the following operations must be carried out to lower the work clamp. (A) For hand start switch or 2-pedal foot switch operation: Press the work clamp switch. (B) For treadle operation: Depress the treadle.	
058	Work clamp operation after automatic sewing is finished		OFF
	OFF	After automatic sewing is finished, work clamp is raised.	
	ON	After automatic sewing is finished, work clamp remains lowered. To raise the work clamp, carry out the following operations. (A) For hand start switch or 2-pedal foot switch operation: Press the work clamp switch. (B) For treadle operation: Depress the treadle backward. * When using the fly indexer, this function is disabled.	

Upper shaft control settings

No.	Setting range	Setting items	Default value
150	Needle up stop when operation is paused		ON
	OFF	Upper shaft stops immediately when sewing is paused.	
	ON	Upper shaft stops at needle up stop position when sewing is paused.	
151	Upper shaft speed correction (rpm)		0
	-30 - 30	Correction can be carried out with respect to the setting speed. Setting can be carried out in units of 10 rpm.	
152	Upper shaft final stitch speed (rpm)		800
	700 - 900	The speed for the final stitch can be set. Setting can be carried out in units of 10 rpm.	
153	Upper shaft speed immediately before stopping (rpm)		350
	250 - 450	The speed immediately before stopping can be set. Setting can be carried out in units of 10 rpm.	
154	Current limit value during upper shaft acceleration		8
	1 - 8	When a larger value is set, a larger amount of current flows during acceleration.	
155	Current limit value during upper shaft deceleration		1
	1 - 8	When a larger value is set, a larger amount of current flows during deceleration.	
156	Upper shaft stopping distance (°)		11
	2.5 - 17.5	When a larger value is set, the interval for stopping control becomes longer. Setting can be carried out in units of 0.5°.	
157	Brake release speed when upper shaft stops		3
	1 - 5	When a larger value is set, the brake is released more quickly.	

NOTE:

Do not change the settings for Nos. 151 - 157 unless specifically instructed to by the manufacturer.

Feed control settings

No.	Setting range	Setting items	Default value
250	Feed timing correction (°)		0
	-20 - 20	When a smaller value is set, the feed timing is advanced. Setting can be carried out in units of 2°.	
251	Automatic upper shaft deceleration to emphasize feeding		OFF
	OFF	Normal	
	ON	The proportional feed time for each stitch is reduced from normal in order to prevent needle deflection. * This may be limited by the sewing speed.	
252	Y axis test feeding speed correction when feed base changes to forward setting (Hz)		-2500
	-3500 - 0	When a smaller value is set, the test feeding speed in the Y axis direction becomes slower. Setting can be carried out in units of 100 Hz.	
253	X axis test feeding speed correction (Hz)		0
	-300 - 0	When a smaller value is set, the test feeding speed in the X axis direction becomes slower. Setting can be carried out in units of 50 Hz.	
254	Y axis test feeding speed correction (Hz)		0
	-2500 - 0*1	When a smaller value is set, the test feeding speed in the Y axis direction becomes slower. Setting can be carried out in units of 50 Hz.	
255	θ axis test feeding speed correction (Hz)		0
	-500 - 0	When a smaller value is set, the test feeding speed in the θ axis direction becomes slower. Setting can be carried out in units of 50 Hz.	
256	Number of home position start cycles		OFF
	OFF	After sewing is finished, home position detection is not carried out.	
	1 - 9	Home position detection is carried out for the number of sewing cycles set.	
257	X axis home position detection speed correction (ms)		0
	0 - 2.0	When a larger value is set, the home position detection speed in the X axis direction becomes slower. Setting can be carried out in units of 0.1 ms.	
258	Y axis home position detection speed correction (ms)		0
	0 - 2.0	When a larger value is set, the home position detection speed in the Y axis direction becomes slower. Setting can be carried out in units of 0.1 ms.	
259	θ axis home position detection speed correction (ms)		0
	0 - 2.0	When a larger value is set, the home position detection speed in the θ axis direction becomes slower. Setting can be carried out in units of 0.1 ms.	

*1… If the version of the main control program (MN) is 1.0.00, the range will be “-1000 to 0”.

Panel operation settings

No.	Setting range	Setting items	Default value
350	Disabling program mode		OFF
	OFF	Normal	
	ON	Switching to program mode is disabled. Shortcut keys are also disabled.	
351	Disabling cycle program mode		OFF
	OFF	Normal	
	ON	Switching to cycle program mode is disabled.	
352	Disabling changing of production counter		OFF
	OFF	Normal	
	ON	Changing the production counter is disabled.	
353	Disabling changing of sewing speed		OFF
	OFF	Normal	
	ON	Changing the sewing speed (parameter No. 01) is disabled.	
354	Disabling changing of program number		OFF
	OFF	Normal	
	ON	Changing the program number is disabled. * However, the steps in cycle programs can be changed.	
355	Disabling changing to cutting before sewing		OFF
	OFF	Normal	
	ON	Changing to cutting before sewing is disabled. * If cutting before sewing is the current setting before this is changed, the setting will change automatically to no cutting.	
356	Disabling changing to cutting after sewing		OFF
	OFF	Normal	
	ON	Changing to cutting after sewing is disabled. * If cutting after sewing is the current setting before this is changed, the setting will change automatically to no cutting.	

User program settings

No.	Setting range	Setting items	Default value
450	Maximum sewing speed (rpm)		2500
	1000 - 2500	A limit to the maximum sewing speed can be set. Setting can be carried out in units of 100 rpm.	
451	Maximum number of cycle programs		9
	0 - 9	The number of effective cycle programs can be set. * If cycle programs are never used, it can be useful to set this to 0.	
452	Production counter when using cycle programs		OFF
	OFF	The counter is updated each time a buttonhole is sewn.	
	ON	The counter is updated each time a single cycle is completed.	
453	Maximum cutting space (mm)		0.5
	0.5 - 0.8	This sets the maximum value for the cutting space. * If setting this to 0.8 mm, adjust so that the needle plate and the throat plate do not interfere with each other. (Refer to “7-20. Adjusting the positions of the work clamp plates”.)	
454	Maximum straight bartack length (mm)		6
	6 - 9	This sets the maximum straight bartack length. * If setting this to 9 mm, adjust so that the needle plate and the throat plate do not interfere with each other. (Refer to “7-20. Adjusting the positions of the work clamp plates”.)	
455	Additional zigzag width when no cutting is set (mm)		0
	0 - 1.0	When sewing using no cutting, the value set here is added automatically to the zigzag width. Setting can be carried out in units of 0.1 mm.	

Device settings

No.	Setting range	Setting items	Default value
550	Hammer on time (ms)		25
	25 - 200	When a larger value is set, the period of contact between the hammer and the knife becomes longer. Setting can be carried out in units of 5 ms. **Note: If this is set to a larger value than necessary, it will shorten the useful life of the hammer and the knife.**	
551	Hammer home position recognition height		160
	150 - 170	In the standby condition, an error (E650) will occur if the value which is read by the hammer position sensor is less than this value. * This setting is enabled when hammer home position error checking is enabled.	
552	Hammer home position error checking		ON
	OFF	Hammer home position error checking disabled * This is used when there is a problem with the hammer position sensor.	
	ON	Hammer home position error checking enabled	
553	Verification of hammer raised position using timer (ms)		OFF
	OFF	Verification of the hammer raised position is carried out based on the hammer position sensor.	
	50 - 500	Verification of the hammer raised position is carried out based on the timer. Setting can be carried out in units of 50 ms. * This is used when there is a problem with the hammer position sensor.	
554	Verification of hammer lowered position using timer (ms)		OFF
	OFF	Verification of the hammer lowered position is carried out based on the hammer position sensor.	
	100 - 500	Verification of the hammer lowered position is carried out based on the timer. Setting can be carried out in units of 100 ms. * This is used when there is a problem with the hammer position sensor.	
555	Upper thread remaining amount increase (mm)		OFF
	OFF	Normal	
	1 - 3	By delaying the upper thread trimming timing by the amount set, it is possible to increase the amount of upper thread remaining from normal. Setting can be carried out in units of 1 mm.	
556	Upper thread tension release off timing (ms) * This is only displayed for -00 and -01 specifications.		50
	0 - 100	When a larger value is set, the upper thread release off timing is delayed after upper thread trimming. Setting can be carried out in units of 2 ms. * This is only enabled for -00 and -01 specifications.	
557	Upper thread tension release off timing (ms) * This is only displayed for -02 specifications.		50
	0 - 100	When a larger value is set, the upper thread release off timing is delayed after upper thread trimming. Setting can be carried out in units of 2 ms. * This is only enabled for -02 specifications.	
558	Disabling use of lower thread trimmer * This is only displayed for -01 and -02 specifications.		OFF
	OFF	Normal (lower thread trimmer operates)	
	ON	Operation of the lower thread trimmer is disabled. * This is only enabled for -01 and -02 specifications.	
559	Verification of lower thread trimming off using timer (ms) * This is only displayed for -01 and -02 specifications.		OFF
	OFF	Verification that the lower thread trimmer is off is carried out based on the lower thread trimming off sensor.	
	5 - 50	Verification that the lower thread trimmer is off is carried out based on the timer. Setting can be carried out in units of 5 ms. * This is used when there is a problem with the lower thread trimming off sensor. * This is only enabled for -01 and -02 specifications.	

No.	Setting range	Setting items	Default value
560	Lower thread trimming timing (ms) * This is only displayed for -02 specifications.		0
	0 - 100	When a larger value is set, the lower thread trimming timing is delayed by more. Setting can be carried out in units of 5 ms. * This is only enabled for -02 specifications.	
561	Upper thread breakage detector (option) * This is not overwritten by CF card data.		OFF
	OFF	Upper thread breakage detector is disabled.	
	ON	Upper thread breakage detector is enabled.	
562	Number of stitches before upper thread breakage is detected * This is displayed when the upper thread breakage detector is enabled.		5
	1 - 9	Upper thread breakage detection starts after the set number of stitches has been sewn.	
563	Number of stitches for upper thread breakage judgment		4
	2 - 7	An upper thread breakage error occurs when the upper thread breakage signal is continuously on for the set number of stitches.	
564	Upper thread nipper device (option) * This is not overwritten by CF card data.		OFF
	OFF	Upper thread nipper device is disabled.	
	ON	Upper thread nipper device is enabled.	
565	Upper thread nipper device closing timing correction (mm) * This is displayed when the upper thread nipper device is enabled.		0
	-10 - 10	When a larger value is set, the upper thread nipping timing is delayed by more. Setting can be carried out in units of 1 mm.	
566	Lapel device (option) * This is not overwritten by CF card data.		OFF
	OFF	Lapel device is disabled.	
	ON	Lapel device is enabled. * When a straight buttonhole program is selected, the sub-hammer is lowered. * The material setting position is automatically set to the forward position.	
567	Program number loaded based on straight buttonhole sensor * This is displayed when the lapel device is enabled.		OFF
	OFF	Normal	
	1 - 20	When there is no material underneath the straight buttonhole sensor, the program number which has been set is loaded, and the sub-hammer is lowered.	
568	Program number for sub-hammer to be always lowered * This is displayed when the lapel device is enabled.		OFF
	OFF	Normal	
	1 - 20	When the program number that has been set is sewn, the sub-hammer is always lowered. * This is not affected by the status of the straight buttonhole sensor or the program settings (eyelet pattern).	
569	Error checking for straight buttonhole sensor * This is displayed when the lapel device is enabled.		OFF
	OFF	Error checking disabled	
	ON	Error checking enabled An error (E942) occurs in the following cases. (A) When there is material underneath the sensor and an attempt is made to sew a straight buttonhole program (B) When there is no material underneath the sensor and an attempt is made to sew an eyelet buttonhole program	

No.	Setting range	Setting items	Default value
570	Sub-hammer on time (ms) * This is displayed when the lapel device is enabled.		5
	5 - 100	When a larger value is set, the period of contact between the sub-hammer and the knife becomes longer. Setting can be carried out in units of 5 ms. **Note: If this is set to a larger value than necessary, it will shorten the useful life of the sub-hammer and the knife.**	
571	No cutting operation using straight buttonhole sensor		OFF
	OFF	Normal	
	ON	When sewing when there is no material underneath the straight buttonhole sensor, no cutting is carried out, regardless of the cutting operation setting on the panel.	
572	Fly indexer (option) * This is not overwritten by CF card data.		OFF
	OFF	Fly indexer is disabled.	
	ON	Fly indexer is enabled.	

* If No. 567 and No. 568 have both been set, only the setting for No. 567 will be enabled.
* If No. 567 and No. 569 have both been set, only the setting for No. 567 will be enabled.
* If No. 568 and No. 569 have both been set, both settings will be enabled.
* If No. 567 and No. 568 and No. 569 have all been set, only the setting for No. 567 will be enabled.

Error processing settings

No.	Setting range	Setting items	Default value
650	Time before buzzer stops sounding (seconds)		OFF
	OFF	When an error occurs, the buzzer keeps sounding until the error is cleared.	
	5 - 15	When an error occurs, the buzzer sounds for the set time and then stops. It can be set in units of 5 sconds.	
651	Pulse motor energization status when a non-resettable error occurs		OFF
	OFF	When a non-resettable error occurs, pulse motor energization is turned off.	
	ON	When a non-resettable error occurs, pulse motor energization remains on.	
652	Checking errors caused by box fan stopping * The box fan is not currently installed.		OFF
	OFF	No checking of errors caused by box fan stopping.	
	ON	Checking of errors caused by box fan stopping.	

Assembly and maintenance settings

No.	Setting range	Setting items	Default value
750	Continuous sewing permission		OFF
	OFF	Normal	
	ON	Continuous sewing is allowed. Continuous sewing can be carried out by keeping the start switch pressed.	
751	Continuous sewing interval (ms) * This is displayed when continuous sewing is allowed.		1000
	0 - 2500	The continuous sewing interval can be set. Setting can be carried out in units of 100 ms.	
752	X cutting position correction value (mm) * This is not overwritten by CF card data.		*
	-0.50 - 0.50	The setting value is added as the X cutting position correction value for all programs. Setting can be carried out in units of 0.05 mm.	

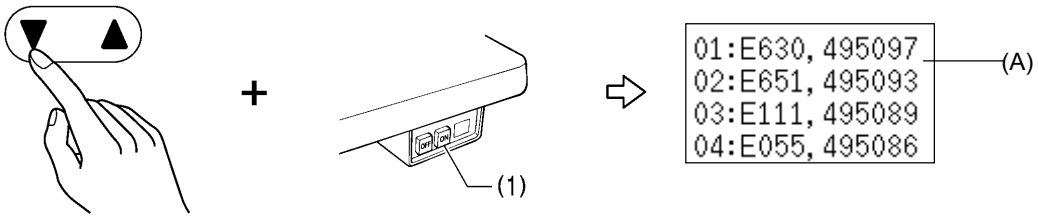
Specifications and destination settings

No.	Setting range	Setting items	Default value
850	Machine head specifications * This is not overwritten by CF card data. **NOTE: Always be sure to set this to match the machine head specifications.**		*
	-00	Sets to -00 specifications.	
	-01	Sets to -01 specifications.	
	-02	Sets to -02 specifications.	
851	Work clamp size * This is only displayed for -02 specifications. * This is not overwritten by CF card data. **NOTE: Always be sure to set this to match the work clamp specifications.**		*
	L1422	Sets to L1422 specifications. The setting range for the sewing length will be 14 - 22 mm.	
	L1826	Sets to L1826 specifications. The setting range for the sewing length will be 18 - 26 mm.	
	L2230	Sets to L2230 specifications. The setting range for the sewing length will be 22 - 30 mm.	
	L2634	Sets to L2634 specifications. The setting range for the sewing length will be 26 - 34 mm.	
	L3442	Sets to L3442 specifications. The setting range for the sewing length will be 34 - 42 mm.	
852	Circular stitch work clamp * This is only displayed for -00 and -01 specifications. * This is not overwritten by CF card data. **NOTE: Always be sure to set this to match the work clamp specifications.**		*
	OFF	When using a normal (not circular stitch) work clamp	
	ON	When using a circular stitch work clamp Parameters only for circular stitches will be displayed when programming.	
853	Language * This is not overwritten by CF card data.		*
	English Japanese Chinese Spanish German French Italian Turkish Portuguese Indonesian Vietnamese (Ver. 1.1.00 or later) Russian (Ver. 1.1.00 or later)	The language can be selected from 12 available languages.	
854	Sewing fold point correction value (mm)		OFF
	OFF	Normal	
	6	Straight buttonholes can be formed with the eyelet knife still installed. At this time, the sewing fold point will be 6 mm forward of the normal point. In addition, the maximum sewing length for straight buttonholes will be 6 mm smaller than normal. * This is enabled when sewing straight buttonholes.	

2-5. Error history checking method

The past error history can be checked by the following procedure.

1 While holding down the ▼ key, push the POWER switch at the ON side (1).



The error history (A) will be displayed. (The display starting from the left side will be: history number, error code and production counter.)

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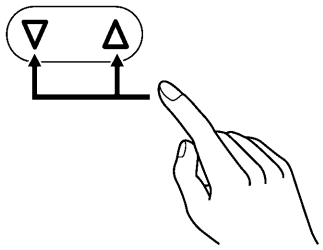
2 When the △ or ▽ key is pressed, the history numbers will change.



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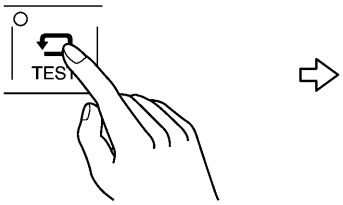
* Up to 64 history events can be recorded, starting from the latest to be recorded. (No. 1 will be the latest error that has occurred.)

3 **[To exit error history checking mode]**

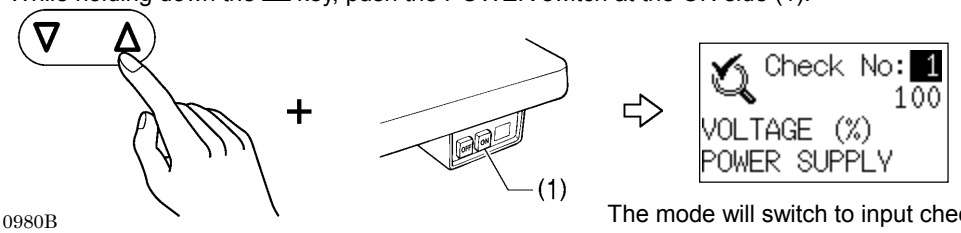
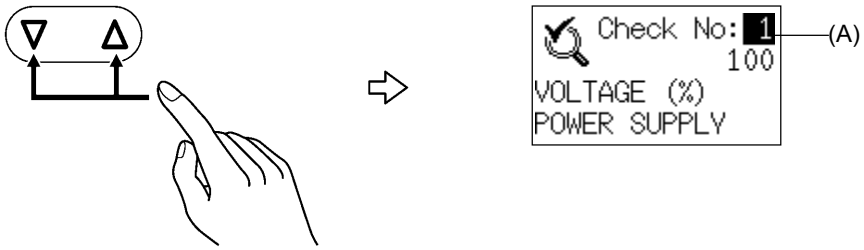


0448B

The sewing machine will change to home position detection standby.

2-6. Input checking method

Use this to check for any malfunctions of the operation panel keys, circuit boards or sensors, and for checking for broken cords and for adjusting sensor positions. This checks if the CPU is reading signals from the key and the sensor correctly.

1	Release the air.
2	While holding down the △ key, push the POWER switch at the ON side (1).  0980B The mode will switch to input checking mode. 0732B
3	Select the check number (A) to be checked.  0413B 0732B
4	Refer to the input check list for key and sensor responses.
5	**[To return to normal operation]** Press the POWER switch at the OFF side to turn off the power, turn on the air, and then turn the power back on.

<Input check list>

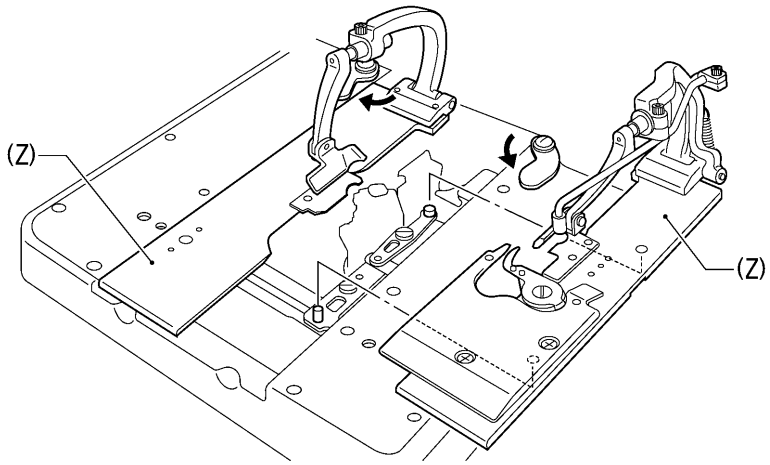
No.	Check item	Checking method	Judgment
1	Power supply voltage	→	Normally around 100%
2	X axis home position sensor	Move the feed base to the left and right by hand.	Left area: No switching ON/OFF Right area: Switches ON/OFF
3	X axis encoder signal	Move the feed base to the left and right by hand.	Left direction: Up Right direction: Down * When the power is turned on, the position will be 0.
4	Y axis home position sensor	Move the feed base forward and back by hand.	Forward area: OFF Backward area: ON
5	Y axis encoder signal	Move the feed base forward and back by hand.	Forward direction: Up Backward direction: Down * When the power is turned on, the position will be 0.
6	θ axis home position sensor	Turn the looper base by hand.	Counterclockwise turning area: No switching ON/OFF Clockwise turning area: Switches ON/OFF
7	θ axis encoder signal	Turn the looper base by hand.	Counterclockwise direction: Up Clockwise direction: Down * When the power is turned on, the position will be 0.
8	Treadle analog value	Operate the treadle.	When depressed backward: About 48 When at neutral position: About 100 When depressed forward: About 190
9	Work clamp switch	Press the work clamp switch.	ON: When pressed OFF: When not pressed
10	Start switch	Press the start switch.	ON: When pressed OFF: When not pressed
11	STOP switch connection signal	→	ON: Connected OFF: Not connected
12	STOP switch	Press the STOP switch.	ON: When pressed OFF: When not pressed
13	Machine head safety switch	Tilt back the machine head.	ON: Normal condition OFF: Machine head is tilted back
14	Hammer position sensor	→	Normally around 190
15	Lower thread trimming OFF sensor	Turn the lower thread trimming cylinder on and off manually.	ON: When cylinder is off OFF: When cylinder is on
16	Fan lock detection signal	→	ON: Fan is not operating OFF: Fan is operating
17	Zigzag sensor	Turn the upper shaft pulley by hand.	ON: Inner zigzag OFF: Outer zigzag
18	Needle up signal	Turn the upper shaft pulley by hand.	ON: Raised OFF: Not raised
19	Needle drop signal	Turn the upper shaft pulley by hand.	ON: Lowered OFF: Not lowered
20	Upper shaft encoder signal	Turn the upper shaft pulley by hand.	Normal rotation: Up Reverse rotation: Down * Normally within the range of 0 - 179. However, an unstable value may be displayed just before a single rotation is completed.

No.	Check item	Checking method	Judgment
21	▲ key	Press the corresponding key.	ON: When pressed OFF: When not pressed
22	▼ key		
23	ENTER key		
24	Shortcut 1 key		
25	Shortcut 2 key		
26	Shortcut 3 key		
27	Shortcut 4 key		
28	Shortcut 5 key		
29	Shortcut 6 key		
30	AUTO key		
31	TEST key		
32	MANUAL key		
33	CYCLE key		
34	PROGRAM key		
35	RESET key		
36	THREAD key		
37	FRONT/BACK key		
38	BEFORE key		
39	AFTER key		
40	F key		
41	Upper thread breakage detection signal	Move the upper thread back and forth inside the sensor.	ON: No moving back and forth OFF: Moving back and forth
42	Straight buttonhole position sensor	Move the sub-hammer up and down by hand.	ON: When sub-hammer is lowered OFF: When sub-hammer is raised
43	Eyelet buttonhole position sensor	Move the sub-hammer up and down by hand.	ON: When sub-hammer is raised OFF: When sub-hammer is lowered
44	Straight buttonhole sensor	Place material underneath the straight buttonhole sensor.	ON: No material underneath sensor OFF: Material underneath sensor
45	Feed plate home position sensor	Install the feed plate.	ON: Installed OFF: Not installed
46	Feed plate drive cylinder left sensor	Turn the feed plate drive cylinder on and off manually.	ON: When cylinder is off OFF: When cylinder is on
47	Feed plate drive cylinder right sensor	Turn the feed plate drive cylinder on and off manually.	ON: When cylinder is on OFF: When cylinder is off
48	External input signal 1	→	ON: Connected OFF: Not connected
49	External input signal 2	→	ON: Connected OFF: Not connected
50	Sensor input 1	This is a spare signal for special orders. (Applicable for main control program (MN) version 1.2.00 and later)	
51	Sensor input 2		

2-7. Output checking method

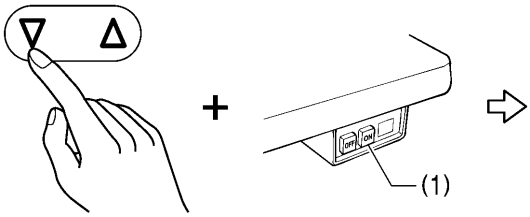
Use this to check for any malfunctions of the circuit boards, and for checking for problems with drive mechanisms and broken cords. This checks if the CPU output signal is working correctly.

NOTE:
When checking operation, the mechanisms may be obstructed and become damaged, so remove the left and right work clamp plates (Z) before checking output.



0749B

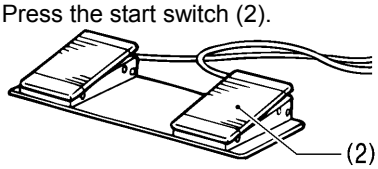
1 While holding down the ▽ key, push the POWER switch at the ON side (1).



⇨ The sewing machine will switch to starting standby mode.

0981B

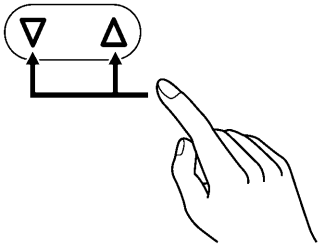
2 Press the start switch (2).



⇨ The feed base will move to the home position.

0982B

3 Select the check number (A) to be checked.



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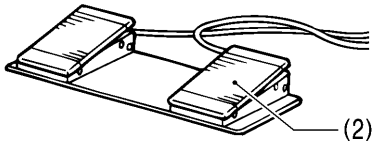
⇨

* Refer to the output check list for the details of signals being checked.

0731B

4 Press the start switch (2).



⇨ The operation corresponding to the signal being checked will be carried out.

0982B

5 **[To return to normal operation]**

Press the POWER switch at the OFF side to turn off the power, and then turn the power back on.

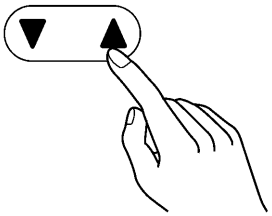
<Output check list>

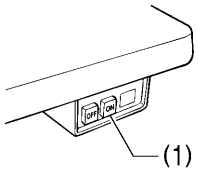
No.	Check item	Operation
1	Work clamp	The work clamp will be lowered while the start switch is being pressed.
2	Spreader	The spreader will open while the start switch is being pressed.
3	Upper thread take-up	The thread take-up lever will be lowered while the start switch is being pressed.
4	Lower tension release	The lower tension will be released for 0.1 seconds. * An error will not occur if the machine head is tilted back.
5	Gimp clamp	The gimp thread will be pressed for 0.1 seconds. * -02 specifications only
6	X-axis motor	The buzzer will sound for 0.7 second, and then the work clamp will be lowered, the spreader will open and the feed base will move +20 mm in the Y axis direction. The feed base will then oscillate in the X axis direction within a range of -6 mm to +6 mm. It will stop when the start switch is released.
7	Y-axis motor	The buzzer will sound for 0.7 second, and then the work clamp will be lowered and the spreader will open. The feed base will then oscillate in the Y axis direction within a range of 0 mm to +65 mm. It will stop when the start switch is released.
8	θ-axis motor	The buzzer will sound for 0.7 second, and then the work clamp will be lowered and the spreader will open. The looper base will then oscillate in the θ axis direction within a range of -49.5° to +364.5°. It will stop when the start switch is released.
9	Upper shaft motor	The buzzer will sound for 0.7 second, and then the work clamp will be lowered and the upper shaft motor will start. It will stop when the start switch is released. The upper shaft encoder value (stop position) will be displayed immediately after the upper shaft stops. Normally a value of about 166 should be displayed. The speed (1000 - 2500 rpm) can be changed using the ▲ and ▼ keys while the upper shaft is stopped. **NOTE:** **Remove the thread before carrying out this check in order to prevent needle breakages.**
10	Hammer	The buzzer will sound for 0.7 second, and then the work clamp will be lowered and the hammer will be lowered. **NOTE:** **This operation is dangerous, so check to make sure that there are no hands or other objects underneath the hammer before carrying out the check.**
11	Upper thread trimming	The buzzer will sound for 0.7 second, and then the θ shaft will turn 180° and upper thread trimming will turn on.
12	Lower thread trimming	-01 specifications: The buzzer will sound for 0.7 second, and then the work clamp will be lowered and the spreader will open, and then the θ shaft will turn 135° and lower thread trimming will turn on. -02 specifications: The buzzer will sound for 0.7 second, and then the spreader will open, and then the θ shaft will turn 180° and lower thread trimming will turn on.
13	Buzzer	The buzzer will sound while the start switch is being pressed.

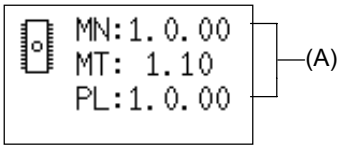
No.	Check item	Operation
14	Panel indicators	The 11 panel indicators will illuminate one by one.
15	Upper tension release	The upper tension will be released while the start switch is being pressed.
16	X axis encoder	The buzzer will sound for 0.7 second, and then the work clamp will be lowered, the spreader will open and the feed will move +20 mm in the Y axis direction. The feed will then oscillate in the X axis direction within a range of -6 mm to +6 mm. It will stop when the start switch is released. * Encoder offset is measured and displayed during operation.
17	Y axis encoder	The buzzer will sound for 0.7 second, and then the work clamp will be lowered and the spreader will open. The feed will then oscillate in the Y axis direction within a range of 0 mm to +65 mm. It will stop when the start switch is released. * Encoder offset is measured and displayed during operation.
18	θ axis encoder	The buzzer will sound for 0.7 second, and then the work clamp will be lowered and the spreader will open. The looper base will then oscillate in the θ axis direction within a range of -49.5° to +364.5°. It will stop when the start switch is released. * Encoder offset is measured and displayed during operation.
19	Upper thread nipper device vertical movement	The upper thread nipper device will be lowered while the start switch is being pressed. * Only with the upper thread nipper device
20	Upper thread nipper device forward/back movement	The upper thread nipper device will move forward while the start switch is being pressed. * Only with the upper thread nipper device
21	Upper thread nipper device opening/closing	The upper thread nipper device will open while the start switch is being pressed. * Only with the upper thread nipper device
22	Sub-hammer	After the feed base has moved forward, the sub-hammer will be lowered. * Only with the lapel device
23	Indexer feed plate auxiliary clamp arm	The feed plate auxiliary clamp arm of the fly indexer will turn on while the start switch is being pressed. * Only with the fly indexer
24	Indexer chuck	The chuck of the fly indexer will turn on while the start switch is being pressed. * Only with the fly indexer
25	Indexer feed plate	The feed plate of the fly indexer will move to the right while the start switch is being pressed. * Only with the fly indexer
26	Valve output 1	This is a spare signal for special orders. (Applicable for main control program (MN) version 1.2.00 and later)
27	Valve output 2	
28	Valve output 3	
29	Valve output 4	

2-8. Software version checking method

1 While holding down the ▲ key, push the POWER switch at the ON side(1).

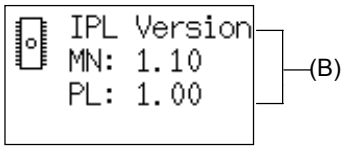






The control program versions (A) will be displayed.
MN … Main control program
MT … Motor control program
PL … Panel control program

When the F key is pressed, the IPL versions (B) will be displayed.

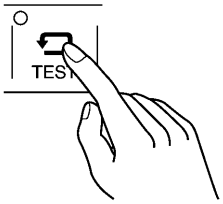


0983B
0452B

MN … Main IPL
PL … Panel IPL

0721B
0710B

2 **[To exit version checking mode]**



The sewing machine will change to home position detection standby.

0448B

3. READING/WRITING DATA

3-1. Precautions when handling CF cards (commercially available)

- Use CF cards with a capacity of 32, 64, 128 or 256 MB.
- Do not attempt to disassemble or modify the CF cards.
- Do not forcibly bend, drop or scratch CF cards or place heavy objects on top of them.
- Do not allow CF cards to come into contact with liquids such as water, oil, solvents or drinks.
- Use and store the CF cards in places that are free from strong magnetic fields and electronic interference.
- Do not use or store the CF cards in places which are subject to vibration, shocks, direct sunlight, dust from items such as thread scraps, high humidity, sudden changes in temperature, or strong magnetic fields from equipment such as speakers.
- Do not subject the CF cards to vibration or shocks or remove them from the sewing machine while data reading or writing is in progress.
- The data on the CF cards may become lost or corrupted due to some malfunction or accident. It is recommended that you make backups of important data.
- Be sure to turn off the power for the sewing machine before inserting and removing CF cards.
- CF cards are already formatted at the time of purchase, so do not reformat them.
- The recommended CF cards are commercially-available ones from SanDisk or HAGIWARA SYS-COM. CF cards from other manufacturers can be used, but different formatting methods may mean that reading from or writing to such cards may not be possible.

For more information, refer to the documentation provided with the CF card.

* This product is compatible with CF cards that have been formatted using the FAT16 method. Cards that have been formatted using the FAT32 method cannot be used.

* CF™ is a trademark of SanDisk Corporation.

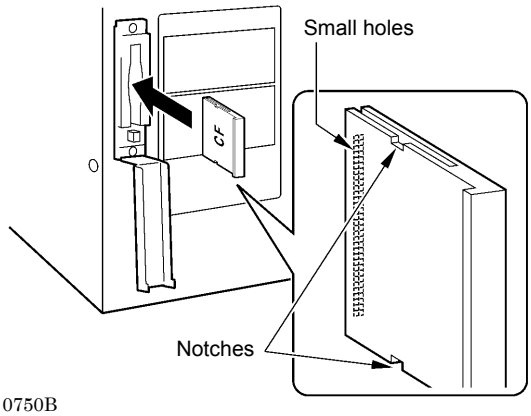
* Company names and product names appearing in this manual are trademarks or registered trademarks of the respective owners. However, no TM or other similar symbols appear in the main text of this manual.

3-2. Structure of a CF card folder

Data type	Folder name	Filenames
Error logs	\BROTHER\ISM\ISMDC00\ISMLDT00\	E*******.LDT ← Error log M*******.LDT ← Memory switches * ****** is a name unique to the sewing machine.
Memory switches	\BROTHER\ISM\ISMDC00\	ISMMSW.SEW
Parameter data	As above	ISMUPG.SEW
Main control program	\BROTHER\ISM\ISMSYS\	ISM03MN.MOT
Panel control program	As above	ISM03PL.MOT

3-3. Data read/write mode

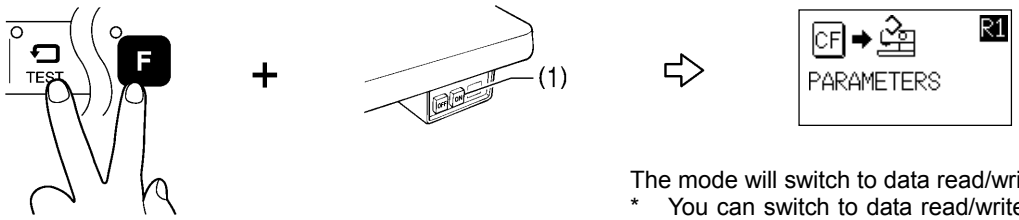
1 With the power turned off, insert the CF card into the CF slot.



0750B

NOTE:
- Make sure the CF card is facing the correct way. (The side with the notches should be facing toward the left, and the side with the small holes should be facing toward the CF slot when the card is inserted.)
- Always be sure to keep the cover closed except when inserting and removing the CF card. If this is not done, dust may get inside and cause problems with operation.

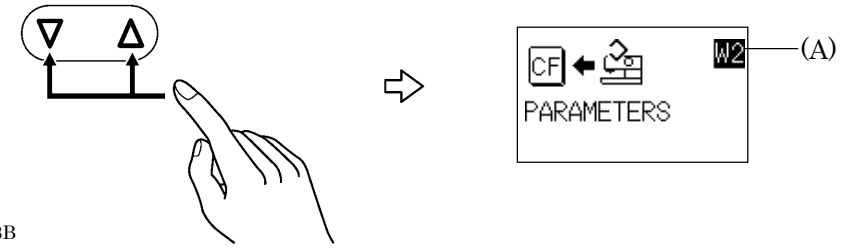
2 While pressing the TEST key and the F key, push the POWER switch at the ON side(1). 0725B



0984B

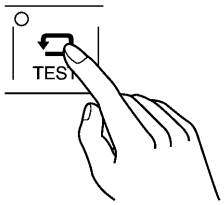
The mode will switch to data read/write mode.
* You can switch to data read/write mode by pressing the TEST key and the F key together, even when in test mode.

3 Select the desired read/write code (A). (Refer to **<Read/write code list>** given below.)



0413B 0727B

4 **[To exit data read/write mode]**

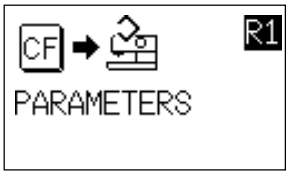


0448B

<Read/write code list>

Code	Setting items
R1	Parameter data is read from the CF card.
W2	Parameter data is written to the CF card.
R3	Memory switch settings are read from the CF card.
W4	Memory switch settings are written to the CF card.
R5	The main control program is read from the CF card and used to update the firmware version.
W6	The error log is written to the CF card.
R7	The panel control program is read from the CF card and used to update the firmware version.

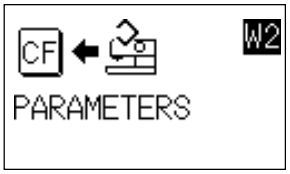
3-4. Reading parameter data from the CF card



0723B

1. Select R1 in data read/write mode.
2. Press the ENTER key.
   The parameter data for all programs on the CF card will be read.
   Once reading is complete, a “COMPLETED” message and the power off symbol will be displayed.
3. Push the POWER switch to the OFF side to turn off the power, and then turn the power back on again.

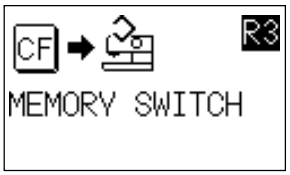
3-5. Writing parameter data to the CF card



0727B

1. Select W2 in data read/write mode.
2. Press the ENTER key.
   The parameter data for all programs in the sewing machine will be written to the CF card.
   Once writing is complete, the buzzer will sound.
3. Press the TEST key.
   Data read/write mode will end.

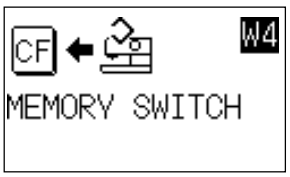
3-6. Reading memory switch data from the CF card



0724B

1. Select R3 in data read/write mode.
2. Press the ENTER key.
   The memory switch data will be read from the CF card (except for some memory switch data).
   * Memory switch data relating to specifications and devices (050, 561, 564, 566, 572, 752, 850, 851, 852 and 853) will not be read.
     Once writing is complete, a “COMPLETED” message and the power off symbol will be displayed.
3. Push the POWER switch to the OFF side to turn off the power, and then turn the power back on again.

3-7. Writing memory switch data to CF cards



0728B

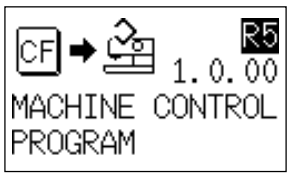
1. Select W4 in data read/write mode.
2. Press the ENTER key.
   All memory switch data from the sewing machine will be written to the CF card.
   Once writing is complete, the buzzer will sound.
3. Press the TEST key.
   Data read/write mode will end.

3-8. Writing error log data to the CF card

0729B

1. Select W6 in data read/write mode.
2. Press the ENTER key.
   The error log in the sewing machine will be written to the CF card.
   The memory switch settings will also be written at this time.
   However, the file destination will be different from the one mentioned in “3-7.” above.
   Once writing is complete, the buzzer will sound.
3. Press the TEST key.
   Data read/write mode will end.

3-9. Updating the main control program



0725B

1. Select R5 in data read/write mode.
2. Press the ENTER key.
   A confirmation message will be displayed.
3. Press the ENTER key. (If you press the RESET key, the operation will be canceled.)
   Firmware updating will start. (It should take about one minute.)
   Once writing is complete, an “UPDATED SUCCESSFULLY” message and the power off symbol will be displayed.
4. Push the POWER switch to the OFF side to turn off the power, and then turn the power back on again.

3-10. Updating the panel control program

0726B

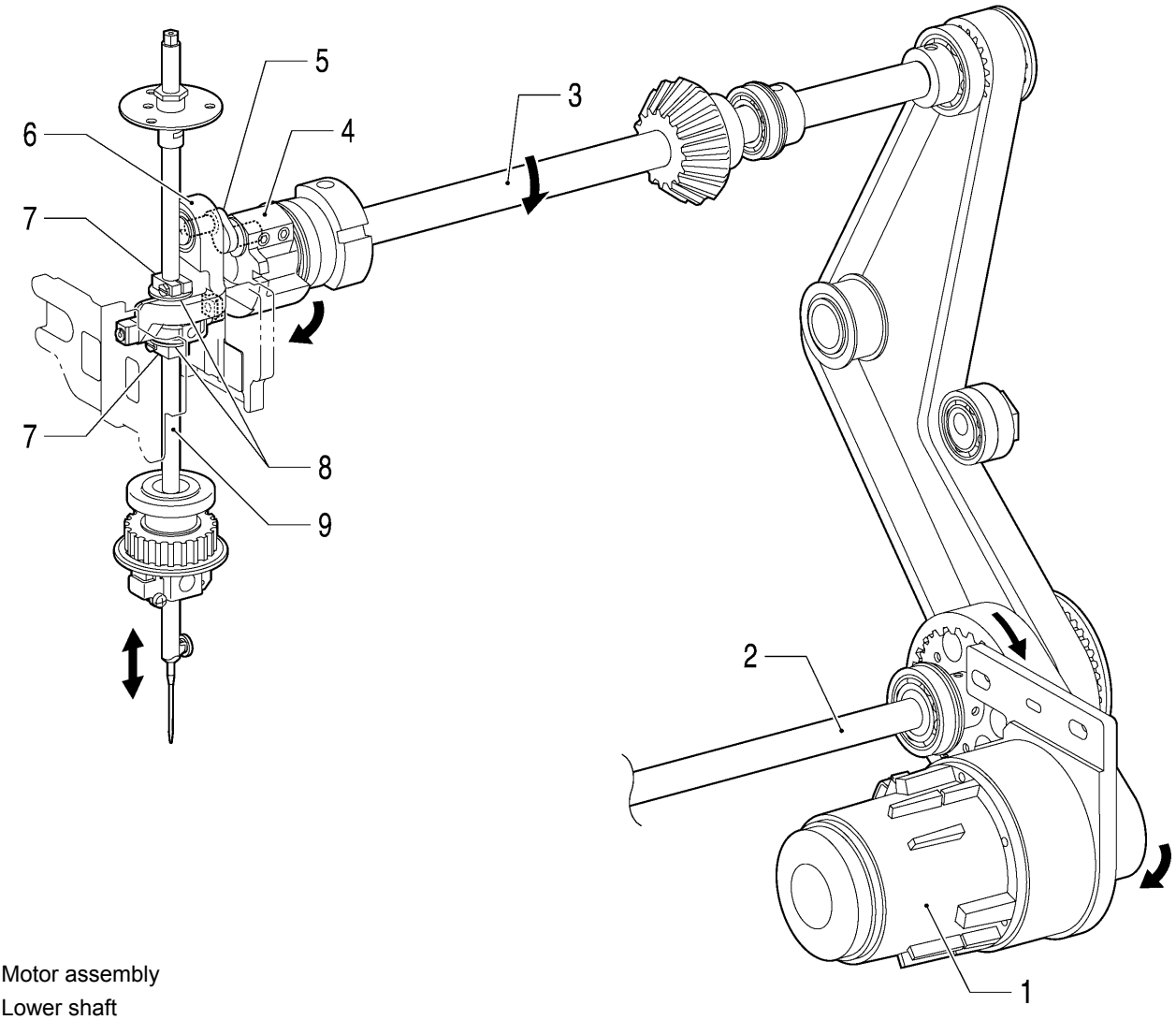
1. Select R7 in data read/write mode.
2. Press the ENTER key.
   A confirmation message will be displayed.
3. Press the ENTER key. (If you press the RESET key, the operation will be canceled.)
   Firmware updating will start. (It should take about three minutes.)
   Once writing is complete, a “COMPLETED” message and the power off symbol will be displayed.
4. Push the POWER switch to the OFF side to turn off the power, and then turn the power back on again.

4. MECHANICAL DESCRIPTIONS

Each mechanism operates in the order of the numbers shown in the illustration.

* <number> indicate the flow of operations that occur separately from each other.

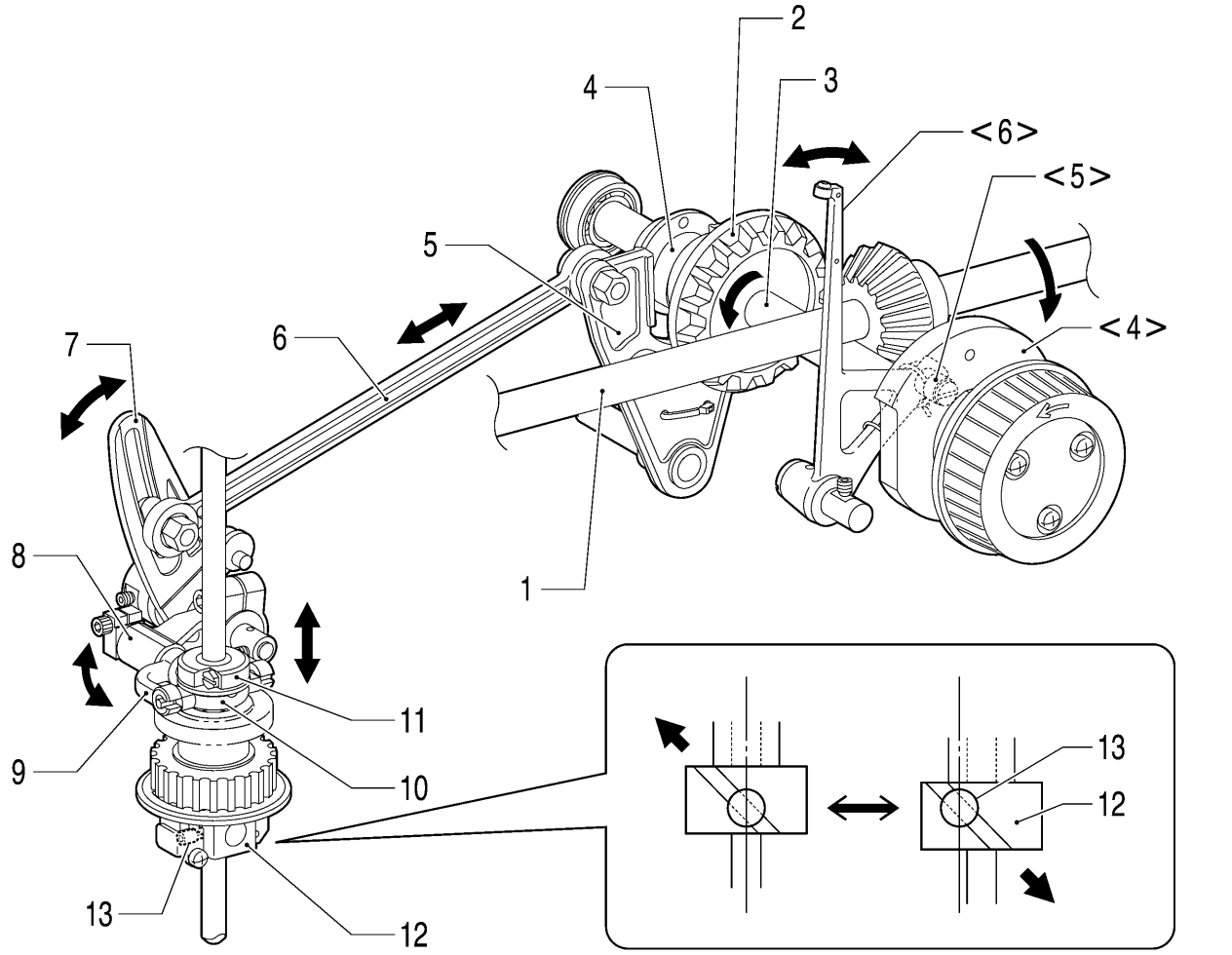
4-1. Upper shaft and Needle bar mechanisms



0658B

1. Motor assembly
2. Lower shaft
3. Upper shaft
4. Upper shaft crank
5. Needle bar crank
6. Crank rod unit
7. Needle bar clamp
8. Spacer
9. Needle bar

4-2. Zigzag and thread take-up mechanisms



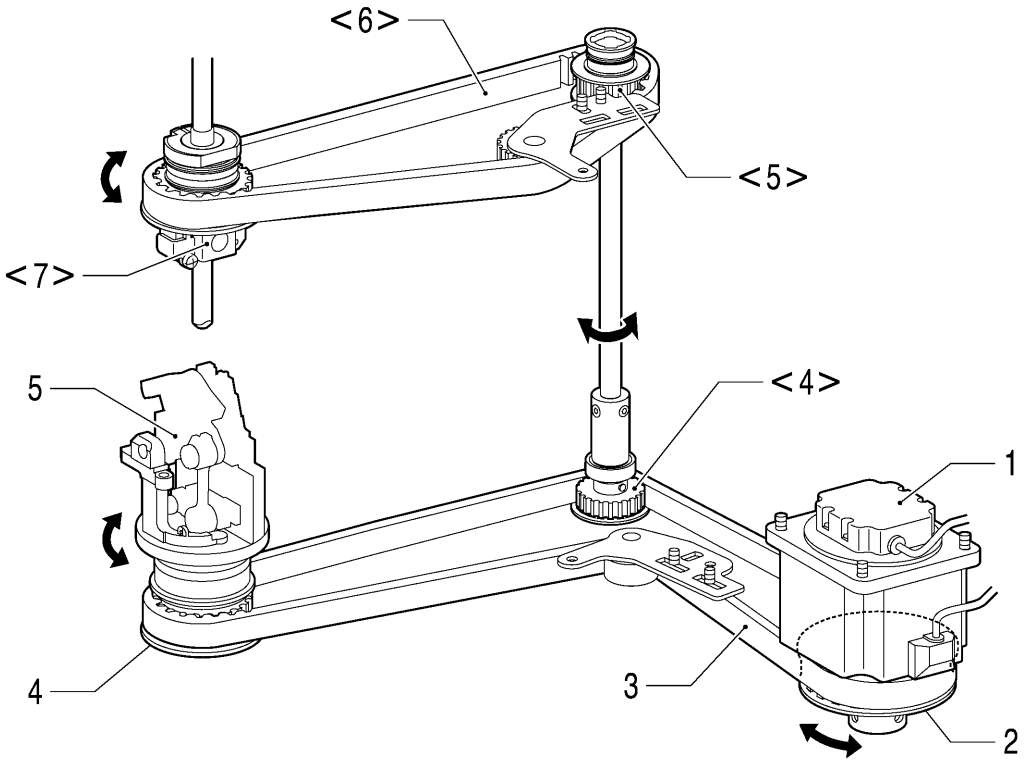
0659B

1. Upper shaft
2. Hypoid gear
3. Orthogonal shaft

4. Zigzag cam
5. Zigzag fork
6. Zigzag connecting rod
7. Zigzag crank
8. Zigzag driving lever
9. Zigzag lever
10. Zigzag horizon link
11. Needle bar block bracket
12. Needle bar block
13. Needle bar guide

<4> Roller take-up cam
<5> Thread take-up roller
<6> Thread take-up

4-3. Needle bar rocking mechanism



0660B

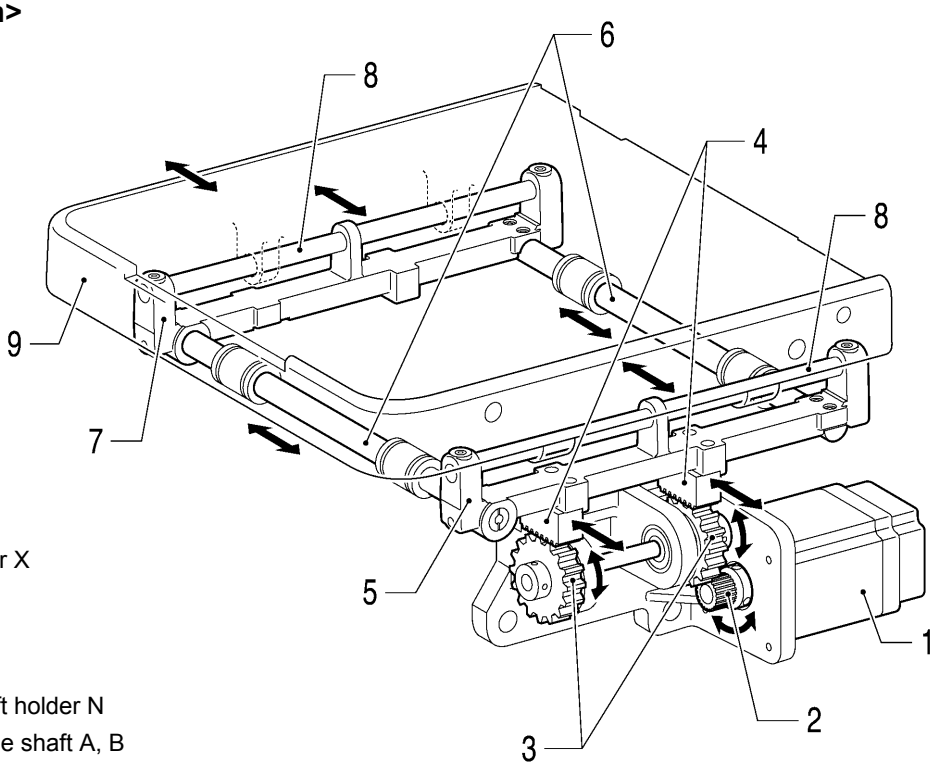
1. Pulse motor R
2. Theta M pulley assembly
3. Timing belt D

4. Looper pulley assembly
5. Looper base assembly

<4> Driving looper shaft assembly
<5> Vertical shaft timing pulley U assembly
<6> Timing belt U
<7> Needle bar gear block unit

4-4. Feed mechanism

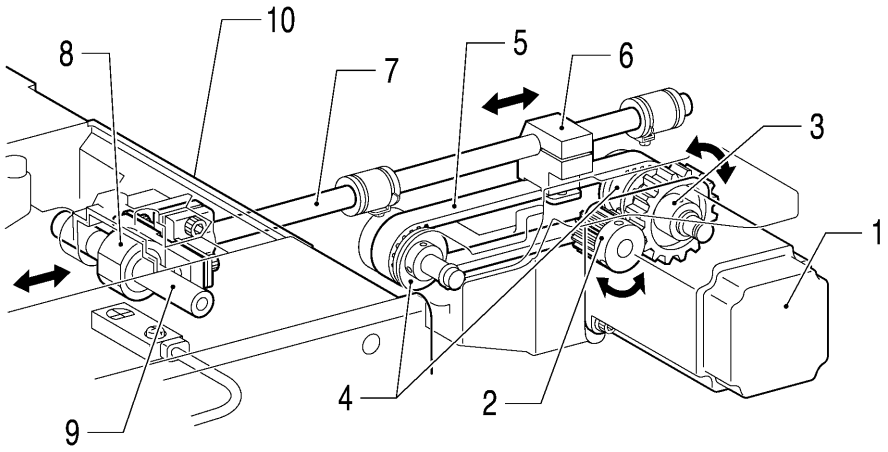
<X direction>



0661B

1. Pulse motor X
2. Feed gear
3. Idler gear
4. X rack
5. X feed shaft holder N
6. X feed guide shaft A, B
7. X feed shaft holder S
8. Y feed guide shaft
9. Feed base

<Y direction>



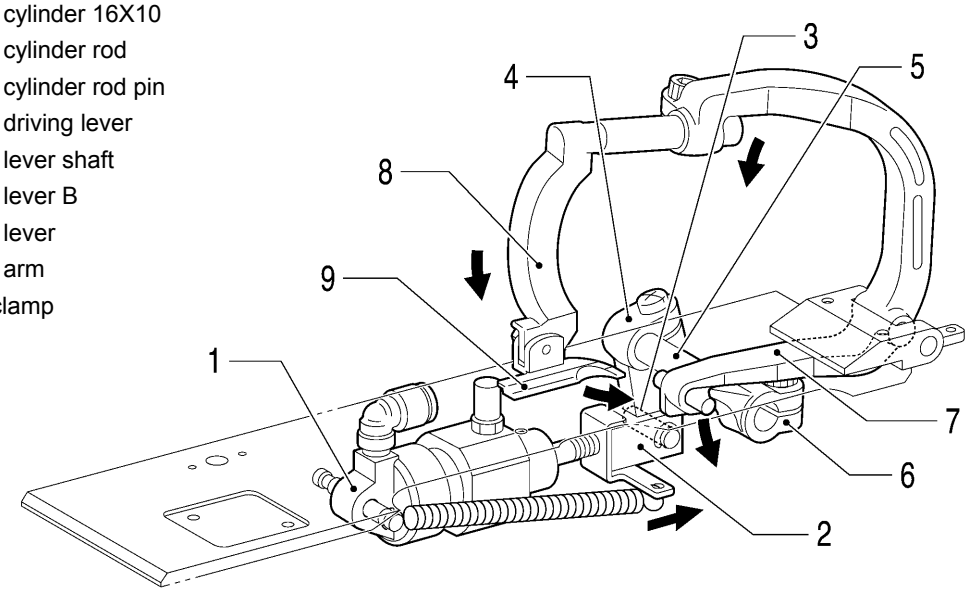
0662B

1. Pulse motor Y
2. Driving gear 20
3. Idler gear
4. Timing pulley
5. Y Timing belt
6. Y driving shaft holder, Belt holder
7. Y shaft
8. Y bearing
9. Y guide shaft
10. Feed base

4-5. Presser foot mechanism

<When work clamp is lowered>

1. Clamp cylinder 16X10
2. Clamp cylinder rod
3. Clamp cylinder rod pin
4. Clamp driving lever
5. Clamp lever shaft
6. Clamp lever B
7. Clamp lever
8. Clamp arm
9. Work clamp

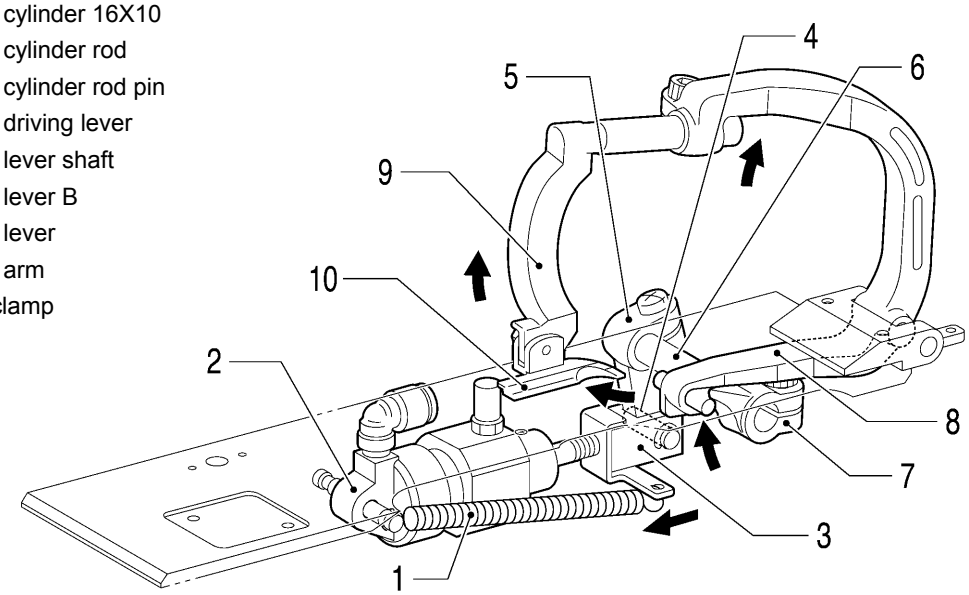


0663B

<When work clamp is raised>

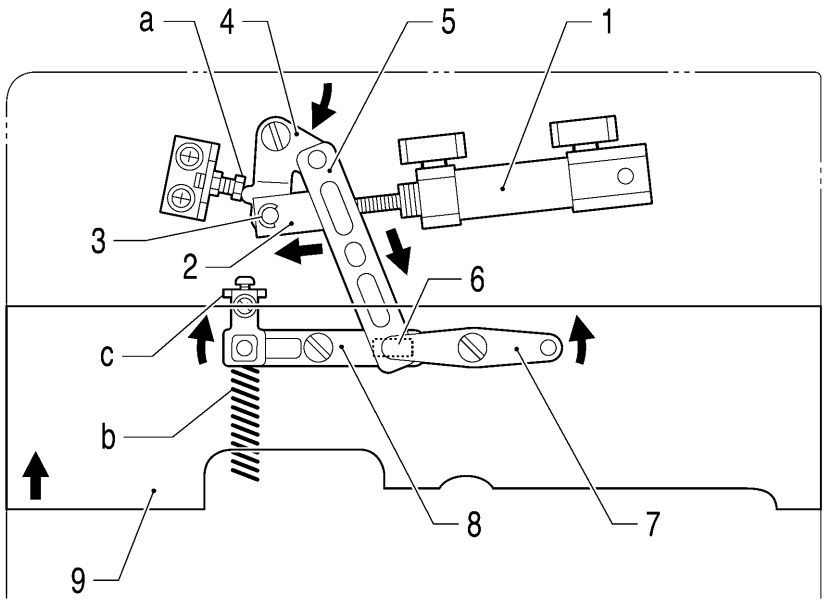
Because the air is bled from the clamp cylinder, the force from the spring (1) has the opposite effect from when lowered.

1. Spring
2. Clamp cylinder 16X10
3. Clamp cylinder rod
4. Clamp cylinder rod pin
5. Clamp driving lever
6. Clamp lever shaft
7. Clamp lever B
8. Clamp lever
9. Clamp arm
10. Work clamp



0783B

4-6. Cloth opening mechanism



<After operation>

0664B

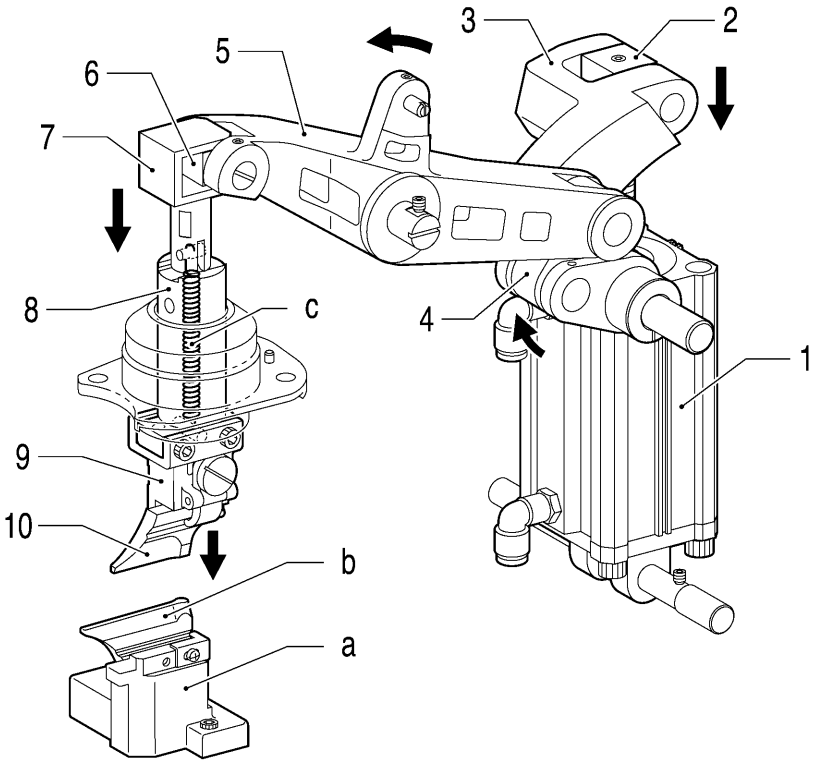
1. Opening cylinder assembly 16X15
2. Opening cylinder rod
3. Opening cylinder rod pin
4. Opening driving lever
5. Opening connecting rod
6. Slide block
7. Fulcrum lever plate
8. Rocker lever
9. Work clamp plate

a. Bolt
b. Extension spring
c. Opening stopper plate

4-7. Cutter mechanism

1. Cylinder 63X100
2. Cylinder rod
3. Cutter lever
4. Cutter link
5. Cutter arm assembly
6. Cutter arm slide block
7. Driving shaft presser
8. Cutter driving shaft
9. Hammer bracket assembly
10. Hammer

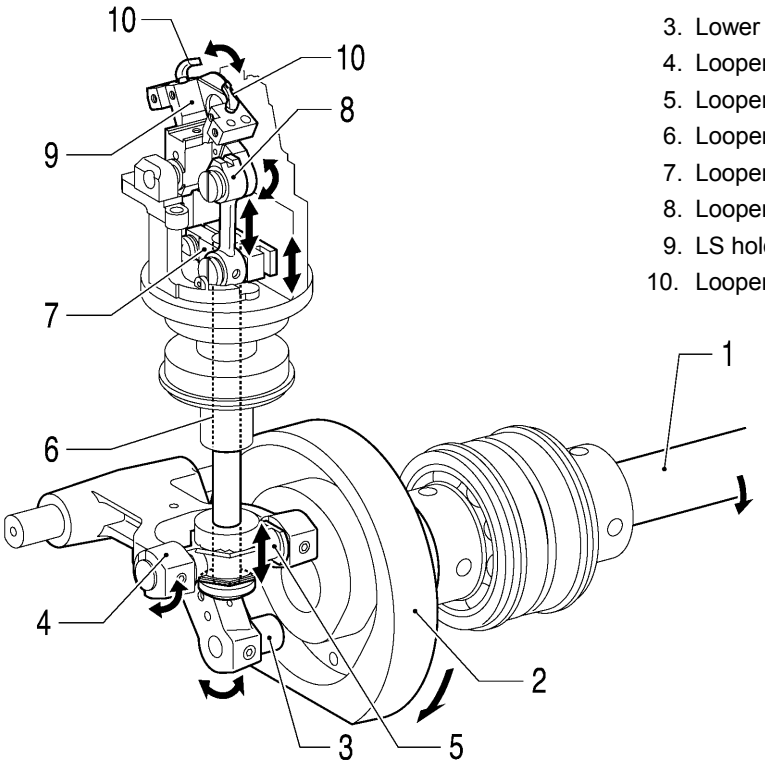
a. Knife bracket unit
b. Knife
c. Spring extension



0665B

4-8. Looper mechanism

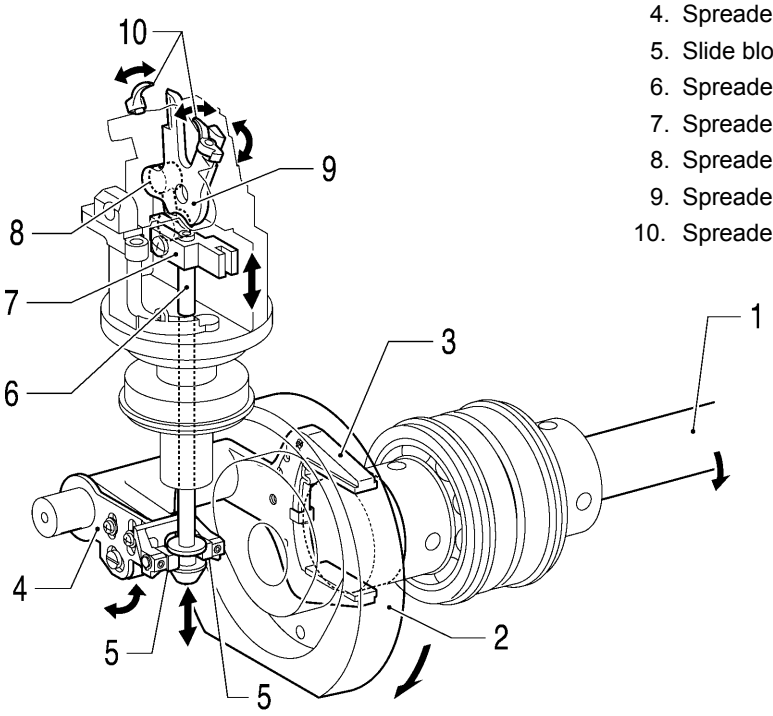
1. Lower shaft
2. Lower shaft cam
3. Lower shaft cam collar
4. Looper lever assembly
5. Looper driving plate
6. Looper driving shaft
7. Looper link clamp
8. Looper link unit
9. LS holder base assembly
10. Looper



0666B

4-9. Spreader mechanism

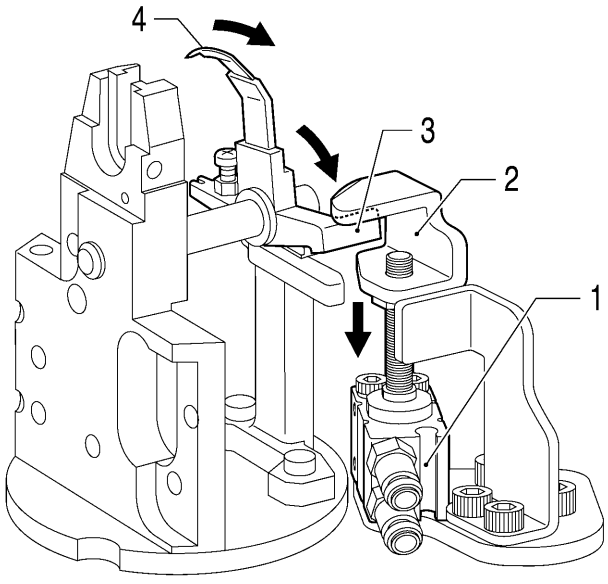
1. Lower shaft
2. Lower shaft cam
3. Spreader lever A
4. Spreader lever B
5. Slide block
6. Spreader link shaft
7. Spreader link base
8. Spreader cam link
9. Spreader driving cam
10. Spreader



0667B

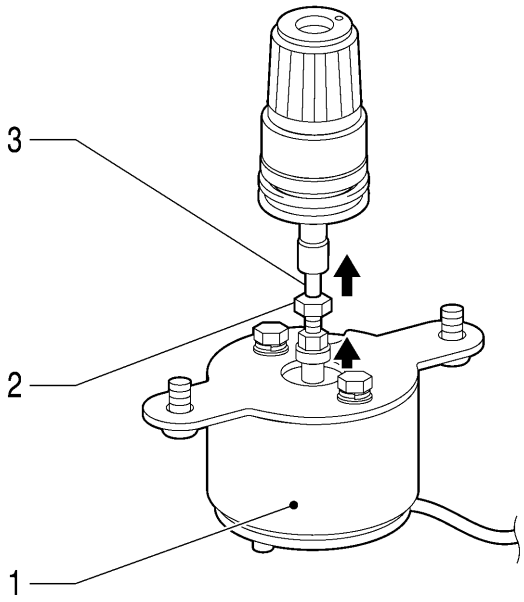
4-10. Upper thread trimmer mechanism

1. Upper thread trimmer cylinder
2. Hammer
3. Thread trimmer lever bracket
4. Upper movable knife



0668B

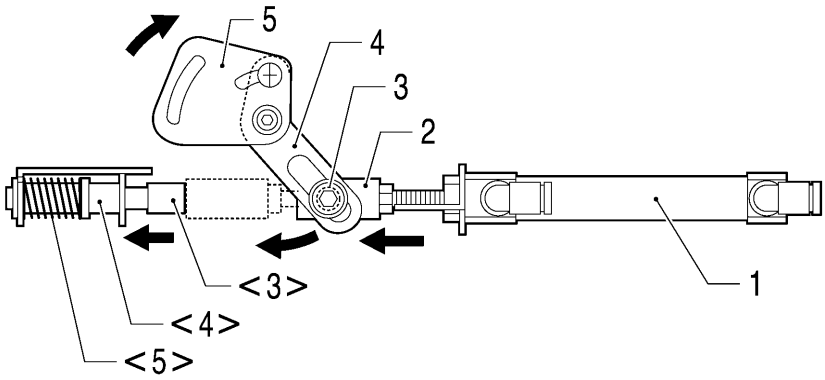
4-11. Upper tension release mechanism



0669B

1. Upper tension release solenoid
2. Bolt
3. Tension release pin

4-12. Upper thread take-up mechanism



0670B

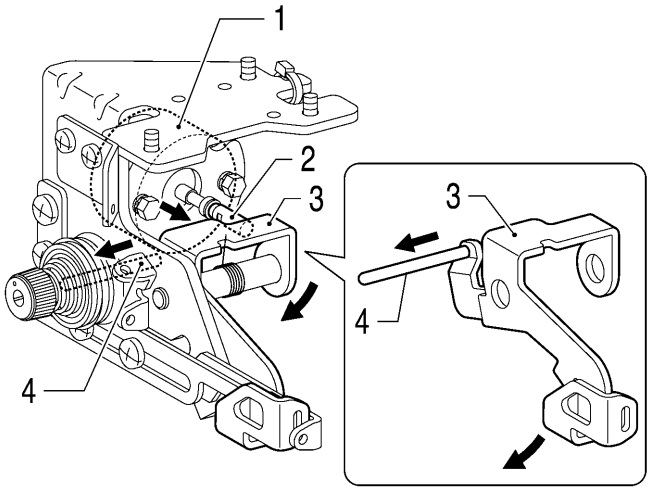
1. Cylinder assembly 10-30
2. Cylinder joint A
3. Collar B
4. Thread take-up lever driving plate
5. Thread take-up lever plate

<3> Rubber cushion
<4> Impact support shaft
<5> Spring compression A

4-13. Lower thread release and lower thread take-up mechanisms

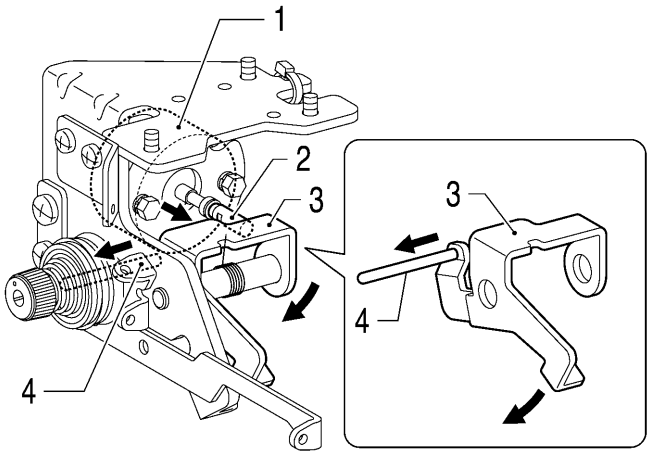
<-01>

1. Lower thread tension release solenoid
2. Lower solenoid shaft
3. Lower thread take-up guide lever (thread take-up)
4. Tension release pin (tension release)



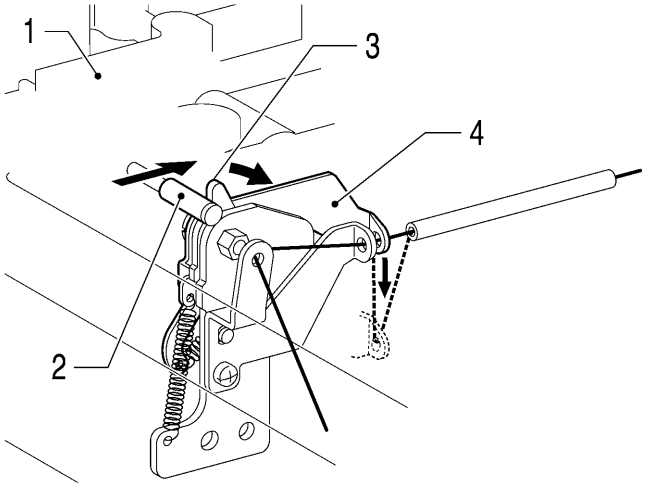
<-00, -02 : Lower thread release only >

1. Lower tension release solenoid
2. Lower solenoid shaft
3. Lower thread release plate
4. Tension release pin (tension release)



0671B

4-14. Gimp thread take-up mechanism <-01 specifications only>

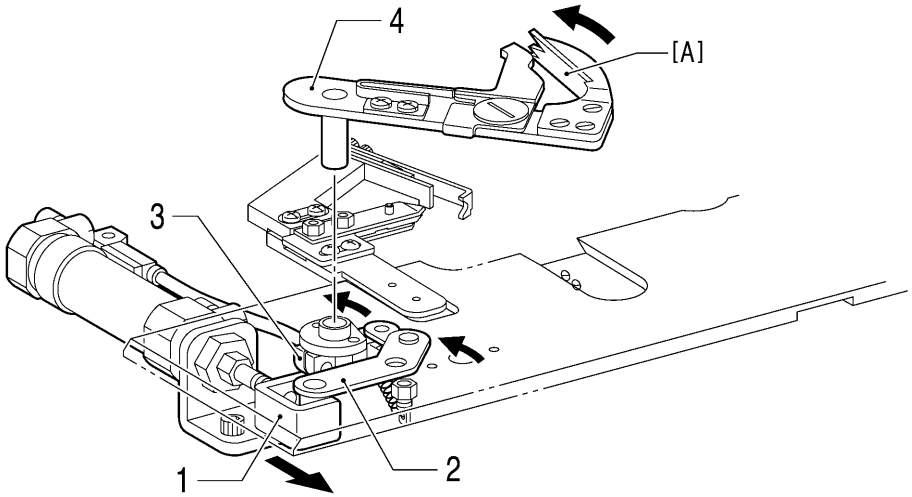


1. Feed bar (Y direction operation)
2. Gimp thread take-up guide collar
3. Gimp thread take-up G-E plate
4. Gimp thread take-up guide plate

0672B

4-15. Lower thread trimmer mechanism

<-01>

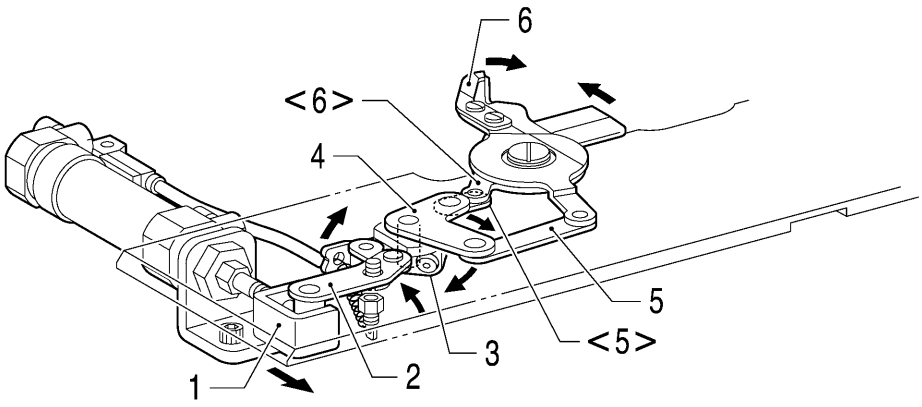


0673B

1. Cylinder assembly 16X30 B
2. Thread trimmer lever
3. Thread cutter lever arm
4. Thread trimmer arm

Refer to “Principle of the thread handler” in “7-25-5. Adjusting the thread handler” for details about the thread handler [A].

<-02>



0674B

1. Cylinder 16X30 assembly B
2. Thread trimmer lever J assembly
3. Thread trimmer lever arm B
4. Movable knife driving plate

5. Thread trimmer link A assembly	<5> Thread trimmer link B assembly
6. Movable knife L	<6> Movable knife R

5. DISASSEMBLY

⚠ DANGER

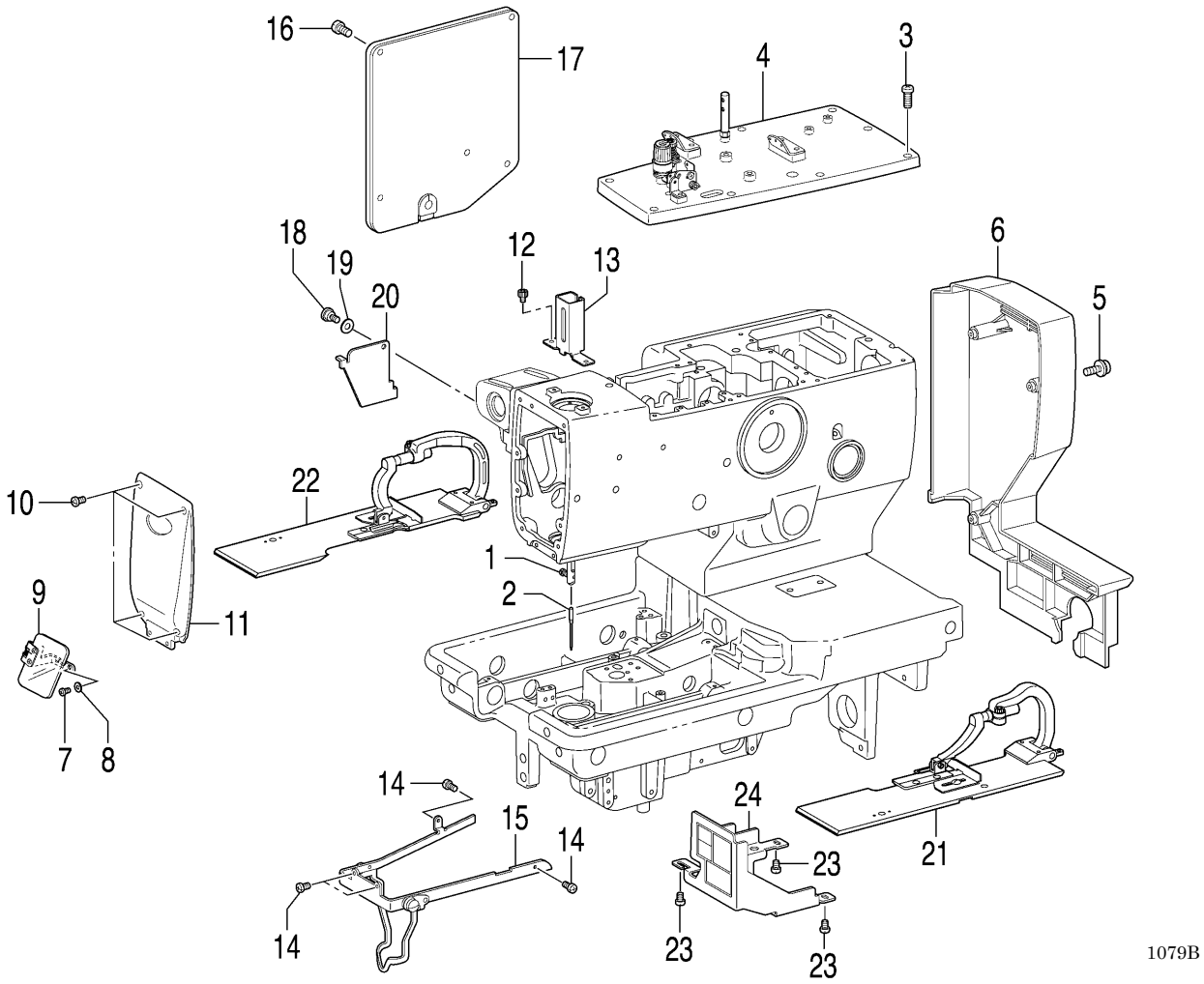
Wait at least 5 minutes after turning off the power switch and disconnecting the power cord from the wall outlet before opening the cover of the control box. Touching areas where high voltages are present can result in severe injury.

⚠ CAUTION

- Disassembly should only be carried out by a qualified technician.
- Turn off the power switch and disconnect the power cord at the following times. If this is not done, the sewing machine may operate if the start switch is pressed by mistake, which could result in serious injury.
- Disconnect the air hoses from the air supply and wait for the needle on the pressure gauge to drop to “0” before carrying out inspection, adjustment and repair of any parts which use the pneumatic equipment.
- Be sure to wear protective goggles and gloves when handling the lubricating oil and grease, so that they do not get into your eyes or onto your skin, otherwise inflammation can result.
  Furthermore, do not drink the oil or eat the grease under any circumstances, as they can cause vomiting and diarrhea.
  Keep the oil out of the reach of children.
- Use only the proper replacement parts as specified by Brother.
- If any safety devices have been removed, be absolutely sure to re-install them to their original positions and check that they operate correctly before using the machine.
- Any problems in machine operation which result from unauthorized modifications to the machine will not be covered by the warranty.

Disassemble the parts in the order shown in the illustration.

5-1. Covers and presser foot mechanism



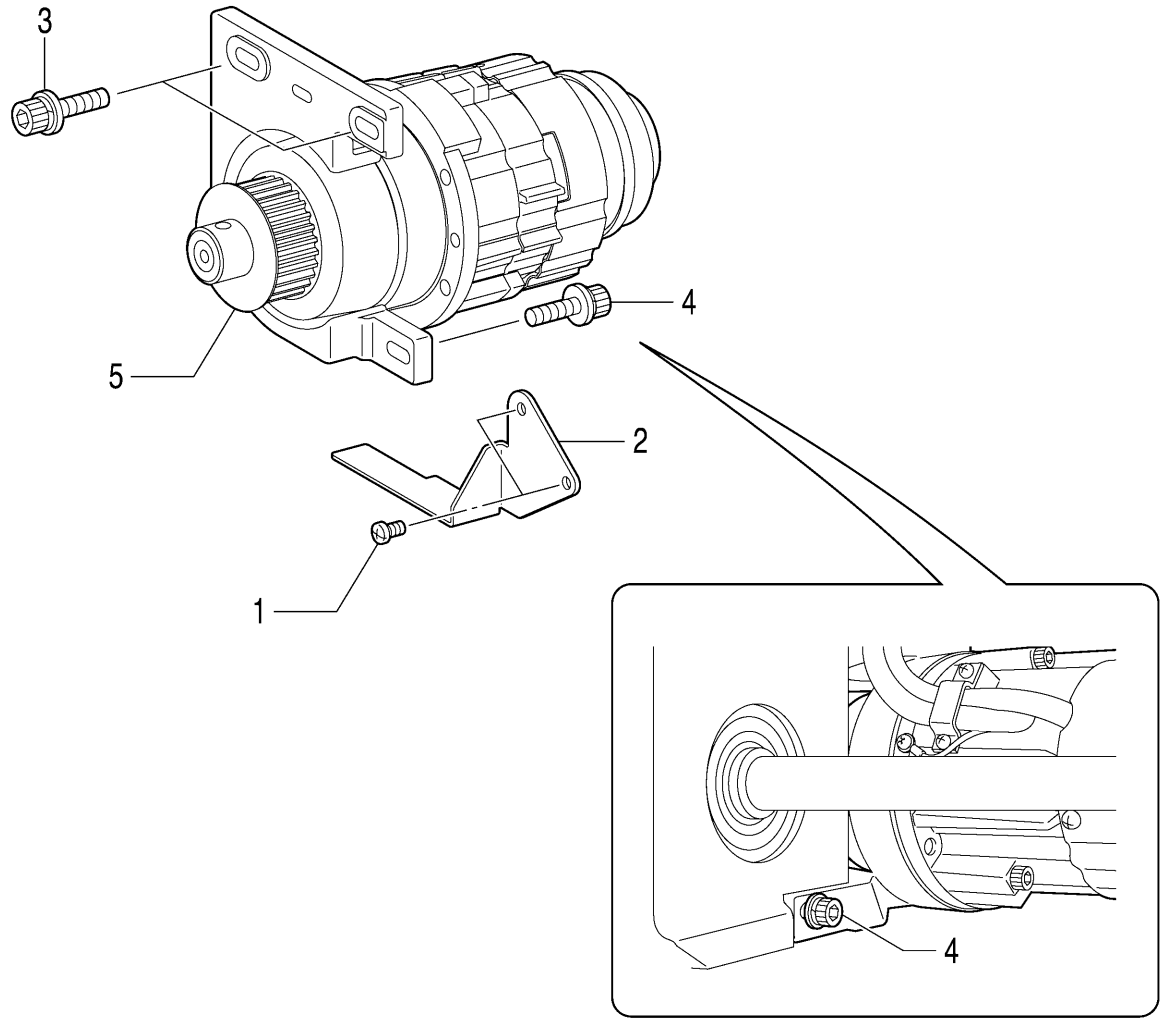
* Start with the machine head in its upright position.

1. Screw (Loosen)
2. Needle
3. Screws [9 pcs]
4. Top cover
5. Screws with washers [4 pcs]
6. Belt cover
7. Screws [2 pcs]
8. Plain washers [2 pcs]
9. Eye guard
10. Screws [4 pcs]
11. Main plate
12. Socket bolts [2 pcs]
13. Needle bar guard
14. Screws [4 pcs]
15. Needle guide cover
16. Screws [5 pcs]
17. Rear cover
18. Shoulder screw
19. Wave washer
20. Zigzag window cover
21. Work clamp plate R assembly
22. Work clamp plate L assembly

(Tilt back the machine head.)

23. Screws [3 pcs]
24. Cam cover

5-2. Upper shaft motor unit mechanism



1080B

* Start with the machine head in its upright position.

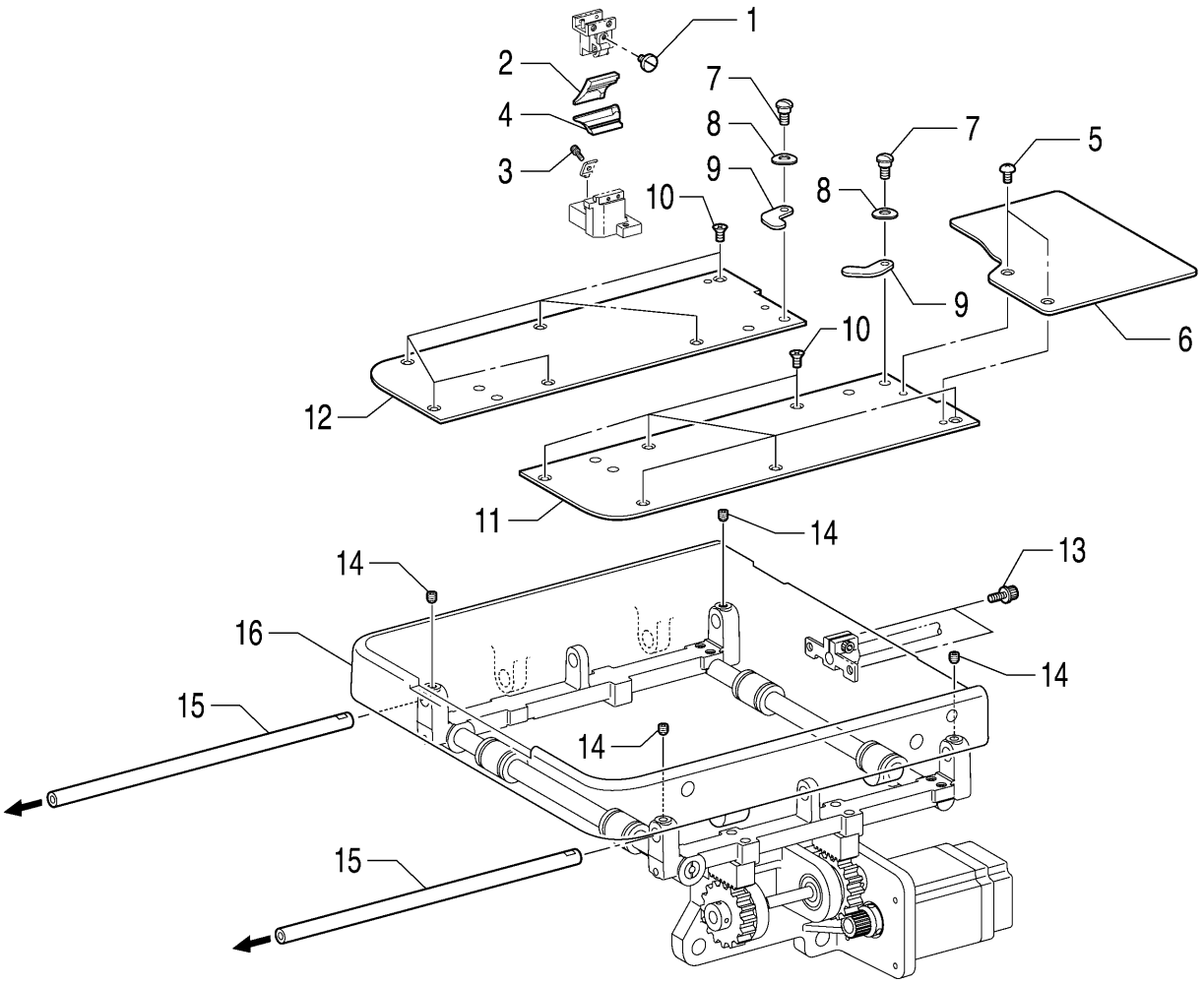
1. Screws [2 pcs]
2. Belt guide
3. Socket bolts with washers [2 pcs]

(Tilt back the machine head.)

4. Socket bolt with washer [1 pcs]
5. Upper shaft motor unit

5-3. Feed mechanism

5-3-1. Feed base unit

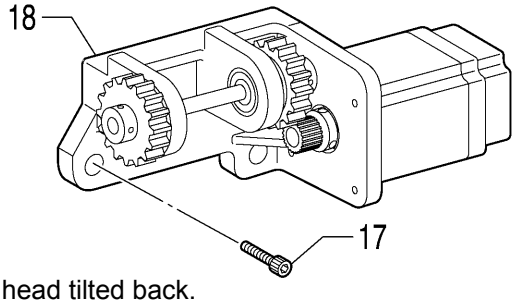


1081B

* Carry out the following with the machine head in the upright position.

1. Screw (Loosen)
2. Hammer
3. Socket bolt (Loosen)
4. Knife
5. Truss screws [2 pcs]
6. Feed base cover U
7. Shoulder screws [2 pcs]
8. Bending washers [2 pcs]
9. Plate pressers [2 pcs]
10. Flat screws [12 pcs]
11. Feed base cover R
12. Feed base cover L
13. Socket bolts with washers [2 pcs]
14. Set screws [4 pcs] (Loosen)
15. X feed guide shafts [2 pcs] (Pull forward to remove)
16. Feed base unit

5-3-2. X feed unit



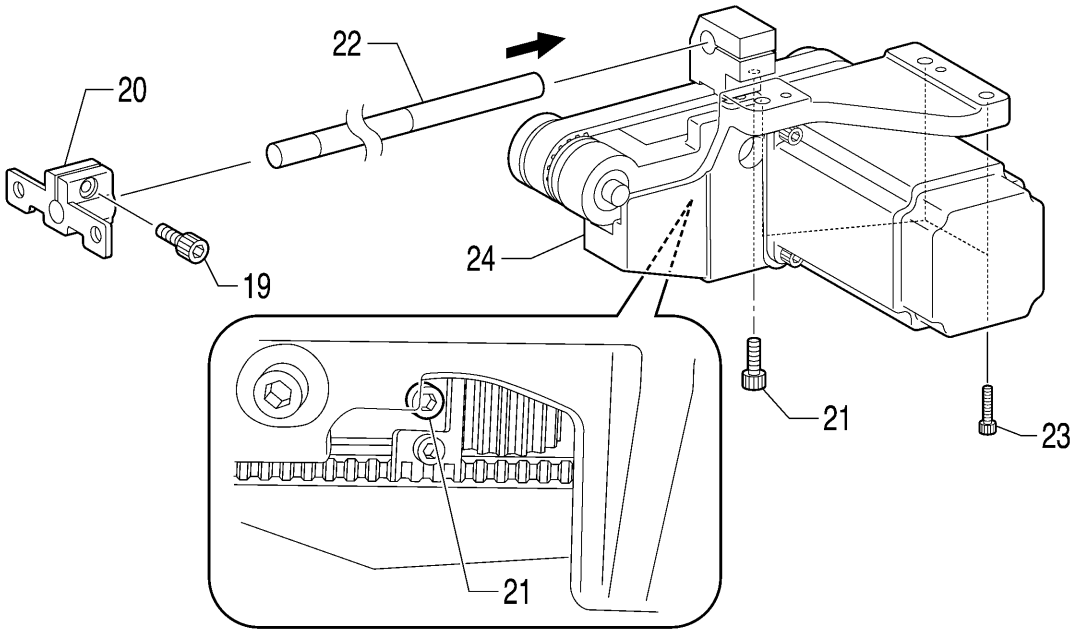
1082B

* Carry out the following with the machine head tilted back.

17. Socket bolts [3 pcs]
18. X feed assembly

5-3-3. Y feed unit

* Disassemble the “5-2. Upper shaft motor unit mechanism” before disassembling the “5-3-3. Y feed unit”.



1083B

* Start with the machine head in its upright position.

19. Socket bolt (Loosen)
20. Y shaft holder

(Tilt back the machine head.)

21. Socket bolt (Loosen)

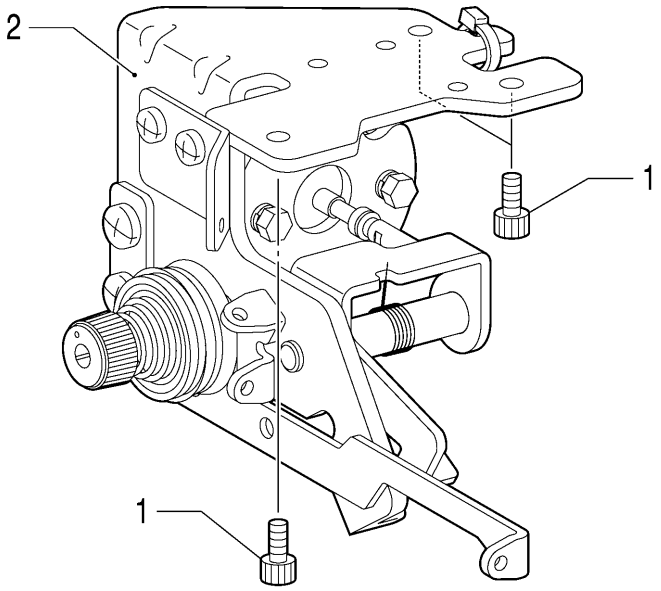
(Return the machine head to its upright position.)

22. Y shaft (Pull backward to remove)

(Tilt back the machine head.)

23. Socket bolts [3 pcs]
24. Y feed assembly

5-4. Lower thread tension mechanism



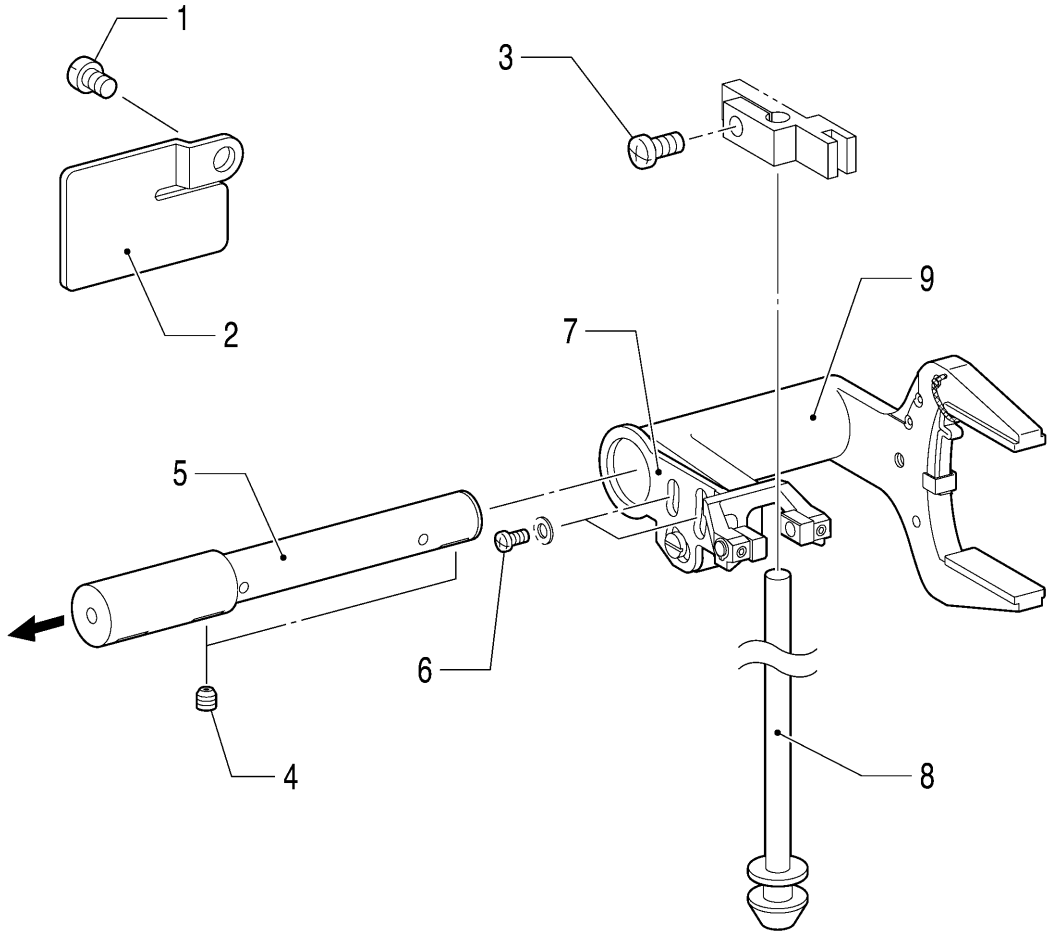
1084B

* Carry out the following with the machine head tilted back.

1. Socket bolts [3 pcs]
2. Lower thread guide adjust assembly

5-5. Spreader mechanism

* Carry out the disassembly procedure in “5-4. Lower thread tension mechanism” before the disassembly procedure in “5-5. Spreader mechanism”.



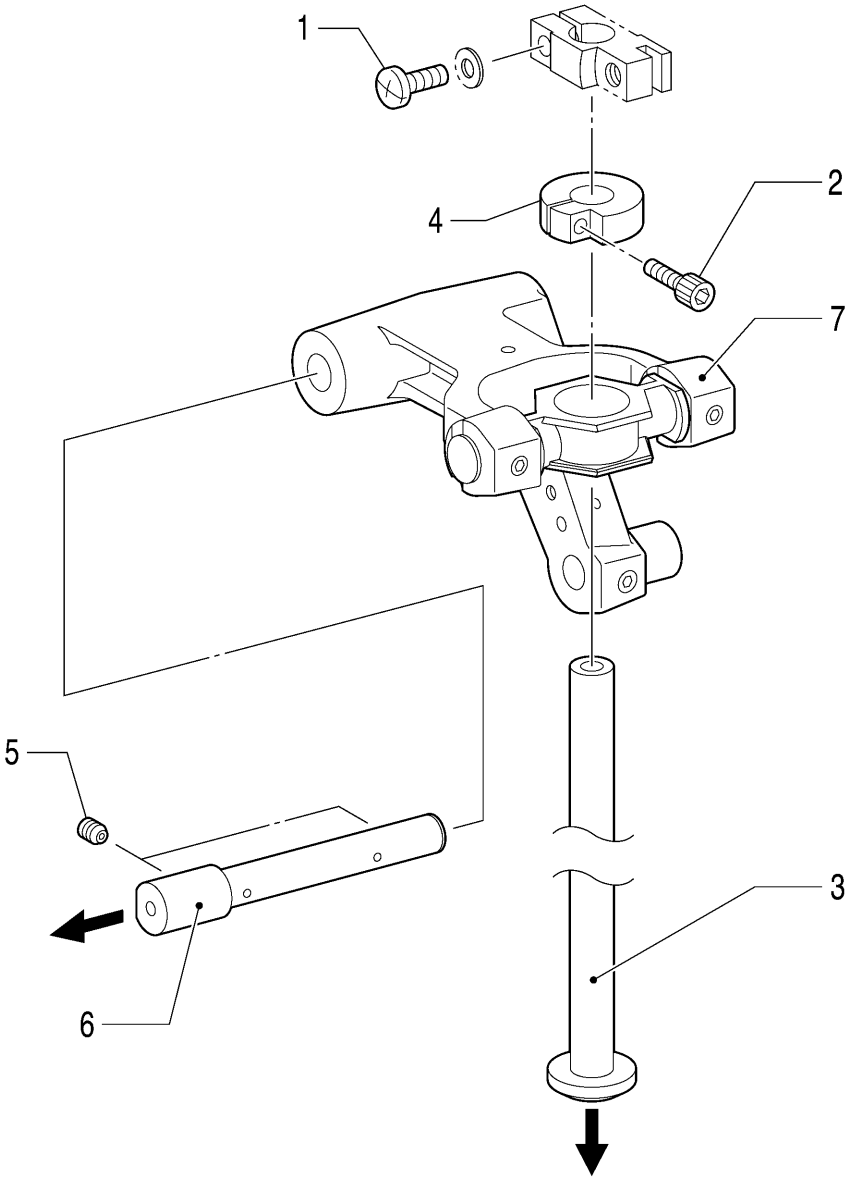
1085B

* Carry out the following with the machine head tilted back.

1. Screw
2. Tube support B
3. Screw (Loosen)
4. Set screws [2 pcs] (Loosen)
5. Spreader lever shaft
6. Screws [2 pcs]
7. Spreader lever B assembly
8. Spreader lever shaft
9. Spreader lever A assembly

5-6. Looper mechanism

* Carry out the disassembly procedure in “5-5. Spreader mechanism” before the disassembly procedure in “5-6. Looper mechanism”.



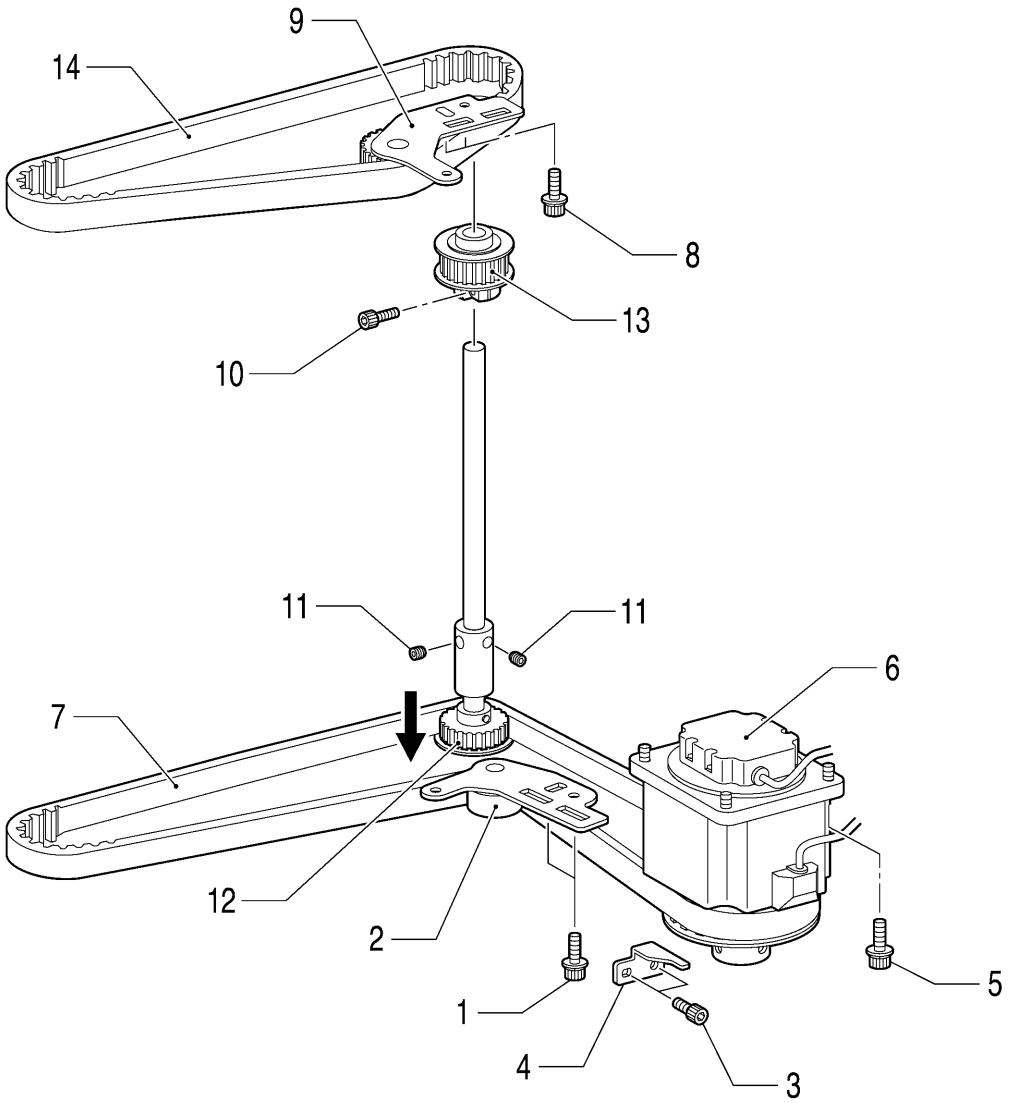
1086B

* Carry out the following with the machine head tilted back.

1. Screw (Loosen)
2. Socket bolt (Loosen)
3. Looper driving shaft
4. Looper driving shaft bracket
5. Set screws [2 pcs] (Loosen)
6. Looper lever shaft
7. Looper lever assembly

5-7. Needle bar rocking mechanism

* Carry out the disassembly procedure in “5-2. Upper shaft motor unit mechanism” before the disassembly procedure in “5-7. Needle bar rocking mechanism”.



1077B

* Start with the machine head tilted back.

1. Socket bolts with washers [2 pcs]
2. Tension pulley D assembly
3. Socket bolts [2 pcs]
4. Motor stopper
5. Socket bolts with washers [4 pcs]
6. Pulse motor assembly R
7. Timing belt D

(Return the machine head to its upright position.)

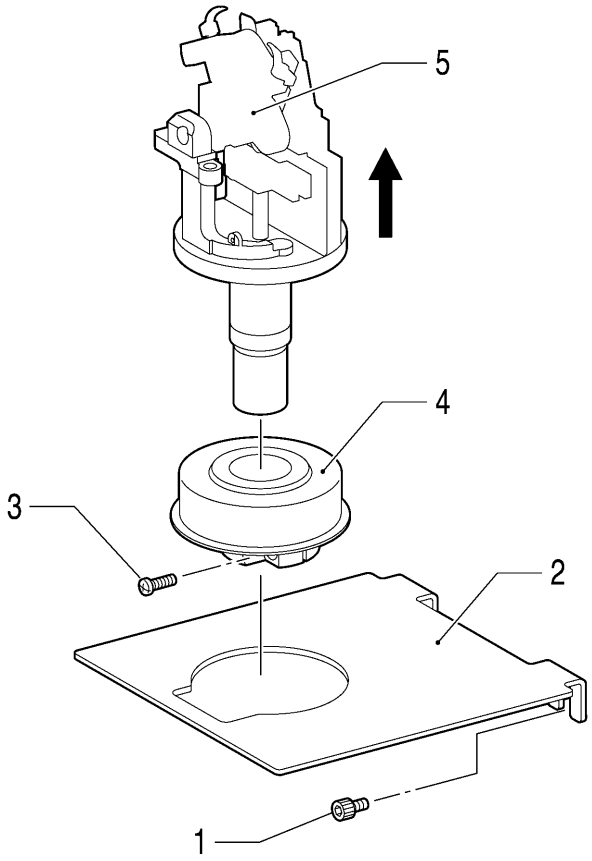
8. Socket bolts with washers [2 pcs]
9. Tension pulley U assembly
10. Socket bolt (Loosen)
11. Set screws [2 pcs] (Loosen)

(Tilt back the machine head once more.)

12. Driving looper shaft assembly
13. Vertical shaft timing pulley U assembly
14. Timing belt U

5-8. Looper base mechanism

* Carry out the disassembly procedure in “5-5. Spreader mechanism” and the “5-6. Looper mechanism” before the disassembly procedure in “5-8. Looper base mechanism”.

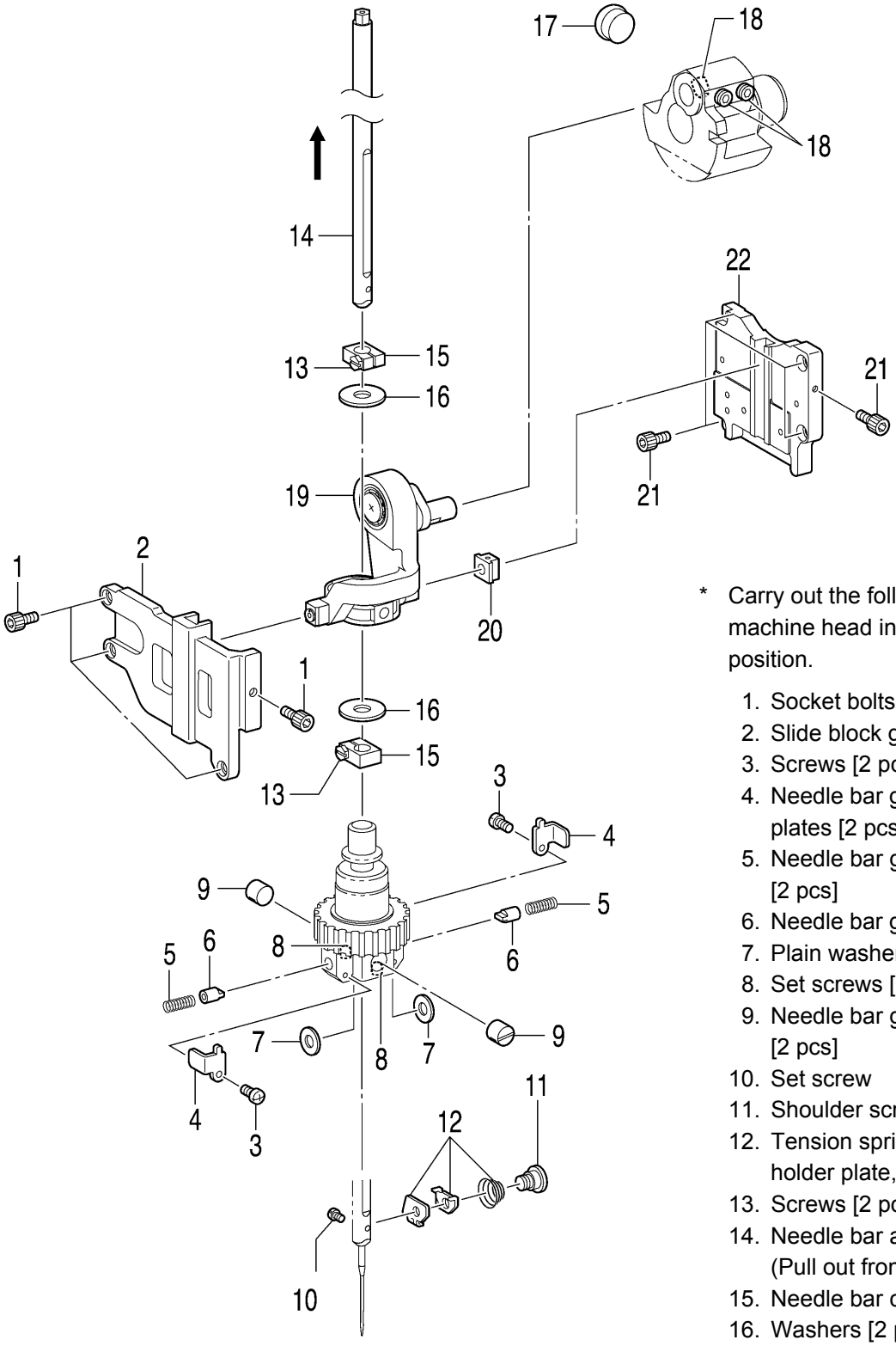


1078B

* Carry out the following with the machine head tilted back.

1. Socket bolts [2 pcs]
2. Partition
3. Screw (Loosen)
4. Looper pulley (screw type)
5. Looper base unit

5-9. Needle bar mechanism

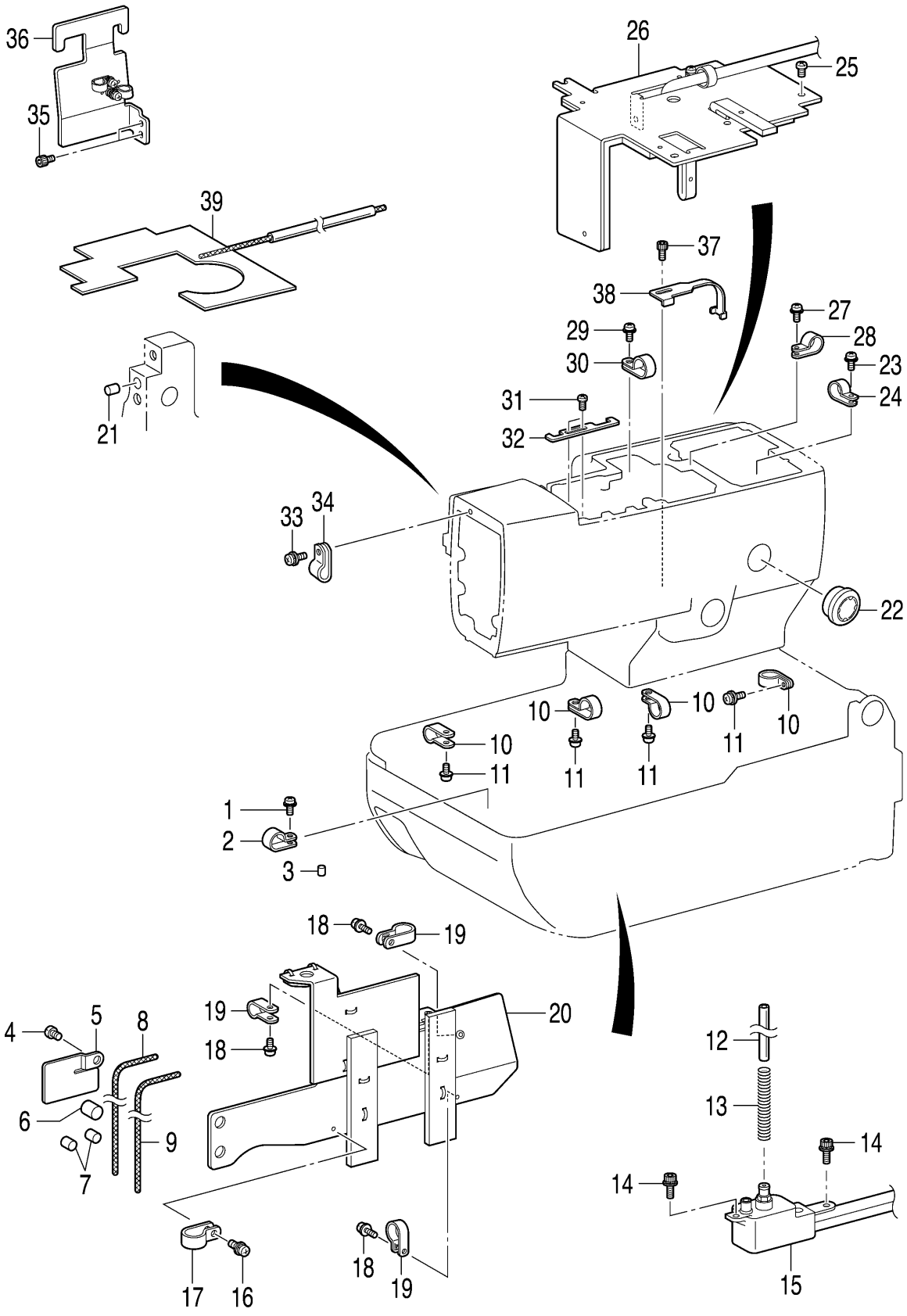


* Carry out the following with the machine head in the upright position.

1. Socket bolts [4 pcs]
2. Slide block guide F
3. Screws [2 pcs]
4. Needle bar guide support plates [2 pcs]
5. Needle bar guide springs [2 pcs]
6. Needle bar guides [2 pcs]
7. Plain washers [2 pcs]
8. Set screws [2 pcs] (Loosen)
9. Needle bar guide collars [2 pcs]
10. Set screw
11. Shoulder screw
12. Tension spring, Needle thread holder plate, Needle guide A
13. Screws [2 pcs] (Loosen)
14. Needle bar assembly (Pull out from the top)
15. Needle bar clamp [2 pcs]
16. Washers [2 pcs]
17. Rubber cap
18. Set screws [3 pcs] (Loosen)
19. Needle bar crank, Crank rod unit
20. Slide block
21. Socket bolts [5 pcs]
22. Slide block guide D

1088B

5-10. Lubrication



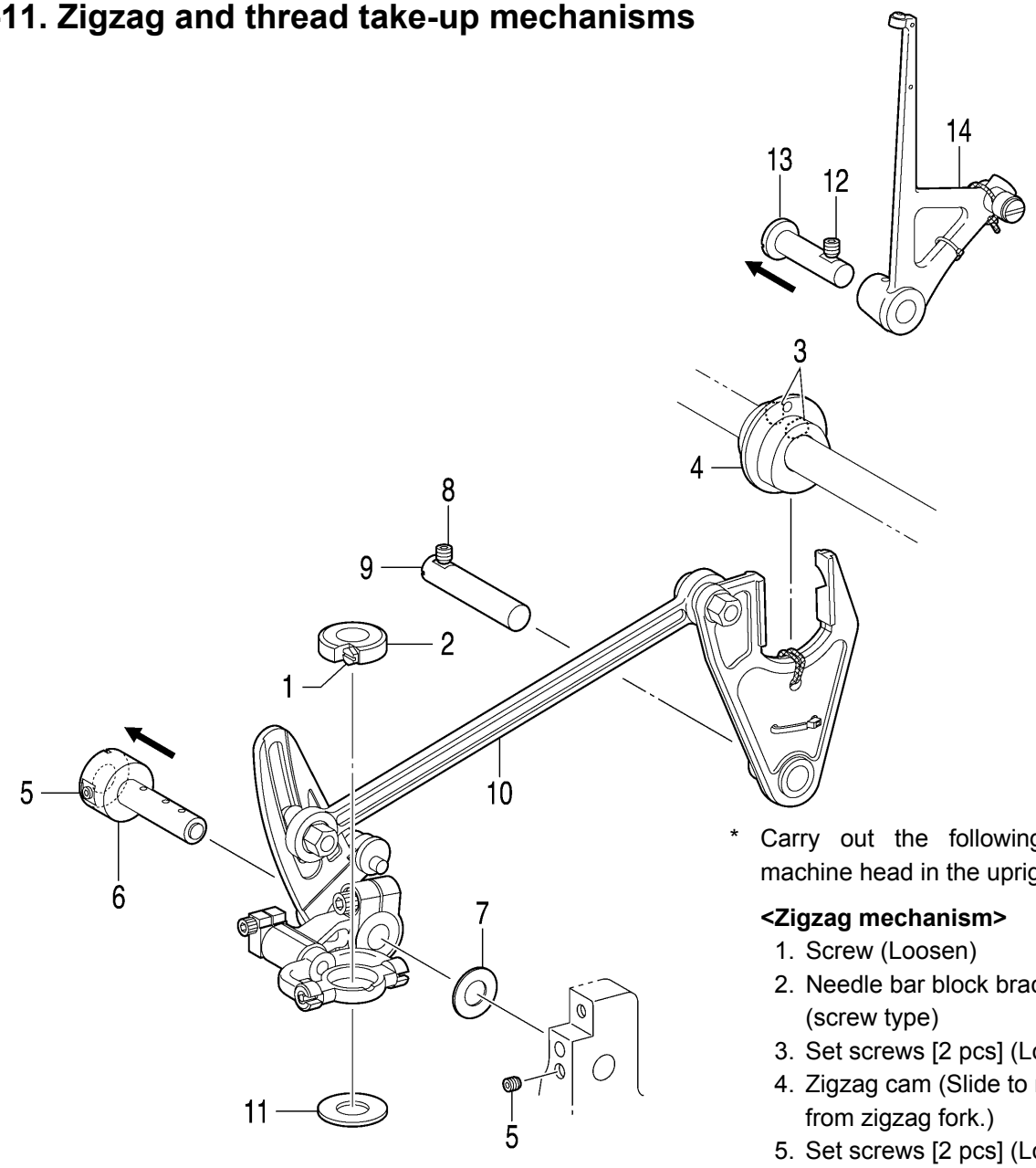
1089B

1. Screw
2. Cord holder
3. Felt
4. Screw
5. Tube support B
6. Felt
7. Felt
8. Wick
9. Wick
10. Cord holders (7N) [4 pcs]
11. Screws [4 pcs]
12. Oil tube
13. Tube clip spring
14. Socket bolts [2 pcs]
15. Sub-tank assembly
16. Screw
17. Cord holder (NK-3N)
18. Screws [3 pcs]
19. Cord holders #10 [3 pcs]
20. Lower shaft cover assembly
21. Felt
22. Oil gauge window
23. Screw
24. Cord holder #5
25. Screws [4 pcs]
26. Oil plate assembly
27. Screw
28. Cord holder (NK-3N)
29. Screw
30. Cord holder (4N)
31. Screw
32. Cord holder
33. Screw
34. Cord holder (NK-3N)
35. Socket bolts [2 pcs]
36. Tube support assembly

(From this point on, disassemble after the disassembly in “5-13. Cutter mechanism” has been done.)

37. Socket bolt
38. Tube guide
39. Felt assembly

5-11. Zigzag and thread take-up mechanisms



1090B

* Carry out the following with the machine head in the upright position.

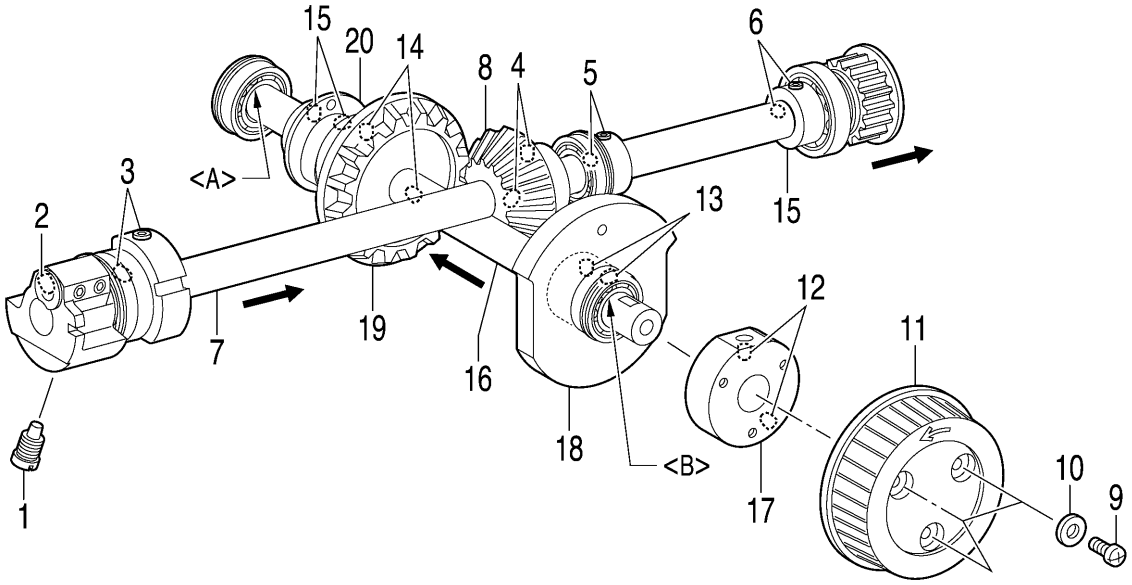
<Zigzag mechanism>

1. Screw (Loosen)
2. Needle bar block bracket (screw type)
3. Set screws [2 pcs] (Loosen)
4. Zigzag cam (Slide to remove from zigzag fork.)
5. Set screws [2 pcs] (Loosen)
6. Zigzag coaxial rock shaft (Pull out)
7. Spacer
8. Set screw (Loosen)
9. Zigzag fork support shaft (Pull out)
10. Zigzag unit (Remove the whole unit from the side of the arm main plate.)
11. Needle bar block collar

<Thread take-up mechanism>

12. Set screw (Loosen)
13. Thread take-up L support shaft (Pull out)
14. Thread take-up lever unit (Remove the roller from the grooved cam and lift upward.)

5-12. Upper shaft mechanism



1091B

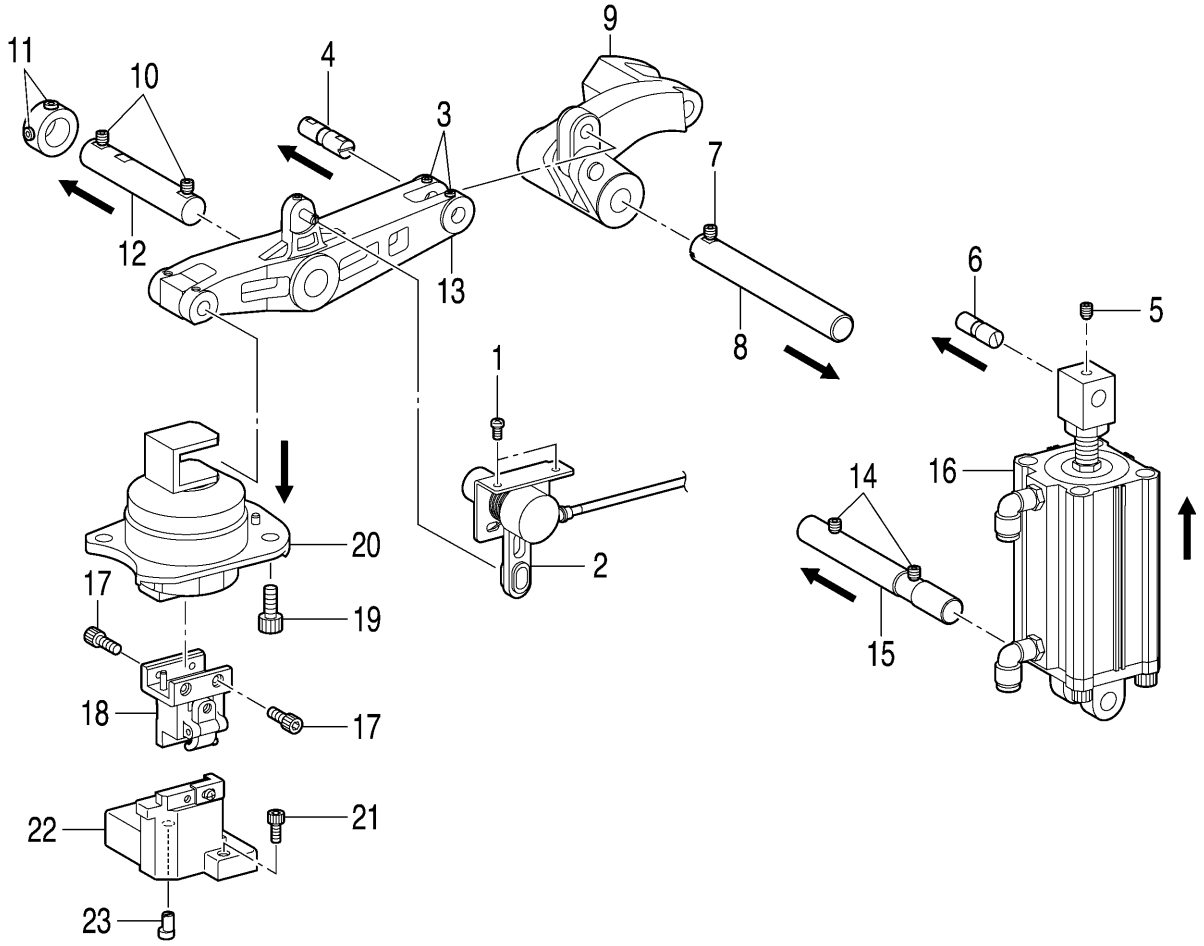
* Carry out the following with the machine head in the upright position.

1. Screw
2. Set screw (Loosen)
3. Set screws [2 pcs] (Loosen)
4. Set screws [2 pcs] (Loosen)
5. Set screws [2 pcs] (Loosen)
6. Set screws [2 pcs] (Loosen)
7. Upper shaft unit (Pull out from the back.)
8. Pinion
9. Screws [3 pcs]
10. Plain washers [3 pcs]
11. Pulley
12. Set screws [2 pcs] (Loosen)
13. Set screws [2 pcs] (Loosen)
14. Set screws [2 pcs] (Loosen)
15. Set screws [2 pcs] (Loosen)
16. Orthogonal shaft unit (Pull out from the rear cover.)
17. Pulley base
18. Take-up cam roller
19. Gear
20. Zigzag cam

NOTE:

The bearing unit (16) and the bearing inner rings <A> and <B> are joined with adhesive, so avoid disassembling them if possible.

5-13. Cutter mechanism



1092B

* Start with the machine head in its upright position.

1. Screws [2 pcs]
2. Cutter sensor assembly
3. Set screws [2 pcs] (Loosen)
4. Cutter arm pin (Pull out)
5. Set screw (Loosen)
6. Cylinder rod shaft (Pull out)
7. Set screw (Loosen)
8. Cutter lever shaft (Pull out)
9. Cutter lever assembly
10. Set screws [2 pcs] (Loosen)
11. Set screws [2 pcs] (Loosen)
12. Cutter arm shaft (Pull out)
13. Cutter arm assembly

(Tilt back the machine head.)

14. Set screws [2 pcs] (Loosen)
15. Cylinder support shaft (Pull out)

(Return the machine head to the upright position once more.)

16. Cylinder assembly (Lift up to remove)
17. Socket bolts [4 pcs]
18. Hammer bracket assembly
19. Socket bolts [3 pcs]
20. Cutter driving shaft unit (Pull down to remove)
21. Socket bolt
22. Knife bracket unit
23. Eccentric pin

6. ASSEMBLY

DANGER

Wait at least 5 minutes after turning off the power switch and disconnecting the power cord from the wall outlet before opening the cover of the control box. Touching areas where high voltages are present can result in severe injury.

CAUTION

Assembly should only be carried out by a qualified technician.

Turn off the power switch and disconnect the power cord at the following times. If this is not done, the sewing machine may operate if the start switch is pressed by mistake, which could result in serious injury.

If the power switch needs to be left on when carrying out some adjustment, be extremely careful to observe all safety precautions.

Disconnect the air hoses from the air supply and wait for the needle on the pressure gauge to drop to “0” before carrying out inspection, adjustment and repair of any parts which use the pneumatic equipment.

Be sure to wear protective goggles and gloves when handling the lubricating oil and grease, so that they do not get into your eyes or onto your skin, otherwise inflammation can result.
Furthermore, do not drink the oil or eat the grease under any circumstances, as they can cause vomiting and diarrhea.
Keep the oil out of the reach of children.

Use only the proper replacement parts as specified by Brother.

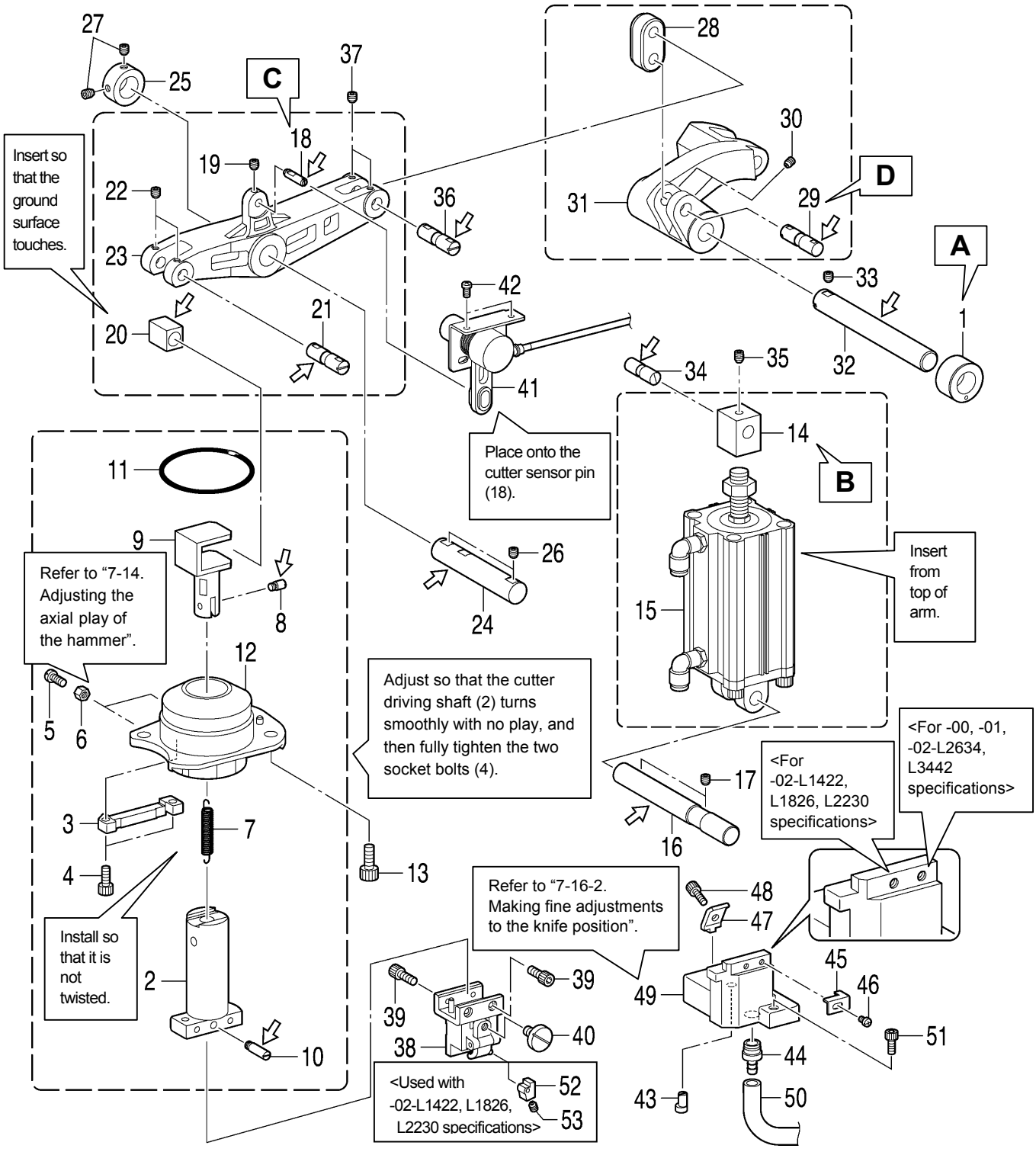
If any safety devices have been removed, be absolutely sure to re-install them to their original positions and check that they operate correctly before using the machine.

Any problems in machine operation which result from unauthorized modifications to the machine will not be covered by the warranty.

- Assemble each part in the order shown in the illustration.
- Parts indicated by [ ] are part of the same assembly.

6-1. Cutter mechanism

* Carry out assembly steps <1> to <8> in "6-25. Lubrication and greasing and routing the oil tubes" before carrying out the assembly in "6-1. Cutter mechanism".
* Refer to the detailed descriptions on the next page for details on A to D in the illustration.
* Apply the grease specified by Brother (**MOLYKOTE LONGTERM W2 manufactured by Dow Corning Corporation**) in the places indicated by ⇦.



1. Bush cutter lever shaft

2. Cutter driving shaft
3. Guide block
4. Socket bolts [2 pcs] (Temporarily tighten)
5. Bolts [2 pcs]
6. Nuts [2 pcs]
7. Extension spring
8. Spring hook pin U
9. Driving shaft presser
10. Spring hook pin D
11. O Ring
12. Bush cutter shaft assembly

13. Socket bolts [3 pcs]

14. Cylinder rod
15. Cylinder

16. Cylinder support shaft
17. Set screw

18. Cutter sensor pin
19. Set screw
20. Cutter arm slide block
21. Cutter arm pin
22. Set screws [2 pcs]
23. Cutter arm

24. Cutter arm shaft
25. Set screw collar
26. Set screws [2 pcs]
27. Set screws [2 pcs]

28. Cutter link
29. Cutter arm pin
30. Set screws [2 pcs]
31. Cutter lever

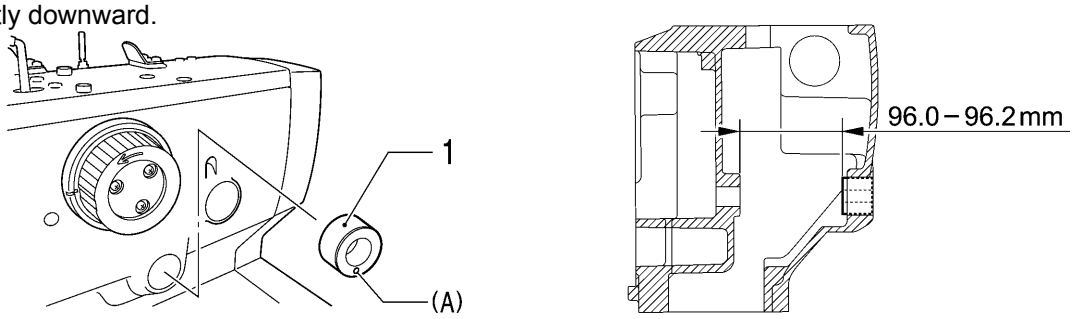
32. Cutter lever shaft
33. Set screw
34. Cylinder rod shaft
35. Set screw

36. Cutter arm pin
37. Set screws [2 pcs]
38. Hammer bracket assembly
39. Socket bolts [4 pcs]
40. Knob screw (Temporarily tighten)
41. Cutter sensor assembly
42. Screws [2 pcs]
43. Eccentric pin
44. Knife garbage joint
45. Block stopper plate
46. Screw (Temporarily tighten)
47. Knife block holder
48. Socket bolt (Temporarily tighten)
49. Knife bracket
50. Knife trash tube
51. Socket bolts [3 pcs] (Temporarily tighten)

<-02-L1422, L1826, L2230 specifications only>

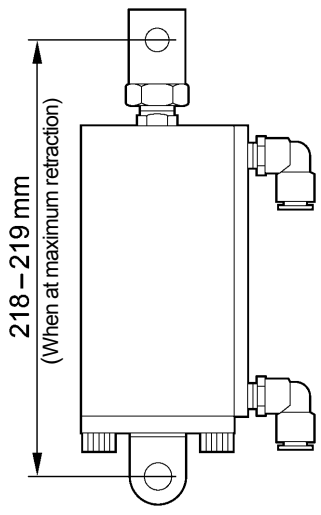
52. Hammer spacer
53. Set screw

A Apply adhesive (Threebond 1373B) to the outer circumference of the bush cutter lever shaft (1), and then press-fit it within the press-fitting dimensions shown in the illustration so that the hole (A) is facing directly downward.



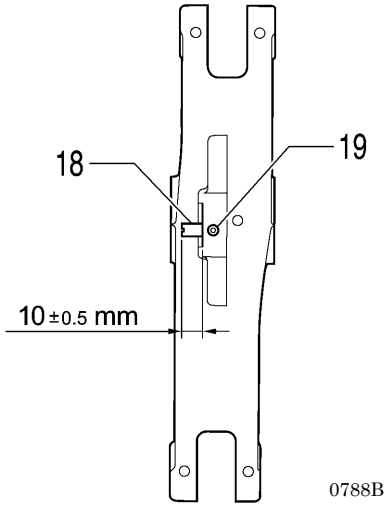
0786B

B Assemble as shown in the illustration.



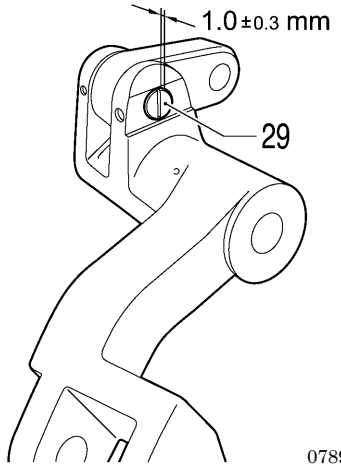
0787B

C Tighten the Set screw (19) so that the cutter sensor pin (18) protrudes by about 1.0 ±0.5 mm.



0788B

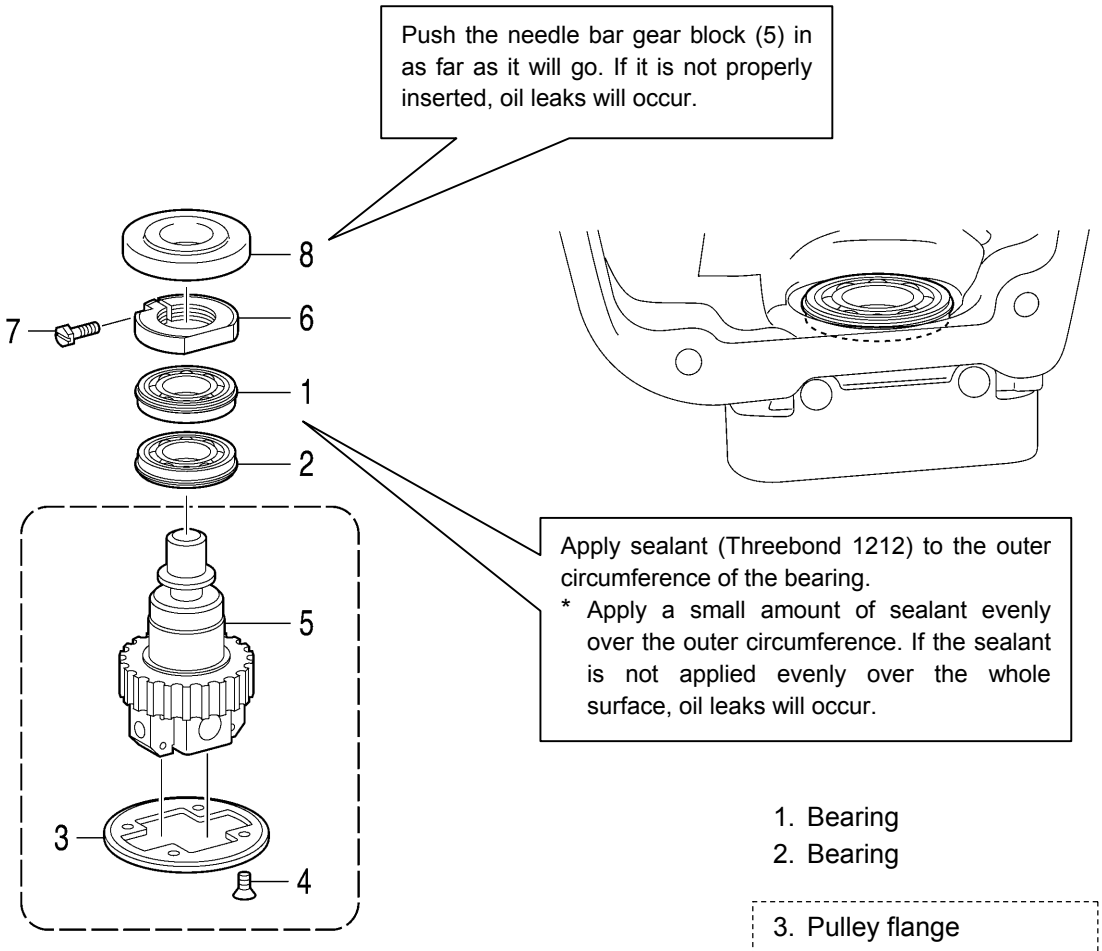
D Insert the cutter arm pin (29) so that the "-" side protrudes from the end of the lever by about 1.0±0.3 mm.



0789B

6-2. Needle bar mechanism (1)

* Refer to “Adjusting the pressure of the needle bar gear block” on the next page.



0790B

1. Bearing
2. Bearing

3. Pulley flange
4. Screws [4 pcs]
5. Needle bar gear block

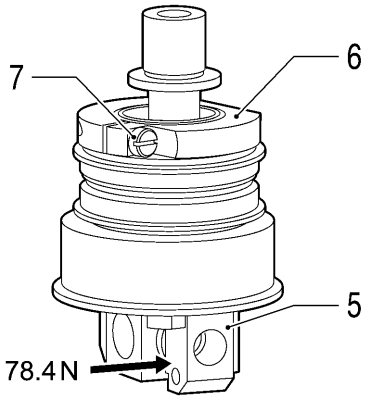
6. Needle bar gear nut
7. Screw
8. Gear nut cover

Adjusting the pressure of the needle bar gear block

Secure the needle bar gear nut (6), and then while pushing the needle bar gear block (5) with a force of 78.4 N, tighten the screw (7).

NOTE:

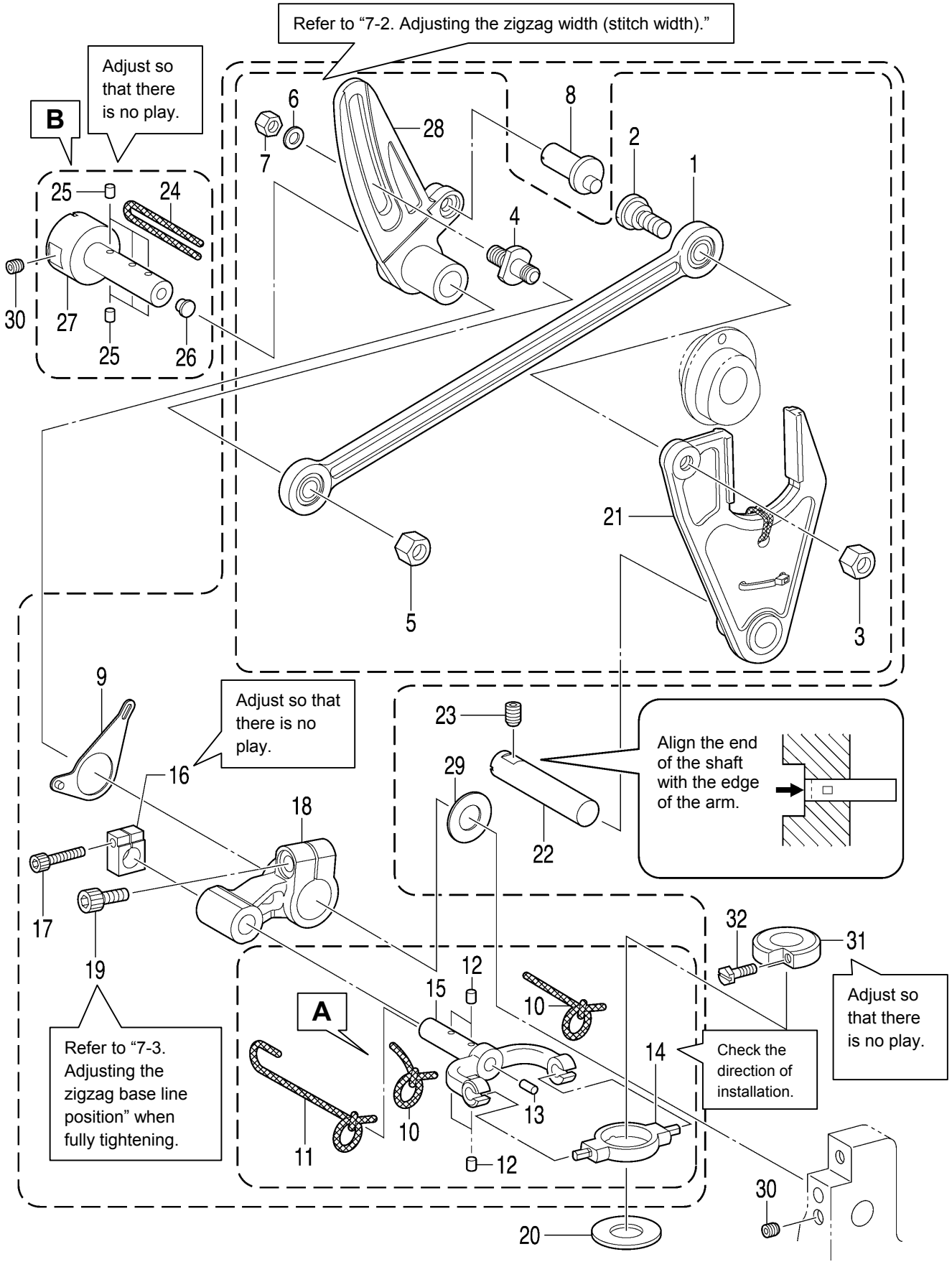
If pressure is not applied, it will not be possible to adjust the turning center for the needle bar and looper base, and this will cause problems with sewing such as skipped stitches.



0791B

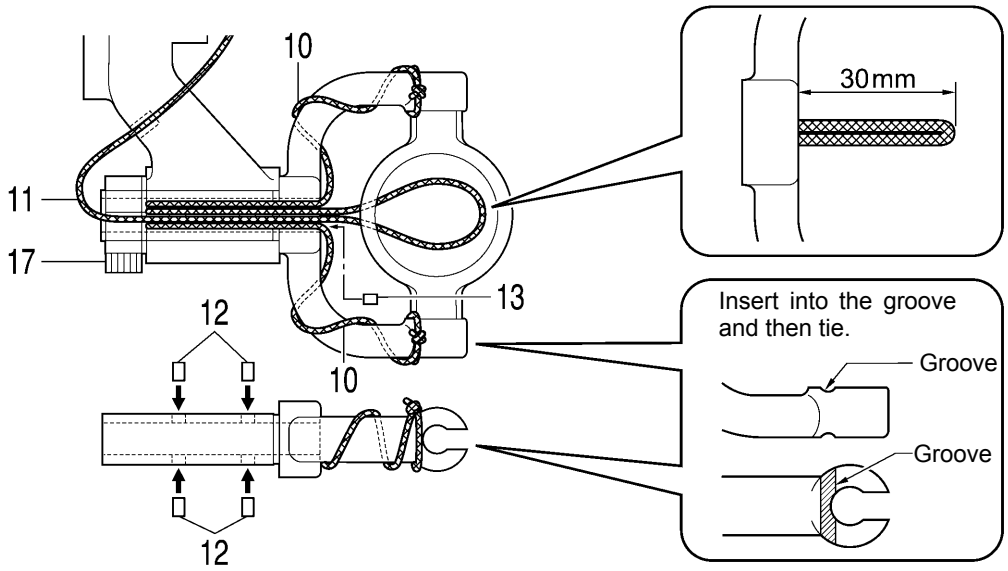
6-3. Zigzag mechanism

* Refer to the detailed descriptions on the next page for details on A and B in the illustration.

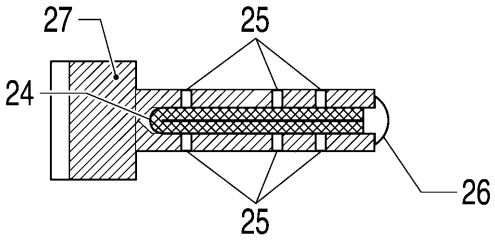


1. Zigzag connecting rod assembly
2. Shoulder screw
3. Nut
4. Zigzag crank screw
5. Nut
6. Plain washer
7. Nut (Temporarily tighten)
8. Zigzag eccentric pin
9. Needle position control plate assembly
10. Wicks [2 pcs]
11. Wick
12. Felts [4 pcs]
13. Felt
14. Zigzag horizon link
15. Zigzag lever
16. Needle bar clamp
17. Socket bolt
18. Zigzag driving lever
19. Socket bolt (Temporarily tighten)
20. Needle bar block collar
21. Zigzag fork
22. Zigzag fork support shaft
23. Set screw
24. Wick
25. Felts [6 pcs]
26. Cap4
27. Zigzag coaxial rock shaft
28. Zigzag crank
29. Spacer
30. Set screws [2 pcs]
31. Needle bar block bracket
32. Screw

A Install the two wicks (10) and the wick (11) as shown in the illustration. Push in the felt (13) so that the wick will not pull out, and then push in the four felts (12) so that they do not protrude from the end of the shaft. After this, install the socket bolt (17) so that it faces as shown in the illustration.

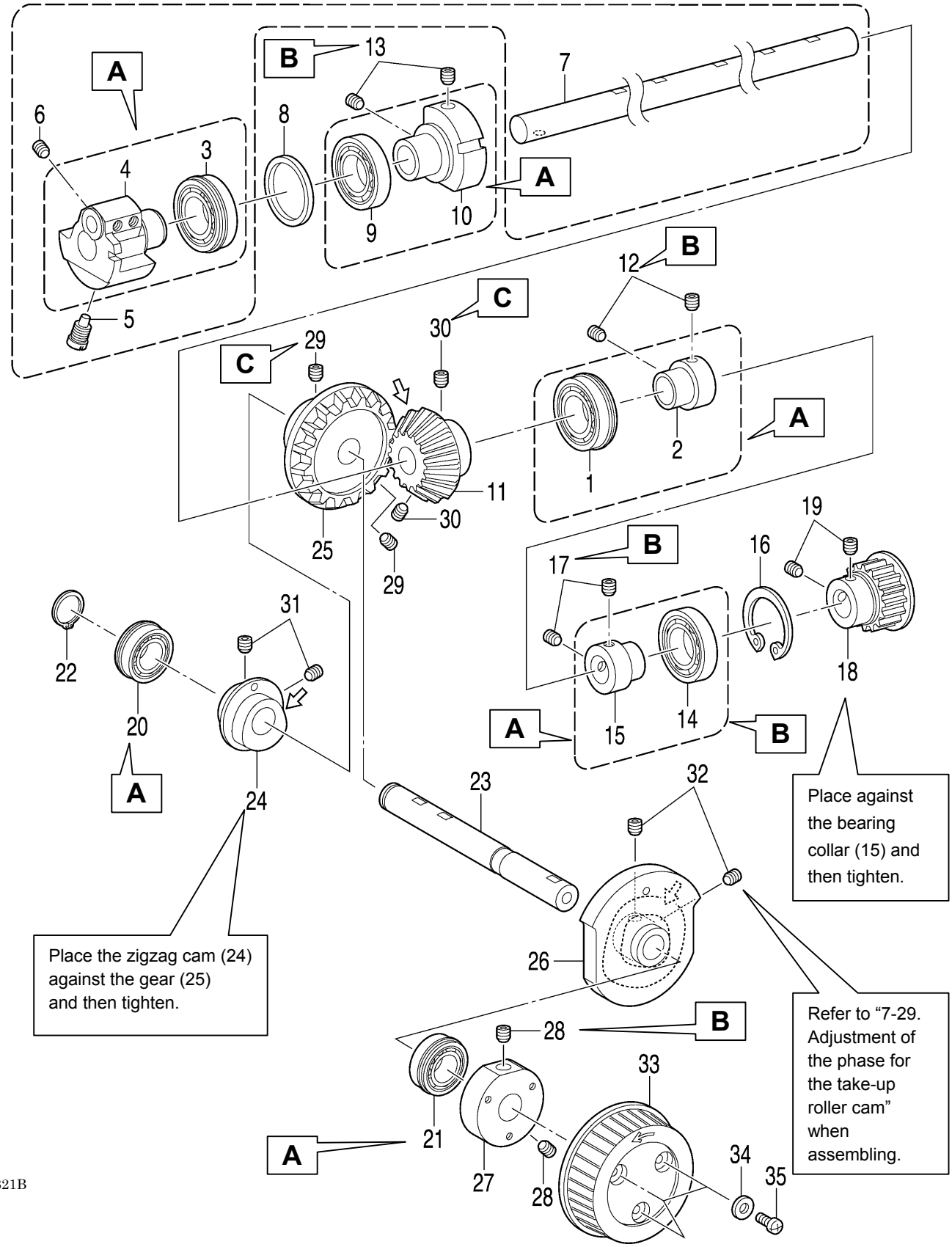


B Install the wick (24) as shown in the illustration.
Next, push the six felts (25) into the end of the shaft so that they do not protrude.



6-4. Upper shaft mechanism

* Refer to the detailed descriptions on pages 62 and 63 for details on A to C in the illustration.
* For parts with screw stops, install so that the screw at the front in the turning direction is at the screw stop position.
* Apply the grease specified by Brother (**MOLYKOTE LONGTERM W2 manufactured by Dow Corning Corporation**) in the places indicated by ⇦ .



1. Bearing
2. Bearing collar

3. Bearing
4. Upper shaft crank

5. Screw
6. Set screw
7. Upper shaft

8. Spacer

9. Bearing
10. Balance collar

11. Pinion
12. Set screws [2 pcs]
13. Set screws [2 pcs]

14. Bearing
15. Bearing collar

16. Internal retaining ring
17. Set screws [2 pcs]
18. Timing pulley assembly
19. Set screws [2 pcs]
20. Bearing
21. Bearing

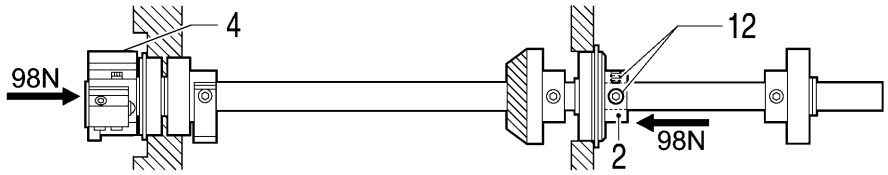
22. Retaining ring C
23. Orthogonal shaft
24. Zigzag cam
25. Gear
26. Take-up cam roller
27. Pulley base
28. Set screws [2 pcs]
29. Set screws [2 pcs]
30. Set screws [2 pcs]
31. Set screws [2 pcs]
32. Set screws [2 pcs]
33. Pulley
34. Plain washers [3 pcs]
35. Screws [3 pcs]

A The outer circumferences of the bearings touch the sewing machine arm and the orthogonal shaft (23) touch the inside of the bearings, so avoid removing them if possible.
If removing them, apply adhesive (Threebond 1373B) to the outer circumferences of the bearings, and apply adhesive (Threebond 1401) to the inside of the bearing on the orthogonal shaft (23). Be sure to wipe away any excess adhesive from the bearings at this time to avoid letting the adhesive get inside the mechanism.

B Upper shaft and orthogonal shaft pressure adjustment

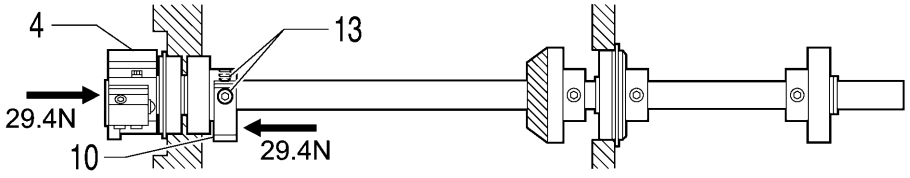
<Adjusting the pressure of the upper shaft>

1) While pushing the upper shaft crank (4) in the direction of the arrow with a force of 98 N, push the bearing collar (2) in the direction of the arrow with a force of 98 N, and then tighten the two set screws (12).



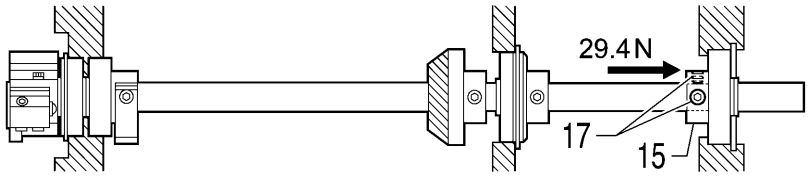
0822B

2) While pushing the upper shaft crank (4) in the direction of the arrow with a force of 29.4 N, push the end of the balance collar (10) against the upper shaft crank (4) with a force of 29.4 N, and then tighten the two set screws (13).



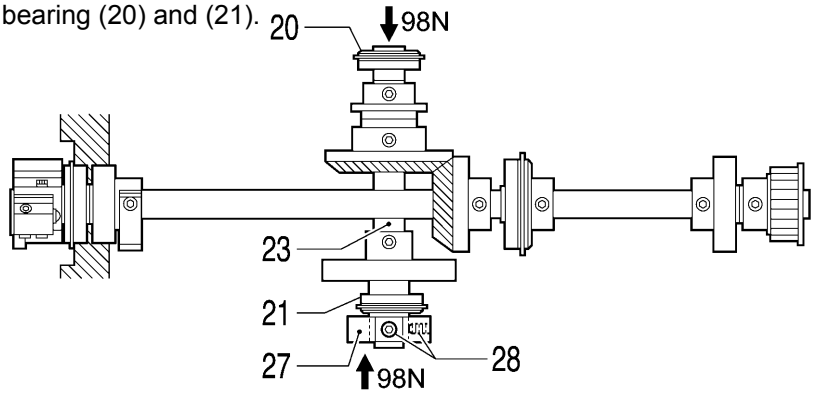
0823B

3) While pushing the end of the bearing collar (15) in the direction of the arrow with a force of 29.4 N, tighten the two set screws (17).



0824B

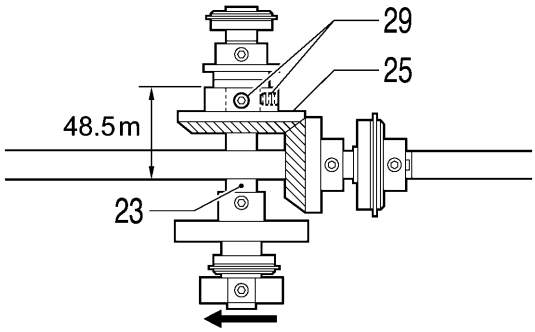
<Adjusting the pressure of the orthogonal shaft>
While pushing the pulley base(27) in the direction of the arrow with a force of 98 N, push the orthogonal shaft (23) in the direction of the arrow with a force of 98 N, and then tighten the two set screws (28).
* This adjustment should be carried out immediately after applying adhesive to the orthogonal shaft (23) and to the inside of the bearing (20) and (21).



0825B

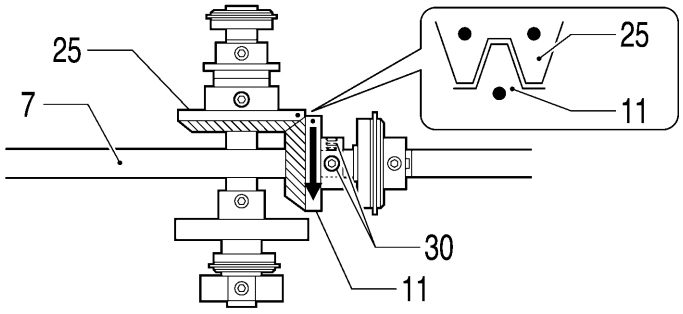
C Hypoid gear installation adjustment

1) Set the gear (25) to the position shown in the illustration, and then tighten the two set screws (29). Align the set screw (29) at the front in the turning direction with the screw stop on the orthogonal shaft (23). (The arrow shows the direction of rotation.)



0826B

2) Align the marks on the pinion (11) and the gear (25) as shown in the illustration. Next, align the set screw (30) at the front of the pinion (11) in the turning direction with the screw stop on the upper shaft (7), and then provisionally tighten the two set screws (30) so that the pinion (11) can still move in the axial direction. (The arrow shows the direction of rotation.)



0827B

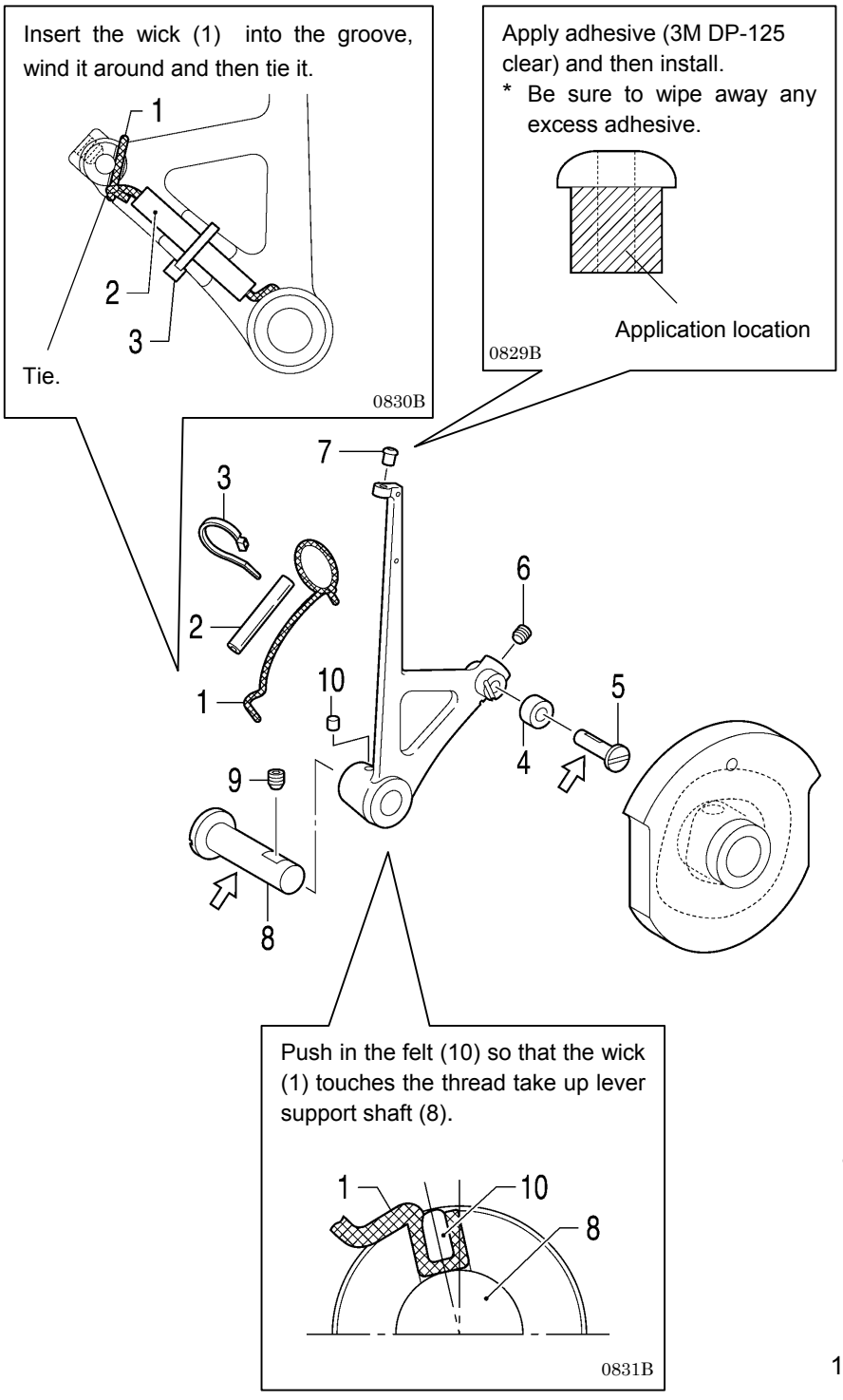
3) Push the pinion (11) against the gear (25) and adjust the backlash so that it is 0.05 mm or less, and then fully tighten the two set screws (30).

<Adjusting the backlash>
Adjust the backlash so that it is zero at the point where it is at a minimum when the gear (25) is turned a full rotation.
NOTE:
If the amount of backlash is too small, the rotation torque will increase and this will cause the gear (25) to become worn. Furthermore, if the amount of backlash is too large, the operating noise will increase, so be sure to adjust the backlash correctly.

6-5. Thread take-up mechanism

Insert the roller (4) into the groove in the thread take-up cam, and then insert the thread take-up L support shaft (8).

* Apply the grease specified by Brother (**MOLYKOTE LONGTERM W2 manufactured by Dow Corning Corporation**) in the places indicated by ⇦ .

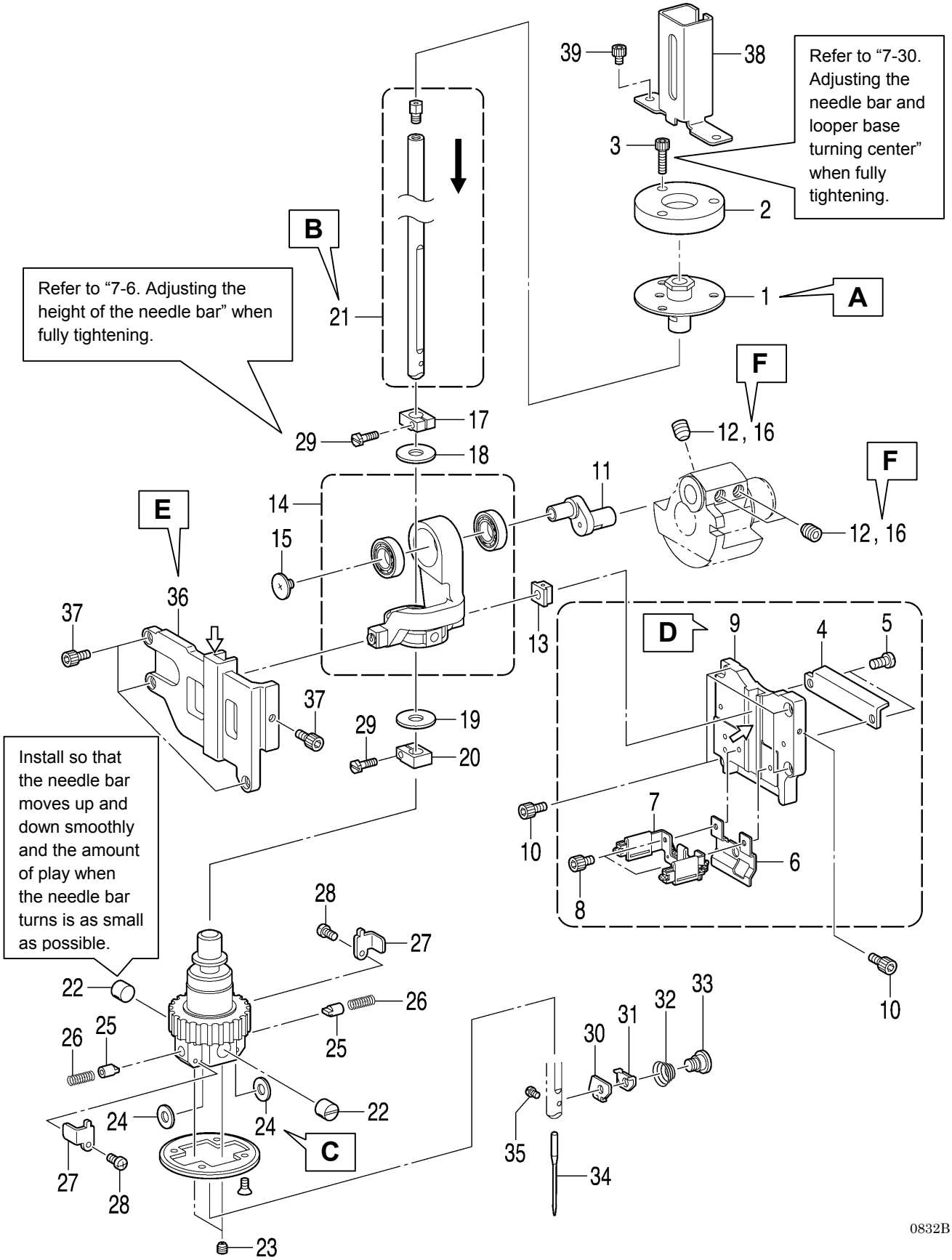


1. Wick
2. Oil tube
3. Fastening band
4. Roller
5. Roller shaft
6. Set screw
7. Thread guide
8. Thread take-up L support shaft
9. Set screw
10. Felt

6-6. Needle bar mechanism (2)

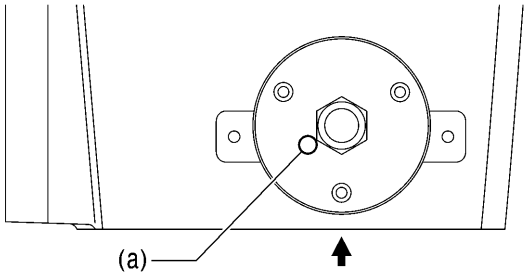
* Refer to the detailed descriptions on pages 66 to 68 for details on A to F in the illustration.

* Apply the grease specified by Brother (**MOLYKOTE LONGTERM W2 manufactured by Dow Corning Corporation**) in the places indicated by ⇦.



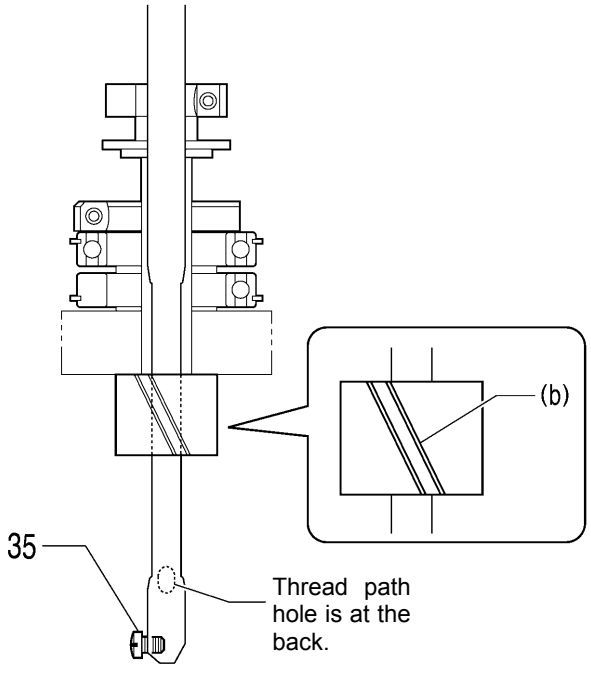
1. Needle bar bush U assembly
2. Needle bar bush holder base C
3. Socket bolts [3 pcs] (Temporarily tighten)
4. Oil plate
5. Screws [2 pcs]
6. Oil stopper
7. Felt holder assembly
8. Socket bolts [2 pcs]
9. Slide block guide D
10. Socket bolts [5 pcs]
11. Needle bar crank
12. Set screws [3 pcs] (Temporarily tighten)
13. Slide block
14. Crank rod unit
15. Screw (Left-hand thread)
16. Set screws [3 pcs] (Fully tighten)
17. Needle bar clamp
18. Plain washer
19. Plain washer
20. Needle bar clamp
21. Needle bar assembly L (Insert from above)
22. Needle bar guide collars [2 pcs]
23. Set screws [2 pcs]
24. Needle bar guide washers [2 pcs]
25. Needle bar guides [2 pcs]
26. Needle bar guide springs [2 pcs]
27. Needle bar guide support plates [2 pcs]
28. Screws [2 pcs]
29. Needle bar bracket screws [2 pcs] (Temporarily tighten)
30. Needle guide A
31. Needle thread holder plate A
32. Tension spring
33. Shoulder screw
34. Needle
35. Set screw, SM
36. Slide block guide F
37. Socket bolts [4 pcs]
38. Needle bar guard
39. Socket bolts [2 pcs]

A Be careful of the position of the hole (a) when assembling.



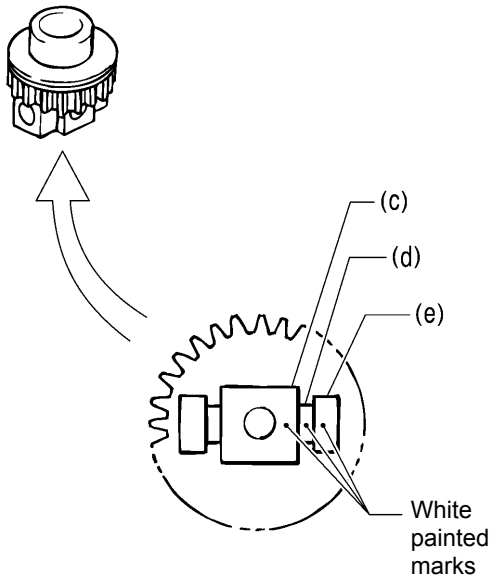
0833B

B Make sure that the direction of the groove (b) is correct when assembling.



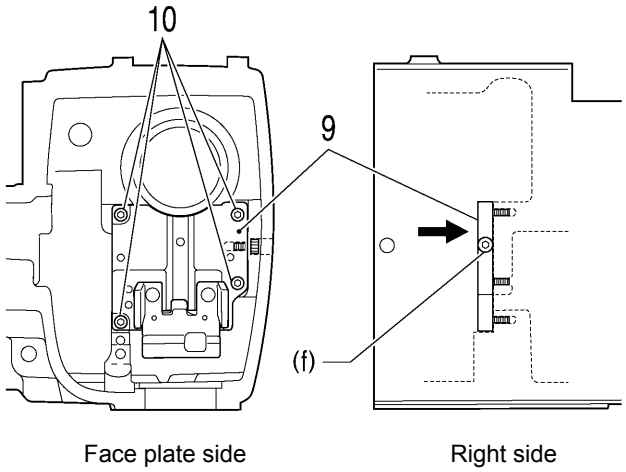
0834B

C Align the white painted marks on the needle bar block (c), needle bar guide washer (d) and needle bar gear (e) before installing.



0835B

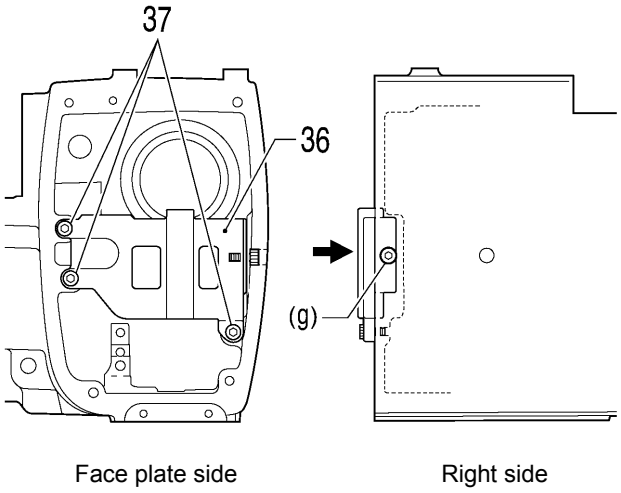
D Slide block guide D installation



1) Provisionally tighten the four socket bolts (10) so that the slide block guide D (9) can still move.
2) While pushing the slide block guide D (9) gently from the face plate side toward the arm installation surface, tighten the fifth socket bolts (10) (f) from the side of the arm.
3) Fully tighten the four socket bolts (10).

0836B

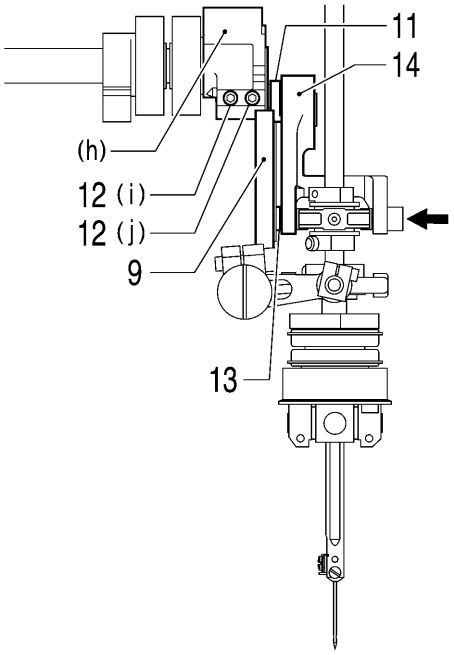
E Slide block guide F installation



1) Provisionally tighten the three socket bolts (37) so that the slide block guide F (36) can still move.
2) While pushing the slide block guide F (36) gently from the face plate side toward the arm installation surface, tighten the fourth socket bolts (37) (g) from the side of the arm.
3) Fully tighten the three socket bolts (37).

0837B

F Needle bar crank forward/back adjustment



1) Align the screw stop of the needle bar crank (11) with the side where the two set screws (12) are on the upper shaft crank (h) (where the set screw (12) (j) is), and then provisionally tighten the two set screws (12) (i) and (j) so that the needle bar crank (11) can still move back and forth.
2) Pull out the crank rod unit (14) slightly.
3) Push the place indicated by ⬅ to gently push the Slide block (13) against slide block guide D (9) so that the upper shaft crank (h) can still turn easily, then tighten the set screw (12) (j) through the hole in the side of the arm, and then tighten the other set screw (12) (i)". After this, turn the upper shaft crank (h) and provisionally tighten the third set screw (12) on the opposite side.

* After assembling, check that the upper shaft crank (h) turns easily. If the slide block (13) is pushed too firmly, the upper shaft torque will become stiffer.

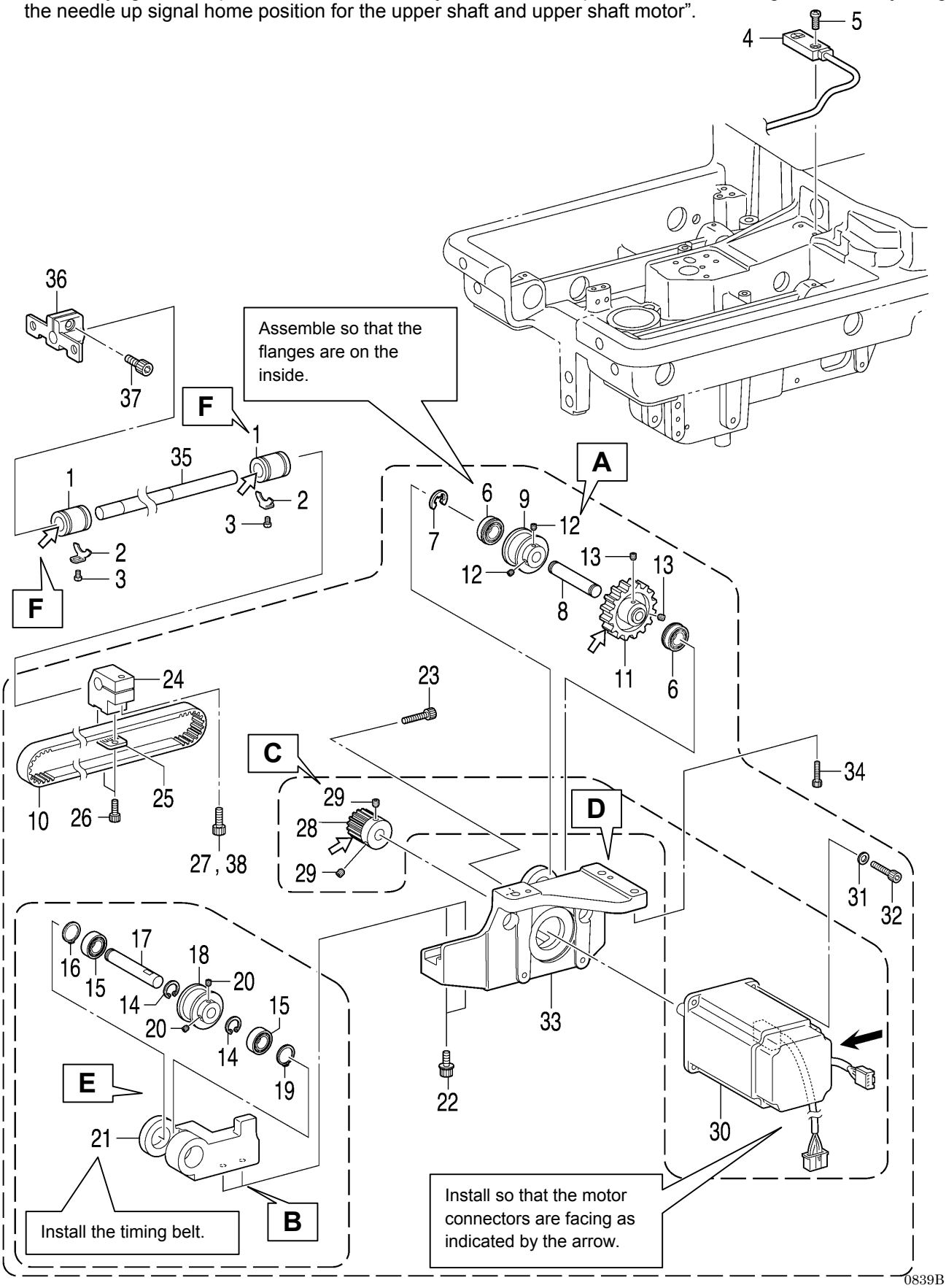
0838B

6-7. Y feed mechanism

* Refer to the detailed descriptions on pages 70 to 72 for details on A to F in the illustration.
* Apply the grease specified by Brother (**MOLYKOTE LONGTERM W2 manufactured by Dow Corning Corporation**) in the places indicated by ⇦.

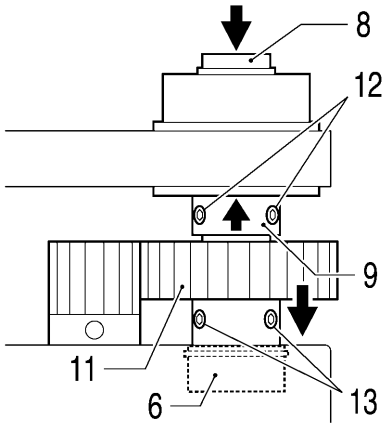
NOTE:

After carrying out this procedure, be sure to adjust the Y home position while referring to "7-35. Adjusting the needle up signal home position for the upper shaft and upper shaft motor".



1. Ball bearings [2 pcs]
2. Ball bearing stoppers [2 pcs]
3. Screws [2 pcs]
4. Y position sensor
5. Screw
6. Ball bearings [2 pcs]
7. Retaining ring E
8. Y pulley shaft F
9. Y timing pulley assembly
10. Timing belt
11. Idler gear 40
12. Set screws [2 pcs]
13. Set screws [2 pcs]
14. Retaining rings C [2 pcs]
15. Ball bearings [2 pcs]
16. Retaining ring C
17. Y pulley shaft R
18. Y timing pulley assembly
19. Retaining ring C
20. Set screws [2 pcs]
21. Y pulley support
22. Socket bolts with washers [2 pcs] (Temporarily tighten)
23. Socket bolt (Temporarily tighten)
24. Y driving shaft holder
25. Belt holder
26. Socket bolts [2 pcs]
27. Socket bolt (Temporarily tighten)
28. Driving gear 20
29. Set screws [2 pcs]
30. Pulse motor Y assembly
31. Washers [4 pcs]
32. Socket bolts [4 pcs]
33. Y feed base
34. Socket bolts [3 pcs]
35. Y shaft
36. Y shaft holder
37. Socket bolt
38. Socket bolt

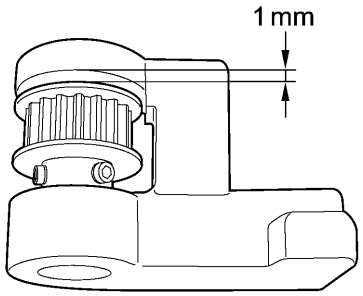
A



1) Push the Y pulley shaft F (8) and the Y timing pulley assembly (9) in the direction of the arrow so that there is no play in the parts, and then tighten the two set screws (12).
2) Align the idler gear 40 (11) with the two set screws (12) of the Y timing pulley assembly (9), and then push it toward the side where the ball bearing (6) are and tighten the two set screws (13).

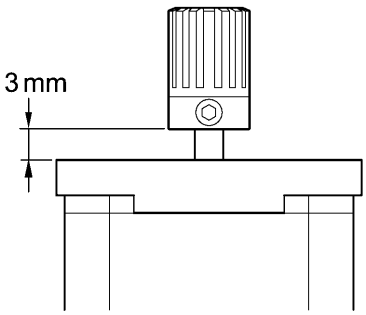
0840B

B Assemble as shown in the illustration.



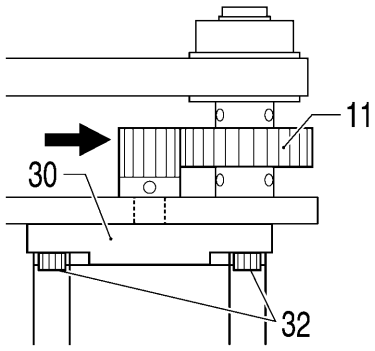
0841B

C Assemble as shown in the illustration.



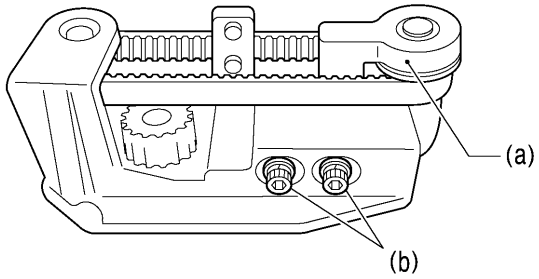
0842B

D Place the pulse motor Y assembly (30) against the idler gear 40 (11) so that the amount of backlash is 0.03 mm or less, and then tighten the four socket bolts (32).

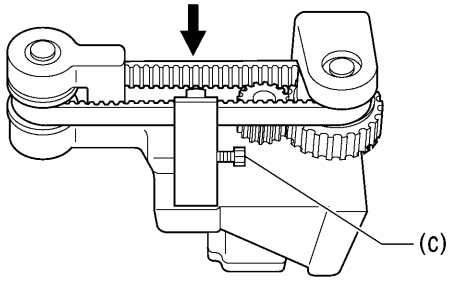


0843B

E Belt tension adjustment



Measurement position



Repeat steps1 to 3 to adjust the belt tension until it is within the ranges given below.

- When using a new belt: 80 - 90 N
- When reusing an old belt: 60 - 70 N

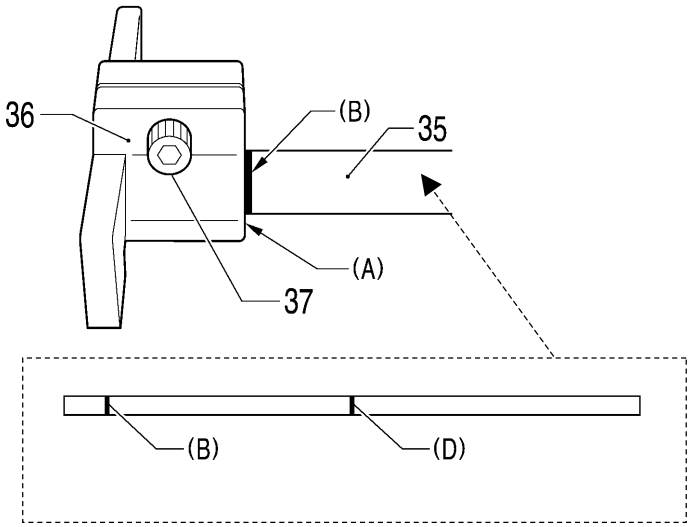
1) Loosen the two screws (b) of the Y pulley support assembly (a).
2) Use the adjustment screw (c) to adjust the belt tension.
3) Tighten the two screws (b) of the Y pulley support assembly (a).

* Be sure to use a belt tension gauge to measure the belt tension, and measure at the position shown in the illustration.
* The belt tension gauge should be set to measure a unit weight of 0.04 kg/m, a belt width of 10 mm and a span length of 120 mm.

0844B
0845B

F Standard installation of motor unit

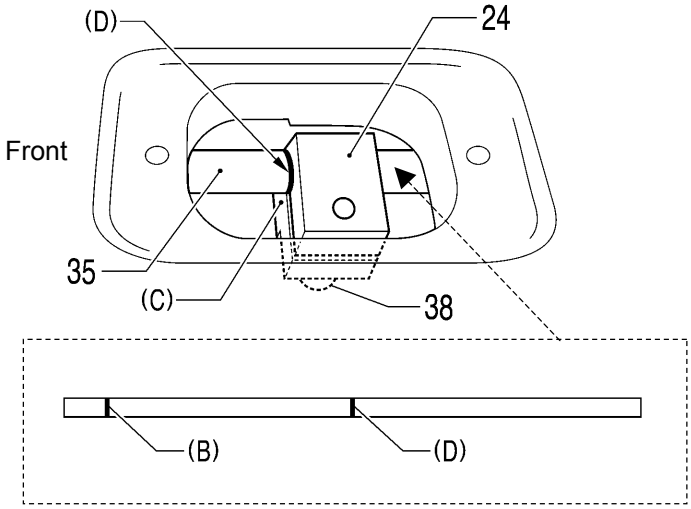
<Y shaft and Y shaft holder installation positions>



Align the end (A) of the Y shaft holder (36) and the reference line (B) on the Y shaft (35), and then tighten the socket bolt (37).

0846B
0847B

<Y shaft and Y driving shaft holder installation positions>

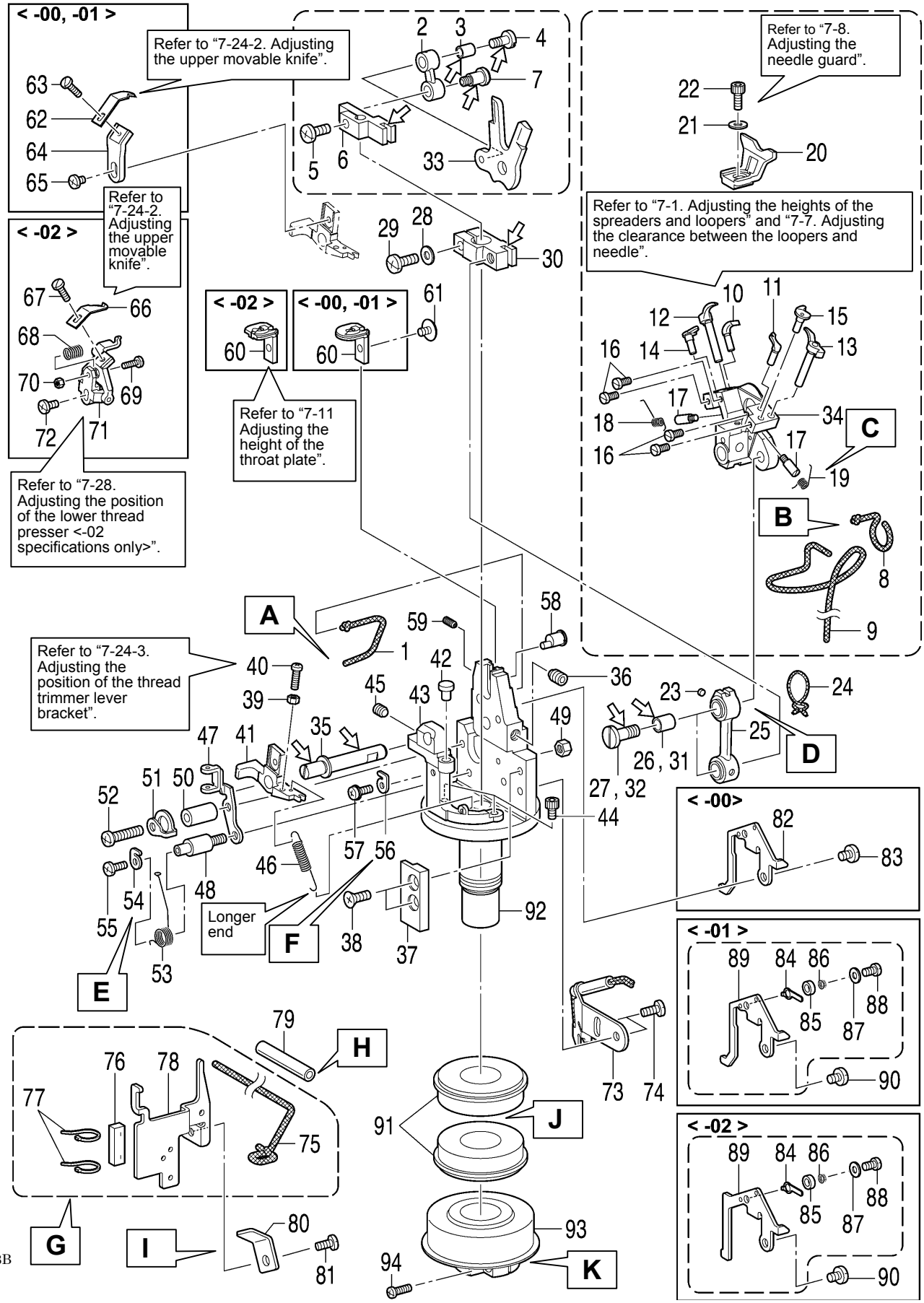


Align the end (C) of the Y driving shaft holder (24) and the reference line (D) on the Y shaft (35), and then tighten the socket bolt (38).

0848B
0847B

6-8. Looper base mechanism

* Refer to the detailed descriptions on pages 75 to 78 for details on A to F in the illustration.
* Apply the grease specified by Brother (**MOLYKOTE LONGTERM W2 manufactured by Dow Corning Corporation**) in the places indicated by ⇦ .



1. Wick
2. Spreader cam link
3. Collar
4. Shoulder screw
5. Screw (Temporarily tighten)
6. Spreader link base
7. Shoulder screw
8. Wick
9. Wick
10. Eye looper
11. Looper R
12. Spreader L
13. Spreader R
14. Spreader stopper L
15. Spreader stopper R
16. Screw [4 pcs] (Temporarily tighten)
17. Spring guide shaft
18. Twist spring L
19. Twist spring R
20. Needle guard U
21. Plain washer
22. Socket bolt (Temporarily tighten)
23. Felt
24. Wick
25. Looper link
26. Collar
27. Shoulder screw
28. Plain washer
29. Screw (Temporarily tighten)
30. Looper link clamp
31. Collar
32. Shoulder screw
33. Spreader driving cam
34. LS holder base
35. Holder presser shaft
36. Set screw
37. LS slide guide
38. Plain washer [2 pcs]
39. Nut
40. Screw (Temporarily tighten)
41. Thread trimmer lever bracket
42. Pin
43. Support shaft base
44. Socket bolts [2 pcs]
45. Set screw
46. Spring
47. Thread guide plate
48. Spring guide shaft
49. Nut
50. Collar
51. L thread take-up spring support
52. Screw (Temporarily tighten)
53. Thread take-up spring
54. L thread take-up spring support
55. Screw (Temporarily tighten)
56. L thread take-up spring support
57. Screw with washer
58. Vertical pin
59. Set screw (Temporarily tighten)
60. Throat plate
61. Screw (Temporarily tighten)

<-00 and -01 specifications only>

62. Upper movable knife A
63. Screw (Temporarily tighten)
64. Upper movable knife base
65. Screw (Temporarily tighten)

<-02 specifications only>

66. Upper movable knife B
67. Screw (Temporarily tighten)
68. Spring
69. Screw
70. Nut
71. Lower thread presser J assembly
72. Screw (Temporarily tighten)
73. Looper base oil plate assembly
74. Screws [2 pcs]
75. Wick
76. Felt
77. Fastening bands [2 pcs]
78. Gimp thread waste plate
79. Oil tube
80. Cord holder
81. Screw

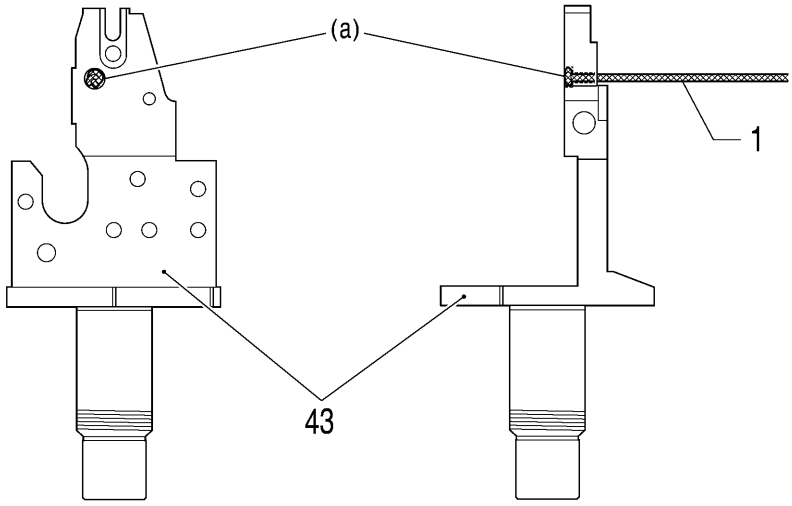
<-00 specifications only>

82. Gimp thread guide C
83. Screw

<-01 and -02 specifications only>

84. Gimp thread clamp plate
85. Collar
86. Spring
87. Plain washer
88. Screw
89. Gimp thread guide C <Gimp thread guide C-J for -02 specifications>
90. Screw
91. Ball bearings [2 pcs]
92. Looper base
93. Looper pulley assembly
94. Screw

A Tie one end of the wick (1) once, and then push that end into the hole (a) in the support shaft base (43).
* Push in so that the knot does not protrude from the hole (a).

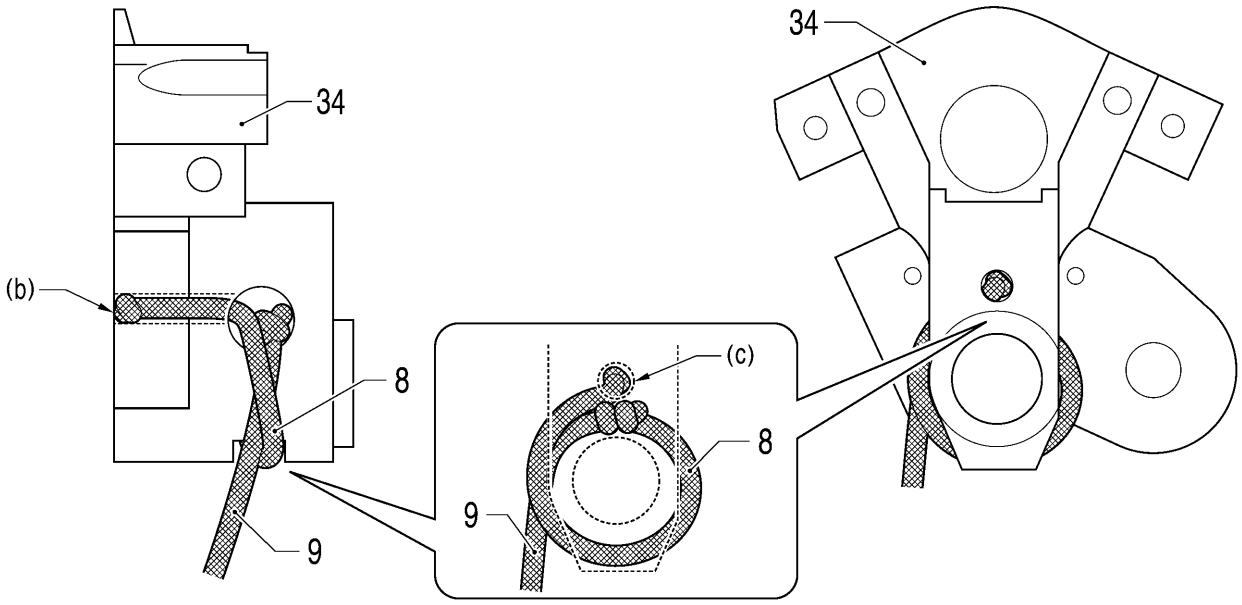


(Viewed from the front) (Viewed from the right)

1184B

B

1) Tie one end of the wick (8) once, and then push that end into the hole (b) in the LS holder base (34).
   * Push in so that the knot does not protrude from the hole (b).
2) Tie the other end of the wick (8) to one end of the wick (9), and then wind them around the LS holder base (34) as shown in the illustration.
   * Tie the wicks twice to form the knot.
   * Wind so that the knot is directly below the hole (c) and so that it does not protrude to the outside.
   * Wind the wick (8) and the wick (9) so that they are positioned as shown in the illustration.

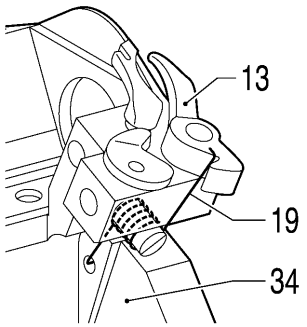


(Viewed from the left) (Viewed from the front)

1185B

C

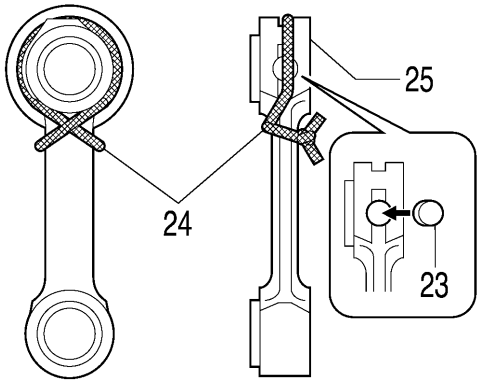
Hook the longer end of twist spring R (19) onto spreader R (13), and pass the shorter end through the hole in the LS holder base (34) as shown in the illustration.



1094B

D

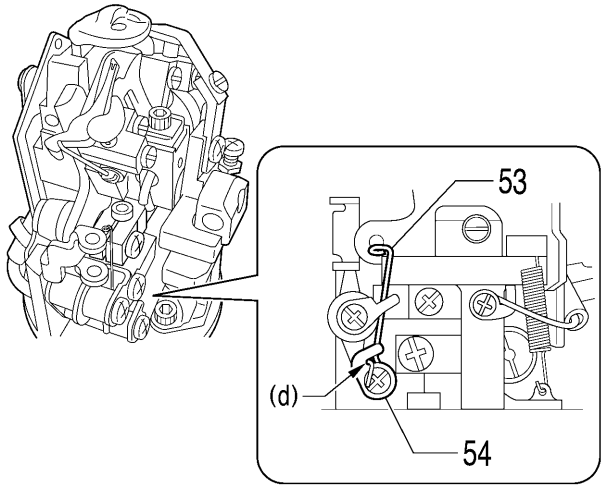
1) Push the felt (23) into the hole in the looper link (25).
2) Tie the wick (24) around the looper link (25) as shown in the illustration.
   * Make a double knot in the wick (24), and then cut off the excess length so that the ends are 2 - 3 mm in length.



1095B

E

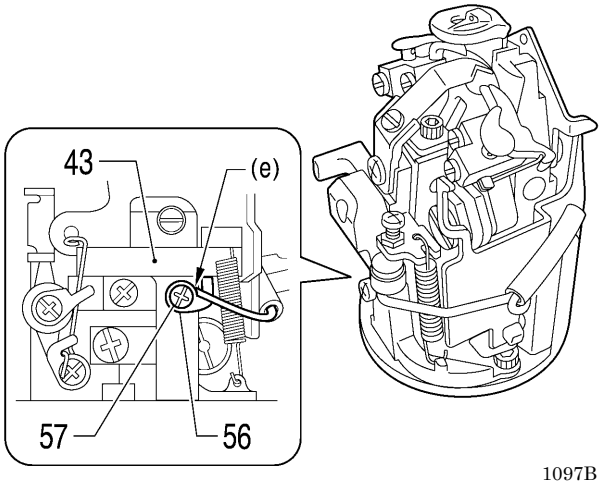
Hook the thread take-up spring (53) onto the hook (d) of the L thread take-up spring support (54) as shown in the illustration.



1096B

F

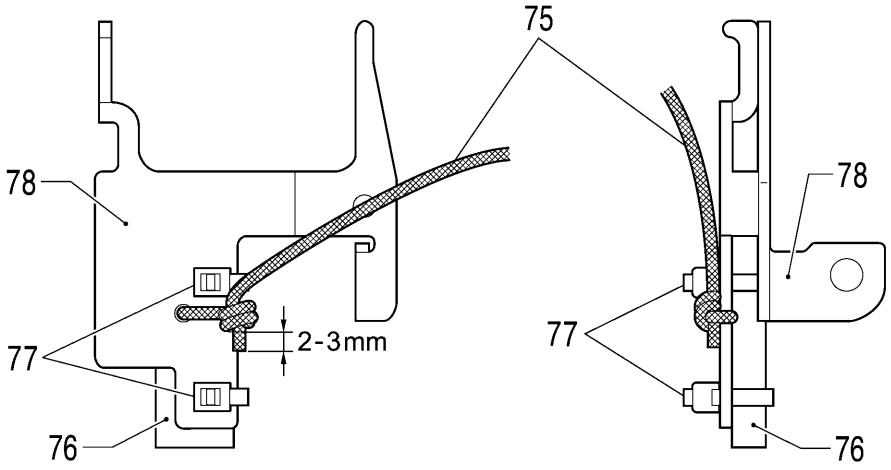
1) Hook the wick onto the hook (e) of the L thread take-up spring support (56) as shown in the illustration.
2) Raise the end of the hook (e) of the L thread take-up spring support (56) so that it touches the support shaft base (43), and then tighten the screw with washer (57) at that position.
   * This will prevent the wick from pulling away.



1097B

G

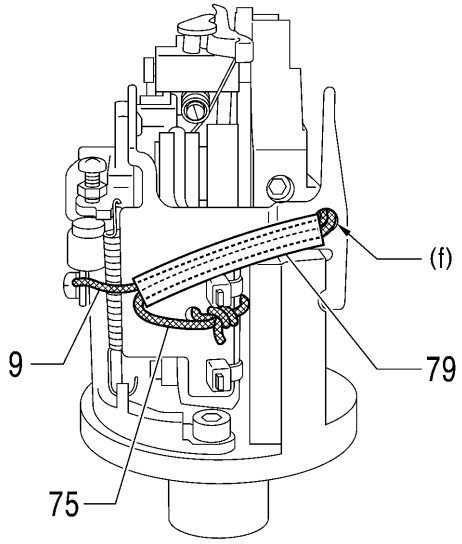
1) Tie the wick (75) around the wick release plate (78) as shown in the illustration.
   * Make a double knot in the wick, and then set the wick so that the distance from the knot to the end is as shown in the illustration, and cut off any excess length.
2) Install the felt (76) to the wick release plate (78) with the two cable ties (77).
   * Cut the ends of the two cable ties (77) so that a length of 0 to 2 mm remains.



(Viewed from the front) (Viewed from the right)

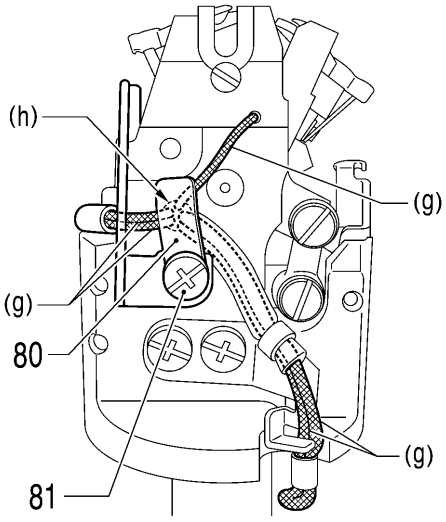
1186B

H Pass the wick (9) and the wick (75) through the oil tube (79) as shown in the illustration, and then pass them through the hole (f).



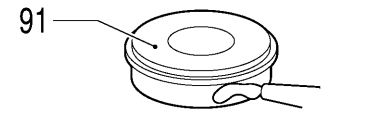
1187B

I Push the five wicks (g) into the hole (h) as shown in the illustration, and then install the cord presser (80) and secure it by tightening the screw (81).

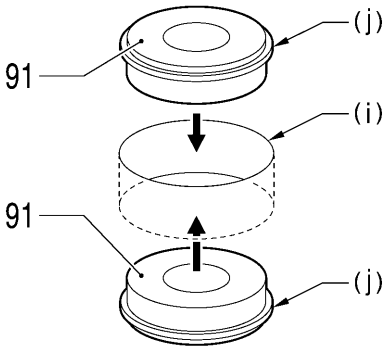


1188B

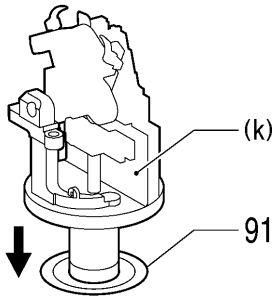
J



1) Apply adhesive (Threebond 1373B) to the outer circumferences of the two ball bearings (91).



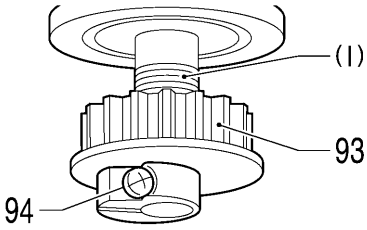
2) Insert the two ball bearings (91) into the top and bottom of the looper base mounting hole (i) in the bed.
   * Insert the two ball bearings (91) securely until their surfaces (j) are fully touching.
   * Wipe away any excess adhesive at this time.



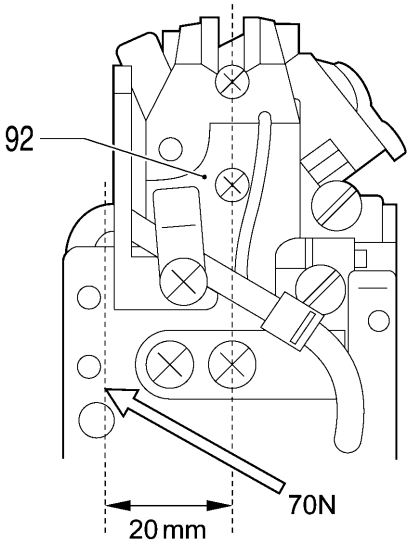
3) Insert the looper base assembly (k).

1098B
1099B
1100B

K **Looper base pressure adjustment**



1) Gently screw the looper pulley assembly (93) onto the threaded section (l) of the looper base.

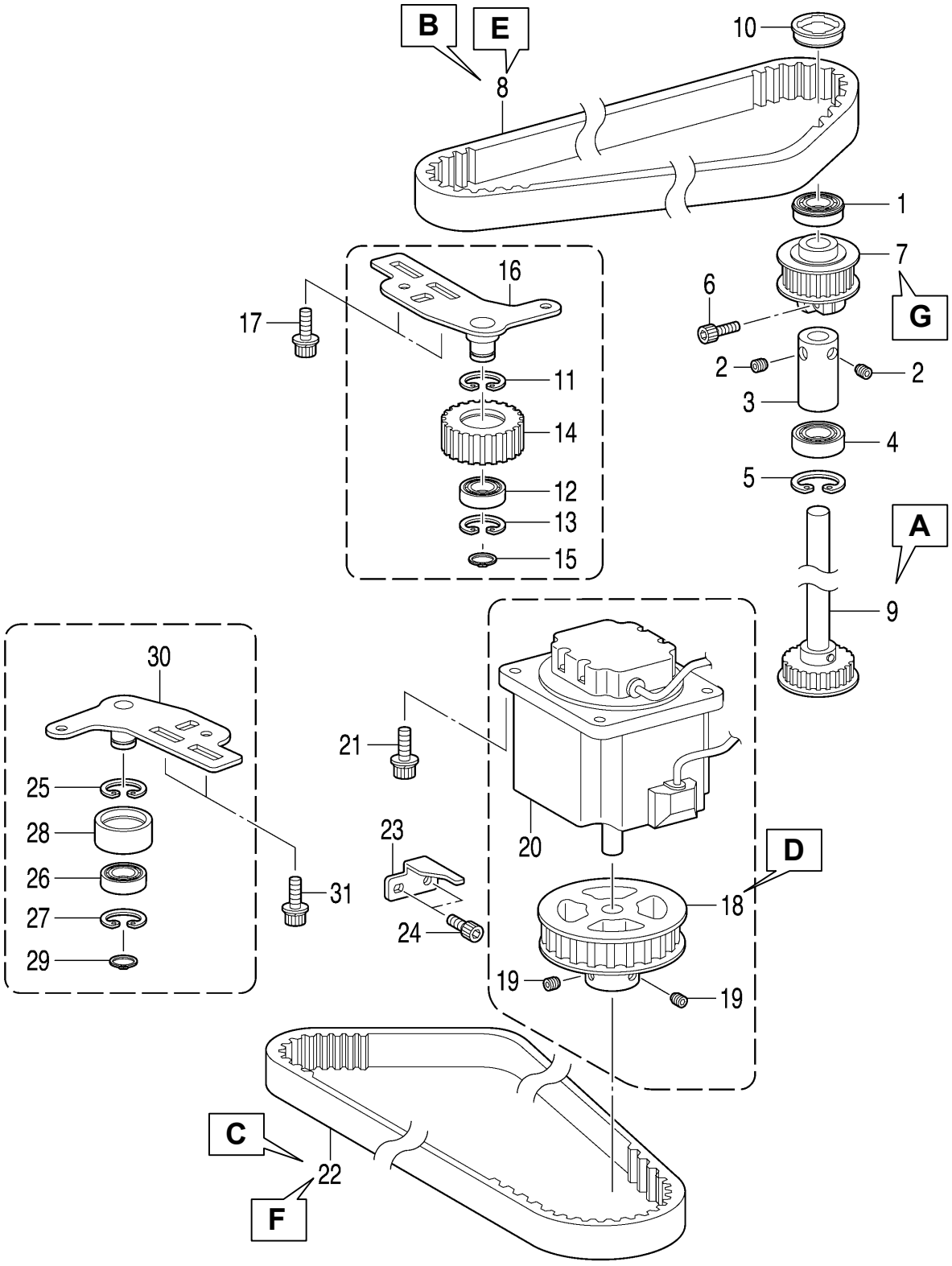


2) Secure the looper pulley assembly (93) so that it will not turn, and then push the back of the looper base (92) at a point 20 mm to the left of center with a force of 70 N.
3) Tighten the screw (94).

1101B

6-9. Needle bar rocking mechanism

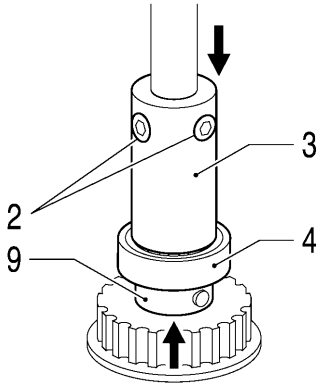
* Refer to the detailed descriptions on pages 80 to 84 for details on A to G in the illustration.



0922B

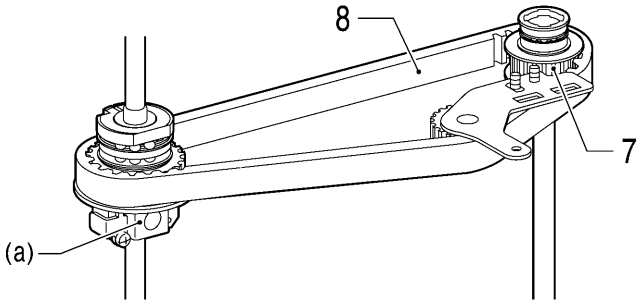
1. Bearing
2. Set screws [2pcs] (Temporarily tighten)
3. Set screw collar
4. Bearing
5. Internal retaining ring
6. Socket bolt (Temporarily tighten)
7. Vertical shaft timing pulley U assembly
8. Timing belt
9. Driving looper shaft assembly
10. Rubber cap
11. Internal retaining ring
12. Bearing
13. Internal retaining ring
14. Tension pulley U
15. Retaining ring C
16. Timing pulley holder assembly
17. Socket bolts with washers [2 pcs]
18. Theta M pulley assembly
19. Set screws [2 pcs]
20. Pulse motor assembly R
21. Socket bolts with washers [4 pcs]
22. Timing belt
23. Motor stopper
24. Socket bolts [2 pcs]
25. Internal retaining ring
26. Bearing
27. Internal retaining ring
28. Tension pulley
29. Retaining ring C
30. Timing pulley holder assembly
31. Socket bolts with washers [2 pcs]

A Push the driving looper shaft assembly (9) from the lowered to the raised position, then push the set screw collar (3) down to clamp the bearing (4), and then tighten the two set screws (2).



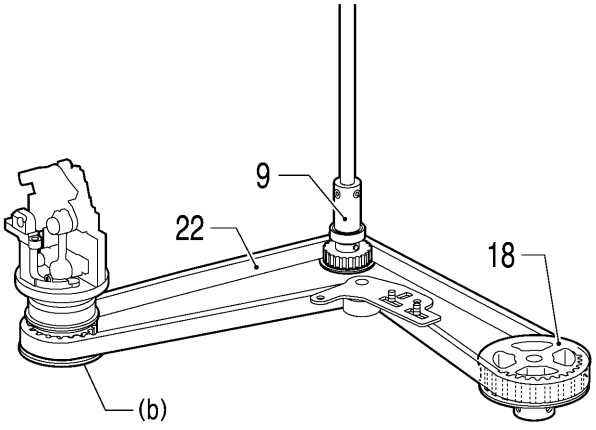
0923B

B Place the timing belt (8) onto the needle bar gear block (a) and the vertical shaft timing pulley U assembly (7).



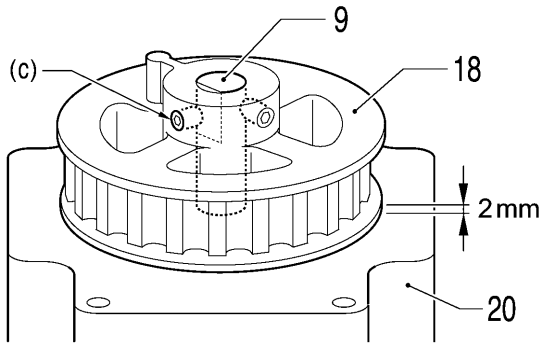
0924B

C Place the timing belt (22) onto the looper base (b), driving looper shaft assembly (9) and the theta M pulley assembly (18).



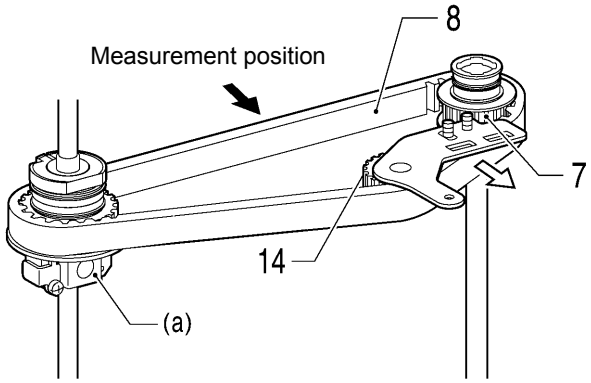
0925B

D Align the screw (c) at the left side of the theta M pulley assembly (18) with the screw stop on the driving looper shaft assembly (9). In addition, set the clearance between the theta M pulley assembly (18) and pulse motor assembly R (20) to 2 mm.



0926B

E Belt tension adjustment for needle bar gear block belt



0927B

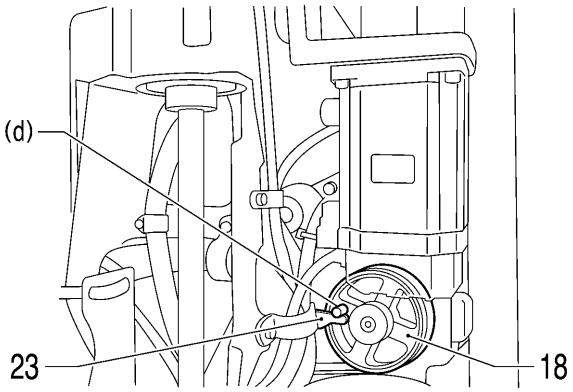
1) Place the timing belt (8) onto the needle bar gear block (a) and the vertical shaft timing pulley U assembly (7), and then provisionally install tension pulley U (14) so that it is gently pressing against the timing belt (8).
2) Pull tension pulley U (14) in the direction of the arrow ⇦ to adjust the belt tension so that it is within the ranges given below.
   - When using a new belt: 80 - 90 N
   - When reusing an old belt: 60 - 70 N

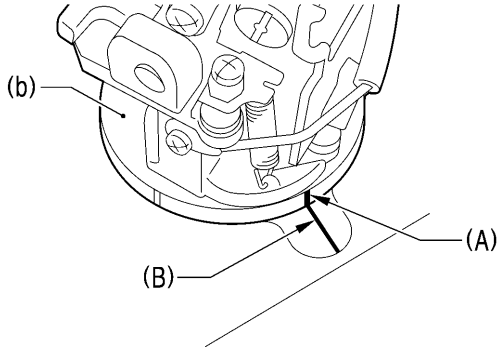
* Be sure to use a belt tension gauge to measure the belt tension, and measure at the position shown in the illustration.
* The belt tension gauge should be set to measure a unit weight of 0.04 kg/m, a belt width of 10 mm and a span length of 219 mm.

NOTE:
If you do not have a belt tension gauge, adjust so that the amount of deflection is approximately 3 mm when a pressure of 5 N is applied to the middle of the span (the measurement position shown in the illustration).

F Belt tension adjustment for driving looper belt

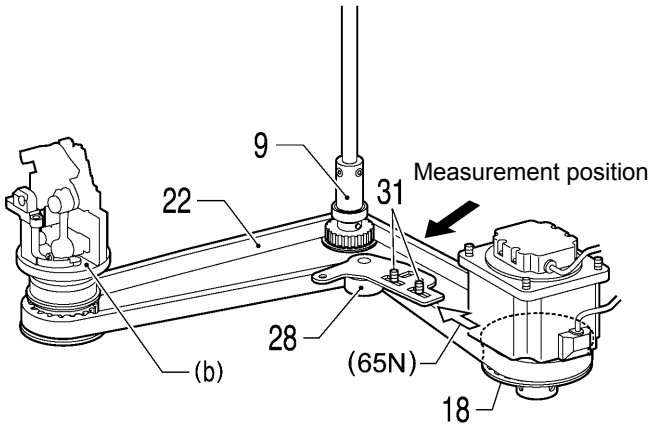
<Standard installation when belt is tensioned>





Attach the timing belt (22) so that the distance from reference line (A) (for installation: 65° position) on the looper base (b) to reference line (B) on the bed is 5 mm or less when (d) of the theta M pulley assembly (18) is touching against the motor stopper (23), and then adjust tension pulley (28) to the appropriate tension.

<Belt tension adjustment>



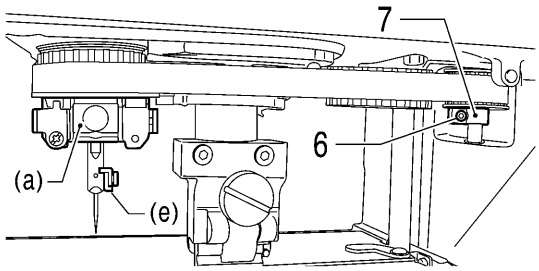
1) Place the timing belt (22) onto the looper base (b), driving looper shaft assembly (9) and theta M pulley assembly (18), and then provisionally install the tension pulley (28) so that it is gently pressing against the timing belt (22).
2) Pull the tension pulley (28) in the direction of the arrow ⇦ to adjust the belt tension so that it is within the ranges given below.
   - When using a new belt: 80 - 90 N
   - When reusing an old belt: 60 - 70 N
3) Check that the mechanism is at the <Standard installation when belt is tensioned> position given above at this time. If the reference lines are more than 5 mm apart, readjust the mechanism.

* Be sure to use a belt tension gauge to measure the belt tension, and measure at the position shown in the illustration.
* The belt tension gauge should be set to measure a unit weight of 0.04 kg/m, a belt width of 10 mm and a span length of 136 mm.

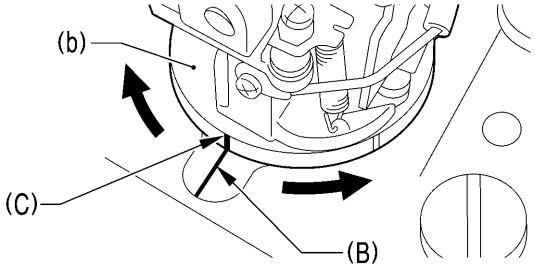
NOTE:
If you do not have a belt tension gauge, use a push-pull gauge to push tension pulley (28) in the direction of the arrow ⇦ with a force of 65 N, and then tighten the two socket bolts with washers (31).

1197B
0928B
0929B

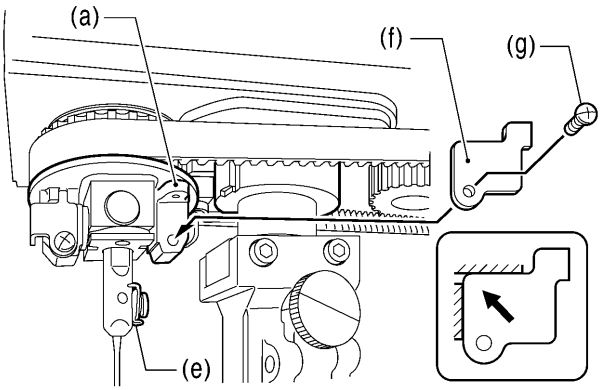
G Looper base and needle bar gear block position adjustment



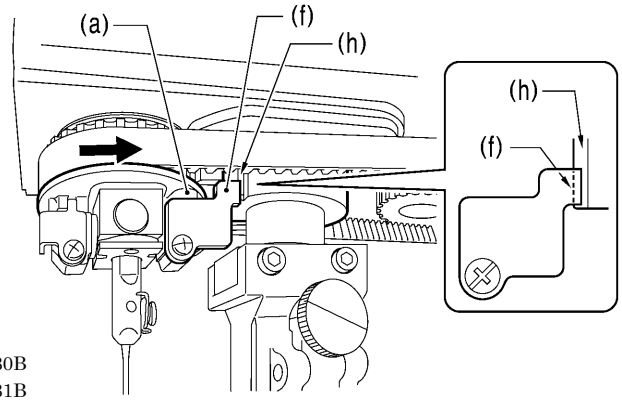
1) Loosen the socket bolt (6) of the vertical shaft timing pulley U assembly (7).
2) Turn the needle bar gear block (a) until the socket bolt (6) of vertical shaft timing pulley U assembly (7) is toward the front when the thread guide (e) on the needle bar is at the back.



3) Turn the looper base (b) until reference line (B) on the bed is aligned with reference line (C) (0°: left side) on the looper base.

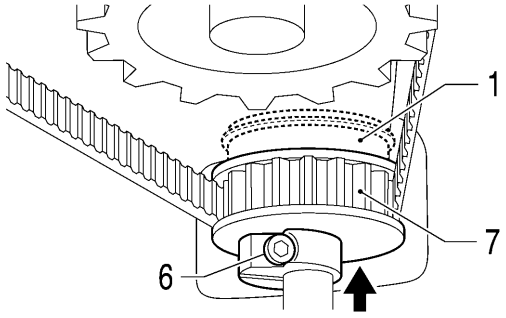


4) Install the positioning gauge (f) to the end of the needle bar gear block (a) with the screw (g). (The thread guide (e) on the needle bar should be all the way in [on the right side in the illustration].)
   * Install the positioning gauge (f) so that it is pushed up to the top-left.



5) Turn the needle bar gear block (a) in the direction of the arrow until the positioning gauge (f) touches the end (h) of the cutter driving bushing.
   * The underside of the positioning gauge (f) should touch the end (h).

0930B
0931B
1195B
1196B

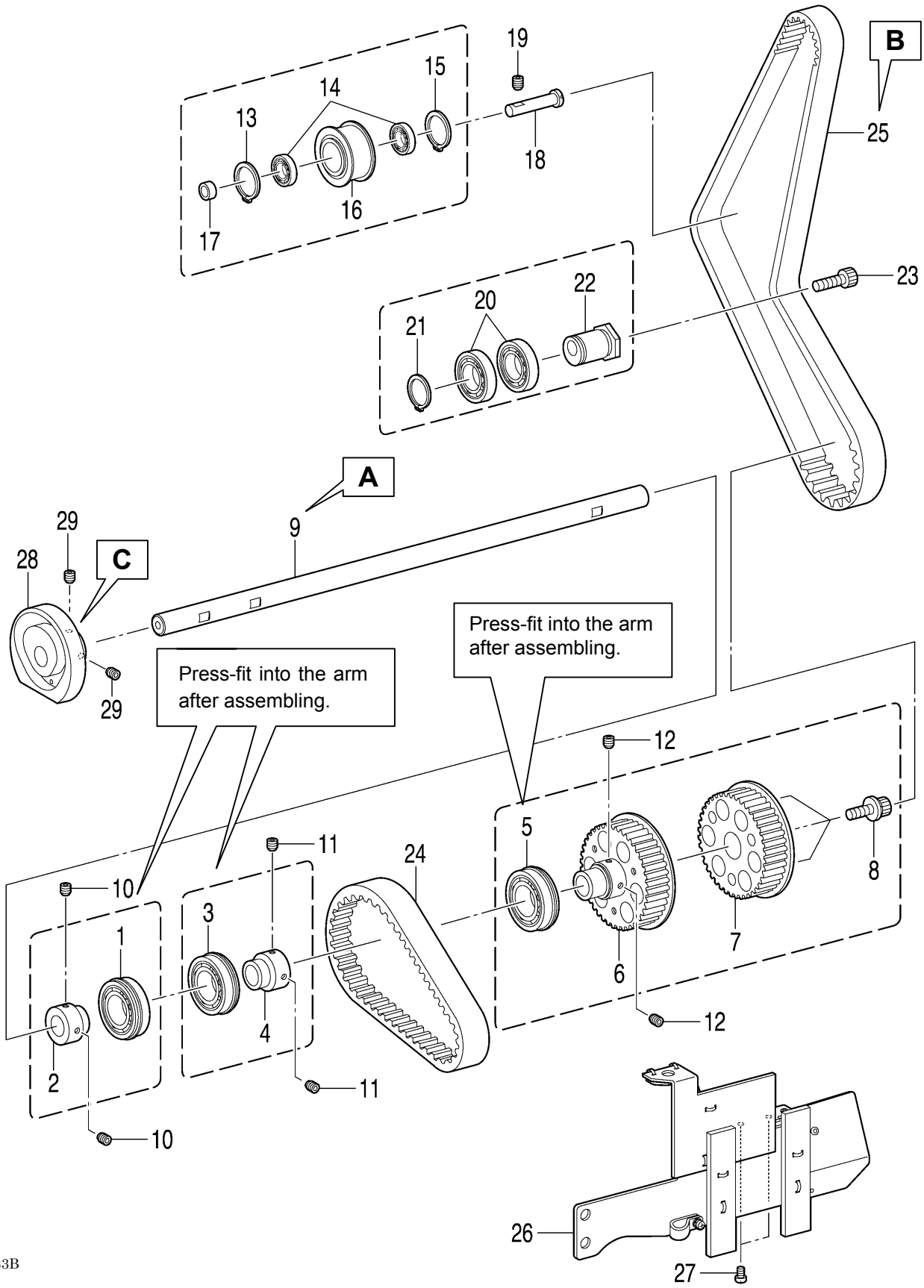


0932B

6) Push the vertical shaft timing pulley U assembly (7) up gently until it touches the bearing (1), and then tighten the socket bolt (6).

6-10. Lower shaft mechanism

* Refer to the detailed descriptions on pages 86 to 89 for details on A to C in the illustration.



0933B

1. Bearing
2. Bearing collar

3. Bearing
4. Bearing collar

5. Bearing
6. Lower shaft tension pulley A
7. Lower shaft tension pulley B
8. Socket bolts with washers [3 pcs]

9. Lower shaft
10. Set screws [2 pcs]
11. Set screws [2 pcs]
12. Set screws [2 pcs]

13. Internal retaining ring
14. Bearings [2 pcs]
15. Internal retaining ring
16. Idler pulley
17. Collar

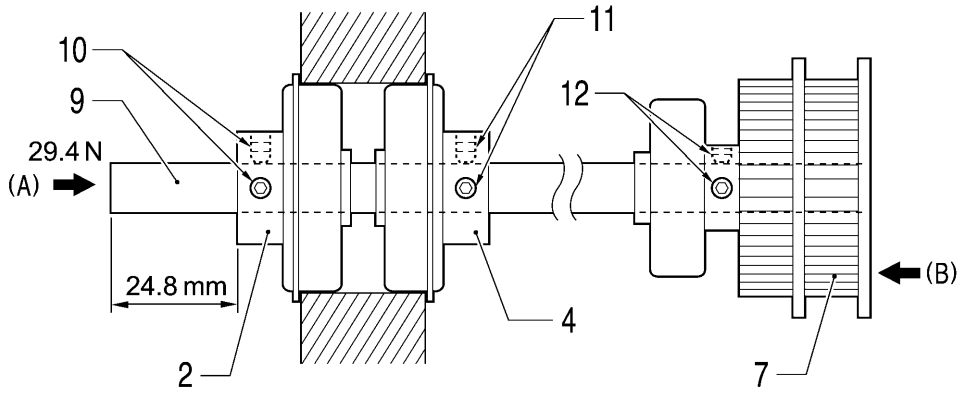
18. Idler pulley shaft
19. Set screw

20. Bearings [2 pcs]
21. Retaining ring C
22. Tension pulley collar

23. Socket bolt (Temporarily tighten)
24. Timing belt (For lower shaft - upper shaft motor) (Temporarily tighten)
25. Timing belt (For upper shaft - lower shaft)
26. Lower shaft cover assembly
27. Screws [2 pcs]
28. Lower shaft cam
29. Set screws [2 pcs] (Temporarily tighten)

A Lower shaft pressure adjustment

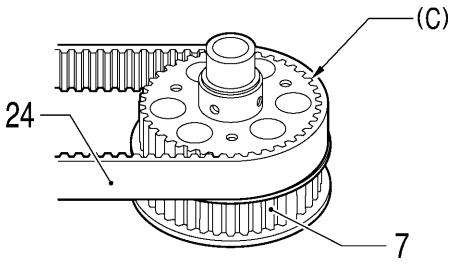
1) Set so that the amount of protrusion is 24.8 mm, and then tighten the two set screws (10) of the bearing collar (2) against the lower shaft (9). (This is to prevent the shaft from protruding when installing the lower shaft cam (28).)
2) While pushing the lower shaft (9). in the direction of arrow (A) with a force of 29.4 N, tighten the two set screws (11) of the bearing collar (4).
3) Push the back of lower shaft tension pulley B (7) gently in the direction of arrow (B) and tighten the two set screws (12).



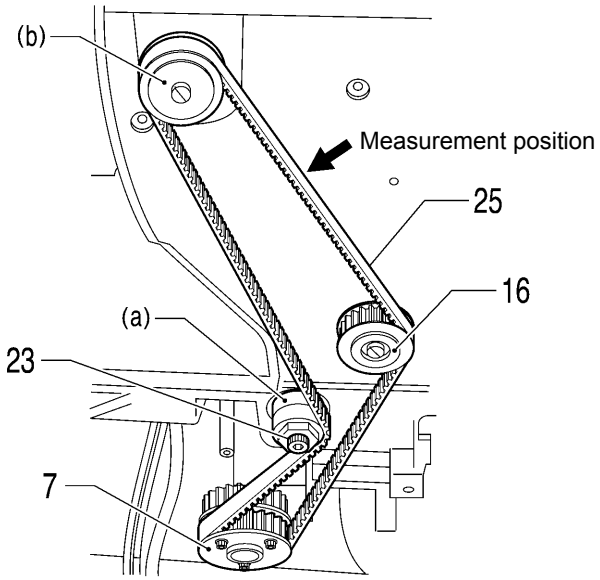
0934B

B Belt (upper shaft - lower shaft) installation and belt tension adjustment

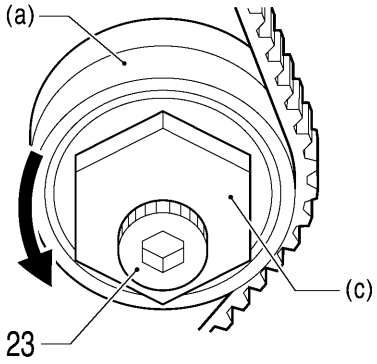
<If the belt (lower shaft – upper shaft motor) is not installed (if installing the upper shaft motor later)>



1) Place the timing belt (24) (for lower shaft – upper shaft motor) into the groove (C) in lower shaft tension pulley B (7).



2) Loosen the socket bolt (23) of the tension pulley assembly (a).
3) Place the timing belt (25) (for upper shaft - lower shaft) onto the upper shaft timing pulley (b), idler pulley (16), lower shaft tension pulley B (7) and tension pulley assembly (a).



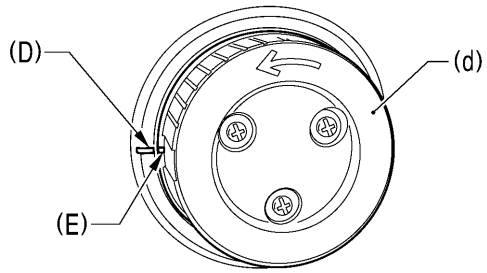
4) Use a spanner to turn the hexagonal part (c) of the eccentric shaft of the tension pulley assembly (a) in the direction of the arrow to adjust the belt tension to within the ranges given below, and then tighten the socket bolt (23).
   - When using a new belt: 170 - 190 N
   - When reusing an old belt: 140 - 170 N

* Be sure to use a belt tension gauge to measure the belt tension, and measure at the position shown in the illustration.
* The belt tension gauge should be set to measure a unit weight of 0.04 kg/m, a belt width of 15 mm and a span length of 198 mm.

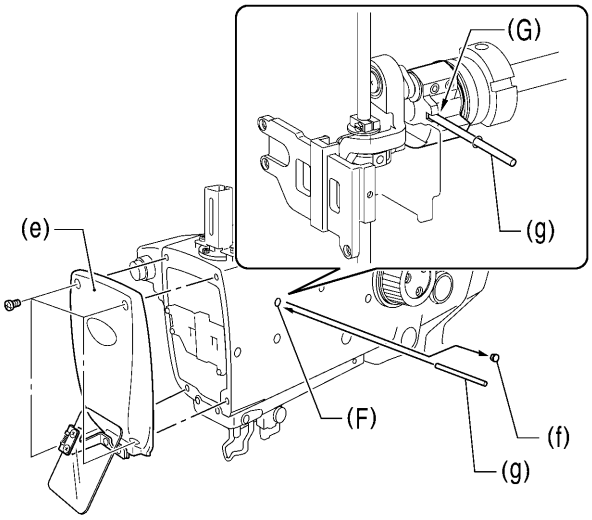
NOTE:
If you do not have a belt tension gauge, adjust so that the amount of deflection is approximately 2 mm when a pressure of 5N is applied to the middle of the span (the measurement position shown in the illustration).

0935B
0936B
0937B

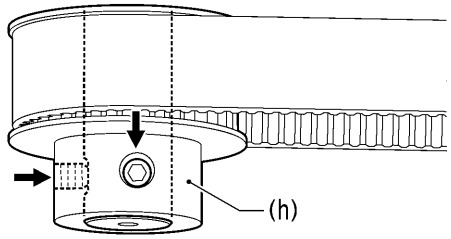
<If the belt (lower shaft – upper shaft motor) is installed (if the upper shaft motor is already installed)>



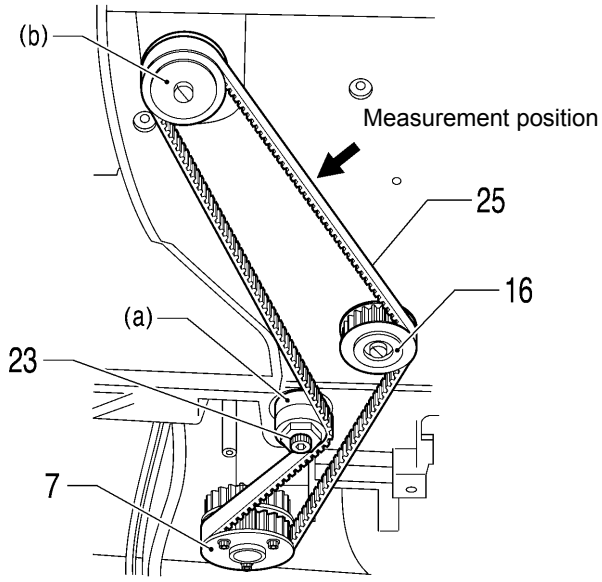
1) Turn the upper shaft pulley (d) to the needle up stop position.
(Align the pulley groove (E) with the arm reference line (D).)



2) Remove the face plate (e) and the rubber cap (f), and then insert the accessory pin (g) into the groove (G) of the crank from the hole (F) in the arm to secure the upper shaft. (Upper shaft 0° position)



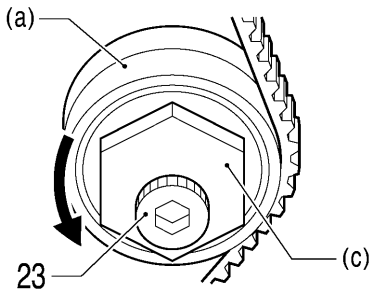
3) Hold the timing pulley (h) of the upper shaft motor still with your hand so that the screw on the timing pulley (h) is in the position shown in the illustration, and then place the timing belt (25) (for upper shaft - lower shaft) onto the upper shaft timing pulley (b), idler pulley (16), lower shaft tension pulley B (7) and tension pulley assembly (a).



4) Use a spanner to turn the hexagonal part (c) of the eccentric shaft of the tension pulley assembly (a) in the direction of the arrow to adjust the belt tension to within the ranges given below, and then tighten the socket bolt (23).
- When using a new belt: 170 - 190 N
- When reusing an old belt: 140 - 170 N

* Be sure to use a belt tension gauge to measure the belt tension, and measure at the position shown in the illustration.

* The belt tension gauge should be set to measure a unit weight of 0.04 kg/m, a belt width of 15 mm and a span length of 198 mm.

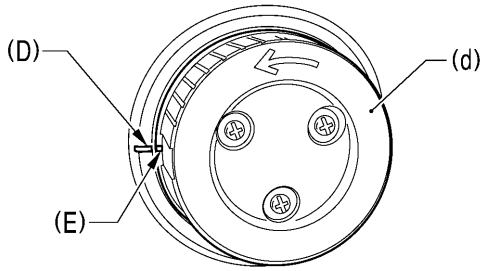


1198B

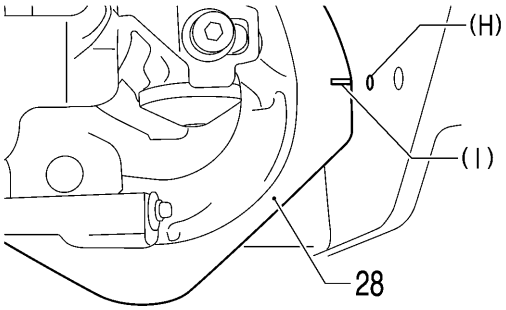
0941B
0938B
0939B
0940B

C Lower shaft provisional installation position

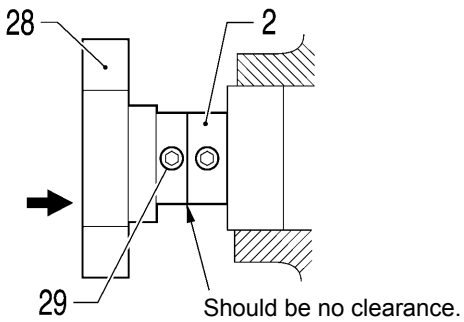
* This position is the provisional position for the lower shaft until the procedure in “7-5. Adjusting the looper stroke” is carried out.



1) Turn the upper shaft pulley (d) to the needle up stop position.
(Align the pulley groove (E) with the arm reference line (D).)



2) Align the index mark (I) of the lower shaft cam (28) with the hole (H) in the bed.



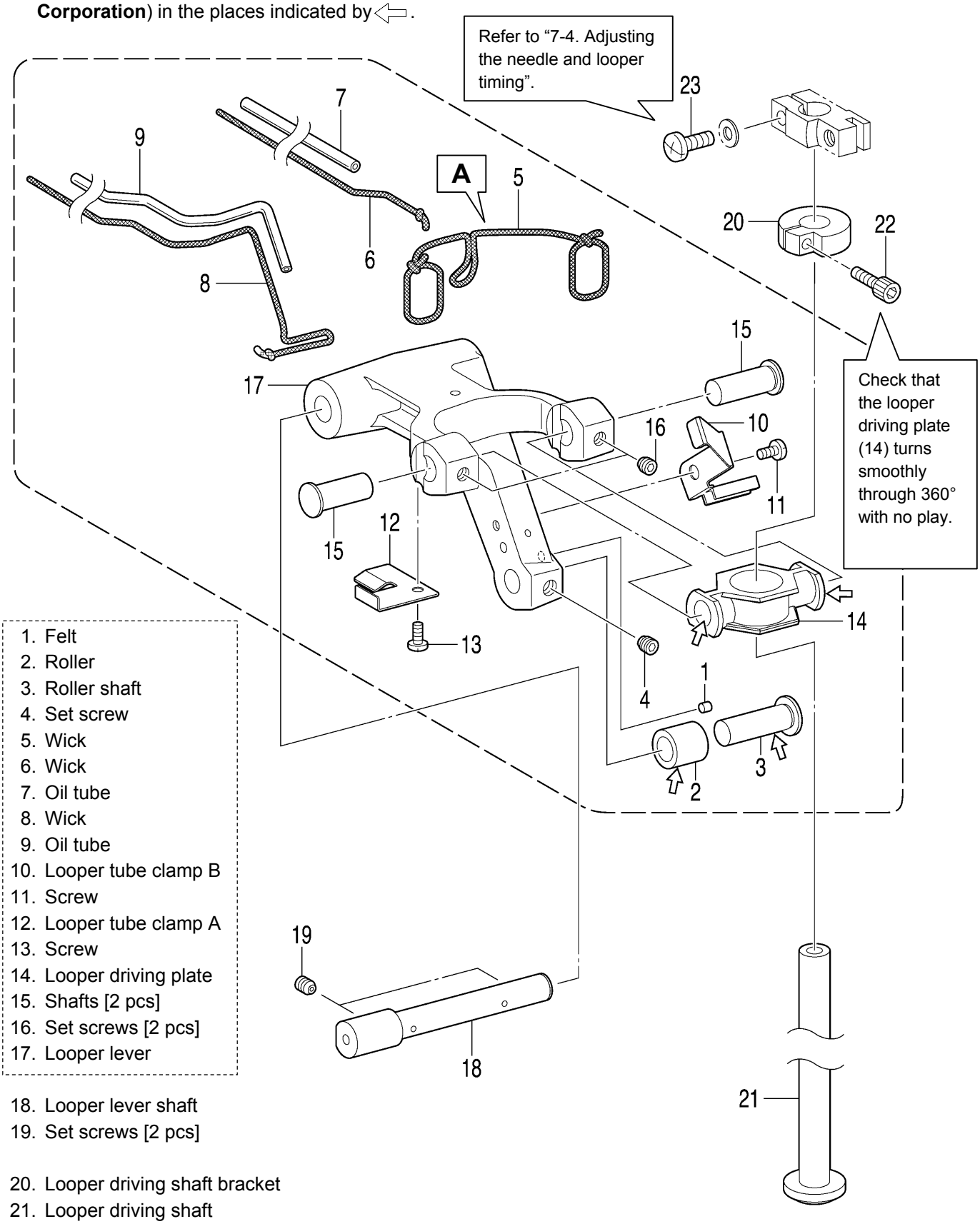
3) Push the lower shaft cam (28) against the end of the bearing collar (2), and then provisionally tighten the two set screws (29).

0941B
0942B
0943B

6-11. Looper mechanism

* Refer to the detailed descriptions on the next page for details on A in the illustration.

* Apply the grease specified by Brother (**MOLYKOTE LONGTERM W2 manufactured by Dow Corning Corporation**) in the places indicated by ⇦.

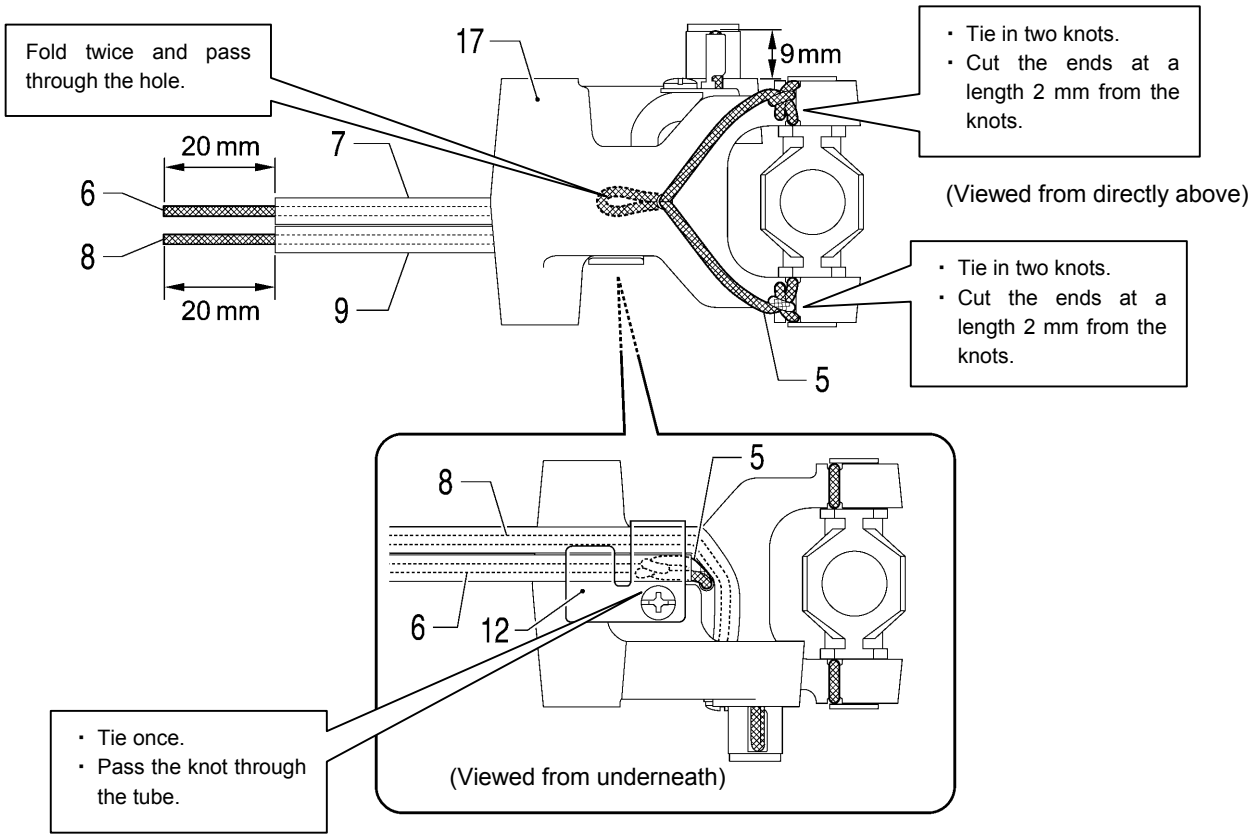


1. Felt
2. Roller
3. Roller shaft
4. Set screw
5. Wick
6. Wick
7. Oil tube
8. Wick
9. Oil tube
10. Looper tube clamp B
11. Screw
12. Looper tube clamp A
13. Screw
14. Looper driving plate
15. Shafts [2 pcs]
16. Set screws [2 pcs]
17. Looper lever
18. Looper lever shaft
19. Set screws [2 pcs]
20. Looper driving shaft bracket
21. Looper driving shaft
22. Socket bolt
23. Screw (Temporarily tighten)

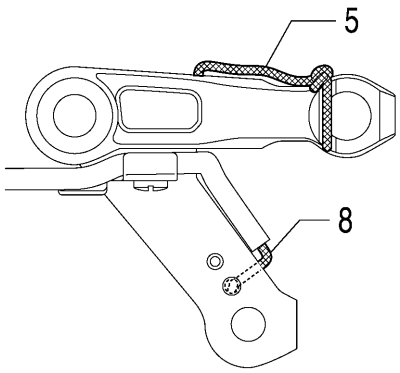
1076B

1102B

A Install the wicks as shown in the illustration.

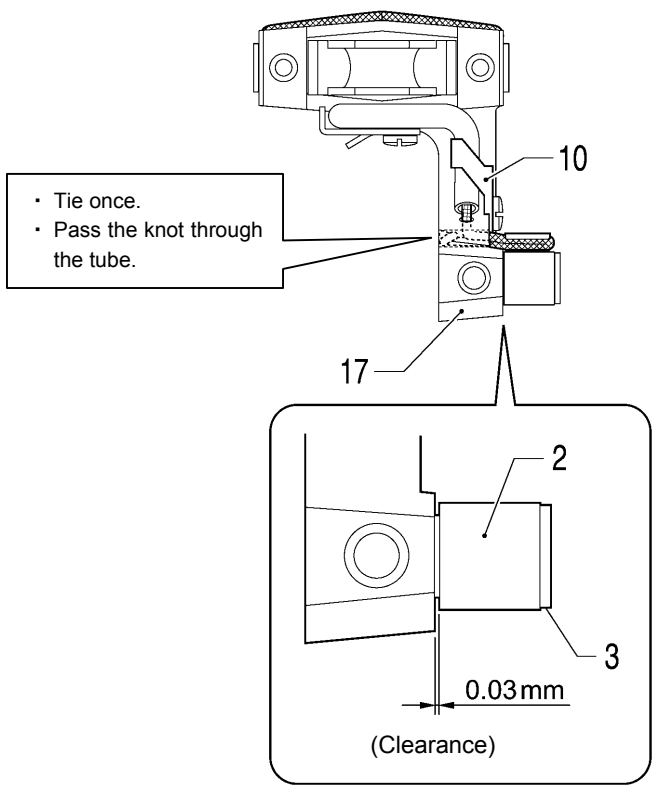


(Viewed from the left)



1103B

(Viewed from the front)

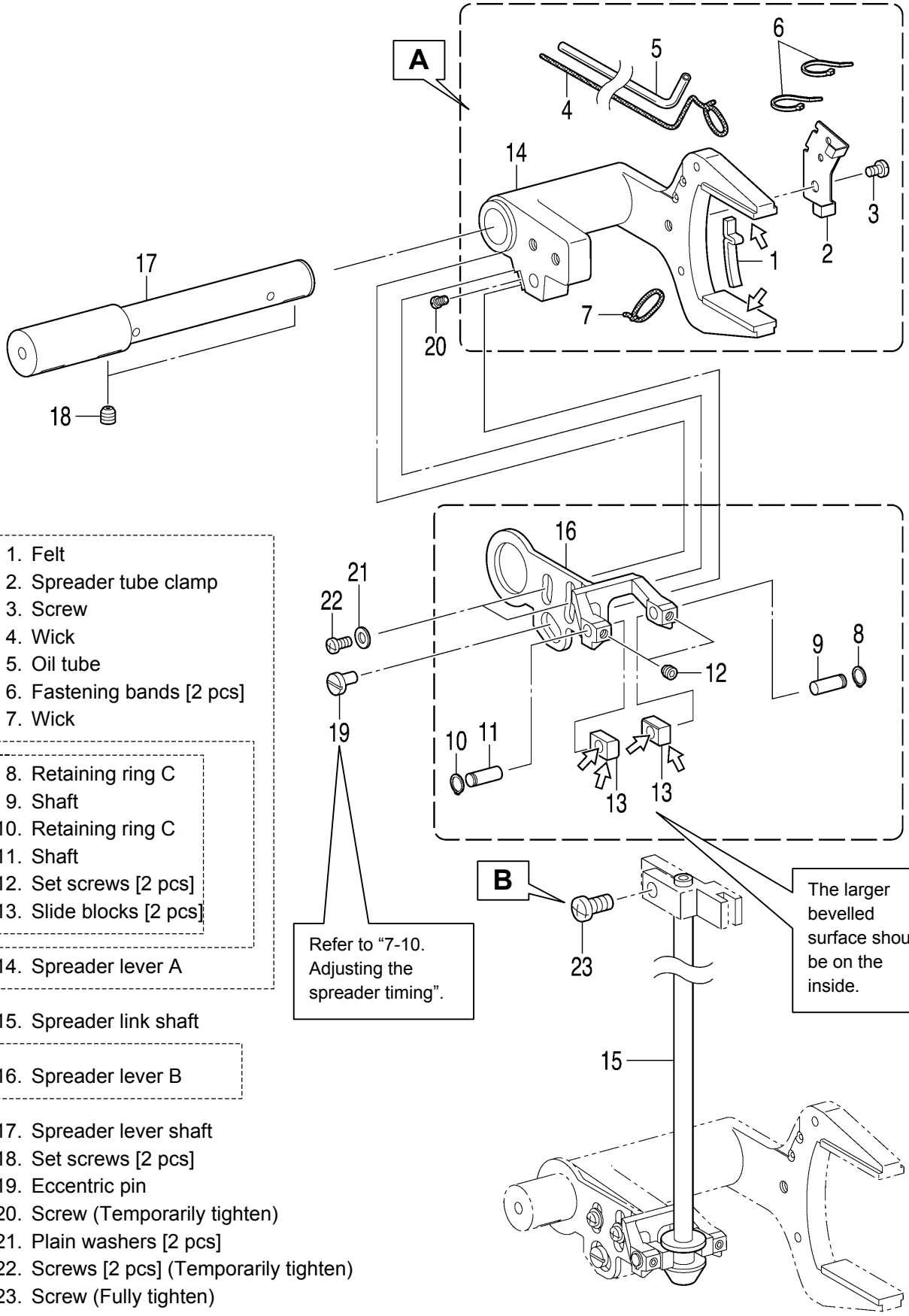


1104B

6-12. Spreader mechanism

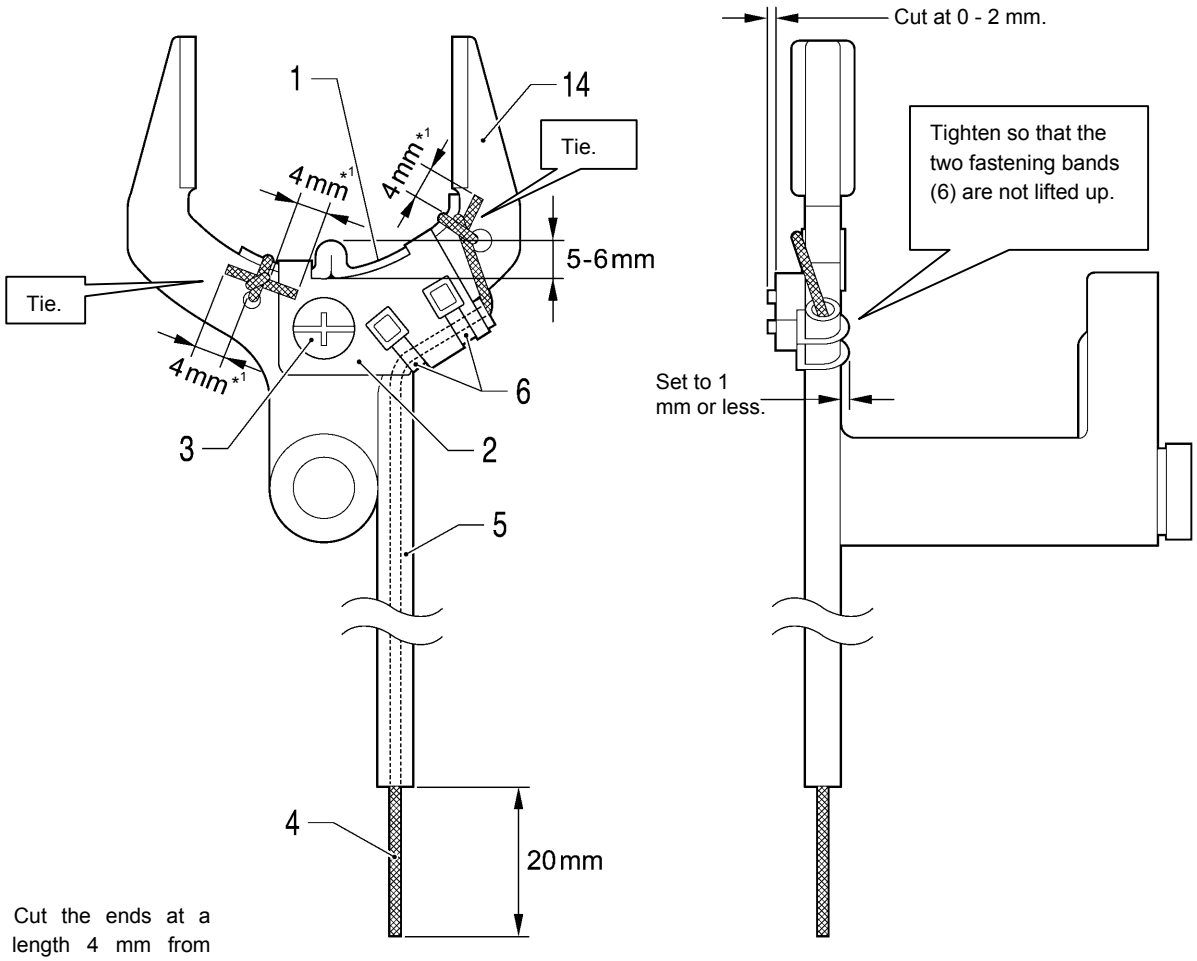
* Refer to the detailed descriptions on the next page for details on A and B in the illustration.

* Apply the grease specified by Brother (**MOLYKOTE LONGTERM W2 manufactured by Dow Corning Corporation**) in the places indicated by ⇦ .



1. Felt
2. Spreader tube clamp
3. Screw
4. Wick
5. Oil tube
6. Fastening bands [2 pcs]
7. Wick
8. Retaining ring C
9. Shaft
10. Retaining ring C
11. Shaft
12. Set screws [2 pcs]
13. Slide blocks [2 pcs]
14. Spreader lever A
15. Spreader link shaft
16. Spreader lever B
17. Spreader lever shaft
18. Set screws [2 pcs]
19. Eccentric pin
20. Screw (Temporarily tighten)
21. Plain washers [2 pcs]
22. Screws [2 pcs] (Temporarily tighten)
23. Screw (Fully tighten)

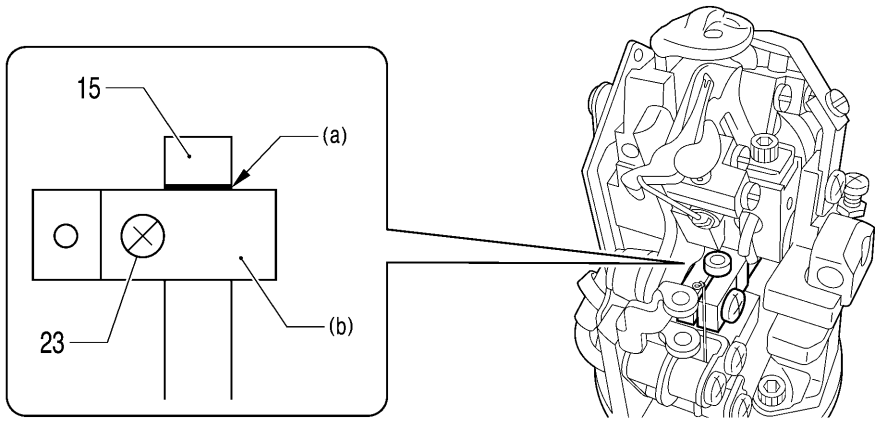
A Install the wicks as shown in the illustration.



*1: Cut the ends at a length 4 mm from the knots.

1027B

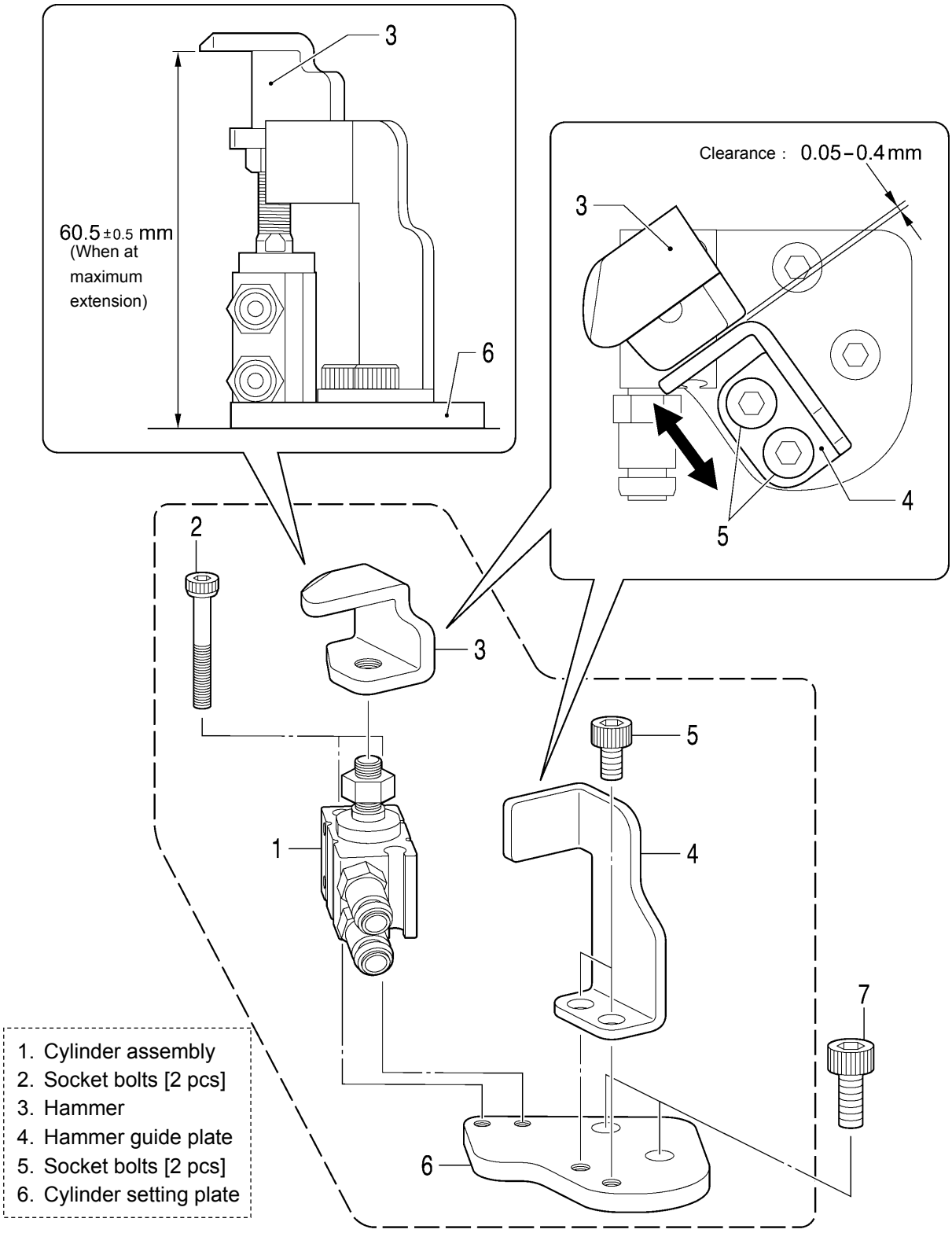
B Align the top of the spreader link base (b) with the reference line (a) on the spreader link shaft (15), and then tighten the screw (23).



1028B

6-13. Upper thread trimmer mechanism

* Install in the positions shown in the illustration.

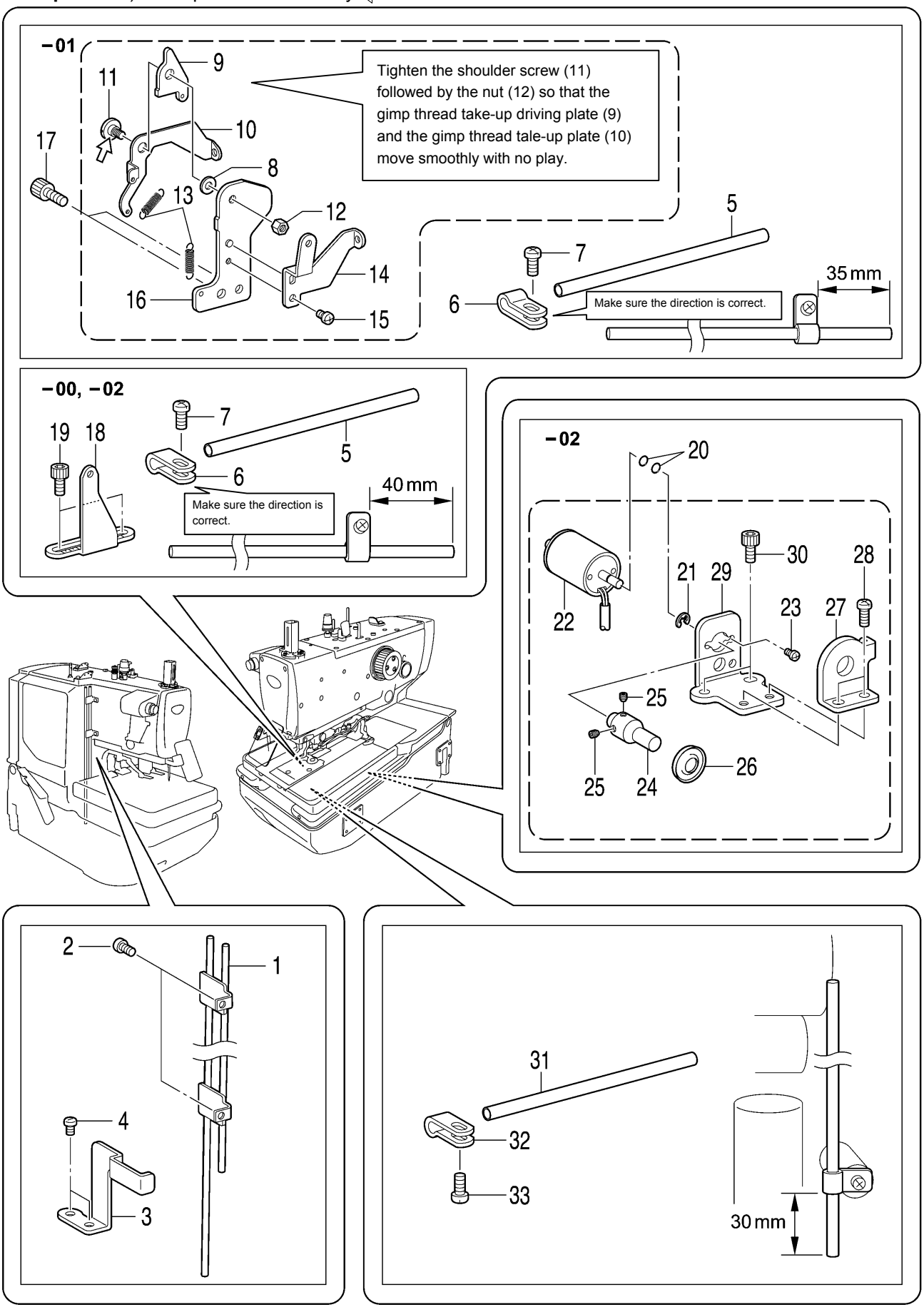


1. Cylinder assembly
2. Socket bolts [2 pcs]
3. Hammer
4. Hammer guide plate
5. Socket bolts [2 pcs]
6. Cylinder setting plate
7. Socket bolts [2 pcs]

0985B

6-14. Threading mechanism

* Apply the grease specified by Brother (**MOLYKOTE LONGTERM W2 manufactured by Dow Corning Corporation**) in the places indicated by ⇦.



1. 2 pedal thread guide pipe
2. Screws [2 pcs]
3. Pipe clamp plate
4. Screws [2 pcs]

5. Thread guide pipe
6. Thread guide pipe support
7. Screw

<-01 specifications only>

8. Washer
9. Gimp thread take-up G-E plate
10. Gimp thread take-up guide plate
11. Shoulder screw
12. Nut
13. Springs [2 pcs]
14. Gimp thread guide
15. Screw
16. Gimp thread take-up G-holder

17. Socket bolts [2 pcs]

<-00 and -02 specifications only>

18. Gimp thread guide J
19. Socket bolts [2 pcs]

<-02 specifications only>

20. O Ring [2 pcs]

21. Retaining ring E
22. Solenoid
23. Screws [2 pcs]
24. Gimp thread shaft
25. Set screws [2 pcs]
26. Tension disc
27. Gimp thread clamp
28. Screws [2 pcs]
29. Gimp thread clamp plate
30. Socket bolts [2 pcs]

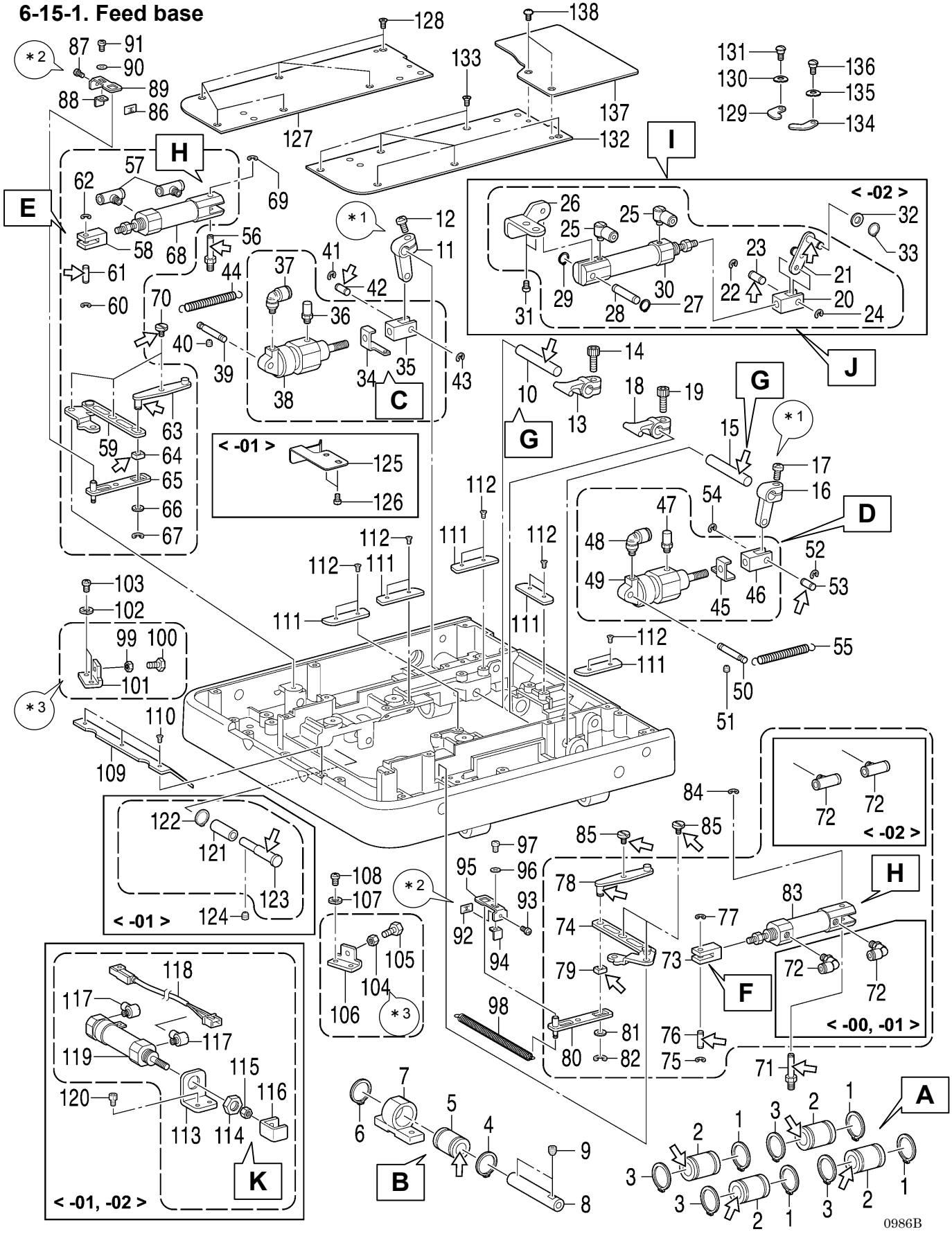
31. Thread guide pipe
32. Thread guide pipe support
33. Screw

6-15. Feed base mechanism

* Refer to the detailed descriptions on pages 102 and 103 for details on A to K in the illustration.

* Apply the grease specified by Brother (**MOLYKOTE LONGTERM W2 manufactured by Dow Corning Corporation**) in the places indicated by ⇦.

6-15-1. Feed base



1. Retaining ring C [4 pcs]
2. Ball bearings [4 pcs]
3. Retaining ring C [4 pcs]
4. Retaining ring C
5. Ball bearing
6. Retaining ring C
7. Y bearing
8. Y guide shaft
9. Set screws [2 pcs]
10. Clamp lever shaft
11. Clamp driving lever
12. Screw (Temporarily tighten)
13. Crank lever B
14. Socket bolt
15. Clamp lever shaft
16. Clamp driving lever
17. Screw (Temporarily tighten)
18. Crank lever B
19. Socket bolt

<-02 specifications only>

20. Cylinder rod
21. Auxiliary clamp connecting rod
22. Retaining ring E
23. Cylinder rod pin
24. Retaining ring E
25. Joint [2 pcs]
26. Auxiliary clamp S holder
27. Retaining ring E
28. Pin
29. Retaining ring E
30. Cylinder

31. Screw
32. Washer
33. Retaining ring C

34. Spring hook
35. Clamp cylinder rod
36. Air bolster
37. Joint
38. Cylinder

39. Clamp cylinder support
40. Set screw
41. Retaining ring E
42. Cylinder rod pin
43. Retaining ring E
44. Spring

45. Spring hook
46. Clamp cylinder rod
47. Air bolster
48. Joint
49. Cylinder

50. Clamp cylinder support
51. Set screw
52. Retaining ring E
53. Cylinder rod pin
54. Retaining ring E
55. Spring
56. Cylinder screw

57. Joint [2 pcs]
58. Opening cylinder rod
59. Opening driving lever L assembly
60. Retaining ring E
61. Cylinder rod pin B
62. Retaining ring E
63. Fulcrum lever plate
64. Slide block
65. Rocker lever
66. Washer
67. Retaining ring E
68. Cylinder

69. Retaining ring E
70. Shoulder screw [3 pcs]
71. Cylinder screw

72. Joints [2 pcs]
73. Opening cylinder rod
74. Opening driving lever R assembly
75. Retaining ring E
76. Cylinder rod pin B
77. Retaining ring E
78. Fulcrum lever plate
79. Slide block
80. Rocker lever
81. Washer
82. Retaining ring E
83. Cylinder

84. Retaining ring E
85. Shoulder screw [3 pcs]
86. Speed nut
87. Screw (Temporarily tighten)
88. Stopper plate
89. Opening stopper plate
90. Washer
91. Screw (Temporarily tighten)
92. Speed nut
93. Screw (Temporarily tighten)
94. Stopper plate
95. Opening stopper plate
96. Washer
97. Screw (Temporarily tighten)
98. Spring

99. Nut (Temporarily tighten)
100. Bolt
101. Opening cylinder stopper

102. Spring washer
103. Screws [2 pcs]

104. Nut (Temporarily tighten)
105. Bolt
106. Opening cylinder stopper

107. Spring washer
108. Screws [2 pcs]
109. Plate guide B
110. Flat screws [3 pcs]
111. Plate guides A [5 pcs]
112. Flat screws [10 pcs]

<-01 and -02 specifications only>

113. Thread trimmer cylinder support plate
114. Nut
115. Nut
116. Thread trimmer cylinder claw
117. Joint
118. Sensor
119. Cylinder

120. Socket bolts [2 pcs]

<-01 specifications only>

121. Collar
122. Retaining ring C
123. Gimp thread take-up guide shaft

124. Set screw
125. Feed base plate spring
126. Screws [2 pcs]

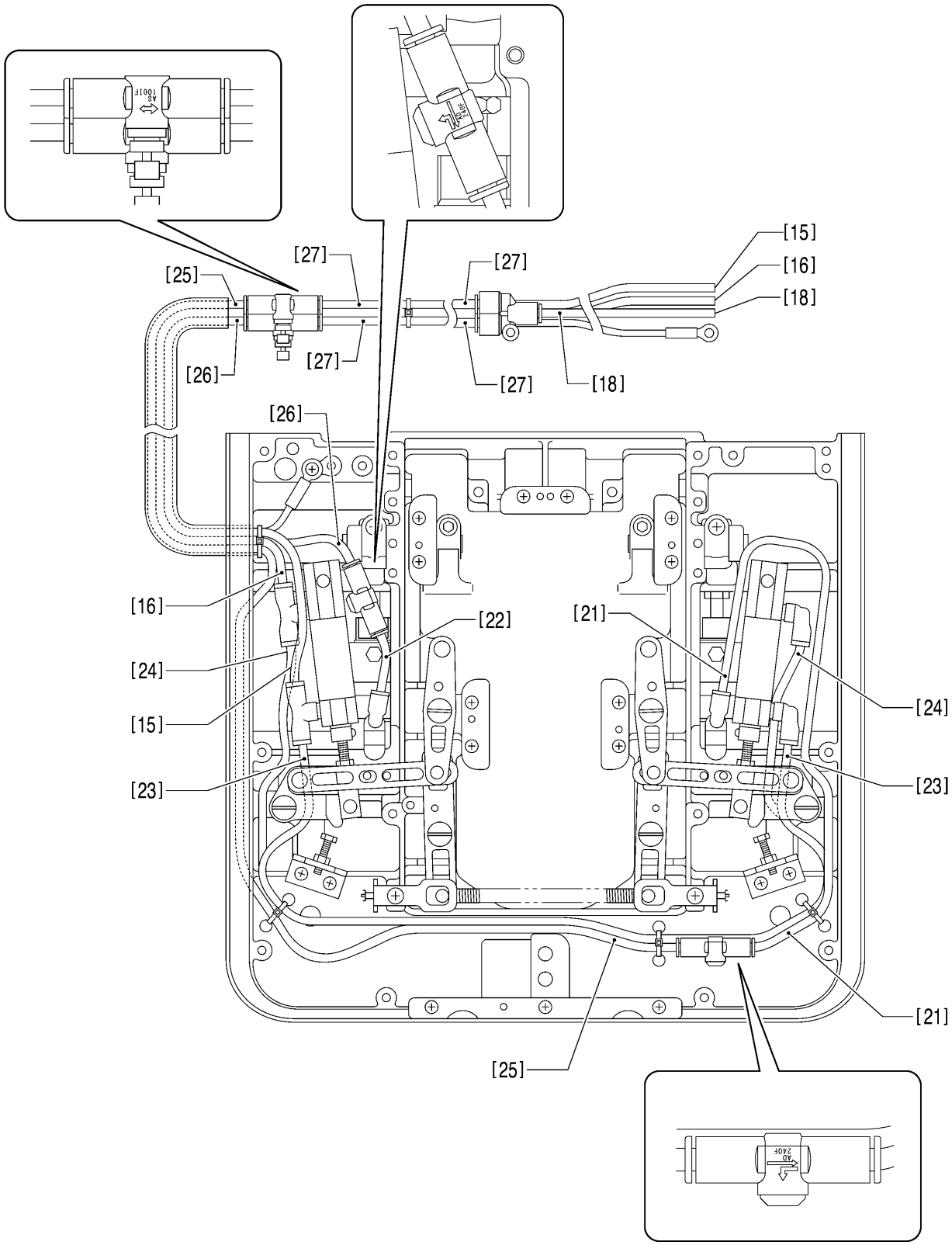
Route the air tubes and harnesses here. (Refer to pages 99 - 101.)

127. Feed base cover L
128. Flat screws [6 pcs]
129. Plate presser
130. Bending washer
131. Shoulder screw
132. Feed base cover R
133. Flat screws [6 pcs]
134. Plate presser
135. Bending washer
136. Shoulder screw
137. Feed base cover U
138. Truss screws [2 pcs]

＊1：Refer to “7-18. Adjusting the work clamp lift amounts”.
＊2：Refer to “7-21. Adjusting the cloth opening amounts”.
＊3：Refer to “7-20. Adjusting the positions of the work clamp plates”.

Routing the air tubes and harnesses <-00 specifications>

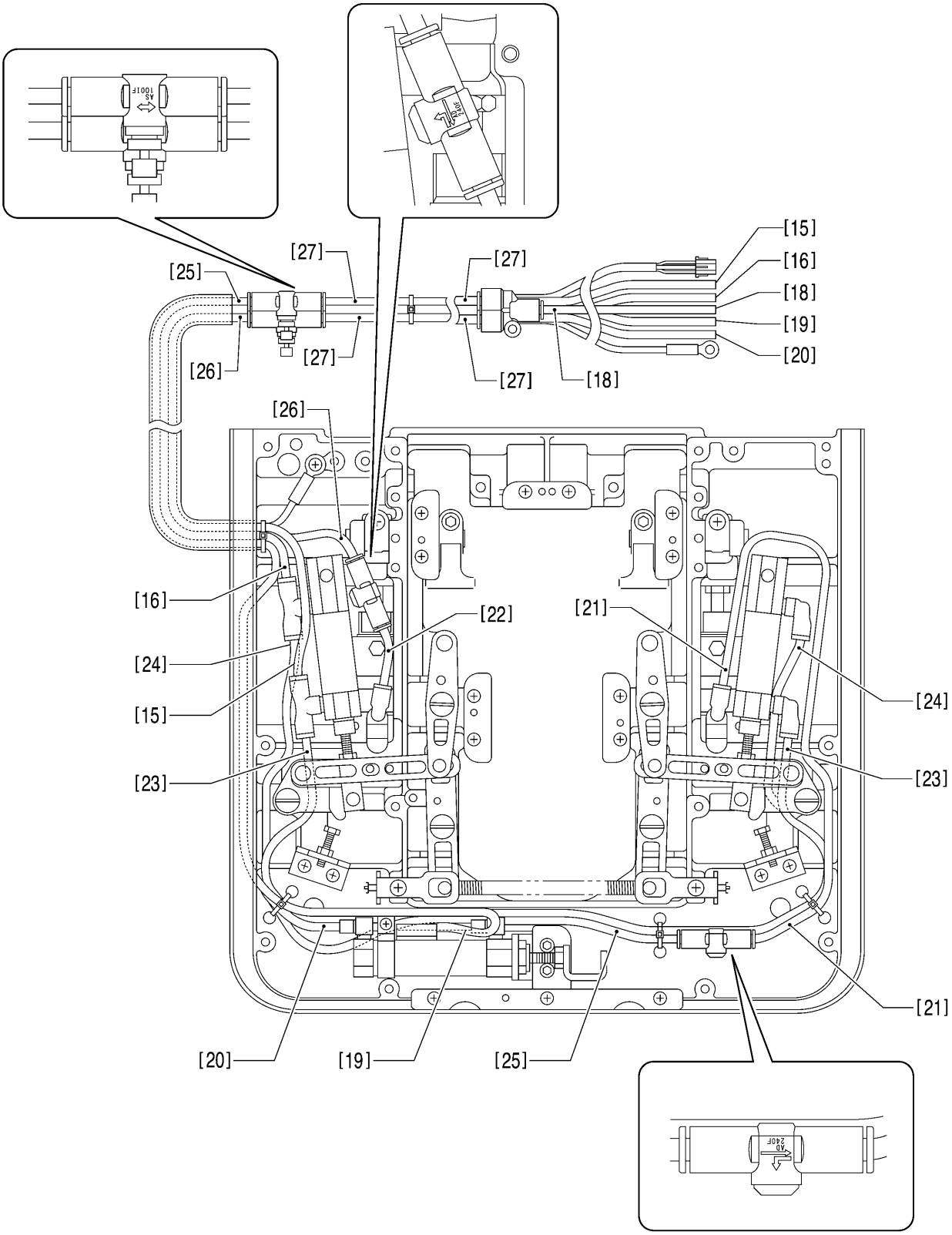
The air tubes and harnesses are numbered as shown in the illustration. Check the number of each air tube and harness to make sure that they are routed correctly as shown in the illustration.



0987B

Routing the air tubes and harnesses <-01 specifications>

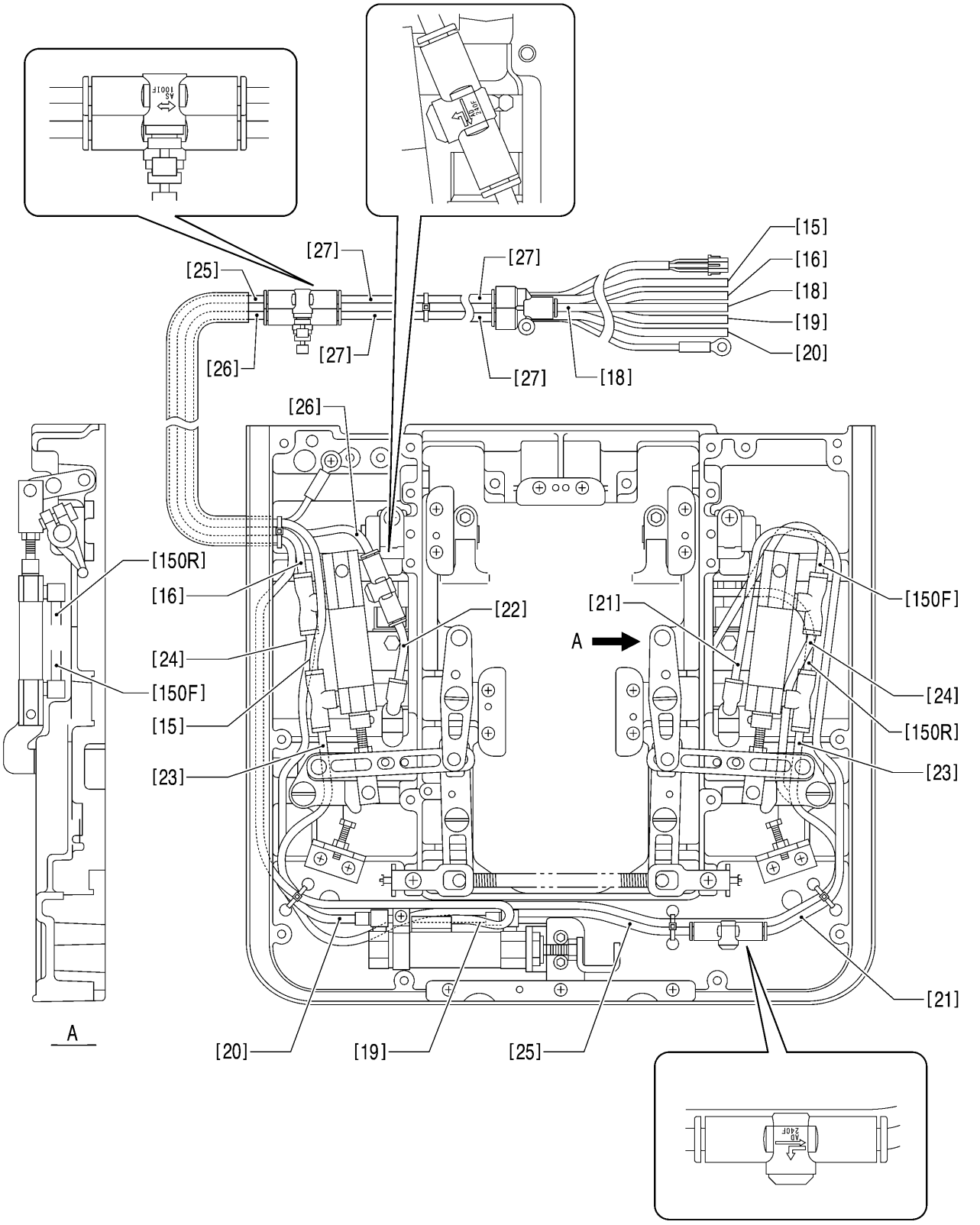
The air tubes and harnesses are numbered as shown in the illustration. Check the number of each air tube and harness to make sure that they are routed correctly as shown in the illustration.



0988B

Routing the air tubes and harnesses <-02 specifications>

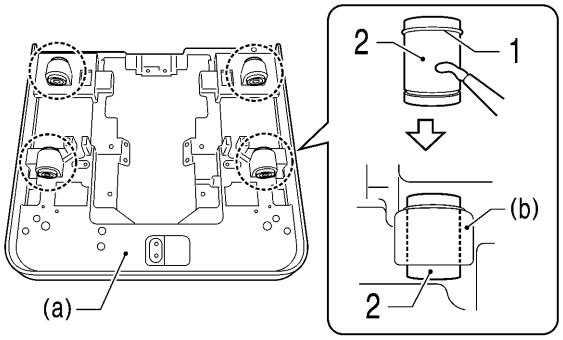
The air tubes and harnesses are numbered as shown in the illustration. Check the number of each air tube and harness to make sure that they are routed correctly as shown in the illustration.



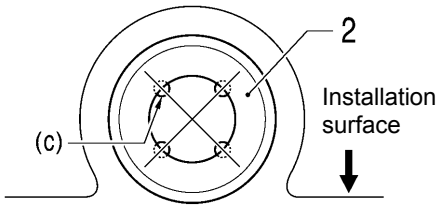
0989B

A Turn the feed base (a) upside down. Place the four retaining rings C (1) onto one side of the four ball bearings (2), then apply adhesive (Threebond 1373B) to the four ball bearings (2) and then insert them into the four holes (b).

* Wipe away any excess adhesive at this time.



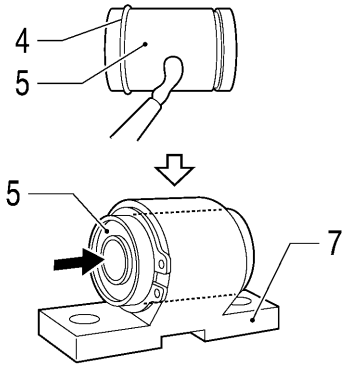
* Install so that the layout of the balls (c) is in an “X” pattern on the installation surface as shown in the illustration.



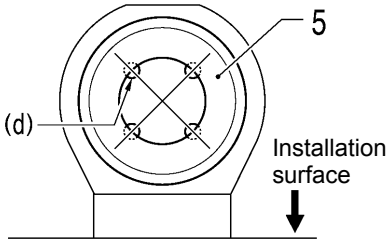
0990B
0991B

B Place the retaining rings C (4) onto one side of the ball bearing (5), then apply adhesive (Threebond 1373B) to the ball bearing (5) and then insert it into the Y bearing (7).

* Wipe away any excess adhesive at this time.

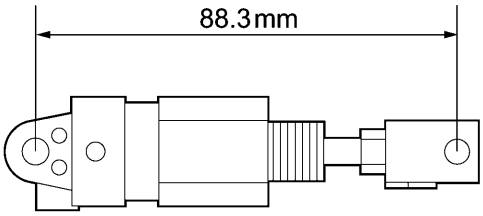


* Install so that the layout of the balls (d) is in an “X” pattern on the installation surface as shown in the illustration.



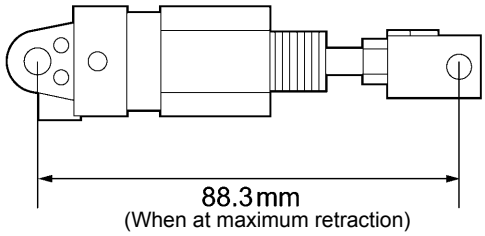
0992B
0993B

C Assemble as shown in the illustration.



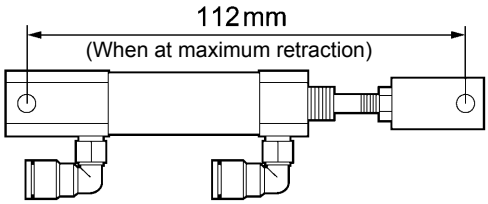
0994B

D Assemble as shown in the illustration.



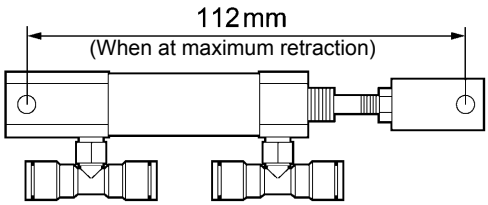
0995B

E Assemble as shown in the illustration.



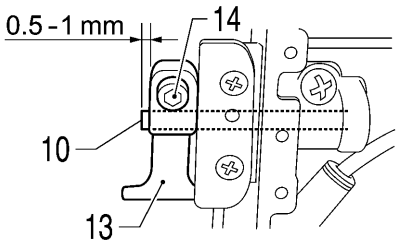
0996B

F Assemble as shown in the illustration.



0997B

G

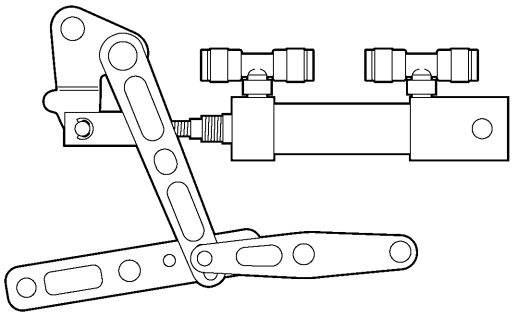


(Right side)

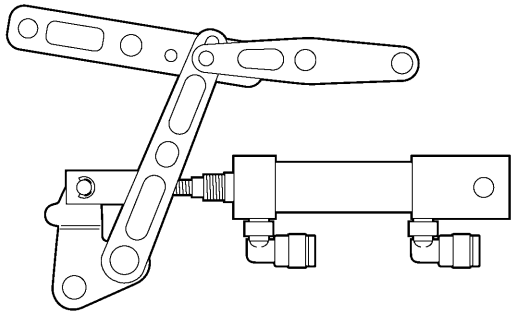
Set the clamp lever shaft (10) so that the amount of protrusion at the end is as shown in the illustration, then assemble crank lever B (13) so that there is no clearance between it and the inside of the clamp lever shaft (10), and then tighten the socket bolt (14).
(The left side is the same.)

0998B

H Assemble while referring to the finished assembly diagram shown below.



(Left side)

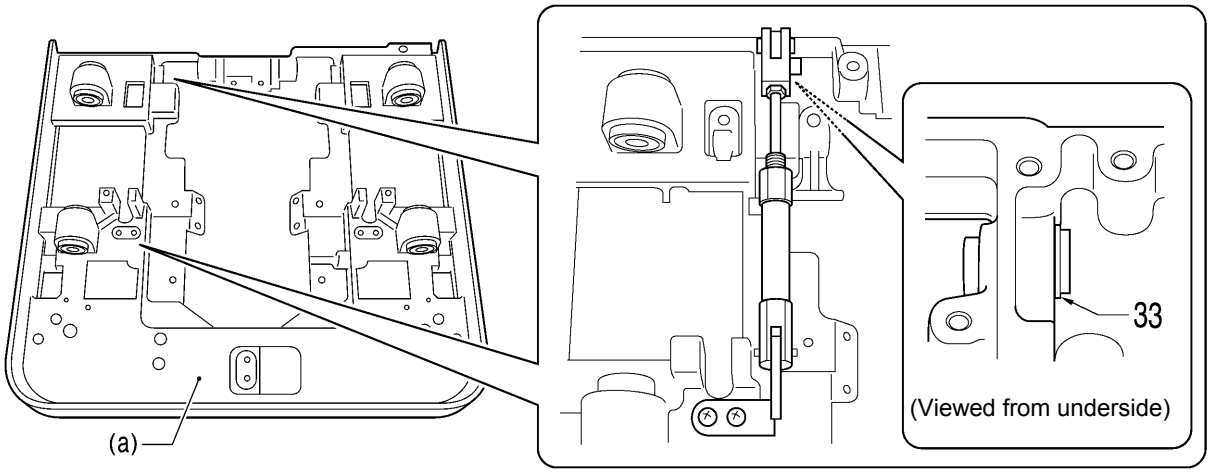


(Right side)

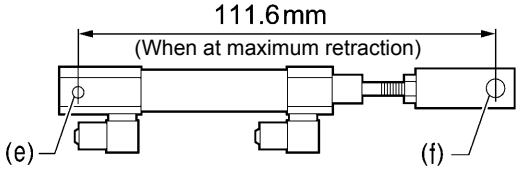
0999B

1000B

I **<For -02 specifications only>**
Install to the feed base (a) as shown in the illustration below.

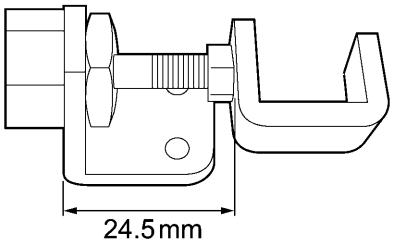


J **<For -02 specifications only>**
Install so that the centers of the pin holes (e) and (f) are at the distance shown in the illustration.



1001B

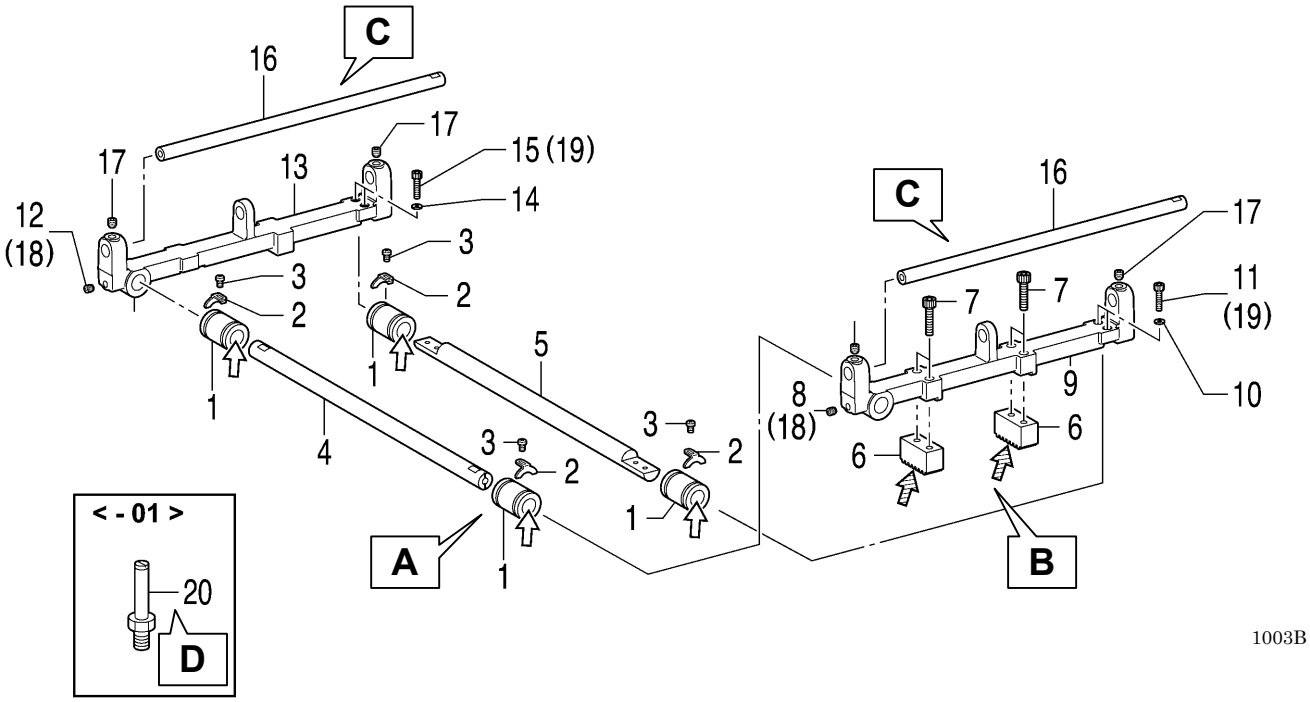
K **<For -01 and -02 specifications only>**
Install at the distance shown in the illustration.



1002B

6-15-2. X feed shaft holder

* Refer to the detailed descriptions on pages 105 and 106 for details on A to D in the illustration.
* Apply the grease specified by Brother (**MOLYKOTE LONGTERM W2 manufactured by Dow Corning Corporation**) in the places indicated by ⇦.
* Apply the grease specified by Brother (**Shin Lube EJ manufactured by Nippon Steel Chemical Corporation**) in the places indicated by ⇦.



1003B

1. Ball bearings [4 pcs]
2. Ball bearing stoppers [4 pcs]
3. Screws [4 pcs]
4. X feed guide shaft B
5. X feed guide shaft A
6. Gears [2 pcs]
7. Socket bolts [4 pcs]
8. Set screw (Temporarily tighten)
9. X feed shaft holder N
10. Washers [2 pcs]
11. Socket bolts [2 pcs] (Temporarily tighten)
12. Set screw (Temporarily tighten)
13. X feed shaft holder S
14. Washers [2 pcs]
15. Socket bolts [2 pcs]

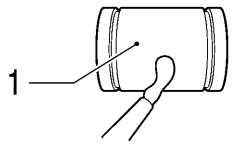
Install the feed base to the bed here.

16. Y feed guide shafts [2 pcs]
17. Set screws [4 pcs]
18. Set screws (8, 12) [2 pcs] (Fully tighten)
19. Set screws (11, 15) [4 pcs] (Fully tighten)

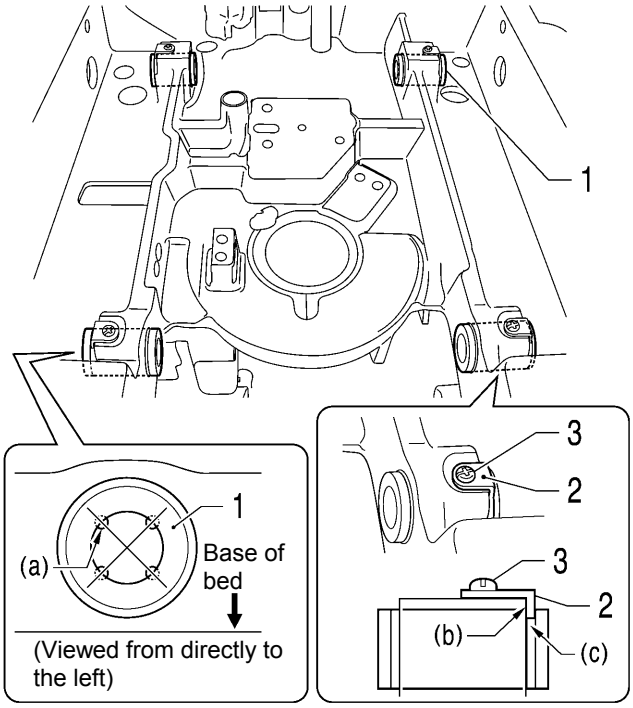
<-01 specifications only>

20. Cylinder screw

A



1) Apply adhesive (Threebond 1373B) to the four ball bearings (1).

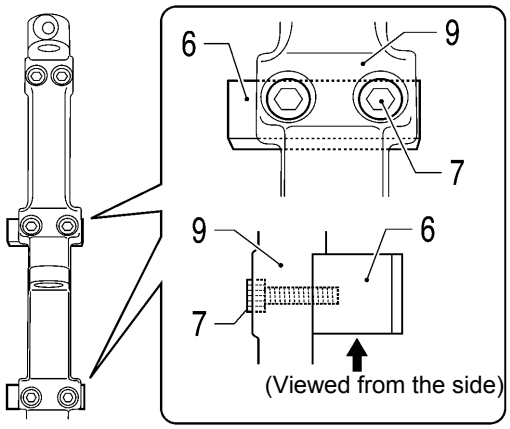


2) Insert the four ball bearings (1) into the holes in the bed so that the layout of the balls (a) is in an "X" pattern on the base of the bed as shown in the illustration.

3) While pushing the four ball bearing stoppers (2) onto the base of the bed, tighten the four screws (3).
   * At this time, insert the projections (b) of the four ball bearing stoppers (2) into the grooves (c) and check that the ball bearing stoppers (2) are flush with the bed surface.

1108B
1004B

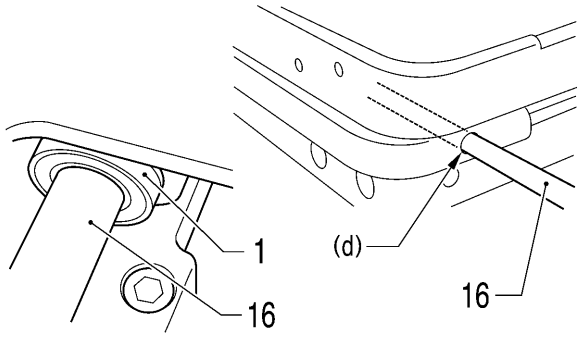
B



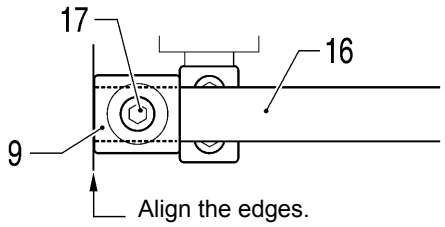
Install the two gears (6) to X feed shaft holder N (9) so that the gear (6) with the shorter distance between the thread hole and the edge is on the right.
* While pushing the two gears (6) in the direction of the arrow ⬅ at this time, tighten the four socket bolts (7).

1005B

C



1) Place the feed base unit onto the bed.
2) Insert the Y feed guide shaft (16) on the left side into the hole (d) in the bed so that the end with the screw stop goes in first, and pass it through the two ball bearings (1).



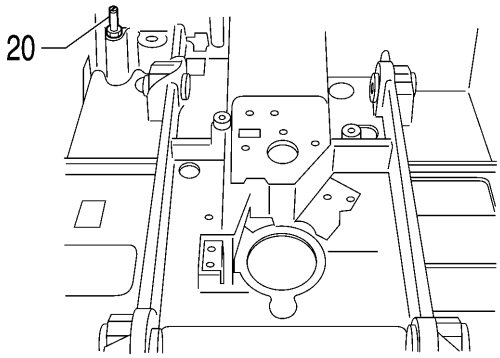
3) Align the screw stop on the Y feed guide shaft (16) with the screw hole in X feed shaft holder N (9).
4) Align the end of the Y feed guide shaft (16) with the end of X feed shaft holder N (9), and then tighten the two set screws (17).

5) Install the Y feed guide shaft (16) on the right side also by following steps 2 to 4 above.

1006B

D **<For -01 specifications only>**

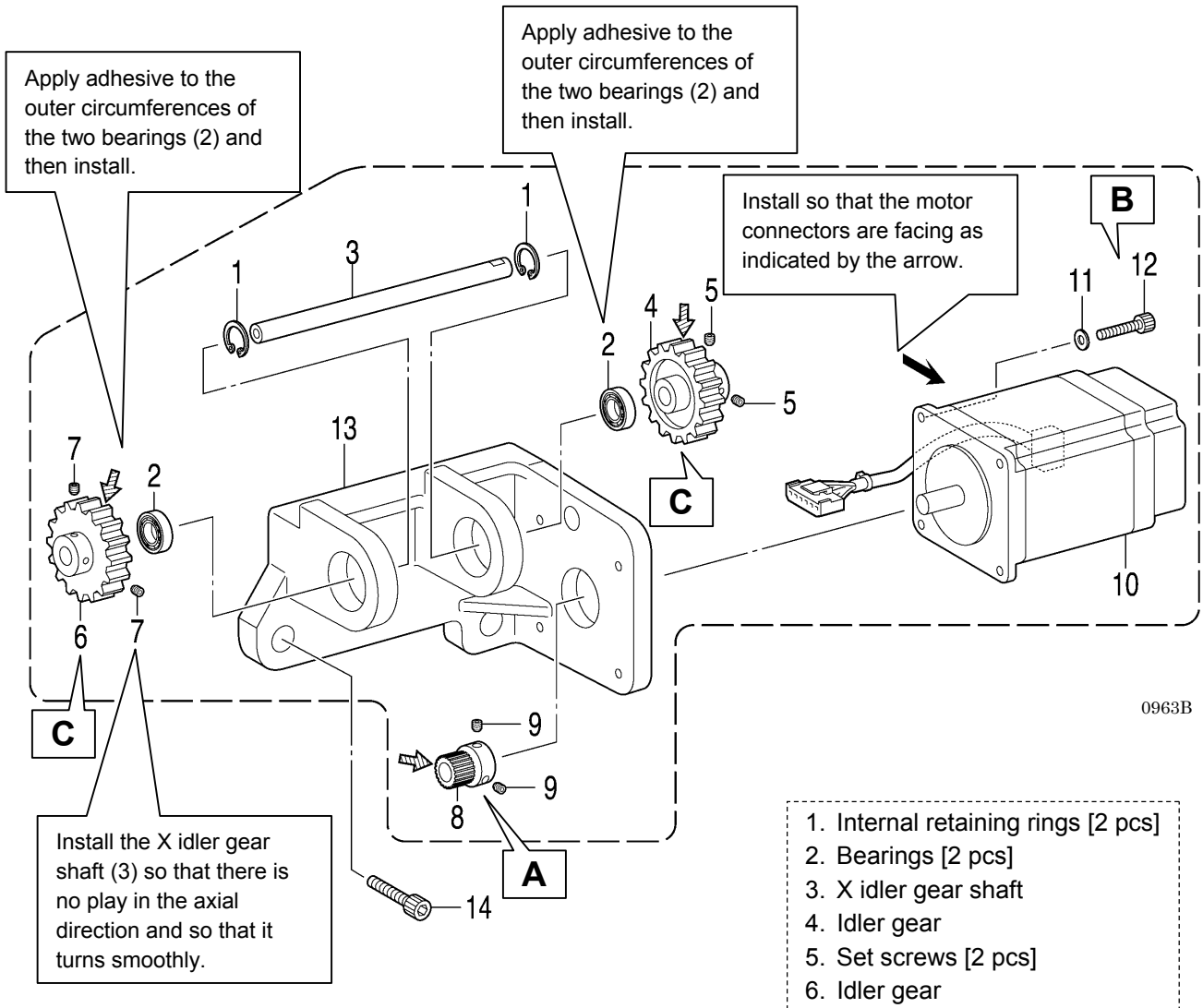
Install the Cylinder screw (20) in the position shown in the illustration.



1007B

6-16. X feed mechanism

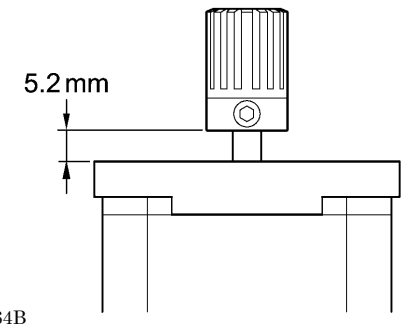
* Refer to the detailed descriptions on the next page for details on A to C in the illustration.
* Apply the grease specified by Brother (**Shin Lube EJ manufactured by Nippon Steel Chemical Corporation**) in the places indicated by ⇦.



1. Internal retaining rings [2 pcs]
2. Bearings [2 pcs]
3. X idler gear shaft
4. Idler gear
5. Set screws [2 pcs]
6. Idler gear
7. Set screws [2 pcs] (Temporarily tighten)
8. Feed gear
9. Set screws [2 pcs]
10. Pulse motor X assembly
11. Plain washers [4 pcs]
12. Socket bolts [4 pcs]
13. X motor support

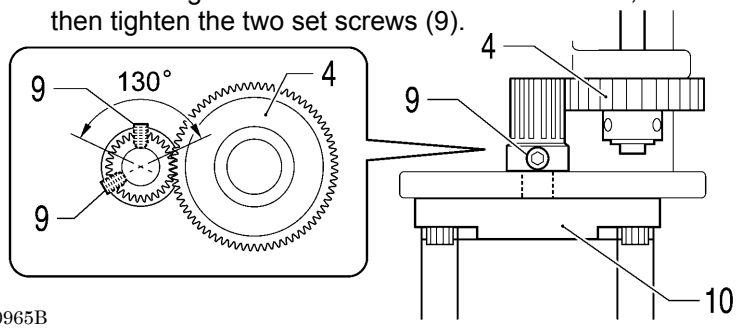
14. Socket bolts [3 pcs]

A Assemble as shown in the illustration.



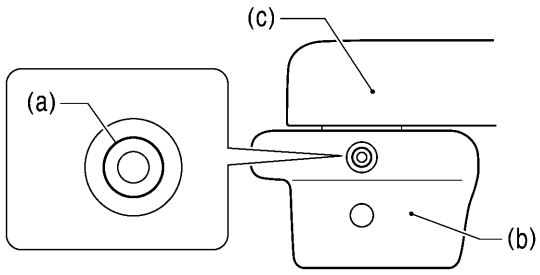
0964B

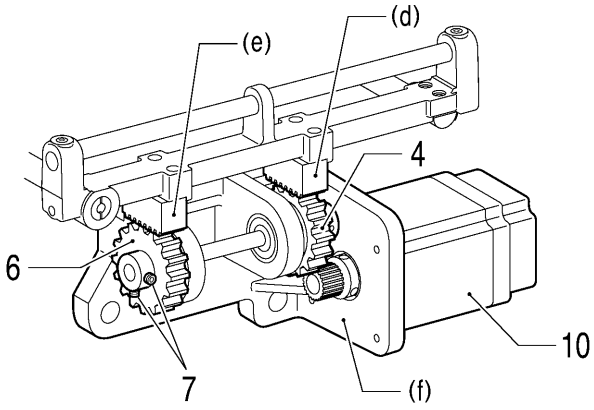
B Place the pulse motor X assembly (10) against the idler gear (4) so that the amount of play is 0.02 mm or less within a range of 130° as shown in the illustration, and then tighten the two set screws (9).

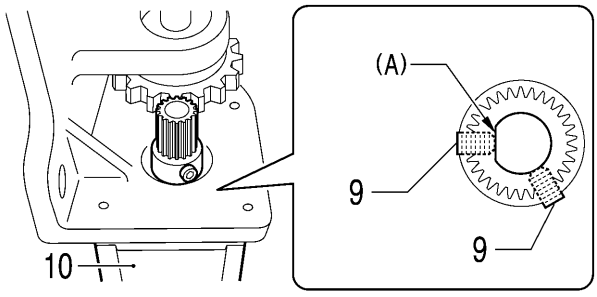


0965B

C Standard installation of motor unit (idler gear adjustment)







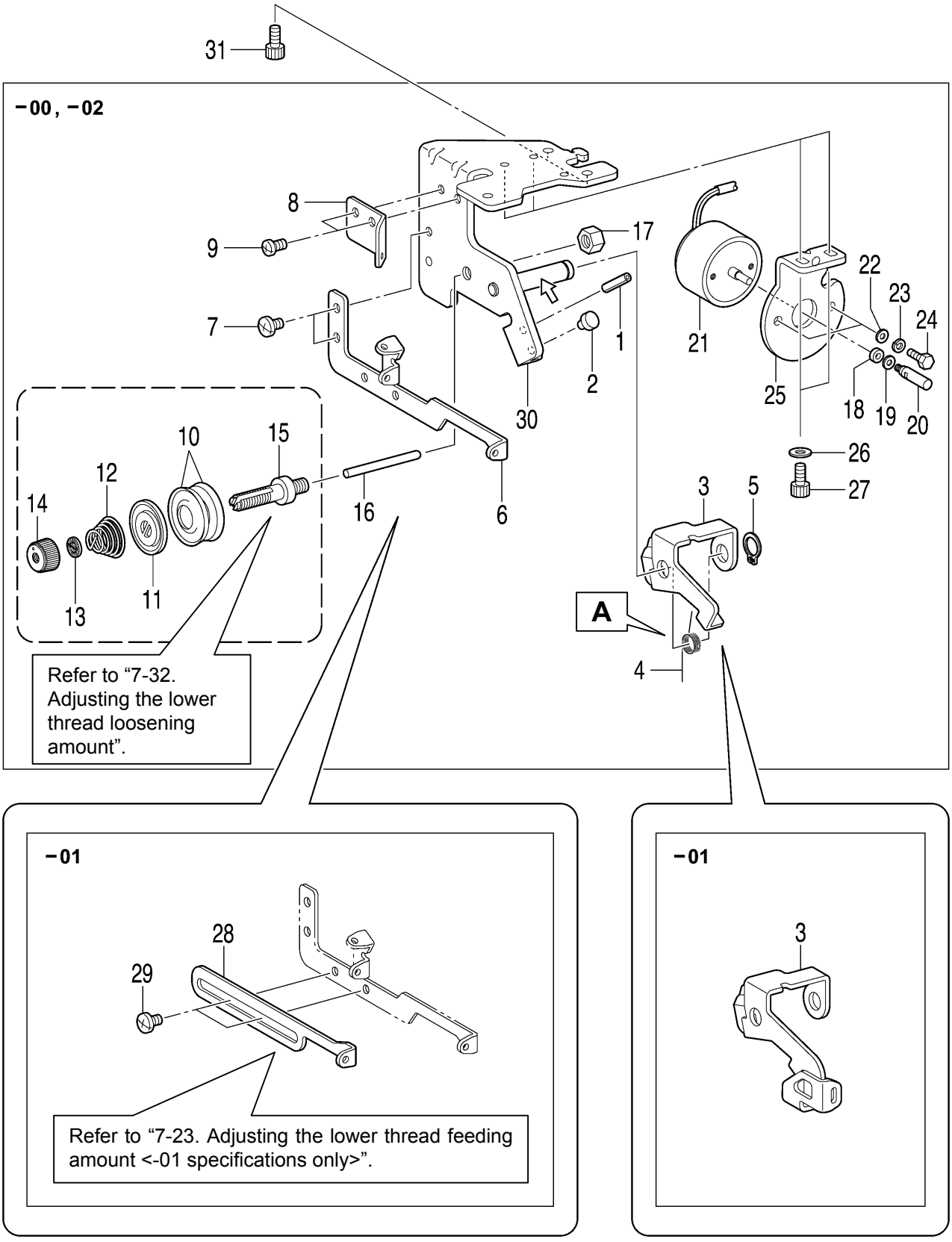
1) Place the feed base (c) onto the bed (b) so that Y feed guide shaft (a) is positioned in the center of the hole in the front of the bed (b).
2) Loosen the two set screws (7) of the idler gear (6) in order to engage the X rack (e) and the idler gear (6) while the X rack (d) and the idler gear (4) are engaged in the standard position.
3) Set so that the screw stop (A) of the pulse motor X assembly (10) and the two set screws (9) of the feed gear (8) are in the positions shown in the illustration.
4) While pushing the idler gear (4) and idler gear (6) to engage them with the X racks (d) and (e) at opposite sides, install the motor unit (f).
5) Tighten the two set screws (7) so that there is no thrust play in the idler gear (6).

* If only removing the motor unit (f), steps 2 and 5 in the adjustment procedure for the idler gear (6) can be omitted. (If carrying out any disassembly or assembly which changes the positions of the X racks or if re-adjusting the backlash, carry out the full procedure.)

0966B
0967B
0968B

6-17. Lower thread tension mechanism

* Refer to the detailed descriptions on the next page for details on A in the illustration.
* Apply the grease specified by Brother (**MOLYKOTE LONGTERM W2 manufactured by Dow Corning Corporation**) in the places indicated by ⇦ .



0969B

[-00 and -02 specifications only]

1. Spring pin
2. Stopper
3. Lower thread release plate
4. Spring
5. Retaining ring C
6. Lower thread guide B
7. Screws [2 pcs]
8. Lower thread guide A
9. Screws [2 pcs]
10. Tension discs [2 pcs]
11. Tension disc presser
12. Spring
13. Washer
14. Tension nut
15. Tension stud
16. Tension release pin
17. Nut (Temporarily tighten)
18. Solenoid cushion
19. Washer
20. Solenoid shaft
21. Solenoid
22. Plain washers [2 pcs]
23. Spring washers [2 pcs]
24. Bolts [2 pcs]
25. Solenoid setting plate
26. Plain washers [2 pcs]
27. Socket bolts [2 pcs]
28. (Not used for -00 and -02 specifications)
29. (Not used for -00 and -02 specifications)
30. Lower thread guide adjusting plate
31. Socket bolts [3 pcs]

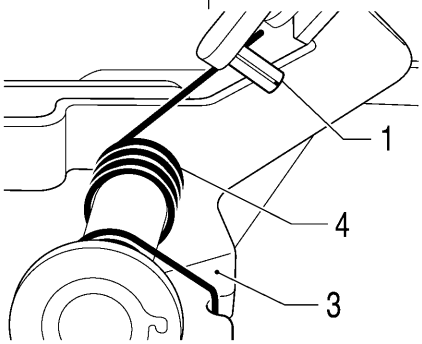
[-01 specifications only]

1. Spring pin
2. Stopper
3. Lower thread take-up guide lever
4. Spring
5. Retaining ring C
6. Lower thread guide B
7. Screws [2 pcs]
8. Lower thread guide A
9. Screws [2 pcs]
10. Tension discs [2 pcs]
11. Tension disc presser
12. Spring
13. Washer
14. Tension nut
15. Tension stud
16. Tension release pin
17. Nut (Temporarily tighten)
18. Solenoid cushion
19. Washer
20. Solenoid shaft
21. Solenoid
22. Plain washers [2 pcs]
23. Spring washers [2 pcs]
24. Bolts [2 pcs]
25. Solenoid setting plate
26. Plain washers [2 pcs]
27. Socket bolts [2 pcs]
28. Lower thread guide C
29. Screws [2 pcs]
30. Lower thread guide adjusting plate
31. Socket bolts [3 pcs]

A

[For -00 and -02 specifications]
Insert the longer end of the spring (4) into the spring pin (1), and insert the shorter end into the notch in the lower thread release plate (3).

[-01 specifications]
Insert the longer end of the spring (4) into the spring pin (1), and insert the shorter end into the notch in the lower thread take-up guide lever (3).



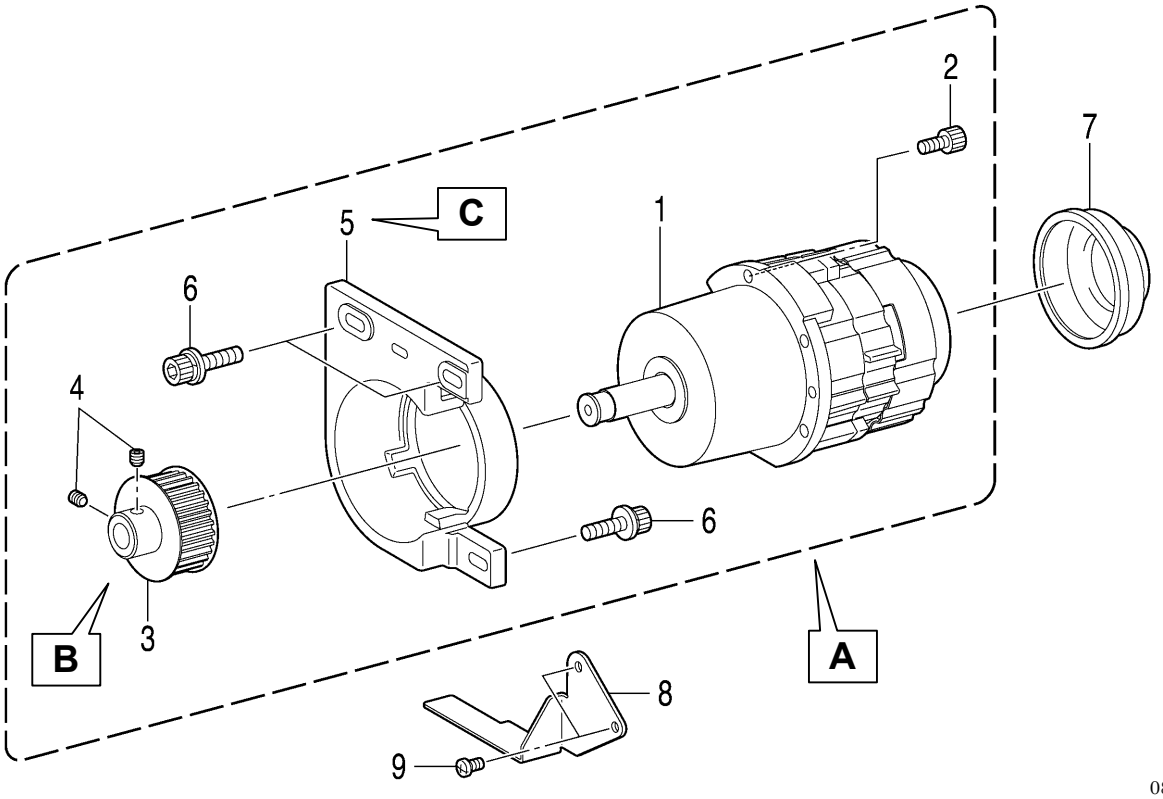
0970B

6-18. Upper shaft motor mechanism

* Refer to the detailed descriptions on pages 112 to 114 for details on A to C in the illustration.

NOTE:

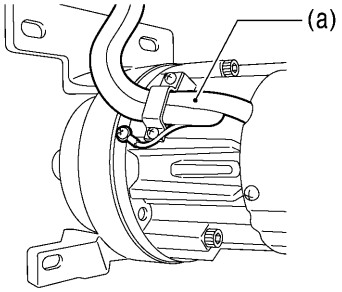
- Check that the Y feed motor assembly and the pulse motor R assembly are installed before carrying out this procedure.
  If they are not installed, install them first.
- After carrying out the procedure in “C Standard installation of upper shaft motor unit and belt tension adjustment”, be sure to carry out the adjustments in “7-35. Adjusting the needle up signal home position for the upper shaft and upper shaft motor” and “7-36. Adjusting the upper shaft stop position”.



0852B

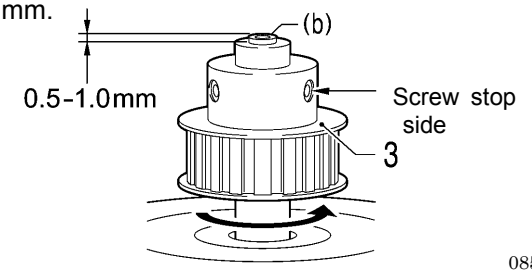
1. Motor assembly
2. Socket bolts [5 pcs]
3. Timing pulley
4. Set screws [2 pcs]
5. Motor holder
6. Socket bolts with washers [3 pcs]
7. Motor cover
8. Belt guide
9. Screws [2 pcs]

A Install so that the cord (a) is in the position shown in the illustration.



0853B

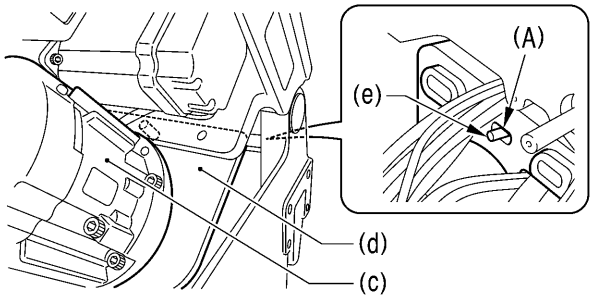
B Align the screw at the front of the timing pulley (3) in the direction of rotation with the screw stop on the motor shaft (b), and then tighten the screw so that the shaft projects by 0.5 - 1.0 mm.



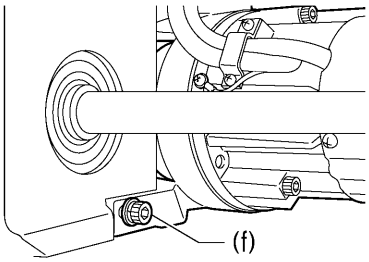
0854B

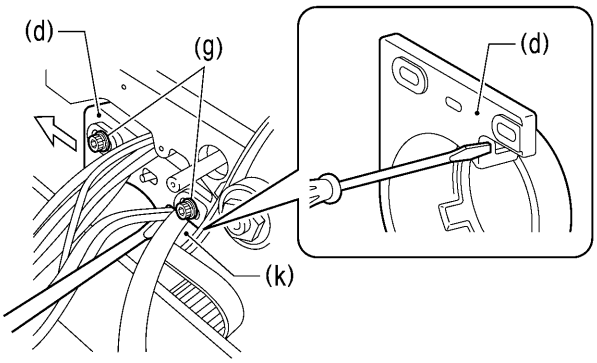
C Standard installation of upper shaft motor unit and belt tension adjustment

<If the belt (upper shaft - lower shaft) is not installed>



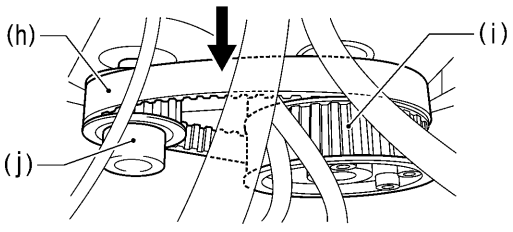
1) With the machine head tilted back, hold the upper shaft motor unit (c) at the front, and place the positioning pin (e) at the rear of the machine head into the slot (A) in the motor holder (d).
2) Provisionally screw in the socket bolt with washer (f) until it is almost fully tightened.
3) Return the machine head to its original position.





4) Provisionally screw in the two remaining socket bolts with washers (g) at the back of the machine head until they are almost fully tightened, and then place the motor on the lower shaft side.
5) Place the belt (h) onto the lower shaft timing pulley (i) and the motor pulley (j).
6) Insert a screwdriver into the gap between the motor holder (d) and the bed (k) and move the upper shaft motor unit (c) to the left to adjust the tension of the belt (h) to within the range given below.
   - When using a new belt: 130 - 140 N
   - When reusing an old belt: 90 - 100 N
7) Tighten the two socket bolts with washers (g).
8) Tilt back the machine head and fully tighten the socket bolt with washer (f) at the front.

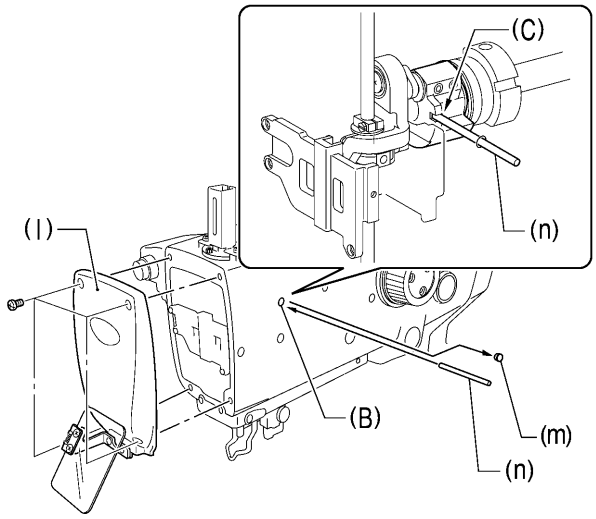
Measurement position



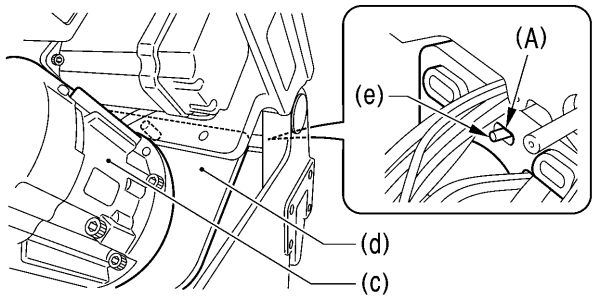
* Be sure to use a belt tension gauge to measure the belt tension, and measure at the position shown in the illustration.
* The belt tension gauge should be set to measure a unit weight of 0.04 kg/m, a belt width of 15 mm and a span length of 92 mm.

0855B

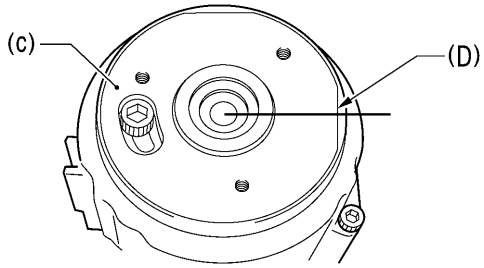
<If the belt (upper shaft - lower shaft) is installed>

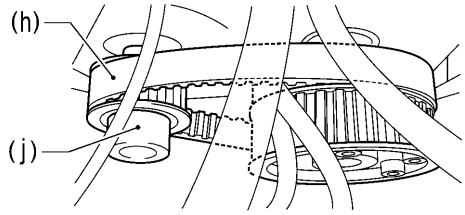


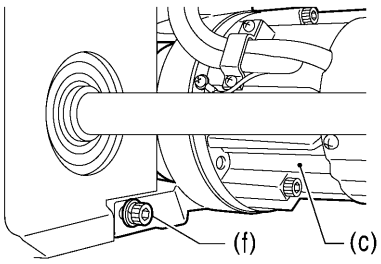
1) Remove the face plate (l) and the rubber cap (m), and then insert the accessory pin (n) into the groove (C) in the upper shaft crank from the hole (B) in the arm to stop the upper shaft from turning. (Upper shaft 0° position)



2) Remove the motor cover (7) if it is installed to the upper shaft motor unit (c).
3) With the machine head tilted back, hold the upper shaft motor unit (c) at the front, and then place the belt (h) onto the motor pulley (j) so that the D cut section (D) of the encoder is facing directly to the right.
4) Place the positioning pin (e) at the rear of the machine head into the slot (A) in the motor holder (d).



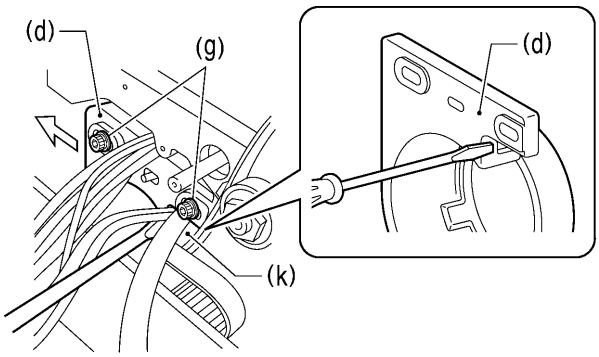




5) Provisionally screw in the socket bolt with washer (f) until it is almost fully tightened.
6) Return the machine head to its original position.

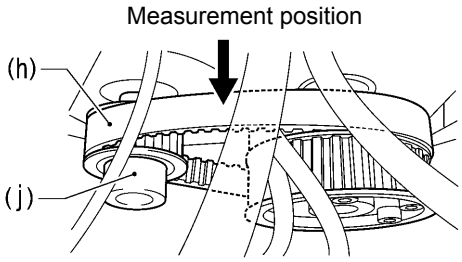
(Continued on next page)

0975B

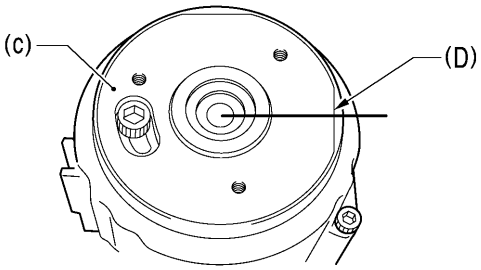


7) Provisionally screw in the two remaining socket bolts with washers (g) at the back of the machine head until they are almost fully tightened, and then place the motor on the lower shaft side.
8) Insert a screwdriver into the gap between the motor holder (d) and the bed (k) and move the upper shaft motor unit (c) to the left to adjust the tension of the belt (h) to within the range given below.
   - When using a new belt: 130 - 140 N
   - When reusing an old belt: 90 - 100 N

* Be sure to use a belt tension gauge to measure the belt tension, and measure at the position shown in the illustration.
* The belt tension gauge should be set to measure a unit weight of 0.04 kg/m, a belt width of 15 mm and a span length of 92 mm.



9) Tighten the two socket bolts with washer (g).

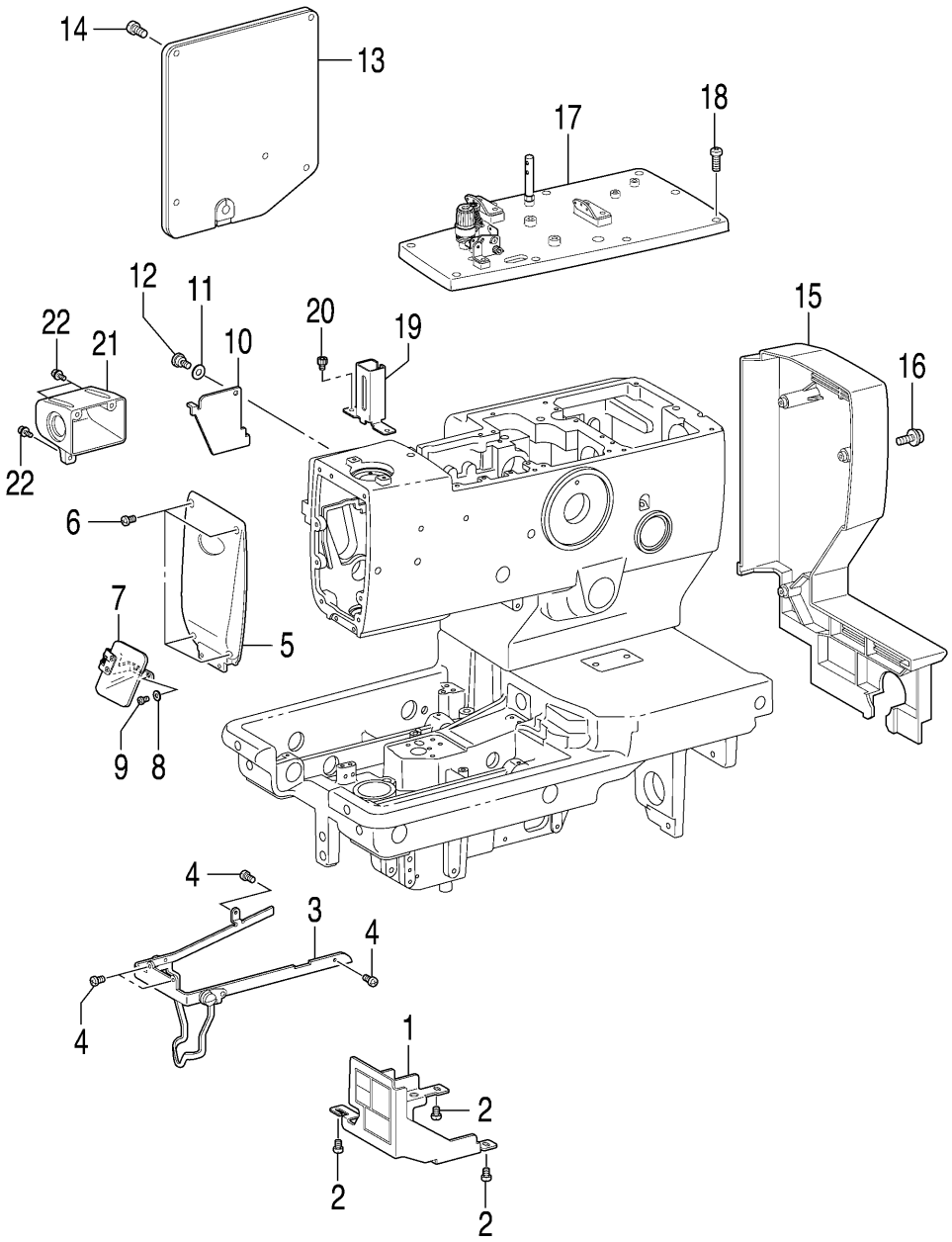


10) Tilt back the machine head and fully tighten the socket bolt with washer (f) at the front.
11) Check that the D cut section (D) of the encoder is facing directly to the right ± 10° at this time.
    * If it is not in this position, repeat steps 3 to 10. (If it is not in the correct position, the adjustment in “7-35. Adjusting the needle up signal home position for the upper shaft and upper shaft motor” will not be possible.)

NOTE:
If you do not have a belt tension gauge, adjust so that the amount of deflection is approximately 1 mm when a pressure of 5 N is applied to the middle of the span (the measurement position shown in the illustration).

0856B

6-19. Covers



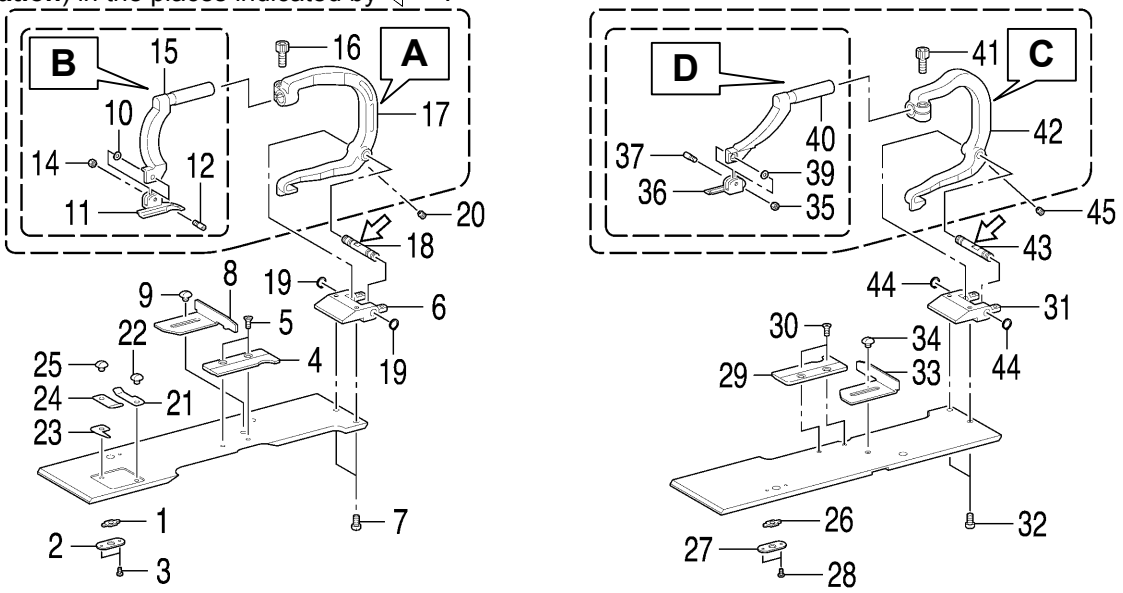
1064B

1. Cam cover
2. Screws [3 pcs]
3. Needle guide cover
4. Screws [4 pcs]
5. Main plate
6. Screws [4 pcs]
7. Eye guard assembly
8. Plain washers [2 pcs]
9. Screws [2 pcs]
10. Zigzag window cover
11. Wave washer
12. Shoulder screw
13. Rear cover
14. Screws [5 pcs]
15. Belt cover
16. Screws with washers [4 pcs]
17. Top cover assembly
18. Screws [9 pcs]
19. Needle bar guard
20. Socket bolts [2 pcs]
21. Switch cover
22. Screws with washers [3 pcs]

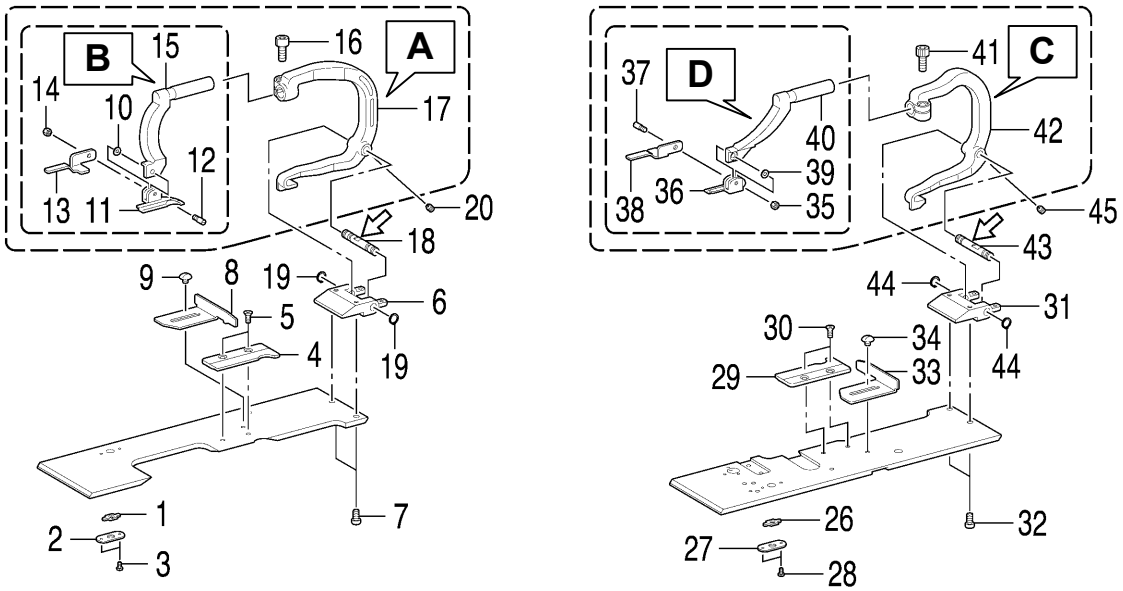
6-20. Work clamp plate mechanism

* Refer to the detailed descriptions on pages 119 and 120 for details on A to D in the illustration.
* Apply the grease specified by Brother (**MOLYKOTE LONGTERM W2 manufactured by Dow Corning Corporation**) in the places indicated by ⇦ .

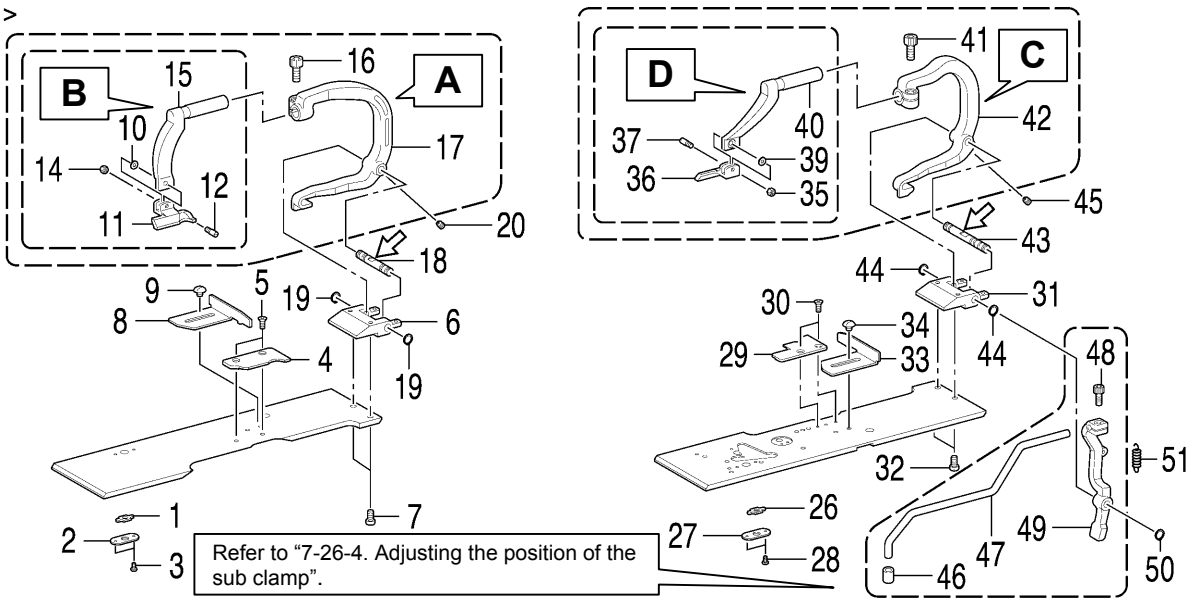
< -00 >



< -01 >



< -02 >



Refer to “7-26-4. Adjusting the position of the sub clamp”.

1. Opening slide block
2. Slide block support plate
3. Screws [2 pcs]
4. Needle plate L
5. Flat screws [2 pcs]
6. Clamp shaft holder
7. Screws [2 pcs]
8. Cloth guide L
9. Screw
10. Bending washer
11. Work clamp L
12. Clamp support pin
13. Work clamp plate L
    <-01 specifications only>
14. Nut
15. Clamp arm L
16. Socket bolt (Temporarily tighten)
17. Clamp lever L
18. Clamp fulcrum shaft
19. Retaining rings C [2 pcs]
20. Set screws [2 pcs]

<-00 specifications only>

21. Plate spring
22. Screw
23. Thread trimmer B
24. Thread trimmer A
25. Screw

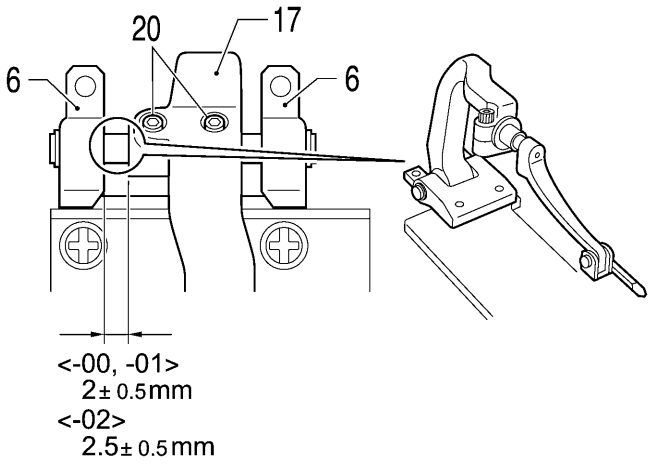
26. Opening slide block
27. Slide block support plate
28. Screws [2 pcs]
29. Needle plate R
30. Flat screws [2 pcs]
31. Clamp shaft holder
32. Screws [2 pcs]
33. Cloth guide R
34. Screw
35. Bending washer
36. Cloth work clamp R
37. Clamp support pin
38. Work clamp plate R
    <-01 specifications only>
39. Nut
40. Clamp arm R
41. Socket bolt (Temporarily tighten)
42. Clamp lever R
43. Clamp fulcrum shaft
44. Retaining rings C [2 pcs]
45. Set screws [2 pcs]

<-02 specifications only>

46. Cloth work clamp A
47. Sub auxiliary clamp wrist
48. Socket bolt (Temporarily tighten)
49. Auxiliary clamp arm
50. Retaining rings C
51. Spring

A Cloth work clamp L sideways position adjustment

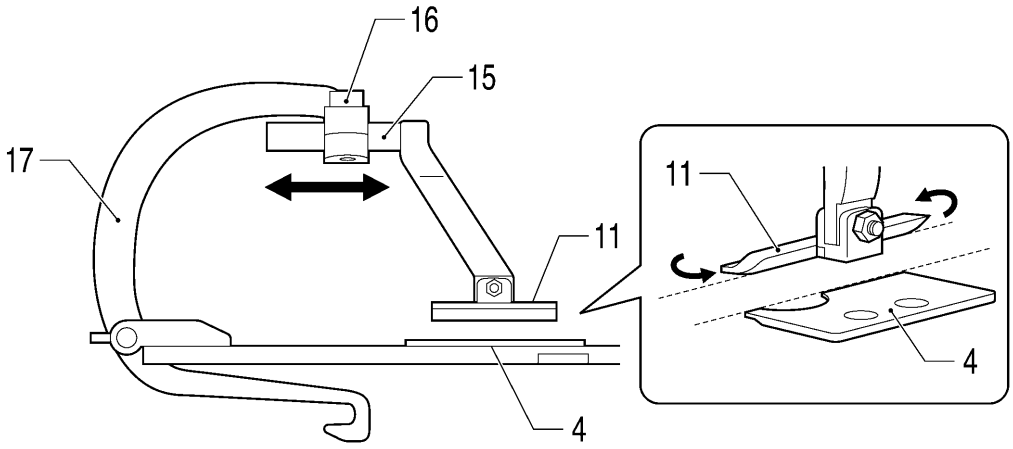
1) Set so that the clearance between the clamp shaft holder (6) and clamp lever L (17) is at the distance shown in the illustration.
2) After adjusting, tighten the two set screws (20).



1009B

B Cloth work clamp L forward/back adjustment

1) Loosen the socket bolt (16) and then adjust the forward/back position of clamp arm L (15).
2) Next, adjust cloth work clamp L (11) so that its side is flush with the side of needle plate L (4).
3) Once adjustment is complete, tighten the socket bolt (16).

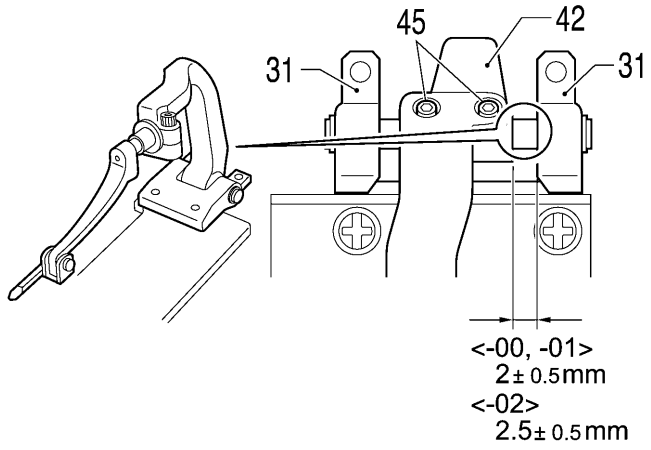


(Viewed from directly to the left)

1010B

C Cloth work clamp R sideways adjustment

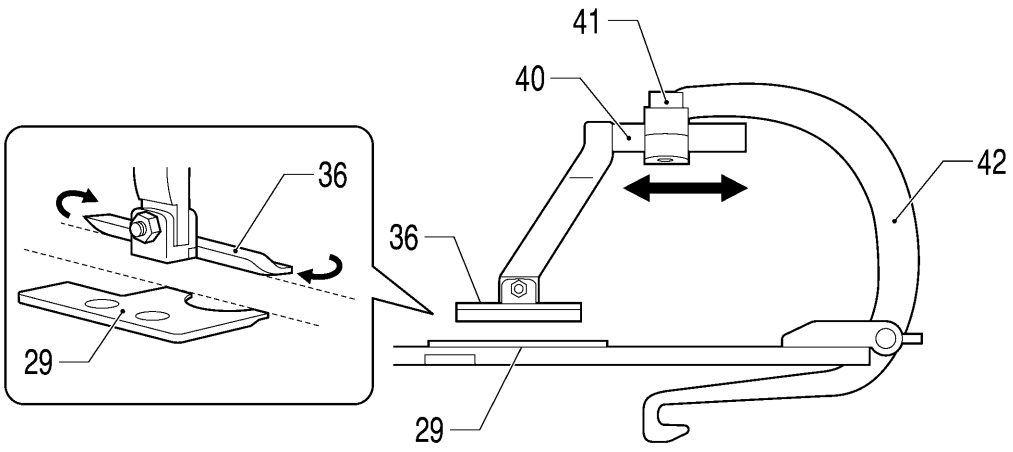
1) Set so that the clearance between the clamp shaft holder (31) and clamp lever R (42) is at the distance shown in the illustration.
2) After adjusting, tighten the two set screws (45).



1011B

D Cloth work clamp R forward/back adjustment

1) Loosen the socket bolt (41) and then adjust the forward/back position of clamp arm R (40).
2) Next, adjust the cloth work clamp R (36) so that its side is flush with the side of needle plate R (29).
3) Once adjustment is complete, tighten the socket bolt (41).



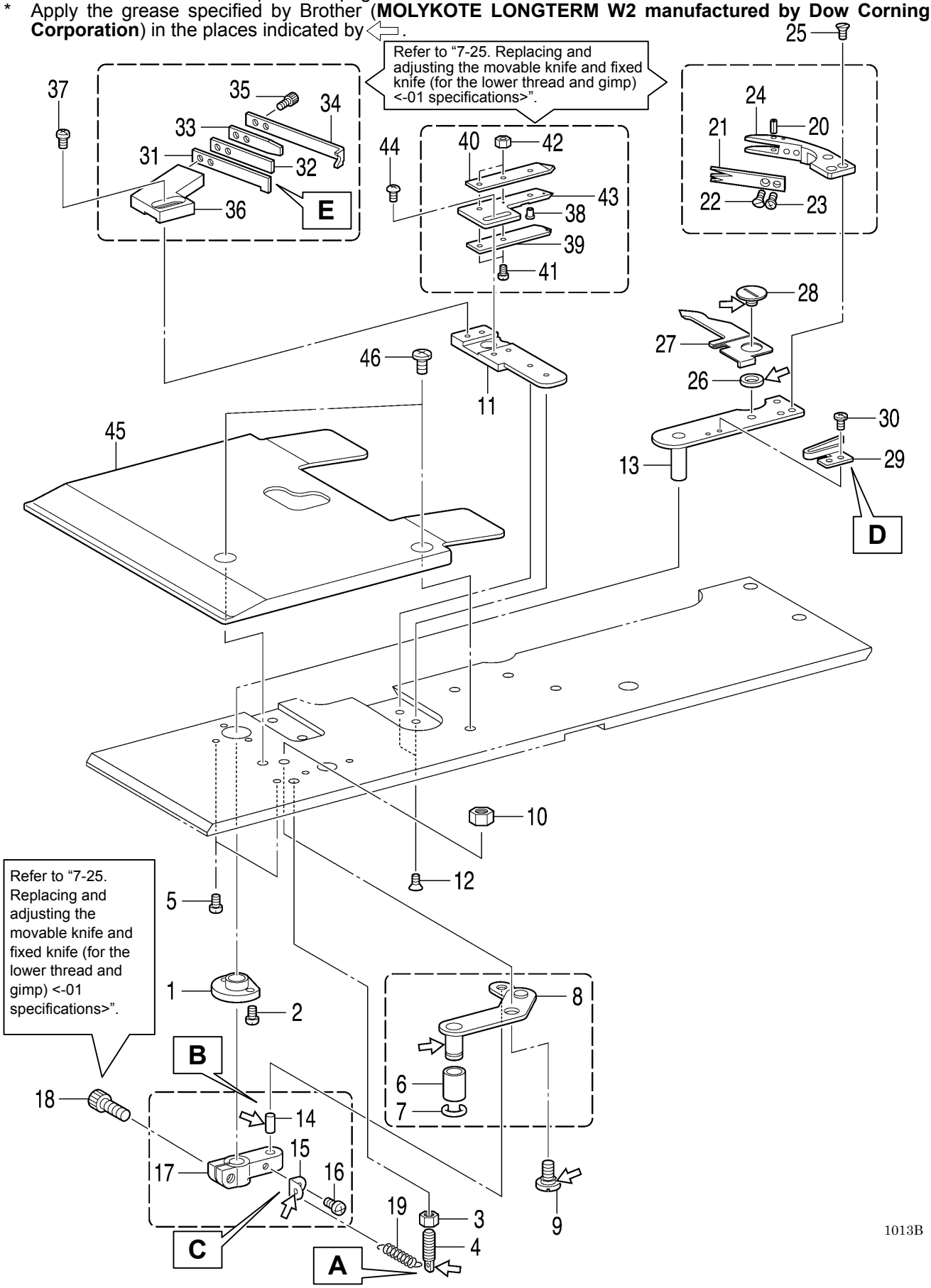
(Viewed from directly to the right)

1012B

6-21. Lower thread trimming mechanism

<-01 specifications>

* Refer to the detailed descriptions on pages 123 and 124 for details on A to E in the illustration.
* Apply the grease specified by Brother (**MOLYKOTE LONGTERM W2 manufactured by Dow Corning Corporation**) in the places indicated by ⇦.



1. Bush thread trimmer arm
2. Screws [2 pcs]
3. Nut
4. Spring hook
5. Screws [2 pcs]

6. Roller
7. Retaining ring
8. Thread trimmer link lever assembly

9. Shoulder screw
10. Nut
11. Fixed knife bracket
12. Flat screws [2 pcs]
13. Thread trimmer arm

14. Pin
15. Spring hook
16. Screw
17. Thread cutter lever arm

18. Socket bolt (Temporarily tighten)
19. Spring

20. Pin
21. Thread handler
22. Flat screw (Temporarily tighten)
23. Screw (Temporarily tighten)
24. Movable knife

25. Flat screws [3 pcs]
26. Movable knife collar
27. Thread nipper opener
28. Shoulder screw
29. Opener spring
30. Screws [2 pcs]

31. Fixed knife
32. Fixed knife plate spring
33. Fixed knife plate spring U
34. Thread guide plate
35. Socket bolts [2 pcs]
36. Fixed knife setting bracket

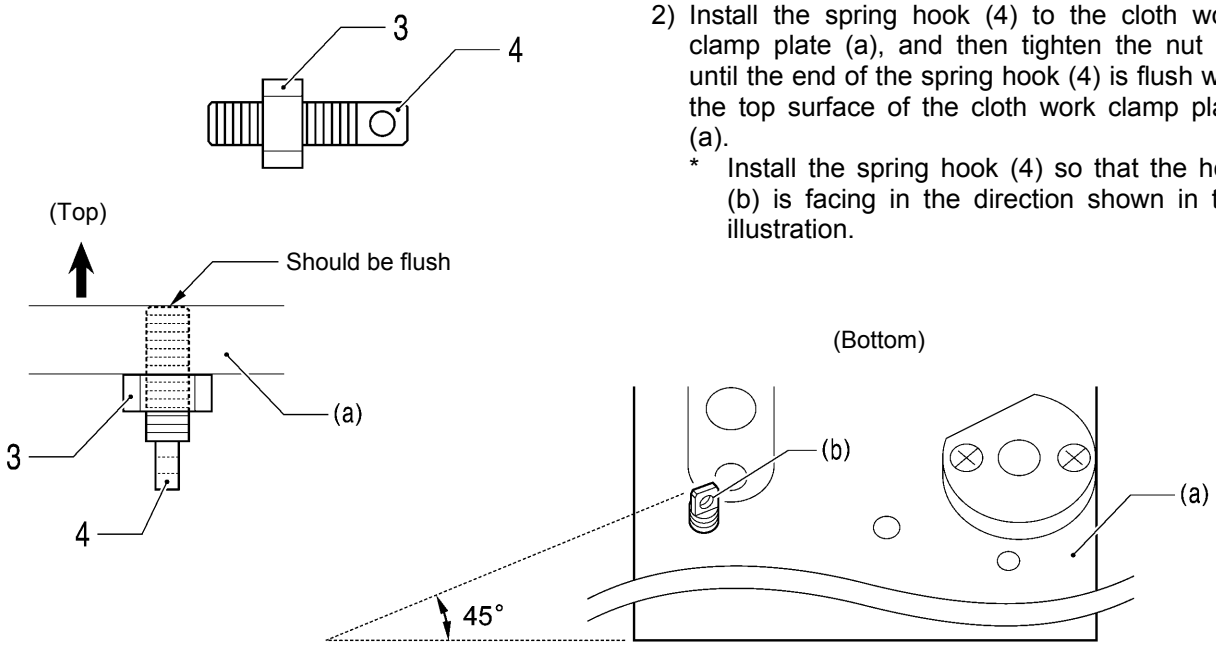
37. Screws [2 pcs] (Temporarily tighten)

38. Opener pin
39. Thread nipper D
40. Thread nipper U
41. Screws [2 pcs]
42. Nuts [2 pcs]
43. Thread nipper M

44. Screws [2 pcs] (Temporarily tighten)
45. Work clamp plate U
46. Screws [2 pcs]

A Spring hook installation

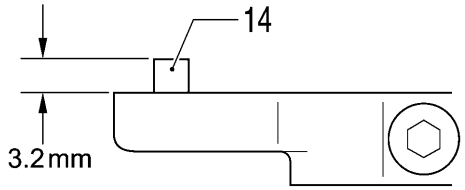
1) Provisionally tighten the nut (3) about halfway onto the spring hook (4).
2) Install the spring hook (4) to the cloth work clamp plate (a), and then tighten the nut (3) until the end of the spring hook (4) is flush with the top surface of the cloth work clamp plate (a).
   * Install the spring hook (4) so that the hole (b) is facing in the direction shown in the illustration.



1014B

B

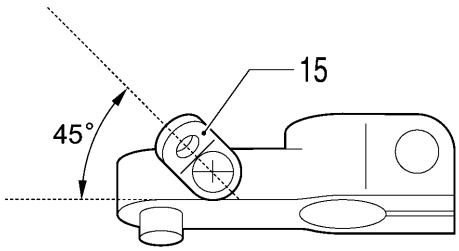
Install the pin (14) so that it projects by the distance shown in the illustration.



1015B

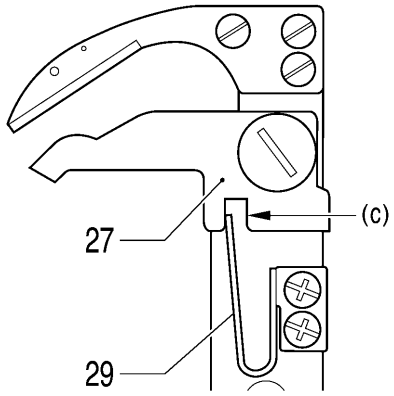
C

Install the spring hook (15) so that it faces in the direction shown in the illustration.



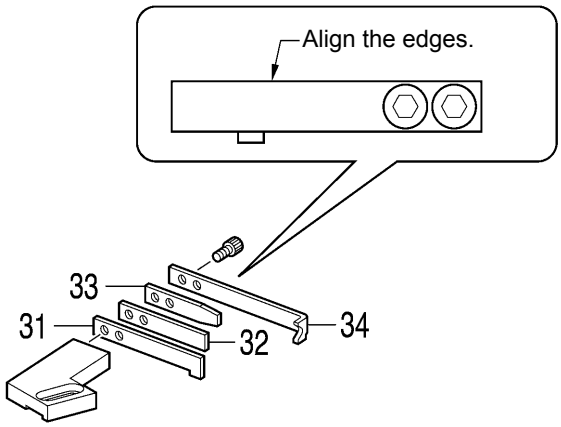
1016B

D Insert the end of the opener spring (29) into the notch (c) of the thread nipper opener (27).



1017B

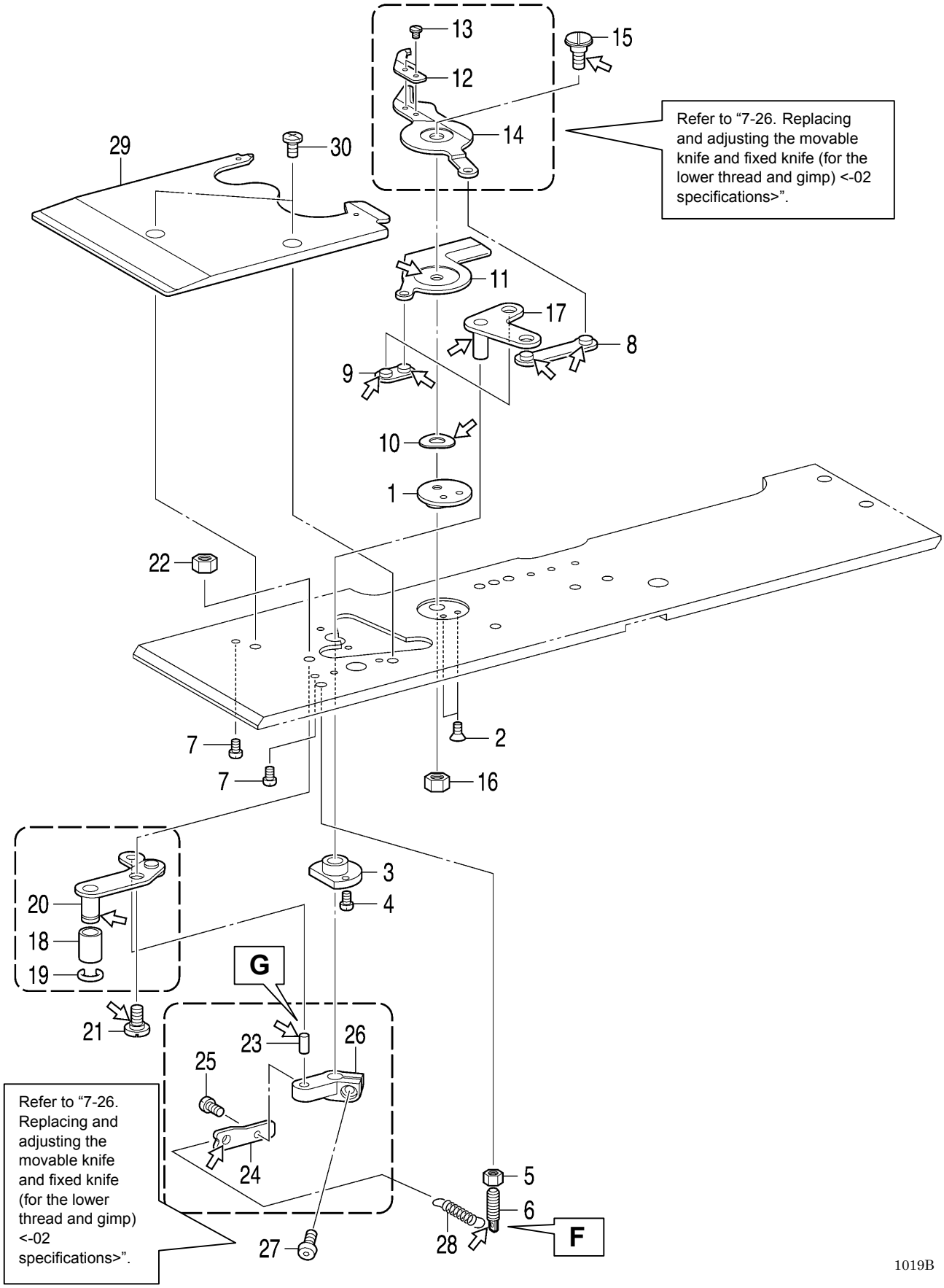
E Install all parts so that the edges are aligned as shown in the illustration.



1018B

<-02 specifications>

* Refer to the detailed descriptions on the next page for details on F and G in the illustration.
* Apply the grease specified by Brother (**MOLYKOTE LONGTERM W2 manufactured by Dow Corning Corporation**) in the places indicated by ⇦.



1. Knife support washer
2. Flat screws [2 pcs]
3. Bush thread trimmer arm
4. Screws [2 pcs]
5. Nut
6. Spring hook
7. Screws [2 pcs]
8. Thread trimmer link A assembly
9. Thread trimmer link B assembly
10. Wave washer
11. Movable knife R

12. Thread handler
13. Screws [2 pcs]
14. Movable knife L

15. Shoulder screw (Temporarily tighten)
16. Nut (Temporarily tighten)
17. Movable knife driving plate

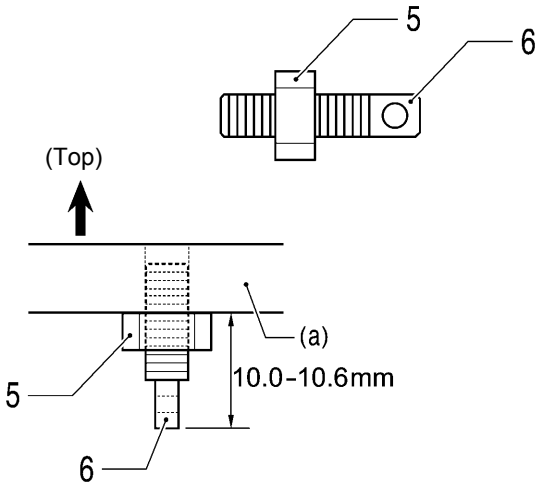
18. Roller
19. Retaining ring
20. Thread trimmer link lever J assembly

21. Shoulder screw
22. Nut

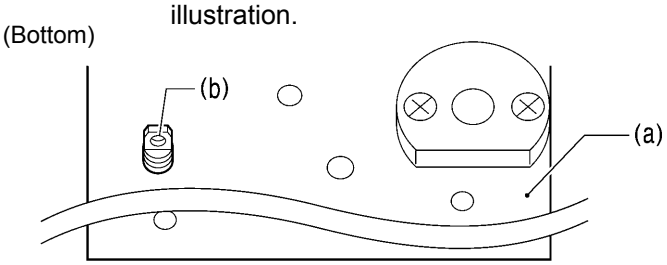
23. Pin
24. Spring hook
25. Screw
26. Thread cutter lever arm

27. Socket bolt (Temporarily tighten)
28. Spring
29. Work clamp plate JU
30. Screws [2 pcs]

F Spring hook installation

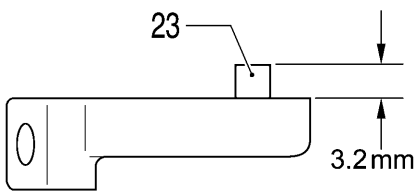


1) Provisionally tighten the nut (5) about halfway onto the spring hook (6).
2) Install the spring hook (6) to the cloth work clamp plate (a), and then tighten the nut (5) to the position shown in the illustration.
   * Check that the end of the spring hook (6) is not protruding from the surface of the cloth work clamp plate (a).
   * Install the spring hook (6) so that the hole (b) faces in the direction shown in the illustration.



1020B

G



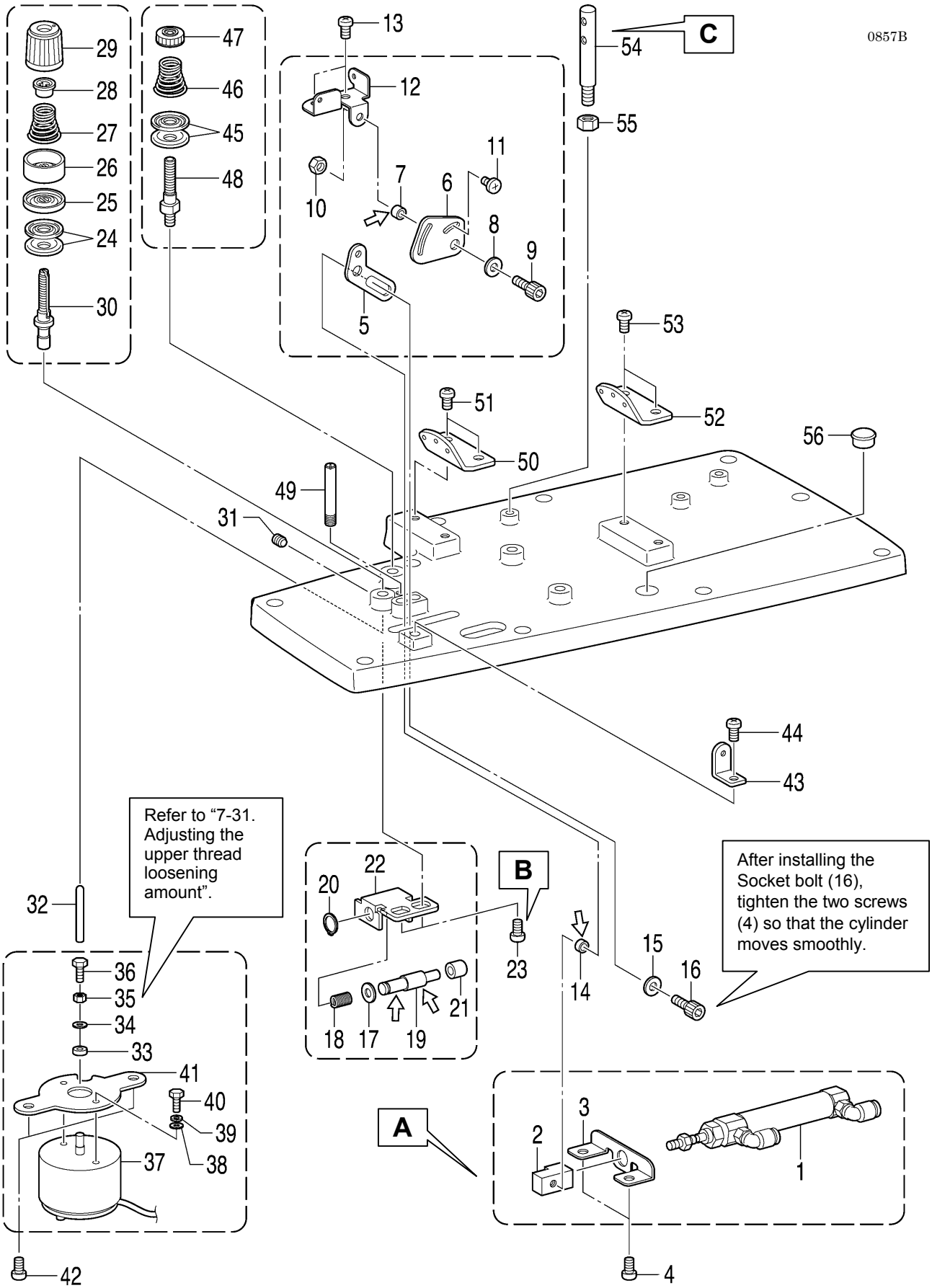
Install the pin (23) so that it projects by the distance shown in the illustration.

1021B

6-22. Upper cover mechanism (upper thread tension release and upper thread take-up mechanisms and upper thread path)

* Refer to the detailed descriptions on the next page for details on A to C in the illustration.

* Apply the grease specified by Brother (**MOLYKOTE LONGTERM W2 manufactured by Dow Corning Corporation**) in the places indicated by ⇦ .



1. Cylinder assembly
2. Cylinder joint A
3. Cylinder setting plate A

4. Screws [2 pcs] (Temporarily tighten)

5. Thread take-up lever driving plate
6. Thread take-up lever plate
7. Collar A
8. Washer
9. Socket bolt
10. Nut
11. Screw
12. Thread take-up lever base

13. Screws [2 pcs]
14. Collar B
15. Washer
16. Socket bolt

17. Plain washer
18. Compression spring
19. Impact support shaft
20. Retaining ring C
21. Button clamp A
22. Impact support plate

23. Screws [2 pcs]

24. Tension discs [2 pcs]
25. Tension disc presser
26. Tension disc presser
27. Tension spring
28. Washer
29. Tension nut
30. Tension stud U

31. Set screw
32. Tension release pin

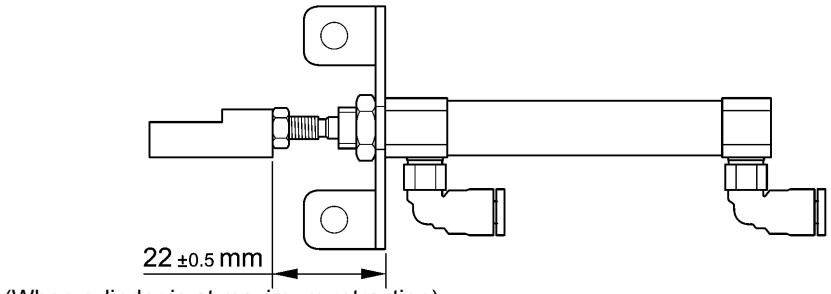
33. Solenoid cushion
34. Washer
35. Nut
36. Bolt
37. Upper thread tension release solenoid
38. Plain washers [2 pcs]
39. Spring washers [2 pcs]
40. Bolts [2 pcs]
41. Solenoid setting plate

42. Screws [2 pcs]
43. Upper thread guide A
44. Screw

45. Thread guide discs [2 pcs]
46. Pre-tension spring B
47. Tension nut
48. Tension stud

49. Thread guide rod A
50. Sewing thread retainer guide
51. Screws [2 pcs]
52. Sewing thread retainer guide
53. Screws [2 pcs]
54. Thread spool pin
55. Nut
56. Rubber cap

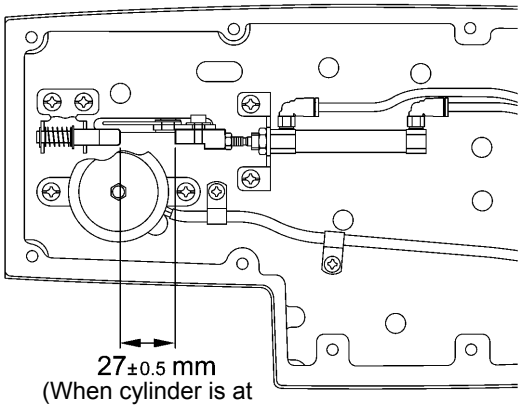
A Assemble as shown in the illustration.



(When cylinder is at maximum retraction)

0858B

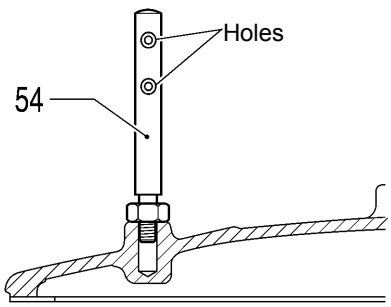
B Assemble as shown in the illustration.



(When cylinder is at maximum retraction)

0859B

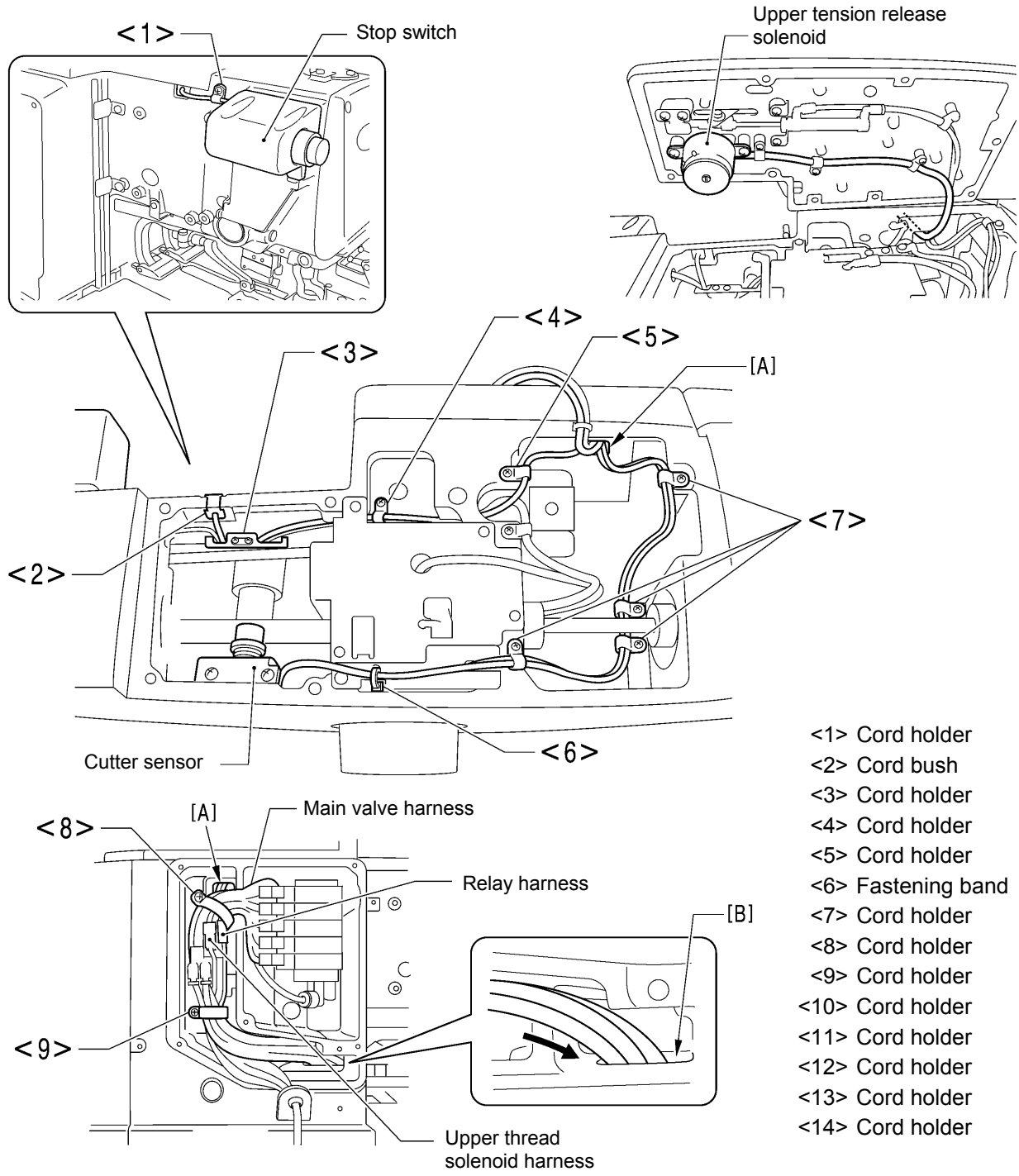
C Install the thread spool pin (54) so that the holes face in the direction shown in the illustration.



0860B

6-23. Routing the harnesses

Route the harnesses from the various parts in the order shown in the table below.

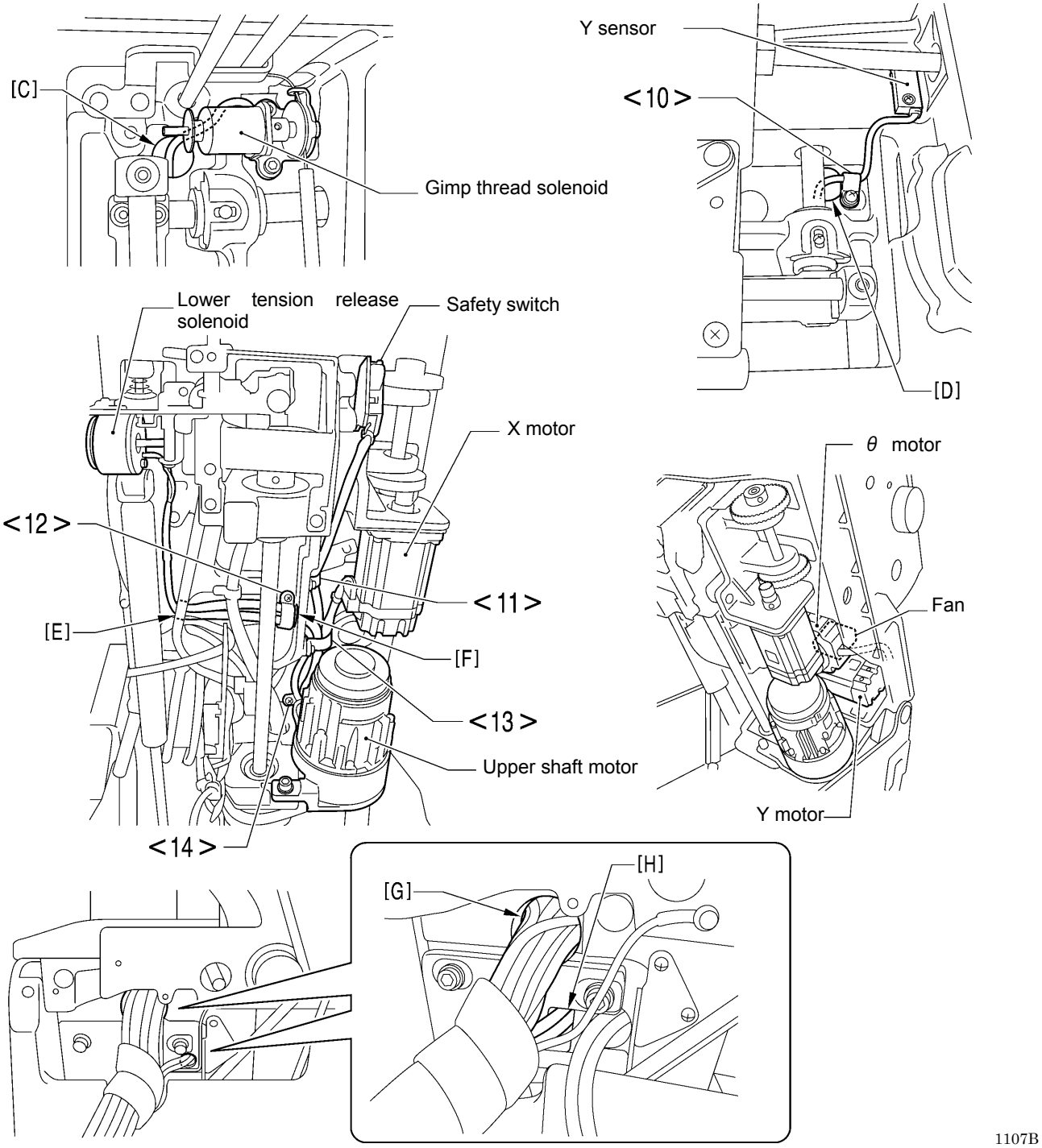


<1> Cord holder
<2> Cord bush
<3> Cord holder
<4> Cord holder
<5> Cord holder
<6> Fastening band
<7> Cord holder
<8> Cord holder
<9> Cord holder
<10> Cord holder
<11> Cord holder
<12> Cord holder
<13> Cord holder
<14> Cord holder

1106B

[A]-[G] : Indicates holes
[H] : Indicates a gap

Routing order / Part name	1	2	3	4	5	6	7	8	9
Stop switch	<1>	<2>	<3>	<4>	<5>	[A]	<8>		
Cutter sensor	<6>	<7>	[A]	<8>					
Upper tension release solenoid	[A]	<8>							
Main valve harness	<8>	<9>	[B]	[E]	<12>	[F]	<13>	<14>	[G]
Relay harness	<9>	[B]	[E]	<12>	[F]	<13>	<14>	[G]	
Upper thread solenoid harness	<9>	[B]	[E]	<12>	[F]	<13>	<14>	[G]	



1107B

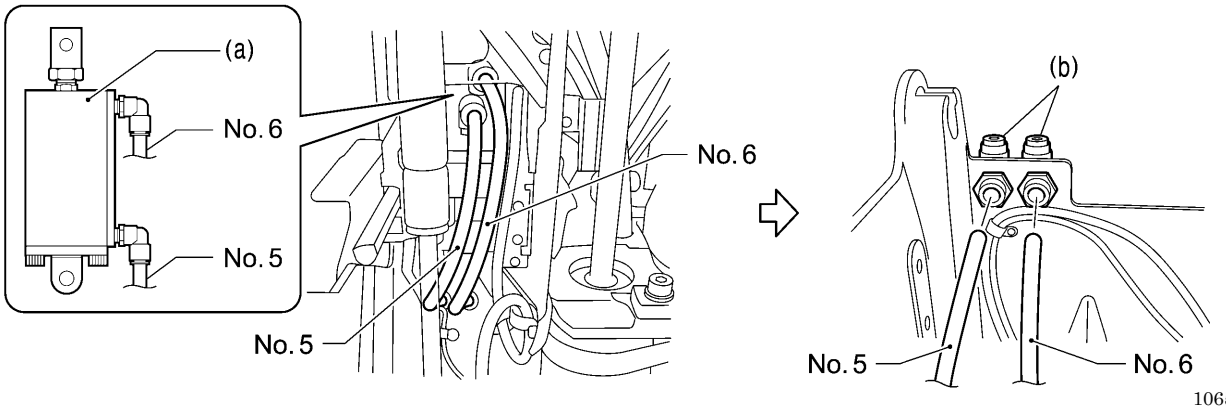
Routing order / Part name	1	2	3	4	5	6	7	8	9
Gimp thread solenoid	[C]	[E]	<12>	[F]	<13>	<14>	[G]		
Y sensor	<10>	[D]	<11>	<13>	<14>	[G]			
Lower tension release solenoid	[E]	<12>	[F]	<13>	<14>	[G]			
Safety switch	<11>	<13>	<14>	[G]					
X motor	<13>	<14>	[G]						
Y motor	[G]								
θ motor	[G]								
Upper shaft motor	[H]								
Fan	[G]								

6-24. Routing the air tubes

Cutter cylinder

Insert the air tubes (No. 5 and No. 6) of the cutter cylinder (a) into the elbows (b) in the bed base.

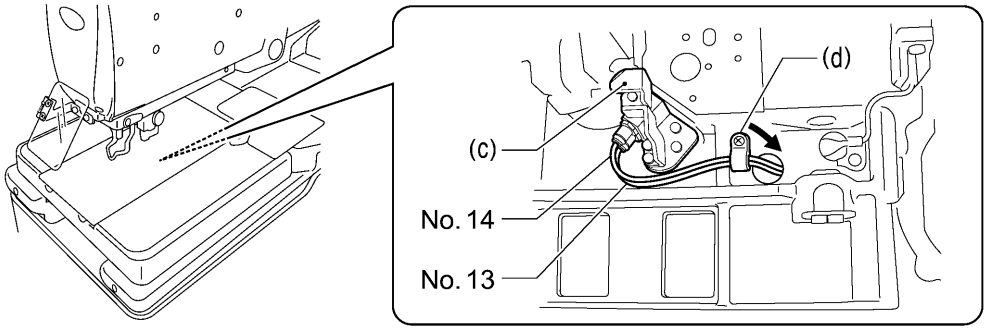
* Insert the air tubes into the elbows (b) with the same numbers.



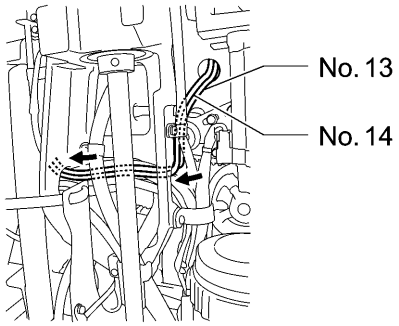
1065B

Upper thread cutter cylinder

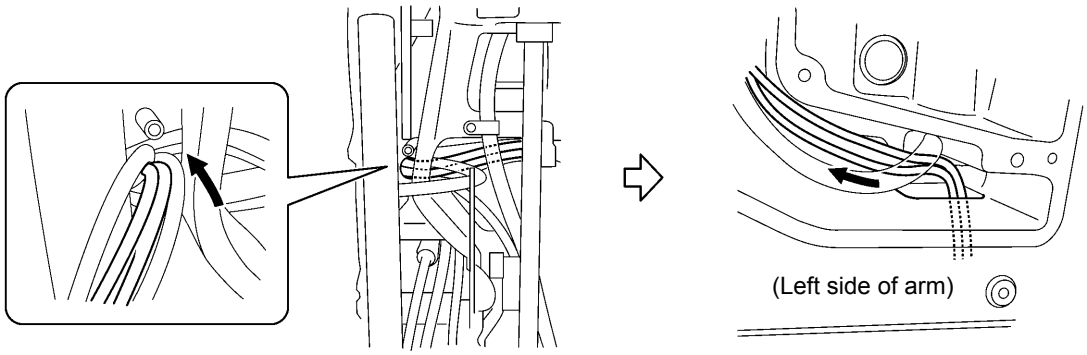
1) Pass the air tubes (No. 13 and No. 14) of the upper thread cutter cylinder (c) through the hole in the bed and out through the bottom.
2) Secure the air tubes with the cord holder (d).



3) Pass the air tubes (No. 13 and No. 14) through the hole in the bed as shown in the illustration below.



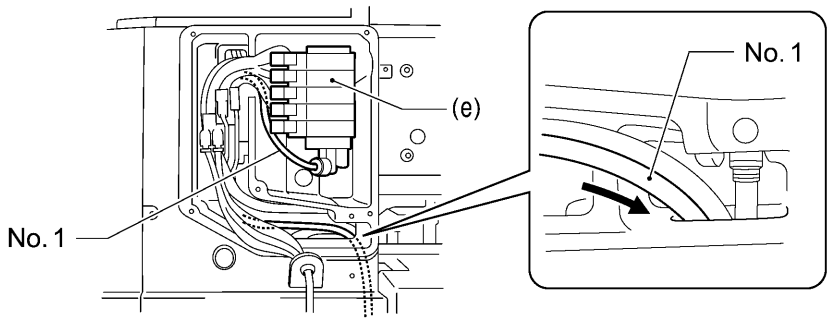
4) Pass the air tubes (No. 13 and No. 14) out through the bottom of the bed into the side of the arm, and then pass them out through the side of the arm.



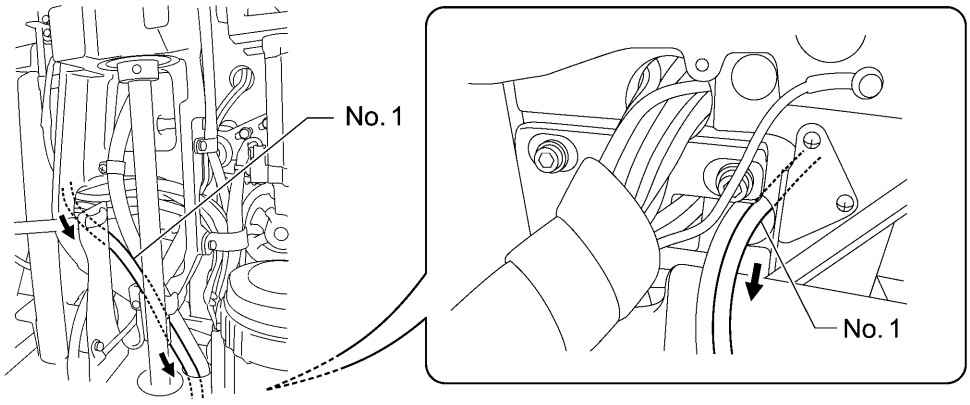
1066B
1067B
1068B

Valve unit

1) Pass the air tube (No. 1) of the valve unit (e) from the side marked with “1” into the hole in the side of the arm and out into the bottom of the bed.



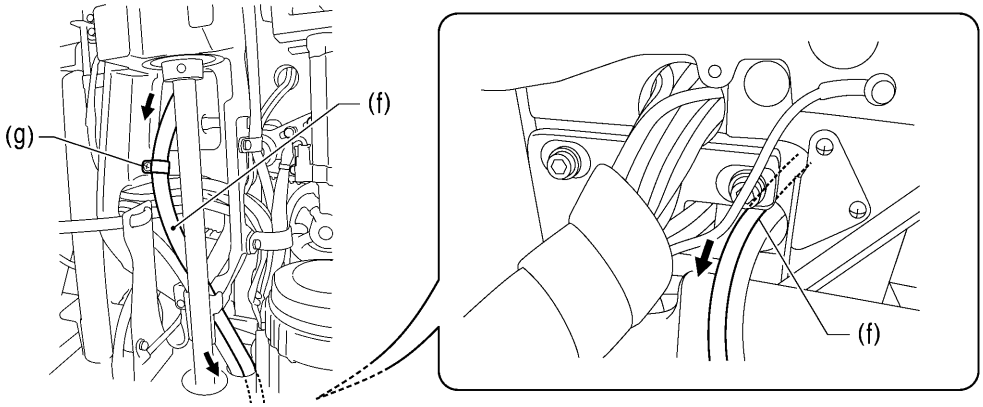
2) Pass the air tube (No. 1) through the hole in the bed and out from the rear of the bed.



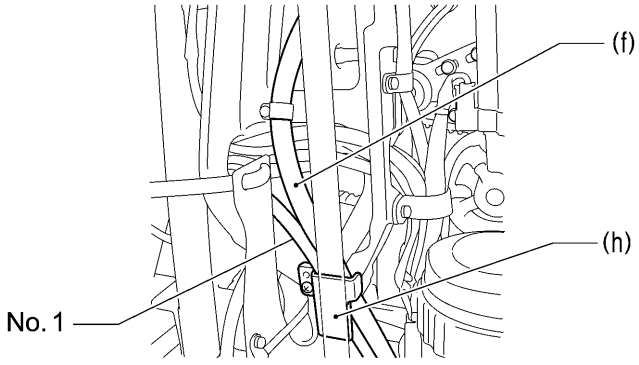
1069B
1070B

Cutting scraps

1) Secure the air tube (f) for cutting scraps with the cord holder (g).
2) Pass the air tube (f) for cutting scraps through the hole and out from the rear of the bed.

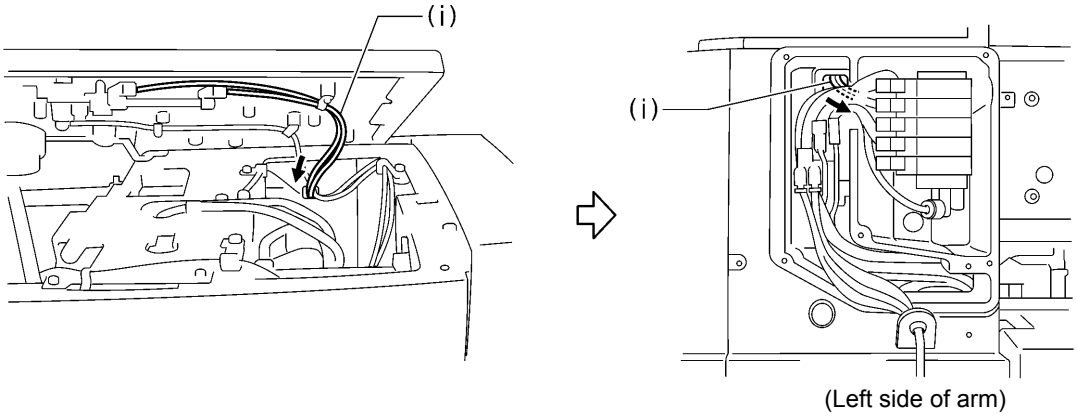


3) Secure the air tube (No. 1) for the valve unit (e) and the air tube (f) for cutting scraps with the tube presser (h).



1071B
1072B

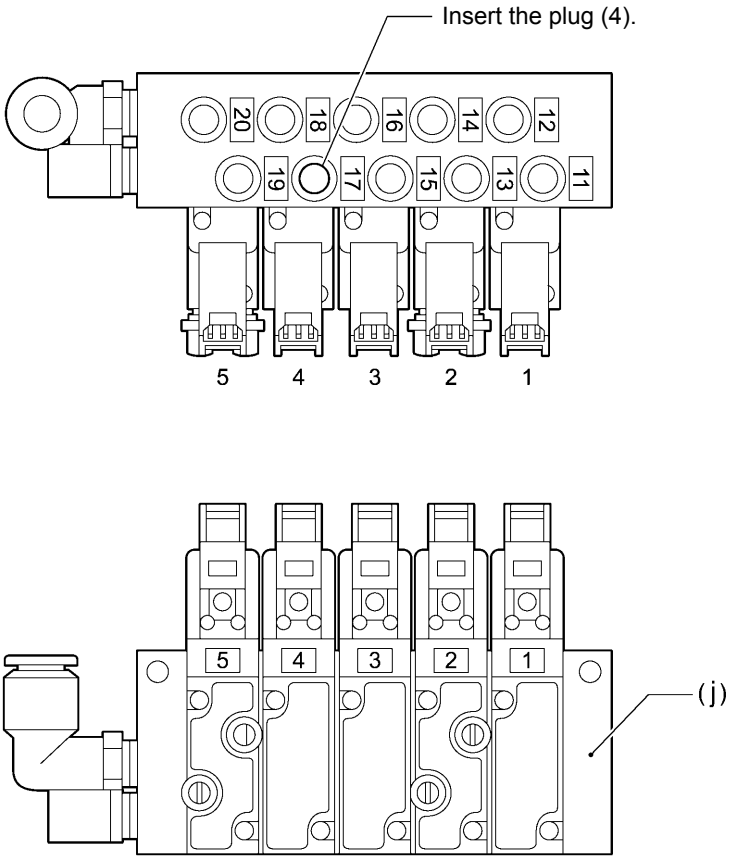
Upper tension release cylinder
Pass the air tube (i) for the upper tension release cylinder through the hole in the arm and out from the side of the rear cover.



1073B

Connecting the air tubes
Insert the air tubes onto the nipples of the solenoid valve assembly (j).

* There are numbers marked on each air tube. Insert the air tubes onto nipples with corresponding numbers.



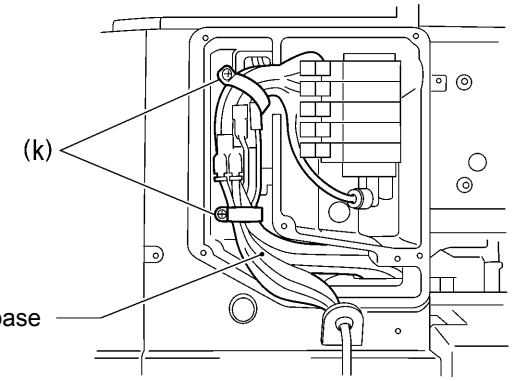
1074B

《Solenoid valve tubes and functions》

Label No.	Solenoid valve type
1	For upper thread take-up
2	For upper thread trimming
3	For cloth spreading (+ for auxiliary clamp arm *1)
4	For cloth work clamp
5	For lower thread trimming *2

*1: Auxiliary clamp arm is for -02 specifications only.
*2: The solenoid valve for label No. 5 is not present in specifications without a lower thread trimmer.

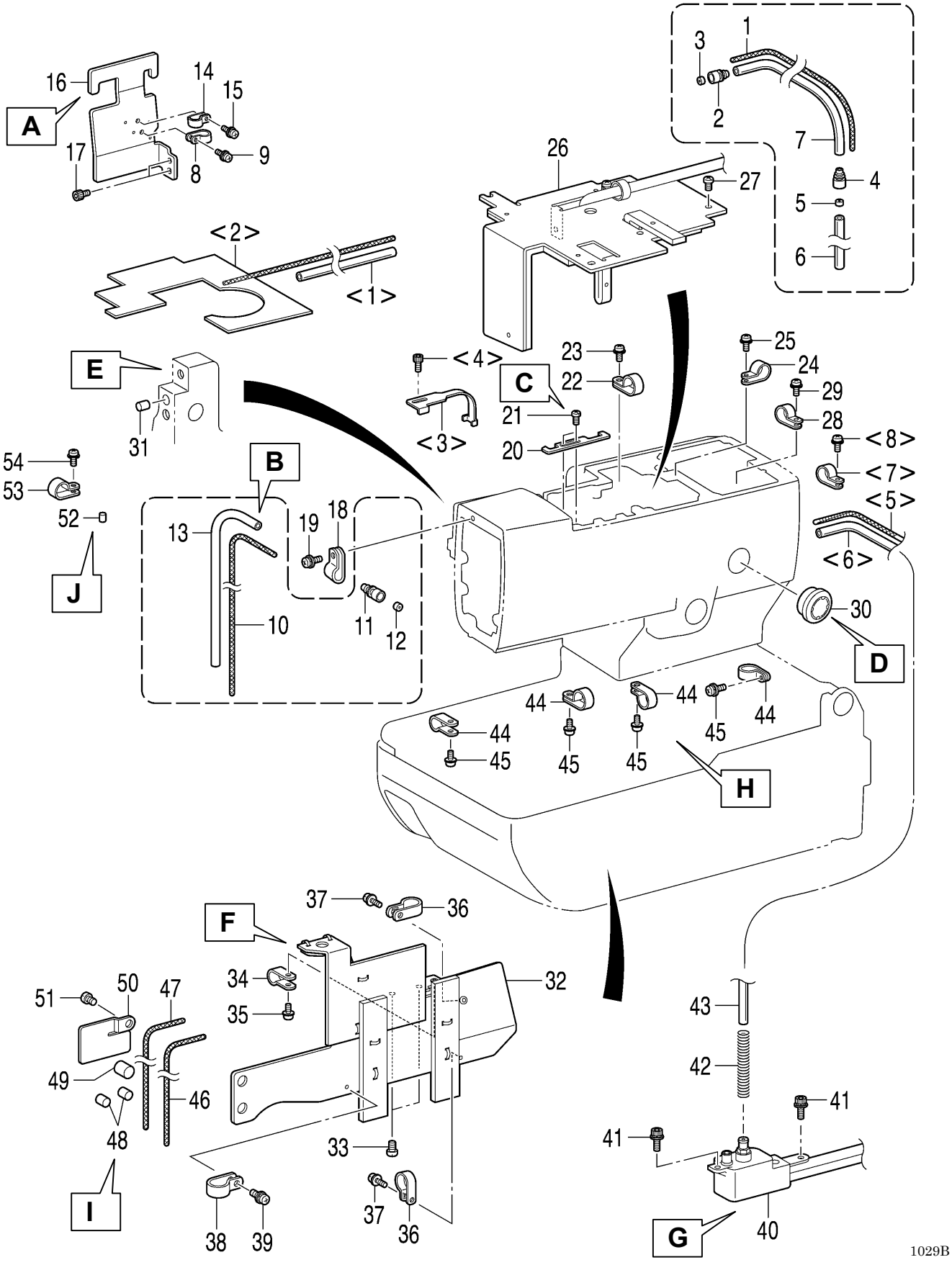
Securing the air tubes
Secure the air tubes and the harnesses with the cord holders (k) (2 places).



1075B

6-25. Lubrication and greasing and routing the oil tubes

* <1> to <8> should be done before carrying out the assembly procedure in “6-1. Cutter mechanism”.
* Refer to the detailed descriptions on pages 136 to 140 for details on A to J in the illustration.



<1> Oil tube
<2> Felt assembly
(Attach with glue)
<3> Tube guide
<4> Socket bolt
<5> Wick
<6> Oil tube
<7> Cord holder #5
<8> Screw

1. Wick
2. Oil tube
3. Oil joint S
4. Collar
5. Oil joint S
6. Collar
7. Oil tube

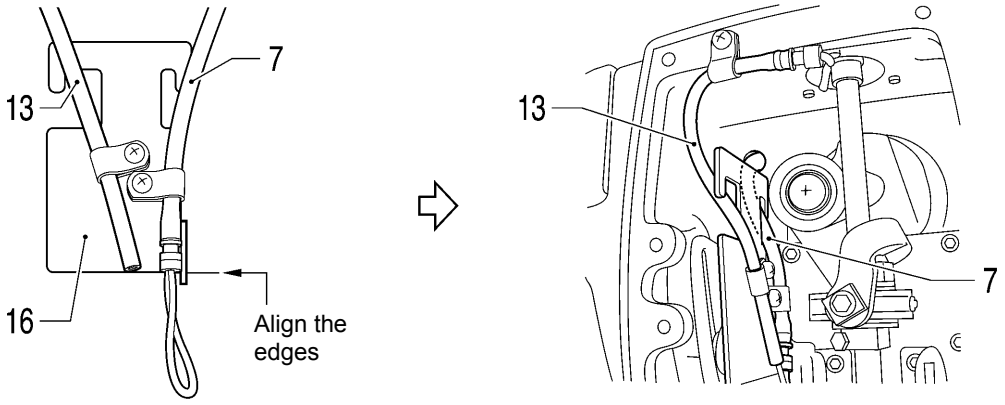
8. Cord holder (NK-3N)
9. Screw

10. Wick
11. Oil joint S
12. Collar
13. Oil tube

14. Cord holder (NK-3N)
15. Screw
16. Tube support
17. Socket bolts [2 pcs]
18. Cord holder (NK-3N)
19. Screw
20. Cord holder
21. Screws [2 pcs]
22. Cord holder
23. Screw
24. Cord holder (NK-3N)
25. Screw
26. Oil plate assembly
27. Screws [4 pcs]
28. Cord holder #5
29. Screw
30. Oil gauge window
31. Felt
32. Lower shaft cover assembly
33. Screws [2 pcs]
34. Cord holders #5
35. Screw
36. Cord holders #10 [2 pcs]
37. Screws [2 pcs]

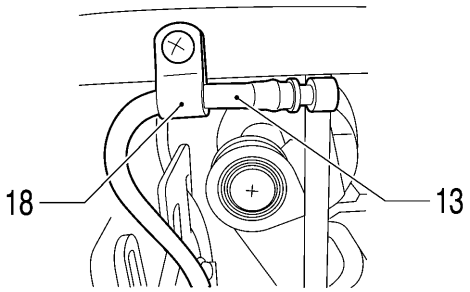
38. Cord holder (NK-3N)
39. Screw
40. Sub-tank assembly
41. Socket bolts [2 pcs]
42. Tube clip spring
43. Oil tube (<6>)
(Push into sub-tank)
44. Cord holders (7N) [4 pcs]
45. Screws [4 pcs]
46. Wick
47. Wick
48. Felts [2 pcs]
49. Felt
50. Tube support B
51. Screw
52. Felt
53. Cord holder #5
54. Screw

A Install the oil tube (7) and the oil tube (13) to the tube support (16) as shown in the illustration.



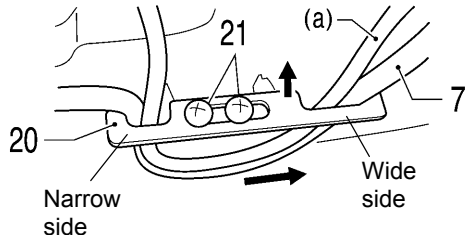
1030B

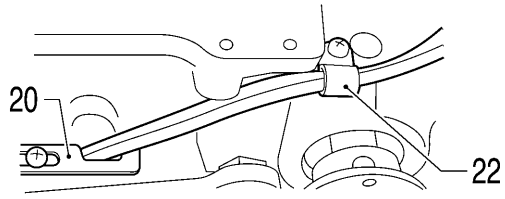
B Secure the oil tube (13) with the cord holder (NK-3N) (18) as shown in the illustration.



1031B

C Cord holder (20) installation



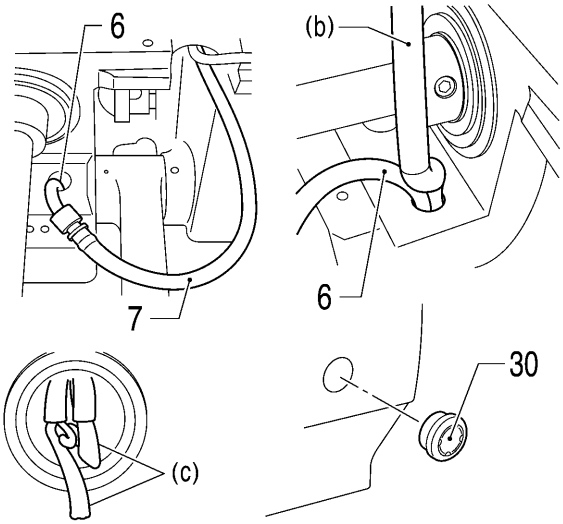


1) Install the cord holder (20) so that the side with the wider hook is on the right as shown in the illustration, and then while gently pushing it in the direction of the arrow, tighten the two screws (21) to secure it in place.

2) Secure the oil tube (7) behind the cord presser (20) and the stop switch cord (a) with the cord presser (22).

1032B

D Tapping in the oil pot window

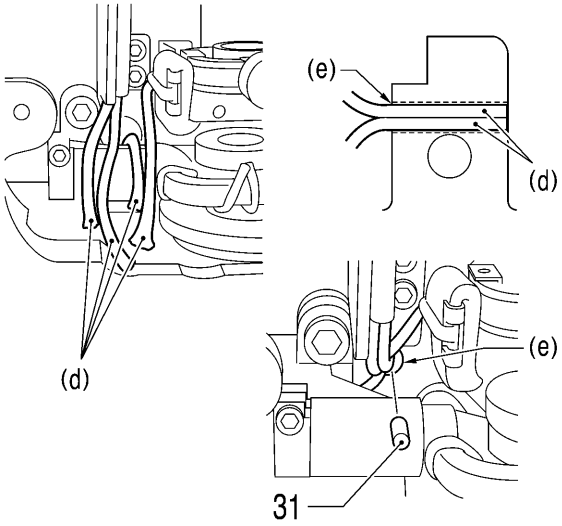


1) Insert the oil tube (6) and the oil tube (b) coming from the oil plate assembly (26) into the oil tank.

2) Check that the wick (c) is attached to the base of the oil tank, and then tap in the oil gauge window (30).

1033B

E Inserting the wicks

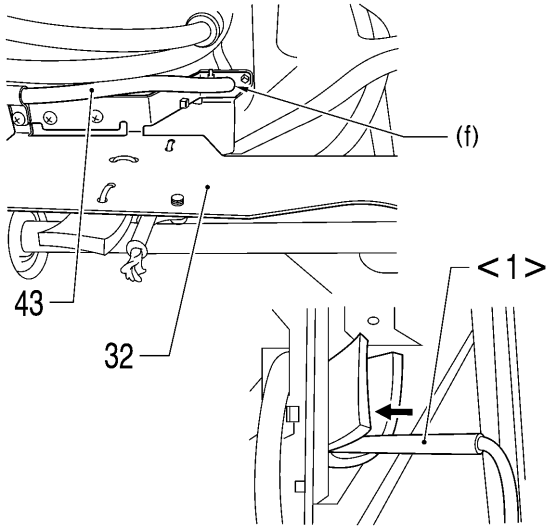


1) Insert the four wicks (d) into the arm relay hole (e).
   * Insert the four wicks (d) securely into the holes as far as they will go.
   * A list of the four wicks (d) is as follows.
     - Wick (1)
     - Wick (10)
     - Felt presser assembly (7) in “6-6. Needle bar mechanism (2)”
     - Wick (11) in “6-3. Zigzag mechanism”

2) Push in the felt (31).

1034B

F **Installing the lower shaft cover assembly**

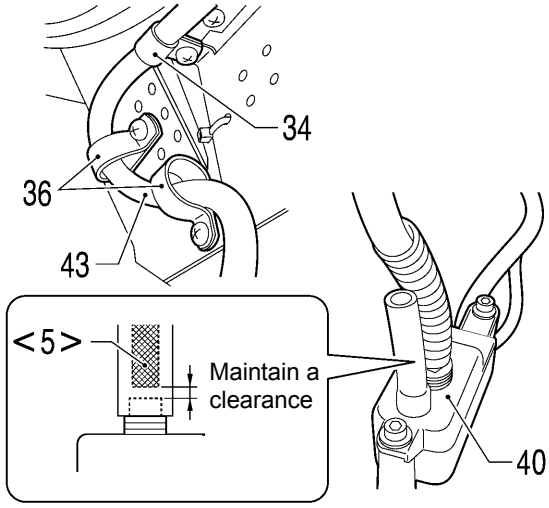


1) Pass the oil tube (43) through the hole (f) in the lower shaft cover assembly (32).

2) Pass the oil tube <1> from the arm through the felts.

1035B

G

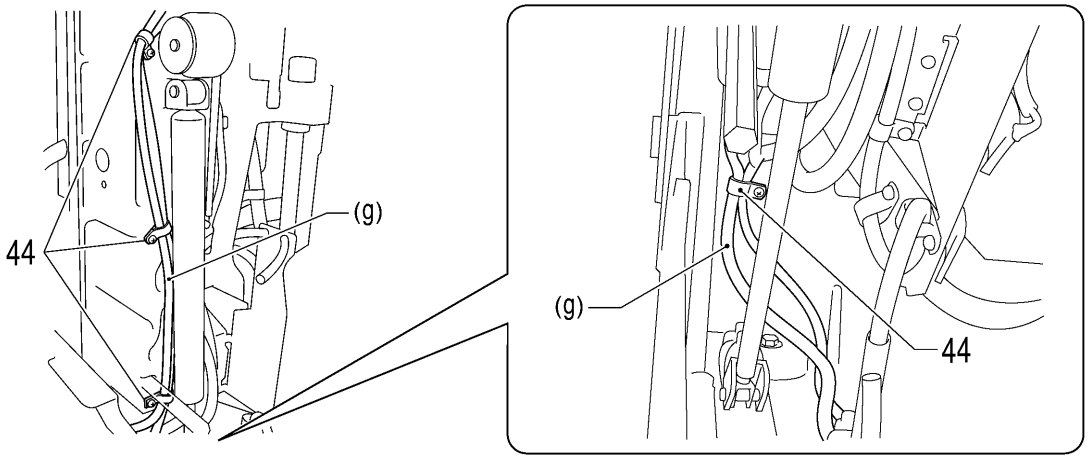


1) Secure the oil tube (43) with the cord holder #5 (34).
2) Install the two cord holders #10 (36) as guides for routing the oil tube (43).

3) Connect the oil tube (43) to the sub-tank assembly (40).
   * Make sure that the wick <5> does not cover the hole.

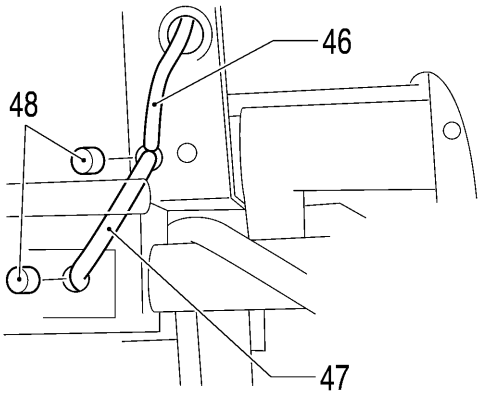
1036B

H Secure the oil tube (g) coming from the sub tank assembly (40) with the four cord holders (44).



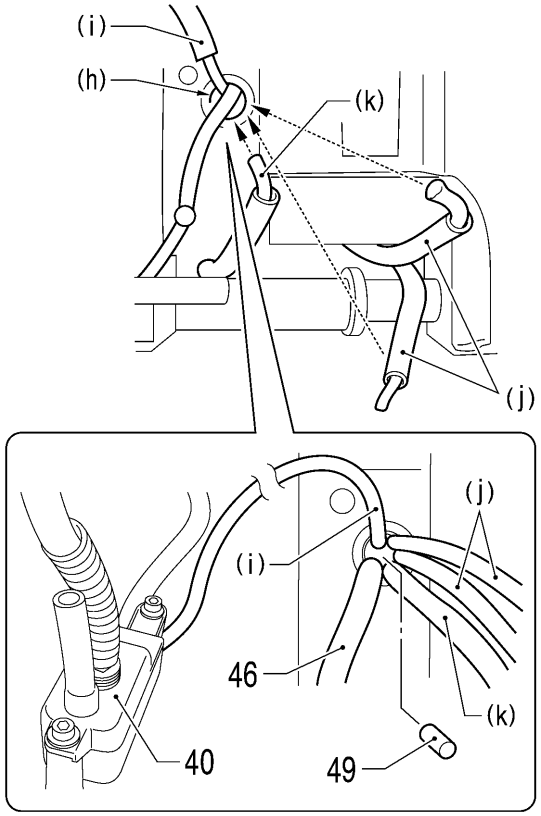
1037B

I



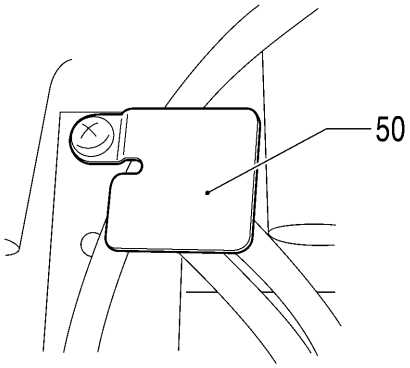
1) Insert the wicks (46) and (47) into the hole in the bed as far as they will go.

2) Push the two felts (48) into the positions shown in the illustration.



3) Insert the four wicks mentioned below into the bed hole (h).
   - Thin wick (i) coming from sub tank assembly (40)
   - Wick (6) and wick (8) (j) of “6-11. Looper mechanism”
   - Wick (4) (k) of “6-12. Spreader mechanism”

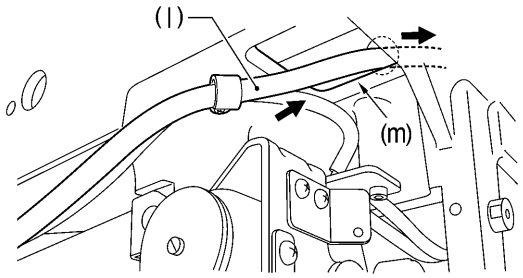
4) Push the felt (49) into the bed hole (h).



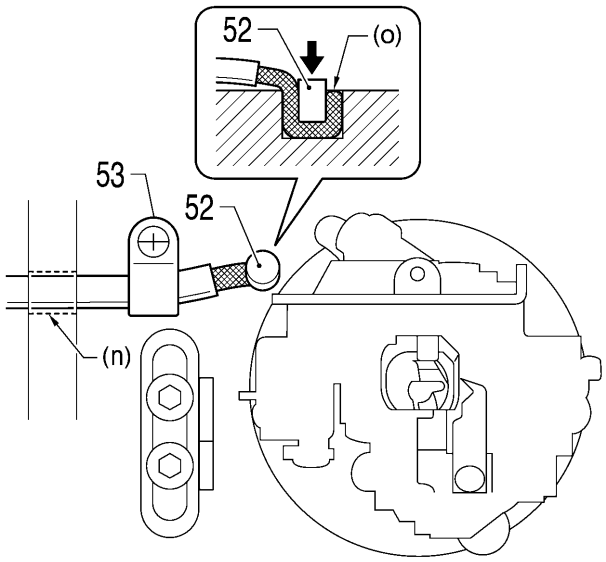
5) Secure the oil tubes with the tube support B (50).

1038B
1039B
1040B

J



1) Pass the thicker oil tube (l) through the underside of the bed.



2) Pass the oil tube (l) through the hole (m), (n) in the bed and out from the looper base side.

3) Push the felt (52) in through the hole (o) in the bed so that it is touching the wick.
4) Secure the oil tube (l) with cord holder #5 (53).

1041B
1042B

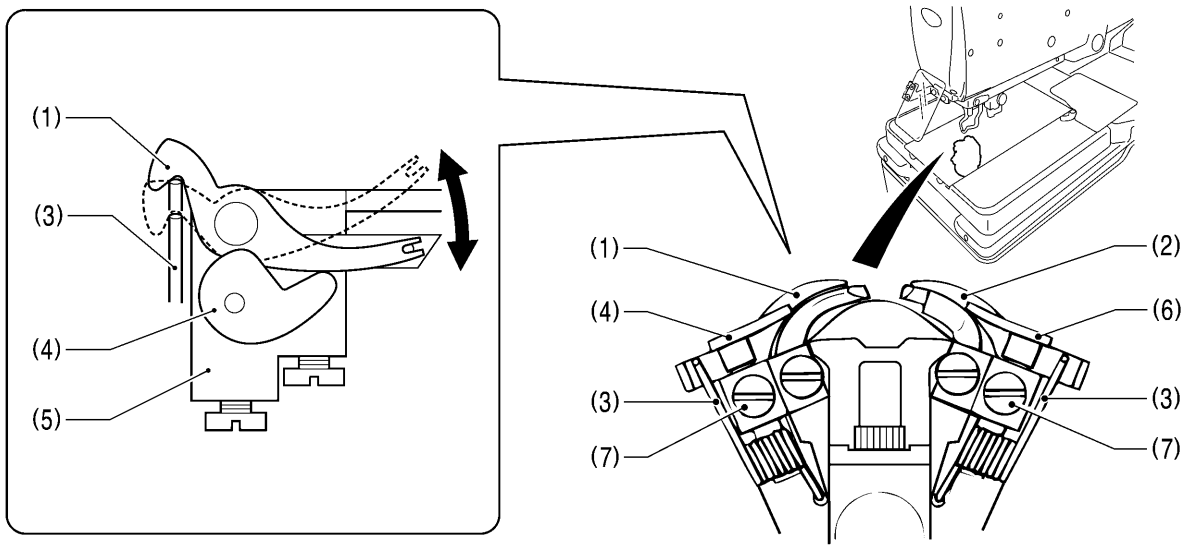
7. ADJUSTMENTS

⚠ CAUTION

- Maintenance and inspection of the sewing machine should only be carried out by a qualified technician.
- Ask your Brother dealer or a qualified electrician to carry out any maintenance and inspection of the electrical system.
- Turn off the power switch and disconnect the power cord at the following times.
  If this is not done, the sewing machine may operate if the start switch is pressed by mistake, which could result in serious injury.
  - When carrying out inspection, adjustment and maintenance
  - When replacing consumable parts such as the loopers and knife
- Disconnect the air hoses from the air supply and wait for the needle on the pressure gauge to drop to “0” before carrying out inspection, adjustment and repair of any parts which use the pneumatic equipment.
- If the power switch and air need to be left on when carrying out some adjustment, be extremely careful to observe all safety precautions.
- If any safety devices have been removed, be absolutely sure to re-install them to their original positions and check that they operate correctly before using the machine.

7-1. Adjusting the heights of the spreaders and loopers

Spreader height

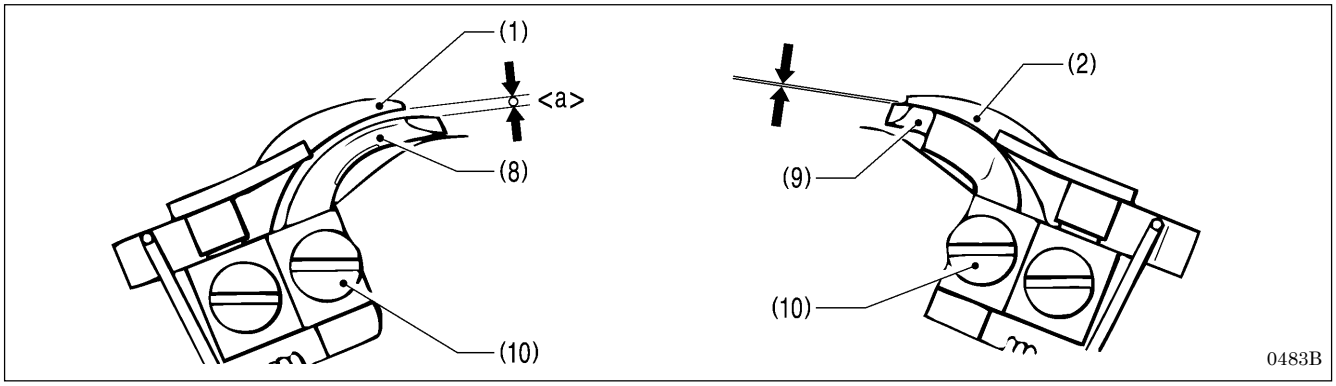


(When viewed from directly above) (When viewed from the front)

0481B

1. Remove the work clamp plates. (Refer to “3-19. Installing and removing the work clamp plates” in the instruction manual.)
2. Check the following.
   - Check that the spring (3) causes the spreader L (1) to move smoothly without any play between the spreader stopper L (4) and the LS holder base (5).
   - Check that the spring (3) causes the spreader R (2) to move smoothly without any play between the spreader stopper R (6) and the LS holder base (5).
3. If the spreaders do not move smoothly or if there is play in their movement, loosen the set screws (7) and move the spreader stopper L (4) or spreader stopper R (6) up or down to adjust.
4. Once adjustment is complete, securely tighten the set screws (7).

Looper height



Adjust so that the positions of the eye looper (8) and the looper R (9) are as follows.

- The clearance <a> between the eye looper (8) and the spreader L (1) should be equal to the thickness of the lower thread (looper thread).
- The clearance between the looper R (9) and the spreader R (2) should be as small as possible (so that the two parts do not touch).

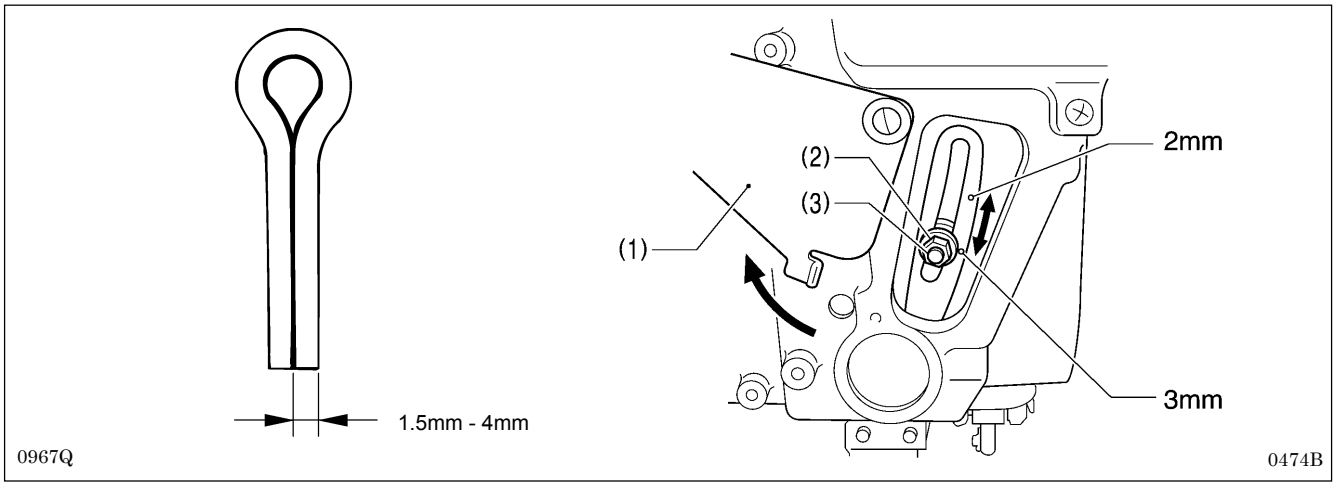
<Adjustment method>

1. Loosen the set screws (10), and then move the eye looper (8) or the looper R (9) up or down to adjust.
2. Check that the spreader L (1) and the spreader R (2) move smoothly by the force of the springs (3).
3. Once adjustment is complete, securely tighten the set screws (10).

7-2. Adjusting the zigzag width (stitch width)

The zigzag width can be adjusted to between 1.5 - 4 mm. It is set to 3 mm at the time of shipment from the factory.

* If the zigzag width is set to 3.2 mm or more, replace the throat plate (optional part).



1. Turn the cover (1) to open it.
2. Use the accessory socket wrench to loosen the zigzag width adjustment nut (2).
3. Move the adjustment screw (3) up or down along the slot to adjust.
   * The zigzag width becomes smaller as the adjustment screw (3) is moved upward.
   * The zigzag width becomes larger as the adjustment screw (3) is moved downward.

* There are index marks at the 2 mm and 3 mm zigzag width positions. Align the middle of the adjustment screw (3) with the index marks.

4. Once adjustment is complete, securely tighten the adjustment nut (2), and then close the cover (1).

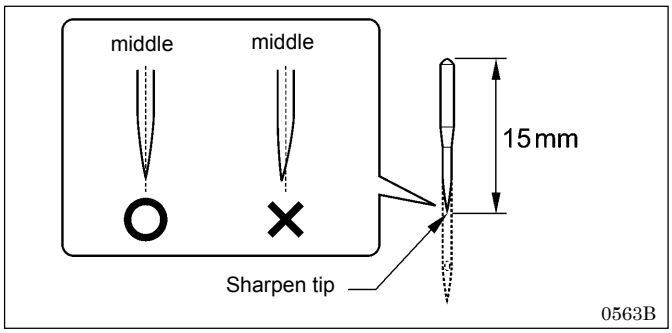
NOTE:

- If the zigzag width has been increased, carry out the following readjustments.
  “7-4. Adjusting the needle and looper timing”, “7-5. Adjusting the looper stroke”, “7-6. Adjusting the height of the needle bar”, “7-7. Adjusting the clearance between the loopers and needle”, “7-8. Adjusting the needle guard”, “7-9. Adjusting the spreader installation positions”, “7-10. Adjusting the spreader timing”.
- The index marks are a guide to the zigzag width. Lower the needle onto a piece of paper or similar to accurately measure the zigzag width.

7-3. Adjusting the zigzag base line position

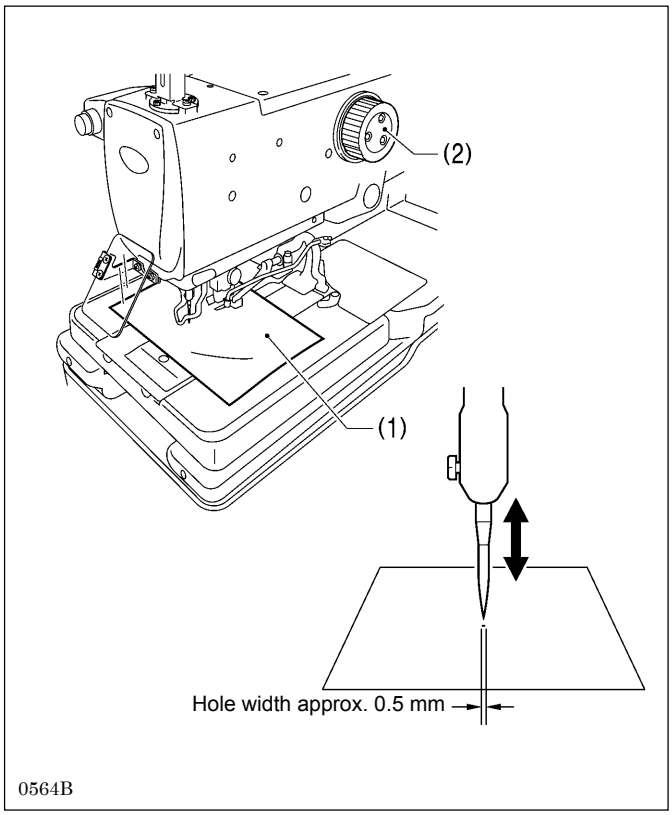
Preparing a short customized needle

Prepare a short needle as described below in order to make very small holes in a piece of paper while checking the needle drop position.



1. Use a grinder or similar to grind the tip of the currently-used needle until the length of the needle is 15 mm.
2. Sharpen the tip of the needle.

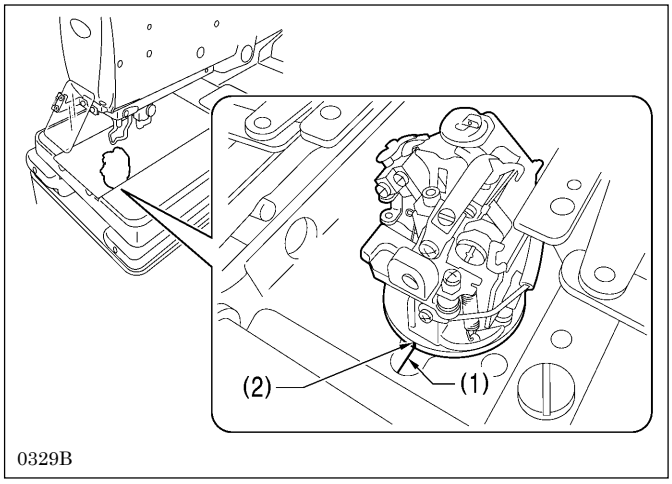
NOTE:
Sharpen the needle so that the tip of the needle is in the middle.



3. Place a piece of paper (1) underneath the work clamps.
4. Turn the upper shaft pulley (2) to set the needle to its lowest position.
5. Move the needle up or down to adjust the installation position of the needle so that the tip of the needle makes a hole with a width of about 0.5 mm in the paper (1) when the needle comes to the needle down position.

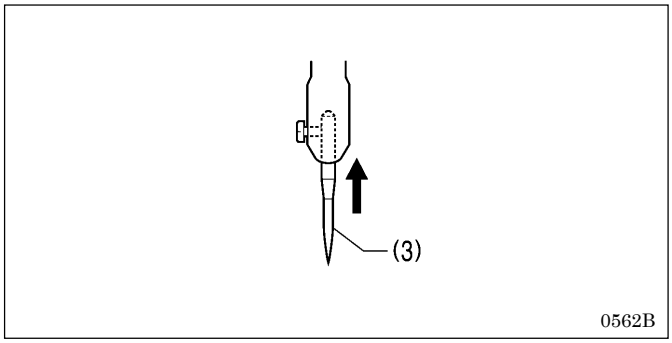
Adjusting the zigzag base line position

The zigzag base line is on the inside of the zigzag.
If you change the zigzag width, only the outer needle drop position will change, and the zigzag base line (inner base line) will not change.



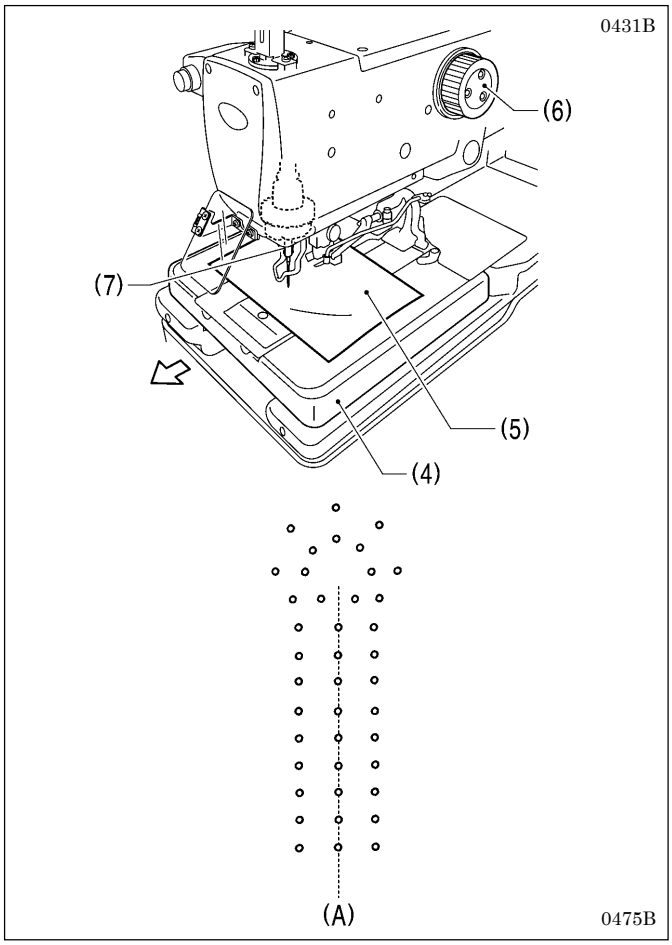
0329B

1. Move the needle bar gear block (θ) to the home position.
   * The home position for the needle bar gear block (θ) is when the bed index mark (1) and the looper base index mark (2) are aligned.



0562B

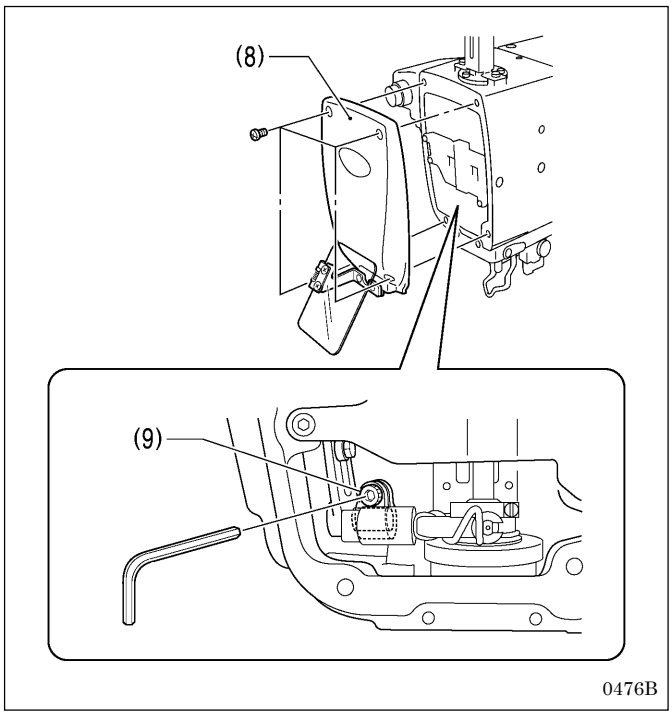
2. Install the short customized needle (3). (Refer to “Preparing a short customized needle” on the previous page.)



0431B
0475B

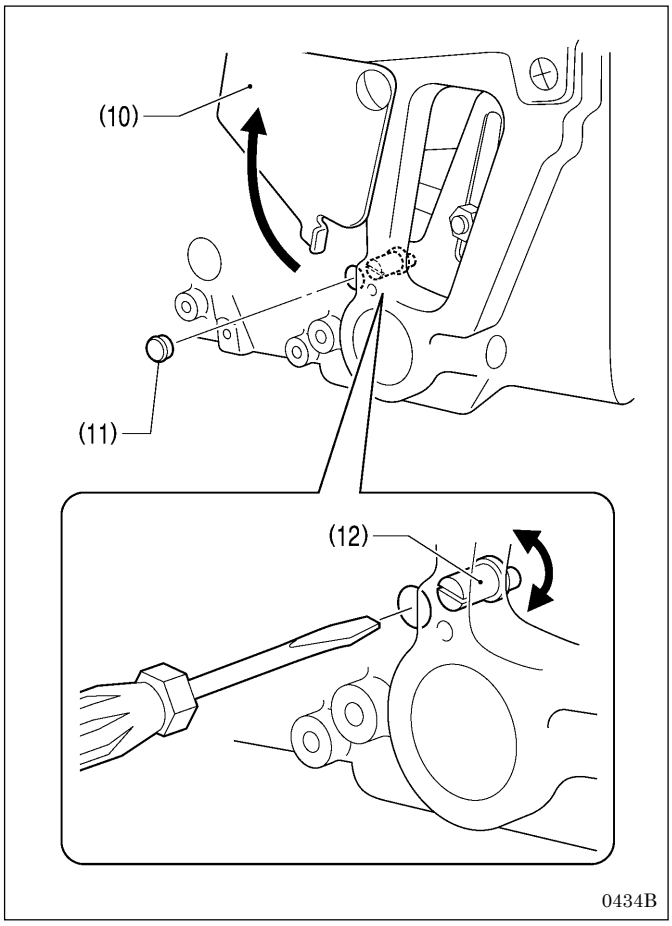
3. Move the feed base (4) forward (to near the sewing start position) by hand.
4. Place a piece of paper (5) underneath the work clamps.
   * Secure the piece of paper so that it will not move.
5. Turn the upper shaft pulley (6) to lower the needle so that it makes a small hole in the paper (5).
6. Turn the upper shaft pulley (6) in reverse to return the needle to its original position (needle up position).
7. Turn the needle bar gear block (needle bar) (7) by hand 180 degrees.
8. Turn the upper shaft pulley (6) to lower the needle so that it makes a small hole in the paper (5).
   * If the inner needle drop positions (A) are not aligned, carry out the adjustments in steps 9 - 12 on the next page.

(Continued on next page)



<Zigzag base line position adjustment>

9. Remove the face plate (8), and then loosen the socket bolt (9).



10. Open the cover (10), and then remove the cap (11).
11. Insert a flat-tipped screwdriver into the hole and turn the zigzag eccentric pin (12) to adjust the zigzag base line position.
12. Tighten the socket bolt (9).
13. Repeat steps 4 - 12 until the inner zigzag base line is aligned correctly.
14. Once adjustment is complete, return the cap (11), cover (10) and face plate (8) to their original positions.

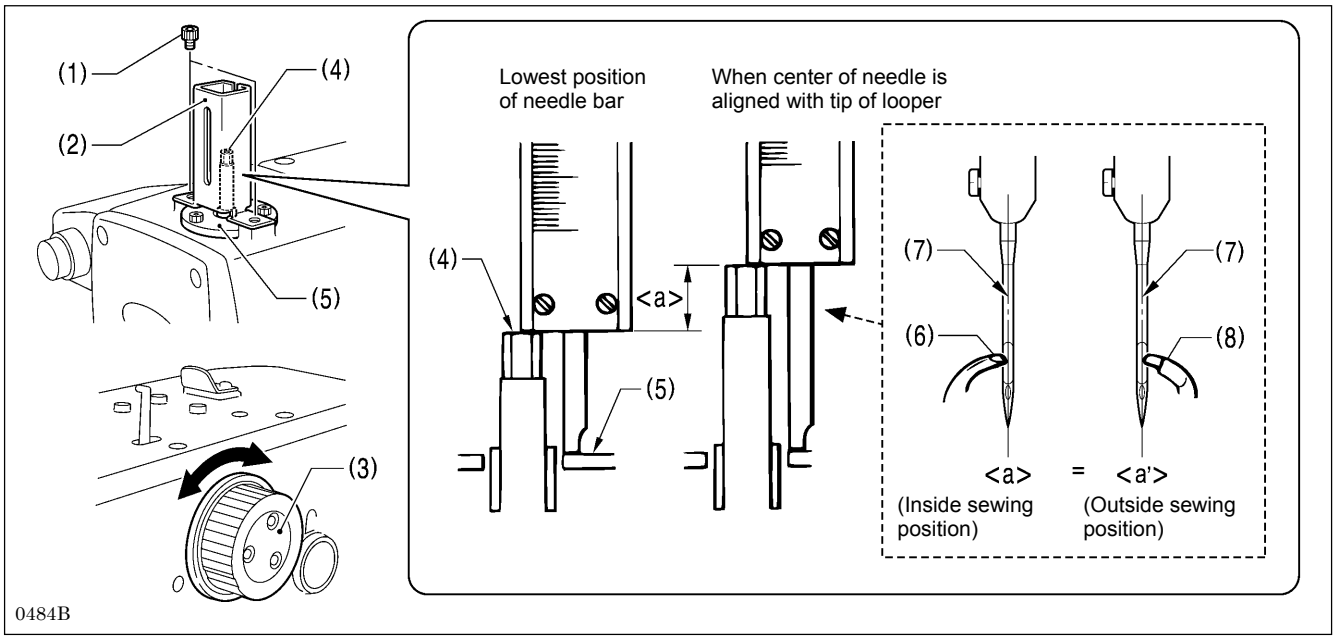
7-4. Adjusting the needle and looper timing

NOTE:

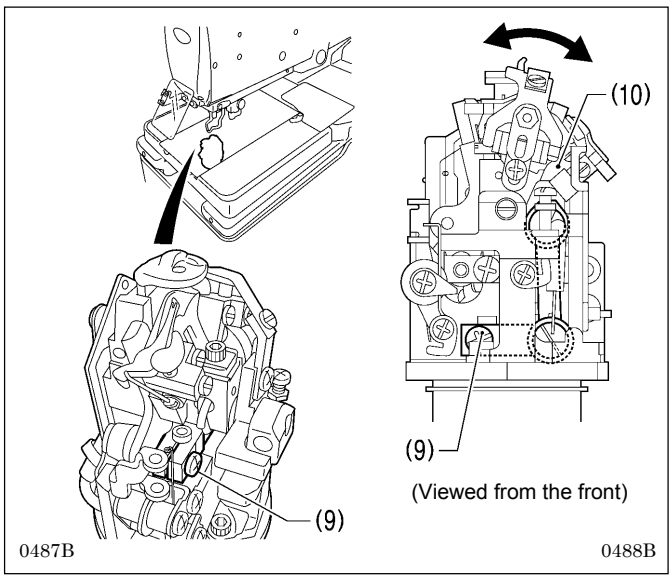
The needle bar moves through two needle drop cycles for each single turn of the upper shaft pulley. The needle drop movement toward the left side (knife cutting side) is called the "**inside sewing position**", and the needle drop movement toward the right is called the "**outside sewing position**". In addition, the amount of movement involved when the needle bar rises from its lowest position until the tip of the looper at either the left or right is aligned with the center of the needle is called the "**loop stroke**".

The left and right loop strokes must be the same as each other. This section describes the adjustments to be carried out so that the left and right loop strokes are the same.

* Before carrying out these adjustments, set the zigzag width (stitch width). (Refer to "7-2. Adjusting the zigzag width (stitch width)".)



1. Remove the two socket bolts (1), an then remove the needle bar guard (2).
2. Turn the upper shaft pulley (3) to set the needle bar to its lowest position at the inside sewing position.
3. Use calipers to measure the length from the edge of the needle bar (4) to the top of the needle bar bush holder base (5).
4. Next, turn the upper shaft pulley (3) until the tip of the eye looper (6) is aligned with the needle center (7).
5. In the same was as in step 3, use calipers to measure the length from the edge of the needle bar (4) to the top of the needle bar bush holder base (5).
6. Calculate the difference <a> between the value obtained in step 5 and the value obtained in step 3.
7. Repeat steps 2 - 6 and calculate the difference <a'> for the outside sewing position in the same way as for the inside sewing position.
   * For the inside sewing position, align the tip of the eye looper (6) with the needle center (7), and for the outside sewing position, align the tip of looper R (8) with the needle center (7).

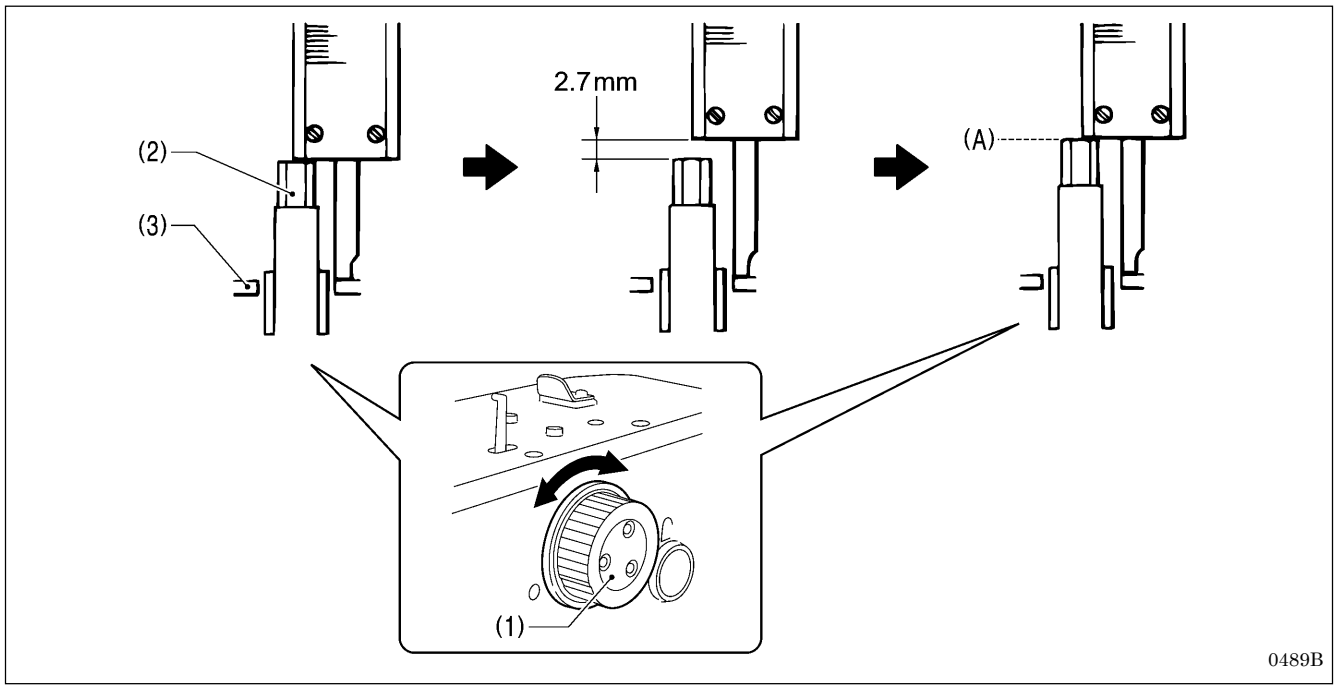


8. Loosen the screw (9).
9. Move the LS holder base (10) to the left or right to adjust so that length <a> and length <a'> are the same.
10. Once adjustment is complete, securely tighten the screw (9).

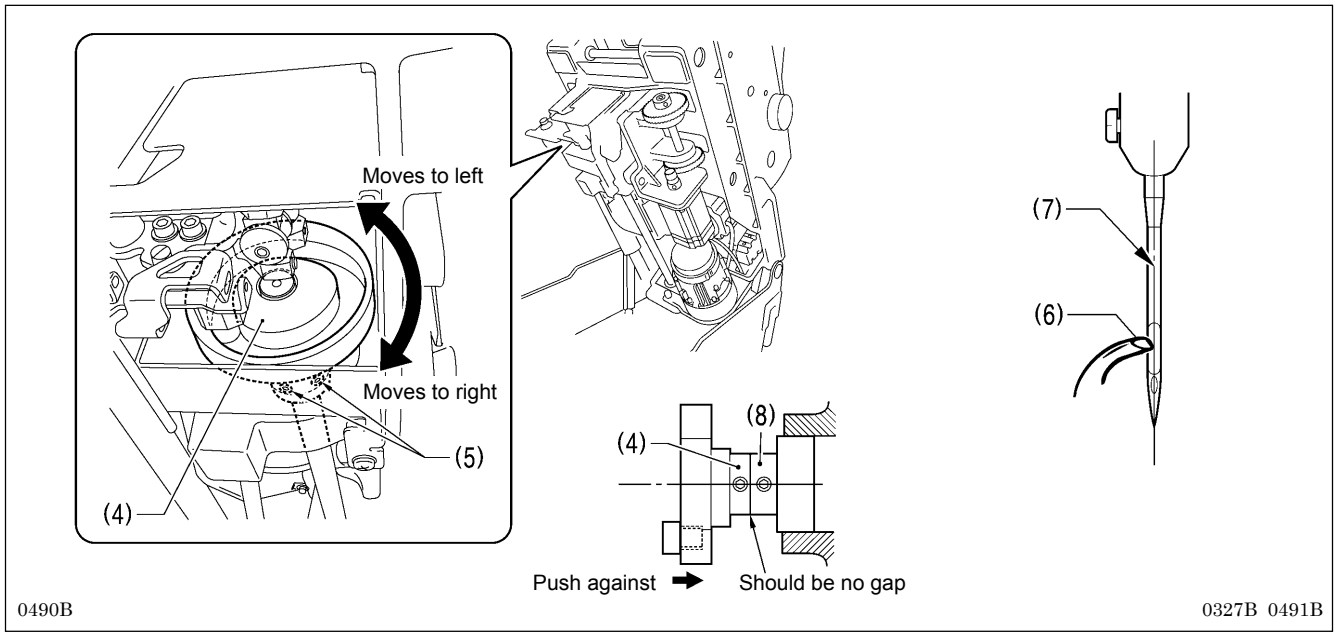
7-5. Adjusting the looper stroke

The standard looper stroke is 2.7 mm. (It may be preferable to change this depending on the material and thread.)

* Carry out the adjustment in “7-4. Adjusting the needle and looper timing” before making this adjustment.



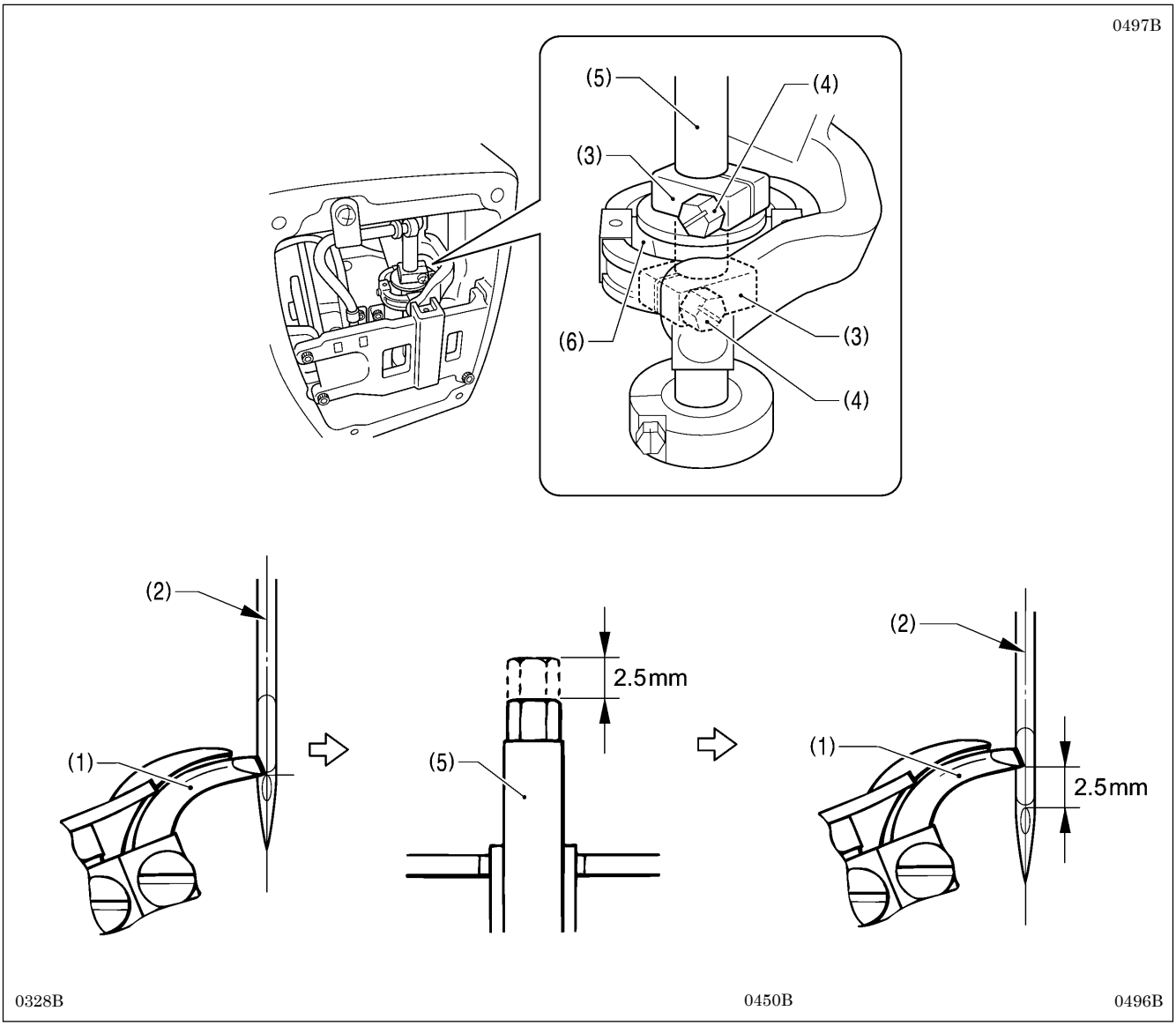
1. Turn the upper shaft pulley (1) to set the needle bar to the needle drop position at the inside sewing position.
2. At this position, use calipers to measure the length from the edge of the needle bar (2) to the top of the needle bar bush holder base (3).
3. Add 2.7 mm to the value obtained in step 2 above, and set the width of the calipers to the resulting value.
4. Turn the upper shaft pulley (1) until the edge of the needle bar (2) touches the edge of the calipers, and stop turning the upper shaft pulley (1) at that point (A).



5. Tilt back the machine head.
6. Loosen the two set screws (5) of the lower shaft cam (4).
7. With the upper shaft pulley (1) stopped, turn the lower shaft cam (4) to adjust so that the tip of the eye looper (6) is aligned with the needle center (7).
8. Once adjustment is complete, push the lower shaft cam (4) against the surface of the bearing collar (8), and then securely tighten the two set screws (5).

7-6. Adjusting the height of the needle bar

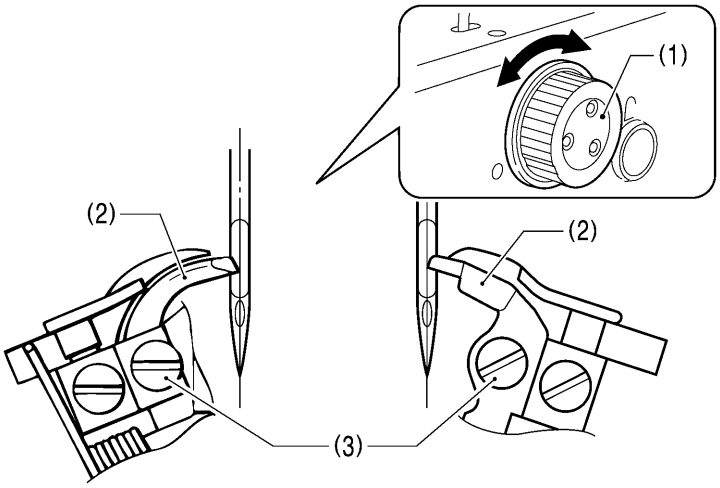
The standard height for the needle bar is 2.5 mm. (It may be preferable to change this depending on the material and thread.)



1. Remove the face plate.
2. Turn the upper shaft pulley until the tip of the eye looper (1) is aligned with the top edge of the needle hole in the needle center (2) when the needle is at the inside sewing position.
3. Loosen the two screws (4) of the top and bottom needle bar clamps (3).
4. Lower the needle bar (5) 2.5 mm from the position where the tip of the eye looper (1) is aligned with the top edge of the needle hole.
5. In order to make the needle bar turn smoothly, adjust so that there is no play in the needle bar, but so that there is enough of a gap between the needle bar clamps (3) and the needle bar feed rock link (6) for oil to get into.
6. Once adjustment is complete, securely tighten the two screws (4) and install the face plate.

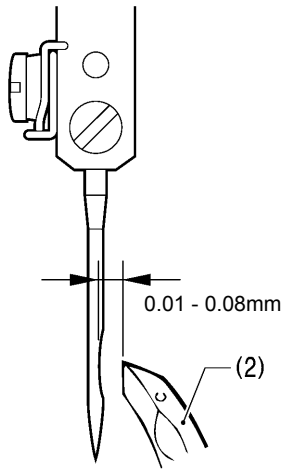
7-7. Adjusting the clearance between the loopers and needle

If the needle count has been changed, always be sure to check the clearance between the needle and the loopers, and adjust the clearances if necessary. These adjustments should be made for both the inside sewing position and outside sewing position.



(Inside sewing position) (Outside sewing position)

0492B



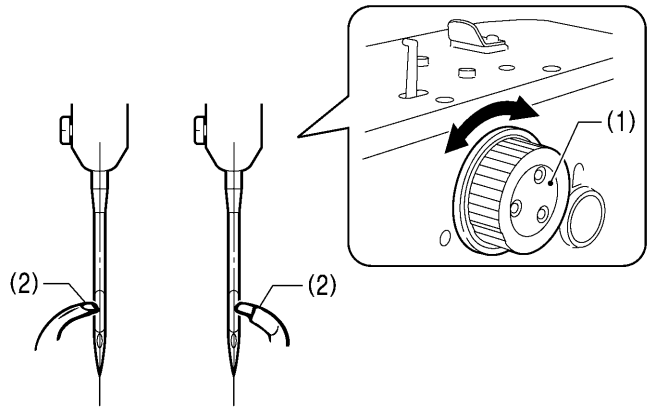
0493B

Turn the upper shaft pulley (1) so that the tips of both the left and right eye loopers (2) are aligned with the needle center, and then loosen the set screws (3) and adjust the clearances between the needle and the tips of the eye loopers (2) to 0.01 - 0.08 mm.

* These clearances must be uniform while the looper base is rotating (through 360 degrees). If they are not uniform, adjust the center of rotation of the needle bar. (The center of rotation is already adjusted at the time of shipment from the factory.)
* After making this adjustment, carry out the adjustment procedures given in “7-9. Adjusting the spreader installation positions”.

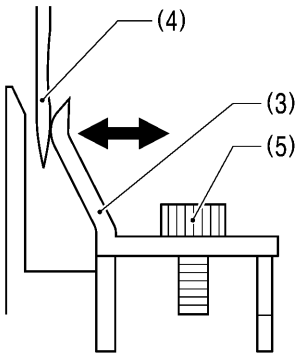
7-8. Adjusting the needle guard

If the needle count has been changed, always be sure to check the position of the needle guard, and adjust the position if necessary. This adjustment should be made for both the inside sewing position and outside sewing position.



(Inside sewing position) (Outside sewing position)

0498B



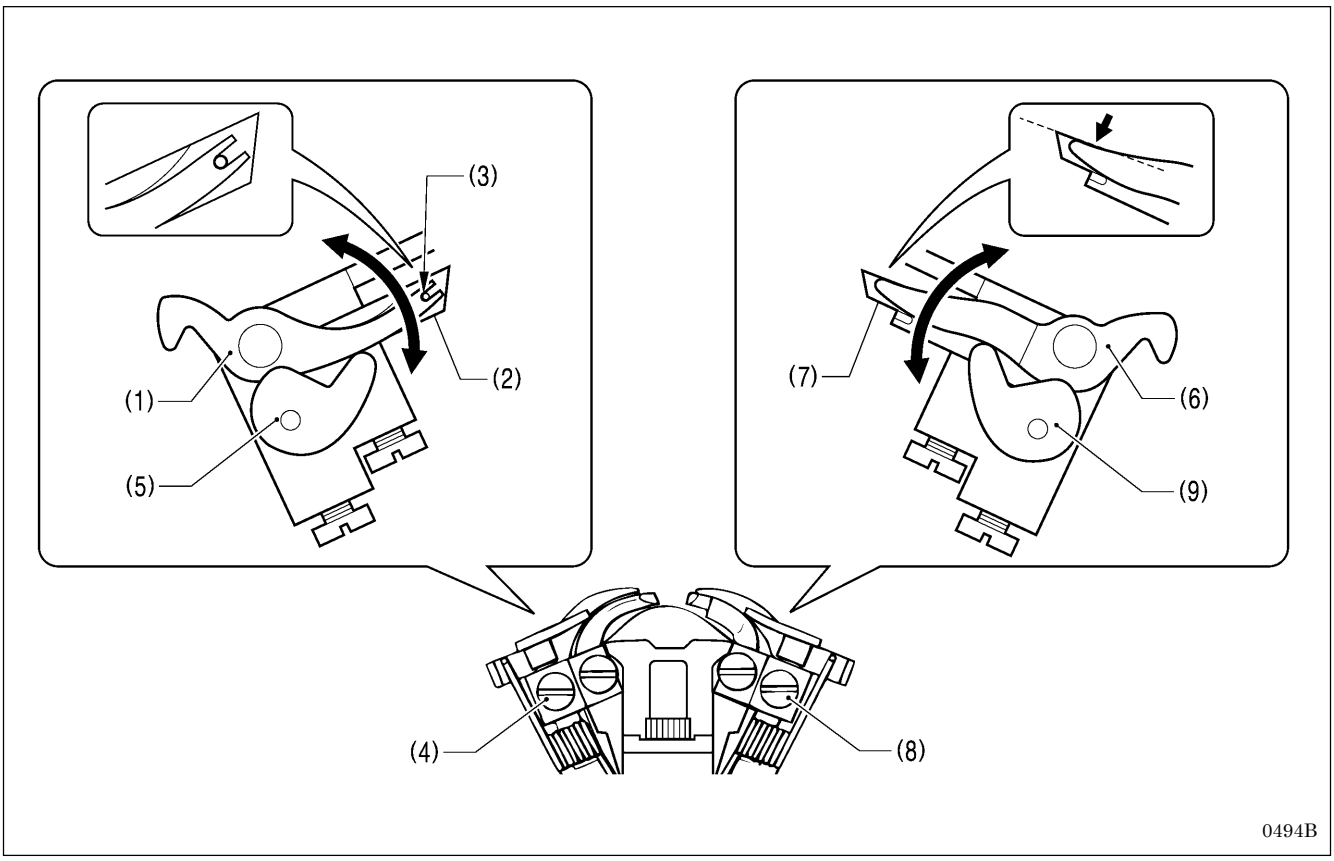
0499B

Turn the upper shaft pulley (1) so that the tips of both the left and right loopers (2) are aligned with the needle center, and then loosen the screw (5) and adjust the needle guard (3) so that it touches the needle (4).

NOTE:

If it crosses the needle more than necessary, it will place a load on the needle and this may cause the needle to break. Alternatively, if it does not cross the needle at all, the tips of the loopers will interfere with the needle and skipped stitches may occur.

7-9. Adjusting the spreader installation positions



1. Loosen the set screw (4) and adjust spreader stopper L (5) so that the relative positions of the U-shaped part at the tip of spreader L (1) and the lower thread guide hole (3) in the eye looper (2) are as shown in the illustration below.
2. Once adjustment is complete, tighten the set screw (4).
3. Loosen the set screw (8) and adjust the spreader stopper R (9) so that the top edge of the tip of spreader R (6) is aligned with the top edge of the tip of looper R (7).
4. Once adjustment is complete, tighten the set screw (8).

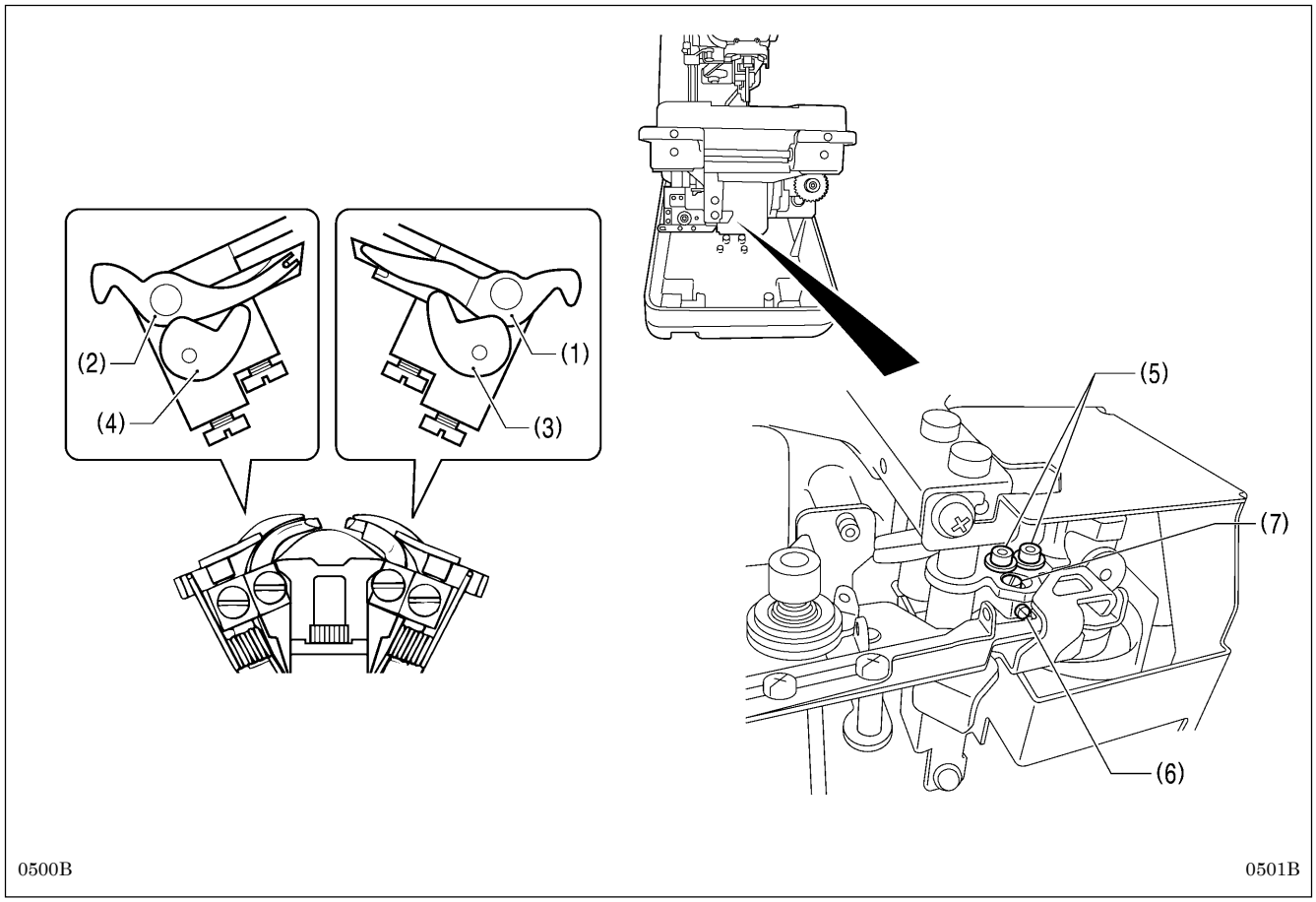
NOTE:

Spreader L (1) and spreader R (6) should not protrude above the eye looper (2) or looper R (7) respectively. If they do, skipped stitches or needle breakages may occur.

7-10. Adjusting the spreader timing

Spreader R (1) (at inside sewing position) and spreader L (2) (at outside sewing position) must touch the spreader stoppers (3) and (4) respectively and stop moving immediately before the needle bar reaches its lowest position.

* Adjustment can be carried out more easily if it is done in manual mode.

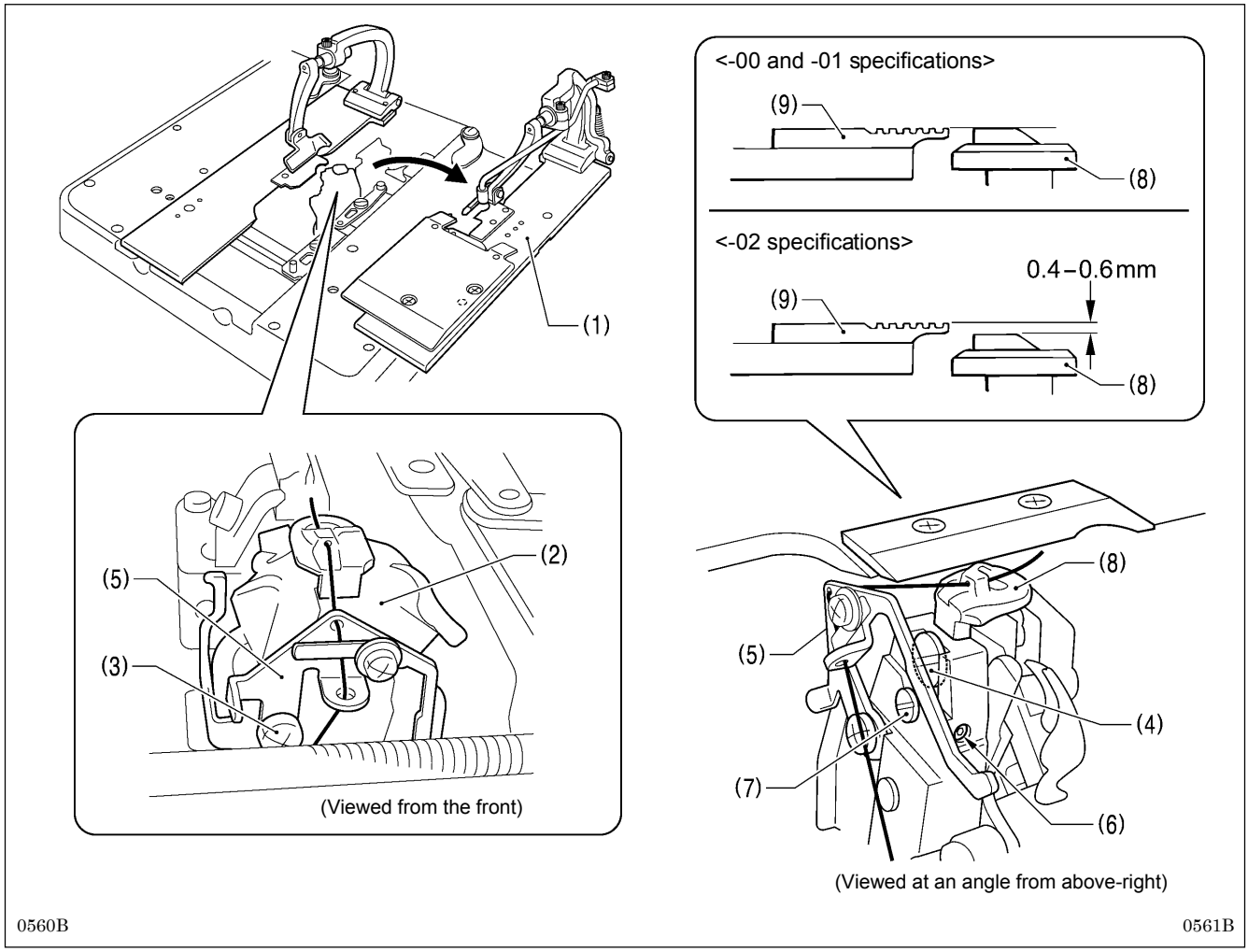


1. Tilt back the machine head.
2. Loosen the two screws (5), and then loose the set screw (6).
3. Turn the eccentric pin (7) to adjust.
4. After adjusting, tighten the set screw (6) and the two screws (5) in that order.

NOTE:

Make sure that spreader R (1) and spreader L (2) do not obstruct the needle after adjustment.

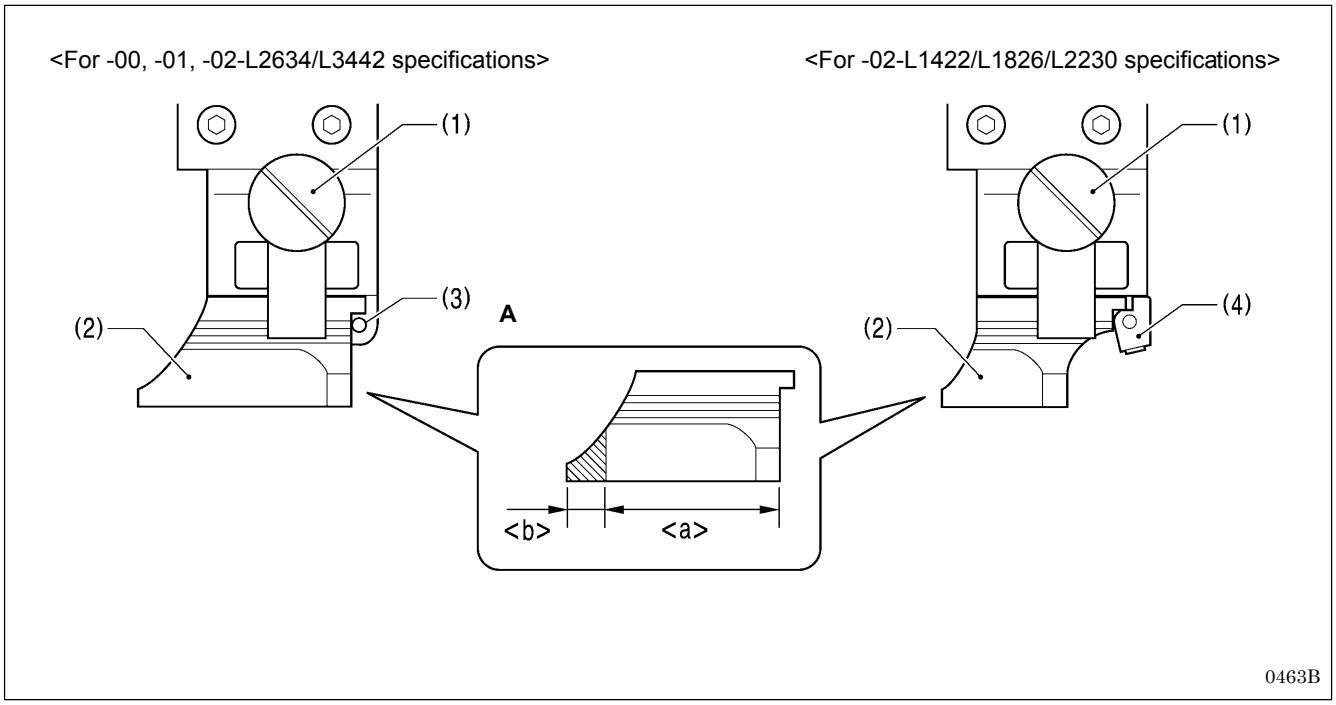
7-11. Adjusting the height of the throat plate



1. Remove the right-side work clamp plate (1).
2. Turn the looper base (2) so that it faces as shown in the illustration.
3. Loosen the screw (3), and then move gimp thread guide C (5) to a position where it will not obstruct turning of the screw (4).
4. Loosen the screw (4) by about 10 turns.
5. Loosen the set screw (6).
6. Move the vertical pin (7) to adjust the height of the throat plate (8) as follows.
   <For -00 and -01 specifications>
   Adjust so that the top of the throat plate (8) and the top of the needle plate (9) are at the same height.
   <For -02 specifications>
   Adjust so that the top of the throat plate (8) is 0.4 - 0.6 mm lower than the top of the needle plate (9).
   NOTE:
   - If the position of the throat plate (8) is too high, it may obstruct the movable knife and damage it.
   - Press down gently on the throat plate (8) from above while adjusting it. If the adjustment is carried out while the throat plate (8) is lifted up, the correct adjustment result will not be obtained.
7. Once adjustment is complete, tighten the screws that were loosened and return all other parts to their original positions.

7-12. Changing the cutting length (Replacing the hammer)

The cutting length is determined by the length of the hammer. File or replace the hammer in order to change the cutting length.

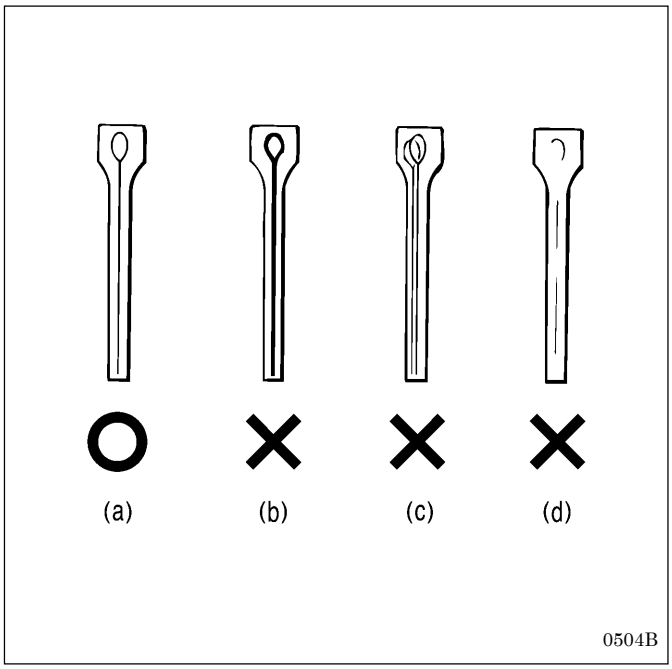


1. Loosen the knob screw (1), and then remove the hammer (2).
2. **[If grinding the hammer (Refer to Figure A)]**
   Use a grinder to grind section <b> of the hammer so that cutting length + 1.5 mm = <a>.
3. **[If installing a new hammer]**
   Push the hammer against the positioning pin (3) (or the hammer spacer (4)), and then tighten the knob screw (1).

NOTE:

If the knife that was being used previously is replaced by a knife with a different number, replace the hammer also. If the same hammer is used for two or more different types of knife, different knife incisions will be formed on the hammer, and this may cause problems with the accurate cutting of the material or may damage the knife.

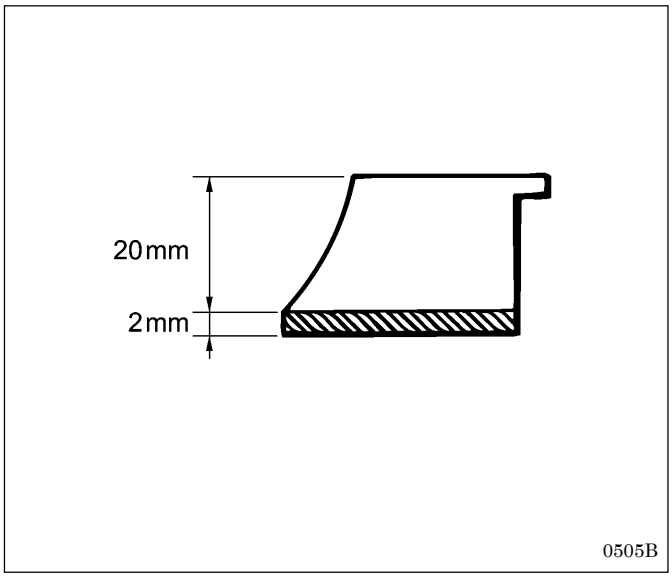
7-13. Adjusting the cutting surface of the hammer



<Adjustment procedure>

1. Remove the hammer. (Refer to the previous page for instructions on removing the hammer.)
2. Check the cutting surface of the hammer. Refer to the illustration at left, and if the cutting surface looks like (b) - (d), file the cutting surface so that the knife incision is made evenly on the cutting surface.
   (a) Knife incision is correct
   (b) Knife incision is too deep
   (c) A different knife was used which produced an overlapping knife incision
   (d) Partial knife incision which is not being made completely
3. If the material cannot be cut cleanly even though the hammer has been ground correctly, also check whether the tip of the knife is worn.
   * If the tip is worn, replace the knife.
   * Do not use the old hammer after the knife has been replaced. If the same hammer is used, it may damage the tip of the knife.

7-13-1. Filing the cutting surface of the hammer



The cutting pressure over the whole of the hammer should be uniform so that the material will be cut cleanly. File the cutting surface of the hammer so that the knife incision will be uniform over the whole of the hammer.

* The hammer can be filed until a height of 20 mm remains.
* Use a flat file for filing the hammer.

Filing the cutting surface of the hammer on which the knife incision is overlapping or has shifted

1. Grip the hammer in a vise.
2. Use the flat file to file the cutting surface of the hammer until the knife incision disappears.

Filing the cutting surface of the hammer in which knife incision is deep

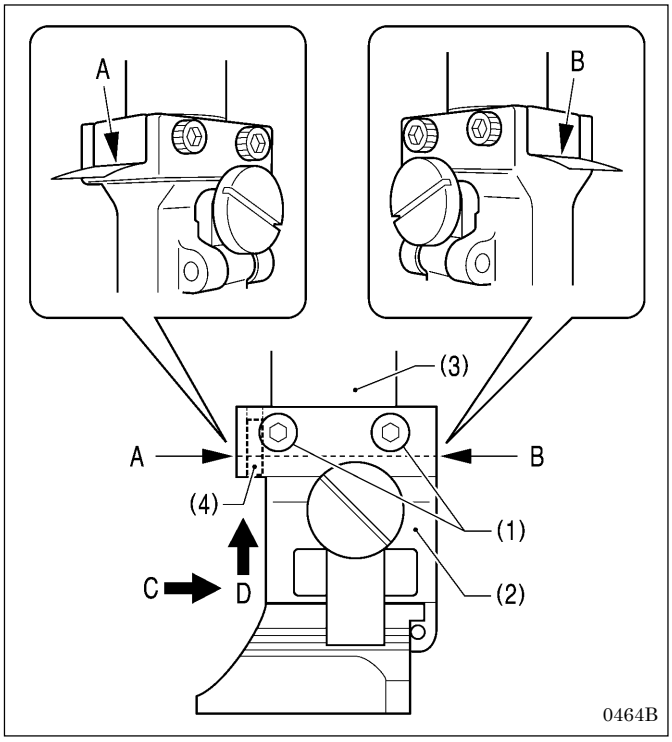
1. Grip the hammer in a vise.
2. Use the flat file to file the cutting surface of the hammer smoothly until a single knife incision can still be seen faintly.

* Once filing is complete, install the hammer.

7-13-2. Adjusting the contact between the knife and the hammer

The knife incision can be seen more clearly if the cutting surface of the hammer is filled over with a marker pen or similar.

1. Operate the hammer three times with the knife making a mark on it each time.
2. If the knife incision is not uniform, file the hammer. (Refer to the previous page for details on filing the hammer.)
3. Repeat steps 1 and 2 until the knife incisions are uniform.

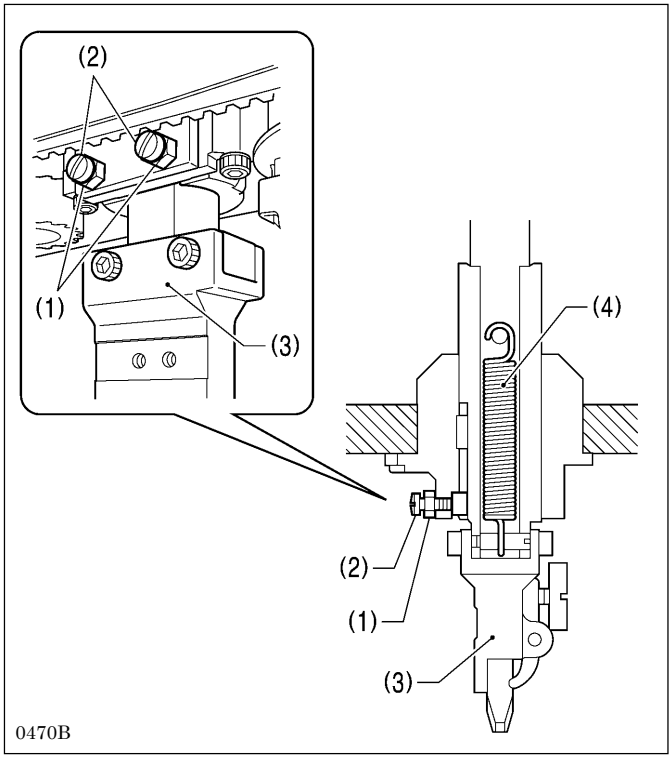


<Contact adjustment method using thin paper>

The following method can also be used to adjust the contact.

1. Loosen the four screws (1).
2. Insert some thin paper into either of the gaps A or B between the hammer bracket (2) and the cutter driving shaft (3).
3. Tighten the four screws (1).
   * Push the hammer bracket (2) in the direction of arrow C and firmly upward in the direction of D shown in the illustration so that there is no gap between the hammer bracket (2) and the cutter driving shaft (3), and then tighten the screws.
   (This operation will position the hammer bracket (2)) accurately by pushing the pin (4) of the hammer bracket (2) against the hole side of the cutter driving shaft (3).)

7-14. Adjusting the axial play of the hammer

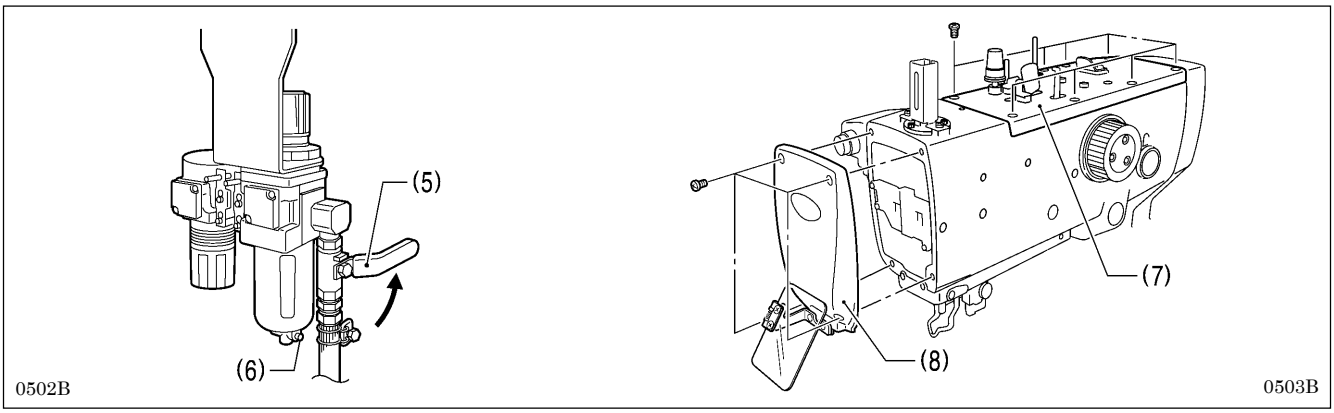


If there is too much axial play in the hammer, carry out the following adjustment.

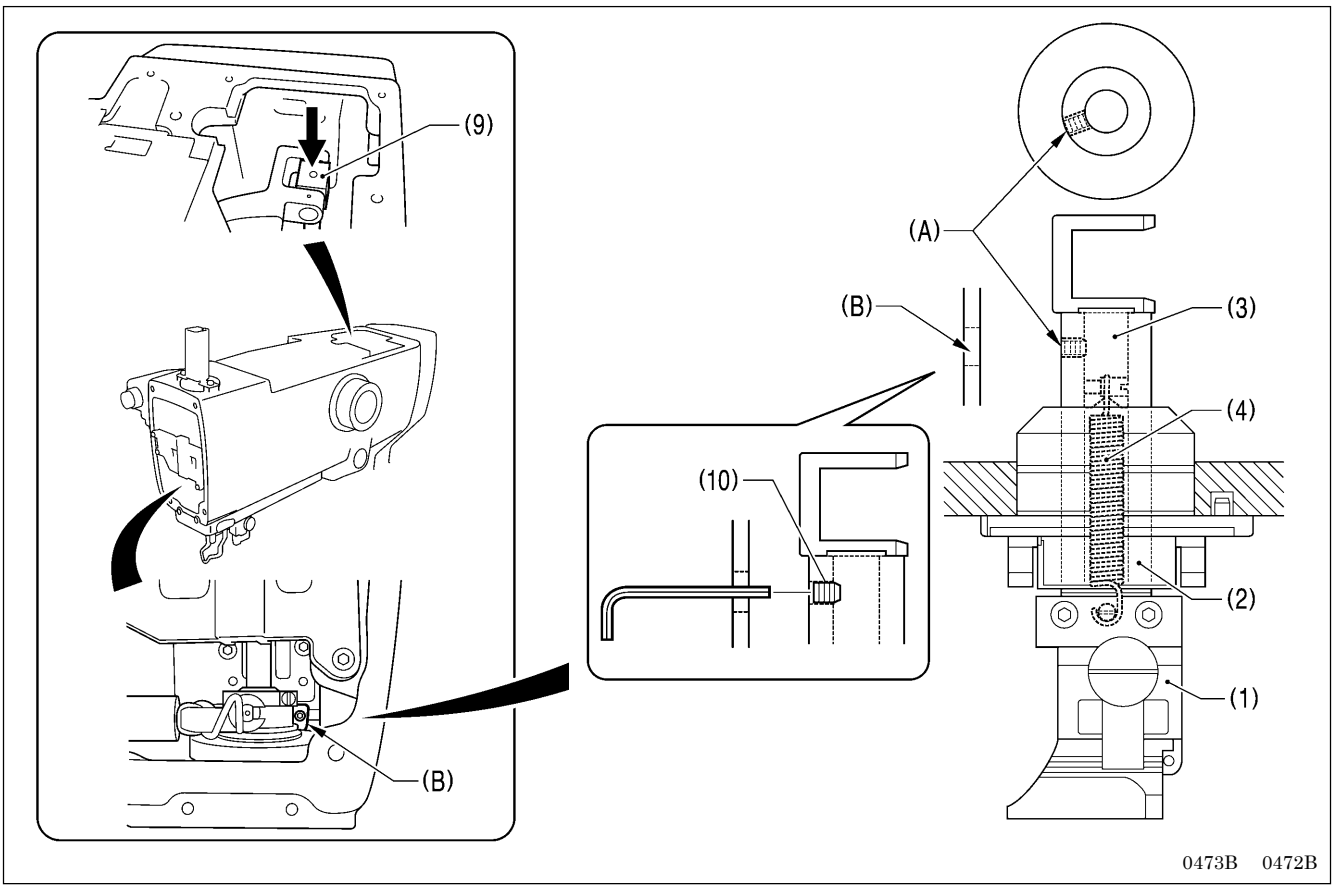
1. Loosen the two nuts (1).
2. Tighten the two screws (2) slightly to adjust while checking the amount of play.
3. When the hammer bracket (3) is pushed downward by hand, check that the built-in extension spring (4) causes it to return correctly.
   * If the hammer bracket (3) does not return correctly, it may obstruct the work clamps and damage may result.
4. Once adjustment is complete, tighten the two nuts (1).

7-15. Making the cutter driving shaft and driving shaft presser move together

The cutter driving shaft (2) and driving shaft presser (3) are linked by an extension spring (4) so that the hammer bracket (1) can be positioned by being pushed down by hand when aligning the needle with an eyelet buttonhole that has already been made in the material in order to resume sewing. If this extension spring (4) has been damaged, or if the return speed of the cutter is too slow, the cutter driving shaft (2) and the driving shaft presser (3) can be made to move together as a single unit.



1. Turn the cock (5) in the direction of the arrow to close it and stop the supply of air.
2. Press the button (6) to release the air.
   NOTE:
   When the air is released, the hammer may lower by its own weight.
3. Remove the upper cover (7) and the face plate (8).



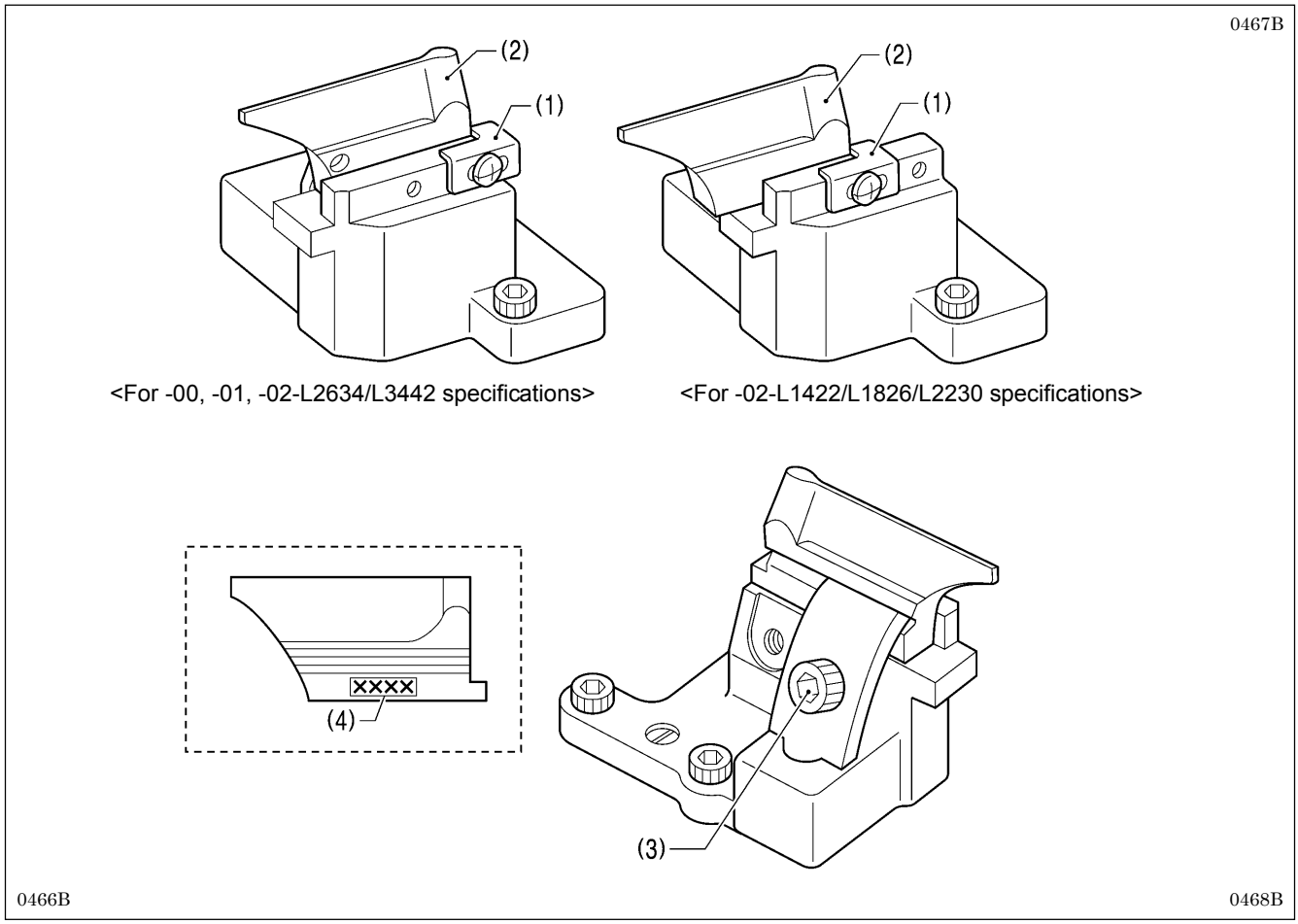
4. Lower the cylinder rod (9) to align the screw (A) of the cutter driving shaft (2) with (B) inside the face plate.
5. Use a commercially-available set screw (6) (M6 with a length of 6mm or less) to secure (A) and (B) together.
   * Tighten the set screw (10) securely. If the set screw (10) is loose and protrudes from the surface of the cutter driving shaft (2), damage may result.
6. Install the face plate (8) and the upper cover (7), and then open the cock (5) to resume the supply of air.

7-16. Replacing the knife and adjusting its position

7-16-1. Replacing the knife

⚠ CAUTION

Do not operate the sewing machine while a knife and hammer with numbers that are different from those which have been set in programs.
If this is not observed, damage to sewing machine parts or the needle or serious injury may occur.



1. Check that there is no gap between the block stopper plate (1) and the knife (2), and then loosen the socket bolt (3) and remove the knife (2).
2. Place the new knife to be installed against the block stopper plate (1), and then tighten the socket bolt (3).

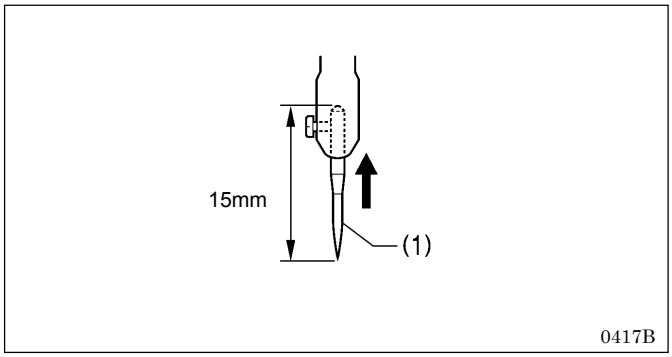
NOTE:

- When replacing the knife, use the parameter settings to change the eyelet pattern to the pattern that corresponds to the knife number (4) that is given on one side of the knife. (Refer to “5-3-1. Parameter list” in the instruction manual.)
- Replace the knife and hammer as a set. If the same hammer is used for two or more different types of knife, different knife incisions will be formed on the hammer, and this may cause problems with the accurate cutting of the material or may damage the knife.

7-16-2. Making fine adjustments to the knife position

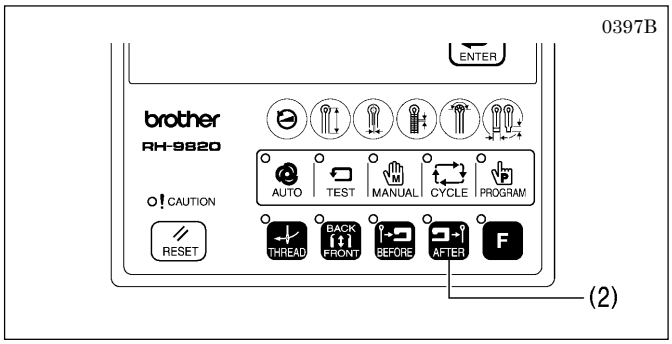
Adjust the knife position so that it cuts the material cleanly at the inside sewing position and around the eyelet.

* Before carrying out this adjustment, check that the procedure in “7-3. Adjusting the zigzag base line position” has been completed correctly.
* The knife position can be adjusted independently in the forward/back direction and tilt direction.

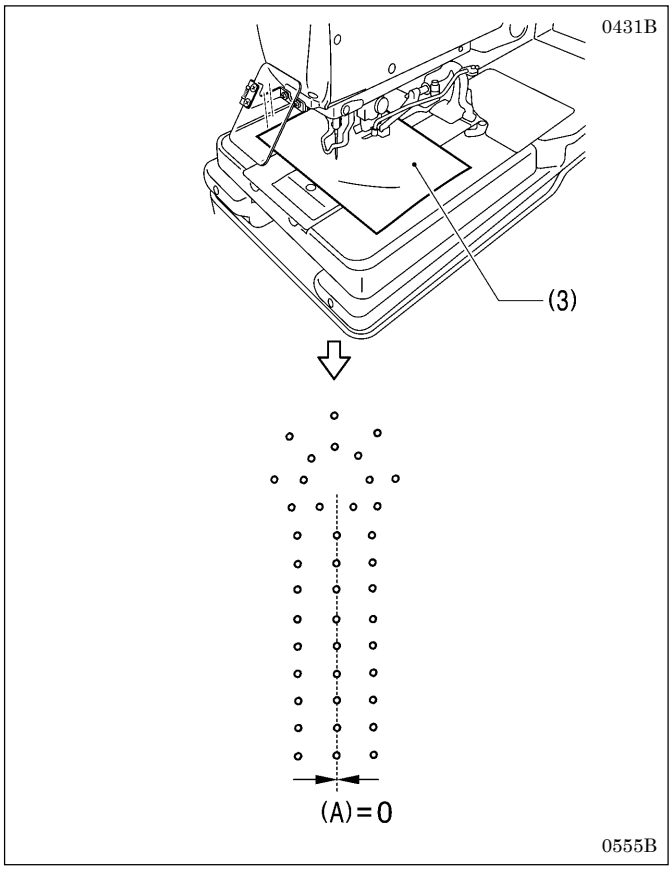


<Adjustment procedure>

1. Install the short customized needle (1). (Refer to “7-3. Resetting the data (initialization)” in the instruction manual for details on the short customized needle (1).)
2. Set the air pressure at the hammer pressure adjustment regulator on the underside of the table to about 0.2 MPa. (Refer to “7-17. Adjusting the cutting pressure”.)
   * This is so that the knife will not make several overlapping incisions in the hammer and so that the paper for checking the needle drop does not become pierced while adjusting the knife position.



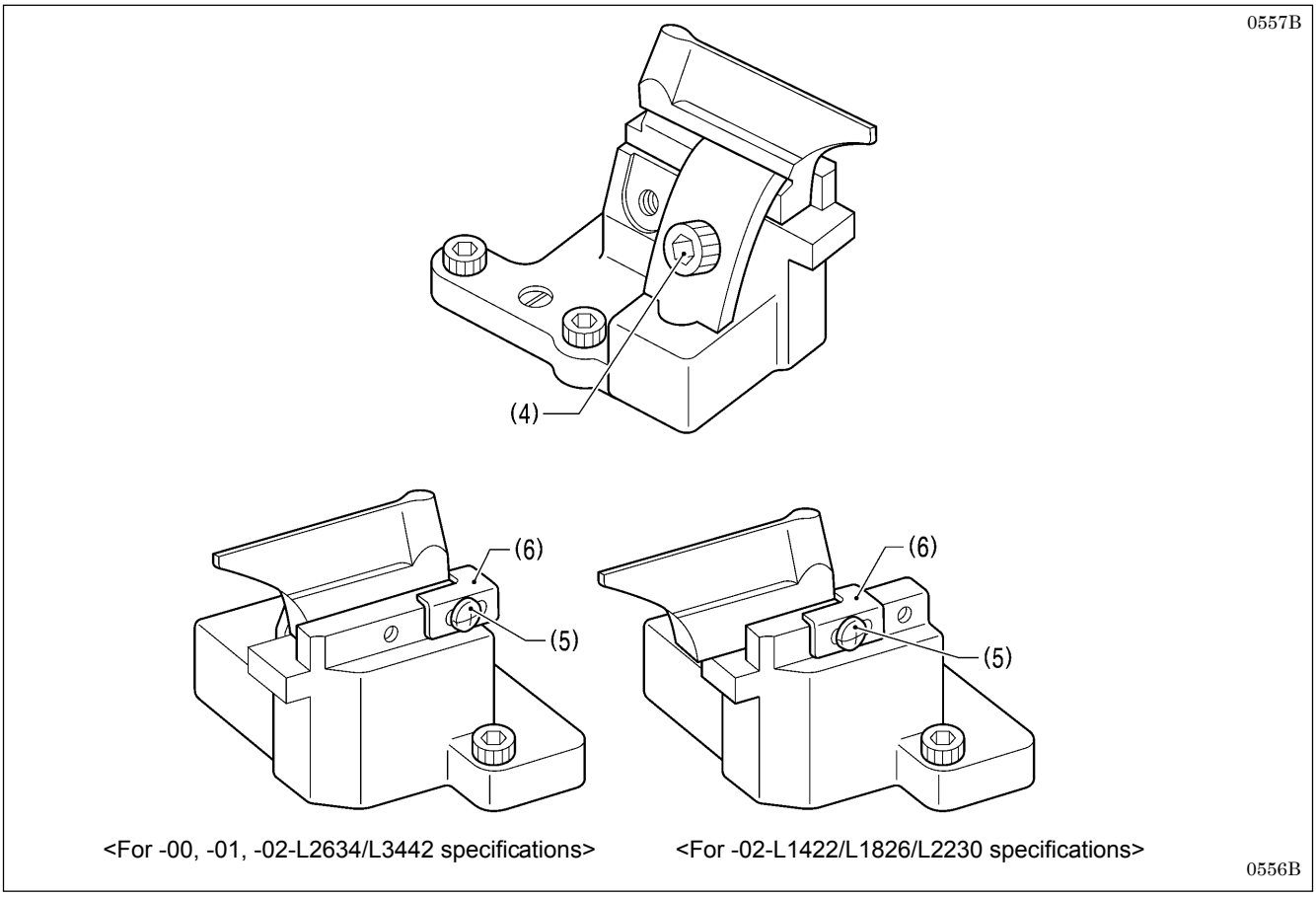
3. Press the AFTER key (2) on the operation panel to set the cutting method to “cutting after sewing”.



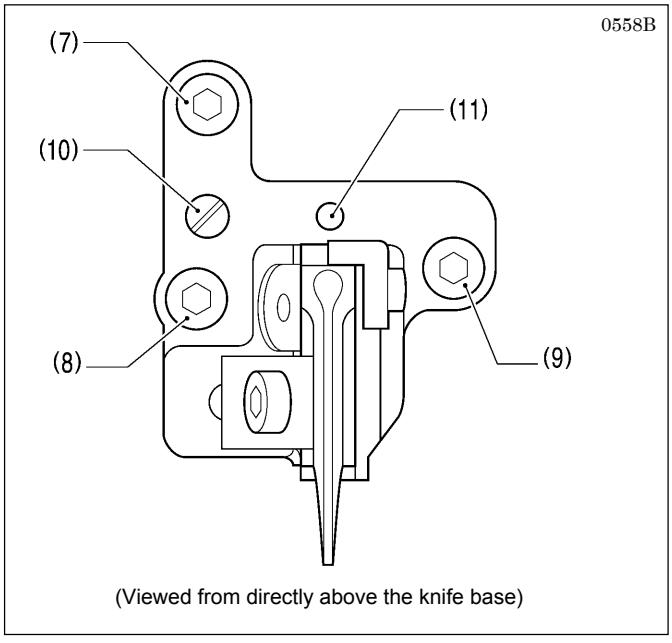
4. Place a piece of paper (3) underneath the work clamps.
5. Start the sewing machine and trace the needle drop position around the eyelet hole.
6. Check that the needle drop positions around the eyelet hole and the knife cutting position overlap uniformly.
   * Checking will be easier if the cutting position value (A) in the parameter settings is set to “0”. (Refer to “5-3-1. Parameter list” in the instruction manual.)
7. If they do not overlap uniformly, turn off the power and carry out the adjustment in steps 8 - 13.
   * Once adjustment is complete, repeat steps 4 - 6 to check, and if further adjustment is needed, repeat step 7.

(Continued on next page)

<Forward/back position adjustment>



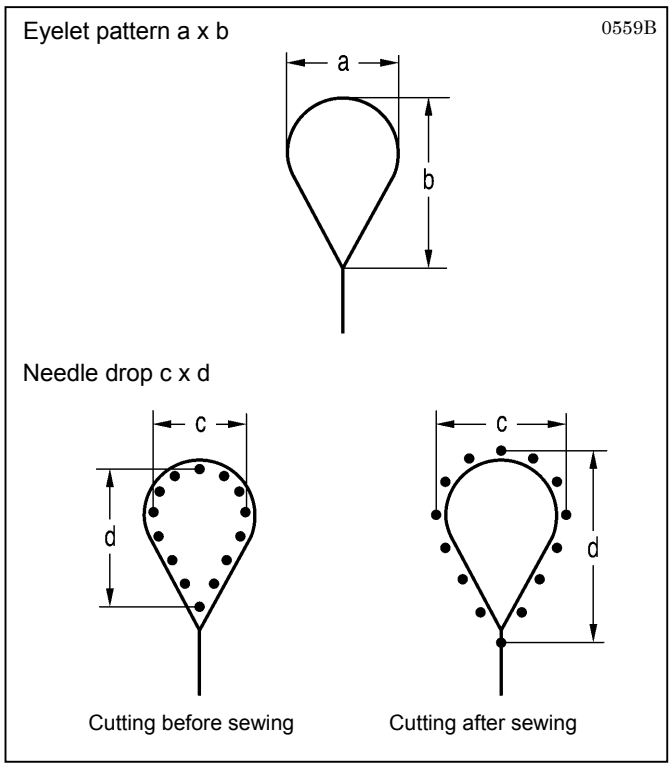
8. Loosen the socket bolt (4), and move the knife position forward or back to adjust.
9. Once the knife position has been determined, securely tighten the socket bolt (4).
10. Loosen the screw (5), push the block stopper plate (6) against the knife, and then tighten the screw (5).
    * The block stopper plate (6) is a guide for showing the current position of the knife, so be sure to move the block stopper plate (6) so that it is touching against the knife.



<Tilt adjustment>

11. Loosen the socket bolts (7), (8) and (9).
12. Turn the eccentric pin (10) to adjust.
    * Fine adjustments can also be made by turning centering on the pivot (11).
13. Once adjustment is complete, tighten the socket bolts (9), (8) and (7) in that order.

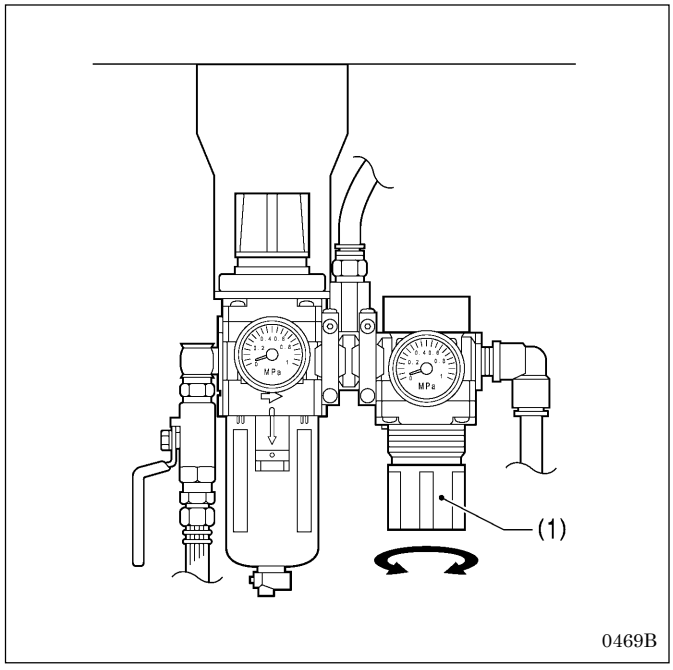
NOTE: Relationship between needle drop position and eyelet pattern at the eyelet



When switching between cutting before sewing or no cutting and cutting after sewing, the needle drop position at the inside sewing position will change automatically in accordance with the eyelet pattern as shown in the illustration.

Knife No.	Eyelet pattern a x b	Needle drop c x d	
		Cutting before sewing or no cutting	Cutting after sewing
1	2.1 x 3.2	1.7 x 2.7	2.5 x 3.8
2	2.8 x 4.3	2.4 x 3.9	3.2 x 4.9
3	3.0 x 4.6	2.6 x 4.1	3.4 x 5.2
4	3.2 x 5.4	2.8 x 4.9	3.6 x 6.0
5	Straight	Straight	Straight
6	3.8 x 4.3	3.4 x 3.8	4.2 x 4.9

7-17. Adjusting the cutting pressure



Set the cutting pressure to the minimum pressure that still allows the material to be cut.

* Set to between 0.1 - 0.6 MPa. (It is set to 0.4 MPa at the time of shipment from the factory.)

<Adjustment method>

Turn the knob (1) of the hammer pressure adjustment regulator on the underside of the table to adjust the air pressure.

NOTE:

- Do not increase the cutting pressure more than necessary. If the pressure is too high, it will wear out the hammer and damage the knife.
- If the material cannot be cut cleanly, do not increase the cutting pressure to too high a pressure.
  Check the timing between the knife and the hammer. (Refer to “7-13-2. Adjusting the contact between the knife and the hammer”.)

7-18. Adjusting the work clamp lift amounts

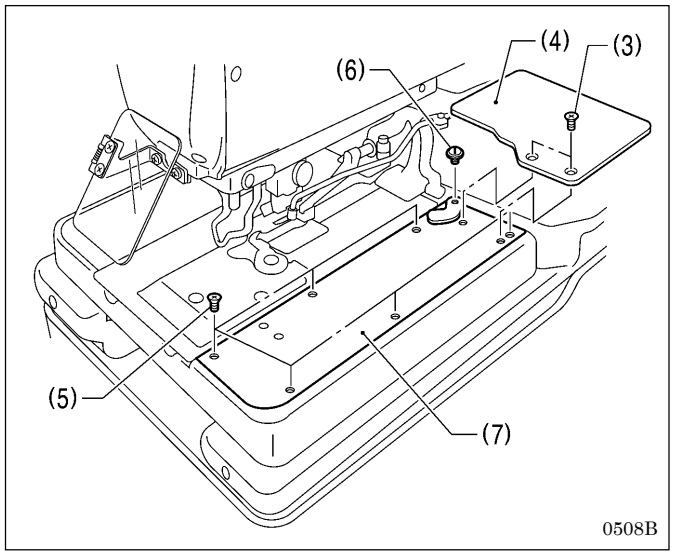
Adjust the work clamp lift amount <a> to one of the values given below.

<For -00, -01 specifications>: 12 mm

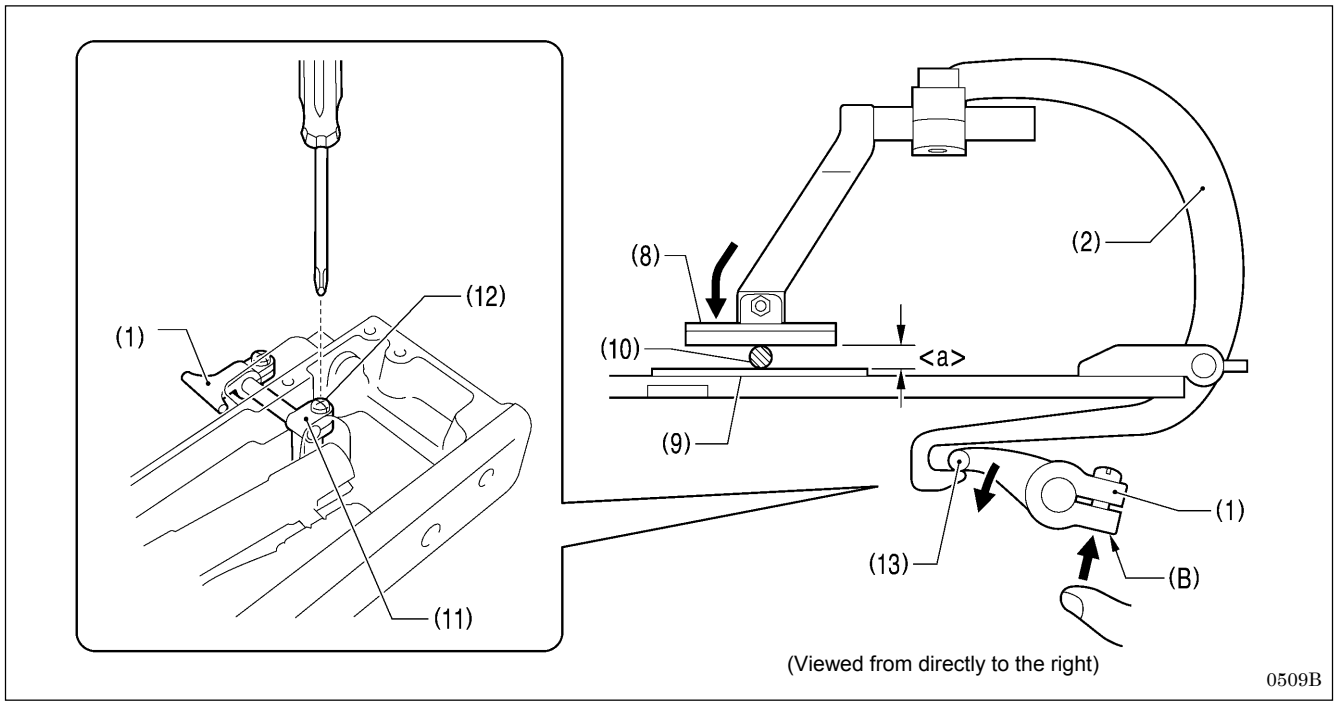
<For -02 specifications>: 16 mm

* The work clamp lift amount <a> is the value which includes the play in crank lever B (1) and the clamp lever (2).

* Carry out adjustment for both the left and right work clamps. (The following describes how to adjust the lift amount for the right-side work clamp.)



1. Remove the two screws (3), and then remove feed base cover U (4).
2. Remove the six screws (5) and the shoulder screw (6), and then remove feed base cover R (7) at the right side.



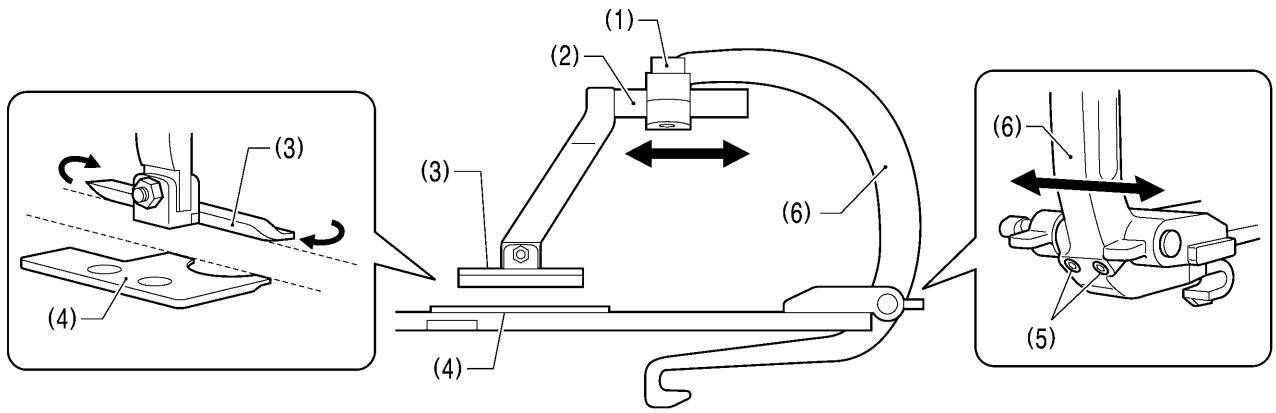
3. Insert a block with a thickness of 12 mm or 16 mm or a gauge (10) in between the support point of work clamp R (8) and the needle plate (9).
4. Loosen the screw (12) of the clamp driving lever (11).
5. Push section (B) of crank lever B (1) upward so that the tip (13) is pressed against the end of clamp lever R (2) as shown in the illustration.
6. While holding the parts in the position in step 5, tighten the screw (12).
   NOTE:
   Check that work clamp R (8) is pressed securely against the block or the gauge (10).
7. Install feed base cover R (7) and feed base cover U (4).

* Adjust the lift amount for the left-side work clamp in the same way.

7-19. Adjusting the work clamp positions

The positions of the work clamps relative to the needle plate can be adjusted forward, back and sideways.

* Adjust the left and right work clamps so that they are both positioned at an equal distance from the needle drop position. (The following describes how to adjust the position of the right-side work clamp.)



(Viewed from directly to the right)

0511B

<Forward/back adjustment>

1. Loosen the socket bolt (1), and then move the position of the clamp arm (2) forward or back to adjust.
2. Next, adjust so that the side of work clamp R (3) is parallel to the side of the needle plate (4).
3. Once adjustment is complete, tighten the socket bolt (1).

<Sideways adjustment>

1. Loosen the two set screws (5), and then adjust the sideways position of the clamp lever (6).
2. Once adjustment is complete, tighten the two set screws (5).

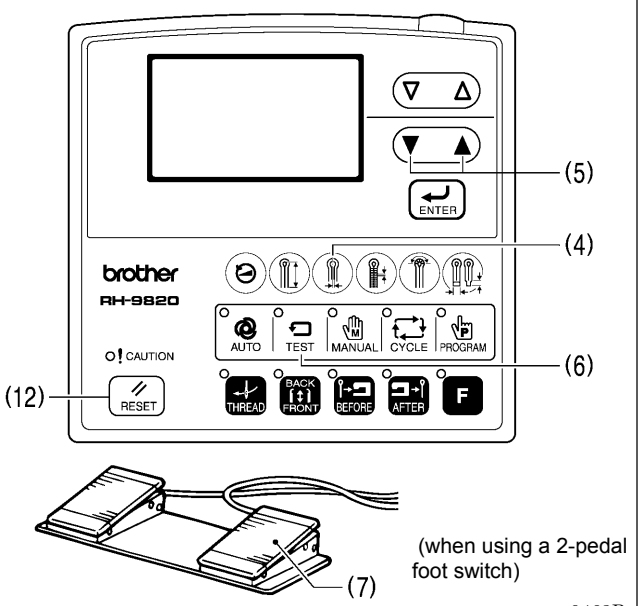
* Adjust the position for the left-side work clamp in the same way.

7-20. Adjusting the positions of the work clamp plates

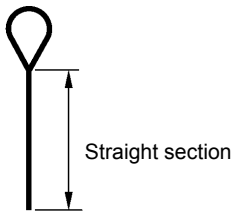
Adjust the positions of the work clamp plates (3) so that the throat plate (1) and needle plates (2) do not touch during sewing. The standard adjustment is when there is a gap of 0.8 mm between the throat plate (1) and the needle plates (2) (when the cutting space is set to "0").

* Carry out adjustment for both the left and right work clamps. (The adjustment method described below is for the position of the right-side work clamp plate (3).)

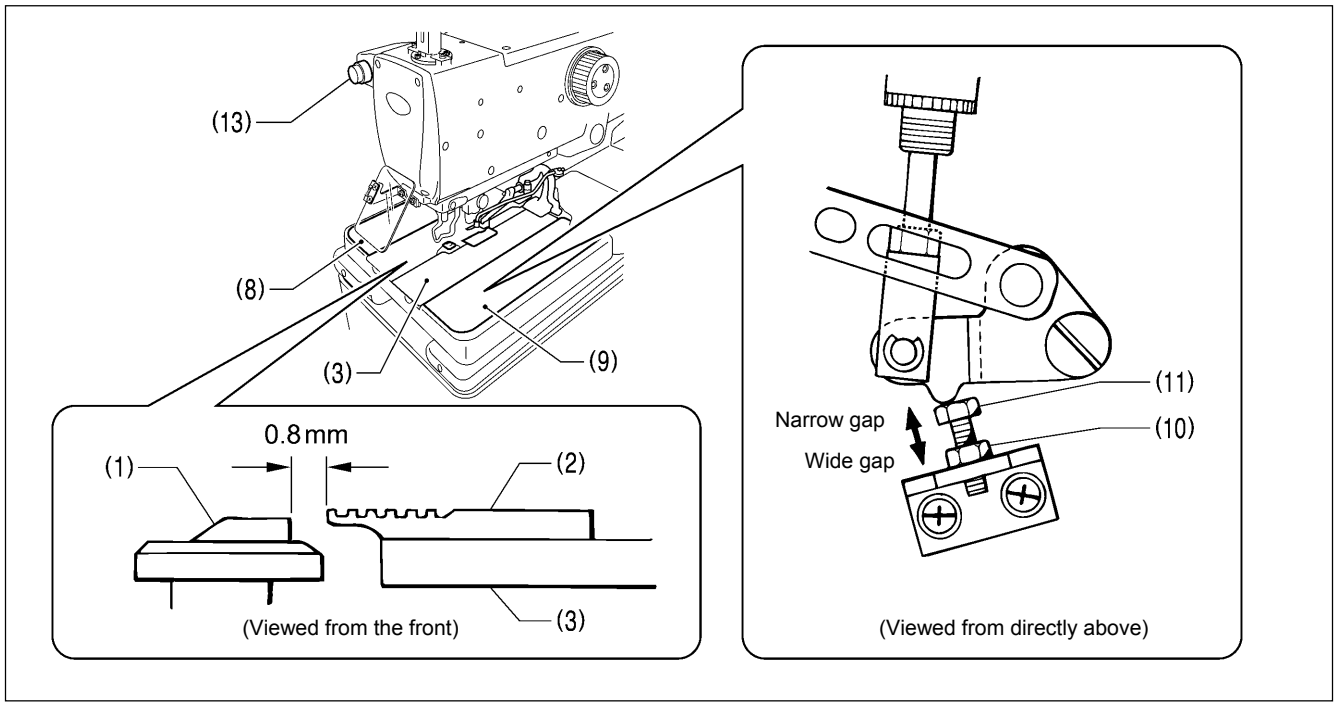
* Carry out adjustment with the work clamp plates (3) installed.



1. Use the parameter settings to set the cutting space to “0”. (Refer to “5-3-1. Parameter list” in the instruction manual.)
   * If you press shortcut key 3 (4), you can then change the value simply by pressing the ▲/▼ keys (5).
2. Press the TEST key (6) to turn on test mode, and then start test operation. (Refer to “5-4. Checking the sewing pattern in test mode” in the instruction manual.)
3. Press and hold the start switch (7) until the feed base moves to the position where the straight section of the sewing shape is sewn, and then release the start switch (7).



0513B



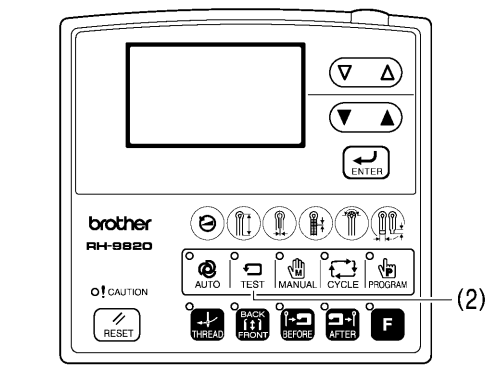
4. Check that there is a gap of 0.8 mm between the throat plate (1) and needle plate R (2).
5. If it is not 0.8 mm, remove feed bar cover L (8) and feed bar cover R (9), loosen the nut (10), and then turn the bolt (11) to adjust the gap.
6. Once adjustment is complete, tighten the nut (10).
7. Press the RESET key (12), and then press the STOP switch (13) to end test mode.

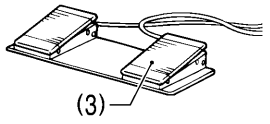
* Adjust the gap between the throat plate (1) and needle plate L in the same way.

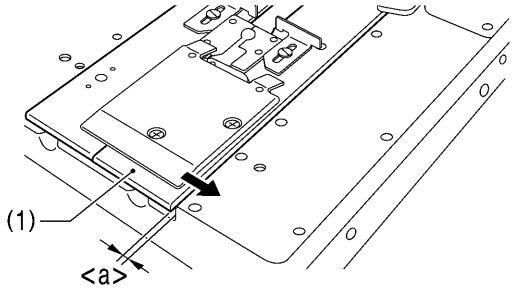
7-21. Adjusting the cloth opening amounts

Adjust so that the opening amounts for the left and right work clamp plates (1) are equal.

* The cloth opening amounts should always be 0.8 mm or more on each side.

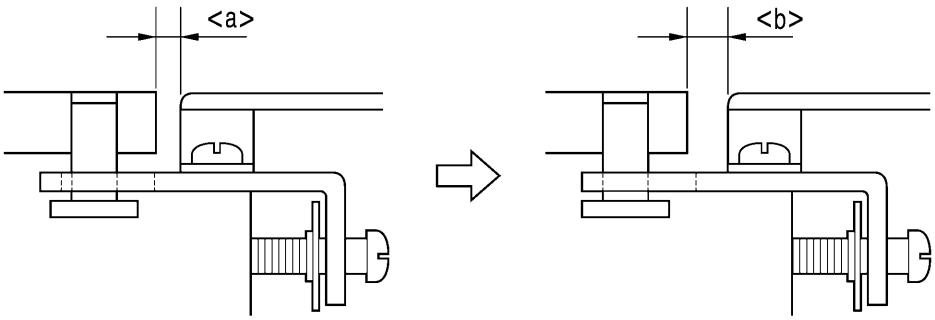






<Opening amount measurement method>

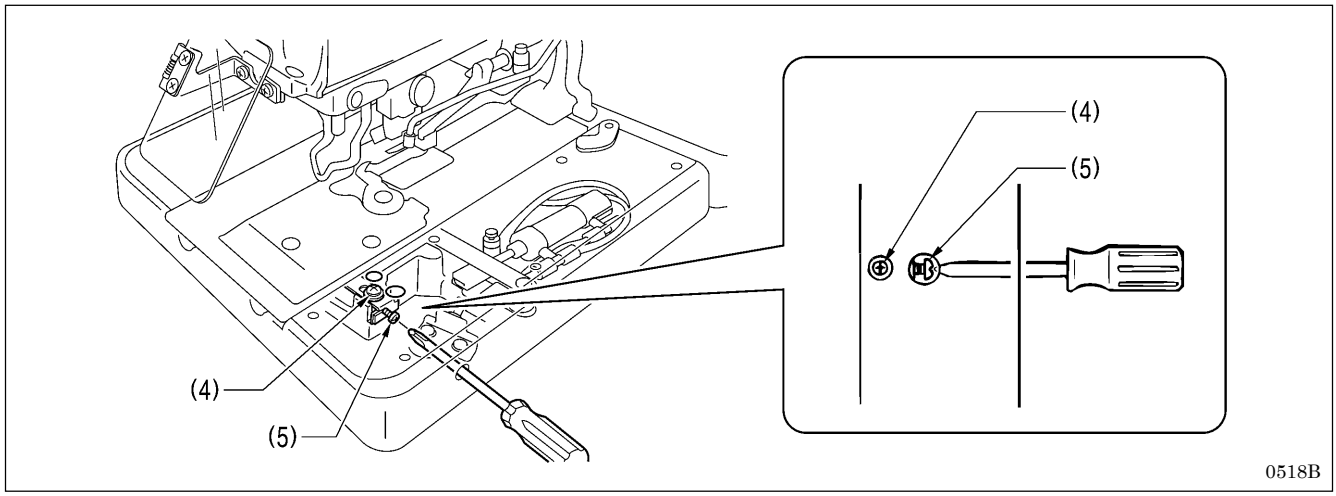
1. Press the TEST key (2) to turn on test mode, and then start test operation. (Refer to "5-4. Checking the sewing pattern in test mode" in the instruction manual.)
2. Depress the start switch (3).
   * Check that the feed base moves and that the work clamp plates (1) at left and right both open. This opening amount is <a>.



3. Use calipers to measure <a> (at both left and right).
4. Turn off the power for the sewing machine.
   * The gap <a> will become wider. This opening amount is <b>.
5. Lower the work clamps, and then use calipers to measure <b> (at both left and right).

   (Cloth opening amount = <b> - <a>)
6. Calculate the cloth opening amounts for both sides.
7. Carry out adjustment if the two cloth opening amounts are not the same, or if the cloth opening amount at either side is lower than 0.8 mm. (Refer to following page.)

<Cloth opening amount adjustment>



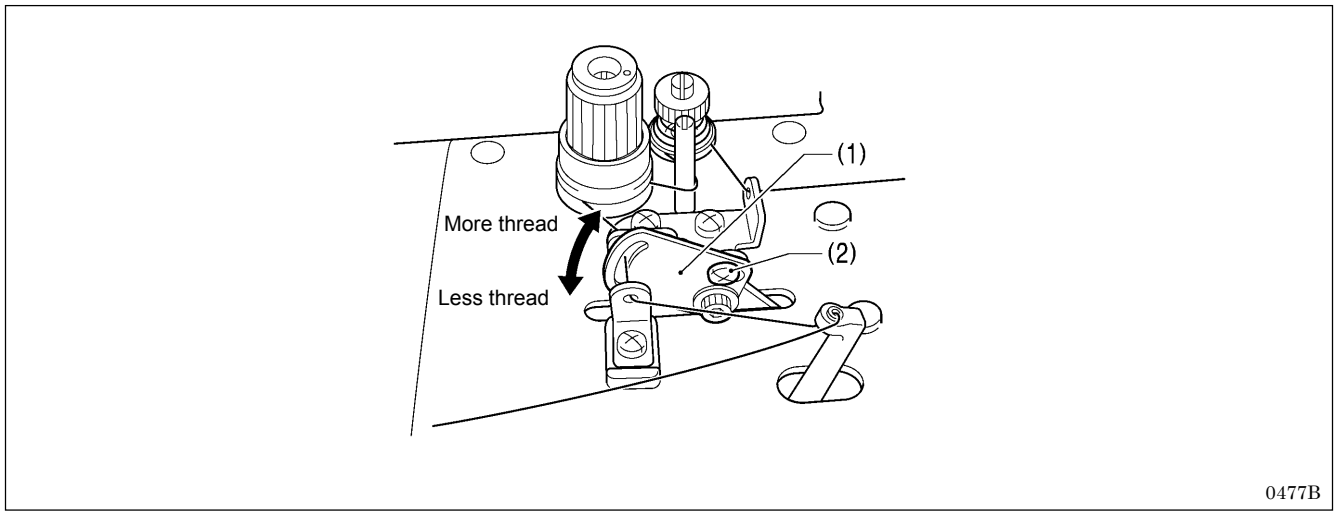
8. Loosen the screw (4).
9. Insert a screwdriver into the notch in the side of the feed base, and turn the adjustment screw (5) to adjust.
10. After tightening the screw (4), measure the opening amounts once more.
11. Repeat steps 2 - 10 until the left and right cloth opening amounts are equal to each other.

7-22. Adjusting the upper thread feeding amount

It is necessary for enough of an upper thread feeding amount to be maintained so that the amount of upper thread is sufficient for stitches to be formed accurately at the sewing start.

NOTE:

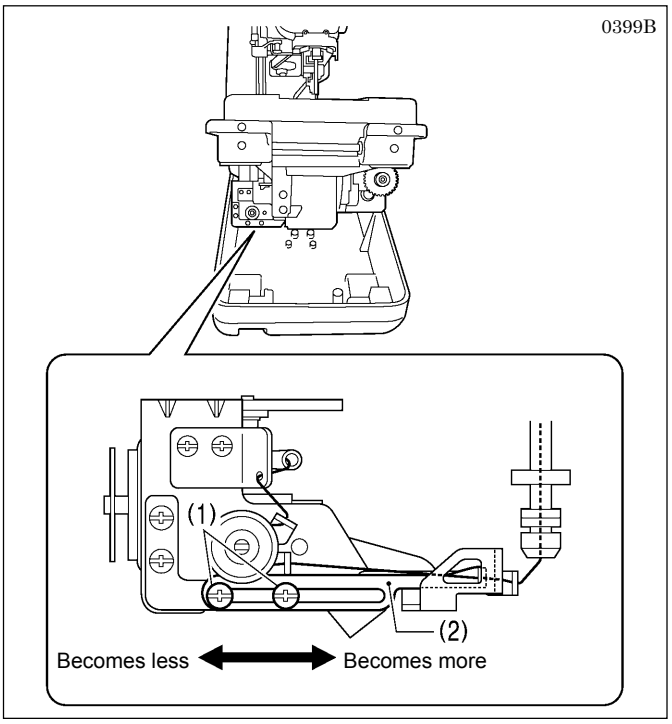
The thread take-up lever (1) operates at the same time as sewing ends, and it stops operating at the same time as the feed base starts moving when the start switch is pressed.



1. Loosen the screw (2).
2. Move the thread take-up lever (1) up or down to adjust the upper thread feeding amount.
3. Once adjustment is complete, securely tighten the screw (2).

7-23. Adjusting the lower thread feeding amount <-01 specifications only>

It is necessary for enough tension to be applied to the lower thread during the time from when the upper thread is picked up by the eye looper at the first stitch until spreader L finishes opening, without the lower thread being pulled out by the thread nipper, so that the first stitch can be sewn correctly at the sewing start.



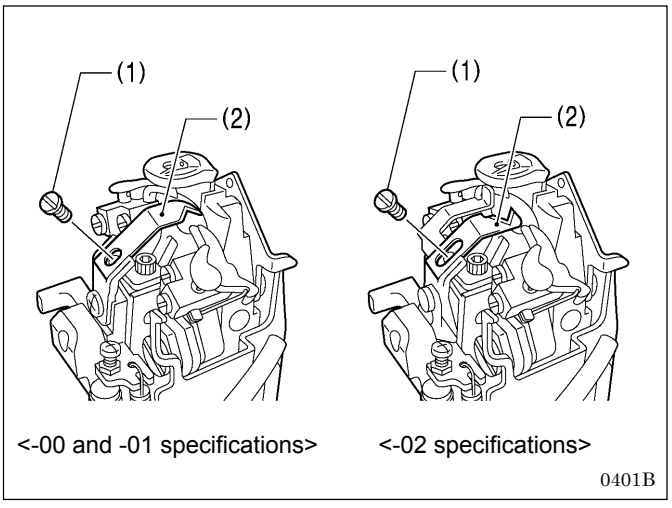
1. After automatic sewing is finished, switch to manual mode and then press the start switch. (Refer to “7-6. Manual sewing (manual mode)” in the instruction manual.)
2. Turn the upper shaft pulley and check the condition of the lower thread.

<If adjustment is necessary>

3. Turn off the power, and then tilt back the machine head.
4. Loosen the two screws (1), and then move lower thread guide C (2) in the direction of the arrow to adjust.
   * If it is moved to the right, the lower thread feeding amount will increase, and if it is moved to the left, the amount will decrease.
5. Once adjustment is complete, securely tighten the two screws (1).

7-24. Replacing and adjusting the upper movable knife

7-24-1. Replacing the upper movable knife

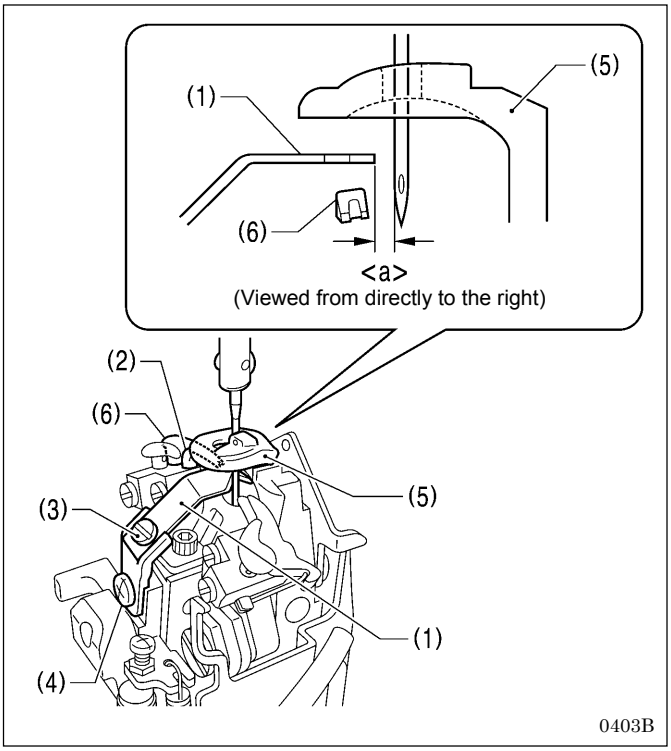


1. Remove the screw (1), and then remove the upper movable knife (2).
2. Install the new upper movable knife with the screw (1).

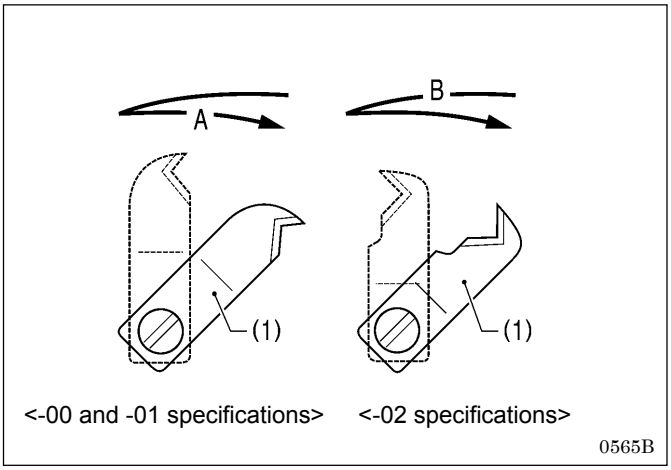
7-24-2. Adjusting the upper movable knife

The upper movable knife (1) is adjusted so that only the upper thread that is in front of looper L (2) is cut. If two of the upper thread loops (front and back) are cut, the upper thread trailing length will become too short and skipped stitches may occur at the sewing start.

* If this adjustment is carried out in manual mode, the upper thread trimming operation can be checked step by step, which will make adjustment easier.



1. Turn the upper shaft pulley to set the needle to the lowest position at the outside sewing position.
2. Loosen the screw (3), and then adjust the gap <a> between the tip of the upper movable knife (1) and the needle to 0.1 - 0.4 mm.
3. Turn the upper shaft pulley to set the needle to its highest position (needle up stop position) at the outside sewing position.
4. Loosen the screw (4), and then adjust the position of the upper movable knife (1) so that it is in between the throat plate (5) and spreader L (6) without touching either of them.
5. Move the upper movable knife (1) sideways by hand and check that it does not touch either the throat plate (5) or spreader L (6).
6. Once adjustment is complete, tighten the screws (4) and (3) in that order.



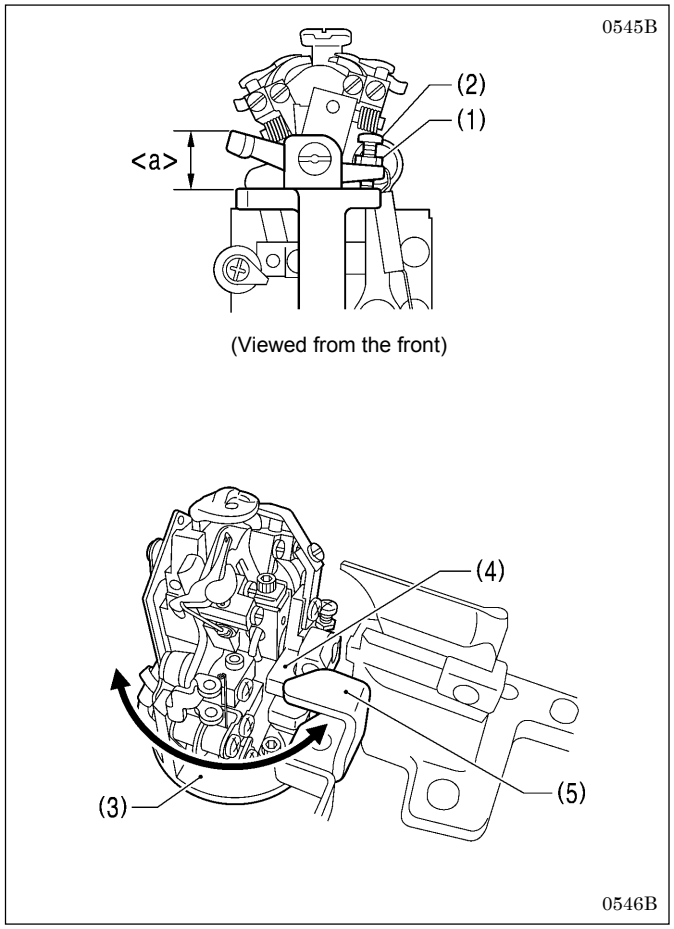
NOTE: Upper thread trimming timing

<-00 and -01 specifications>
When the upper movable knife (1) has returned to its original position, the upper thread is trimmed at position A.

<-02 specifications>
When the upper movable knife (1) starts moving, the upper thread is trimmed at position B.

7-24-3. Adjusting the position of the thread trimmer lever bracket

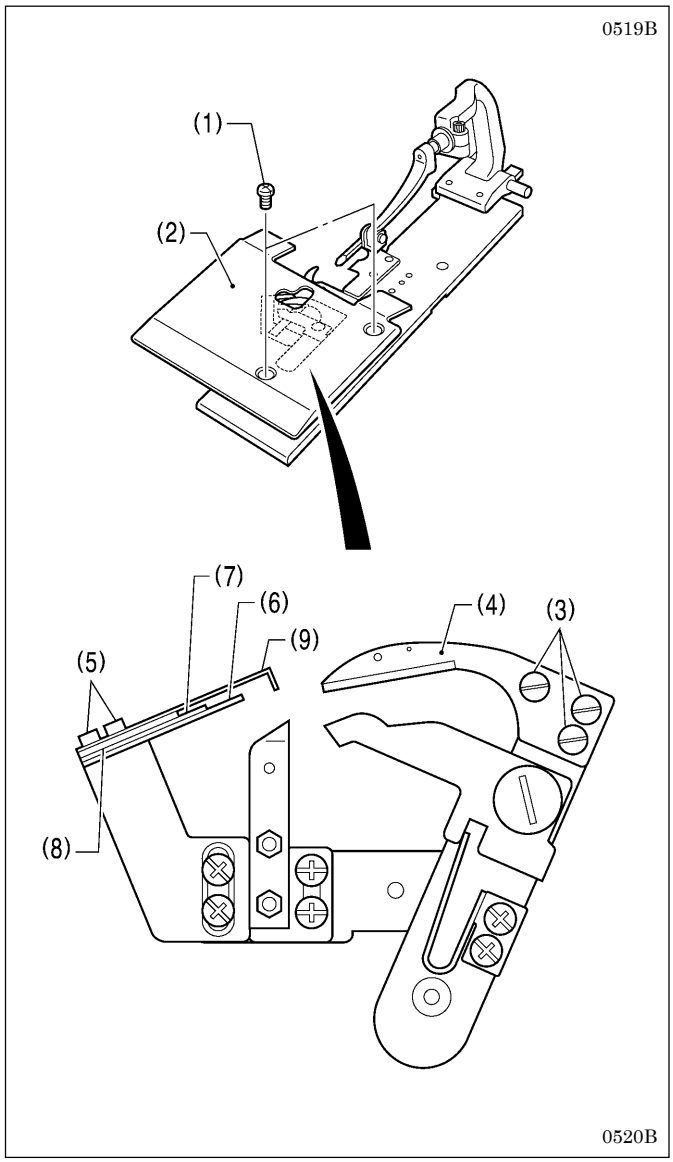
The position of the needle must be adjusted so that it does not obstruct the upper movable knife when it is at the maximum zigzag width for the outside sewing position.



1. Loosen the nut (1).
2. Turn the screw (2) to adjust <a> in the illustration to 12 mm.
3. Turn the looper base (3) and check that the thread trimmer lever bracket (4) moves underneath the thread trimmer hammer (5) without obstructing any other parts.
4. Once adjustment is complete, securely tighten the nut (1).

7-25. Replacing and adjusting the movable knife and fixed knife (for the lower thread and gimp) <-01 specifications>

7-25-1. Replacing the movable knife and fixed knife



1. Remove the two screws (1), and then remove work clamp plate U (2).

<Movable knife replacement>

2. Remove the three screws (3), and then remove the movable knife (4).
3. Install the new movable knife, and then tighten the three screws (3).

<Fixed knife replacement>

4. Remove the two screws (5), and then remove the fixed knife (6).
5. Install the new fixed knife (6), fixed knife plate spring (7), fixed knife plate spring U (8) and thread guide plate (9) on top of each other in that order, and then tighten the two screws (5).

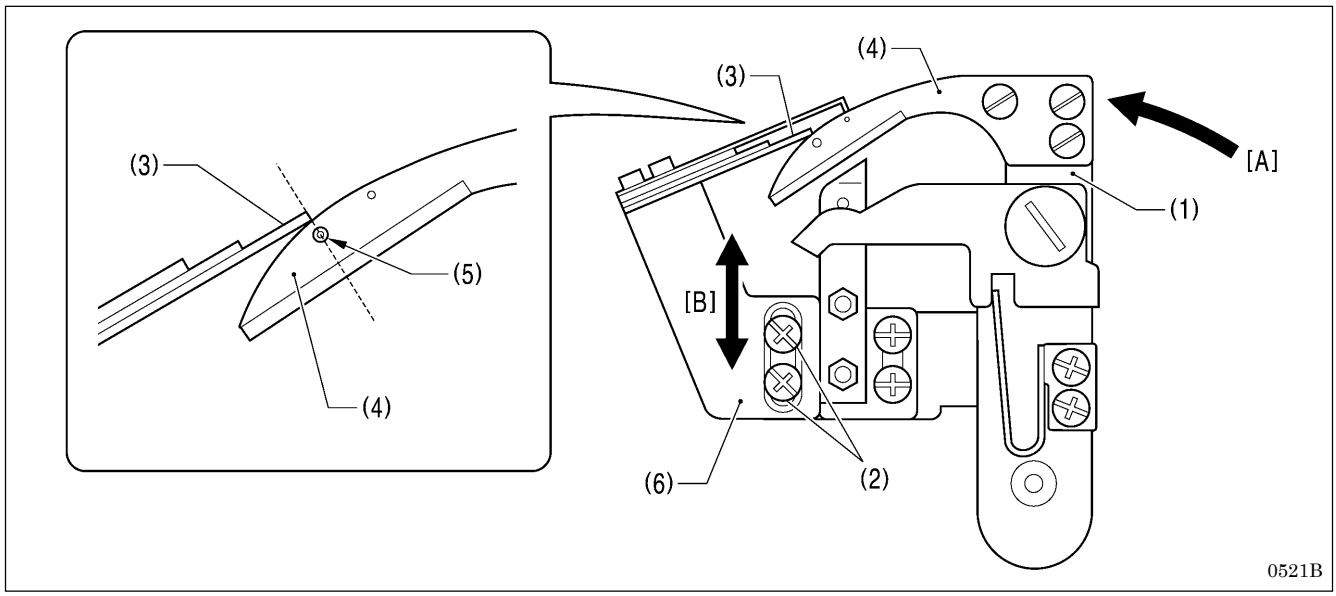
* After replacing the knives, carry out the adjustments from “7-25-2. Adjusting the cutting pressure” to “7-25-5. Adjusting the thread handler”. Once adjustment is complete, install work clamp plate U (2).

7-25-2. Adjusting the cutting pressure

Adjust the cutting pressure to a suitable pressure so that the threads are trimmed cleanly.

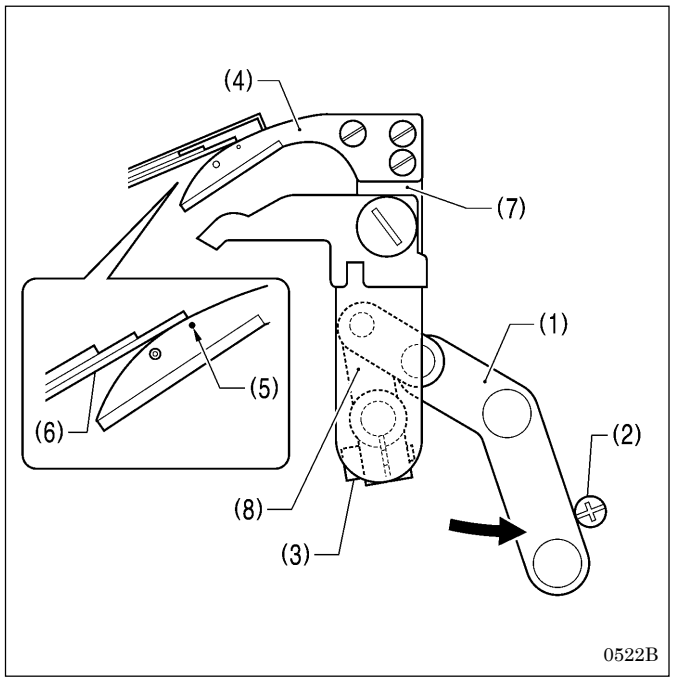
NOTE:

Do not apply excessive pressure. Excessive pressure will cause the knives to become worn or damaged.



1. Push the thread trimmer arm (1) as far as it will go in the direction of the arrow [A].
2. Loosen the two screws (2).
3. With the thread trimmer arm (1) pushed as far as it will go, move the fixed knife setting bracket (6) along the guide groove in the direction of arrow [B] to adjust so that the position where the tip of the fixed knife (3) and the movable knife (4) first start touching is immediately above the mark (5).
4. Once adjustment is complete, securely tighten the two screws (2).

7-25-3. Adjusting the meshing amount



1. Turn the thread trimmer link lever (1) in the direction of the arrow until it touches the screw (2).
2. Loosen the socket bolt (3).
3. Adjust the position of the thread trimmer arm (7) so that the tip of the fixed knife (6) is directly above the index mark (5) on the movable knife (4).
4. Once the adjustment is complete, securely tighten the socket bolt (3).

NOTE:

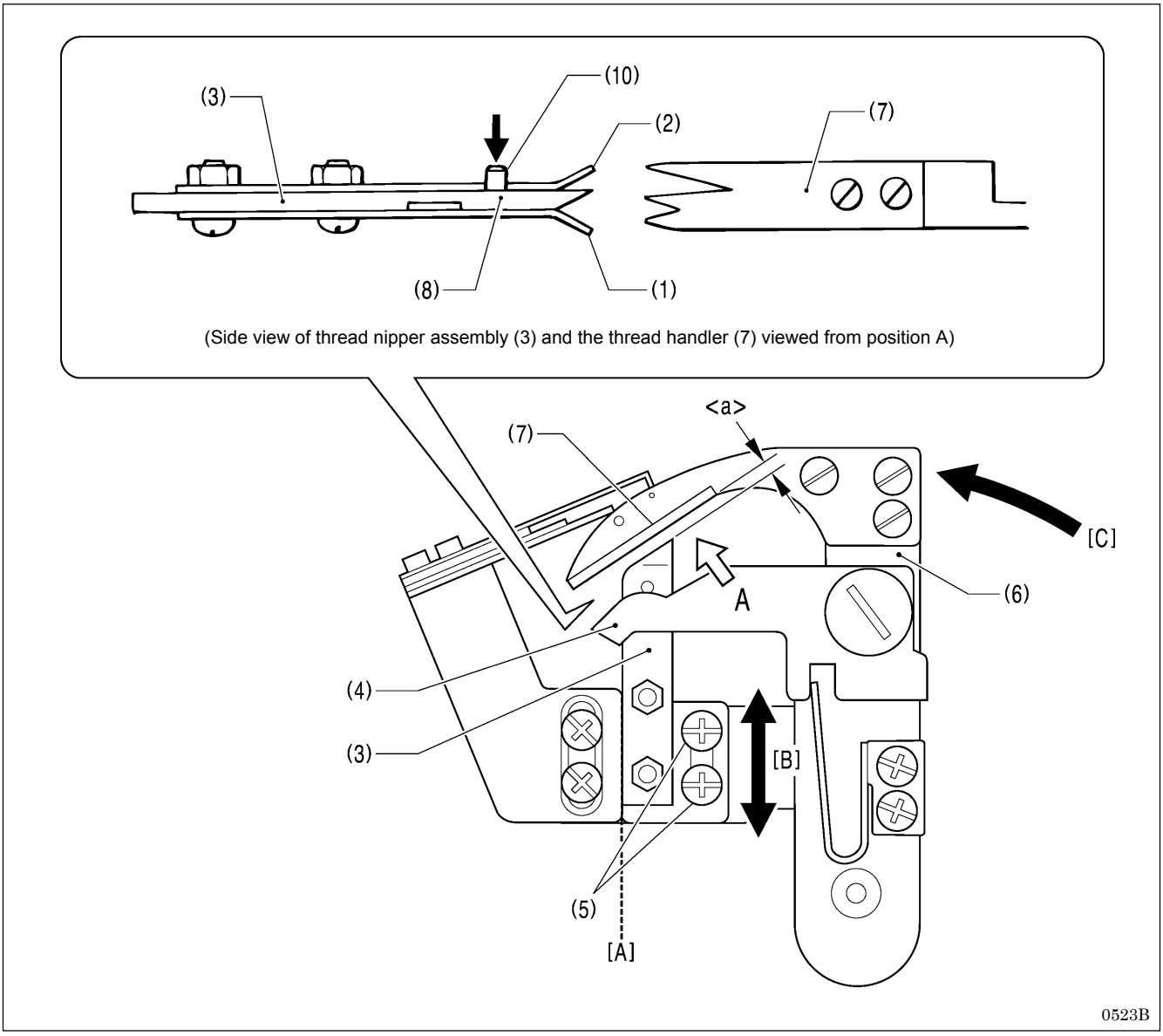
- When tightening the socket bolt (3), check that the thread trimmer lever arm (8) and the thread trimmer arm (7) move smoothly with no play.
- If the meshing amount is too small, problems with the lower thread nipper will occur and the thread will be pulled out at the sewing start.

7-25-4. Adjusting the thread nipper assembly and opener

The lower thread must pass through thread nipper D (1) and the gimp thread must pass through thread nipper U (2). Therefore, check that the thread nipper assembly (3) is installed in the correct position and that the thread nipper opener (4) moves correctly.

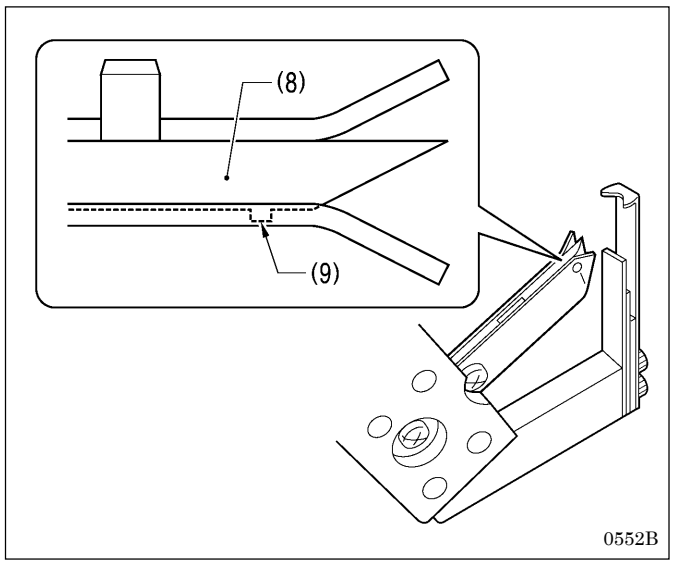
NOTE:

The lower thread must be securely held by thread nipper D (1) at the sewing start.

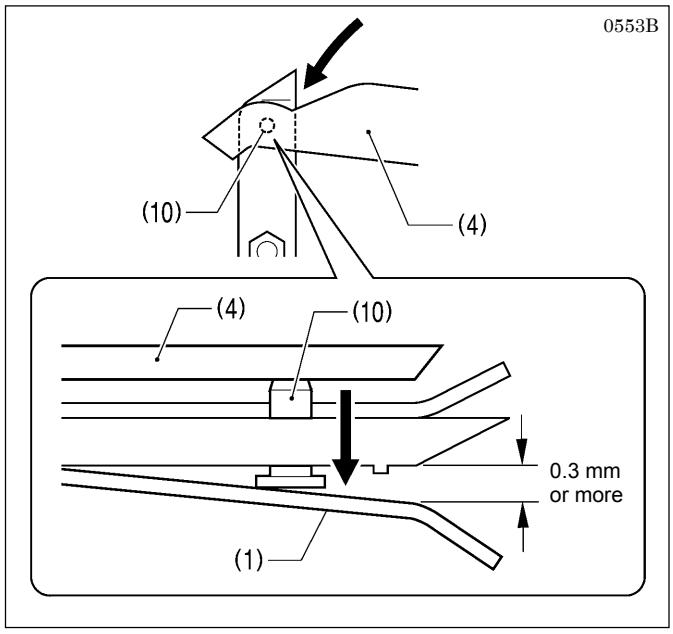


1. Loosen the two screws (5), and then move the thread nipper assembly (3) along the dotted line [A] in the illustration in the direction of the arrow [B] to adjust.
   * Adjust so that the gap <a> between the thread nipper assembly (3) and the thread handler (7) is as narrow as possible without the two parts touching when the thread trimmer arm (6) is turned in the direction of the arrow [C].

   NOTE:
   - If the gap <a> is too wide, problems with the lower thread nipper will occur and the thread will be pulled out at the sewing start.
   - If the thread nipper assembly (3) is installed at an angle, thread nipper D (1) may touch the throat plate and fail to open, and problems with the lower thread nipper will occur and the thread will be pulled out at the sewing start.

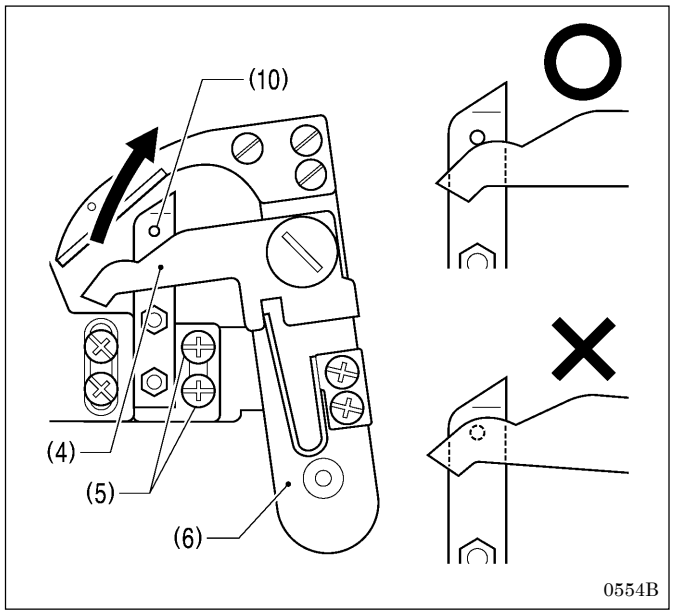


2. The lower thread must go over the projection (9) on thread nipper M (8) and be held securely. To make sure this happens, check that the operations in (a), (b) and (c) below are all correct.



(a) Thread nipper D (1) should open by 0.3 mm or more when the thread nipper opener (4) pushes down on the opener pin (10).

(b) Thread nipper D (1) should close immediately before the thread is trimmed.



(c) Thread nipper D (1) should not open when the thread trimmer arm (6) returns after thread trimming, so that the thread nipper opener (4) returns without going over the opener pin (10).

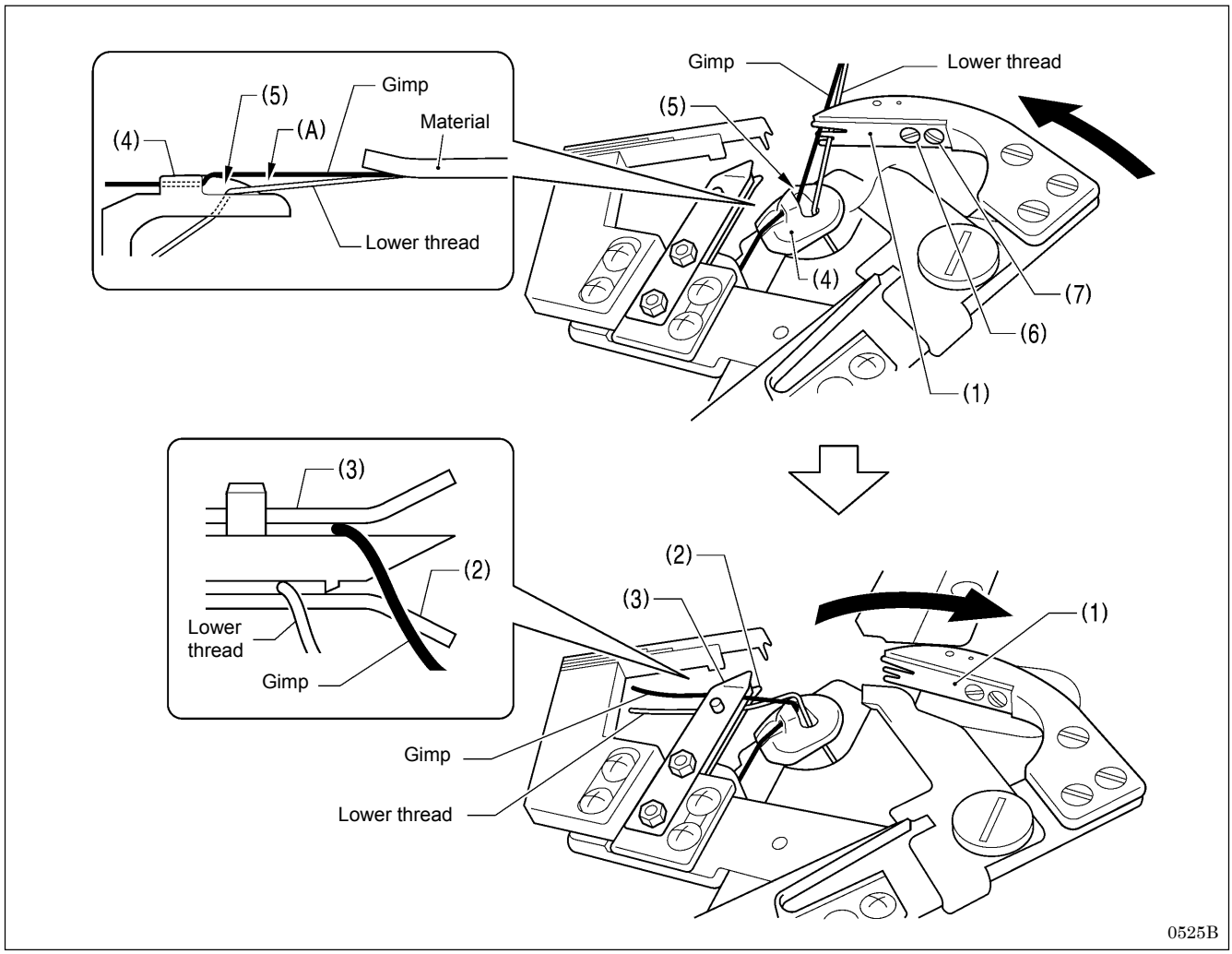
3. Once adjustment is complete, securely tighten the two screws (5).

7-25-5. Adjusting the thread handler

The lower thread and gimp are securely separated and guided by the thread handler (1), after which the lower thread needs to go smoothly into thread nipper D (2), while the gimp needs to go smoothly into thread nipper U (3).

NOTE: Principle of the thread handler

When the thread trimmer arm operates, the throat plate (4) turns 45 degrees. This causes the gimp to sit on top of the projection (5) of the throat plate (4) so that a difference in height is created between the lower thread and the gimp, and a triangular shape (A) is formed between the two threads and the final stitch. The thread handler (1) goes into this triangular shape (A) to separate the lower thread and gimp.



<Adjustment method>

* If this adjustment is carried out in manual mode, the lower thread trimming operation can be checked step by step, which will make adjustment easier.

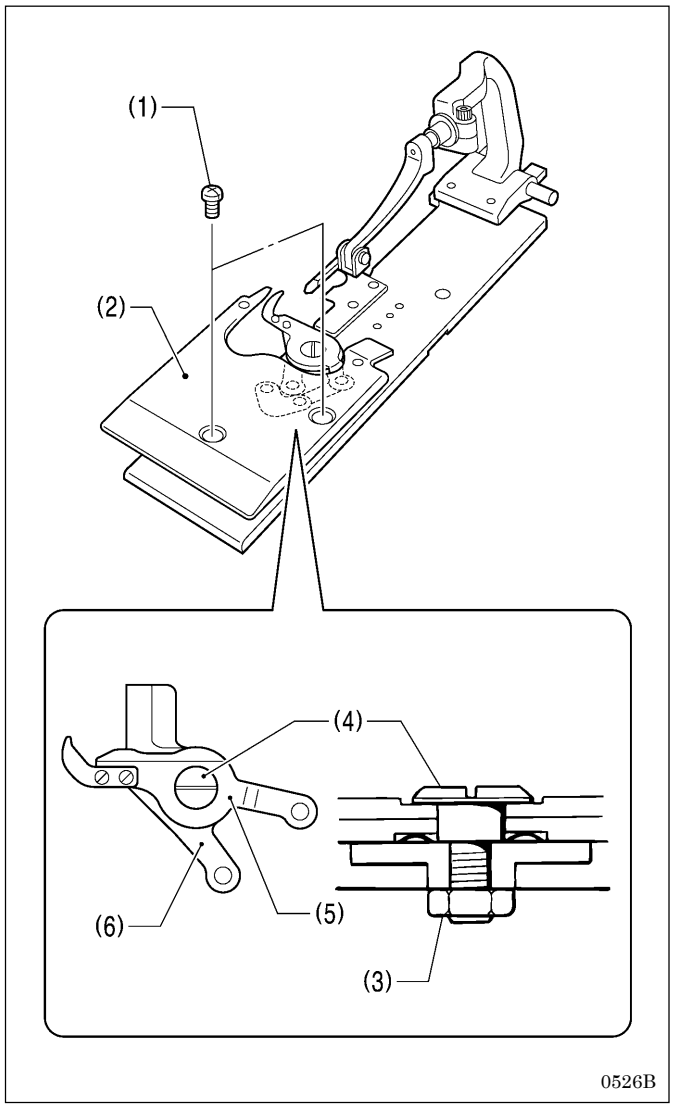
1. Use the parameter settings to set the stitch pitch to 2.0 mm and reduce the total number of stitches. (Refer to “5-3-1. Parameter list” in the instruction manual.)
2. In manual mode, depress the start switch, and then turn the upper shaft pulley to sew manually as far as the final stitch. (Refer to “7-6. Manual sewing (manual mode)” in the instruction manual.)
3. With the needle bar at the needle up stop position, depress the start switch one press at a time.
   * The thread trimming operation will be carried out one step at a time.
4. Loosen the pan screw (6) and the screw (7), and then use the pan screw (6) as a pivot to turn the thread handler (1) to adjust.
5. Once adjustment is complete, securely tighten the pan screw (6) and the screw (7).

NOTE:

If the height of the throat plate (4) has been changed, the triangular shape (A) defined by the final stitch, lower thread and gimp will change, and so you should adjust the thread handler (1).

7-26. Replacing and adjusting the movable knife and fixed knife (for the lower thread and gimp) <-02 specifications>

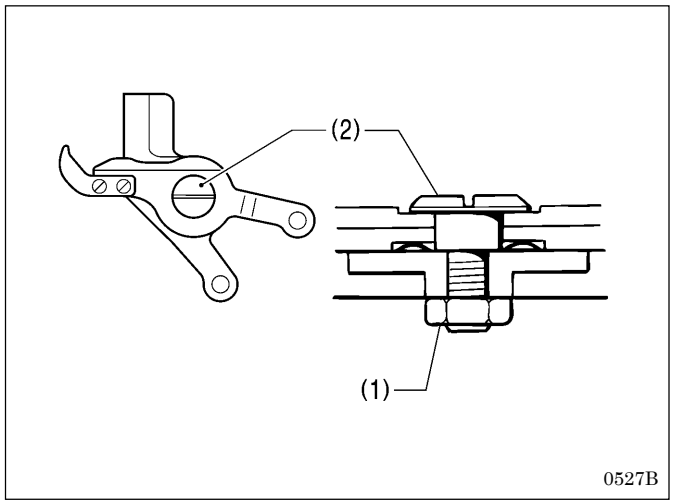
7-26-1. Replacing the movable knife and fixed knife



1. Remove the two screws (1), and then remove work clamp plate U (2).

2. Remove the nut (3).
3. Remove the shoulder screw (4), and then remove movable knife L (5) and movable knife R (6).
4. Install the new knives, and then install the shoulder screw (4).
5. Adjust the cutting pressure (see below), and then tighten the nut (3).
6. Install work clamp plate U (2).

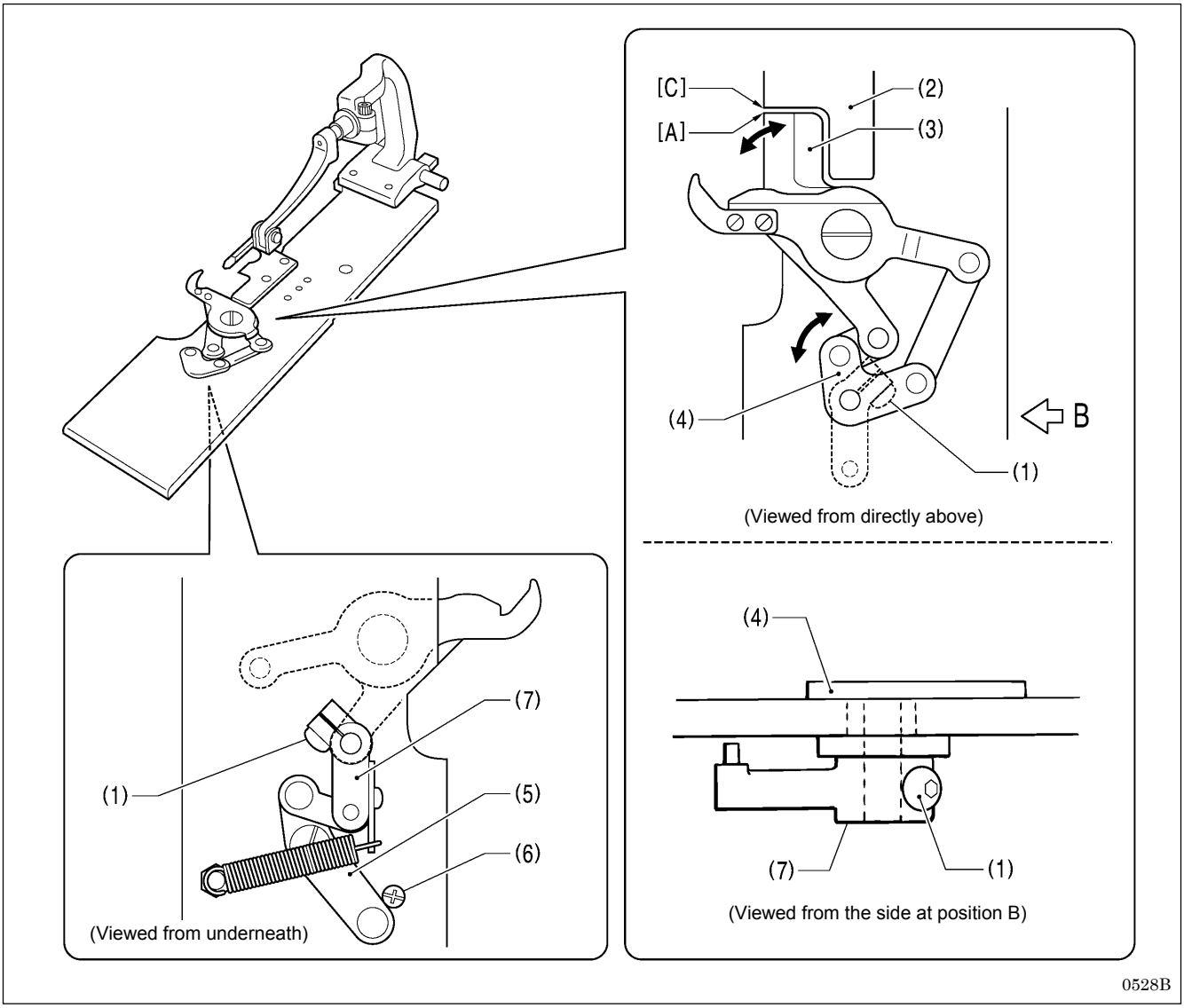
7-26-2. Adjusting the cutting pressure



Adjust the cutting pressure to the minimum pressure at which thread trimming can be carried out cleanly.

1. Loosen the nut (1).
2. Turn the shoulder screw (2) to adjust the cutting pressure.
   NOTE:
   If the shoulder screw (2) is tightened as far as it will go, the movable knives will no longer operate. Gradually loosen the shoulder screw (2) to a point where the movable knives turn smoothly.
3. Once adjustment is complete, securely tighten the nut (1).

7-26-3. Adjusting the movable knife installation position



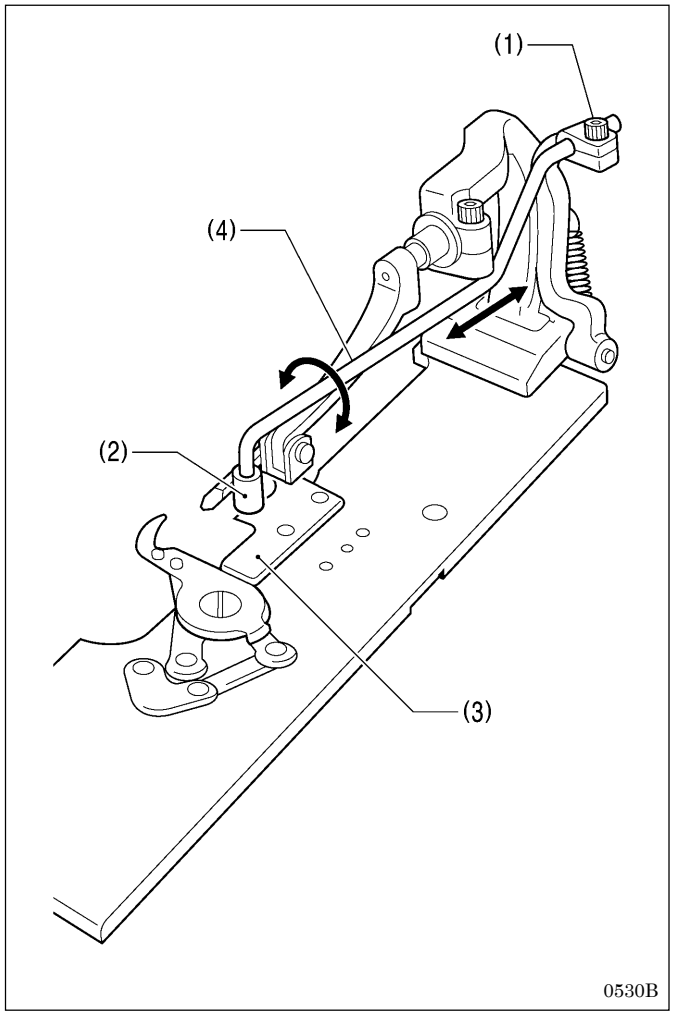
1. Remove work clamp plate U. (Refer to “7-26-1. Replacing the movable knife and fixed knife”.)
2. Loosen the screw (1).
3. Turn the movable knife driving plate (4) so that the tip [A] of movable knife R (3) and the corner [C] of the needle plate (2) are aligned.
4. Turn thread trimmer lever arm B (7) until the thread trimmer link lever J assembly (5) touches against the screw (6), and then tighten the screw (1).
5. Once adjustment is complete, install work clamp plate U.

NOTE:

Check that the movable knife driving plate (4) and thread trimmer lever arm B (7) turn smoothly with no play.

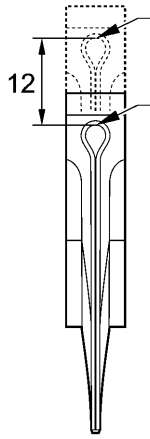
7-26-4. Adjusting the position of the sub clamp

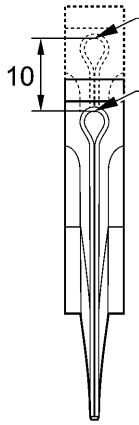
Trimming of the lower thread and gimp is carried out when the work clamps rise. The sub clamp ensures that the material does not move during thread trimming, in order to maintain a stable thread length after trimming.

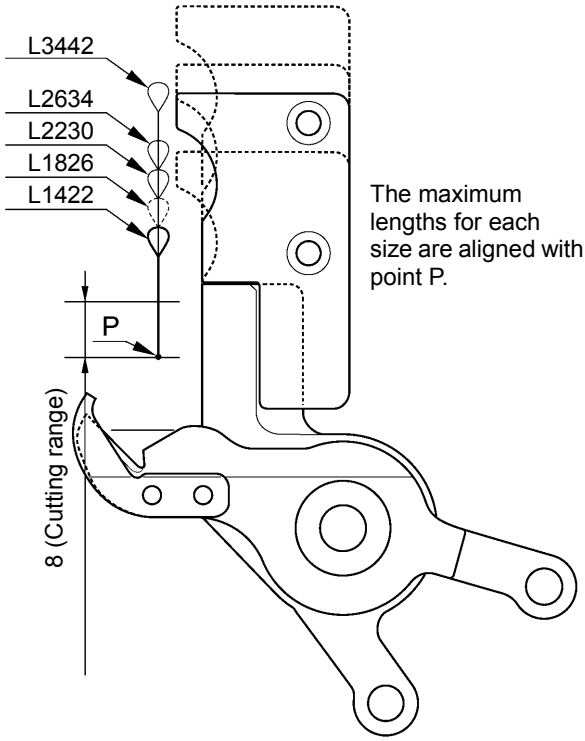


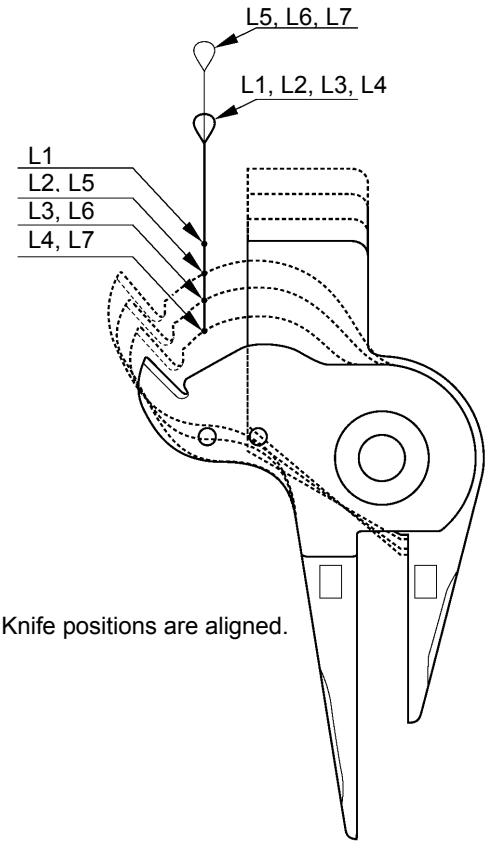
1. Loosen the socket bolt (1).
2. Adjust the installation position of the sub clamp wrist (4) with respect to the article being sewn so that the button clamp (2) moves above the needle plate (3).
3. Once adjustment is complete, securely tighten the socket bolt (1).

7-26-5. Differences from older models

<table>
<tr><th></th><th>RH-9820</th><th>RH-981A</th></tr>
<tr><td>Knife installation position</td><td>1189B
 

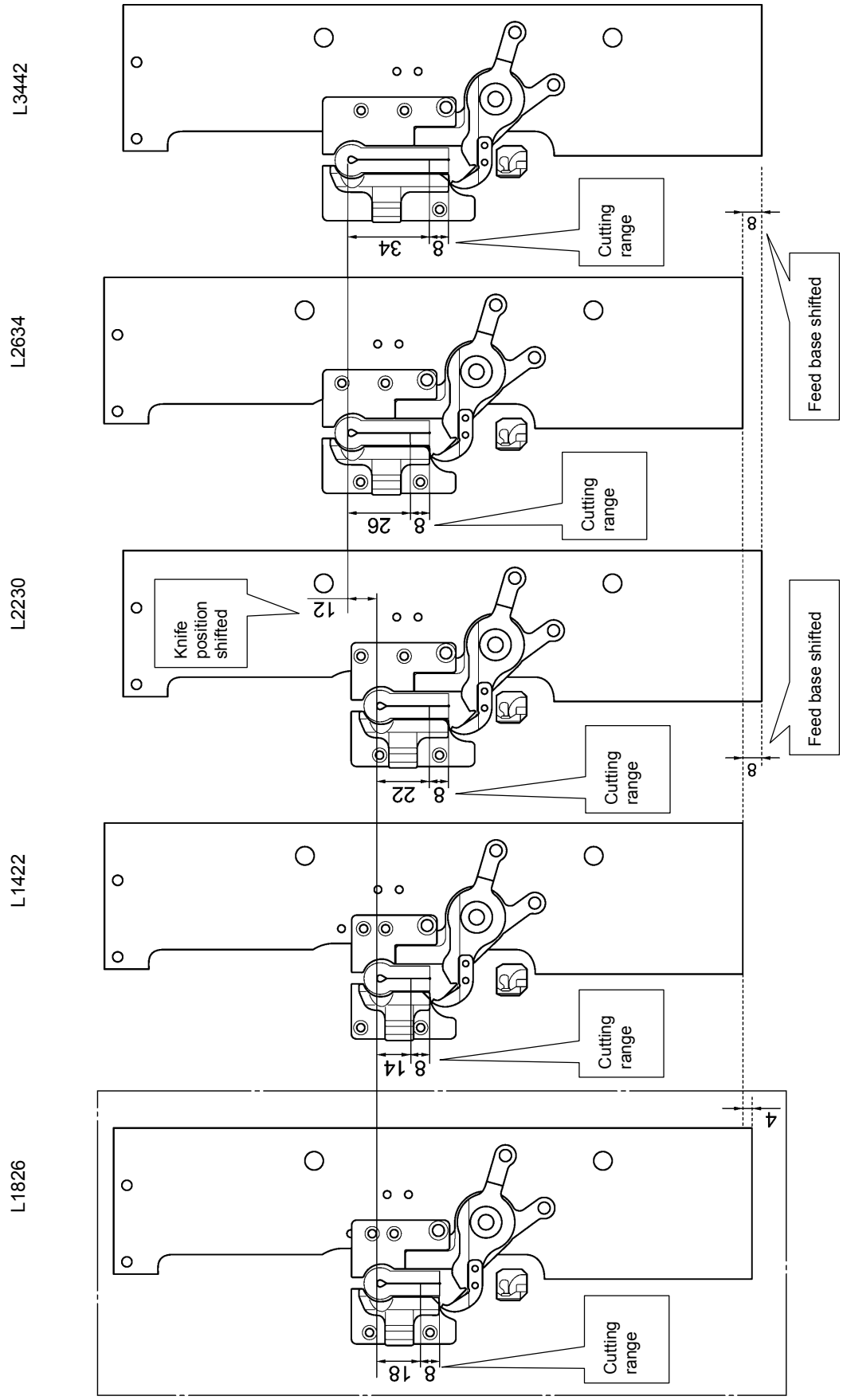
-00,-01
-02: L2634, L3442
-02:L1422,L2230
L1826
(Position when S hammer is being used)
* In order to ensure interchangeability with the RH-981A hammer, install the hammer spacer (SA6800-001) to the hammer mounting bracket when using a S-- hammer. (Refer to “7-16-1. Replacing the knife”.)</td><td>1190B
 

-00,-01
-02: L5, L6, L7
-02: L1, L2, L3, L4
(Position when S hammer is being used)
* Because there is a shift of 10 mm, the S-- hammer is offset.
1192B</td></tr>
<tr><td>Needle plate position viewed from work clamp plate</td><td>1191B
 

The maximum lengths for each size are aligned with point P.
Advantage : The left and right movable knives do not need to be replaced.
Note : The feed base position when the material is set back varies depending on the size.</td><td> 

Knife positions are aligned.
Advantage : The feed base position when the material is set back s the same for all sizes.</td></tr>
<tr><td>L specifications changed (replacement parts)</td><td>・Needle plate L and R
・Work clamp L and R
Total 4 points</td><td>・Needle plate L and R
・Movable knife L and R
・Specification harness
・Work clamp L and R
Total 7 points</td></tr>
<tr><td>Other settings</td><td>Settings for memory switch No. 851 changed</td><td>—</td></tr>
</table>

NOTE:
When the material is set back and when the knife is lowered, the position of the feed base varies depending on L specifications (size).



7-27. Adjusting the gimp trailing length <-02 specifications only>

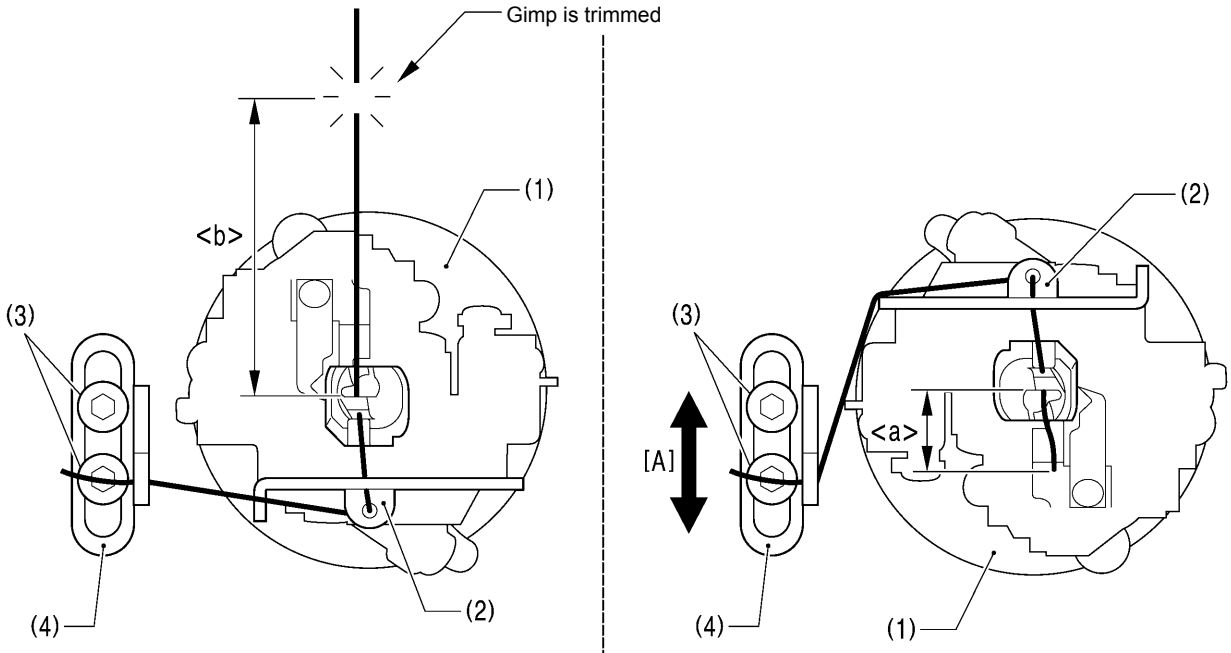
The gimp is pressed against the material by means of the twisting of the first 2 - 3 stitches at the sewing start, and is then pulled out continuously. Because of this, if strong tension is applied to the gimp when the feed base is at the sewing position and the gimp trailing length (<a> in the illustration below) becomes extremely short, the gimp may be pulled out of the stitches.
The gimp should be adjusted to as short a length as possible which will still allow the gimp to be securely wound around the stitches at the sewing start and leave a length protruding from above the stitches.

NOTE: Principle of gimp pulling

When the looper base (1) turns back from 180 degrees to 0 degrees after the gimp has been trimmed, gimp thread guide C-J (2) pulls the gimp to make it come out.

Adjustment of the gimp trailing length is necessary in the following cases.

- When the sewing length has been changed (the gimp is trimmed at the feed base home position, so the length of <b> will change. As a result, the gimp trailing length <a> will also change.)
- When the type of gimp and the gimp tension have been changed (the gimp trailing length <a> will change.)

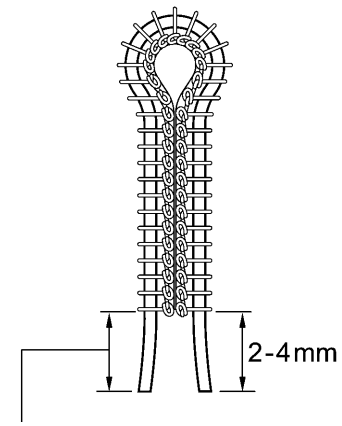


When looper base is turned 180 degrees

When looper base has returned to 0 degrees

(Viewed from directly above)

0547B



0548B

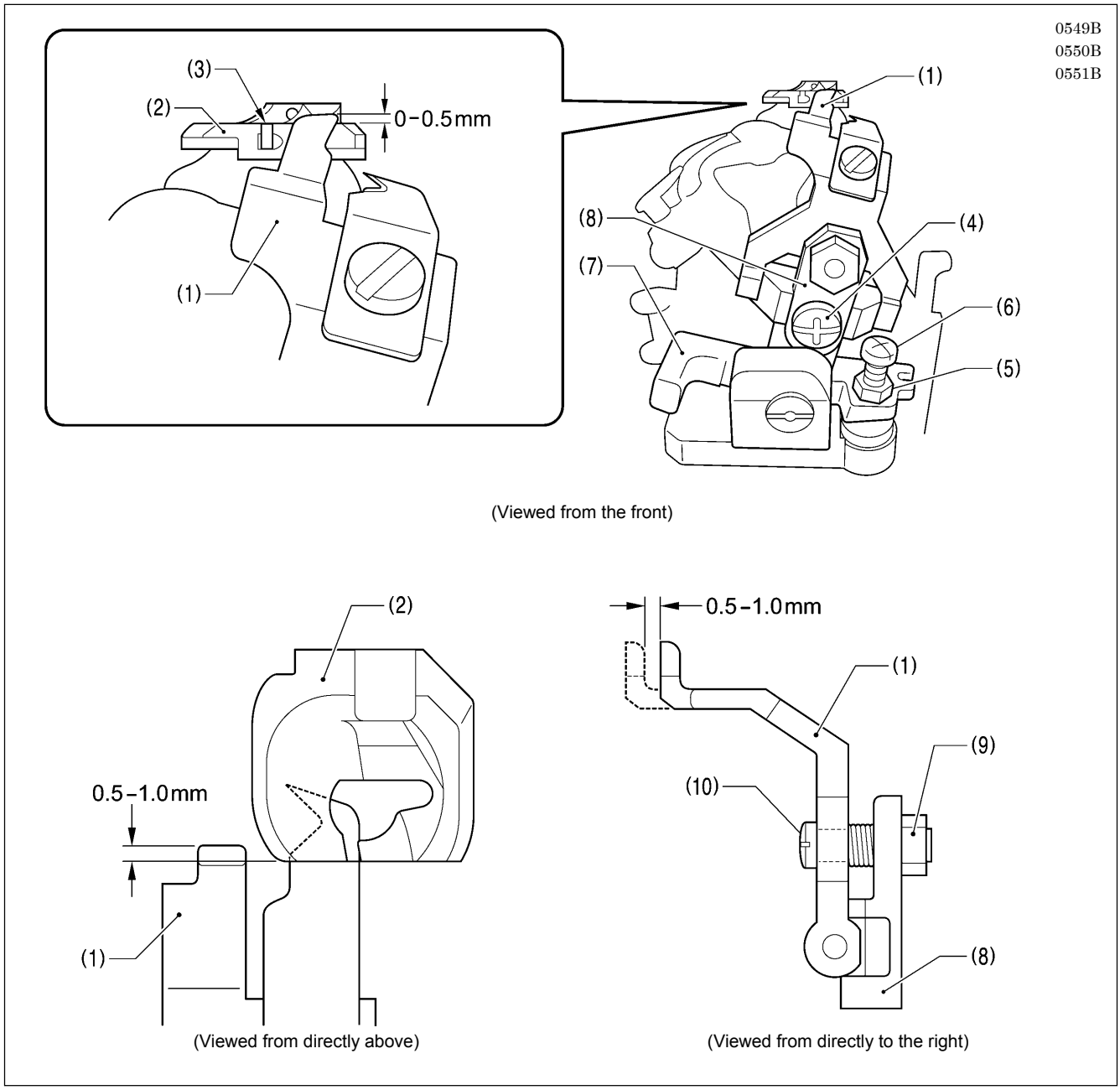
The gimp trailing length at the sewing end is uniform because of thread trimming.

<Adjustment method>

1. Loosen the screw (3).
2. Move gimp thread guide J (4) in the direction of the arrow [A] to adjust so that 2 - 4 mm of the gimp protrudes from the seam at the sewing start.
3. Once adjustment is complete, securely tighten the screw (3).

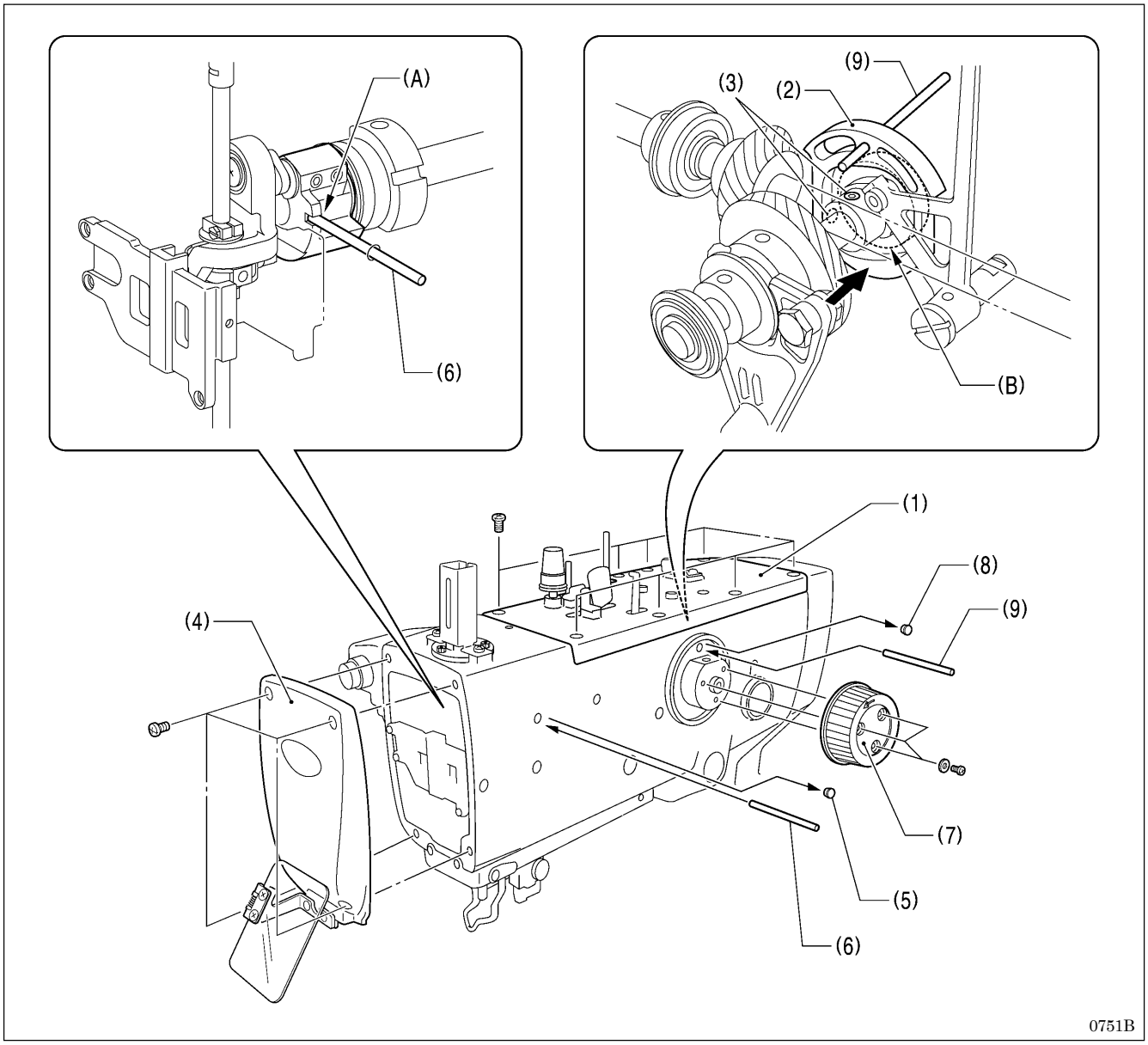
7-28. Adjusting the position of the lower thread presser <-02 specifications only>

Adjust the lower thread presser (1) so that it securely holds the lower thread.



1. Loosen the screw (4) and move the lower thread presser (1) up or down to adjust so that its top projects approximately 0.5 mm from the top of the thread groove (3) in the throat plate (2).
2. Check that the lower thread presser (1) does not cover the groove at the front of the throat plate (2).
   * If the groove is covered, loosen the nut (5) and then turn the screw (6) to adjust.
3. Check that the front of the throat plate (2) and the lower thread presser (1) are overlapping by 0.5 - 1.0 mm after thread trimmer lever bracket B (7) has operated.
   * If adjustment is required, remove the lower thread presser base (8), loosen the nut (9), and then turn the screw (10) to adjust.
4. Once adjustment is complete, tighten the nuts (5) and (9) that were loosened, and install the lower thread presser base (8).

7-29. Adjustment of the phase for the take-up roller cam



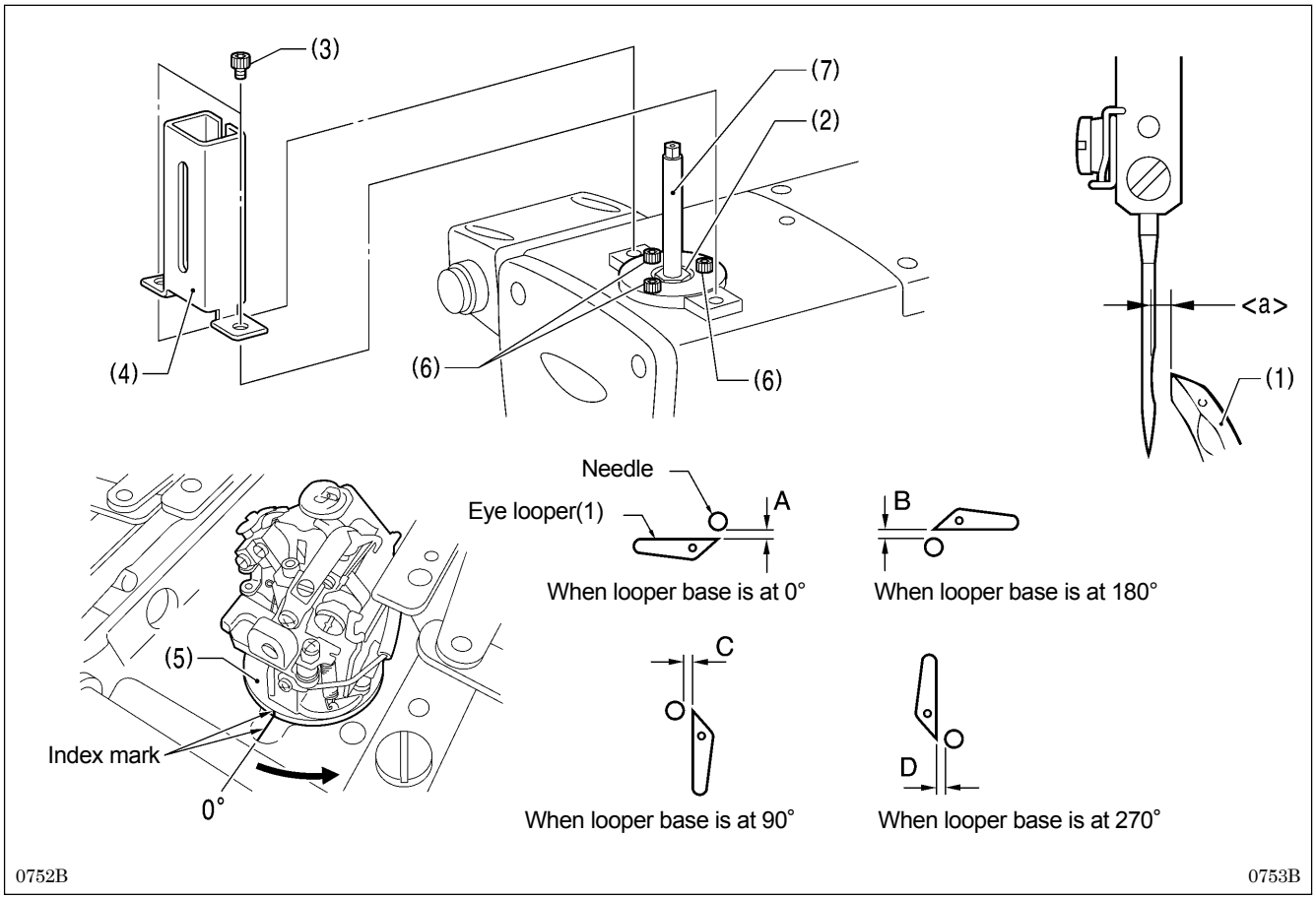
1. Remove the upper cover (1).
2. Loosen the two set screws (3) of the take-up roller cam (2).
3. Remove the face plate (4).
4. Set the sewing machine to the stopped position.
5. Remove the rubber cap (5) and then insert the accessory pin (6).
   * Check that the pin (6) is inserted into the groove (A) in the upper shaft crank at this time so that the upper shaft is secured and cannot be turned.
6. Remove the upper shaft pulley (7).
7. Remove the rubber cap (8), and then insert the accessory pin (9) into the hole in the take-up roller cam (2).
8. Push the take-up roller cam (2) against the edge of the bearing (B), and then tighten one of the set screws (3).
9. Pull out the pins (6) and (9) and then tighten the other set screw (3).
10. Once adjustment is complete, install the rubber cap (8), rubber cap (5), upper shaft pulley (7), face plate (4) and upper cover (1) in that order.

7-30. Adjusting the needle bar and looper base turning center

The turning center for the needle bar and the looper base is accurately adjusted at the time of shipment from the factory.
If the sewing machine has been disassembled (such as when replacing the needle bar gear block unit, needle bar or looper base), adjust the position of needle bar bush U (2) so that the clearance <a> between the needle and the tip of eye looper (1) remains uniform while the looper rotates through 360°.

NOTE:

Before adjusting the position of the needle bar bush U (2), check that there is no play in the needle bar gear block and the looper base. If there is any play, adjust while referring to "6-2. Needle bar mechanism (1): Adjusting the pressure of the needle bar gear block" and "6-8. Looper base mechanism: Looper base pressure adjustment".



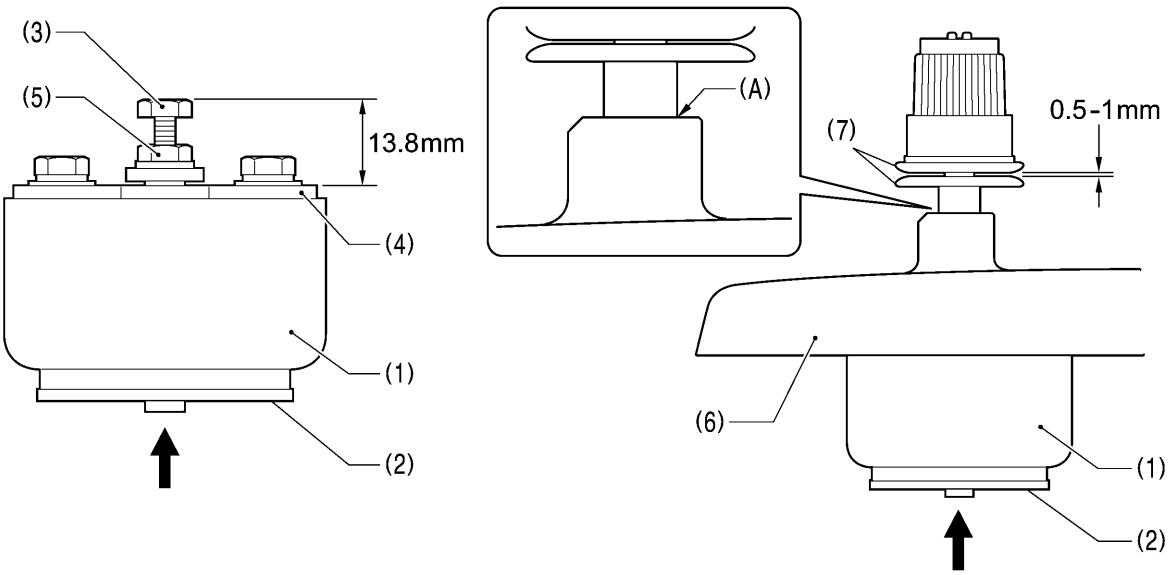
<Adjustment>

1. Loosen the two bolts (3), and then remove the needle bar guard (4).
2. Turn the upper shaft pulley until the tip of the eye looper (1) is aligned with the center of the needle.
3. Turn the looper base (5) by hand and check that the distance A between the tip of eye looper (1) and the needle when the looper base (5) is turned to 0° is the same as the distance B when the looper base is turned to 180°.
4. If there is a large difference between distance A and distance B, loosen the three bolts (6) and move the needle bar (7) gently forward or back to adjust the position of needle bar bush U (2). Tighten the bolts (6), and then repeat the check in step (3).
5. Turn the looper base (5) by hand and check that the distance C between the tip of eye looper (1) and the needle when the looper base (5) is turned to 90° is the same as the distance D when the looper base is turned to 270°.
6. If there is a large difference between distance C and distance D, loosen the three bolts (6) and move the needle bar (7) gently to the left or right to adjust the position of needle bar bush U (2). Tighten the bolts (6), and then repeat the check in step (5).
7. Carry out the check in step 3 once more.

NOTE:

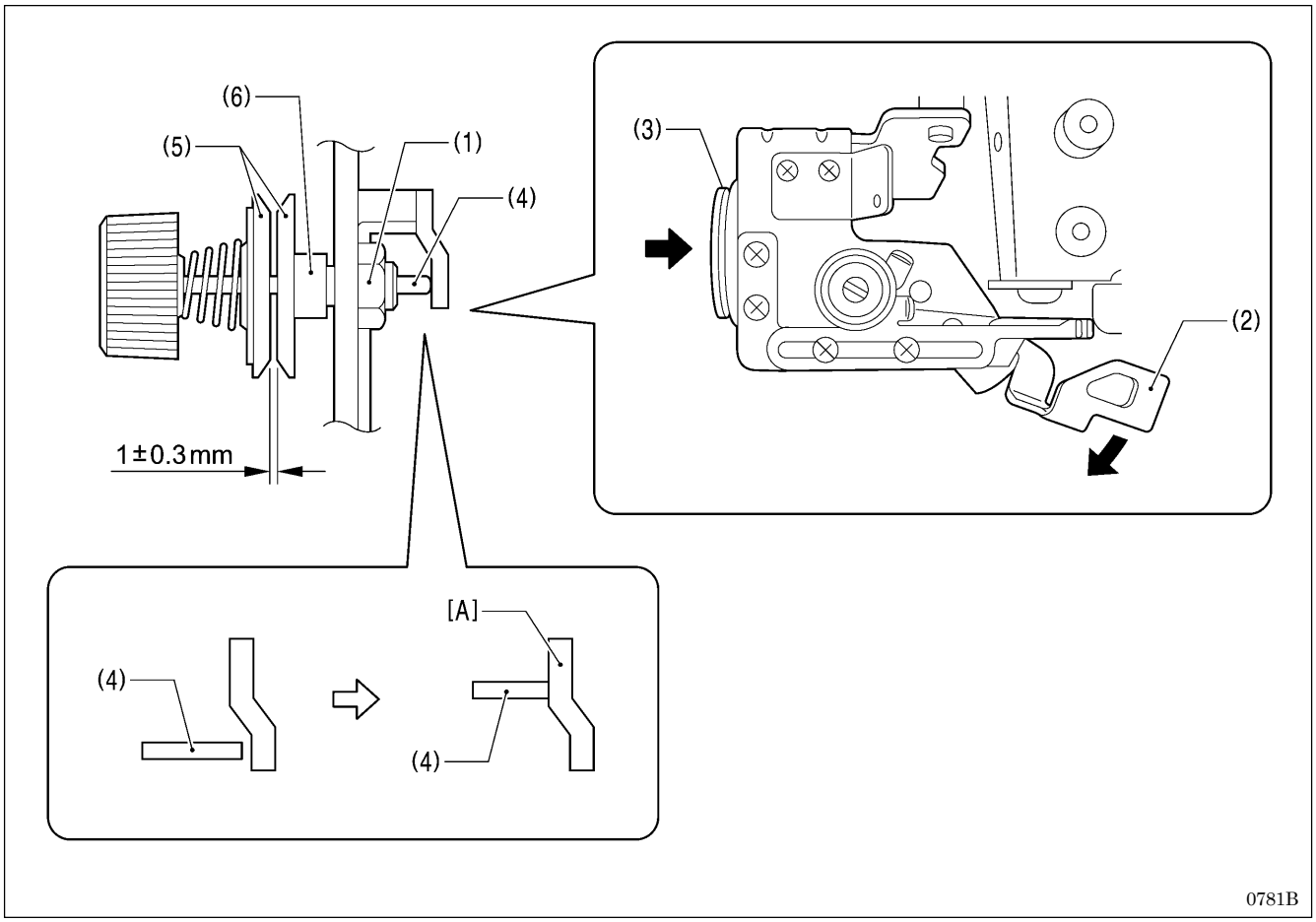
- Once adjustment is finished, turn the upper shaft pulley and check that the needle bar moves gently up and down.
- If a sheet of paper is placed under the needle and the needle drop position is adjusted so that the needle makes a single hole in the paper, the distance <a> between the needle and the tip of eye looper (1) will still not be uniform.

7-31. Adjusting the upper thread loosening amount



1. With the plunger (2) of the upper thread tension release solenoid (1) pushed all the way in, loosen the nut (5) and turn the bolt (3) to adjust so that the clearance between the end of the bolt (3) and the solenoid setting plate (4) is 13.8 mm.
2. With the upper thread tension release solenoid (1) installed to the upper cover (6), check that the opening amount for the tension discs (7) is 0.5 - 1 mm when the plunger (2) is pushed all the way in.
   * Section (A) should be sealed at this time.

7-32. Adjusting the lower thread loosening amount

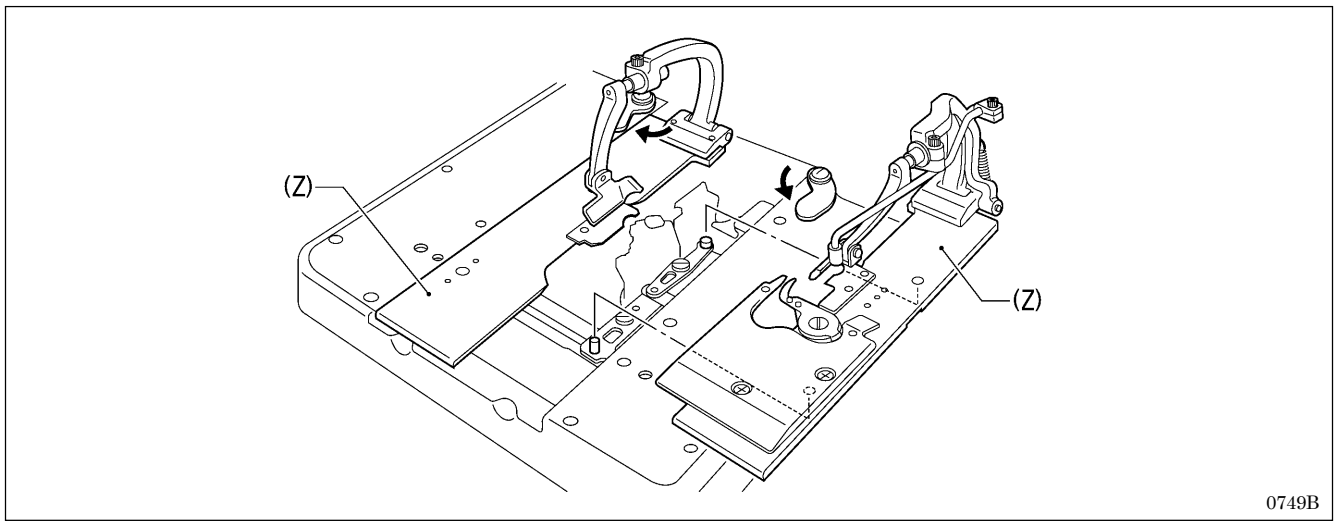


1. Loosen the nut (1).
2. Turn the lower thread release plate (2) by hand or push the plunger (3) of the tension release solenoid from the back to turn the lower thread release plate (2) until the tension release pin (4) is sitting on stepped part [A].
3. Turn the tension stud D (6) to adjust the height so that the opening amount for the tension discs (5) is 1 ± 0.3 mm at this time.
4. Tighten the nut (1).

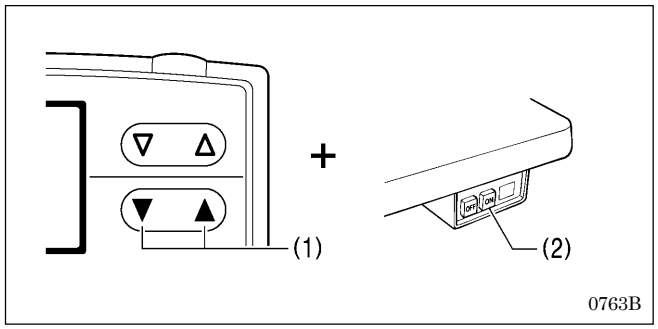
7-33. Adjusting the looper base home position

NOTE:

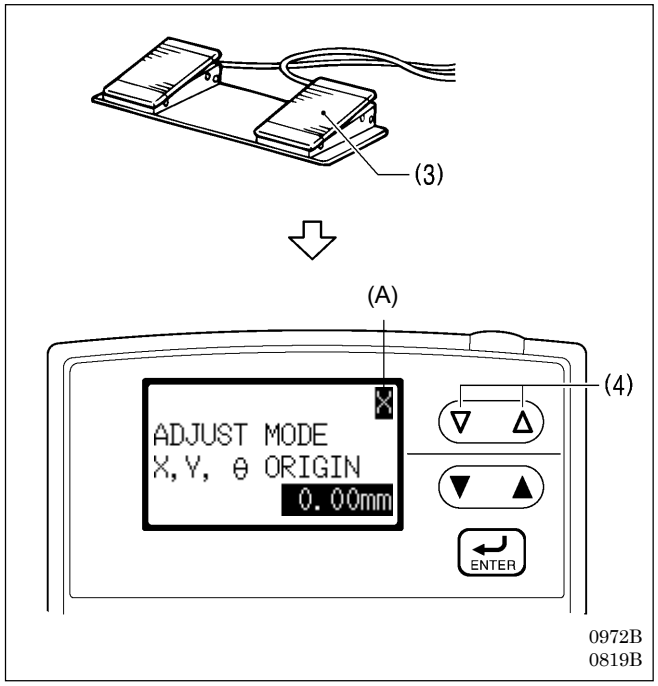
Before carrying out this adjustment, check that the adjustments in “6-9. Needle bar rocking mechanism: Belt tension adjustment for driving looper belt” have been carried out correctly.



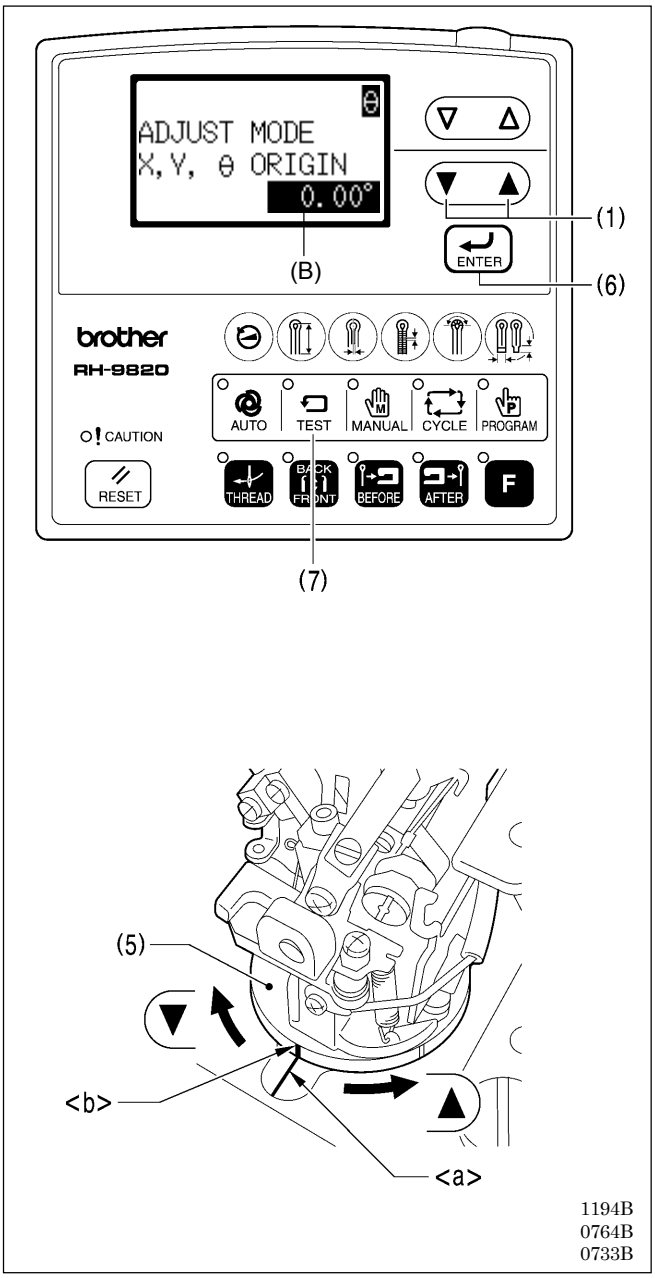
1. Remove the left and right work clamp plates (Z).



2. While holding down the ▲ and ▼ keys (1), push the POWER switch at the ON side (2).



3. Press the start switch (3).
   The motors will carry out home position detection, and then the sewing machine will switch to home position adjustment mode.
   * At this time, “X” will appear in the display (A).
4. Press the △ or ▽ key (4) to change the display (A) to “θ”.
   * When “θ” is displayed, the X and Y feed motors will be turned off, so that the feed base can be moved by hand.

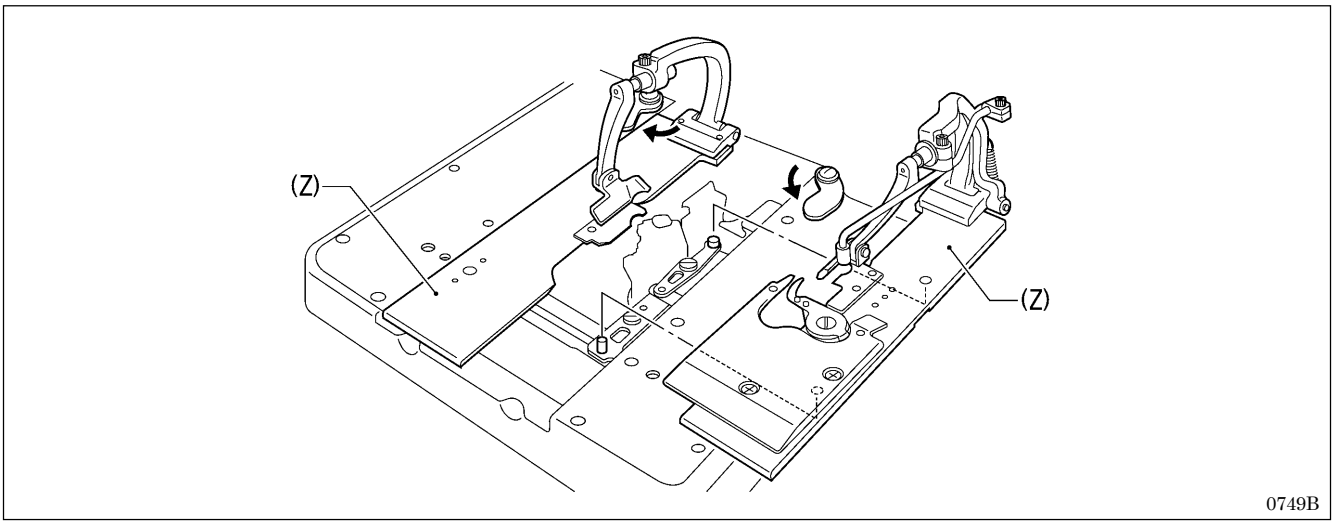


5. Press the ▲ or ▼ key (1) to change the offset value (B).
   The looper base (5) will move as the keys are pressed. Do this until the looper base reference line (0°) <b> is aligned with the bed reference line <a>.
   * The setting range is -12.86 ° - +12.86° (in units of 0.64°).
6. Press the ENTER key (6).
   The home position detection operation will be carried out, and the offset value (B) will be saved.
   NOTE:
   If you continue to the next step without pressing the ENTER key (6), the offset value will not be changed.
7. Check that the bed reference line <a> and the looper base reference line (0°) <b> are aligned.
   * If they are not aligned, repeat steps 5 and 6 until they are aligned.
8. Press the TEST key (7).
   Home position adjustment mode will end and the sewing machine will return to home position standby.

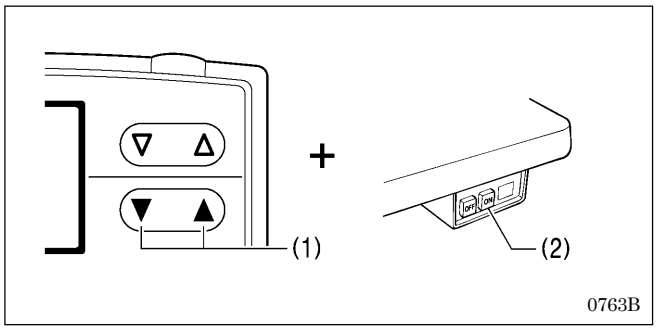
7-34. Adjusting the feed base X home position and Y home position

NOTE:

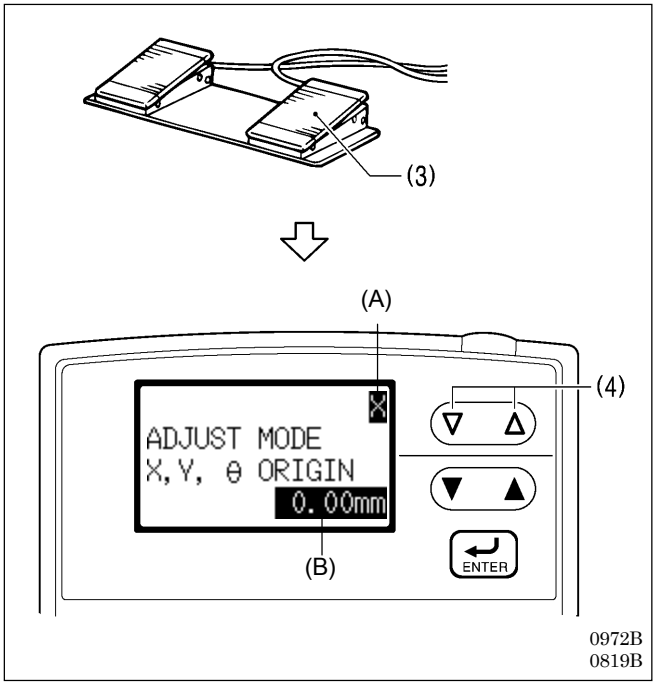
* Before adjusting the X home position, check that the adjustment in “6-16. X feed mechanism: Standard installation position for motor unit (idle gear adjustment)” has been carried out correctly.
* Before adjusting the Y home position, check that the adjustment in “6-7. Y feed mechanism: Standard installation of motor unit” has been carried out correctly.



1. Remove the left and right work clamp plates (Z).



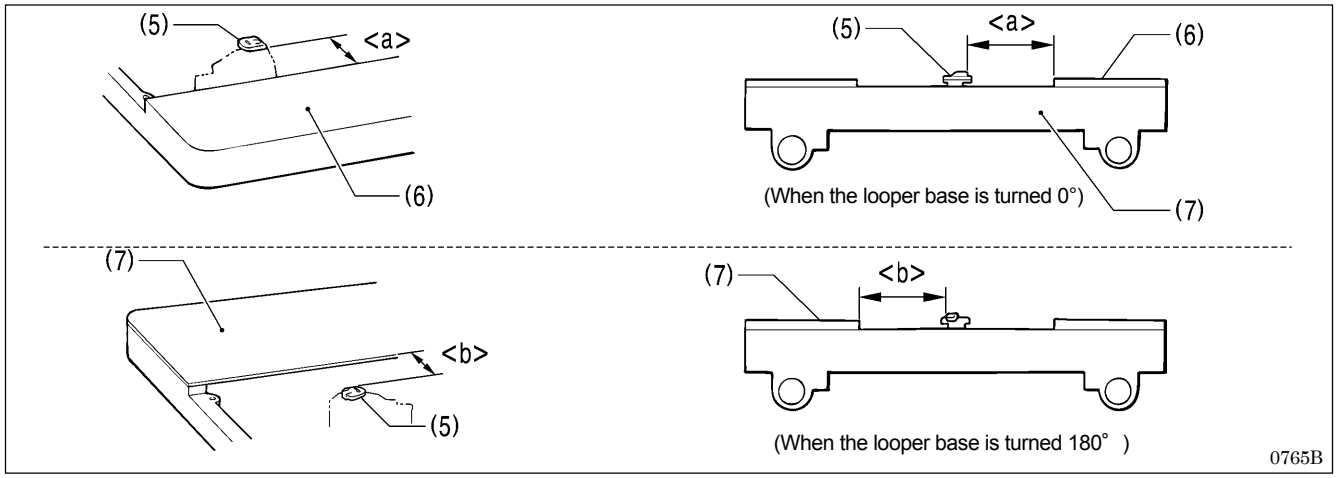
2. While holding down the ▲ and ▼ keys (1), push the POWER switch at the ON side (2).



3. Press the start switch (3).
   The motors will carry out home position detection, and then the sewing machine will switch to home position adjustment mode.
   * At this time, “X” will appear in the display (A).
4. Press the △ or ▽ key (4) as necessary to change the display (A) so that “Y” appears.
   * “X” or “Y” should be displayed while this adjustment is carried out.

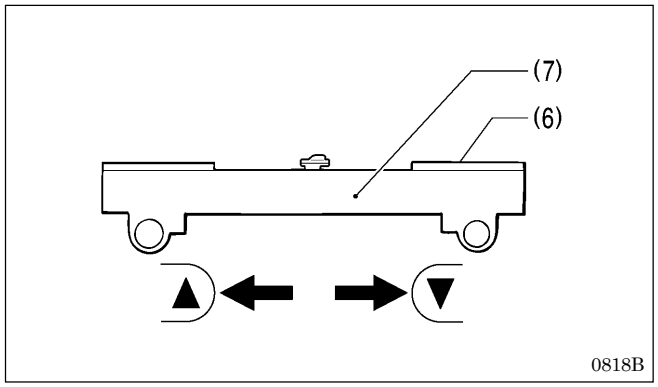
   [When “X” is displayed]
   The motor (θ) for driving the looper base will be turned off, so that the looper base and needle bar gear block can be moved by hand.
   [When “Y” is displayed]
   The X-feed motor, Y-feed motor and motor (θ) for driving the looper base will all be turned on, so that the looper base and needle bar gear block cannot be moved by hand.

5. **[Adjusting the X home position]**

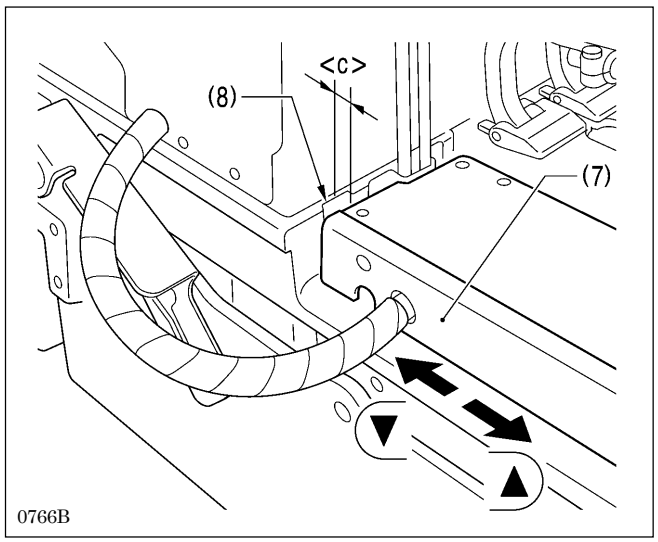


Carry out the following adjustments so that the distances <a> (when the looper base is turned 0°) and <b> (when the looper base is turned 180°) between the end of the projection on the throat plate (5) and the sides of feed base cover R (6) and feed base cover L (7) on the feed base are equal.

5-1. Turn the looper base by hand and measure the distances <a> and <b>.



5-2. When you press the ▲ or ▼ key (1) to change the offset value (B), the feed base (7) will move as the keys are pressed. Repeat this step until distances <a> and <b> are equal.
   * The setting range is -2.00 - +2.00 mm (in units of 0.05 mm).



[Adjusting the Y home position]

Carry out the following adjustments so that the distance <c> between the rear of the feed base (7) and the hollow in the bed (8) is 18 ± 0.2 mm.

5-3. When you press the ▲ or ▼ key (1) to change the offset value (B), the feed base (7) will move as the keys are pressed.
   * The setting range is -2.00 - +2.00 mm (in units of 0.05 mm).

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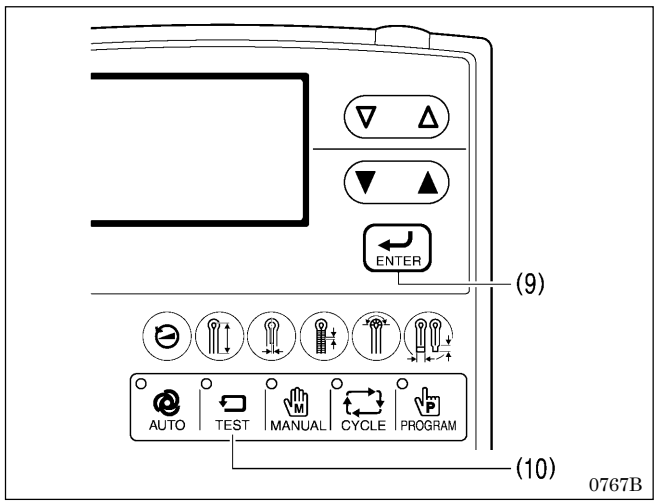
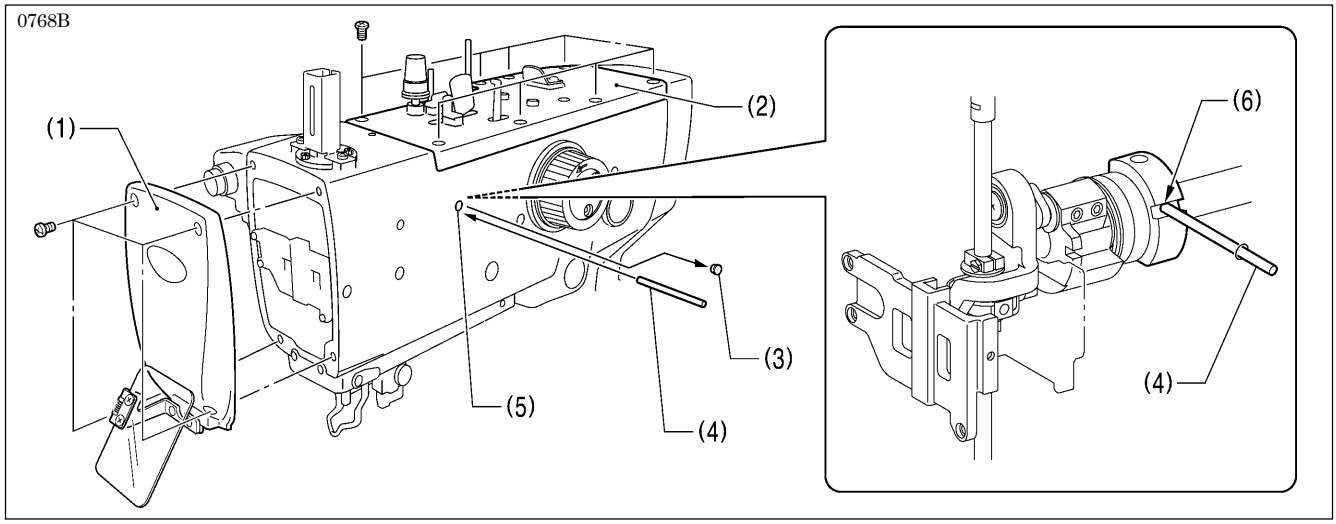


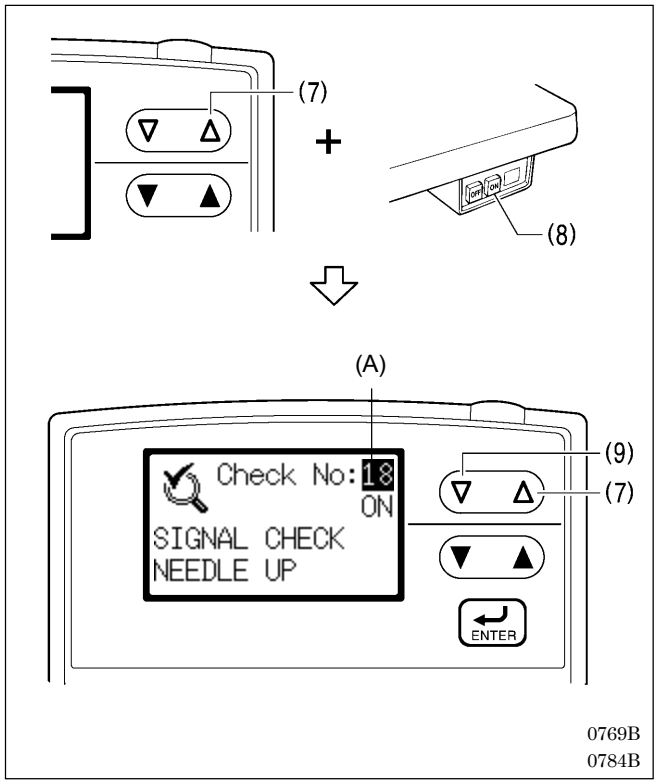
6. Press the ENTER key (9).
   The home position detection operation will be carried out, and the offset value (B) will be saved.
   NOTE:
   If you continue to the next step without pressing the ENTER key (9), the offset value will not be changed.
7. Check the results of the adjustments.
   * If the adjustments are not correct, repeat steps 5 and 6.
   * To continue with another adjustment, repeat the adjustment procedure from step 4.
8. Press the TEST key (10).
   Home position adjustment mode will end and the sewing machine will return to home position standby.

7-35. Adjusting the needle up signal home position for the upper shaft and upper shaft motor

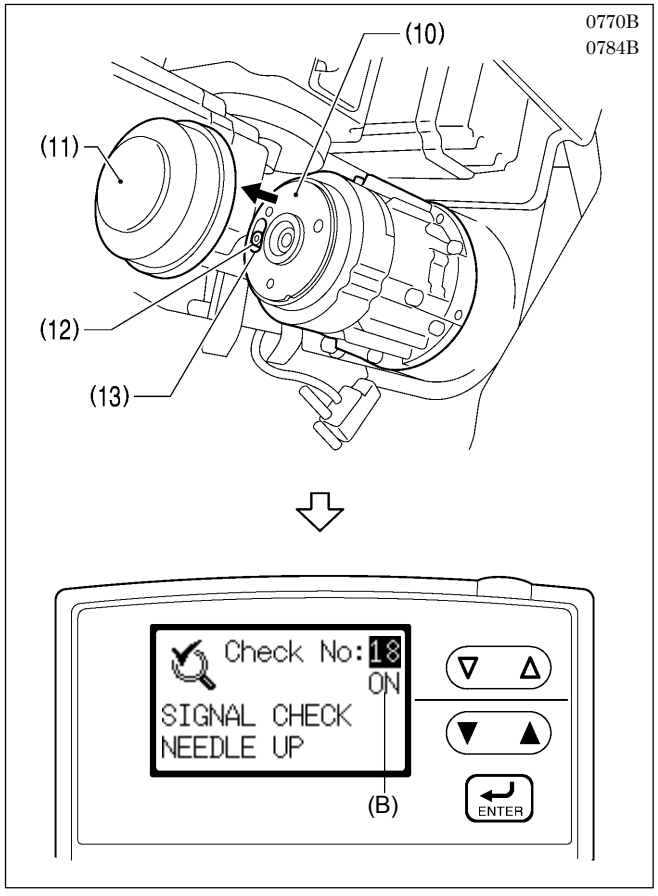
NOTE:
- Before carrying out this adjustment, check that the adjustments in “6-18. Upper shaft motor mechanism: Standard installation of upper shaft motor unit and belt tension adjustment)” and “6-10. Lower shaft mechanism: Belt (upper shaft - lower shaft) installation and belt tension adjustment” have been carried out correctly.
- After carrying out this adjustment, be sure to carry out the procedure in “7-36. Adjusting the upper shaft stop position”.



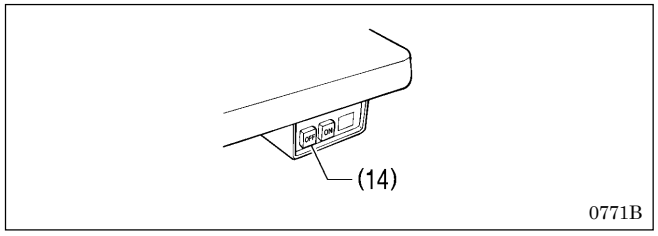
1. Remove the face plate (1) and the upper cover (2).
2. Remove the rubber cap (3).
3. Insert the accessory pin (4) into the groove (6) in the balance collar from the hole (5) in the arm to stop the upper shaft from turning. (Upper shaft: 22.5° position)



4. While holding down the △ key (7), push the POWER switch at the ON side (8).
   The mode will switch to input checking mode.
5. Press the △ key (7) or ▽ key (9) to set the checking signal (A) to “18 (needle up signal)”.



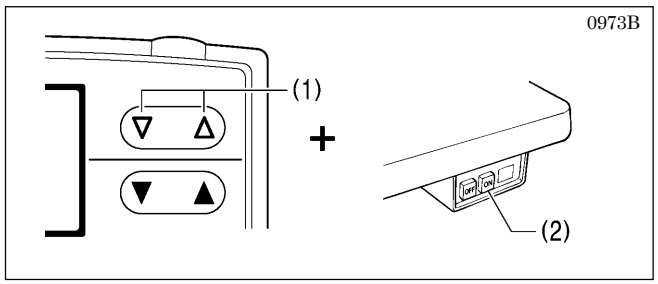
6. Tilt back the machine head and remove the motor cover (11) from the upper shaft motor (10).
7. Loosen the bolt (12) for the needle up magnet of the motor by 90° only.
   NOTE:
   Do not loosen the screw by more than 90°. If it is loosened too much, the parts may touch the P. C. board and damage may result.
8. Move the position of the slot (13) to the point where the panel display (B) switches from “ON” to “OFF”, and tighten the bolt (12) at that point.



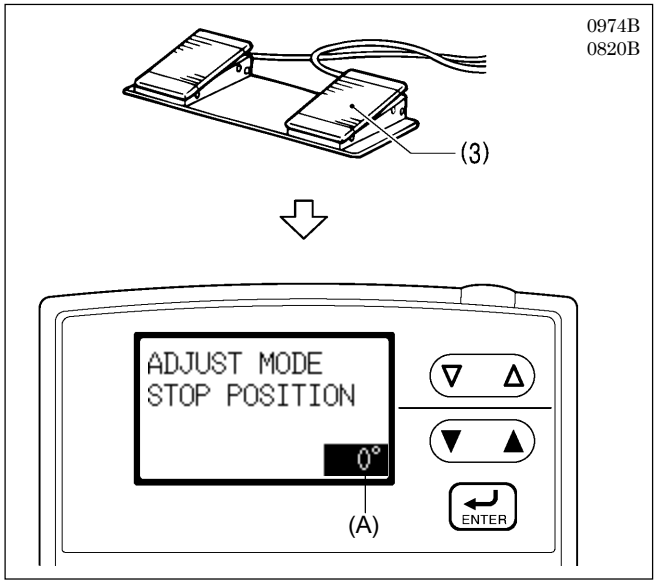
9. Press the POWER switch at the OFF side (14) to turn off the power.

7-36. Adjusting the upper shaft stop position

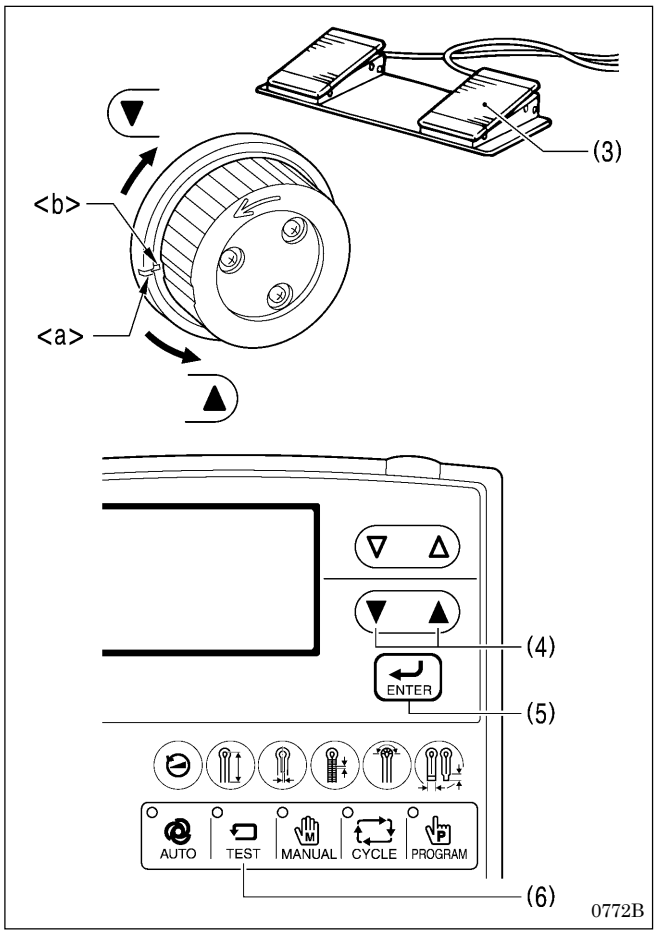
Adjust the stop position so that upper thread loops are maintained when the upper thread is trimmed.



1. While holding down the △ and ▽ keys (1), push the POWER switch at the ON side (2).



2. Press the start switch (3).
   The motors will carry out home position detection, and then the work clamp will be lowered to the ready position and the sewing machine will switch to upper shaft stop position adjustment mode.
   * In upper shaft stop position adjustment mode, the offset value (A) is displayed.



3. Press the start switch (3) again until the upper shaft begins to move.
4. After the upper shaft stops, check that the arm reference line <a> and the upper shaft pulley reference line <b> are aligned.

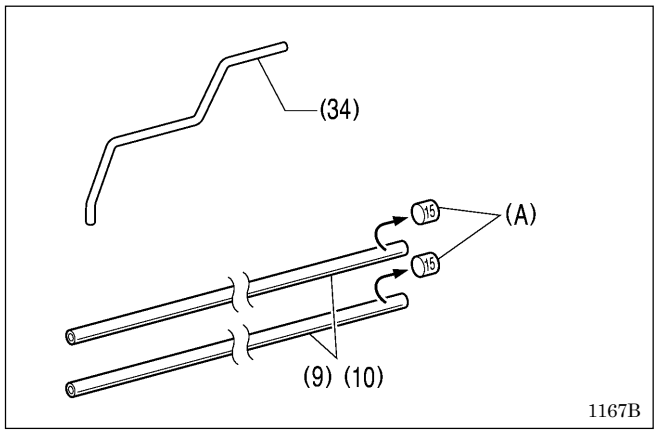
   [If they are not aligned]
   Press the ▲ or ▼ key (4) to change the offset value (A), and then repeat step 3.
   * The setting range is -5 ° - +10° (in units of 1°).

   [If they are aligned]
   Continue to the next step.

5. Press the ENTER key (5).
   The offset value will be stored.
   NOTE:
   If you continue to the next step without pressing the ENTER key (5), the offset value will not be changed.
6. Press the TEST key (6).
   Upper shaft stop position adjustment mode will end and the sewing machine will return to home position standby.

7-37. Installing (replacing) the sub clamp on the left side

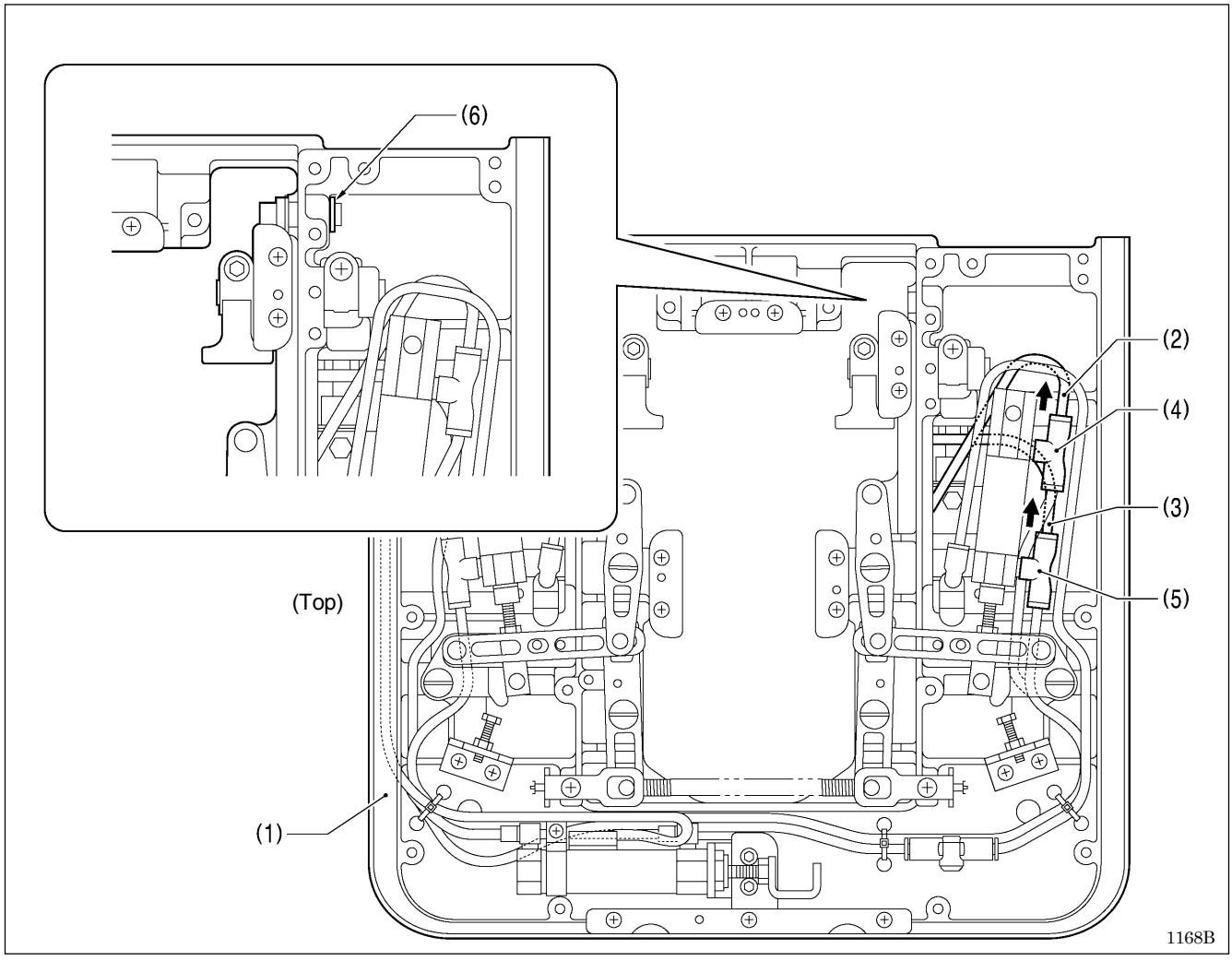
If necessary, the sub clamp can be removed from the right side and can be installed on the left side instead. In this case, the following optional parts are required.



To install the sub clamp on the left side, first have the following option parts ready.

Ref. No.	Code	Qty.	Part name
(34)	SA7152001	1	Sub clamp wrist L
(9) (10)	SA5683001	2	Air hose (outer dia. 4 mm, inner dia. 2.5 mm, length 750 mm)

* Be sure to remove the stickers (A) before using the air hoses (9) and (10).



1. Stop the air and then bleed the air. (Refer to “3-16. Adjusting the air pressure” in the instruction manual.)
2. Remove the feed base unit (1) from the bed. (Refer to “5-3. Feed mechanism”.)
3. Disconnect the air tubes (2) and (3) from the joints (4) and (5).
4. Remove retaining ring C (6).

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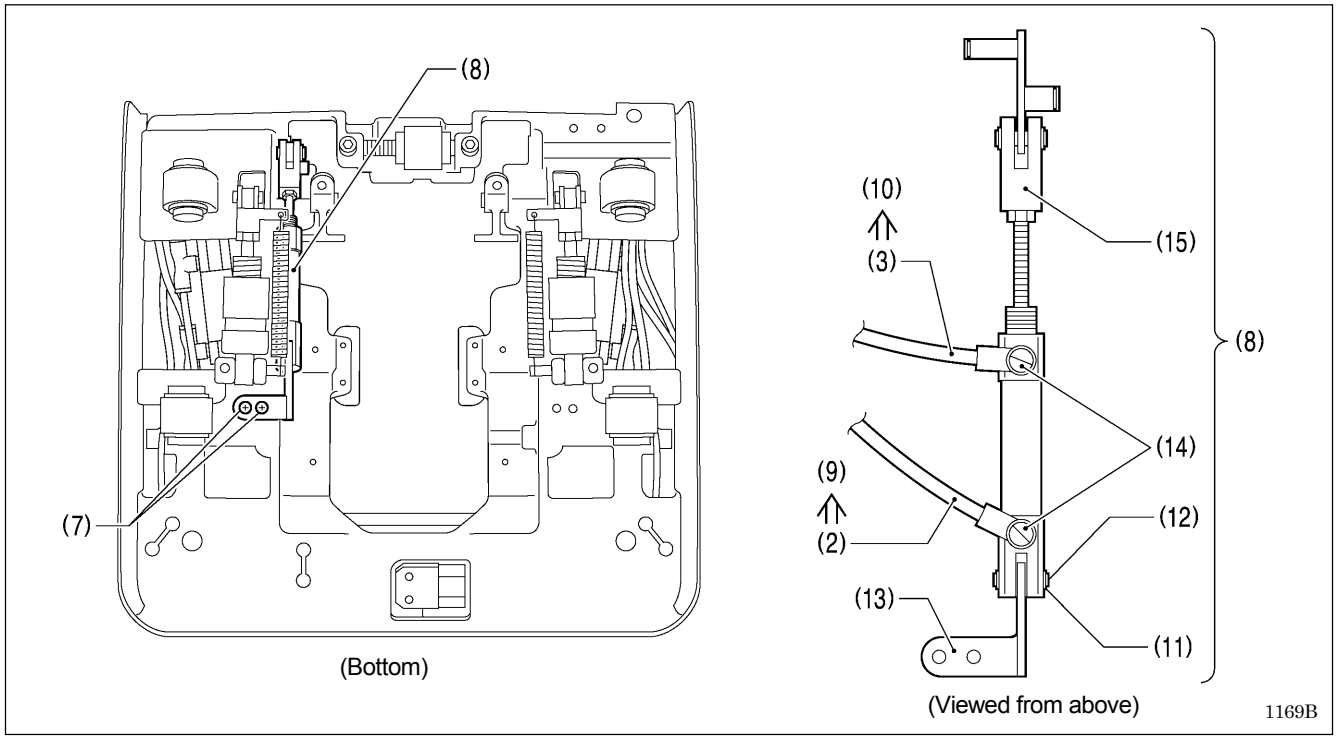
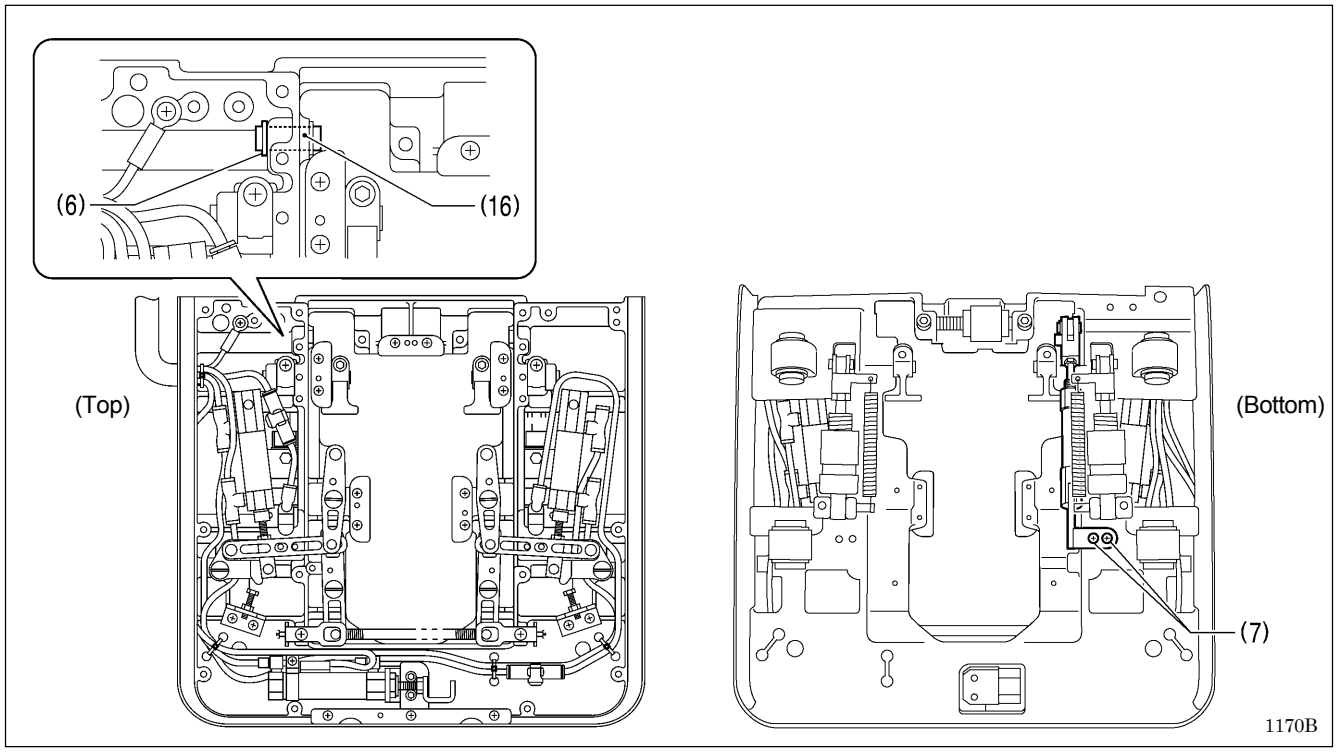
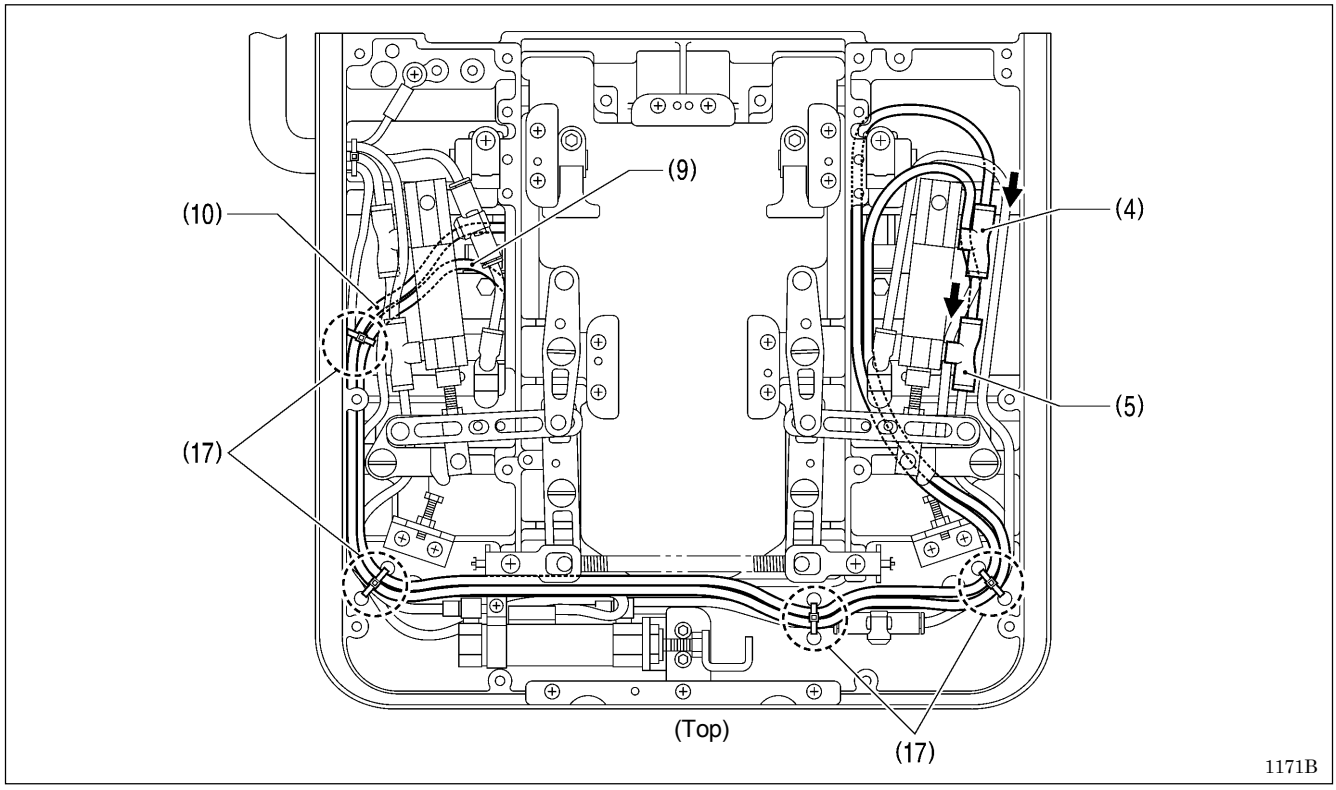


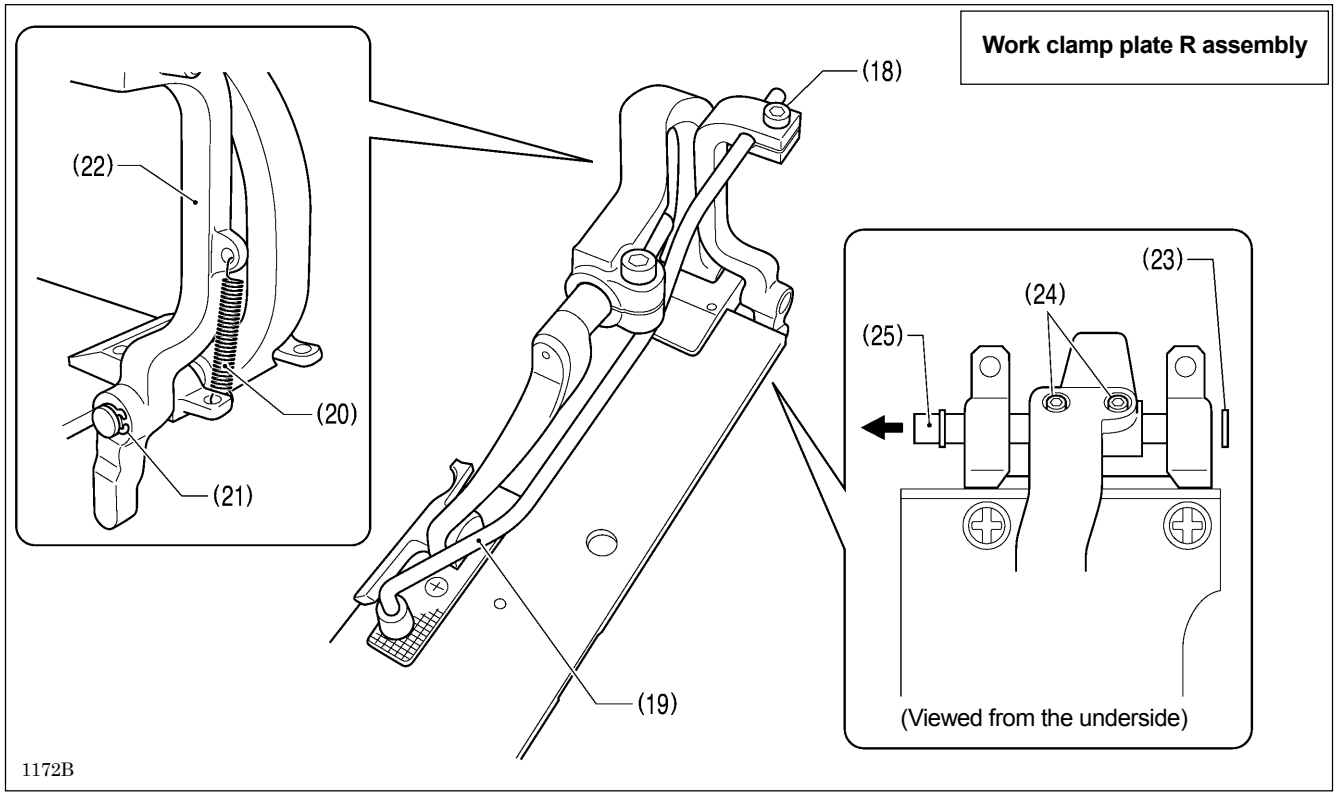
5. Remove the two screws (7), and then remove the sub clamp cylinder assembly (8).
6. Replace the air hoses (2) and (3) with the optional air hoses (9) and (10).
7. Remove retaining ring C (11) and pull out the shaft (12).
8. Insert the shaft (12) into the sub clamp S holder (13) in the direction shown in the illustration, and then install retaining ring C (11).
9. Set the joint (14) and the cylinder rod (15) so that they are facing as shown in the illustration.



10. Insert the shaft (16) of the sub clamp connecting rod into the hole in the feed base, and then install retaining ring C (6).
11. Tighten the two screws (7).



12. Route the tubes as shown in the illustration, and then connect the air hose (9) to the joint (4) and the air hose (10) to the joint (5).
13. Secure the air hoses (9) and (10) in four places using the four bead bands (17) as shown in the illustration.



14. Loosen the socket bolt (18), and then remove the sub clamp wrist (19).
15. Remove the spring (20).
16. Remove retaining ring C (21), and then remove the sub clamp arm (22).
17. Remove retaining ring C (23), loosen the two set screws (24), and then remove clamp support shaft J (25) in the direction of the arrow.

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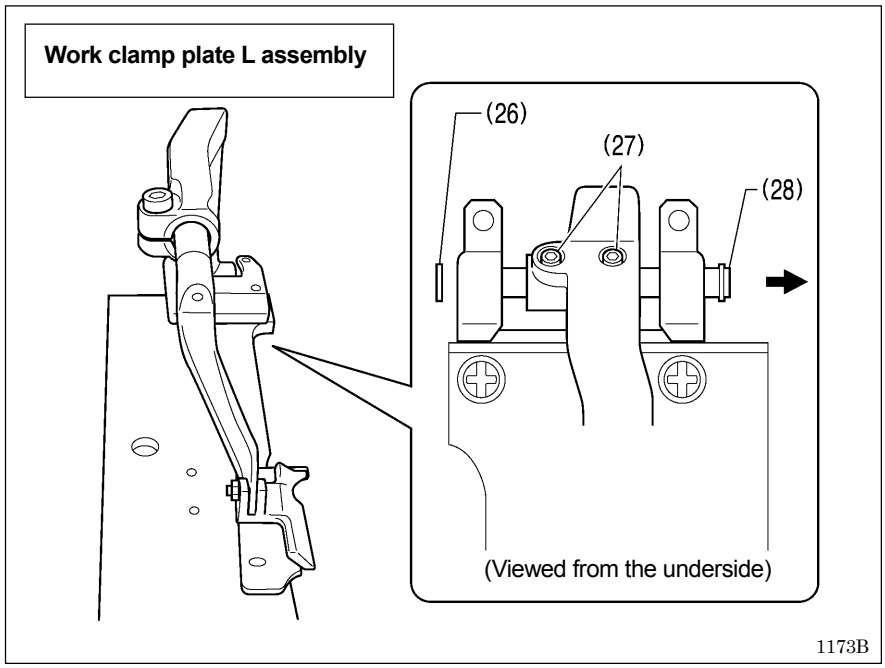
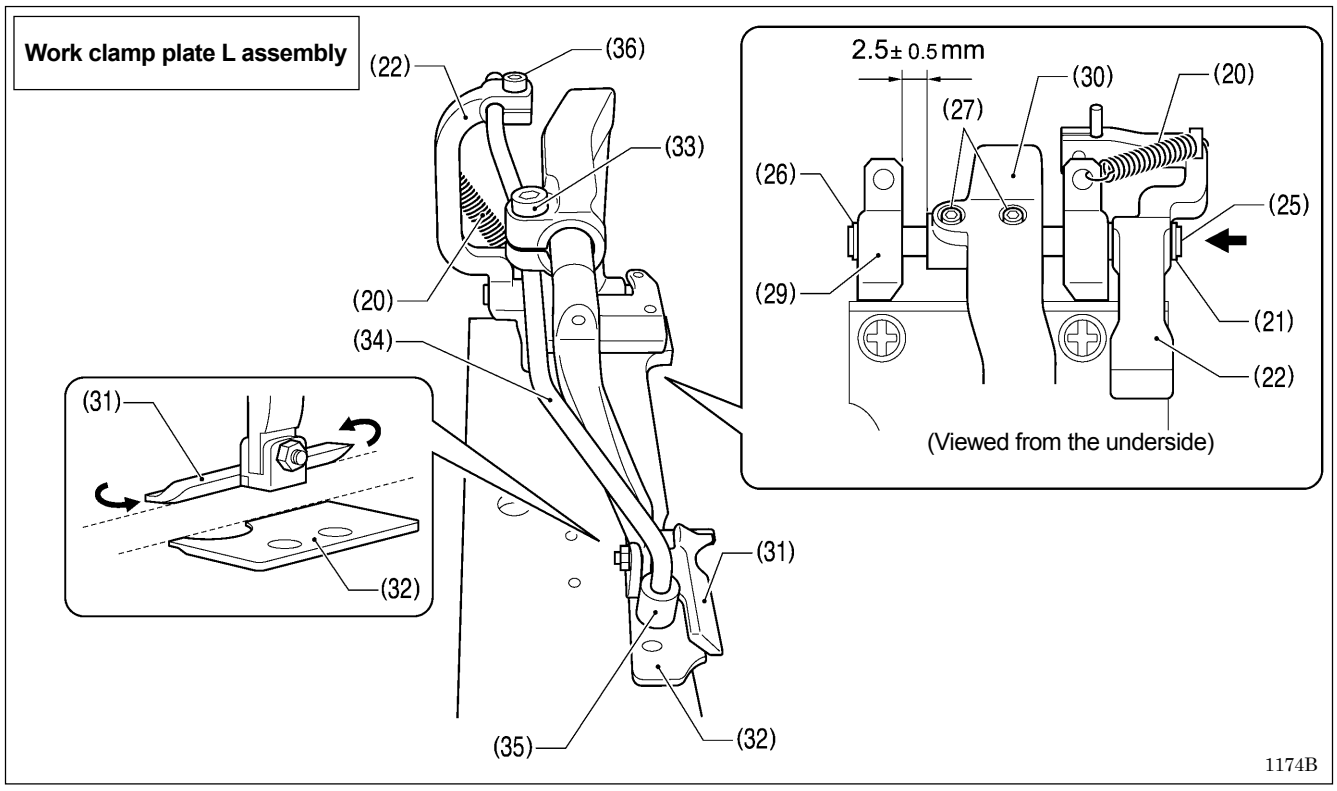
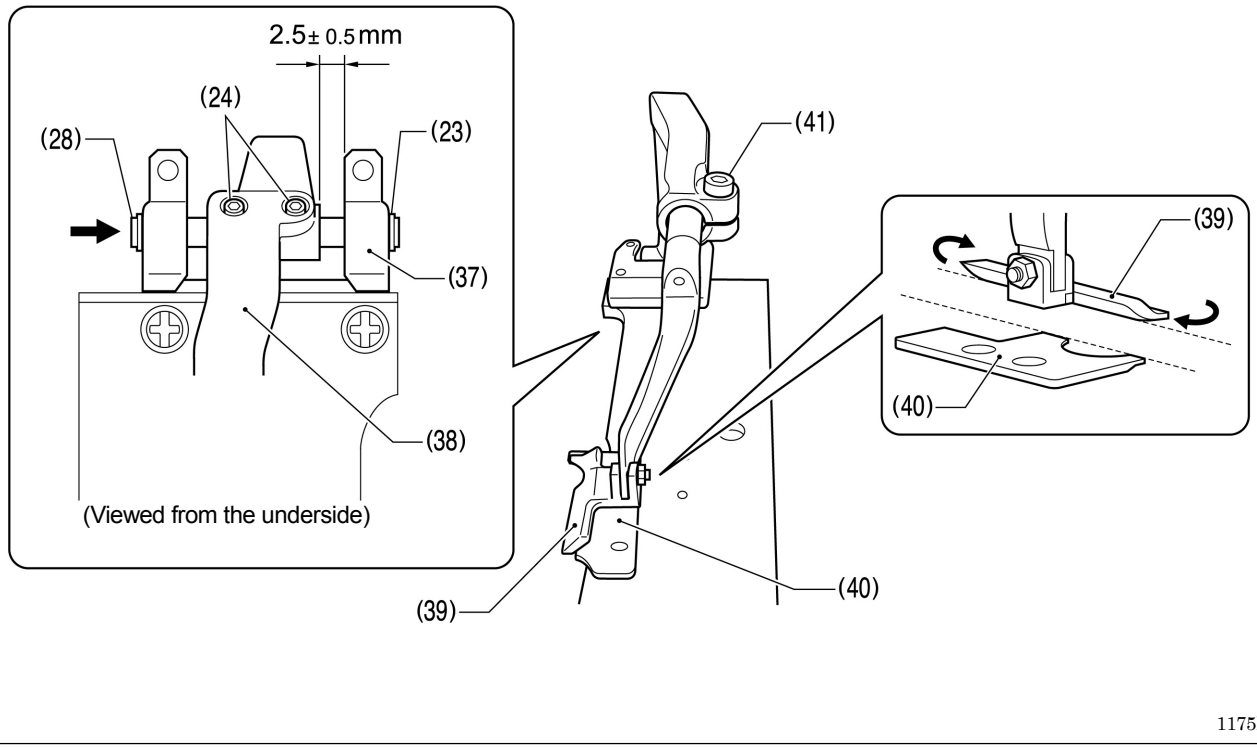


18. Remove retaining ring C (26), loosen the two set screws (27), and then remove the clamp support shaft (28) in the direction of the arrow.



19. Insert clamp support shaft J (25) in the direction of the arrow, and then install retaining ring C (26).
20. Place the sub clamp arm (22) onto clamp support shaft J (25) as shown in the illustration, and then install retaining ring C (21).
21. Tighten the two set screws (27) so that the clearance between the clamp shaft holder (29) and clamp lever L (30) is 2.5 ± 0.5 mm.
    * Check that the sides of work clamp L (31) and needle plate L (32) are aligned at this time. If they are not aligned, loosen the socket bolt (33) and adjust.
22. Install the button clamp (35) to the optional sub clamp wrist L (34).
23. Install sub clamp wrist L (34) to the sub clamp arm (22), and then secure it by tightening the socket bolt (36). (Refer to “7-26-4. Adjusting the position of the sub clamp”.)
24. Install the spring (20) to the sub clamp arm (22) and the clamp shaft holder (29).

Work clamp plate R assembly



25. Insert the clamp support shaft (28) in the direction of the arrow, and then install retaining ring C (23).
26. Tighten the two set screws (24) so that the clearance between the clamp shaft holder (37) and clamp lever R (38) is 2.5 ± 0.5 mm.
    * Check that the sides of work clamp R (39) and needle plate R (40) are aligned at this time. If they are not aligned, loosen the socket bolt (41) and adjust.

8. ELECTRICAL MECHANISM

⚠ DANGER

Wait at least 5 minutes after turning off the power switch and disconnecting the power cord from the wall outlet before opening the cover of the control box. Touching areas where high voltages are present can result in severe injury.

8-1. Precautions while carrying out adjustments

Be sure to note the following cautions when opening the control box to carry out inspections and adjustments.

Electric shocks
High voltages can remain in large-capacity capacitors for up to 5 minutes in some circumstances, even when the power has been turned off. Accordingly, wait at least 5 minutes after turning off the power before carrying out the following operations.

- Opening and closing the control box
- Replacing fuses
- Inserting and disconnecting connectors
- Measuring resistance values
- Any other tasks that may involve touching components inside the control box

Some inspection items require the control box to be open when the power is turned on and voltages are measured.
At such times, be extremely careful never to touch anywhere other than the specified locations. In addition, note that high voltages may remain for up to 5 minutes after the power is turned off.

Injury
Be careful not to touch metallic objects such as the heat sink and cover when connecting and disconnecting connectors and making measurements.

8-2. Inside the control box and operation panel structure

Main P.C. board
Secured to the side. This is the P.C. board that controls sewing machine operation.

PMD P.C. board
Secured to the base plate. This P.C. board drives the pulse motors and solenoids.

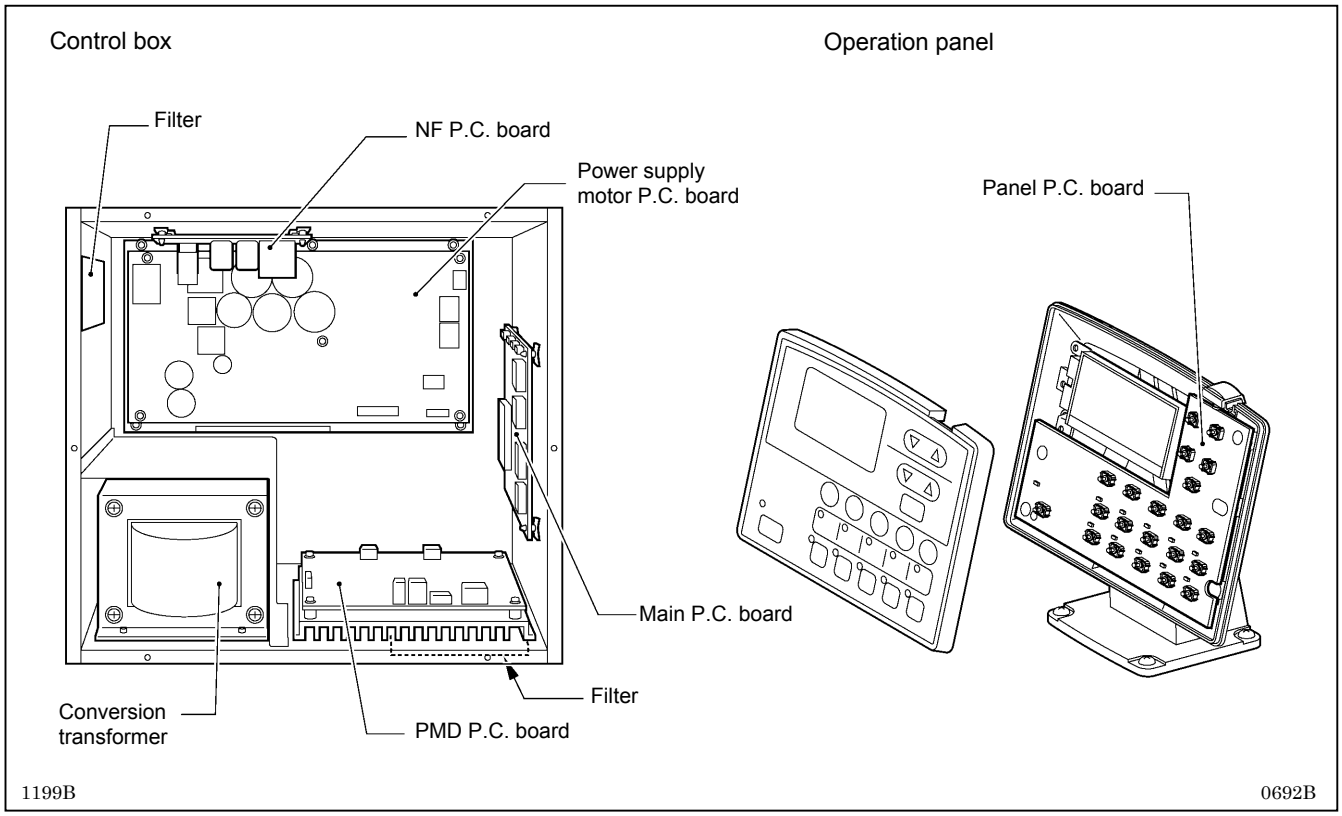
Power supply motor P.C. board
Secured to the rear. This P.C. board generates the voltages that are required for control, and drives the upper shaft motor. There are 8 fuses on this P.C. board.

Filters (3 places)
The filters at the air intake slots in the cover and control box (2 places) should be cleaned about once a month.

Conversion transformer (Two types are used depending on the power supply voltage specifications.)
This breaks down the power supply voltage into the voltages that are required for control operations.

NF P.C. board
This eliminates the electrical interference that is generated by the power supply line.

Panel P.C. board
Secured to the inside of the operation panel. This P.C. board is used for displaying the sewing machine status and for input operations.

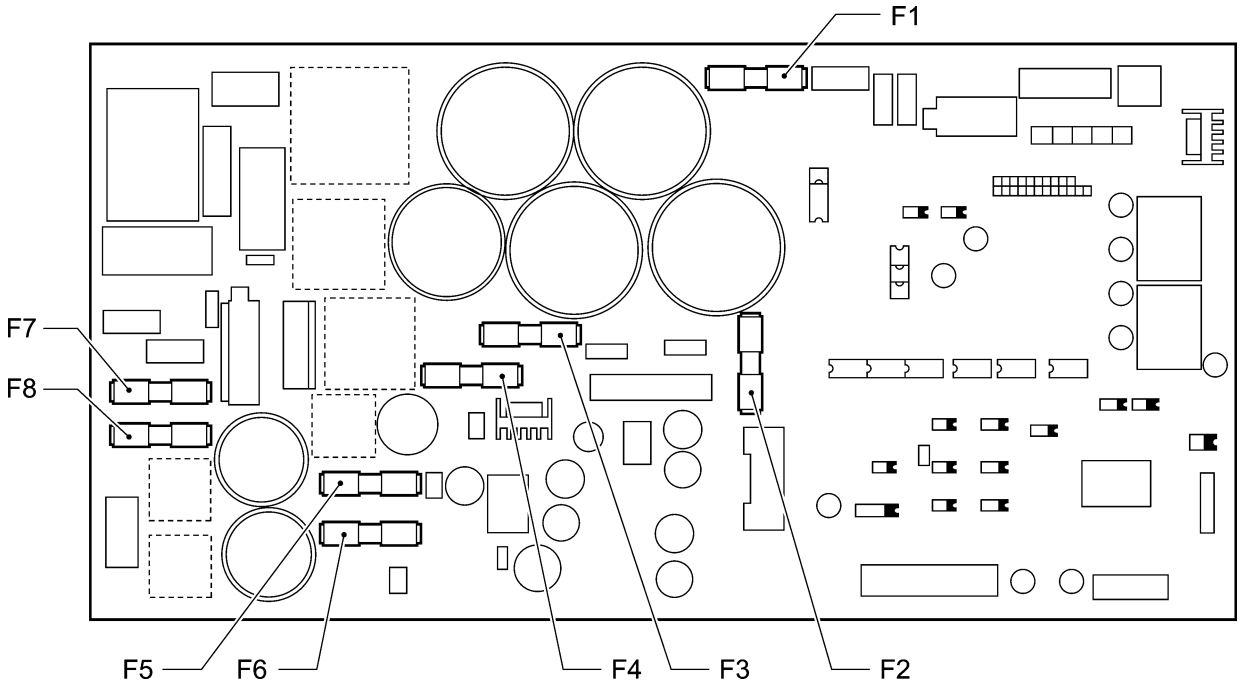


8-3. Description of fuses

When replacing the fuses, be sure to use the fuses specified below.
If the components on the P.C. boards are damaged, the fuses may blow again soon even after they have been replaced.

No.	Part name	Parts code	Symptom when fuse blows
F1	Fuse 15AFB (Glass tube fuse 15A-250V)	SA3794-001	Sewing machine motor does not operate and [E130] is displayed.
F2	Fuse 6AFB (Glass tube fuse 6A-250V)	SA3759-001	Feed mechanism does not operate and [E201] or [E211] is displayed. θ pulse motor does not operate and [E220] is displayed.
F3	Fuse 6AFB (Glass tube fuse 6A-250V)	SA3759-001	Thread trimming solenoid or digital tension/tension release solenoid does not operate, and thread trimming or thread tightening problems occur.
F4	Fuse 3AFB (Glass tube fuse 3A-250V)	616167-001	Communication problem with PMD P.C. board and [E403] is displayed.
F5	Fuse 3AFB (Glass tube fuse 3A-250V)	616167-001	Power indicator does not illuminate and nothing operates.
F6	Fuse 3AFB (Glass tube fuse 3A-250V)	616167-001	DC fan motor does not operate and [E740] is displayed.
F7 F8	Fuse 15AFB (Glass tube fuse 15A-250V)	SA3794-001	Power indicator does not illuminate and nothing operates.

Power supply motor P.C. board



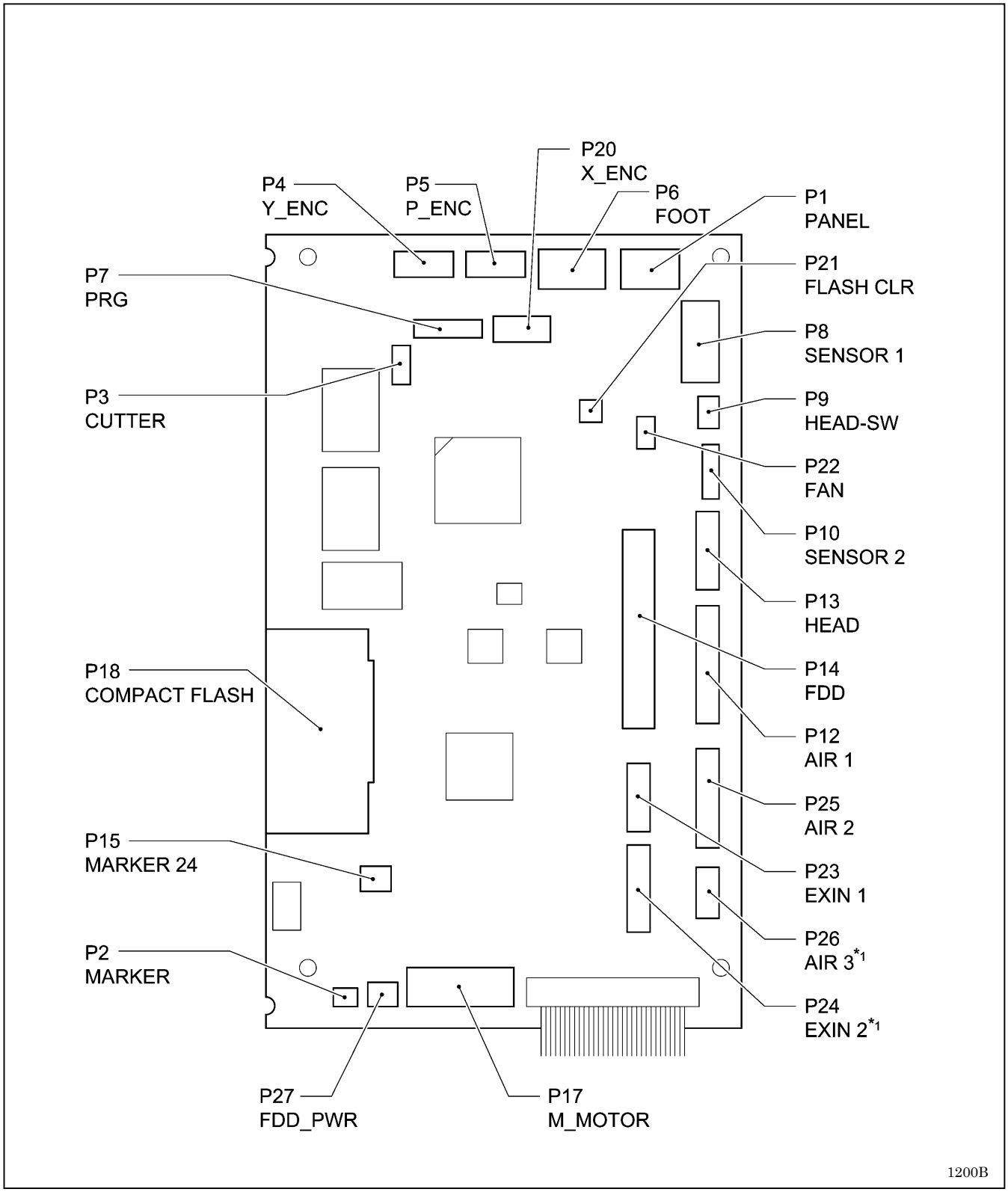
4590Q

8-4. Description of connectors

A large number of problems are often caused by connectors that are not inserted correctly or which are contacting poorly. As a result, check that all connectors are inserted correctly and that the pins and wires are crimped properly before carrying out problem diagnosis.

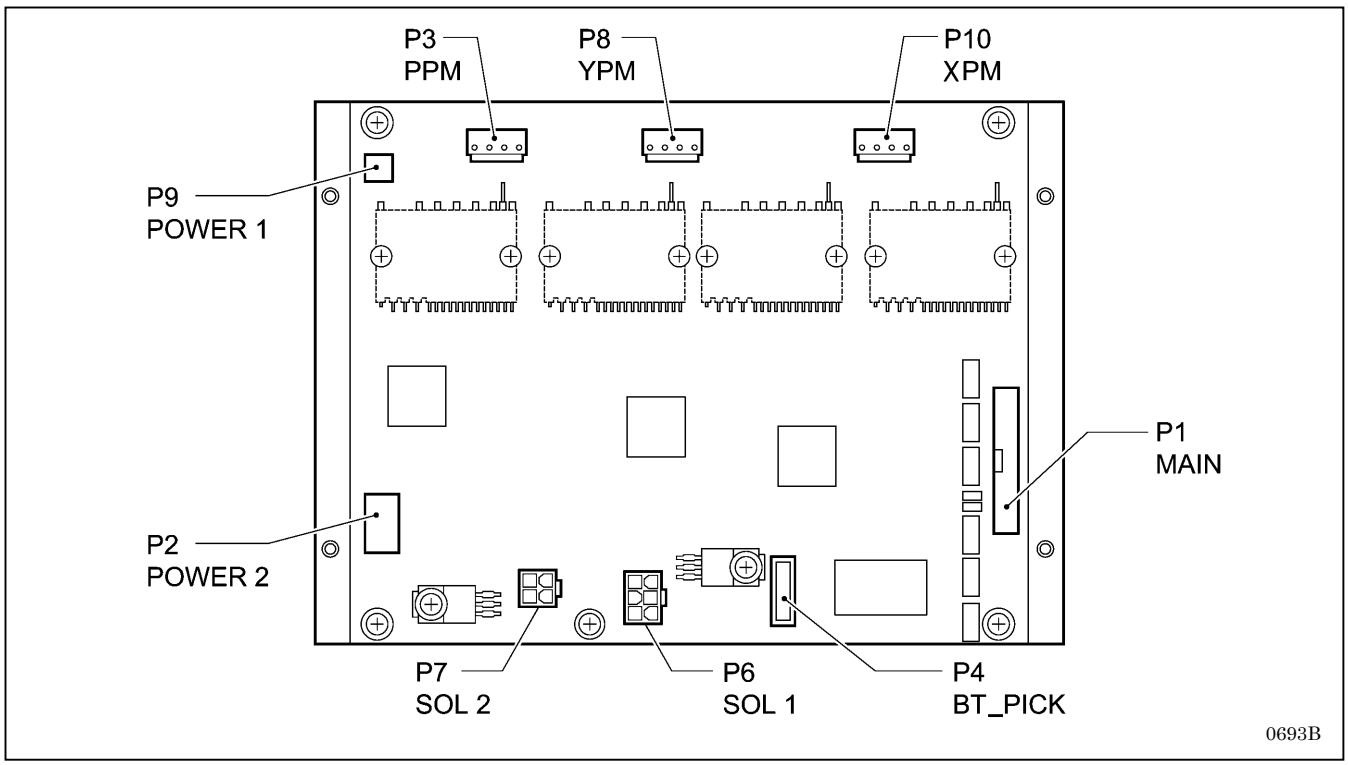
8-4-1. Connector positions

Main P.C. board

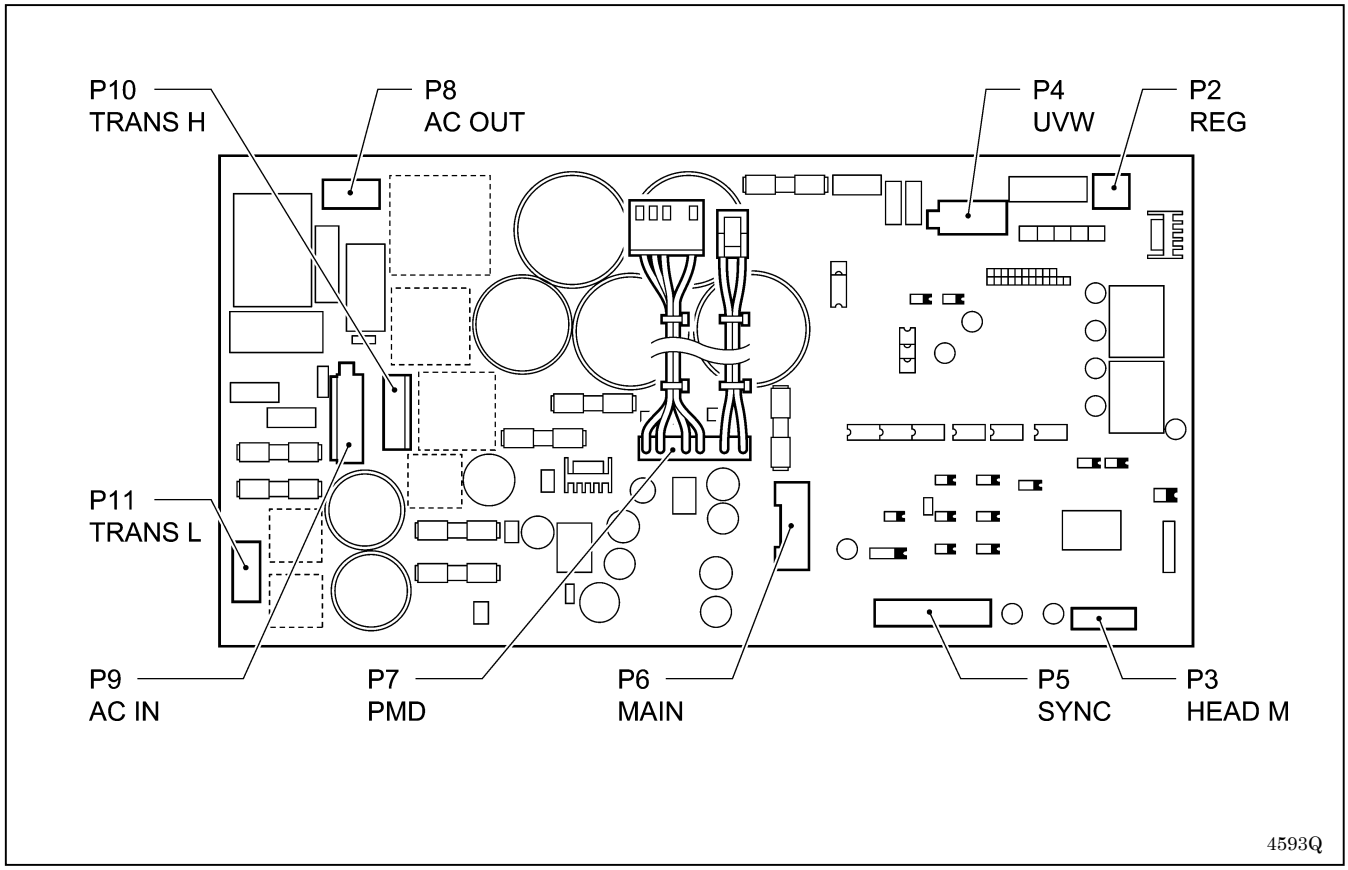


*1 This is a spare signal for special orders.

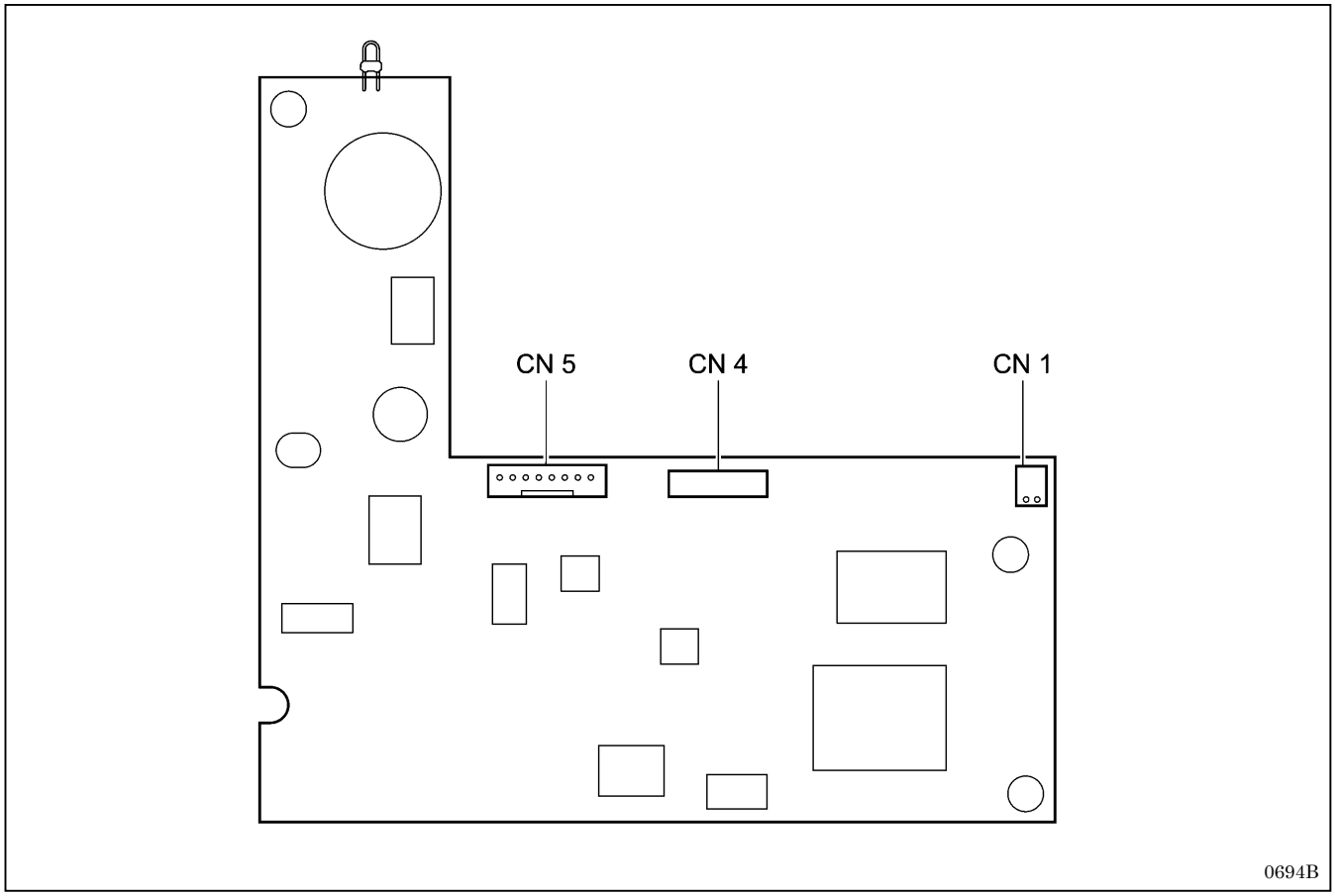
PMD P.C. board



Power supply motor P.C. board



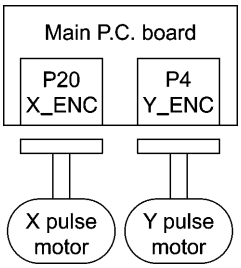
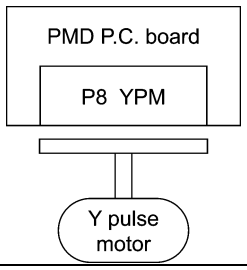
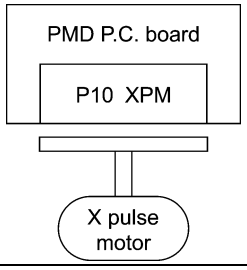
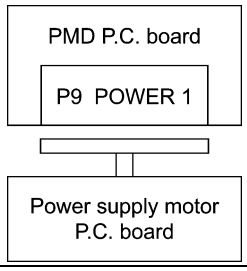
Panel P.C. board



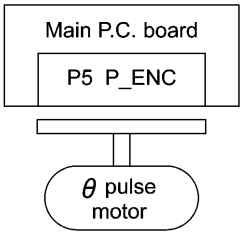
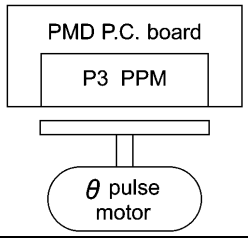
8-4-2. Symptoms when there are poor connections

This divides the functions of the connectors into five sections, but some connectors have more than one function, so be sure to refer to the trouble symptoms in other sections too.

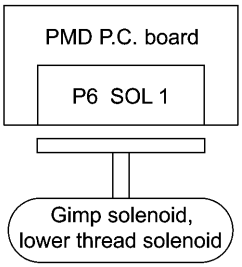
Feed mechanism

Trouble symptom	Connector No. and position
• The feed mechanism operates briefly but does not detect the home position correctly. • [E200] or [E210] is displayed.	 5241Q
• Problems with feed mechanism moving forward and back. • [E210] or [E211] is displayed.	 4708Q
• Problems with feed mechanism moving to the left and right. • [E200] or [E201] is displayed.	 4709Q
• Feed motor does not operate. • [E200] is displayed.	 4710Q

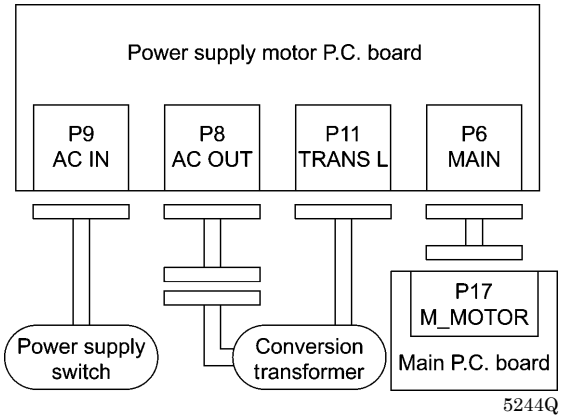
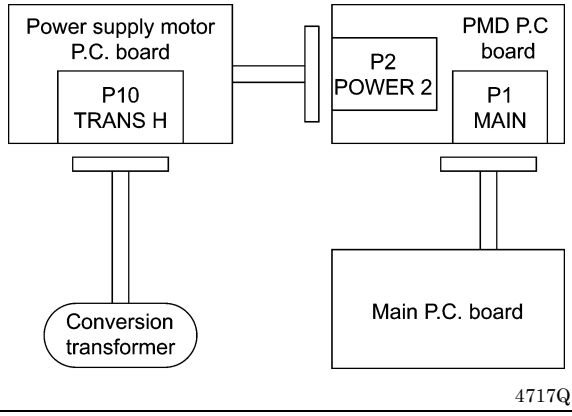
θ pulse motor mechanism

Trouble symptom	Connector No. and position
• The θ pulse motor operates, but the home position is not detected correctly. • [E220] is displayed.	 0755B
• The θ pulse motor does not operate. • [E220] or [E221] is displayed.	 0756B

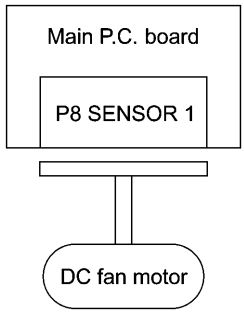
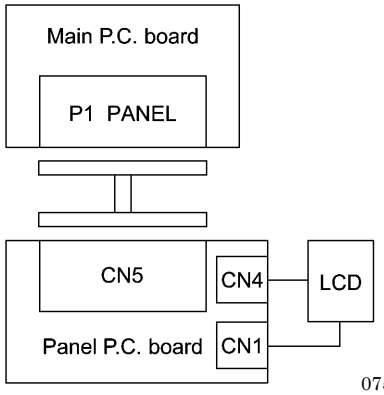
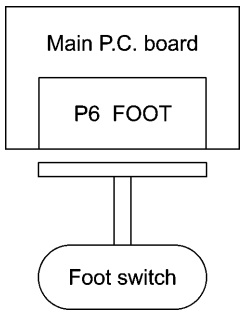
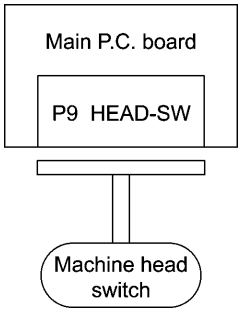
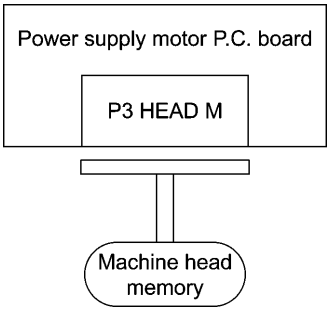
Thread trimming mechanism

Trouble symptom	Connector No. and position
• Gimp solenoid and lower thread solenoid do not operate. (No error displayed)	

Sewing operations

Trouble symptom	Connector No. and position
• Power indicator does not illuminate and sewing machine does not operate. • Operation is unstable.	
• [E403] is displayed when the power is turned on and the sewing machine does not start.	

Other

Trouble symptom	Connector No. and position
• DC fan motor does not operate. • [E740] is displayed.	 0758B
• Operation panel display is incorrect. • Power indicator does not illuminate. • Operation panel keys do not work. • Backlight does not illuminate.	 0759B
• Sewing machine does not start when foot switch is depressed. [Treadle] Work clamp drops when depressed to the 1st step Sewing machine starts when depressed to the 2nd step [2 pedal] Work clamp drops when work clamp switch (left) is depressed Sewing machine starts when start switch (right) is depressed	 5247Q
• After the power is turned on, [E055] is displayed.	 5248Q
• After the power is turned on, [E450] is displayed.	 5249Q

8-5. Troubleshooting

8-5-1. Troubleshooting procedure

Carry out troubleshooting by following the procedure given below.

1 Checking connectors

With the power turned off, check that all connectors are securely inserted while referring to “8-4. Description of connectors”.

2 Diagnosis flowchart

Carry out diagnosis while following the steps in “8-5-2. Diagnosis flowchart” on the next page, and if a problem # is reached, continue to the next procedure.

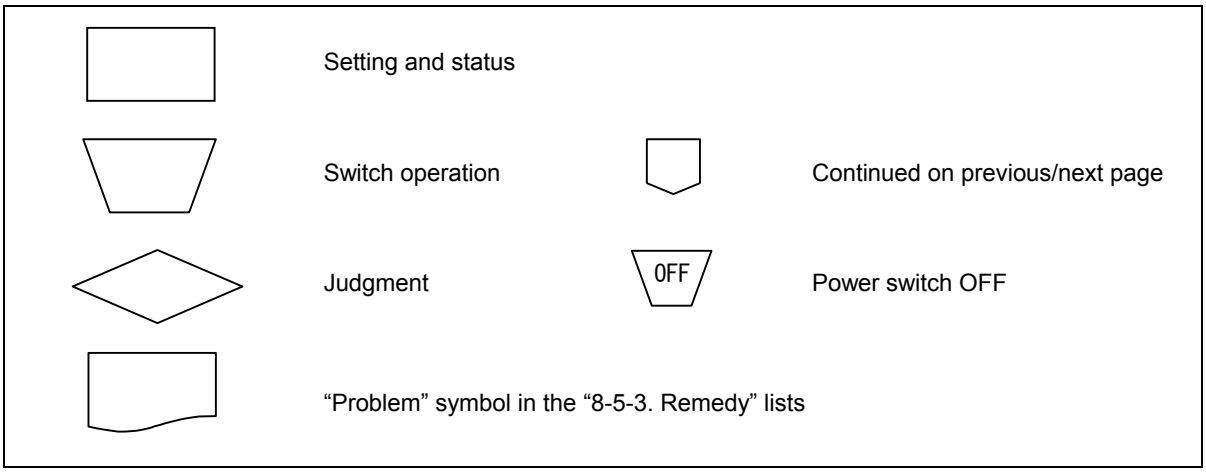
3 Remedy

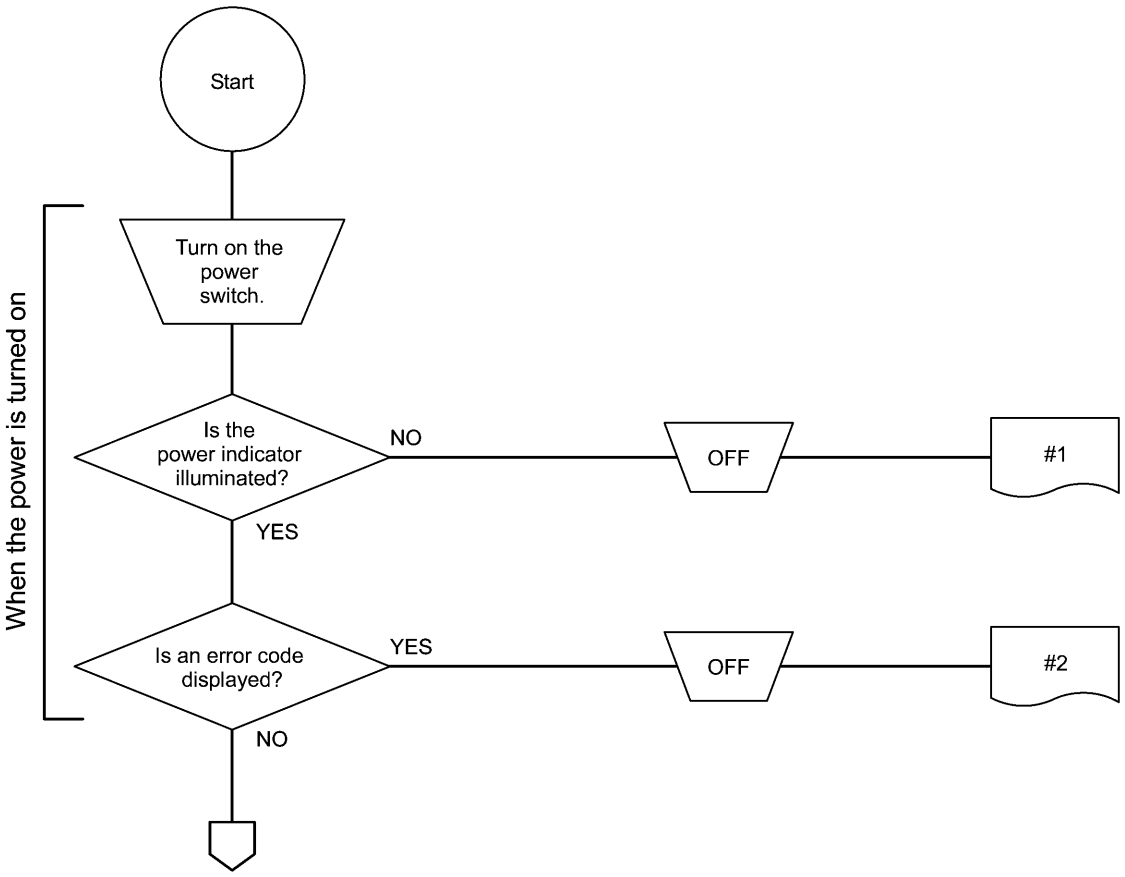
Refer to “8-5-3. Remedy” for the item that corresponds to the problem #. Carry out the inspections for the problems in the order of the numbers in the “Cause” column.

NOTE:
When replacing the fuses, be sure to use a fuse with the same material and rating.

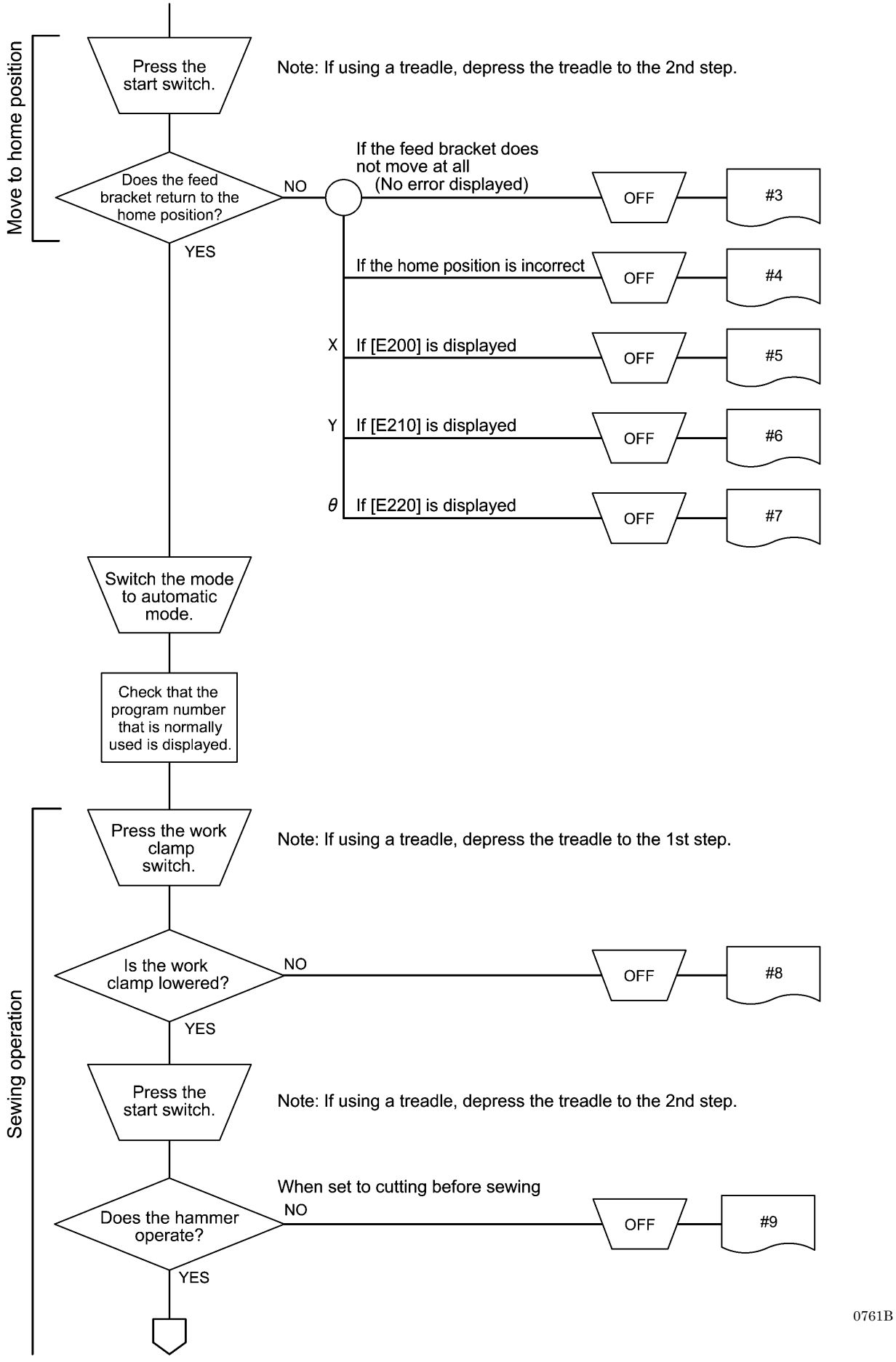
8-5-2. Diagnosis flowchart

Description of symbols

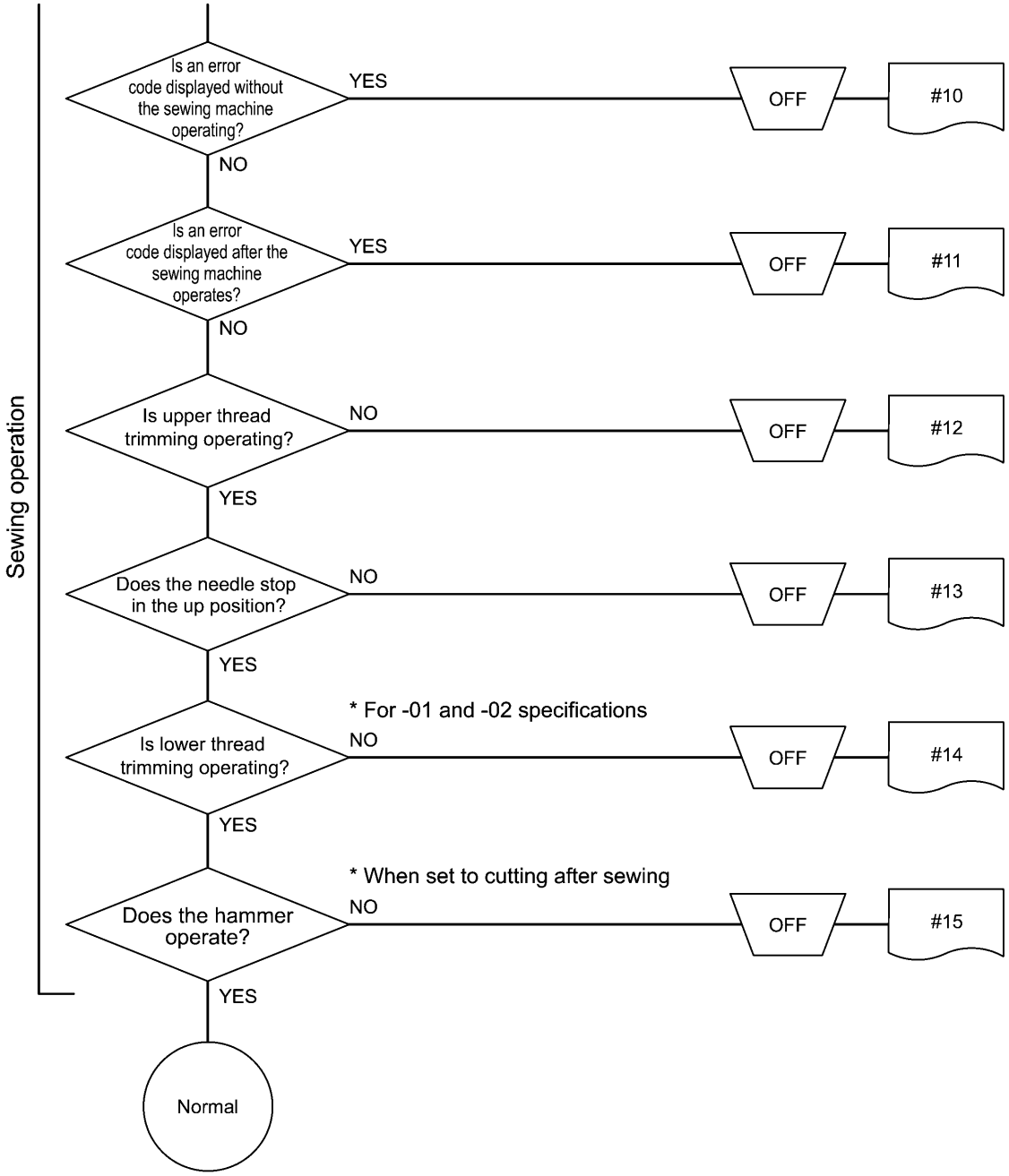




0760B


Move to home position
Press the start switch.
Note: If using a treadle, depress the treadle to the 2nd step.
Does the feed bracket return to the home position?
NO
YES
If the feed bracket does not move at all (No error displayed)
OFF
#3
If the home position is incorrect
OFF
#4
X
If [E200] is displayed
OFF
#5
Y
If [E210] is displayed
OFF
#6
θ
If [E220] is displayed
OFF
#7
Switch the mode to automatic mode.
Check that the program number that is normally used is displayed.
Sewing operation
Press the work clamp switch.
Note: If using a treadle, depress the treadle to the 1st step.
Is the work clamp lowered?
NO
OFF
#8
YES
Press the start switch.
Note: If using a treadle, depress the treadle to the 2nd step.
When set to cutting before sewing
Does the hammer operate?
NO
OFF
#9
YES

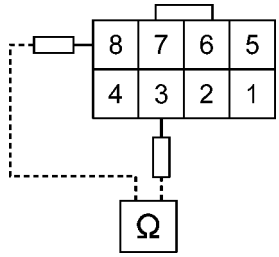
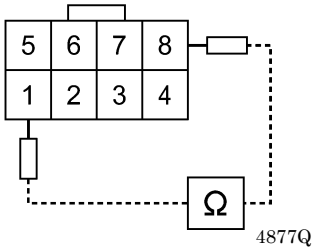
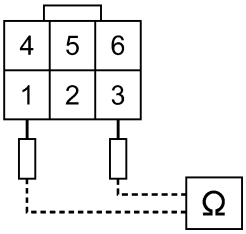
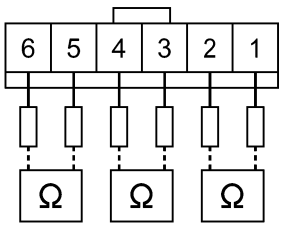
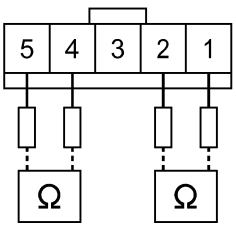
0761B


Sewing operation
Is an error code displayed without the sewing machine operating?
YES
OFF
#10
NO
Is an error code displayed after the sewing machine operates?
YES
OFF
#11
NO
Is upper thread trimming operating?
NO
OFF
#12
YES
Does the needle stop in the up position?
NO
OFF
#13
YES
* For -01 and -02 specifications
Is lower thread trimming operating?
NO
OFF
#14
YES
* When set to cutting after sewing
Does the hammer operate?
NO
OFF
#15
YES
Normal

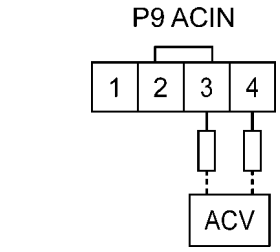
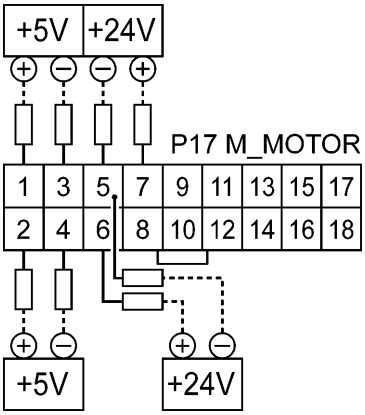
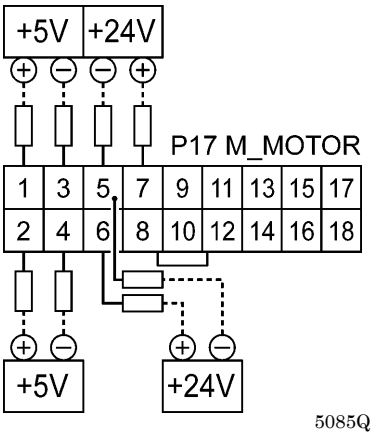
0762B

8-5-3. Remedy

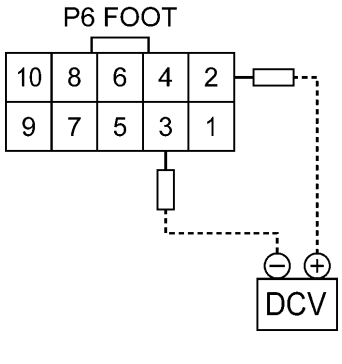
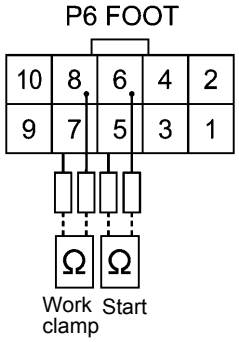
Problem #1 The power indicator does not illuminate when the power is turned on.

Cause	Inspection/Remedy/Adjustment	Replacement if a malfunction
1. Malfunction of voltage select harness *** **For 200V specifications**  4876Q	a. Check if there is a broken wire in the voltage select harness. b. Disconnect the connector at the transformer side, turn on the power and then measure the voltage at the cord. (The wiring position may vary depending on the voltage specifications.) OK if same as wall outlet voltage Voltage specifications / Pin No. 100V: 6-8 110V: 5-8 120V: 4-8 200V: 3-8 220V: 2-8 240V: 2-7 H220V: 3-6 380V: 2-3 400V: 1-3	Voltage select harness *** (*** indicates voltage specifications)
2. Malfunction of transformer **100V, 200V, 220V specifications** [A]  4877Q **380V, 400V specifications** [B]  4878Q [C]  [D]  4879Q	• For 100V, 200V, 220V specifications 1) OK if there is continuity between pins 1-8, 2-8, 3-8, 4-8, 5-8 and 6-8 of the 8-pin connector coming out from the transformer. [Fig. A] 2) OK if there is continuity between pins 1-2, 3-4 and 5-6 of the 6-pin connector coming out from the transformer. [Fig. C] 3) OK if there is continuity between pins 1-2 and 4-5 of the 5-pin connector coming out from the transformer. [Fig. D] • For 380V, 400V specifications 1) OK if there is continuity between pins 1-3, 2-3, 3-4 and 3-6 of the 6-pin connector coming out from the transformer. [Fig. B] 2) OK if there is continuity between pins 1-2, 3-4 and 5-6 of the 6-pin connector coming out from the transformer. [Fig. C] 3) OK if there is continuity between pins 1-2 and 4-5 of the 5-pin connector coming out from the transformer. [Fig. D]	Transformer

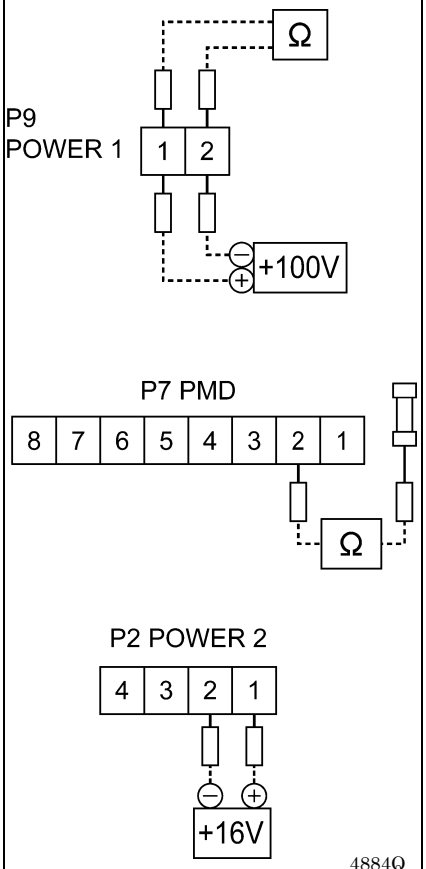
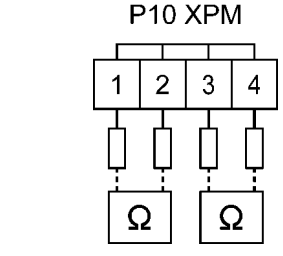
Problem #1 The power indicator does not illuminate when the power is turned on.

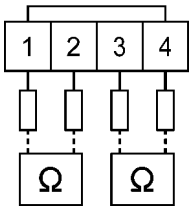
Cause	Inspection/Remedy/Adjustment	Replacement if a malfunction
3. Malfunction of power cord  4880Q	Disconnect connector P9 (ACIN) on the power supply motor P.C. board from the circuit board, turn on the power, and then measure the voltage between pins 3-4 of the cord-side connector. OK if same as wall outlet voltage After inspecting, turn off the power and insert connector P9.	
4. Blown fuse	Remove fuses F7 and F8 and check the continuity. OK if continuity (If there is no continuity, replace the fuse and then carry out the inspections in 5.)	Glass tube fuse 15A-250V
5. Malfunction of power supply motor P.C. board  5085Q	Disconnect connector P17 (M-MOTOR) of the main P.C. board, turn on the power, and then measure the voltages between the pins at the cord-side connector. OK if the voltages are as shown in the table below. Pin Nos. (+ side / − side) — Normal voltage 1 / 3 — +5V 2 / 4 — +5V 6 / 5 — +24V 7 / 5 — +24V After measuring, turn off the power, wait 5 minutes or more and then insert P14.	Power supply motor P.C. board
6. Malfunction of main P.C. board  5085Q	With connector P17 (M-MOTOR) inserted into the main P.C. board, turn on the power and then measure the voltages between the pins at the cord-side connector. OK if the voltages are as shown in the table below. Pin Nos. (+ side / − side) — Normal voltage 1 / 3 — +5V 2 / 4 — +5V 6 / 5 — +24V 7 / 5 — +24V After measuring, turn off the power.	Main P.C. board
7. Malfunction of panel P.C. board	Check that connector P1 (PANEL) is inserted into the main P.C. board, and that connector CN5 (MAIN) is inserted into the panel P.C. board.	Panel P.C. board Panel harness

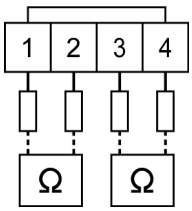
Problem #2 When the power is turned on, an error code is displayed.		
Cause	Inspection/Remedy/Adjustment	Replacement if a malfunction
1. If [E025] or [E035] is displayed, the foot switch is still depressed.	1) Check if the foot switch is still depressed. 2) Check that the setting for memory switch No. 050 is correct while referring to “2-3. Memory switch setting method (Advanced)”. 3) Check if there is a harness short-circuit. 4) Check that connector P6 (FOOT) is inserted into the main P.C. board. 5) Check the switch input while referring to “2-6. Input checking method”.	Treadle unit 2-pedal foot switch
2. If [E055] is displayed, there is a malfunction of the machine head safety switch.	1) Check that the machine head safety switch is OFF. 2) Check that connector P9 (HEAD-SW) is inserted into the main P.C. board. 3) Check if there is a harness short-circuit. 4) Check the machine head safety switch input while referring to “2-6. Input checking method”.	Machine head safety switch
3. If [E065] is displayed, one of the keys on the operation panel is still depressed.	1) Check that connector P1 (PANEL) is inserted into the main P.C. board, and that connector CN5 (MAIN) is inserted into the panel P.C. board. 2) Check the key input while referring to “2-6. Input checking method”.	Panel P.C. board Panel harness
4. If [E110] is displayed, there is a malfunction of the needle up signal.	1) Turn the upper shaft pulley to move the needle bar to the needle up stop position. 2) Check that connector P5 (SYNC) is connected to the power supply motor P.C. board and that the synchronizer is connected. 3) Check the zigzag sensor and needle up signal input while referring to “2-6. Input checking method”.	
5. If [E403] is displayed, there is a poor connection between the main P.C. board and the PMD P.C. board.	1) Check that connector P1 (MAIN) is inserted into the PMD P.C. board. 2) Check if there is a harness short-circuit.	Main P.C. board PMD P.C. board
6. If [E401] is displayed, there is a poor connection between the main P.C. board and the power supply motor P.C. board.	1) Check that connector P17 (M-MOTOR) is inserted into the main P.C. board, and that connector P6 (MAIN) is inserted into the power supply motor P.C. board. 2) Check if there is a harness short-circuit.	Harness Power supply motor P.C. board Main P.C. board
7. If [E450] is displayed, the machine head memory cannot be verified.	1) Check that connector P3 (HEAD-M) is inserted into the power supply motor P.C. board. 2) Check if there is a harness short-circuit.	Machine head memory
8. If [E700] is displayed, there is an abnormal rise in the power supply voltage.	1) Check that the power supply voltage at the wall outlet is within the range of the specification voltage +/- 10%. 2) Refer to check items #1-2 and #1-3. 3) Check the power supply voltage while referring to “2-6. Input checking method”.	
9. If [E705] is displayed, there is an abnormal drop in the power supply voltage.	1) Check that the power supply voltage at the wall outlet is within the range of the specification voltage +/- 10%. 2) Refer to check items #1-2 and #1-3. 3) Check the power supply voltage while referring to “2-6. Input checking method”.	
10. If [E740] is displayed, there is a malfunction of the cooling fan.	1) Check if there are any thread scraps blocking the cooling fan. 2) Check that connector P8 (SENSOR1) is inserted into the main P.C. board. 3) Check the fan signal input while referring to “2-6. Input checking method”.	Fan motor assembly

Problem #3 Feed base does not move at all when the start switch is depressed.		
Cause	Inspection/Remedy/Adjustment	Replacement if a malfunction
1. Malfunction of treadle unit  	With connector P6 (FOOT) inserted into the main P.C. board, turn on the power and then measure the voltages between pins 2-3 at the cord-side connector. (No. 2 +, No. 3 –) OK if the voltage is approximately 2 V at neutral and approximately 4 V when the foot switch is depressed as far as it will go.	Treadle unit
2. Malfunction of 2-pedal foot switch Malfunction of hand start switch  	Disconnect connector P6 (FOOT) from the main P.C. board, and check the continuity between pins 5-6 and 7-8 at the cord-side connector. OK if normally ∞ Ω, and 0 Ω when the foot switch is depressed.	Foot switch Foot switch cord assembly Hand start switch

Problem #4 Feed base home position is shifted.		
Cause	Inspection/Remedy/Adjustment	Replacement if a malfunction
Incorrect home position adjustment	Switch to home position adjustment mode and adjust the position of the feed base while referring to “7-34. Adjusting the feed base X home position and Y home position”.	
Sewing machine specifications and memory switch settings do not match.	Check that the settings for memory switch No. 850 and No. 851 are correct while referring to “ 2-3. Memory switch setting method (Advanced)”.	
Malfunction of encoder	Check the mechanisms for the X axis, Y axis and θ axis home position sensors while referring to “2-6. Input checking method”.	Pulse motor X assembly Pulse motor Y assembly Pulse motor θ assembly

Problem #5 When the start switch is depressed, an error code [E200] is displayed.		
Cause	Inspection/Remedy/Adjustment	Replacement if a malfunction
1. If the X feed does not operate and [E200] is displayed, there is a blown fuse.	Remove fuse F2 from the power supply motor P.C. board and check the continuity. OK if continuity (If there is no continuity, carry out the inspections in 2.)	Fuse 6A-250V
2. If the X feed does not operate and [E200] is displayed, there is a malfunction of the PMD P.C. board or of the power supply motor P.C. board.  4884Q	1) Disconnect connector P9 (POWER1) from the PMD P.C. board and measure the resistance between pins 1-2 at connector P9. OK if ∞ Ω; if 0 Ω, there is a malfunction of the PMD P.C. board. 2) Measure the resistance between the fuse F2 terminal that is close to P6 (MAIN) and pin 2 of connector P7 (PMD) on the power supply motor P.C. board. (D10 check) OK if ∞ Ω 3) Disconnect connector P9 (POWER1) from the PMD P.C. board, and then measure the voltage between pins 1-2 of the cord-side connector. OK if approx. +100 V After measuring, turn off the power, wait 5 minutes or more and then insert P9. 4) Disconnect connector P2 (POWER2) from the PMD P.C. board, and then measure the voltage between pins 1-2 of the cord-side connector. OK if approx. +16 V After measuring, turn off the power, wait 5 minutes or more and then insert P2. 5) Check that connector P1 (MAIN) is inserted into the PMD P.C. board.	PMD P.C. board or power supply motor P.C. board
3. If the feed mechanism does not move and [E200] is displayed, there is a malfunction of the pulse motor or cord.  4885Q	1) Disconnect connector P10 (XPM) from the PMD P.C. board, and measure the resistance between pins 1-2 and 3-4 at the cord-side connector. OK if 2–3 Ω After measuring, insert P10. 2) If 1) is OK, there is a malfunction of the PMD P.C. board.	Pulse motor assembly PMD P.C. board
4. If the X feed moves slightly and then [E200] is displayed, there is a malfunction of the X axis home position sensor (encoder).	1) Check that connector P20 (X-ENC) is inserted into the main P.C. board. 2) Check the X axis home position sensor (encoder) input while referring to "2-6. Input checking method".	Pulse motor X assembly

Problem #6 When the start switch is depressed, an error code [E210] is displayed.		
Cause	Inspection/Remedy/Adjustment	Replacement if a malfunction
1. If the feed mechanism does not move and [E210] is displayed, there is a malfunction of the pulse motor or cord. P8 YPM  4886Q	1) Disconnect connector P8 (YPM) from the PMD P.C. board, and measure the resistance between pins 1-2 and 3-4 at the cord-side connector. OK if 2-3 Ω After measuring, insert P8. 2) If 1) is OK, there is a malfunction of the PMD P.C. board.	Pulse motor Y assembly PMD P.C. board
2. If the Y feed moves and then [E210] is displayed, there is a malfunction of the Y axis home position sensor (proximity sensor).	1) Check that connector P8 (SENSOR1) is inserted into the main P.C. board. 2) Check the Y axis home position sensor input while referring to “2-6. Input checking method”. 3) If a metallic object is brought close to the Y axis home position sensor and the LED inside the sensor does not illuminate, there is a malfunction of the sensor.	Y axis home position sensor

Problem #7 When the start switch is depressed, an error code [E220] is displayed.		
Cause	Inspection/Remedy/Adjustment	Replacement if a malfunction
1. If the θ pulse motor does not move and [E220] is displayed, there is a malfunction of the pulse motor or cord. P3 PPM  4888Q	1) Disconnect connector P3 (PPM) from the PMD P.C. board, and measure the resistance between pins 1-2 and 3-4 at the cord-side connector. OK if 2-3 Ω After measuring, insert P3. 2) If 1) is OK, there is a malfunction of the PMD P.C. board.	Pulse motor P assembly PMD P.C. board
2. If the θ pulse motor moves slightly and then [E220] is displayed, there is a malfunction of the θ shaft home position sensor (encoder).	1) Check that connector P5 (P-ENC) is inserted into the main P.C. board. 2) Check the θ axis home position sensor (encoder) input while referring to “2-6. Input checking method”.	Pulse motor P assembly

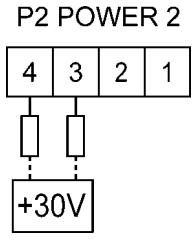
Problem #8 Work clamp is not lowered during sewing.		
Cause	Inspection/Remedy/Adjustment	Replacement if a malfunction
Malfunction of valve or valve harness	1) Check that connector P12 (AIR1) is inserted into the main P.C. board. 2) Check the air.	Valve harness

Problem #9 Hammer does not operate (When set to cutting before sewing).		
Cause	Inspection/Remedy/Adjustment	Replacement if a malfunction
Malfunction of valve or valve harness	Check that connector P25 (AIR2) is inserted into the main P.C. board.	Valve harness

Problem # 10 Sewing machine does not operate during sewing and [E120] is displayed.		
Cause	Inspection/Remedy/Adjustment	Replacement if a malfunction
1. Malfunction of sewing machine motor cord	Check connector P4 (UVW) of the power supply motor P.C. board and the sewing machine motor connector.	Motor cable
2. If the fuse (F1) on the power supply motor P.C. board is blown, there is a malfunction of the main P.C. board.	1) If the fuse (F1) is blown, check the resistance values between all pins of the connector P4 (UVW) and the pins of the fuse ($\infty\ \Omega$) and replace the fuse. 2) If the fuse blows again, replace the power supply motor P.C. board.	Power supply motor P.C. board
3. Sewing machine motor overheats and the thermostat inside the motor operates when the sewing machine is operated at short cycle.	1) Turn off the power and let the sewing machine stand for 30 minutes or more. 2) Turn the power back on; OK if operation is normal. Avoid repeated sewing of sewing data that is less than 15 stitches.	Motor cable

Problem #11 An error code is displayed after the sewing machine operates.		
Cause	Inspection/Remedy/Adjustment	Replacement if a malfunction
1. If [E120] (Needle drop signal error), [E130] (Upper shaft signal error) or [E131] (Upper shaft signal error) is displayed after the sewing machine operates, there is a malfunction of the synchronizer, interference is causing operating problems, or the sewing machine is incorrectly adjusted.	1) Check that connector P5 (SYNC) is inserted into the power supply motor P.C. board and that the synchronizer is connected. 2) If the needle drop signal or upper shaft encoder signal can be confirmed to be turning on and off while referring to "2-6. Input checking method", then they are OK. 3) Turn the pulley by hand and check that it turns smoothly. 4) Check that connector P17 (M_MOTOR) is inserted into the main P.C. board and that connector P6 (MAIN) is inserted into the power supply motor P.C. board. 5) Check the harness between connector P17 (M_MOTOR) of the main P.C. board and connector P6 (MAIN) of the power supply motor P.C. board. 6) Check that the ground wire is connected to a secure ground and that there is no equipment nearby that is generating strong electrical interference.	Motor assembly CCD-9820
2. If [E150] is displayed after the sewing machine operates, the motor is abnormally overheating.	1) Turn off the power and let the sewing machine stand for 30 minutes or more. 2) Turn the power back on; OK if operation is normal.	

Problem #12 Upper thread trimming does not operate.		
Cause	Inspection/Remedy/Adjustment	Replacement if a malfunction
Malfunction of valve or valve harness	Check that connector P12 (AIR1) is inserted into the main P.C. board.	Valve harness

Problem #13 Needle does not stop in the up position. ([E111] is displayed.)		
Cause	Inspection/Remedy/Adjustment	Replacement if a malfunction
1. Incorrect adjustment	Adjust while referring to "7-36. Adjusting the upper shaft stop position".	
2. Malfunction of needle up signal	Check the needle up signal input while referring to "2-6. Input checking method".	
3. Malfunction of zigzag sensor	1) Check that connector P10 (SENSOR2) is inserted into the main P.C. board. 2) Check the zigzag sensor while referring to "2-6. Input checking method".	Main P.C. board
4. Malfunction of cord	Refer to inspection #10.	
5. Malfunction of power supply motor P.C. board  4892Q	With connector P2 (POWER2) connected to the PMD P.C. board, measure the voltage at the cord. OK if approximately 30 V DC between pins 3-4.	Power supply motor P.C. board
6. Malfunction of main P.C. board		Main P.C. board
7. Malfunction of motor		Motor

Problem #14 Lower thread trimming does not operate.		
Cause	Inspection/Remedy/Adjustment	Replacement if a malfunction
Malfunction of valve or valve harness	Check that connector P12 (AIR1) is inserted into the main P.C. board.	Valve harness

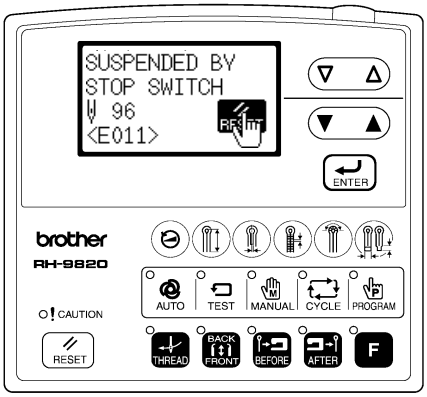
Problem #15 Hammer does not operate (when set to cutting after sewing).		
Cause	Inspection/Remedy/Adjustment	Replacement if a malfunction
Malfunction of valve or valve harness	Check that connector P25 (AIR2) is inserted into the main P.C. board.	Valve harness

9. ERROR CODES

⚠DANGER

Wait at least 5 minutes after turning off the power switch and disconnecting the power cord from the wall outlet before opening the cover of the control box. Touching areas where high voltages are present can result in severe injury.

If a problem should occur with the sewing machine, the buzzer will sound and an error code and error message will appear in the display.
Follow the remedy procedure to eliminate the cause of the problem.



0320B
0461B

Switch-related errors

Code	Cause	Remedy	Page
E010	Stop switch was pressed during standby.	Remove your finger from the stop switch (so that it is off).	*1
E011	Stop switch was pressed during sewing.	Press the RESET key to clear the error. * Press the ▼ key to move the feed mechanism so that you can continue sewing.	*1
E015	The stop switch was still being pressed, or there is a problem with the stop switch connection.	Turn off the power, and check the stop switch if it was not being pressed at the time.	-
E016	Problem with the stop switch connection.	Turn off the power and check the connection of the stop switch connector P13 at the main P.C. board.	200
E024	Start switch is being pressed.	Release the start switch (so that it turns off).	*1
E025	Start switch was depressed after the power was turned on, or connection of start switch is defective.	Turn off the power and check if the start switch is pressed. If the start switch is not being pressed, check the switch connector P6 at the main P.C. board.	200
E034	Work clamp switch is being pressed.	Release the work clamp switch (so that it turns off).	*1
E035	Work clamp switch was depressed, or connection of work clamp switch is defective.	Turn off the power and check the work clamp switch.	*1
E050	Machine head tilting was detected after the power was turned on.	Turn off the power, and then return the machine head to its original position. Check the connection of the machine head safety switch connector P9 at the main P.C. board.	200
E051	Machine head tilting was detected while the sewing machine was operating.	Turn off the power, and then return the machine head to its original position. Check the connection of the machine head safety switch connector P9 at the main P.C. board.	200
E055	Machine head tilting was detected when the power was turned on.	Turn off the power, and then return the machine head to its original position. Check the connection of the machine head safety switch connector P9 at the main P.C. board.	200
E065	An operation panel key was still being pressed when the power was turned on, or key is faulty.	Turn off the power and check that no keys are being pressed.	-

*1 : Refer to the reference page in “10. ERROR CODES” in the instruction manual.

Upper shaft motor-related errors

Code	Cause	Remedy	Page
E110	Needle up stop position error	Turn the upper shaft pulley until the point where the error display disappears. If the error display does not disappear, turn off the power and check the connection of the synchronizer connector P5 at the power supply motor P.C. board.	201 217
E111	Needle up stop position error	Turn off the power, and check the connection of the synchronizer connector P5 at the main P.C. board.	201 217
E120	Needle drop signal could not be detected.	Turn off the power, and check the connection of the synchronizer connector P5 at the main P.C. board.	201 216 217
E130	Sewing machine motor stopped due to a problem, or synchronizer is faulty.	Turn off the power, and then turn the upper shaft pulley and check if the sewing machine has locked up. Check that the upper shaft motor connector P4 and synchronizer connector P5 are connected at the power supply motor P.C. board.	201 217
E131	Synchronizer is faulty.	Turn off the power, and check the connection of the synchronizer connector P5 at the power supply motor P.C. board.	201 217
E132	Problem detected with sewing machine motor operation.	Turn off the power, and then turn the upper shaft pulley and check if the sewing machine has locked up. Check that the upper shaft motor connector P4 and synchronizer connector P5 are connected at the power supply motor P.C. board.	201
E133	Sewing machine motor stopping position is incorrect.	Turn off the power, and then turn the upper shaft pulley and check if the sewing machine has locked up. Check that the upper shaft motor connector P4 and synchronizer connector P5 are connected at the power supply motor P.C. board.	201
E140	Sewing machine motor operated in reverse during sewing.	Turn off the power, and then turn the upper shaft pulley and check if the sewing machine has locked up. Check that the upper shaft motor connector P4 and synchronizer connector P5 are connected at the power supply motor P.C. board.	201
E150	Sewing machine motor is overheating, or temperature sensor is faulty.	Turn off the power, and then turn the upper shaft pulley and check if the sewing machine has locked up. Check that the upper shaft motor connector P4 and synchronizer connector P5 are connected at the power supply motor P.C. board.	201

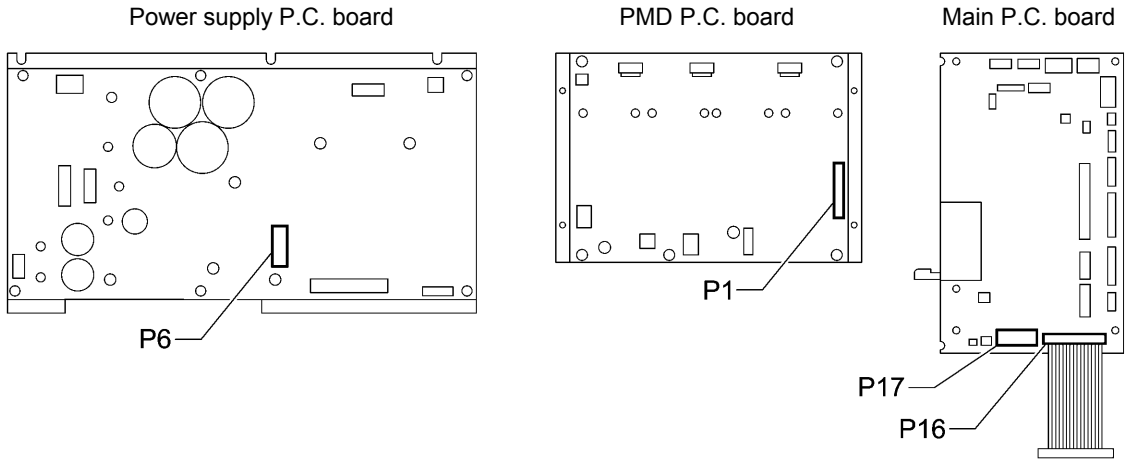
Feed mechanism-related errors

Code	Cause	Remedy	Page
E200	X-feed motor home position cannot be detected. Problem with X-feed motor or poor X home position sensor connection.	Turn off the power, and then check that the X-feed motor connector P10 is connected at the PMD P.C. board and that the X pulse motor encoder connector P20 is connected at the main P.C. board.	200 201 214
E201	X-feed motor stopped due to a problem.	Turn off the power, and then check if there are any problems in the X-feed direction.	-
E210	Y-feed motor home position cannot be detected. Problem with Y-feed motor or poor Y home position sensor connection.	Turn off the power, and then check that the Y-feed motor connector P8 is connected at the PMD P.C. board and that the Y pulse motor encoder connector P4 and sensor connector P8 are connected at the main P.C. board.	200 201 215
E211	Y-feed motor stopped due to a problem.	Turn off the power, and then check if there are any problems in the Y-feed direction.	-
E220	θ-feed motor home position cannot be detected. Problem with θ-feed motor or poor θ home position sensor connection.	Turn off the power, and then check that the θ-feed motor connector P3 is connected at the PMD P.C. board and that the θ-feed motor encoder connector P5 is connected at the main P.C. board.	200 201 215
E221	θ-feed motor stopped due to a problem.	Turn off the power, and then check if there are any problems in the θ-feed direction.	-

Communication and memory-related errors

Code	Cause	Remedy	Page
E401	Connection error detected between the main P.C. board and power supply motor P.C. board when the power was turned on.	Turn off the power, and then check that connector P17 on the main P.C. board and connector P6 on the power supply motor P.C. board are properly connected.	200 201
E403	Communication error detected between the main P.C. board and PMD P.C. board when the power was turned on.	Turn off the power, and then check that connector P16 on the main P.C. board and connector P1 on the PMD P.C. board are properly connected.	200 201
E410	Communication error between main P.C. board and panel P.C. board detected.	Turn off the power, and then check that the operation panel connector P1 is connected at the main P.C. board.	200 201
E411	Communication error between main P.C. board and power supply motor P.C. board detected.	Turn off the power, and then check that connector P17 on the main P.C. board and connector P6 on the power supply motor P.C. board are properly connected.	200 201
E420	No CF card is inserted. (No messages are displayed.)	Turn off the power, and then insert a CF card into the CF card slot of the control box.	-
E422	Error occurred while reading CF card.	Check the data on the CF card.	-
E424	Insufficient free space on CF card.	Use a different CF card.	-
E425	Error occurred while writing to CF card.	Use the specified type of CF card.	-
E430	Problem with flash memory on main P.C. board.	Turn the power off and then back on again.	-
E440	Problem with EEPROM on main P.C. board.	Turn the power off and then back on again.	-
E450	Model selection cannot be read from the machine head memory.	Turn off the power, and check the connection of the machine head memory connector P3 at the power supply motor P.C. board.	212
E451	Data cannot be backed up to machine head memory.	Turn the power off and then back on again.	-
E480	Problem with RAM on main P.C. board.	Turn the power off and then back on again.	-

[P.C. board and connector positions]



0535B

Software-related errors

Code	Cause	Remedy	Page
E569*2	Program version error between main and motor detected.	Press the RESET key to clear the error. * This error is displayed when a power supply motor P.C.board for a different model is installed. Replace with the power supply motor P.C.B. for the RH-9820 as soon as possible.	198
E580	Error in EEPROM version detected.	Turn off the power and carry out level 3 initialization.	*3
E581	Error in memory switch version detected.	Turn off the power and carry out level 2 initialization.	*3
E582	Error in parameter data version detected.	Turn off the power and carry out level 1 initialization.	*3

*2 : If the version of the main control program (MN) is 1.0.00, this error (E569) will not be displayed.
*3 : Refer to “7-3. Resetting the data (initialization)” in the instruction manual.

Device-related errors

Code	Cause	Remedy	Page
E600	Upper thread breakage occurred.	Thread the upper thread, and then press the RESET key to clear the error. * Press the ▼ key to move the feed mechanism so that you can continue sewing.	*4
E601	Upper thread breakage detector is not connected.	Turn off the power and check the connection of the stop switch connector P13 at the main P.C. board.	200
E630	Lower thread trimmer does not operate, or lower thread trimming sensor is faulty.	Turn off the power, and then check that the valve harness connector P12 and sensor connector P10 are inserted at the main P.C. board.	200
E650	Hammer is lowered, or hammer position sensor is faulty.	Turn off the power, and then check that the hammer valve harness connector P25 and hammer position sensor connector P3 are inserted at the main P.C. board.	200
E651	Hammer is not lowered, or hammer position sensor is faulty.	Turn off the power, and then check that the hammer valve harness connector P25 and hammer position sensor connector P3 are inserted at the main P.C. board.	200

*4 : Refer to the reference page in “10. ERROR CODES” in the instruction manual.

P.C. board-related errors

Code	Cause	Remedy	Page
E700	Abnormal rise in power supply voltage.	Turn off the power and check the input voltage.	212
E701	Abnormal rise in sewing machine motor drive voltage.	Turn off the power, and then check the voltage.	-
E705	Abnormal drop in power supply voltage.	Turn off the power and check the input voltage.	212
E710	Abnormal current detected in sewing machine motor.	Turn off the power, and then check if there are any problems with the sewing machine.	-
E719	Problem detected with PMD P.C. board.	Turn off the power, and then check the PMD P.C. board.	-
E740	Cooling fan does not operate.	Turn off the power, and then check that the cooling fan sensor connector P8 is connected at the main P.C. board.	-

Optional device-related errors

Code	Cause	Remedy	Page
E940	Sub-hammer is not set even though straight buttonhole program is being sewn. (Straight buttonhole position sensor is not responding.)	Turn off the power, and then check that connector P12 and connector P24 on the main P.C. board are properly connected.	*5
E941	Sub-hammer is not retracted even though eyelet buttonhole program is being sewn. (Eyelet buttonhole position sensor is not responding.)	Turn off the power, and then check that connector P12 and connector P24 on the main P.C. board are properly connected.	*5
E942	Sewing machine is trying to sew an eyelet buttonhole while there is no material under the straight buttonhole sensor. Sewing machine is trying to sew a straight buttonhole while there is material under the straight buttonhole sensor.	Press the RESET key.	*5
E950	No response from feed plate home position sensor while feed plate is being driven.	Turn off the power, and then check that connector P23 and connector P25 on the main P.C. board are properly connected.	*5
E951	No response from feed plate left sensor while feed plate is being driven.	Turn off the power, and then check that connector P23 and connector P25 on the main P.C. board are properly connected.	*5
E952	No response from feed plate right sensor while feed plate is being driven.	Turn off the power, and then check that connector P23 and connector P25 on the main P.C. board are properly connected.	*5

*5 : Refer to the instruction manuals for the corresponding devices.

If an error code that is not listed above appears or if carrying out the specified remedy does not solve the problem, contact the place of purchase.

10. TROUBLESHOOTING

- If there is a problem with operation, first check that the threads are correctly threaded and that the needle is correctly installed.
- Please check the following points before calling for repairs or service.
- If the following remedies do not fix the problem, turn off the power switch and consult a qualified technician or the place of purchase.

⚠ CAUTION

Turn off the power switch and disconnect the power cord before carrying out troubleshooting.
Otherwise the machine may operate if the start switch is pressed by mistake, which could result in serious injury.

Problem	Cause	Remedy	Page
Thread breaks	Thread tension is too strong.	Adjust the thread tension to the correct tension.	Instruction manual
	Needle is not installed correctly.	Install the needle so that it faces correctly.	Instruction manual
	Thread is too thick for the needle.	Select a thread which is suitable for the needle.	Instruction manual
	Needle and looper adjustment is incorrect.	Adjust the clearance between the needle and looper, the needle bar height or the looper and spreader height.	141, 148 149
	Needle, looper, spreader, throat plate or thread path is damaged.	Repair or replace the respective part(s).	
	Thread is not threaded correctly.	Thread the thread correctly.	Instruction manual
Skipped stitches occur.	Upper thread tension is too strong or too weak.	Adjust the upper thread tension to the correct tension.	Instruction manual
	Needle point is broken or bent.	Replace with a new needle.	
	Clearance between needle and looper tip is incorrect.	Adjust the clearance between the needle and looper tip.	149
	Needle, looper and spreader adjustment is incorrect.	Adjust correctly.	141 146 - 151
	Needle and needle guard adjustment is incorrect.	Adjust the needle guard.	149
	Eye looper tip is blunt.	Repair with an oilstone or replace the looper with a new one.	
	Needle is not installed correctly.	Install the needle so that it faces correctly.	Instruction manual
	Needle is too thin.	Select a needle that is suitable for the sewing conditions.	Instruction manual

Problem	Cause	Remedy	Page
Broken needle	Needle is bent.	Replace with a new needle.	
	Needle, looper and spreader adjustment is incorrect.	Adjust correctly.	141 146 – 151
	Needle guard is covering the needle too far.	Adjust the needle guard.	149
	Needle is too thin.	Select a needle that is suitable for the sewing conditions.	Instruction manual
Upper thread is not cut.	Upper movable knife is blunt.	Replace the upper movable knife with a new one.	166, 167
	Upper movable knife does not move to the full stroke because air pressure is too weak.	Adjust the air pressure.	Instruction manual
	Upper movable knife is not picking up the upper thread.	Install the upper movable knife so that it cuts only one side of the upper thread loop.	167
	Upper movable knife is not picking up the upper thread because the last stitch is being skipped.	Refer to the remedies given under “Skipped stitches occur” in this troubleshooting chart.	225
	Upper movable knife position is incorrect.	Adjust the position of the upper movable knife.	167
Lower thread is not cut.	Movable knife is blunt.	Replace the movable knife with a new one.	169, 174
	Movable knife does not move to the full stroke because air pressure is too weak.	Adjust the air pressure.	Instruction manual
	Movable knife position is incorrect.	Adjust the position of the movable knife or the thread handler.	170, 173 175
	Cutting pressure for lower thread trimming is too weak.	Adjust to an appropriate cutting pressure.	170, 174
Thread unravelling at sewing start	Lower thread is not being held.	Adjust the lower thread nipper (-01 specifications) or the lower thread presser (-02 specifications).	171, 173 180
	Upper thread length is too short after trimming.	Adjust the sub tension.	Instruction manual
	Not enough upper thread is being fed out.	Adjust the amount of upper thread being fed out.	165
Material is not being cut cleanly.	Cutting pressure is too weak.	Adjust the cutting pressure so that it is strong enough.	160
	Knife and hammer are not contacting properly.	Grind the hammer surface.	154
	Knife is blunt.	Replace the knife with a new one.	157
Poor thread tightening	Upper thread tension is too strong or too weak.	Adjust the upper thread tension to the correct tension.	Instruction manual
	Lower thread tension is too strong or too weak.	Adjust the lower thread tension to the correct tension.	Instruction manual
	Tension or stroke of thread take-up spring is incorrect.	Adjust the tension and stroke of the thread take-up spring.	Instruction manual

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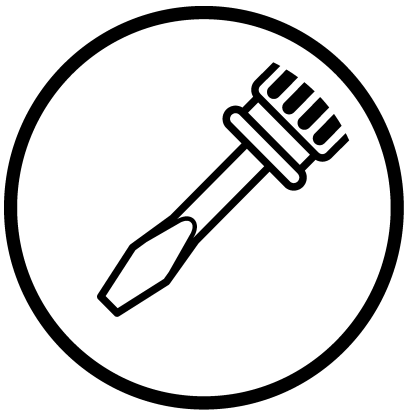

SERVICE MANUAL

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