

MITSUBISHI

Industrial Sewing Machine

INSTRUCTION MANUAL <Sewing Machine>

Electronic Pattern Sewing Machine

PLK-A2016F

PLK-A2016FL

A180E257P01

Introduction

Thank you for purchasing this industrial-use electronic sewing machine from Mitsubishi. Before attempting to operate the unit, please read through these instructions since they will help you to keep the unit in the best possible working order.

These instructions describe the operations of the mechanical parts, inclusive of the machine head, of this industrial-use electronic sewing machine. For details on how to operate the control unit and how to prepare the sewing patterns, reference should be made to the Instruction Manual below.

Mitsubishi Industrial Sewing Machine Instruction Manual
<Control Unit>: A180E243P01

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1. CONSTRUCTION

PLK-A2016F and PLK-A2016AF are configured with the parts shown below.

(PHOTO : PLK-A2016F)

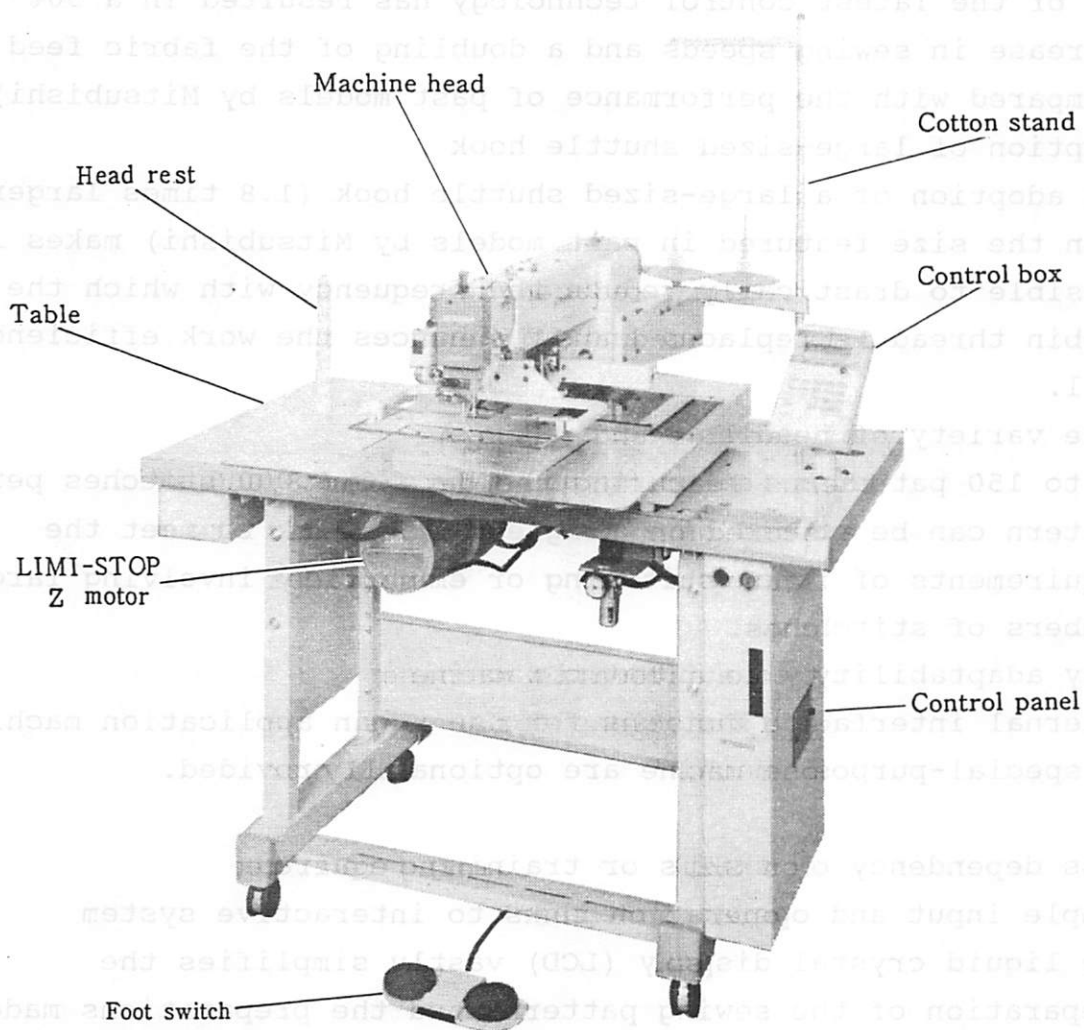


Fig. 1.1

2. FEATURES

(1) Valuable contribution to increasing productivity

- High-speed sewing

Use of the latest control technology has resulted in a 50% increase in sewing speeds and a doubling of the fabric feed rate (compared with the performance of past models by Mitsubishi).

- Adoption of large-sized shuttle hook

The adoption of a large-sized shuttle hook (1.8 times larger than the size featured in past models by Mitsubishi) makes it possible to drastically reduce the frequency with which the bobbin thread is replaced and it enhances the work efficiency as well.

- Wide variety of needles and patterns

Up to 150 patterns featuring the data for 8,000 stitches per pattern can be stored on a single floppy disk to meet the requirements of fancy stitching or embroidery involving large numbers of stitches.

- Easy adaptability to automatic machine

External interface functions for use as an application machine or special-purpose machine are optionally provided.

(2) Less dependency on skills or training required

- Simple input and operation thanks to interactive system

The liquid crystal display (LCD) vastly simplifies the preparation of the sewing patterns and the preparations made for operation, and it also displays operating errors in the form of messages. The teaching playback type of input makes it possible to create sewing patterns which match the clamp frame.

- Easy maintenance

The full line-up of troubleshooting functions make the pinpointing of trouble and its display on the LCD an easy task.

- Adding/subtracting counters provided as a standard feature

The subtracting counter uses a buzzer to sound the time at which the bobbing thread should be replaced while the adding counter

makes it possible to verify the output.

(3) Esthetically pleasing seams and stitching

- Stable feed system

The fabric feed mechanism features both a travel system which uses races and backlash-free timing belts. It enables reliable intermittent feed drive and makes for clear, well-defined seams and stitches.

- Resolution in 0.1 mm units

By bringing the resolution of the fabric feed mechanism accurately down to a 0.1 mm pitch, it is now possible to sew both smoothly and precisely.

- Maximum stitch length of 12.7 mm

The variable stitch length accommodates everything from stitches where a delicate touch is required such as in embroidery to large-pitch sewing of such articles as container bags.

3. SPECIFICATIONS

3.1 General specifications

(1) Specifications of mechanisms

Type of stitching: Single-needle lockstitch

Needle bar stroke: 41.2 mm

Take-up lever stroke: 68 mm

Needle: DP x 17 #18 (standard)

Wiper: Lengthwise thread wiping drive
(with wiper release switch)

Work holder lift: 25 mm

Presser foot lift: 10 mm or higher

Presser foot stroke: 4 to 10 mm (set to 4 mm when
shipped)

Hook: Large-sized shuttle hook

Bobbin case: With slip prevention spring

Bobbin: Aluminum bobbin for large-sized hook

Thread trimmer: Combination of fixed knife and movable
knife (plane scissoring)

Lubrication system: Manual oiling and replenishment
with oil braid (Tank type)

Oil used: White spindle oil No.2

Sewing area: PLK-A2016F : 200mm in X (cross-wise) direction
160mm in Y (lateral) direction
PLK-A2016FL : 250mm in X (cross-wise) direction
190mm in Y (lateral) direction

Max. sewing speed: 2,000 spm (for feed length of less
than 3.0 mm)

Stitch length: 0.1 to 12.7 mm

Dimensions: PLK-A2016F : 1200(W) × 1260(L) × 1120(H)mm
PLK-A2016FL : 1200(W) × 1275(L) × 1120(H)mm
(Excluding cotton stand)

Weight: 180 kgf (total weight including head, table)

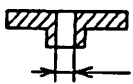
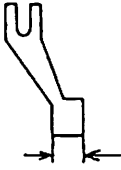
(2) Specifications of control unit

Item	Specification			
Control system	Fully electronic control system using microcomputer			
Sewing area	200×160mm (PLK-A2016F) 250×190mm (PLK-A2016FL)			
Pattern storage media	3.5" floppy disk and P-ROM (option)			
Number of storable patterns	3.5" floppy disk P-ROM (option)	150 patterns 16 patterns		
Number of storable stitches	3.5" floppy disk P-ROM (option)	360000 stitches in total 8000 stitches in total		
Number of stitches/pattern	8000 stitches			
Length of stitch	0.1 to 12.7 mm (Resolution: 0.1 mm)			
Speed setting	200 to 2000 s/min. 10 levels selectable			
Enlargement/reduction	10 to 200%, 0.1% step			
Mechanical home position	Set by optical sensor and insulator			
Mechanical home position correction	0.1 to 12.7 mm 0.1 mm unit adjustable			
Second home position	Set by input program			
Halt	Set by input program			
Reverse rotation shaft output	Set by input program			
Baste stitching	Set by input program			
Test function	Jog switch			
Format function	Format can be made using 3.5" floppy disk (2HD type).			
Error display	Various errors are displayed on the LCD display.			
Troubleshooting function	Check of input switch signals Check of output signals Confirmation and adjustment of sewing speed			
Power	Phases	Frequency (Hz)	Voltage (V)	Input (kVA)
	Single-phase	50, 60	100 110 120 200 220 230 240	1
	Three-phase	50, 60	200 220 380 415	1
Ambient temperature humidity	5 to 40°C 45 to 85% (No condensation)			

(3) Teaching specifications

Item	Specification
Input method	Point input by teaching, P-P input , circle input , arc input
Pattern input area	200×160mm (PLK-A2016F) , 250×190mm (PLK-A2016FL)
Length of stitch	0.1 to 12.7 mm (resolution: 0.1 mm)
Enlargement/reduction	100% only
No. of input stitches	8,000 stitches
Input data	Stitch data, Feed data Thread trimming data, End data Secondary home point data, Halt data Reverse turn support output data Baste stitch data
Stitch speed command	4-step setting: high speed (H), medium speed (MD1), medium to low speed (MD2), low speed (L)
Correction: Stitch number reduction Stitch number addition 1 stitch correction Speed change Function change	1 or N stitches reduced from last stitch; 1 or N stitches reduced from middle stitch; deletion of data from assigned position to the last stitch 1 stitch added at assigned position 1 stitch corrected at assigned posi- tion Speed change of N stitches from assigned position; speed change from assigned position to the last stitch Addition/deletion of function codes
Test function	Jogging at pattern input Jogging at correction (input data verification)
Data write	Written onto floppy disk and P-ROM
Delete	Deletion of assigned patterns (floppy disk only)

3.2 Replacement parts for light and heavy fabrics

Specification		For light fabric	For medium/ heavy fabric (standard)	For heavy fabric
Name of part				
Thread tension regulator		→	For DB standard MF10E0210	For DB heavy fabric MF82E0210
Needle plate  Needle hole diameter		1.6 mm dia. MS03A0101	2.2 mm dia. MS03A1101	2.6 mm dia. MS03A2101
Presser foot  Outer diameter		Outer dia. 3.5 mm (ID: 2.0) MV30A1256	Outer dia. 4.5 mm (ID: 3.0) MV30A0256	←
Hook retainer		→	Standard MS01A0616	For heavy fabric MS01A1616
Inner hook	Large-sized	→	MS17A0120	MS17A1120
	Standard	→	MS01A0120	MS01A1120
Bobbin case	For large hook	→	MS17A0125	←
	For standard hook	→	MS09E0125	←
Bobbin	For large hook	→	MS17A0123	←
	For standard hook	→	MS09A1123	←

4. INSTALLATION

4.1 Installing the table

- (1) The casters under the table can be locked into position by pressing down on the lever of each caster. When the sewing machine is to be moved, raise the caster levers to release them.
- (2) Install the sewing machine on a flat and rigid floor so that it does not tilt or wobble.
- (3) The table can be set for operating the sewing machine in a standing or sitting position. Since it has been factory-adjusted for sitting work, change the table height as follows to operate the machine in a standing position.
 - ① Loosen the bolts (5 units at the left and 5 units at the right) used to secure the stand.
 - ② Lift the table to the desired height and then secure it properly using the bolts for securing the stand.

Notes:

- ① The table height should be changed before the machine head is installed.
- ② If the table height must be changed after the machine head has been installed, detach the head from above the table (for safety) and then proceed.

- (4) Insert an accessory rubber pad (6 units) into each of the holes provided in the table.
- (5) Insert the accessory hinges (A) (2 units) into the recesses in the table and secure them with the countersunk wood screws.

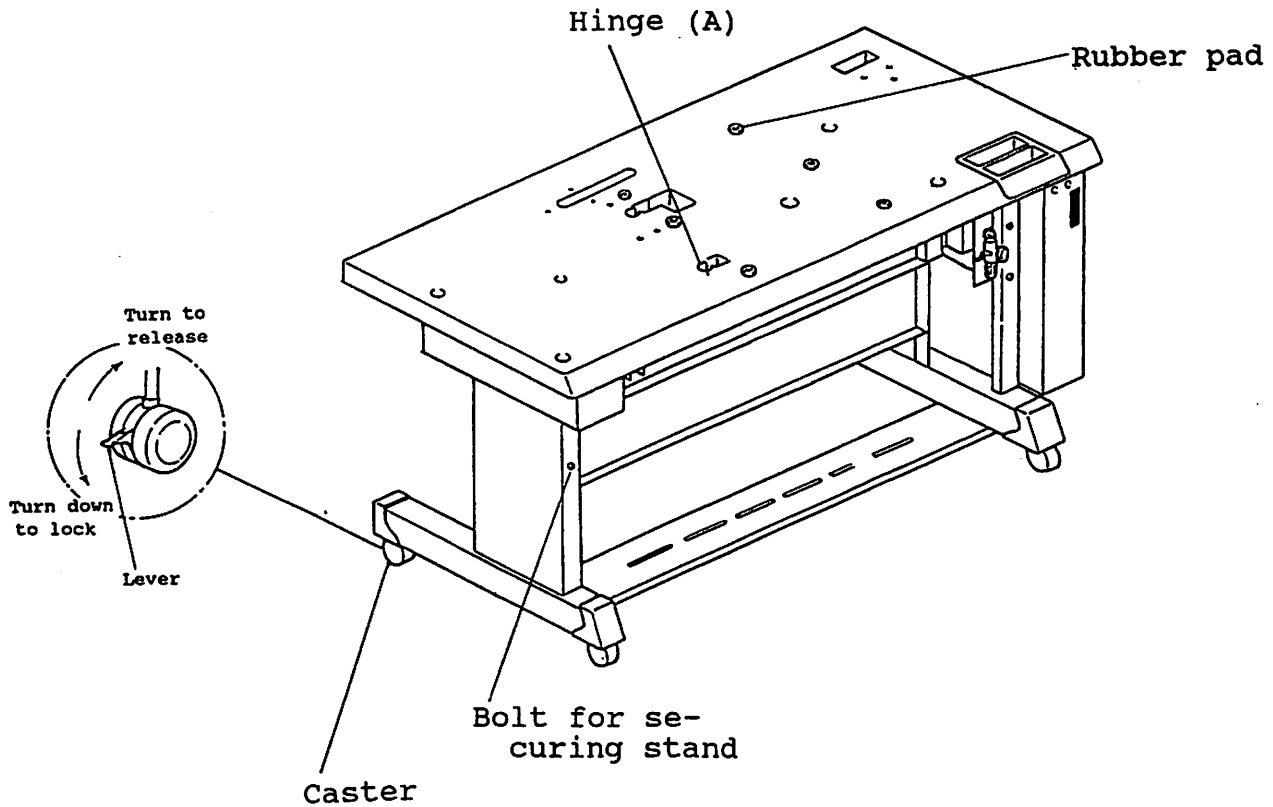


Fig. 4.1

* The hinges (A) should be placed with their chamfered surface face up, as shown in Fig. 4.2.

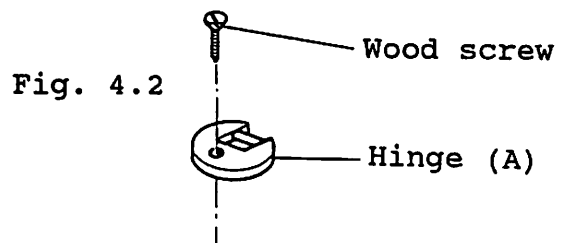


Fig. 4.2

4.2 Assembling the machine head (see Figs. 4.4, 4.5)

- (1) Insert the accessory head rest into the corresponding holes provided on the table.
- (2) Insert the two hinges (B) into the machine head which has been removed from its packing box.
- (3) Place the head on the table so that it rests on the six rubber pads and two hinges.

- (4) Remove the handles provided in the machine head. Bear in mind that when the machine is tilted on its side with the handles still attached, the bolts in the handles will make contact with the table.
- (5) Tilt the machine on its side, and pass the air tubes down through the hole in the table.
- (6) Install the accessory oil pan as shown in Fig. 4.5, and secure it using the wood screws (4 units) in line with the holes which have been prepared on the top of the table.
- (7) Install the V belts provided and return the machine to its original position.
- (8) Mount the special bolt for the belt cover (large) at the rear of the machine.
- (9) Secure the accessory belt cover (large) to the machine using the screws provided.
- (10) Secure the accessory belt cover (small) to the table using the wood screws (3 units).

Notes: Checkpoints for carrying sewing machine

- ① Front of sewing machine ... Be sure to use the two handles (left and right) to hold the machine.
- * Under no circumstances should the slide plate be held.
- ② Back of sewing machine ... Hold the joint between the Y-synchronizer and arm (preferably on the arm side).
- * If only the Y-synchronizer cover is held, the Y-synchronizer cover may be warped and proper operation may not be possible.

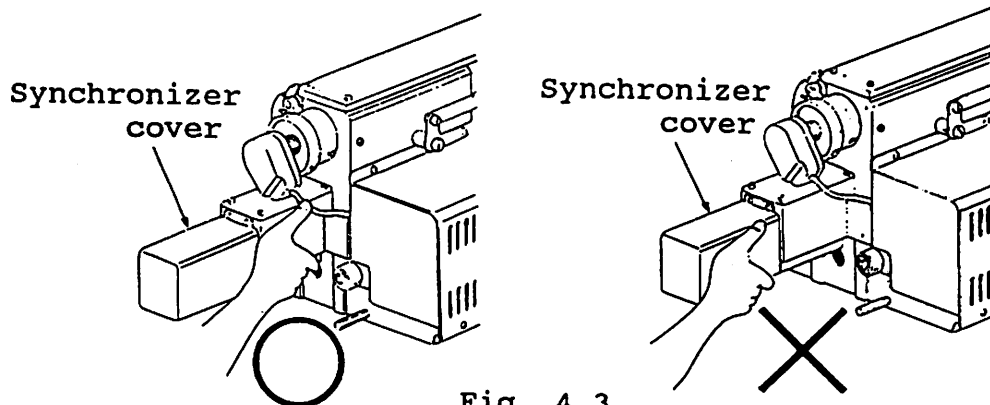


Fig. 4.3

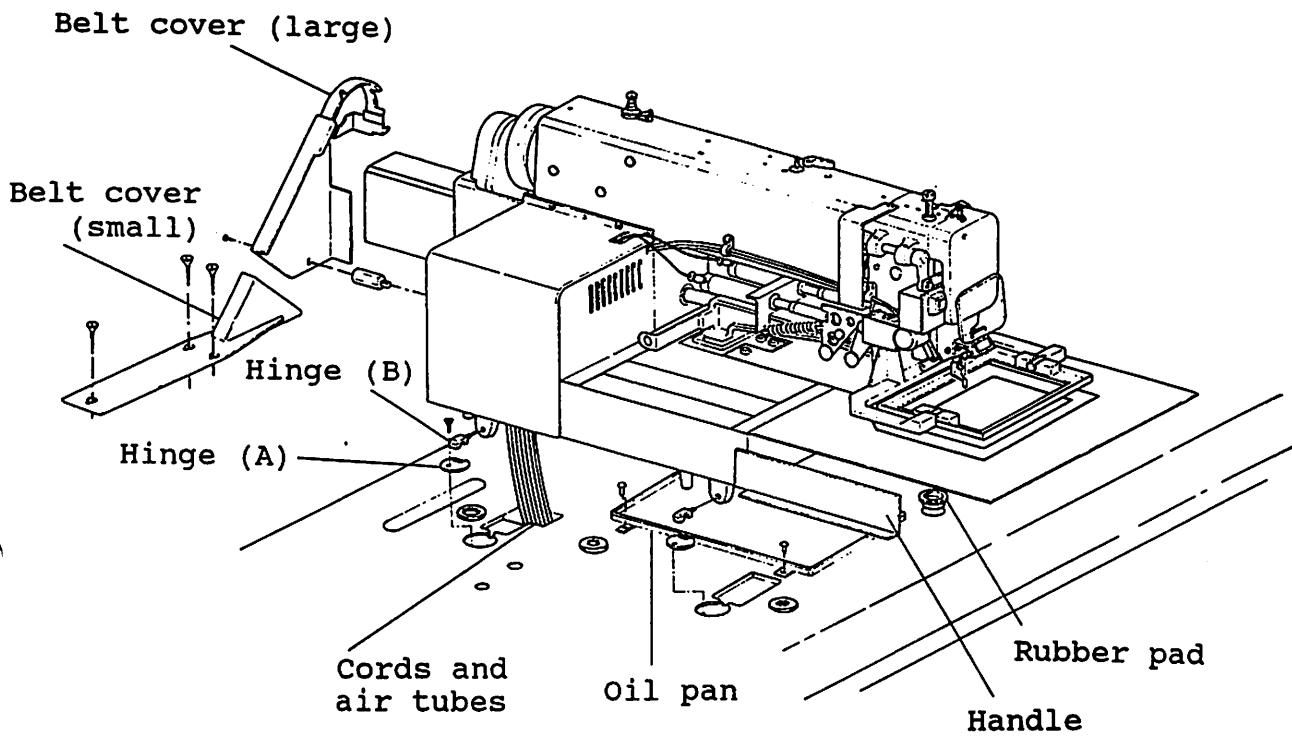


Fig. 4.4

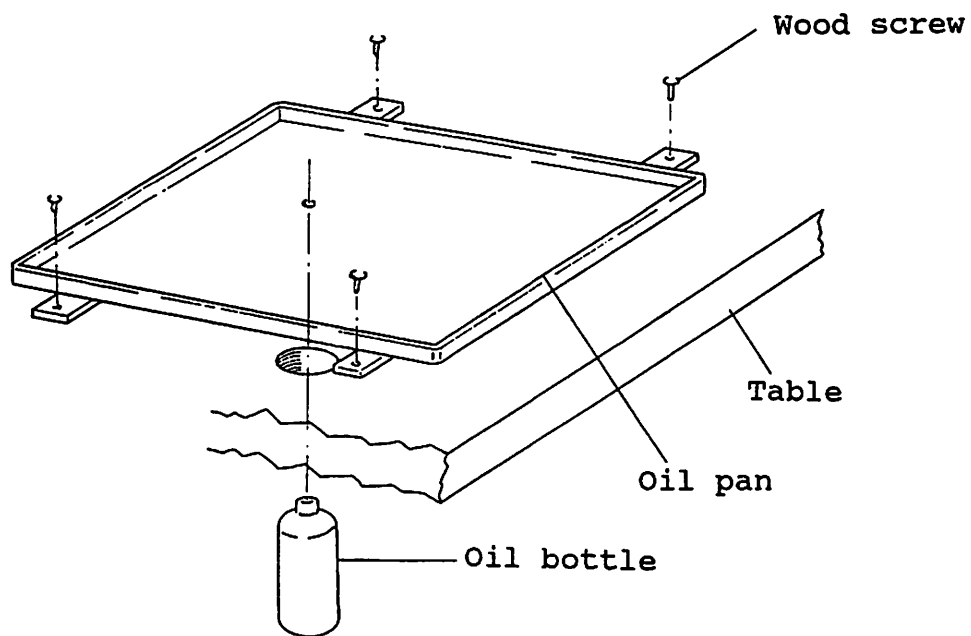


Fig. 4.5

4.3 Connecting the Air Tubes

- (1) Connect three air tubes ("A"~"C") to solenoid valve tube fittings ("A"~"C") shown in Fig. 4.6.
- (2) Connect one air tube to tube fitting "D" shown in Fig. 6.6.
- (3) Air pressure is to be set to 4 kg/cm^2 ($3.92 \times 10^5 \text{ Pa}$).
To set, pull up the air pressure control knob and turn.
After setting, press down the knob.
- (4) Disconnecting the air tubes
To disconnect air tube, push the end of tube forward and, while holding down the fitting sleeve, pull the tube.
- (5) The air tubes for the work holder and presser foot are as shown in Fig. 4.7.

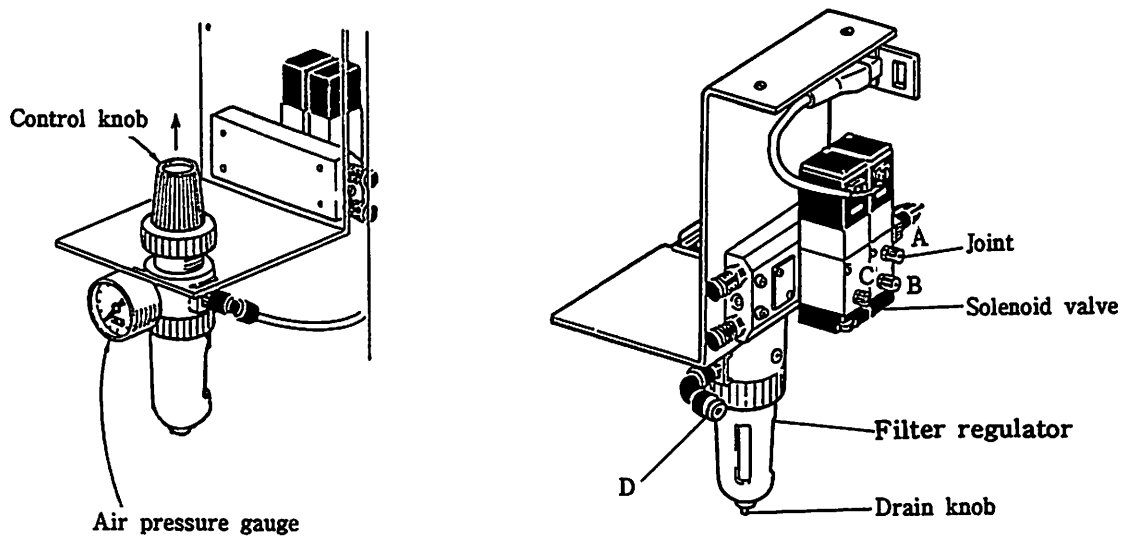


Fig. 4.6

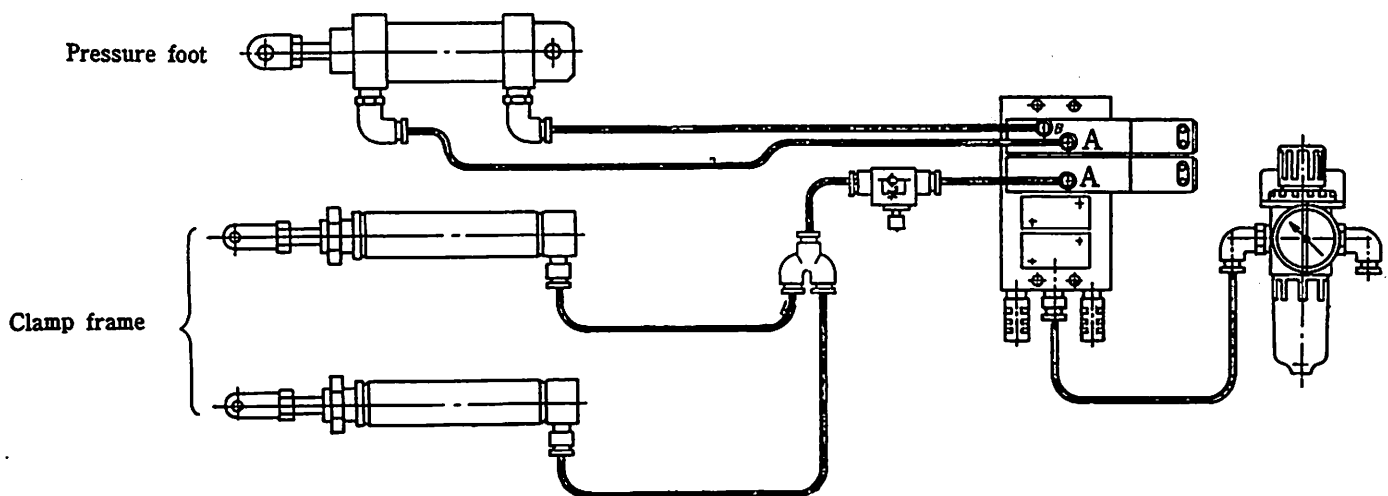
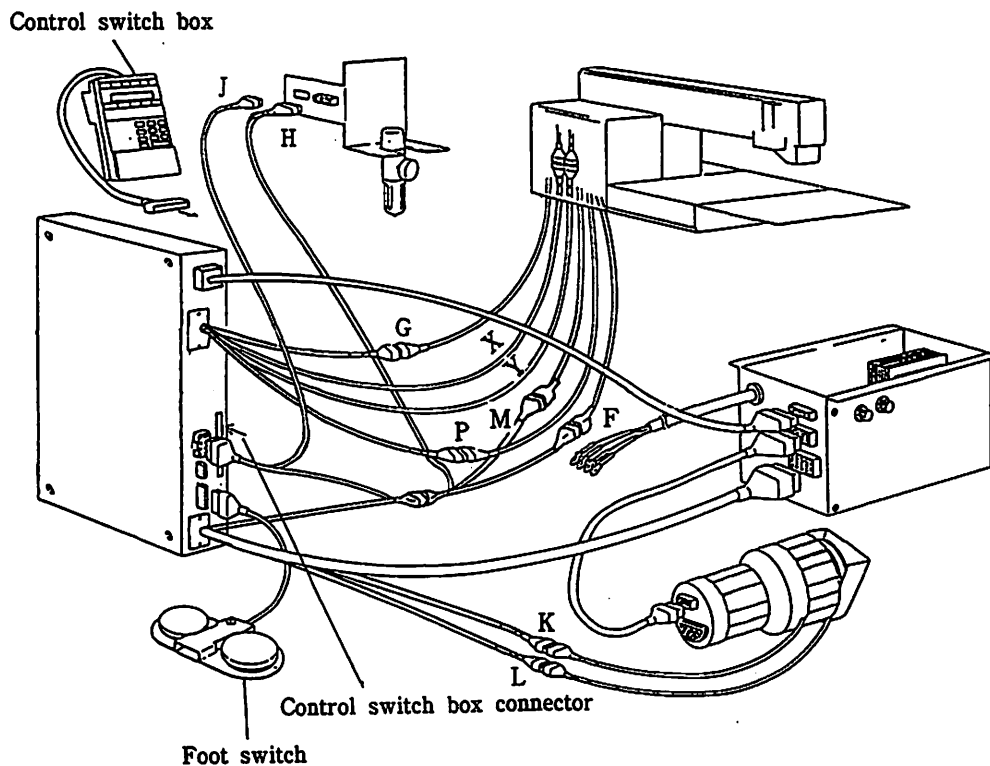


Fig. 4.7

4 . 4 Connecting the Leads

- (1) Pass the leads from the sewing machine head through the holes on the ceiling plate, and connect with the connectors from the control box that have the same symbols.
 - 1) The upper shaft detector connector is P.
 - 2) Connector H is connected to the solenoid valve.
 - 3) Connector J is for the options (2-step clamp) ,and there is no mate connector.Insert it into the solenoid valve installation plate and fix.
 - 4) Connectors X and Y are for the stepping motor.Remove the motor cover on the left of the sewing machine and connect to the stepping motor.
 - 5) Connector F is for the wiper solenoid.
 - 6) Connector M is for the tension release solenoid.
 - 7) Connector G is for the X-Y sensor and the halt switch.
- (2) Neatly bundle the connected leads with the cord holder.



4.5 Installing the control box

- (1) Align the stand with the hole used to secure the stand positioned on the right of the table.
- (2) Provisionally secure the stand using the flat washers and hexagon socket head bolts (3 units).
- (3) Adjust the direction of the stand so that it will be easy to operate the function switches, and tighten up the hexagon socket head bolts.
- (4) Mount the control box on the stand rest, and use the screws (4 units) to secure it from behind the rest.
- (5) Pass the control box cord along the stand support and secure it in two places with the nylon clip.
- (6) At the rear of the stand, a cable through hole in the table.
- (7) Fit and lock the connector of the control box cord into the connector marked "control panel" at the rear of the control panel.

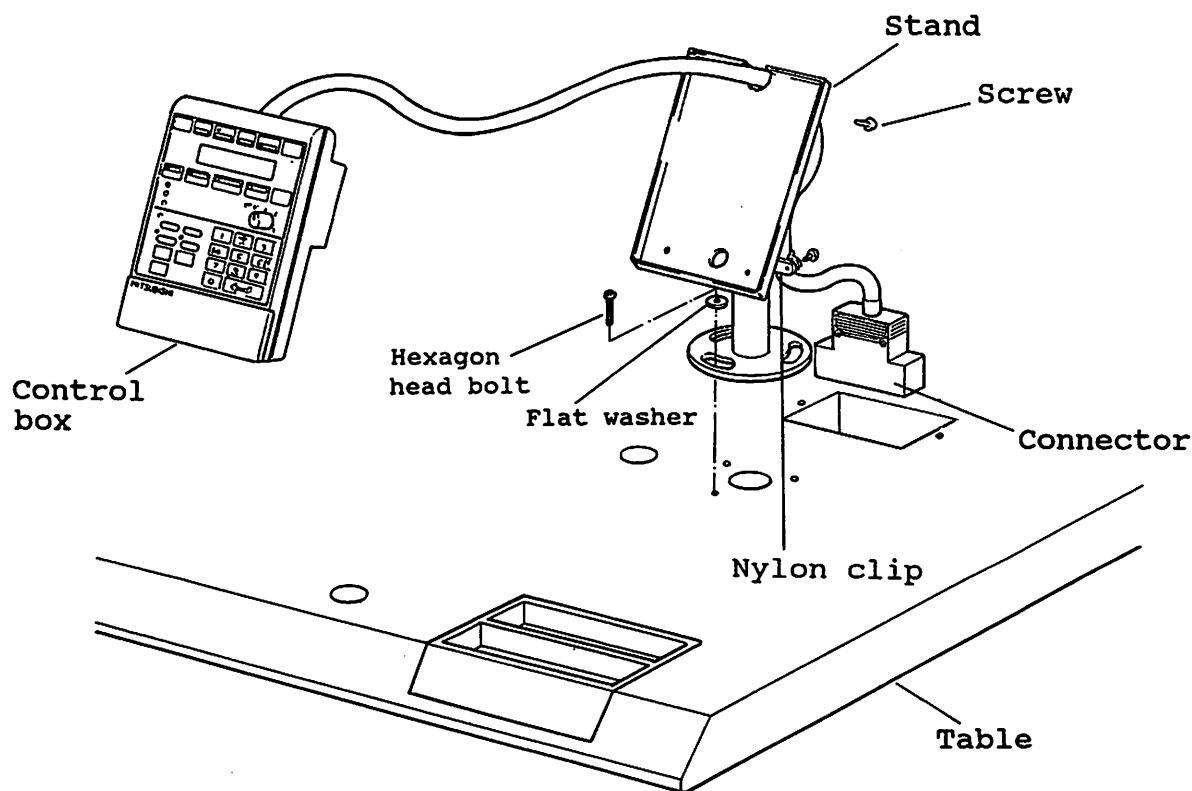


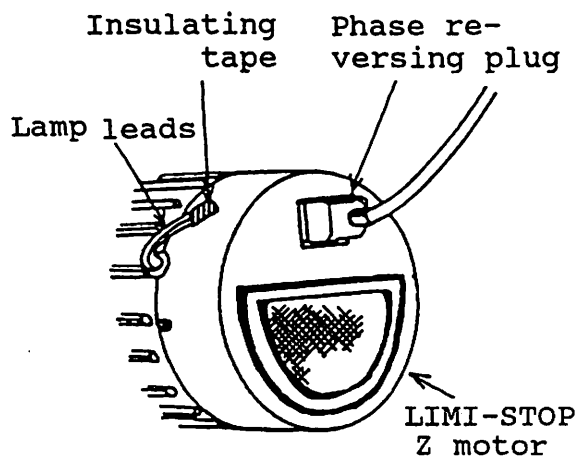
Fig. 4.8

4.6 Power cord for work lamp

- (1) When the work lamp (6V, 15-20W) is mounted, use the connecting leads provided at the front of the motor. Removing the insulating tube, strip the leads as necessary, make the connections, and then wind insulation tape around the connections.

Note:

Although the lamp voltage is only 6V, the ground voltage is around 100V. Make absolutely sure that the power is turned off before the leads are connected.



- (2) If the lamp will not be used, its two leads must be insulated to prevent shortcircuiting. As in the figure on the right, proceed as for (1) or (2), and be sure to insulate the leads. Shortcircuiting may result in a burn-out of the motor winding.

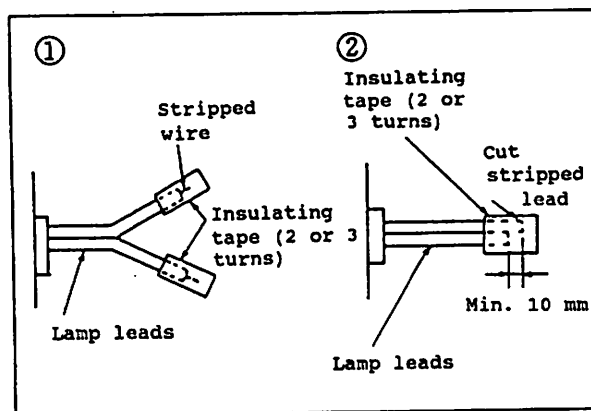


Fig. 4.9

Note:

Do not connect the work lamp and a heating device such as a foot warmer in parallel since this will result in overloading and a possible burn-out of the motor winding.

4.7 Connecting the power cable

Use a power supply with a capacity high enough to accommodate the motor rating, and select a power cable which is more than adequate to accommodate the power supply requirements.

- (1) When a 3-phase motor is used, connect the power supply in its correct phase sequence: "U" phase ... red lead; "V" phase ... white lead; "W" phase ... black lead.
- (2) Connect the green lead in the 3-phase power cable to the ground terminal. To ensure safety, do not neglect to undertake this ground connection. Be sure to have a qualified electrician do this for you.
This grounding work must be done if a single-phase power supply and the accessory conversion plug (for conversion from 3 pins with ground to 2 pins) are used.
- (3) When a single-phase motor is used, do not plug the power cord into a branch socket but to a wall outlet.

Notes:

- <1> All leads should be bundled together and secured so that they will not come into contact with the V-belts.
- <2> The plugs and connectors must be securely connected.
- <3> The power plug must be disconnected when any of the leads are connected.

4.8 Changing the direction of the motor rotation

If the motor of the sewing machine is rotating in the reverse direction, reverse rotation is first identified automatically when operation is started, the following display appears, and the machine stops operating.

REVERSE ROTATION

When this display has appeared, normal rotation is restored by turning the phase-reversing plug through 180° and inserting it. Be sure to insert it properly as far as it will go. (See Fig. 4.10)

Since it takes about 5 minutes for a single-phase motor to stop completely after the power has been turned off, remember to switch on the power after it has stopped. (The direction of the motor rotation will remain unchanged if the power is turned on while the motor is running.)

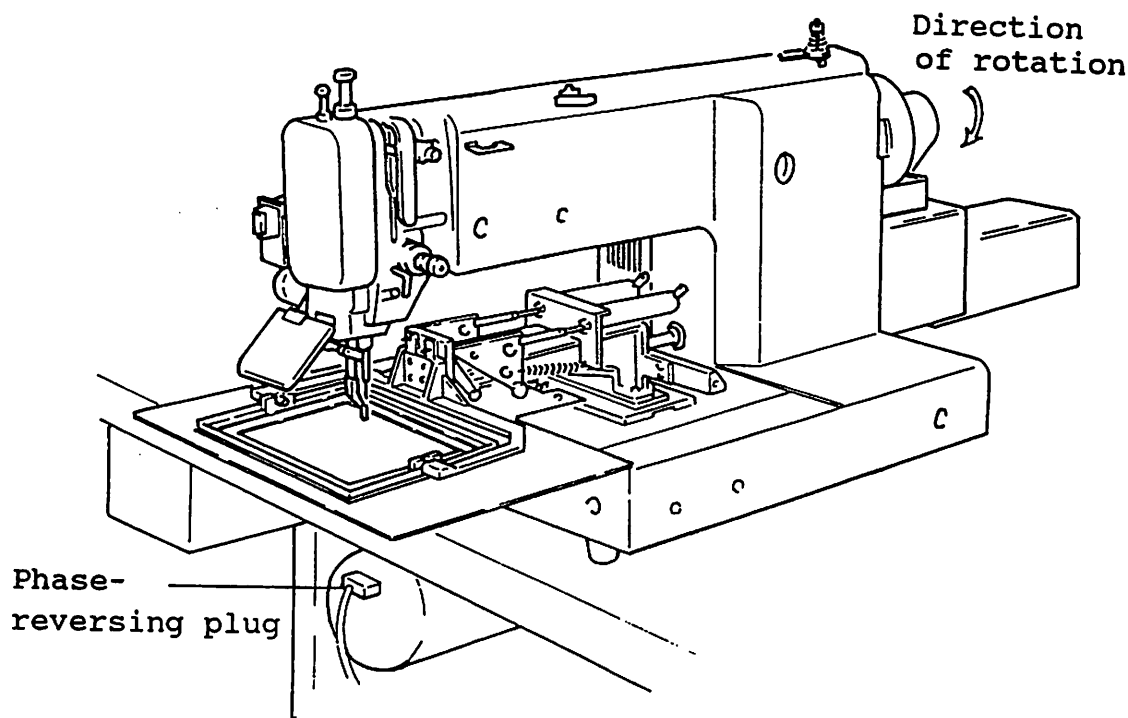


Fig. 4.10

Note: Be sure to set the power switch to the OFF position when disconnecting the power plug.

5. PREPARING TO OPERATE AND PRECAUTIONS

(1) Check that the supply voltage conforms with the requirements of the sewing machine being used.

(2) Check that the floppy disk containing the patterns has been installed properly.

(When the sewing machine leaves the manufacturing plant, test patterns are contained on the accessory floppy disk attached inside the front cover of the control panel.)

(3) Check that the machine parts have been lubricated. (See Section 7.1.)

(4) Check out the following points before turning on the power.

- Move and position the work holder by hand so that the needle is always located within the frame of the work holder.
- Make sure that the needle is set at the center of the presser foot.

(5) Position of work holder

The relationship between the work holder and home position is such that the home position is not at the center of the work holder but deviates to the right of center by a dimension equivalent to the allowance for the presser foot, as shown in Fig. 5.1.

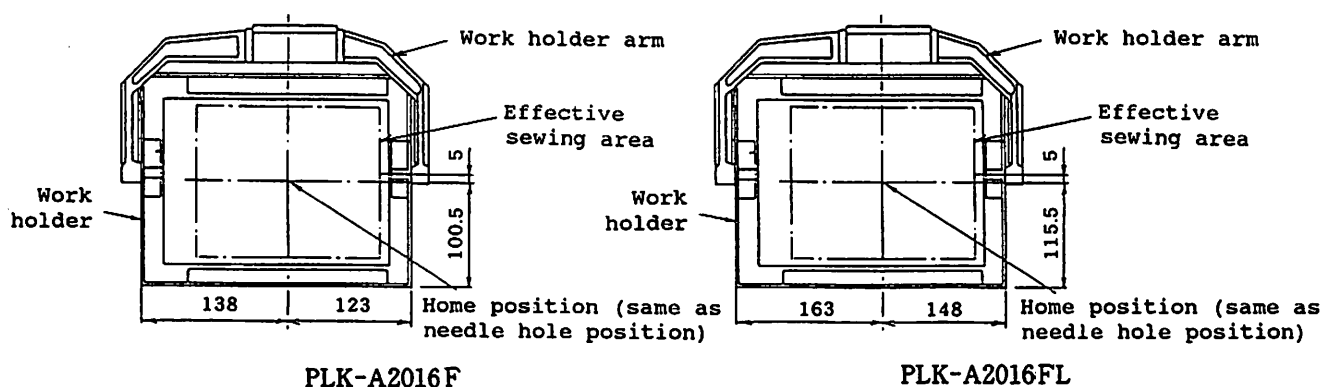


Fig. 5.1

(6) Check that the air is being supplied at a pressure of 4 kgf/cm² . (3.92×10⁵Pa)

6. CHECKPOINTS FOR OPERATION

(1) Safety

① A machine which is operating is dangerous and so every care must be taken not to touch any of its moving parts. Also, remember to turn off the power before proceeding with repair work or inspections.

② Make absolutely sure that the sewing machine is grounded in order to safeguard against noise and electric shocks.

(2) Operating environment

① Do not operate the sewing machine at high temperatures (over 40°C) or low temperatures (under 5°C). Otherwise, trouble or malfunctioning may occur in the machine.

② Do not install the sewing machine in a position where it will be exposed to direct sunlight or near a source of heat such as heating appliance.

③ Take care not to allow water or any other liquid substance from entering the machine head and control unit and to keep metal waste and other conductive materials away from the sewing machine.

④ The sewing machine cannot be used in an atmosphere where it will be exposed explosive gases, dust or oily vapors.

⑤ Avoid using the sewing machine in a location where it will be exposed to excessive shock or vibration.

(3) Operation

① Do NOT turn off the power or remove the floppy disk while the floppy disk drive is reading or writing data (while the drive LED is lighted). This may cause the data stored to be lost.

② Turn off the power before inserting or removing the P-ROM cassette.

③ When sewing a new pattern or enlarging a pattern, be sure to perform a test operation and check the relationship between the work holder and pattern.

- ④ Remove your foot from the start switch (pedal switch) when turning the power switch ON or OFF.
- ⑤ The presser foot must be lowered when the balance wheel is turned manually. It is lowered when the power is off so that the wheel can be rotated without further adjustment. When the power is ON, it can be lowered by setting the bobbin winder switch to the ON position.
- ⑥ The maximum sewing speed differs according to the stitch length. The maximum speed is automatically limited in accordance with the lengths shown in the table, and it should be set for each individual fabric.

Stitch length and maximum speed limit

Stitch length (mm)	Maximum speed limit (spm)
0.1 to 3.0	2,000
3.1 to 3.5	1,820
3.6 to 4.0	1,670
4.1 to 4.5	1,430
4.6 to 5.0	1,250
5.1 to 6.5	1,000
6.6 to 9.0	800
9.1 to 12.7	600
--	400
--	200

- ⑦ When a single-phase motor is being used, do not perform the start operation immediately but wait about 10 seconds after the power has been switched on until the motor operation stabilizes.
- ⑧ Burnouts may be caused by insufficient lubrication of the mechanical parts. Before operation, be sure to lubricate (see page 24) and check the parts.
- ⑨ Under no circumstances should the operator bring his or her fingers near the work holder while the sewing machine is being operated.
- ⑩ Do not operate the sewing machine without the eye guard and protective covers in place.

(4) Supply voltage

- ① Use a supply voltage within a $\pm 10\%$ range of the rating.
- ② When an instantaneous power failure occurs, the sewing machine stops in the reset or error mode. To resume operation, first make sure that the power is OFF and then switch it back on again.

(5) Noise

- ① When the power line is affected by surge voltages (noise), the stitch pattern may shift or malfunctioning may occur in the sewing machine.
- ② Similar effects may occur when the sewing machine is operated in the vicinity of any equipment which generates high noise levels (such as a high-frequency welder). Keep the machine as far away from such equipment as possible and use a separate power line to supply power to it.
- ③ Using a radio or TV set near the sewing machine may cause noise interference in the reception of the radio or TV broadcast. In cases like this, use a different power supply or place the radio or TV set at a distance from the sewing machine.

(6) Inspection of control circuitry

- ① Avoid using a multimeter to inspect the internal control circuitry since the voltage from such may damage the semiconductor parts.

(7) Up-turn of sewing machine head

When the sewing machine head is turned up for the adjustment of thread trimmer, etc., observe following cautions.

- ① Before turning up the head (see Fig. 6.2), fix X-Y cover (upper, see Fig. 7.1) with the adhesive tape, etc. in order to prevent it sliding down with its own weight.
- ② Remove beforehand the V belt which is connected to 7 type sewing machine motor because the belt will disturb the up-turn of head as it is raised higher.

- ③ Place a holder of head on the table (Fig. 6.1). Since the belt cover (small) interferes with the head when it is raised, remove beforehand the cover by loosening set screws.

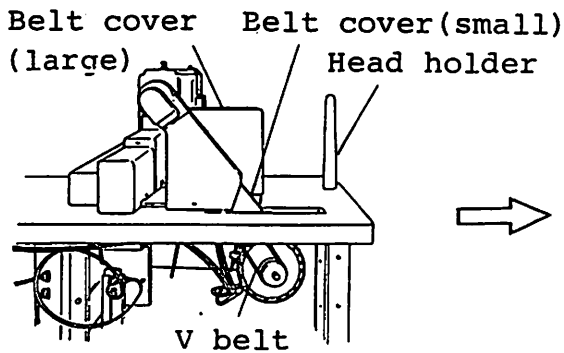


Fig. 6.1

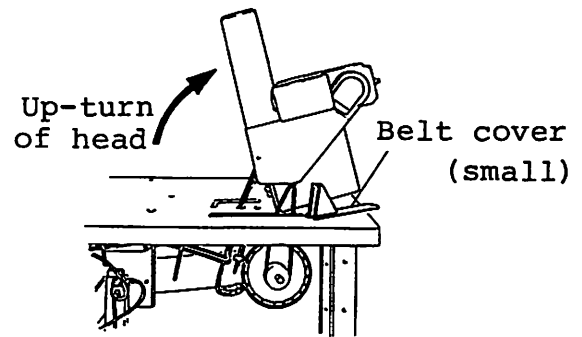


Fig. 6.2

7. HANDLING THE SEWING MACHINE HEAD

Names of major parts of machine head

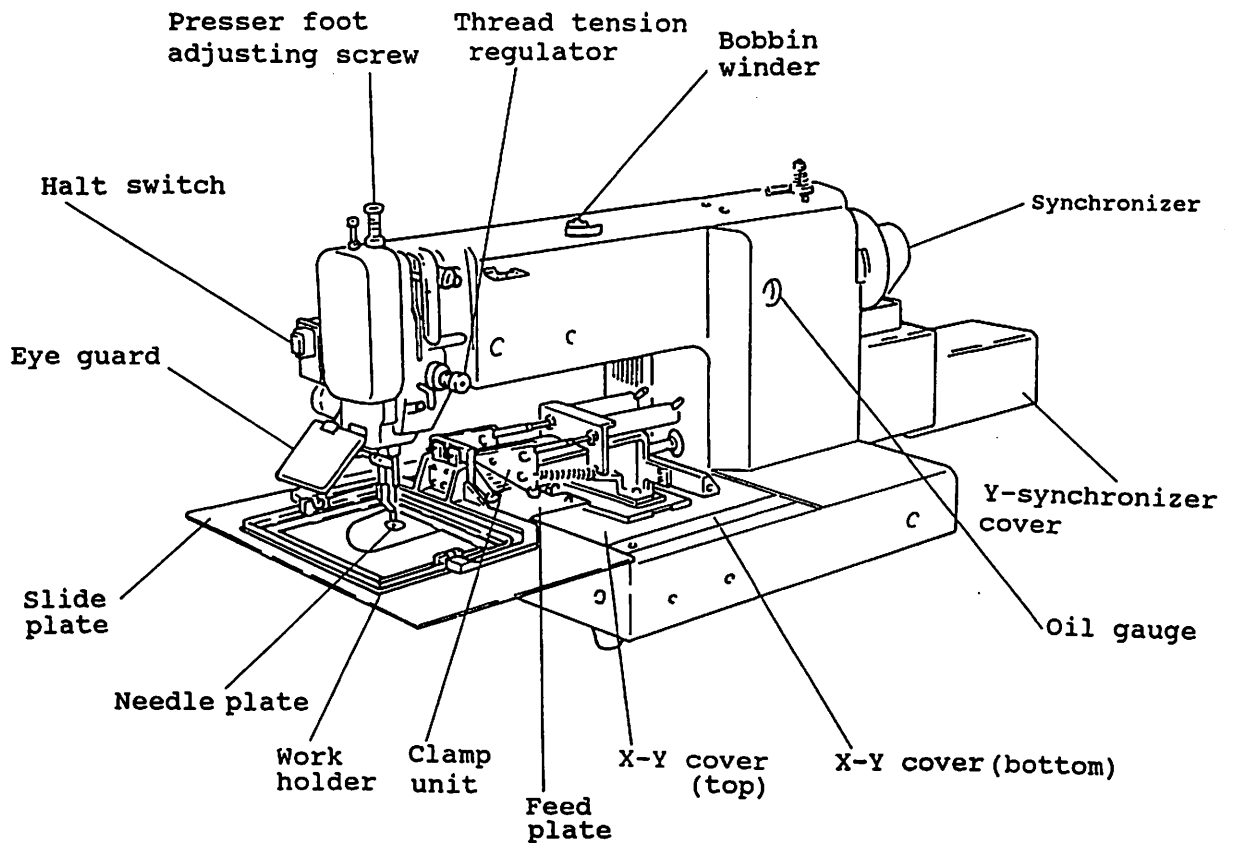


Fig. 7.1

7.1 Lubrication

(1) Supplying the lubricant

Before proceeding with operation, be sure to lubricate, as necessary, parts A to F indicated by the arrows in Fig. 7.2.

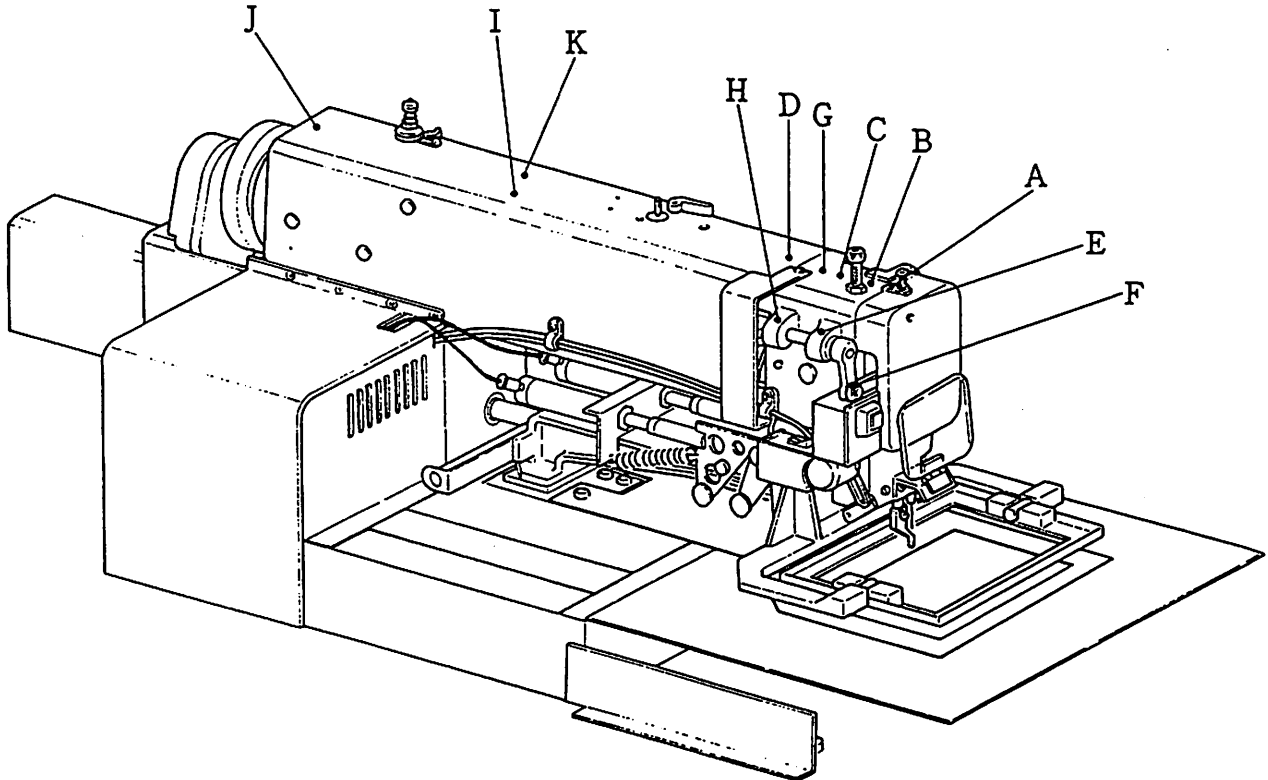


Fig. 7.2

Lubricate parts A to J before proceeding with a test run after the sewing machine has been installed. (Fig. 7.2) (Normally, lubricant is supplied automatically from the oil supply tank.)

(2) Replenishing the oil tank

Replenish oil through supply ports K and L on the arm side and head side, respectively, until the oil reaches the round red mark in the center of the oil gauge. Excessive supply may cause oil to spill from the supply ports when the head is tilted.

Note: Use white spindle oil #2 for lubrication.

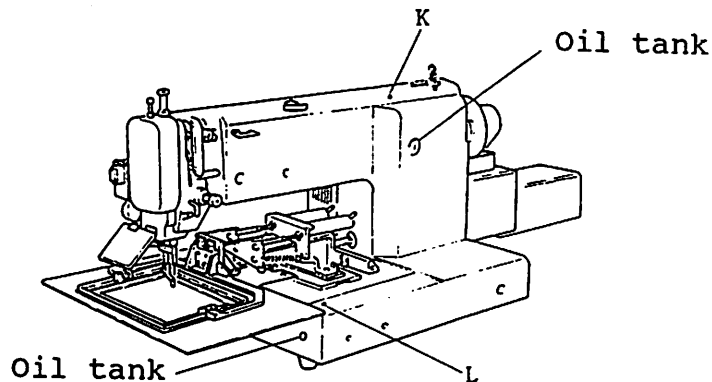


Fig. 7.3

7.2 Installing the needle

- (1) Before installing or removing the needle, turn off the power so that the sewing machine will not be started up in error.
- (2) Insert the needle into the needle socket as far as it will go.
- (3) With the needle prime groove turned to the front, tighten up the needle set screw to secure the needle.
- (4) For more satisfactory stitching results, it is recommended that the needle be installed and turned by about 10° in the direction of the arrow in Fig. 7.4

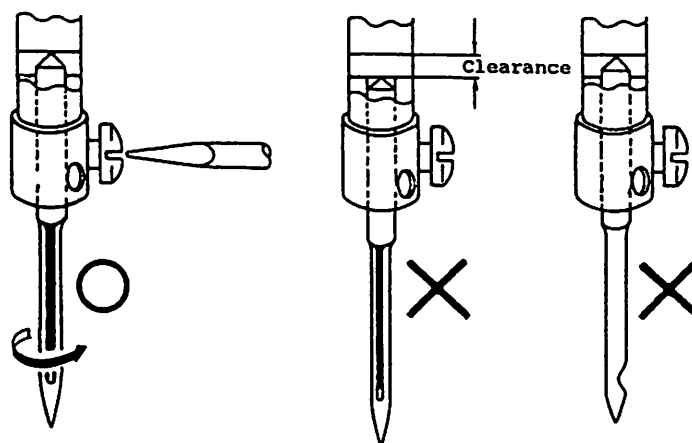


Fig. 7.4

7.3 Threading the needle thread

The needle thread should be threaded, as shown in Figs. 7.5 and 7.6, with the thread end extended about 4 cm from the needle.

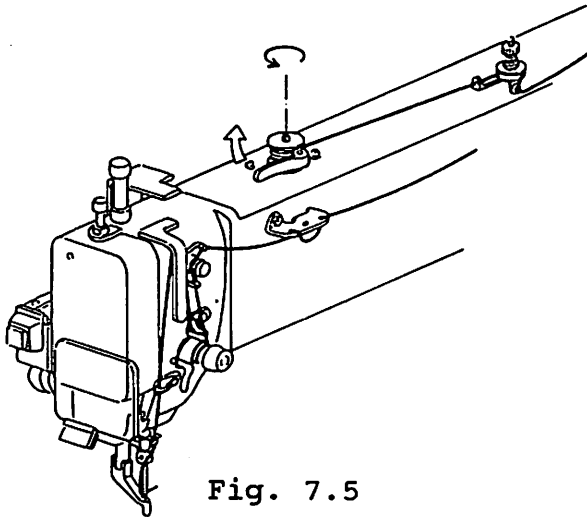


Fig. 7.5

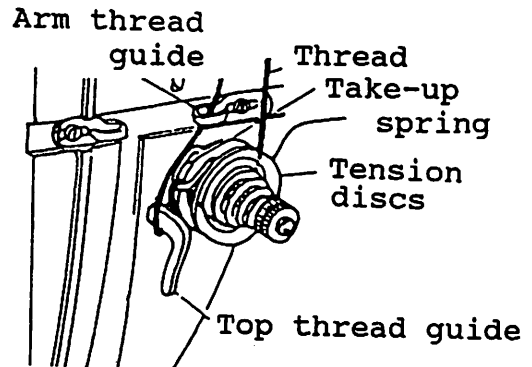


Fig. 7.6

7.4 Winding the bobbin thread

(1) Pass the thread coming from the spool holder base as shown in Fig. 7.7 and wind the end of the thread around the bobbin by several turns in the direction of arrow "a."

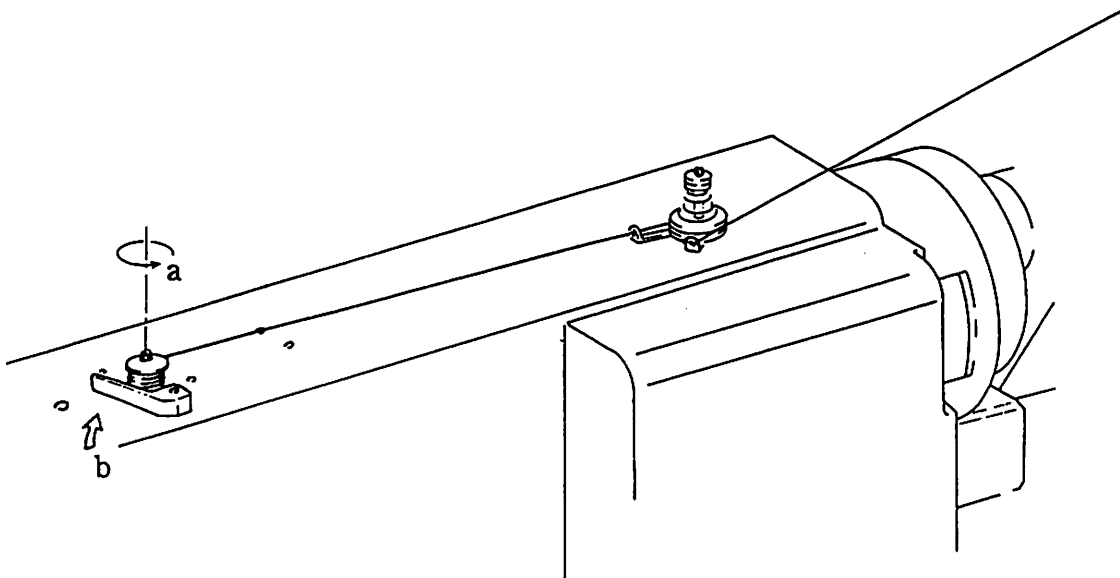


Fig. 7.7

- (2) Push the adjust lever in the direction of arrow (b).
- (3) Lower the work holder using the work holder switch (black pedal switch).
- (4) Setting the bobbin winder switch on the control panel to the ON position (LED lights) lowers the presser foot and allows the sewing machine to enter the bobbin winder mode.
- (5) Step on the start switch (red pedal switch).
While the start switch is pressed down, the sewing machine will operate at a speed equivalent to approximately 600 spm.
- (6) Upon completion of the thread winding, press the bobbin winder key again. (This turns the LED off.)

7.5 Installing the bobbin

- (1) Place the bobbin (B) inside the bobbin case (A).
- (2) Put the thread (E) into the slit (C) and pass it through the eyelet (D).
(See Fig. 7.8)

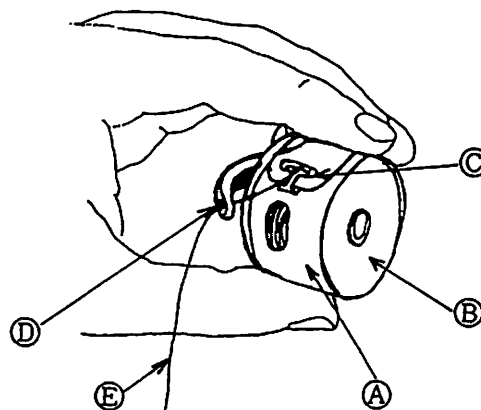


Fig. 7.8

7.6 Installing the bobbin case

- (1) Set the needle bar to its highest position and open the bottom cover.
(See Fig. 7.9)
- (2) Open the bobbin case latch (A) fully and fit it securely into the inner hook.

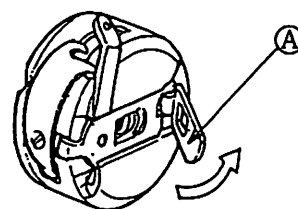


Fig. 7.9

Note:

The thread end should be extended about 2.5 cm from the square hole in the bobbin case.

7.7 Removing the inner hook

The hook clamp and inner hook itself can be removed by turning the hook clamp lever (Fig. 7.10) in the direction shown by the arrow as far as the horizontal position.

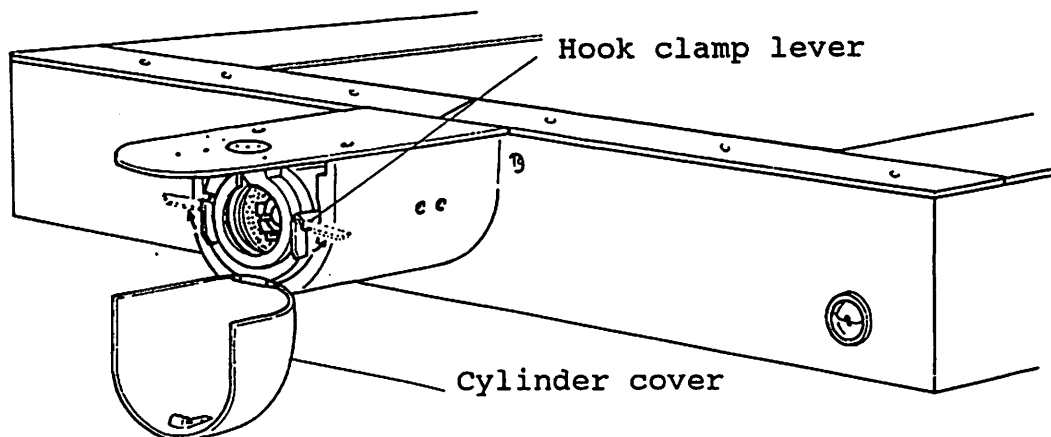


Fig. 7.10

7.8 Thread tension

Attain a balance between the needle thread tension and bobbin thread tension.

As shown in Fig. (A), the optimum tension balance is yielded when the needle thread is interlocked with the bobbin thread along the center line of the fabric layers.

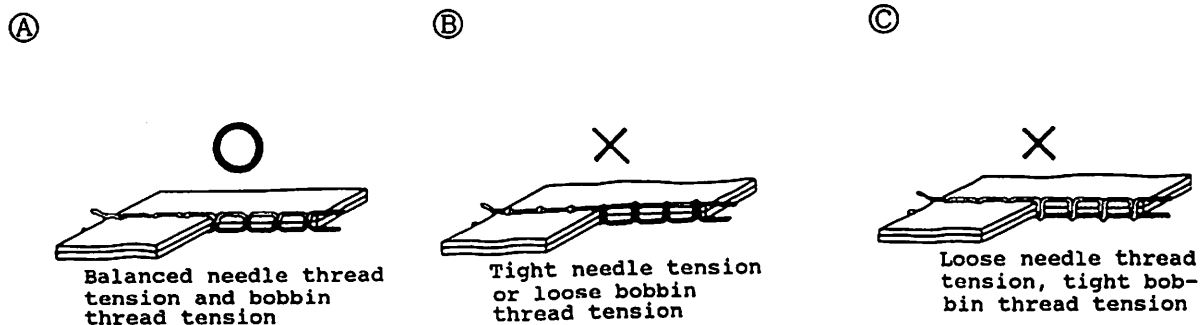


Fig. 7.11

(1) Bobbin thread tension

The bobbin thread tension can be adjusted by turning the thread tension adjusting screw. The tension is increased by turning the screw clockwise and reduced by turning it counterclockwise. (Fig. 7.12)

(2) Needle thread tension

The needle thread tension is adjusted in reference to the bobbin thread tension. To adjust, turn the tension regulating thumb nut in Fig. 7.13.

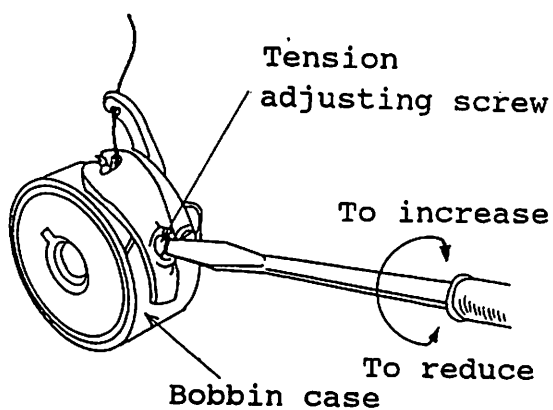


Fig. 7.12

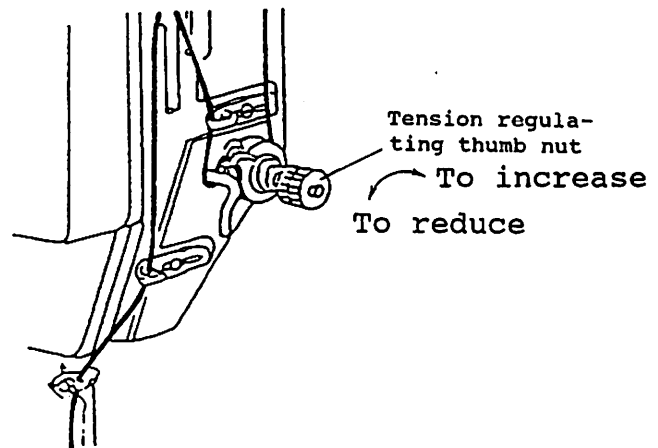


Fig. 7.13

Note:

Excessive tension may result in puckering or a broken thread.

7.9 Adjusting the work holder

7.9.1 Adjusting the work holder pressure

The work holder pressure is generated by a pneumatic (air) system, and it can be adjusted by turning the air pressure regulator knob. (See Fig. 4.6) Increase the air pressure for a higher work holder pressure and reduce it for a lower pressure. The standard air pressure is 4 kgf/cm².

7.9.2 Replacing the work holder

- (1) The work holder can be replaced in a single-action operation. To remove it, push the work holder down from the work holder arm pin.
- (2) To install the replacement work holder, engage its U-groove with the work holder arm pin. Then check that there is no play in the direction indicated by the arrow. The existence of play may cause a shift in the stitches.

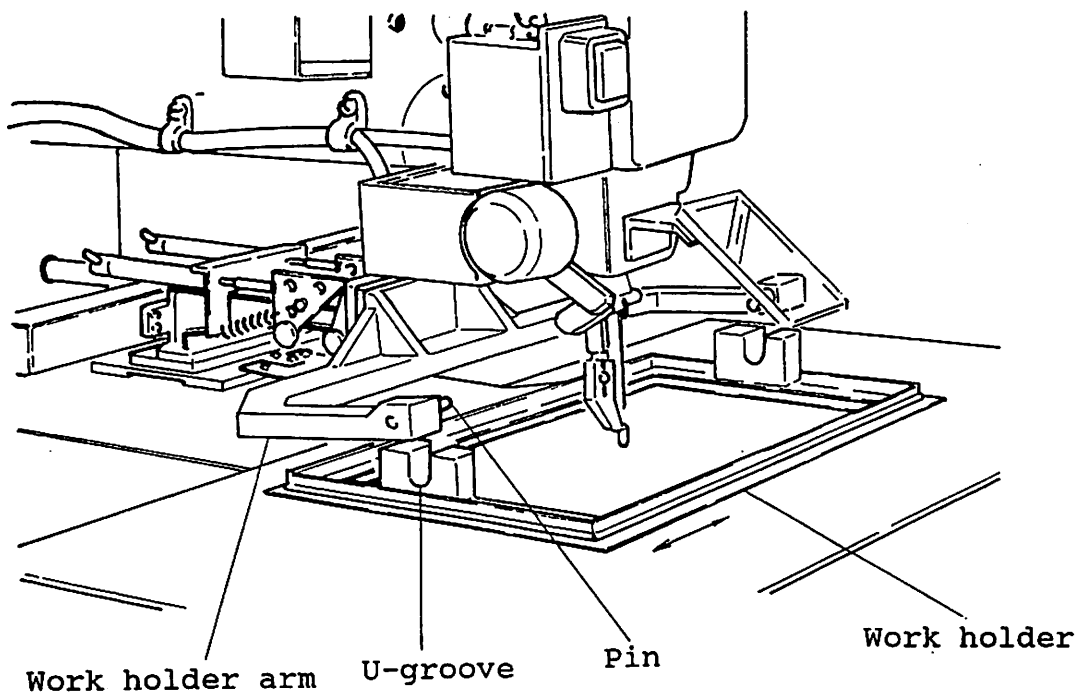


Fig. 7.14

7.10 Adjusting the presser foot

- (1) Check that the needle passes through the center of the presser foot hole.
- (2) Rotate the balance wheel manually and loosen the presser foot set screw (Fig. 7.15) or presser bar set screw (Fig. 9.11) and adjust the height of the presser foot so that the lower end of the presser foot is between 0 and 0.5 mm above the fabric when the presser bar is at its lowest position.

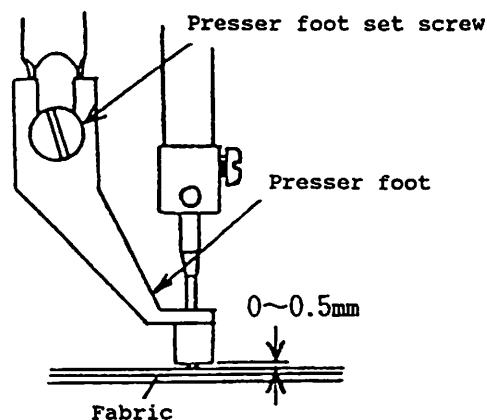


Fig. 7.15

- (3) The vertical stroke of the presser foot is factory-adjusted to 4 mm. To increase the stroke, loosen the bolt in Fig. 7.16 and move it up. The vertical stroke can be increased up to 10 mm.
- (4) To adjust the pressure of the presser foot, loosen the thumb nut in Fig. 7.16 and turn the presser foot adjusting screw.

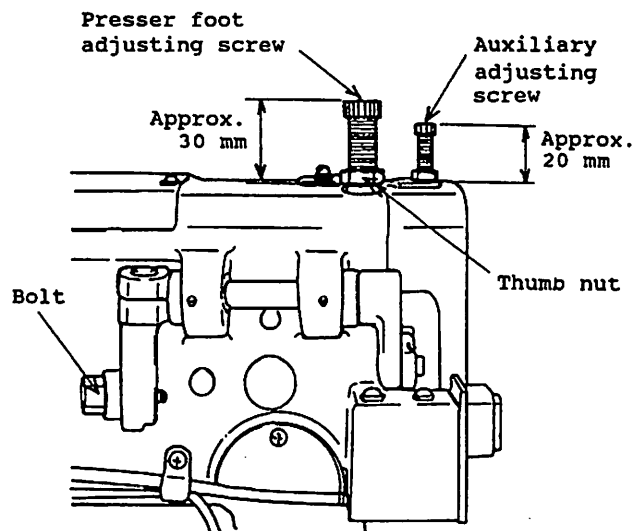


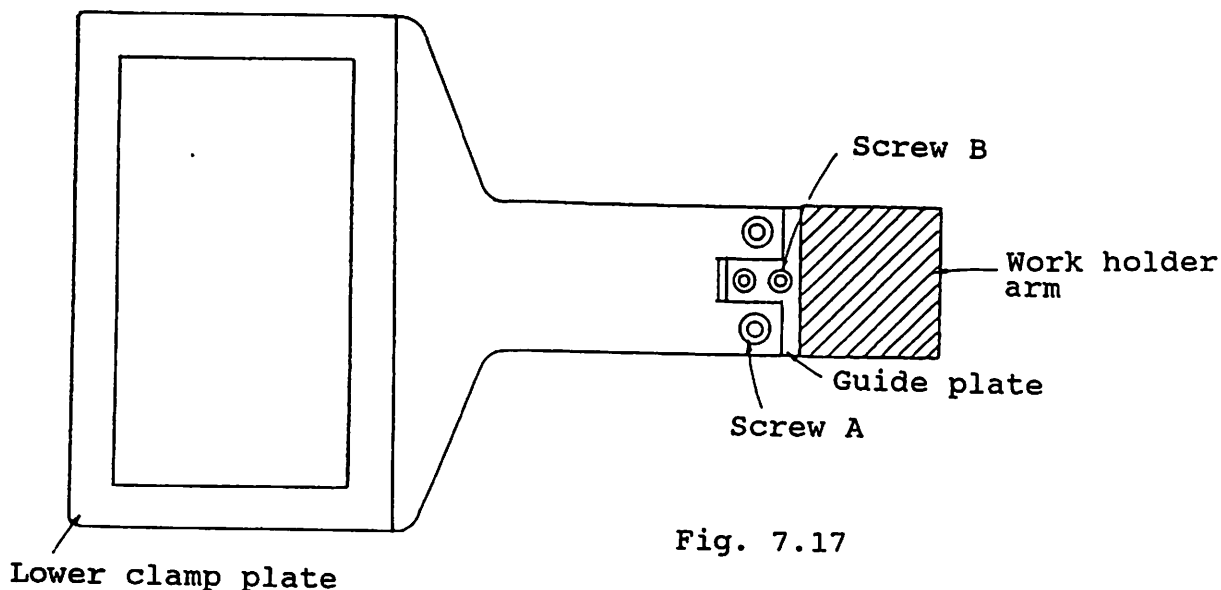
Fig. 7.16

Note:

The height of the presser foot must also be changed when the thickness of the fabric is changed.

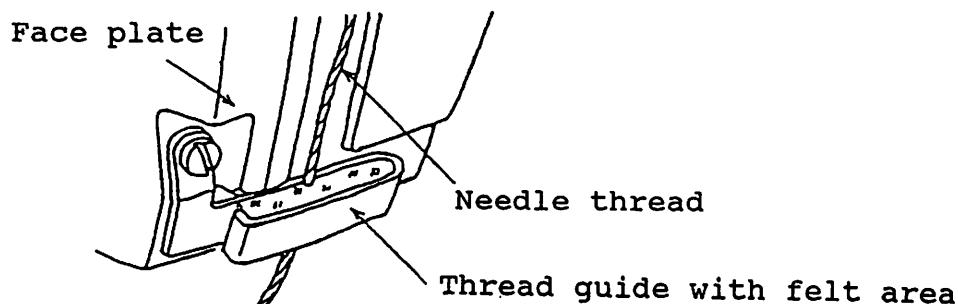
7.11 Replacing the lower clamp frame (Fig. 7.17) (For PLK-A2016-F)

- (1) To replace the lower clamp frame, remove screws (A) and replace.
- (2) The guide plate is provided for positioning the lower clamp frame. If the lower clamp frame is not aligned with the work holder, loosen screws (A) and (B), and adjust.



7.12 Lubrication with silicone oil

When applying silicone oil to the needle thread, mount the thread guide with the felt area onto the bottom part of the face plate, as shown in Fig. 7.18, and supply the oil to the felt area.



8. OPERATION

Refer to the separate control unit manual.

9. ADJUSTMENT AND MAINTENANCE

9.1 Adjusting the bobbin winder

(1) Adjusting the winding volume

To reduce the winding volume, first loosen screw (A) and move the adjust lever toward the bobbin; conversely, to increase the volume, move it in the opposite direction.

The adjust lever is set so that it will return in the direction of arrow "a" with the thread wound up to 80% of its full volume on the bobbin.

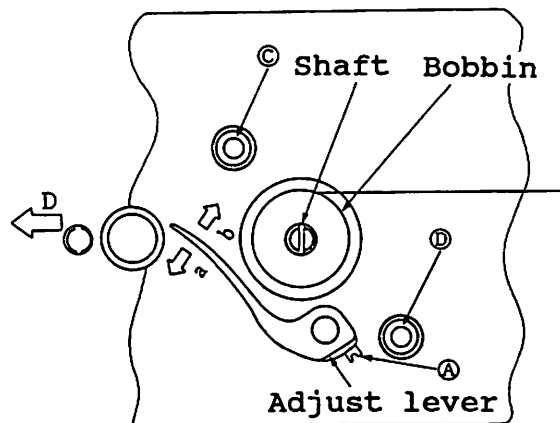


Fig. 9.1

(2) Adjusting the turning of the bobbin

Loosen screws (C) and (D) of the winder bobbin complete, mount onto the shaft a bobbin on which thread has been appropriately wound, and push the adjust lever in the direction of arrow "b." Next, move the bobbin winder complete in the direction of arrow "c" in the center of the figure. Once resistance is felt, tighten up screws (C) and (D) to finalize the positioning operation.

9.2 Adjusting the height of the needle bar

- (1) First, switch off the power.
 - (2) Turn the pulley and set the needle bar to its lowest position.
 - (3) Remove the rubber plug from the face plate and loosen the set screw of the needle bar clamp.
 - (4) Move the needle bar up and down to set timing mark (A) on the bar against the bottom end of the metal, and lock the bar at this position using the needle bar connecting stud set screw. (Set mark (B) against the bottom of the metal when the DPx5 type of needle is used.)
- There are 4 timing marks, one of which is selected to correspond with the type of needle used.

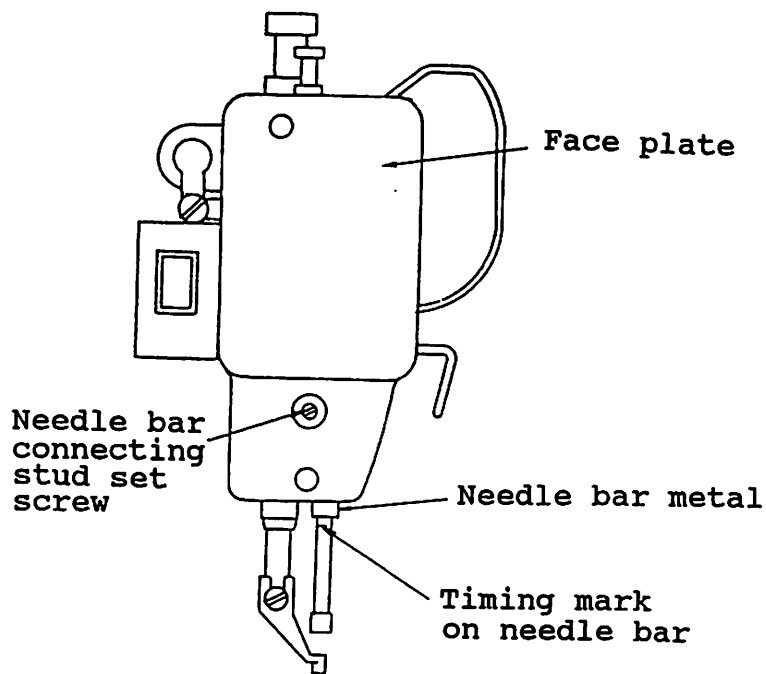


Fig. 9.2

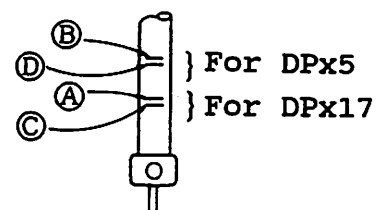


Fig. 9.3

9.3 Adjusting the driver and hook

- (1) Use an Allen wrench to loosen the driver set screw. (A hole to insert the wrench is provided under the cylinder head.)

- (2) Adjust the driver so that the head of the inner hook is aligned with the needle center when the pulley is turned and when timing mark (C) (or (D)) is pointing to the bottom end of the needle bar metal. (See Fig. 9.4)

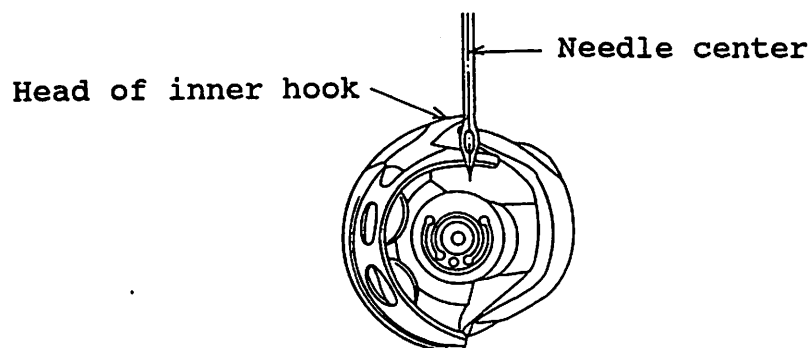


Fig. 9.4

- (3) Now adjust the position of the rotating hook so that a clearance of 0 to 0.05 mm is created between the head of the inner hook and needle. (See Fig. 9.6) The rotating hook can be moved by first loosening its set screw and then turning the eccentric pin using a slot-head screwdriver.

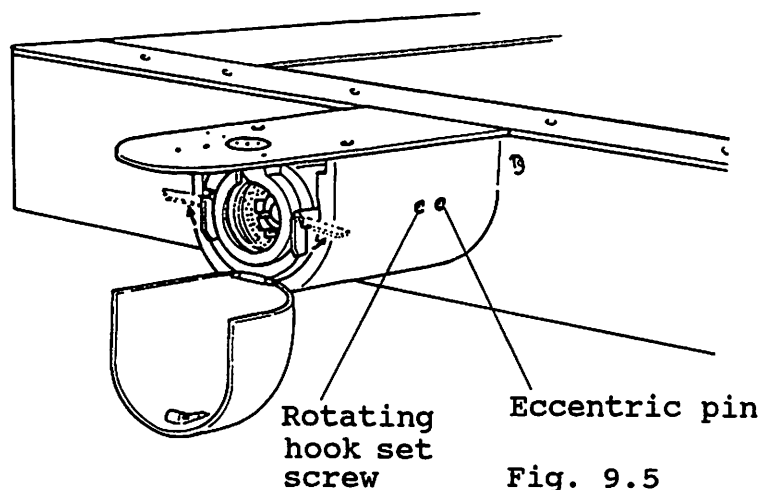


Fig. 9.5

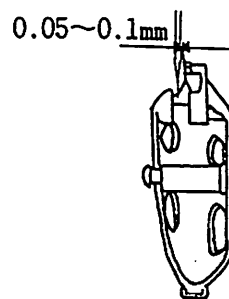


Fig. 9.6

- (4) In this condition, adjust the longitudinal position of the driver so that the clearance between the driver and needle is reduced to zero millimeters, and then lock the driver set screw.

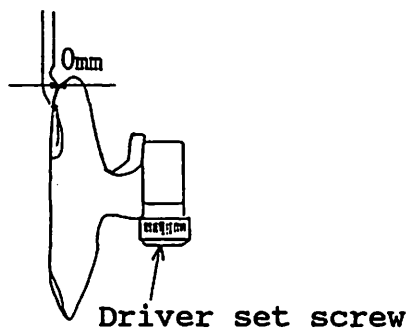


Fig. 9.7

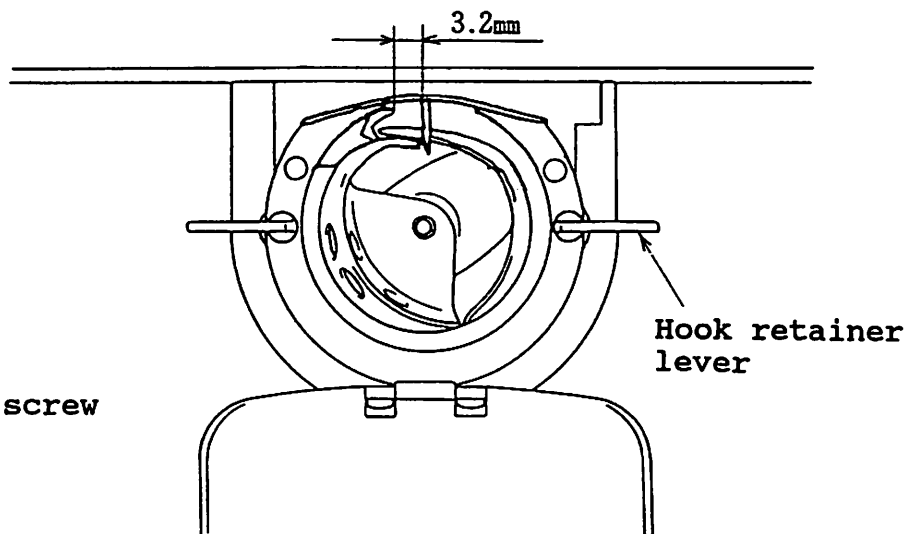


Fig. 9.8

* Lateral adjustment of driver

As a general guideline and as shown in Fig. 9.8, the timing can also be adjusted by creating a clearance of about 3.2 mm between the head of the hook and left side of the needle when the head of the hook has been retracted to its leftmost position.

9.4. Adjusting the thread guide (above hook) (Fig. 9.9)

- (1) Adjust the thread guide above the hook so that its left and right shoulders are aligned with the side surface of the needle. A failure in thread trimming may result if this position should shift out of alignment.
- (2) Adjust the thread guide so that a clearance (standard: 0.8 mm) between the hook retainer and thread guide is created which will permit the needle thread to pass through easily. A failure in thread trimming may result if this clearance is too great; conversely, if it is too small, improper thread tension, uneven length of the trimmed needle thread or jamming of the thread in the hook may result.

(3) Check carefully that the surface condition is smooth since the condition of the thread guide surfaces with which the thread comes into contact greatly affects the thread tension and thread trimming performance.

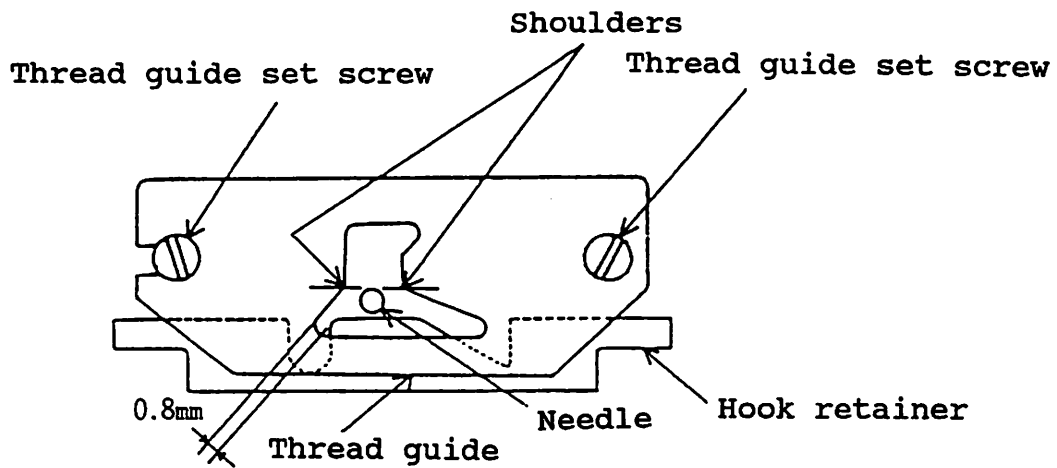


Fig. 9.9

9.5 Adjusting the presser foot

9.5.1 Adjusting the timing of the presser foot motion

To adjust the vertical motion of the presser foot, remove the cover on the back of the arm, and make the adjustment through the window.

- (1) Loosen the eccentric ring set screw (C).
- (2) Turn the pulley and stop it when the needle bar reaches its lowest position. The eccentric ring set screw (A) will be positioned at the front (standard position).
- (3) Loosen the eccentric ring set screw (A).
- (4) Secure the eccentric ring (B), and turn the pulley slowly to position ring (B).
- (5) The timing is increased when the pulley is turned in the forward direction (of arrow (D)); conversely, it is reduced when it is turned in the other direction.
- (6) After the adjustment, press down on the eccentric ring (B) in the direction of the arrow while tightening up set screws (A) and (C) in that order.
- (7) Position and secure the upper vertical feed crank using its clamping screw so that the vertical center line of the bell crank is made parallel to the presser foot bar when the take-up lever is at its highest position.

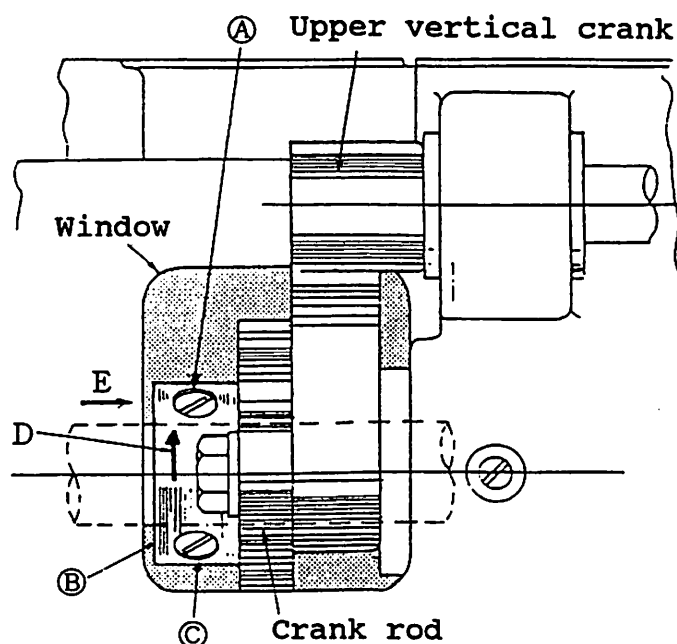


Fig. 9.10

9.5.2 Adjusting the vertical stroke of the presser foot

- (1) The stroke of the presser foot can be adjusted to zero and within a range from 2 to 10 mm. When connecting the link and arm using the step screw shown in Fig. 9.11, the stroke range is 4 to 10 mm; when connecting at screw hole "A," it is 2 to 5 mm; and when connecting at screw hole "B," it is zero.

The stroke is factory-set to 4 mm at the position shown in Fig. 9.11. To adjust the stroke in each range, loosen the top and bottom adjusting bolts. If connecting hole "A" or "B" is used, the lift distance of the inside presser foot in the halt status will increase by between 1 and 2 mm. Since the height of the inside presser foot also changes, loosen the presser bar set screw to readjust the height of the presser bar.

- (2) Since the amount of noise and vibration increase in direct proportion to the extent of the vertical stroke, it is recommended that the stroke be adjusted to as low as possible.

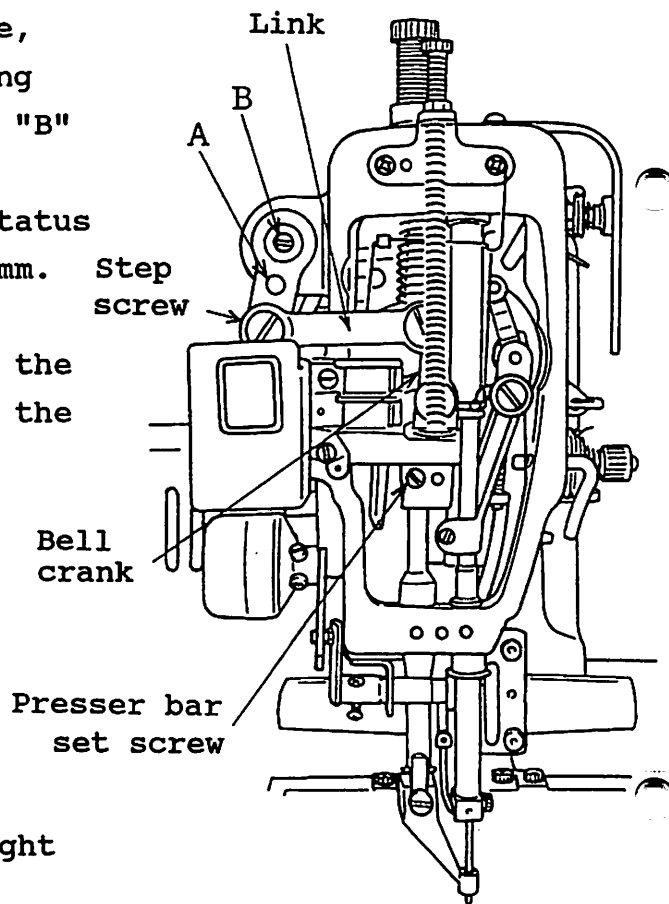


Fig. 9.11

9.5.3 Adjusting the presser foot height

- (1) Presser foot height during stitching
- ① Without switching on the power and with the sewing machine at the stop position, turn the balance wheel by hand (and place the take-up lever at the highest position).

Then secure the upper vertical crank in Fig. 9.10 so that the lengthwise center of the bell crank (see Fig. 9.11) is made parallel to the presser bar. (For this adjustment, the eccentric ring must be adjusted properly.)

- ② Place some fabric in position and turn the balance wheel by hand to set the presser foot to the lowest position. Now adjust the presser foot so that a clearance of between 0 and 0.5 mm is created between the bottom surface of the presser foot and the top of the fabric, and then secure the presser bar set screw. Also adjust the direction of the presser bar so that the needle will pass through the center of the hole in the tip of the presser foot.
- ③ Although the standard height of the presser foot is such that the clearance between the presser foot at its lowest position and the top of the fabric is between 0 and 0.5 mm, to prevent stitch skipping, this clearance can be reduced (by lowering the presser foot). However, noise will increase somewhat when the fabric is pushed down by the presser foot. Moreover, since an increase in the fabric holding time adversely affects the needle thread tension and seam tightness and since the fabric may be caught by the presser foot to throw the pattern into disarray, the lowering of the presser foot should be kept to the absolute minimum.

9.6 Adjusting the wiper drive mechanism

- (1) Loosen the set screw of the rotary solenoid drive crank.
- (2) Adjust the clearance between the bent part of the stopper and washer to approximately 4 mm, as shown in Fig. 9.12, and secure the stopper.
- (3) Locate the wiper drive crank so that the driven crank pin is at the center of the slotted hole of the drive crank, as shown in Fig. 9.12.
- (4) Set the set screw of the driven crank so that the wiper end is positioned as shown in Fig. 9.14 when the wiper drive crank is

brought into contact with the stopper.

- (5) While using your finger to push down on the drive crank, rotate the rotary solenoid by hand, and check that it moves smoothly across the entire range.
- (6) Adjust the thread wiping position of the wiper to the dimension shown in Fig. 9.13 when drive crank has been stopped at the above position.

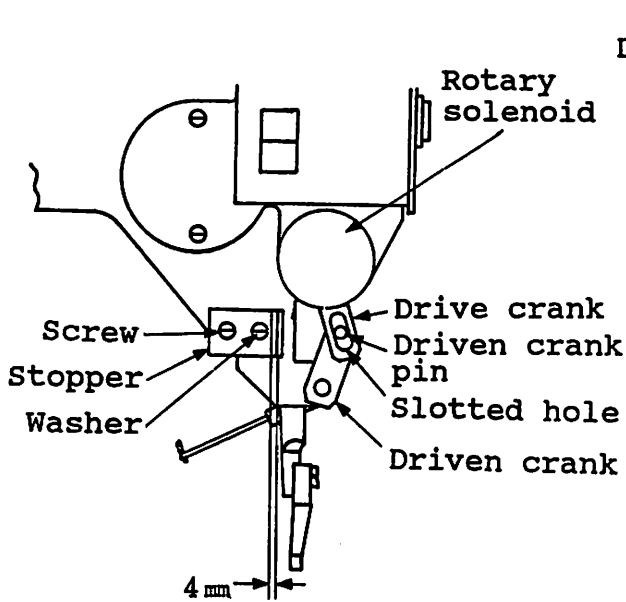


Fig. 9.12

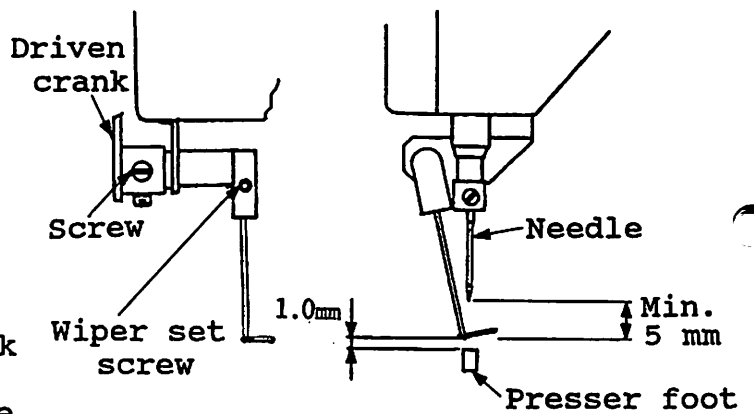


Fig. 9.13

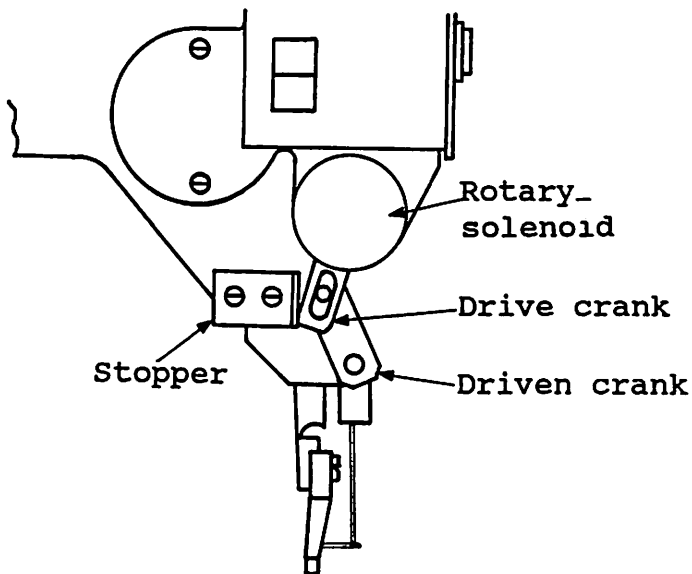
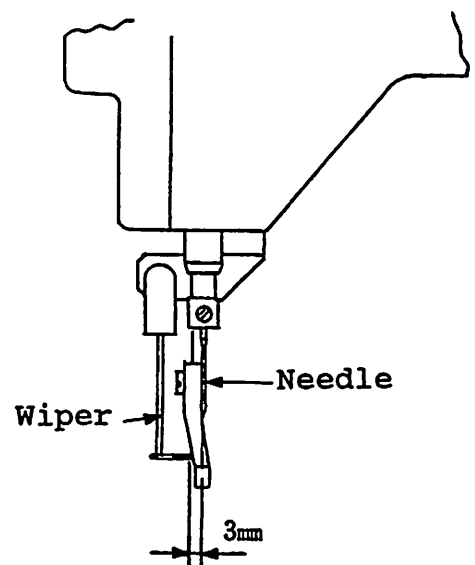


Fig. 9.14



9.7 Adjusting the home position

When the sewing machine is shipped from the factory, the standard home position is set to the center of the sewing area although it can be adjusted within the range below.

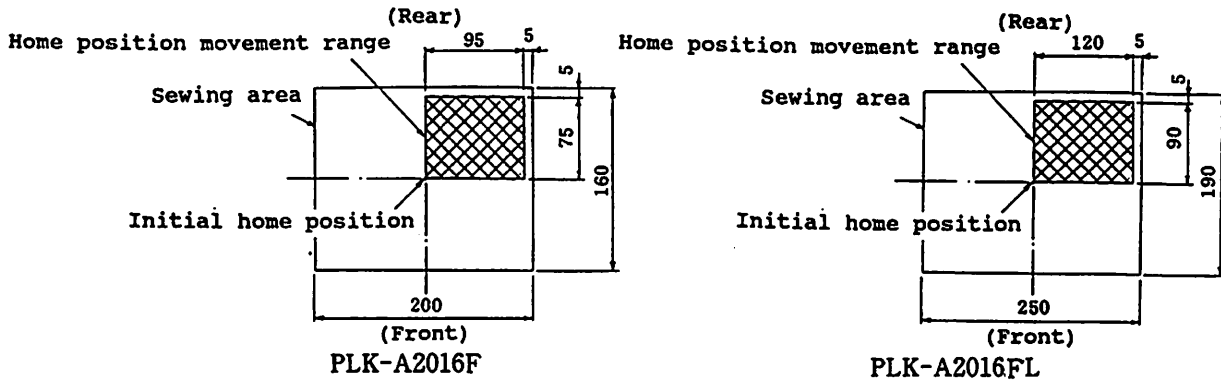


Fig. 9.15

9.7.1 Preparations for home position adjustment

- (1) Set SW3 switch 2 in the control panel to the ON position.

If this switch is OFF, the effective sewing area will be reduced by an amount equivalent to the movement of the home position.

Example:

Stitching will not be possible in the shaded area shown below if the home position is moved 60 mm in the X direction and 40 mm in the Y direction.

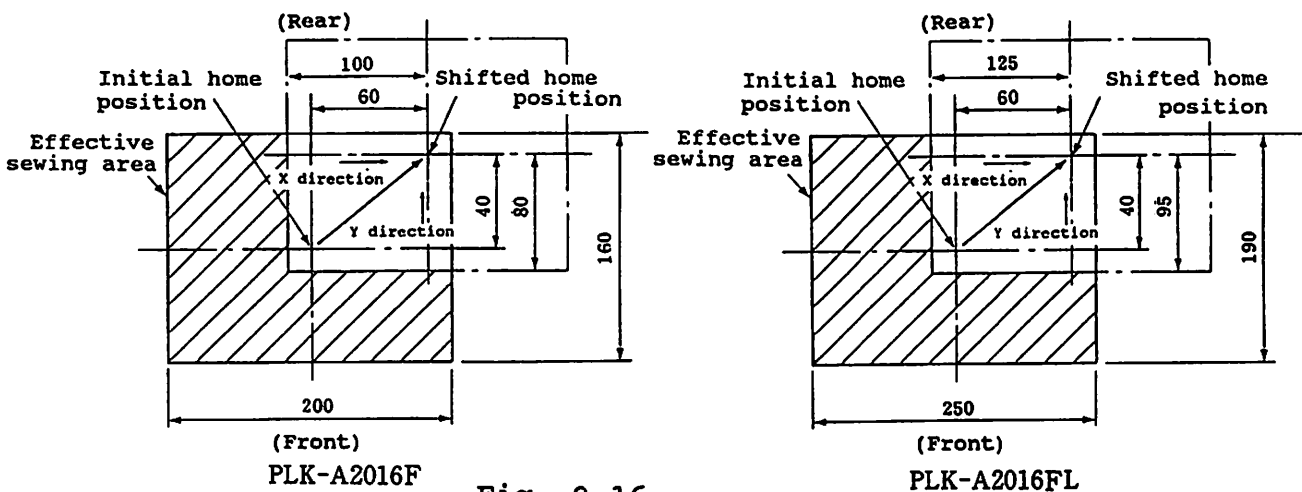


Fig. 9.16

- (2) The adjustment of the home position is facilitated when the procedure below is followed.

Plot the center lines (X, Y directions) of the original home position and the desired home position on paper, and place the paper on the lower clamp frame. After performing home position return, place the paper so that the initial home position traced on the paper is brought under the needle, and carefully secure the paper on the frame using adhesive tape. Then proceed with the adjustment of the home position as described below.

9.7.2 Adjusting the home position in the X (right) direction.

- (1) Remove the X-Y cover (top) clamping screws and the left and right X-Y covers, and set to the status shown in Fig. 9.17.
- (2) The home position can be moved to the right by moving the X-axis synchronizer in the direction of arrow C and the detector plate in the direction of the arrow.

The detector plate can be moved only by a distance equivalent to the length of its slotted hole.

Additional movement of the X-axis synchronizer beyond the dimension of the slotted hole is possible by removing screws (A) and changing the position of the holder base screw.

- (3) Fine adjustment of home position
The home position can be adjusted finely by loosening the holder base screw (B) and using a screwdriver to turn the home position fine adjusting screw.
- (4) Upon completion of the adjustment, move the X-Y table by hand and check that the detector plate does not come into contact with the synchronizer or horizontal shaft, etc.
- (5) Set the HOME key to ON, perform home position return, and check that the home position has been shifted as intended.

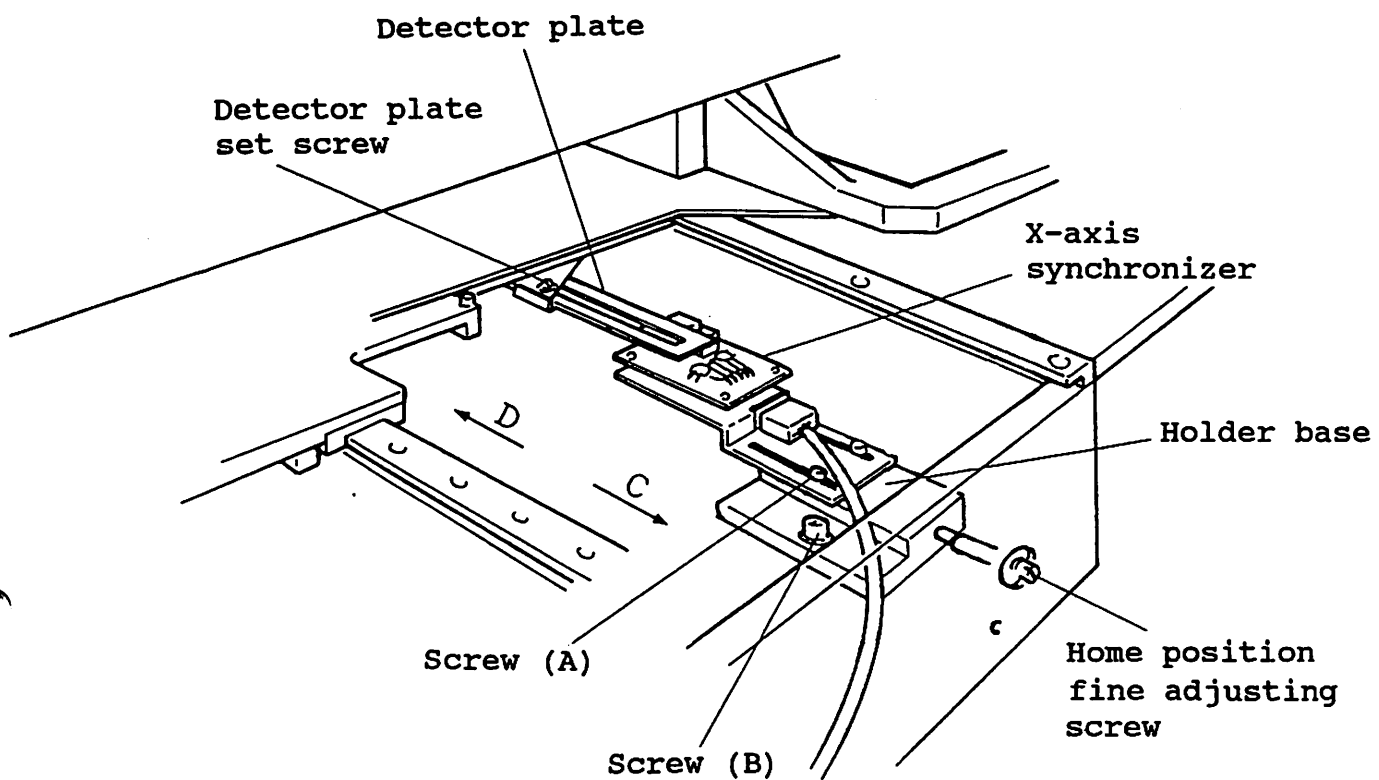


Fig. 9.17

9.7.3 Adjusting the home position in the Y (rear) direction

- (1) Remove the synchronizer cover.
- (2) The home position can be shifted toward the rear by loosening screws (B) of the synchronizer mounting plate and by moving the synchronizer in the direction of the arrow.
- (3) To move the synchronizer over a long distance, remove screws (B) and tighten it up in an appropriate screw hole.
- (4) The home position can be adjusted finely by turning the home position fine adjusting screw after set screw (A) has been loosened. (Adjustable distance: 3 mm)
- (5) After the adjustment, check that the synchronizer plate passes through the center of the synchronizer without making contact and that it passes through the synchronizer in the perpendicular direction as well.
- (6) Set the HOME key to ON, perform home position return, and check that the home position has been shifted as intended.

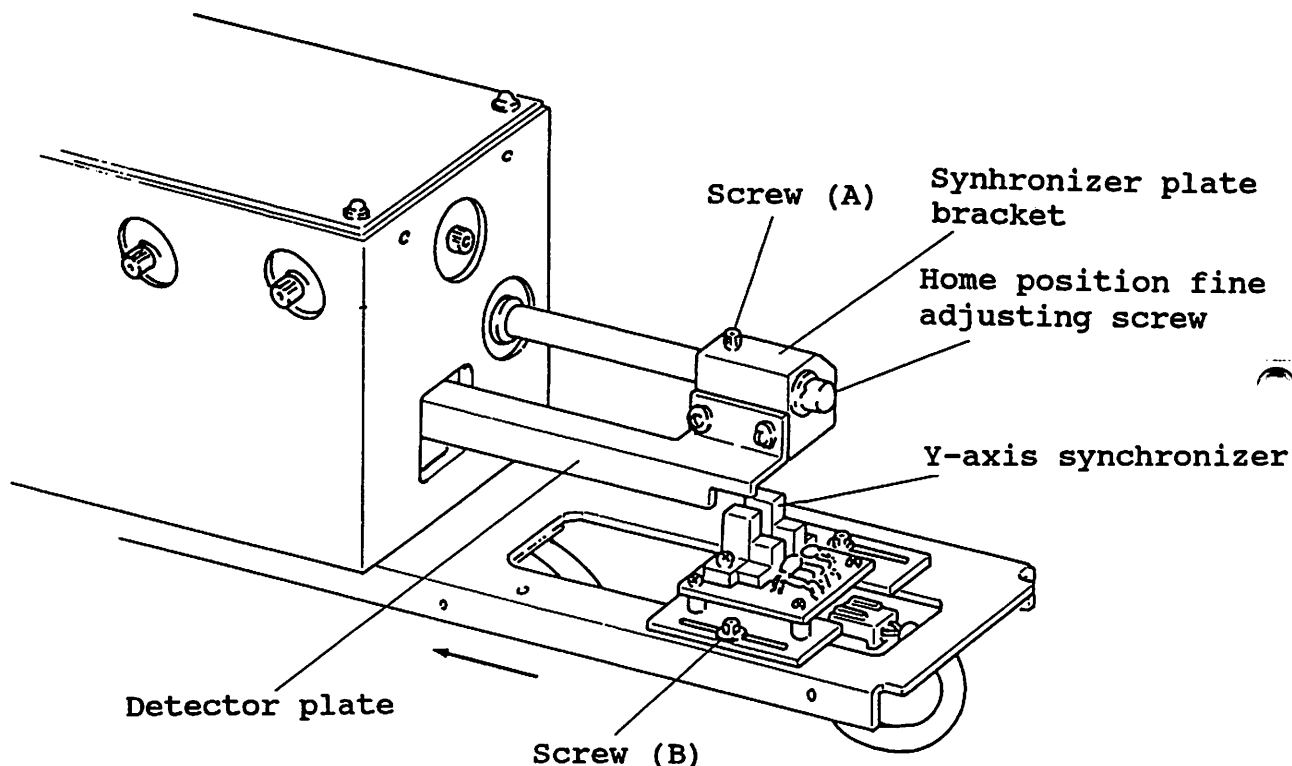


Fig. 9.18

9.8 Maintaining and inspecting the X-Y table

- (1) Through long-term use, scraps of thread and lint can build up on the races to make the movement of the X-Y table stiff. When this occurs, remove the X-Y covers (top and bottom) and the Y axis bellows (see Fig. 7.1), and remove the scraps and lint.

* Configuration of races

A race is an assembly of two slide units and a track rail, and it comes in a pair which makes a set.

- (2) Grease has been applied to the slide units although, after operation for a period of time or even after no use at all, aging will cause the properties of the grease to change. It is thus a good idea to replenish the grease about once every six months. Use Albania EP grease #2 or its equivalent, and apply to the raceway surface of the track rail.

Note:

If the oil runs out or if the grease dries out, this will result in increased sliding resistance which, in turn, results in a deterioration of the smoothness of operation and accuracy of the response. When the sewing machine has not been used for a prolonged period of time, inspect the raceway surfaces.

- (3) Since the X-Y table vibrates strongly during sewing operations and this may loosen the screws, it is recommended that regular inspections be conducted and the screws tightened up where necessary. In particular, looseness in the races has a direct effect on the sewing performance and so it is recommended that these be inspected every 3 months.

* Screws for tightening track rail of race

The track rail is tightened up every other pitch which means that no tightening screws are missing.

- (4) Follow the procedure below to adjust a race which has become loose.

The reference side of the track rail is the side where the

mounting surface has a shoulder, and the other side is the driven side. (See Fig. 9.19)

① Cleaning the mounting surface

Use a clean cloth to wipe the surface where the race will be mounted.

② Provisionally securing the track rails

Provisionally secure the pair of track rails so that they can be moved slightly.

③ Securing the track rails at the reference side

Press the track rails at the reference side firmly against the mounting surfaces, and tighten each of the screws successively in turn and repeat this procedure until they are all tightened up evenly together.

④ Securing the slide units

Press all the slide units firmly against the mounting surfaces and secure them.

⑤ Securing the track rails at the driven side

Move the X-Y table and while checking that it moves smoothly, secure the track rails at the driven side. Proceed to tighten up the screws successively in turn and repeat this procedure until they are all tightened up evenly together.

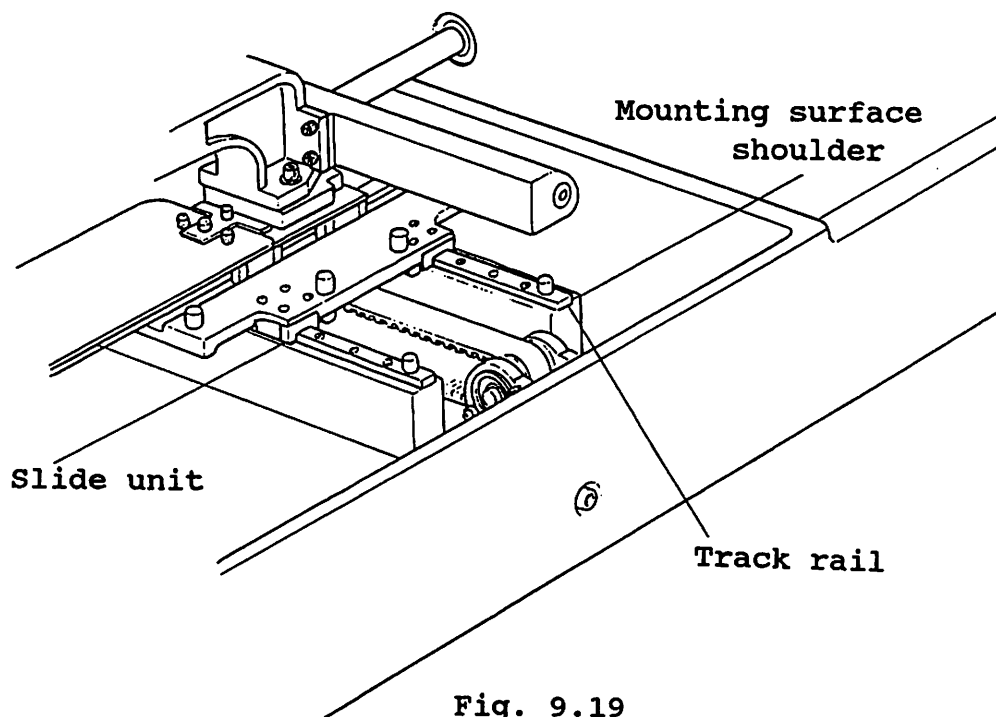


Fig. 9.19

Notes:

1. When a race has been removed, the track rail will lean, causing the slide unit to slide and fall off. Therefore, in cases like this, stop the slide unit from sliding by holding it together and hold the track rail horizontally.
2. If one of the slide units of a race has fallen off, do not attempt to repair it or combine it with another slide unit for re-use. In cases like this, replace it with a complete race assembly (4 slide units and 2 track rails) so as to ensure that precision will be maintained.

9.9 Adjusting the X-Y table belt tension

9.9.1 Adjusting the X-axis belt tension

- (1) Loosen the four bracket clamping screws and turn the belt tension adjusting screw to adjust the belt tension.
- (2) To increase the X-axis belt tension, tighten up the X-axis belt tension adjusting screw located at the side of the bed. The recommended belt tension is such that no slack is detected when the belt is pushed down lightly. This tension is attained by turning the adjusting screw by about 90° from a position where it is stiff to the touch.

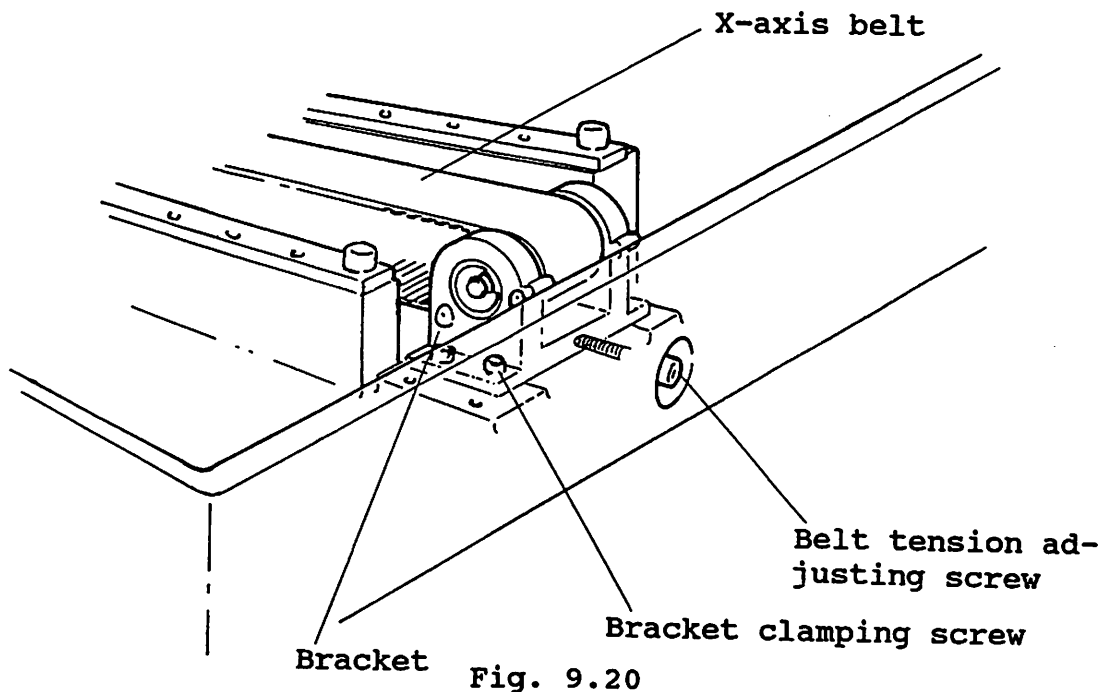


Fig. 9.20

9.9.2 Adjusting the Y-axis belt tension

- (1) Loosen the bracket clamping bolts to an extent where the bracket moves slightly.
- (2) To increase the Y-axis belt tension, tighten up the Y-axis belt tension adjusting screw. The recommended belt tension is such that no slack is detected when the belt is pushed down lightly. This tension is attained by turning the adjusting screw by about 90° from a position where it is stiff to the touch.

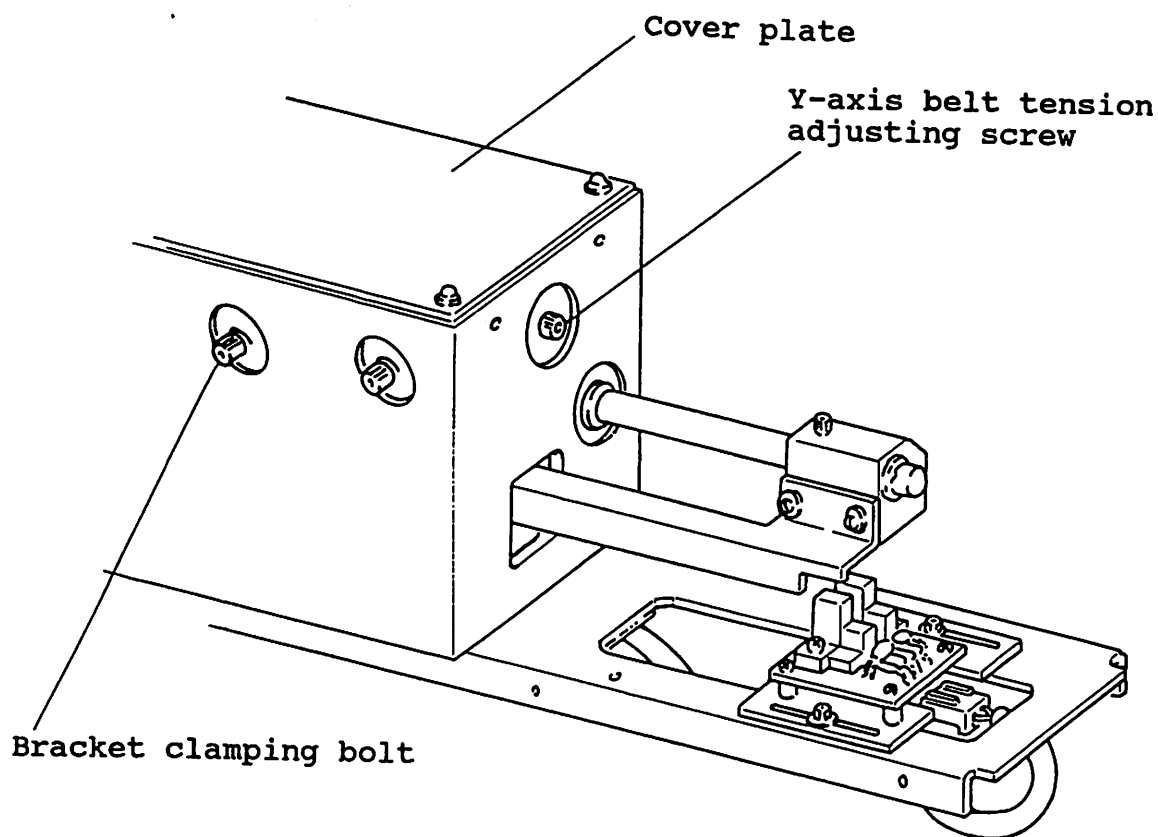


Fig. 9.21

9.10 Adjusting the synchronizer

9.10.1 Adjusting the needle bar stop (up) position

- (1) Upon completion of the stitching, the sewing machine should stop with timing mark (A) on the arm aligned with timing mark (B) on the pulley. (See Fig. 9.22)
- (2) If the deviation between these two marks is 3 mm or more, loosen the synchronizer coupling set screw and turn the coupling to adjust the stop position. Turning the coupling clockwise delays the stop position; conversely, turning it counterclockwise advances the stop position.
- (3) If the needle bar stop comes too early, the needle thread may disengage from the needle eye when stitching is commenced. Conversely, if it is delayed, the needle will stop at a lower position which may mean that the wiper will be caught by the needle or that the movable knife will not move since the cam follower roller of the thread trimmer cannot enter the cam groove.

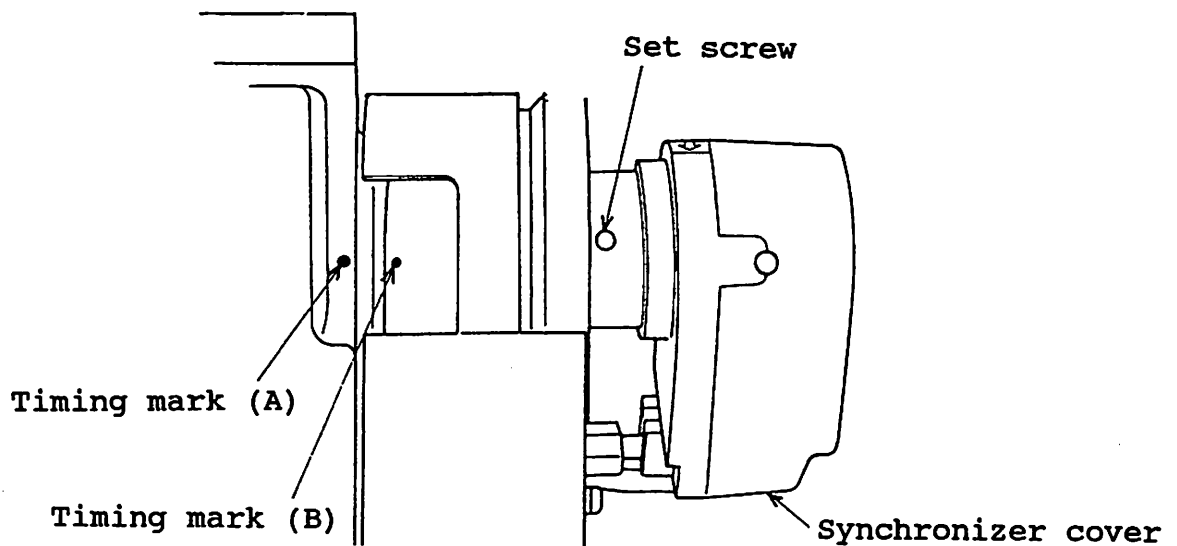


Fig. 9.22

9.10.2 Adjusting the position detecting discs

The 3 position detecting discs do not normally need to be adjusted but it should be checked that their positions stand in the relationship indicated below.

- (1) Draw out the synchronizer cover toward the cable and remove it.

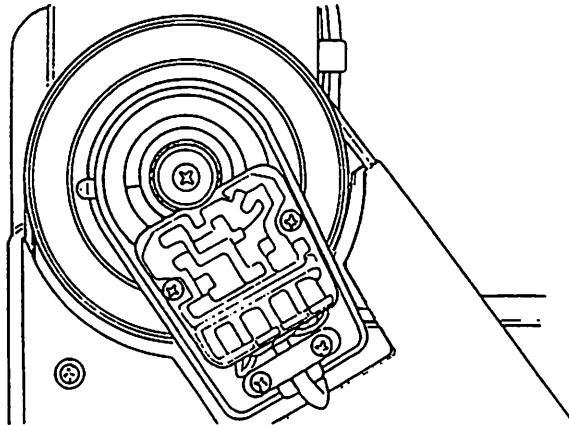


Fig. 9.23

- (2) The synchronizer comes with 3 position detecting discs. The front disc (red) is used to detect the DOWN position, the middle disc (black) to detect the UP position, and the rear disc (blue) to time the thread release.
- (3) The middle disc (black) has a scale. Align the triangular mark of the front disc (red) at the 115° position on this scale and the triangular mark of the rear disc (blue) at the 340° position.

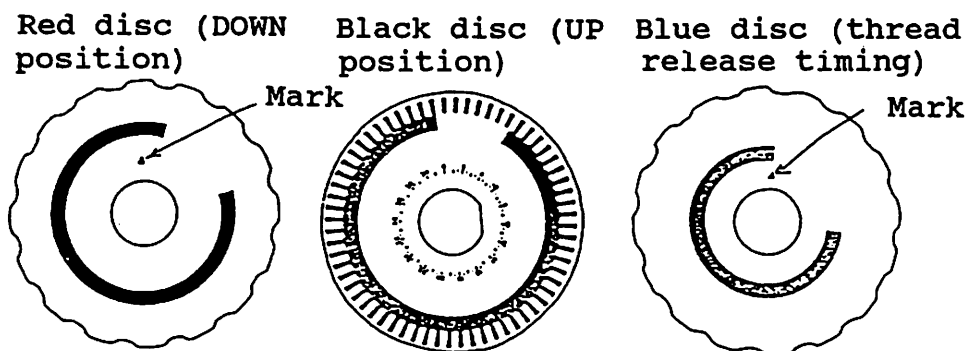


Fig. 9.24

9.11 Adjusting the thread trimmer

- (1) Adjust the cam follower so that the roller is normally positioned on the cam shoulder about 1 mm away from the thread trimmer cam, as shown in Fig. 9.25.
- (2) Use your hand to press the cam follower crank in the direction of the arrow in Fig. 9.25, and check that the roller engages with and disengages from the cam groove without resistance.

- (3) The range in which the roller can be engaged and disengaged is where the cam groove is concentric with the arm shaft. If the roller cannot be engaged and disengaged smoothly, check that the roller is positioned on the shoulder, loosen the nut in Fig. 9.25, tighten the stopper screw until it makes contact with the cam follower crank stopper, loosen the stopper screw by about one-third of a complete turn, and then tighten up the nut.

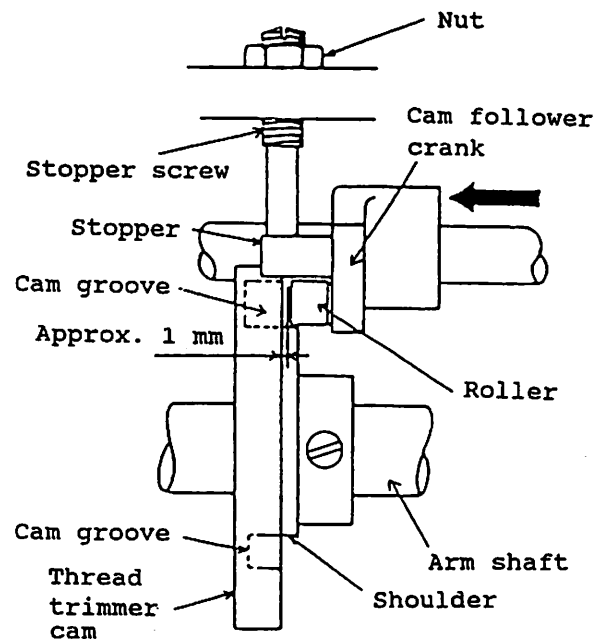


Fig. 9.25

- (4) To remove the knife assembly, remove the E-type stop ring in Fig. 9.26, the feed plate shown in Fig. 7.1 and the four center slide plate set screws. The movable knife can be taken out together with the center slide plate.
- (5) To adjust the movable knife, loosen the movable knife position adjusting screw at the back of the bed and adjust the knife drive crank so that the end of the movable knife stops at a 0.5 mm distance, as shown in Fig. 9.26, from the hook retainer when the sewing machine is stopped. (See Fig. 9.27)

If the movable knife is located too far from the needle hole, the thread may not be trimmed satisfactorily or the E-type stop ring will strike the thread guide set screw shown in Fig. 9.9. Moreover, if it is located too close to the hole, the trimmed needle thread tail may be sandwiched between the fixed knife and movable knife.

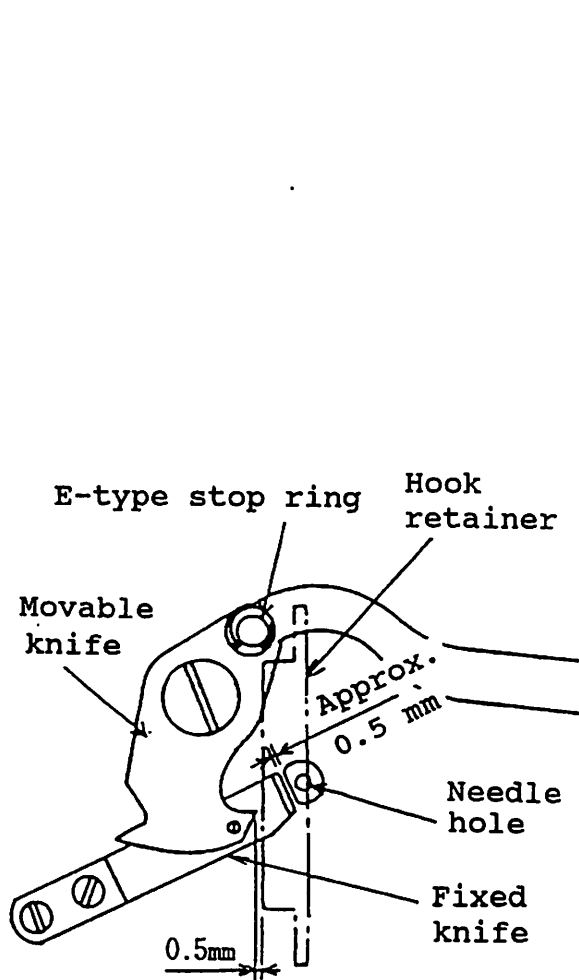


Fig. 9.26

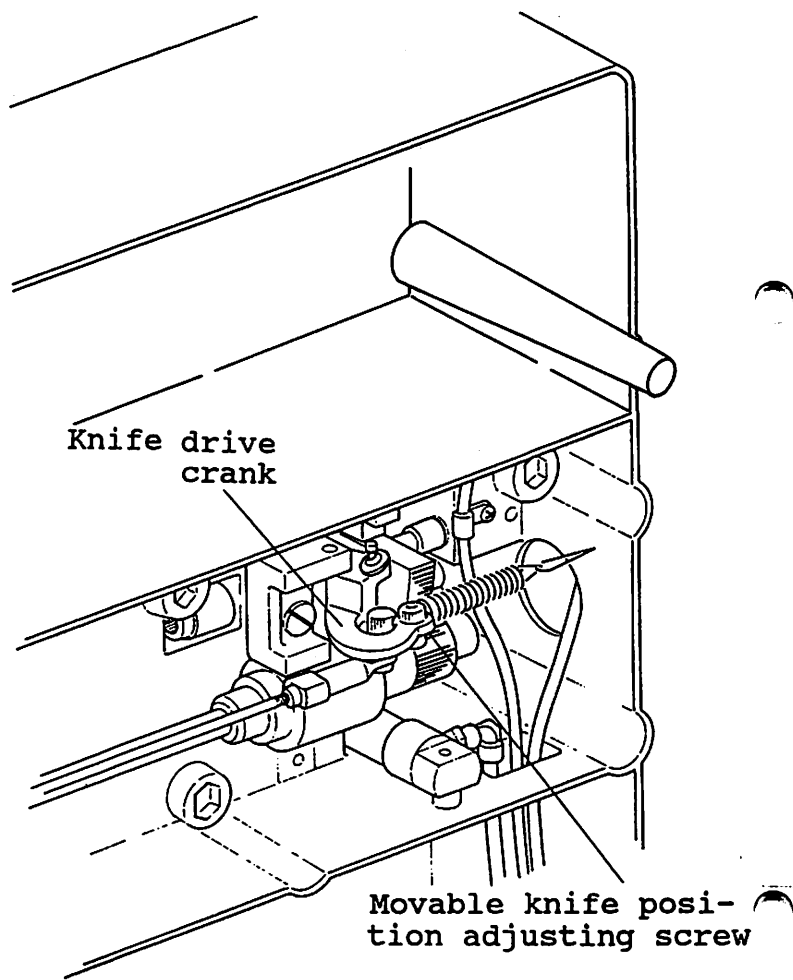


Fig. 9.27

9.12 Adjusting the trimmer thread tail length

- (1) It is not possible to adjust the length of the thread tail left on the bobbin after trimming. Stitches may be skipped at the start of sewing if the trimmed thread does not extend for more than 22 mm from the bobbin case horn (see Fig. 7.8). If this should occur, proceed as follows.
- (2) Reduce the bobbin thread tension and, based on this, the needle thread tension as well since trimmed thread will contract when the bobbin thread tension is too high or when elastic thread is used. For the same reason, it is recommended that the thread be wound around the bobbin with the lowest possible tension.
- (3) If the fixed knife projects too far from the bottom of the needle plate, there is a danger that the thread--and this is particularly true with thin thread--will rub against the fixed knife blade and that it may break or that the bobbin and needle threads will be shortened before the knife blade engages. To prevent this, install the fixed knife at a distance from the needle plate hole or remove the spacer below the needle plate to create a clearance of 0.2 mm or less between the fixed knife and needle plate. Care should be taken when the needle plate is re-installed to ensure that it is installed in its proper direction: the notch on the reverse of the needle plate should be on the same side as the fixed knife. (Fig. 9.28)
- (4) The trimmed needle thread tail length can be adjusted by turning the pretensioner thumb nut shown in Fig. 9.29. This length is shortened when the nut is turned clockwise.

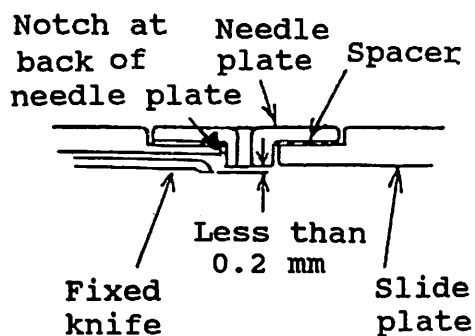


Fig. 9.28

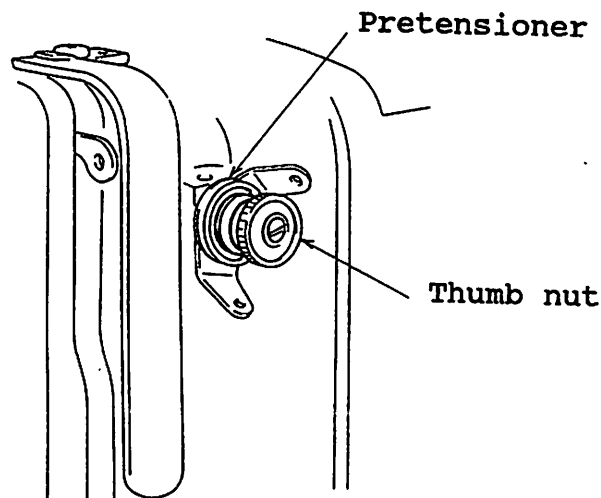


Fig. 9.29

9.13 Adjusting the thread release

- (1) If the thread release is not adjusted properly, the trimmed thread tail length will be reduced and stitches will be skipped or the needle thread may leave the needle when sewing commences.
- (2) If the tension discs do not close when the presser foot is lowered, the needle thread tension is reduced and the overall thread tension develops an imbalance.
- (3) When the thread release is adjusted properly, a clearance of 0.8 to 1.0 mm develops when the tension discs open, as shown in Fig. 9.30.

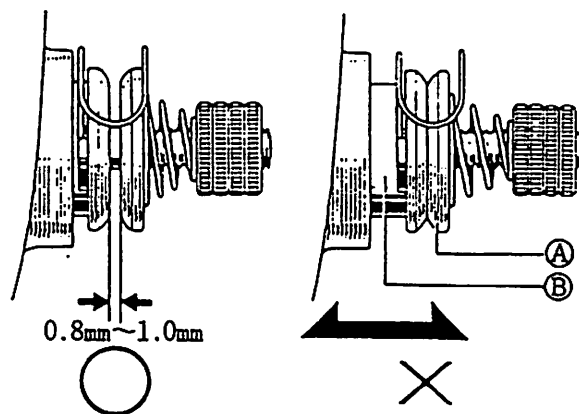


Fig. 9.30

- (4) Thread release occurs when the presser foot rises (the work holder is at the home position when the power is switched ON or the fabric is fed without stitching) and when threads are trimmed.
- (5) Adjusting the amount of thread release during thread trimming
 - To adjust, remove the top cover, loosen nut (C) shown in Fig. 9.31 and move the wire tube. The opening of the discs will increase when turned to the arrow.

Note

If opening of the tension discs is too small, the needle thread may break due to excessive tension to the needle thread. Too loose tension discs, however, may cause loose stitch.

- If opening cannot be adjusted by moving the wire tube, loosen the screw (A) and pull the wire to adjust.

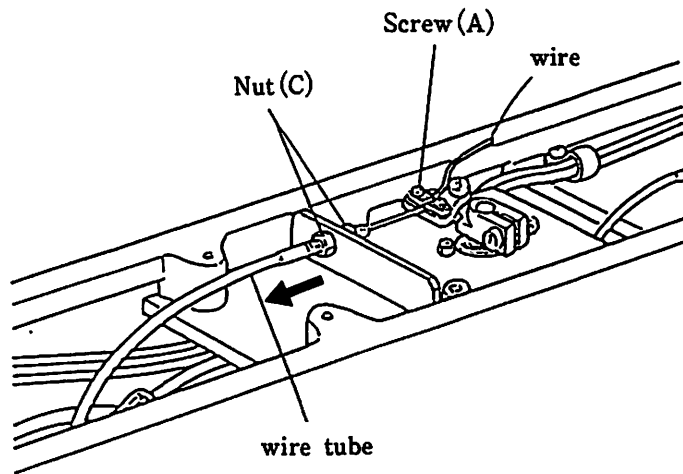


Fig. 9.31

9.14 Adjusting the stroke of the take-up spring

- (1) Loosen the needle thread tension stud set screw (B).
 - (2) Turn the tension regulating thumb nut (C) clockwise or counterclockwise to adjust the stroke of the take-up spring, and then tighten up screw (B) after the adjustment.
- Turn to the right to increase the stroke.
Turn to the left to reduce the stroke.

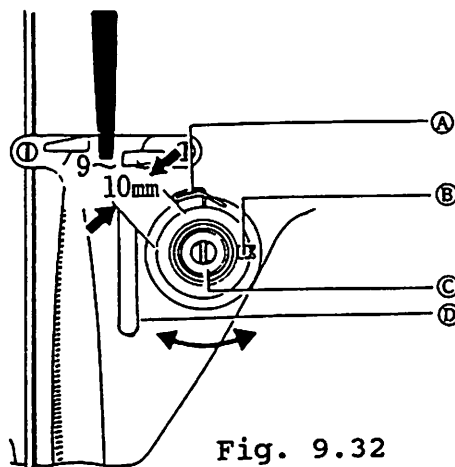


Fig. 9.32

- o The standard stroke of the take-up spring (clearance between take-up spring (A) and thread guide (D)) is 9 to 10 mm.

9.15 Adjusting the LIMI-STOP Z motor belt tension

- (1) Remove the belt cover.
- (2) Loosen the two nuts shown below.
- (3) Adjust the motor position using the upper nut so that the appropriate tension is yielded in the belt by the gravity of the motor. After the adjustment, tighten up the lower nut.

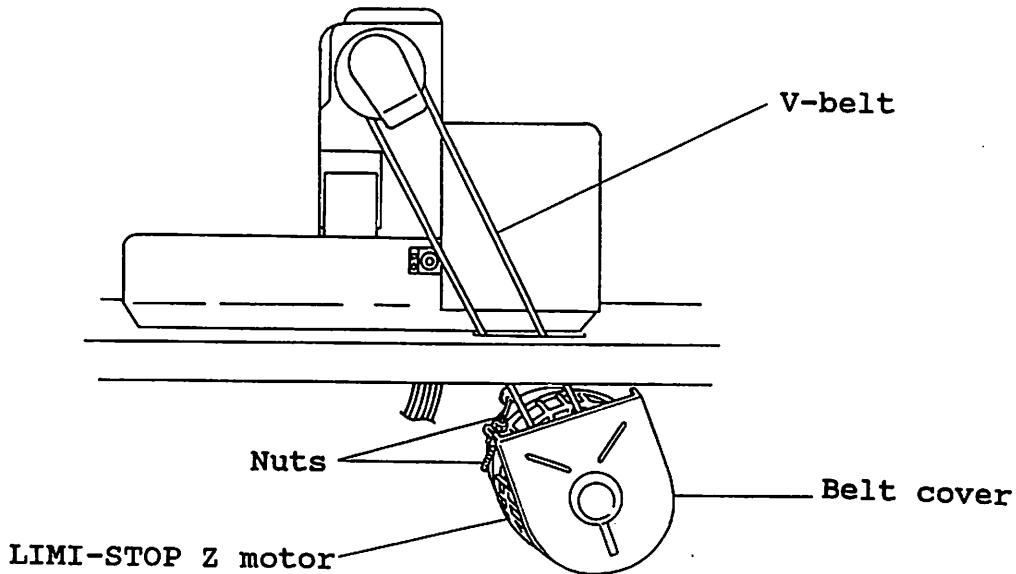


Fig. 9.33

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