

MITSUBISHI **Industrial Sewing Machine** **INSTRUCTION MANUAL**

Model **PLK-109**

Single-Needle Lockstitch
Electronic Bar Tack Machine

WT90020X01

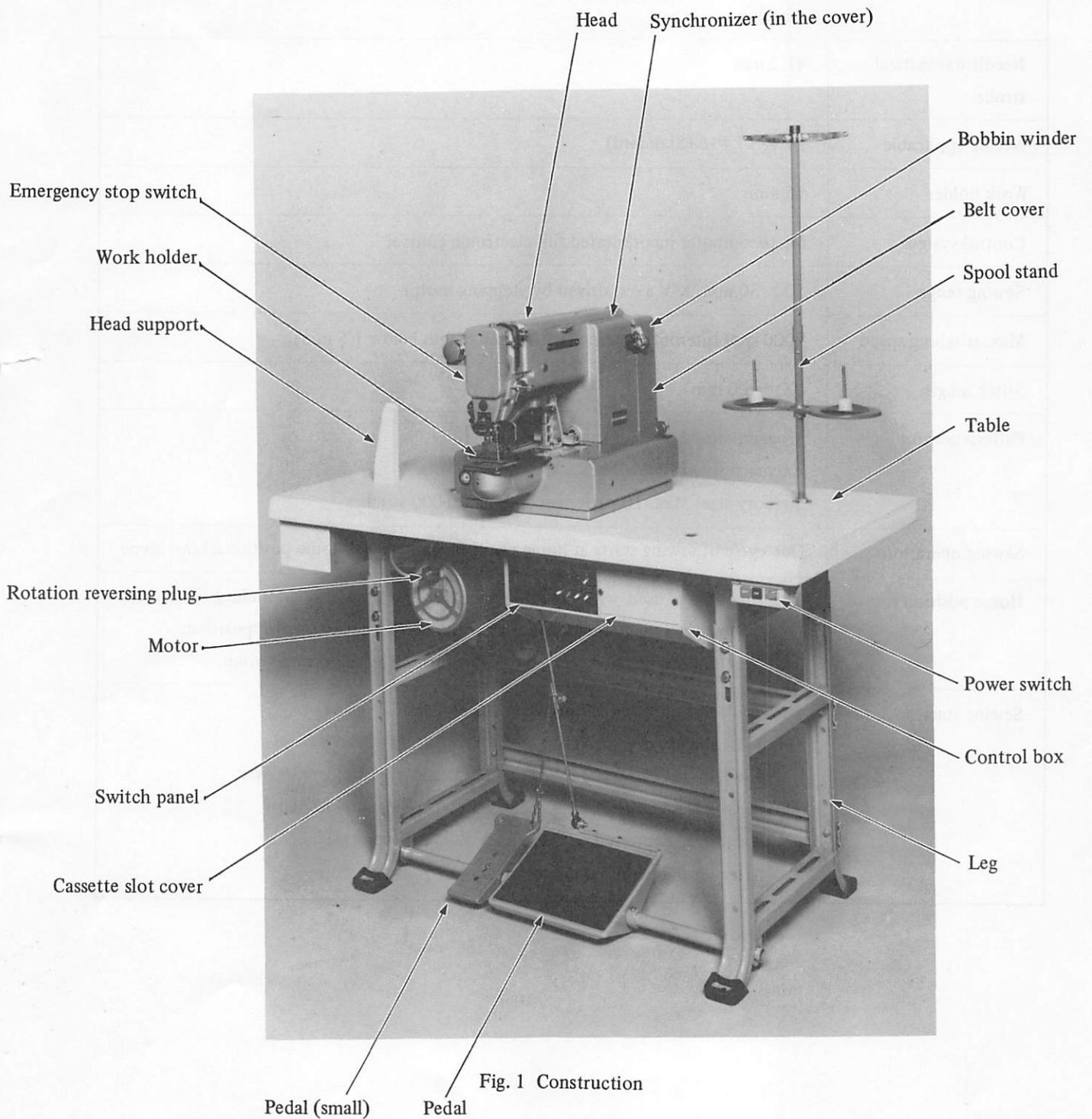


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1. Construction



2. Specifications

Head	Half-rotating hook, cylinder bed, single-needle lockstitch, electronic bartack sewing machine
Needle bar vertical stroke	41.2 mm
Needle applicable	DP X 17 #16 (Standard)
Work holder	15 mm
Control system	Microcomputer incorporated full-electronic control
Sewing range	50 X 30 mm, X-Y axes, driven by stepping motor
Max. stitching speed	2000 spm Intermittent feed (with stitch length below 1.5 mm)
Stitch length	0.2 ~ 6.0 mm
Pattern control	Program stored in memory (PROM) Exchangeable PROM Memory size: Max. 10 patterns/chip, max. 1000 stitches
Sewing operation	One cycle of sewing starts at home position, and ends at home position. Machine home
Home position return	The function is used when the X-Y position deviates during stitching. The work holder returns to the home position after the needle stops at its UP position. This function occurs once every time after turning on the power switch.
Sewing start	Sewing starts at home position when the pedal is depressed. (1) Pedal slightly depressed down by toe (ON) Work holder: DOWN Pedal release (OFF) Work holder: UP (2) Pedal fully depressed Sewing starts. After sewing, work holder automatically rises and stops.

Emergency stop function	Needle may be stopped at UP position in the course of sewing. After the emergency stop, the remaining stitches can be completed in inching mode.
Stitching speed setting	The speed best suited for given fabrics and sewing pattern can be preset within a range from 200 spm to 2000 spm with an increment of about 200 spm.
Check function	Test run or test sewing is possible at a low sewing speed permitting visual checking.
Pattern enlargement/reduction function (SCALE)	Pattern stored in memory (PROM) can be enlarged or reduced. Enlargement or reduction can be specified independently in X and Y axes. ± 100% with 1% increment
Pattern selection	Any one of 10 patterns is selectable.
Error indication	Lamps are provided to visualize errors.

3. Assembling and Installation

3.1 Assembling the machine head

- 3.1.1. Put the furnished head support in the hole of the table to install it upright. (Refer to Fig. 1 Construction.)
- 3.1.2. Install the furnished rubber pads (4 pcs.) in each recess provided at the table top.
- 3.1.3. Unpack the head and place it on the table as shown in Fig. 2. The head should be so placed on the table that each rubber pad enters the respective recesses provided in the base.
- 3.1.4. Secure the base to the table using the furnished two wood screws.
- 3.1.5. Be sure the insulation rubbers be inserted into the upper surface of the base at two places.

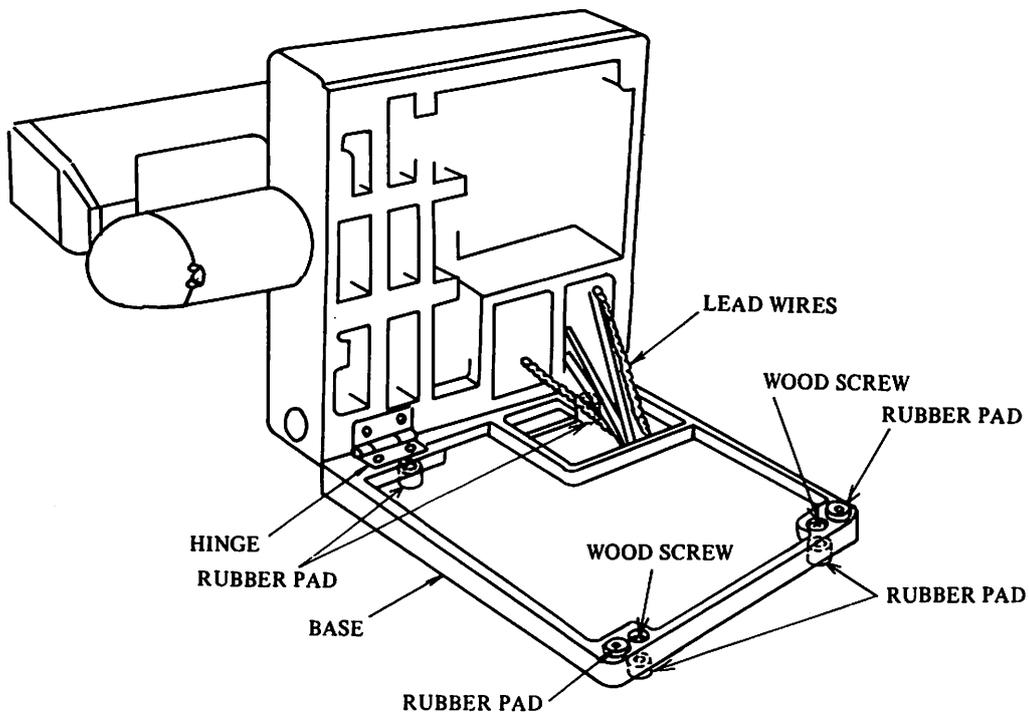


Fig. 2

Caution:

In case of leaning the head downward, take care that the base may leap up with the head, if the base is not secured with the wood screws.

3.2 Connection of lead wires

- 3.2.1 Pass the lead wires from the head through a table hole and connect them to the corresponding connectors. (Fig. 4)
- 3.2.2 Bind the lead wires with wire clamper
- 3.2.3 Install the belt to the pulleys.
- 3.2.4 Set the head upright.
- 3.2.5 Install the belt cover.

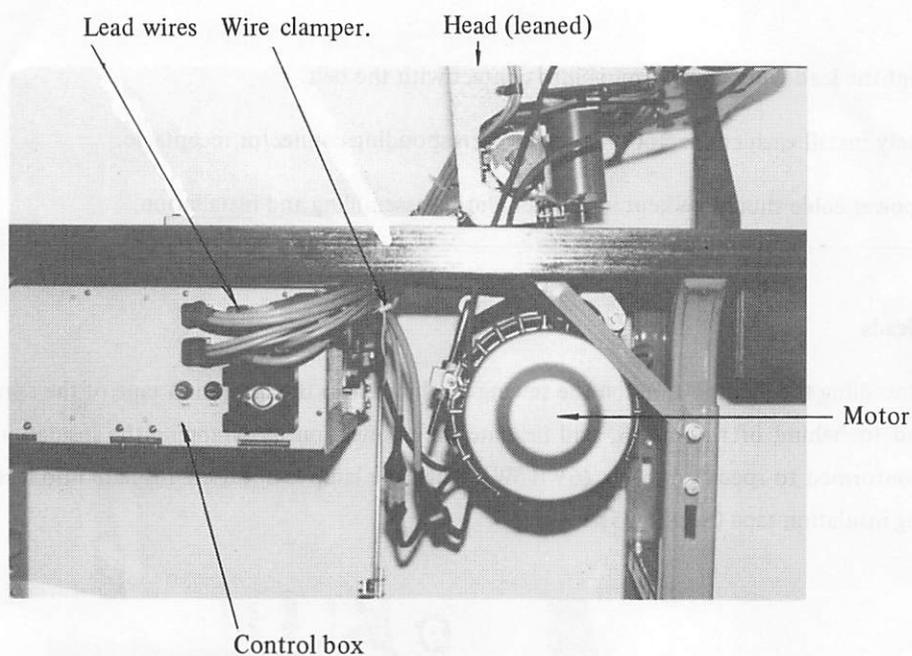
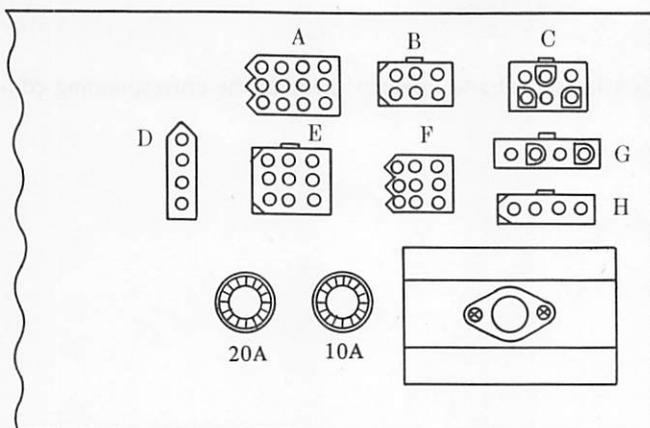


Fig. 3 Connection between machine head and control box



- Ⓐ : Stepping motor connector
 - Ⓑ : Synchronizer connector
 - Ⓒ : Power cable connector
 - Ⓓ : Emergency stop switch connector
 - Ⓔ : Thread trimmer connector
 - Ⓕ : Home position detector connector
 - Ⓖ : Option connector
 - Ⓗ : Motor clutch/brake connector
- shows lead wires from the machine head.

Fig. 4 Back view of control box

Cautions:

- (1) Prevent the lead wires from coming into contact with the belt.
- (2) Securely install each connector plug to the corresponding connector receptacle.
- (3) The power cable should be kept unplugged during assembling and installation.

3.3 Lamp leads

When installing the lighting lamp on the sewing machine, strip the insulation tape of the connecting code attached to behind of the motor, and insulate the connection by wrapping the insulation tape. Use a lamp conformed to specified rating (6V 15W). When the lamp is not used, insulate into leads each other by using insulation tape (See Fig. 5).

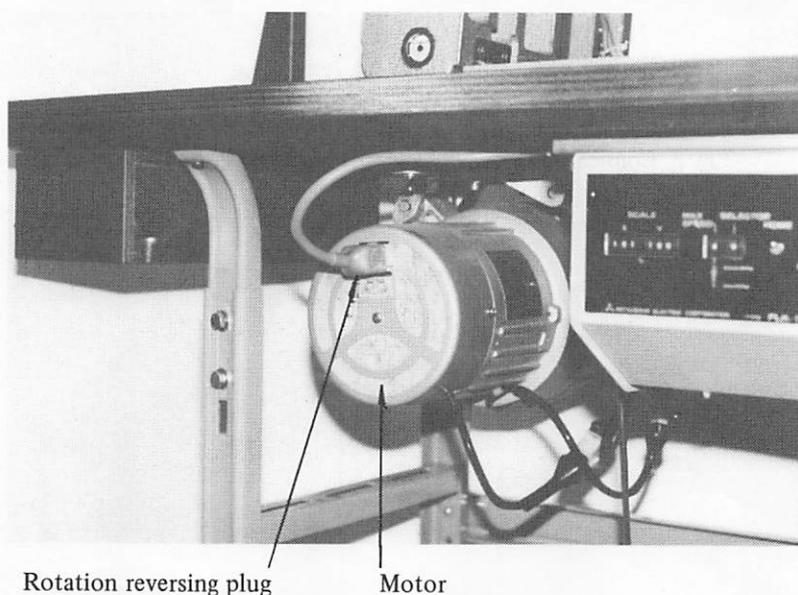


Fig. 5 Rotation reversing plug

3.4 Electrical power connection

Electrical power supply capacity should be conformed to the motor rating. Connecting code which have enough rating, should be used. Connect the power cable to the three-phase in phase sequence motor: U-phase (red), V-phase (white) and W-phase (black). The green wire for three-phase should be connected to the terminal of ground and, for the safety, be earthed. Ask the electric shop to make earth connection. In case of single-phase motor, avoid to connect many leads to one electric outlet.

3.5. Changing of motor running direction

It is possible to change the direction of rotation of motor inversely by turning in 180 degrees and inserting a reversing plug. Install the plug securely. In case of single-phase motor, the power should be applied after the motor stops, because it takes approximately 2 minutes until the motor completely stops. (The direction of rotation cannot be changed if the power is applied while the motor is still running.)

4. Handling of Machine Head

4.1 Installation of needle

- 4.1.1 Before installing or removing the needle, be sure to turn off the sewing machine.
- 4.1.2 Fully insert the needle shank into the needle bar hole until it butts against the bottom of the needle bar hole.
- 4.1.3 Turn front the prime groove of the needle and secure by tightening the set screw.

Fully insert needle shank into needle bar hole until it butts against bottom of needle bar hole, turn front prime groove and tighten set screw.

Needle shank is not fully inserted.

Needle is installed in wrong direction.

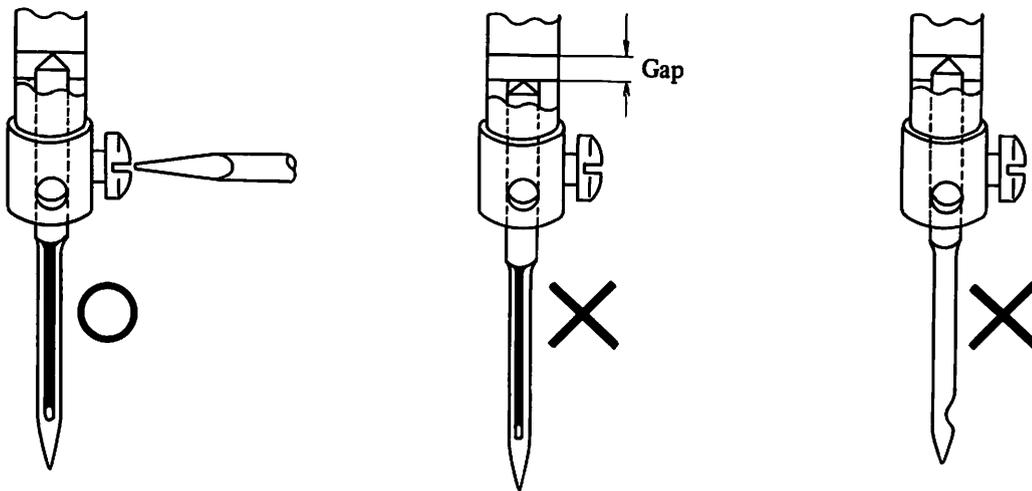


Fig. 6

4.2 Threading of needle thread

Thread the needle thread as shown in Fig. 7.

The needle thread passed through the needle eye should extend about 4 cm from the needle eye.

4.3 Threading of bobbin thread

Pass the bobbin thread through the hole of the bobbin case horn, as shown in Fig. 13, and set the bobbin case into the inner hook.

The end of the bobbin thread should extend about 2.5 cm from the hole of the bobbin case horn.

4.4 Removal of inner hook

Turn the hook clamp in the direction shown by arrow in Fig. 15. When the hook clamp is turned to the horizontal position, the inner hook can be removed.

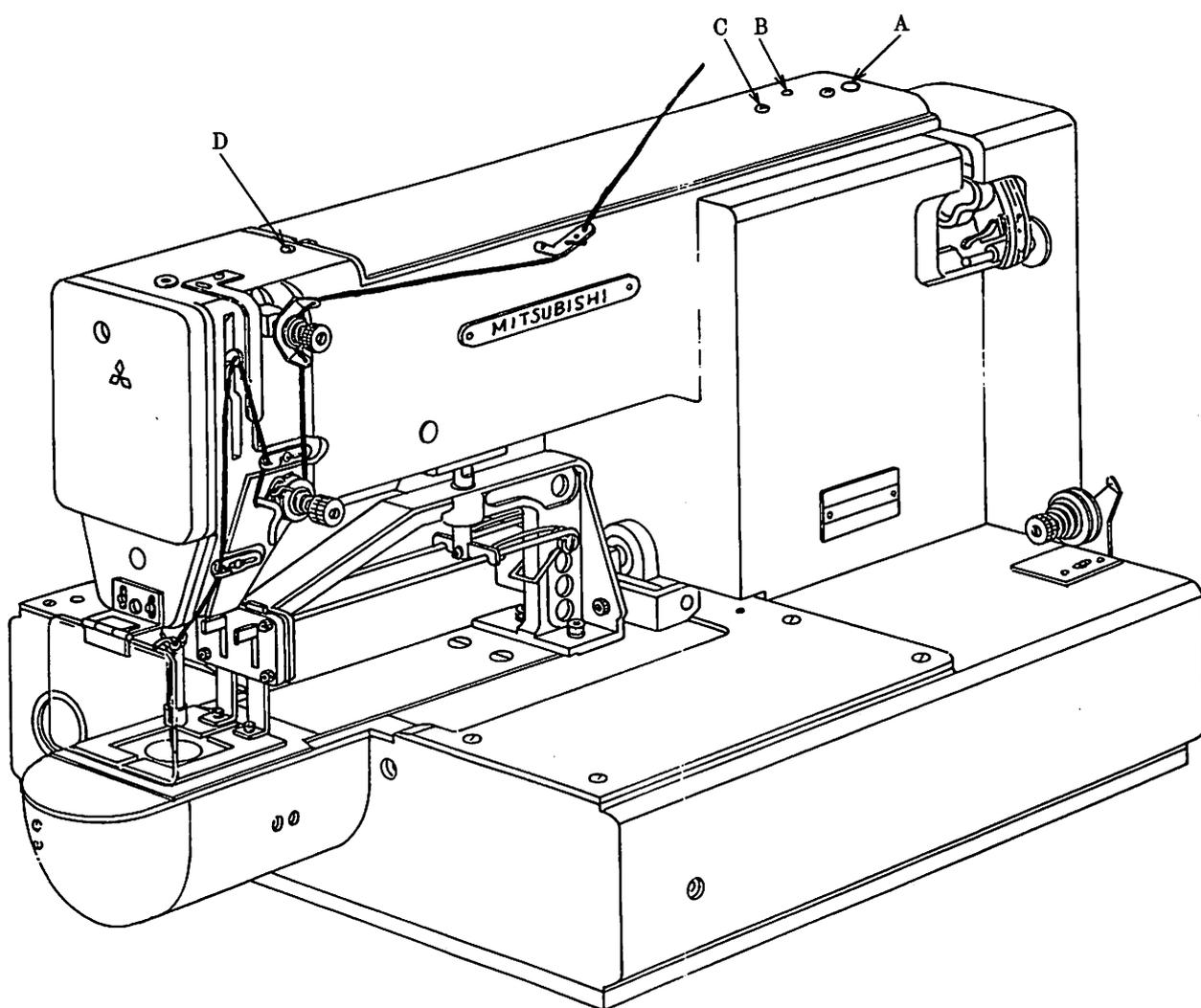


Fig. 7

4.5 Adjustment of work holder pressure

4.5.1 To increase pressure of the work holder, loosen the nut shown in Fig. 8 and turn counter-clockwise the work holder shaft by the spanner.

(Length of the work holder shaft and bracket "A" becomes large when the nut is turned counter-clockwise.)

4.5.2 By turning the nut clockwise, pressure of the work holder can be decreased.

4.5.3 When the work holder is adjusted to the standard pressure, it cannot satisfactorily hold a fabric thicker than 6 mm. In such a case, decrease the work holder pressure.

4.5.4 With increase of work holder pressure, thickness of fabric that can be held by the work holder decreases.

4.6 Replacement of work clamp

To replace the work clamp, remove the work clamp set screw shown in Fig. 8 and remove the work clamp.

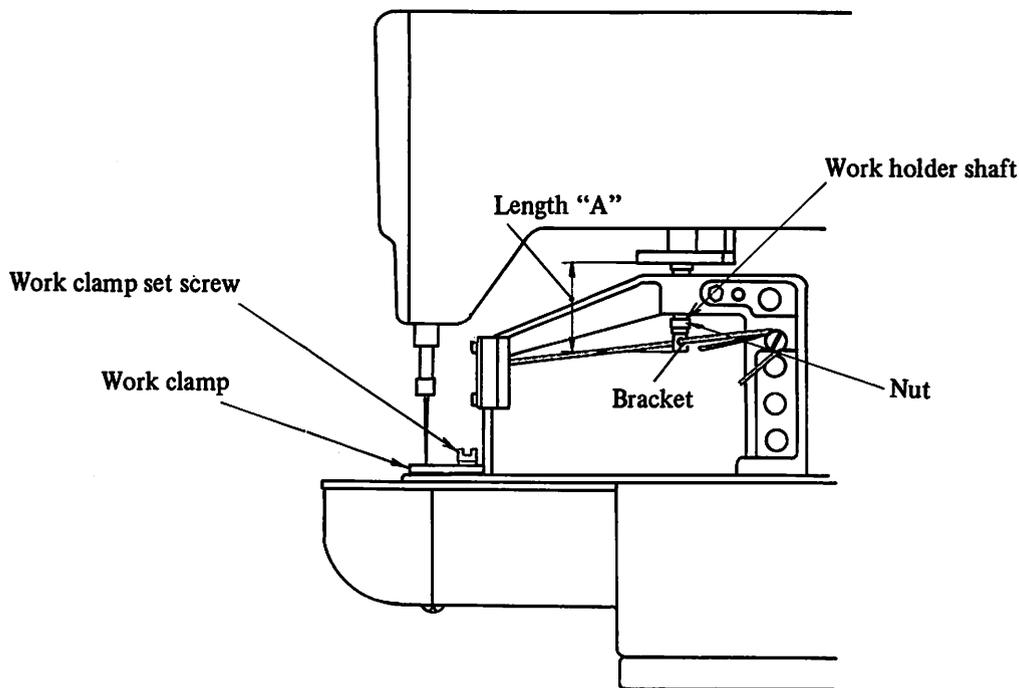


Fig. 8

4.7 Installation of presser-foot (Fig. 9)

4.7.1 Install the presser-foot so that its lower end is in slight contact with the fabric when the fabric is pressed down.

4.7.2 The presser-foot adjusted too high may cause skip stitch or uneven stitch.

4.7.3 The presser-foot adjusted too low may cause slippage of the fabric.

4.7.4 To adjust the presser-foot in height and direction, remove the rubber plug from the face plate and loosen the presser bar set screw shown in Fig. 9.

4.7.5 In case of changing the thickness of the fabric, confirm that the presser-foot does not touch the work clamp.

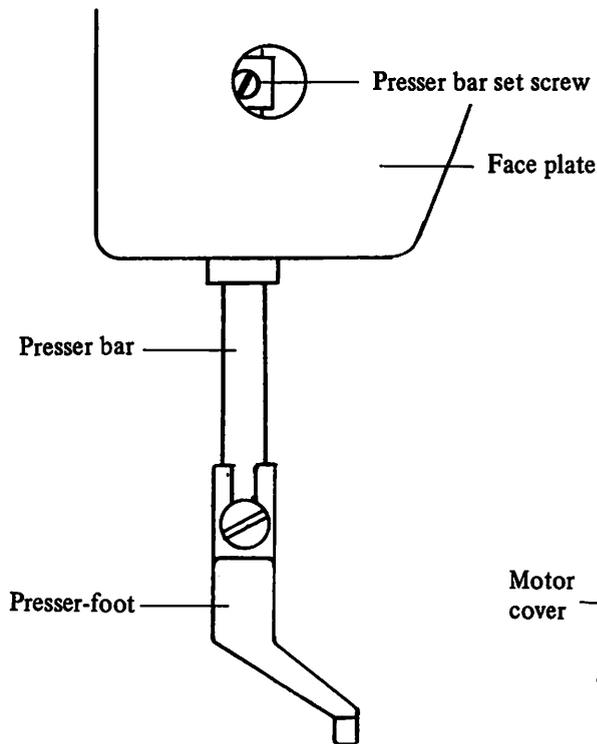
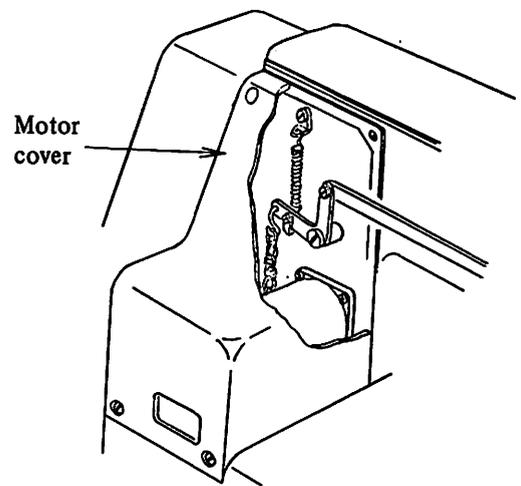


Fig. 9



4.8 Installation of pedal-presser-foot (Fig. 10)

To install the pedal-presser-foot, remove the motor cover, and install the chain and the pedal as shown in Fig. 10.

In this case, take care to prevent the chain from coming into contact with the lead wires.

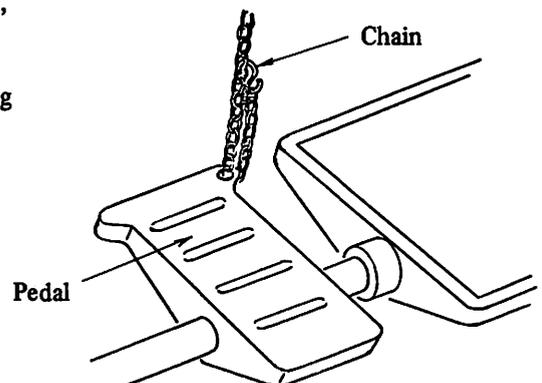


Fig. 10

4.9 Winding up of bobbin thread

4.9.1 Lead the thread from the spool stand, as shown in Fig. 11, and twine the thread end several turns around the bobbin.

4.9.2 Set upward the WIND switch on the switch panel and then depress the pedal. (Refer to 5.7.)

4.9.3 After winding up, set the winding up switch downward.

4.9.4. If the thread is not wound cylindrically, move the thread guide toward the smaller diameter.

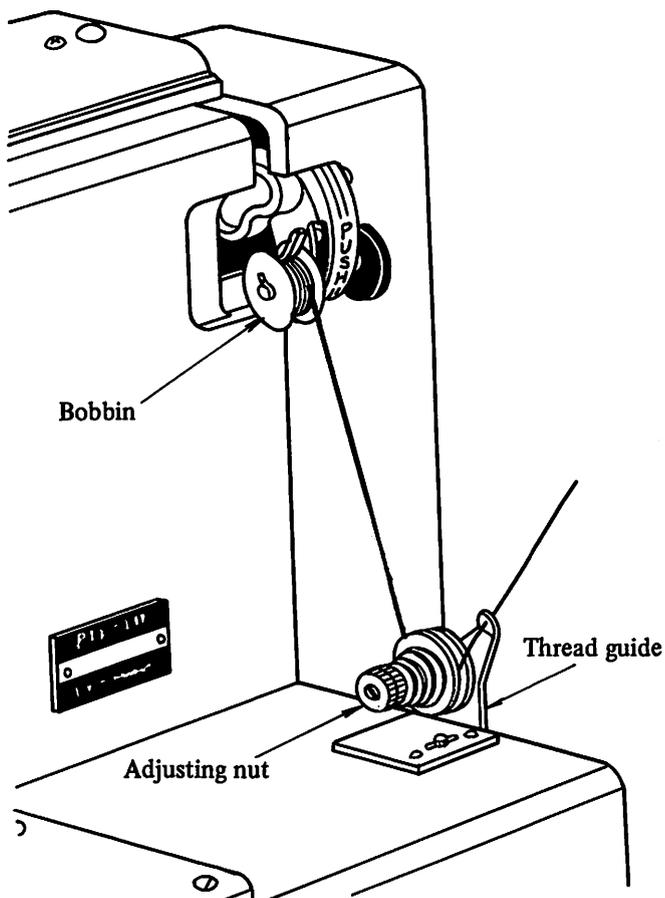
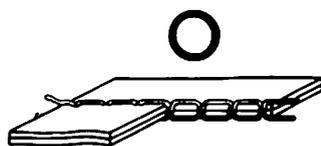


Fig. 11

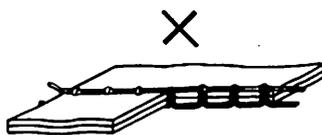
4.9.5 Polyester thread and nylon thread should be wound at faint tension.

4.10 Thread tension (Fig. 12)

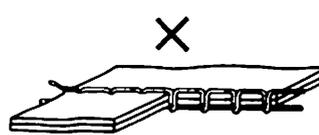
Balance the needle thread tension with the bobbin thread tension.



Balanced tension



Unbalanced tension
Needle thread tight
or bobbin thread loose.



Unbalanced tension
Needle thread loose
or bobbin thread tight.

Fig. 12

4.10.1 Bobbin thread tension (Fig. 13)

The standard bobbin thread tension for cotton thread #60 is that the bobbin case gradually goes down when thread end is held by fingers and the bobbin case is released.

To adjust bobbin thread tension, turn the thread tension adjusting screw shown in Fig. 13.

4.10.2 Needle thread tension (Fig. 14)

The needle thread tension should be adjusted with reference to the bobbin thread tension.

To adjust needle thread tension, turn the needle thread tension adjusting nut shown in Fig. 14.

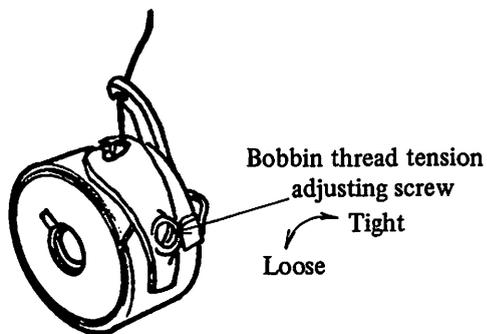


Fig. 13

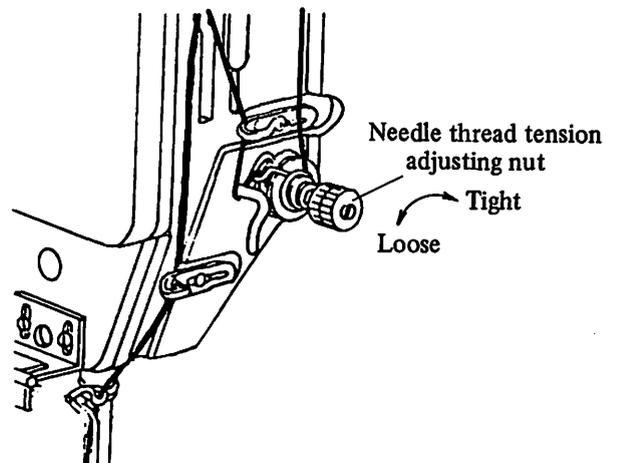


Fig. 14

4.11 Lubrication

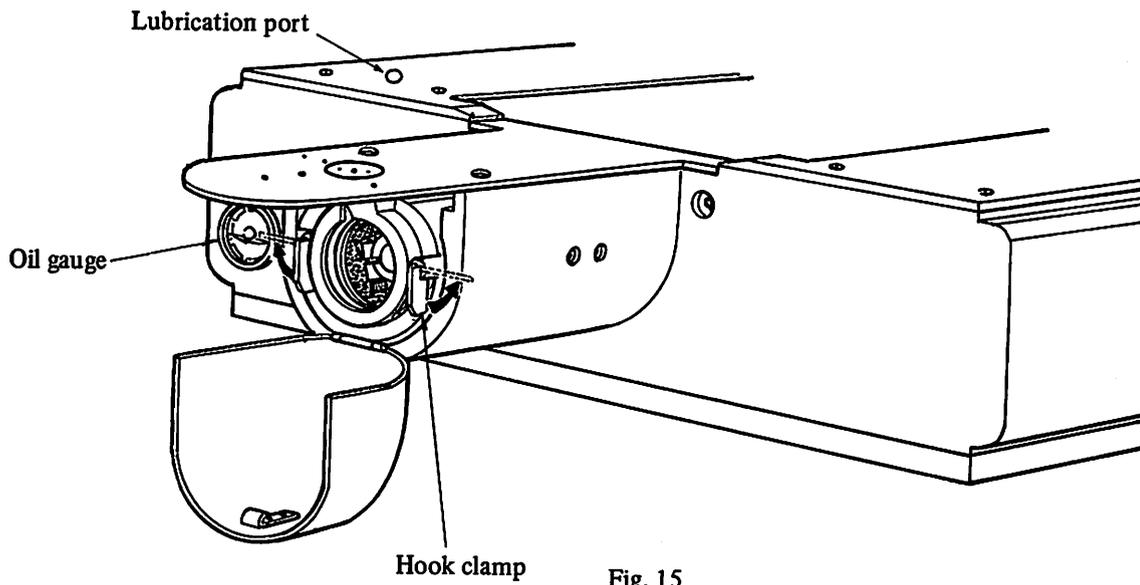


Fig. 15

Oil to positions A, B, C and D shown in Fig. 7 before starting sewing work. Use several drops of oil for each oiling position.

For oiling to the oil inlet at the bed top (Fig. 15), fill the oil gauge up to the red marking with oil.

Note that too much oil might cause overflow if the head is leaned.

5. Switch Panel

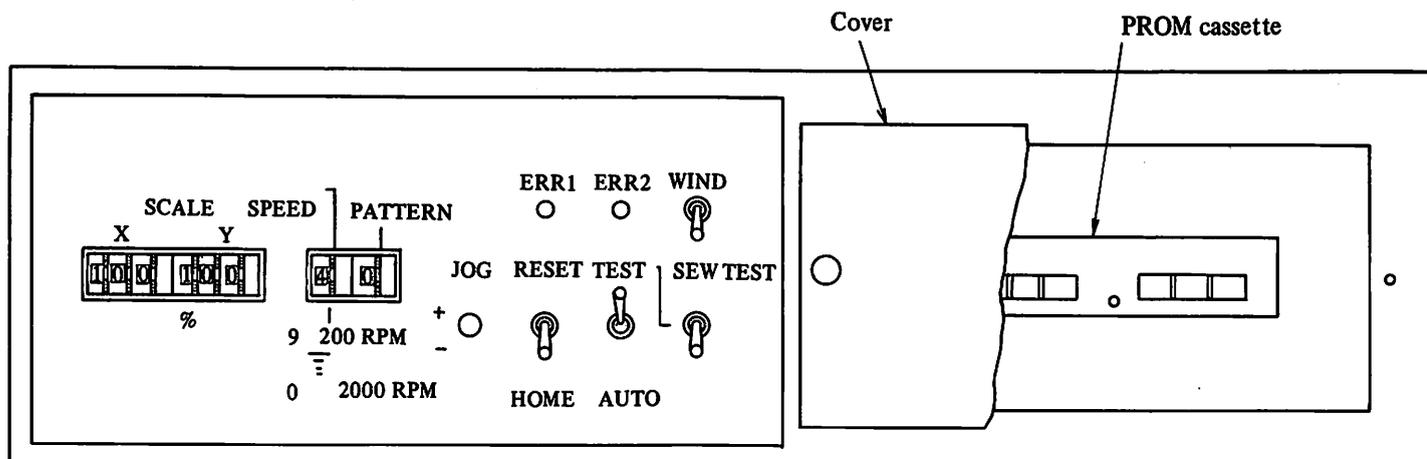
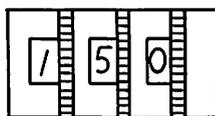


Fig. 16 Switch panel

5.1 SCALE (Pattern Enlargement/Reduction)

The patterns programmed and stored in the memory (PROM) can be enlarged or reduced within a range of 0 to 1.99 times independently in X-axis and Y-axis direction. (Stitch length is enlarged or reduced.)

Ex.:



Use the switch within 010 to 199% range.

150% (1.5 times)

Fig. 17 Enlargement/Reduction switch

Cautions:

- (1) When a pattern is enlarged, test should be made to make sure the enlarged pattern is within a sewable range restricted by the work holder frame. (Refer 5.6.1)
- (2) When a pattern is enlarged, stitching speed may decrease. (Refer 7.4)

5.2 SPEED (Stitching Speed Control)

The maximum stitching speed can be preset by this switch.

5.3 PATTERN (Pattern Selection)

The desired pattern can be selected by this switch.

5.4 JOG

The work holder can be exactly positioned by operating this switch after depressing the EMERGENCY STOP switch (provided on the machine head Fig. 1) to stop the machine.

5.4.1 When the JOG switch is set at \oplus position, only work holder advances in the pattern forwarding direction at an inching speed.

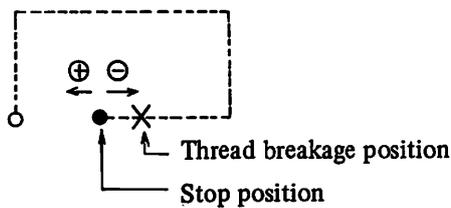


Fig. 18 Work holder moving direction in jog operation

5.4.2 When the JOG switch is set at \ominus position, only work holder moves in the pattern backwarding direction at an inching speed.

5.4.3 When the JOG switch is kept at \oplus or \ominus position, work holder goes on forward or backward.

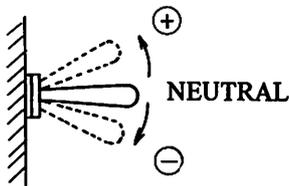


Fig. 19 JOG switch

5.5 RESET/HOME

5.5.1 RESET When the switch is set upward, the brake works causing immediate stop of the sewing machine and the machine status is reset.

5.5.2 HOME When the switch is set downward, the work holder is returned to the home position.

(If the needle is not at UP position, the needle automatically goes up to UP position and the work holder is returned to the home position.)

In usual operation, the switch is kept downward (HOME position)

5.6 TEST/AUTO

This switch allows selection between test sewing and automatic sewing (regular sewing).

5.6.1 TEST

(1) Test run (Only work holder is moved The TEST/AUTO switch to be set downward.)

The work holder moves at a constant speed as far as the pedal is fully depressed by toe, and stops when the pedal is returned to NEUTRAL position. When the pedal is depressed by toe again, the work holder resumes moving to complete remaining pattern motion.

The work holder does not rise when the pedal is returned to NEUTRAL position during the test run, but rise when the pedal is returned to NEUTRAL position after the completion of the test run.

(2) Sewing test (Work holder moves and sewing machine works The TEST/AUTO switch to be set upward.)

The sewing machine actually stitches the given fabric at the minimum speed as far as the pedal is fully depressed, and stops with the needle at UP position after trimming the thread when the pedal is returned to NEUTRAL position.

When the pedal is fully depressed again, the remaining pattern is sewn up.

The work holder motion is same as that in test run.

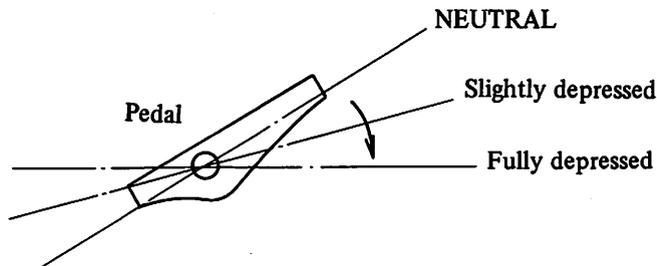


Fig. 20 Pedal operation

5.6.2 AUTO (Actual sewing)

With the TEST/AUTO switch as AUTO position, sewing started by depressing the pedal continues until one cycle (pattern) is completed even when the pedal is returned to NEUTRAL position after the starting. The work holder goes up automatically after the thread trimming and the wiping motions are over.

5.7 WIND

When the WIND switch is set upward and the pedal is fully depressed by toe, the work holder goes down and the sewing machine starts running at medium speed, but the work holder does not move in X or Y direction.

When the pedal is returned to NEUTRAL position, the sewing machine stops with the needle at UP position.

Note: Setting the WIND switch to upward position while the sewing machine is running does not affect machine operation at all. To start the winding motion after sewing operation ends, the pedal should be depressed again after it is once returned to NEUTRAL position.

5.8 ERROR indication

The lamp lights in the following cases and the sewing machine stops with the needle at UP position, thus process does not advance.

5.8.1 ERR 1

“Green” The lamp lights when no input data exists or incorrect data is entered.

➔ Use a correctly programmed PROM cassette.

“Red” The lamp lights when pattern is excessively enlarged and stitch length becomes larger than 6.0 mm.

5.8.2 ERR 2

“Green” The lamp lights when the work holder moves over the range of 50 x 30 mm.

➔ Reduce the pattern enlargement factor.

“Red” The lamp lights when temperature in the control box becomes too high.

➔ Consult with our service agency.

6. Operation

6.1 Setting the PROM cassette

Remove the cover of the switch panel and insert the cassette into the slot.

The cassette should be set in the correct direction.

After the setting, be sure to install the cover again.

A special PROM writer (PT-100, option) is necessary to erase and rewrite program in the PROM.

For handling of the cassette, refer to 8.2.

6.2 Setting the switches on switch panel

In order to check the function, set the switches on the switch panel as shown in Fig. 16. (The SCALE switch should be set to "100" for both X and Y axes, and the SPEED switch to "4". The PATTERN switch may be set to a suitable numeral within a range from "0" to "9", depending on the program stored in the PROM applied.)

6.3 Checking

When the above-mentioned preparatory operation has been completed, turn on the power source and check as follows:

- (1) Home position return: When the power switch is set to ON, the work holder should return to the home position.
- (2) Work holder DOWN: When the pedal is slightly depressed by toe, the work holder should go down (and go up when the pedal is returned to NEUTRAL position).
- (3) Work holder motion: The work holder should move in accordance with the sewing pattern when the pedal is fully depressed by toe, and stop when the pattern is sewn up. (When the pedal is returned to NEUTRAL position, the motion stops with the work holder lowered.)

In the above checking, only the work holder moves and the sewing machine remains stopped when the SEW TEST switch is set downward as shown in Fig. 16. To let work the sewing machine, the switch should be set upward.

Perform this switching operation to check the work holder for its positions, dimensions and location.

6.4 Sewing

- (1) Set the TEST/AUTO switch on the switch panel to AUTO position.
- (2) Set other switches as instructed in section 5.
- (3) Set up a fabric and slightly depress the pedal, the work holder will go down. The sewing machine starts running when the pedal is fully depressed by toe. When the sewing machine once starts running, it will go on until the sewing cycle is completed and thread is trimmed even when the pedal is returned to NEUTRAL position during the sewing.

6.5 Emergency stop

The sewing machine can be immediately stopped by depressing the emergency stop switch. The work holder remains at DOWN position when the sewing machine is stopped.

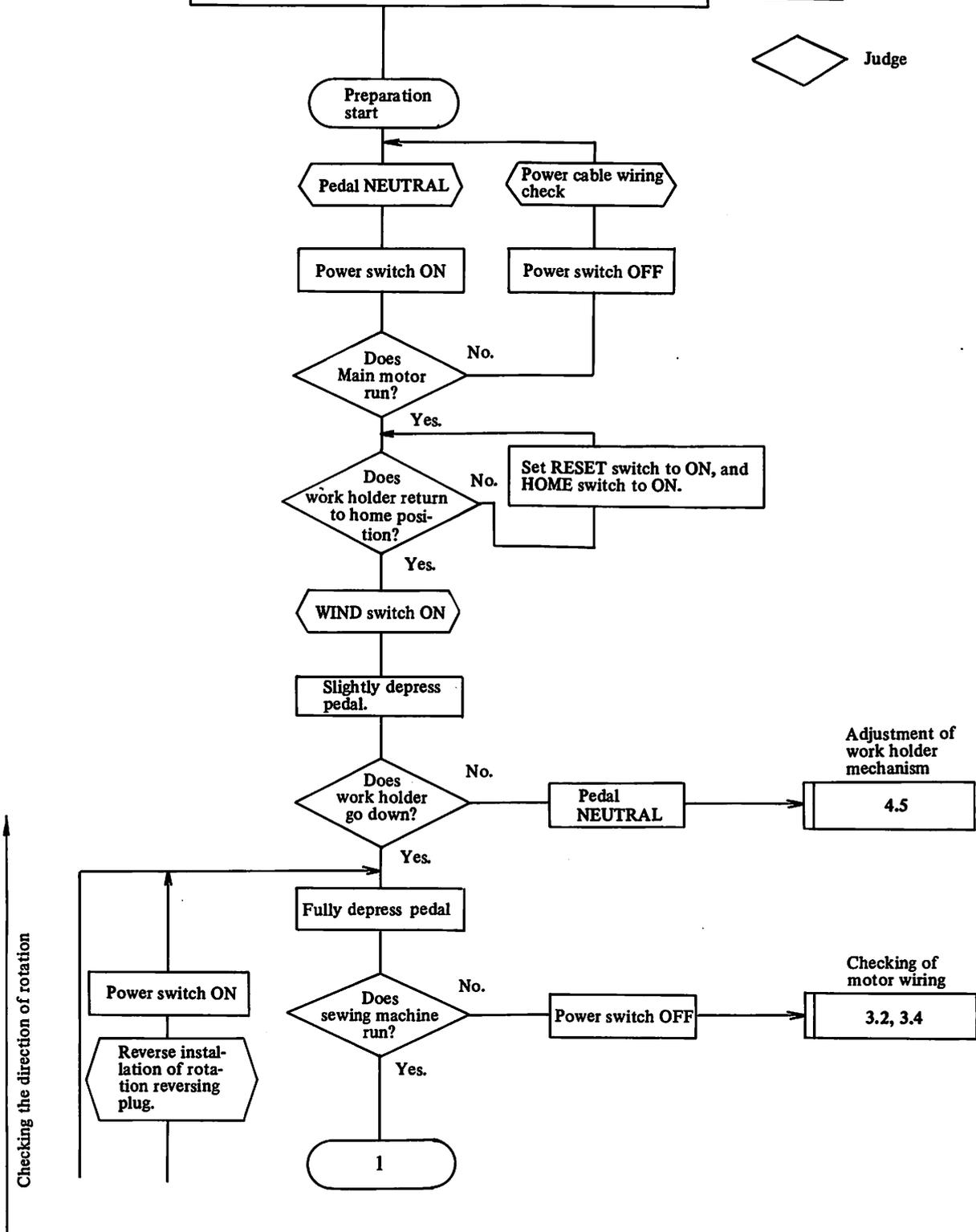
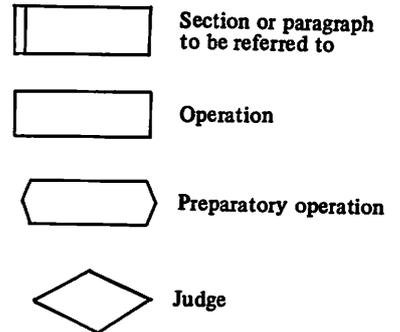
To start again, adjust the restarting position by the JOG switch and depress the pedal. The machine resumes the remaining pattern. (Refer to 5.4)

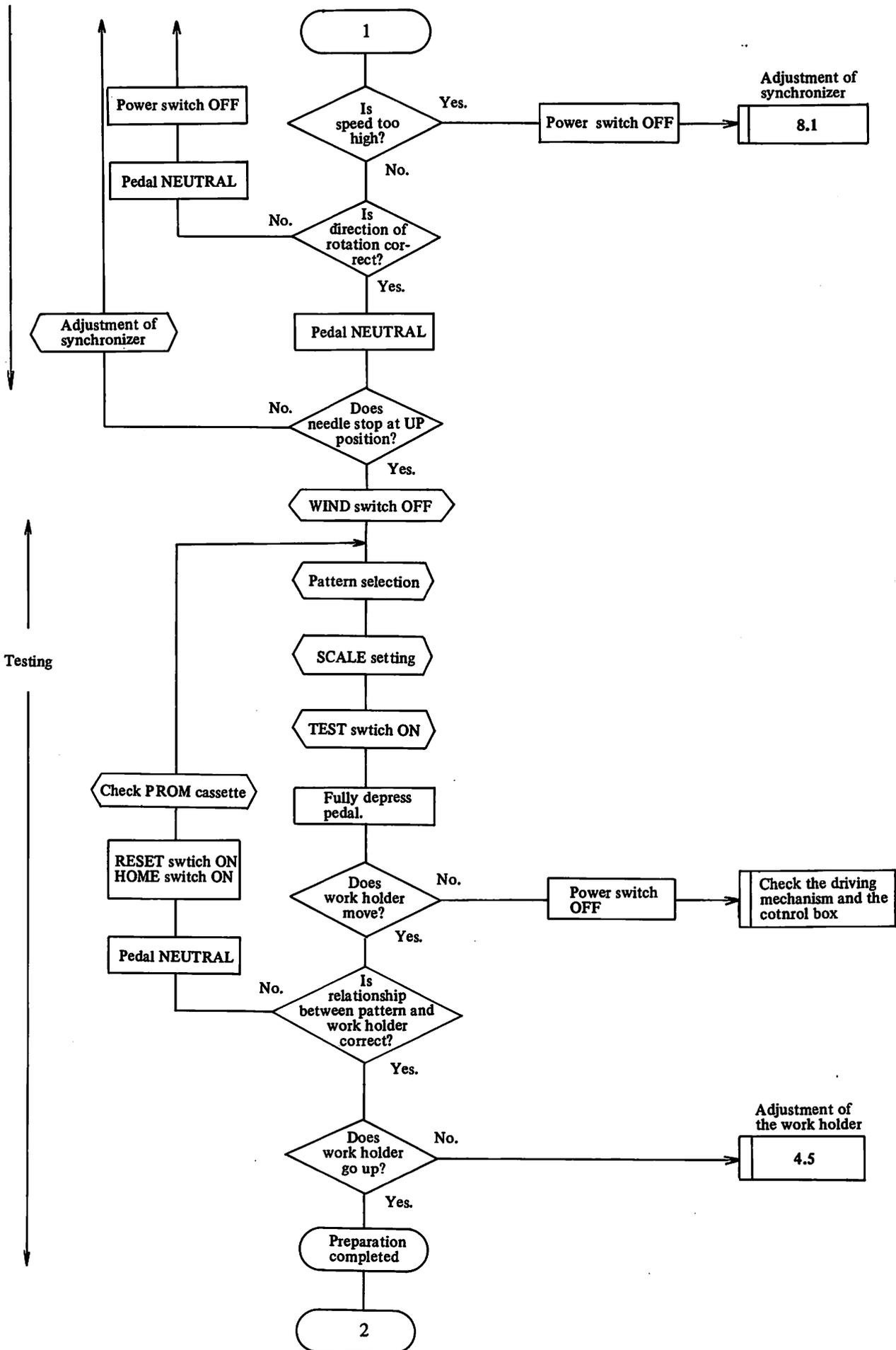
6.6 Operation procedure

Proceed in accordance with the following flowchart to operate the sewing machine.

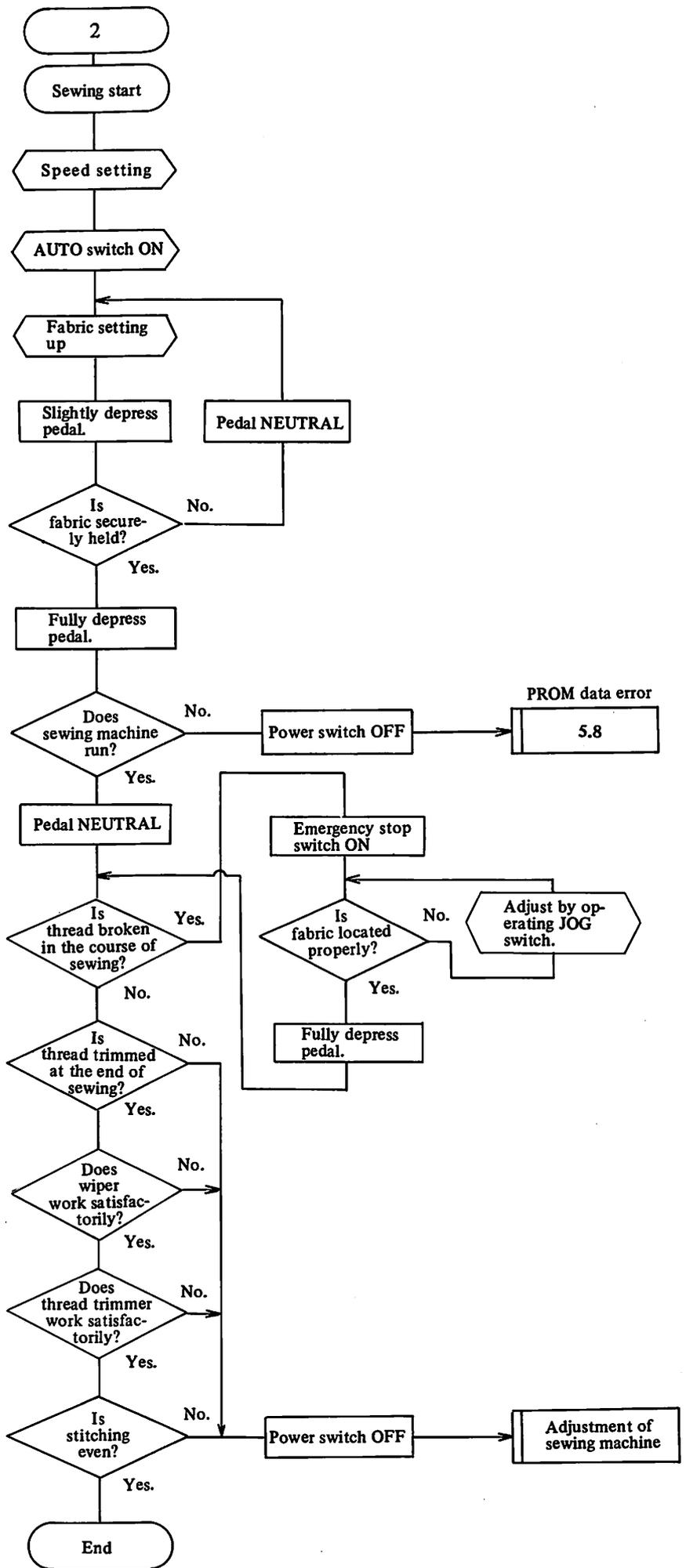
Checking before starting operation

- (1) Is the power cable securely connected?
- (2) Are other wiring or cables securely connected?
- (3) Is the PROM cassette properly set?
- (4) Are fuses (2 fuses) not blown out?





Automatic operation
(Actual sewing)



7. Cautions on Operation

- 7.1 Before replacing PROM in the PROM cassette, be sure to carefully read 8.2 in this manual. It should be also noted that the power switch is set to OFF before insertion and removal of the PROM cassette.
- 7.2 If any ERR lamp lights, check for cause, referring to 5.8, and remedy.
- 7.3 When a new pattern is sewn, or pattern is enlarged, do not fail to check the relationship between the work holder and the pattern by conducting test operation.
- 7.4 The maximum stitching speed depends on stitch length, and is automatically restricted in connection with stitch length as listed in Table 1.

Stitch length	Max. speed
Below 6 mm	600 spm
Below 5 mm	850 spm
Below 4 mm	1100 spm
Below 3 mm	1400 spm
Below 2 mm	1600 spm
Below 1.5 mm	2000 spm

Table 1

Sewing machine max. speed in connection with stitch length.

- 7.5 The cover of the control device should be closed, because entrance of dust into control device may cause malfunction or defect of the machine.
- 7.6 The foot should be released from the pedal during setting the power "ON" or "OFF". In case of single-phase motor, avoid to operate the pedal before combination of the motor warming-up after the power "ON" (approx. 10 seconds).
- 7.7 The power should be "OFF", prior to adjustment of the sewing machine or opening the cover of control device for adjusting.
- 7.8 Avoid a check of the interior control circuit using a tester, because the parts of semiconductor are energized by voltage of the tester and damage of these parts may be caused.

8. Maintenance and Checking

8.1 Adjustment of synchronizer

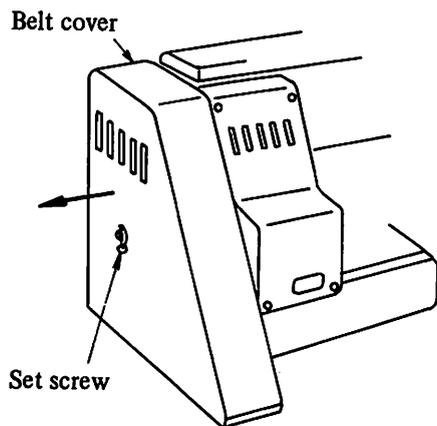


Fig. 21

8.1.1 Remove the belt cover.

To remove the belt cover, loosen the set screw, pull up the belt cover and draw in the direction of arrow shown in Fig. 21.

8.1.2 Adjustment of synchronizer gaps.

Adjust the gaps as illustrated in Fig. 22.

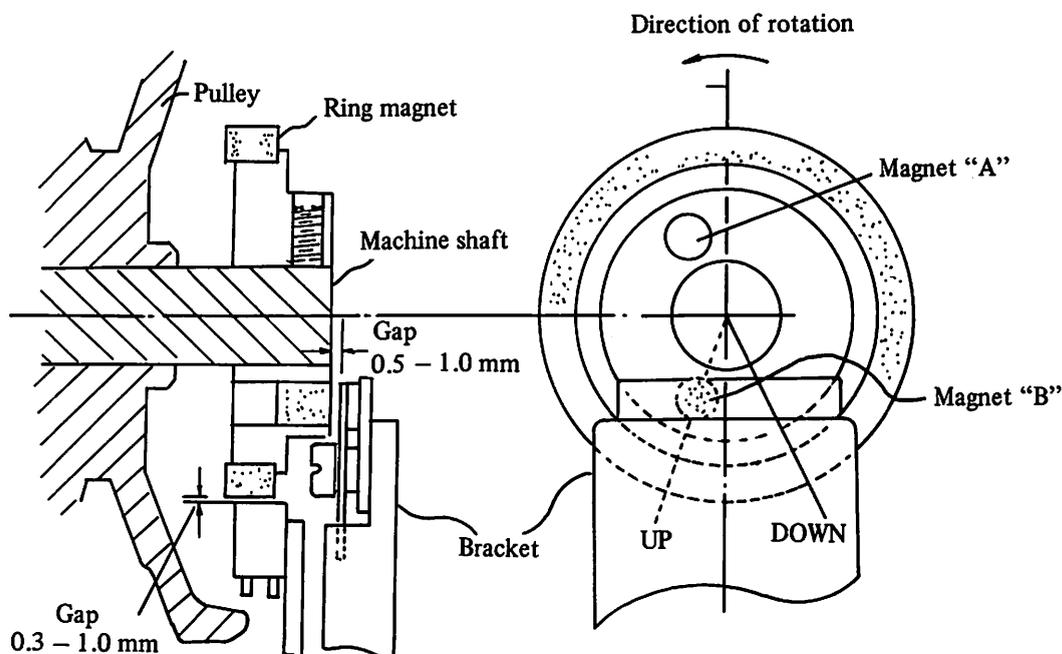


Fig. 22 Synchronizer gap adjustment

8.1.3 Adjustment of stop position

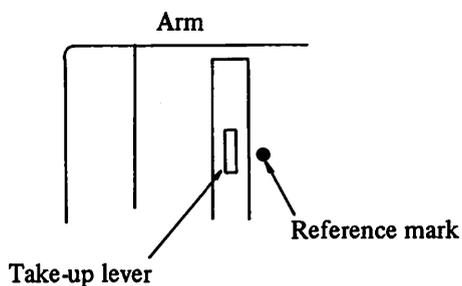


Fig. 23

Adjust the machine stop position so that the take-up lever thread hole meets the reference mark on the arm during the upward stroke of the take-up lever.

8.2 Replacement of PROM

PROM is installed on the socket of PC board in the cassette.

To replace PROM, proceed as follows (see Fig. 24 and 25):

- (1) Lever up the cassette case cover using a screwdriver.
- (2) Take out the PC board from the cassette case.
- (3) Carefully remove the PROM from the IC socket using a screwdriver or any other suitable means.
- (4) Insert a new PROM into the IC socket in such way that the PROM is installed in the direction as shown in figure. PROM might be damaged, if installed in wrong direction.
- (5) Install the PC board in the cassette case and cover the cassette case.

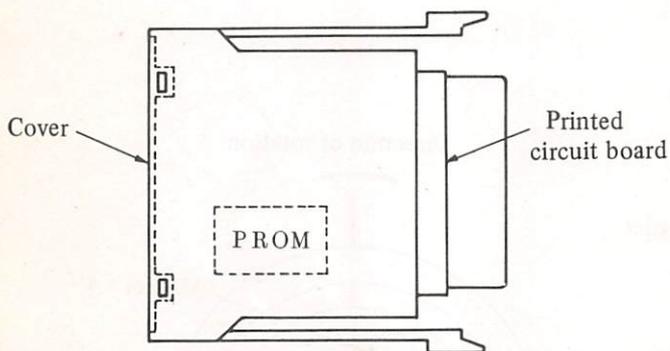
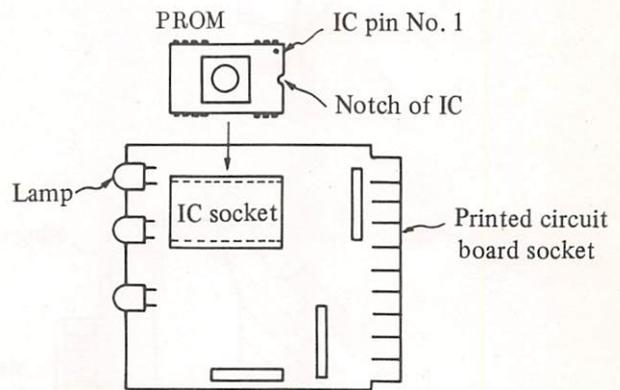


Fig. 24 Cassette case



Notch of the IC should come to the PC board pin side.

Fig. 25 PC board

8.3 Cleaning of fan filter

8.3.1 Remove the external filter.

To remove, lever the external filter using a screwdriver.

8.3.2 Remove dust from the external filter and internal filter.

8.3.3 Put the external filter into the keyway to install it again.

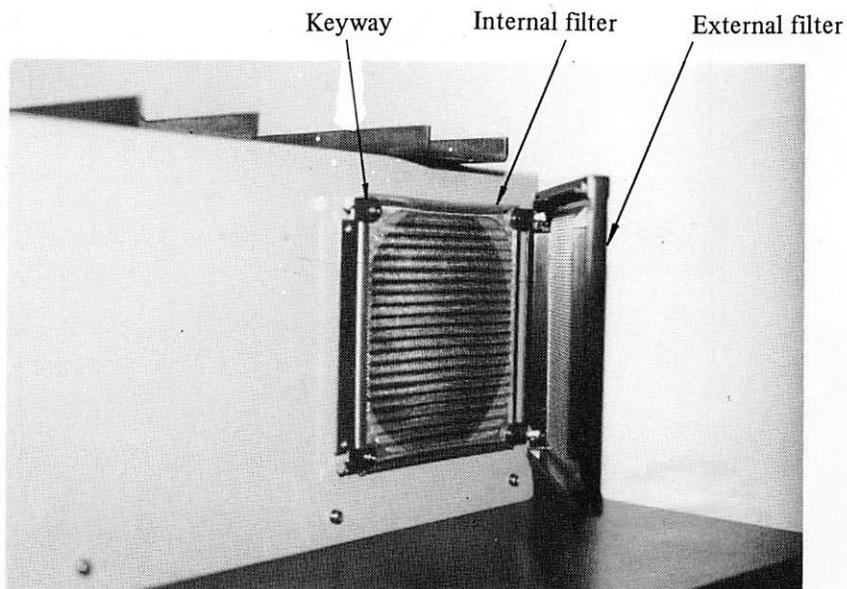


Fig. 26 Filter



MITSUBISHI ELECTRIC CORPORATION

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