

7-56

mitsubishi

Industrial Sewing Machine

INSTRUCTION MANUAL

Model **PLK-2520A**

**Single-Needle Lockstitch
Electronic Pattern Sewing Machine**

'A180E102P01



From the library of: Superior Sewing Machine & Supply LLC

In order to operate the sewing machine in the best condition at all times, please read this Instruction Manual carefully and properly handle and maintain the sewing machine.

- C O N T E N T S -

1. CONSTRUCTION	1
2. FEATURES	2
3. SPECIFICATIONS	4
3.1 General specifications	4
3.2 Replacement parts for medium and heavy fabrics	6
4. INSTALLATION	8
5. PREPARATION BEFORE STATING THE OPERATION	12
6. CONTROL SWITCHES AND FUNCTIONS	13
6.1 Switch panel	13
6.1.1 Power ON and OFF	13
6.1.2 SCALE switches	13
6.1.3 PATTERN select switch	14
6.1.4 SPEED setting dial	14
6.1.5 RESET/HOME select switch	14
6.1.6 MIRROR IMAGE X, Y switches	14
6.1.7 ERROR indication lamps	15
6.2 Foot switches	16
6.2.1 WORK HOLDER switch	16
6.2.2 START switch	16
6.3 Operation panel on machine head	16
6.3.1 COARSE/FINE select switch	16
6.3.2 MOVE switches	16
6.3.3 \pm JOG switches	17
6.3.4 UP switch	17
6.3.5 STOP switch	17
7. OPERATION	18
7.1 Loading the FROM cassette	18
7.2 Switch setting on switch panel	18
7.3 Switch function checking	18
7.4 Sewing operation	19
7.5 STOP switch operation	19
7.6 Operation procedure and checking	20

8. CAUTIONS ON USE	23
9. HANDLING THE SEWING MACHINE HEAD	24
9.1 Installation of needle	24
9.2 Winding the bobbin thread	24
9.3 Threading the needle thread	25
9.4 Thread tension	25
9.5 Installing the bobbin	26
9.6 Installing the bobbin case	26
9.7 Adjusting the needle thread tension	26
9.8 Adjusting the bobbin thread tension	27
9.9 Lubrication	27
9.10 Timing adjustment between needle motion and hook motion	28
9.11 Adjusting the hook position	28
9.12 Thread tension	30
9.13 Adjusting the bobbin thread tension	30
9.14 Adjusting the needle thread tension	31
9.15 Adjusting the intensity of thread takeup spring	32
9.16 Adjusting the movable range of takeup spring	32
9.17 Adjusting the thread tension discs	33
9.18 Adjusting the hook oiling rate	33
9.19 Adjusting the presser foot	35
9.20 Adjusting the timing of presser foot motion	36
9.21 Adjusting the needle bar stop (UP) position	37
10. ADJUSTING THE THREAD TRIMMER	38
10.1 Thread trimmer mechanism	38
10.2 Installation of knife bracket and kife bracket unit	38
10.3 Connection of knife bracket with driving crank	39
10.4 Knife driving shaft	39
10.5 Installation of air cylinder	40
10.6 Installation of trimming cam	41
10.7 Adjusting the knife engagement	42
10.8 Adjusting the needle thread tension release	44
10.9 Adjusting the synchronizer discs	44
10.10 Adjusting the length of needle thread end after trimming	45
10.11 Hook, bobbin case and bobbin	45

11. MAINTENANCE AND CHECKING	46
11.1 Adjusting the XY table	46
11.2 Greasing the XY table	47
11.3 Pneumatic system	47
11.4 Maintenance of machine head	47
12. CONTROL SYSTEM	49
12.1 LIM-STOP Z motor	49
12.2 Grounding for prevention of malfunction due to noise	50
12.3 Fuses and magnetic breakers	50
13. REPLACING THE PROM	52
14. AUXILIARY FUNCTIONS	53
14.1 Repeat function	53
14.2 Home position return cancellation when the power is turned on	53
14.3 Home position return cancellation	53
14.4 Thread trimming cancel when HALT switch is depressed	54
14.5 Adjustment of fabric feed timing	54
14.6 Speed select function	55
15. WIRING DIAGRAM	56
15.1 General wiring diagram	56
15.2 LIM-STOP Z motor wiring	57
16. TROUBLESHOOTING	60

1. CONSTRUCTION

PLK-2520A consists of the parts shown below.

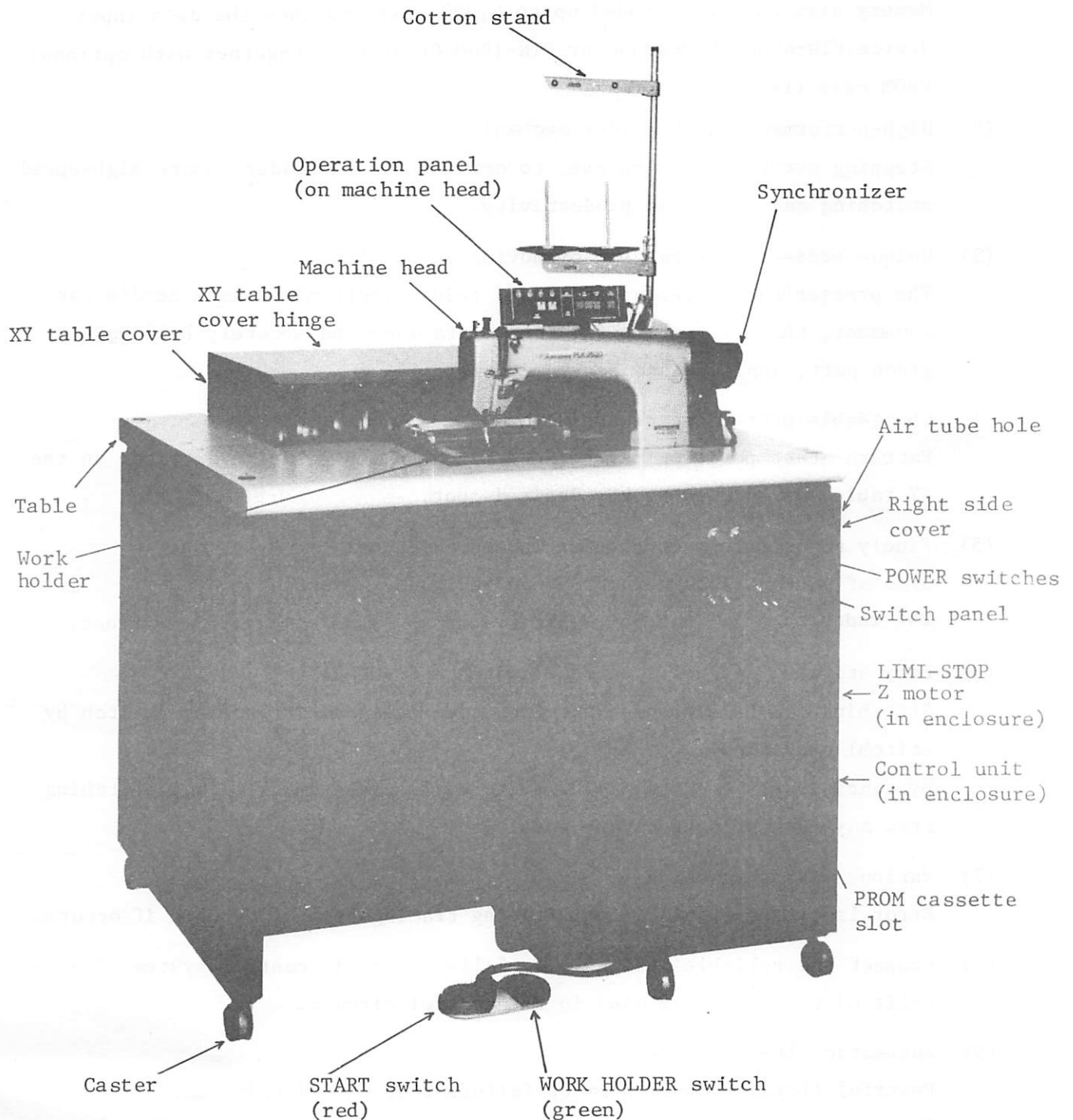


Fig. 1.1

2. FEATURES

(1) Easy pattern change

Pattern data can be stored up to 10 patterns within 1,000 stitches in the PROM cassette. By using the data input device, pattern data can be easily stored in PROM.

Memory size can be expanded up to 4,000 stitches when the data input device PTN-4000, PTN-4000A or PTN-1000-OL is used together with optional PROM cassette.

(2) High-performance work holder mechanism

Stepping motors and belts used to drive the work holder assure high-speed stitching and increased productivity.

(3) Unique presser foot capable of moving vertically

The presser foot moves up and down, being synchronized with needle bar movement, thus preventing floating of fabrics and securely holding a given part, applique and heavy material.

(4) Changeable pattern start position

Pattern start position may be determined by the position detector on the XY table, or located to any desired spot.

(5) Finely adjustable pattern size (SCALE function)

Size of pattern stored in PROM can be finely adjusted within $\pm 4\%$ independently in X and Y directions by means of digital switches.

(6) Easy stitch aligning HALT switch and JOG switch

Stitching can be suspended and amended or aligned in inching (stitch by stitch) operation.

By continuously operating \pm JOG switches, pattern checking and stitching from any part of pattern are possible.

(7) Various safety functions

Error lamps are provided facilitating tracing back of trouble if occurs.

(8) Compact and reliable design full-electronic control system

8-bit microcomputer is used in the control circuit.

(9) Automatic thread trimmer

Powerful thread trimmer permits failure-free thread trimming.

Since exceptionally large hook is used, frequency to replace the bobbin will be decreased.

(10) Mirror image

With simple switch operation, symmetrical pattern is easily stitched.

(11) Easy machine maintenance

LIMIT-STOP Z motor equipped with clutch featuring almost permanent life is used to drive the sewing machine, requiring almost no maintenance. The XY table is easily accessible for maintenance by removing the XY table cover.

3. SPECIFICATIONS

3.1 General specifications

Stitching type	Single-needle lockstitch
Sewing machine	Model DY-359-22, Automatic thread trimmer equipped
Needle bar stroke	40 mm
Take-up lever stroke	72 mm
Applicable needle	DP x 17 #23 (Standard)
Work holder lift	70 mm (Standard), adjustable
Presser foot lift	10 mm
Presser foot stroke	4 - 10 mm (set to 4 mm at shipping)
Hook	Full-rotation, automatic lubrication (large type for thread trimmer use)
Bobbin case	Equipped with racing prevention spring
Bobbin	Steel bobbin for thread trimmer use
Lubrication	Manual oiling Screw pump for lubrication of hook
Applicable oil	White spindle oil, #2
Thread trimmer	Rotary scissoring by left movable knife and right fixed blade
Control system	Full electronic, microprocessor incorporated control
Sewing area	240mm x 200mm (X - Y dual axial drive by stepping motor)
Max. sewing speed	2,000 spm (intermittent feed)
Stitch length	0.2 - 6.2 mm
Sewing pattern	Pattern is reproduced with data stored in PROM (replaceable). Maximum 10 pattern (1,000 stitches) can be stored in each PROM.

	Maximum 4,000 stitches can be stored with optional PROM.
Sewing operation	Pattern start position may be set at user's discretion as home position or any desired spot.
Return to home position	This function is used if X and/or Y positions is out of alignment. The work holder returns to the home position in X axis and Y axis direction after the needle stops at UP position.
START operation	Stitching starts when START switch is depressed to "ON".
Work holder	The work holder goes down when the WORK HOLDER switch is pressed down for the first time, and goes up when pressed down again.
HALT operation	Sewing operation can be suspended by depressing the HALT switch. After the suspension, the work holder can be moved stitch by stitch along the sewing pattern in inching operation. By depressing the START switch again, the sewing operation can be started again.
Pattern size fine adjustment (SCALE function)	Size of pattern stored in PROM can be finely adjusted within a range of $\pm 4\%$ ($\pm 1\%$ increment) in X axis and Y axis independently.
Pattern select function	Any one of 10 patterns stored in PROM can be selected.
Sewing speed setting	Sewing speed can be set in nine steps within a range from 180 spm to 2,000 spm. (about 200 spm increment)

Stitch correcting function	Stitches can be corrected or amended by moving the work holder stitch by stitch forward or backward along the pattern by operating \pm JOG switches.			
Test function	This function is used to check work holder movement without actual sewing.			
Mirror image	A symmetrically turned over patten can be stitches.			
Error indicator	Trouble or failure is immediately identified.			
Main drive motor	LIMI-STOP Z motor			
Work holder	Pneumatic Type (5kg/cm ²)			
Power source	Frequency(Hz)	Voltage(V)	INPUT(KVA)	Phases
	50 60	200,220, 380,415	1	Three Phase
Dimensions (mm)	1,150 mm (width) x 1,020 mm (length) x 1,200 mm (height) (cotton stand is not included in the height)			
Weight	350 kg (including weight of machine head)			

Table 3.1

3.2 Replacement parts for medium and heavy fabrics

Specification Name of part	For medium fabric	For heavy fabric (standard)
Thread tension regulator	For LS ₂ standard application (option) (W346065G02)	A131C513G01
Pretensioner	—————→	(W487036G03)

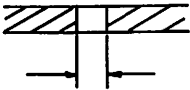
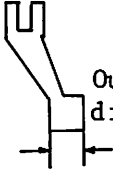
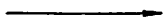

Needle plate  Needle hole diameter	$\phi 2$ (furnished) (W34 9841H02)	$\phi 3$ (W34 9841H01)
Presser foot  Outer diameter	$\phi 3.5$ (furnished) (Inner dia.: $\phi 2$) (A130C201H02)	$\phi 4.5$ (Inner dia.: $\phi 3$) (A130C201H01)
Hook		For DY (P975040X02)
Bobbin case		For DY (A190D175P01)

Table 3.2

4. INSTALLATION

4.1 Caster is locked when its lever is pressed down.

For transference of the sewing machine, pull up the lever of each caster.

4.2 Remove the eye bolts to replace them with furnished flathead screws (standard accessories).

4.3 Loosen wing bolts on the left and right sides of the XY table cover and remove the XY table cover.

The XY table cover is provided with detachable hinge (Fig. 1.1).

4.4 Loosen four hexagon socket head bolts, used to secure the work holder, with furnished hexagon key wrench and turn counter-clockwise the work holder (Fig. 4.1).

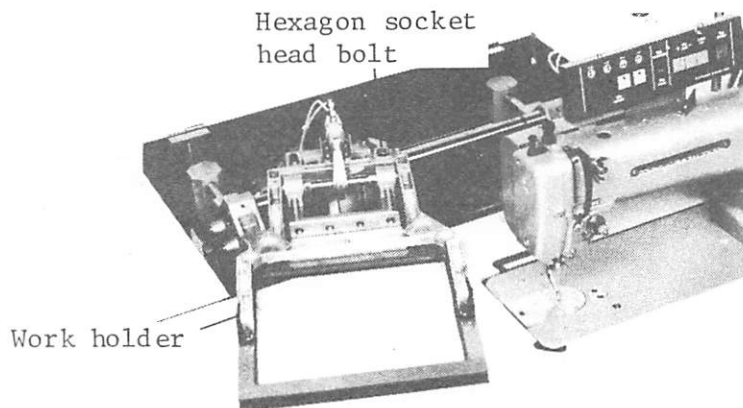


Fig. 4.1

4.5 Place the machine head on the table. Connect the 20-circuit flat cable (standard accessory) to the operation panel on the machine head, passing it through the cable hole in the table.

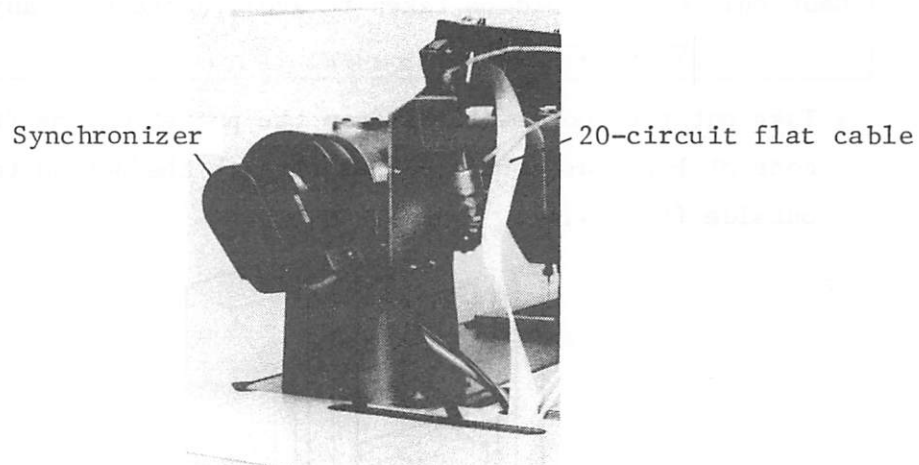


Fig. 4.2

The synchronizer cable and tension release connector should be also passed through the cable hole (Fig. 4.2)

4.6 Loosen the six right side cover mounting screws to remove the right side cover (Fig. 1.1).

- The connectors of synchronizer cable, tension release cable, 20-circuit flat cable from the operation panel on the machine head, and the power cable should be installed as shown in Fig. 4.3.

Caution: The power cable should be installed so that it cannot be tensed.

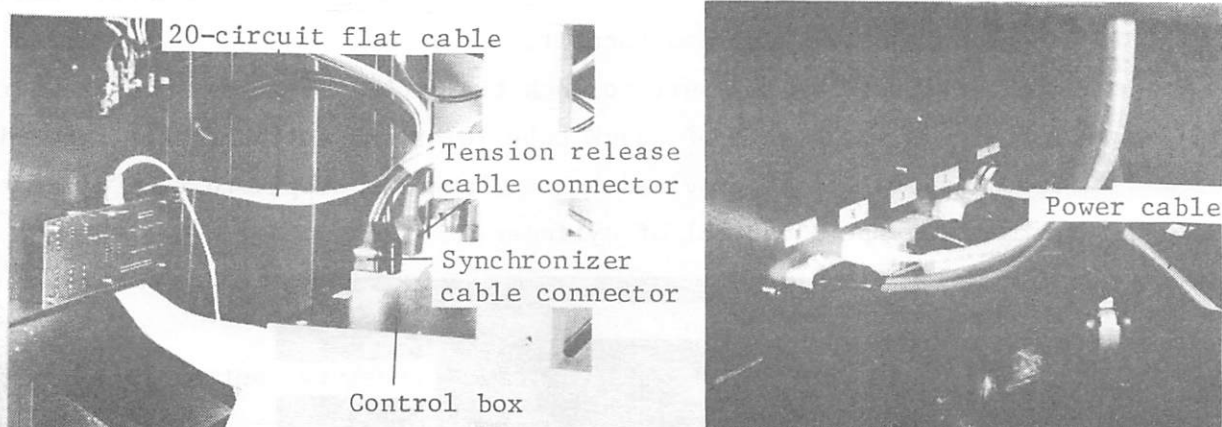


Fig. 4.3 View when right side cover is removed

- Install the V-belt between the machine head pulley and LIM1-STOP Z motor pulley. V-belt tension should be that the belt is sunken by about 10 mm when it is depressed at its center of the span by finger.

Caution: Care should be taken to avoid contact of any cable with the V-belt.

- Take out the foot switches from the pocket on the front cover of control box, pass their cables through the bottom to brought them outside (Fig. 4.4).

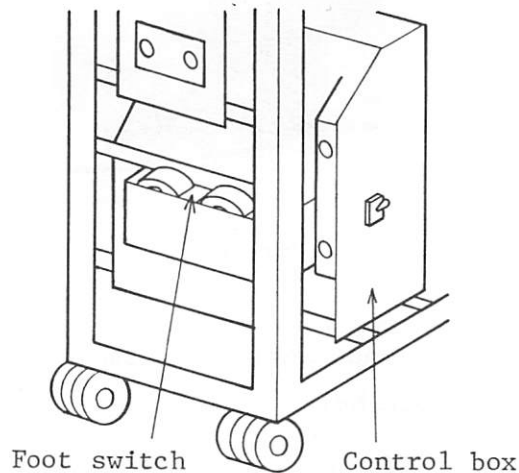


Fig. 4.4

- Install the furnished cotton stand on the table (Fig. 1.1).

4.7 Air piping (See Fig. 4.6)

Install the right side cover to the machine, pass furnished air tube through the air tube hole (see Fig. 1.1) and connect it to the quick tube joint.

Air pressure should be set to 5 kg/cm^2 . To set air pressure, pull the pressure control knob and turn it.

After the setting, be sure to lock the knob. To disconnect the air tube, push the sleeve of quick tube joint and pull the tube outward. Speed controller is provided to regulate air supply to each cylinder, permitting speed control of cylinder.

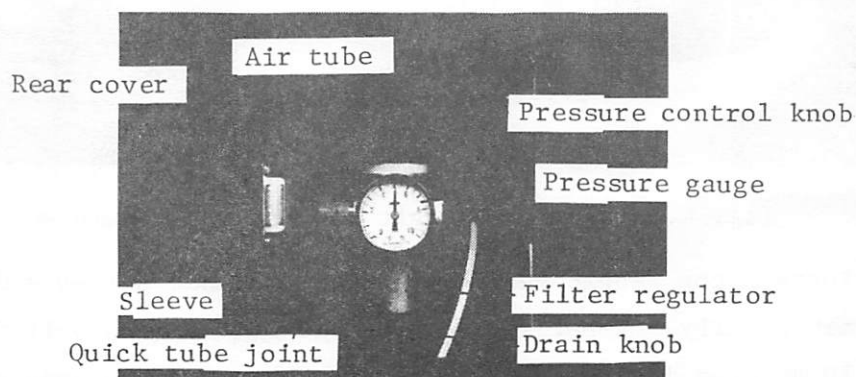


Fig. 4.5 View when the rear inspection window is removed

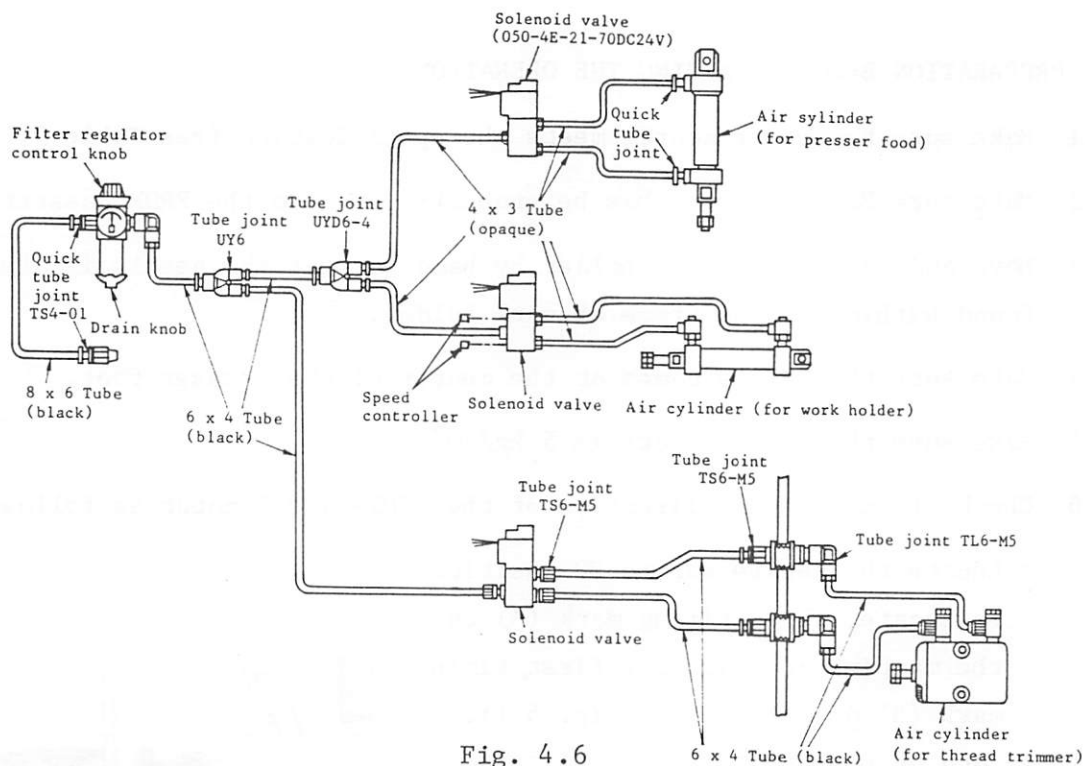


Fig. 4.6

- 4.8 Turn the work holder until it strikes the positioning pin and fully tighten hexagon socket head bolts (Fig. 4.7).

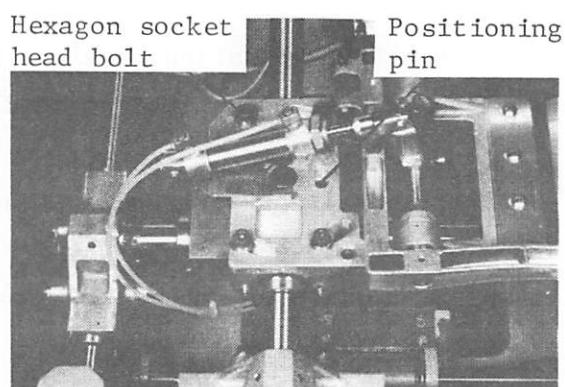


Fig. 4.7

- 4.9 Install the XY table cover (see Fig. 1.1).

5. PREPARATION BEFORE STARTING THE OPERATION

- 5.1 Make sure the power source meets the specification (see Table 3.1).
- 5.2 Make sure PROM cassette has been properly put into the PROM cassette slot.
- 5.3 Move and locate the work holder by hand so that the needle is always found within the frame of work holder.
- 5.4 Make sure the needle comes at the center of the presser foot.
- 5.5 Make sure the air pressure is 5 kg/cm².
- 5.6 Check the rotational direction of the LIM-STOP Z motor as follows:

- Locate the needle bar to UP position.

To locate, align timing mark (A) on the machine arm with the first timing mark (B) on the pulley (Fig. 5.1).

- Turn on the power.
- Depress the WORK HOLDER switch (brack) to lower the work holder.
- Turn the balance wheel by hand so that the needle bar is away from the UP position.

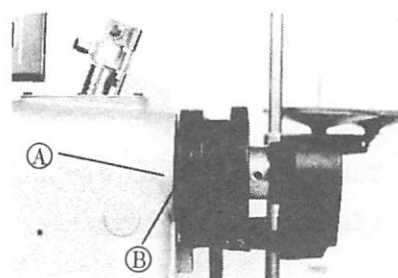


Fig. 5.1

- Depress the UP switch of the operation panel on the machine head. The sewing machine will start and stop with the needle bar located at the UP position.

When the LIM-STOP Z motor is properly wired, the balance wheel rotates counter-clockwise, view from the balance wheel side.

- To change rotational direction of the motor, change power cable connection between two of three wires.

- 5.7 Before disconnecting the power cable, be sure to turn off the power switch and make sure the pilot lamp does not light.
- 5.8 The dimensional relationship between the work holder and its home position is shown in Fig. 5.2.

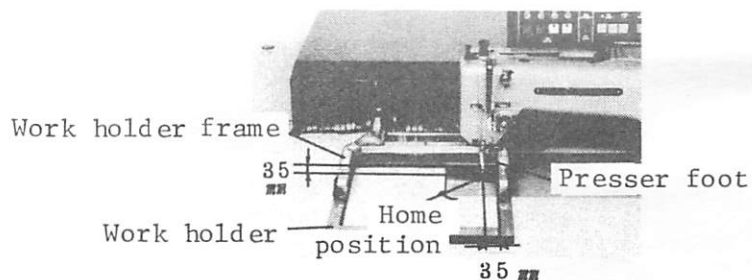


Fig. 5.2

6. CONTROL SWITCHES AND FUNCTIONS

6.1 Switch panel

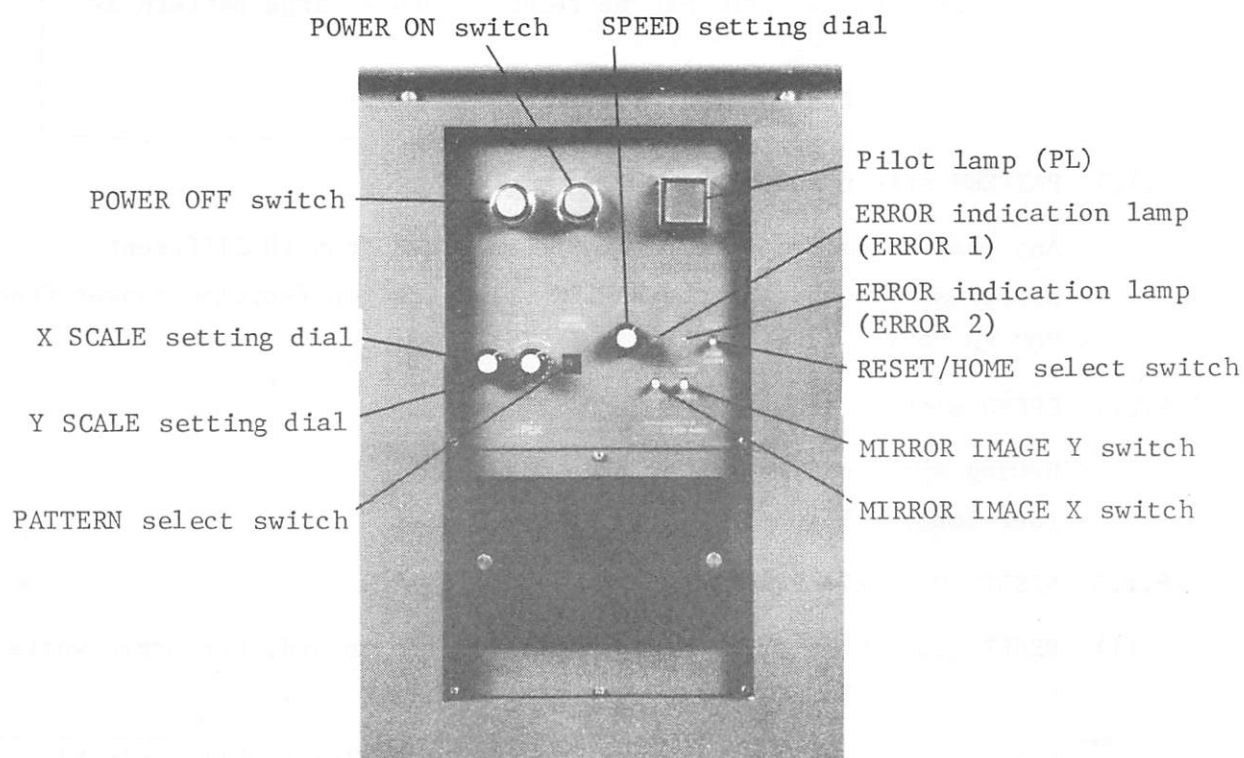


Fig. 6.1 Switch panel

6.1.1 POWER ON and OFF

- (1) When the POWER ON switch (green pushbutton) is depressed, the pilot lamp (PL) lights.
- (2) When the POWER OFF switch (red pushbutton) is depressed, the pilot lamp goes out. The work holder goes up when it is at lowered position.

6.1.2 SCALE switches

- (1) Size of pattern stored in PROM can be adjusted within $\pm 4\%$ of the real size (stored in PROM) in X axis direction and Y axis direction independently.
- (2) This scale adjustment is made in reference to the home position.

Cautions 1: After the fine adjustment of pattern, test should be performed to check that the entire pattern is within the work holder frame.

(Refer to para. 6.3.3.)

2: Sewing speed may be reduced when enlarge pattern is stitched.

(Refer to para. 8.1.)

6.1.3 PATTERN select switch

Any one of desired pattern can be selected from 10 different patterns by operating the PATTRN select switch (setting ranges from "0" to "9").

6.1.4 SPEED setting dial

Sewing speed can be set by this dial.

(See Table 8.1.)

6.1.5 RESET/HOME select switch

- (1) RESET When this toggle switch is set upward, the brake works stopping all movements.

Caution: Do not set the switch to RESET position while stitching is going on.

- (2) HOME When this toggle switch is set downward, the work holder automatically returns to the home position.

When the needle position is other than UP position, the needle automatically goes up and the work holder returns to the home position (see Fig. 5.2).

In usual operation, the switch is set at HOME position.

6.1.6 MIRROR IMAGE X, Y switches

A pattern can symmetrically turned over in X direction and Y direction by operating these switches.

The switch setting does not affect axial movement of the work holder (MOVE ... para. 6.3.2.) and work holder traverse direction at home return (refer to para. 6.1.5).

Since the mirror image conditions are initially set, change of mirror image switch setting during stitching or test operation is ignored.

Pattern changes as shown in Fig. 6.2.

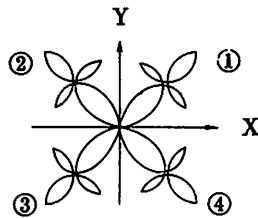


Fig. 6.2

	X	Y
1	Positive	Positive
2	Negative	Positive
3	Negative	Negative
4	Positive	Negative

6.1.7 ERROR indication lamps

When an error lamp lights, the sewing machine stops with the needle at UP position and proceeding of operation becomes impossible.

- (1) When ERROR 1 lights in green ... Sewing pattern is not stored or stored data are improper.
⇒ Use correctly programmed PROM cassette.
- (2) When ERROR 1 lights in red ... Stitch length is larger than 6.2 mm resulting from excessively enlarged pattern.
- (3) When ERROR 2 lights in green ... The work holder moves beyond the sewing area. The movable range of work holder is set by the XY table position detector and detector plate (refer to section 11.).
⇒ Move the work holder into the movable range of work holder using MOVE function (refer to para. 6.3.2).
- (4) When ERROR 2 lights in red ... PROM cassette is not loaded.
⇒ Turn off the power and properly load PROM cassette.
- (5) When ERROR 1 and ERROR 2 light in red ... The needle is not at UP position when the power is turned on.
⇒ Set the RESET/HOME select switch to "HOME" position. The work holder will return to the home position and the sewing machine stops with the needle at UP position.
- (6) When ERROR 1 and ERROR 2 flicker in red ... Motor or sewing machine is blocked or V-belt leaves pulley.
⇒ Turn off the power, remedy and turn on the power again.
- (7) When ERROR 1 and ERROR 2 light in green ... PATTERN select switch setting is changed while the 2nd home position is used.
⇒ Operate the RESET/HOME select switch.

6.2 Foot switches (Fig. 1.1)

6.2.1 WORK HOLDER switch

The work holder goes down when the WORK HOLDER switch (brack) is depressed, and goes up when the switch is depressed again.

6.2.2 START switch

The sewing machine starts stitching when the START switch (red) is depressed.

It does not start, however, if the work holder is not at DOWN position and the needle is not UP position.

6.3 Operation panel on machine head

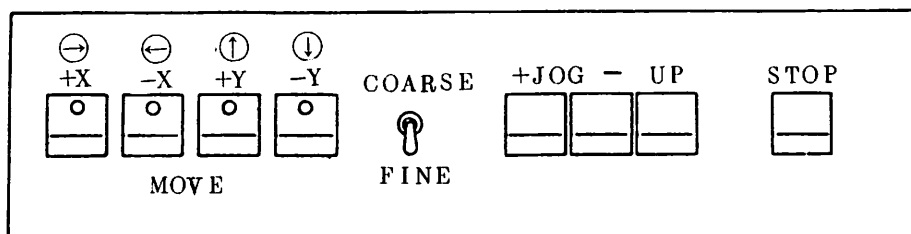


Fig. 6.3

6.3.1 COARSE/FINE select switch

With this switch set at "FINE" position, the work holder moves by 0.2 mm every when a MOVE switch is depressed. With this switch set at "COARSE" position, the work holder goes on moving as long as a MOVE switch is held down.

When switch setting is changed from "COARSE" to "FINE" before pattern stitching starts, the presser foot lowers.

6.3.2 MOVE switches

The movement of WORK HOLDER resulting from MOVE switch operation is as follows:

- +X: Rightward movement, viewed from the front (leftward stitching)
- X: Leftward movement, viewed from the front (rightward stitching)
- +Y: Upward movement, viewed from the front (downward stitching)
- Y: Downward movement, viewed from the front (upward stitching)

For this operation, the needle and the work holder should be at UP position and DOWN position respectively.

6.3.3 +JOG switches

(1) TEST function

Only the work holder advances in the stitching direction at a fixed speed while the +JOG switch is held down after the work holder is returned to the home position.

When the -JOG switch is depressed, the work holder moves in the opposite direction.

When the +JOG switch is held down and the work holder reaches the end of pattern, the work holder goes up and then returns to the home position.

When the -JOG switch is held down and the work holder reaches the home position, it stops there permitting start of stitching (when the START switch is depressed), or test (the +JOG switch is operated).

During the test, the presser foot goes down for stitching, and goes up for work holder traversing (the work holder moves without stitching operation).

(2) Stitch correct function

For correction or amendment of stitches, the work holder can be moved in forward or backward direction stitch by stitch along the pattern by operating the +JOG or -JOG switch after stitching is suspended by depressing the STOP switch (refer to para. 6.3.5).

This inching motion is same as that of test function, but differs in that the work holder moves at a speed lower than the speed in test operation.

6.3.4 UP switch

When the sewing machine stops with the needle at a position other than the UP position, this switch is depressed to locate the needle to the UP position.

This function can be used only when the work holder is at the DOWN position.

6.3.5 STOP switch

When the sewing machine must be stopped for thread breakage or for replenishment of bobbin thread, this switch is used.

Stitching can be resumed by depressing the START switch (red).

It is also possible to move the work holder by operating the +JOG or -JOG switch.

7. OPERATION

7.1 Loading the PROM cassette

Open the switch panel front cover and insert a PROM cassette in which necessary pattern data have been stored into the cassette slot, using care not to insert it in wrong direction. After the insertion, do not fail to install the front cover again.

For pattern writing and erasure to and from PROM, optionally available PROM writer (PT-100, PT-100A, PTN-4000, PTN-4000A, PTN-1000-OL) is necessary. For selection of PROM, refer to Table 7.1. For handling of PROM cassette, refer to section 13.

7.2 Switch setting on switch panel

In order to check each function, set each switch on the switch panel as follows:

Set the SCALE X and Y switches to "0", the PATTERN select switch to any one of 10 positions ("0" - "9"), the SPEED setting dial to "4", and the RESET/HOME switch to "HOME" position.

7.3 Switch function checking

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

(1) Home return

Set the RESET/HOME to "RESET" position and then to "HOME" to make sure the work holder returns to the home position (refer to para. 6.1.5).

(2) Work holder lowering motion

The work holder should go down when the WORK HOLDER switch is depressed (it goes up when the switch is depressed again).

(3) Work holder movement

The work holder should move tracing the given pattern when the +JOG switch is depressed.

When the work holder reaches the end of the pattern, it will go up to the UP position, and return to the home position (the work holder stops at the UP position when the +JOG switch is released while the work holder is moving ... refer to para. 6.3.3).

When the test is made, only the work holder moves and stitching motion does not occur.

By performing the test, check the dimensions and location of the work holder. To check stitching condition, set stitching speed to "low speed" and proceed as instructed in para. 7.4.

7.4 Sewing operation

- (1) Referring to Fig. 6.1., properly set switches on the switch panel.
- (2) Set up a fabric and depress the WORK HOLDER switch to let down the work holder. Then depress the START switch, the sewing machine will start stitching.

Once stitching starts, it continues even when the START switch is released, and stops with the work holder at the UP position after thread trimming.

7.5 STOP switch operation

To suspend stitching, depress the STOP switch (see Fig.6.3).

Stitching stops with the work holder at the DOWN position after thread trimming.

To start stitching again, adjust the stitching start position by operating the +JOG and/or -JOG switches and depress the START switch again. The sewing machine starts and sews the remaining pattern.

Note: In order to make yourself familiar with each switch function, it is recommended to operate switches on the switch panel without needle thread.

PROM x Q'ty	Number of stitches	Number of patterns
2716 x 1	1000	10
2716 x 2	2000	10
2732 x 1	2000	10
2732 x 2	4000	10

Table 7.1 (PROM combination)

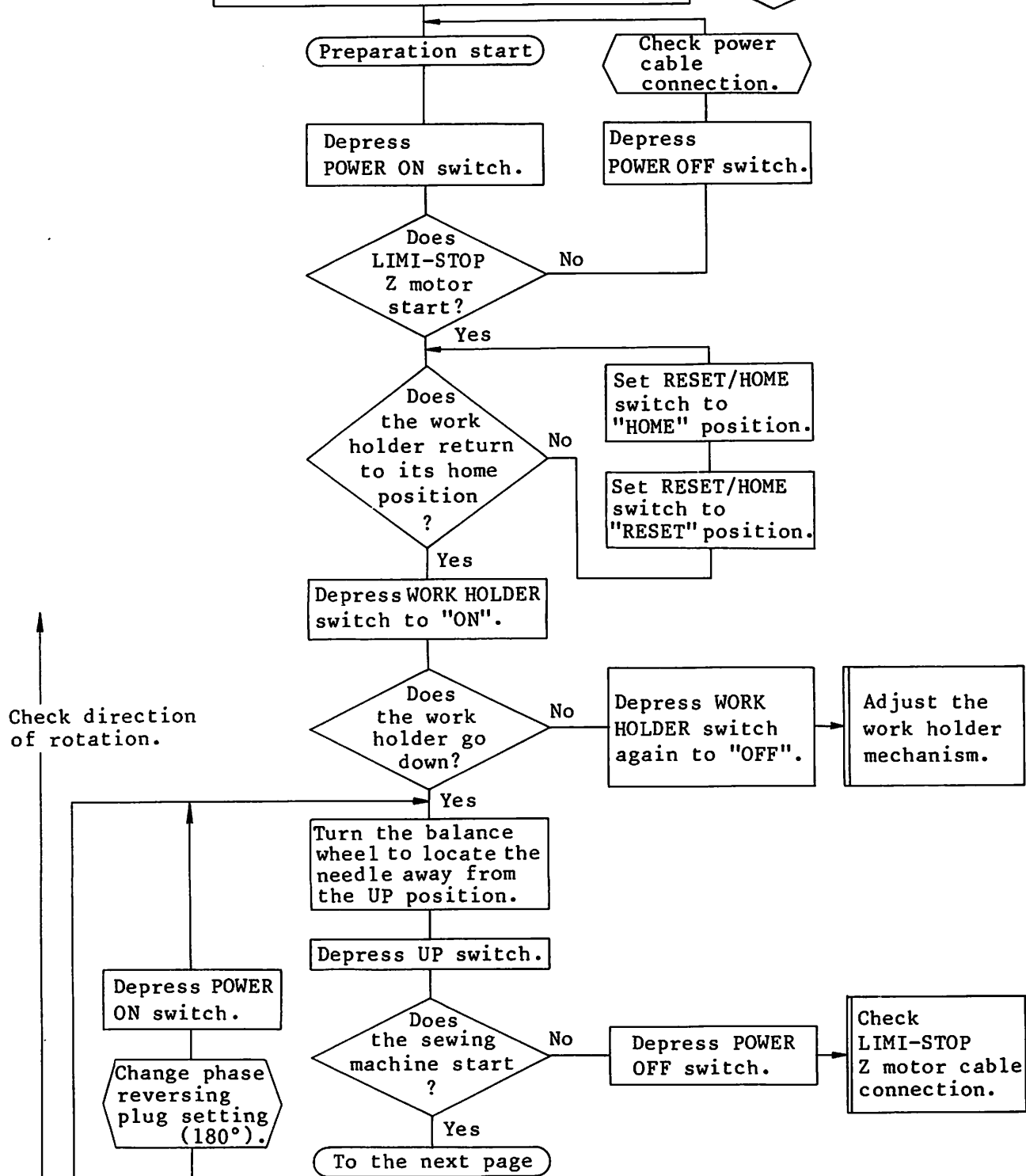
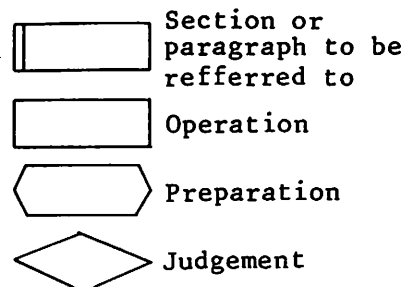
Note: For use of two PROMs, a P.C. board of Cassette case having two PROM sockets should be used.

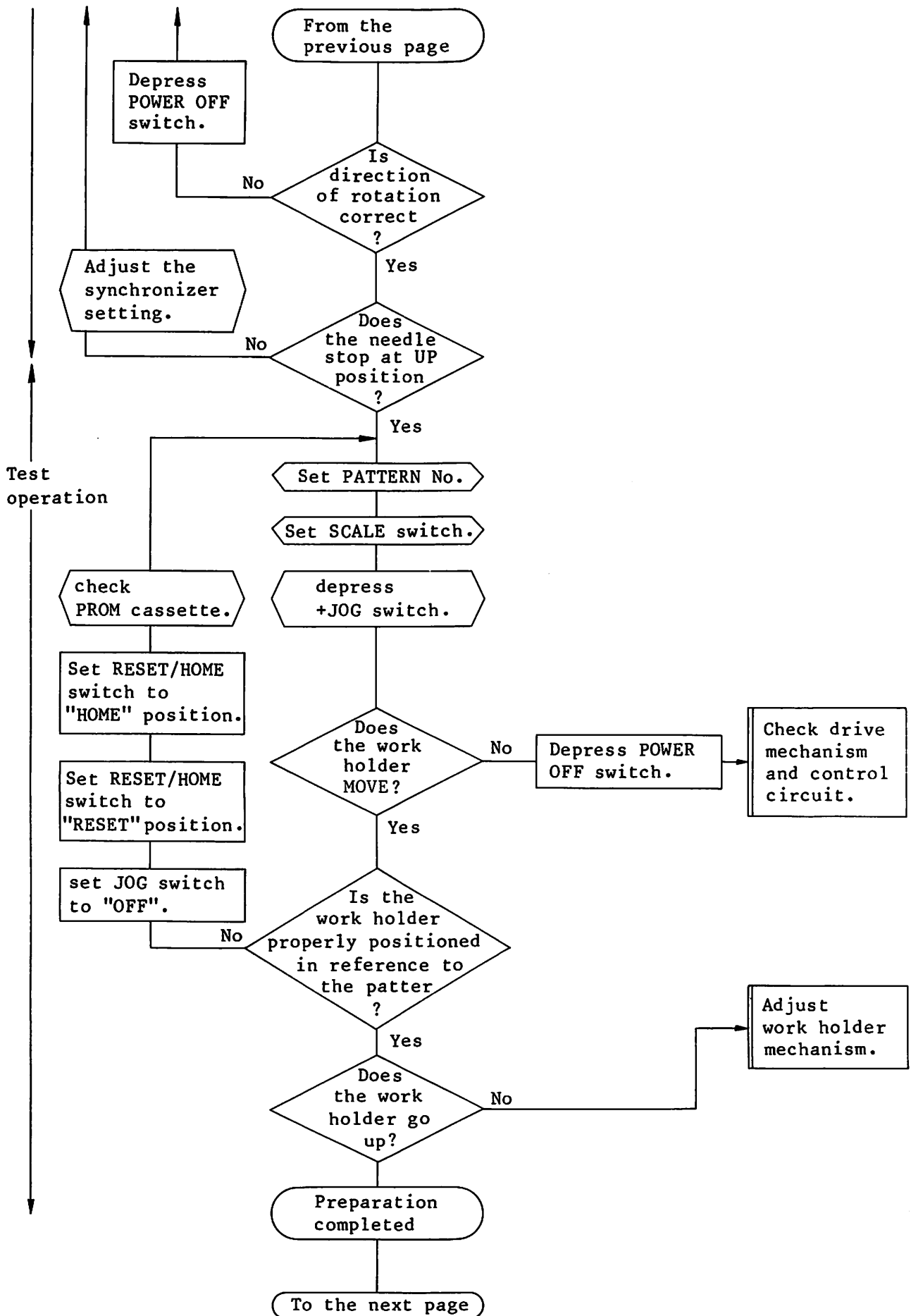
7.6 Operation procedure and checking

The sewing machine should be operated and checked in accordance with the following flow chart:

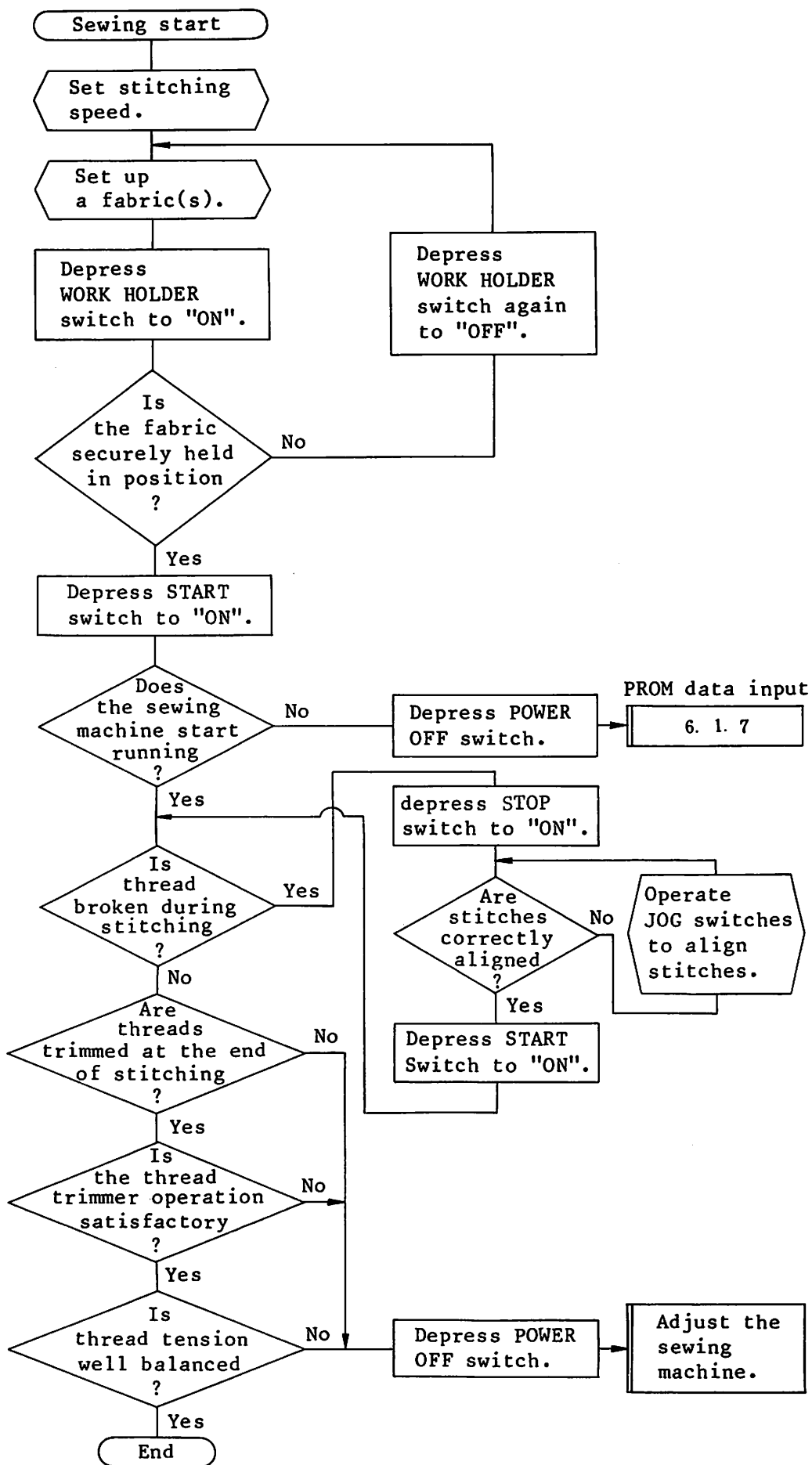
Checking before starting operation

- (1) Is the power cable plugged in power source outlet and connector?
- (2) Are all other cables properly plugged?
- (3) Is PROM cassette loaded on the machine?
- (4) Are fuses not blown out?





Automatic
sewing
operation



8. CAUTIONS ON USE

- (1) Before replacement of PROM in PROM cassette, carefully read section 13 "REPLACING THE PROM".

The power should be turned off before PROM cassette is loaded or unloaded.

- (2) If any ERROR lamp lights, trace its cause referring to the description in para. 6.1.7.
- (3) When a new pattern is stitched for the first time, or pattern size is finely adjusted, be sure to perform test operation to check the relationship between the work holder movement and the pattern.
- (4) Maximum sewing speed depends on stitch length.
(Refer to item 12.4 for detail)
- (5) Dust in the control unit might cause malfunction or trouble.
During operation, the control box cover should be kept close.
- (6) When the power is turned on, foot should not be placed on the START switch.
- (7) When adjustment is made on the sewing machine, be sure to turn off the power before gaining access to the mechanisms or control box interior.
- (8) Do not apply a multimeter to the control circuit for checking or adjustment. Otherwise semiconductors in the circuit might be damaged due to voltage from the multimeter.
- (9) Since air fed to the pneumatic line contains moisture, depress the drain knob of filter regulator to eliminate accumulated water (see Fig. 4.5).

9. HANDLING THE SEWING MACHINE HEAD

9.1 Installation of needle (Fig. 9.1)

Caution: Before installing or removing the needle, turn off the power for safety.

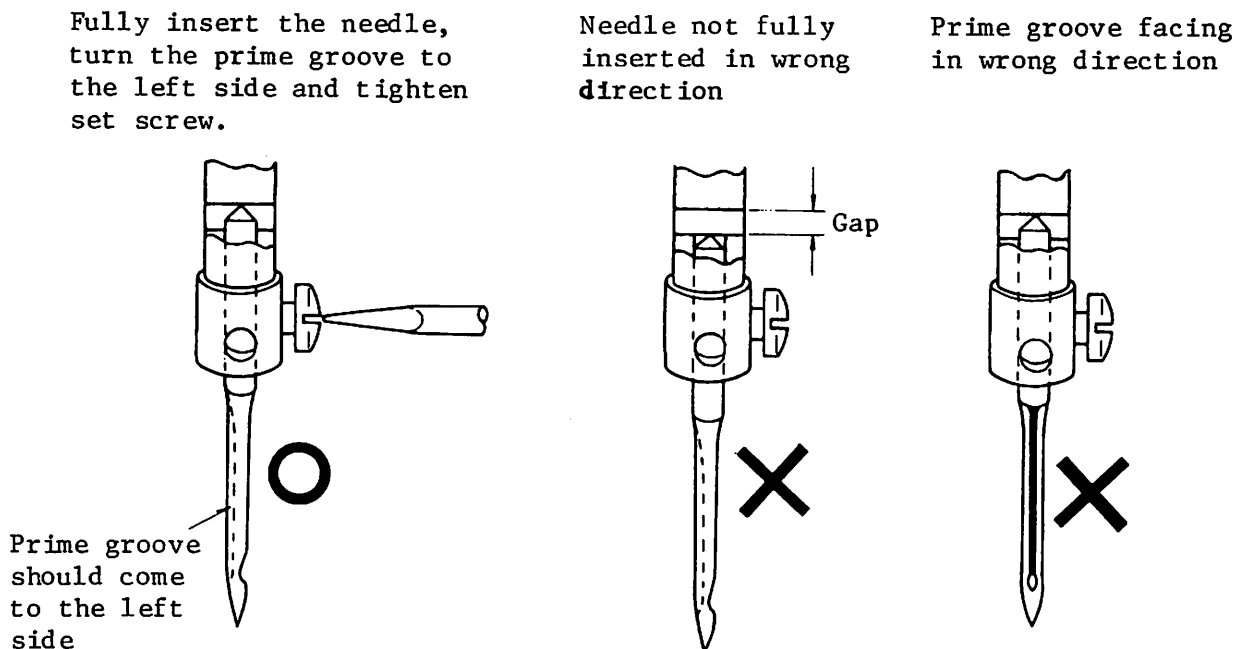


Fig. 9.1

9.2 Winding the bobbin thread (Fig. 9.2)

[Adjustment] - Tension of wound thread Small tension is recommended for polyester and nylon thread.

- Conically wound thread Move the thread guide toward smaller diameter of wound thread layers.
- Length of wound thread Tighten the thread length adjusting screw to increase length of wound thread, and loosen the screw to decrease.

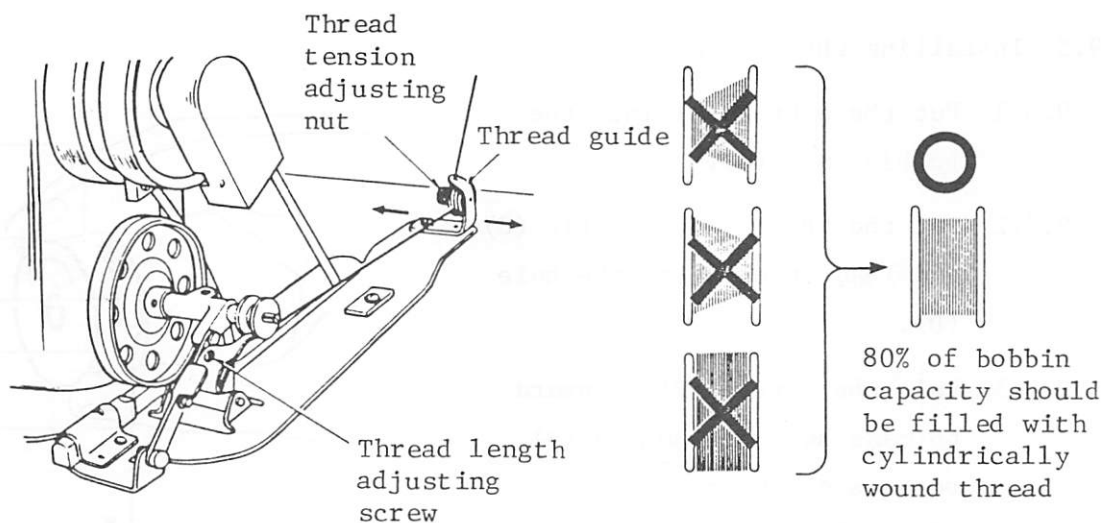


Fig. 9.2

9.3 Threading the needle thread (Fig. 9.3, 9.4)

With the takeup lever set at the uppermost position, pass the needle thread in the order numbered in Fig. 9.3.

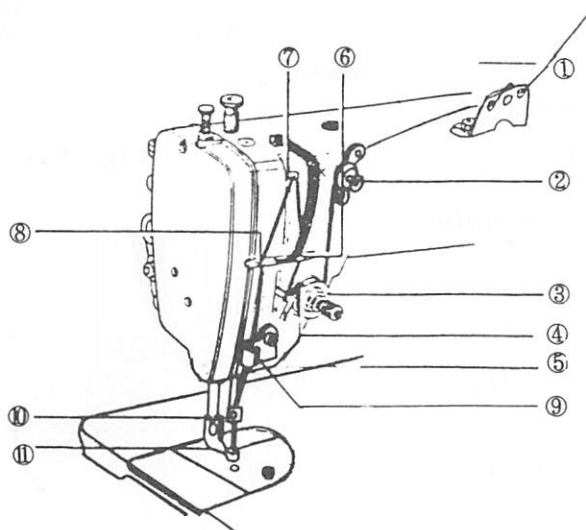


Fig. 9.3

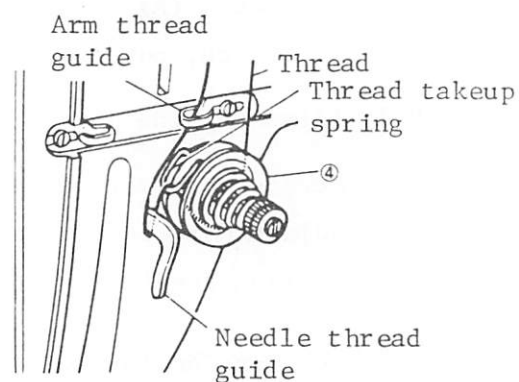


Fig. 9.4

9.4 Thread tension (Fig. 9.5)

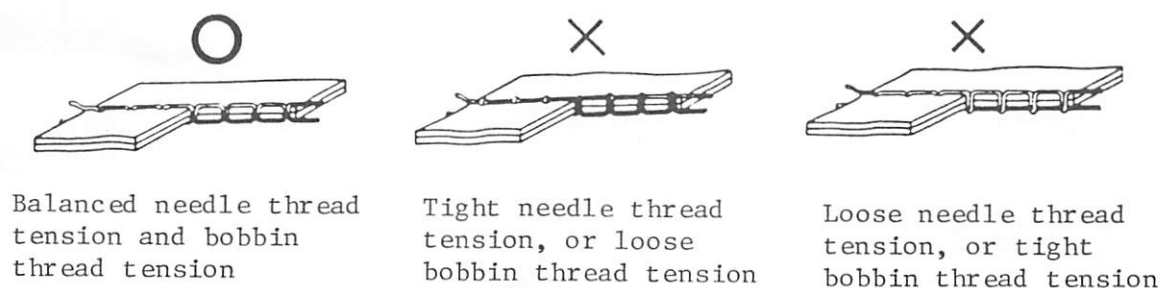


Fig. 9.5

9.5 Installing the bobbin

- 9.5.1 Put the bobbin (B) into the bobbin case (A).
- 9.5.2 Put the thread in the slit (C) and lead it out from the hole (D).
- 9.5.3 Pull the thread (E) downward to make sure the bobbin (B) rotates clockwise.
If the bobbin rotates counter-clockwise, reverse the bobbin (B).

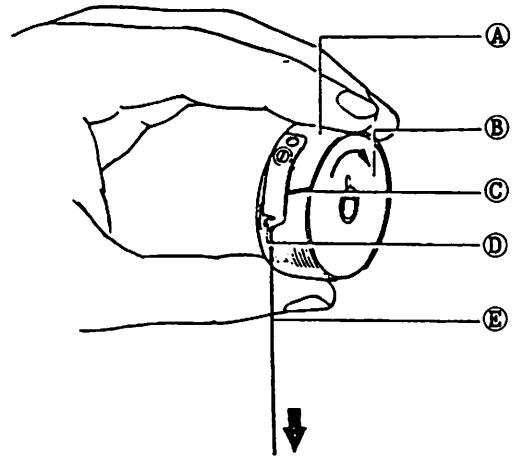


Fig. 9.6

9.6 Installing the bobbin case

- 9.6.1 Locate the needle bar to its uppermost position and open the lower cover.
- 9.6.2 Fully open the bobbin case latch (A) and, holding the latch, put it into (B).

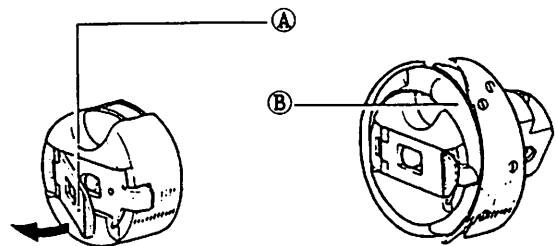


Fig. 9.7

9.7 Adjusting the needle thread tension.

Needle thread tension can be adjusted by turning the thread tension regulating tumb nut (A).

Tension increases when it is turned clockwise.

Tension decreases when it is turned counter-clockwise.

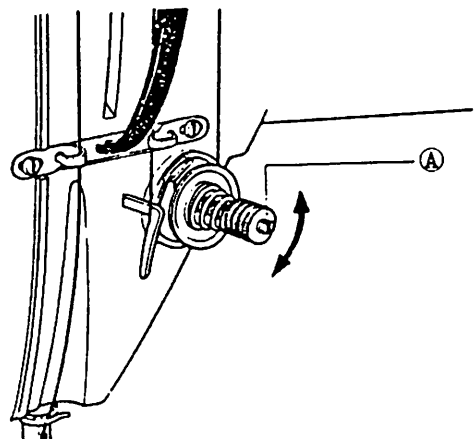


Fig. 9.8

9.8 Adjusting the bobbin thread tension

Bobbin thread tension can be adjusted by turning the thread adjusting screw (A).

Tension increases when it is turned clockwise.

Tension decreases when it is turned counter-clockwise.

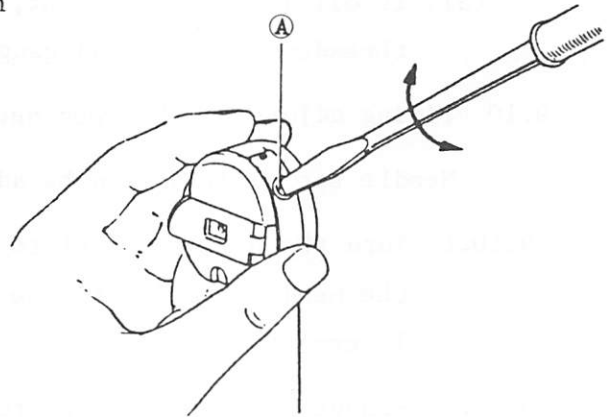


Fig. 9.9

9.9 Lubrication

9.9.1 To fill the oil tank with the machine head leaned backward

- (1) Lean the machine head and pour oil through the oiling hole (A) until level reaches the red line (B).
- (2) Oiling rate has been factory-adjusted, requiring readjustment in usual operation. If it must be adjusted, refer to para. 9.25.

Oil used: White spindle oil, #2

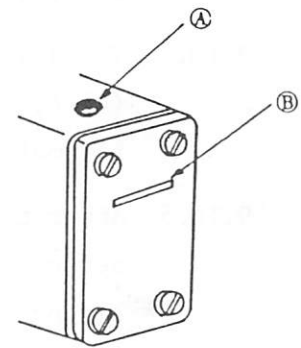


Fig. 9.10

9.9.2 To fill the oil tank without leaning the machine head

- (1) Loosen and remove the oil gauge found on the top of machine bed.
- (2) When the oil gauge is oiled up to the lower end of white paint, the oil tank is filled with sufficient amount of oil (Fig. 9.11).

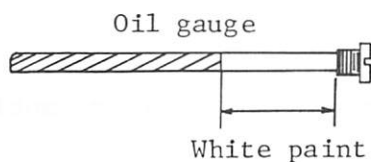


Fig. 9.11

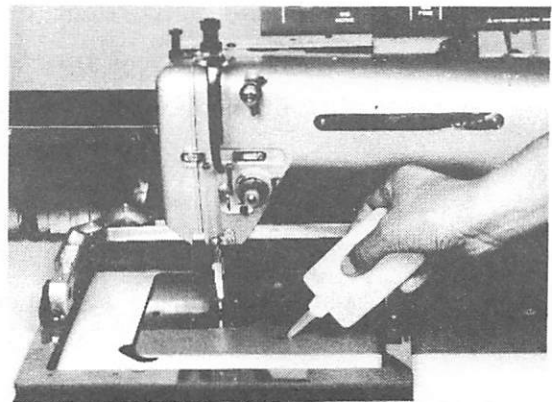


Fig. 9.12

- (3) If oil is not sufficient, pour suitable quantity of oil through the threaded hole for oil gauge (Fig. 9.12).

9.10 Timing adjustment between needle motion and hook motion

Needle bar position can be adjusted as follows:

- 9.10.1 Turn the balance wheel to located the needle bar (C) to the lowermost position.
- 9.10.2 Remove the rubber plug from the face plate (A).
- 9.10.3 Loosen the needle bar bracket set screw (B).
- 9.10.4 Vertically move the needle bar (C) to adjust timing of needle bar motion*.
- 9.10.5 After the adjustment, tighten the set screw (B).

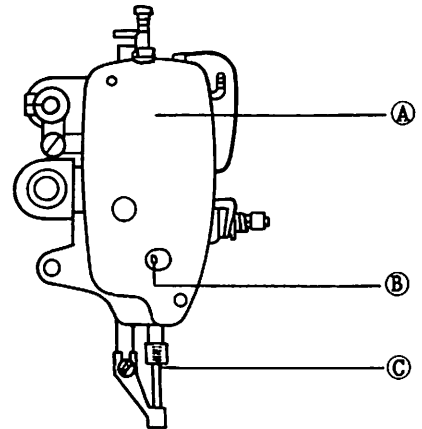


Fig. 9.13

* Timing of needle bar motion

- When the needle bar (C) is at the lowermost position, the needle bar timing mark (B) must be in line with the lower edge of the needle bar bushing (A).
- With the adjustment at the above step, the inside surface (E) of hook should be aligned with the center (D) of needle eye.
- There are four timing marks and one of them should be selected for the needle used.

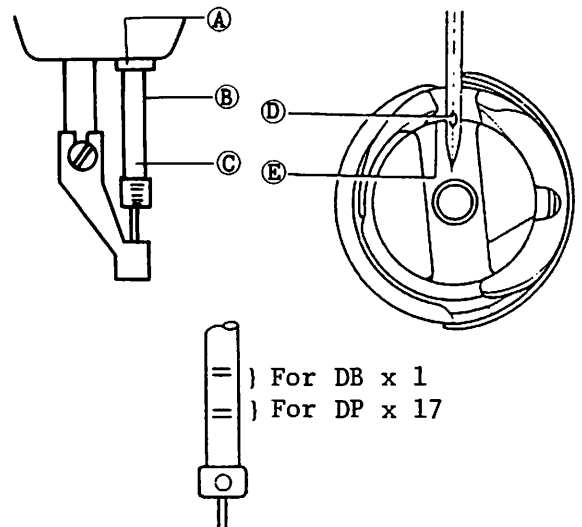


Fig. 9.14

9.11 Adjusting the hook position

- 9.11.1 Loosen the hook screw (A).
- 9.11.2 Turn and position the hook (B) to adjust timing of motion of hook point*.

9.11.3 Gap between the needle (D) and the hook point (C) should be about 0.05 mm.

* Timing of hook point motion

The standard timing is as follows:

When the needle bar (B) is lifted by 2.4 mm from the lowermost position (refer to timing marks (A) put on the needle bar at an interval of 2.4 mm), the following conditions should be satisfied.

- (1) The hook point (D) should meet the center (C) of needle.
- (2) The gap between the needle eye upper edge (E) and the hook point (D) should be within a range from 1.0 mm to 1.5 mm.

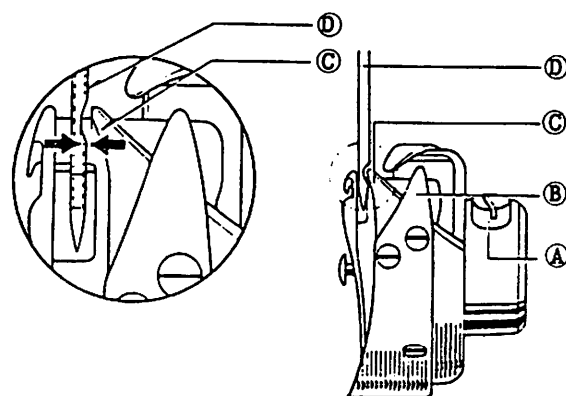


Fig. 9.15

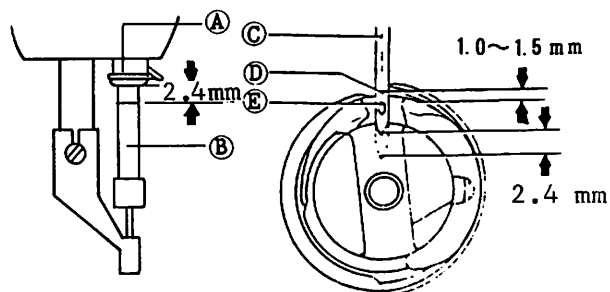


Fig. 9.16

9.11.4 Location of hook positioner

Position of the hook positioner (A) should be adjusted so that the side surface of needle (B) is in line with the side surface of hook stopper point (A) as shown to the right.

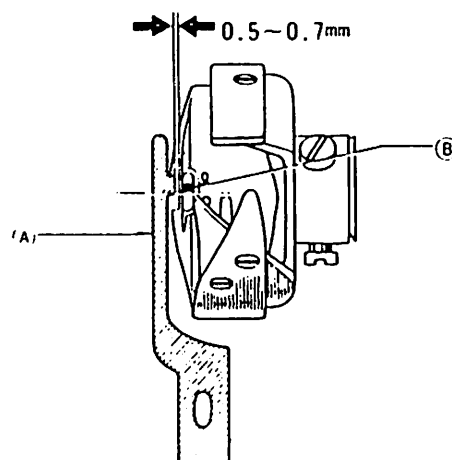


Fig. 9.17

9.12 Thread tensions

Needle thread tension should be adjusted in reference to bobbin thread tension.

9.12.1 Bobbin thread tension can be adjusted by changing intensity of bobbin case thread tension spring.

9.12.2 Needle thread tension can be adjusted by changing (1) intensity of thread takeup spring (B) of needle thread tension regulator, (2) movable range (A) of thread takeup spring (B), and (3) pressure of tension discs (C).

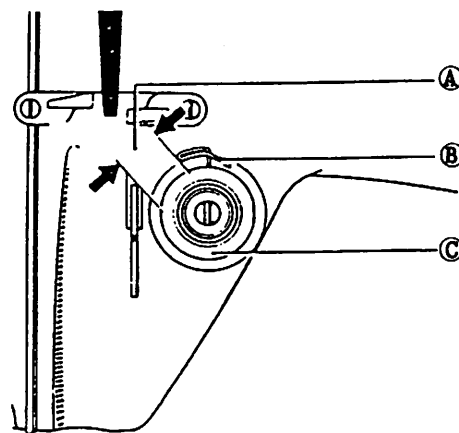


Fig. 9.18

9.13 Adjusting the bobbin thread tension

9.13.1 Put the bobbin with polyester thread #30 into the bobbin case (A) and lead out the thread (C) through the slit (B).

9.13.2 Tie furnished hexagon key wrench (small) (D) to the thread (C) to hang the key wrench, as shown in Fig. 9.18

9.13.3 The standard bobbin thread tension* is that the thread is gradually unwound when the bobbin case is slowly swung up and down.

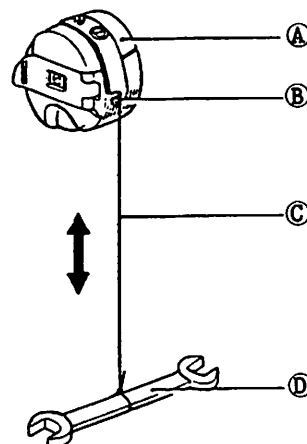


Fig. 9.19

Standard bobbin thread tension: 40 - 50g

*The bobbin thread tension can be adjusted by turning the screw (B) of bobbin case thread tension spring (A). Thread tension increases when the screw is turned clockwise, and decreases when turned counter-clockwise.

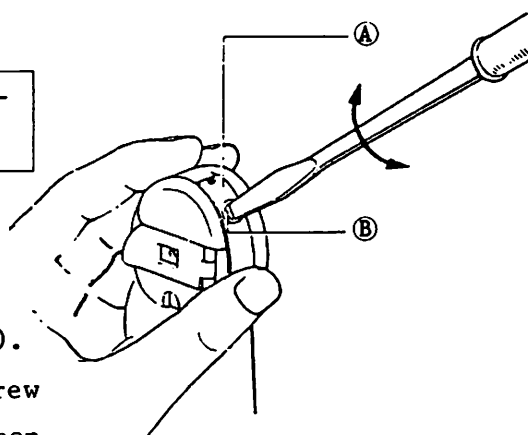


Fig. 9.20

9.14 Adjusting the needle thread tension
(Adjusting the intensity of thread
takeup spring)

- 9.14.1 Loosen the tension stud set screw and
turn tension stud (B) counter-clockwise
until intensity of thread takeup spring
(A) reaches zero.
- 9.14.2 Turn the thread stud (B) clockwise until
the takeup spring (A) comes into contact
with the spring stopper and then further
turn the tension stud (B) about 3/4
round.

The needle thread tension will be
adjusted to the standard tension.

Standard needle thread tension: About 40 - 50g

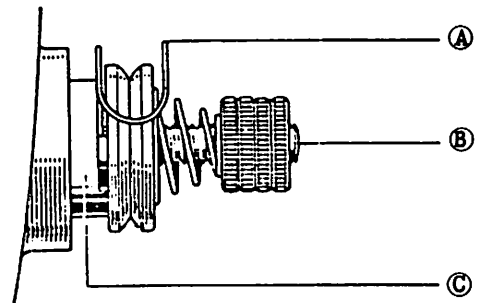


Fig. 9.21

9.15 Adjusting the intensity of thread takeup spring

9.15.1 Loosen the tension stud set screw (A).

9.15.2 Intensity of thread takeup spring can be adjusted by turning the tension stud (B).

Spring intensity increases when the tension stud is turned clockwise, and decreases when it is turned counterclockwise.

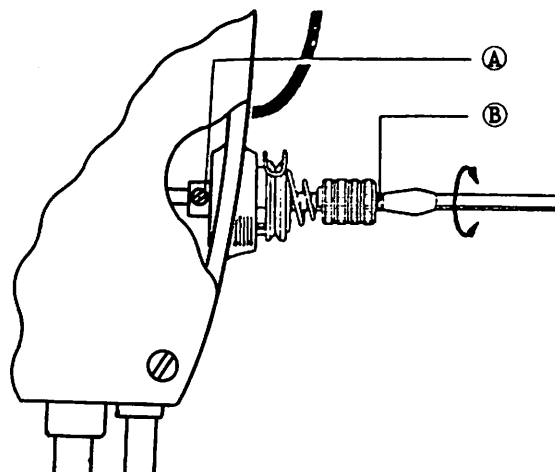


Fig. 9.22

9.15.3 After the adjustment, tighten the set screw (A).

9.16 Adjusting the movable range of takeup spring

9.16.1 Loosen the needle thread tension stud set screw (B).

9.16.2 Turn the tension regulating thumb nut (C) clockwise or counter-clockwise to adjust movable range of takeup spring*.

9.16.3 The movable range increases when the thumb nut is turned clockwise, and decreases when turned counterclockwise.

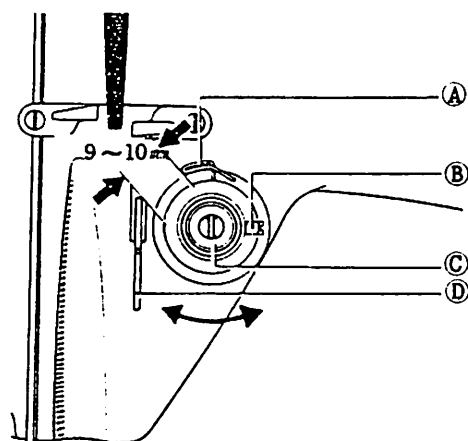


Fig. 9.23

*The standard movable range of takeup spring (gap between the takeup spring (A) and the thread gulde (D)) ranges from 9mm to 10mm.

9.17 Adjusting the thread tension discs

9.17.1 Lift the presser foot.

9.17.2 Loosen the thread tension regulator set screw.

9.17.3 Move the tension regulator bushing (B)*in the direction indicated by arrow in Fig. 9.23, and position it so that the opening of the tension discs (A) is within a range from 0.8mm to 1.0mm.

9.17.4 After the adjustment, be sure to tighten the set screw.

*Whenever the needle thread tension regulator set screw is loosened, make sure the opening of tension discs (A) is within a range from 0.8mm to 1.0mm.

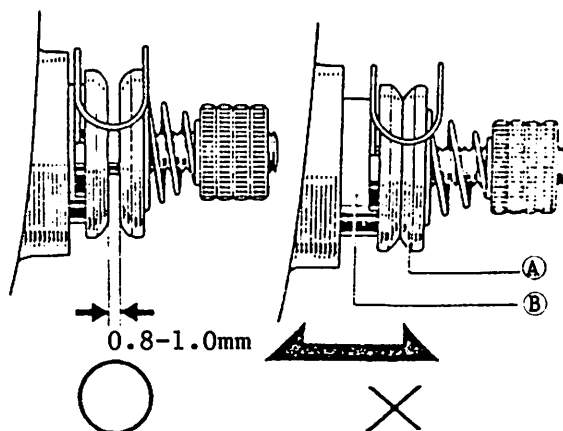


Fig. 9.24

9.18 Adjusting the hook oiling rate

9.18.1 Tighten oiling adjusting screw (A) by fingers or small screwdriver until it stops.

9.18.2 Loosen the adjusting screw within a range of one turn to adjust oiling rate.

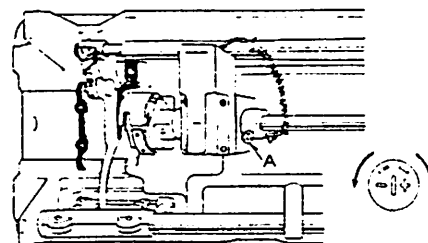


Fig. 9.25

9.18.3 Hook oiling rate can be checked by observing the oil trace, splashed from the hook, on a test paper (B).

Caution: Do not excessively tighten the oiling adjusting screw (A).

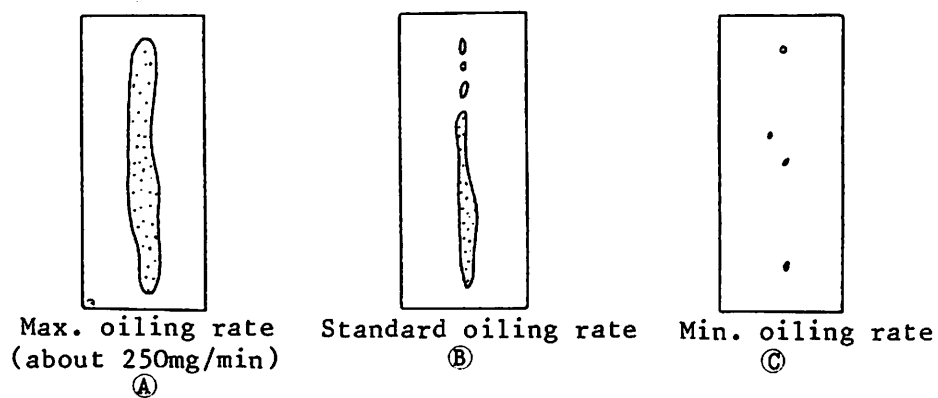


Fig. 9.25 Oil splashed from hook (for 10 sec.)

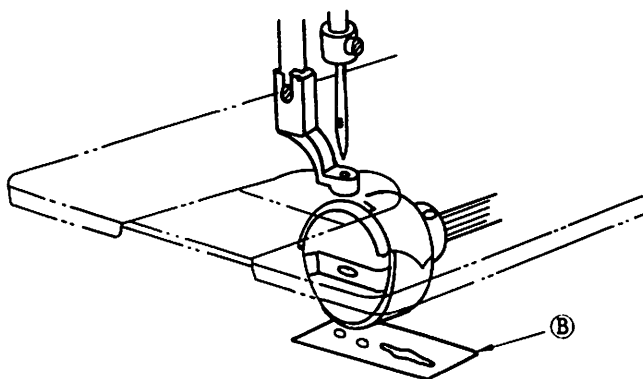


Fig. 9.26

9.19 Adjusting the presser foot

9.19.1 Adjusting the height of presser foot

Height of the presser foot should be adjusted so that the lower end surface of presser foot comes into slight contact with fabric (0 - 0.5mm) when the balance wheel is turned by hand to locate the presser foot at the lowermost position of its stroke.

To adjust, loosen the presser foot set screw or presser bar set screw shown in Fig. 9.27 and move the presser foot.

Note that the presser foot adjusted too high or low may cause stitching trouble.

After the adjustment, make sure the needle passes the center of presser foot end bore.

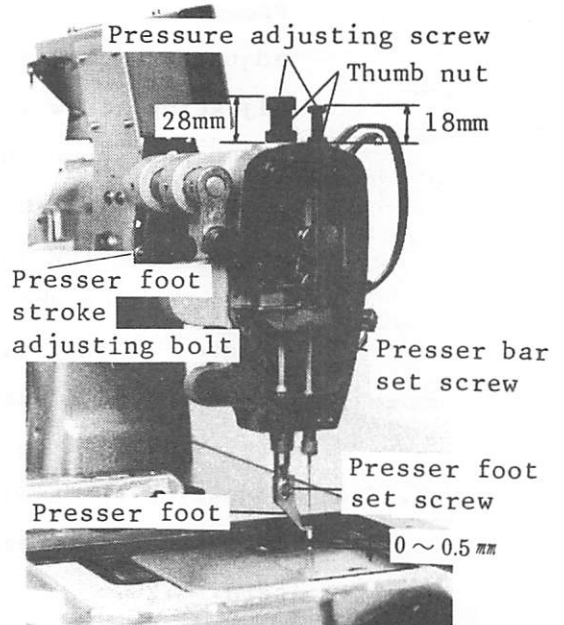


Fig. 9.27

Note: When thickness of fabric changes, height of the presser foot should be changed.

9.19.2 Adjusting the presser foot stroke

Presser foot stroke can be adjusted within a range from 4mm to 10mm (factory-adjusted to 4mm).

To Increase the stroke, remove the arm cover and loosen the the presser foot stroke adjusting bolt shown in Fig. 9.27 to move the adjusting bolt upward.

When it is adjusted to the uppermost position, the storke is about 10mm.

9.19.3 Adjusting the presser foot pressure

Presser foot pressure can be adjusted by turning the pressure adjusting screw after loosening the thumb nut shown in Fig. 9.27. The pressure increases when the adjusting screw is turned clockwise, and decreases when turned counter-clockwise.

The standard adjustment is shown in Fig. 9.27.

9.19.4 Adjusting the timing of presser foot motion

For this adjustment, refer to para. 9.20.

9.20 Adjusting the timing of presser foot motion

Timing of presser foot vertical movement can be adjusted through the opening that will be found after removing the arm cover.

- (1) Loosen the eccentric ring set screw (C).
- (2) Turn the balance wheel by hand and stop it when the needle bar reaches its lowermost position. The eccentric ring set screw (A) will come to the front (standard position).
- (3) Loosen the eccentric ring set screw (A).
- (4) Secure the eccentric ring (B).
- Carefully turn the balance wheel to position the eccentric ring (B).
- (5) Timing becomes faster when the balance wheel is turned in the direction of arrow (D).

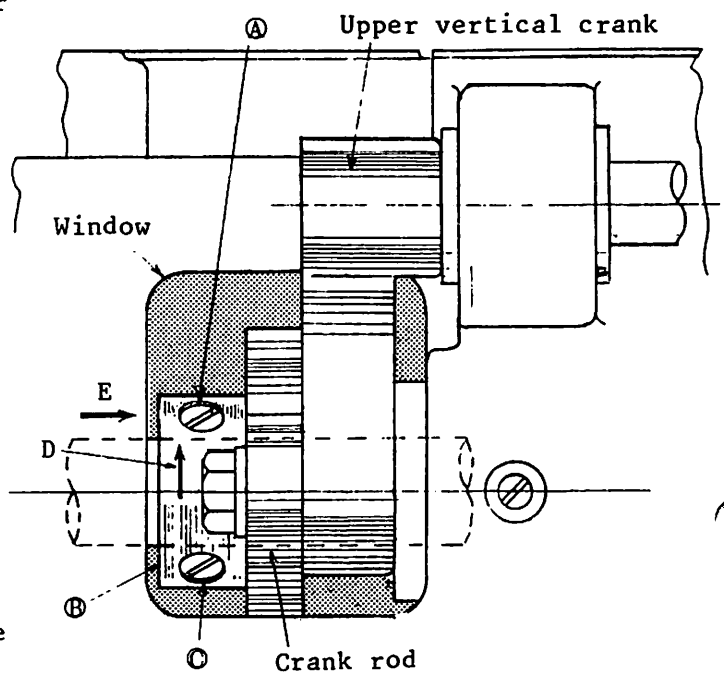


Fig. 9.28

- (6) After the adjustment, while pressing the eccentric ring (B) in the direction of arrow (E), secure the set screws (A) and (C) in this order.
- (7) Position and secure the upper vertical crank with the clamping screw, so that the vertical center line of the bell crank is in parallel with the presser bar when the takeup lever is at the uppermost position.

Note: For adjustment of presser foot height, vertical stroke and pressure, refer to para. 9.19.

9.21 Adjusting the needle bar stop (UP) position

After the completion of stitching, the machine should stop with the timing mark (A) on the arm positioned in line with the first timing mark (B) on the pulley. If the marks deviate more than 3 mm from each other, loosen the set screws of synchronizer

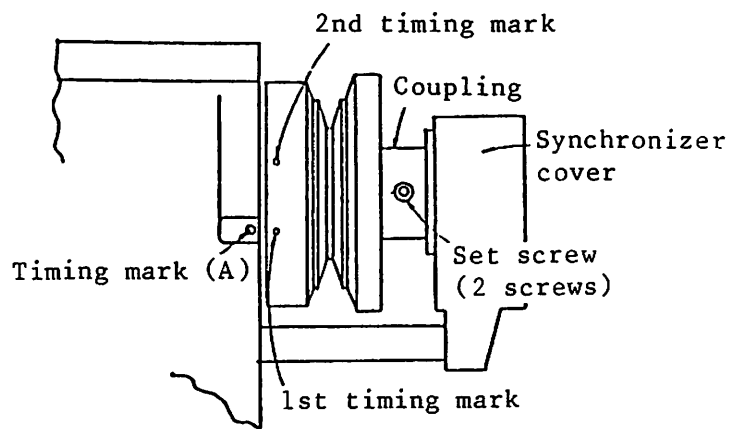


Fig. 10.17

coupling and, holding the coupling with one hand, move the pulley to adjust the needle stop position.

NOTE: Although the DOWN position of the needle bar is not usually required to be adjusted, the following check should be performed.

- (1) Remove the synchronizer cover by pulling it toward the cable side (see Fig. 10.17).
- (2) The first synchronizer disc (red) is for DOWN position detection, and the second (black) is for UP position detection.
- (3) The matching mark on the first disc (red) should be at 115° on the scale of second disc (black).

If the first disc is not at 115°, turn the first disc to set to 115° (see Fig. 10.18).

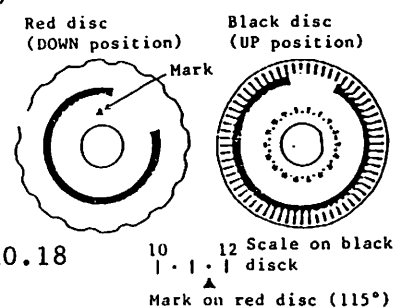


Fig. 10.18

10. ADJUSTING THE THREAD TRIMMER

10.1 Thread trimmer mechanism

(1) Construction

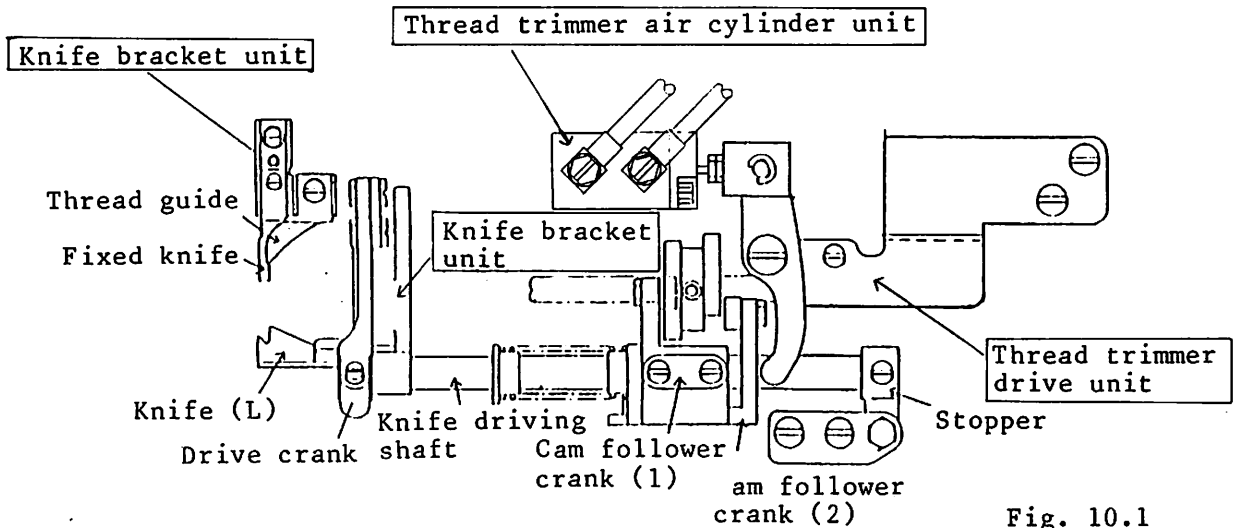


Fig. 10.1

(2) Caution at adjustment

A hook shaft drive system is employed in the trimmer mechanism. When the machine is adjusted, if the machine runs with the air cylinder engaged (the roller of cam follower crank (2) being engaged with the trimmer cam groove), the movable knife comes into contact with needle, and may be damaged.

Therefore, the air cylinder should be engaged in only usual operation (from lower position to upper position) of the trimmer.

10.2 Installation of knife bracket and knife bracket unit

10.2.1 Knife bracket unit

- (1) Install the knife bracket unit to hook shaft bushing (L) with screw A (see Fig. 10.2).

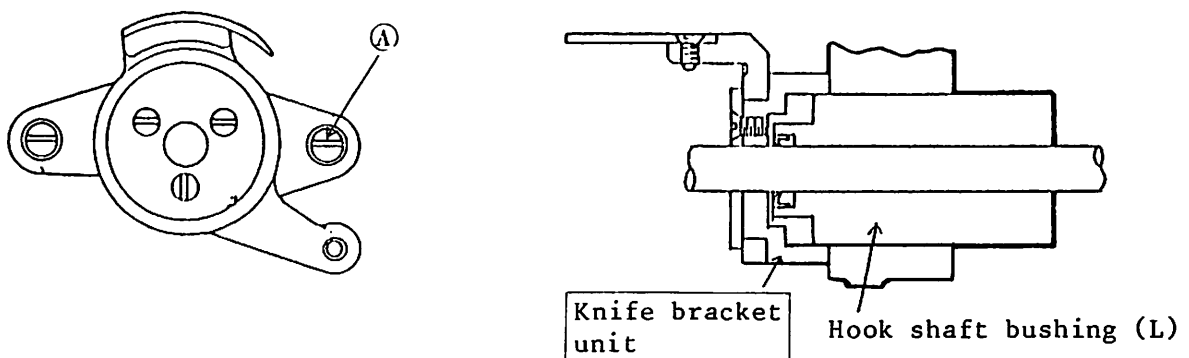


Fig. 10.2

10.2.2 Knife bracket unit

Install the knife bracket unit by using screw (A) with the hook positioner removed, as shown in Fig. 10.3.

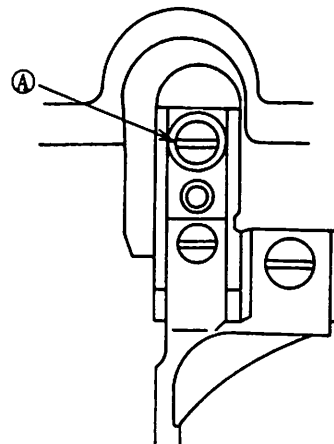
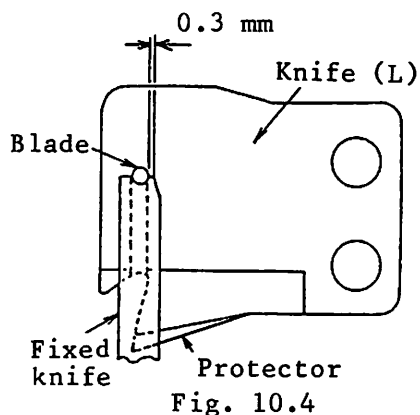


Fig. 10.3

10.2.3 Relative positions of fixed knife and movable knife

- (1) Standard installation of the fixed knife and movable knife is shown in Fig. 10.4.
- (2) If this gap (0.3mm) is too large, the upper thread may leave the needle eye when threads are trimmed. On the other hand, if the gap is too small, thread trimming failure may occur.
- (3) The gap should be adjusted when the movable knife or fixed knife is installed.



10.3 Connection of knife bracket with driving crank

Fig. 10.5 shows how to connect the knife bracket with the driving crank.

- (1) When connecting, pay attention to location of the link.

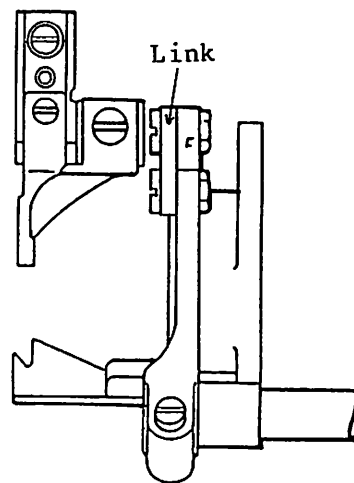


Fig. 10.5

10.4 Knife driving shaft

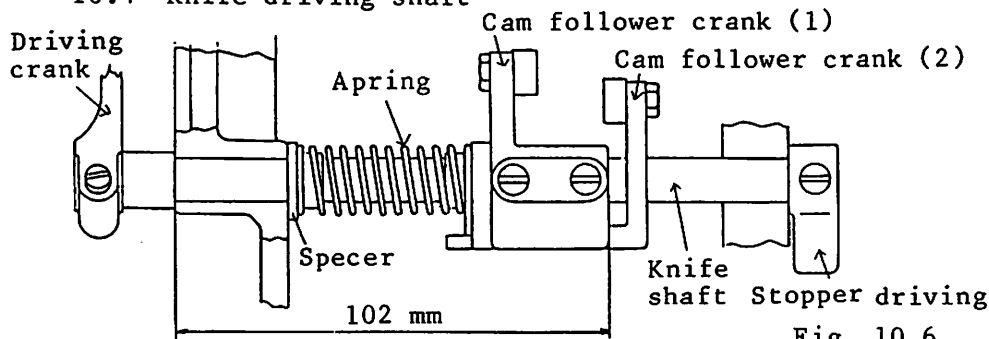


Fig. 10.6



- (1) Fig. 10.6 shows the standard installation of the knife driving shaft.
- (2) To assemble, pass the knife driving shaft through the hole of driving crank first.
- (3) Secure the cam follower crank (1) to flat part of the knife driving shaft.
- (4) Secure the stopper to the flat part of the knife driving shaft so that the knife driving shaft can rotate smoothly.

10.5 Installation of air cylinder

- (1) Installation of air cylinder unit
 - (a) Use screws (B) and (C) to install the air cylinder unit. When the air cylinder retracts, gap of about 2.5mm should be developed at part (D). Adjust this gap by moving the mounting plate after screw (C) is loosened.
 - (b) When the air cylinder extends, gap of about 0.5mm should be developed between the cam follower arms (1) and (2) as shown in Fig. 10.7 (standard adjustment).

To adjust this gap, loosen screw (A) and move the air cylinder in the direction of the arrow shown in Fig. 10.7.

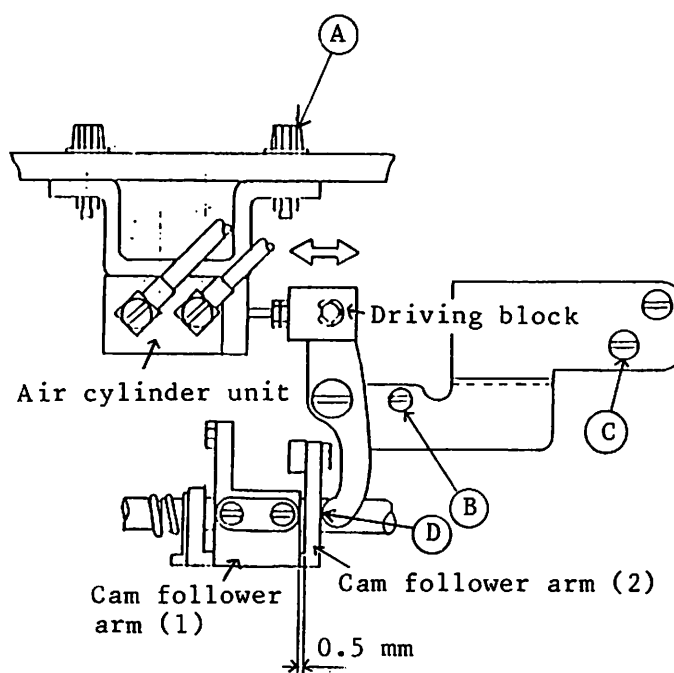


Fig. 10.7

10.6 Installation of trimming cam

- (1) Match the second timing mark (A) put on the pulley to the matching mark on the arm. (see Fig. 10.8 (a))
- (2) With the air cylinder engaged, turn the trimmer cam in the direction proper by allow in Fig. 10.8 (b), until the roller come to be touch up by the cam, then secure the trimmer cam by tightening 2 screws (B). (see Fig. 10.8 (b))
- (3) When the air cylinder disengaged, the cam follower crank is in release at original position, and the gap between end face the trimmer cam and the end of roller is kept 0.5 - 1.0mm. (see Fig. 10.8 (c))

Note: Fig. 10.9 shows the standard position of the cam follower crank 2. If position of the cam follower crank 2 is changed, adjust the adjusting bolt (Fig. 10.6) and then perform steps (1) - (3) above.

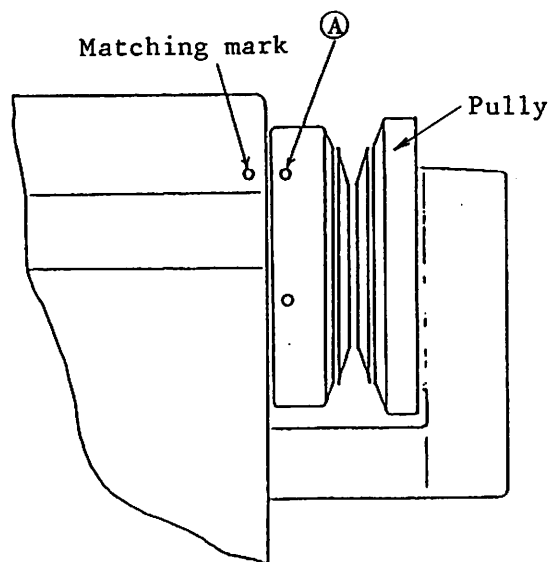


Fig. 10.8 (a)

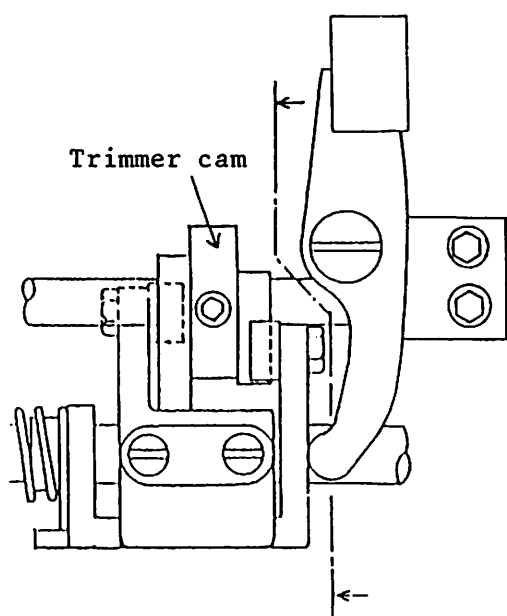


Fig. 10.8 (b)

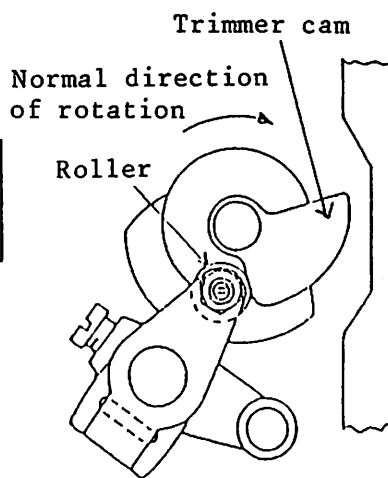


Fig. 10.8 (c)

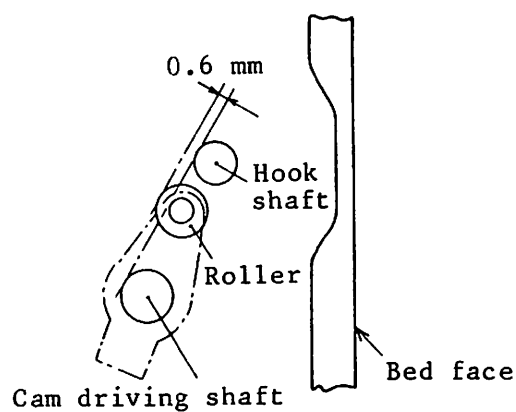


Fig. 10.9

10.7 Adjusting the knife engagement

- (1) Positions of movable and fixed knives
- (1) Fig. 10.10 shows the standard installation of the knives.

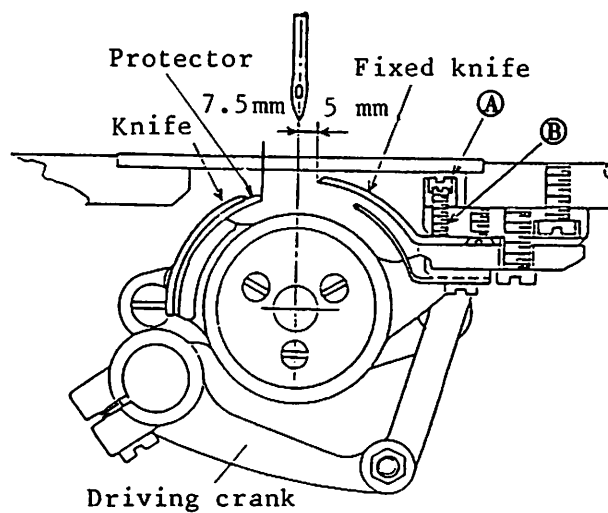


Fig. 10.10

- (2) Adjusting the knife engagement
 - (1) With the air cylinder extended, turn the machine pulley and the movable knife starts rotating. When the movable knife comes to the farthest position, the knife engagement shown in Fig. 10.11 is 1.5mm - 2.0mm (standard adjustment).

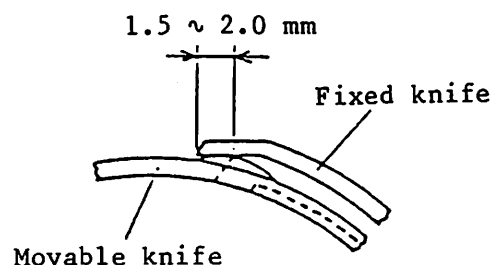


Fig 10.11

- (2) This adjustment should be made by changing position of the driving crank.
- (3) Adjusting pressure of knife engagement

- (1) The standard knife engagement is that the movable knife starts engaging with the fixed knife when they are positioned as shown in Fig. 10.12.

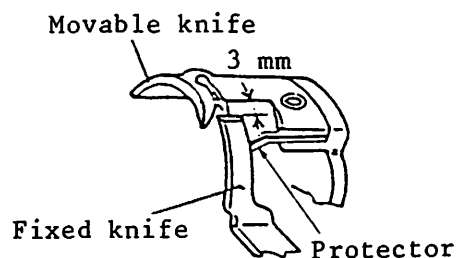


Fig. 10.12

- (2) If the threads cannot be trimmed satisfactorily, because of thickness, slightly increase pressure of the knife engagement.
- (3) To adjust pressure of the knife engagement, loosen lock nut (B) shown in Fig. 10.10 and turn adjusting screw (A).

10.8 Adjusting the needle thread tension release

- (1) Adjust the needle thread tension release so that the tension discs open about 1.0mm when the tension release solenoid is actuated.
- (2) To adjust, loosen nut (C) shown in Fig. 10.14 and move the flexible wire.

Note: If the discs do not open sufficiently, the needle thread may be trimmed with too short end and leave the needle eye. Too widely opened discs cannot assure suitable tension to the needle thread.

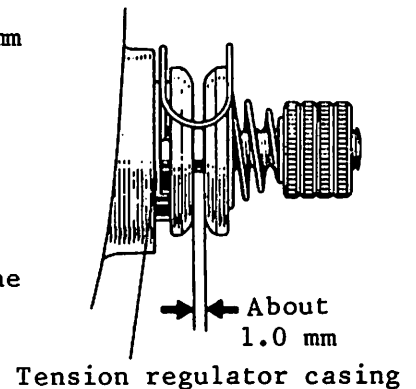


Fig. 10.13

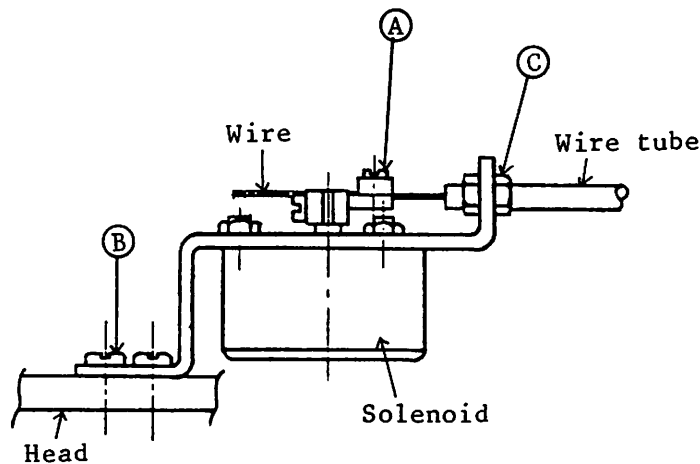


Fig. 10.14

- (3) When the solenoid must be attached and detached for replacement, loosen screw (A) and nut (C), remove the wire and then loosen three bolts (B).

10.9 Adjusting the synchronizer discs

Usually, the synchronizer discs are not required to be adjusted, but should be checked for position as follows:

- (1) Pull outward the synchronizer cover to remove.
- (2) There are three synchronizer discs.
The first one (red) is used for timing control of needle down position, the second one (black) for timing control of needle up position, and the third one (blue) for tension release timing control.
- (3) The second disc has scale.
Mark of the first disc (red) and mark of the third disc (blue) should be positioned to 115° and 175° of the scale respectively.

Red ring (For DN) Blue ring (For IM) Black ring (For PG, UP)

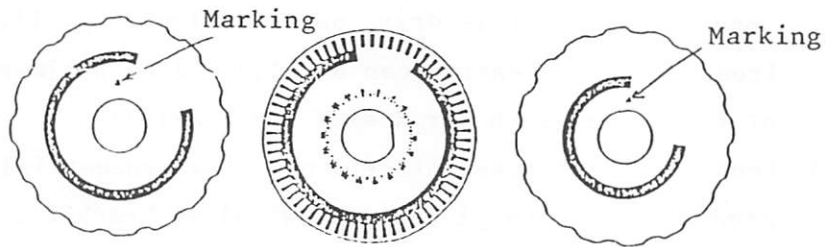


Fig. 10.15

Note: To adjust length of trimmed thread end, position mark of third disc (blue) within the range from 175° to 275°.

- 10.10 Adjusting the length of needle thread end after trimming (1) This adjustment can be made by turning the pretensioner nut (A).

Length of thread end becomes short when the nut (A) is turned clockwise.

Length of thread end becomes long when the nut (A) is turned counter-clockwise.

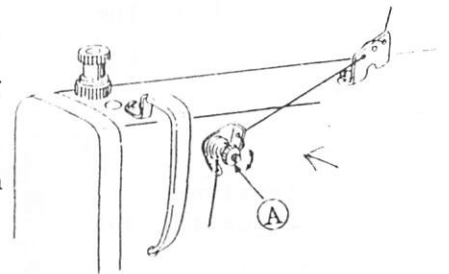


Fig. 10.16

- 10.11 Hook, bobbin case and bobbin

(1) For hook, that for thread trimmer use (having bobbin thread guide groove (A)) should be used.

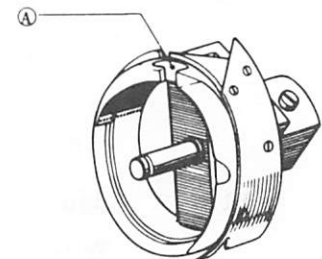


Fig. 10.17

(2) For bobbin case, that having bobbin racing prevention spring (A) should be used.

When bobbin thread tension is adjusted with the bobbin case alone, the tension should be smaller than bobbin thread tension for usual single-needle lockstitch sewing machine.

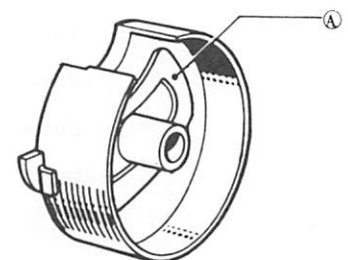


Fig. 10.18

(3) Use the furnished bobbin.

When aluminum bobbin is used, bobbin thread should be wound loosely to prevent deformation of the bobbin.

11. MAINTENANCE AND CHECKING

11.1 Adjusting the XY table

- 11.1.1 Adjusting the table drive belt tension (Fig. 11.1) The timing (toothed) belt tension can be adjusted as follows (to be adjusted at two places each for X axis and Y axis):
- (1) Loosen the set screw of driven pulley bracket (slotted hole is used for mounting of the driven pulley bracket).
 - (2) Tighten the tension adjusting nut.
 - (3) When tightening the tension adjusting nut, use care not to allow rotation of the tension adjusting bolt.
 - (4) Loosen the bracket set screw so that the belt does not run out of line when the XY table is moved.
 - (5) The belt tension should be that no slack is developed when the belt is depressed by finger.

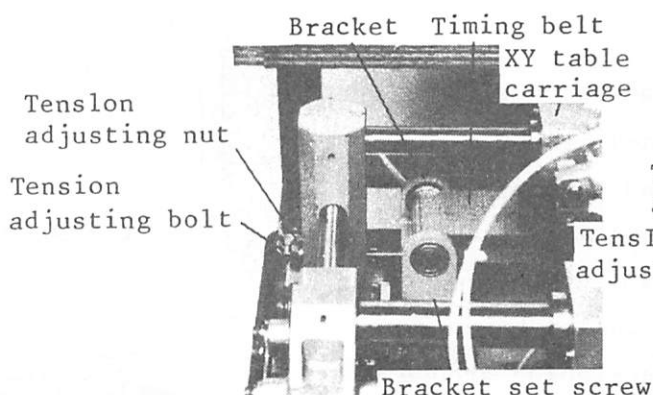


Fig. 11.1 Y axis side

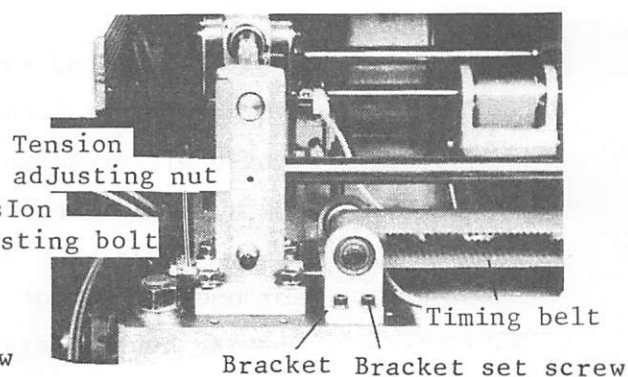


Fig. 11.2 X axis side

11.1.2 Adjusting the stepping motor belt tension (Fig. 11.2)

Tension of the timing belt on the pulley of stepping motor (located under the XY table) can be adjusted on the tension pulley as follows:

- (1) Loosen the bracket set screw.
- (2) To increase belt tension, tighten the tension adjusting screw (thereby the tension pulley moves and the belt is tensed).
- (3) To decrease belt tension, loosen the tension adjusting screw.
- (4) The belt tension should be that no slack is developed when the belt is depressed by finger.

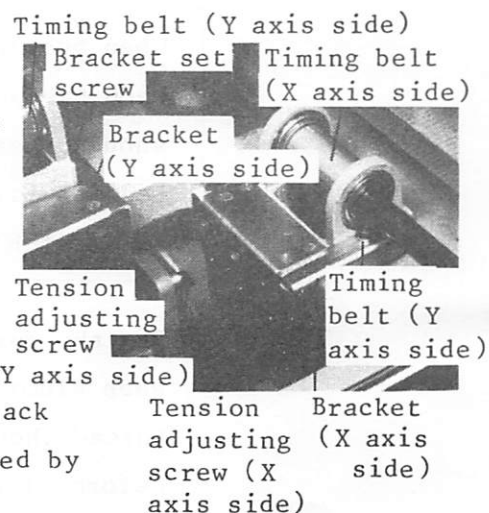


Fig. 11.2

11.2 Greasing the XY table

For smooth and accurate movement of the XY table, grease the XY table carriage (4 places) and slide bracket (2 places) once every 6 months through grease nipple using a grease pump available on the market.

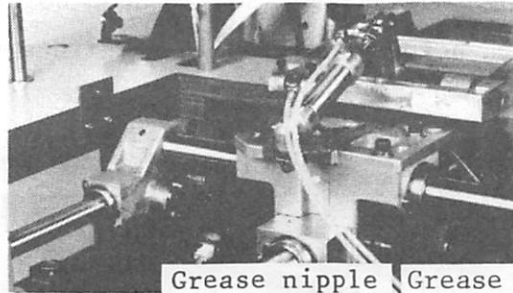


Fig. 11.3

11.3 Pneumatic system

11.3.1 Apply small quantity of turbine oil to the air inlet of slim cylinders installed to the machine head and work holder once every 6 months (Fig. 11.4).

11.3.2 Before the operation of the pneumatic system, depress the drain knob of filter regulator (Fig. 4.5)

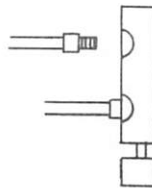


Fig. 11.4

11.4 Maintenance of machine head

The thread trimmer and hook can be maintained and adjusted as follows:

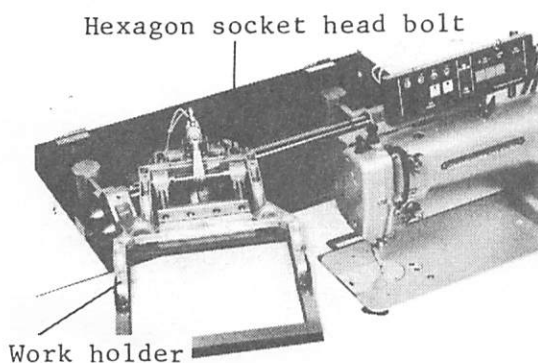


Fig. 11.5

11.4.1 Move the work holder to the left extremity of its stroke by hand.

11.4.2 Using the furnished hexagon wrench key, loosen four hexagon socket head bolts of work holder.

11.4.3 Fully swing the work holder clockwise around the pivot screw (Fig. 11.5).

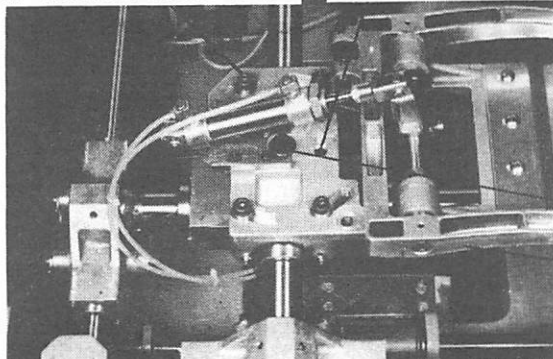
11.4.4 Lean the machine head backward and perform necessary maintenance or adjustment.

After that, rise the machine head upright.

11.4.5 Return the work holder until it strikes the stopper screw and tighten the four hexagon socket head bolts (Fig. 11.6).

11.4.6 Adjust work holder position in reference to the machine needle.

Hexagon socket head bolt Positioning pin



Pivot pin

Work holder

Fig. 11.6

12. CONTROL SYSTEM

12.1 LIM-STOP Z motor

12.1.1 Filter

Periodically clean the air filters in the end cover and on pulley side. (Note that clogged air filter may cause overheat to the motor.)

12.1.2 Motor

The motor is usually not required to be overhauled.

If stop position becomes inaccurate, speed becomes unstable or metallic sound occurs when the motor is braked, check the motor as follows:

- (1) Turn off the power to stop the motor (it will takes about 2 min. until the motor stops completely).
- (2) Remove the belt and motor pulley.
- (3) Remove the cable plug (for brake) connected to the control box from the bracket.
- (4) Remove three bracket mounting screws.
- (5) Remove the bracket. The brake assembly will be removed together with the bracket.
- (6) Check the brake lining and brake disc for condition.
If the brake lining is found worn out, replace it.
- (7) Holding the clutch shaft by hand, carefully pull it out.
The driven member (cup) and brake lining can be removed together with the clutch shaft.

If they cannot be removed, prepare two bolts (M5 X 0.8, Min. 45mm of thread length) and screw them into the tapped holes in the cup and boss (made of aluminum) to remove the clutch shaft.

- (8) To replace the brake lining, remove the bearing on the pulley side and install a new brake lining and bearing.

When the brake lining is installed, align the tapped hole mentioned at step (7) with holes in the brake lining. (Whenever bearing is removed, install a new bearing.) (9) Assemble each part in reverse steps to the disassembling.

In assembling, if the clutch shaft cannot be set in place, lightly tap the Clutch shaft end with mallet. (Do not tap it strongly.)

- (10) When the brake lining is replaced, turn the clutch shaft by hand after the assembling to make sure it can smoothly rotate and try operation for fitting.

To fit the brake lining, start the motor and operate the START switch repeatedly.

Cautions:

- o During disassembling and assembling, carefully handle the brake cup avoiding its deformation or damage.
- o Since bearing of special specification is used, address to us when it is replaced.

12.2 Grounding for prevention of malfunction due to noise

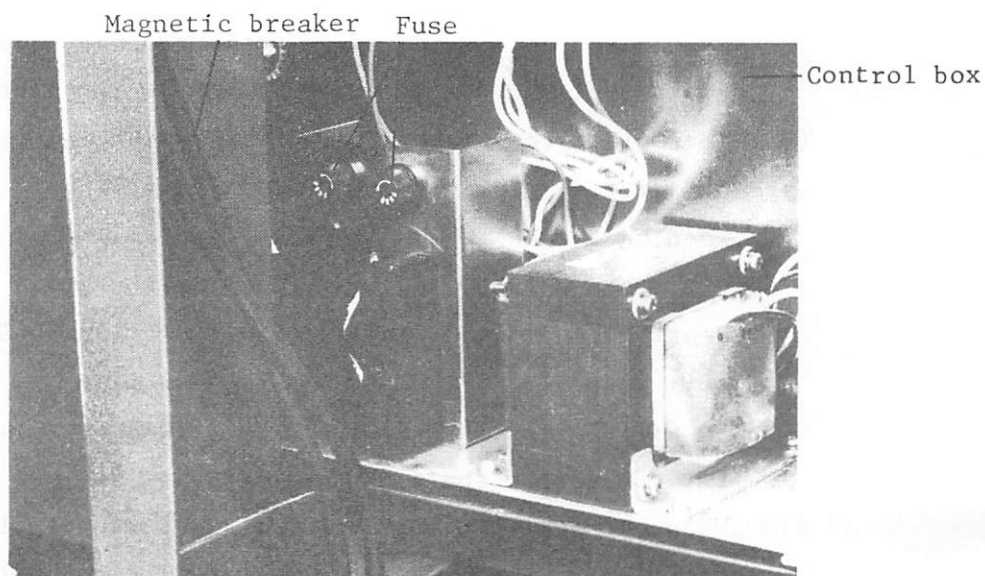
- (1) Malfunction caused by noise may be eliminated to a certain extent by grounding the control box, synchronizer and sewing machine head. (When the source voltage is large than AC150V, grounding is indispensable for safety. Leave the grounding work to qualified electrician.)
- (2) Do not locate the sewing machine near equipment that generate intense noise, such as high-frequency welders.

12.3 Fuses and magnetic breakers

- (1) For fuse, use glass tube fuse of 10A rating ($\phi 6.4 \times 30$) For location of these fuses, refer to Fig. 12.1.
- (2) Magnetic breaker

The thermal settings of magnetic breakers are as follows:

200V - 50/60Hz	2.6A
220V - 50/60Hz	2.6A
380V - 50/60Hz	2.1A
415V - 50/60Hz	2.1A



12.4 Speed select function

The clutch current control resistor (12Ω 40W) can be short-circuited or inserted by setting the switch shown in Fig. 12.1.

Table 12.2 shows the relationship between switch setting and speed control knob, and stitch length.

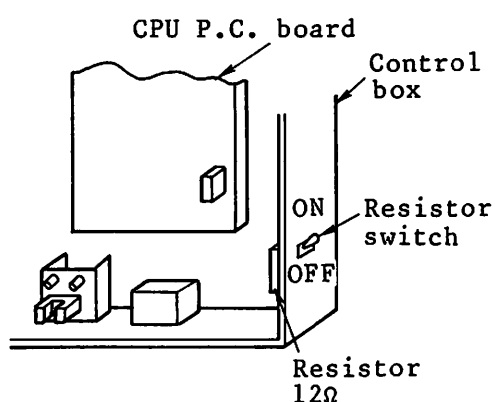


Fig. 12.1

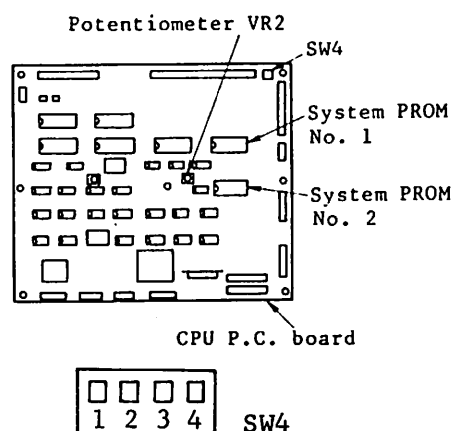
		Faster stitching	Initial setting
Switch setting	Internal switch SW4 (4)	ON	OFF
	Resistor switch	OFF (insert)	ON (short-circuit)
Conditions	Fabric	Medium	Heavy
	Needle penetration force	Medium	Large
	Speed limit	Increase	Standard

	Knob setting	Stitch length (mm)	Stitch length (mm)	Speed (rpm)
Stitch length for speed control knob setting	0	6.2 - 5.4	6.2 - 5.6	200
	1	6.2 - 5.4	6.2 - 5.6	200
	2	6.2 - 5.4	6.2 - 5.6	380
	3	6.2 - 5.4	6.2 - 5.6	610
	4	5.2 - 4.8	5.4 - 4.8	850
	5	4.6 - 4.0	4.6 - 3.6	1060
	6	3.8 - 3.4	3.4 - 2.6	1300
	7	3.2 - 2.8	2.4 - 1.8	1550
	8	2.6 - 1.8	1.6 - 1.2	1780
	9	1.6 - 0.2	1.0 - 0.2	2000

Table 12.2

When the switch setting is changed, speed slightly changes. When exact speed adjustment is required, use a speed meter and turn VR2.

Note: The internal switch SW4(4) and the resistor switch should be set in the combination shown in Table 1.



13. REPLACING THE PROM

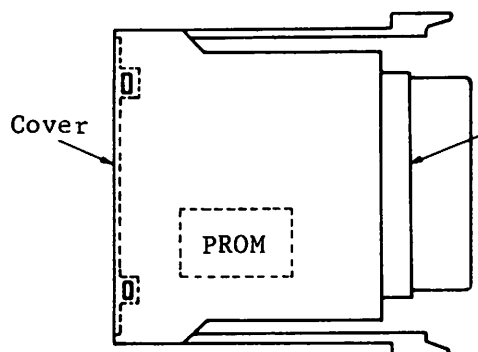
PROM is installed in the socket on the printed circuit board encased in the PROM cassette.

Referring to Fig. 13.1 and 13.2, replace it as follows:

- (1) Lever out the cassette cover using a small screwdriver.
- (2) Take out the P.C. board from the cassette.
- (3) Remove the PROM from the socket using a screwdriver.
- (4) Install a new PROM to the socket. When installing, be careful not to place it in wrong direction. Otherwise the PROM might be damaged.
- (5) Put the P.C. board into the cassette and install the cassette cover.
- (6) Use care not to touch the P.C. board terminals (pins) with bare hand.
- (7) When removing the PROM with screwdriver, carefully handle it avoiding damages to the circuit pattern.

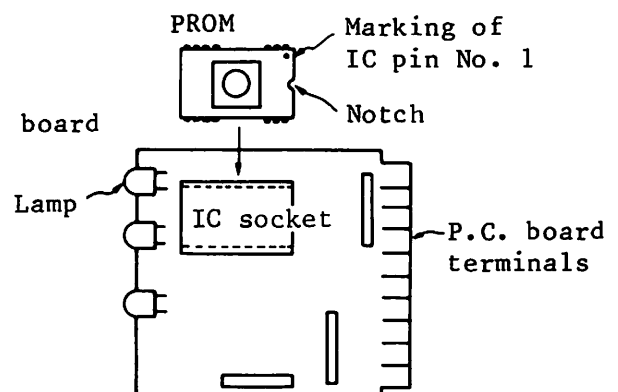
It is recommended to use a IC remover (Type P-63, TAKARA TOOL S/S, for example).

- (8) Do not place the P.C. board and PROM on statically charged cloth or plastic, but place it on a metallic sheet.



Cassette case

Fig. 13.1



Notch of IC (PROM) should come on P.C. board terminal side.

P.C. board

Fig. 13.2

- (9) Optionally available PROM cassette for memory expansion should be installed as shown in Fig. 13.3.

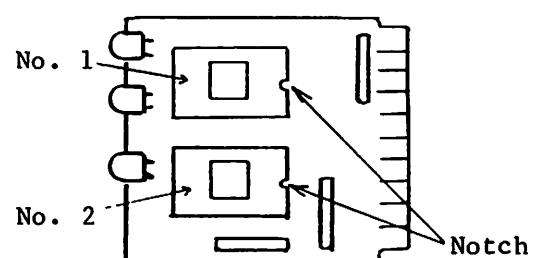


Fig. 13.3

14. AUXILIARY FUNCTIONS

The DIP switches SW1 and SW2 on the CPU card in the control box have the following functions:

(The switches are protected with a transparent cover.

After the setting, be sure to install the cover

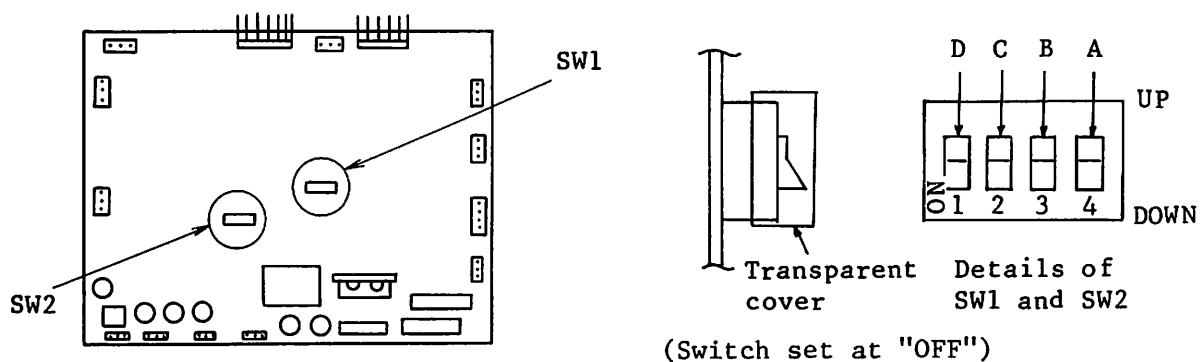


Fig. 14.1

14.1 Repeat function

With switch (A) of SW1 set at "ON", the work holder goes up when the power is turned on, or when the WORK HOLDER switch is depressed to "ON", and, as usual, kept at down position when the stitching is completed. Stitching can be resumed only by depressing the START switch with the work holder kept at DOWN position.

The function is very useful when a pattern is sewn repeatedly, or a part or applique held by part guide plate is sewn.

14.2 Home position return cancellation when the power is turned on

With switch (B) of SW1 set at "ON", the work holder does not automatically return to the home position and the sewing machine does not start when the power is turned on.

Automatic home return becomes possible when the RESET/HOME switch is operated.

This function is used when it is desired to prohibit automatic return at the time the power is turned on (for avoiding collision of the work holder, for example).

14.3 Home position return cancellation

Home position return does not occur when switch (C) of SW1 is set at "ON", that is, stitching can be started at any position within the area of the work holder frame.

When this switch is set at "OFF", the start point and end point in pattern stitching are the home position at all times.

Since the work holder does not return to the home position when this switch is set at "ON", **PRETURN** and **END** are to be programmed.

14.4 Thread Trimming Cancel when HALT Switch is Depressed

When the switch D of SW1 is at OFF position (at shipped), the sewing machine operates as described below. When the HALT switch is depressed, the thread is trimmed and the work holder remains lowered and stops. When STOP command has been entered by the data input device, the thread is not trimmed and the work holder stops after rising. When TRIM and STOP commands have been entered by the data input device, the thread is trimmed and the work holder stops after rising. When the switch D is set to ON position, the sewing machine operates as described below. When the HALT switch is depressed, the thread is not trimmed and the work holder remaining lowered and stops. When STOP command has been entered by the data input device, the thread is not trimmed and the work holder remains lowered. When TRIM and STOP commands have been entered by the data input device, the thread is trimmed and the work holder remains lowered.

Then, lower the work holder when it is located at the upper position. When the work holder is located at the lower position, the START switch. Then, stitching operation is continued.

14.5 Adjustment of fabric feed timing

Fabric feed timing can be set on SW2 switches.

The timing is as listed below.

Switch (B) and (D) are set at "OFF" when the machine is shipped, thereby the arm shaft rotates by the angle corresponding to 5 pulses (one pulse corresponds to 5.6° rotation) after the synchronizer detects needle DOWN position, and then the feed motion starts.

When switches (B) and (C) are set to "OFF", for example, feed starting timing delays by 2 pulses ($4 + 2 = 6$ pulses) that corresponds 5.6 arm shaft rotation as compared with shipping condition.

The feed timing can be checked as follows:

- (1) Locate the needle at UP position and turn on the power.
- (2) Depress the WORK HOLDER switch to lower the work holder.
- (3) Start the sewing machine and then depress the STOP switch.
- (4) Remove the V belt while keeping the sewing machine stopped.
- (5) Depress the START switch to "ON" without the V-belt.

Switch	Timing
(A) OFF	8 pulses
(B) OFF	4 pulses
(C) OFF	2 pulses
(D) OFF	1 pulse

Fig. 14.2

- (6) In several seconds after the START switch is set to "ON", the ERROR 1, 2 lamps flicker (notifying that the V-belt leaves pulley) and the LIM-STOP Z motor clutch is disengaged. In this condition, checking by turning the balance wheel may be made.
- (7) By turning the balance wheel by hand, the work holder is driven by the stepping motors.
- (8) Since the work holder movement corresponds to fabric feed timing, visually check the timing in reference to height of the needle.

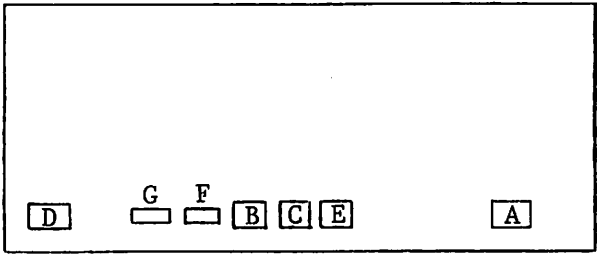
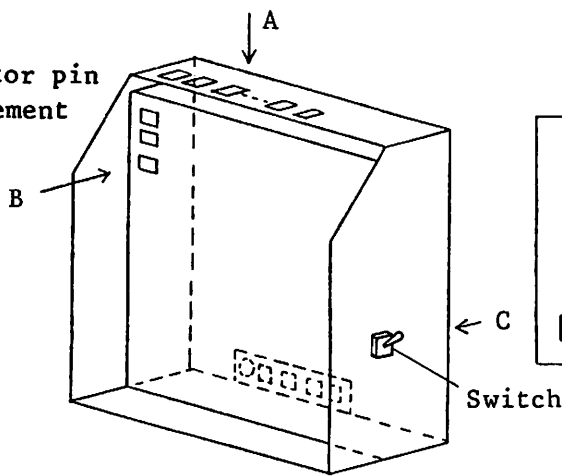
14.6 Speed select function

For medium and heavy fabric, switch SW4 (A) should be set to "ON" position. For details, refer to 12.4.

15.1 General wiring



15.2 Connector pin arrangement



Control box

View from "A"

A Connector 1991-06R

CPU		
A	Signal	CON 3
1	GND	1
2	PG	2
3	(RO)	3
4	UP	4
5	DN	5
6	+12V	6

E connector 1292-R1

CPU		
E	Signal	CON 8
1	+12V	1
2	XHOME	2
3	YHOME	3
4	XLIMIT	4
5	YLIMIT	5
6	GND	6
7	GND	
8	GND	6
9		

C connector 1261R

CPU		
C	Signal	CON 4
1	CCD/u ^(Presser foot)	4
2	+30V	3
3	CHD/u ^(Work holder)	8
4	(WHLD3)	7
5	+30V	5
6	(WHLD4)	10

B connector 1360R

CPU		
B	Signal	CON 4
1	Chassis GND	
2	WIP	6
3	+30V	1
4	TRM	2
5		
6		
7	WHLD4	10
8	+30V	5
9		
10		
11		
12		

F connector 1490 R

F	Signal	PMD output
1	A	
2	A	
3	B	
4	B	

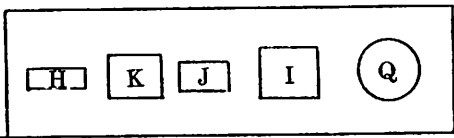
D connector 3191-03P

CPU		
D	Signal	CON 36
1	S 10	1
2	S 11	2
3	GND	3

G connector 1490R

G	Signal	PMD output
1	A	
2	A	
3	B	
4	B	

View from "C"



H connector 1991-04R

CPU		
H	Signal	CON 7
1	CL	1
2	+30V	2
3	+30V	3
4	BK	4

J connector 3191-06P

J	Signal	Transformer input
1	AC 100V	White 1
2	AC 100V	Black 1
3		
4	AC 100V	White 2
5	AC 100V	Black 2
6	Chassis GND	

O connector 1306P

PMD signal input			
CPU		CPU	
1360-P	Signal	CON 11	CON 40
1	+5V	5	
2	XPN	2	
3			
4	XPP	1	
5			
6	YPN	4	
7			
8	YPP	3	
9			
10			3
11			1
12			

I connector 1991-12R

I	Signal	Magnet contactor
1	AC 200	U2 (Red)
2		
3	AC 200	W6 (Black)
4		
5		
6		
7		
8		
9	Chassis GND	
10	AC 200	V4 (White)
11		
12		

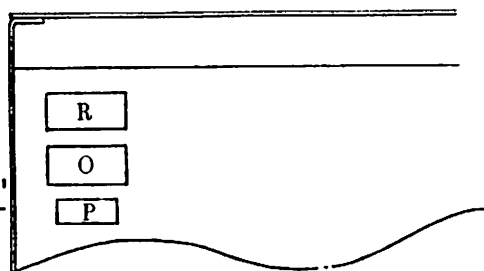
K connector 3191-09P

Switch panel input			
PMD input			
K	Signal	3191-06R	1396-R1
1	AC200V		
2			
3	Chassis GND		
4			
5	AC200V		
6	AC100V	4	
7	AC100V	5	
8	AC100V		1
9	AC100V		2

PL

FAN

View from "B"



PAL connector 3 5274-03A PMD 0 connector

CON3	Signal	1360 -P
1	+5V	1
2	GND	11
3		

R connector 3191-06P Switch panel

3191-06P	Signal	Magnet connector
1	AC 200	T 5 (Black)
2	"	14
3		
4	AC 100	
5	"	
6	AC 200	13

P connector 1396-P PMD power input

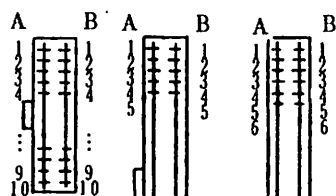
1396 -P	Signal	K connector
1	AC 100	8
2	"	9
3	Chassis GND	

Q connector 150-R4M

150 -R4M	Signal	Magnet connector
1	AC 200	R 1 (Red)
2	"	S 3 (White)
3	"	T 5 (Black)
4	Chassis GND	(Green)

PLK-1C-CPU ↔ PLK-1-CST N

CPU	Signal	CST
1A	GND	1A
2A		2A
3A	D4	3A
4A	D3	4A
5A	D5	5A
6A	D2	6A
7A	D6	7A
8A	D1	8A
9A	D7	9A
10A	D0	10A
11A	A1	11A
12A	A2	12A
13A	A10	13A
14A	A3	14A
15A	RESET	15A
16A	A4	16A
17A	A5	17A
18A	A9	18A
19A	A6	19A
20A	A8	20A
21A	A7	21A
22A		22A
23A		23A
24A		24A
25A	+5V	25A
1B	GND	1B
2B		2B
3B		3B
4B		4B
5B		5B
6B		6B
7B		7B
8B	WR	8B
9B		9B
10B		10B
11B	A0	11B
12B		12B
13B		13B
14B		14B
15B		15B
16B	A11	16B
17B		17B
18B		18B
19B		19B
20B		20B
21B		21B
22B		22B
23B		23B
24B		24B
25B	+5V	25B



J A E

PS-20SEO-D4P1-1C

20-circuit flat cable

J A E

PS-40SEO-D4P1-1C

40-circuit flat cable

J A E

PS-50SEO-D4P1-1C

50-circuit flat cable

PLK-1C-CPU ↔ PLK-20-PAL M

CPU	Signal	PAL
A1	GND	A1
A2	ERR4	A2
A3	ERR2	A3
A4	+JOG	A4
A5	UP	A5
A6	Y mirror image	A6
A7	X mirror image	A7
A8		A8
A9	YPLMP	A9
A10	XNLMP	A10
A11	XPLMP	A11
A12	YNLMP	A12
A13	JOGY-	A13
A14	JOGY+	A14
A15	JOGX-	A15
A16	JOGX+	A16
A17	XSCALE8	A17
A18	" 4	A18
A19	" 2	A19
A20	" 1	A20
B1	GND	B1
B2	ERR3	B2
B3	ERR1	B3
B4	-JOG	B4
B5	STOP	B5
B6	RESET/HOME	B6
B7	C/FCH	B7
B8		B8
B9	PSE1	B9
B10	" 2	B10
B11	" 4	B11
B12	" 8	B12
B13	SPEED1	B13
B14	" 2	B14
B15	" 4	B15
B16	" 8	B16
B17	YSCALE8	B17
B18	" 4	B18
B19	" 2	B19
B20	" 1	B20

PLK-20-PAL ↔ PV-12PPB L

PAL	Signal	PPB
1A	GND	1KA
2A	C/FCH	2KA
3A	STOP	3KA
4A	-TEST	4KA
5A	+TEST	5KA
6A	JOGX+	6KA
7A	JOGX-	7KA
8A	JOGY+	8KA
9A	JOGY-	9KA
10A	UP	10KA
1B		1KB
2B		2KB
3B		3KB
4B		4KB
5B		5KB
6B	XPLMP	6KB
7B	XNLMP	7KB
8B	YPLMP	8KB
9B	YNLMP	9KB
10B	+5V	10KB

LIMI-STOP Z motor wiring
Motor (200V, 220V)

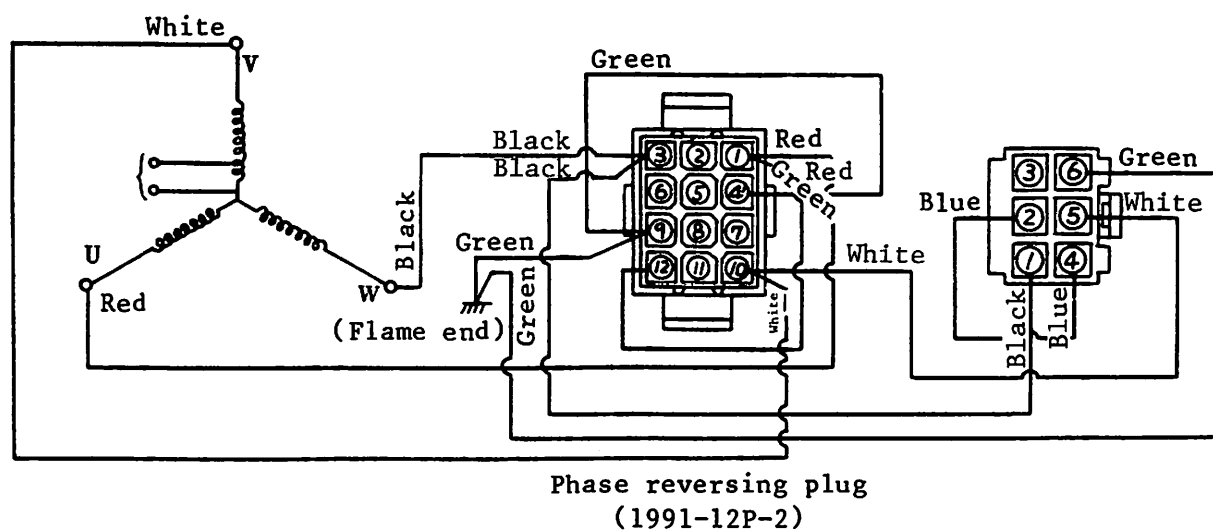


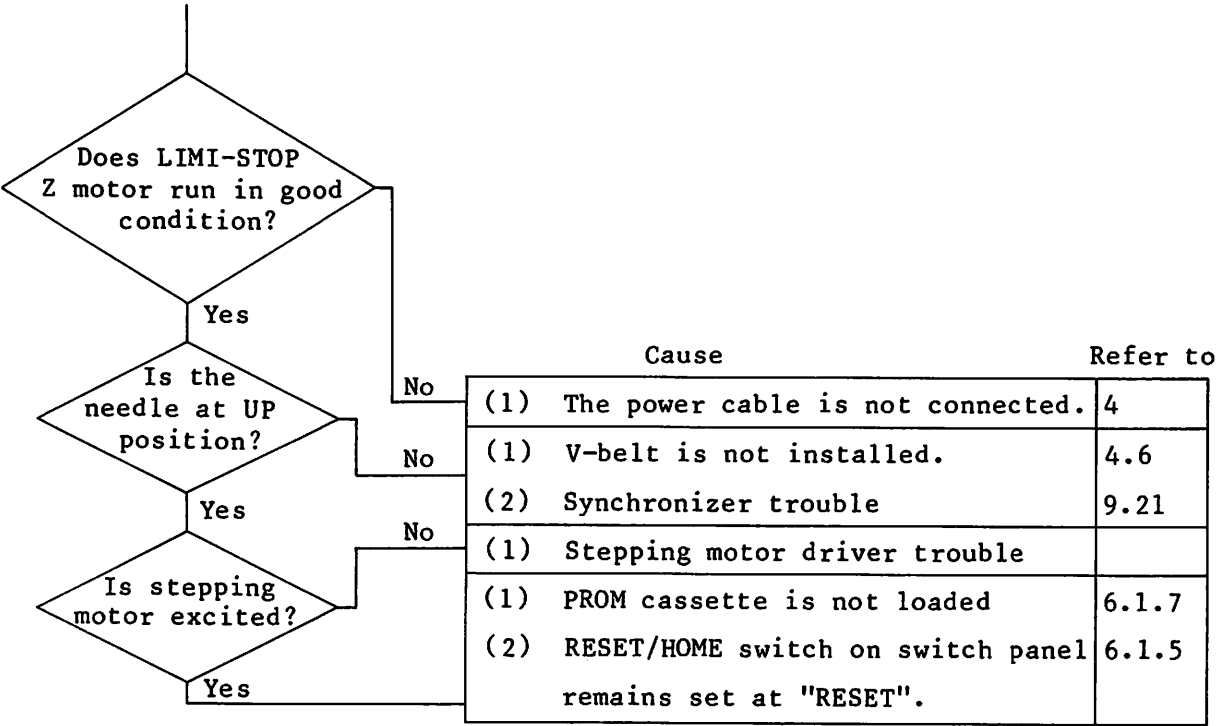
Fig. 15.3

16. TROUBLESHOOTING

If any trouble occurs with the sewing machine, the following checking should be performed prior to elaborate troubleshooting.

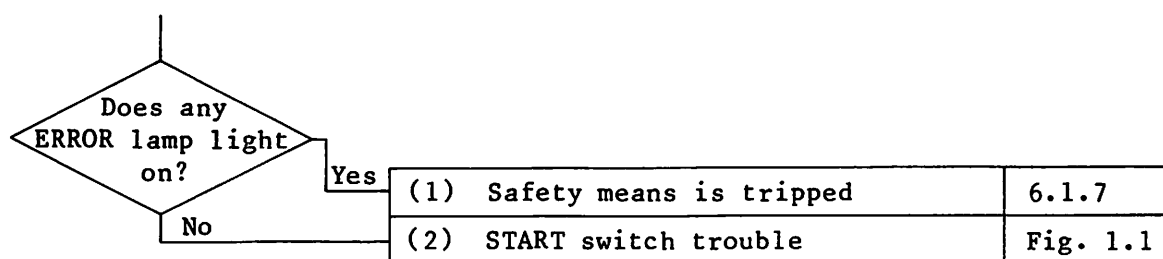
- (1) Is the power source at the specified voltage?
All all connectors, phase reversing plug and switches properly set?
- (2) Are the connectors in the control box properly installed?
- (3) Is the PROM cassette properly loaded in position?
(See the pilot lamp on the cassette to check.)
- (4) Does any ERROR lamp on the panel light on?
(If any lamp is found lighting, trace the cause and remedy.)
- (5) Is any fuse not blown out?
(Two fuses are used in the sewing machine.)

16.1 The work holder does not return to the home postion when the power is turned on

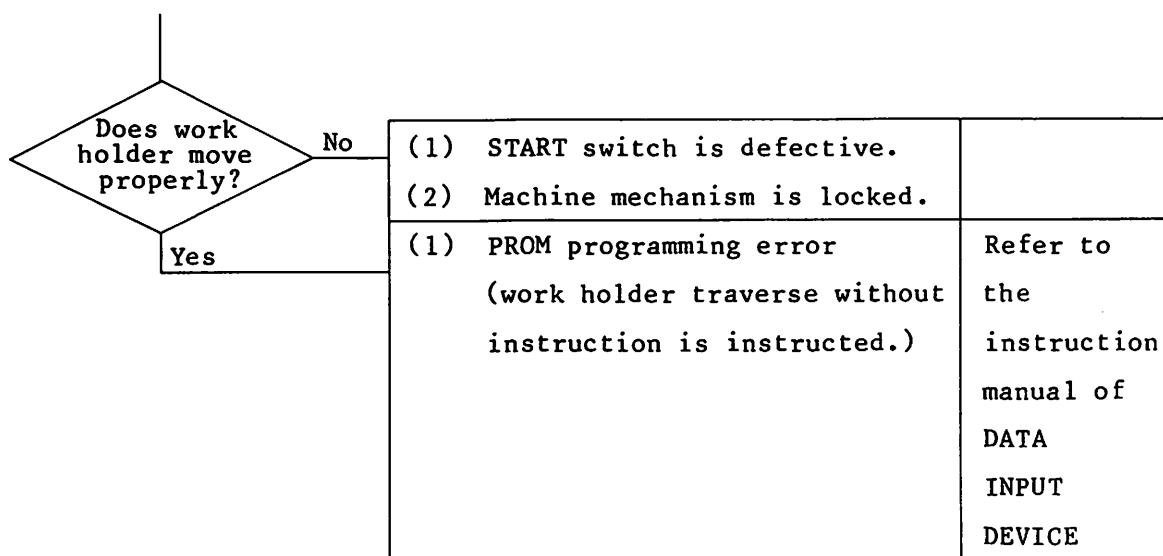


Note: If stepping motor is not excited, the work holder may be moved by hand.

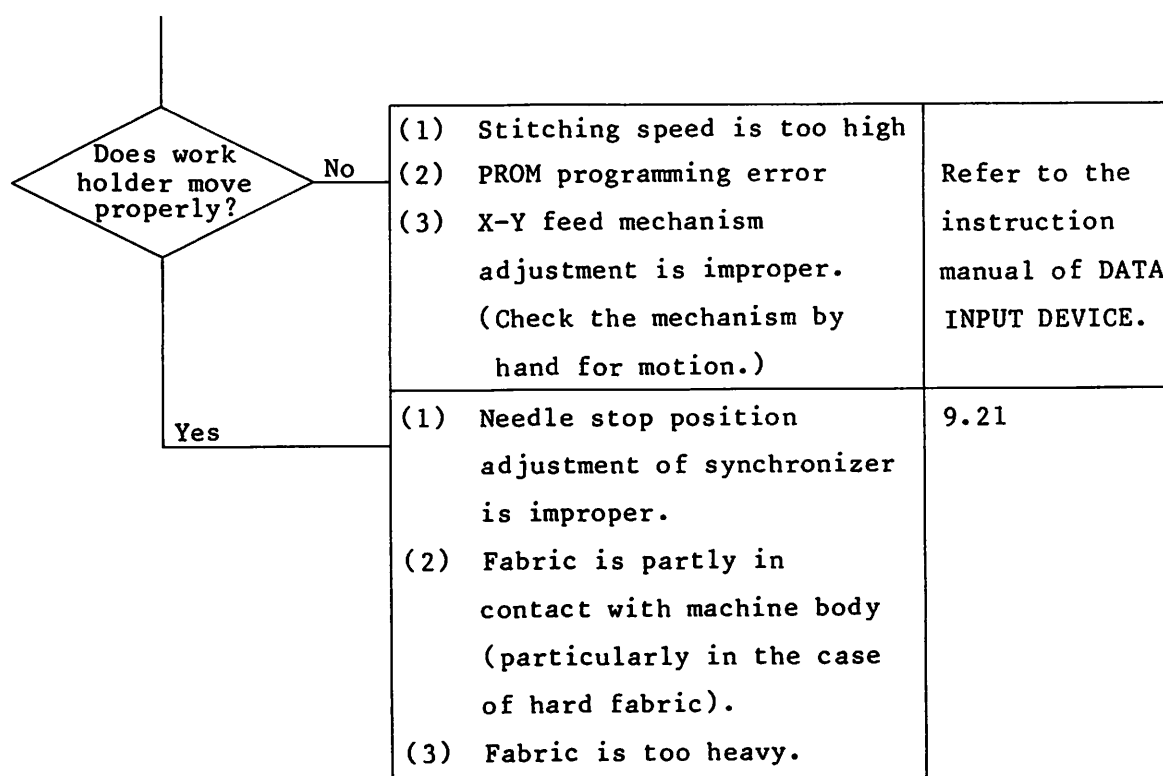
16.2 The work holder does not move when the START switch is operated



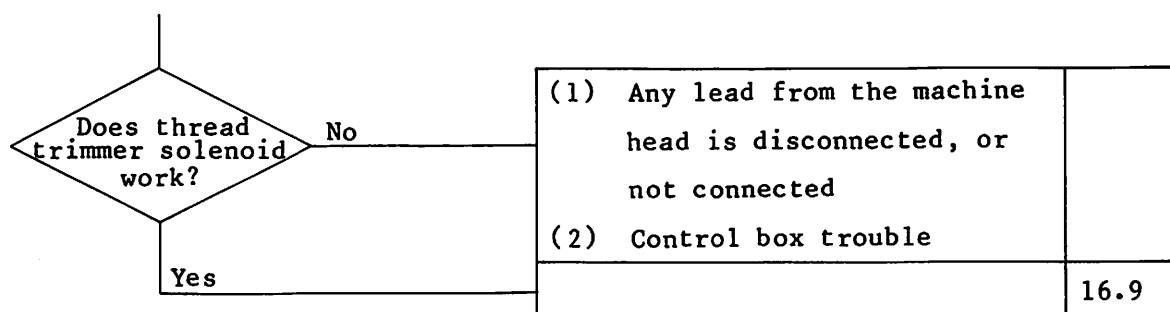
16.3 Sewing machine does not run



16.4 Stitched pattern deviates



16.5 Thread cannot be trimmed satisfactorily



16.6 HALT (stitching suspension) is impossible

(1) HALT switch trouble (2) any lead of HALT switch is disconnected, or not connected. (3) Control box trouble	
--	--

16.7 Stitching speed is unusually low...

(1) Torque required to drive the stitching is too large due to distorted mechanism. (2) Synchronizer trouble	
---	--

16.8 Stitching speed is unusually high...

(1) Synchronizer pulse generator is disconnected (2) Synchronizer trouble	
--	--

16.9 Troubleshooting (sewing machine mechanisms)

Trouble	Cause	Remedy	Refer to
Thread cannot be trimmed.	Fixed knife is not properly engaged with movable knife.	Adjust knife engagement.	10.7
	Knife engagement is loose.	Adjust knife engagement pressure.	10.7
	Knife blade is damaged, or worn.	Replace damaged knife.	
	Needle stops too early.	Adjust needle stop position.	9.21
	Fixed knife is not positioned properly.	Adjust position of fixed knife.	10.7
	Movable knife motion too fast and thread cannot be trimmed properly.	Adjust position of thread trimming cam.	10.6
Needle thread comes off needle eye after thread trimming.	Tension discs do not open when thread is trimmed.	Adjust the needle thread release.	10.8
	Timing of thread trimming is not proper.	Adjust position of thread trimming cam.	10.6
	Thread is trimmed by fixed knife before scissoring. Needle is too thick for thread used.	Adjust position of fixed knife.	10.7
	Pretension discs are too tight.	Adjust pretension discs.	10.10
	Thread tension is too faint.	Adjust thread tension.	
	Protector is located improperly.	Locate protector properly.	10.7

Trouble	Cause	Remedy	Refer to
Stitches are not interlocked at start of sewing.	Bobbin thread extending from bobbin case becomes short due to racing of bobbin.	Use a bobbin case having spring for prevention of racing.	10.11
	Bobbin thread tension is too high.	Adjust bobbin thread tension.	9.12
	Length of trimmed end thread (needle thread) is too short after thread trimming.	1. Adjust pretension discs. 2. Check thread trimming cam for installation. 3. Check threading.	10.10 10.6
Trimmer end thread (needle thread) is too long.	Pretension discs are too faint.	Adjust pretension discs.	10.10
	Thread trimming delays.	Adjust position of thread trimming cam.	10.6
	Thread often leaves hook.	Adjust hook gap.	9.11



HEAD OFFICE: MITSUBISHI DENKI BLDG. MARUNOUCHI, TOKYO 100 TEL: 03-218-3426

From the library of: Superior Sewing Machine & Supply LLC

SH (NA)-3027-B (8804) ROD

Printed in Japan