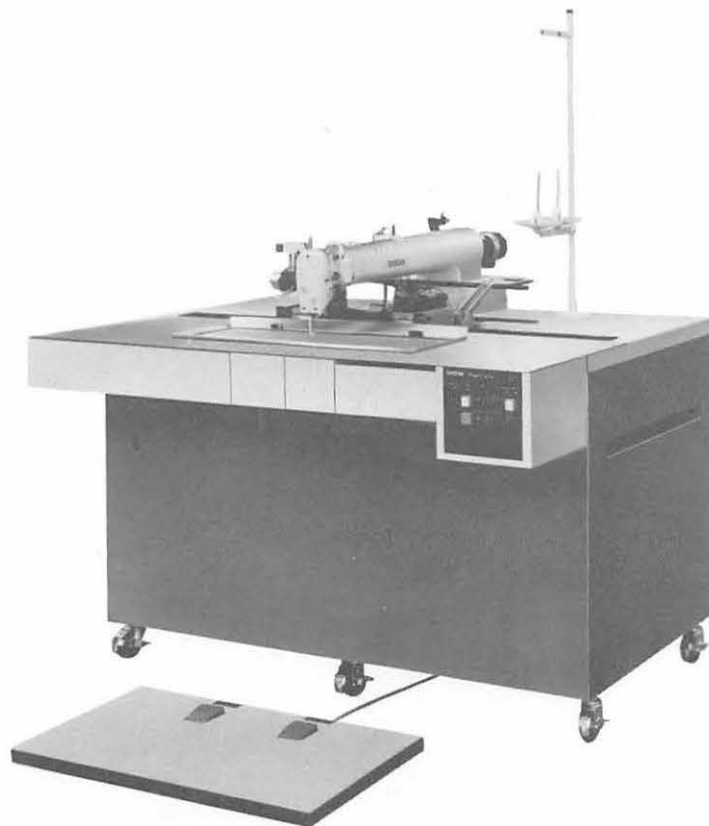


# SERVICE MANUAL FOR BAS-361

PROGRAMMABLE ELECTRONIC  
PATTERN SEWER Profile L



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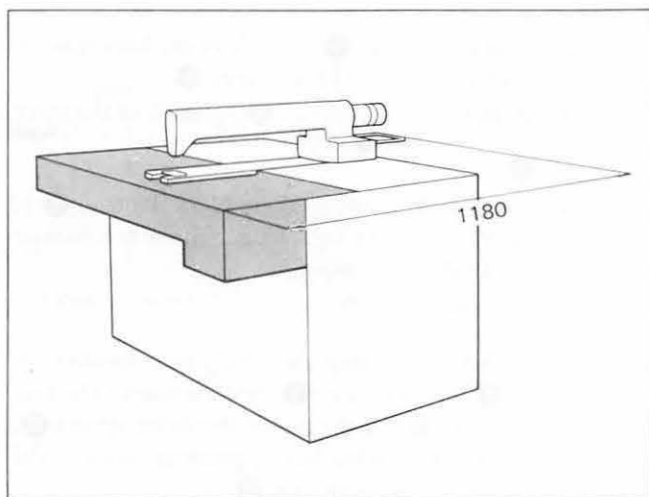
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## DISASSEMBLY FOR MACHINE TRANSPORTATION

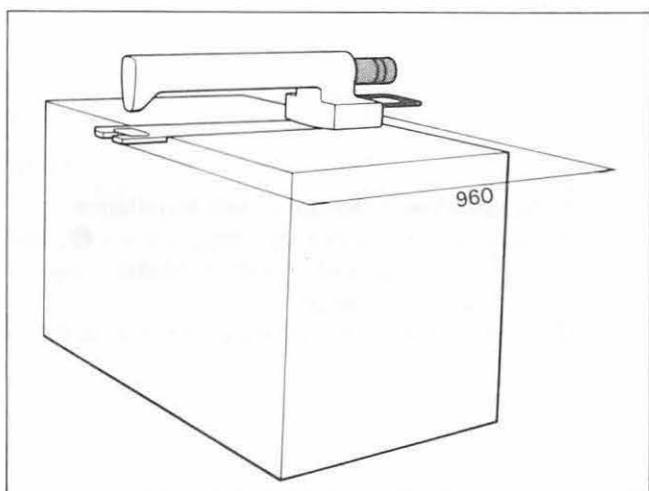
\* This machine is 1400 (W) × 1390 (L) × 1200 (H) mm.

When the entrance or exit is narrow, first measure the entrance size and compare with the machine's dimensions and then disassemble in the following order until the machine will pass through the entrance.



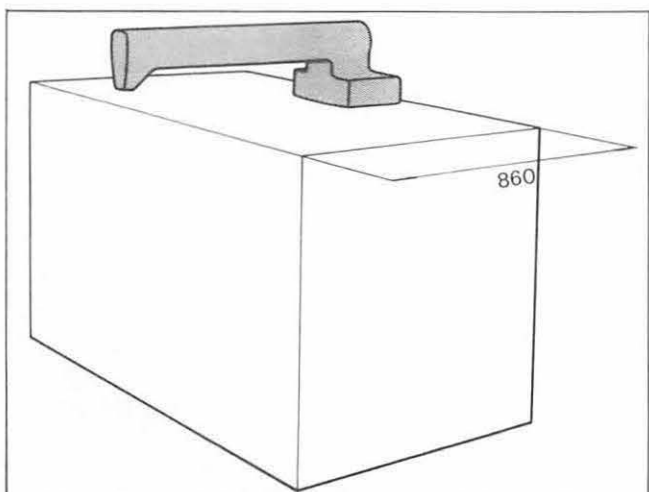
### Step A (machine size: 1390 mm)

Perform steps 1 ~ 9 in "[1] Feed Guide Mechanism and Cover Removal." The dimension shown in the illustration at right will become 1180 mm. Reinstallation of these parts after machine transportation is performed in the opposite order, step 9 ~ 1, of removal.



### Step B (machine size: 1180 mm)

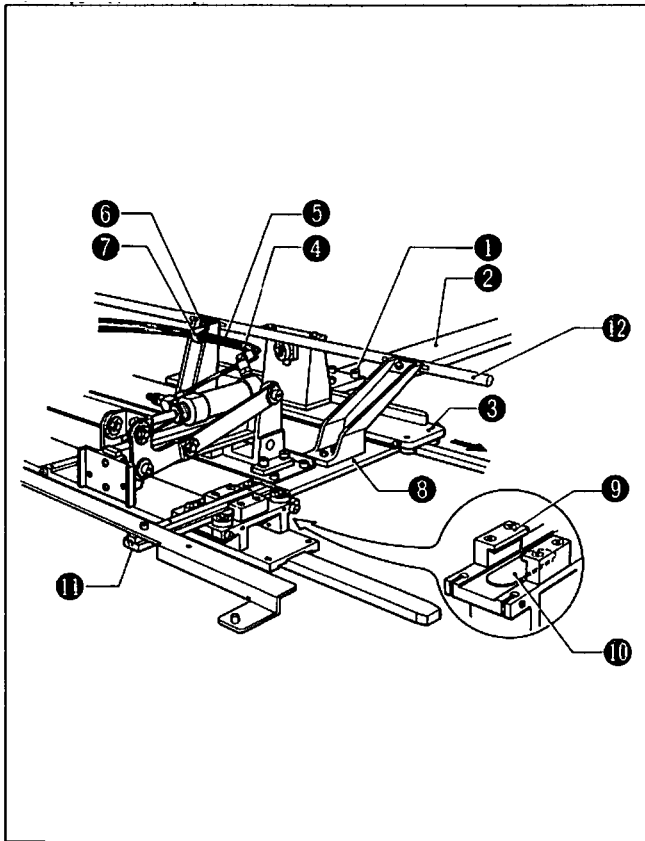
Perform "[1] Feed Guide Mechanism and Cover Removal" and "[2] Rail-Y Cover and DD Motor Removal" in regular order. The dimension shown at right will become 960 mm. Reinstallation after machine transportation is the reverse of removal order.



### Step C (machine size: 960 mm)

Perform "[1] Feed Guide Mechanism and Cover Removal" and "[2] Rail-Y Cover and DD Motor Removal" and "[3] Machine Head Removal" in regular order. The dimension shown at right will become 860 mm. Reinstallation after machine transportation is the reverse of removal.

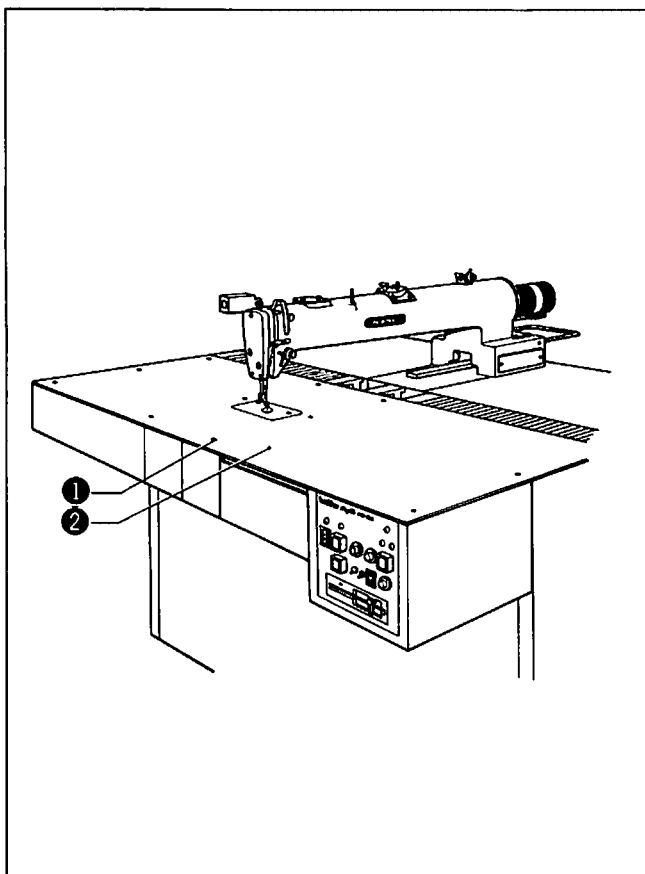
## 1 FEED GUIDE MECHANISM AND COVER REMOVAL



### 1. Feed Guide Mechanism Removal and Installation

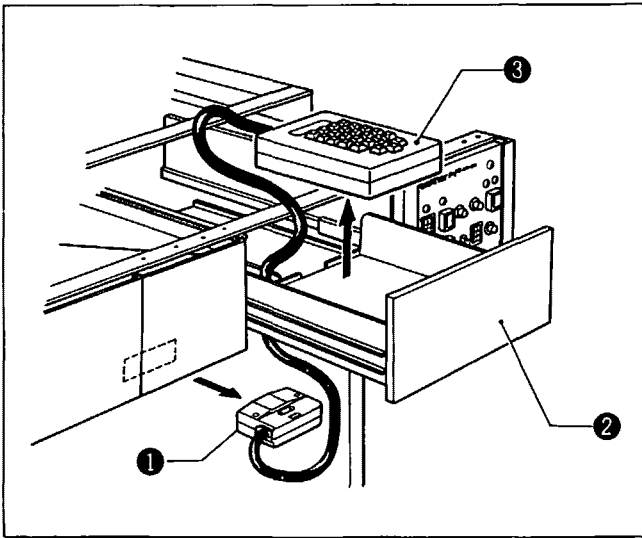
- (1) Remove the 4 bolts ①, and after pushing rail-Y ② slightly back by hand, pull the guide rail holder (front) ③ out in the direction of the arrow.
- (2) Loosen the nut ④ at each of the four elbows, and disconnect the air tubes ⑤.
- (3) Remove the set screws ⑥ for each of the three nylon clamps ⑦, and remove the nylon clamps ⑦.
- (4) After moving the feed guide mechanism ⑧ to either the left or right side, pull the mechanism forward and remove.
- (5) Installation is the reverse of removal order.

- \* When inserting the feed guide mechanism ⑧ into the slider ⑨, rest the side of the feed guide ⑪ on the top of the slider spacer ⑩, and insert while firmly pressing down on the top of the guide bar ⑫.
- \* Connect the air tubes ⑤ and elbows ④ in the correspondingly numbered locations.



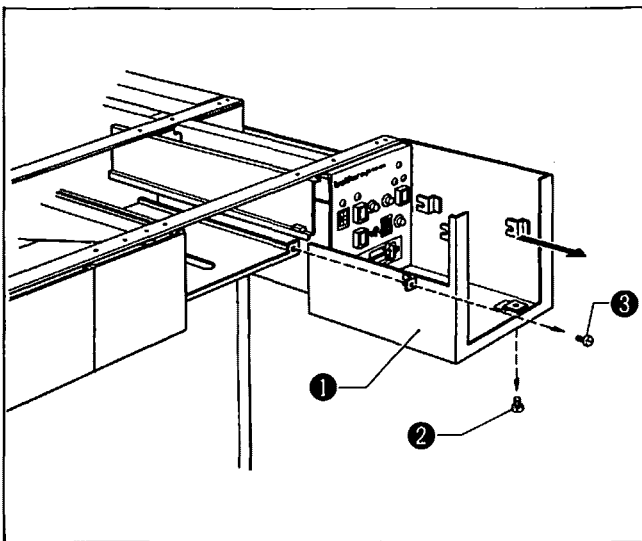
### 2. Needle Plate L Removal and Installation

- (1) Remove the twelve mounting screws ①, and while raising needle plate L slightly, pull it forward and remove.
- (2) Installation is the reverse of removal order.



### 3. Programmer Drawer Removal and Installation

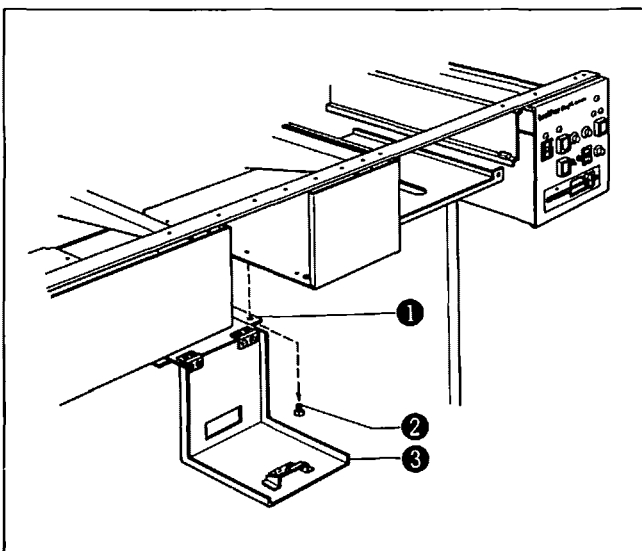
- (1) Disconnect the connector ① for the programmer.
- (2) Pull out the programmer drawer ② and remove the programmer ③.
- (3) Remove the programmer drawer ② by shifting it up and down.
- (4) Installation is the reverse of removal order.



### 4. Panel Setting Plate Cover Removal and Installation

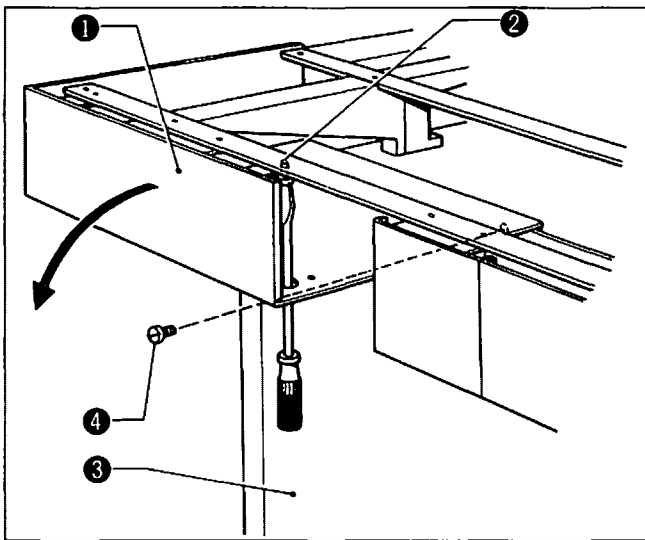
- (1) Remove the four screws ② on the bottom and the one screws ③ on the side of the panel setting plate cover ①.
- (2) Holding both sides of the panel setting plate cover ①, pull it forward firmly and remove.

\* Be sure to install the panel setting plate cover ① after installing front cover R ④.



### 5. Rotary Hook Cover Removal and Installation

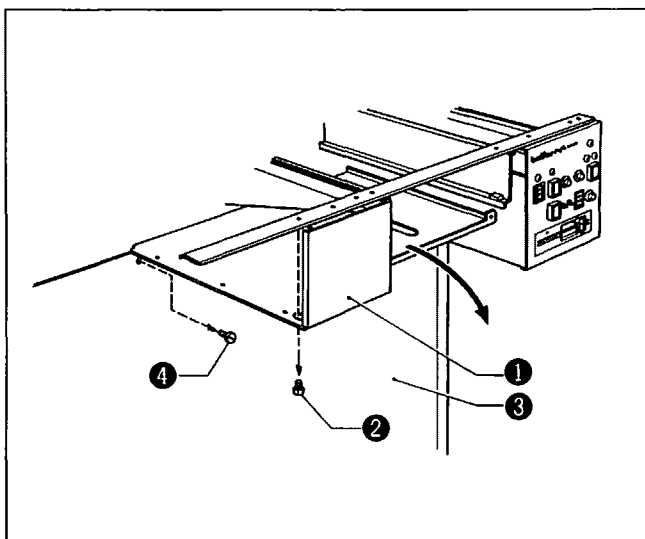
- (1) Remove the four screws ② in the rotary hook cover R ①, and remove the rotary hook cover R ① and rotary hook cover front ③ as a set. When doing this step, support the rotary hook cover front ③ and rotary hook cover bottom ② with your hand so they do not fall.
- (2) Installation is the reverse of removal order.



#### 6. Front Cover Upper L Removal and Installation

- (1) Insert a screwdriver from the bottom of the front cover upper L ❶ and loosen the four screws ❷.
- (2) Remove the four screws ❹ on the upper part of the front cover ❸.
- (3) Slightly lift the front cover upper L ❶, pull it forward and remove.
- (4) Installation is the reverse of removal order.

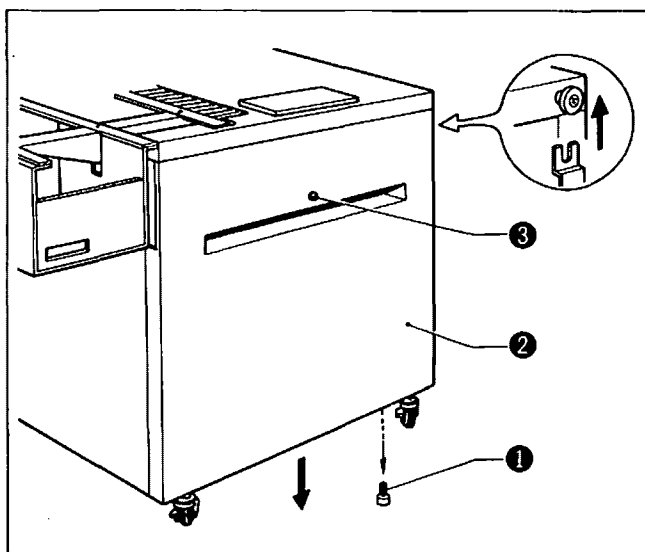
\* When installing the front cover upper L ❶, first place the bottom edge between the front cover ❸ and the legs, and then finish installing.



#### 7. Front Cover Upper R Removal and Installation

- (1) Insert a screwdriver from the bottom of the front cover upper R ❶ and loosen the two screws ❷.
- (2) Remove the three screws ❹ in the upper part of the front cover ❸.
- (3) Slightly lift the front cover upper R ❶, pull it forward and remove.
- (4) Installation is the reverse of removal order.

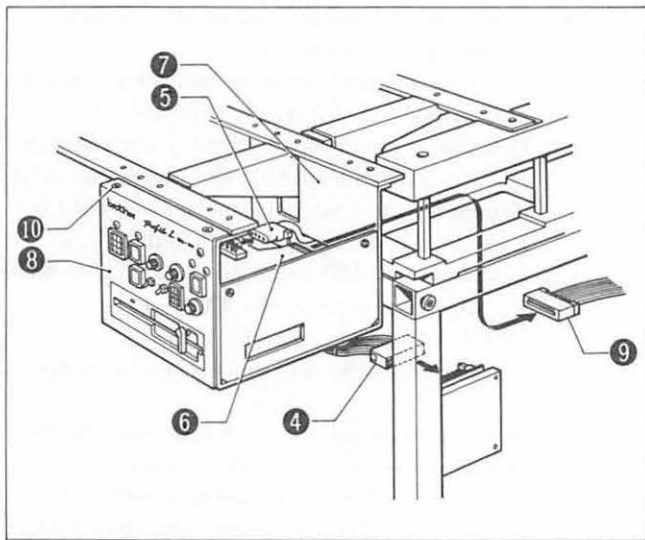
\* When installing the front cover upper R ❶, first place the bottom edge between the front cover ❸ and the legs, and then finish installing.



#### 8. Panel Setting Plate Removal and Installation

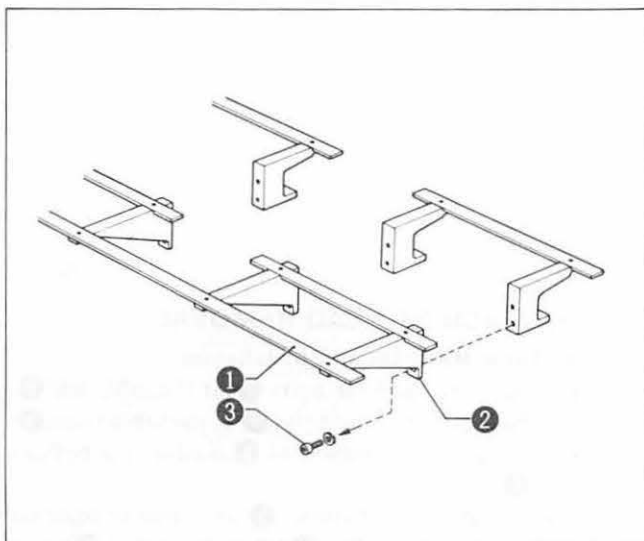
- (1) Remove the two bolts ❶ on the bottom of the legs.
- (2) While supporting side cover R ❷ with one hand, remove the screw ❸ in the top center of the cover.
- (3) Gradually reducing the strength supporting the side cover ❷, slide the cover down and remove it.

\* To install the side cover, first insert its four tabs in the cover stops and then finish installing.



- (4) Disconnect floppy harness A ⑨ and floppy harness B ⑤ from the floppy drive ⑥, and pull the two harnesses out from the panel setting plate ⑦.
- (5) Disconnect the harness ④ to the switch panel ⑧, and pull it inside the panel setting plate ⑦.
- (6) Loosen the four screws ⑩, pull the panel setting plate ⑦ forward and remove.
- (7) Installation is the reverse of removal order.

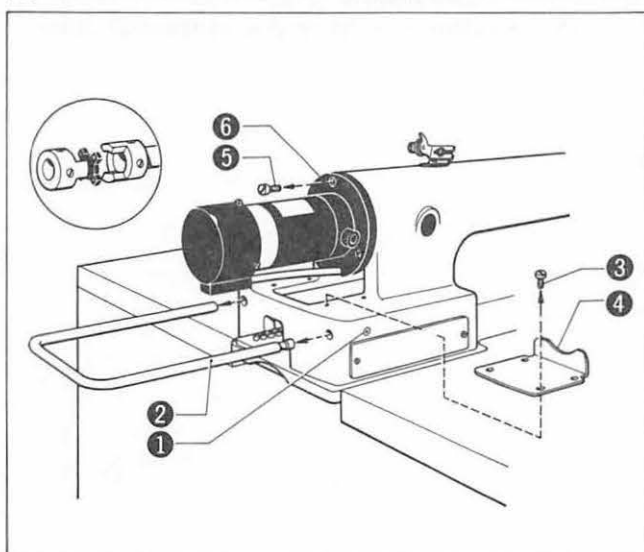
\* When installing, be sure to plug in all connectors firmly.



#### 9. Needle Plate Support Guide Removal and Installation

- (1) While holding needle plate support guide A ①, remove the eight bolts to needle plate support guide brackets A ②, and then remove the needle plate support guide as a single unit.
- (2) To install, temporarily install needle plate support guide bracket A ② with the eight bolts ③. Next, after installing needle plate L (refer to p. 2), firmly tighten the eight bolts ③. After installing the support guides, remove needle plate L.

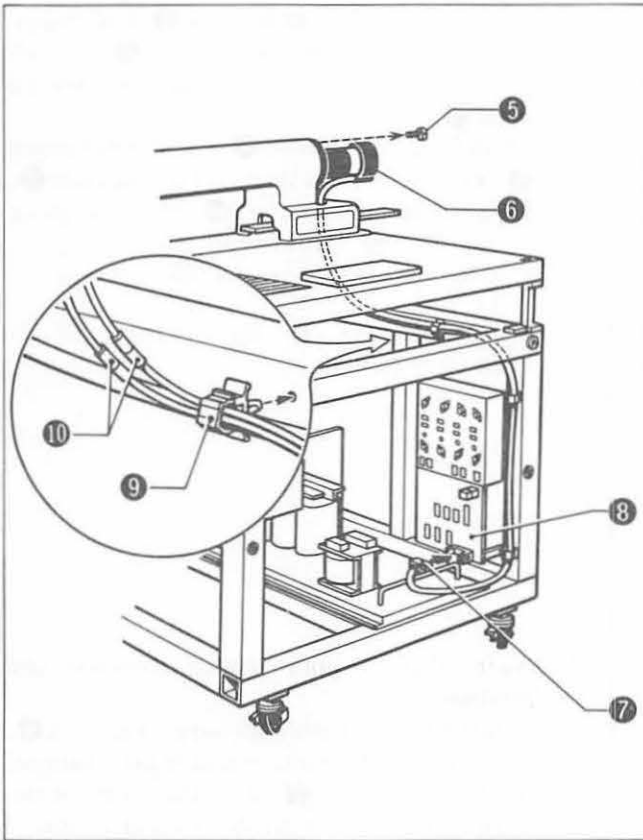
#### 2 RAIL-Y COVER AND DD MOTOR REMOVAL



- (1) Loosen the two right and left set screws ①, and remove the Y-axis rail cover ②.
- (2) Remove the four screws ③, and remove the arm rear cover ④.
- (3) Remove the five screws ⑤, and remove the DD motor bracket assembly ⑥. At this time, if the cord is pulled up slight, the DD motor bracket assembly can be placed on the table.
- (4) Installation is the reverse of removal order.

\* When removing the DD motor bracket assembly, take note or make a mark of the arm shaft and DD motor coupling position. If not properly installed, the motor and shaft will be 180° out of phase.

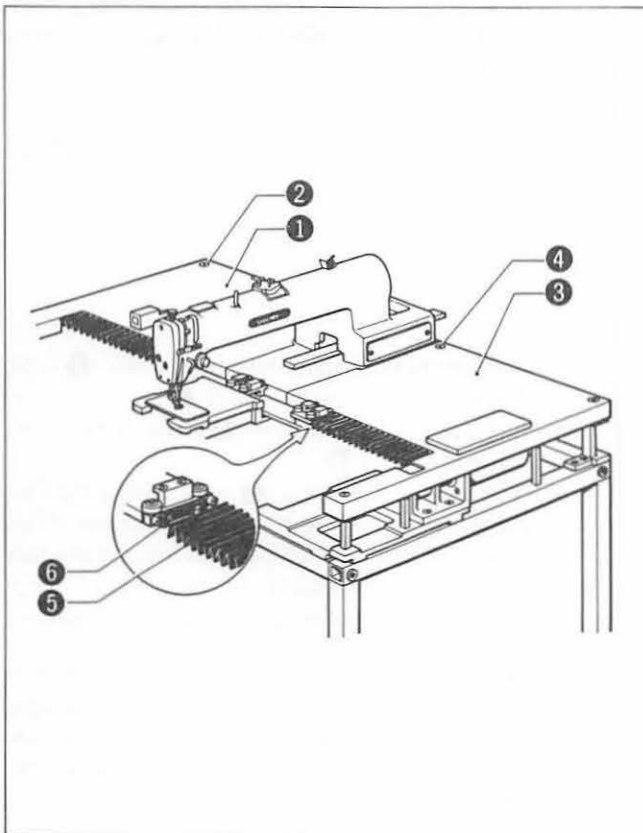




★ If arm bed removal is necessary, perform the following steps in order.

- (1) Refer to the previous page and remove the Y-axis rail cover and arm rear cover.
- (2) Disconnect the encoder assembly cord 7 from DD motor circuit board L 8, remove the cord clamps 9 (three straps), and pull the cord out from the hole in the back of the arm.
- (3) Disconnect the DD motor power connector 10.
- (4) Remove the three screws 5, and remove the DD motor bracket assembly 6.
- (5) Installation is the reverse of removal order.

\* When removing the DD motor bracket assembly, take note or make a mark of the arm shaft and DD motor coupling position. If not properly installed, the motor and shaft will be 180° out of phase.



### 3 MACHINE HEAD REMOVAL

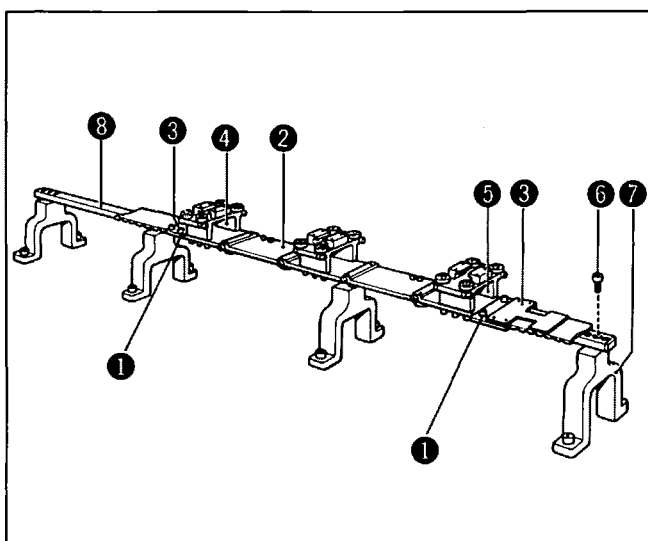
#### 1. Table Removal and Installation

- (1) Remove the four bolts 2 at the table left 1.
- (2) Remove the four bolts 4 at the table right 3.
- (3) Remove the two screws 6 holding the bellows 5 in place.

- (4) Compress the bellows 5 and remove together with the table left 1 and table right 3.

Note: When removing table right 3, raise the inside edge of the table approx. 30 cm and then remove.

- (5) Installation is the reverse of removal order.

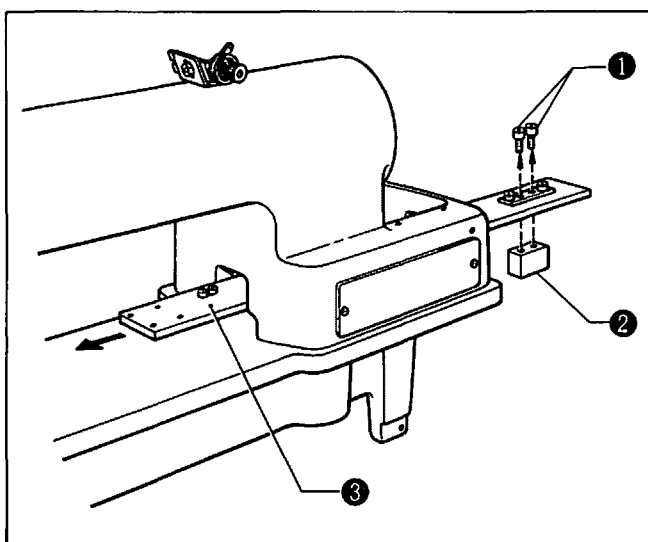


## 2. Slider and Slider Guide Removal and Installation

- (1) Remove the two bolts ① right and left, and remove the belt support plate ③ from the slider ②.
- (2) Hold slider upper left ④ and slider upper right ⑤ by hand, and while moving the slider right to left, lift and remove.
- (3) Remove the four bolts ⑥, and remove the slider guide ⑧ from the rail guide base brackets ⑦.

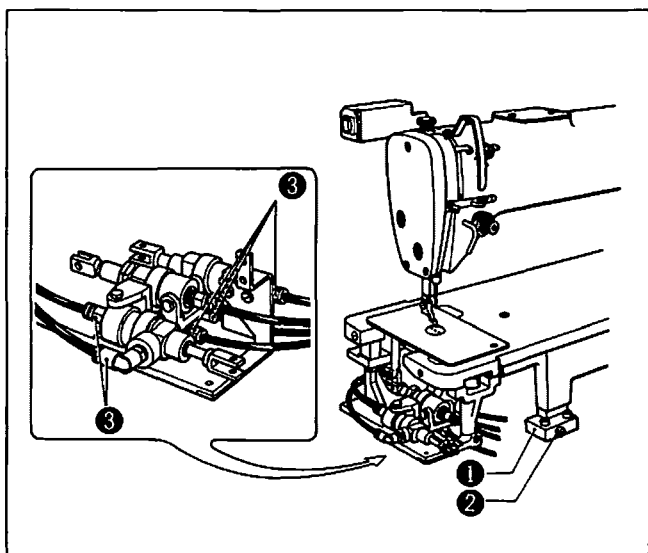
Note: There are four places with three bolts each in the slider guide ⑧; remove only the middle bolt in each of the four places.

- (4) Installation is the reverse of removal order.



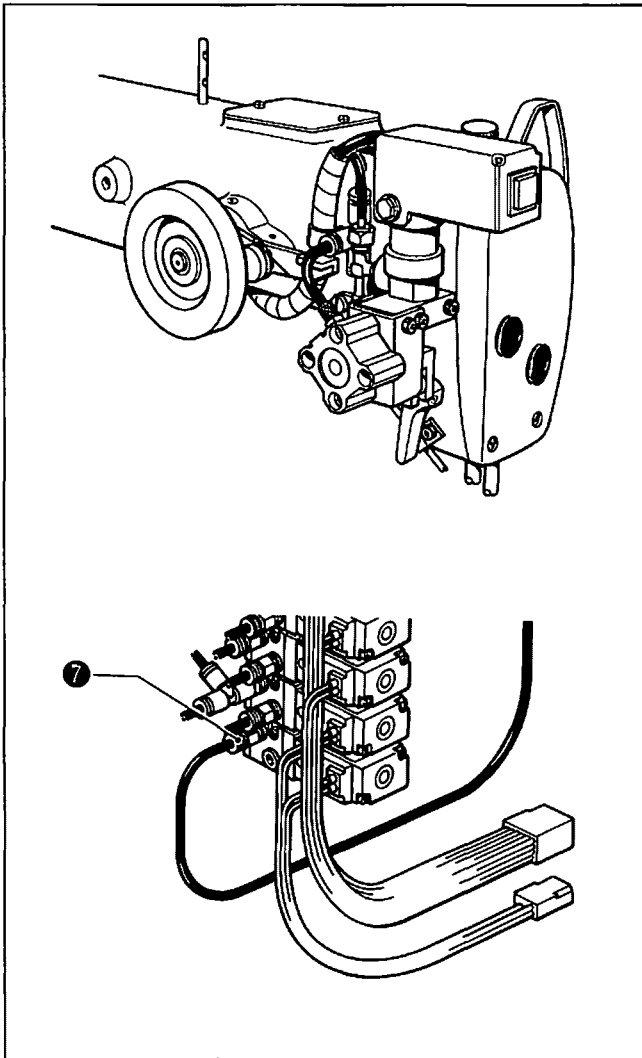
## 3. Rail-Y Removal and Installation

- (1) Remove the two bolts ①, and remove the Y-ES dog ②.
- (2) Pull rail-Y ③ forward and remove.
- (3) Installation is the reverse of removal order.



## 4. Arm Bed Removal and Installation

- (1) Remove the four bolts ② in each of the four machine positioning brackets ①.
- (2) Disconnect the six coupling nuts ③ to the thread trimmer assembly, and remove together with the air tubes.
- (3) Remove the air hoses on the machine head related to air.



(4) With two or more people, raise and remove the arm bed.

(5) Installation is the reverse of removal order.

\* Be sure to connect thread trimmer air tubes to the correspondingly numbered connection.

## STITCH LENGTH AND MACHINE SPEED

★ On the BAS-360, machine speed will be automatically adjusted according to stitch length, or by using the speed selector switches up to four set speeds can be selected.

Selector Switch Stitch Length	1	2	3	4
0.1 ~ 2.4 mm	2,000	1,750	1,500	1,250
2.5 ~ 4.4 mm	1,400	1,300	1,200	1,100
4.5 ~ 6.3 mm	800	700	600	500

## LOWER THREAD CAPACITY AND BOBBIN REPLACEMENT FREQUENCY

1. With the thread wound to approx. 90% of the bobbin's outer diameter, thread length will be as in the table below.

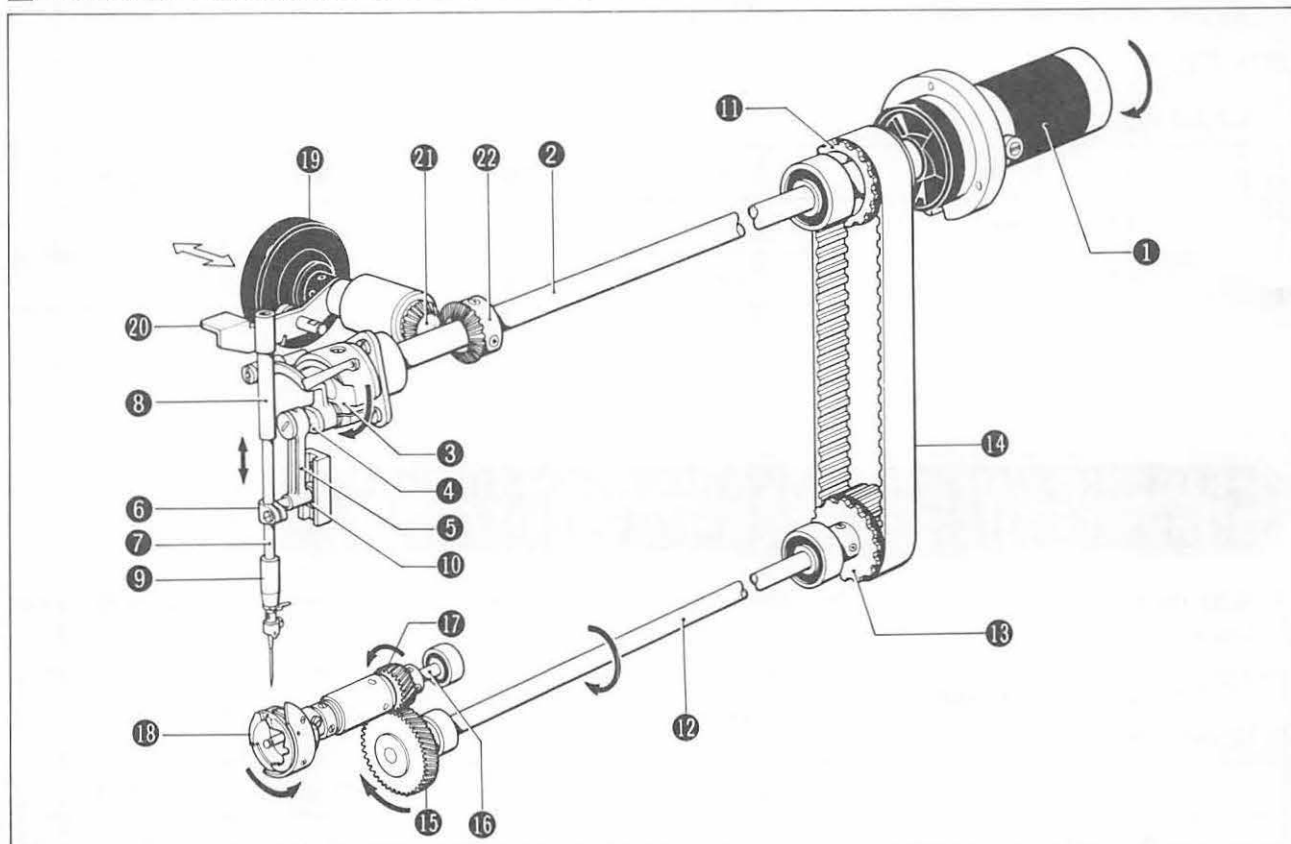
Thread size Thread type	#8	#20	#30	#50
Cotton	20 m	29 m	44 m	81 m
Spun rayon	/	32 m	/	87 m
Vinylon	23 m	/	/	/
Polyester	30 m	/	65 m	/

2. When the lower thread is wound to the capacities indicated in the above table and make 10,000 stitches, the bobbin will need replacing the number of times shown in the following table.

Stitch Length Thread size	2 mm	3 mm	4 mm	5 mm	6 mm
Cotton #8	1	1 ~ 3	2 ~ 3	3 ~ 4	3 ~ 6
Cotton #20	0 ~ 1	1 ~ 2	1 ~ 2	2 ~ 3	2 ~ 4
Cotton #30	0	0 ~ 1	1	1 ~ 2	1 ~ 2
Cotton #50	0	0	0	0 ~ 1	0 ~ 1
Spun rayon #20	0 ~ 1	1	1 ~ 2	1 ~ 3	2 ~ 3
Spun rayon #50	0	0	0	0 ~ 1	0 ~ 1
Vinylon #8	1	1 ~ 2	2 ~ 3	2 ~ 4	3 ~ 5
Polyester #8	0 ~ 1	1	1 ~ 2	1 ~ 3	2 ~ 4
Polyester #30	0	0	0 ~ 1	0 ~ 1	1

## MECHANICAL DESCRIPTIONS

### 1 NEEDLE BAR, THREAD TAKE-UP LEVER, LOWER SHAFT, AND ROTARY HOOK MECHANISM



#### I Needle Bar and Thread Take-up Lever Mechanism

- (1) When the DD motor ① rotates in the direction of the arrow, the take-up lever crank ③ is rotated by the arm shaft ②.
- (2) The needle bar crank ④ is connected to the take-up lever crank ③, and moves the needle bar clamp ⑥ vertically by means of the needle bar connecting rod ⑤.
- (3) The needle bar ⑦ supported by the needle bar clamp ⑥ is guided by needle bar bushing U ⑧, needle bar bushing D ⑨ and the needle bar guide block ⑩, and should move smoothly up and down.

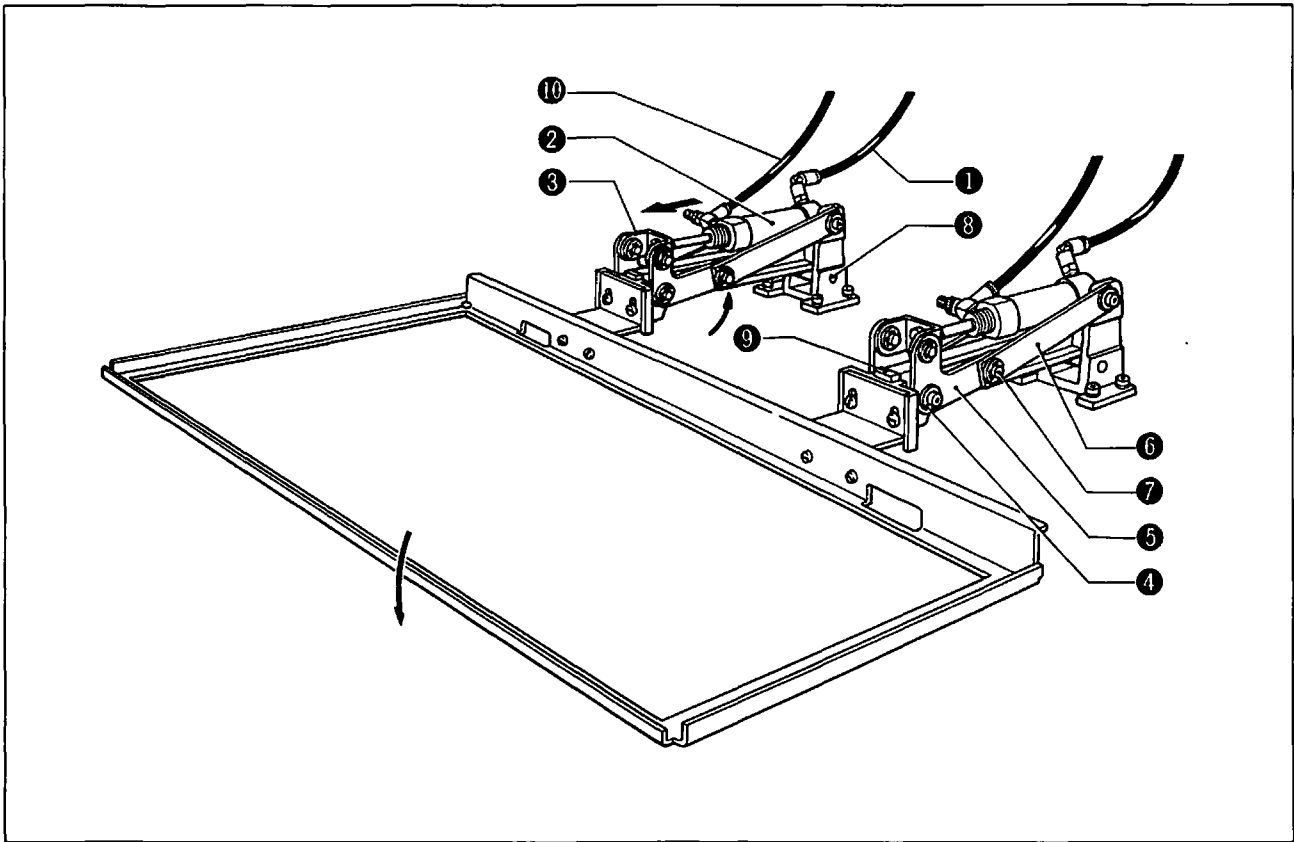
#### II Lower Shaft and Rotary Hook Mechanism

- (4) When the DD motor ① rotates in the arrow direction, timing pulley U ⑪ rotates.
- (5) The lower shaft ⑫ is connected to timing pulley D ⑬ and is driven by the timing belt ⑭.
- (6) The spiral gear ⑮ connected to the end of the lower shaft ⑫ meshes with the pinion gear ⑰ connected to the rotary hook shaft ⑱. When the lower shaft ⑫ rotates one full revolution, the rotary hook shaft ⑱ rotates twice.
- (7) A rotary hook ⑲ is connected to the end of the rotary hook shaft ⑱, and rotates simultaneously with the shaft ⑱.

#### ★ Hand Rotation

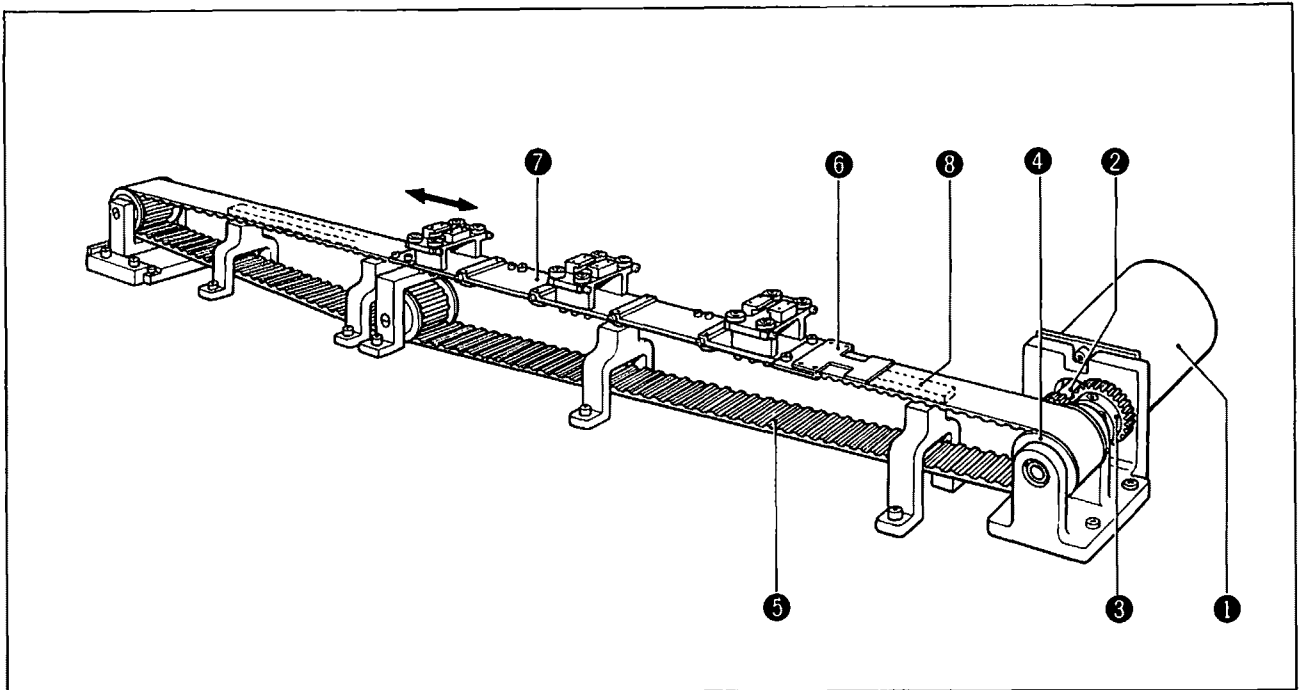
- (8) Pushing on the pulley ⑲ will engage the stopper ⑳ causing the pulley shaft gear ㉑ to mesh with gear ㉒ and the arm shaft ② can then be turned by hand.  
Pushing on the stopper ⑳ again will release the stopper to its original position.

## 2 WORK CLAMP MECHANISM



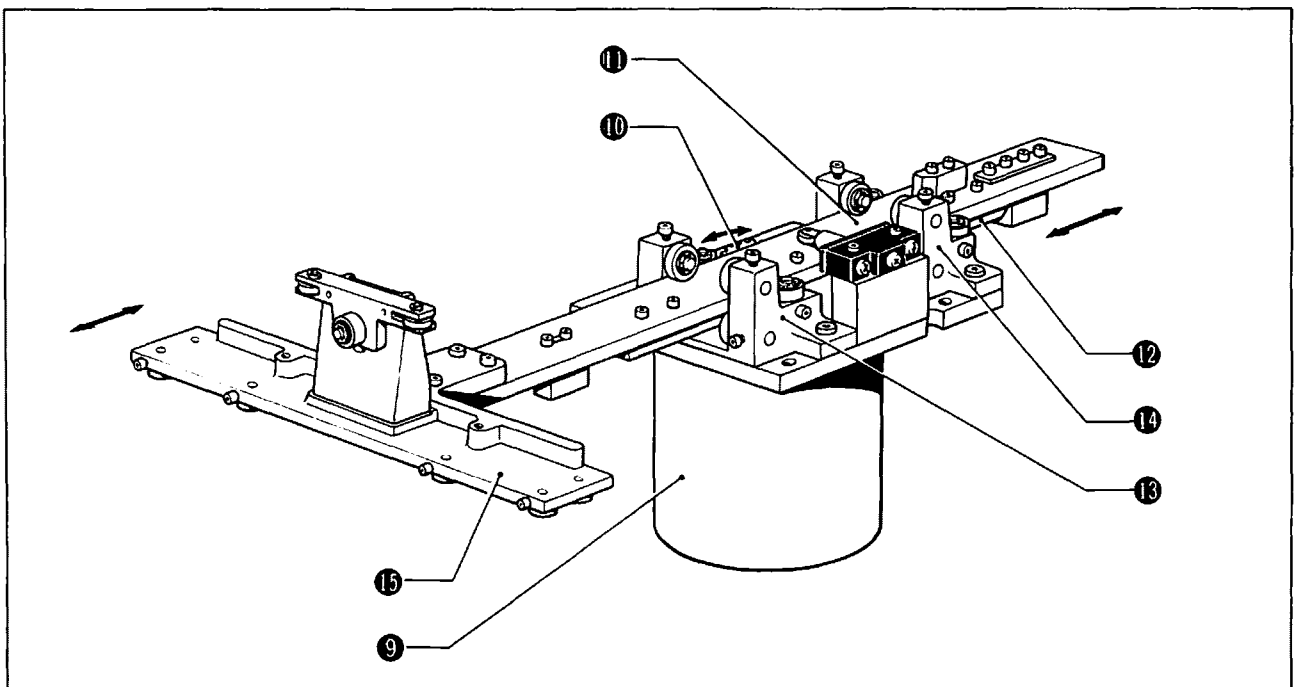
- (1) When air pressure is increased to the pressure cylinders ② by the air tubes ①, the cylinder setting plate ③ connected to the pressure cylinder ② is pushed forward and lever A ⑤ is rocked via the collar ④.
- (2) Lever A ⑤ is connected to lever B ⑥ by the lever stud ⑦, and the presser arm ⑨ is lowered, pivoting on hinge stud ⑧.
- (3) When presser arm ⑨ drops and the collar ④ is in line with lever stud ⑦, work clamp pressure reaches a maximum and the work clamp holds the material firmly.
- (4) When pressure in the pressure cylinder ② is increased by air tube ⑩, the presser arm ⑨ rises.

### 3 FEED MECHANISM (DRIVE SIDE)



#### [X-axis]

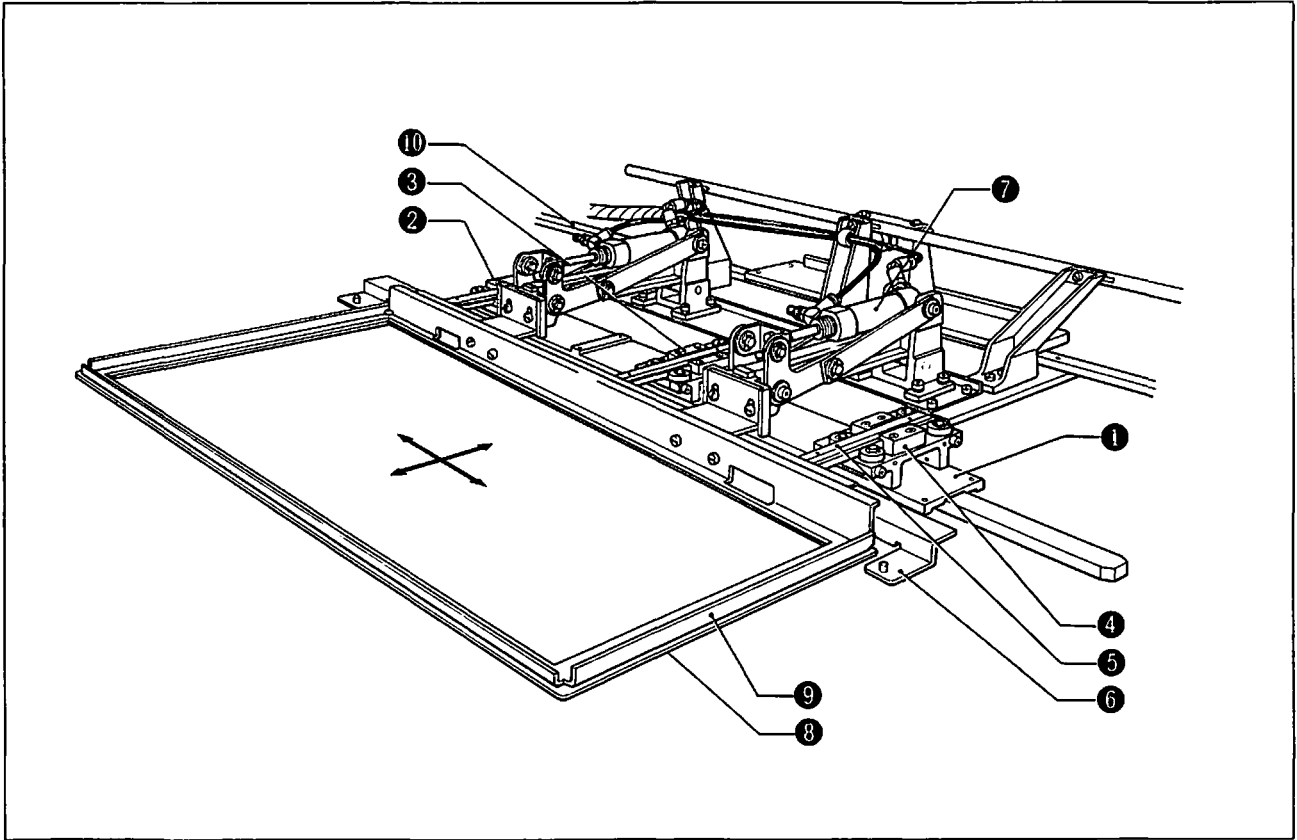
1. When the pulse motor ① rotates, the timing pulley B ④ is turned via gear X ② and the gear assembly ③ and the timing belt ⑤ are driven in turn.
2. The timing belt ⑤ is connected to the belt support panel ⑥, and the belt support panel ⑥ is connected to the slider ⑦.
3. The slider ⑦ is guided by the slider guide ⑧, and relays pulse motor ① revolutions to the feed guide assembly.



#### [Y-axis]

4. When the pulse motor ⑨ rotates, the pulse motor gear ⑩ meshes with the rack ⑫ installed on rail-Y ⑪, and moves rail-Y ⑪ in a straight line.
5. Rail-Y ⑪ is guided by rail-Y guide front ⑬ and rail-Y guide rear ⑭, and relays pulse motor ⑨ revolutions to the rail guide holder front ⑮ which is connected the end of rail-Y ⑪.

#### 4 FEED GUIDE MECHANISM



##### [X-axis]

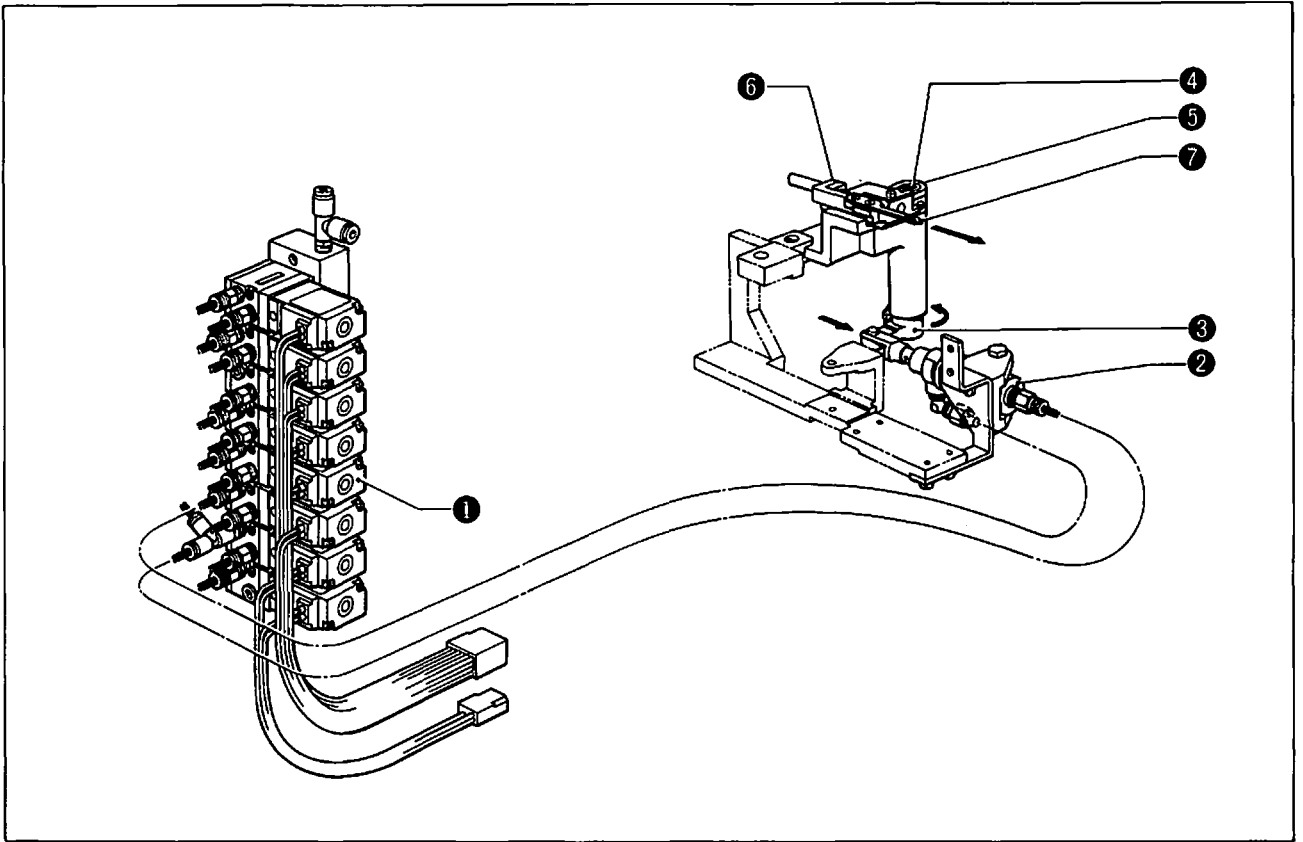
1. When the slider ① moves a full trip on the X-axis, motion is relayed to the feed guide ⑤ that is guided by slider upper left ②, slider upper center ③ and slider upper right ④.
2. The feed guide plate front ⑥ and clamp mechanism ⑦ are connected to the feed guide ⑤, and motion is relayed to the clamp ⑨ and feed plate ⑧ which are connected to these.

##### [Y-axis]

3. When the guide rail holder front moves a full trip on the Y-axis, action is relayed to matching feed guide X ⑩.
4. The feed guide ⑤ is connected to feed guide X ⑩; it is guided by the slider ① and moves on the Y-axis.
5. The feed guide plate front ⑥ and clamp mechanism ⑦ are connected to the feed guide ⑤, and motion is relayed to the clamp ⑨ and feed plate ⑧ which are connected to the guide plate front ⑥ and clamp mechanism ⑦.



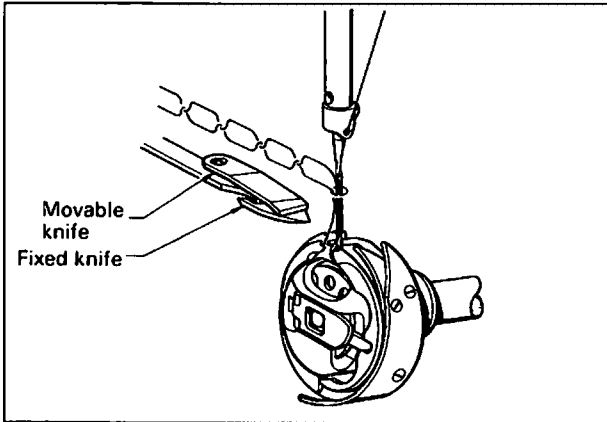
## 5 THREAD TRIMMING MECHANISM



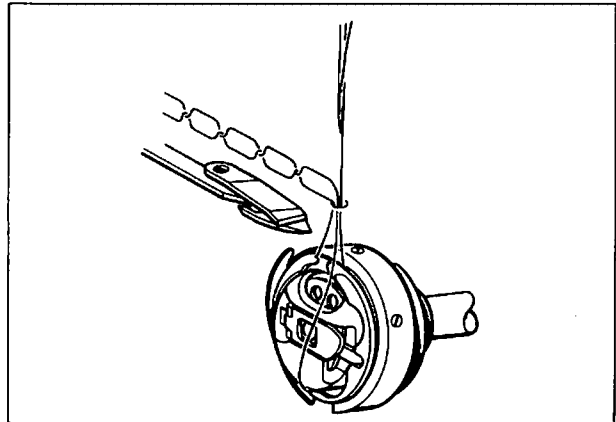
### (I) Thread Trimming Mechanism

1. When the thread trimming signal turns the solenoid valve ① on, the thread trimming cylinder ② moves in the arrow direction.
2. The knife lever ③ connected to the thread trimming cylinder ② activates knife rock arm A ⑤ via the knife rock arm shaft ④.
3. The forked-part of knife rock arm A ⑤ fits the movable knife base assembly ⑥, and thereby moves the movable knife ⑦ connected to the movable knife base assembly ⑥.
4. When the solenoid valve ① becomes off, the thread trimming cylinder ② moves opposite to the arrow direction and the movable knife ⑦ returns to its original position.

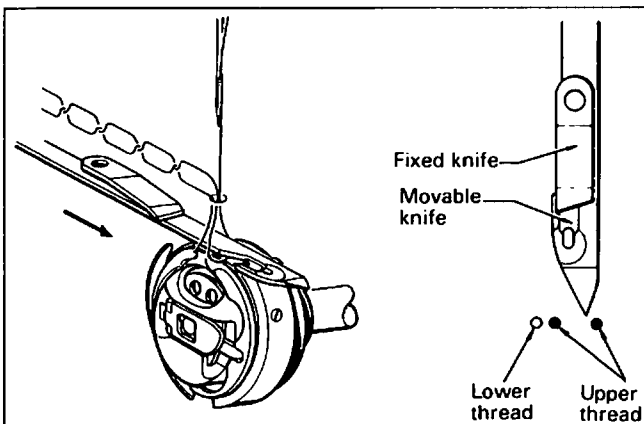
## (II) Upper and Lower Thread Trimming



(1) When the needle is moved 2.2 mm above the needle lowest position, the rotary hook point catches the upper thread loop. At this time, the thread trimmer signal has been sent, but the movable knife is stationary because the signal is delayed.

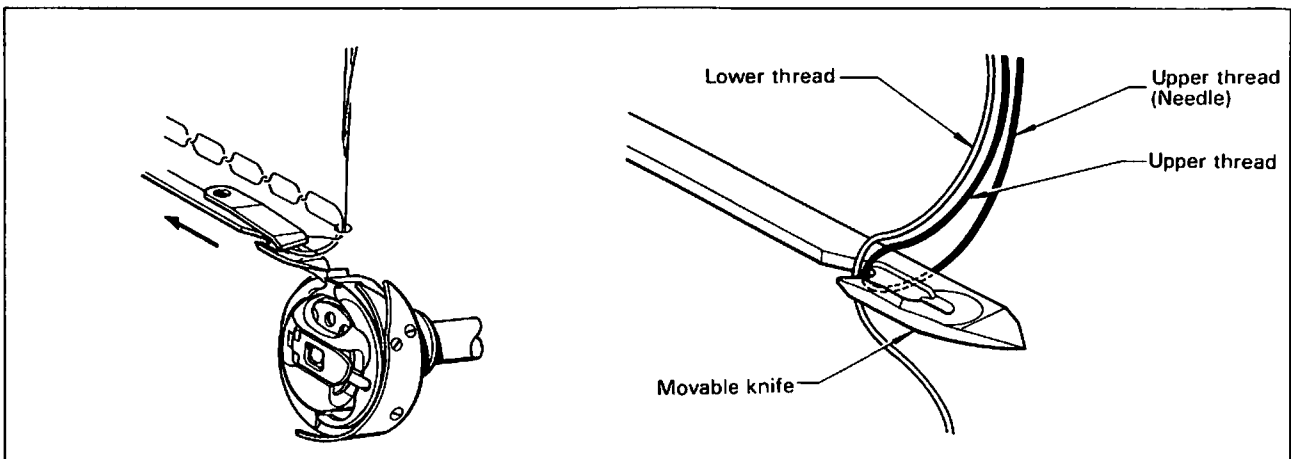


(2) The upper thread loop is pulled by the rotary hook point and passes around the inner hook. The movable knife begins to move.



(3) The needle rises and the thread take-up lever lifts the upper thread. The movable knife tip passes through the upper thread loop which has been opened by the rotary hook point and loop spreading occurs.

\* If this timing is either too fast or too slow, it will appear in the operation of the movable knife and may be the cause of thread trimming misses.

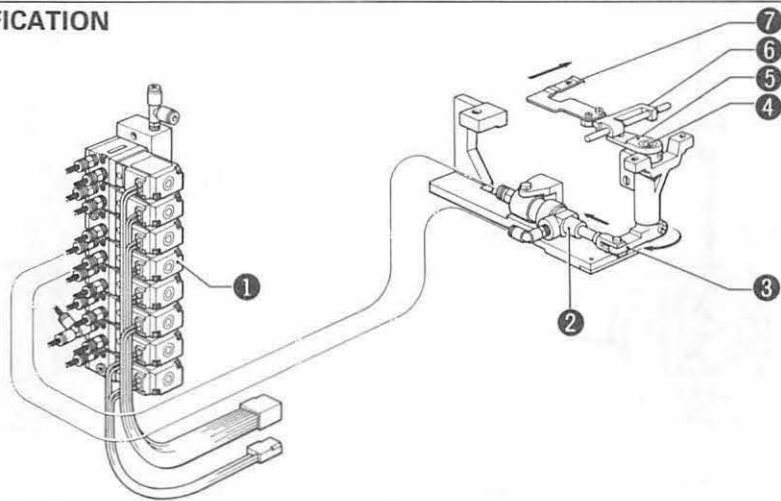


(4) The needle rises, and stops at the needle up position; the thread take-up lever approaches its highest point. The upper or lower thread hooked by the movable knife is cut by the fixed knife as the movable knife retracts. When the movable knife pulls the thread and retracts, the thread tension release activates so that no excess stress is made on the upper thread and it pulls out smoothly.

\* The thread length set by the movable knife becomes both the needle thread length and the bobbin thread length after thread trimming. This effects the stitch at the start of new sewing.

## 6 THREAD CATCHER MECHANISM

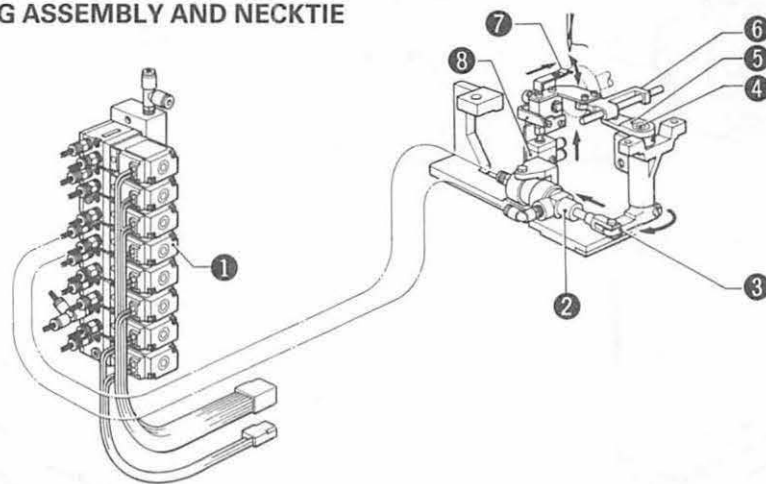
### STANDARD SPECIFICATION



#### (I) Thread Catcher Mechanism

1. When the solenoid valve ① becomes ON before the start of sewing, the thread catcher cylinder ② moves in the arrow direction.
2. The thread catcher lever ③ connected to the thread catcher cylinder ② activates the knife rock arm B ⑤ via knife rock arm shaft B ④.
3. The forked-part of knife rock arm B ⑤ fits the movable knife base bracket B ⑥ and thereby activates the thread catcher spring ⑦ connected to movable knife base bracket B ⑥.
4. When the synchronization signal at the first stitch at the start of sewing turns the solenoid valve ① OFF, the thread catcher cylinder ② moves opposite to arrow direction and the thread catcher spring ⑦ returns to its original position.

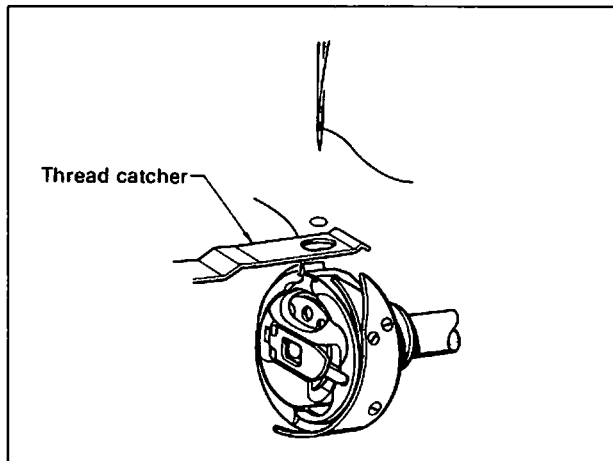
### SPECIFICATIONS FOR BAG ASSEMBLY AND NECKTIE



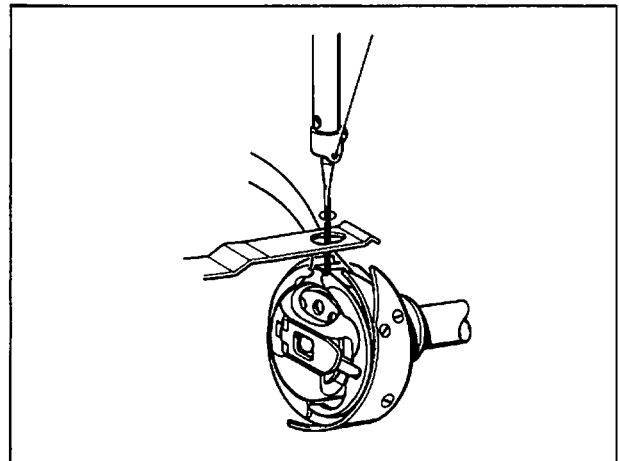
#### (I) Thread Catcher Mechanism

1. When the solenoid valve ① becomes ON before the start of sewing, the thread catcher cylinder ② moves in the arrow direction.
2. The thread catcher lever ③ connected to the thread catcher cylinder ② activates the knife rock arm B ⑤ via knife rock arm shaft B ④.
3. The forked-part of knife rock arm B ⑤ fits the movable knife base bracket B ⑥ and thereby activates the thread catcher spring ⑦ connected to movable knife base bracket B ⑥.
4. When the synchronization signal at the first stitch at the start of sewing turns the solenoid valve ① OFF, the thread catcher cylinder ② moves opposite to arrow direction and the thread catcher spring ⑦ returns to its original position.
5. After several stitches has been sewn at the start of sewing, the signal from the machine turns on the solenoid valve, the cylinder ⑧ moves in the direction of the arrow, the thread catcher spring ⑦ rotates and the needle thread is released.

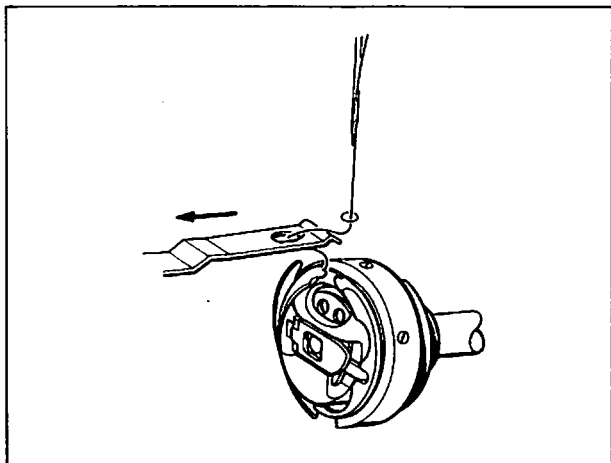
## (II) Thread Catcher Operation



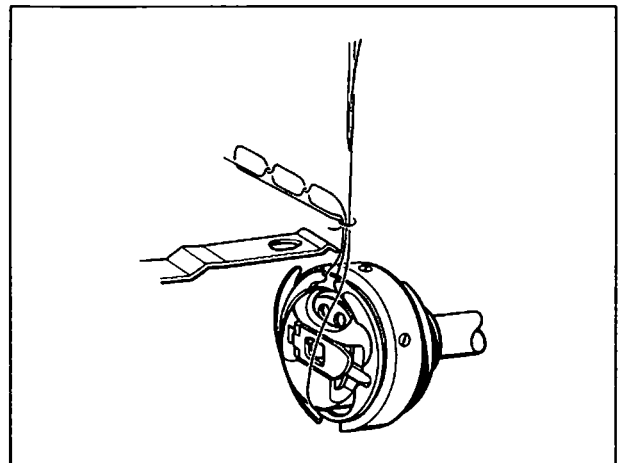
1. Before sewing starts, the thread catcher spring advances.



2. At the first stitch, the rotary hook point catches the upper thread, and the end of the upper thread is pulled below the needle plate.

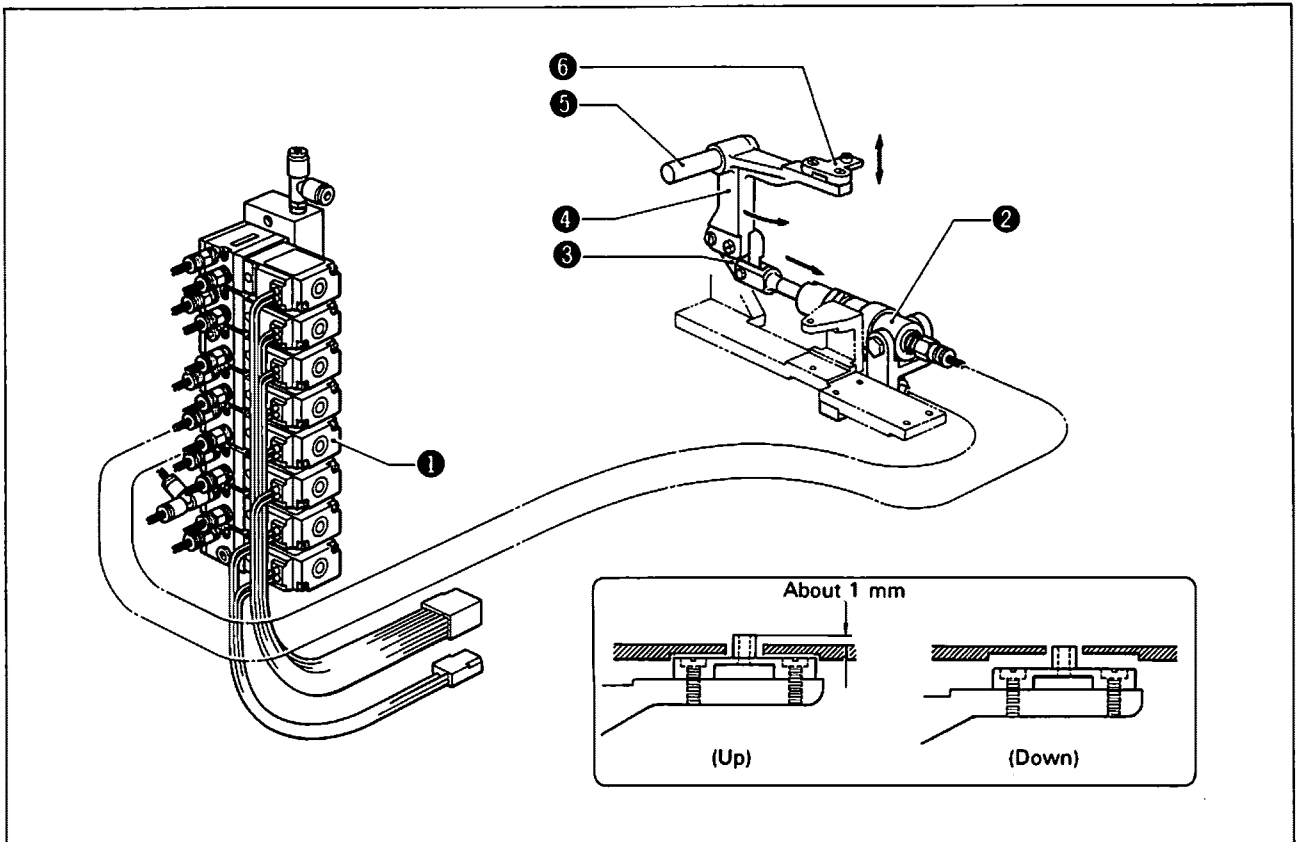


3. The synchronization signal causes the thread catcher spring to retract, and the tip of the upper thread is held lightly between the thread catcher spring and the bottom of the needle plate.

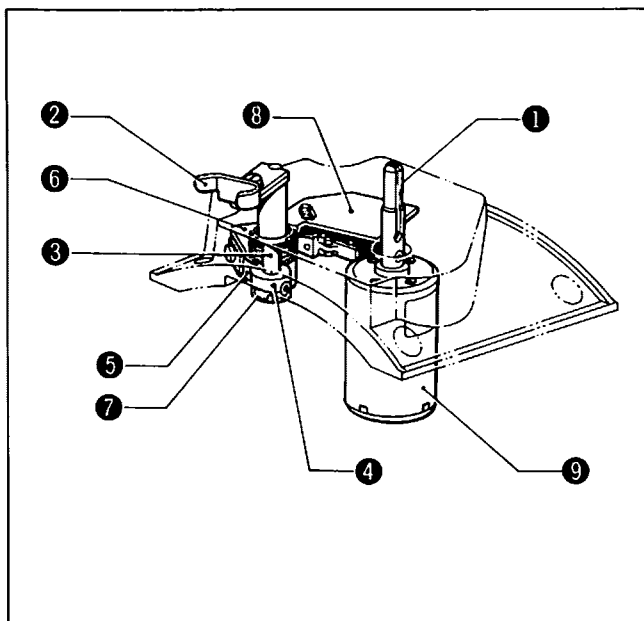


4. As sewing continues, the upper thread is released from the thread catcher spring.

## 7 BOTTOM PLUNGER MECHANISM



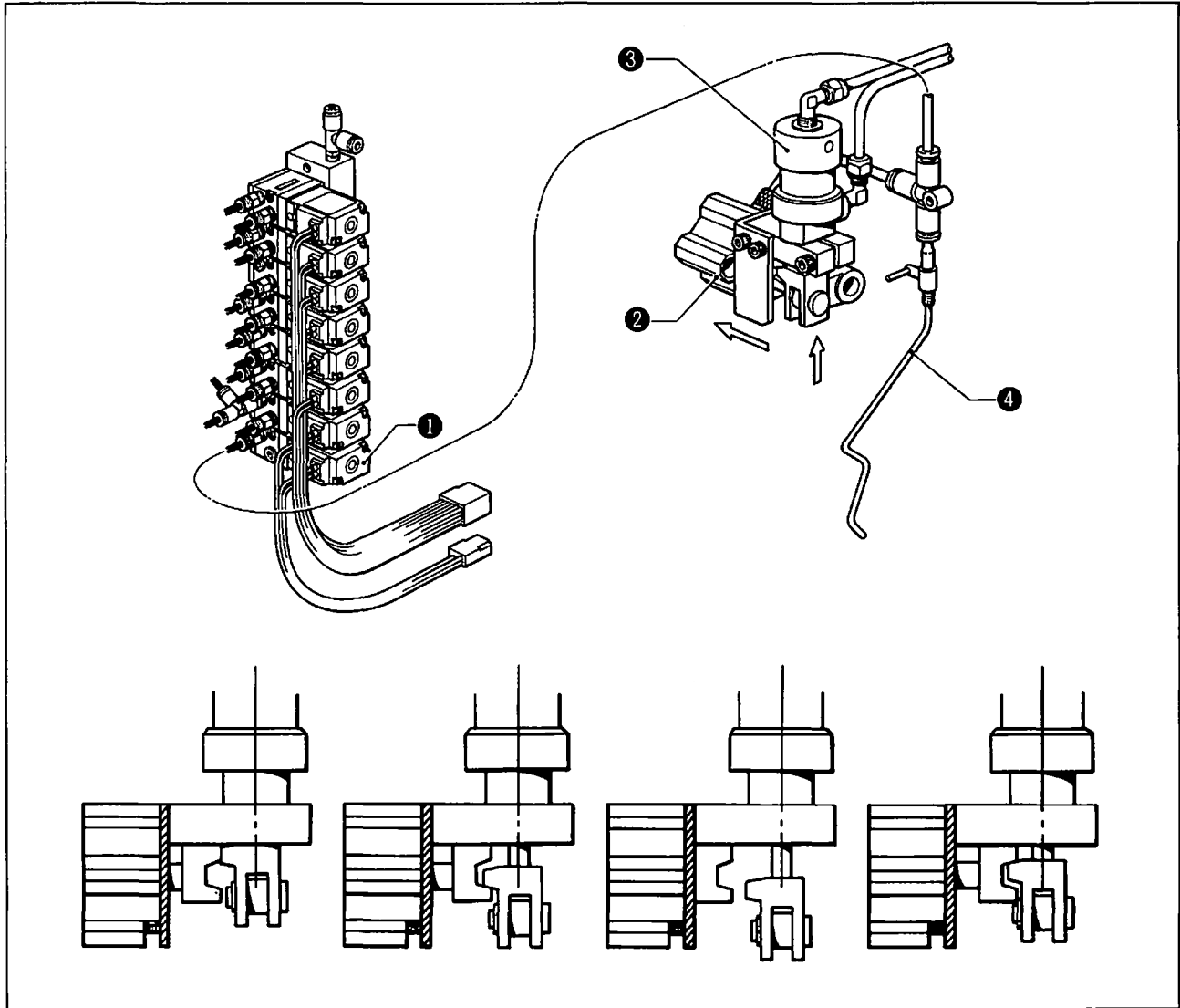
1. When the solenoid valve ① becomes on at the start of sewing, the bottom cylinder ② moves in the arrow direction.
2. The bottom lever plate ③ connected to the bottom cylinder ② is fixed to the bottom lever ④, and activates the bottom plunger ⑥ via the bottom shaft ⑤.
3. When sewing ends and the solenoid valve ① becomes off, the bottom cylinder ② moves opposite to arrow direction and the bottom plunger ⑥ returns to its original position.



## 8 BOBBIN WINDER MECHANISM

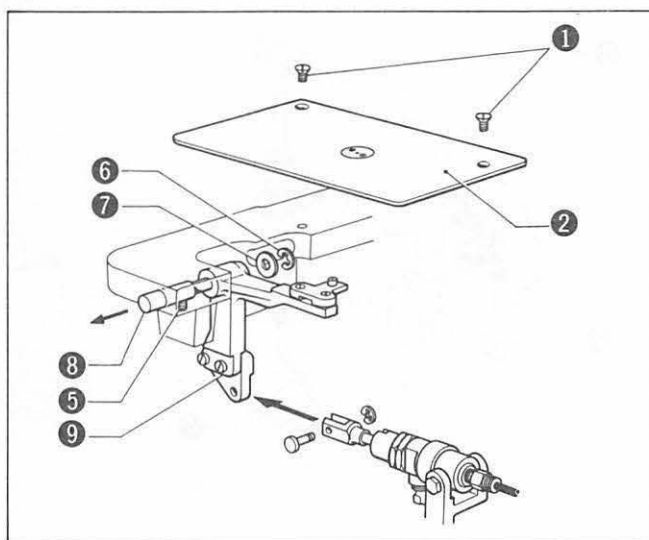
1. When the bobbin is mounted on the bobbin winder spindle ①, and bobbin winder stop latch ② is swung towards the bobbin winder spindle ①, the bobbin winder stop latch tripping arm ④ mounted on the bobbin winder stop latch hinge pin ③ presses the leaf spring ⑤.
2. The leaf spring ⑤ is mounted on the bobbin winder lever ⑥ and revolves around the bobbin winder screw ⑦. When the bobbin winder motor limit switch ⑧ turns on, the bobbin winder motor ⑨ begins to turn, winding thread onto the bobbin as long as the bobbin winder spindle ① is rotating.
3. When the specified amount of thread is wound onto the bobbin, the bobbin winder stop latch hinge pin ③ swings back, the bobbin winder lever ⑥ moves away from the limit switch ⑧, the motor ⑨ stops, and the bobbin winder spindle ① stops.

## 9 NEEDLE BAR DESCENT GUARD AND NEEDLE COOLER



1. When the feed mechanism functions, the solenoid ① is on, thin material cylinder ② will move in the direction of the arrow, and presser foot lifter cylinder ③ will operate vertically in the direction of the arrow. The solenoid ① will then turn off, and the thin material cylinder ② will move back, opposite to the direction of the arrow.
  2. When material feed is completed, the presser foot lifter cylinder ③ will move back, opposite to the direction of the arrow, assuming the stand-by condition illustrated above.
  3. At the beginning of sewing when the solenoid ① turns on, the thin material cylinder ② will move in the direction of the arrow, and the presser foot lifter cylinder ③ will move naturally in the opposite direction of the arrow. During sewing solenoid ① will remain on, and the needle cooler ④ will continue to function.
  4. During thread cutting after sewing is completed, solenoid ① will turn off, and the presser foot lifter cylinder ③ will move in the direction of the arrow.
- \* The needle cooler ④ will only function while solenoid ① is on.
  - \* Tension release will only function when the machine is in the stand-by mode and during thread cutting; at other times it holds the needle thread tight.

# MACHINE HEAD DISASSEMBLY PROCEDURES

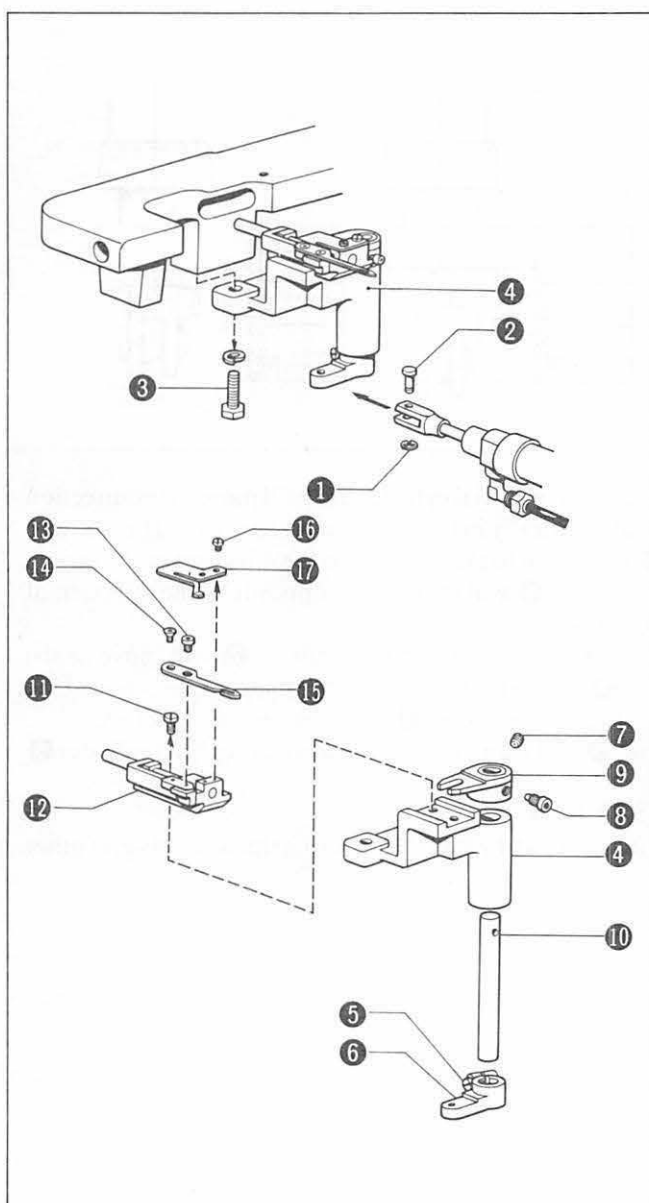


## • To Start

Perform these steps after performing the steps "1 Feed Guide Mechanism and Cover Removal" for machine transportation.

### 1 BOTTOM PLUNGER ASSEMBLY

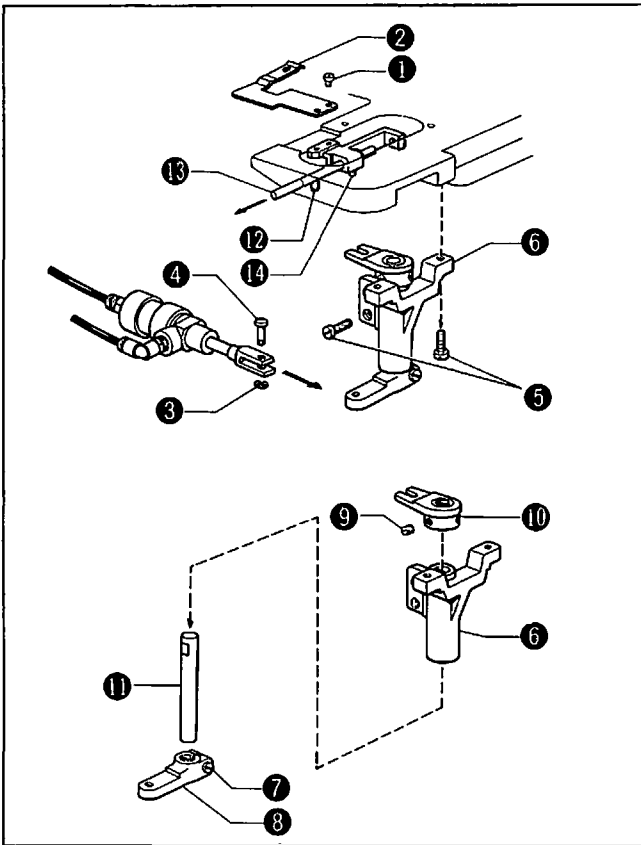
1. Remove the two flat screws ①, and remove needle plate S ②.
2. Remove stop ring E ③ and pull out the link pin ④.
3. Loosen the screw ⑤ from below the bed.
4. Remove the stop ring ⑥ and washer ⑦; remove the bottom lever shaft ⑧, and remove the bottom lever ⑨.



### 2 THREAD TRIMMER

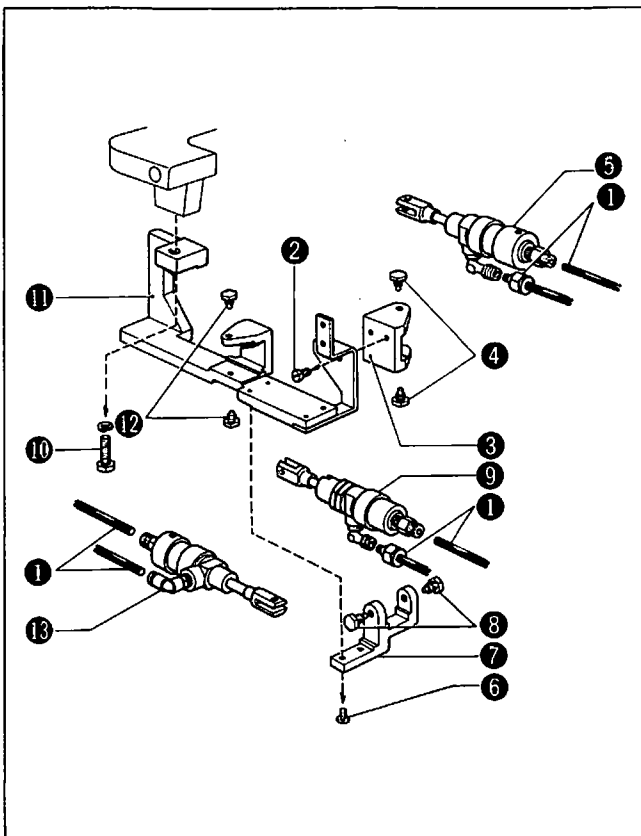
1. Remove the stop ring ① and pull out the link pin ②.
2. Remove the two screws ③, and remove the movable knife base bracket ④ with all connected parts still attached.
3. Loosen the screw ⑤ and remove the knife lever ⑥.
4. Loosen the set screw ⑦ and screw ⑧, and remove knife rock arm A ⑨ and knife rock arm shaft A ⑩.
5. Remove the two screws ⑪, and remove the movable knife base assembly ⑫.
6. Remove screws ⑬ and ⑭ and remove the movable knife ⑮.
7. Remove the two screws ⑯ and remove the thread presser spring ⑰ and then thread catcher spring.

### 3 THREAD CATCHER



1. Remove the two screws ①, and remove the thread catcher spring ②.
2. Remove the stop ring ③, and pull out the link pin ④.
3. Remove the four screws ⑤, and remove the thread catcher base ⑥ with all parts still connected.
4. Loosen screw ⑦, and remove the thread catcher lever ⑧.
5. Loosen the two screws ⑨ and remove knife rock arm B ⑩ and knife rock arm shaft B ⑪.
6. Loosen screw ⑫ from below the bed, pull out slide shaft B ⑬, and remove movable knife base B ⑭.

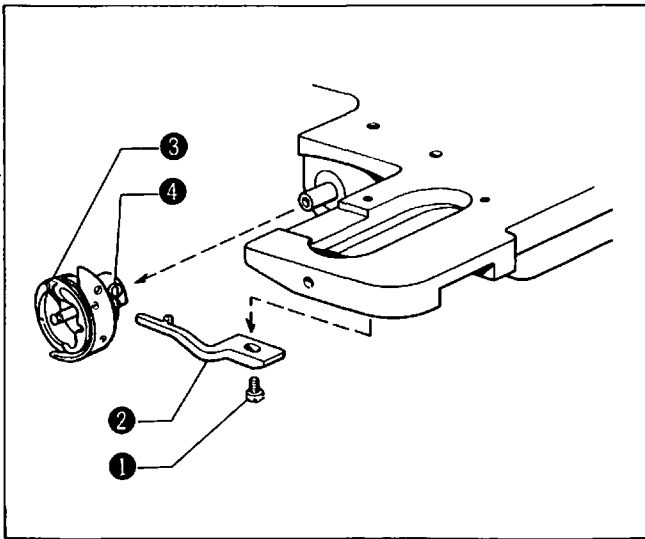
### 4 CYLINDERS



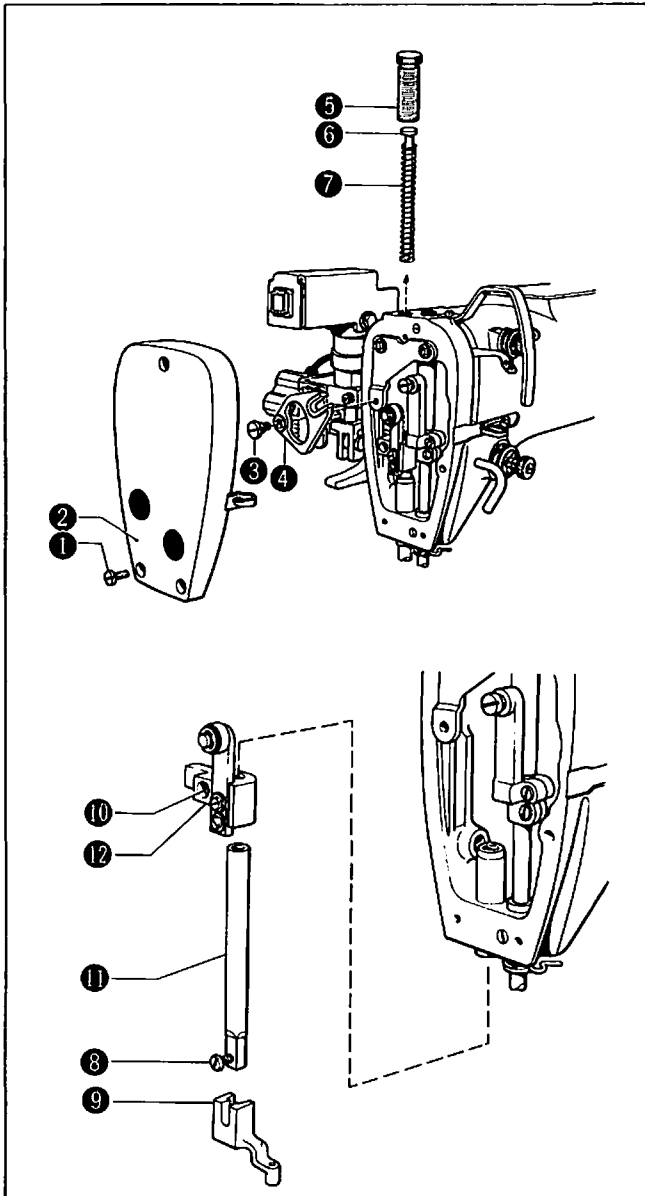
1. Remove the nuts ① for each of the six air tubes connected to the elbows, and disconnect the air tubes.
2. Remove the two screws ②, and after removing the knife cylinder base ③, remove the two screws ④ and the knife cylinder ⑤.
3. Remove the two screws ⑥ and after removing the bottom cylinder base ⑦, remove the two screws ⑧ and remove the bottom cylinder ⑨.
4. Remove the bolt ⑩ and after removing the thread catcher cylinder base ⑪, remove the two screws ⑫ and remove the thread catcher cylinder ⑬.



## 5 ROTARY HOOK



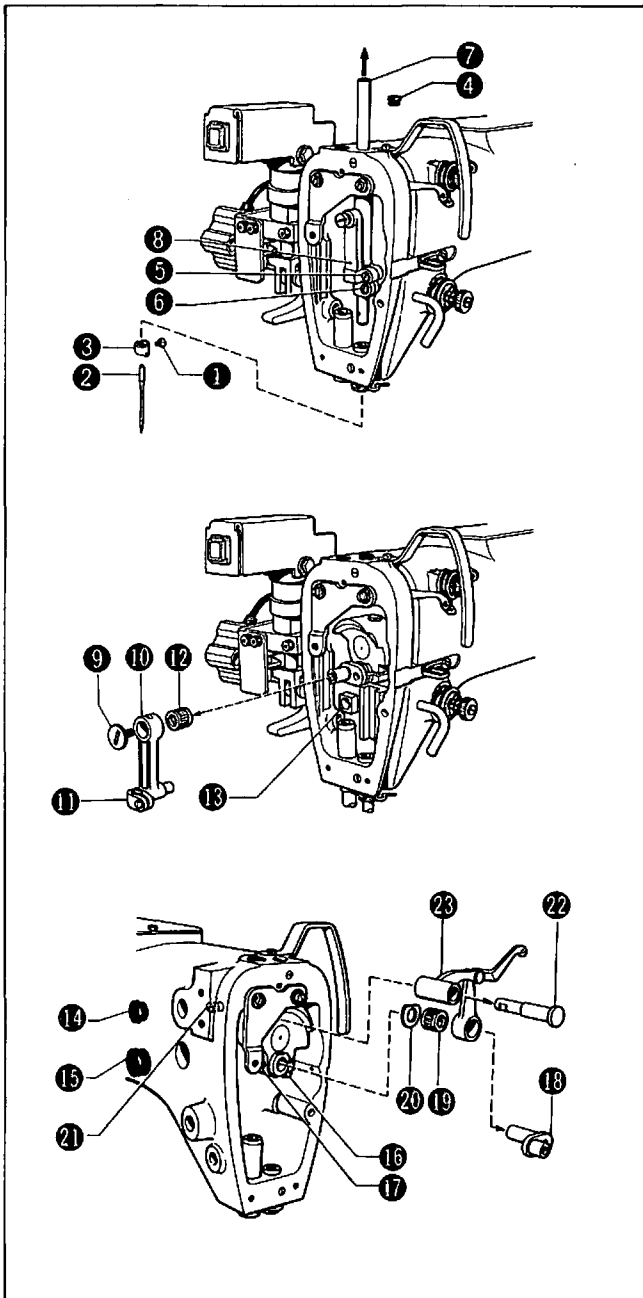
1. Remove the screw ①, and remove the bobbin case holder position bracket ②.
2. Loosen the three screws ④, and remove the rotary hook ③.



## 6 STEPPING FOOT

1. Remove the three screws ①, and remove the face plate ②.
2. Remove the screws ③, and remove the stepping foot drive cam ④.
3. Remove the presser foot adjusting screw ⑤, and remove the presser spring guide ⑥, presser spring ⑦.
4. Loosen the set screw ⑧, and remove the presser foot ⑨.
5. Loosen the set screw ⑩, pull the presser bar ⑪ down and out, and remove the stepping foot presser bar clamp ⑫.

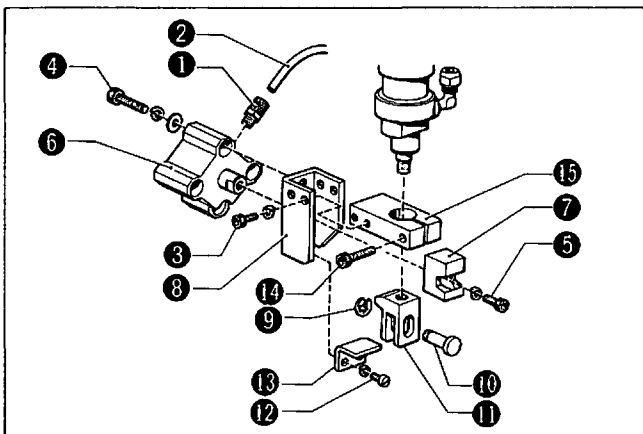
## 7 NEEDLE BAR, THREAD TAKE-UP



1. Remove the set screw **1**, and after removing the needle **2**, remove the thread guide **3**.
2. Remove the oil cap **4**.
3. Loosen screws **5** and **6**, pull the needle bar **7** up and out from the arm, and remove the stepping foot presser bar clamp **8**.

4. Remove the flat screw **9** (left-hand thread), and remove the needle bar clamp **11** still connected to the needle bar crank rod **10**.  
When doing this, be careful not to drop the needle bearing **12** or the needle bar guide block **13**.

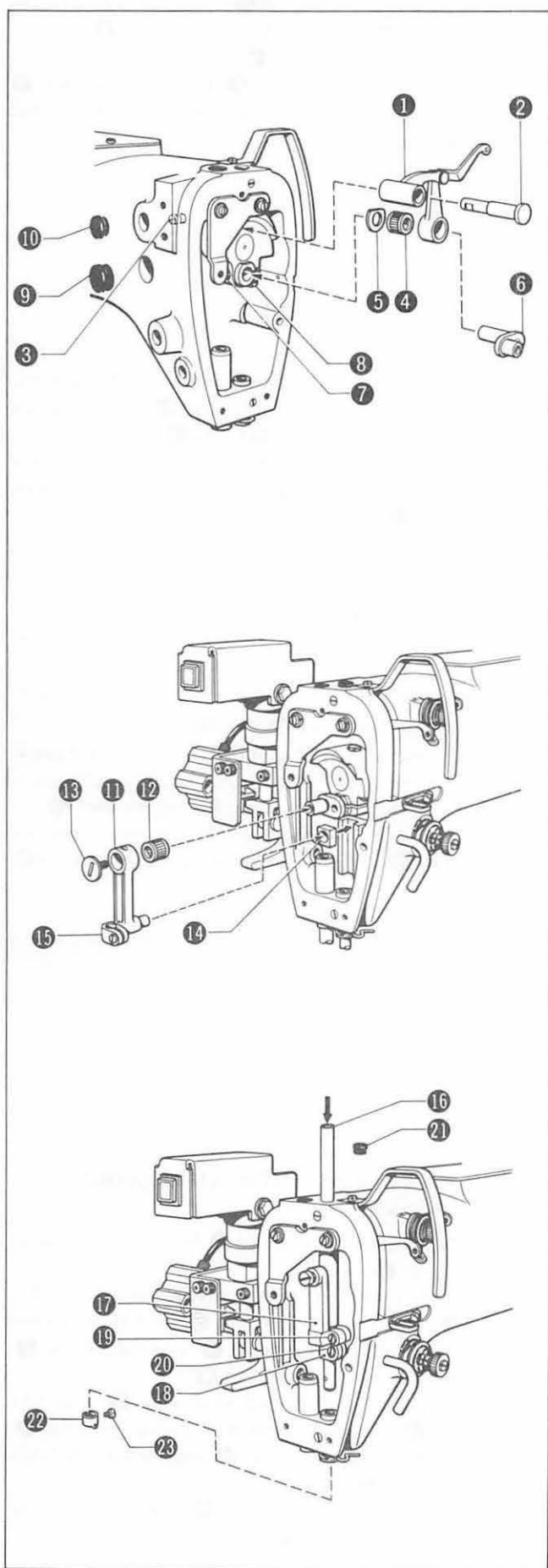
5. Remove oil caps **14** and **15**.
6. Loosen screws **16** and **17**, and remove the needle bar crank **18**. When doing this, be careful not to drop the needle bearing **19** and washer **20**.
7. Loosen screw **21**, pull out the rotary take-up stud **22** and remove the thread take-up lever **23**.



## 8 NEEDLE BAR DESCENT GUARD ASSEMBLY

1. Disconnect the air hose **2** from the nylon hose nipple **1**.
2. Remove the four Allen bolts **3**, two Allen bolts **4**, and single Allen bolt **5**, and then remove thin material cylinder **6**, coupling hook **7**, and the cylinder support **8**.
3. Remove the E-shaped snap ring **9**, and link pin **10**, and then remove the piston rod joint **11**.
4. Remove the two screws **12**, and remove the hook bracket **13**.
5. Loosen the Allen bolt **14**, and remove the cylinder bracket **15**.

## MACHINE HEAD ASSEMBLY PROCEDURES



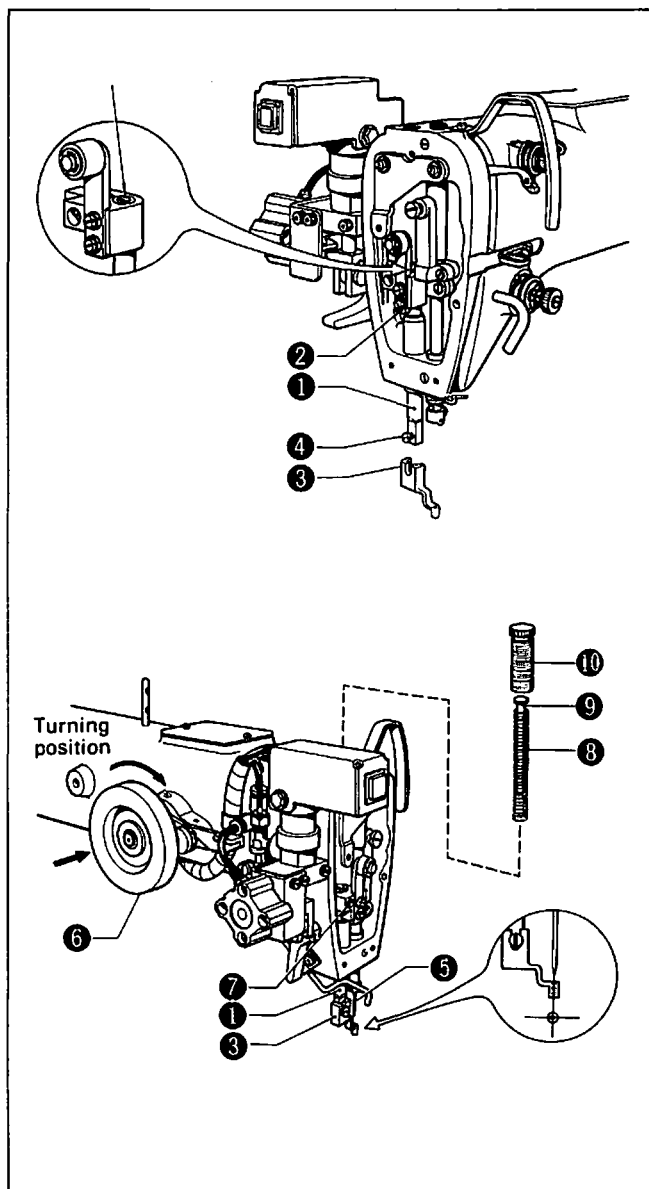
### 1 NEEDLE BAR, THREAD TAKE-UP

1. Connect the thread take-up lever ① to the arm by the thread take-up lever stud ②, and tighten screw ③.
2. Put the needle bearing ④ onto the thread take-up lever ①; while holding the washer ⑤ with one hand, insert the needle bar crank ⑥, and tighten screws ⑦ and ⑧ to hold it in place. Install so that screw ⑦ aligns with the screw in the needle bar crank ⑥.
3. Insert oil caps ⑨ and ⑩.

4. Put needle bearing ⑫ onto the needle bar crank rod ⑪ and connect to the needle bar crank with the flat screw ⑬ (left-hand thread).
5. Put the needle bar guide block ⑭ into the needle bar guide, and insert the tip of the needle bar clamp ⑮.

6. Insert the needle bar ⑯ from the top of the arm, pass it through the stepping foot needle bar clamp ⑰ and the needle bar clamp ⑱ and temporarily tighten screws ⑲ and ⑳.
7. Insert oil cap ㉑.
8. Install the needle bar thread guide ㉒ on the end of the needle bar, and tighten screw ㉓.

## 2 STEPPING FOOT



1. Pass the presser bar ① through the bottom of the arm, and install the stepping foot presser bar clamp ②.

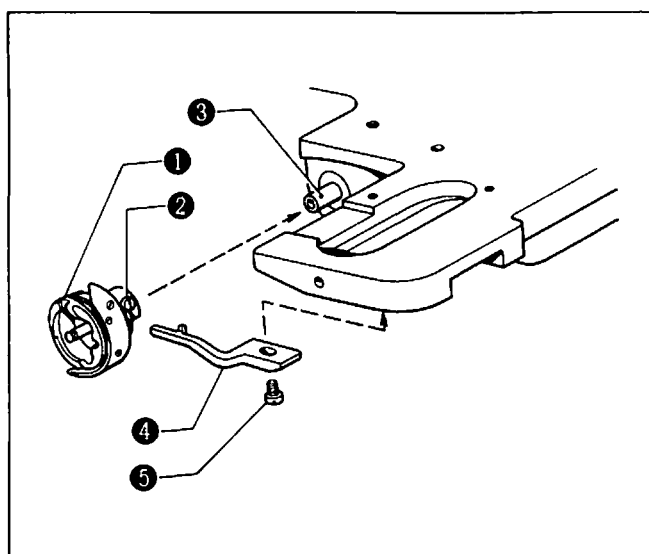
Install so that the end of the presser bar and the top end of the stepping foot presser bar clamp are in close alignment.

2. Install the presser foot ③ on the bottom end of the presser bar ① with screw ④.

3. Install the needle ⑤ in the needle bar.

4. After pressing pulley ⑥, turn the pulley ⑥ clockwise and lower the needle bar; now, move the presser bar ① and adjust so that the needle ⑤ aligns with the center of the needle hole in the presser foot ③, and then tighten set screw ⑦ to fix the position.

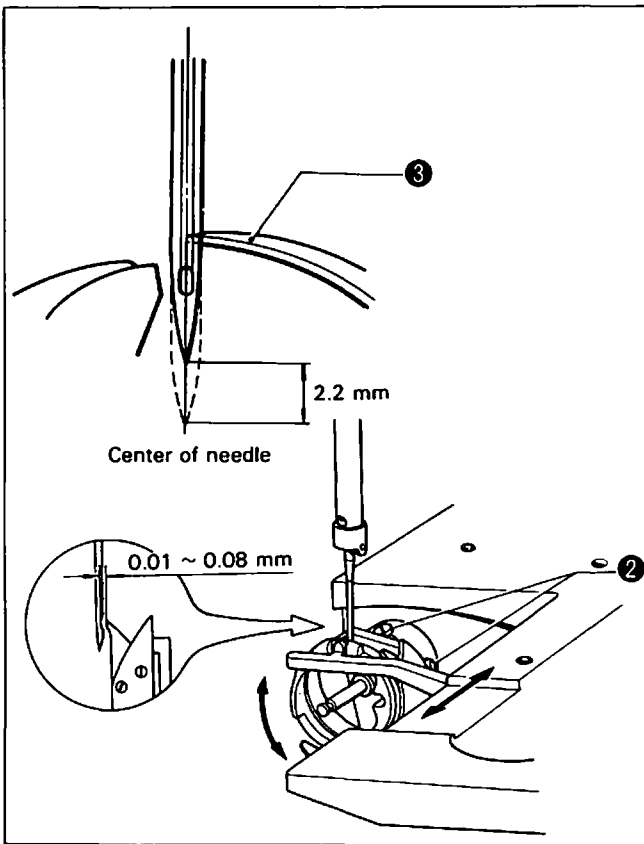
5. Set the presser bar ① in place, insert the presser spring ⑧, and presser spring guide ⑨, and tighten the presser spring adjustment screw ⑩ appropriately.



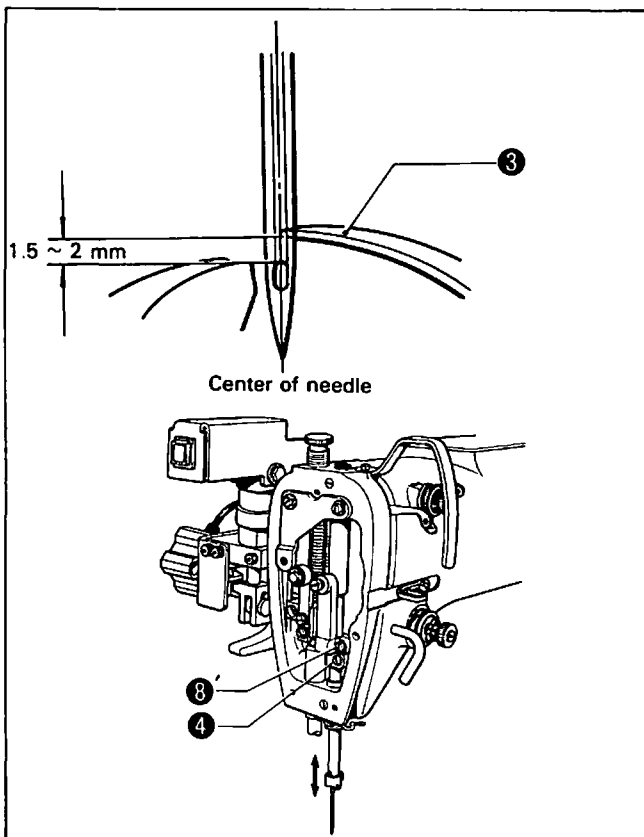
## 3 ROTARY HOOK

1. Temporarily connect the rotary hook ① to the rotary hook shaft ③ by the three set screws ②.

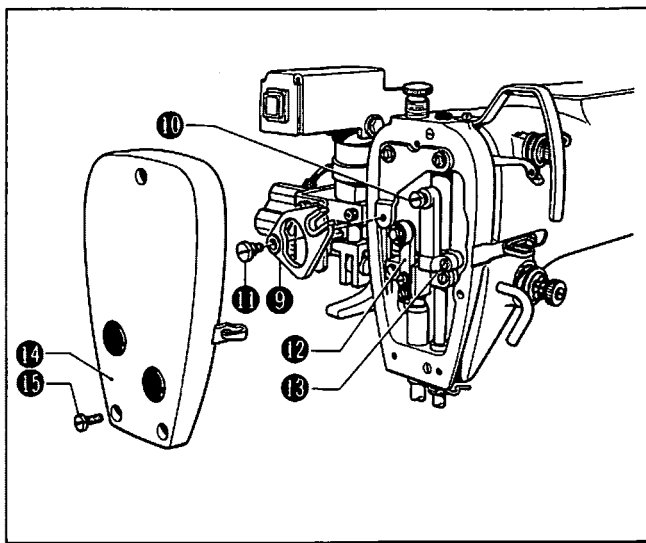
2. Install the bobbin case holder position bracket ④ to the bottom of the bed with screw ⑤.



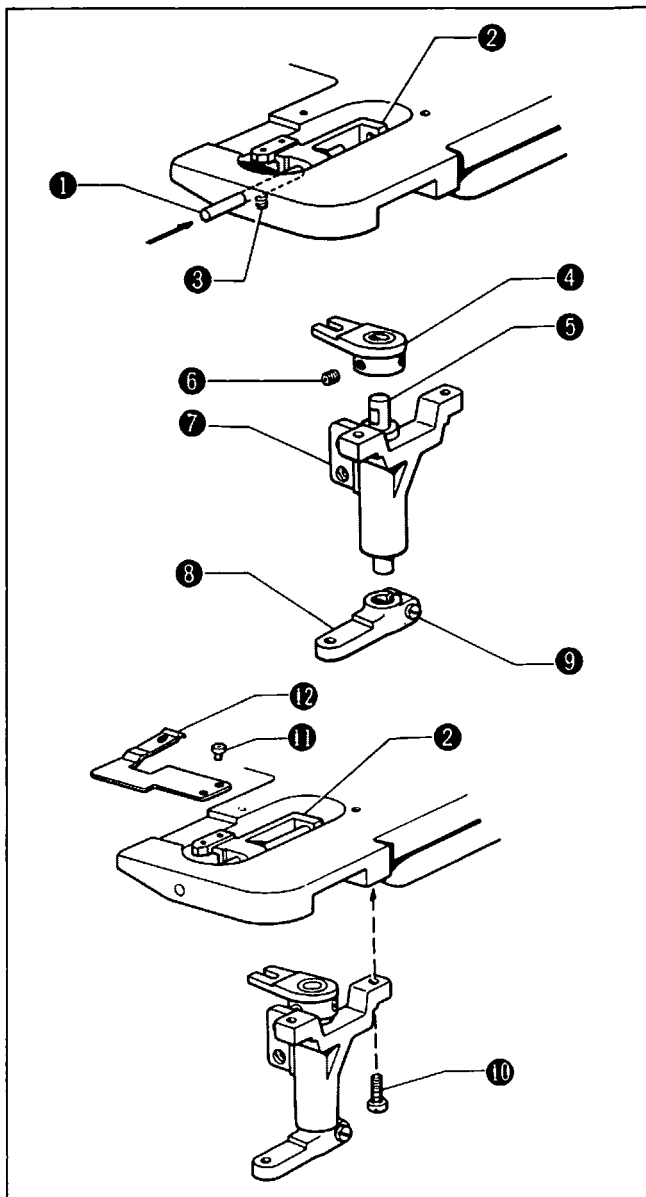
3. Turn the pulley and raise the needle 2.2 mm from the needle lowest position; at this time, loosen the three set screws 2 and rotate the rotary hook 1, adjusting so that the rotary hook point 3 aligns with the center of the needle. After adjusting, the gap between the rotary hook point and the needle should be between 0.01 ~ 0.08 mm.



4. When the pulley is turned and the rotary hook point 6, is aligned with the needle center, loosen screws 8 and 8', and adjust the vertical position of the needle bar so that the rotary hook point 6 to needle hole top gap is 1.5 ~ 2.0 mm.



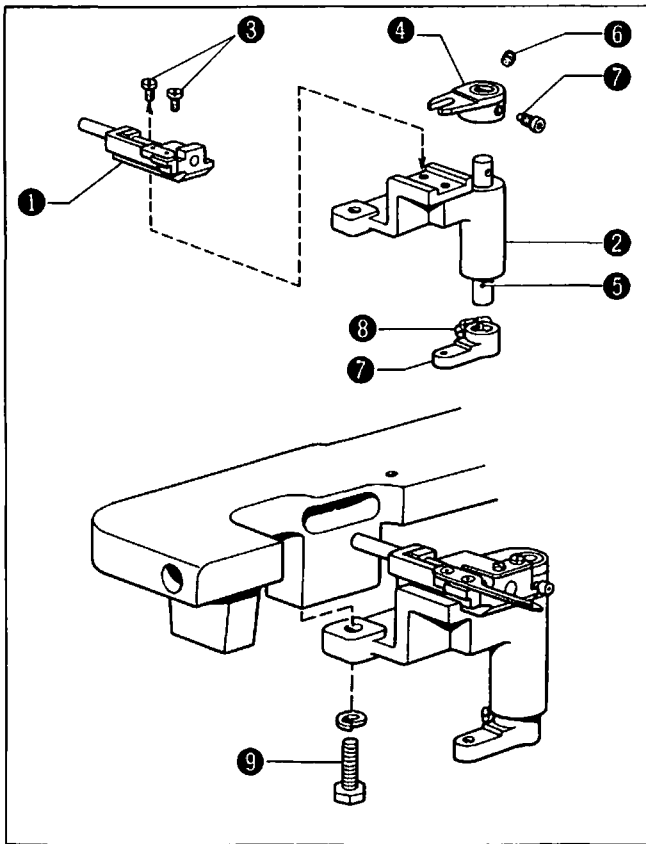
5. After mounting the U-part of the stepping foot drive cam ⑨ onto the stud screw ⑩ of the stepping foot needle bar clamp, secure it with screw ⑪.
6. Rest the stepping foot needle bar clamp ⑫ on the top of the needle bar clamp, and tighten in place with screw ⑬.
7. Attach the face plate ⑭ with the three screws ⑮.



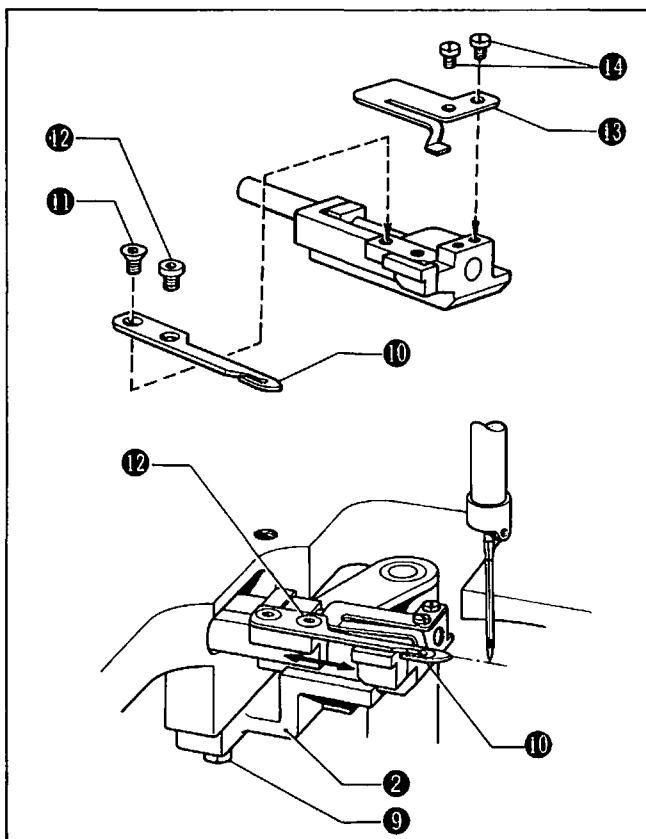
#### 4 THREAD CATCHER MECHANISM

1. Pass slide shaft B ① through the bed and install slider B ②.
2. Align the edge of slide shaft B ① even with the side of the bed, and tighten screw ③.
3. Connect knife rock arm B ④ to knifer rock arm shaft B ⑤ with the two screws ⑥. Install so that one of the screws meets the screw stop.
4. Pass knife rock arm shaft B ⑤ through the thread catcher base bracket ⑦; install the thread catcher lever ⑧ at the bottom of shaft B ⑤, and temporarily tighten screw ⑨ so that there is no vertical play (along the shaft).
5. Mount the U-part of knife rock arm B ④ onto the roller on the bottom of slider B ②; next, attach the thread catcher base bracket ⑦ to the bottom of the bed with two screws ⑩.
6. Temporarily install the thread catcher spring ⑪ with two screws ⑫.

## 5 THREAD TRIMMING MECHANISM

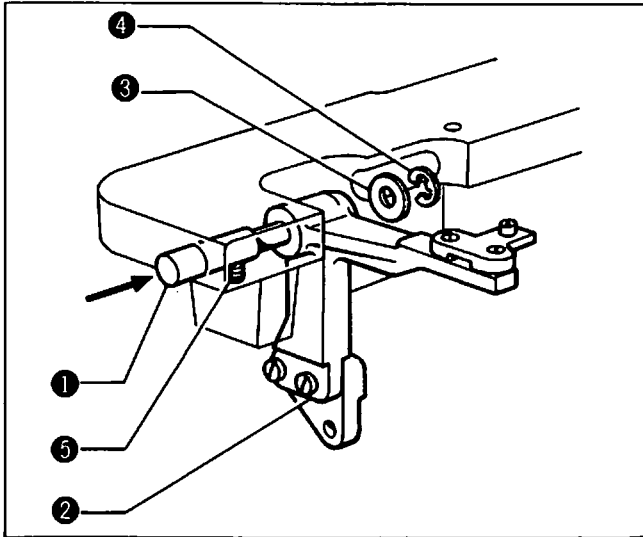


1. Install the slider assembly ① onto the thread trimming base bracket ② with two screws ③.
2. Install knife rock arm A ④ onto knife rock arm shaft A ⑤ with set screws ⑥ and ⑦. Be sure set screw ⑥ is aligned with the position alignment hole when tightening the screws.
3. Pass knife rock arm shaft A ⑤ through the thread trimming base bracket ②; install the thread trimming lever ⑦ on the bottom of shaft A ⑤, and temporarily tighten screw ⑧ so that there is no vertical play (along the shaft).
4. Mount the U-part of knife rock arm A ④ onto the roller at the bottom of the slider assembly ①; temporarily install the thread trimming base bracket ② with the two bolts ⑨.



5. Install the movable knife ⑩ with flat head screw ⑪ and screw ⑫. At this time, temporarily tighten screw ⑫ in the middle of the screw hole so that the movable knife ⑩ can be adjusted right or left.
6. Set the thread catcher spring ⑬ directly below the movable knife ⑩ and temporarily tighten the two screws ⑭ so that the spring does not slide horizontally.
7. Turn the pulley and lower the needle bar.
8. While pressing with your finger on the top of the movable knife ⑩ and sliding it in the direction of the arrow, move both the thread trimming base bracket ② and movable knife ⑩ so that the tip of the movable knife ⑩ aligns with the needle center; after adjusting, tighten the two bolts ⑨ and screw ⑫.

## 6 BOTTOM PLUNGER ASSEMBLY

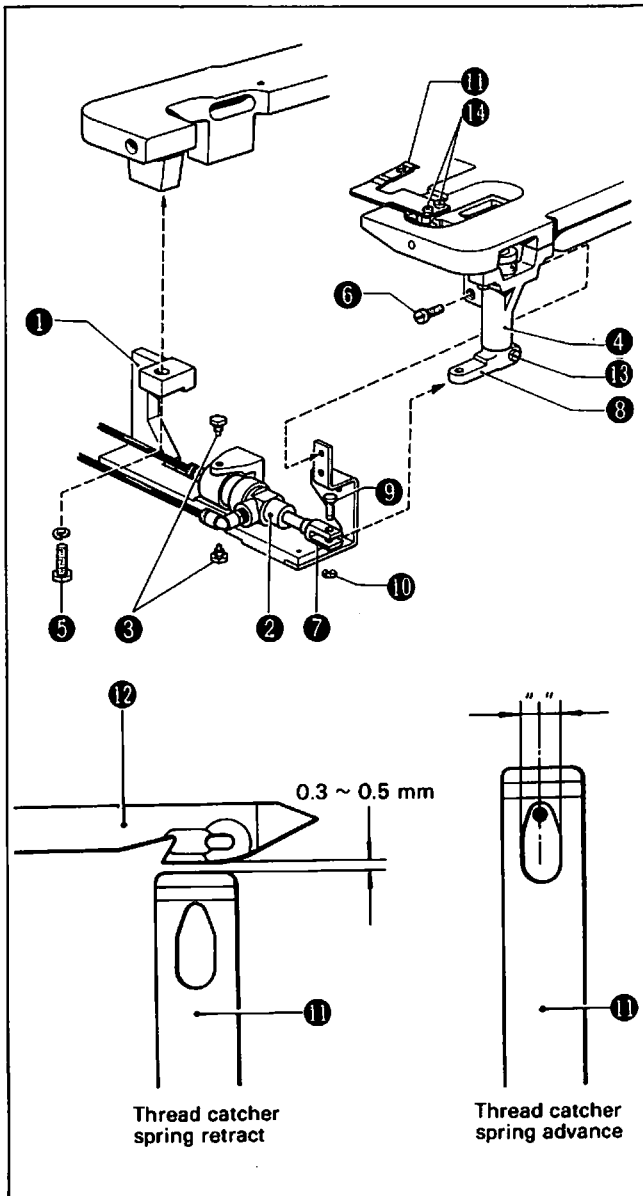


1. Pass the bottom lever shaft ① through the bed, and install the bottom lever ②.
2. Put the washer ③ on the bottom lever shaft ①, and attach the stop ring ④.
3. Align the end of the bottom lever shaft ① with the side of the bed and tighten screw ⑤.

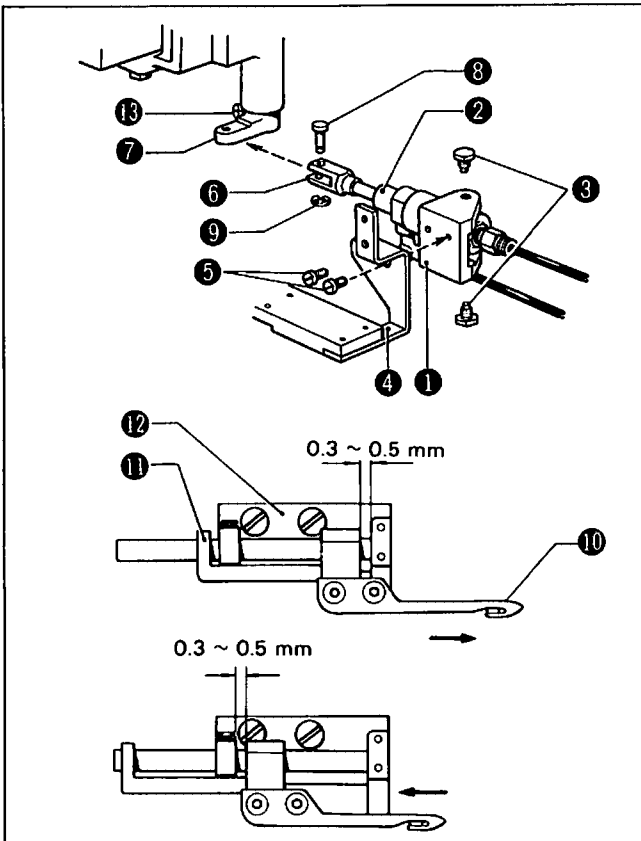
## 7 CYLINDERS

### (1) Thread Catcher Cylinder

1. Connect the thread catcher cylinder ② to the thread catcher cylinder base ① with the two cylinder mounting screws ③.
2. Temporarily install the thread catcher cylinder base ① with bolt ⑤ and the two screws ⑥ to both the bed and thread catcher base ④.
3. Connect the thread catcher cylinder rod joint ⑦ and the thread catcher lever ⑧ with link pin ⑨, and secure the link pin with stop ring ⑩. After connecting, check that the thread catcher cylinder moves smoothly, and then firmly tighten bolt ⑤ and the two screws ⑥.
4. Connect the correspondingly numbered air tubes to the elbows.
5. Move the thread catcher cylinder by hand and when the thread catcher spring ⑪ is fully retracted, loosen screw ⑬ and move the thread catcher lever ⑧ so that the gap between the spring ⑪ and movable knife ⑫ is between 0.3 ~ 0.5 mm.
6. Move the thread catcher cylinder by hand, and fully advance the thread catcher spring ⑪; next, turn the pulley, loosen the two screws ⑭, and adjust the needle so that the spaces are even on left and right sides of the needle when it is in the oval hole.

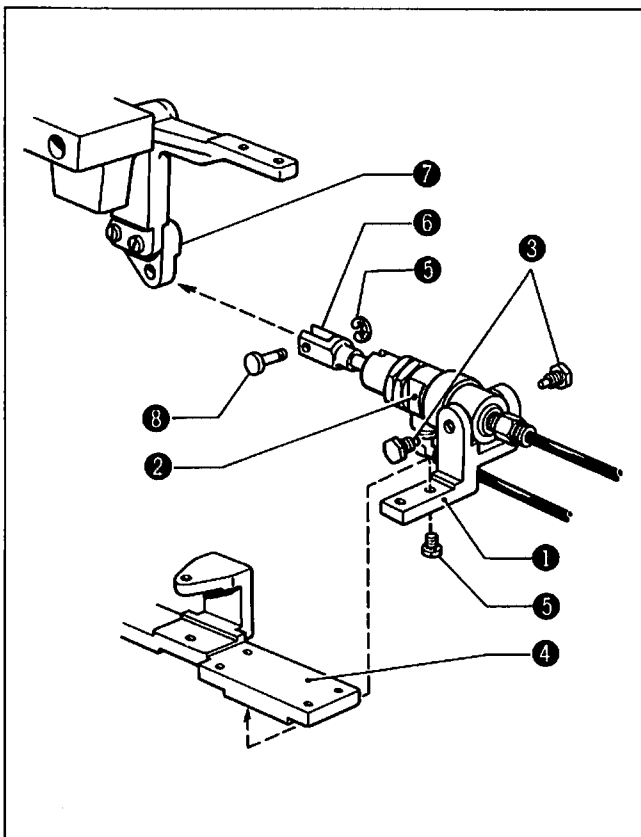






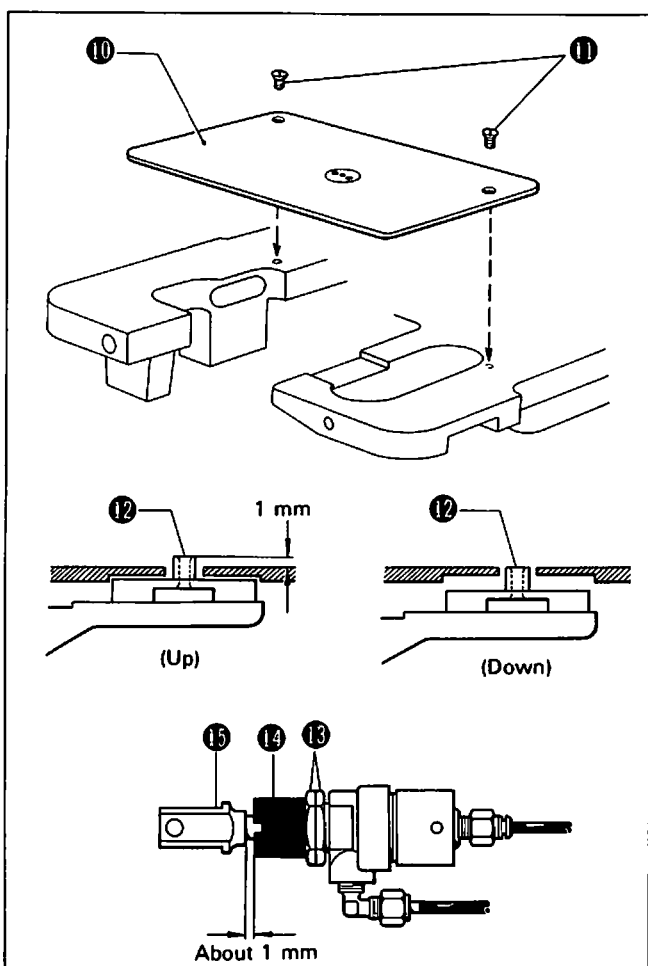
## (2) Thread Trimming Cylinder

1. Install the thread trimming cylinder ② on the thread trimming cylinder base ① with the two cylinder mounting screws ③.
2. Temporarily install the thread trimming cylinder base ① on the cylinder connecting plate ④ with the two set screws ⑤.
3. Connect the thread trimming cylinder rod joint ⑥ and the thread trimming lever ⑦ with link pin ⑧ and attach stop ring ⑨. After connecting these, confirm that the thread trimming cylinder moves smoothly, and then tighten the two set screws ⑤.
4. Connect the correspondingly numbered air tubes to the elbows.
5. While lightly pressing the top of the movable knife ⑩ with your finger, move the thread trimming cylinder by hand; loosen set screw ⑬ and move the thread trimming lever ⑦, adjusting the gap between the slider ⑪ and slider base ⑫ to within 0.3 ~ 0.5 mm when the movable knife is moved both forward and back.



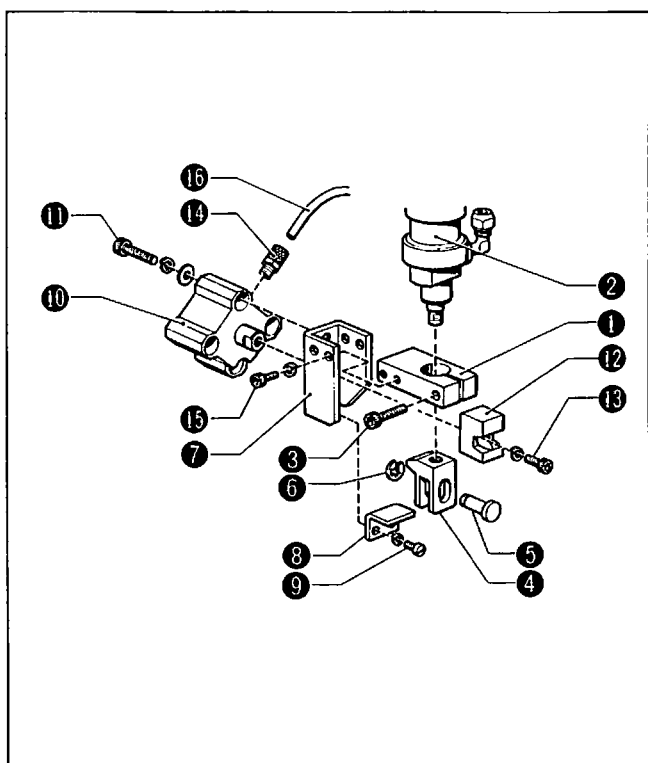
## (3) Bottom Cylinder

1. Install the bottom cylinder ② on the bottom cylinder base ① with the two cylinder mounting screws ③.
2. Temporarily install the bottom cylinder base ① onto the thread catcher cylinder base ④ with the 2 set screws ⑤.
3. Connect the bottom cylinder rod joint ⑥ and the bottom lever plate ⑦ with link pin ⑧ and attach stop ring ⑨. After connecting these, confirm that the bottom cylinder moves smoothly, and then tighten the two set screws ⑤.
4. Connect the correspondingly numbered air tubes to the elbows.



5. Install needle plate S ⑩ with two flat head screws ⑪.
6. Moving the bottom cylinder by hand, first lower the bottom plunger ⑫ and align the top end of the bottom plunger ⑫ with the top surface of the needle plate; next, raise the bottom plunger ⑫ fully, and adjust so that the top end of the plunger ⑫ is 1 mm above the needle plate, and then firmly tighten the two set screws ⑤ in this position.

\* If the up and down stroke of the bottom plunger is less than 1 mm, loosen nut ⑬, and increase the gap between the stopper ⑭ and rod joint ⑮. Likewise, if the stroke is greater than 1 mm, decrease the gap.

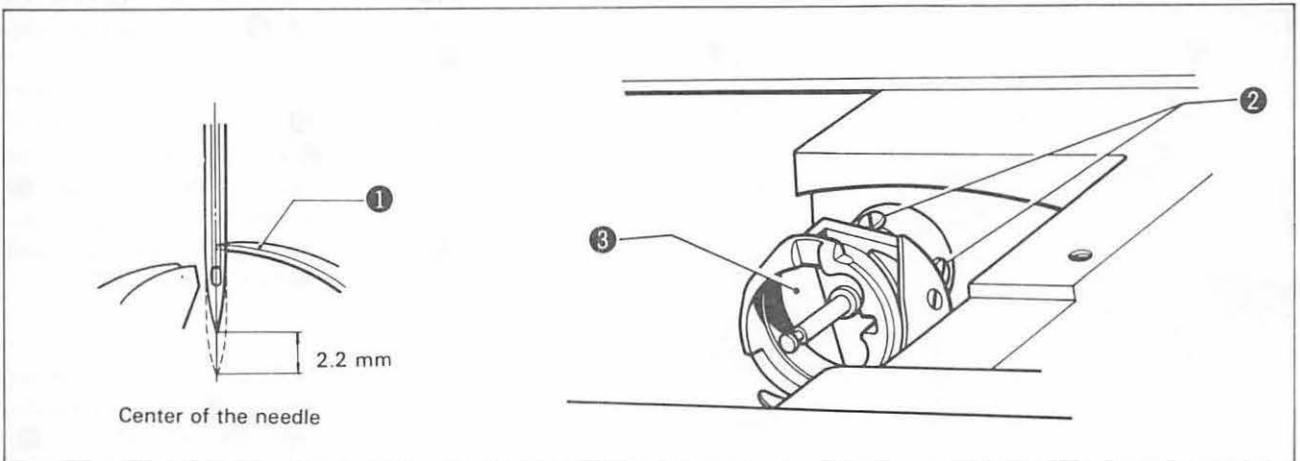


#### 8 NEEDLE BAR DESCENT GUARD ASSEMBLY

1. Mount the cylinder bracket ① on the presser foot lifter cylinder ②, and secure with the Allen bolt ③.
2. Mount the piston rod joint ④ on the presser foot lifter cylinder ②, insert the link pin ⑤, and secure it with the E-shaped snap ring ⑥.
3. Mount the hook bracket ⑧ on the cylinder support ⑦ with the two screws ⑨, and the thin material cylinder ⑩ with two Allen bolts ⑪.
4. Mount the coupling hook ⑫ with the Allen bolt ⑬ on the thin material cylinder ⑩, and then screw in the nylon hose nipple ⑮.
5. Mount the cylinder support ⑦ on the cylinder bracket ① with four Allen bolts ⑮, and then connect the air hose ⑯ to the nipple ⑮.
6. Finally, push the coupling hook ⑫ with a screwdriver to confirm that it moves freely. If it does not, loosen screw ⑨ and Allen bolts ⑪ and ⑮, adjust the hook so that it does move freely, and then retighten the screw and bolts.

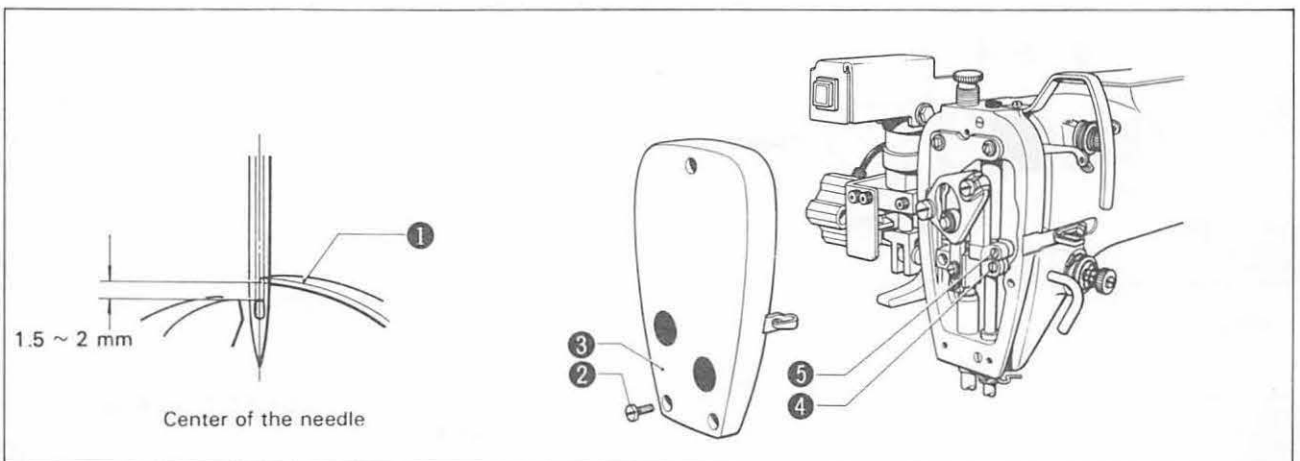
## STANDARD ADJUSTMENTS

### 1 ADJUSTMENT OF THE ROTARY HOOK



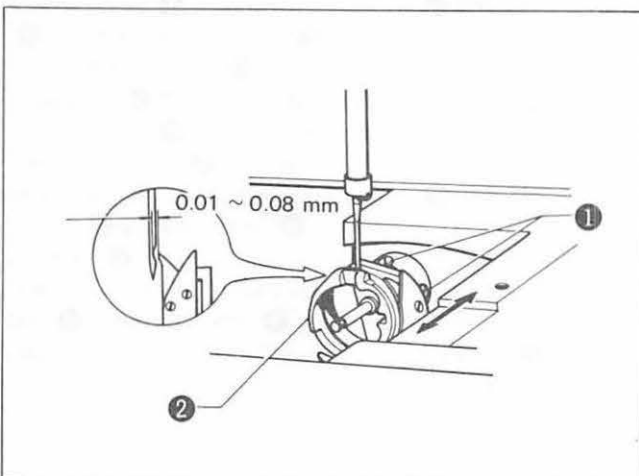
- ★ Turn the pulley and raise the needle bar 2.2 mm from the lowest position. Then, loosen the set screws ② and turn the rotary hook ③ to make an adjustment in such a way that the hook point ① of the rotary hook becomes aligned with the center of the needle.

### 2 ADJUSTMENT OF THE NEEDLE BAR HEIGHT



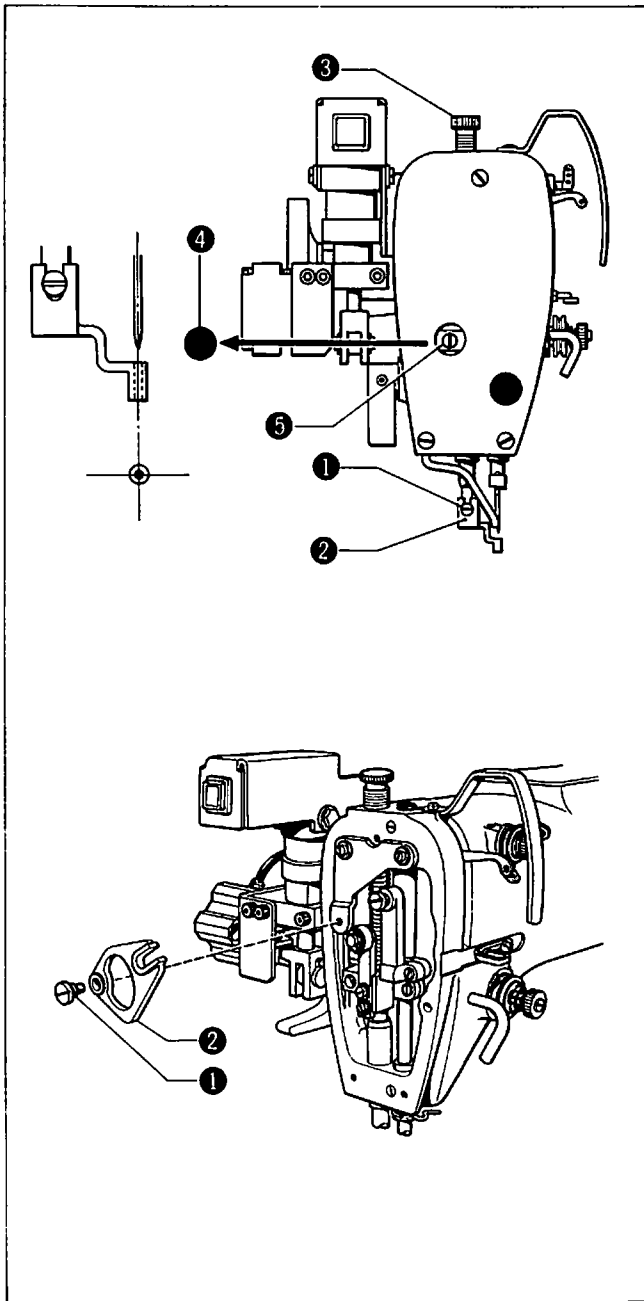
- Turn the pulley and align the rotary hook point with the needle center. Remove the three screws ②, and face plate ③, loosen screws ④ and ⑤, and vertically adjust the needle bar so that the rotary hook point ① to needle hole top gap is 1.5 ~ 2.0 mm.

### 3 ADJUSTMENT OF THE CLEARANCE BETWEEN THE NEEDLE AND THE ROTARY HOOK



- ★ Turn the pulley and align the hook point of the rotary hook with the center of the needle. Then, loosen the screws ① and make an adjustment by moving the rotary hook ② so that there is a clearance of 0.01 ~ 0.08 mm between the needle and the hook point of the rotary hook.

#### 4 ADJUSTMENT OF THE PRESSER FOOT



★ Lower the presser foot to the lowest position, and make adjustments according to the following procedure.

To lower the presser foot:

◎ **Before sewing**

Turn the test and intermediate sewing switch on, and then press the step back switch to lower the presser foot.

◎ **When emergency stop switch is pressed during sewing**

First release the emergency stop switch, press the step back switch, and set the presser foot to the down position. Now press the read/write switch to lower the presser foot to the lowest position.

◎ **During test feed**

First release the test/intermediate sewing switch, and then press the read/write switch to lower the presser foot to the lowest position. The feed mechanism will again function when the test/intermediate sewing switch is pressed again.

- (1) Turn the pulley, and check to confirm that the needle enters the center of the needle hole of the presser foot ②. If not, loosen the presser adjustment screw ③ sufficiently, remove the cap ④, loosen the set screw ⑤, and make an adjustment by moving the presser foot.

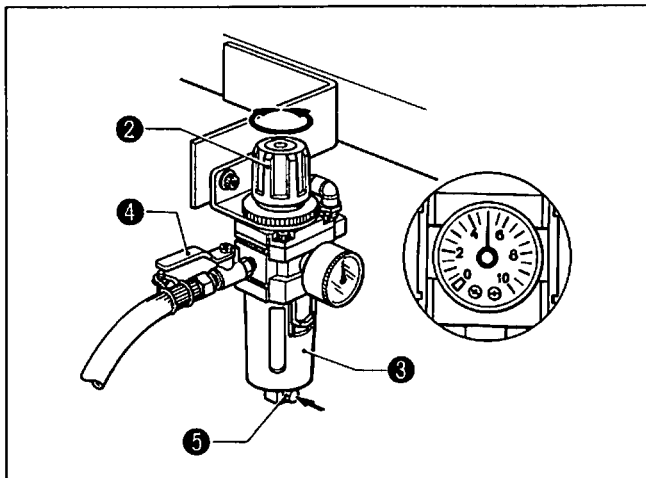
After making the necessary adjustment, tighten the presser adjustment screw ③ and the set screw ⑤.

**Note:** that when the stepping presser foot is not being used, the sewing material can become misaligned if the presser foot is lowered too far. On the other hand, if it is not lowered sufficiently, it can cause stitch-skipping to occur.

- (2) Loosen the set screw ①, and then tighten it at the position at which the lower surface of the presser foot ② lightly contacts the upper surface of the sewing material.

☒ If the stepping presser foot is not to be used. If the stepping presser foot is not to be used, it can be removed in the following procedure.

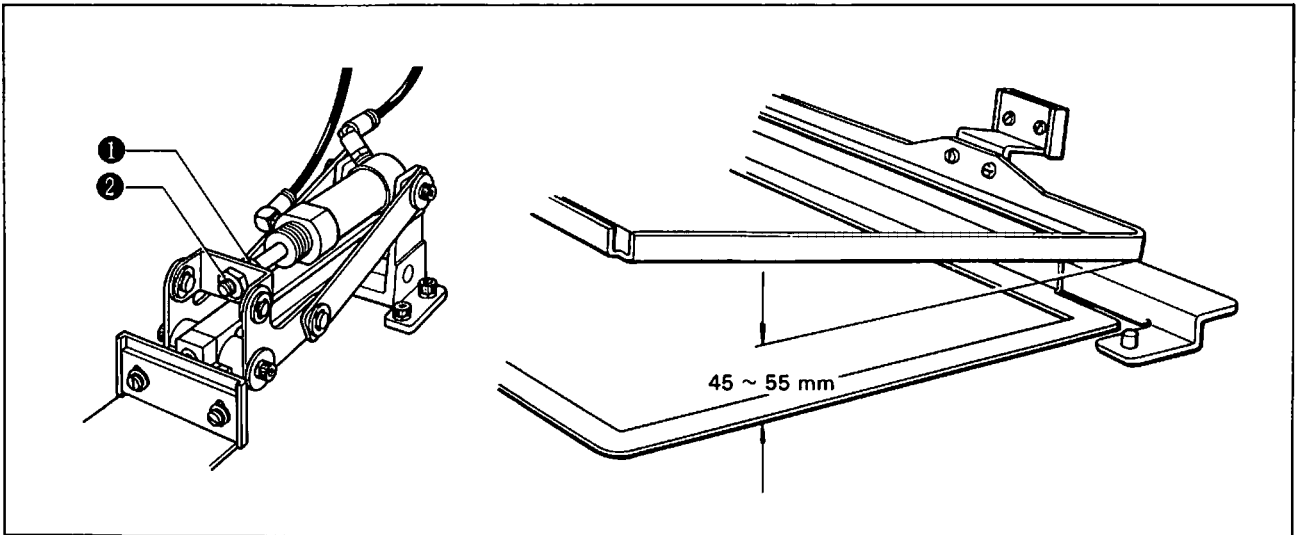
- (1) Remove the face plate.
- (2) Turn the pulley, and raise the needle bar to the highest position.
- (3) Remove the stud screw ①, and then remove the stepping presser cam ②.



### 5 AIR PRESSURE ADJUSTMENT

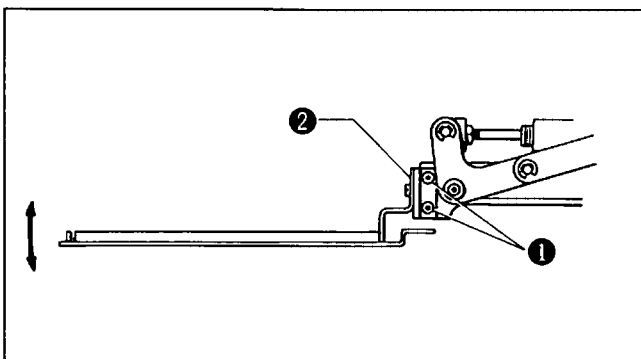
- Use an air pressure at 5 kgf/cm<sup>2</sup>. Pull up the cap at the top of the air unit ① and adjust the pressure. After adjustment, push the cap down to lock it.
- When water has gathered in the bottle ②, close the air cock ③ and push the drain cock ④ to remove the water.

### 6 WORK CLAMP ADJUSTMENT



To adjust the work clamp install a standard work clamp. The distance from the bottom of the back of the work clamp to the top of the needle plate should be within 45 ~ 55 mm when the work clamp is raised; if it is not, loosen nut ① and slide nut ② in or out and adjust as needed. When adjusting, if nut ② is turned right, the work clamp opening increases. Adjust the nut left or right as needed.

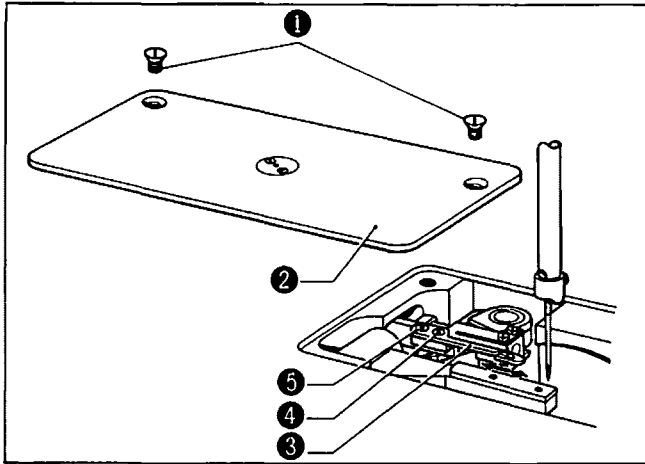
\* Increasing the work clamp opening makes it harder to hold material securely. Decreasing the work clamp opening increases work clamp pressure.



### 7 WORK CLAMP POSITION ADJUSTMENT

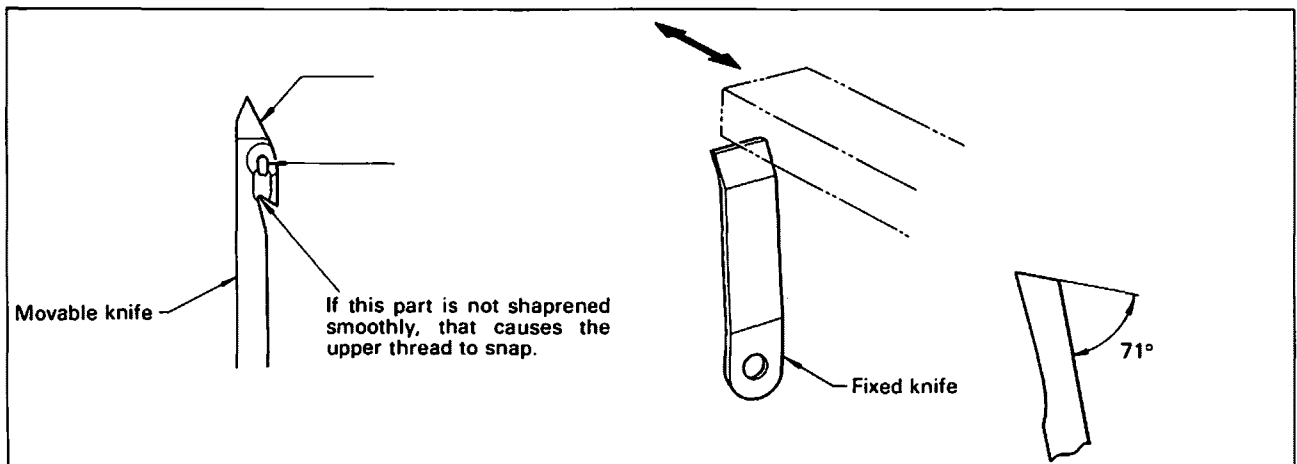
The work clamp should be positioned so as to apply work clamp pressure evenly over the material. To adjust, loosen the four Allen screws ① and move the clamp guide ② in the arrow direction as necessary. When using a unit work clamp, be sure to adjust the clamp guide angle the same on both right and left.

## 8 MOVABLE KNIFE ADJUSTMENT



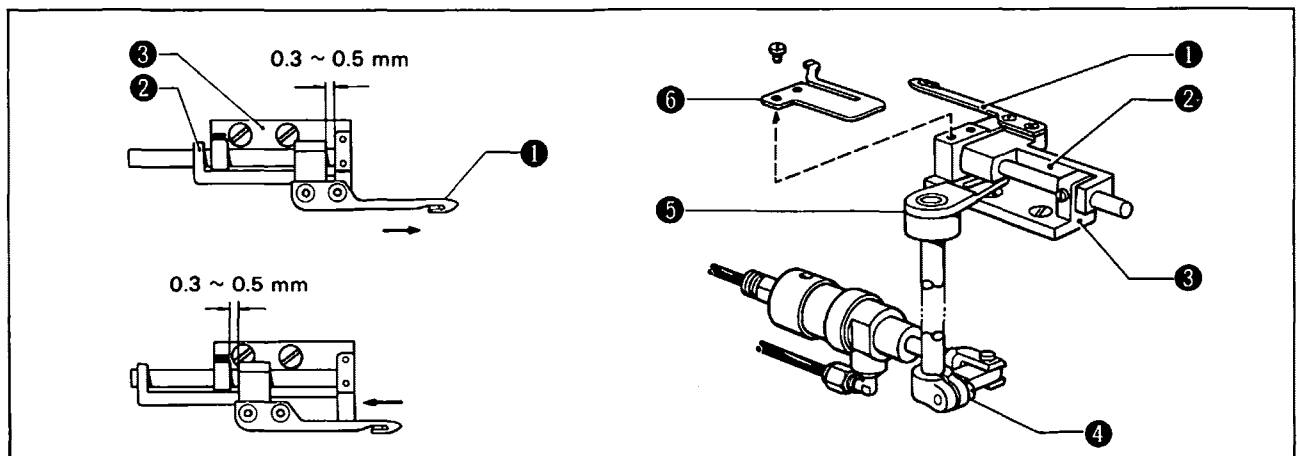
★ Adjust after releasing the air pressure.

1. Remove the screws ① and remove needle plate S ②.
2. Turn the pulley and lower the needle.
3. While pressing on the top of the movable knife ③ with your finger and sliding the movable knife ③ in the arrow direction, loosen set screw ④ and screw ⑤ to adjust so that the movable knife tip aligns with the needle center.



\* When thread trimming leaves the tip of the thread rough or ragged, sharpen the fixed knife as shown in the illustration. Note that the movable knife cannot be sharpened; replace it with a new movable knife.

## 9 THREAD TRIMMING SLIDER ADJUSTMENT

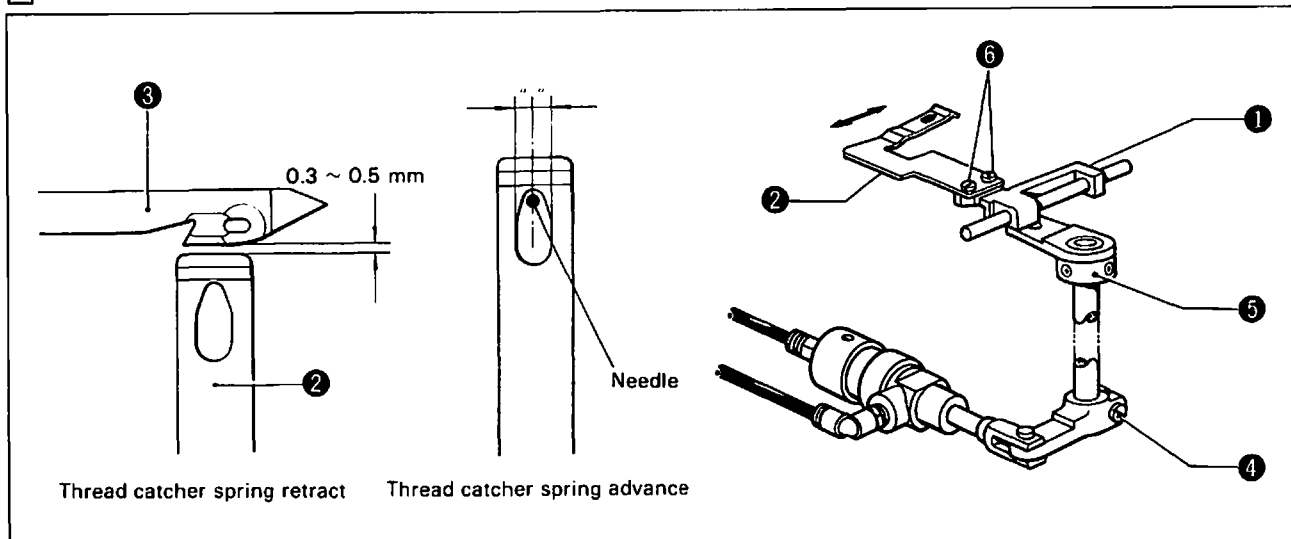


★ Adjust after releasing the air pressure.

While pressing lightly on the top of the movable knife ① and moving the slider ② by hand in the arrow direction, loosen set screw ④ and move knife rock arm A ⑤, adjusting the gap between the slider ② and the slider base ③ to between 0.3 ~ 0.5 mm.

\* Install the lower thread catcher spring ⑥ directly below the movable knife ①.

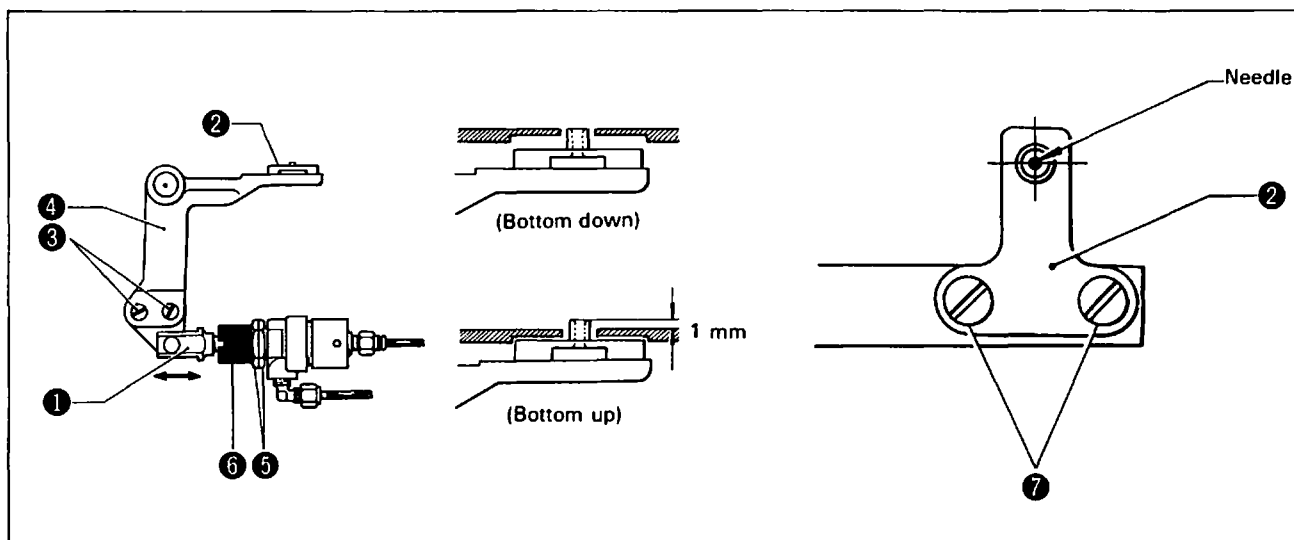
## 10 THREAD CATCHER SLIDER ADJUSTMENT



★ Adjust after releasing the air pressure.

- (1) Move slider B ① by hand and fully retract the thread catcher spring ②; loosen set screw ④ and move knife rock arm B ⑤, adjusting both front and back so that the gap between the movable knife ③ and thread catcher spring ② is within 0.3 ~ 0.5 mm.
- (2) Move slider B ① by hand and with the thread catcher spring ② fully advanced, turn the pulley; when the needle is lowered into the oval hole, loosen set screw ⑥ and move the thread catcher spring ②, adjusting so that the spaces on the left and right sides of the needle are equal.

## 11 BOTTOM PLUNGER ADJUSTMENT



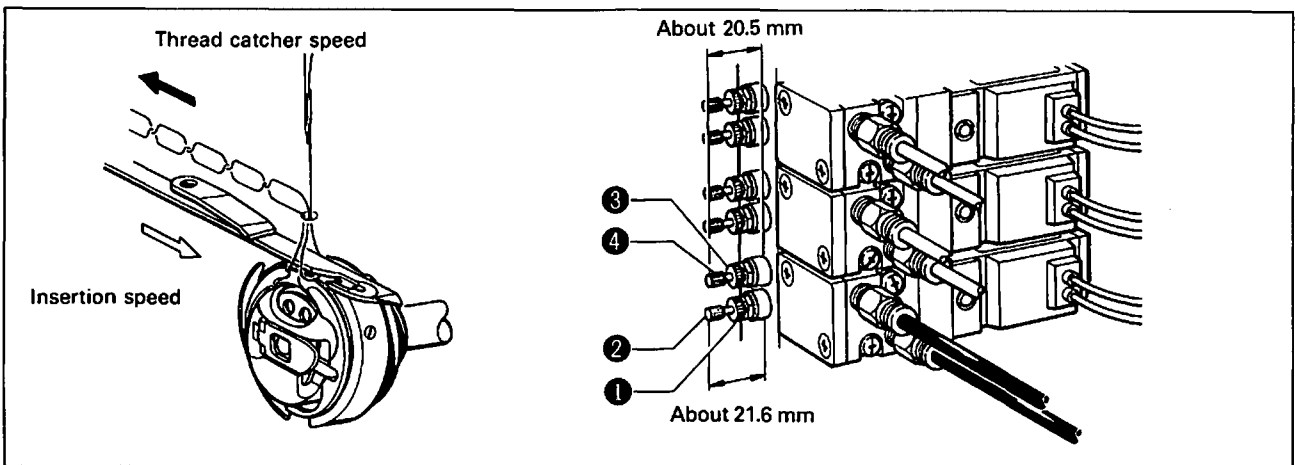
★ Adjust after releasing the air pressure.

- (1) Move the rod joint ① by hand and lower the bottom plunger ②. Loosen the two screws ③ and move the bottom lever ④, adjusting so that the top of the bottom plunger and top of the needle plate are even.
- (2) Move the rod joint ① by hand, and lift the bottom plunger ②; loosen nut ⑤ and adjust the gap between the stopper ⑥ and rod joint ① so that the top of the bottom plunger ② is 1 mm above the top of the needle plate.

\* Adjustment is easier if the cylinder has been disconnected.

- (3) With the bottom lever ④ raised manually, turn the pulley and lower the needle bar; loosen the two set screws ⑦ and move the bottom plunger, adjusting so that the needle is in the center of the needle hole in the bottom plunger ②.

**12 THREAD TRIMMING CYLINDER SPEED ADJUSTMENT (third valve from bottom in eight valve series)**



● **Movable Knife Speed**

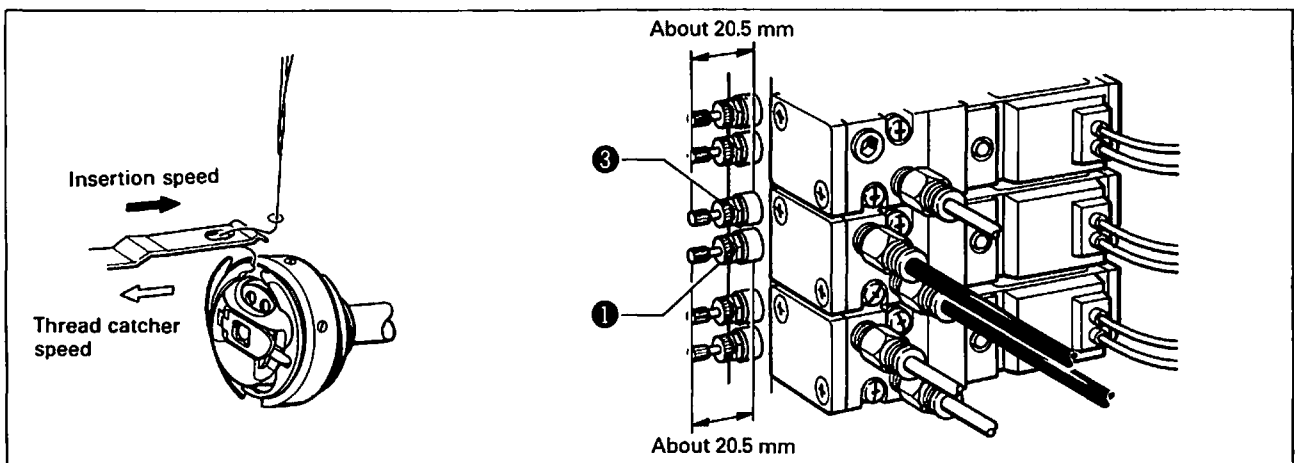
If the movable knife speed is slower than necessary, the timing of the movable knife entering the upper thread loop will be late and may result in thread trimming misses. Adjust the movable knife to insert as quickly as possible by loosening nut ① and turning the speed control ②.

● **Movable Knife Returning Speed**

If the movable knife returning speed is faster than necessary, the thread will be cut by only the fixed knife, and the needle thread may be too short. Furthermore, if it is too slow, the thread will not be cut until sewing continues, and will result in thread trimming misses and defects in sewing. Therefore, adjust so that thread trimming finishes before the feed mechanism advances to the next sewing position. Adjust by loosening nut ③, and turning speed control ④.

\* Values in the above illustration may vary slightly. Use them as a guide.

**13 THREAD CATCHER CYLINDER ADJUSTMENT (fourth valve from top in eight valve series)**



● **Thread Catcher Speed**

If the thread catcher speed is faster than necessary, the thread catcher spring will advance during the movable knife's thread trimming operation and result in lower thread trimming misses. Furthermore, if it is slower than is necessary, the thread catcher will strike the needle before the thread trimming operation ends. Therefore, loosen nut ① and turn the speed control ②, adjusting to a speed which does not interfere with thread trimming.

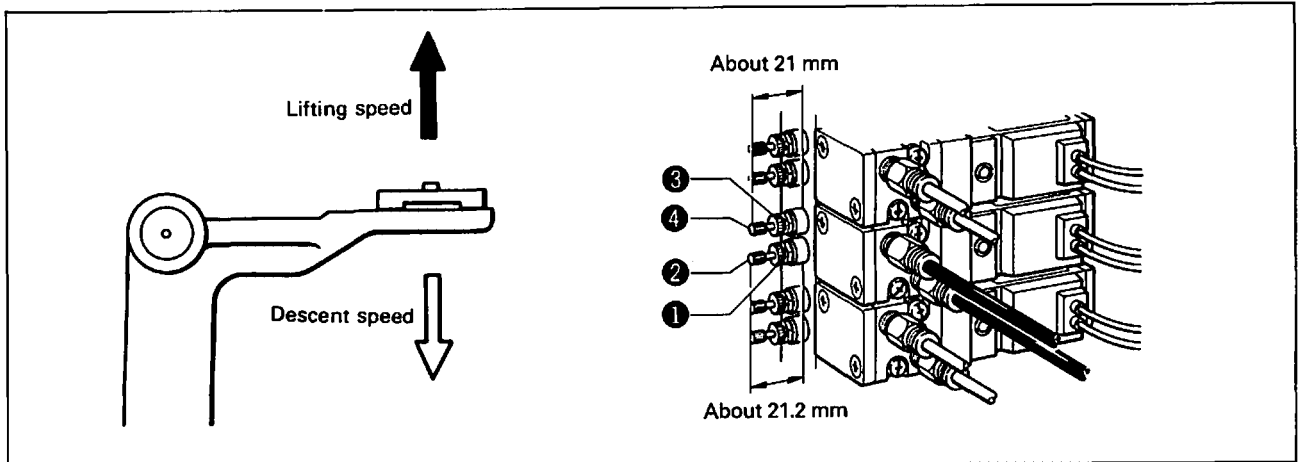
● **Thread Catcher Returning Speed**

If the thread catcher speed is faster than is necessary, a upper thread will be caught by the thread catcher, longer, and a longer upper thread will be left on the back of the sewn article. Furthermore, if it is slower than necessary, the thread catcher will retract after the thread has pulled out of the oval hole in the thread catcher and the upper thread will not be caught. Therefore, loosen nut ③ and turn speed control ④, adjusting to a speed that will leave the upper thread as consistently short as possible.

\* Values in the above illustration may vary slightly. Use them as a guide.



**14 BOTTOM CYLINDER SPEED ADJUSTMENT (fourth valve from bottom in eight valve series)**



● **Bottom Plunger Lifting Speed**

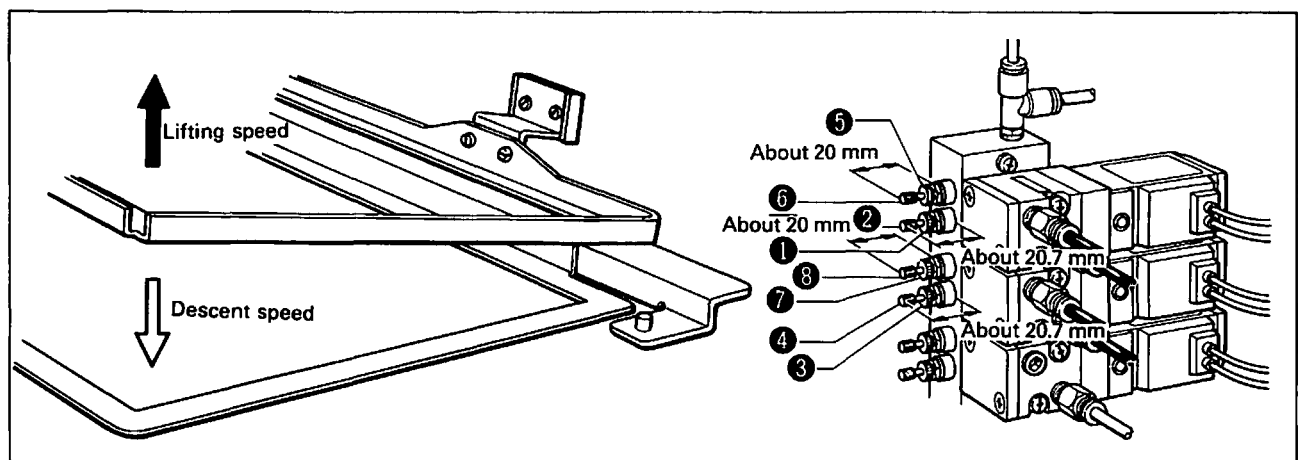
A synchronization signal at the first stitch causes the bottom plunger to rise. Consequently, if the lifting speed is too slow, sewing will continue for several stitches with the bottom plunger in the lowered position, and the effect of the bottom plunger will be lost. Therefore, loosen nut ❶ and turn speed control ❷, adjusting so that the bottom plunger operates as quickly as possible.

● **Bottom Plunger Descent Speed**

If the descent speed is too slow, the bottom plunger may strike the feed plate when material is being fed. Therefore, loosen nut ❸ and turn speed control ❹, adjusting so that the plunger drops before the feed mechanism proceeds to the next sewing step.

\* Values in the above illustration may vary. Use them as a guide.

**15 WORK CLAMP CYLINDER SPEED ADJUSTMENT (second valve from bottom in eight valve series)**



● **Work Clamp Lifting Speed**

If the work clamp lifting speed is faster than necessary, the entire work clamp will vibrate. Loosen nuts ❶ and ❸ and turn speed controls ❷ and ❹, adjusting to a speed where the work clamp does not vibrate.

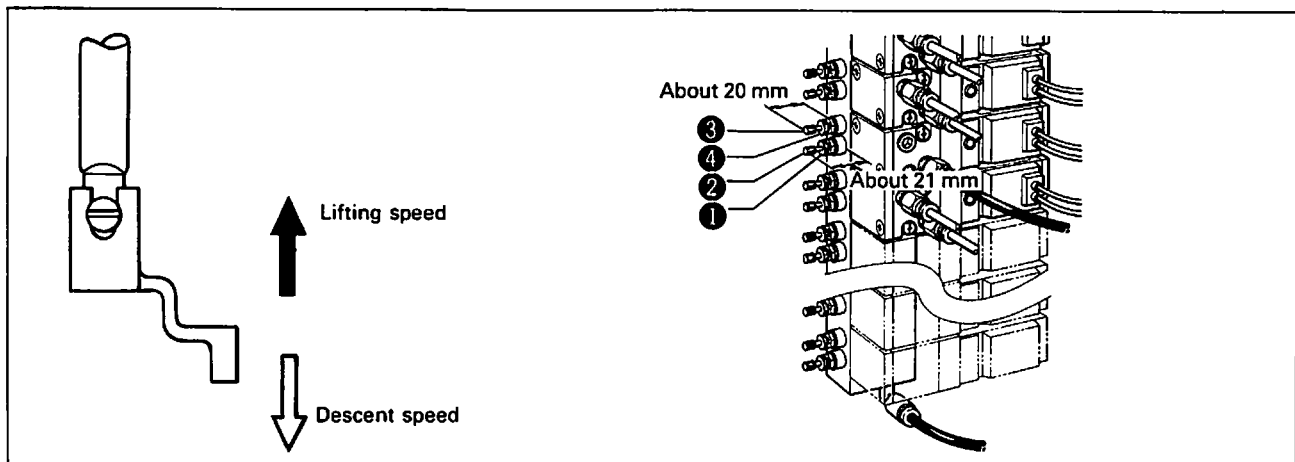
● **Work Clamp Descent Speed**

If the work clamp descent speed is faster than necessary, a banging sound may be heard from the work clamp striking the feed plate. Loosen nuts ❺ and ❽ and turn speed controls ❻ and ❿, adjusting so that there is no banging.

Note: Adjust speed controls ❷ and ❹, and ❻ and ❿ in pairs so that both right and left work clamp cylinders operate at the same speed.

\* Values in the above illustration may vary. Use them as a guide.

**16 PRESSER FOOT LIFTER CYLINDER SPEED ADJUSTMENT**  
(third valve from bottom in eight valve series)



● **Presser Foot Lifting Speed**

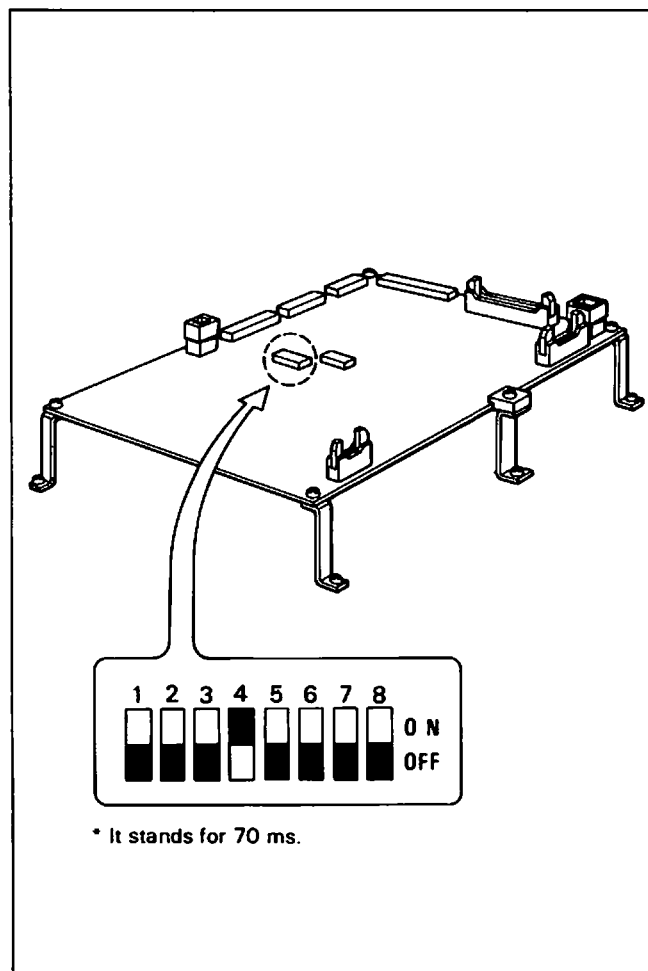
If the presser foot lifting speed is slower than necessary, the presser foot may strike and damage the work clamp or cassette. Therefore, loosen nut ① and turn speed control ②, adjusting so that the presser foot rises as quickly as possible.

● **Presser Foot Descent Speed**

Note that presser foot descent speed is constant, and speed control valve ④ will not vary it. However, loosen nut ③, and turn speed control valve ④ to adjust as shown in the above picture.

\* Values in the above figure will vary slightly with different machines; use these as a guide.

**17 MOVABLE KNIFE TIMING ADJUSTMENT**



The thread trimming signal is adjusted to the needle bar's down position. However, if the solenoid valve turns on with the transmission of the needle bar lowest signal, the movable knife will operate before the upper thread loop is formed and the upper thread will not be cut. To prevent this, switch the movable knife timing dip switch on the control circuit board, set a delay time for the solenoid valve to turn on after the needle bar lowest signal is transmitted, and adjust to a timing for no thread trimming misses.

Delay time can be adjusted in 16 steps of 10 ms each. Refer to the table on the next page for dip switch positions.

\* Switches No. 5 ~ 8 of the movable knife timing dip switches are not used. They should be set to OFF.

Note: The movable knife timing is adjustable because the needle lowest signal (an electrical signal) causes the thread trimming mechanism to switch the solenoid valve, air pressure causes the cylinders to operate, and signal positions may vary due to the precision of mechanical parts.

○ This table shows the delay time resulting from dip switch positioning.

Dip switch				Delay time
1	2	3	4	
ON	ON	ON	ON	0 ms
OFF	ON	ON	ON	10 ms
ON	OFF	ON	ON	20 ms
OFF	OFF	ON	ON	30 ms
ON	ON	OFF	ON	40 ms
OFF	ON	OFF	ON	50 ms
ON	OFF	OFF	ON	60 ms
OFF	OFF	OFF	ON	70 ms

Dip switch				Delay time
1	2	3	4	
ON	ON	ON	OFF	80 ms
OFF	ON	ON	OFF	90 ms
ON	OFF	ON	OFF	100 ms
OFF	OFF	ON	OFF	110 ms
ON	ON	OFF	OFF	120 ms
OFF	ON	OFF	OFF	130 ms
ON	OFF	OFF	OFF	140 ms
OFF	OFF	OFF	OFF	150 ms

[Delay time and thread trimming misses]

Delay time	0	50 ms	60 ms	70 ms	80 ms	90 ms	100 ms	110 ms
Thread trimming misses %		80	0	0	0	0	5	100

4 steps

[Time between thread trimming operations and thread trimming misses]

Delay time		0	50 ms	60 ms	70 ms	80 ms	90 ms	100 ms	110 ms
Thread trimming misses %	Long time		80	0	0	0	0	5	100
	Short time		100	80	0	0	0	0	70

☒ Selection of a delay time for no thread trimming misses

Thread trimming timing will vary with each of various conditions. However, because there are normally around 4 ~ 5 speed settings with no trimming misses, adjust to the timing speed that best matches the sewing conditions.

(1) Feed programs in which the time between thread trimming operations is short as compared with programs in which this time is long (30 seconds or more).

- Fast timing results in many thread trimming misses.
- Likewise, slow timing results in fewer thread trimming misses.

Delay time		50 ms	60 ms	70 ms	80 ms	90 ms	100 ms	110 ms
Thread trimming misses %	Accelerated stroke hook timing	20	0	0	0	5	80	100
	Standard hook timing	80	0	0	0	0	5	100
	Delayed hook timing	100	10	0	0	0	0	80

Delay time		50 ms	60 ms	70 ms	80 ms	90 ms	100 ms	110 ms
Thread trimming misses %	Thick material	100	0	0	0	0	0	20
	Medium-thick material	80	0	0	0	0	5	100
	Thin material	20	0	0	0	20	100	100

(2) Needle bar stroke and thread trimming misses  
When the hook timing is accelerated

- Slow timing increases thread trimming misses.
- Likewise, fast timing decreases thread trimming misses.

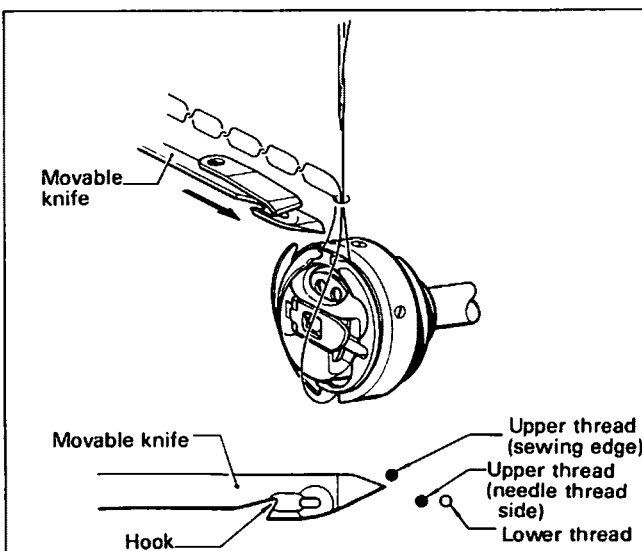
When the hook timing is delayed

- Fast timing increases thread trimming misses.
- Slow timing decreases thread trimming misses.

(3) Sewing thick and thin materials and thread trimming misses

- With thick materials, the delay time has a tendency to increase.
- Likewise, with thin materials, the delay time has a tendency to decrease. (The delay time is nearly the same when timing is fast; slow timing tends to change more.)

(4) Special threads and thread trimming misses  
With andalia and similar threads, the delay time has a tendency to decrease the same as with thin fabrics.

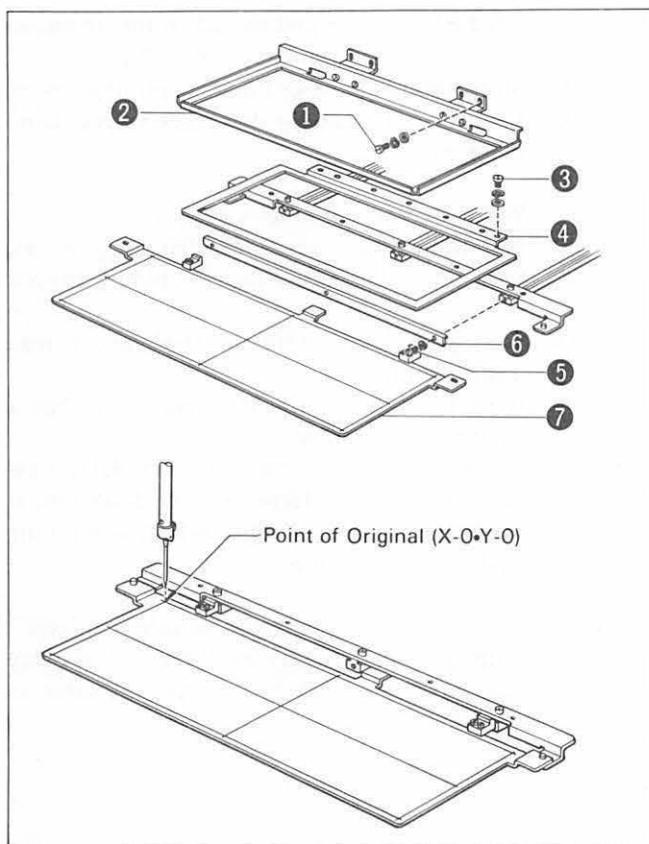


(5) Short needle thread after thread trimming

As shown in the right figure, before a normal loop has formed, the movable knife may advance, catch the needle thread side with the hook and trim the thread with the knife. When this happens the needle thread will become short, and thread come-off will occur when sewing starts.

If the needle thread is extremely short, adjust for normal thread trimming by slightly increasing the delay time.

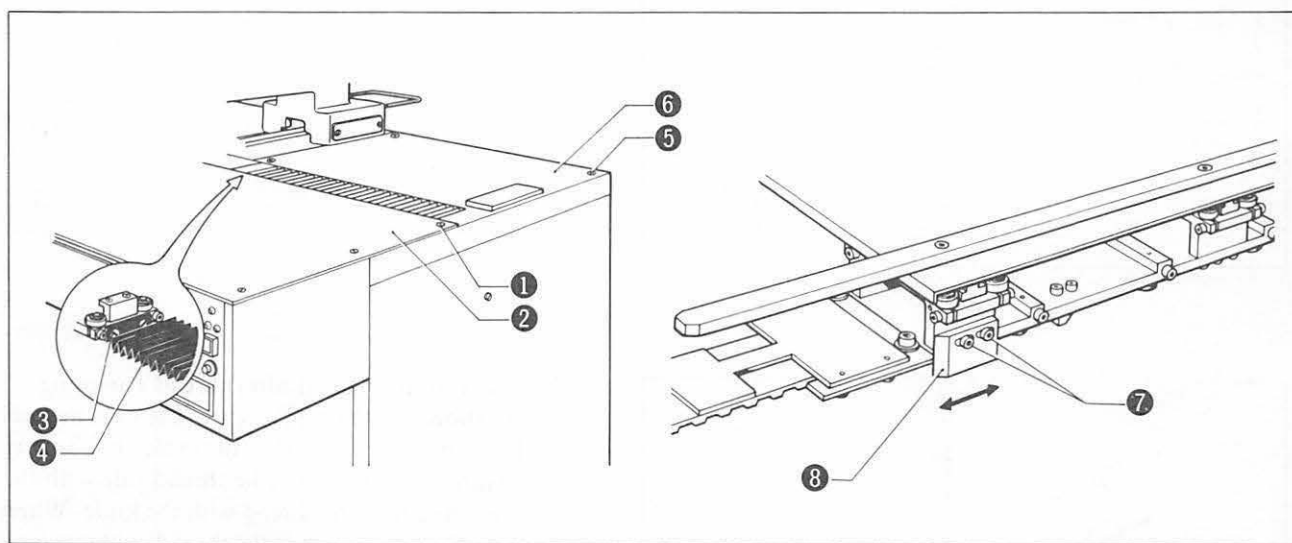
- \* When timing must be between 60 ~ 90 ms for no thread trimming misses, select a 70 ms setting to account for timing variations resulting from temperature and humidity.



## 18 ORIGIN POSITION ADJUSTMENT

### (1) Origin Position Check

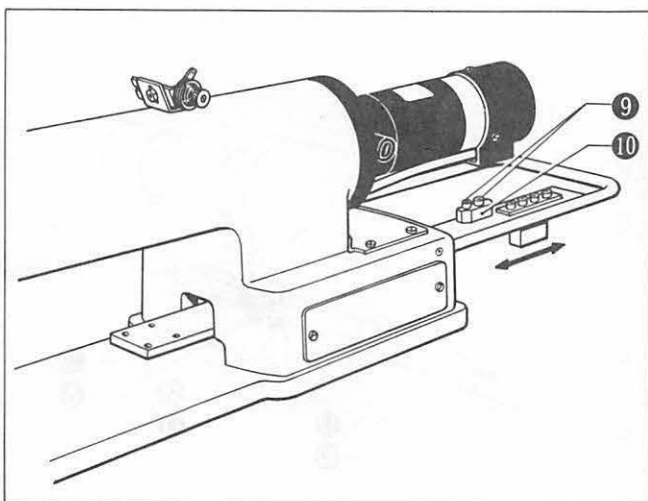
1. Remove the four installation screws ① and remove the clamp ②.
  2. Remove the four screws ③, and remove the feed plate ④.
  3. Remove the three screws ⑤, and remove the slider cover ⑥.
  4. Install the program reference plate ⑦.
  5. Move the feed guide to the center.
  6. Turn the power switch on.
  7. Depress the work clamp lifter switch, and after setting the clamp in the clamping position, depress the start switch.
  8. The feed mechanism will move to the origin position and the emergency stop lamp will illuminate.
  9. Turn the pulley, lower the needle and confirm that the needle tip aligns with the origin position on the program reference plate ⑦.
- \* To program the machine, press key **[P]**; the feed mechanism will move to the origin position. This way, the programmer can also be used to check the origin position.



### (2) Origin Position Adjustment

#### [X-axis Adjustment]

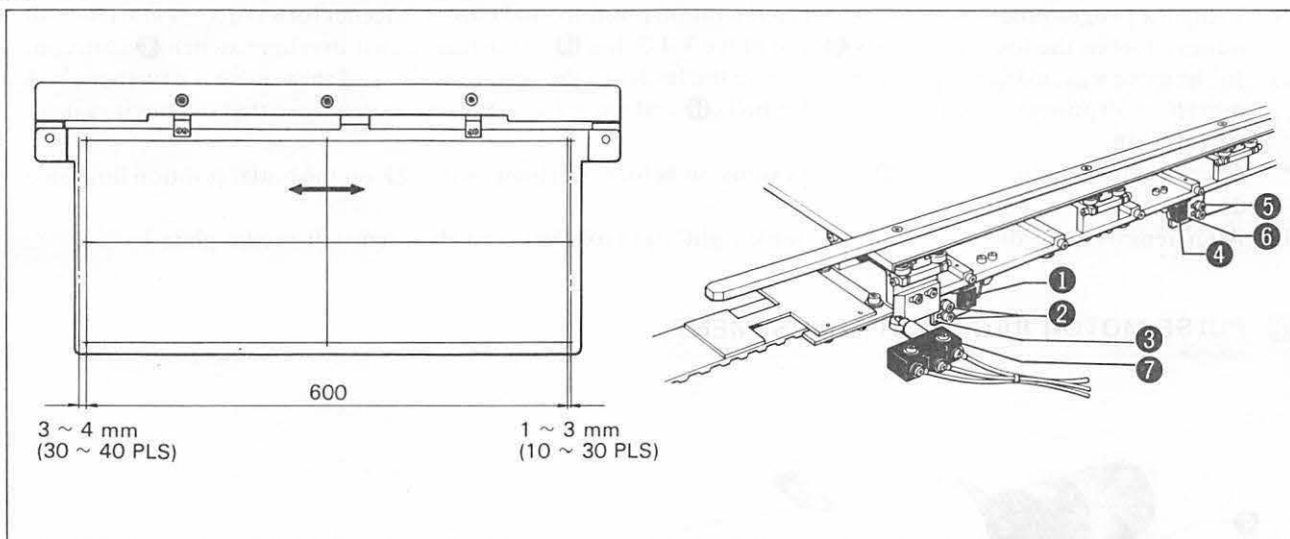
1. After pushing the feed guide assembly to the left rear, remove the twelve screws ①, and remove needle plate L ②.
2. Remove the two screws ③ and after compressing the bellows assembly ④, remove the four Allen bolts ⑤; next, remove table right ⑥.
3. Install needle plate L ②.
4. Adjust by loosening the four set screws ⑦ and moving the X-position dog ⑧.
5. After adjustment, check the origin position.
6. After removing needle plate L ② and installing table right ⑥, reinstall needle plate L ②.



[Y-axis Adjustment]

7. Push the feed guide assembly to the rear.
8. Loosen the two screws 9; adjust by moving the Y-position dog 10.
9. After adjustment, check the origin position.

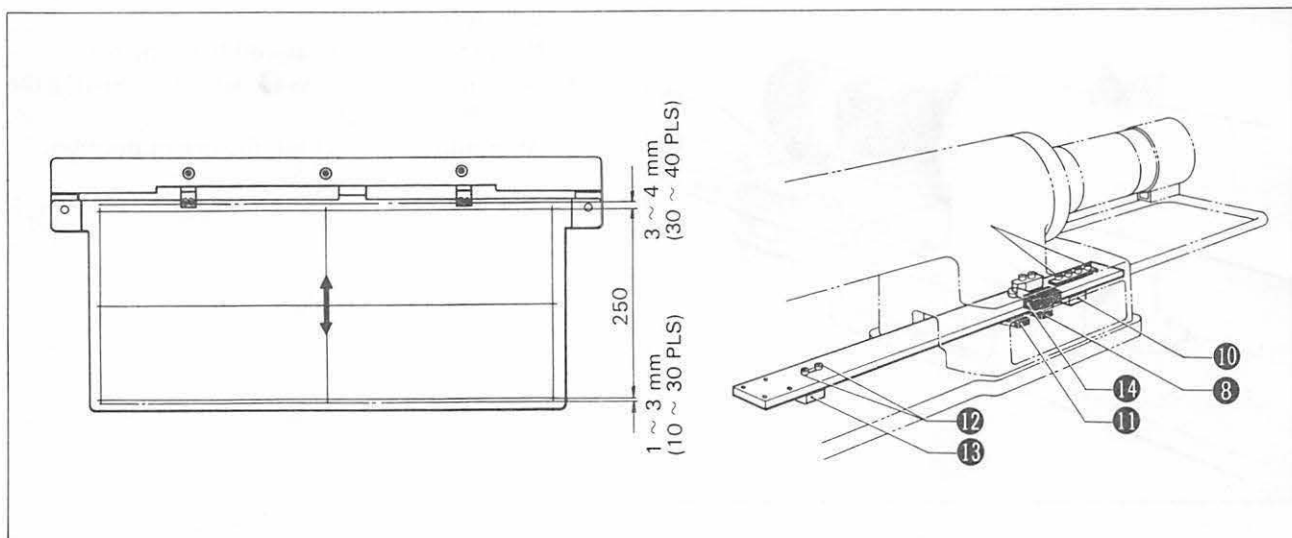
19 OVERLIMIT SWITCH ADJUSTMENT



[X-axis Adjustment]

1. Refer to steps 1 ~ 3 in "Origin Position Check" and remove the work clamp, feed plate, and slider cover.
2. Push the feed guide assembly to the rear.
3. Remove the twelve screws, and remove needle plate L.
4. Remove the eight Allen bolts, and remove both right and left tables.
5. Install needle plate L.
6. Install the program reference plate.
7. Turn the power switch on.
8. Using the programmer, move the feed mechanism to the origin position, and move the feeder 3 ~ 4 mm (30 ~ 40 pulses) further to the right from the origin position; now, loosen the two Allen bolts 2 and move the X-ES dog 3, adjusting so that the overlimit switch 1 turns on.
9. In the same way, move the feeder to the left side by using the programmer, and then move it 1 ~ 3 mm (10 ~ 30 pulses) further to the left; now, loosen the two Allen bolts 5 and move the X-ES dog 6, adjusting so that the overlimit switch 4 turns on.

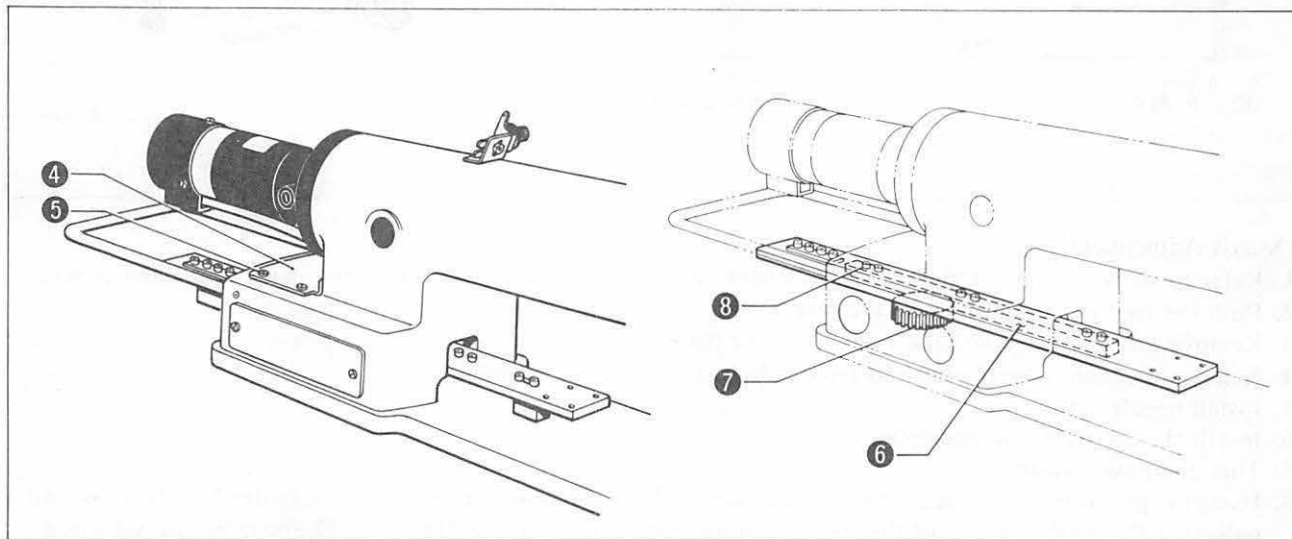
\* Confirm that origin limit switch 7 always turns on before overlimit switch 1 on the initial position limit side does.



[Y-axis Adjustment]

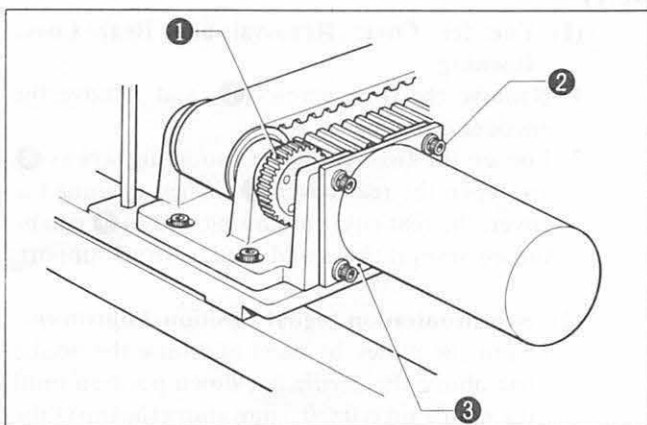
10. Using the programmer, move the feeder to the origin position, and move the feeder forward 3 ~ 4 mm (30 ~ 40 pulses); loosen the four Allen bolts ⑨ and move Y-ES dog ⑩, adjusting so that overlimit switch ⑧ turns on.
11. In the same way, using the programmer move the feeder to the opposite side, and then move it a further 1 ~ 3 mm (10 ~ 30 pulses); loosen the two Allen bolts ⑫ and move the Y-ES dog, adjusting so that overlimit switch ⑪ turns on.
- \* Check that origin limit switch ⑭ always turns on before overlimit switch ⑧ on the initial position limit side does.
12. After removing needle plate L, install table right and table left, and then reinstall needle plate L.

20 PULSE MOTOR BACKLASH ADJUSTMENT



[Y-axis Adjustment]

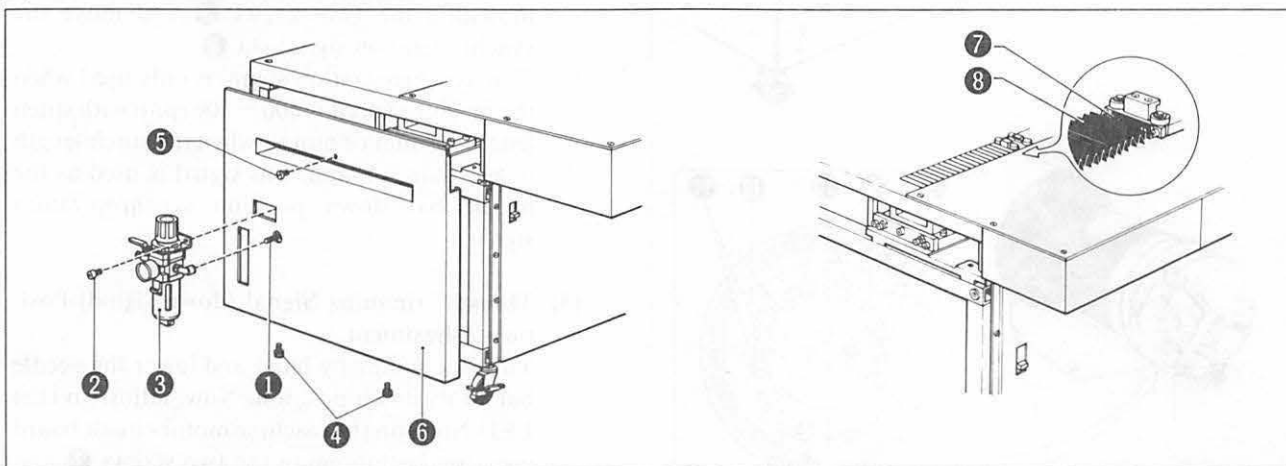
1. Remove the four screws ④, and remove the arm rear cover ⑤.
2. Loosen the six Allen bolts ⑧ and move the rack ⑥, adjusting so that the gear assembly ⑦ and rack ⑥ backlash is within 0 ~ 0.03 mm when the power switch is on and the feed guide assembly is moved back and forth by hand. Also, confirm that the feed guide assembly moves smoothly when it is pushed forward and back by hand.



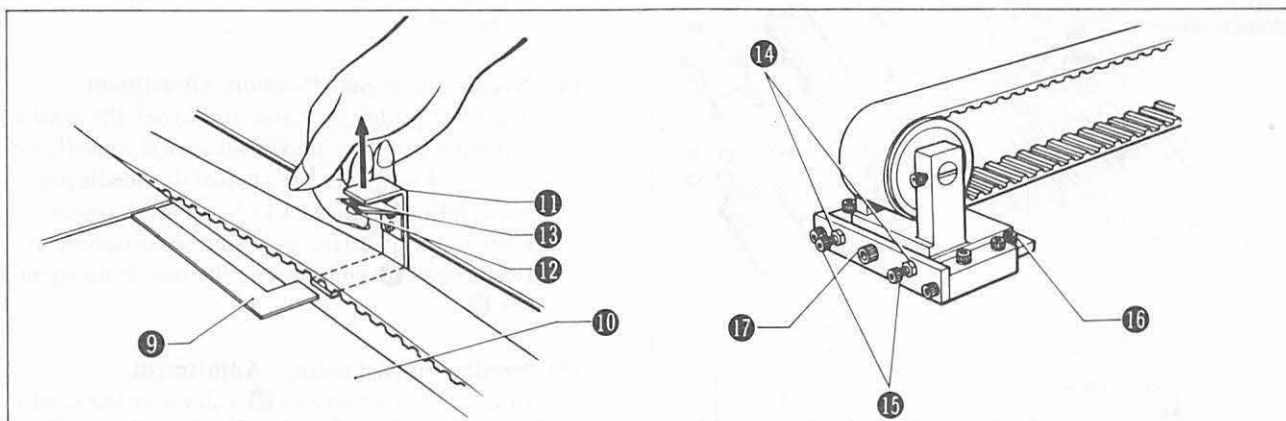
#### [X-axis Adjustment]

1. Remove needle plate L, remove table right, and then reinstall needle plate L.
2. Turn the power on, loosen the four Allen bolts **2** and shift the pulse motor mount **3** so there is only 0 ~ 0.03 mm of play in the gear assembly **1** when the feed guide assembly is moved right and left by hand.
3. Make sure the feed guide assembly moves smoothly both right and left.
4. Remove needle plate L, reinstall table right, and then reinstall needle plate L.

### 21 BELT TENSION ADJUSTMENT



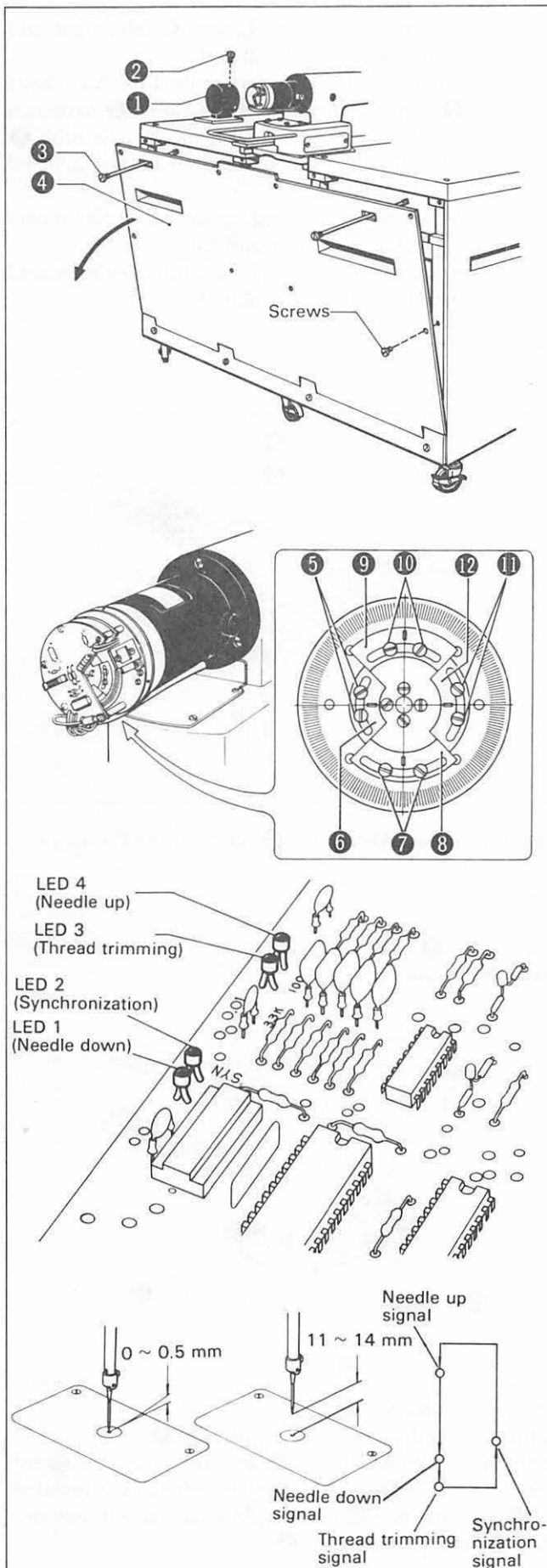
1. After turning the air off, disconnect the air tube **1**. Remove the two Allen bolts **2**, and remove the air unit assembly **3**.
2. Remove the two Allen bolts **4** on the back of the support.
3. Remove screw **5**, and remove the left side cover **6**.
4. Remove the two screws **7**, and compress the bellows assembly **8** to the left side.
5. Move the feed guide assembly until it meets the right-side X-ES dog.



6. Align and set accessory tension plate C **9** at the right edge of table left **10**.
7. Hook the belt on tension plate A **11** and align it with the extended part of tension plate C **9**.
8. Loosen nut **14** and after loosening Allen bolt **15**, loosen left and right Allen bolts **16** and turn Allen bolt **17** to adjust so that screw **13** meets tension plate A **11** when tension plate D **12** is raised with the index finger, and the top of the belt aligns with the bottom of tension plate C **9**. Turning bolt **17** to the right increases belt tension.
9. After adjustment, first tighten bolt **16**, then tighten bolts **15** and set with nuts **14**.



## 22 ENCODER (POSITION DETECTOR) ADJUSTMENT



### (1) Encoder Cover Removal and Rear Cover Opening

1. Remove the three screws ①, and remove the encoder cover ②.
2. Loosen the two rear cover mounting screws ③ and open the rear cover ④. When opening the cover, the rear cover mounting screws ③ can be turned several times and used as stops support.

### (2) Synchronization Signal Position Adjustment

Turn the pulley by hand and raise the needle bar above the needle bar down position until the needle tip is 0 ~ 0.5 mm above the top of the needle plate; now, adjust so that LED No. 2 on the machine motor circuit board goes out by loosening the two screws ⑤ and move the synchronization signal slit ⑥.

- \* This synchronization signal is only used when the machine speed is 500 ~ 800 rpm (with stitch length 4.5 mm or more); when the stitch length is less than 4.5 mm, this signal is used as the needle bar down position synchronization signal.

### (3) Thread Trimming Signal (down signal) Position Adjustment

Turn the pulley by hand and lower the needle bar to its down position. Now, adjust so that LED No. 3 on the machine motor circuit board goes out by loosening the two screws ⑦ and moving the thread trimmer signal slit ⑧.

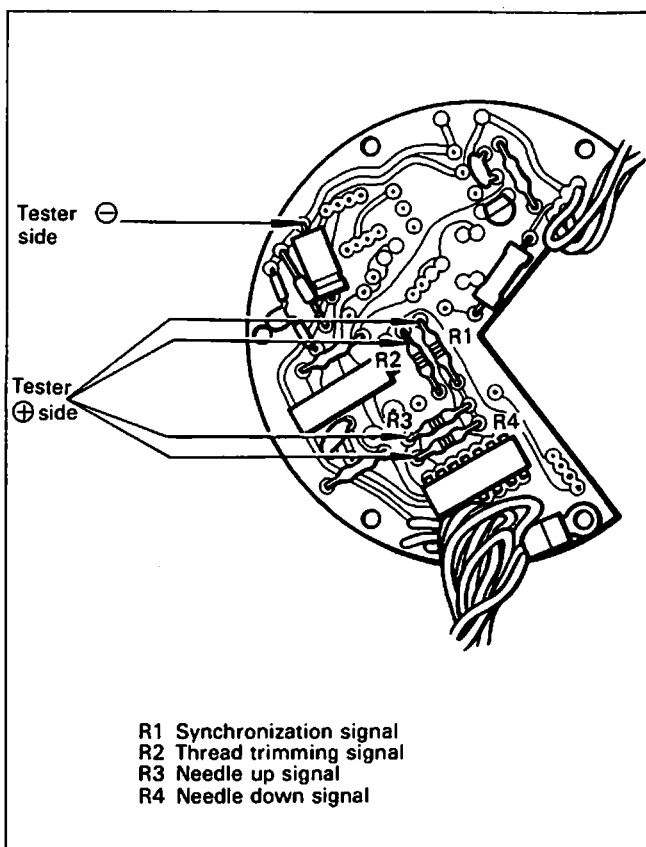
- \* This signal also functions as the sync signal when the stitch length is 4.4 mm or less. If this thread trimming signal is adjusted when it is also functioning as the sync signal, be sure to adjust the movable knife insertion timing (see p. 40). If the down signal position is delayed, the movable knife insertion timing should be increased.

### (4) Needle Up Signal Position Adjustment

Turn the pulley by hand and lower the needle bar from its highest position until the needle tip is 11 ~ 14 mm above the top of the needle plate. Now, adjust so that LED No. 4 on the machine motor circuit board goes out by loosening the two screws ⑨ and moving the needle up signal slit ⑩.

### (5) Needle Down Position Adjustment

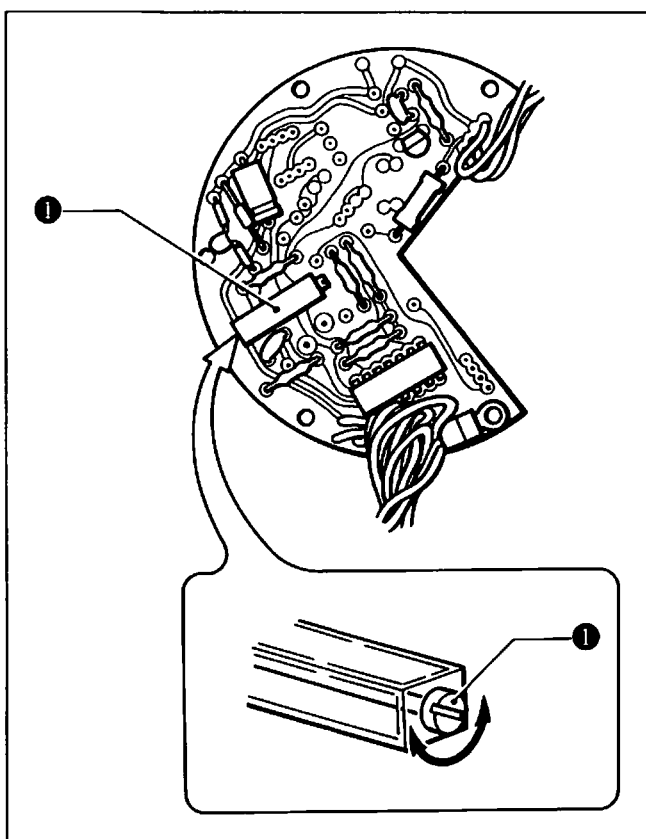
Loosen the two screws ⑪ and move the needle down signal slit ⑫, adjusting so that LED No. 1 on the machine motor circuit board goes out between the time the needle bar descends from the needle up position and the time it reaches the down position when the pulley is turned by hand.



#### (6) Needle Position Detector Sensitivity Adjustment

The sensitivity of the phototransistor for the needle position detector may drop and prevent the machine motor from operating normally. Therefore, periodically check the sensitivity of this phototransistor.

1. Apply the negative (−) side of a tester to the negative side of the 10  $\mu$ F (25 V) capacitor on the encoder circuit board, and then apply the positive (+) side to each of the signal's resistor terminals. To test, set the testers range to 10-V DC.
2. Turn the power switch on and turn the pulley by hand; check if the output voltage of R1, R2, R3, and R4 is over 4.5 V in each of the synchronization, thread trimming, needle up, and needle down positions. At this same time confirm that LEDs 1 ~ 4 on the machine motor circuit board are not illuminated.
3. As performed in step 2 above, confirm that the output voltage of R1 ~ R4 is below 2 V when the machine is in any position not specified above. Also check that in motor one machine revolution, signals are not transmitted from two locations.



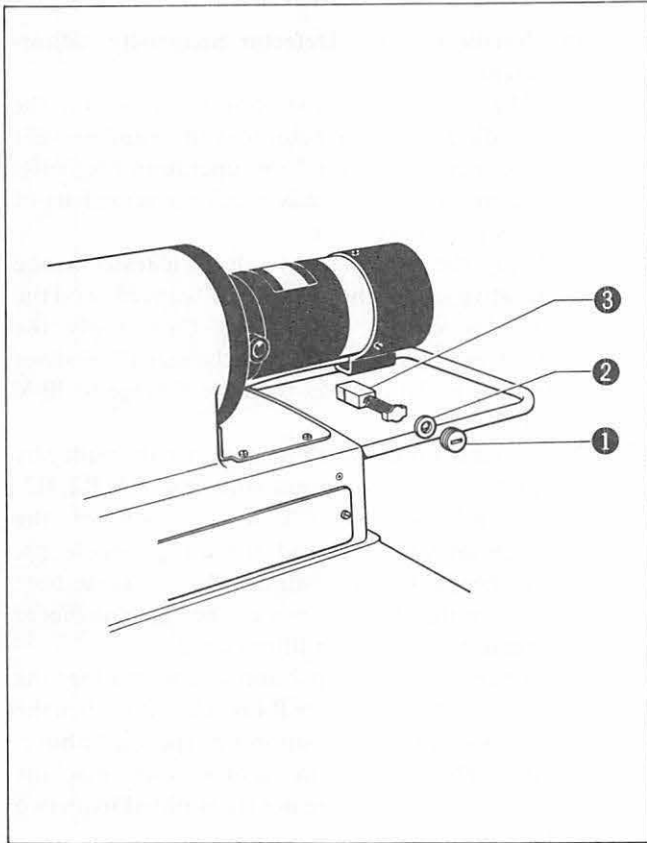
#### (7) Speed Detector Sensitivity Adjustment

If the photo interlapper output for the speed detector varies, machine speed will not be detected and the machine will run at high speed, stop and then the emergency stop lamp will illuminate. Accordingly, if the machine suddenly stops during sewing and the emergency stop lamp illuminates, it is necessary to adjust the interlapper sensitivity for the speed detector.

1. Turn the power on and run the machine at high speed by using the dip switch on the top of the machine motor board. (Refer to p.76).
2. Turn the adjustment control 1 on the encoder circuit board to the right and store the control position where the machine suddenly stopped.
3. If the emergency stop switch is depressed, the machine will again begin to operate; this time, turn the control to the left, and as above record the position where the machine suddenly stopped.
4. Adjust to between the two positions recorded in steps 2 and 3 above, and run the machine. If the machine operates normally, adjustment is completed.

\* This adjustment is not necessary if the machine operates normally.

## 23 DIRECT DRIVE MOTOR MAINTENANCE INSPECTION



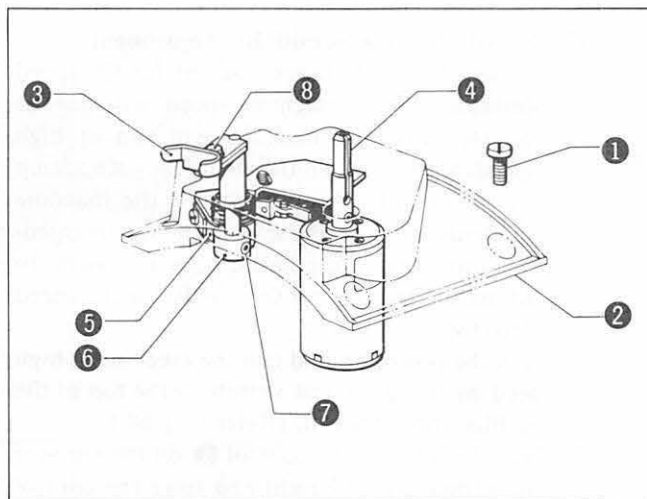
### (1) Brush Inspection and Replacement

1. Remove screw ①.
2. Remove washer ② and brush ③.
3. After brush inspection and replacement, reassemble in the original order and tighten screw ①.

\* When not replacing the brushes, be sure to reinstall in the original position; do not mistake the top and bottom positions.

### ★ Maintenance Inspection Notes

1. Do not strike, drop or otherwise cause any big shock to the motor.
2. When replacing the brushes, be careful to prevent any dust or dirt from entering the motor.
3. If the brushes have worn down to the mark, replace them with new brushes. When brushes are replaced, run the machine at high speed for approx. one hour for trial.



## 24 BOBBIN WINDER ADJUSTMENT

### (1) Bobbin winder stop latch tripping arm clamping screw

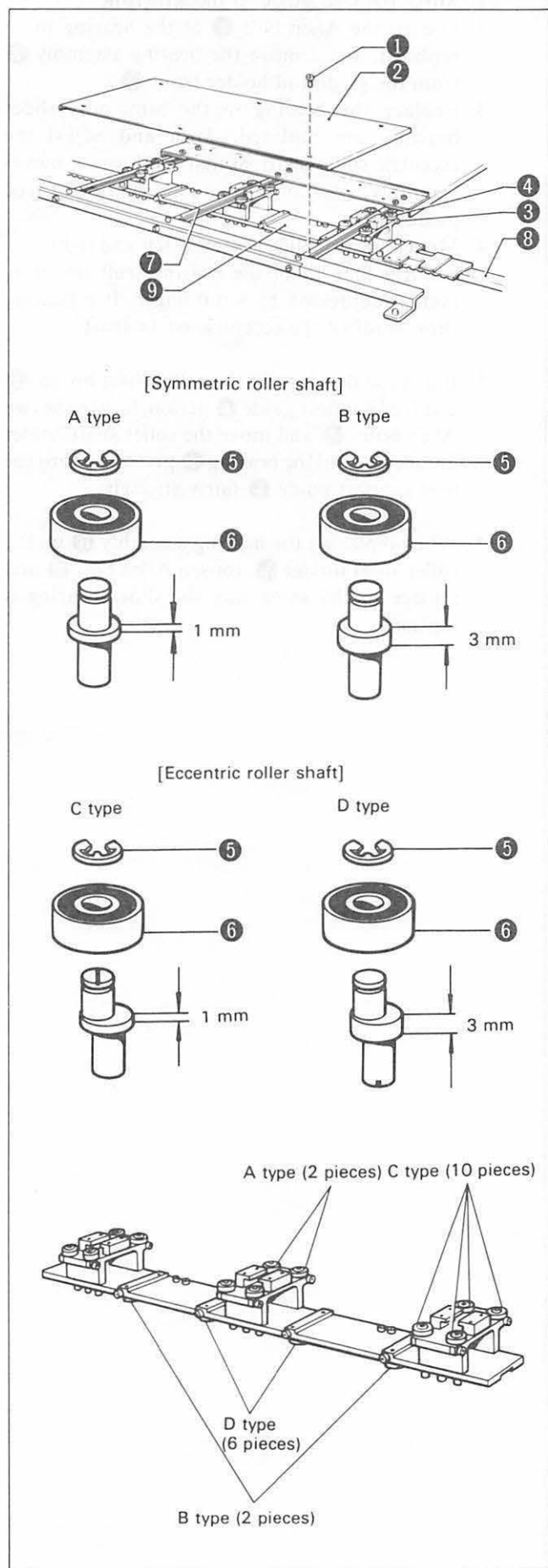
1. Remove the four set screws ①, and remove the bobbin winder base ②.
2. Move the bobbin winder stop latch ③ towards the bobbin winder spindle ④ to the point immediately prior to bobbin winding completion.
3. Tighten the two set screws ⑦ so that the leaf spring ⑤ comes to the shoulder of the clamping ⑥.

### (2) Bobbin winder stop latch position

1. Loosen the set screw ⑧, and move the bobbin winder stop latch ③ to adjust the amount of thread wound on the bobbin.

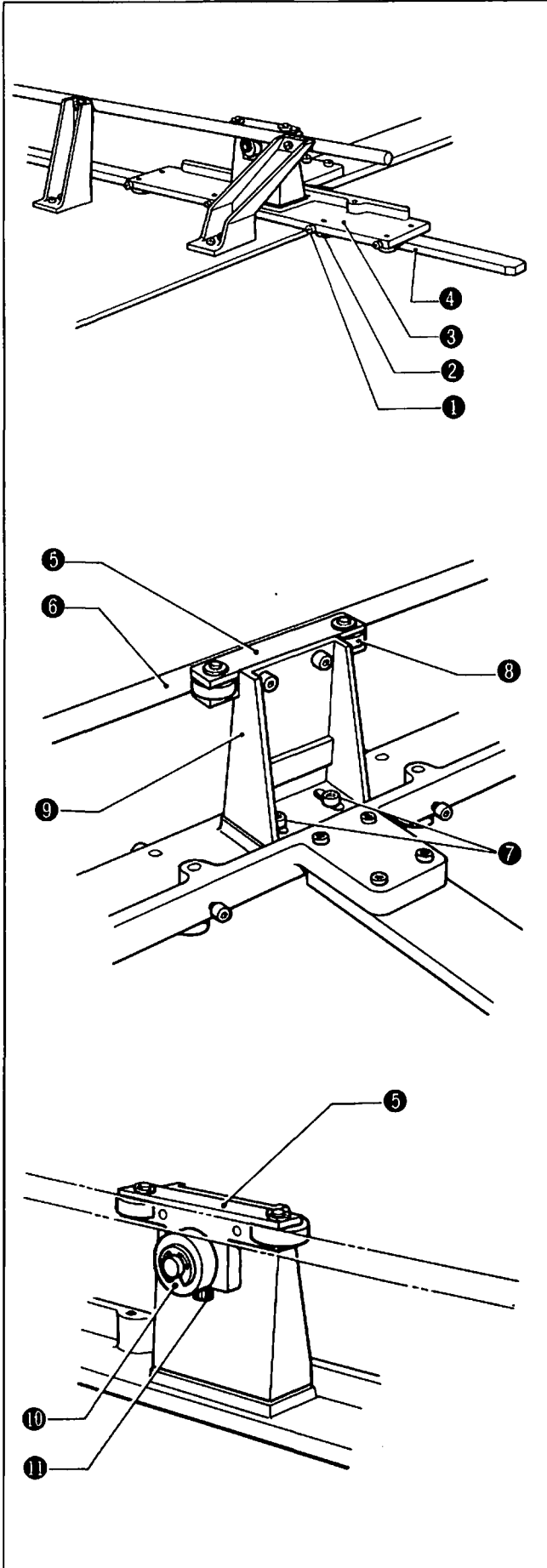
# BEARING REPLACEMENT AND ADJUSTMENT

## 1 SLIDER BEARINGS REPLACEMENT AND ADJUSTMENT



1. After pushing the feed guide assembly to the rear, remove the twelve screws and remove needle plate L.
  2. Move the feed guide assembly to the left front, remove the four Allen bolts, and remove table right.
  3. Remove the six screws ①, and remove the feed guide cover front ②.
  4. Loosen the Allen bolt ③ at the place to be replaced, and remove the bearing assembly ④.
  5. Remove the stop ring ⑤ from the previously removed roller shaft, replace the old bearing ⑥ with a new one, and reinstall in the original position.
- \* There are four types of bearing assemblies for use in the slider; be sure to install the correct type.
6. Turn the eccentric roller shaft and adjust so that the bearings move smoothly with no rattling over the feed guide ⑦ and slider guide ⑧ surfaces.
- \* When adjusting the eccentric roller shaft for the slider ⑨, support the roller shaft by hand so that it does not fall out.
  - \* When replacing symmetric roller shafts only, adjustment is not necessary.
  - \* When replacing eccentric roller shafts only, turn the eccentric roller shaft and adjust.
  - \* When replacing both symmetric and eccentric roller shafts, first install the symmetric roller shaft, and then turn and adjust the eccentric roller shaft.
  - \* When adjusting without replacing the bearings, loosen Allen bolt ③ and then turn and adjust the eccentric roller shaft.
  - \* Adjustment order: first adjust the eccentric roller shaft opposite the symmetric roller shaft, and then adjust the remaining eccentric roller shafts.
7. Move the feed guide assembly and confirm that all of the bearings rotate even if depressed by your finger. If a bearing slips, readjust the eccentric roller shaft.

## 2 GUIDE RAIL HOLDER FRONT BEARING REPLACEMENT AND ADJUSTMENT

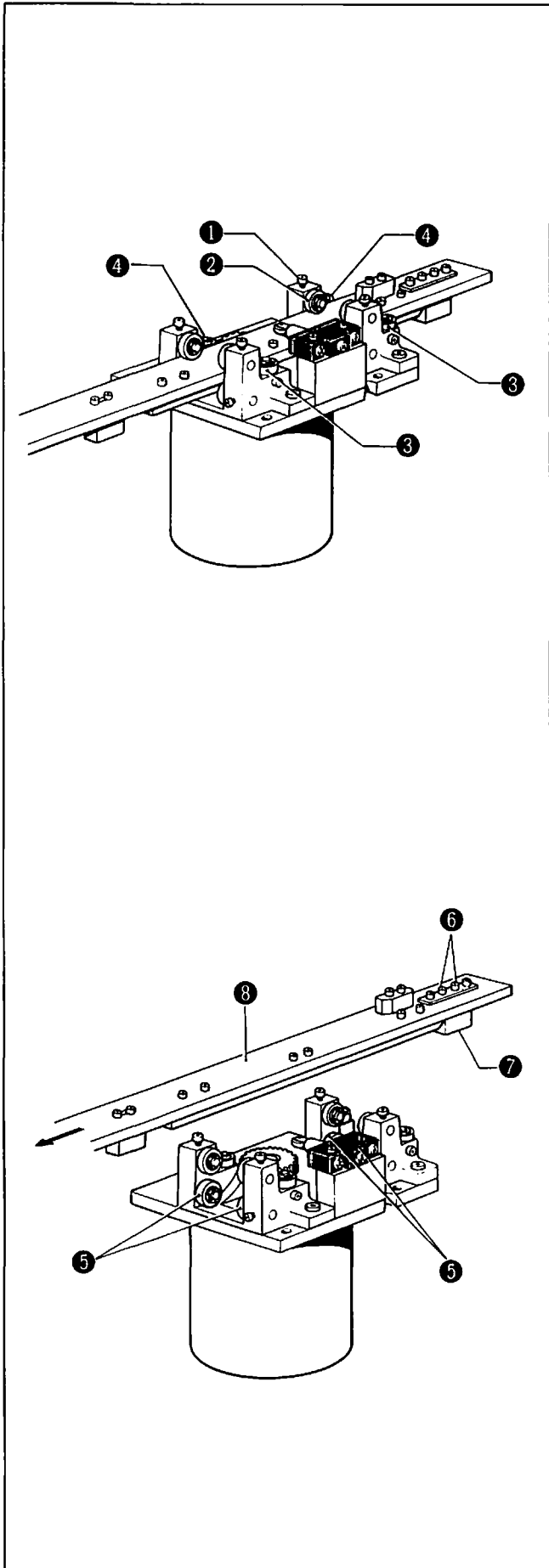


1. Move the feed guide to the left front.
2. Loosen the Allen bolt ① at the bearing to be replaced, and remove the bearing assembly ② from the guide rail holder front ③.
3. Replace the bearing in the same way slider bearings are replaced. Turn and adjust the eccentric roller shaft so that the bearing moves smoothly with no rattling over the side of feed guide X ④.
4. Move the feed guide assembly left and right, and confirm that all of the bearings roll smoothly even if depressed by your finger. If a bearing slips, readjust the eccentric roller shaft.

\* If a rattle develops in the roller shaft holder ⑤ and feed support guide ⑥ action, loosen the two Allen bolts ⑦ and move the roller shaft holder mount ⑨ until the bearing ⑧ presses against the feed support guide ⑥ fairly strongly.

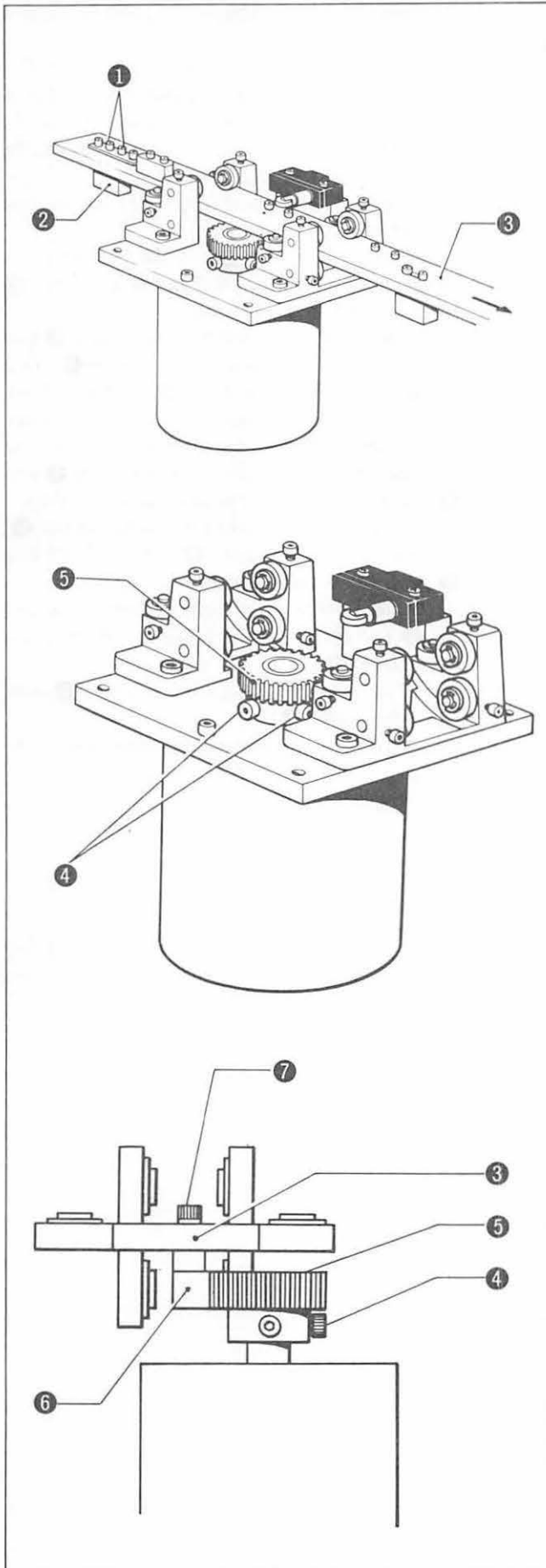
\* When replacing the bearing assembly ⑩ on the roller shaft holder ⑤, loosen Allen bolt ⑪ and replace in the same way the slider bearing is replaced.

### 3 RAIL-Y BEARING REPLACEMENT AND ADJUSTMENT



1. Remove the four set screws and remove the arm cover rear.
2. Remove the three set screws, remove the DD motor bracket assembly and put it on the table.
  - \* When removing the motor, mark down the coupling position. If not properly installed, the motor will be 180° out of phase.
3. Remove the eight left and right set screws, and remove the arm cover side.
4. Loosen the Allen bolt ① for the bearing to be replaced, and remove the bearing assembly ② from inside the rail-Y guide.
  - \* To replace the two eccentric roller shafts ③ and the other two eccentric roller shafts ④, first replace shafts ③ while shafts ④ are still secured, and adjust the bearing position. After that, replace shafts ④ following the same steps. The bearings of eccentric roller bearing shafts ③ and ④ make the X-axis perpendicular to the Y-axis.
5. To replace the four symmetric roller shafts ⑤, remove the two Allen bolts ⑥, remove Y-ES dog ⑦, pull rail-Y out forward and replace it.
6. As in slider bearing replacement, turn and adjust ②, ③ and ④ so that the bearings roll smoothly over rail-Y ⑧.
7. Install rail-Y ⑧, and secure Y-ES dog ⑦ with two Allen bolts ⑥.
8. Check the origin position alignment. (Refer to p.42.)

#### 4 GEAR REPLACEMENT, ADJUSTMENT AND MAINTENANCE



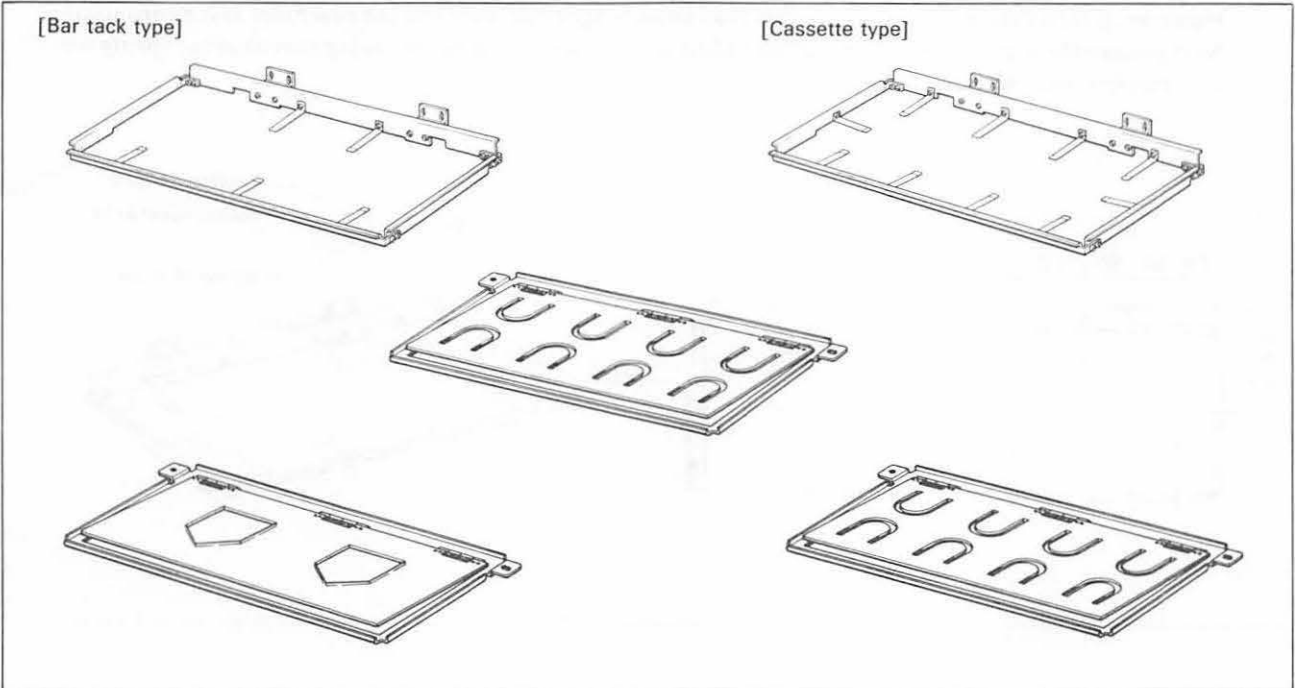
1. Remove the four screws, and remove arm cover rear.
2. Remove the four screws, and remove the left-hand arm cover side.
3. Remove the three screws, and remove the DD motor bracket assembly and put it on the table.
- \* When removing the motor, mark down the coupling position. If not properly installed, the motor will be 180° out of phase.
4. Remove the two Allen bolts ①, remove Y-ES dog ② and pull rail-Y forward and out.
5. Loosen the two Allen bolts ④, and remove the gear assembly ⑤. The gear assembly can be easily removed by using two screwdrivers and lifting up on both sides.
6. Mount the new gear assembly ⑤ on the pulse motor shaft and adjust so that one of the two Allen bolts ④ meets the screw guide; now align the top of the gear assembly with the top of the rake ⑥, and firmly tighten the Allen bolts ④.
7. Install rail-Y ③.
- \* If there is excessive backlash between the gear assembly ⑤ and rack ⑥, loosen the six Allen bolts ⑦, and shift the rack ⑥ to adjust. Likewise, if the gear assembly ⑤ and rack ⑥ teeth meet too strongly, adjust in the same way. (Refer to p.43.)
8. Install Y-ES dog ② with two Allen bolts ①.
9. Check the origin position alignment. (Refer to p.42.)

#### ★ Maintenance

1. Regularly grease the rack ⑥ gear teeth. Apply grease whenever necessary.

# WORK CLAMP CONSTRUCTION

★ There are two ways to use the work clamp: 1) the clamp uses the cassette as a bar tack, and 2) the cassette type in which work clamps are interchangeable.



Work clamp type	Sewing conditions	Set time	Sewing time
Bar tack type	Sewing on a flat surface	Items which are set easily	Relatively short
Cassette type	Sewing pieces onto background material. Simultaneous sewing of more than two spots.	Items which take time to set	Relatively long

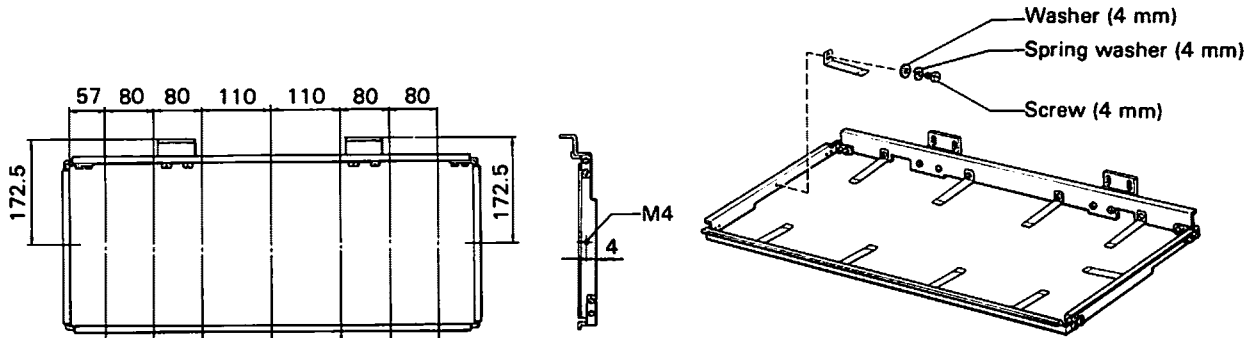
**(1) Work Clamp Construction**

1. The right illustration shows dimensions for the standard work clamp.

2. Possible sewing area and work clamp dimensions are shown in comparison at right.

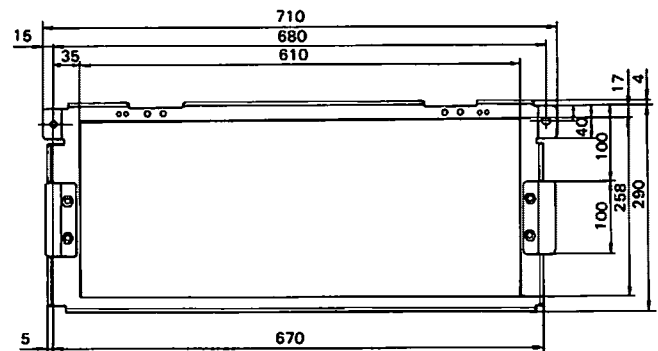


3. On the reference work clamp there are 16 M4 screw holes for the installation of the work clamp spring. However, if installation in a position other than these is desirable, drill and tap new holes as is appropriate. Next, install the standard plate spring according to the illustration below, being sure that the spring will not interfere with sewing.



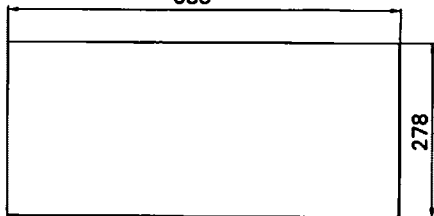
**(2) Cassette Construction**

1. Cassette assembly dimensions are shown in the right illustration.

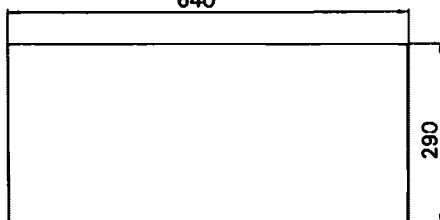


2. The below table shows the various cassette tops and bottoms available. Select parts appropriate to the article to be sewn.

[Cassette top]  
630

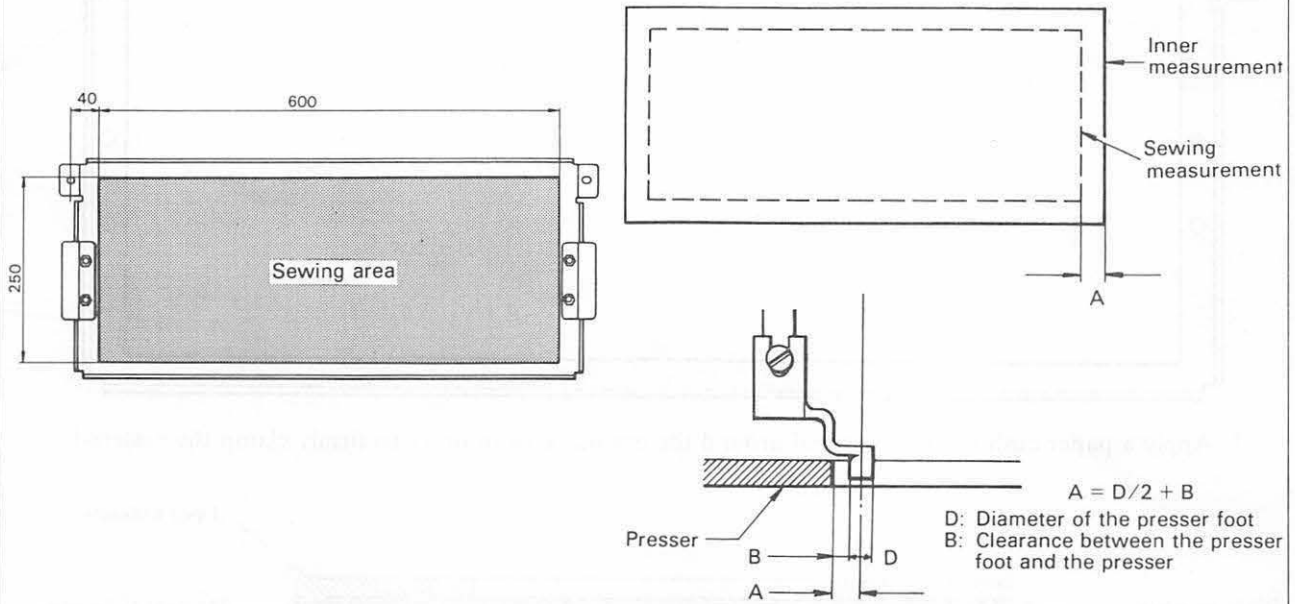


[Cassette bottom]  
640

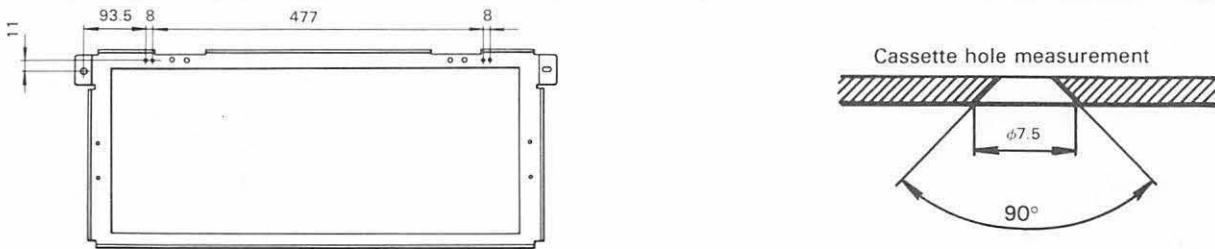


Parts Name	Parts No.	Thickness (mm)
Cassette top 1	158586000	1 mm
Cassette top 2	157763000	2 mm
Cassette top 3	157727000	3 mm
Cassette bottom	157764000	1 mm

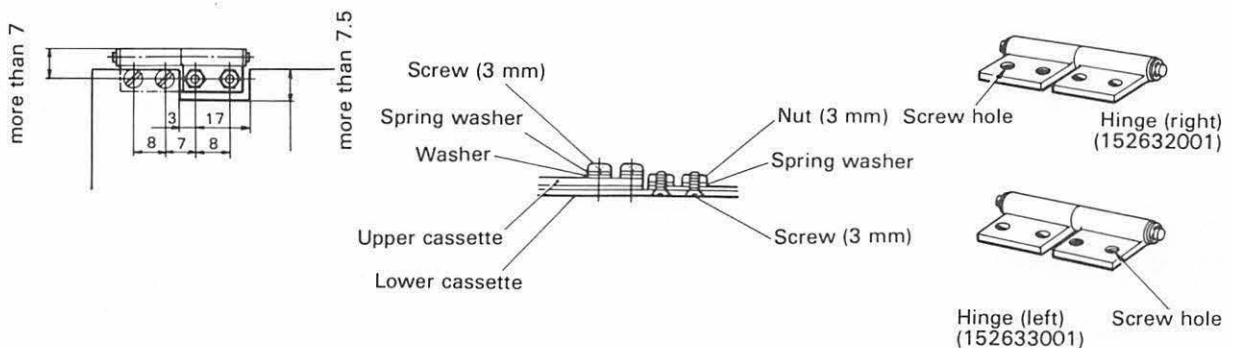
3. Decide where to place and sew the garment and cut out the cassette appropriate to the sewing dimensions. Cassette assembly and the sewing area should meet the dimensions shown below. (If cassettes are to be usable interchangeably, cut the cassettes out to the same dimensions.)
- \* Cut out both cassette bottoms and tops only "A" greater than the sewing area.



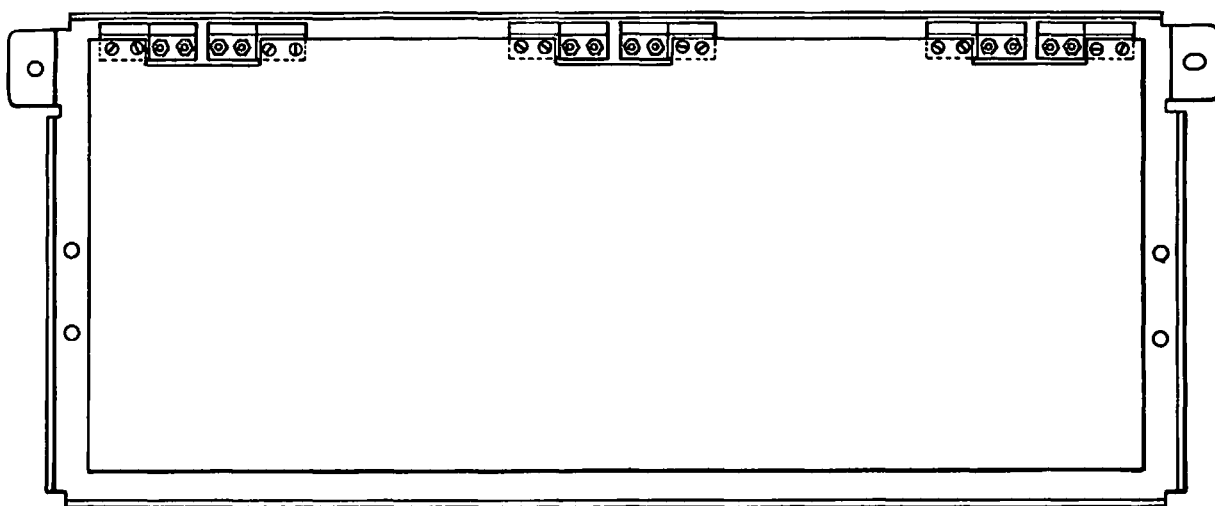
4. Four mounting holes are provided in the cassette holder for installation of one cassette top. For installation in any other position, open mounting holes in the cassette holder as shown below.



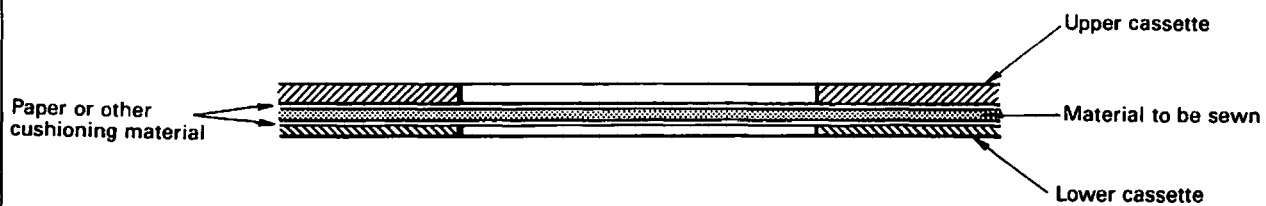
5. Install the hinge as follows.



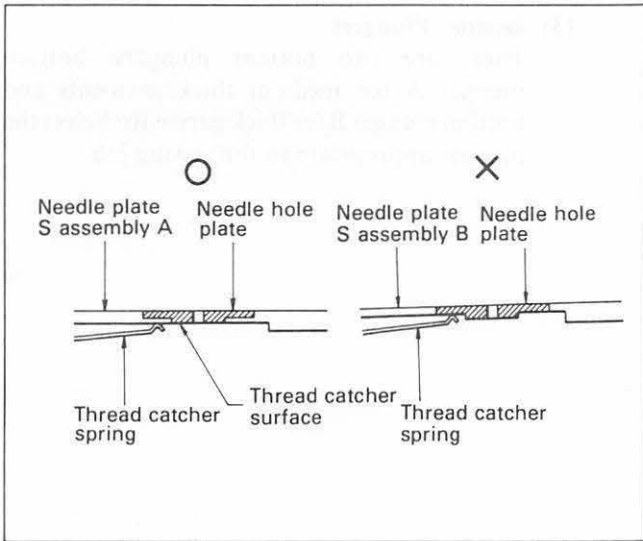
6. When hinges and two cassettes top are installed to cassette the predrilled holes, the assembly appears as below.



7. Apply a paper cushion type-material around the cut out area in order to firmly clamp the material.



## PROPER USE OF SPECIAL ACCESSORIES

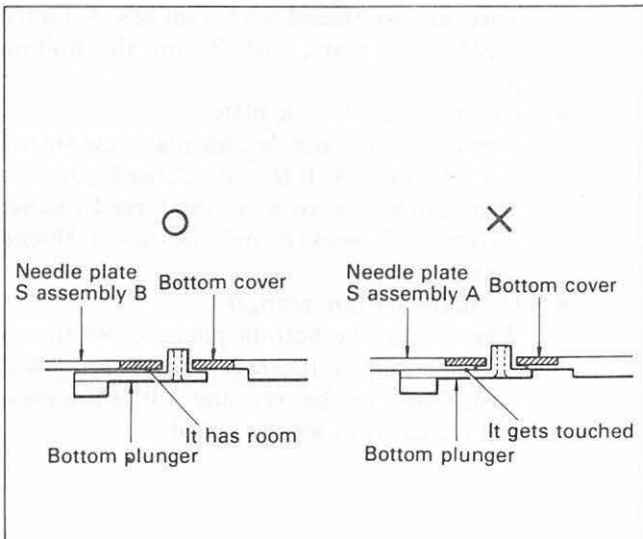


### (1) Needle Plate S Assembly

The needle plate S assembly consists of the needle plate S assembly A (for the needle hole plate), and needle plate S assembly B (for the bottom plunger).

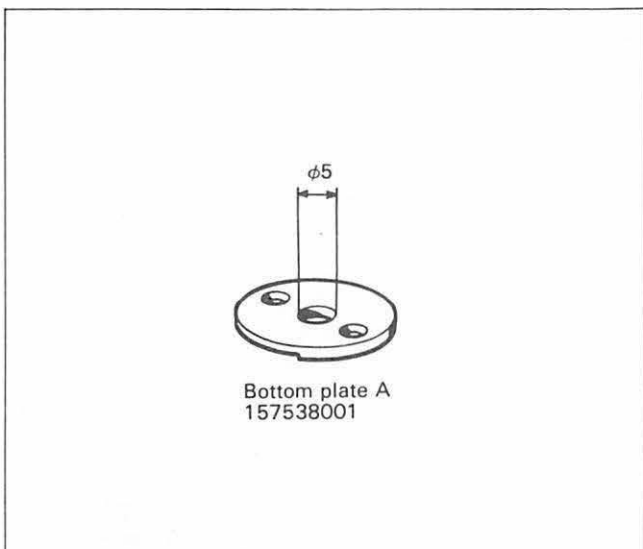
- Use of the needle hole plate

When using the needle hole plate, always use needle plate S assembly A. If assembly B is used, the upper thread catcher surface will not align with the bottom of the needle hole plate, and when the thread catcher spring advances it will strike the needle hole plate and may result in trouble.



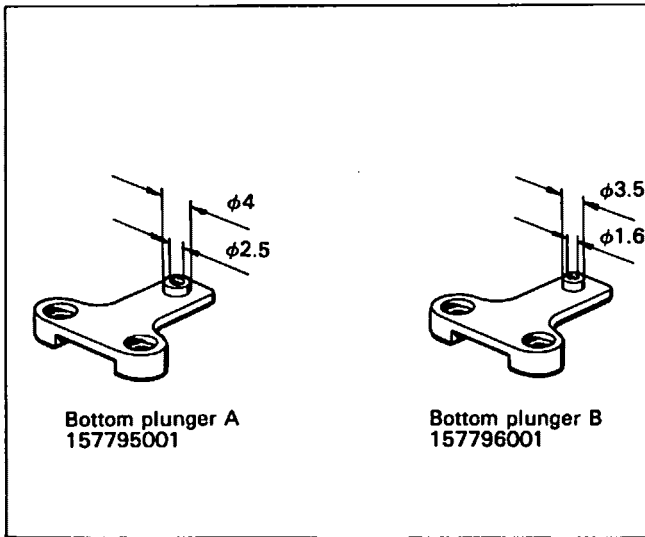
- Using the bottom plunger

When using the bottom plunger, always use needle plate S assembly B and the bottom lid in a pair. Needle plate S assembly A cannot be used because it will strike the bottom plunger if installed on the bed.



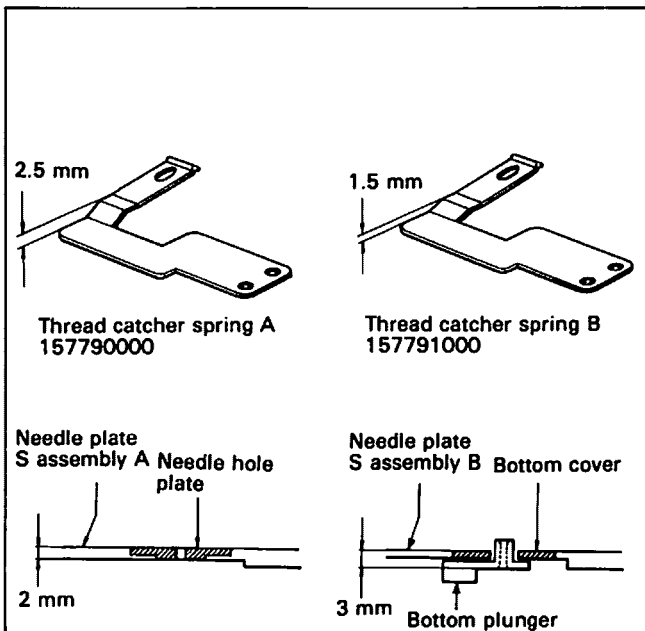
### (2) Bottom Plate

When using the bottom plunger, always use in a pair with needle plate S assembly B.



### (3) Bottom Plungers

There are two bottom plungers: bottom plunger A for medium thick garments and bottom plunger B for thick garments. Select the plunger appropriate to the sewing job.

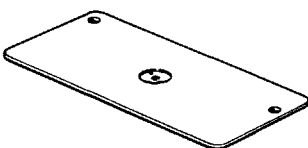


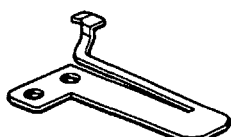
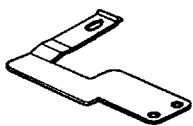


### (4) Thread Catcher Spring

There are two thread catcher springs: A, for the needle hole plate; and B, for the bottom plunger.

- Using the needle hole plate  
When using the needle hole plate, use thread catcher spring A. If thread catcher spring B is used, catcher pressure at the thread catcher surface will weaken and the upper thread cannot be held.
- Using the bottom plunger  
When using the bottom plunger, use thread catcher spring B. If thread catcher spring A is used, thread catcher pressure will be too great and the garment will be pulled.

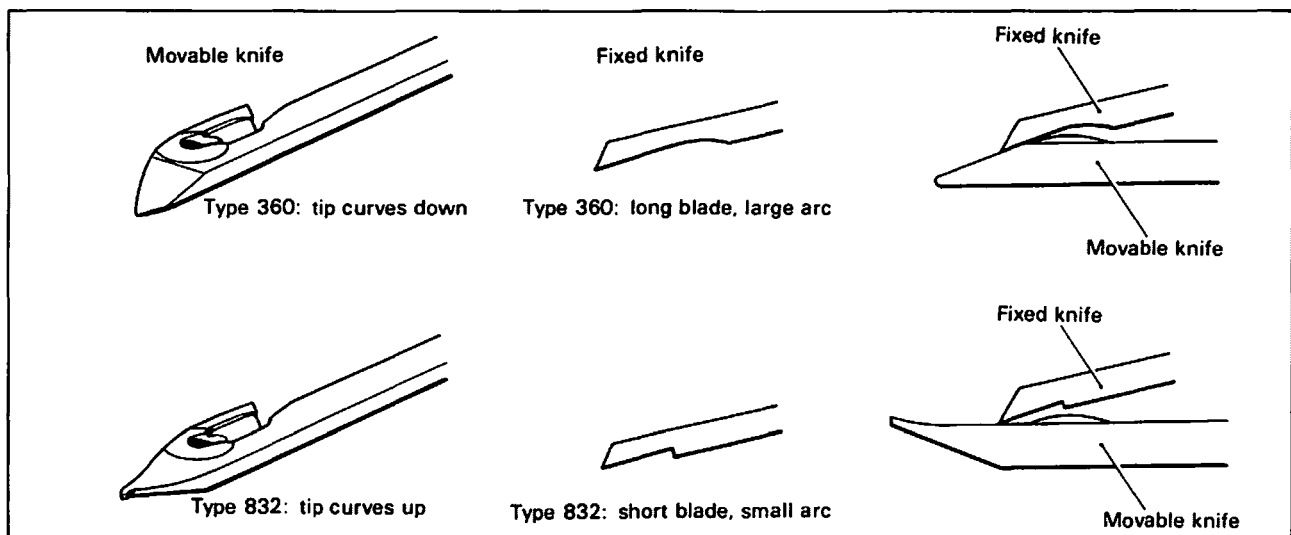
**☑ Standard Combinations**

Parts Name	Use	Use with needle hole plate	Use with bottom plunger
Needle plate S assembly 		Needle plate S assembly A 157534001	Needle plate S assembly B 157536001
Bottom plate 		/	Bottom plate A 157538001
Bottom plunger 			Bottom plunger A 157795001 *Bottom plunger B 157796001
Thread presser spring 		for medium thick garments 148593000	
Thread catcher spring 		Thread catcher spring A 157790000	Thread catcher spring B 157791000

Note: Items with a \* mark are optionally available. Please order separately.

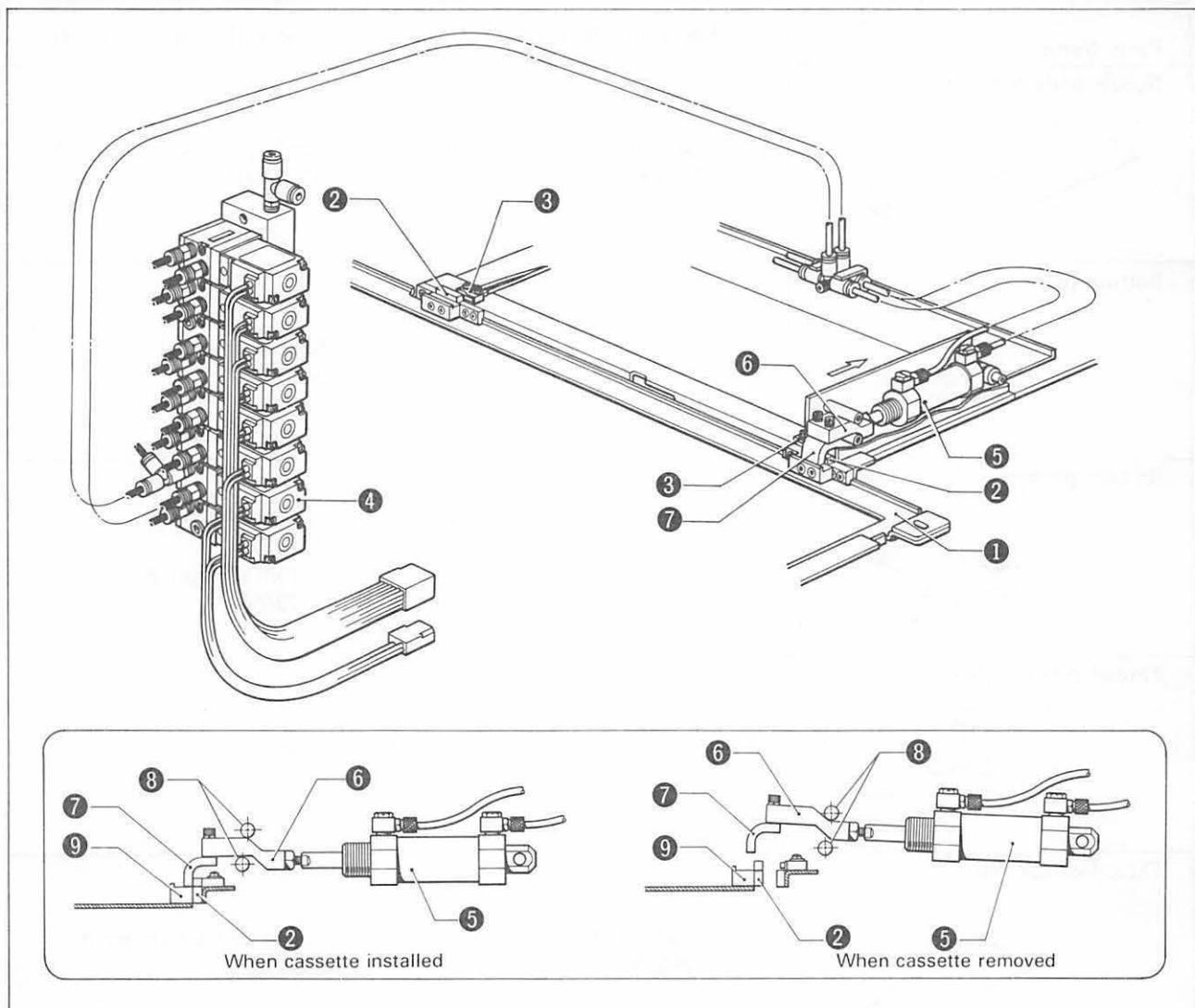
**☑ Movable and Fixed Knife Shape**

The movable knife on this machines is the same shape as type 832. However, because it differs in the points shown below, use it as is.



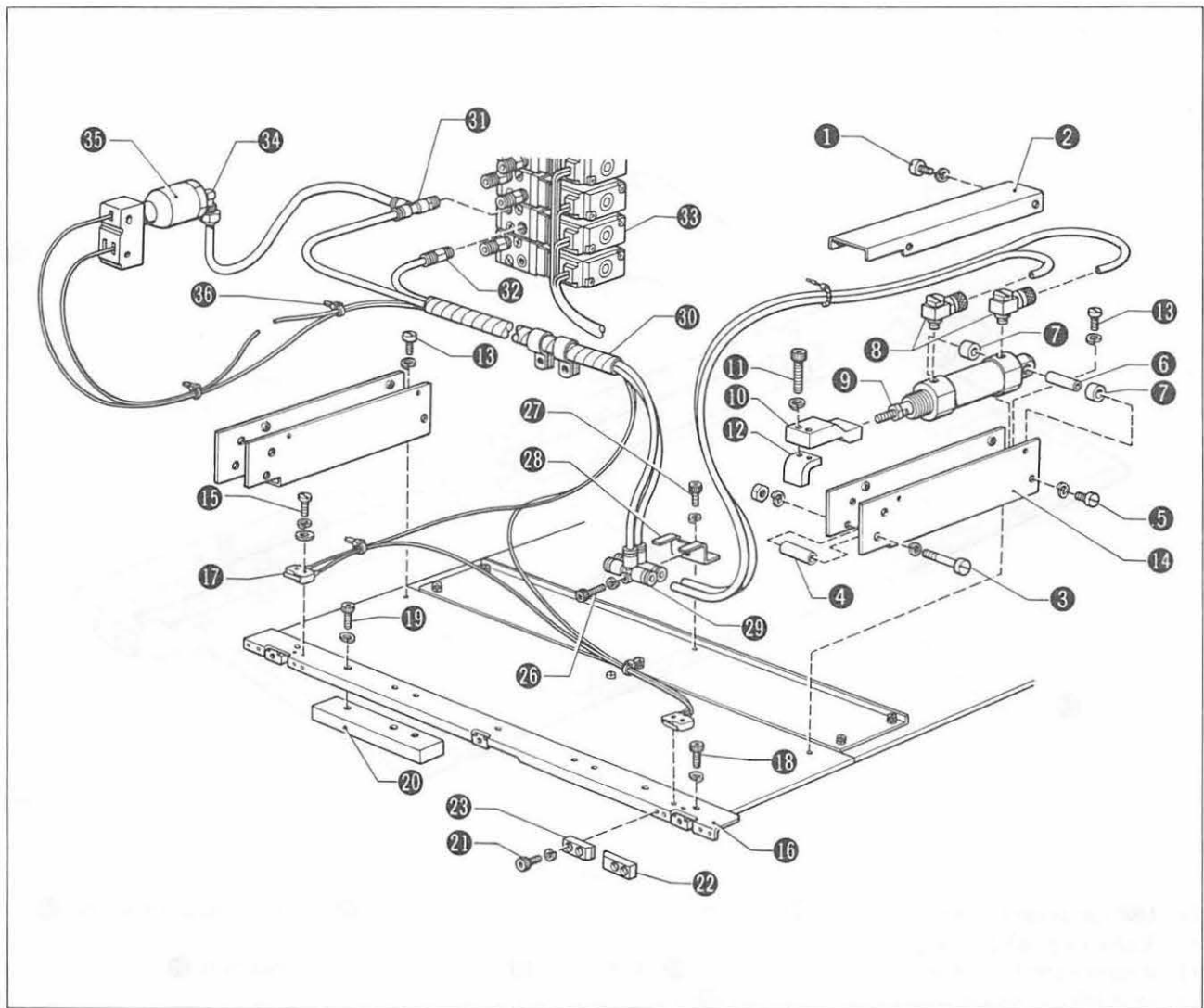
## AUTO EJECT (optional parts)

### 1 AUTO-EJECTOR FUNCTION



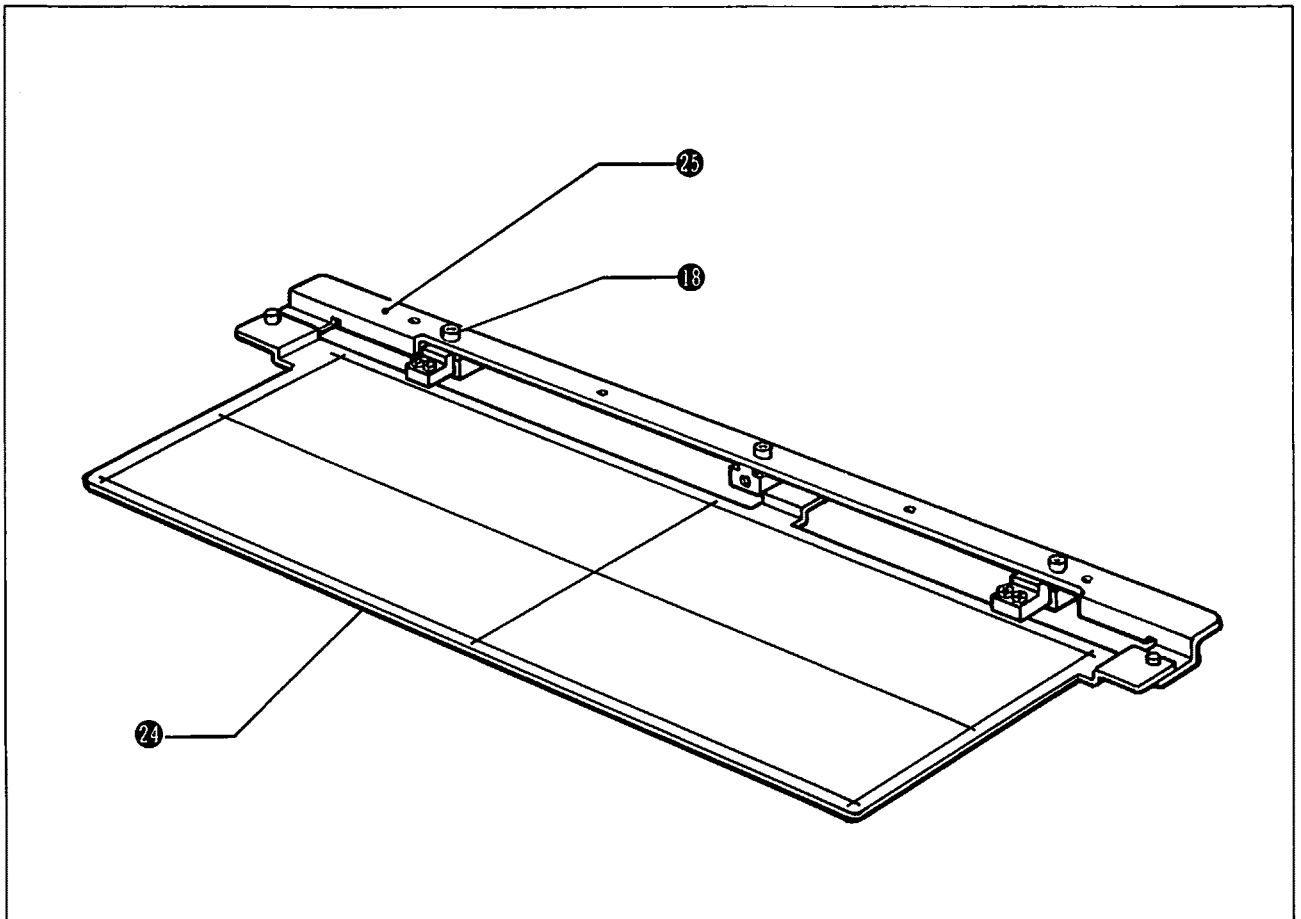
1. When the cassette holder ① is mounted on the feed assembly, the cylinder 15 ⑤ will move in the direction of the arrow when the solenoid ④ is turned off both when the two position detectors A ② turn limit switch ③ on, and when the presser foot lifter switch is depressed.
2. This motion is transferred to the slide block ⑥ and tab ⑦ connected to cylinder 15 ⑤.
3. Because slide block ⑥ is guided by the two rollers ⑧, the straight-line motion of the cylinder 15 ⑤ is converted to horizontal and vertical motion, and relayed to tab ⑦.
4. Tab ⑦ pulls position detector A ②, and holds the cassette holder ① to the feed assembly.
5. If the presser foot lifter switch is depressed when sewing is completed, the solenoid ④ will turn on, cylinder 15 ⑤ will move opposite the arrow, tab ⑦ will press position detector B ⑨, and the cassette holder ① will be released from the feed assembly.

## 2 AUTO-EJECTOR DISASSEMBLY



1. Remove the four set screws **1**, and remove the cylinder support **2**.
  2. Remove the two set screws **3**, and remove the slide block guide **4**.
  3. Remove the two set screws **5**, and remove the roller **6** and two cylinder collars **7**.
  4. Disconnect the air hoses from the two nylon nipples **8**.
  5. Loosen nut **9**, remove slide block **10**, and remove the two Allen bolts **11** and tab **12**.
  6. Remove the two set screws **13**, cylinder mount R **14**, and then replace the set screws **13** in their original positions.
  7. Repeat steps 1. to 6. for the other side.
  8. Remove the four set screws **15**, and then remove microswitch assembly AE **17** from feed guide inner front AE **16**.
  9. Remove the four Allen bolts **18**, remove feed guide inner front AE **16**, four Allen bolts **19**, and then remove the front plate **20**. Next, remove the eight Allen bolts **21**, and remove position detectors C **22** and D **23**, two each.
  10. Attach the front plate **20** to the feed guide inner plate **25** by four Allen bolts **19**.
- \* Mount the front **20** so that the bevel is on the front bottom.

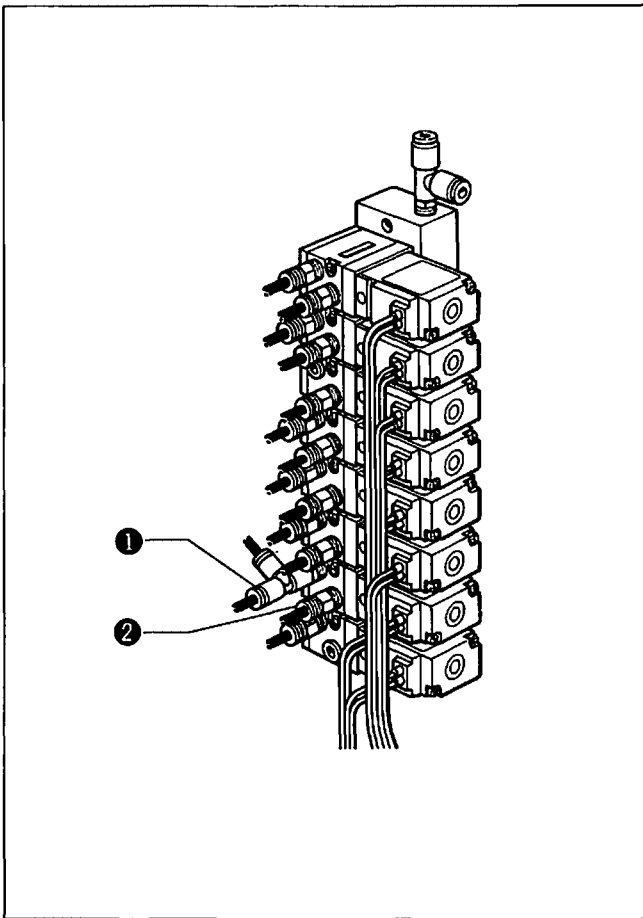




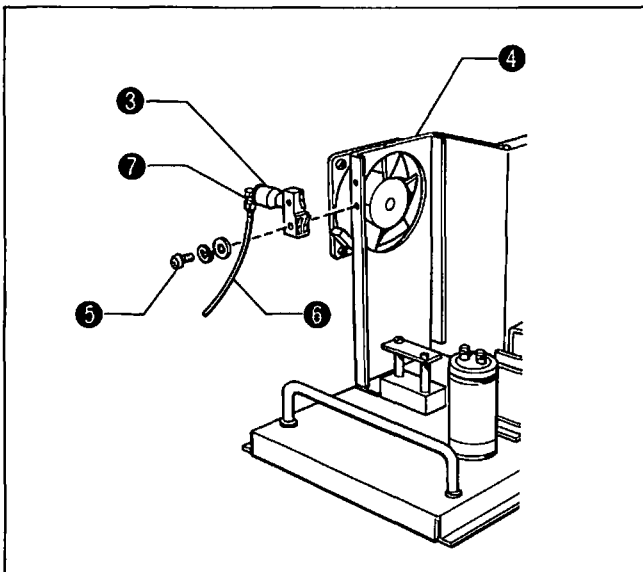
11. Use the program reference plate 24 and mount the feed guider inner plate 25 with the three set screws 18.  
\* Refer to p. 43 for origin adjustment.
12. Remove the four Allen bolts 26, Allen bolt 27, L-bracket 28, and then replace Allen bolt 27.
13. Disconnect the six air tubes from union 29.
14. Disconnect the spiral tubing 30, T-connector 31, nipple 32, and the three air tubes.
15. Cap the solenoid 33 with the auxiliary stops in place of the T-connector 31 and nipple 32.
16. Disconnect the air tube from elbow 34, and disconnect the elbow 34 from pressure switch 35.
17. Disconnect the connector to microswitch AE 17.

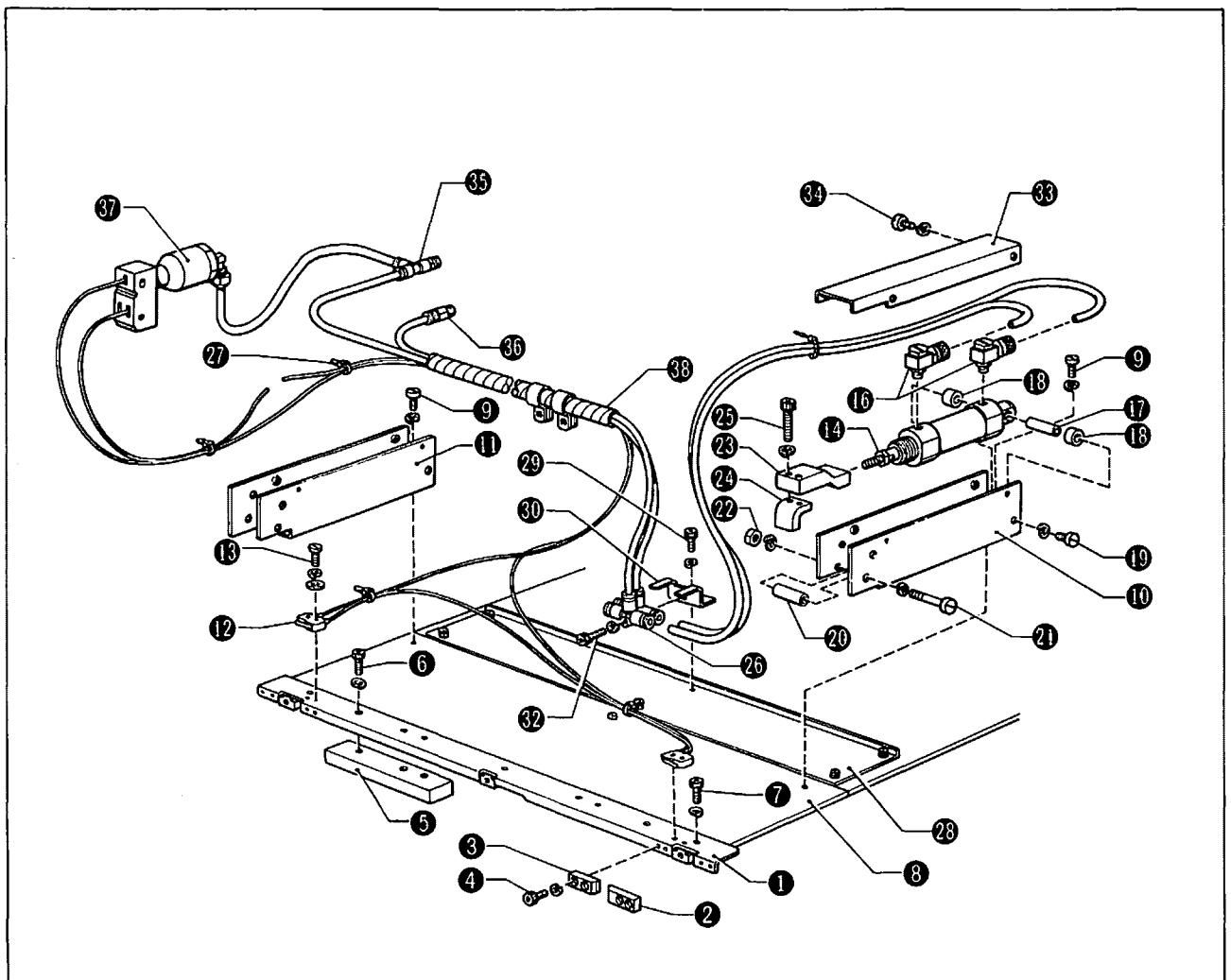
### 3 AUTO-EJECTOR ASSEMBLY

1. When eight valve groups are connected as shown in the figure at right, mount T-connector ❶ and nipple ❷ at the second from bottom group.

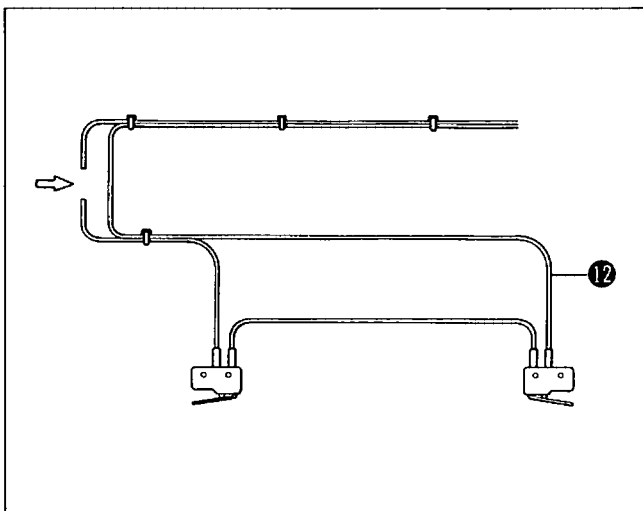
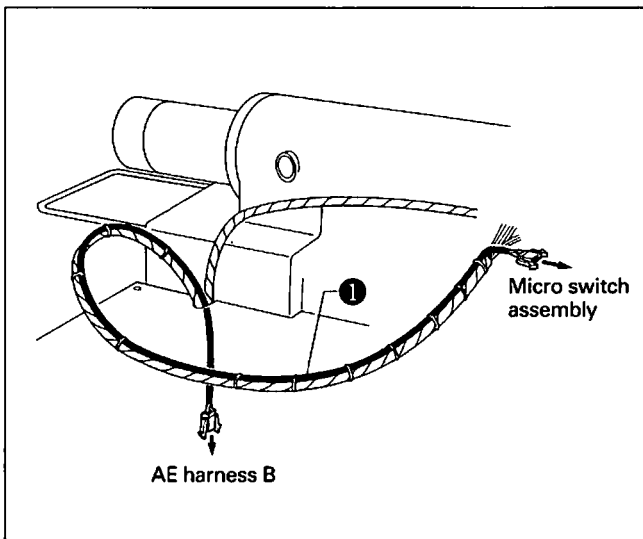
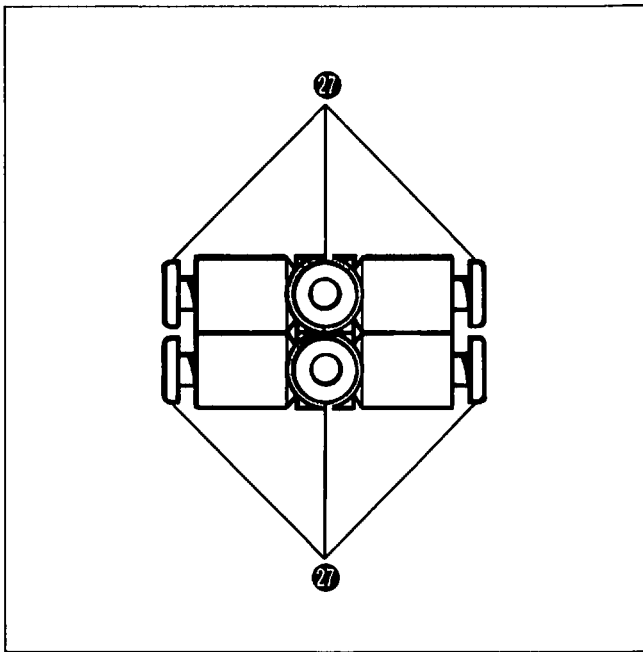


2. Mount the pressure switch ❸ on the fan plate ❹ on the power unit with two Allen bolts ❺, and then connect the elbow ❽ and T-connector ❶ with air tube ❻ (300 mm).

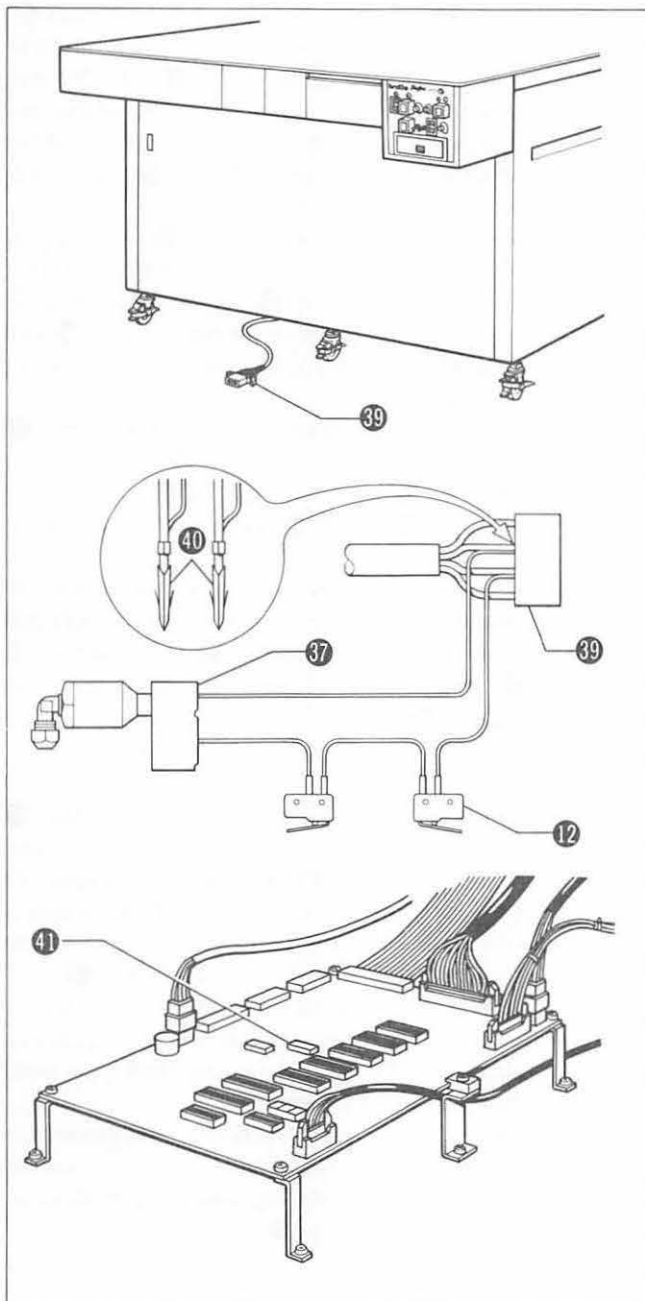




3. Temporarily mount the two position detectors C ② and D ③ (two each) on the feed guide inner front AE ① with the eight Allen bolts ④. Next, install the two bottom fronts ⑤ with the four screws ⑥.
- \* Install the bottom front ⑤ so that the bevel is on the front bottom.
4. Remove the feed guide inner front presently in place, and temporarily install feed guide inner front AE ① with three Allen bolts ⑦. Use the program reference plate to determine the positions of position detector C ② and D ③, and mount them with eight Allen bolts ④. Position detectors C ② and D ③ should be perpendicular to the needle plate at this time. Next, tighten the three Allen bolts ⑦. Remove the four screws ⑨ on the left and right of the feed guide inner cover front ⑧, and then install cylinder plate R ⑩ and L ⑪ (with the larger flank on the inside) with the four screws ⑨.
5. Install the microswitch AE ⑫ with four screws ⑬. Be careful the switch is properly installed; the cord should pass between cylinder plates R ⑩ and L ⑪.
6. Mount the four universal elbows ⑮ and four nylon hose nipples ⑯ on the two cylinders 15 so that they face the back.
7. Pass roller ⑰ through cylinder 15 ⑭, place the two cylinder collars ⑱ on both sides of the roller, and install cylinder plate R ⑩ and L ⑪ with two screws ⑲. Install roller guide ⑳ on plate R ⑩ and L ⑪ with screw ㉑ and nut ㉒. Next, mount the elbow ㉔ on the slide block ㉓ with the two Allen bolts ㉕ so that the inner side of the elbow ㉔ and the tap hole of the slide block ㉓ are perpendicular, and then mount the slide block ㉓ on the cylinder 15 ⑭. The slide block ㉓ should be mounted so that when it is pushed back with the cylinder 15 ⑭, the front surface position detector C ② and the inner face of the slide block are nearly aligned. Secure the nut at this position. Next, install one of the slide block guides ㉖.
- \* Adjust screw ⑲ so that slide block guide ㉖ is positioned between cylinder plate R ⑩ and L ⑪.



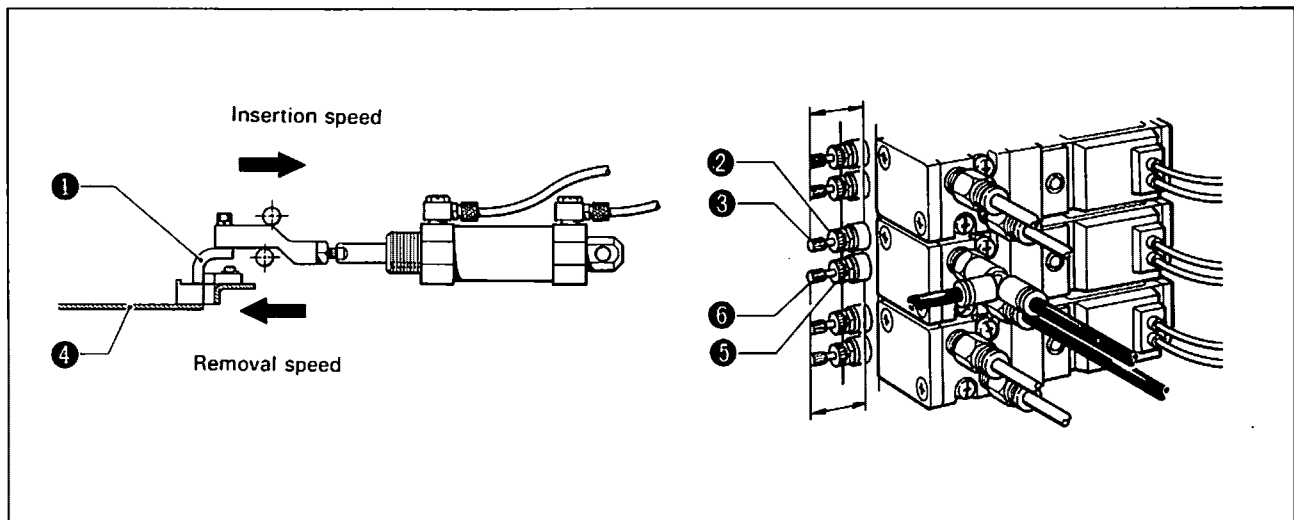
8. Connect the six air tubes to the two unions (26).
- \* There are three tube lengths. Connect the 2260-mm tube to the center union (26); the 265-mm tube to the rear right and left sides; connect the 325-mm tube to the front right and left. After retightening the union (26) nut (27), adjust the union as shown in the figure.
9. Remove the three Allen bolts (29) at the center rear of the pressure foot support (28), install the union mount front (30), enclose the two T-connectors (26) between the mount front (30) and back (31), and secure them with the four Allen bolts (32).
10. Secure the four air tubes to the nylon nipples (16) on right and left cylinder (15).
11. Mount the cylinder support (33) on cylinder panels R (10) and L (11) with the four set screws (34).
12. Remove needle plate L, and remove table left.
13. Secure the air tubes coming from the rear and center of the T-connector (26) to the service T (35), and the tubes from the front center to the nipples (36).
14. Cut the section of the limit switch assembly (12) indicated by the arrow in the right picture. Now solder the long cord from the left microswitch to the normal open terminal of the pressure switch (37), and the cord that was cut to the common terminal of the microswitch (37).
15. Disconnect the spiral tubing (38), and rewrap the six air tubes. Wire the AE harness separately along with the spiral tube and bind them with the band at 7-8 places.
16. Use the cord clamps (previously used) to secure the microswitch assembly cord (12) and pressure switch (37) cord to the leg, and connect them to the treadle connector (39).



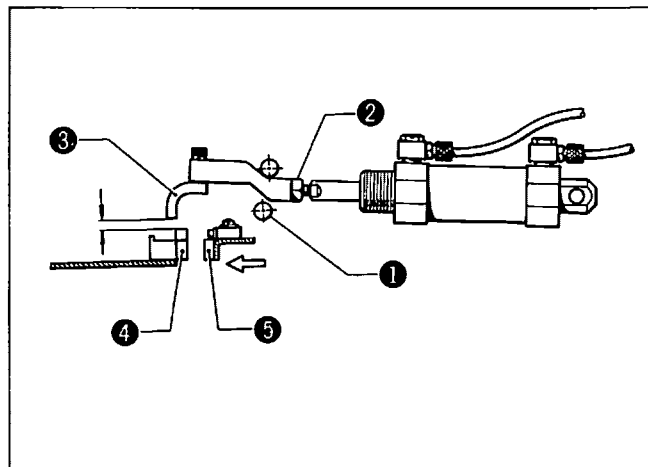
17. Use a pin extractor to disconnect the cords of the #2 and #3 connectors from the treadle connector 39. Be sure to note for subsequent reconnection the colors and numbers of respective connectors and cords; the machine will not function normally if cords and connectors are improperly connected. Next, cut off the cord pins 40, insert the cords from the microswitch 12 and pressure switch 37 as shown in the picture, and then reconnect connector 39 in its original position.
18. Turn dipswitch No. 6 41 on.
19. Replace table right, needle plate L, and the left front cover.

## 4 AUTO-EJECTOR ADJUSTMENT

### 1. Auto-ejector speed adjustment



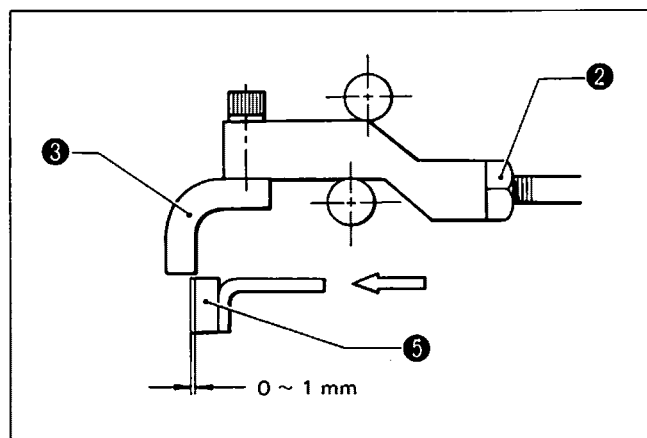
- Speed adjustment for ejector insertion  
If the tab ① moves slower than is necessary for ejector insertion, the feed mechanism will start to function before the auto-ejector is properly inserted. Should this happen, loosen nut ②, and turn speed control ③ to increase the speed as required.
- Speed adjustment for ejector removal  
If the tab ① moves slower than is necessary for ejector removal, the cassette assembly ④ will not be brought forward. Loosen nut ⑤ and turn speed control ③ to increase the speed as required.



### 2. Auto-ejector feed adjustment

Make the following adjustments so that the cassette is moved back and forth with the right and left sides moving parallel.

- (1) To increase the cassette feed stroke
  - Mount the lower feed block guide ① as far as possible in the direction of the arrow.
  - Loosen nut ②, move it opposite to the arrow, and retighten.
  - The tab ③ should be at least 1 mm above position detector A ④ during ejector removal.
- (2) To decrease the cassette feed stroke
  - Mount the lower feed block guide ① as far as possible in the direction opposite to the arrow.



- Loosen nut ②, move it toward the arrow and retighten.
- When the auto-ejector is inserted, the inner side of the tab ③ should be roughly aligned with the face of position detector C ⑤. It should not be positioned forward of this face; if it does project, the cassette will not be held firmly in place.

# ADJUSTMENT GUIDE

Trouble	Cause	Check	Remedy	Reference page
Needle breakage	Needle hits movable knife	Scar on movable knife	Adjust thread trimming slider	35
			Adjust thread trimming signal	46
	Needle hits thread catcher spring	Scar on thread catcher spring	Adjust so needle does not strike thread catcher spring	37
	Needle hits bottom plunger	Scar on bottom plunger	Adjust so needle does not strike bottom plunger	36
	Needle hits the presser foot or presser	Scar on the presser foot or presser	Adjust so the needle does not strike the presser foot or presser	33
	Correct needle up stop position	Needle up stop position	Adjust the needle up stop position	46
Improper needle and feed timing	Feed doesn't move though needle is in material	Adjust feed timing (synchronization signal)	46	
Skip stitches	Improper needle and rotary hook timing	Hook timing	Adjust the hook timing	32
	Excessive needle and rotary hook gap	Needle gap	Adjust needle and rotary hook gap	32
	Presser foot position too high	Presser foot and garment gap	Adjust the presser foot position	33
	Improper clamping	Is material properly clamped?	Change the clamp type	53
	Presser foot pressure is too low	Does presser foot vibrate up and down during sewing?	Adjust presser foot pressure	33
	Bottom plunger is too low when it rises	Bottom plunger height	Adjust plunger height	36
	Needle thread length is too short	Is needle thread length OK?	Adjust the pretension	/
		Is the needle up stop position too high?	Adjust the needle up stop position	46

Trouble	Cause	Check	Remedy	Reference page
Thread come-offs at sewing start	Thread take-up spring is too weak	Does thread take-up spring work during thread trimming?	Strengthen the thread take-up spring	/
	Thread catcher spring does not catch upper thread	Is thread catcher spring speed too slow?	Adjust thread catcher spring speed	37
		Does thread catcher spring meet the needle plate?	Replace with thread catcher spring that meets needle plate	59
	Needle thread length is too short	Is needle thread length OK?	Adjust the pretension	/
		Is the needle up stop position too high?	Adjust the needle up stop position	46
	Thread breaks and frays	Needle center not aligned with presser foot needle hole	Is presser foot position OK?	Adjust presser foot position
Scratch in presser foot needle hole		Scratch in presser foot needle hole	Remove the scratch in presser foot needle hole with sandpaper	/
Needle center not aligned with bottom plunger needle hole		Bottom plunger position	Adjust bottom plunger position	36
Scratch in bottom plunger needle hole		Scratch in bottom plunger needle hole	Remove scratch with sandpaper	/
Scratch in needle hole in needle hole plate		Needle hole scratch	Remove scratch with sandpaper	/
Scratch Mar on rotary hook surface		Scratch on rotary hook surface	Remove scratch with sandpaper	/
Upper thread breakage	Upper thread tension too great	Upper thread tension	Adjust upper thread tension	/
	Improper needle installation	Needle facing	Install so needle groove faces forward	/
	Improper thread take-up spring strength, height	Thread take-up spring strength, height	Adjust thread take-up spring strength, height	/
	Scratches or marred rotary hook, bottom plunger, needle, etc.	Scratch, marring	Correct or replace damaged part	/
	Improper needle and feed timing	Feed does not operate though needle is in material	Adjust feed timing (synchronization signal)	46



Trouble	Cause	Check	Remedy	Reference page
Lower thread breakage	Lower thread tension too great	Lower thread tension	Adjust lower thread tension	
	Scratch on bobbin case, bottom plunger	Scratch	Correct or replace	
Thread trimming misses (upper, lower threads aren't cut)	Movable knife and fixed knife do not meet	Movable knife operating position	Adjust thread trimming slider	35
	Damaged knife tip	Fixed knife tip	Sharpen or replace	35
		Movable knife tip	Replace	
	Movable knife tip not aligned with needle center	Movable knife position	Adjust movable knife position	35
	Thread trimming speed too slow	Has next sewing procedure started before thread cutting?	Adjust thread trimming speed	37
	Movable knife doesn't move	Is thread trimming signal sent?	Inspect electrical circuits	
Thread trimming misses (upper thread isn't cut)	Improper needle installation	Needle position	Install properly	
	Needle skips at last stitch		Refer to "Skip Stitches"	68
	Stitch quality is not good at final stitch	Thread take-up spring stroke	Adjust thread take-up spring stroke	
	Movable knife doesn't catch loop	Movable knife insertion timing	Adjust	39
		Thread trimming signal position	Adjust the down position signal	46
		Movable knife timing is too slow	Adjust movable knife speed	39
	Movable knife and fixed knife don't meet	Movable knife operating position	Adjust the thread trimming slider	35
	Dull knife tip	Fixed knife tip	Sharpen or replace	35
Movable knife tip		Replace		

Trouble	Cause	Check	Remedy	Reference page
Thread trimming misses (lower thread isn't cut)	Movable knife and fixed knife do not meet	Movable knife operating position	Adjust trimming slider position	35
	Damaged knife tip	Fixed knife tip	Sharpen or replace	35
		Movable knife tip	Replace	
	Thread catcher spring advances too quickly	Thread catcher spring advances before thread trimming	Adjust thread catcher speed	37
Pattern distortion	Gap between guide plate and bearing	Does the bearing roll properly?	Adjust or replace bearing	49
	Excessive gear and rack backlash	Gear and rack backlash	Adjust gear and rack backlash	44
	Improper belt tension	Belt tension	Adjust belt tension	45
	Material position is changed	Material properly clamped?	Adjust work clamp	34
		Work clamp pressure too weak	Adjust work clamp pressure	33
		Needle and feed timing OK?	Adjust needle and feed timing (synchronization signal)	46
		Presser foot descends too far	Adjust presser foot height	33
	Origin position is off	Origin position	Adjust origin position	42
Work clamp is too heavy	Work clamp	Use material as light as possible	53	

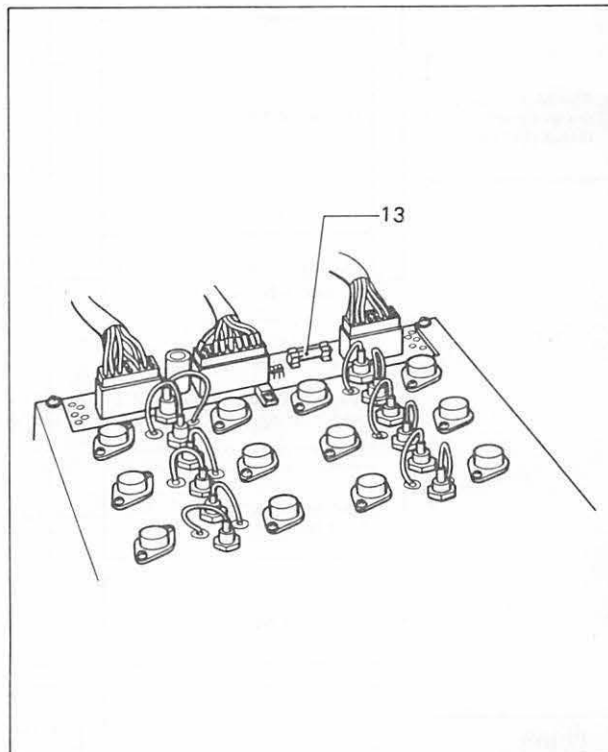
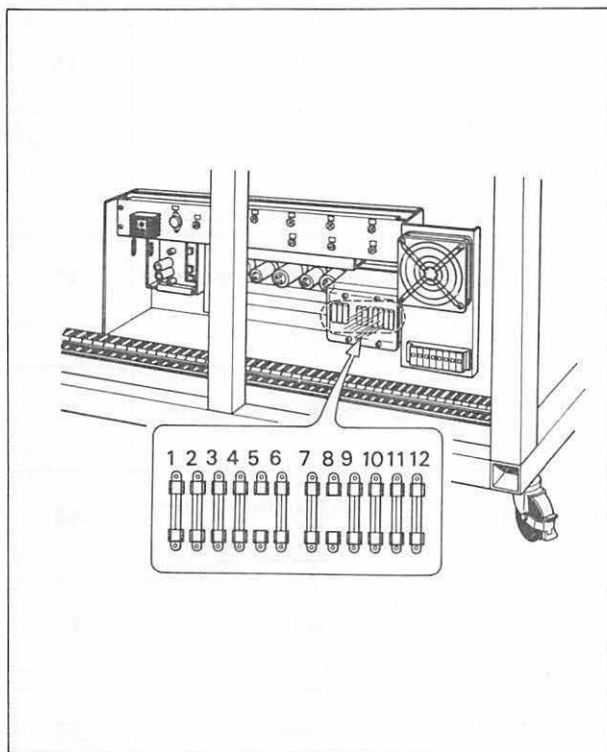
# ELECTRICAL ADJUSTMENT

★ When replacing any parts, always turn the power switch off.

## I FUSE REPLACEMENT

### (1) Fuse Positions

Open the rear cover. Fuses No. 1 ~ 12 and fuse number 13 for the pulse motor are inside the electrical equipment fuse box.



### (2) Fuse Capacity

No.	Fuse types and capacity		Remarks
1	Slow blow fuse	5A-250V	For pulse motor
2	Slow blow fuse	5A-250V	For pulse motor
3	Fuse	10A-125V	For D.D-motor
4	Slow blow fuse	0.5A-250V	For bobbin winder motor
6	Fuse	5A-125V	For air solenoid
7	Fuse	1A-125V	For floppy motor
9	Fuse	5A-125V	For pulse motor (high voltage)
10	Fuse	5A-125V	For control + 5V
11	Fuse	1A-125V	For control + 12V
12	Fuse	1A-125V	For control - 5V
13	Slow blow fuse	1A-250V	For pulse motor logic

**(3) Fuse Replacement**

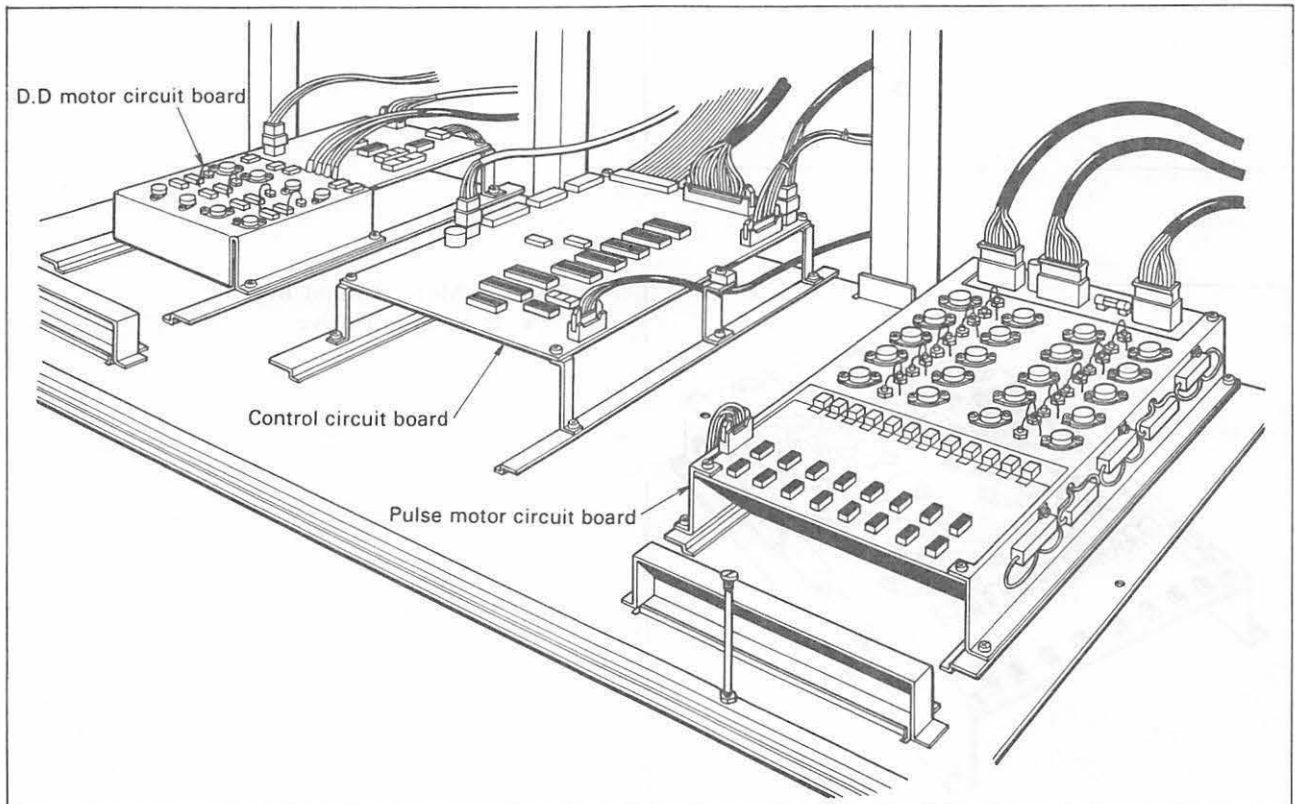
The chart below shows that happens when each fuse blows. Refer to it when replacing fuses.  
**Caution:** Be sure to always replace a fuse with one of the same capacity.

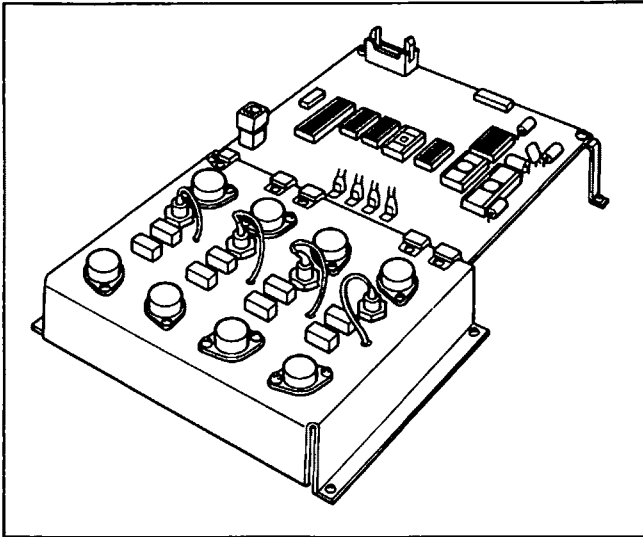
Fuse No.	Result of blown fuse	Reference page
1, 2, 9	<ul style="list-style-type: none"> <li>• Pulse motor torque drops; motor sounds as if it were operating properly but feed mechanism does not work.</li> <li>• Unusual sounds heard; feed does not operate according to program.</li> </ul>	p.97 #14, 1
3	<ul style="list-style-type: none"> <li>• Machine will not operate; emergency lamp illuminates.</li> </ul>	p.101 #24, 1
4	<ul style="list-style-type: none"> <li>• When the power switch is turned on or off, the machine moves slightly.</li> </ul>	
6	<ul style="list-style-type: none"> <li>• Though air pressure is normal, the work clamp, presser foot, thread trimmer, bottom plunger and thread catcher will not operate.</li> </ul>	p.96 #9, 4
7	<ul style="list-style-type: none"> <li>• When programming the memory disc, the lamp illuminates; however, the emergency lamp illuminates with no clicking sound heard.</li> </ul>	p.94 #5, 4
11, 12	<ul style="list-style-type: none"> <li>• Absolutely no machine movement.</li> <li>• When the power switch is turned on, the machine runs at an abnormally high speed.</li> </ul>	p.91 #1, 3 p.92 #2, 1
13	<ul style="list-style-type: none"> <li>• The feed mechanism will not operate, and pulse motor circuit board LED will not illuminate.</li> </ul>	p.97 #14, 1

**2 CIRCUIT BOARDS AND DIP SWITCH REPLACEMENT**

**(1) Circuit Board Positions**

Open the back cover and the D.D motor, control, and pulse motor circuit boards are arranged as shown below.



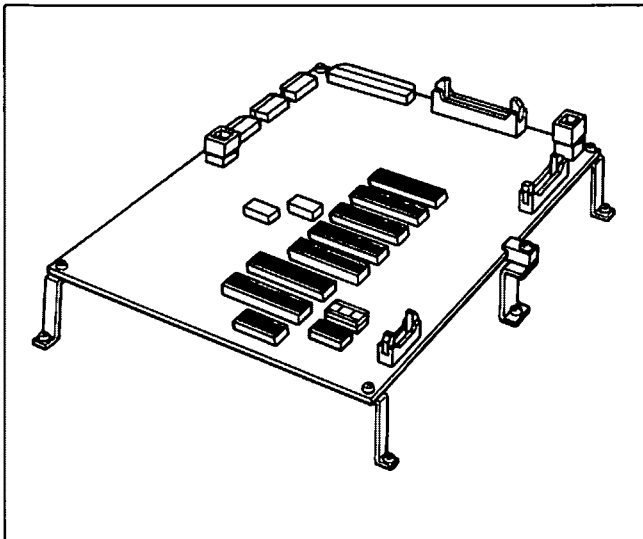


## (2) Circuit Board Functions

Circuit board functions are listed below. Refer to these lists when replacing circuit boards.

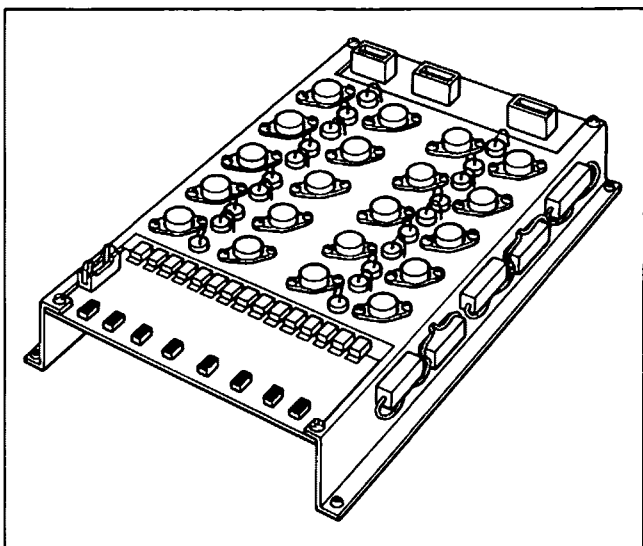
### 1. D.D Motor Circuit Board

- D.D motor rotation control
- D.D motor needle up stop position
- Relay of synchronization and thread trimmer signals to the control board.



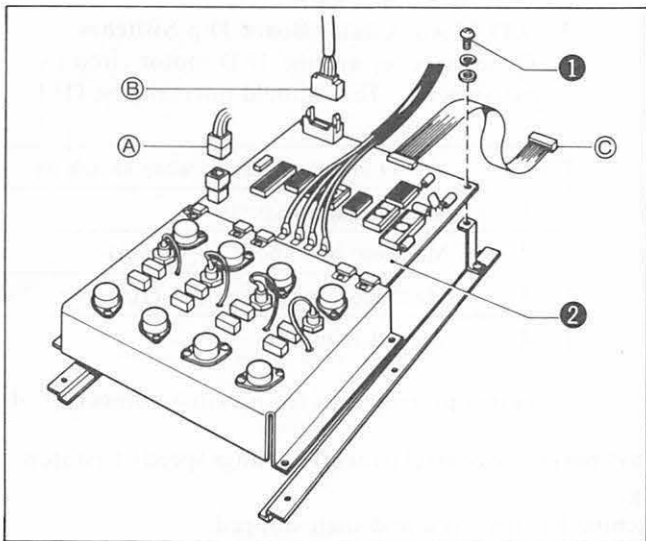
### 2. Control Circuit Board

- Transmits command signals to the D.D motor circuit board.
- Transmits command signals to the puls motor circuit board.
- Memory disc control
- Air solenoid drive (clamp, thread trimmer, bottom plunger, thread catcher)
- Discrimination of input to each switch
- Programming control



### 3. Pulse Motor Circuit Board

- Pulse motor drive



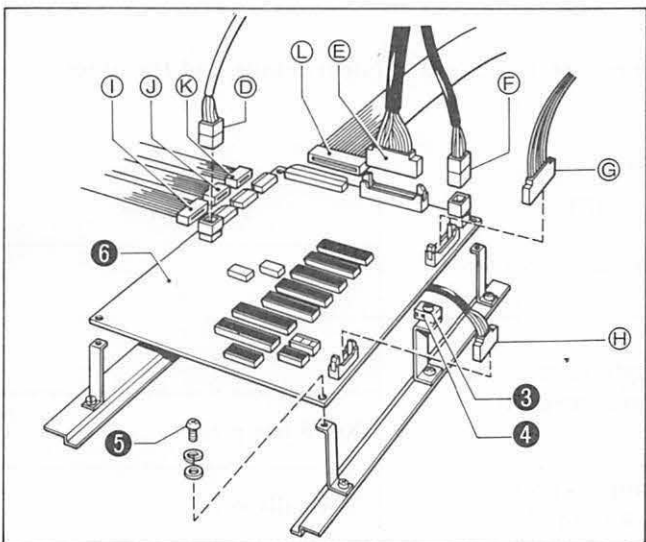
### (3) Circuit Board Replacement

★ Always turn the power switch off, then open the back cover and perform the following steps.

#### [1] D.D Motor Circuit Board Replacement

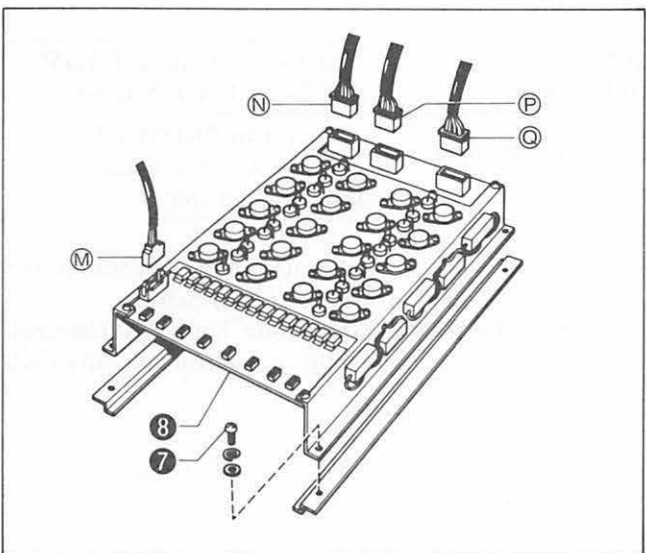
1. Disconnect connectors (A) and (B) and flat cable (C).
2. Disconnect tab terminals (1), (2), (3) and (4).
3. Remove the six installation screws (1) and replace the D.D motor circuit board.

\* Be sure to reconnect the tab terminals in the proper order.



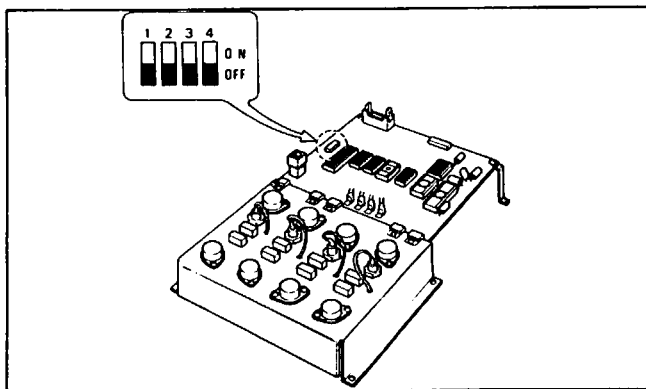
#### [2] Control Circuit Board Replacement

1. Disconnect connectors (D), (E), (F), (G), and (H).
2. Disconnect flat cables (I), (J), (K), and (L).
3. Loosen the two set screws (3), and shift the circuit board mounting plate (4).
4. Remove the four installation screws (5), and replace the control circuit board (6).



#### [3] Pulse Motor Circuit Board Replacement

1. Disconnect connectors (M), (N), (P) and (Q).
2. Remove the four installation screws (7), and replace the pulse motor circuit board (8).



### 3 DIP SWITCH USE

#### 1. D.D Motor Circuit Board Dip Switches

These switches are the D.D motor circuit self-test switches. They should normally be OFF.

No.	D.D motor operation when switch on
1	Machine high speed
2	Machine low speed (150 rpm)
3	Machine superlow speed (100 rpm)
4	Thread trimming

\* Switch priority runs from switch number 1 ~ 4.

Note 1: High speeds are selectable by the speed selector switches on the control panel. To change speeds, first stop the machine, change speeds and proceed sewing.

Note 2: The thread trimmer will not work until the machine has been run and then stopped.

Note 3: If only No. 1 switch is turned on and off, the machine will stop suddenly after high speed operation and emergency lamp may illuminate. However, this is not a malfunction or unusual.

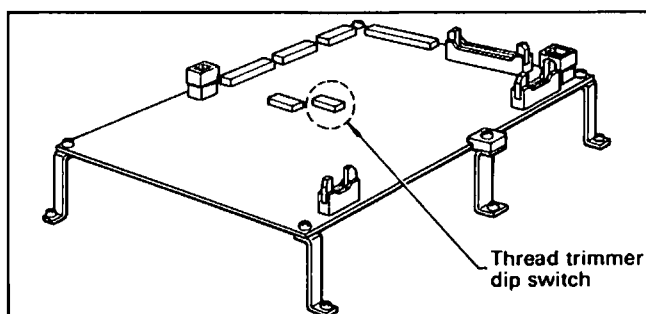
Note 4: Do not use switches 5 ~ 8.

#### 2. Control Circuit Board Dip Switches

There are two sets of control circuit board dip switches, one for thread trimmer timing and the other for specification selection.

##### ◎ Specification Selection Dip Switches

Switch No.	ON	OFF	Remarks
1	Work clamp still down when sewing completed.	Clamp automatically rises at end.	
2	Simultaneous clamp rise; descent is left clamp, then right.	Left and right clamps rise, descend simultaneously.	No. 3 has priority.
3	Clamp rise is left, then right; simultaneous descent.		
4	Operate without air pressure	Machine stops if pressure not over 4 kg/cm <sup>2</sup> .	Normally off
5			
6	Ejector specification	Bar tack specification	
7	500 ~ 800 rpm regardless of stitch length.	Sewing speed changes according to stitch length.	This function not in PROM 1-1, 2-1, 3-1, 4-1, 5-1, 6-1.
8	888[F] is split for lower thread.	888[F] is no thread-trimming feed.	All prior to PROM 1-5, 2-3, 3-3, 4-1, 5-1, 6-4 are lower thread split.



Note: There may be later additions for improvement of product performance.

\* Refer to "Movable Knife Timing Adjustment" (p.39) concerning the thread trimmer dip switch.

#### 4 CONNECTORS

Improper connector connections and contacts may be the cause of various malfunctions. Consequently, before performing the troubleshooting checks, check whether the connectors are properly connected, and whether the pins and wires have proper contact. The below table lists the results of improper connections. Refer to it as necessary.

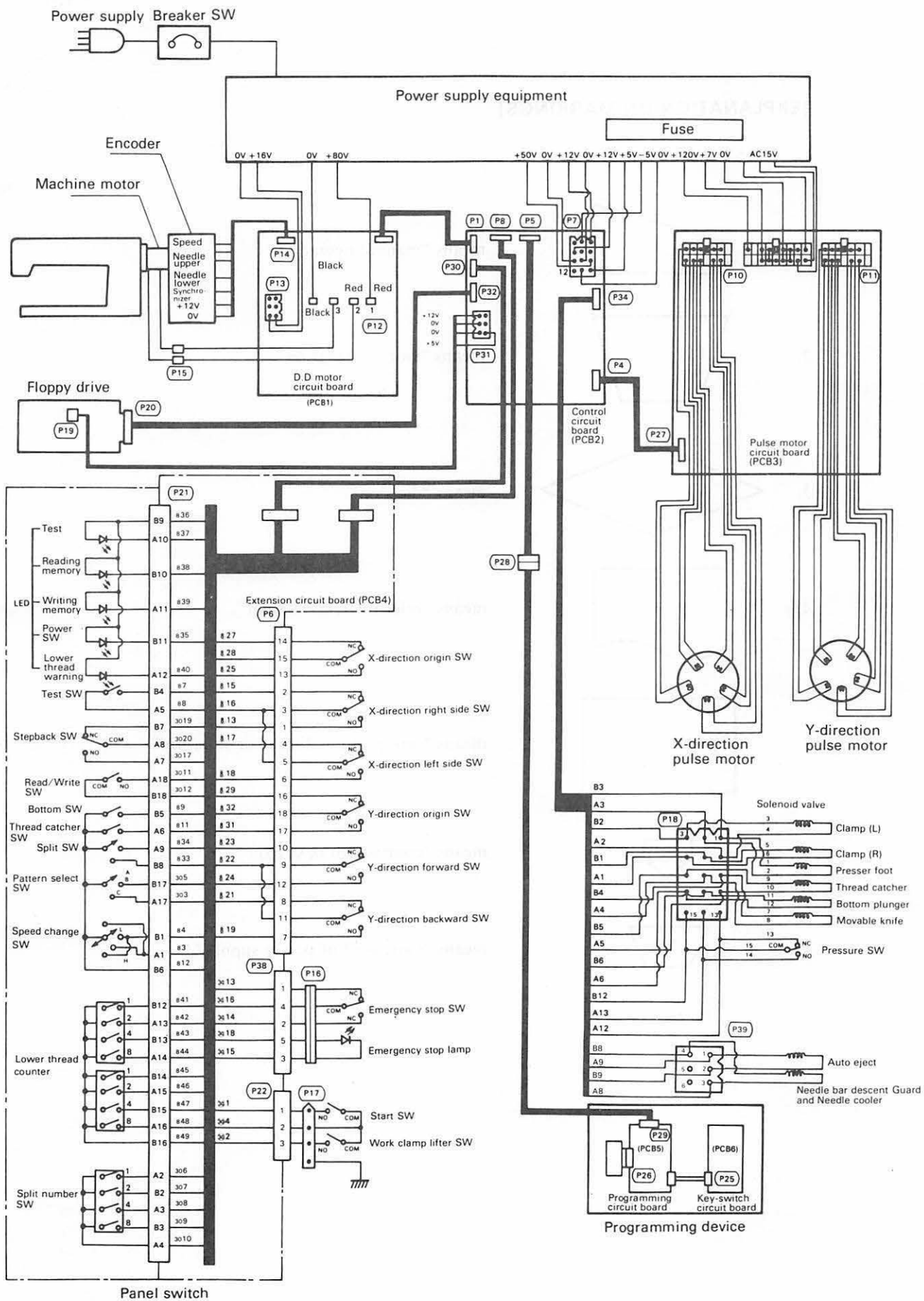
\* Refer to the block diagrams for connector numbers. (Refer to p. 70.)

Connector No.	Connected portion	Main signal	Result of improper connection
(P1)	Control Circuit board ↕ D.D motor circuit board	<ul style="list-style-type: none"> <li>• Speed command from control circuit board</li> <li>• Synchronization and needle down position signals from encoder</li> <li>• Power supply to machine motor circuit board (+5V; +12V; -5V)</li> </ul>	Improper D.D motor operation
(P4) (P27)	Control circuit board ↕ Pulse motor circuit board	Pulse motor operation command	Pulse motor does not operate
(P5) (P28) (P29)	Control circuit board ↕ Programming circuit board	Key switch signals and display signals.	<ul style="list-style-type: none"> <li>• Programmer switch does not operate</li> <li>• Faulty programmer display</li> </ul>
(P6)	Micro switch ↓ Extension circuit board	Origin position and overlimit switch signals	<ul style="list-style-type: none"> <li>• Origin position not detected</li> <li>• Emergency stop illuminates, cannot be cancelled.</li> </ul>
(P7)	Power supply ↕ Control circuit board	+5V, +12V, -5V  For solenoid drive (+50V) For floppy motor (+12V)	Improper control functions
(P8) (P30)	Extension circuit board ↕ Control circuit board	External switch signals	Refer to (6), (21), (22), (38)
(P9) (P10) (P11)	Power supply ↕ Pulse motor circuit board ↕ Pulse motor	+120V, +7V, 15V AC  Motor drive current	<ul style="list-style-type: none"> <li>• Abnormal operation</li> <li>• Abnormal sounds from the pulse motor</li> <li>• During programming, one pulse is skipped by the feed key.</li> </ul>



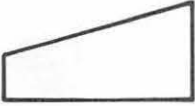
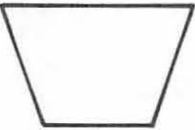
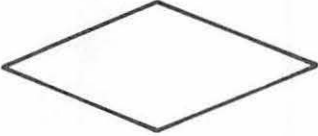

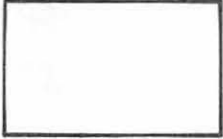


Connector No.	Connected portion	Main signal	Result of improper connection
(P12) (P15)	Power supply ↕ D.D motor circuit board ↕ Machine motor	+80V  Machine motor drive current	Machine motor will not operate (emergency stop lamp illuminates).
(P14)	Encoder ↕ D.D motor circuit board	+12V, encoder signal	<ul style="list-style-type: none"> <li>• Machine runs at high speed momentarily and then stops. (Emergency stop lamp illuminates.)</li> <li>• Synchronization, needle down, needle up, down position signals are not output.</li> </ul>
(P16) (P38)	EM switch assembly ↓ EM harness ↓ Extension circuit board	<ul style="list-style-type: none"> <li>• Emergency stop switch signal</li> <li>• LED signal</li> </ul>	<ul style="list-style-type: none"> <li>• Emergency stop does not function</li> <li>• Emergency stop lamp illuminates, will not cancel</li> </ul>
(P17) (P22)	Foot switch assembly ↓ Foot connector ↓ Extension circuit board	Start signal, work clamp lifter signal	Will not operate even though work clamp lifter and start switches are depressed. (Emergency stop lamp does not illuminate.)
(P18) (P34)	Air solenoid ↑ Air connections ↑ Control circuit board	<ul style="list-style-type: none"> <li>• Solenoid drive current</li> <li>• Pressure switch signal</li> </ul>	Improper work clamp, presser foot, movable knife, thread catcher, bottom plunger operation
(P19) (P20) (P31) (P32)	Control circuit board ↕ Floppy drive	+12V, +5V, floppy control signal	Emergency stop lamp soon illuminates during data storage and read-in on the memory disc
(P26)	Programming circuit board ↓ Display circuit board	Drive current for display	Improper programmer display
(P25)	Programming circuit board ↑ Key switch circuit board	Key switch signals	Programmer key switches do not function.

# CONTROL CIRCUIT BLOCK DIAGRAM

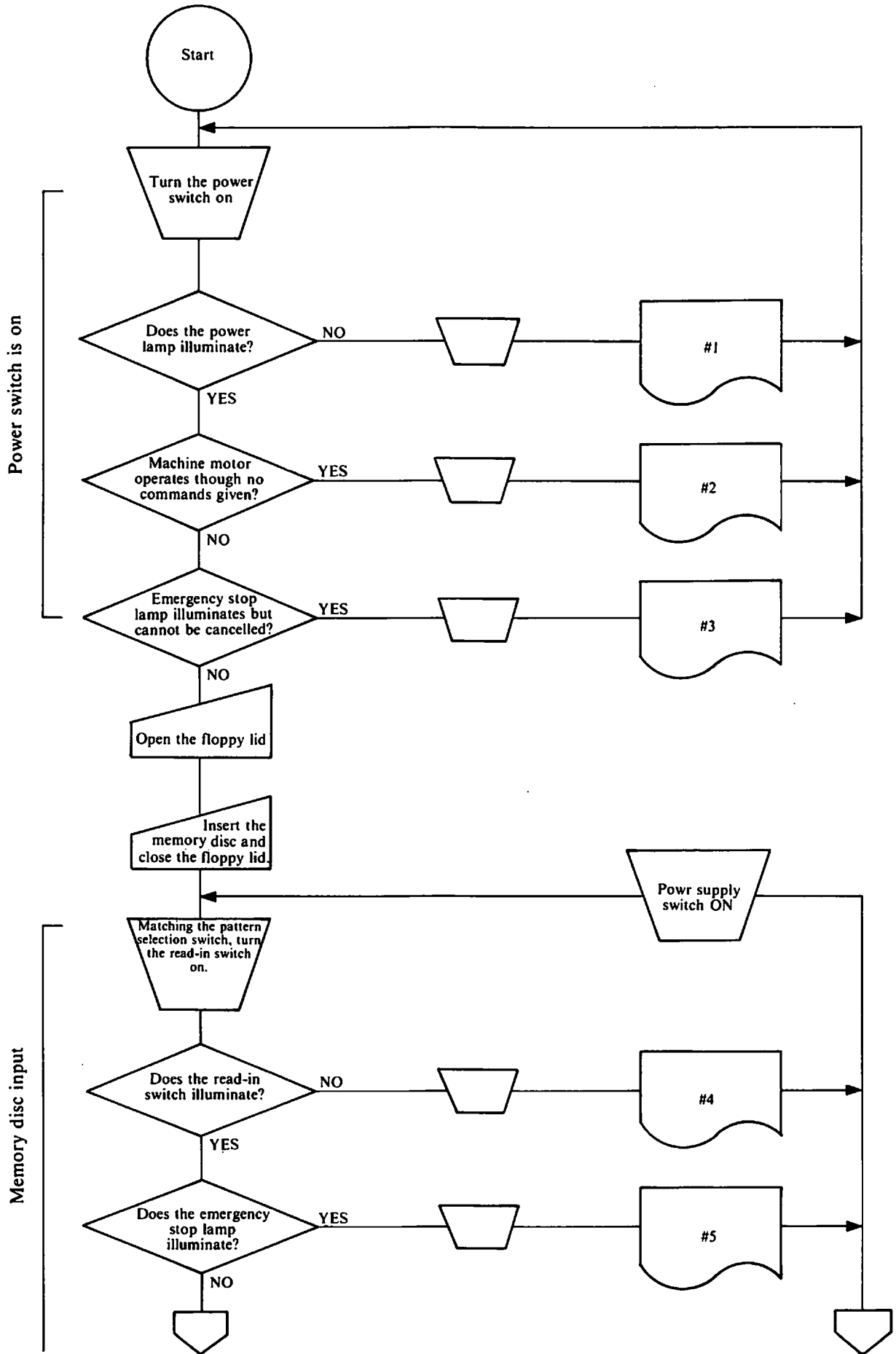


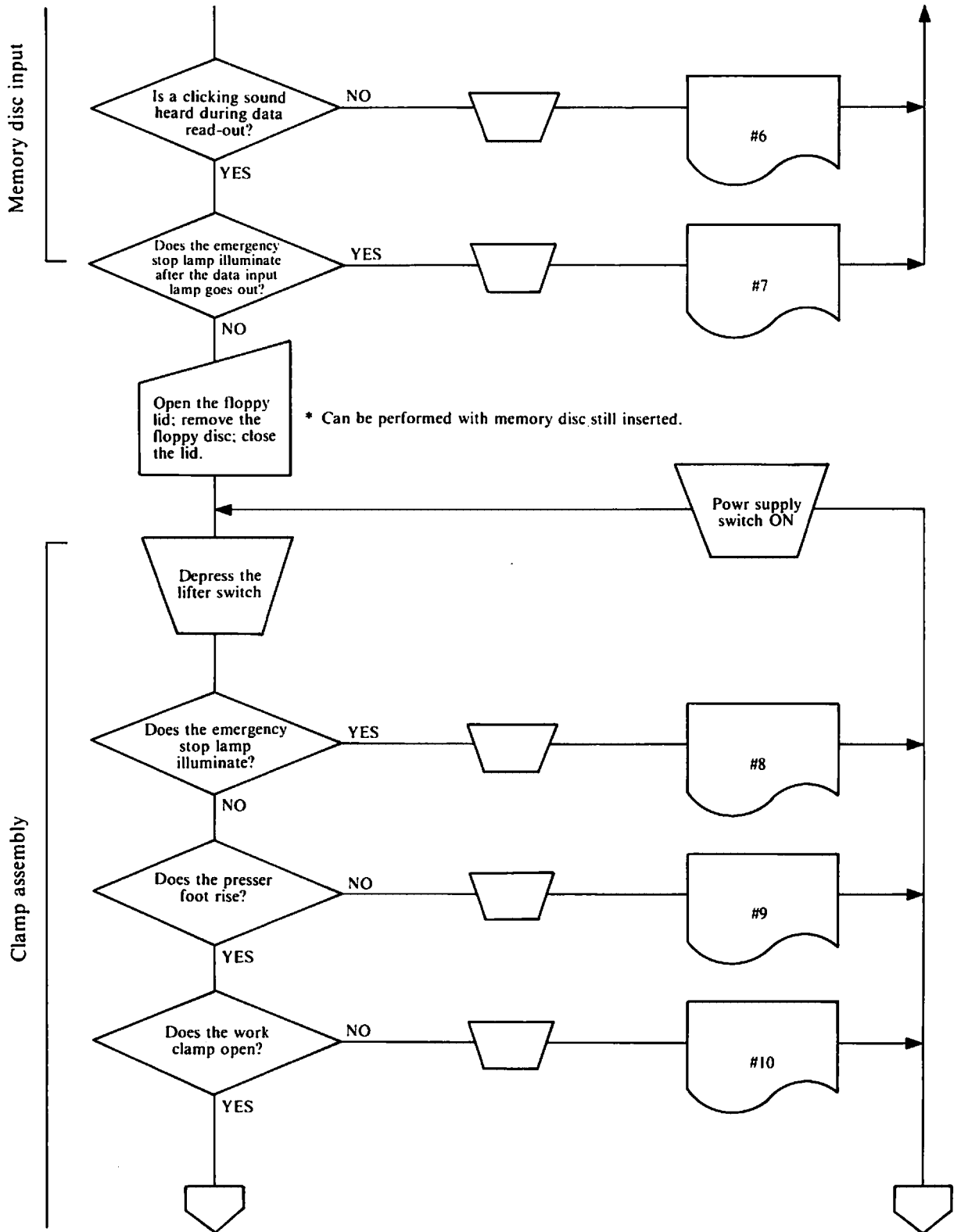
# TROUBLE SHOOTING FLOW CHART

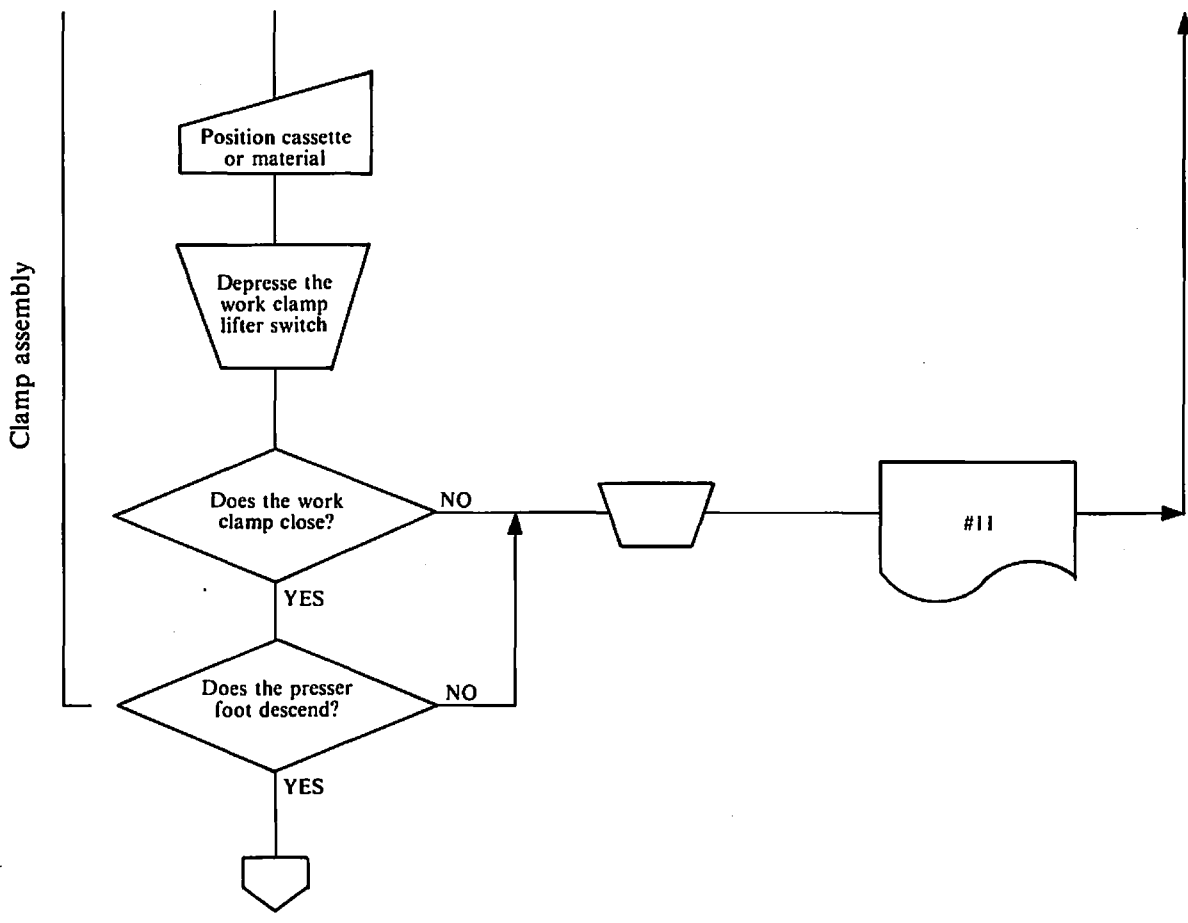
## [EXPLANATION ON MARKINGS]

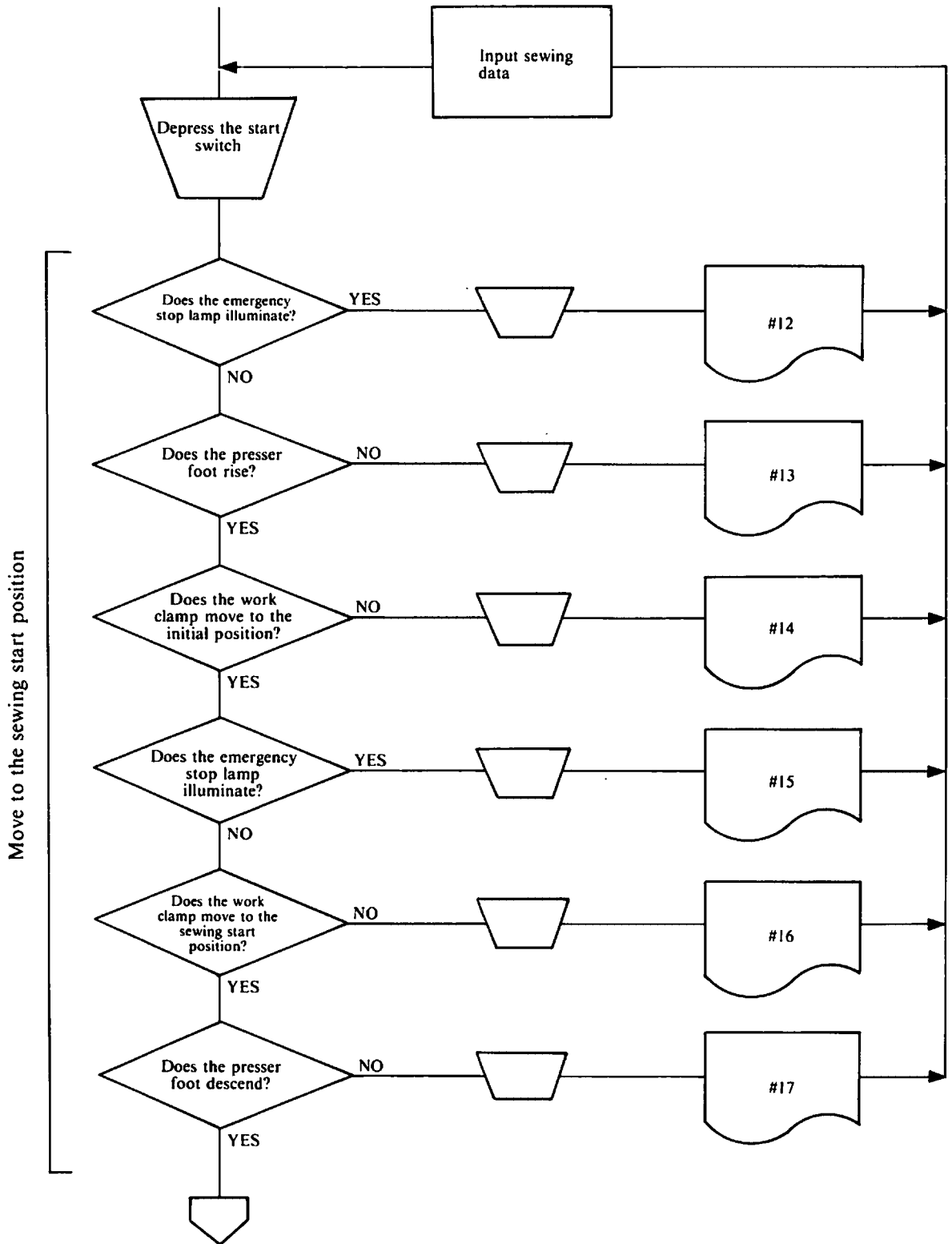
1.  means "manual operation"
2.  means "switch operation"
3.  means "decision"
4.  means "refer to Item Number"
5.  means "set-up of conditions or situation"
6.  means "continue to next page"
7.  means "switch-off of power supply"

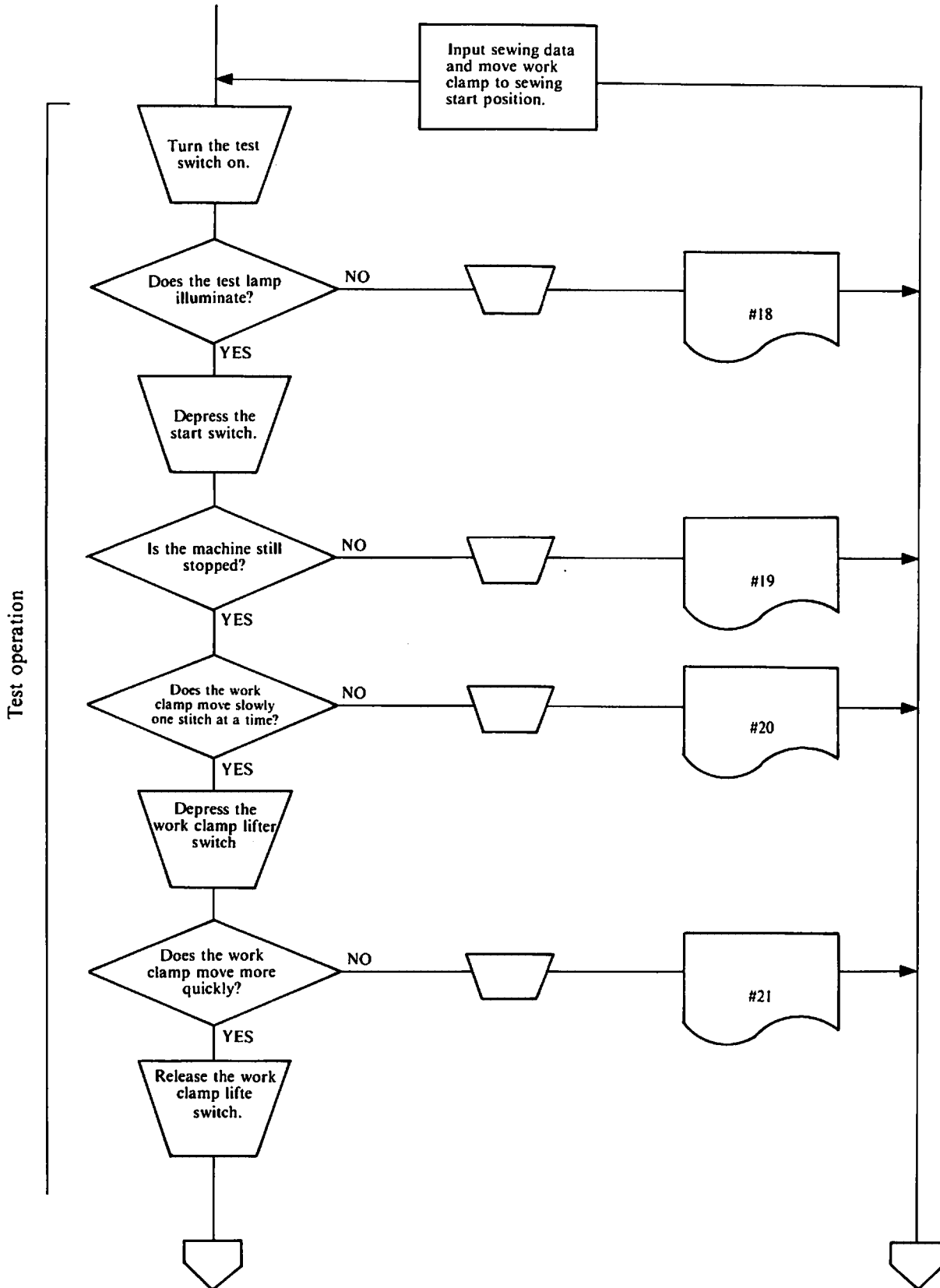
**I TROUBLESHOOTING FLOW CHART FOR MACHINE CONTROL DEVICE**



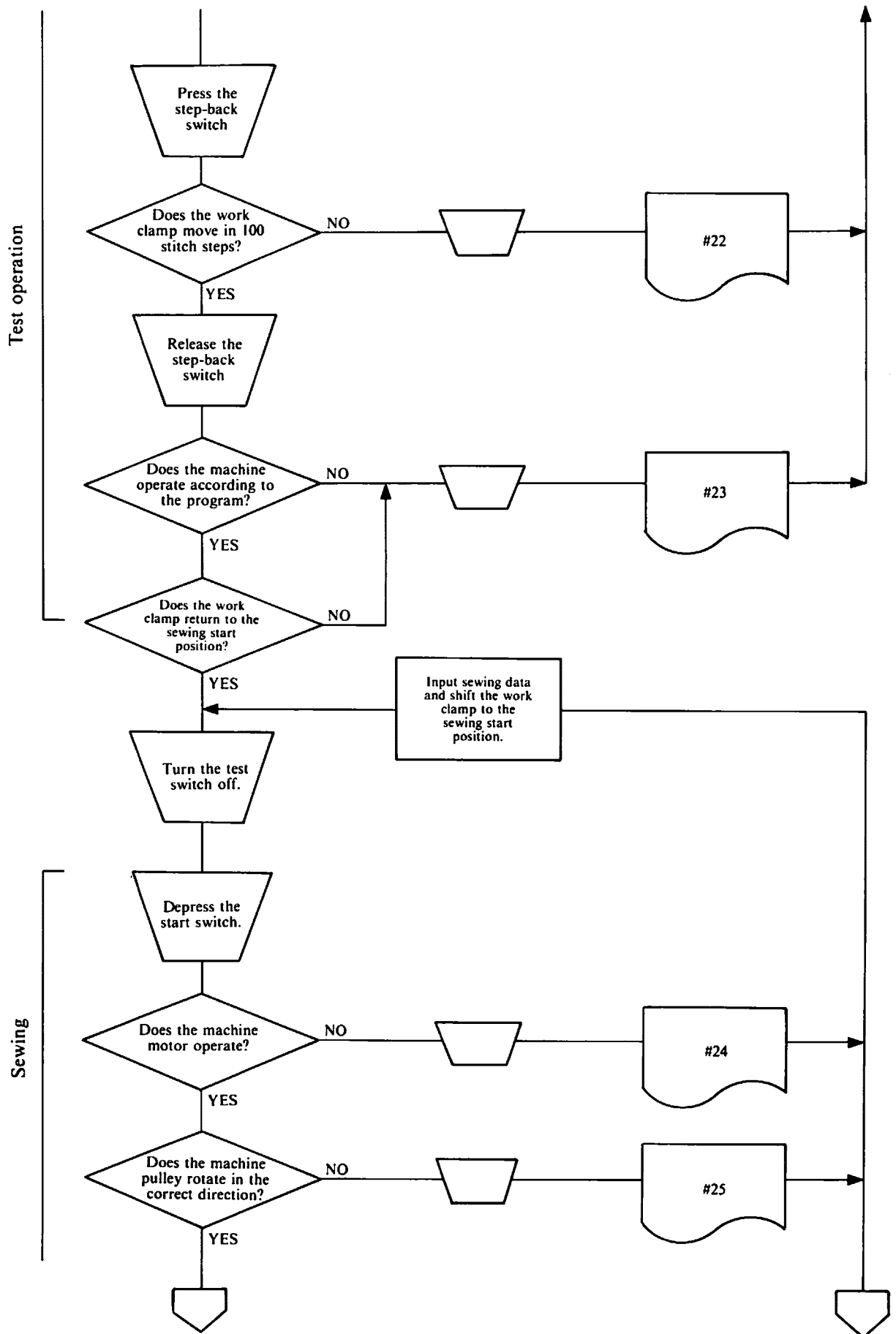




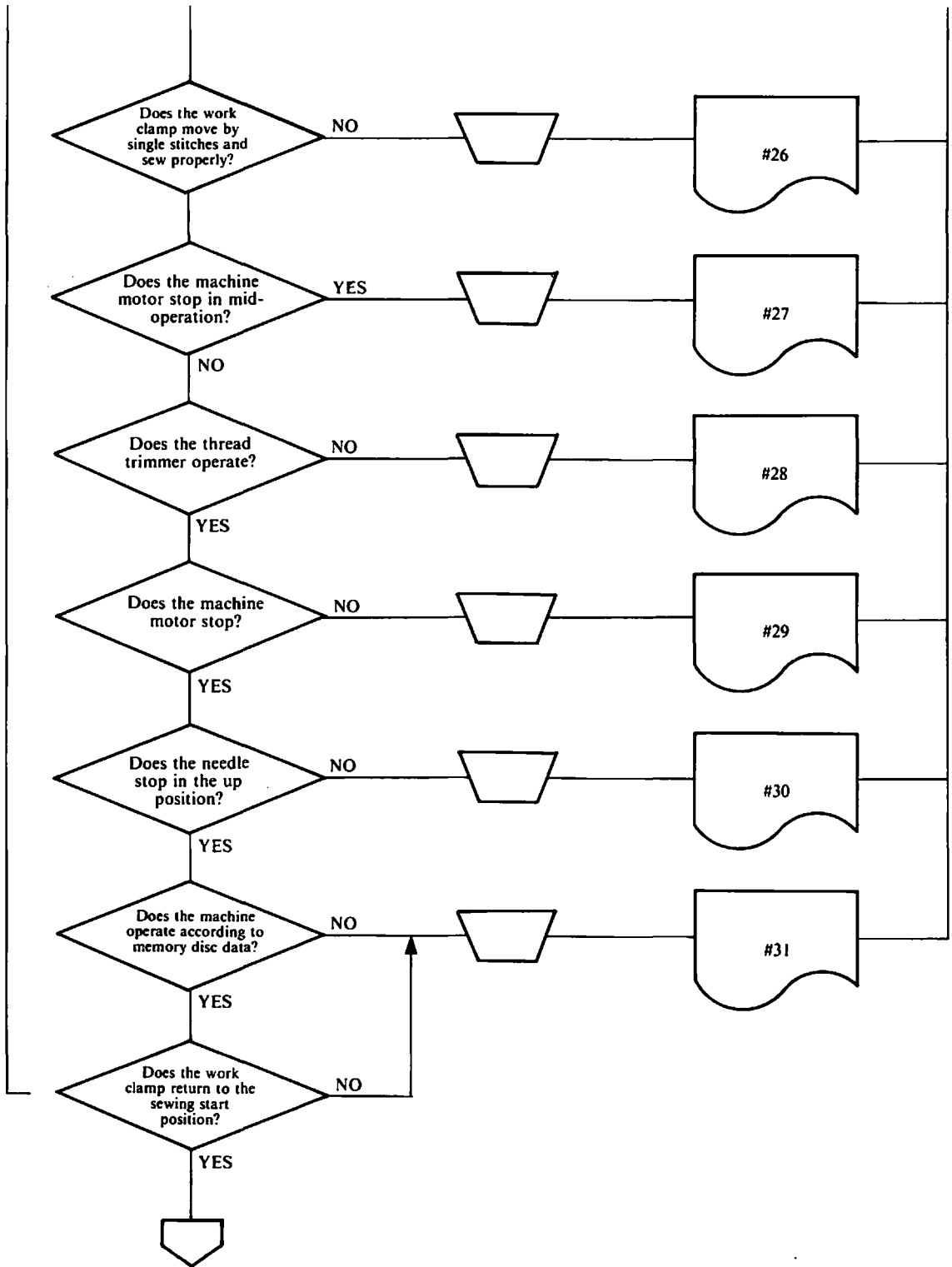


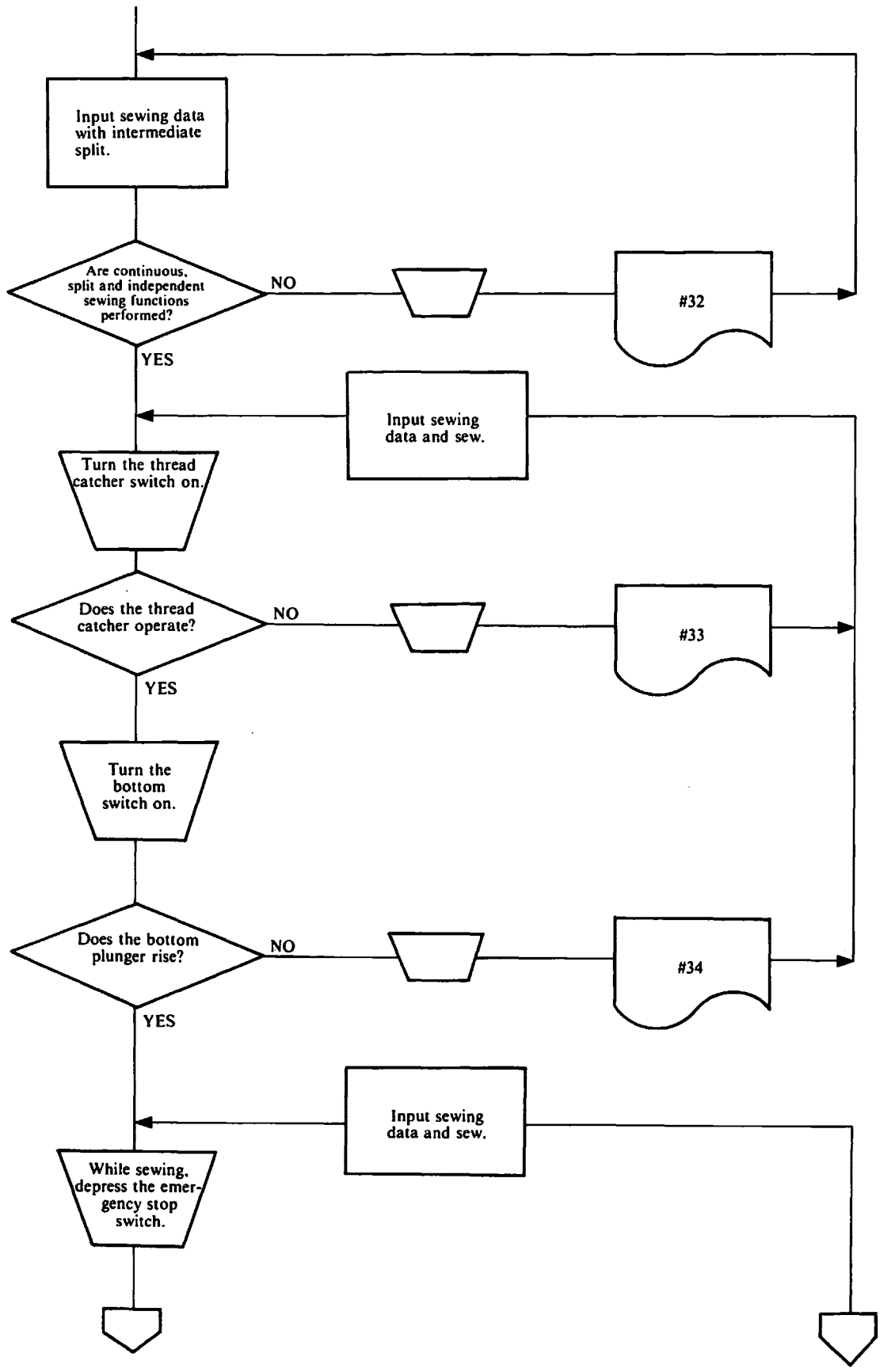


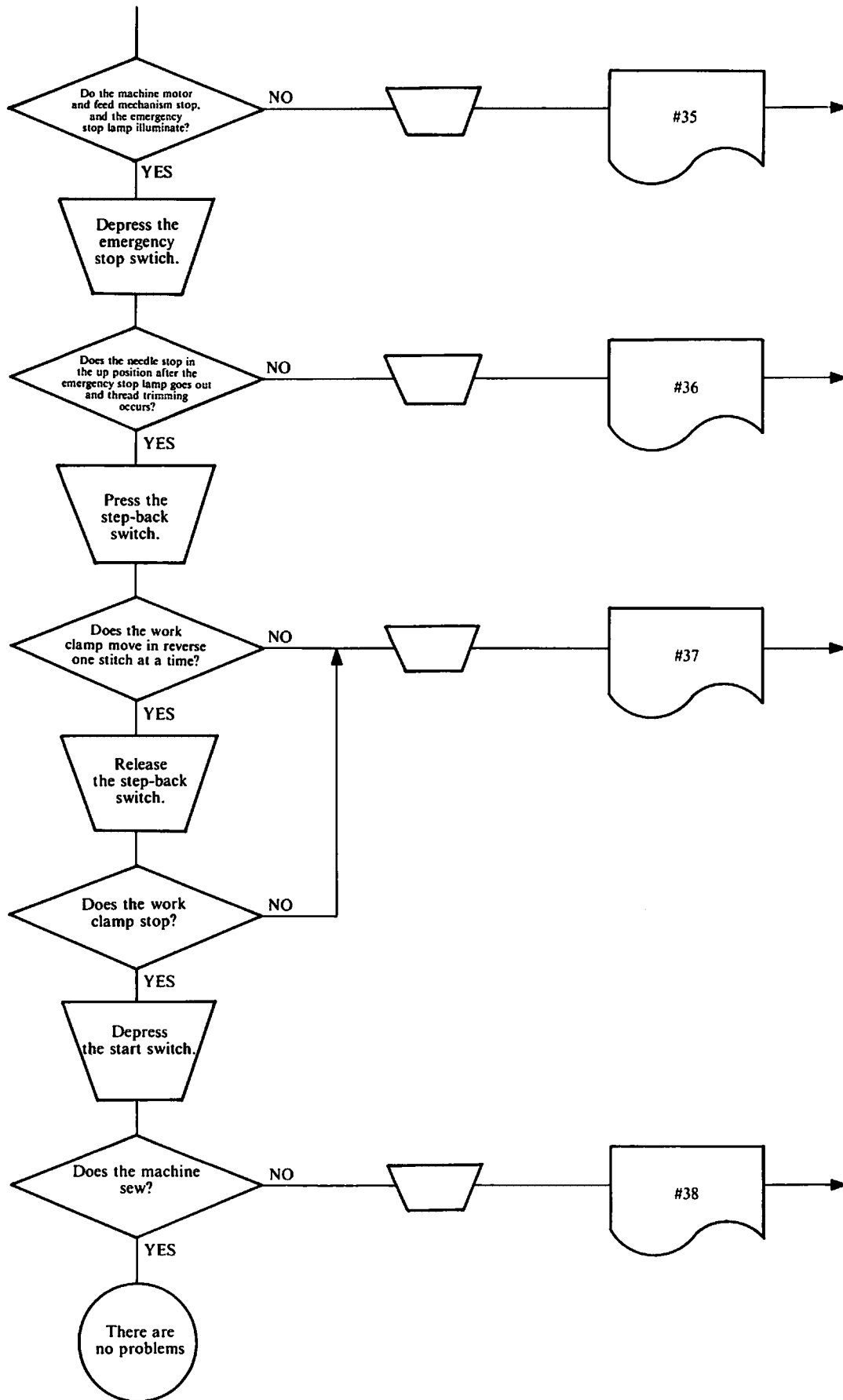




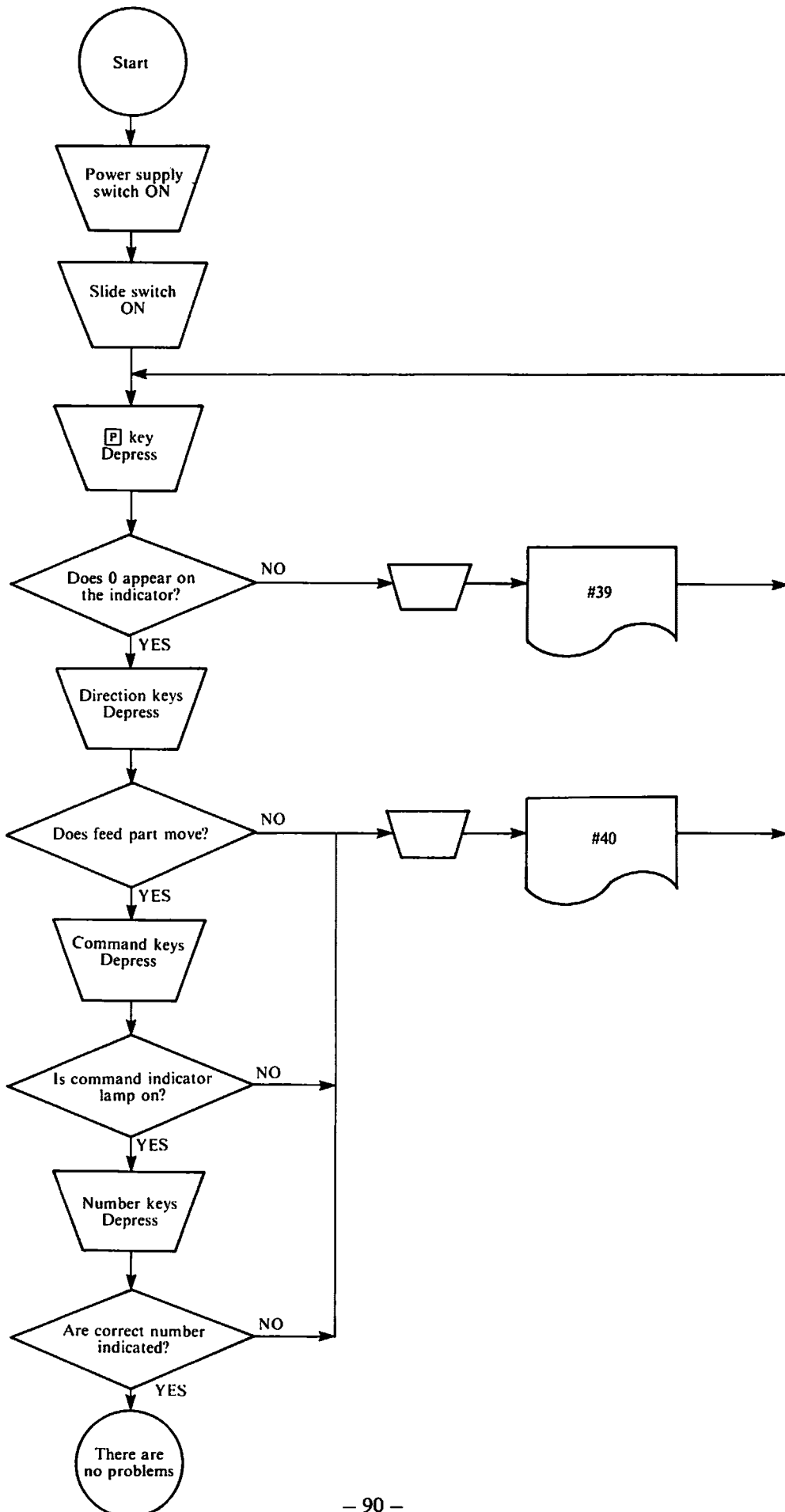
Sewing







**2 TROUBLESHOOTING FLOW CHART FOR PROGRAMMING DEVICE**



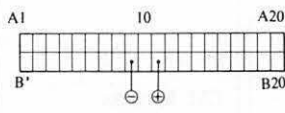
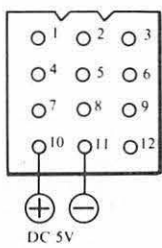
# ACTION COUNTERMEASURE

## WARNINGS WHEN CARRYING OUT TROUBLESHOOTING:

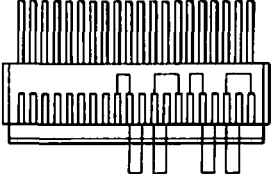
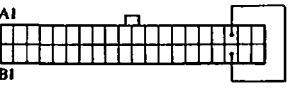
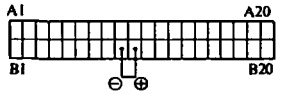
1. Make sure to remove or replace the plug after switching off the power supply.
2. Switch off the power supply when taking off the covers or tables from the machine.
3. When replacing fuse, always make sure to use exactly the same quality and capacity of fuse.
4.  ..... Turn the switch on, and check the voltage.  
 ..... Turn the switch off, and check the resistance.

## ◀BEFORE MAKING ADJUSTMENTS▶

1. Check whether fuse is not blown.
2. Confirm whether all plugs are properly connected.
3. Find out with flow chart under what condition it's symptoms occurs.

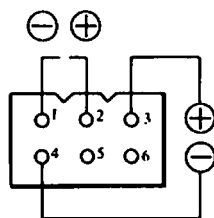
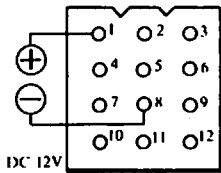
No.	Cause	Check, Repair, Adjustment	Replacement parts	Page
Power lamp does not illuminate when power switch is turned on.	1. Power is not being supplied.	<input type="checkbox"/> Measure the voltage of 3ph power.		/
	2. Fault on power supply switch cord	<input type="radio"/> Open the rear cover. Disconnect power plug and turn power switch on; using a tester, check between R, S, T, E on the electrical equipment terminal panel, and the power plug. If continuity exists, the cord is OK.	Power switch Power supply cord	/
	3. Blown fuse	<input type="radio"/> Remove fuse No. 10 and test for continuity. If continuity exists, the fuse is OK.	Fuse No. 10 (5A)	73
	4. Fault on lamp (LED) or cord  	<input type="radio"/> Disconnect plug P21 on the intermediate circuit board and measure the resistance. If the needle moves in the maximum magnification range, the lamps or cords are OK.	Switch panel assembly (LED)	79
	5. Defective electrical equipment  	<input type="checkbox"/> Disconnect plug P7 on the control circuit board, and measure the voltage. If 5V DC, equipment is OK.  No. 10 ⊕ — No. 11 ⊖  Check whether the connector pin-to-cord contacts or the connector pins are causing a faulty connection.	Power supply equipment (Power supply circuit board)  Connector pin	79

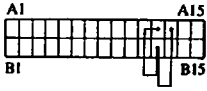


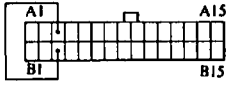
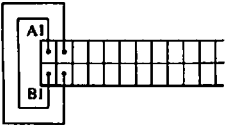
No.	Cause	Check, Repair, Adjustment	Replacement parts	Page
#3 Emergency stop lamp will illuminate and will not cancel.	2. Fault on overlimit circuit switch or cord 	<ul style="list-style-type: none"> <li>○ Disconnect plug P6 on the intermediate board, and check for continuity.</li> <li>a. If continuity exists between ② and ③, ④ and ⑤, ⑧ and ⑩, ⑧ and ⑪, OK.</li> <li>b. If continuity by exists between ① and ③, ⑥ and ⑤, ⑨ and ⑫, ⑦ and ⑪, OK.</li> <li>* Confirm that the overlimit switch is not on.</li> </ul>	Micro-switch assembly	79
	3. Fault on power supply equipment	<ul style="list-style-type: none"> <li>□ If the voltage between the 0V → +5V terminals on the control circuit board is 5V DC, OK.</li> <li>□ Acceptable value for the above voltage is +5V, ±0.25V; if outside this range, adjust to +5V with the controls on the power circuit board.</li> </ul>	Power supply equipment (Power supply circuit board)	79
	4. Fault on control circuit board	If the above cases are OK, change control circuit board.	Control circuit board	75
#4 Data input lamp does not illuminate even though data input switch is depressed.	1. Fault on data input switch or cord 	<ul style="list-style-type: none"> <li>○ Disconnect plug P6 on the intermediate circuit board, and check for continuity.</li> <li>A18 — B18 When data input switch is off, continuity does not exist.</li> <li>When data input switch is on, continuity should exist.</li> </ul>	Switch panel assembly (LED)	79
	2. Fault on data input lamp (LED) or cord 	<ul style="list-style-type: none"> <li>○ Disconnect plug P6 on the intermediate circuit board, and check for continuity.</li> <li>B9 ⊖ — B⑩ ⊕ If needle waves in the maximum magnification range for resistance, OK.</li> </ul>	Switch panel assembly (LED)	79
	3. Fault on control circuit board	If the above cases are OK, change control circuit board.	Control circuit board	75



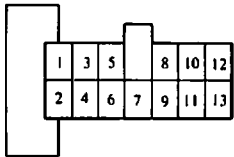
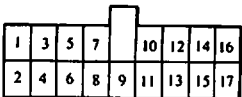
No.	Cause	Check, Repair, Adjustment	Replacement parts	Page
Several seconds after depressing the data input switch, the emergency stop lamp illuminates.	1. Forgot to insert memory disc	Insert a memory disc.		
	2. Fault on memory disc	If a standard memory disc is inserted and data can be input normally, the first disc is defective.	Memory disc	
	3. Incorrect inserting memory disc	Insert memory disc in correct direction.		
	4. Blown fuse	○ Disconnect fuse P7 (for floppy drive motor) on the control circuit board and check for continuity. If continuity exists, OK.	Fuse No. 7 (1A)	73
	5. Fault on power supply equipment	□ Disconnect plug P7 on control circuit board and measure the voltage.  No. 1 ⊕ — No. 8 ⊖ If 12V DC, OK.  Check for faulty connector pin contact.	Power supply equipment  Connector pin	79
	6. Fault on cord	○ Disconnect plug P31 (for floppy power supply) on control circuit board and check for continuity.  No. 3 ⊕ — No. 4 ⊖ If needle waves No. 2 ⊕ — No. 1 ⊖ in the maximum magnification range for resistance, OK.  Check for defect in flat cable connected to plug P32 of the control circuit board.	Floppy harness B Floppy harness A	79
	7. Fault on floppy drive	Change floppy drive.	Floppy drive	
	8. Fault on control circuit board	In other cases, fault on control circuit board.	Control circuit board	75



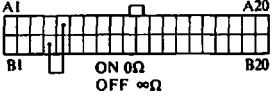
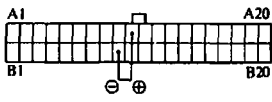
No.	Cause	Check, Repair, Adjustment	Replacement parts	Page
#6 When the data input switch is depressed, a clicking sound is heard and data is not read-out.		Refer to #5-2, -6, -7, -8.		
#7 EM lamp illuminates after data input goes out.		Refer to #5-2, -6, -7, -8.		
#8 The emergency stop lamp illuminates when the work clamp lifter switch is depressed.	<p>1. Short of air pressure</p> <p>2. Fault on pressure switch or cord</p> 	<p>If air pressure is appropriate (5 kg/cm<sup>2</sup>), it is OK.</p> <p>○ With air pressure at 5 kg/cm<sup>2</sup>, disconnect plug P34 of the control circuit board and check for continuity.</p> <p>A12 — B12 If continuity does not exist, OK.</p> <p>A13 — B12 If continuity exists, OK.</p> <p>□ Reset connector P34.</p>	<p>Pressure switch</p> <p>Parts connected with solenoid valve</p>	<p>33</p> <p>79</p>
#9 Presser foot does not rise even though the work clamp lifter switch is depressed.	1. Fault on work clamp lifter switch or cord	<p>○ Disconnect plug P22 of extension circuit board and check for continuity.</p> <p>②—③ When depressing work clamp lifter at least 0Ω usually ∞Ω) is OK.</p> <p>□ Reset connector P30 on control circuit board.</p>	<p>Foot switch assembly</p> <p>Foot switch harness assembly</p> <p>Foot connector</p>	79

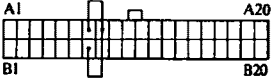
No.	Cause	Check, Repair, Adjustment	Replacement parts	Page		
#9	Presser foot does not rise even though the work clamp lifter switch is depressed.	2. Fault on working of air cylinder	Adjust so the cylinder shaft moves lightly.	Work clamp lifter cylinder assembly	38	
		3. Fault on solenoid valve or cord	<input type="radio"/> Disconnect connector P34 of control circuit board and measure resistance. B3 — A3 If approx 400Ω, OK. <input type="checkbox"/> Reset connector.	Air solenoid valve.	79	
						
		4. Blown fuse	<input type="radio"/> Disconnect fuse No. 6 and check for continuity. If continuity exists, OK.	Fuse No. 6 (5A)	73	
		5. Fault on power supply equipment	<input type="checkbox"/> Disconnect plug P7 of control circuit board and measure the voltage. No. 7 ⊕ — No. 9 ⊖ If approx. 50V DC, OK. <input type="checkbox"/> Check whether the contact of connector pin is bad or not.	Power supply equipment  Connector pin	79	
		6. Fault on control circuit board	In other case, change control circuit board.	Control circuit board	75	
#10	Work clamp does not open even though the work clamp lifter switch is depressed.	1. Fault on working of air cylinder	Adjust so the cylinder shaft moves lightly.	Work clamp lifter cylinder	38	
		2. Fault on solenoid valve	<input type="radio"/> Disconnect connector P34 of control circuit board and measure resistance. A1 — B1 If approx 400Ω, OK. A2 — B2 <input type="checkbox"/> Reset connector.	Parts connected with solenoid valve	79	
						
	3. Fault on control circuit board.	In other cases, change control circuit board	Control circuit board	75		

No.	Cause	Check, Repair, Adjustment	Replacement parts	Page
#11 Work clamp does not close even though the work clamp lifter switch is depressed.	1.	Refer to #9-1.		75
	2. Fault on control circuit board	Change control circuit board.	Control circuit board	
#12 Emergency stop lamp illuminates when start switch is depressed.		Refer to #8.		
#13 Presser foot does not rise even though the start switch is depressed.	1. Fault on start switch or cord (*In this case, presser foot does not move to original point.)	○ Disconnect plug P22 of extension circuit board and check for continuity. Switch OFF.... ①-② ∞Ω ON..... ①-② 0 Ω  Reset connector P30 connecting extension circuit board with control circuit board.	Foot switch assembly Foot switch harness assembly Foot connector	79
#14 Work clamp does not return to the initial position even though the start switch is depressed.	1. Fuse failure	○ Remove fuse No. 1, No. 9 and No. 13, and check for continuity. If continuity exists, OK.  If No. 1, No. 2 and No. 9 are disconnected, presser foot does not lift though motor sounds. If No. 13, is disconnected, LED lamp on PMD circuit board does not illuminate.	Fuse No. 1, No. 2 (Slow blow 5A) No. 9 (5A) No. 13 (1A)	73

No.	Cause	Check, Repair, Adjustment	Replacement parts	Page
Work clamp does not return to the initial position even though the start switch is depressed.	2. Fault on clock harness	Switch off. Reconnect plug P4 of control circuit board and plug 27 of pulse motor.  <input type="checkbox"/> Check for continuity. If continuity exists, OK.  P4 B1 — B5 P27 B2 — B4 B3 — B3 B4 — B2 B5 — B1	Clock harness assembly L	79
	3. Fault on pulse motor connector  	<input type="radio"/> Switch off. Disconnect plug P10 and P11 of pulse motor circuit board and check and resistance. If continuity exists between 1 and 2, 3 and 4, 5 and 6, 8 and 9, 10 and 11, OK.  <input type="radio"/> Check fault on pin connection.  * When measuring the resistance value, always measure from the cord side. If the tester rod is inserted into the contacts, faulty connections may result.	Pulse motor assembly	79
	4. Fault on power supply connector for pulse motor	<input type="radio"/> Switch off. Disconnect pulg P9 on pulse motor circuit board and check their function.	Connector Connector pin	79
	5. Fault on power supply  	<input type="checkbox"/> Switch off. Disconnect plug P9 on pulse motor circuit board and measure the voltage.  <div style="text-align: right;">Approx. value</div> 1 ⊕ — 10 ⊖ 120V(DC) 5,6,7,8,9 ⊕ — 10,11,12,13,14 ⊖ 6~7V(DC) 15,16,17 — 10 15V(AC)  * When measuring the resistance value, always measure from the cord side. If the tester rod is inserted into the contacts, faulty connections may result.	Power supply equipment	79

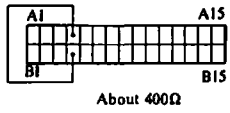
No.	Cause	Check, Repair, Adjustment	Replacement parts	Page
#14 Work clamp does not return to the initial position even though the start switch is depressed.	6. Fault on pulse motor circuit board	<p>If when the power is turned on and any of fuses number 1, 2, 9, or 13 blow, the pulse motor circuit board is defective.</p> <p>If when the work clamp operates an abnormally high sound is heard or the work clamp moves jerkily even though no fuses are blown, then the pulse motor circuit board is defective.</p>	Pulse motor circuit board	75
	7. Fault on control circuit board	Control circuit board is fault except the above.	Control circuit board	75
#15 Emergency stop lamp illuminates #5 after the work clamp moves to the initial position.	1. Fault of memory disc input	Input memory disc.		/
	2. Incorrect adjustment of overlimit switch and original point dogu	Adjust so that the overlimit switch is depressed after the initial position limit switch is depressed.		43
#16 Work clamp does not move to the sewing start position.	1. Fault on memory disc	If another memory disc is input and is normal, the memory disc is faulty.		/
	2. Fault on control circuit board	Change control circuit board.	Control circuit board	75
#17 The presser foot does not descend at the sewing start position.	1. Fault on control circuit board	Change control circuit board.	Control circuit board	75

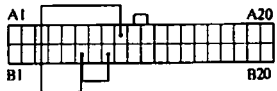
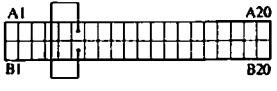
No.	Cause	Check, Repair, Adjustment	Replacement parts	Page
#18 Test lamp does not illuminate even though the test switch is depressed.	1. Fault on test switch and code  	○ Switch off. Remove plug P21 of resistor circuit board and check continuity.  A5 — B4  When switch is on, the electricity is on.	Switch panel assembly L	79
	2. Fault on test lamp and code  	○ Switch off. Remove plug P21 of the resistor circuit board and check resistance. If the tester shows limit, it's OK.  A10 ⊕ — B9 ⊖	Switch panel assembly L	79
	3. Fault on control circuit board	Change control circuit board.	Control circuit board	75
#19 Machine motor rotates during testing.	1. Fault on control circuit board	Change control circuit board.	Control circuit board	75
#20 Work clamp does not move one stitch at a time during testing.		Refer to #4.		
#21 Cannot fast feed during testing.	1.	Refer to #9-1.		
	2. Fault on control circuit board	Change control circuit board.	Control circuit board	75


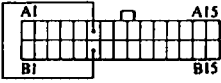
No.	Cause	Check, Repair, Adjustment	Replacement parts	Page
#22 Cannot feed in 100-stitch steps during testing.	1. Fault on step back switch and code  	<input type="radio"/> Disconnect plug 21 of resistor circuit board and check continuity.  Step back switch is off. A8 — B7 0Ω A8 — A7 ∞Ω  Step back switch is on. A8 — B7 ∞Ω A8 — A7 0Ω	Switch panel assembly L	79
	2. Fault on control circuit board	Change control circuit board.	Control circuit board	75
#23 Does not operate according to program during testing.	1. Incorrect adjustment of X axis belt tension	Adjust the tension of X axis timing belt.		45
	2. Incorrect adjustment of feed	Adjust by handling feed so that it can be moved smoothly in the sewing area.		/
	3.	Refert to #14.		/
#24 Machine motor does not turn during sewing.	1. Fuse failure	<input type="radio"/> Remove fuse No. 3 (for machine motor) and check continuity. If continuity exists, OK.	Fuse No. 3 (10A)	72
	2. Fault on code	<input type="radio"/> Disconnect connections 2 and 4 from terminals on motor circuit board and measure resistance. If about 3 ~ 4Ω exist, OK.		79
	3. Fault on power supply equipment	<input type="checkbox"/> Disconnect connections 1 and 4 from terminals on motor circuit board and measure output voltage 80V DC.		79



No.	Cause	Check, Repair, Adjustment	Replacement parts	Page
#24 Machine motor does not turn during sewing.	4. Fault on motor	Check the brush.	Motor brush	48
	5. Fault on motor circuit board or control circuit board	In 1 ~ 4 above, the emergency stop lamp always illuminates. If it does not illuminate, replace the machine motor circuit board and the control circuit board.	Motor circuit board Control circuit board	74
#25 Machine motor rotates in reverse during sewing.	1. Incorrect insert of terminal	Connect the tab terminal 3, 4 of motor circuit board correctly.		74
#26 Machine motor rotates during sewing but work clamp does not operate.	1. Fault on encoder	<input type="checkbox"/> If synchronization signal output of encoder is over 4.5V, OK.	Encoder assembly	47
	2. Fault on control circuit board	Change control circuit board.	Control circuit board	74
#27 Machine motor suddenly stops during sewing.	1. Fault on encoder	Adjust the volume of encoder.	Encoder assembly	47
	2. Machine toroku is too heavy.	Adjust the machine head. * Emergency stop lamp is always illuminated in case of #27-1, 2.		/
	3. Fault on motor circuit board	Change motor circuit board.	Motor circuit board	74

No.	Cause	Check, Repair, Adjustment	Replacement parts	Page
No thread trimming.	#28 1. Fault on encoder	<input type="checkbox"/> If the signal at the lowest point on encoder is over 4.5V, OK.	Encoder assembly	47
	2. Fault on air cylinder	Adjust by disconnecting air so that movable knife can be moved smoothly.		/
	3. Fault on solenoid valve or code	<input type="radio"/> If the resistance between A4 and B4 is about 400Ω when connector P34 of control circuit board is removed, it is OK.	Solenoid valve Air mechanisms	79
				
	4. Incorrect adjustment of thread trimming	Adjust thread trimming by dep switch of control circuit board.		39
	5. Fault on control circuit board	Change the control circuit board when the movable knife cannot move though #28-1 ~ 4 are correct.	Control ciucuit board	74
#29 Machint does not stop afte thread trimming.	1. Fault on encoder	<input type="checkbox"/> If the needle lower signal or the needle up signal is over 4.5V, OK.	Encoder assembly	47
#30 Needle does not stop at upper position.	1. Incorrect adjustment of encoder	Adjust the position of needle up signal.		46
	2. Fault on motor circuit board	Change the motor circuit board when the emergency stop lamp is illuminated after thread trimming.	Motor circuit board	74

No.	Cause	Check, Repair, Adjustment	Replacement parts	Page
#31 Cannot sew a pattern according to the program.		Refer to #23.		
#32 Sprit switch does not operate.	<p>1. Fault on sprit switch or code</p> 	<p>○ Disconnect the plug P21 on resistor circuit board and check continuity as follows.</p> <p>On succession B6 — B8 <math>\infty\Omega</math>, B6 — A9 <math>\infty\Omega</math> — OK</p> <p>On single B6 — B8 <math>\infty\Omega</math>, B6 — A9 <math>0\Omega</math> — OK</p> <p>On sprit B6 — B8 <math>0\Omega</math>, B6 — A9 <math>\infty\Omega</math> — OK</p>	Switch panel assembly L	79
	2. Control circuit board	Change control circuit board.	Control circuit board	74
#33 Thread catcher does not operate.	<p>1. Fault on thread catcher switch or code</p> 	<p>○ Disconnect the plug P21 on resistor circuit board and check continuity as follows.</p> <p>B6 — A6 If <math>0\Omega</math> exists between B6 and A6 when thread catcher is off, OK.</p> <p>If <math>0\Omega</math> exists between B6 and A6 when thread catcher is on, OK.</p>	Switch panel assembly L	79
	2. Fault on air cylinder	Adjust by disconnecting air so that thread catcher can be moved smoothly.		
	3. Fault on solenoid valve or code	○ If the resistance is about $400\Omega$ between A5 and B5 when the connector P34 on control circuit box is removed, OK.	Solenoid valve Air mechanism	79
	4. Fault on control circuit	Change control circuit board.	Control circuit board	74

No.	Cause	Check, Repair, Adjustment	Replacement parts	Page
#34  Bottom plunger does not operate.	1. Fault on bottom plunger or code  	○ Disconnect the plug P21 on resistor circuit board and check continuity.  B6 — B5 If $\infty\Omega$ exists between B6 and B5 when bottom plunger is off, OK.  If $0\Omega$ exists between B6 and B5 when bottom plunger is on, OK.		79
	2. Fault on air cylinder	Adjust by disconnecting air so that bottom plunger can be moved smoothly.		/
	3. Fault on solenoid valve or code  	○ If the resistance is about $400\Omega$ between A6 and B6 when the connector P34 on control circuit board is disconnected, OK.		79
	4. Fault on control circuit board	Change control circuit board.	Control circuit board	74
#35  Machine operations do not stop even if the emergency stop is depressed during sewing.		Refer to #3-1.		/
	2. Control circuit board	Change control circuit board.		74
#36  Thread trimmer does not operate even though the emergency stop is cancelled during sewing.		Refer to #28, #29, #30.		/

No.	Cause	Check, Repair, Adjustment	Replacement parts	Page
#37 Step back switch does not operate.		Refer to #22.		/
#38 Intermediate sewing cannot be done.		Refer to #24 ~ #31.		/
#39 Zero does not be displayed when key is pushed.	1. Improper connection of program harness	Reconnect the connector.		77
	2. Improper connection of program circuit board connector.	Reconnect the connector.		77
	3. Improper connection of key switch circuit board	Reconnect the connector.		77
	4. Improper connection of display circuit board	Reconnect the connector.		77
#40 Presser mechanism does not operate.		Refer to #1-1, -2, -3.		/