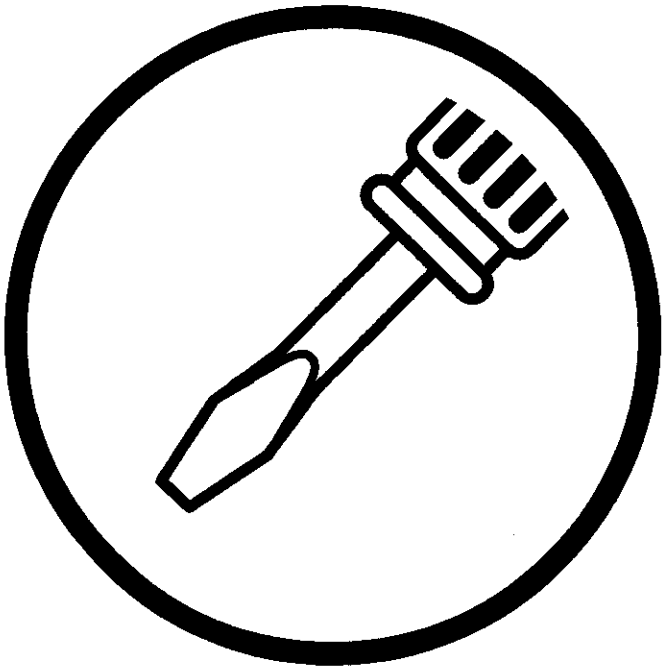
# BES-110AF

SERVICE MANUAL

Please read this manual before making any adjustments.

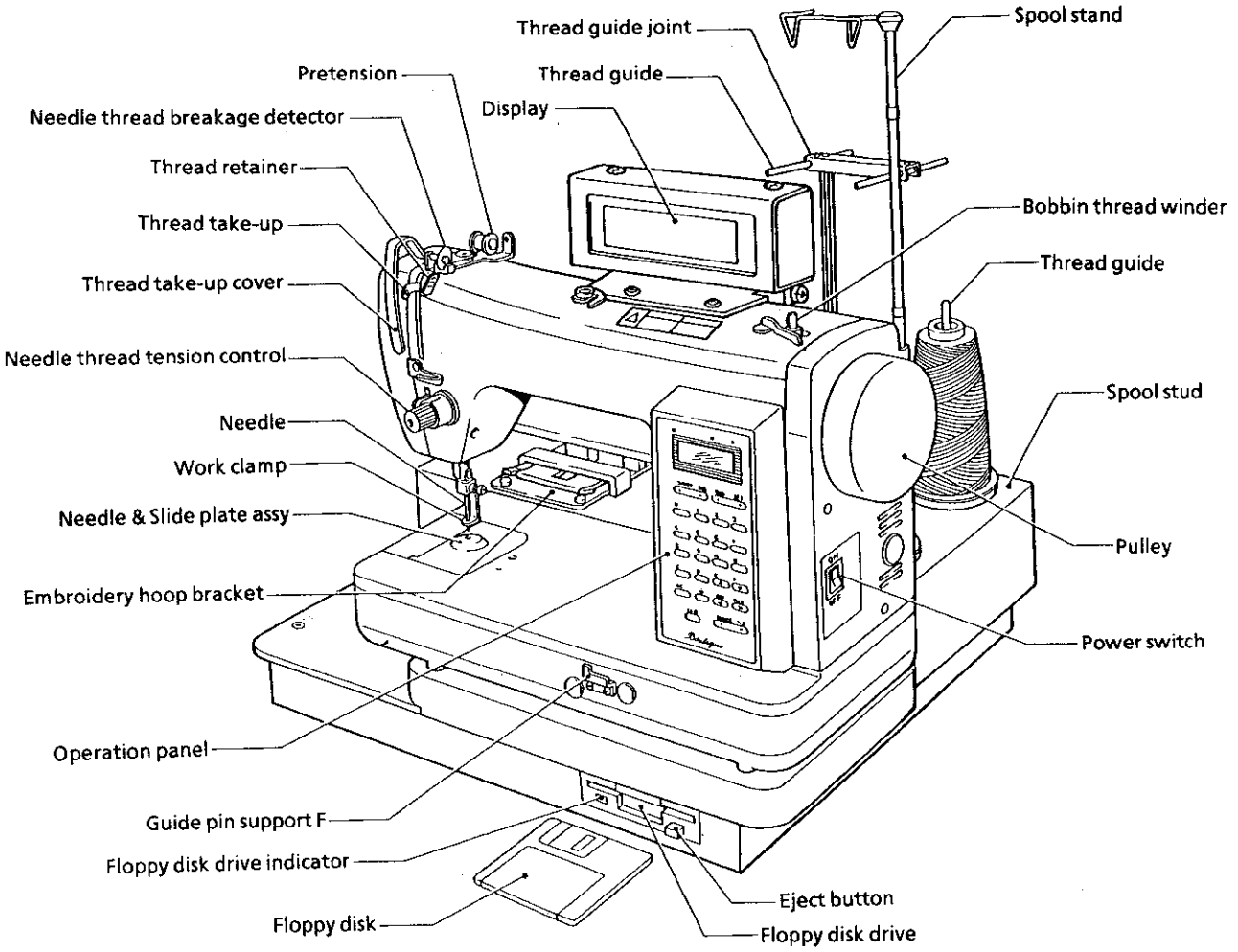
## COMPACT COMPUTERIZED MONOGRAMMING MACHINE



brother

# CONTENTS

# 1. Main Parts' Names



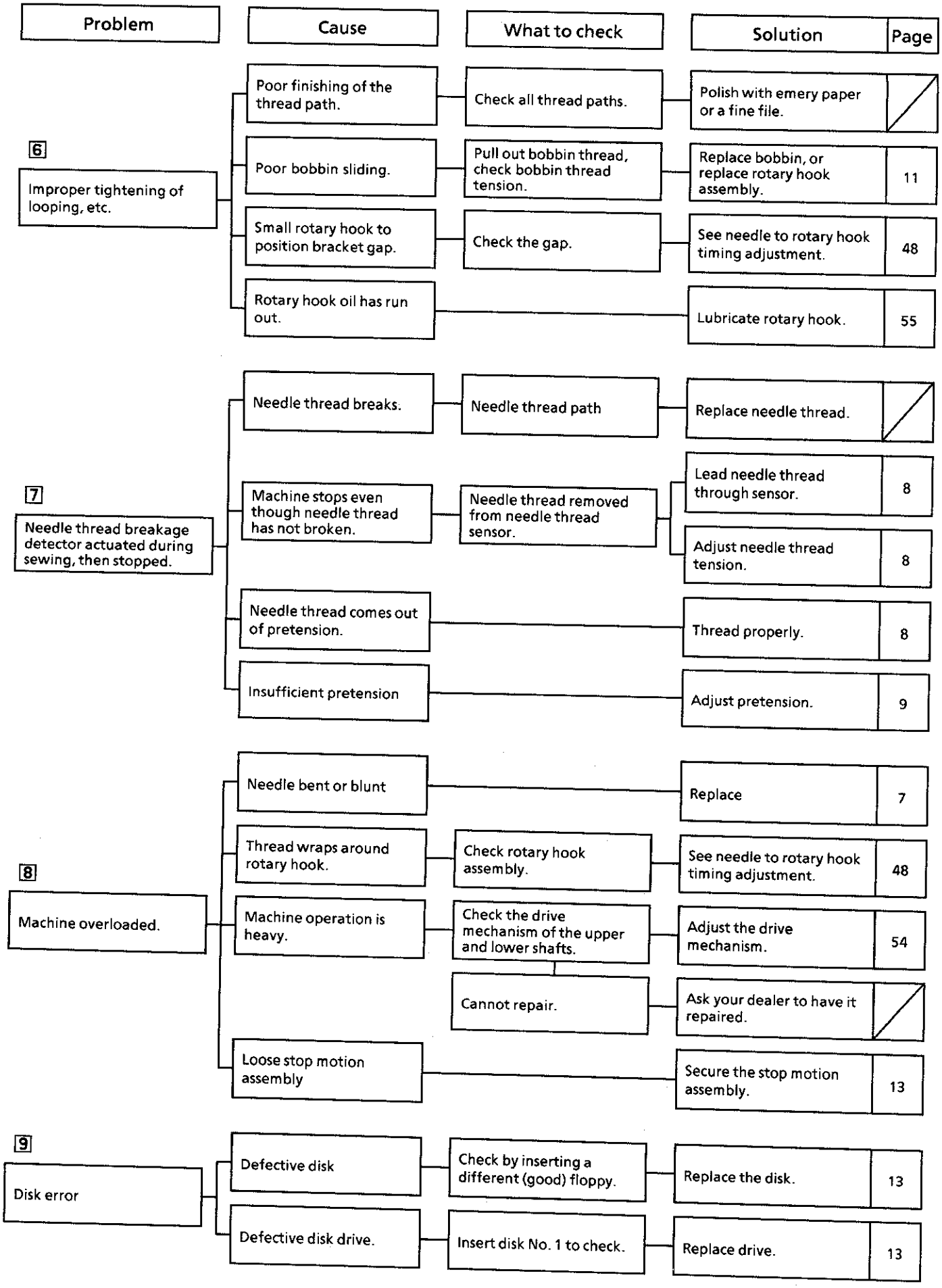

| | |
|---|---|
| Sewing machine model | BES-110AF |
| Application | Monogramming on suits, shirts, sportswear, handkerchiefs, and the like |
| Maximum sewing speed | 1,000 rpm (Either of low, medium, or high speed is selectable.) |
| Sewing area | 120 mm × 100 mm |
| Stitch pitch | 0.1 - 12.7 mm |
| Storage medium | 3.5 floppy disk |
| Power supply | Single phase 120V · 220V · 240V |
| Machine dimensions | 400 mm (D) × 520 mm (W) × 460 mm (H) |
| Weight | 30 kg |

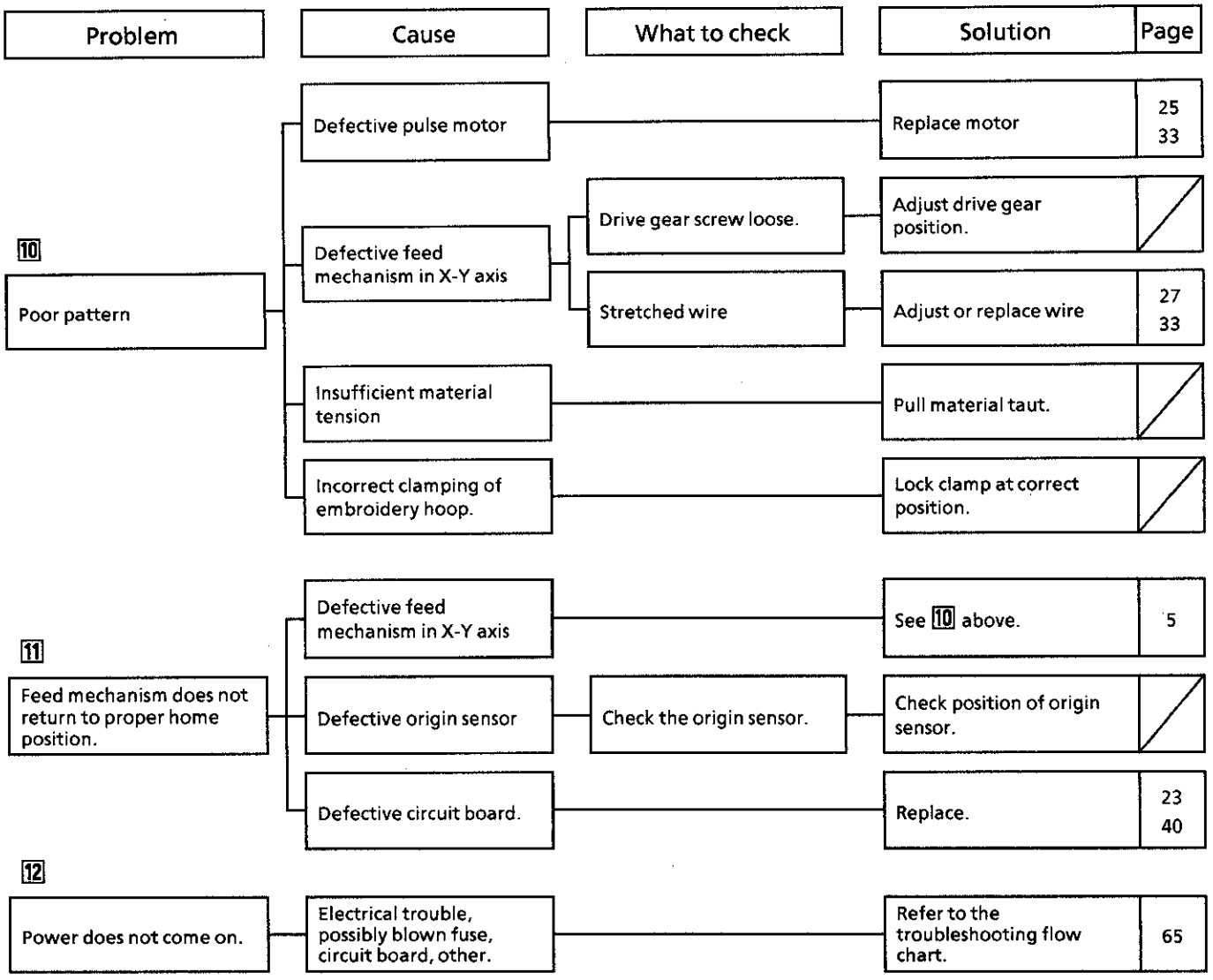
# 2. Troubleshooting Guide

※ Problems requiring simple adjustment

| Problem | Cause | What to check | Solution | Page |
|---|---|---|---|---|
| [1] Needle breaks | Needle is bent, needle tip blunted, or eye is clogged. | Needle | Replace | 6 |
| | Needle improperly installed. | Needle facing, height | Reinstall needle properly. | 6 |
| | Poor needle to rotary hook timing | Needle bar lift stroke / Needle bar height / Needle to rotary hook point gap | See needle to rotary hook timing adjustment. | 48 |
| | Needle comes out of needle clamp. | | Tighten needle screw securely. | 6 |
| | Incorrect presser foot installation | Presser foot screw or presser foot hole Needle should be inserted into hole of presser foot. | Reposition presser foot. | 49 |
| [2] Thread breakage (snapped or frayed) | Needle improperly installed. | Needle facing, height | Reinstall needle properly. | 6 |
| | Needle is bent, needle tip blunted, or eye is clogged. | Needle | Replace | 6 |
| | Machine improperly threaded | Threading | Thread properly. | 8 |
| | Excessive needle thread tension | Needle thread tension | Set to appropriate tension. | 8 |
| | Excessive bobbin thread tension | Bobbin thread tension | Set to appropriate tension. | 9 |
| | Excessive thread take-up spring tension | Thread take-up spring stroke | Adjust. | 9 |
| | Rough edge or surface on rotary hook or needle plate causing thread to break. | Rotary hook and needle plate surfaces | Remove any rough edge or surface with emery paper. | |
| | Needle comes out of needle clamp. | | Tighten needle screw securely. | 6 |
| | Incorrect presser foot installation | Presser foot height | Adjust height. | 49 |
| | Rotary hook oil has run out. | | Lubricate rotary hook. | 55 |

| Problem | Cause | What to check | Solution | Page |
|---|---|---|---|---|
| 3 Skipped stitches | Needle improperly installed. | Needle facing, height | Reinstall needle properly. | 6 |
| | Needle is bent, needle tip blunted, or eye is clogged. | Needle | Replace | 6 |
| | Wrong needle being used. | Needle count and length | Replace with a needle one size larger. | 6 |
| | Machine improperly threaded | Threading | Thread properly. | 8 |
| | Poor needle to rotary hook timing | Needle bar lift stroke | See needle to rotary hook timing adjustment. | 48 |
| | | Needle bar height | | |
| | | Needle to rotary hook point gap | | |
| | Thread take-up spring is too weak to raise bobbin thread. | Thread take-up spring tension | Adjust | 9 |
| | Blunt rotary hook point | Rotary hook point | Replace rotary hook. | 48 |
| | Bobbin spinning, shortening the length of thread from the bobbin case, and preventing bobbin thread from rising. | Bobbin case presser spring | Replace the spring. | 11 |
| | Incorrect presser foot installation | Presser foot height | Adjust height. | 49 |
| 4 Needle thread does not tighten. | Low needle thread tension | | Increase tension. | 8 |
| | Excessive bobbin thread tension | | Decrease tension. | 9 |
| | Incorrect presser foot installation | Presser foot height | Adjust height. | 49 |
| | Incorrect thread take-up spring length | Thread take-up spring | Thin material: Increase length.<br>Thick material: Decrease length. | 9 |
| 5 Bobbin thread does not tighten. | Excessive needle thread tension | | Decrease tension. | 8 |
| | Low bobbin thread tension | | Increase tension. | 9 |
| | Incorrect presser foot installation | Presser foot height | Adjust height. | 49 |

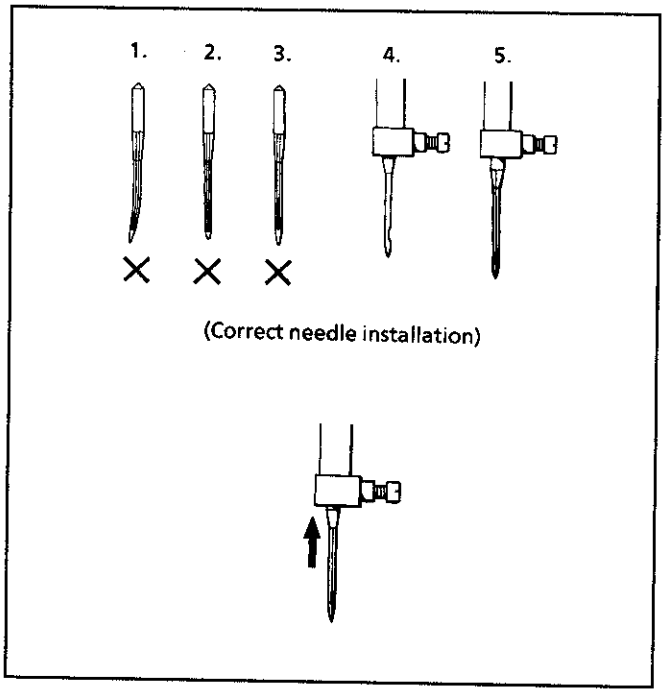

Problem
Cause
What to check
Solution
Page
6
Improper tightening of looping, etc.
Poor finishing of the thread path.
Check all thread paths.
Polish with emery paper or a fine file.
Poor bobbin sliding.
Pull out bobbin thread, check bobbin thread tension.
Replace bobbin, or replace rotary hook assembly.
11
Small rotary hook to position bracket gap.
Check the gap.
See needle to rotary hook timing adjustment.
48
Rotary hook oil has run out.
Lubricate rotary hook.
55
7
Needle thread breakage detector actuated during sewing, then stopped.
Needle thread breaks.
Needle thread path
Replace needle thread.
Machine stops even though needle thread has not broken.
Needle thread removed from needle thread sensor.
Lead needle thread through sensor.
8
Adjust needle thread tension.
8
Needle thread comes out of pretension.
Thread properly.
8
Insufficient pretension
Adjust pretension.
9
8
Machine overloaded.
Needle bent or blunt
Replace
7
Thread wraps around rotary hook.
Check rotary hook assembly.
See needle to rotary hook timing adjustment.
48
Machine operation is heavy.
Check the drive mechanism of the upper and lower shafts.
Adjust the drive mechanism.
54
Cannot repair.
Ask your dealer to have it repaired.
Loose stop motion assembly
Secure the stop motion assembly.
13
9
Disk error
Defective disk
Check by inserting a different (good) floppy.
Replace the disk.
13
Defective disk drive.
Insert disk No. 1 to check.
Replace drive.
13


Problem
Cause
What to check
Solution
Page
10
Poor pattern
Defective pulse motor
Replace motor
25
33
Defective feed mechanism in X-Y axis
Drive gear screw loose.
Adjust drive gear position.
Stretched wire
Adjust or replace wire
27
33
Insufficient material tension
Pull material taut.
Incorrect clamping of embroidery hoop.
Lock clamp at correct position.
11
Feed mechanism does not return to proper home position.
Defective feed mechanism in X-Y axis
See 10 above.
5
Defective origin sensor
Check the origin sensor.
Check position of origin sensor.
Defective circuit board.
Replace.
23
40
12
Power does not come on.
Electrical trouble, possibly blown fuse, circuit board, other.
Refer to the troubleshooting flow chart.
65

## 1 Needle breaks

**Needle is bent, needle tip blunt, or groove is clogged.**

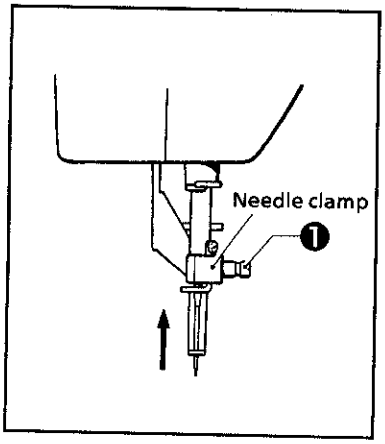
Check the following:

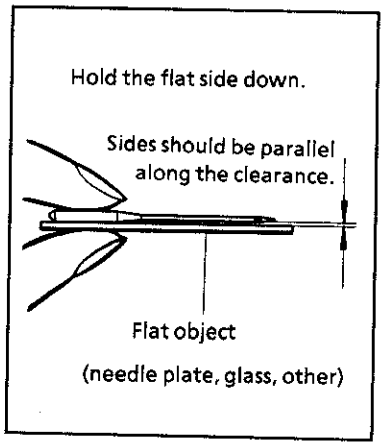



1. Is the needle bent?
2. Is the needle tip blunt?
3. Is the needle groove clogged?
4. Is the needle installed in the correct direction?
5. Is the needle installed at the correct height?

**Needle improperly installed**

Correct needle installation




1. Loosen the screw ❶, and replace the needle with a new one.
2. Insert the needle with the flat side facing left, until the needle cannot be inserted any more. Securely tighten the screw ❶.

**NOTE**

Use a straight needle.

To determine if a needle is bent, hold it against a flat object to check their surfaces are parallel and the clearance is even.

Materials and needles

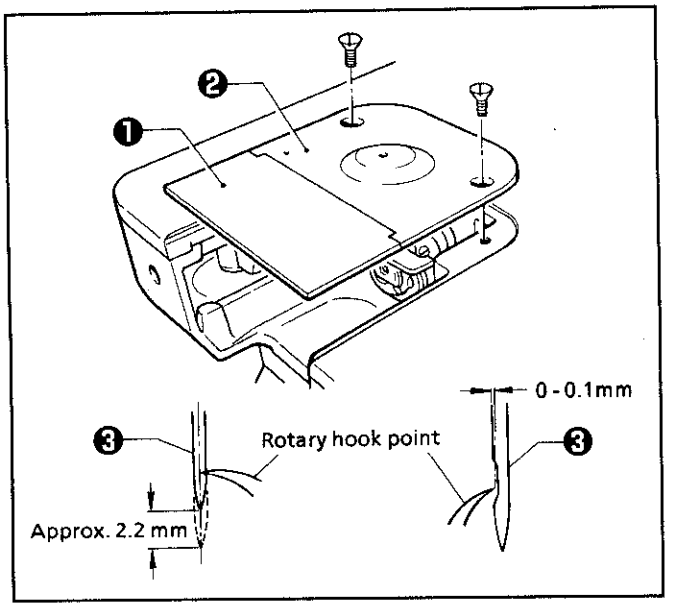
| Material type | Needle type and size | |
|---|---|---|
| Denim<br>Artificial leather<br>Real leather | HL×5 | #11 - #16 |
| Handkerchief<br>Dress shirt<br>Towel | HL×5 | #9 - #11 |

**NOTE**

When using special threads such as gold, silver, and rame yarn, use a heavy-duty needle (#11 - #14) for better finishing.

## Poor needle to rotary hook timing

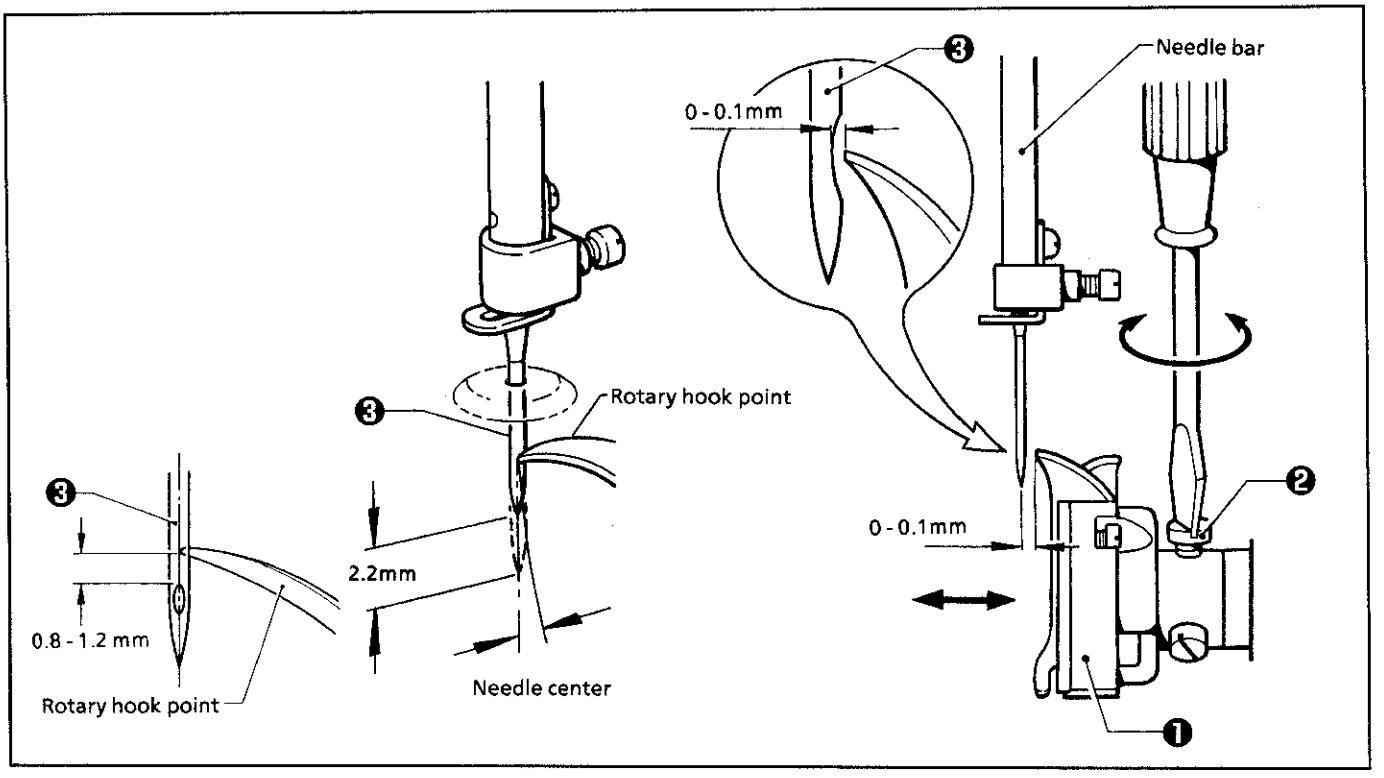
Remove the slide plate ❶ and the needle plate ❷.




Check the following:

1. Is the rotary hook point aligned with the center of the needle ❸ when the needle bar is raised approx. 2.2 mm above its lowest point?
2. Is the clearance between the rotary hook point and the needle ❸ from 0 to 0.1 mm?

## Needle to rotary hook timing




1. Loosen the three screws ❷ around the rotary hook ❶.
2. Raise the needle ❸ approximately 2.2 mm above its lowest point. Align the rotary hook point with the center of the needle ❸, and adjust the clearance between the needle groove and the rotary hook point to 0 - 0.1 mm so that the rotary hook point does not make contact with the needle ❸.
3. Tighten the three screws ❷ around the rotary hook ❶.
4. Loosen the screw of the needle bar clamp. Move the needle bar up or down so that the distance from the top end of the needle eye to the rotary hook point is 0.8 - 1.2 mm.

## Incorrect presser foot installation

Refer to page 49.

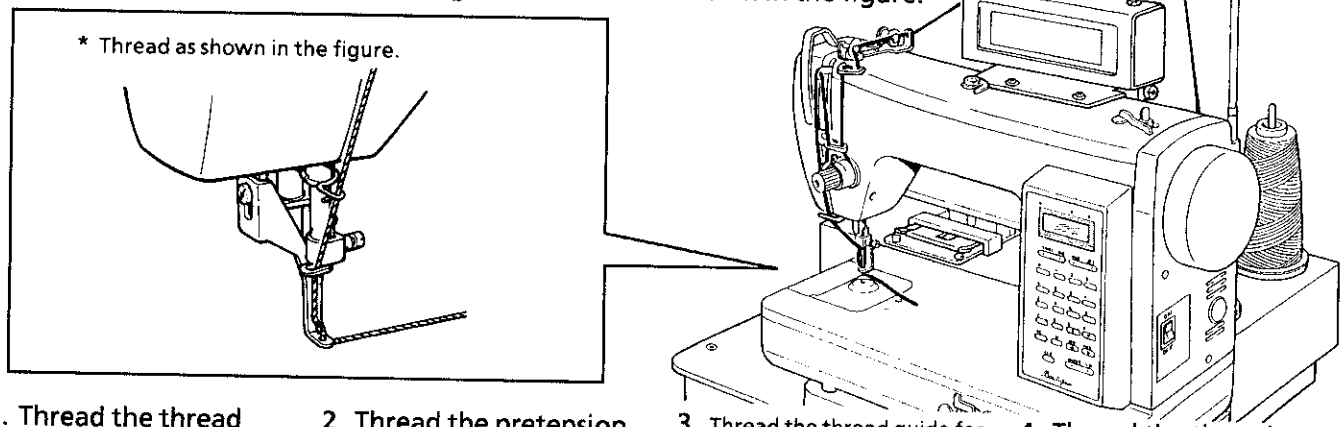
## 2 Thread breakage

- Needle improperly installed
- Needle is bent, needle tip blunt, or groove is clogged.

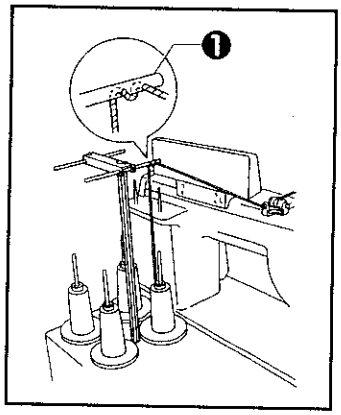
Refer to page 6, "Needle breaks".

- Incorrect threading

Check that the thread is passed through the machine as shown in the figure.




1. Thread the thread guide.

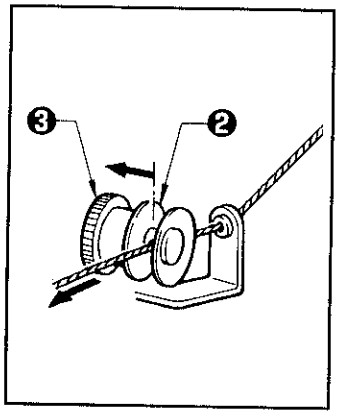



Pass the thread from the outside to the inside of the thread guide ❶.

■ Installing and adjusting the thread guide

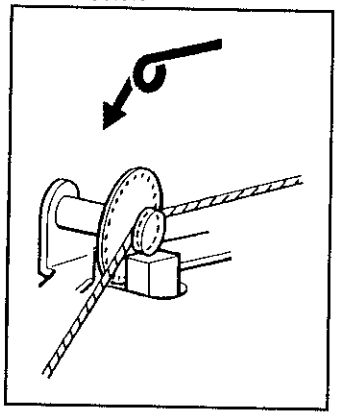
- Screw the thread guide support bar in as far as it will go.
- If the thread guide is misaligned, loosen the screw Ⓐ and turn the thread guide until the thread guide hole comes to directly above the needle bar.

2. Thread the pretension.



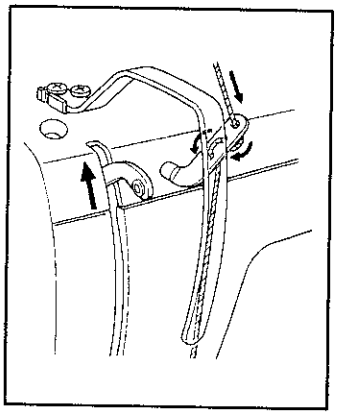

Press the thread guide disc ❷ to open it, pass the thread through the hole, and adjust the thread tension by means of the pulley ❸.
(Approx. 60 g)
0.05 - 0.1 N (5 - 10 gf)

3. Thread the thread guide for the needle thread breakage detector.



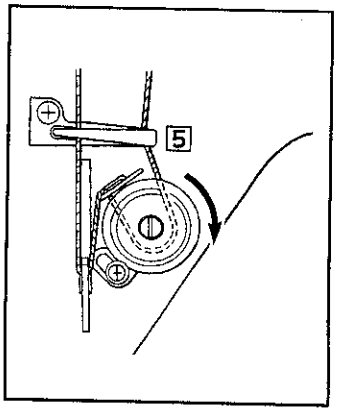
Wind the thread 2 - 3 times so that it crosses over at the bottom as shown in the illustration.

4. Thread the thread retainer.

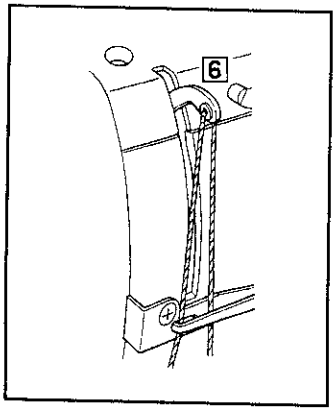


Turn the pulley to raise the thread take-up lever to its upper position. Thread in order shown above.

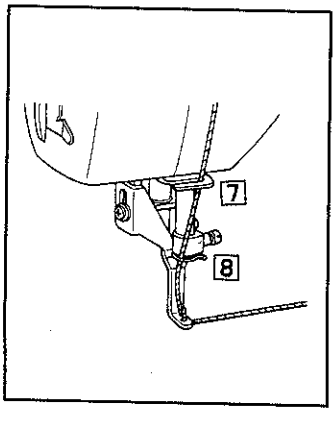
5. Thread the thread tension bracket.




6. Thread the thread take-up.



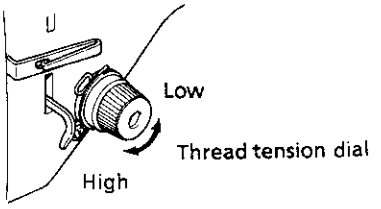

7. Thread the thread guide and needle.



## Excessive needle thread tension.

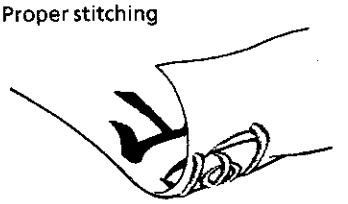
Check if the bobbin thread is not pulled to the top of the material.

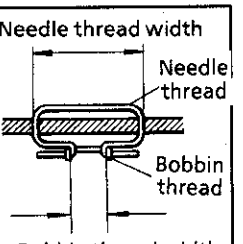
Adjust the thread tension using the thread tension dial.




If the tension is too high, turn the dial counterclockwise.
If the tension is too low, turn the dial clockwise.

Proper stitching



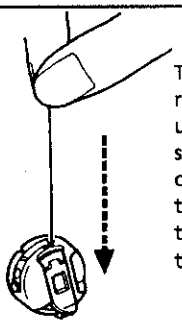



Adjust the thread tension dial so that the needle thread is pulled to the underside of the material, and the bobbin thread stitch width is about 1/3 of the needle thread stitch width.

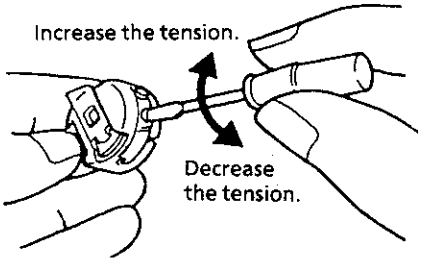
## Excessive bobbin thread tension

Adjust the bobbin thread to the correct tension.

Proper bobbin thread tension
15 - 20 gf

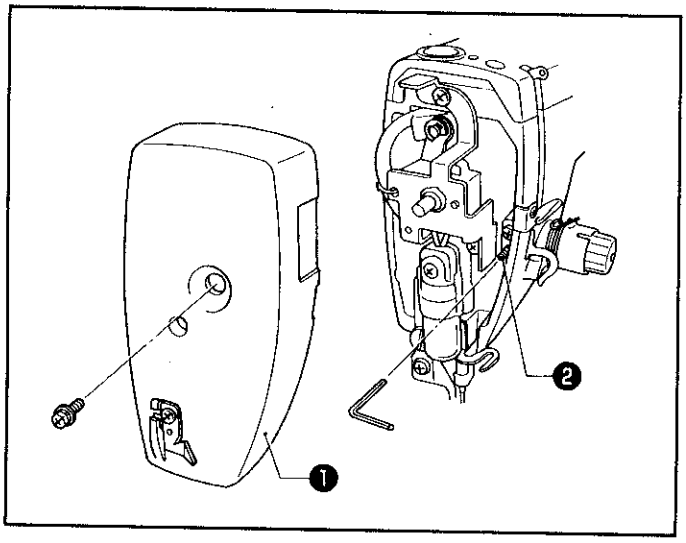


The precise bobbin thread tension required will vary with the thread used. Adjust the bobbin tension screw so that the bobbin will not drop due to its own weight when the bobbin is suspended by the thread. (Standard bobbin thread tension is 15 - 20 gf.)

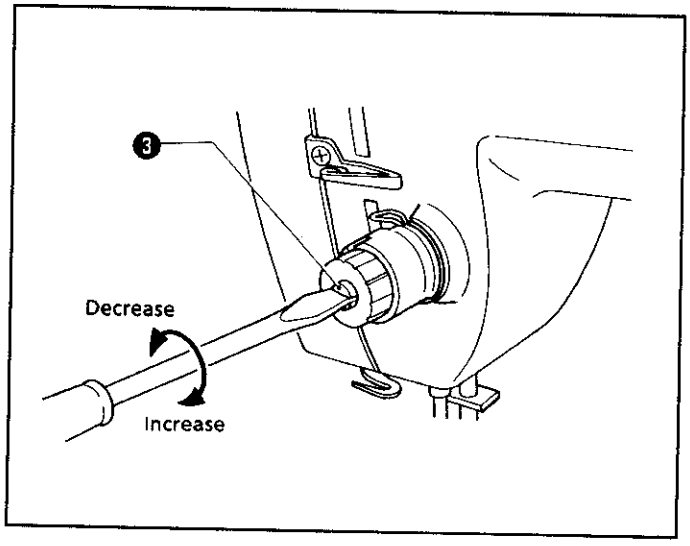


## Excessive thread take-up spring tension

If the thread take-up spring tension is too high, the needle thread may break; if too low, the needle thread may be caught in the rotary hook.



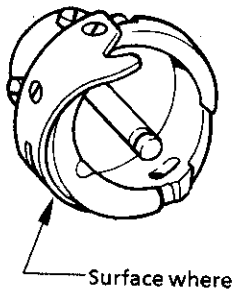

1. Remove the screw, and the face plate ❶.
2. Loosen the set screw ❷.
   (There is no need to remove it.)




2. Insert a screwdriver into the slot of the tension stud.
   Turn the screwdriver clockwise to increase the tension.
   Turn the screwdriver counterclockwise to decrease the tension.
3. After adjustment, securely tighten the set screw.

## Damaged rotary hook surface where the thread passes

Check for any burrs where the thread passes.
(The rotary hook may have burrs or be scratched when the needle breaks.)




* If any scratches or burrs are found, remove them with very fine emery paper (#1000 - 1500) or polishing compound.

## Incorrect presser foot installation

Refer to page 49.

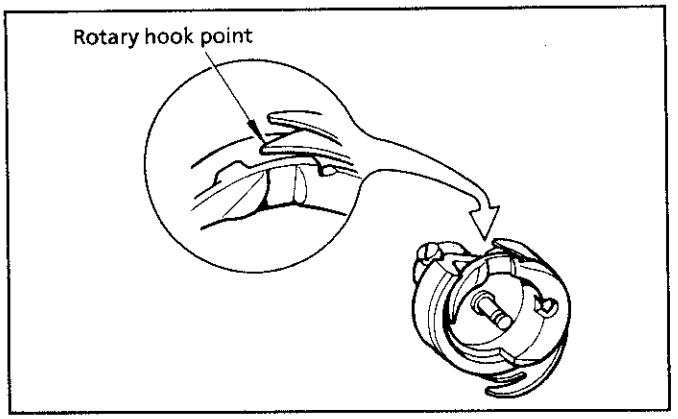
## Rotary hook oil has run out.

Refer to page 55.

## 3 Skipped stitches

| | |
|---|---|
| Incorrect needle installation | Refer to page 6, "Needle breaks". |
| Needle is bent, needle tip blunt. | |
| Incorrect needle size | |
| Incorrect threading | Refer to page 8, "Thread breakage". |
| Poor needle to rotary hook timing | Refer to page 6, "Needle breaks". |
| Thread take-up spring tension is too insufficient to pull bobbin thread through material. | Refer to page 8, "Thread breakage". |
| Blunt rotary hook point | |
| Incorrect presser foot installation | Refer to page 49, "Presser foot height". |
| Because bobbin has spun, the length of thread from the bobbin case is shortened, and the bobbin thread does not reach through the material. | |

Check the rotary hook point.

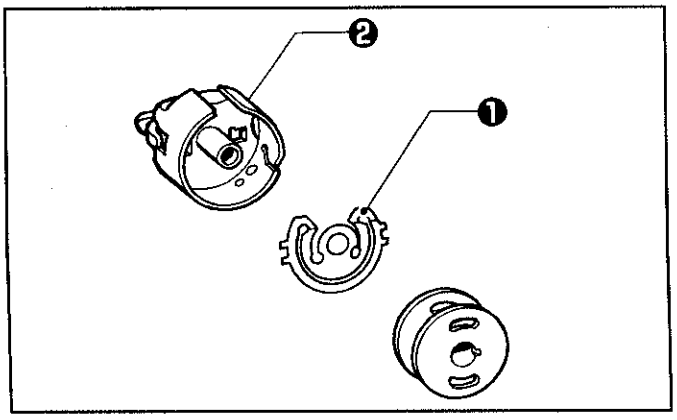



If the rotary hook point is blunt or damaged, replace the rotary hook with a new one.

**NOTE**

Refer to page 7 when replacing the rotary hook.

Check the spinning prevention spring ❶.




* If the spinning prevention spring is defective, the bobbin may spin in the rotary hook, resulting in the thread getting tangled.

**NOTES**

- Make sure that the bobbin thread is not tangled inside the bobbin case ❷.
- Check the bobbin thread tension referring to page 9.
- Make sure that the bobbin is free when inserted in the bobbin case ❷.
- If the spring ❶ is unsuitable, replace it.

## 4 Needle thread does not tighten.

| | |
|---|---|
| Needle thread tension is too low. | Refer to page 8, "Thread breakage". |
| Bobbin thread tension is too high. | |
| Incorrect presser foot installation | Refer to page 49, "Presser foot height". |

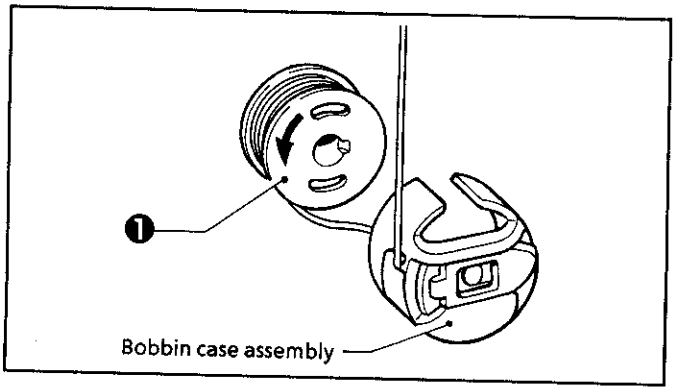
## 5 Bobbin thread does not tighten.

| | |
|---|---|
| Needle thread tension is too high. | Refer to page 8, "Thread breakage". |
| Bobbin thread tension is too low. | |
| Incorrect presser foot installation | Refer to page 49, "Presser foot height". |

## 6 Improper tightening of looping

| | |
|---|---|
| Poor finishing of the thread path | Refer to page 8, "Thread breakage". |
| Poor bobbin sliding | |

Check for any burrs on the bobbin.




**NOTES**

- Replace the bobbin ❶ with a new one if burred or scratched.
- Check the bobbin thread tension referring to page 9.

| | |
|---|---|
| Clearance between the rotary hook and the inner rotary hook stopper plate is too small. | Make sure that the thread passes easily even when a thick thread is used. |

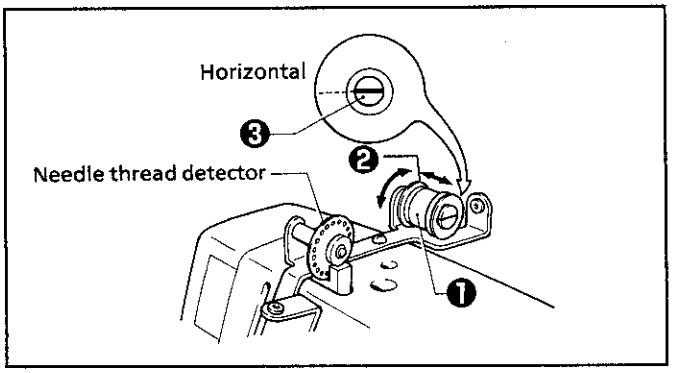
## 7 Thread breakage detector actuated during sewing.

| Needle thread breaks. |
|---|

Pass the needle thread through the machine referring to page 8.

| Machine stops. |
|---|

Slightly increase the tension of the pretension if the needle thread deviates on the thread breakage detector during sewing. (Standard tension is 5 gf.)




**NOTES**

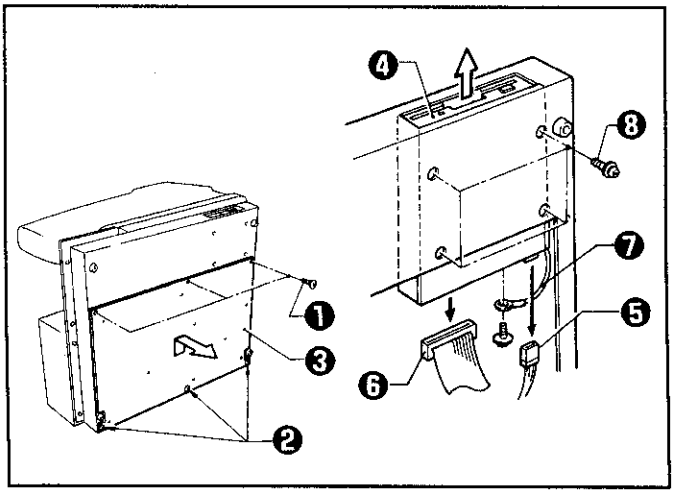
- Press the pretension ❶ and adjust the nut ❷ so that resistance is slightly applied to the thread.
- The slot in the pretension shaft ❸ should be horizontal or slightly raised to the right.

## 8 Machine overloaded.

| Needle is blunt or bent. | Replace the needle with a new one referring to page 8. |
|---|---|
| Thread is tangled on the rotary hook. | Adjust the timing between the needle and the rotary hook referring to page 6. |
| Machine operation is sluggish. | Turn the pulley manually to check the load. |

## 9 Disk error

| Defective floppy disk | Insert another floppy disk to see if it works correctly. |
|---|---|
| Defective floppy disk drive (FDD) | |

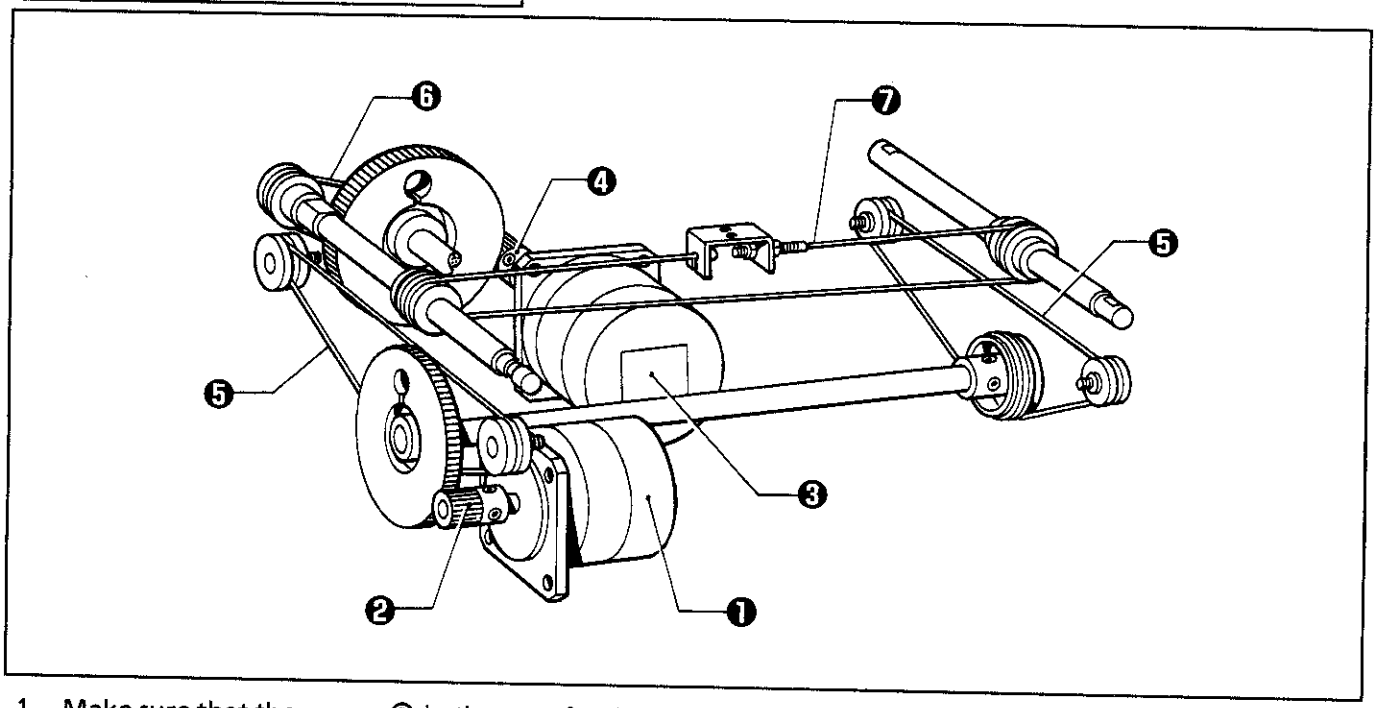



Insert floppy disk No.1 into the floppy disk drive. If the floppy disk drive is defective, replace it with a new one as follows:

1. Remove the three screws ❶, loosen the three screws ❷, and remove the circuit board set plate ❸ by lifting it upward, being careful of the wiring and cables. (Refer to page 18.)
2. Remove the connector ❺, the flat cable ❻, and the ground wire ❼ from the floppy disk drive ❹.
3. Remove the four screws ❽ from the underside of the circuit board set plate ❸, and replace the floppy disk drive ❹ with a new one.

## 10 Poor pattern appearance

| | |
|---|---|
| Defective pulse motor. | Check the X and Y pulse motors, and replace if necessary. |
| Defective feed mechanism in X-Y axis. | |




1. Make sure that the screws ❷ in the gear for the Y pulse motor ❶ are securely tightened.
2. Make sure that the screws ❹ in the gear for the X pulse motor ❸ are securely tightened.
3. Make sure that the left and right Y mini wires ❺, the X drive wire ❻, and the X mini wire ❼ are not stretched.
4. Check the X and Y pulse motors, and replace if necessary.
   (If a wire has been cut, ask your dealer to have it repaired.)

## 11 Feed mechanism does not return to correct home position.

| | |
|---|---|
| Defective feed mechanism in X-Y axis | Refer to above item. |
| Incorrect home position sensor | Replace X and Y index circuit boards with new ones. (See page 38.) |
| Defective circuit board | Replace the circuit board in question (the main circuit board, power circuit board, or the PMD circuit board) with a new one. (See page 62.) |

## 12 Power is not turned on.

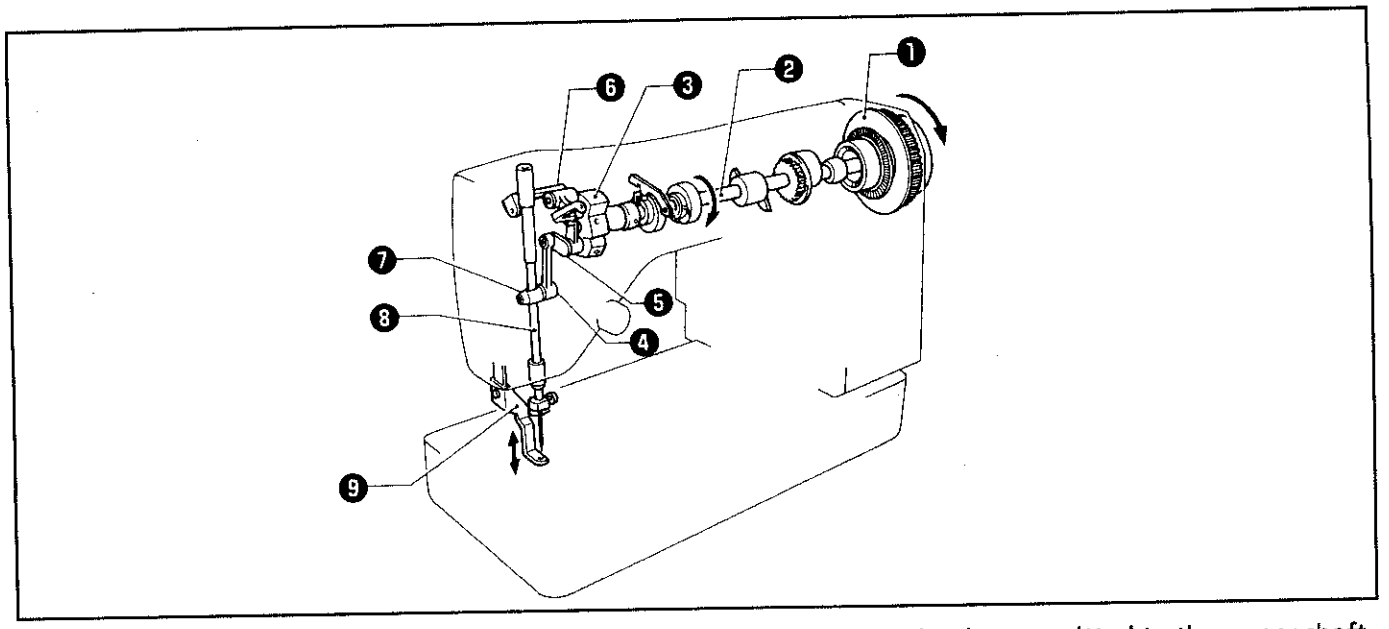
| | |
|---|---|
| Electrical trouble;<br>blown fuse or defective circuit board | Replace as necessary, referring to troubleshooting flowchart (page 64). |

## 13 Tapering pattern width

1. When pattern width tapers off in X direction, make sure that the X drive wire ❻ and the X mini wire ❼ are not stretched.
2. When pattern width tapers off in Y direction, make sure that the left and right Y mini wires ❺ are not stretched.

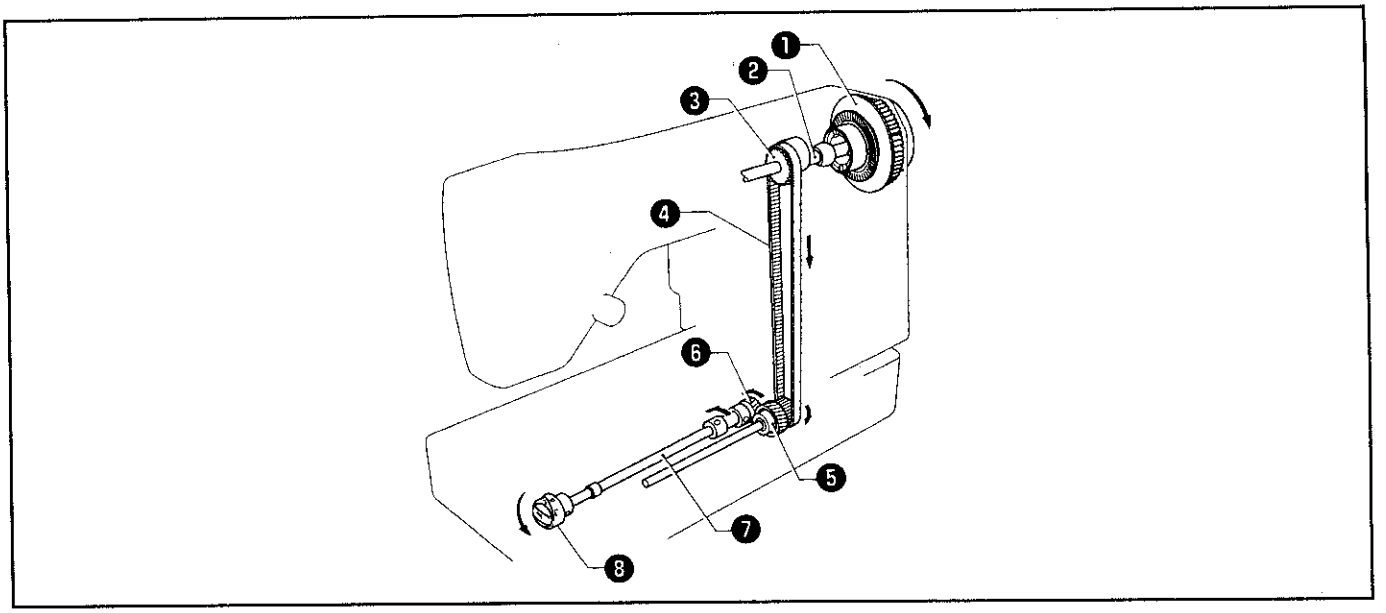
# 3. Mechanical Description

## [1] Upper shaft and needle bar mechanism



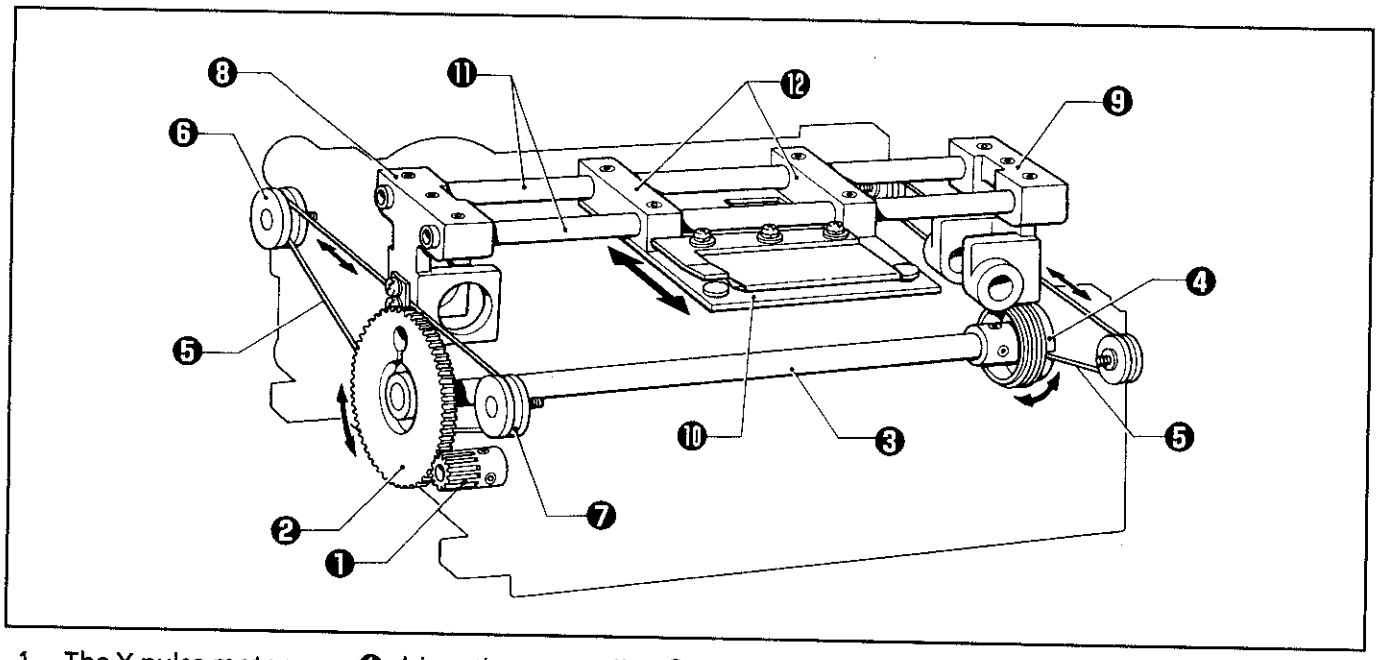

1. When the pulley ❶ is turned in the direction of the arrow, the motion is transmitted to the upper shaft ❷, and the thread take-up crank ❸ is turned.
2. Motion is transmitted to the needle bar crank rod ❺ and the thread take-up support shaft ❻ through the needle bar crank ❹ attached to the thread take-up crank ❸.
3. The needle bar ❽ is moved up and down by the needle bar clamp ❼.
4. The thread take-up support shaft ❻ moves the presser foot ❾ up and down.

## [2] Lower shaft and rotary hook mechanism



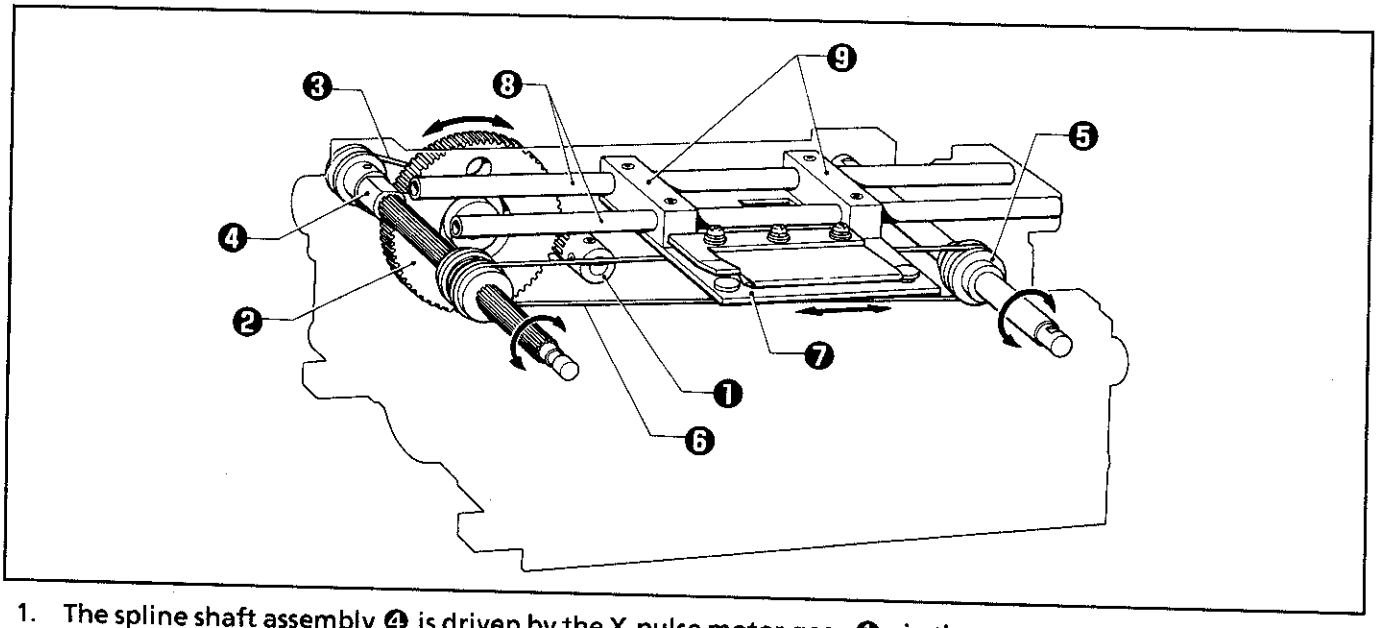

1. When the pulley ❶ is turned in the direction of the arrow, the motion is transmitted to the upper shaft ❷, and timing pulley U ❸ is turned.
2. Timing pulley U ❸ transmits the motion to the lower shaft gear ❻ connected to the idle pulley ❺ via the timing belt ❹.
3. Motion is transmitted to the lower shaft ❼ connected to the lower shaft gear ❻, and the rotary hook ❽ rotates in the direction of the arrow.

## 3 Feed guide mechanism - 1




1. The Y pulse motor gear ❶ drives the gear pulley ❷, which thus drives pulley Y ❹ via the pulley shaft ❸.
2. Both ends of the left and right Y mini wires ❺ are secured to the gear pulley ❷ and pulley Y ❹, and are secured to bush holders L ❽ and R ❾, through tension pulley L ❻ and support B ❼.
3. The slide plate ❿ is connected to the sliders ❿❷ mounted on the slide shafts ❶❶ inserted in bush holders L ❽ and R ❾.
4. When the gear pulley ❷ is turned, the left and right Y mini wires ❺ operate, and the slide plate ❿ is moved in the Y direction (back and forth) on the shafts between bush holders L ❽ and R ❾.

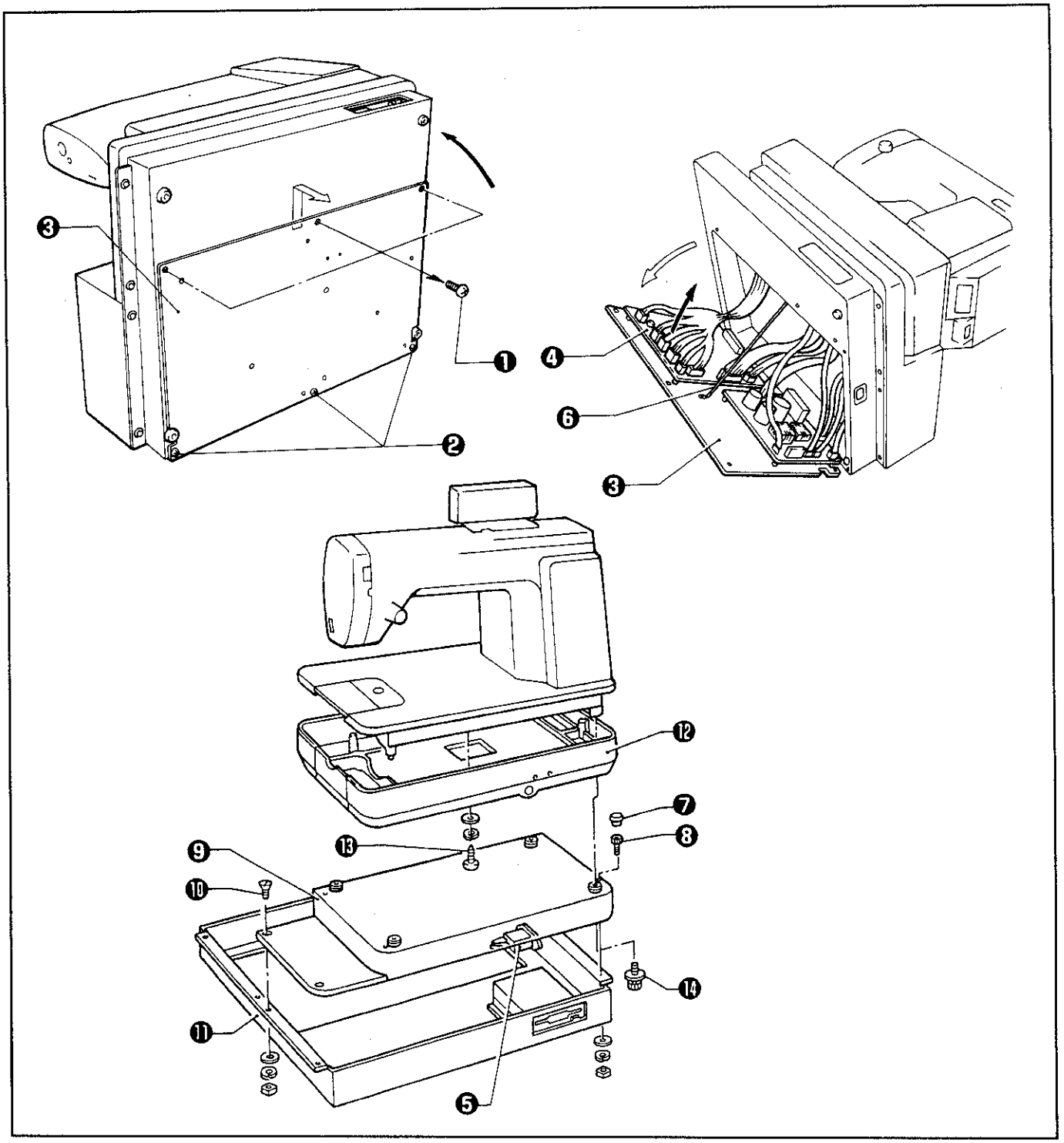
## 4 Feed guide mechanism - 2




1. The spline shaft assembly ❹ is driven by the X-pulse motor gear ❶ via the gear pulley ❷ and the X drive wire ❸.
2. When the spline shaft assembly ❹ turns, the slide plate ❼, which is secured to the X mini wire ❻ via the idle pulley ❺, is moved on the slide shafts ❽ in the X direction (to the left and right) along with the sliders ❾.

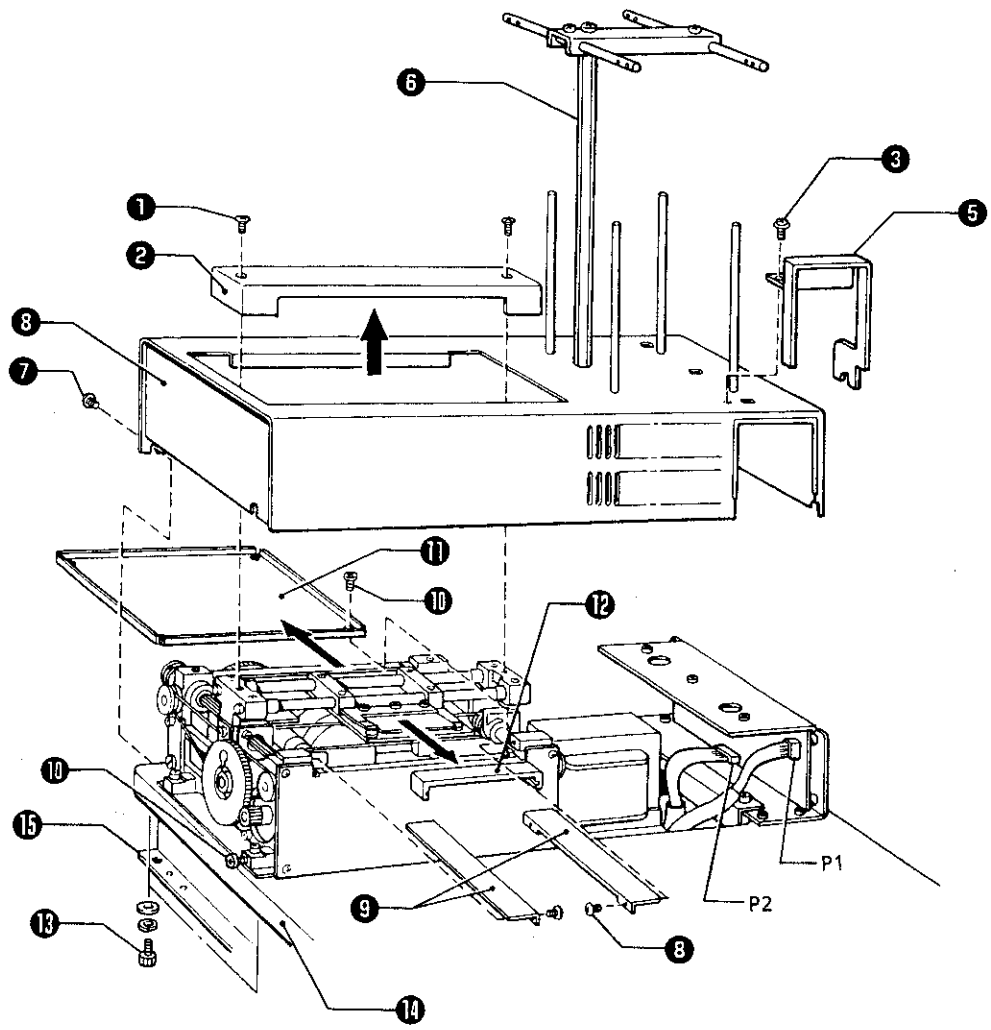
# 4. Disassembly

## 1 Machine head



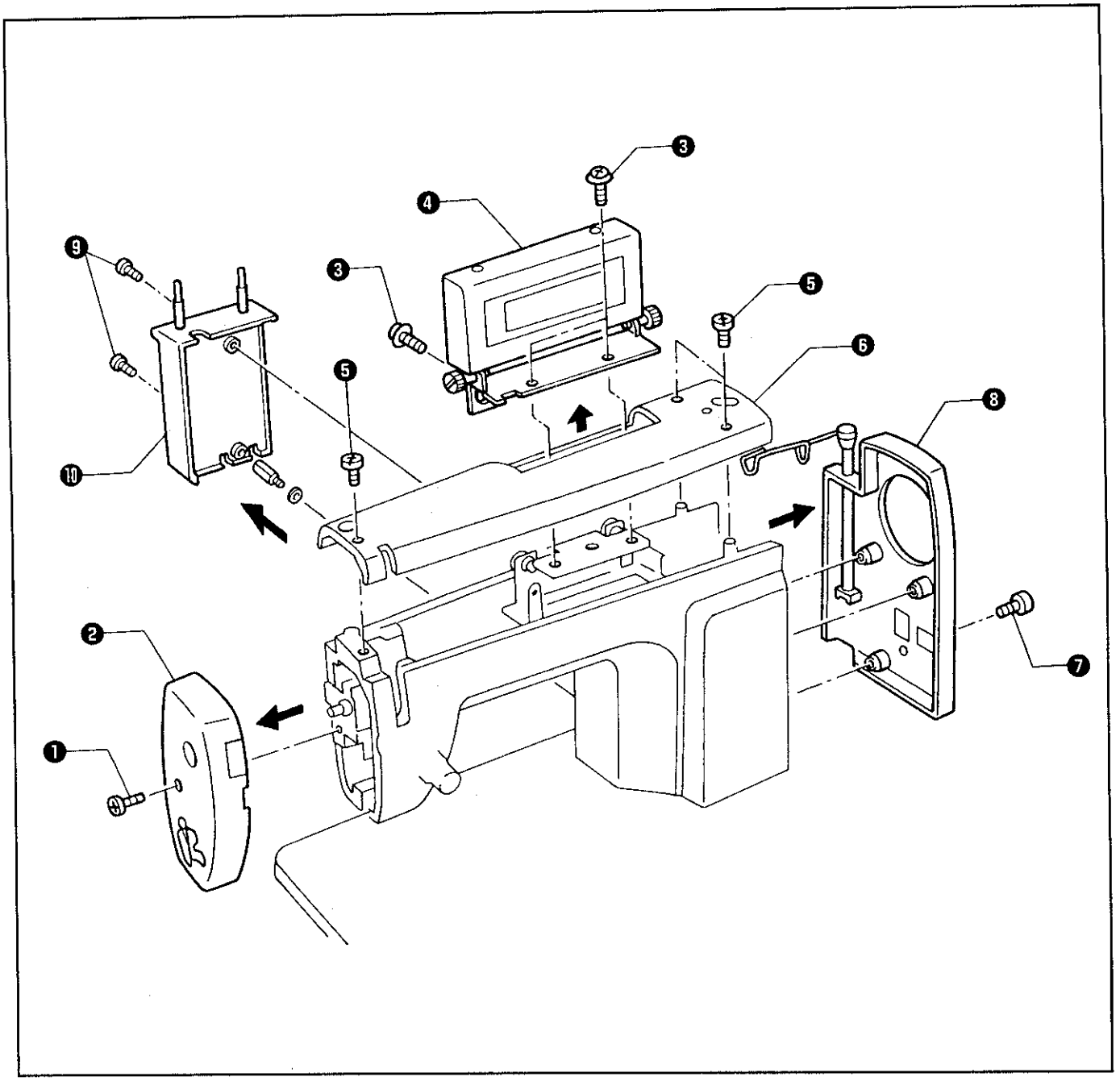

1. Tilt the machine head until it stops as shown in the figure above. Remove the three screws ❶, loosen the three screws ❷, and remove the circuit board set plate ❸ by lifting it upward, being careful of the wiring and cables.
2. Remove the connectors from the main circuit board ❹.
3. Remove the connectors from the noise filter ❺.
4. Remove the ground wire ❻ from the circuit board set plate ❸.
5. Remove the two oil caps ❼, the two bolts ❽, and the two screws ❿ of the sewing machine fix bracket ❾. Remove the machine head from the body base ⓫.
6. Remove the screw ⓭ from the center of the bottom cover ⓬, and the machine head from the bottom cover ⓬.
7. Remove the four bolts ⓮. Remove the machine head from the sewing machine fix bracket ❾.

## 2 X-Y feed unit cover



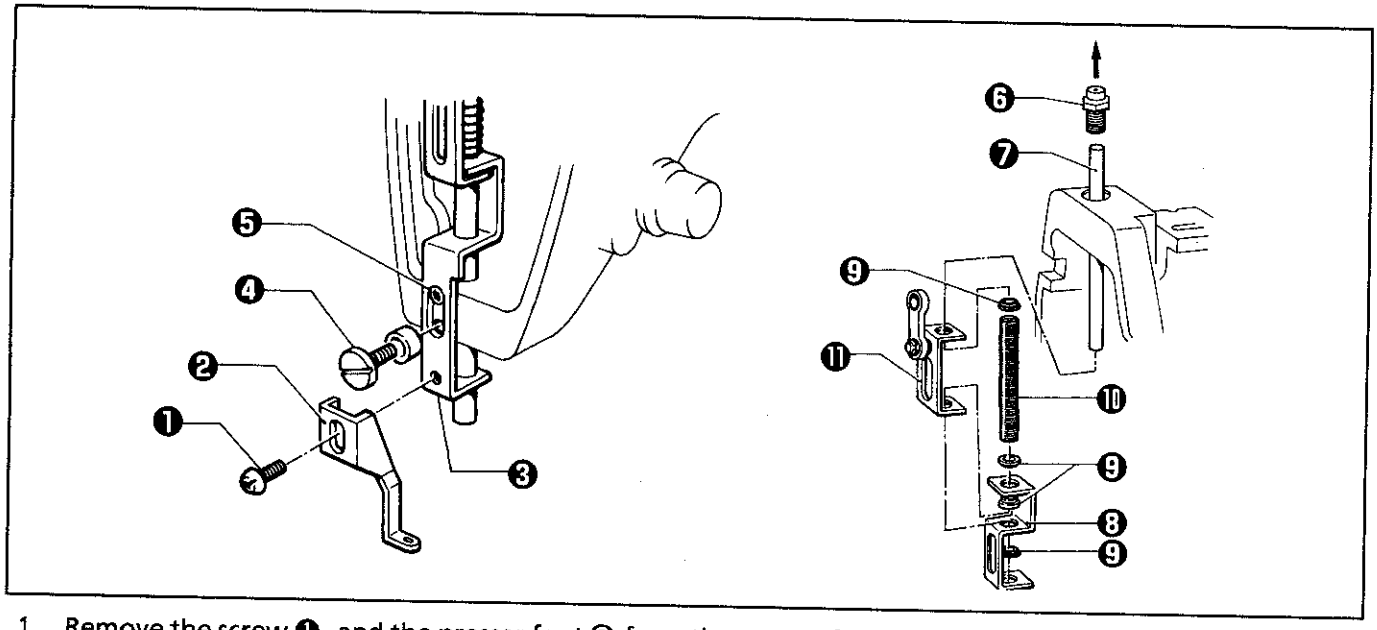

1. Remove the two screws ❶, and the slide cover ❷.
2. Loosen the screw ❸, and remove the carriage cover ❹ from the harness cover ❺ and thread guide bar ❻.
3. Remove the five screws ❼, and the carriage covers.
4. Remove the four screws ❽, and the left and right cover US ❾.
5. Remove the four screws ❿, and cover U ⓫.
6. Remove the slider cover ⓬.
7. Remove connectors P1 and P2.
8. Remove the four bolts ⓭, and the carriage base ⓮ from the body base.

## 3 Machine covers



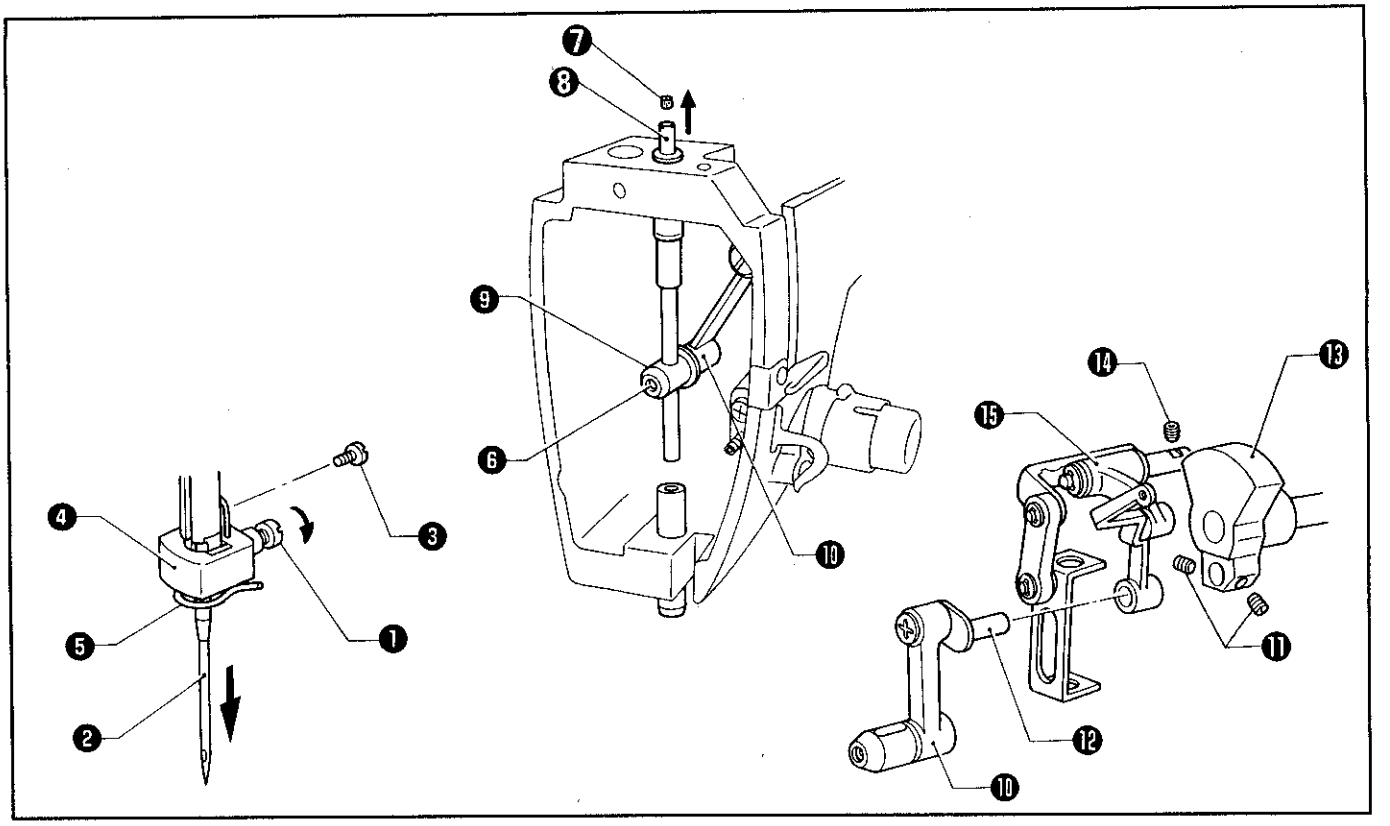

1. Remove the screw ❶, and the face plate ❷.
2. Remove the four screws ❸, and the LCD module ❹. (Remove the two cords for LCD module ❹ from the cord holders, and pull them out from the main circuit board.)
3. Remove the three screws ❺, and the upper cover ❻.
4. Loosen the three screws ❼, and the belt cover ❽.
5. Remove the two screws ❾, and the motor cover ❿.

## 4 Presser bar mechanism



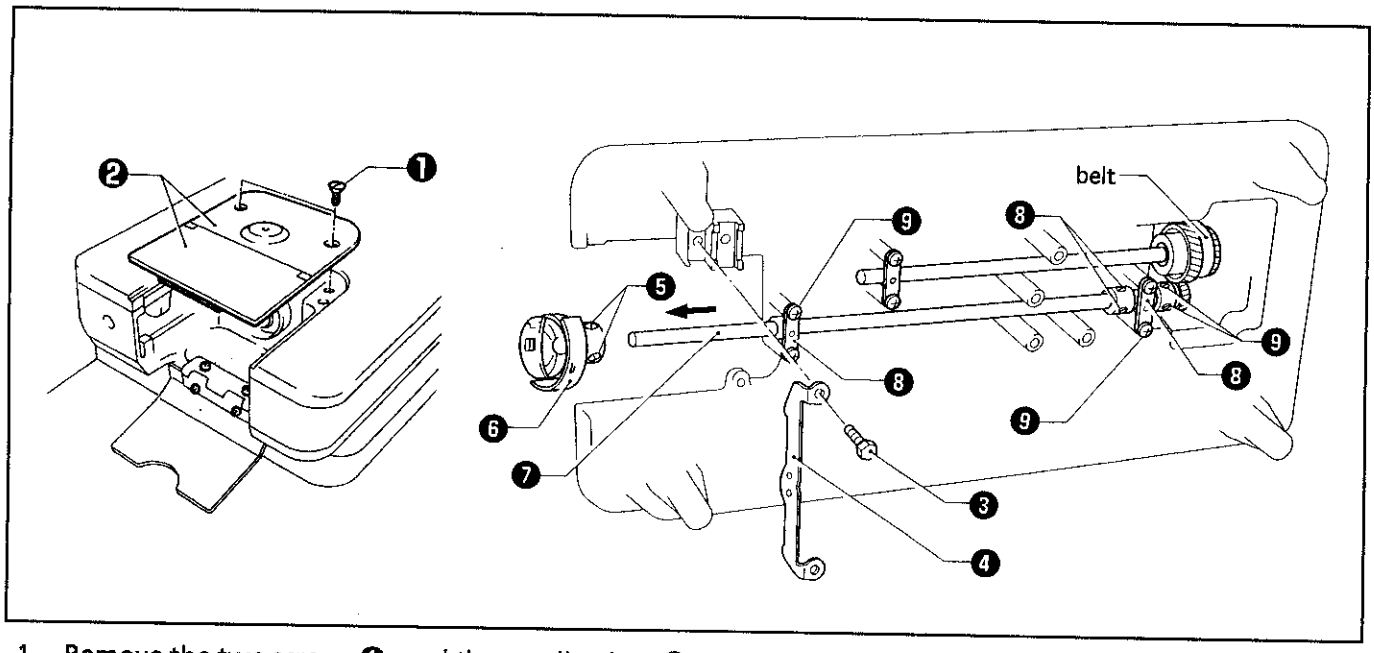

1. Remove the screw ❶, and the presser foot ❷ from the presser foot set plate ❸.
2. Remove the screw ❹ and the collar, and loosen the set screw ❺.
3. Remove the presser cap ❻, then the presser bar ❼ by lifting it upward.
   (The presser foot set plate ❽, the four presser foot bushes ❾, the spring ❿, and the presser foot guide ⓫ will come off in this order.)

## 5 Needle bar mechanism




1. Loosen the screw ❶, and remove the needle ❷.
2. Remove the screw ❸, and the needle bar thread guide ❺ along with the needle clamp ❹.
3. Loosen the screw ❺.
4. Remove the felt ❼, and the needle bar ❽ by lifting it upward. (The needle bar clamp ❾ will come off the needle bar ❽ and needle bar crank rod ❿.)
5. Loosen the two set screws ⓫, and remove the needle bar crank ⓬.
6. Loosen the set screw ⓭, and remove the link thread take-up assembly ⓮.

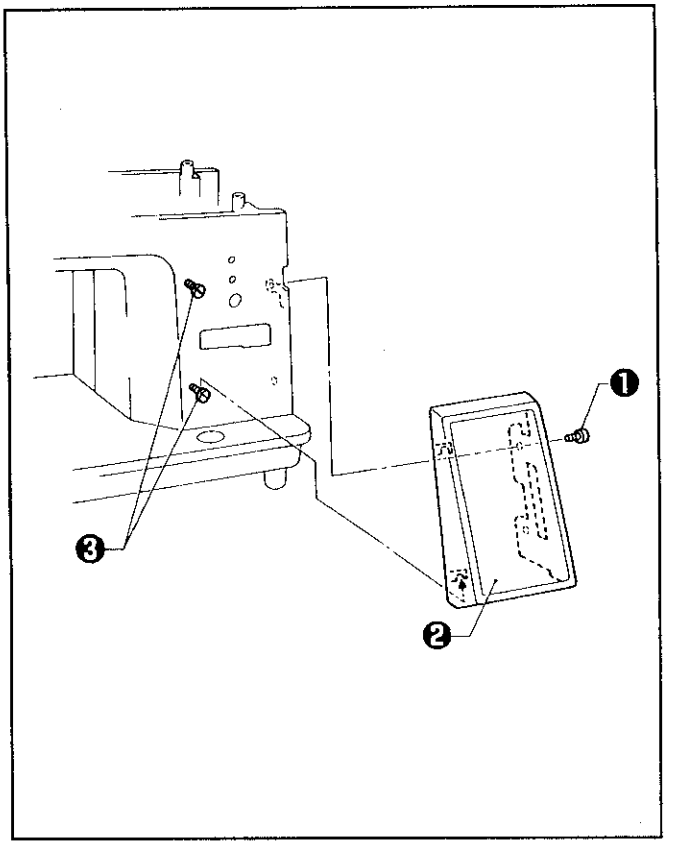
## 6 Lower shaft mechanism




1. Remove the two screws ❶, and the needle plate ❷.
2. Tilt the machine head until it stops.
3. Remove the bolt ❸, and the inner rotary hook stopper plate ❹.
4. Loosen the three screws ❺ securing the rotary hook ❻, and remove the rotary hook ❻ from the lower shaft ❼.
5. Loosen the screws ❾ of the bush presser ❽ (right and left), and remove the lower shaft ❼ by pulling it toward the front of the rotary hook ❻.

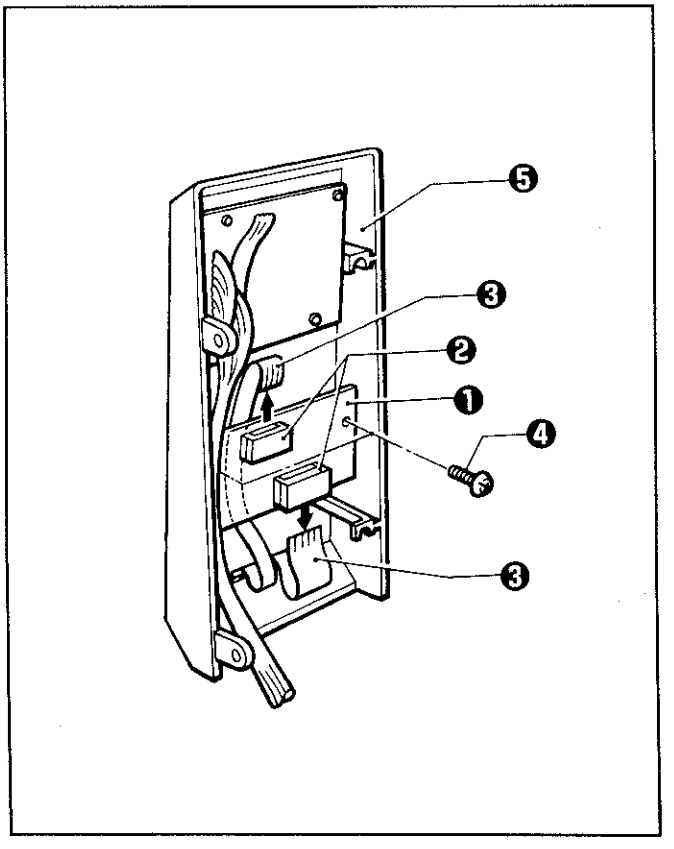
## 7 Display unit assembly

■ Operation panel



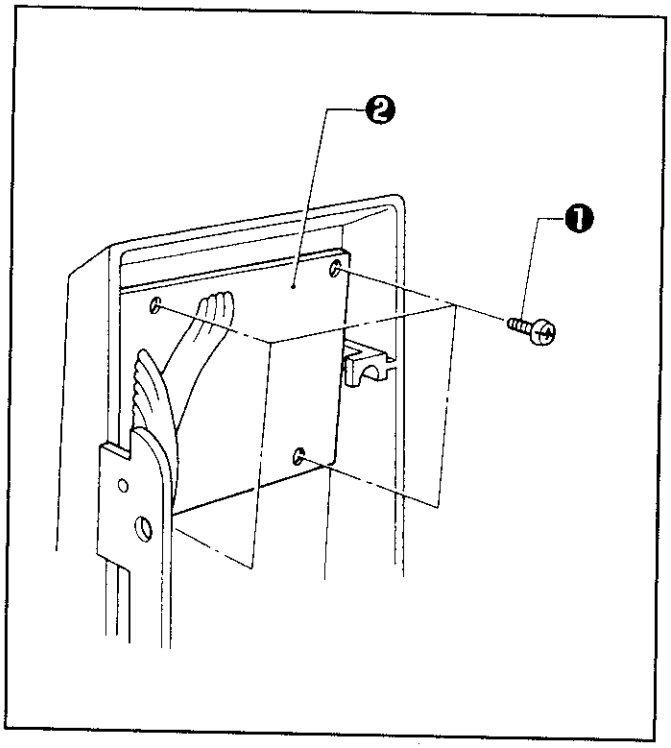

1. Remove the screw ❶, and the front of the belt cover.
2. Remove the operation panel ❷ from the shoulder screws ❸ by lifting it upward.

■ Relay circuit board



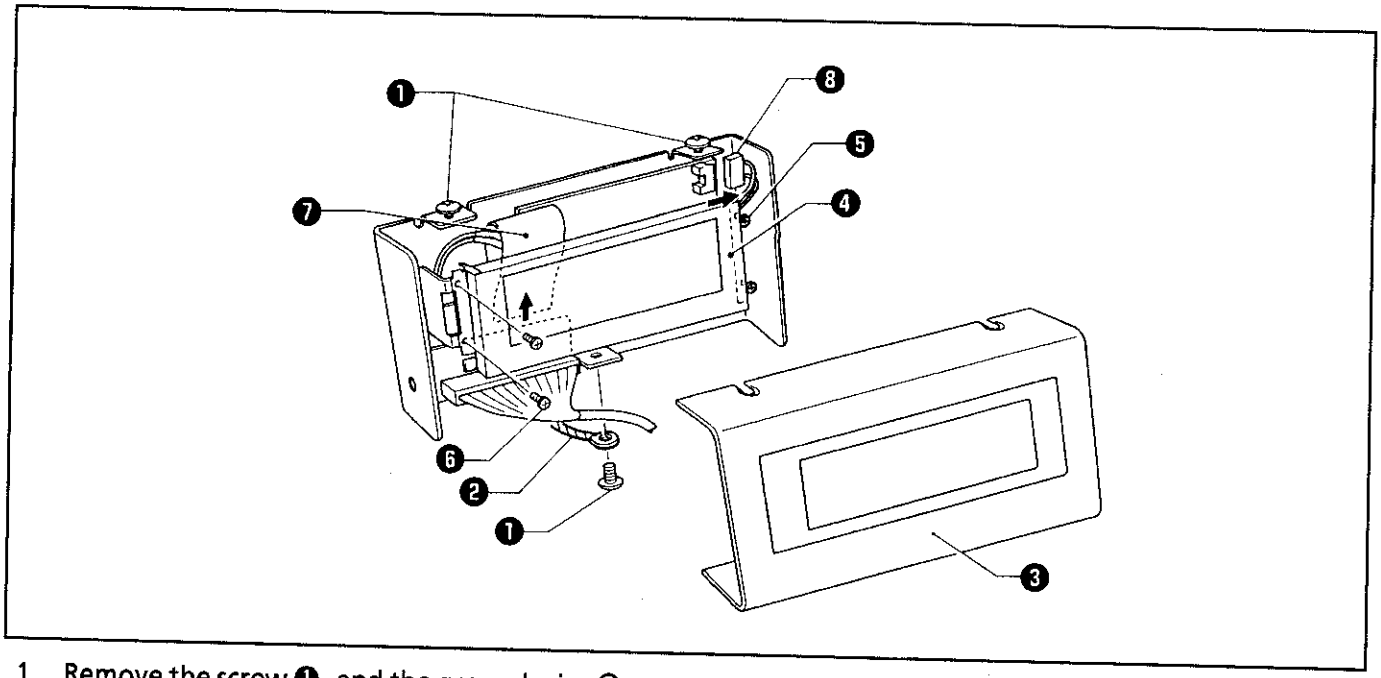

1. Press the connector ❷ from both sides to unlock the connector ❷ on the relay circuit board ❶, and remove the flat cable ❸ by pulling it toward the front.
2. Remove the two screws ❹, and the relay circuit board ❶ from the switch panel plate ❺.

■ Panel circuit board assembly



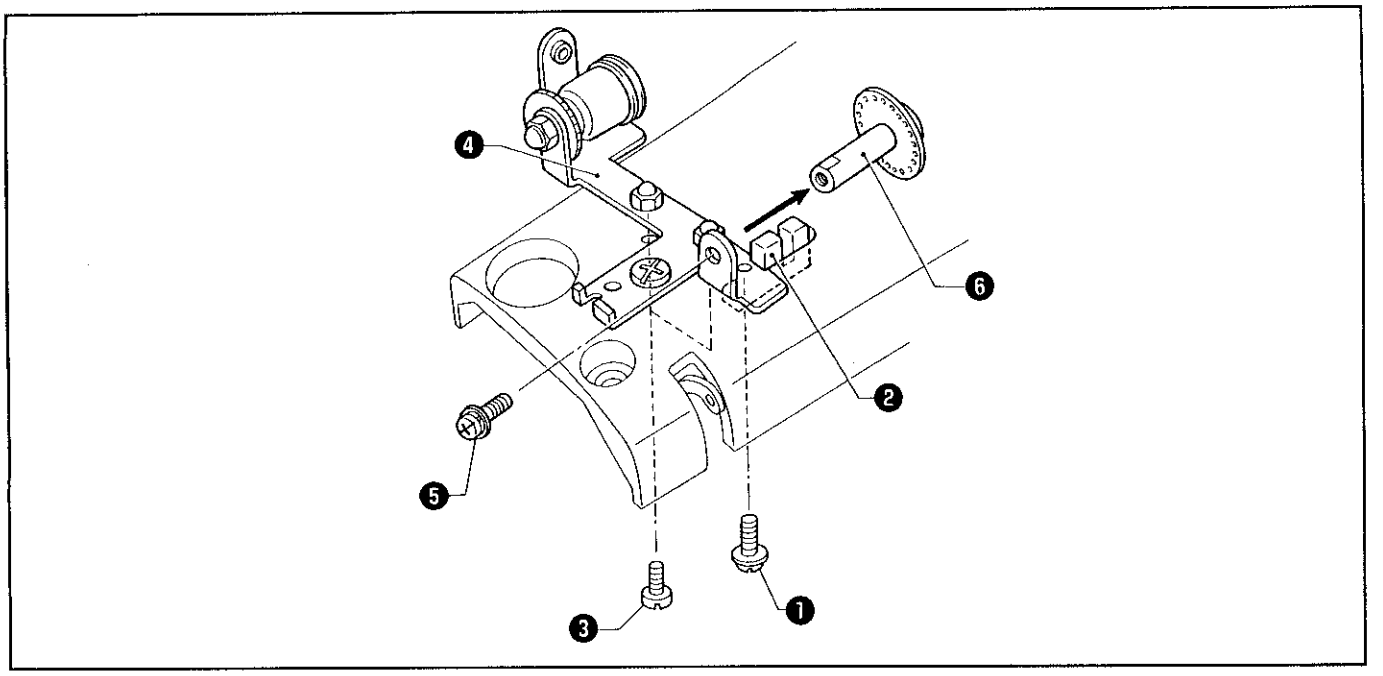

Remove the four screws ❶, and the panel circuit board ❷ from the switch panel plate.

■ LCD module circuit board assembly




1. Remove the screw ❶, and the ground wire ❷.
2. Remove the screws ❶, and the LCD module ❸.
3. Loosen the two screws ❺ on the right and remove the two screws ❻ on the left which are securing the LCD module ❹, and then remove the LCD module ❹.
   Disconnect the flat cables ❼ of the relay circuit board and the LCD inverter connector ❽ at this time also.

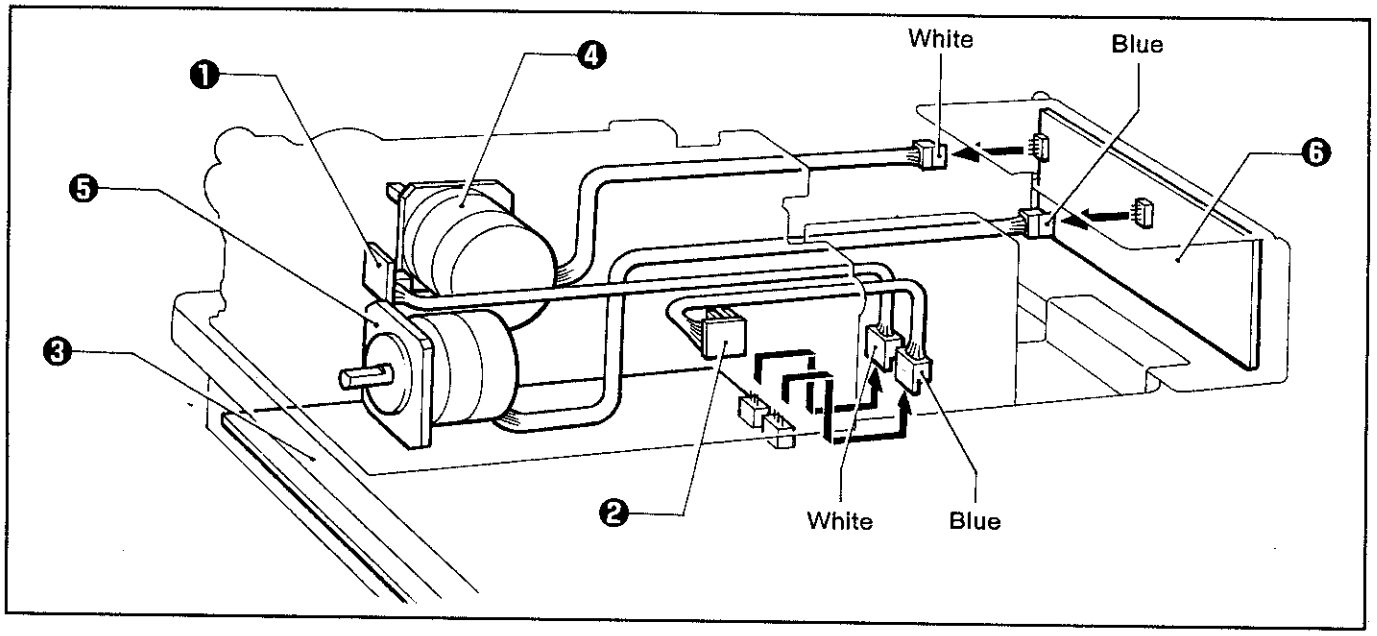
## [8] Thread breakage detector




1. Remove the three screws, and the upper cover.
2. Remove the screw ❶ from the underside of the upper cover, and the thread breakage detector ❷.
3. Remove the screws ❸, and the thread breakage sensor plate ❹.
4. Remove the screw ❺, and the pulley shaft ❻ from the thread breakage sensor plate ❹.

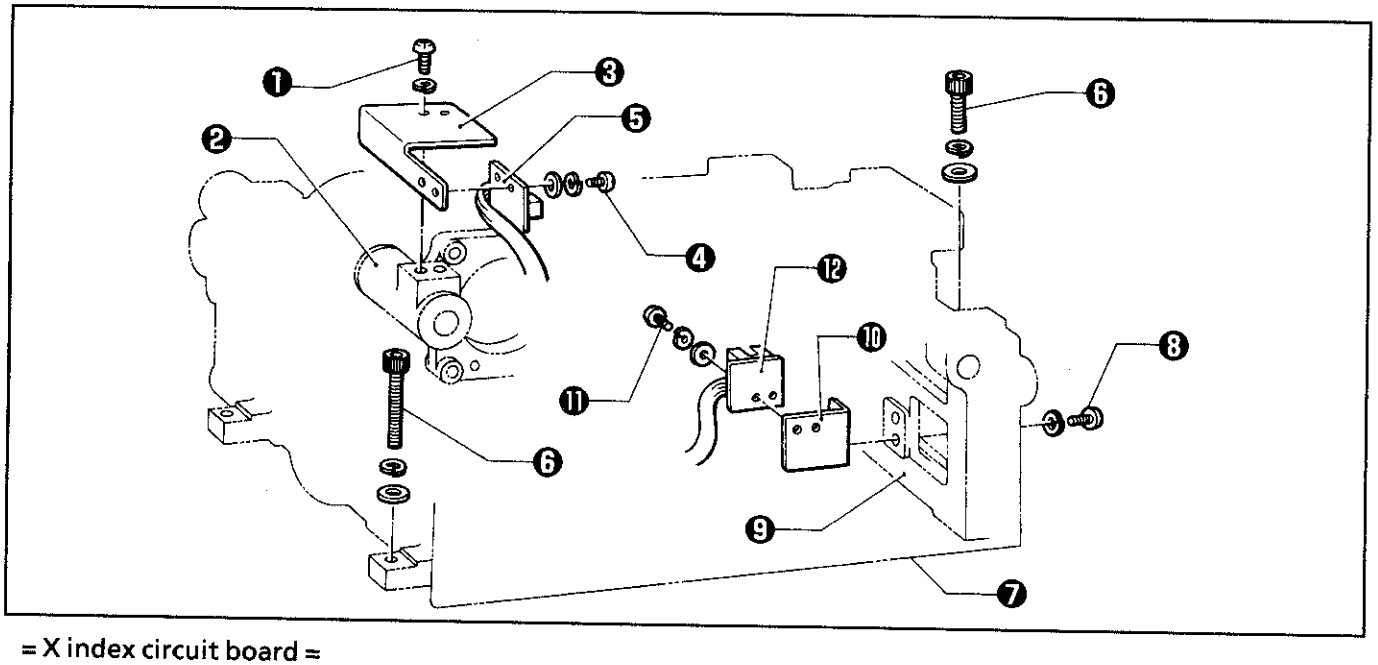
## 9 Power table

■ Connectors




1. Remove the connectors of the X index circuit board ❶ and the Y index circuit board ❷ from the main circuit board assembly ❸.
2. Remove the connectors of the X pulse motor ❹ and the Y pulse motor ❺ from the PMD circuit board ❻.

■ X and Y index circuit boards



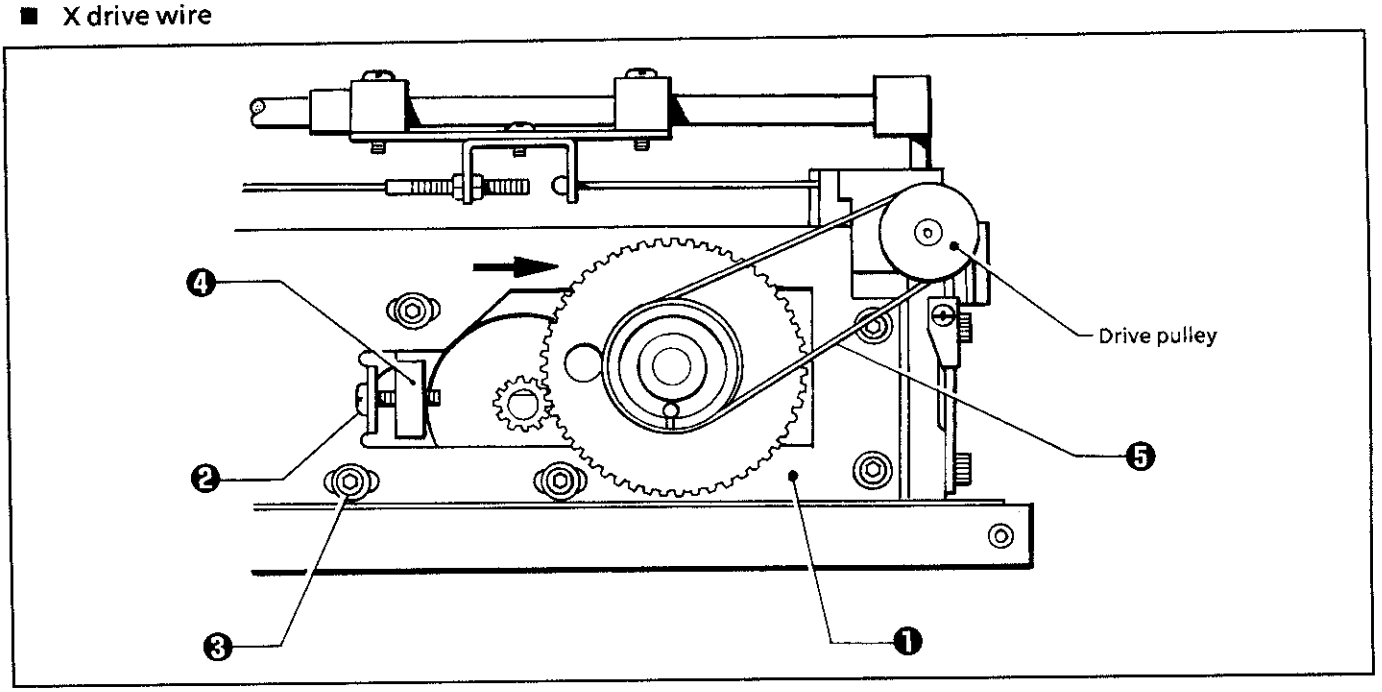
= X index circuit board =

1. Remove the two screws ❶, and sensor bracket X ❸ from motor bracket X ❷.
2. Remove the two screws ❹, and the X index circuit board assembly ❺ from sensor bracket X ❸.

= Y index circuit board =

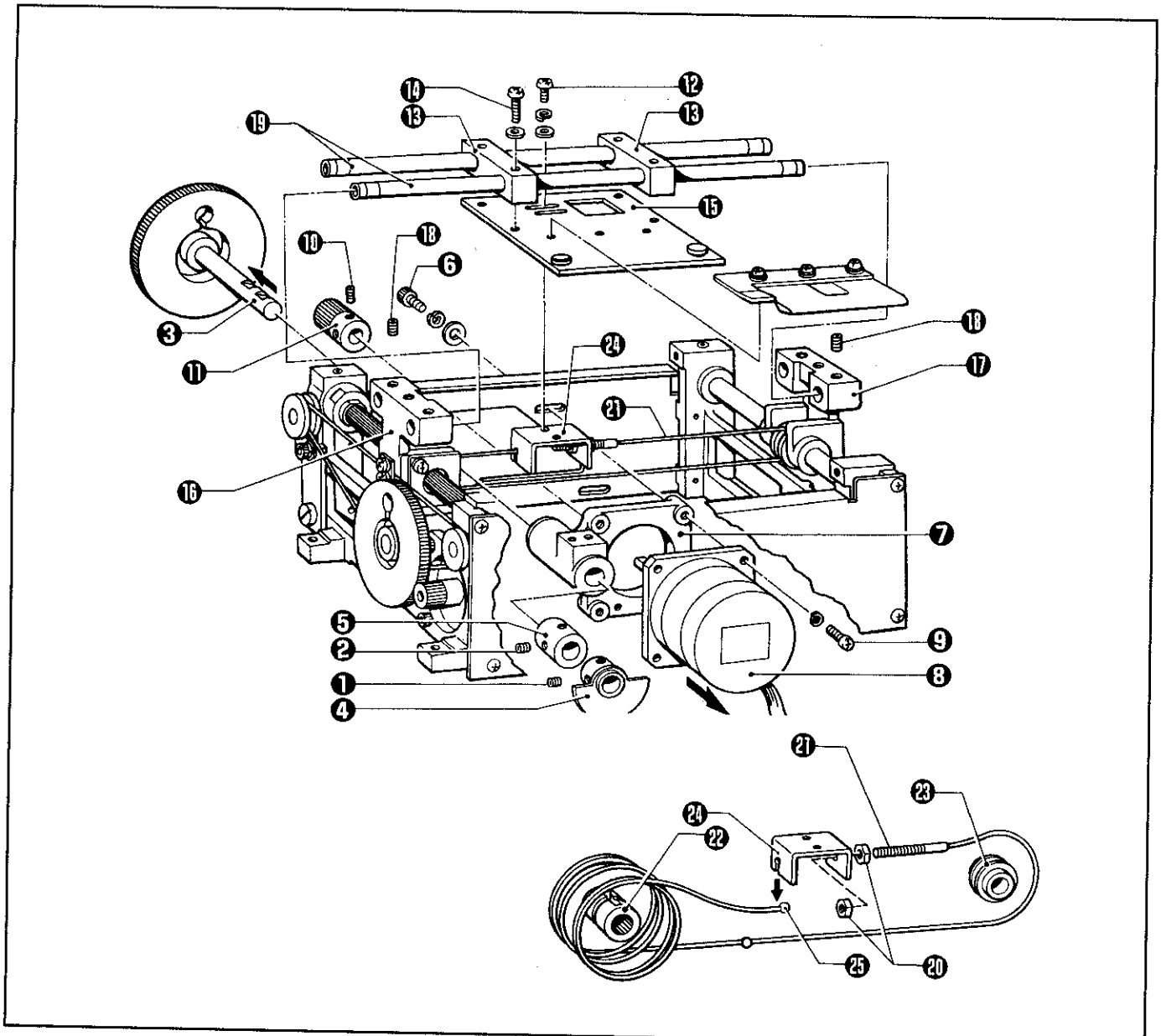
3. Remove the four bolts ❻, and the X-Y feed unit assembly ❼.
4. Remove the two screws ❽, and sensor bracket Y ❿ from frame L ❾.
5. Remove the two screws ⓫, and the Y index circuit board assembly ⓬ from sensor bracket Y ❿.

■ X drive wire



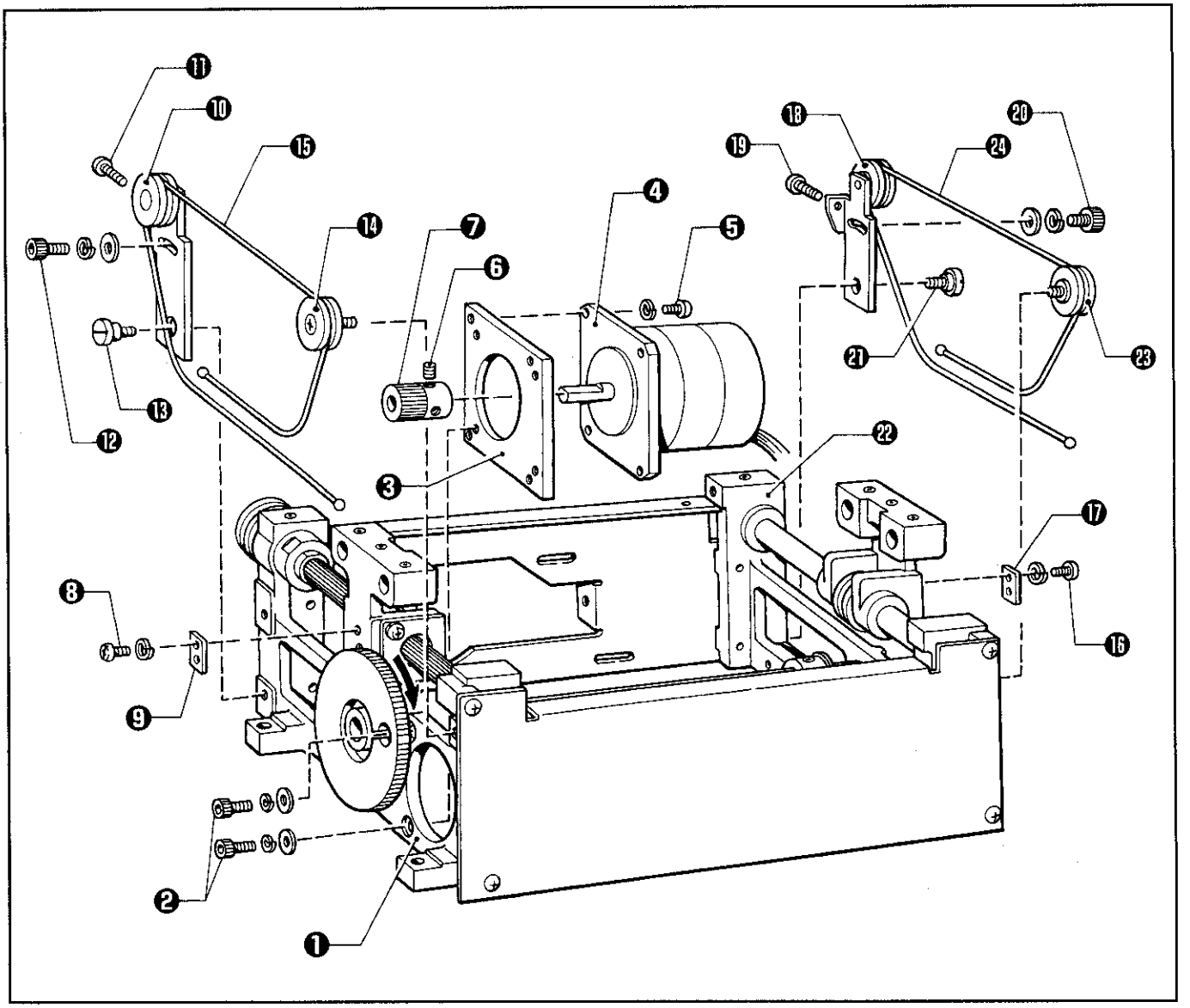

1. Remove the adjustment screw ❷ in the back of the base plate ❶.
2. Loosen the three screws ❸ in the base plate ❶, move motor bracket X ❹, and remove the X drive wire ❺.

■ X pulse motor, sliders, X mini wire



1. Loosen the set screws ❶ and ❷, and remove the gear shaft ❸, the home position dog ❹, and collar (X) ❺.
2. Remove the three screws ❻, and motor bracket X ❼. (When replacing the X pulse motor ❽, remove the four screws ❾, loosen the set screw ❿, and remove the gear ⓫.)
3. Remove the two screws ⓬, the four screws ⓮ of the left and right sliders ⓭, and the slide plate assembly ⓯.
4. Loosen the four set screws ⓲ in bush holders L ⓰ and R ⓱, and remove the slide shaft ⓳ from the left and right sliders ⓭.
5. Loosen the nut ⓴, and remove the X mini wire ㉑.
6. Remove the X mini wire ㉑ from the spline shaft assembly ㉒ and the idle pulley ㉓, and the end ball ㉕ from the wire hook ㉔.

■ Y mini wires



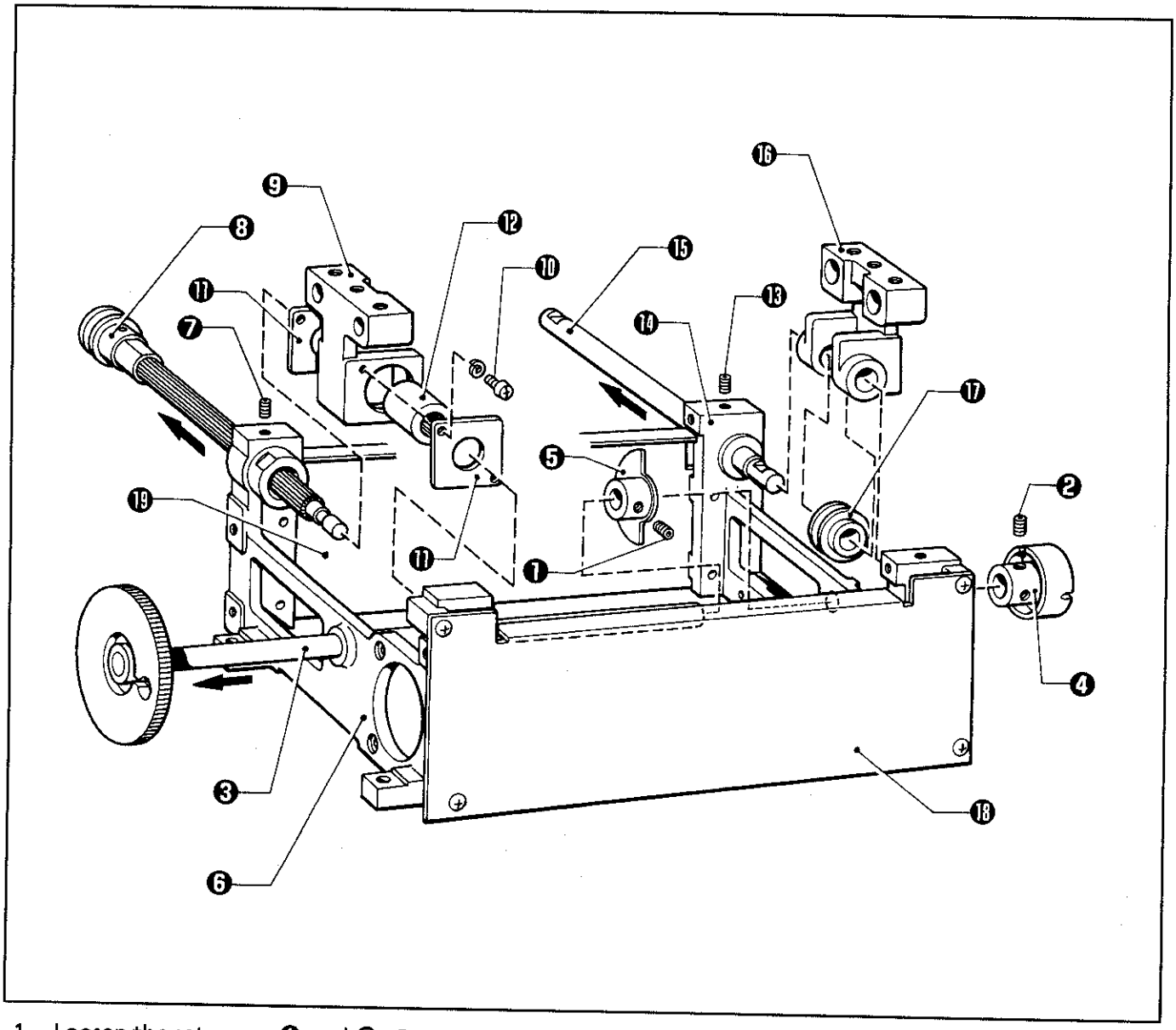

= Left frame side =

1. Remove the four bolts ❷ from frame L ❶, and the motor bracket Y assembly ❸. (When replacing the Y pulse motor ❹, remove the four screws ❺, loosen the set screw ❻, and remove the gear ❼.)
2. Remove the two screws ❽, and the wire presser ❾.
3. Loosen the screw ⓫, the bolt ⓬, and the shoulder screw ⓭ securing tension pulley L ⓾. (There is no need to remove them from frame L ❶.)
4. Remove support B ⓮, and the Y mini wire ⓯.

= Right frame side =

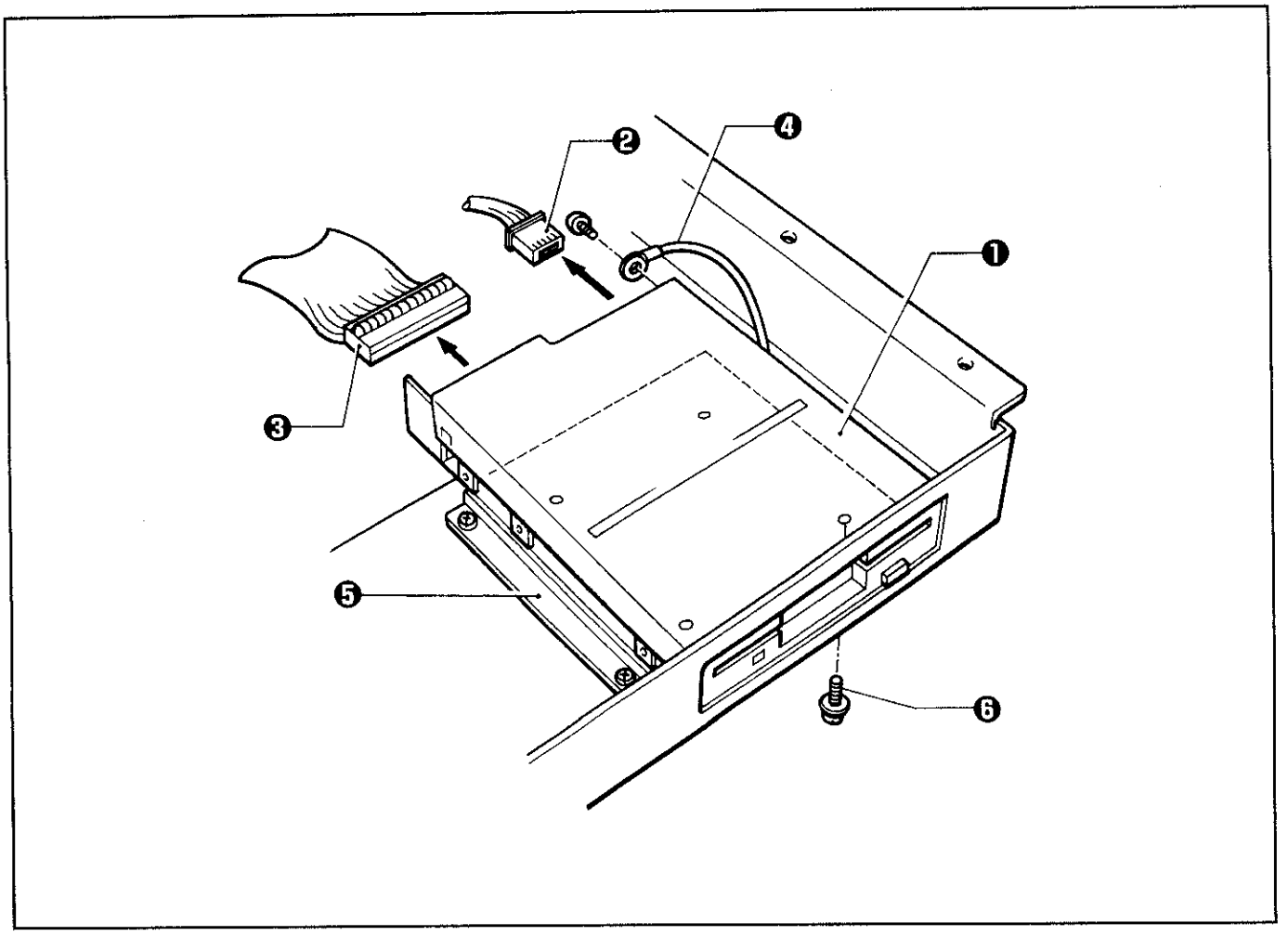
5. Remove the two screws ⓰, and the wire presser ⓱.
6. Loosen the screw ⓳, the bolt ⓴, and the shoulder screw ㉑ securing tension pulley R ⓲. (There is no need to remove them from frame R ㉒.)
7. Remove support B ㉓, and the Y mini wire ㉔.

■ Frame




1. Loosen the set screws❶ and ❷. Remove pulley Y ❹ and the home position dog ❺ while pulling out the pulley shaft ❸.
   **NOTE**
   When pulling out the pulley shaft ❸, make sure that the home position dog ❺ does not strike the Y index circuit board assembly.
2. Loosen the set screw ❼ in frame R ❻.
3. Remove the spline shaft ❽ by pulling it to the rear, and remove metal holder L ❾.
4. Remove the four screws ❿, the front and back nut pressers ⓫ and the spline bush ⓬ from metal holder L ❾.
5. Loosen the set screw ⓭, pull out the guide shaft ⓯ from frame L ⓮, and remove bush holder R ⓰ and the idle pulley ⓱.
   **NOTE**
   Do not disassemble the connecting plate ⓲, the base plate ⓳, and frames R ❻ and L ⓮.

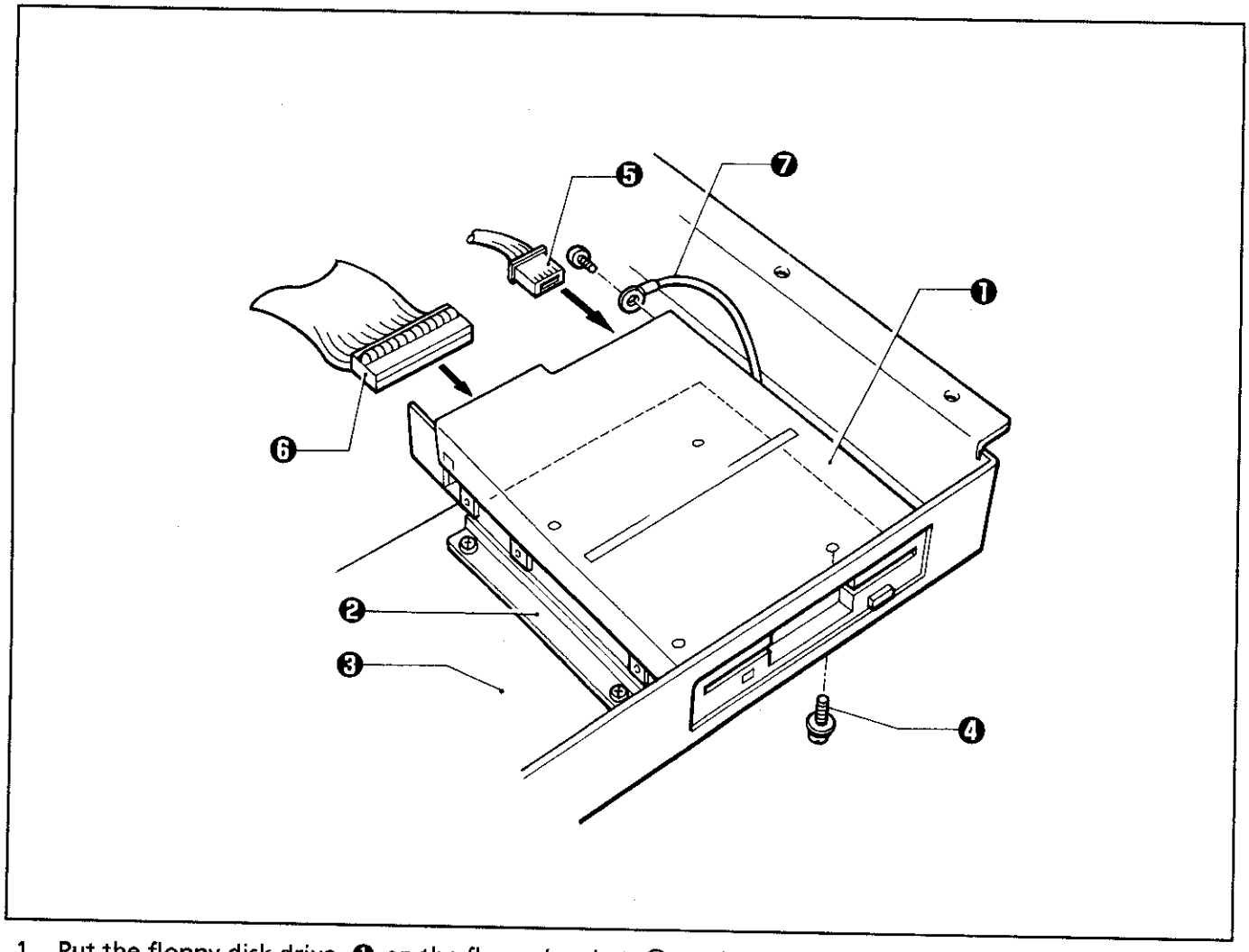
## ⑩ Floppy disk drive assembly




1. Remove the connector ❷, the flat cable ❸, and the ground wire ❹ from the floppy disk drive ❶.
   **NOTE**
   One of the screws securing the floppy bracket is also used to connect the ground wire ❹.
2. Remove the four screws ❻ from the underside of the body base ❺. Remove the floppy disk drive ❶.

# 5. Assembly

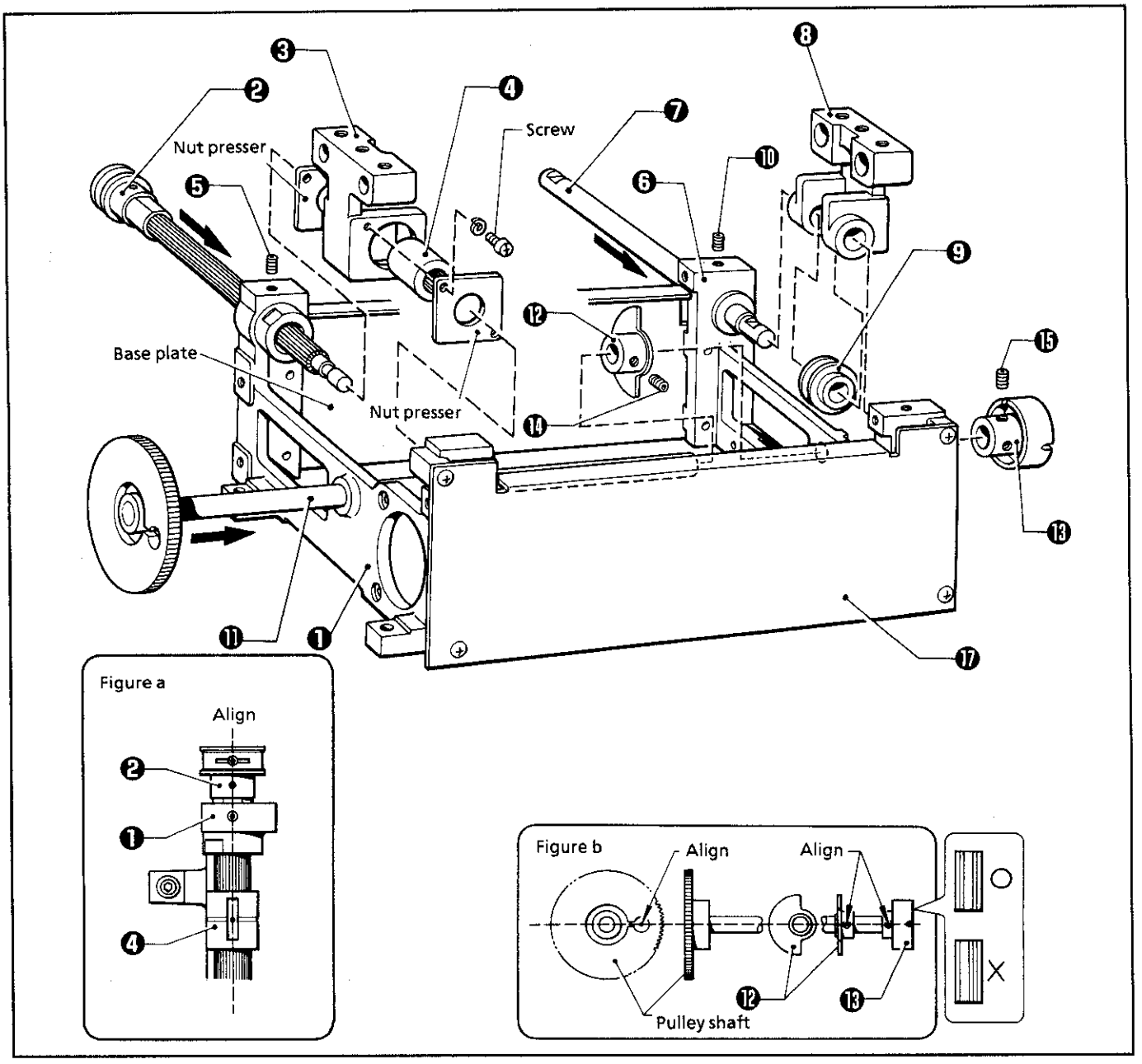
## 1 Floppy disk drive assembly




1. Put the floppy disk drive ❶ on the floppy bracket ❷, and attach it using the four screws ❹ from the underside of the body base ❸.
   **NOTE**
   If the four screws ❹ securing the floppy disk drive ❶ to the floppy bracket ❷ are tightened too much, the floppy disk drive ❶ may not operate correctly. Be careful and tighten the screws with about 9 gf.
2. Attach the connector ❺, the flat cable ❻, and the ground wire ❼ to the floppy disk drive ❶.

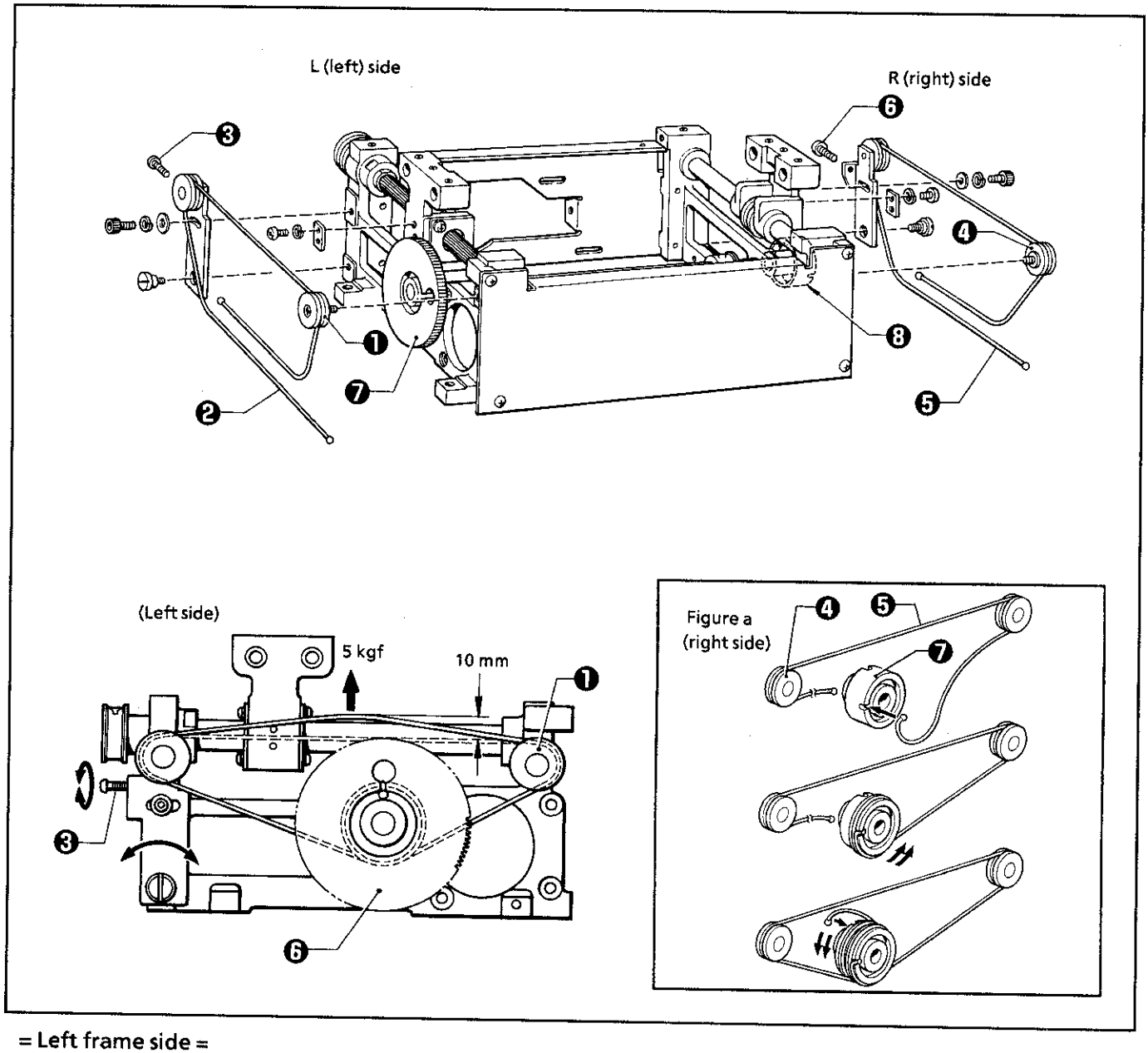
## 2 Power table

■ Frame




1. Pass the spline shaft assembly ❷ through frame R ❶, and attach bush holder R ❸.
   **NOTE**
   Align the keyway in the spline shaft bush ❹ and the hole in the spline shaft assembly ❷ as shown in figure a.
2. Securely tighten the set screw ❺ on the screw flat of the spline shaft assembly ❷.
3. Pass the guide shaft ❼ through frame L ❻, position the idle pulley ❾ between arms of bush holder L ❽, before sliding them onto the guide shaft ❼. Then further slide the guide shaft ❼ into frame L ❻, and lock it using the set screw ❿.
4. Pass the pulley shaft ⓫ through frame R ❶, and then slide the home position dog ⓬ on it. Next slide the pulley shaft ⓫ through frame L ❻ before mounting pulley Y ⓭ on it. (When attaching the home position dog ⓬, make sure that it does not strike the Y index substrate.)
5. Tighten the set screw ⓮ of the home position dog ⓬, and the set screw ⓯ of pulley Y ⓭.
6. When attaching pulley Y ⓭ to the pulley shaft ⓫, adjust the wire around it so it is as shown in figure b.
   **NOTE:**
   The hole in the pulley shaft assembly should be at the top at this time.

■ Y mini wires



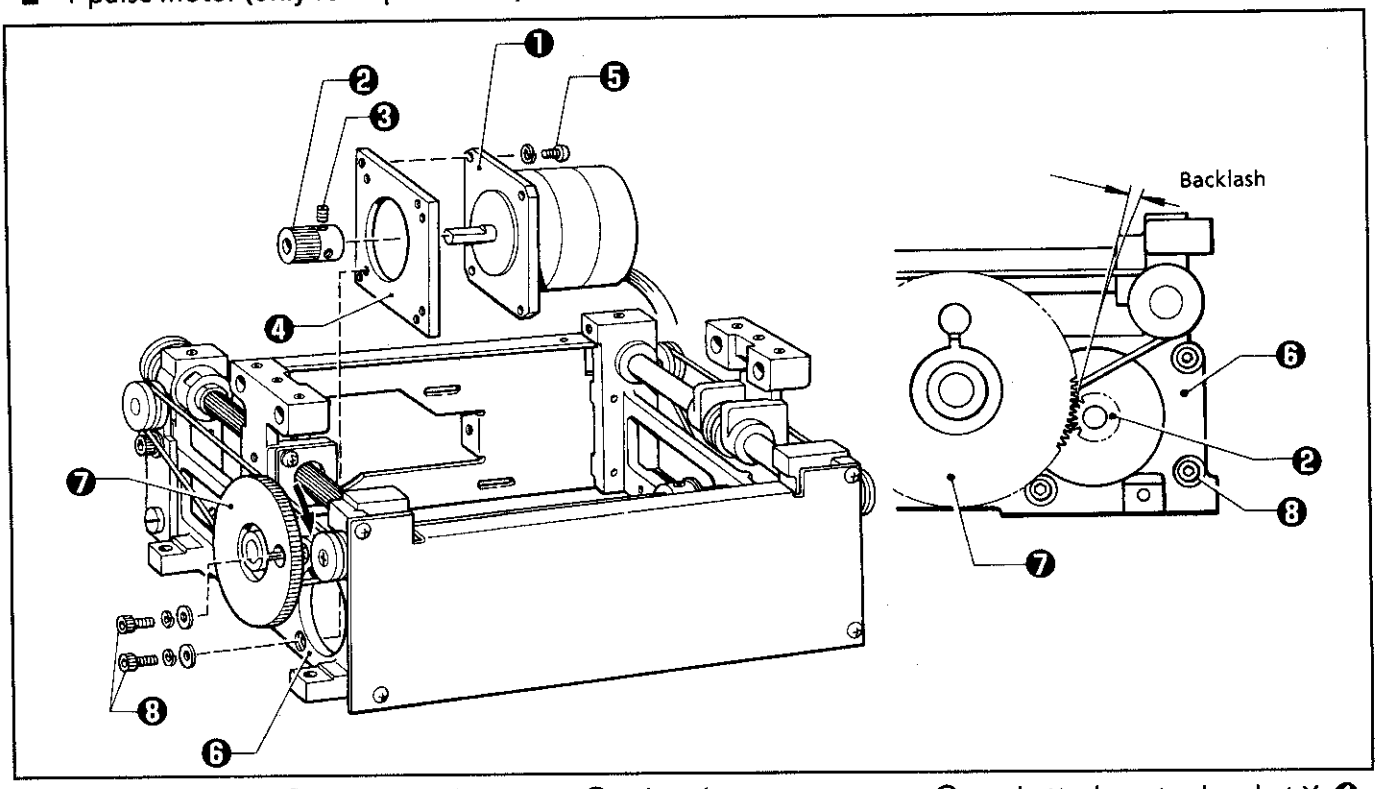

= Left frame side =

1. Attach support B ❶.
2. Attach the Y mini wire ❷. (See figure a.)
3. Adjust the tension of the Y mini wire ❷. (Apply a 5 kg load to the center of the Y mini wire ❷, and adjust the screw ❸ so that there is approximately 10 mm of give.)

= Right frame side =

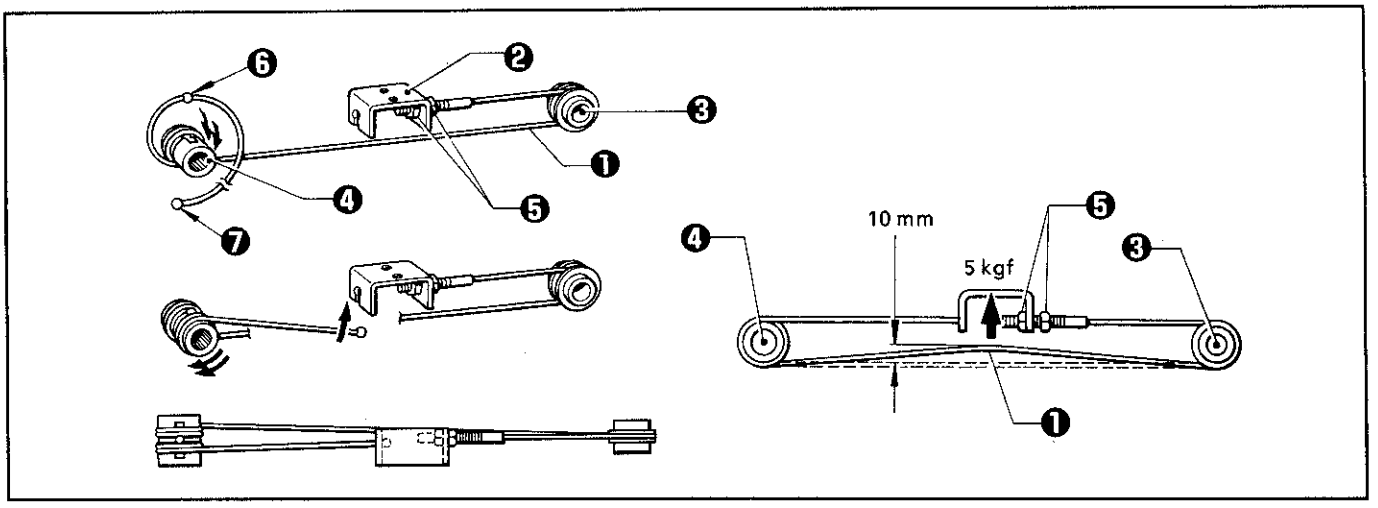
1. Attach support B ❹.
2. Attach the Y mini wire ❺. (Wrap it on as for the left side.)
3. Adjust the tension of the Y mini wire ❺ using the screw ❻. (Adjust it as for the left side.)
4. Refer to figure a when wrapping the left and right Y mini wires ❷ and ❺ around the gear pulley ❼ and pulley Y ❽, respectively.

■ Y pulse motor (only for replacement)



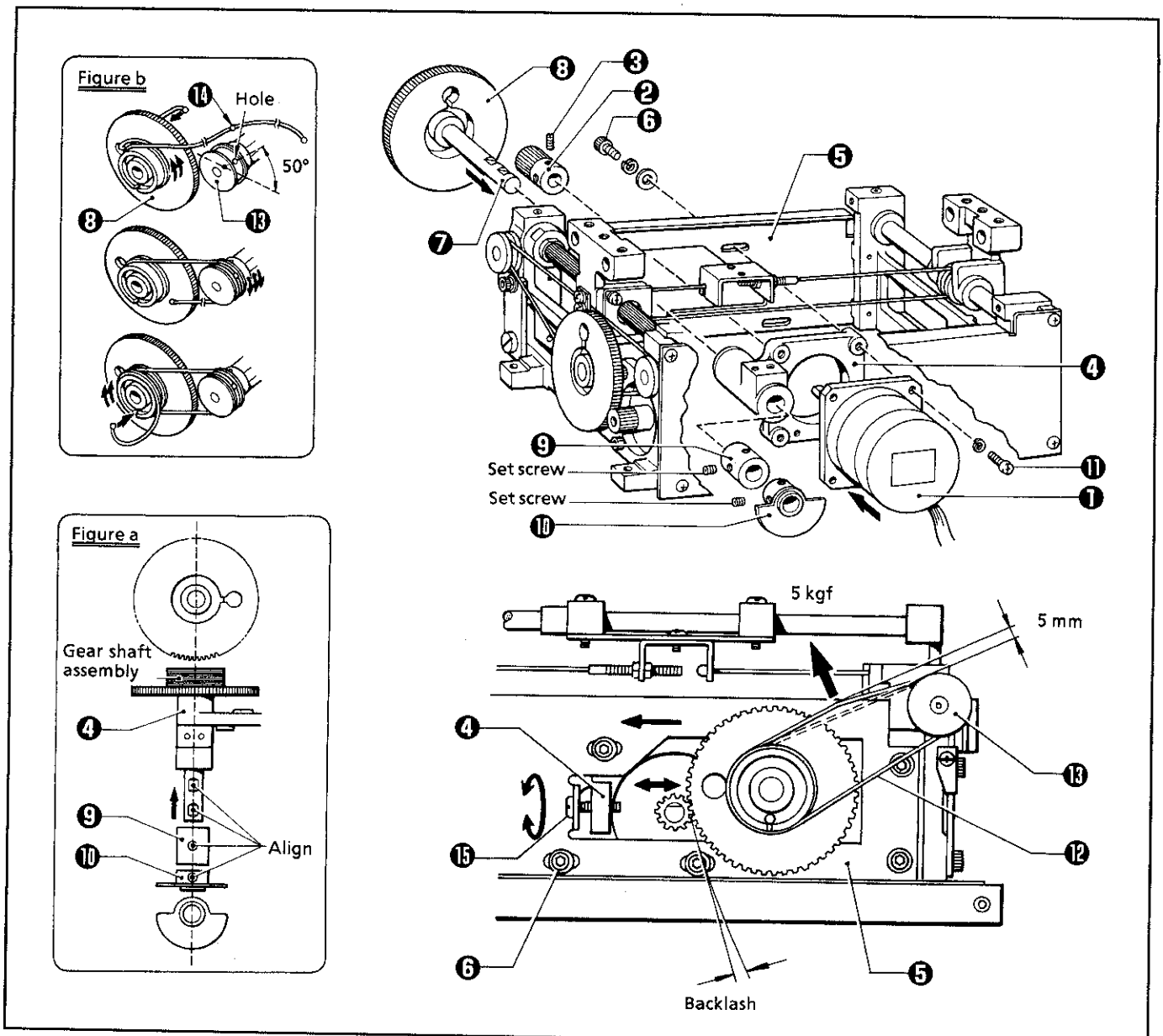

1. Attach the gear ❷ to the Y pulse motor ❶ using the two set screws ❸, and attach motor bracket Y ❹ using the four screws ❺.
2. Adjust the backlash so that the gear ❷ and the gear pulley ❼ rotate smoothly without any looseness between them. Attach motor bracket Y ❹ to frame R ❻ using the four screws ❽.

■ X mini wire



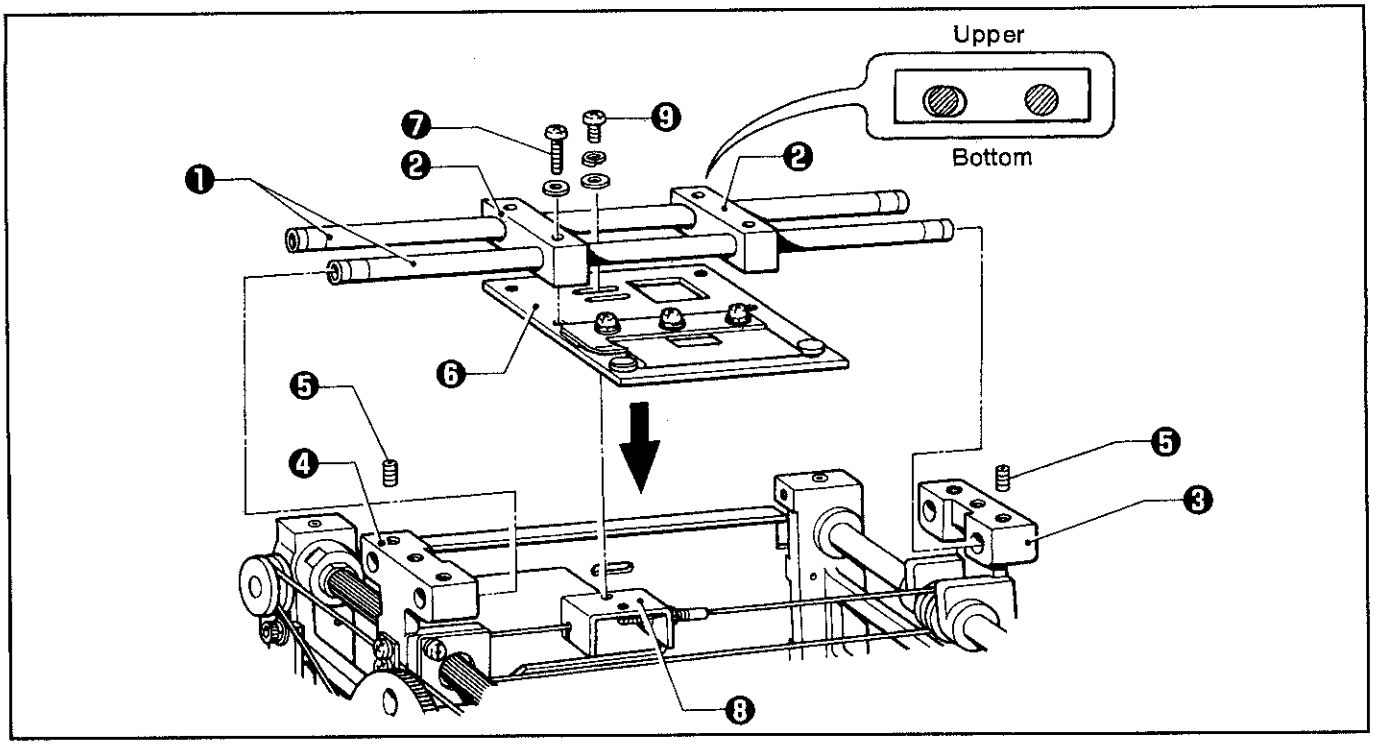

1. Attach the X mini wire ❶ to the wire hook ❷.
   (Be sure to check the direction of wire that is looped around the idle pulley ❸ and the spline shaft bush ❹.)
   **NOTE**
   Attach the X mini wire ❶ to the right of the wire hook ❷ using the two nuts ❺, and wrap the wire ❶ around the idle pulley ❸. Insert a ball ❻ into the notch in the spline shaft bush ❹, and wrap the wire ❶ twice around the spline shaft bush ❹ following the groove in it, then insert the end ball ❼ into the notch on the left of the wire hook ❷.
2. Adjust the tension of the X mini wire ❶.
   **NOTE**
   After checking the X mini wire ❶ is not twisted, apply a 5 kg load (5 kgf) to the center of the wire ❶, and adjust the nut ❺ until the give is approximately 10 mm.

■ X pulse motor, gear pulley, X drive wire



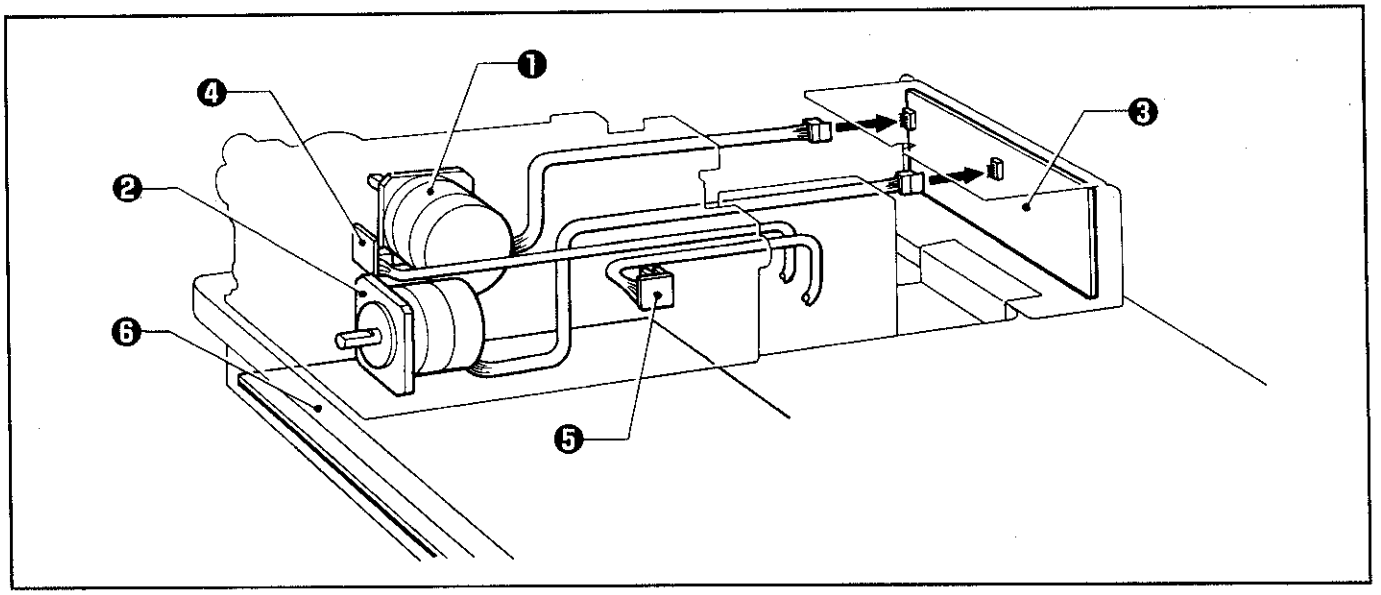

1. Attach the gear ❷ to the X pulse motor ❶ using the three set screws ❸.
2. Temporarily attach motor bracket X ❹ to the base plate ❺ using the three screws ❻.
3. Attach the gear shaft ❼ (with the gear pulley ❽), collar (X) ❾, and the home position dog ❿ to motor bracket X ❹.
   **NOTE**
   Align the screw flats of the gear shaft ❼ with the screw positions of collar (X) ❾ and the home position dog ❿ as shown in figure a.
4. Engage the gear pulley ❽ and the gear ❷, attach them to motor bracket X ❹ using the four screws ⓫ while adjusting them so that they move smoothly without backlash.
5. Attach the X drive wire ⓬. (Refer to figure b.)
   **NOTE**
   Set the wire mounting slot in the gear pulley ❽ and the hole (3.6 mm diameter) in the drive pulley ⓭ about 50° apart, wrap the wire twice around the gear pulley ❽, once around the drive pulley ⓭, insert the ball ⓮ into the hole in the drive pulley ⓭, wrap the wire once around the pulley ⓭, and then twice around the gear pulley ❽.
6. Adjust the tension of the X drive wire ⓬. (Loosen the three screws ❻, apply a 5 kg load to the center of the X drive wire ⓬, turn the adjustment screw ⓯ so that there is about 5 mm of give, and then retighten the three screws ❻.)

■ Sliders



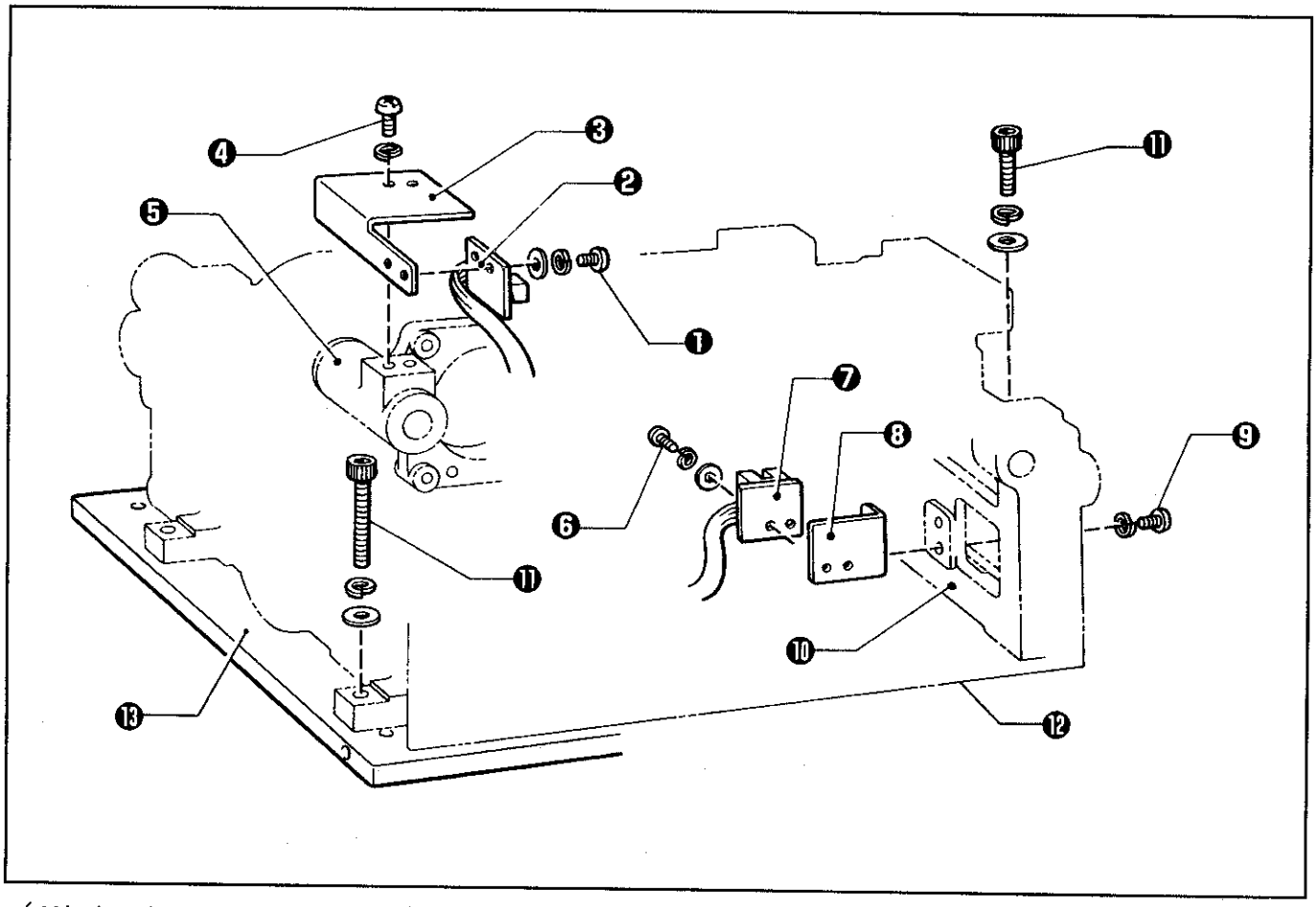

1. Pass the two slide shafts ❶ through bush holder L ❸, insert the two sliders ❷ into the shafts, and pass them through bush holder R ❹.
   **NOTE**
   Install the slider so that the round hole in it is facing the front and the oval one is facing the rear.
2. Attach the slide plate ❻ to the left and right sliders ❷ using the four screws ❼.
3. Secure metal holders L ❸ and R ❹ using the four screws ❺.
4. Attach the wire hook ❽ to the slide plate ❻ using the two screws ❾.
   * Refer to page 55, "⑩ Feed guide mechanism."

■ Connectors




1. Attach the connectors of the X pulse motor ❶ and the Y pulse motor ❷ to those on the PMD circuit board assembly ❸.
2. Attach the connectors of the X index circuit board assembly ❹ and the Y index circuit board assembly ❺ to those on the main circuit board assembly ❻.
   **NOTE**
   Secure the cords with cord holders.

■ X and Y index circuit board assemblies




〔 X index circuit board assembly 〕

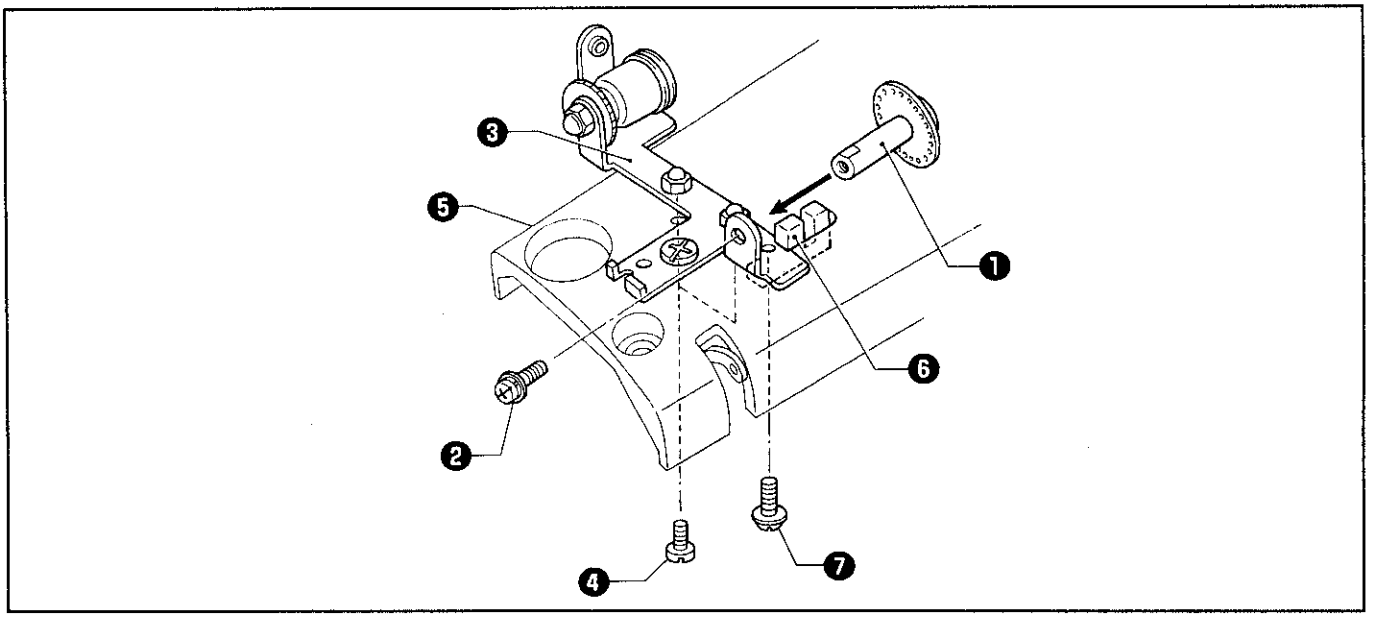
1. Attach the X index circuit board assembly ❷ to sensor bracket X ❸ using the two screws ❶.
2. Attach sensor bracket X ❸ to motor bracket X ❺ using the two screws ❹.

〔 Y index circuit board assembly 〕

3. Attach the Y index circuit board assembly ❼ to sensor bracket Y ❽ using the two screws ❻.
4. Attach sensor bracket Y ❽ to frame L ❿ using the two screws ❾.
5. Attach the X-Y feed unit assembly ⓬ to the carriage base ⓭ using the two bolts ⓫.

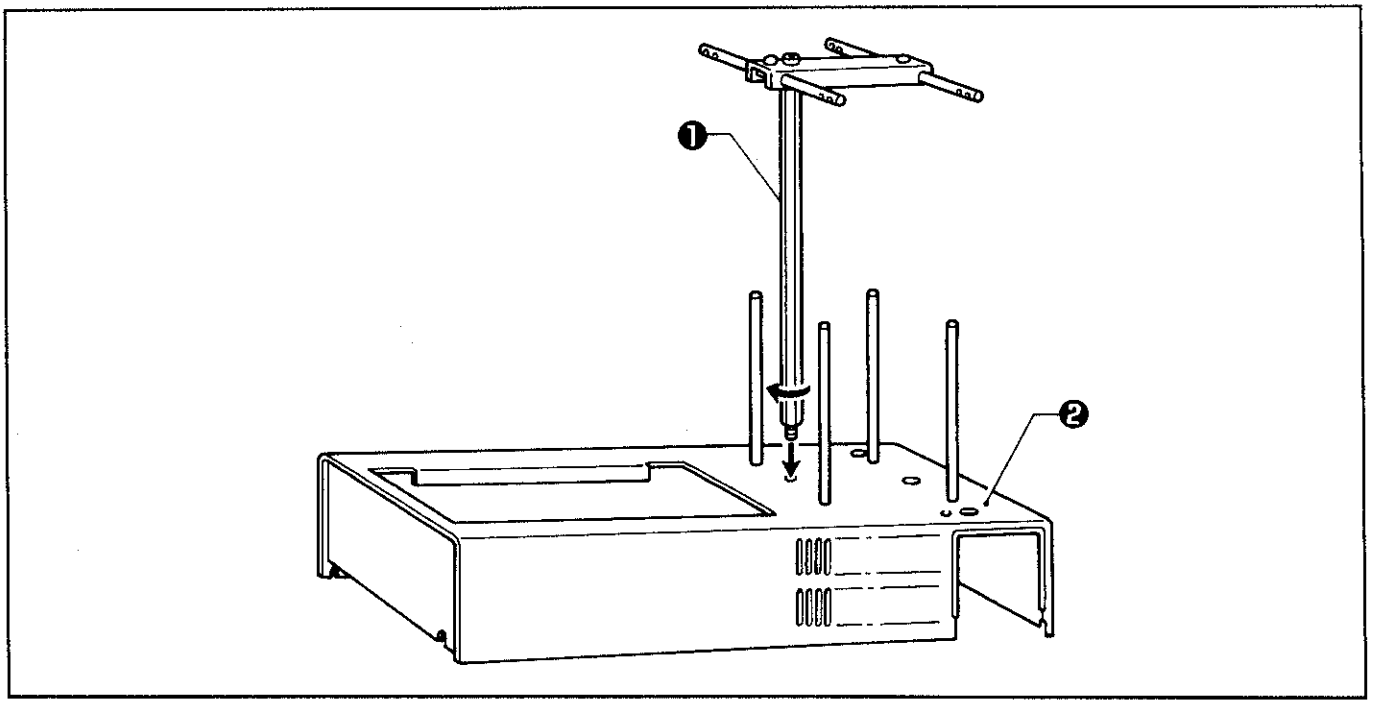
## 3 Thread breakage detector

■ Thread breakage detector




1. Attach the pulley shaft ❶ to the thread breakage sensor plate ❸ using the screw ❷.
2. Attach the thread breakage sensor plate ❸ to the upper cover ❺ using the screw ❹.
3. Attach the thread breakage detector ❻ to the upper cover ❺ using the screw ❼.
4. Attach the upper cover ❺ to the machine head using the three screws.

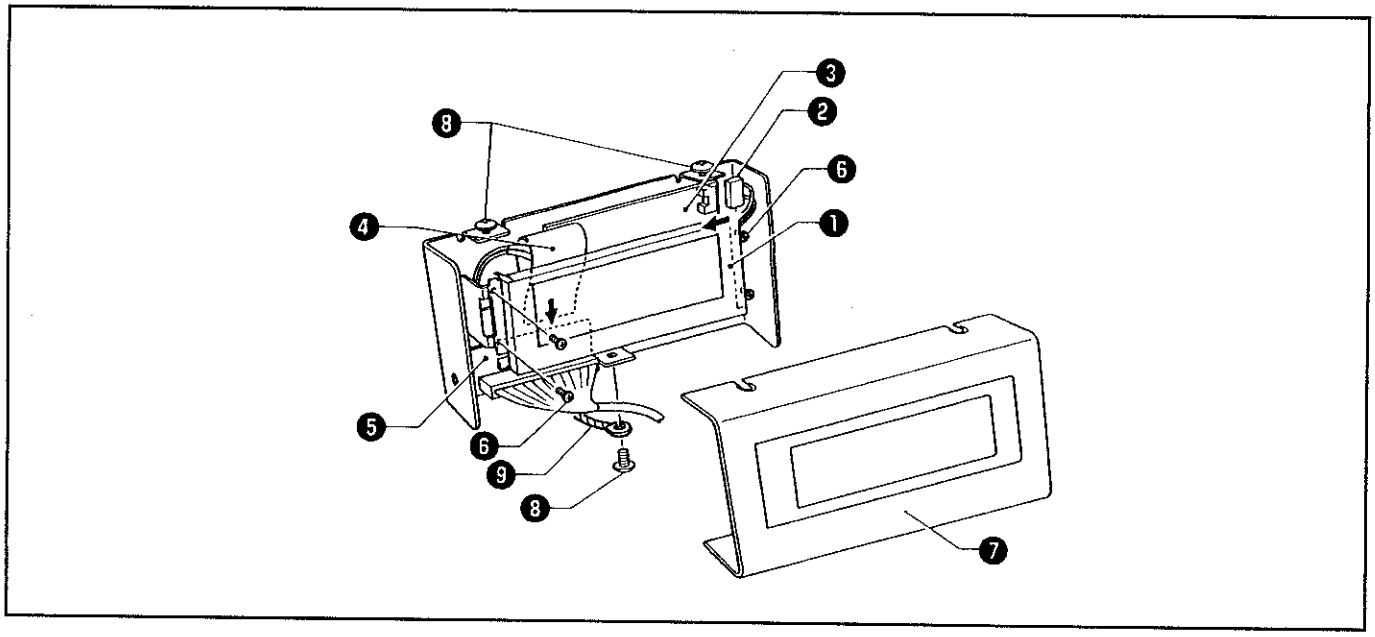
■ Thread guide




1. Attach the thread guide and thread guide bar ❶ to the carriage cover ❷.

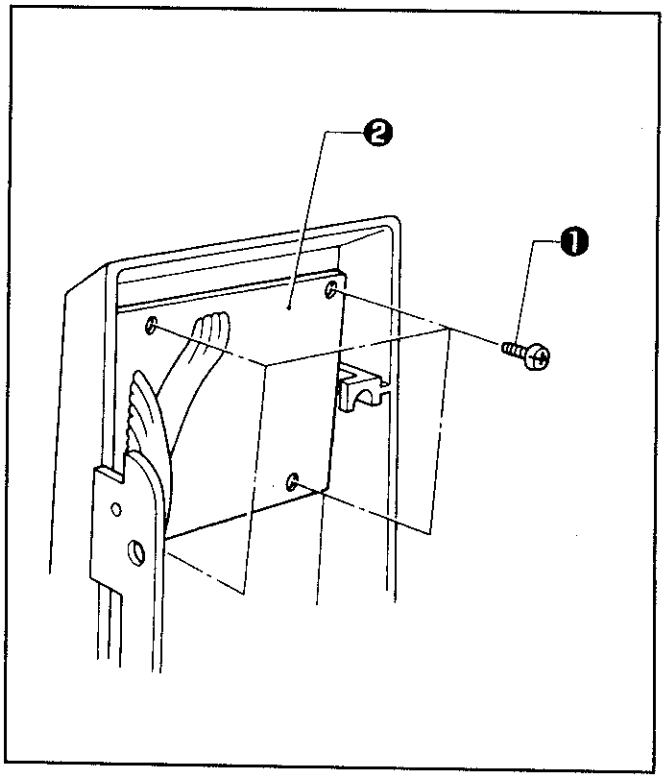
## 4 Display unit assembly

■ LCD module circuit board



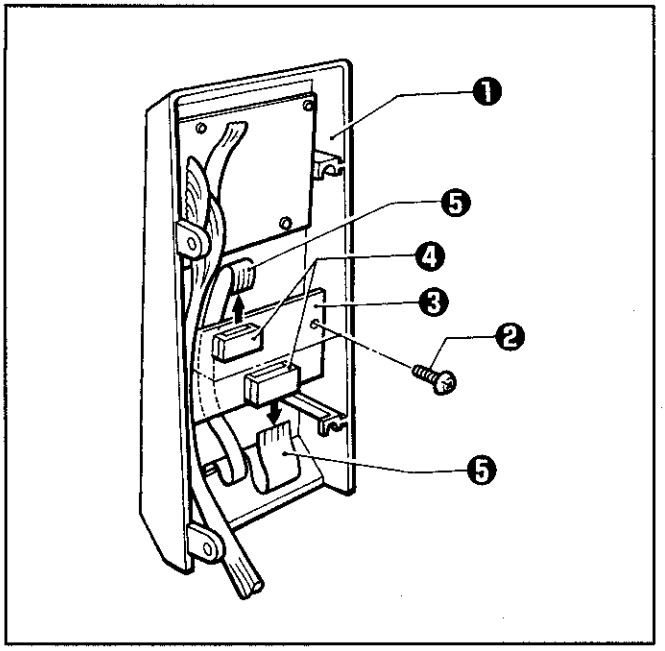

1. Connect the connector ❷ which is coming from the LCD module circuit board ❶ to the relay circuit board ❸, and connect the flat cables ❹ to the LCD inverter circuit board ❺.
2. Install the LCD module circuit board ❶ with the four screws ❻.
3. Install the display panel ❼ and secure it with the three screws ❽. (At this time, connect the ground wire ❾ using the screw ❽ at the bottom of the display panel.)

■ Panel circuit board



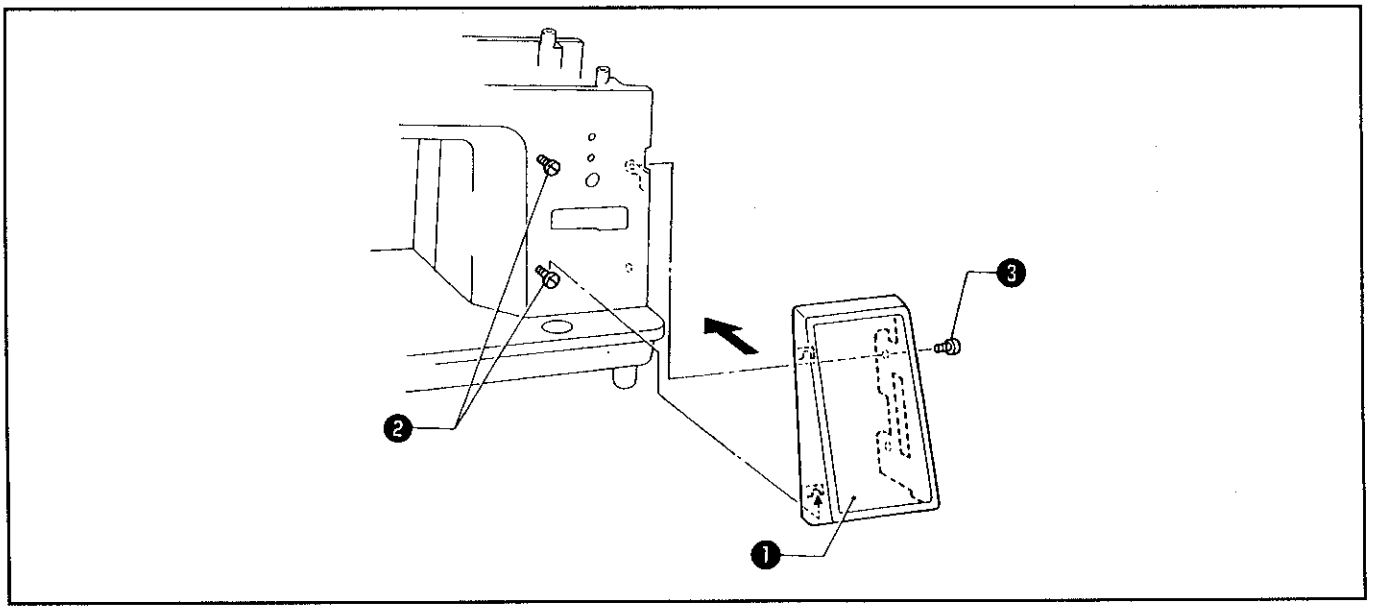

Attach the panel circuit board ❶ to the switch panel plate ❸ using the four screws ❷.

■ Relay circuit board



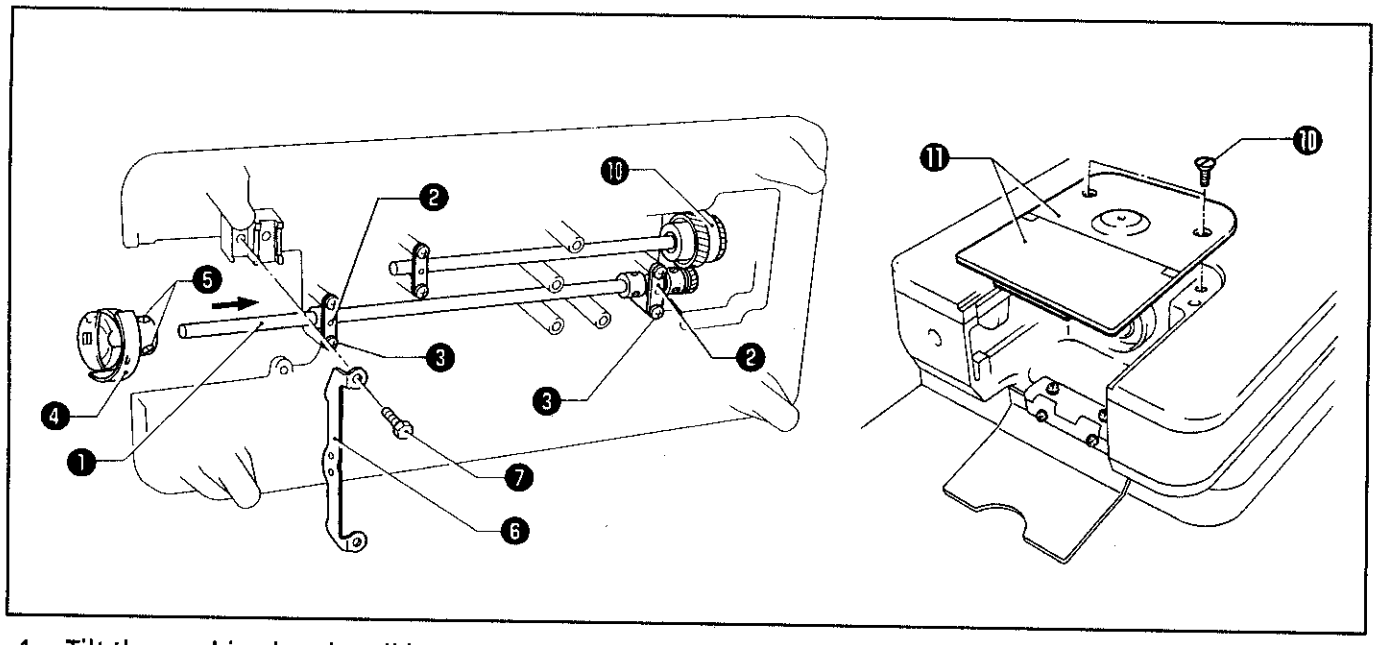

1. Attach the relay circuit board ❸ to the switch panel plate ❶ using the two screws ❷.
2. Insert the two flat cables ❺ into the connector ❹ of the relay circuit board ❸, and lock them.

■ Operation panel assembly



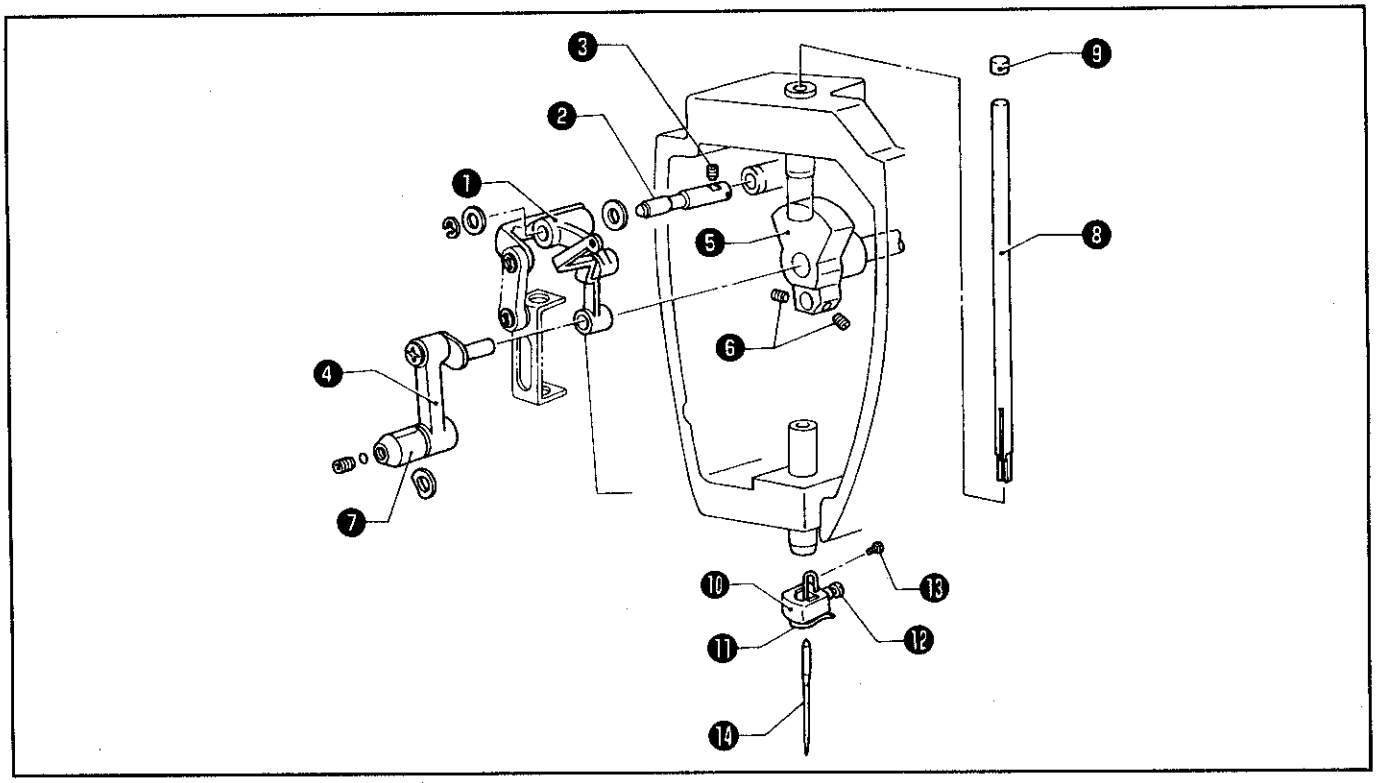

1. Attach the two shoulder screws ❷ to the front of the machine head, and slide the panel assembly ❶ on the front of the machine head until the shoulder screws ❷ are fully inserted into the notches.
2. Attach the belt cover ❸ and the operation panel assembly ❶ using the two shoulder screws ❷.

## 5 Lower shaft mechanism



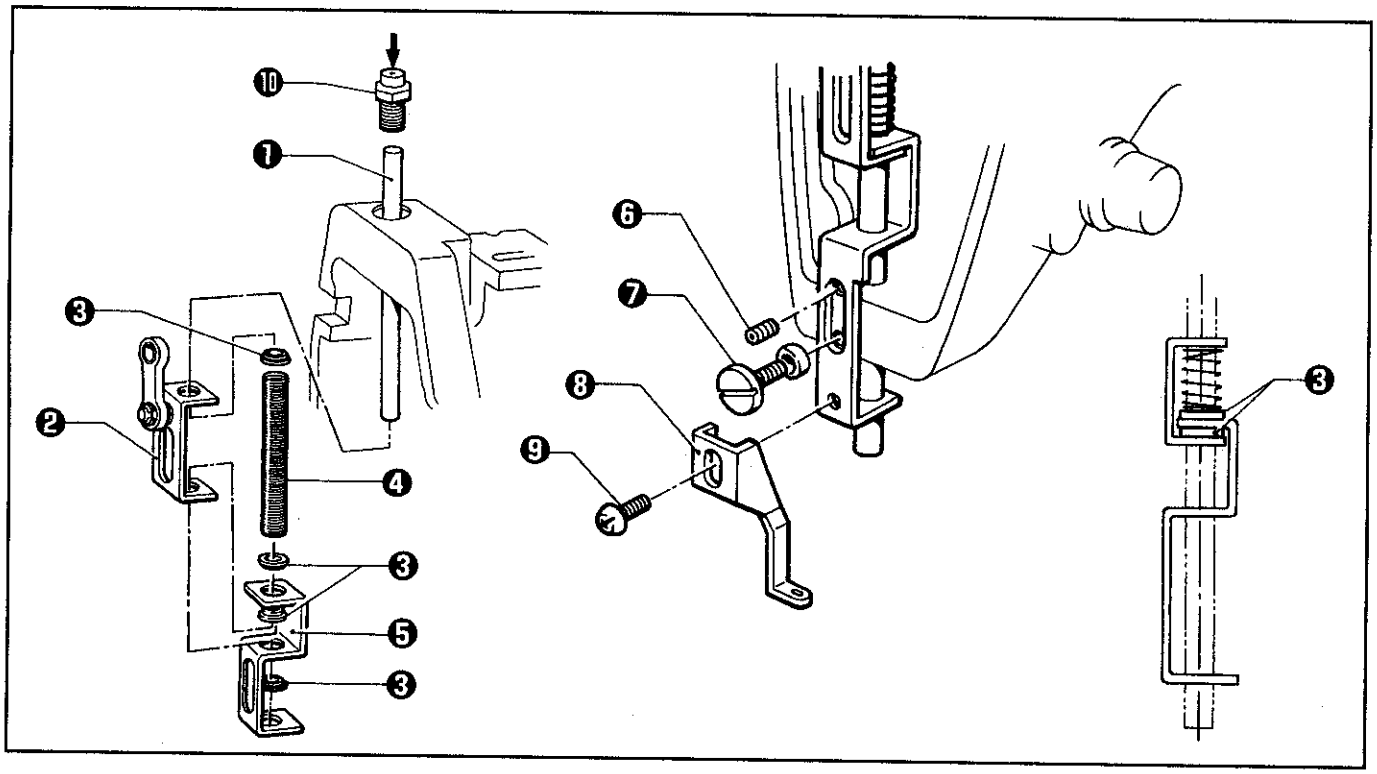

1. Tilt the machine head until it stops.
2. Attach the lower shaft ❶ using the bushing presser ❷ (R, L) and the screw ❸.
3. Attach the rotary hook ❹ to the lower shaft ❶ using the set screw ❺.
4. Secure the inner rotary hook stopper plate ❻ using the two bolts ❼.
5. Raise the machine head. Attach the needle plate ⓫ using the two screws ❿.
   Adjust the tension of the belt ❿.
   * Refer to page 51, "Timing belt tension."

## [6] Needle bar mechanism



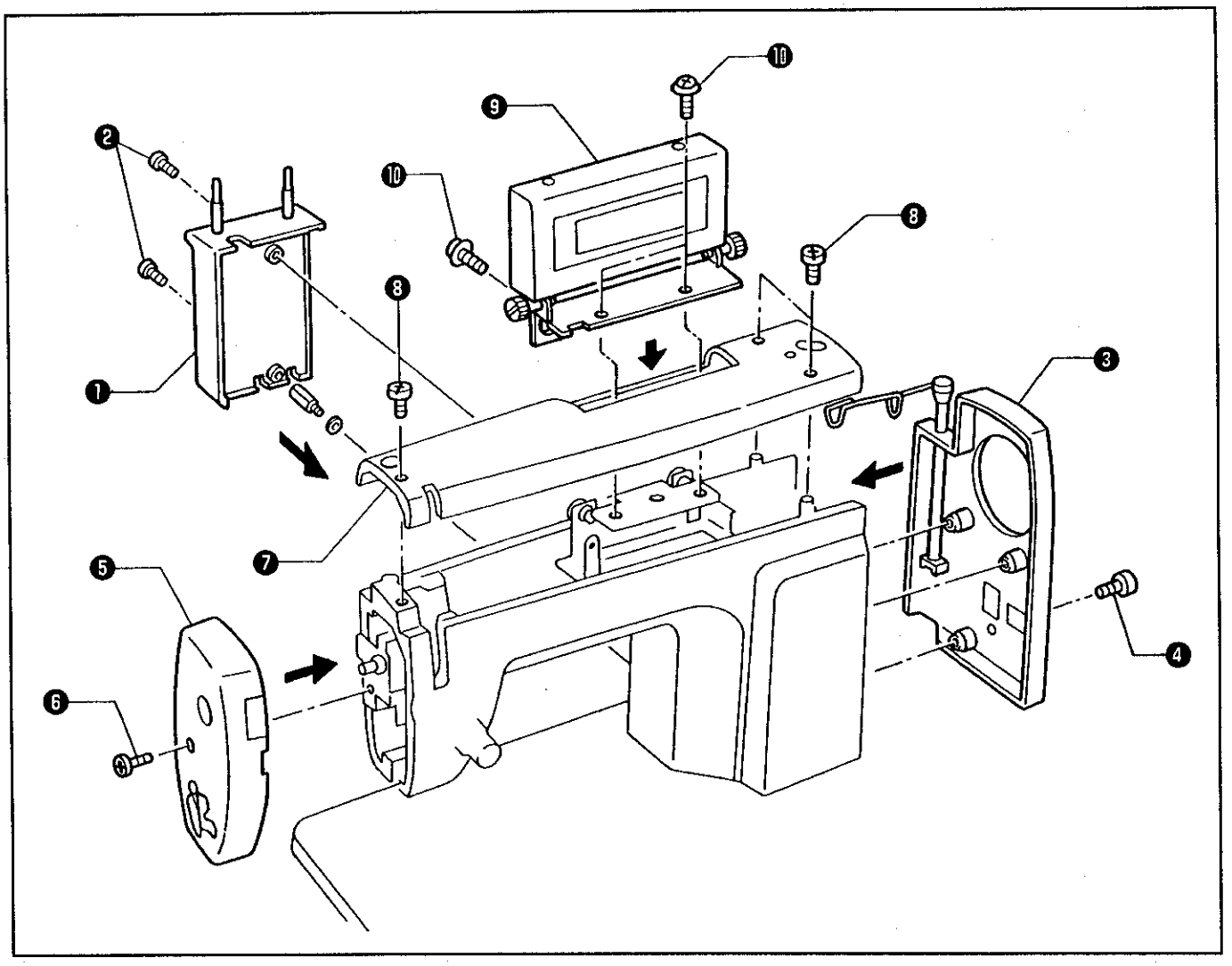

1. Slide the thread take-up support shaft ❷ in the link thread take-up assembly ❶ into the arm. Tighten the set screw ❸.
2. Attach the needle bar crank rod ❹ to the thread take-up crank ❺ using the two set screws ❻.
3. Attach the needle bar clamp ❼ to the needle bar crank rod ❹, insert the needle bar ❽ from the top of the machine head into the needle bar clamp ❼. (Insert the felt ❾ into needle bar bush U.)
4. Attach the needle clamp ❿ and the needle bar thread guide ⓫ to the needle bar ❽ using the set screw ⓭ and the screw ⓬.
5. Pass the needle ⓮ through the needle clamp ❿, and attach it to the needle bar ❽ using the screw ⓬.
   * Refer to page 48, "Needle bar height."

## 7 Presser bar mechanism



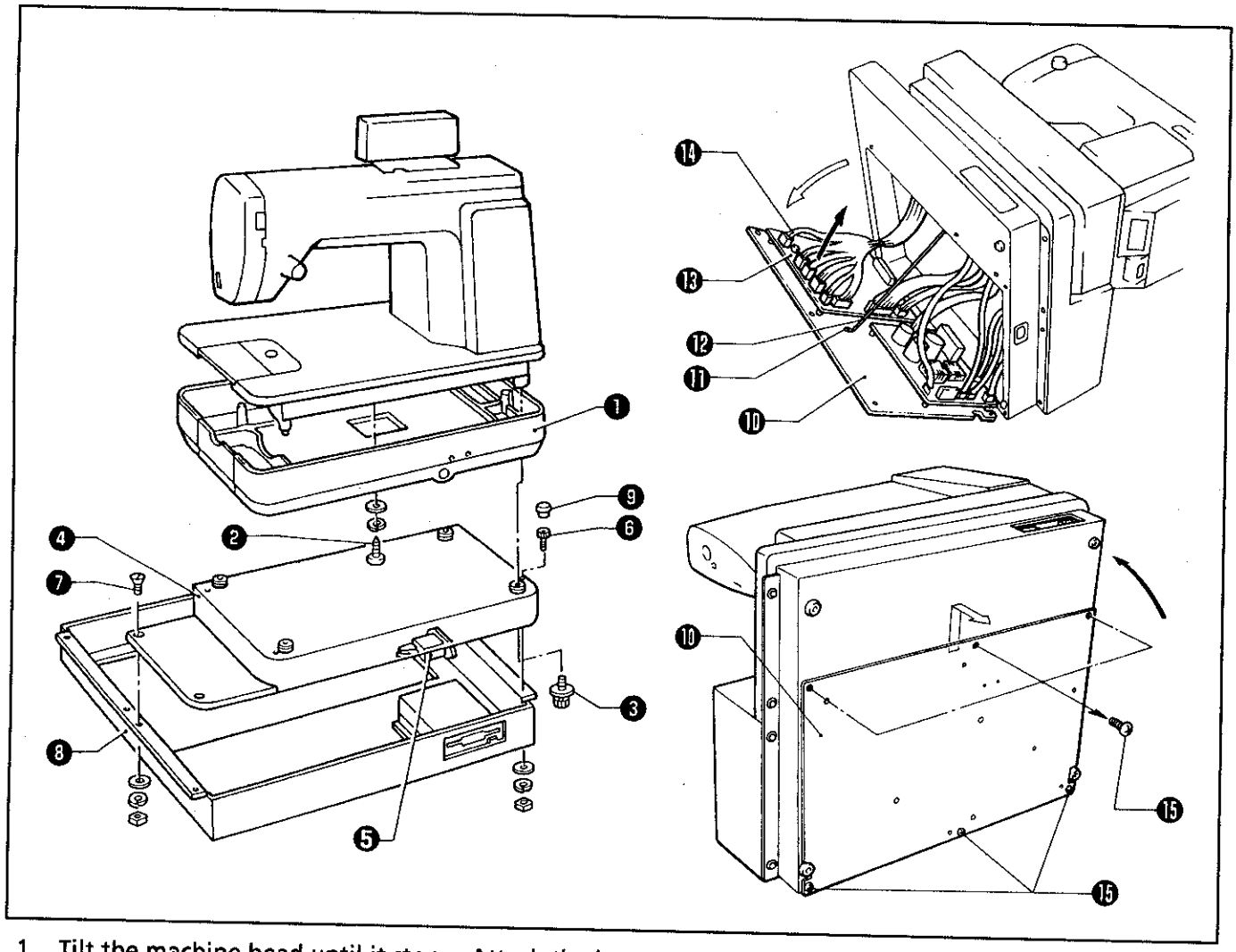

1. Pass the presser bar ❶ through the machine head, and place the presser foot guide ❷, the presser foot bush ❸, the spring ❹, the presser foot bush ❸, and the presser foot set plate ❺ on the presser bar ❶ in this order. (See figure a.)
2. Set the set screw ❻ to the the screw flat on the presser bar ❶, and tighten it.
3. Insert the roller into the slot of the presser foot set plate ❺, and attach the presser foot set plate ❺ to the machine head using the screw ❼.
4. Attach the presser foot ❽ to the presser foot set plate ❺ using the screw ❾.
5. Attach the presser cap ❿ to the machine head 1.
   * Refer to page 49, "Presser foot height."

## [8] Machine head covers



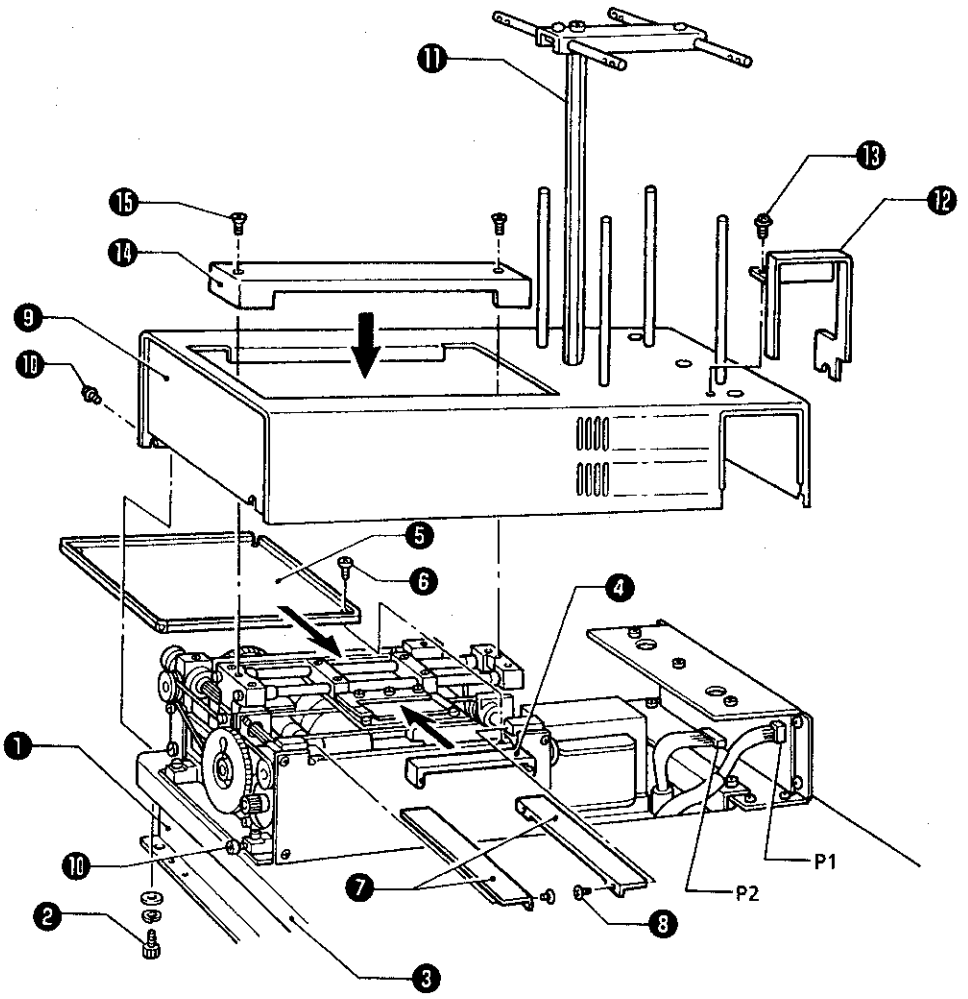

1. Attach the motor cover ❶ using the two screws ❷.
2. Attach the belt cover ❸ using the three screws ❹ and the screw.
3. Attach the face plate ❺ using the screw ❻.
4. Pass the cords through the machine head, and attach the upper cover ❼ using the three screws ❽.
5. Attach the LCD module ❾ to the upper cover ❼ using the four screws ❿.

## 9 Machine head




1. Tilt the machine head until it stops. Attach the bottom cover ❶ to the machine head using the screw ❷.
2. Attach the sewing machine fix bracket ❹ to the machine head using the four bolts ❸.
3. Attach the connector to the noise filter ❺.
4. Attach the body base ❽ to the machine head using the two bolts ❻ and the two screws ❼. (Cover the oil caps ❾ over the holes for the bolts ❻ tightened.)
5. Attach the ground wire ⓬ to the circuit board set plate ❿ using the screw ⓫.
6. Plug the connector ⓮ into the main circuit board ⓭.
7. Plug the machine head connectors into the main circuit board ⓭.
8. Attach the circuit board set plate ❿ to the body base ❽ using the six screws ⓯.

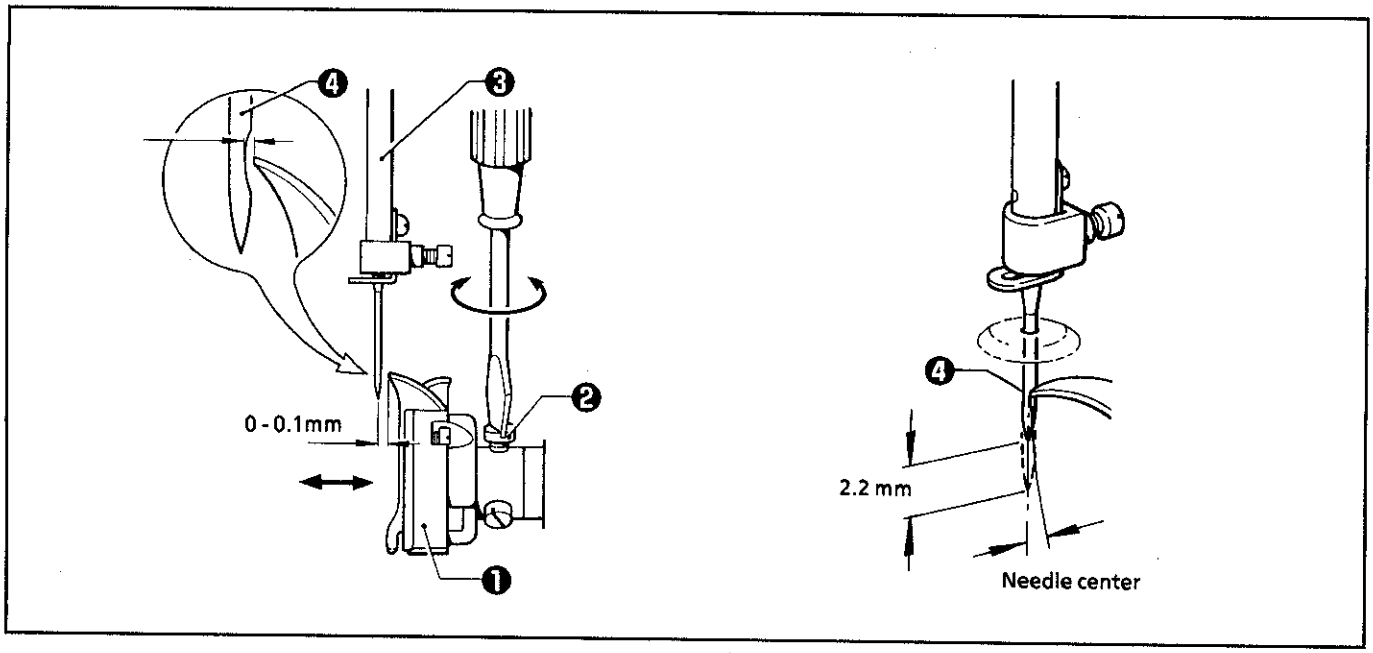
## ⑩ X-Y feed unit covers




1. Attach the body base ❶ to the carriage base ❸ using the bolts ❷.
2. Attach connector P1, P2.
3. Attach the slider cover ❹.
4. Attach cover U ❺ using the four screws ❻.
5. Attach the left and right covers US ❼ using the four screws ❽.
6. Attach the carriage cover ❾ using the five screws ❿.
7. Attach the thread guide bar ⓫, the harness cover ⓬ to the carriage cover ❾.
8. Attach the slide cover ⓮ using the two screws ⓯.

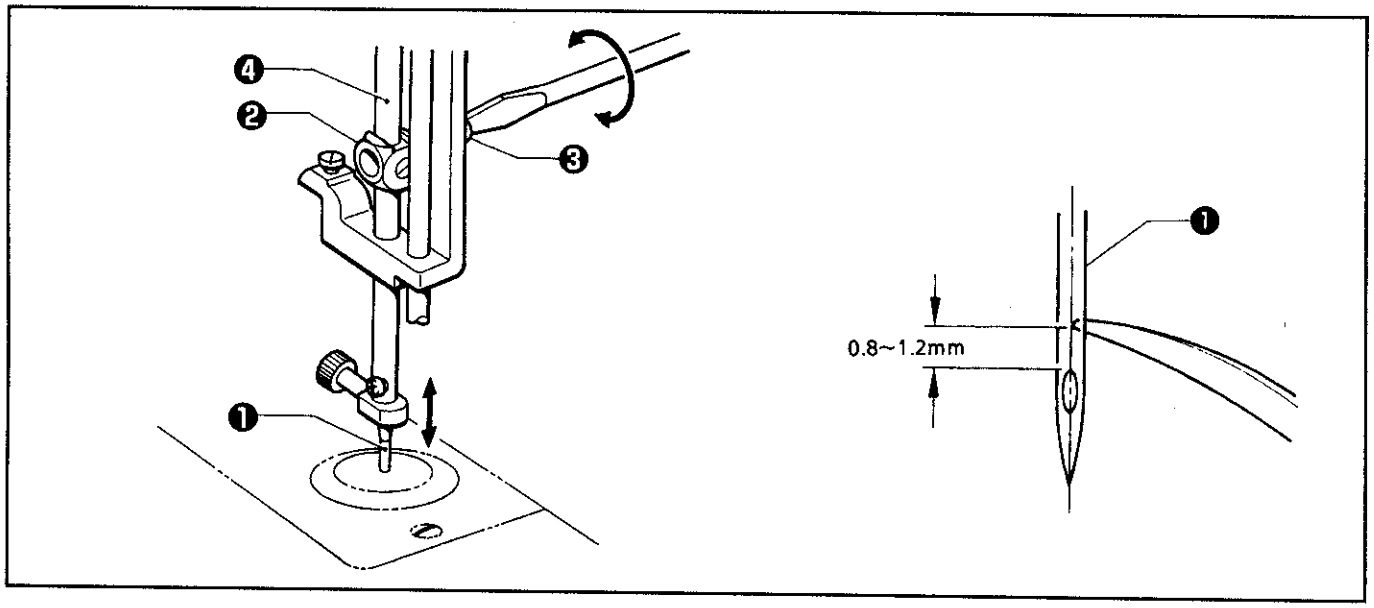
# 6. Adjustment

## 1 Needle and rotary hook timing



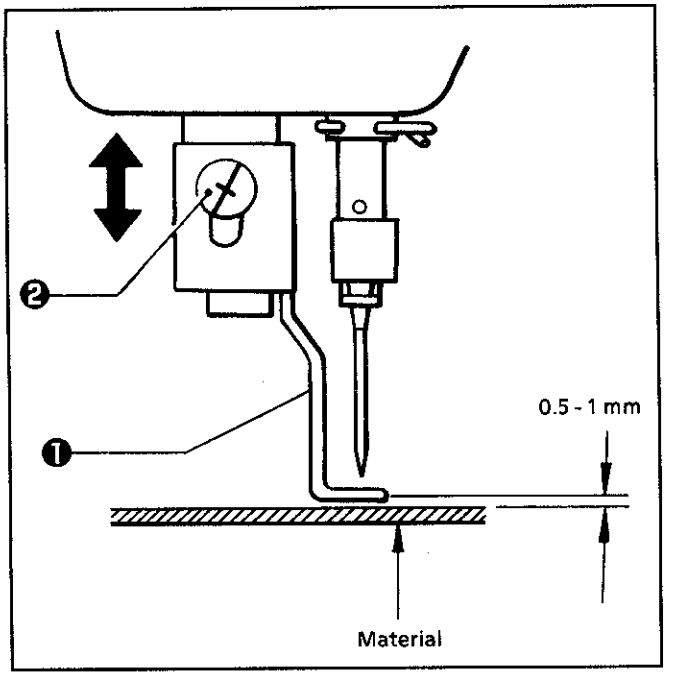

1. Loosen the three screws ❷ around the rotary hook ❶.
2. Turn the pulley toward you until the needle bar ❸ is raised 2.2 mm from its lowest point (the reference line of the needle bar is aligned with the bottom of the bush). The rotary hook point should be aligned with the center of the needle ❹. Adjust the clearance between the needle groove and the rotary hook point to 0 - 0.1 mm. The rotary hook point should not make contact with the needle ❹.
3. Tighten the three screws ❷ around the rotary hook ❶.

## 2 Needle bar height




1. Turn the pulley toward you to align the rotary hook point with the center of the needle ❶.
2. Loosen the screw ❸ in the needle bar clamp ❷, and move the needle bar ❹ up or down to adjust the clearance between the upper end of the needle eye and the rotary hook point to 0.8 - 1.2 mm.
3. Tighten the screw ❸ in the needle bar clamp ❷.

## 3 Presser foot height



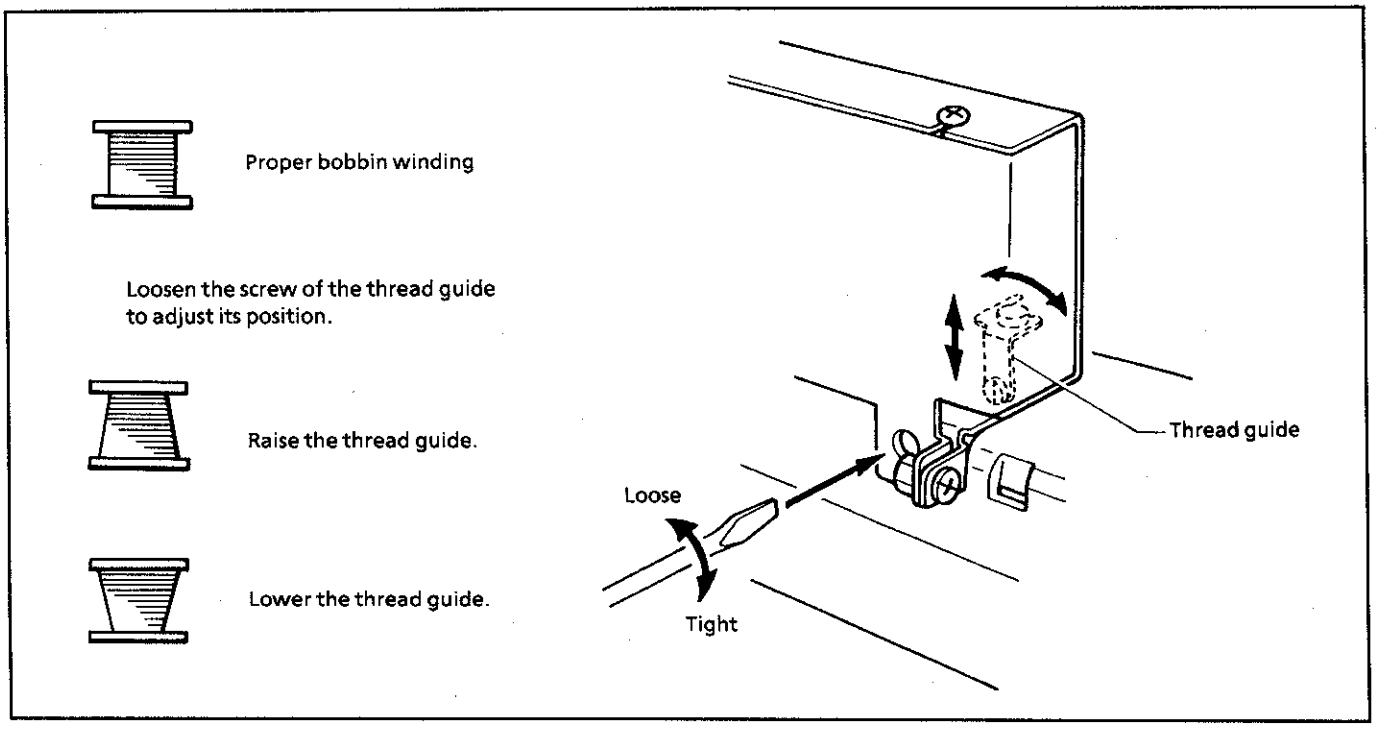

Turn the pulley to lower the presser foot ❶ to its lowest point. Loosen the screw ❷, and move the presser foot ❶ up or down to adjust the clearance between the material surface set in the embroidery hoop and the bottom of the presser foot ❶ to 0.5 - 1 mm.

**NOTE**

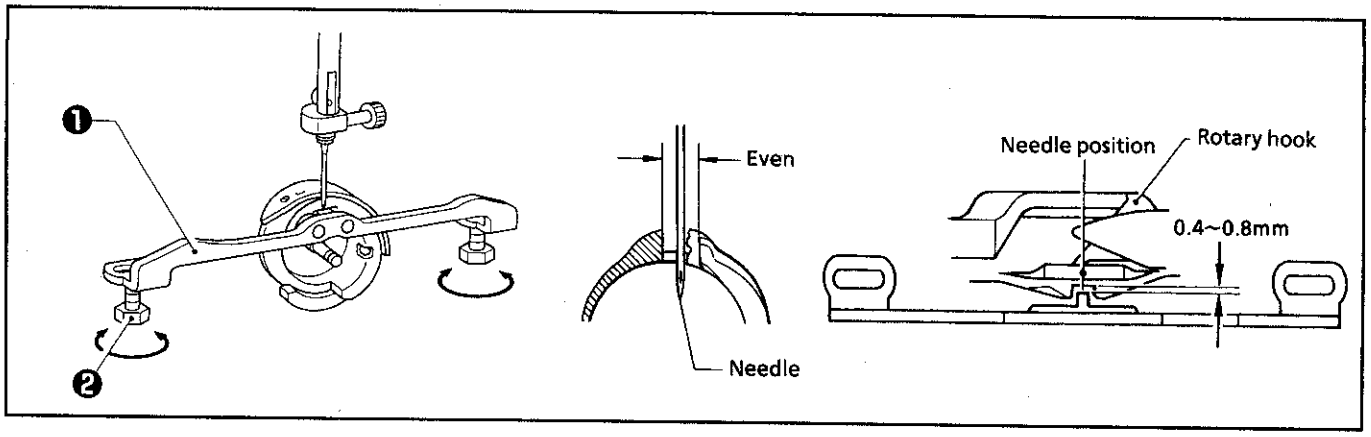
Before tightening the screw, make sure that the needle is centered in the hole of the presser foot ❶.

## 4 Thread guide

If the bobbin thread is not wound around the bobbin evenly, it may cause the improper bobbin thread tension.

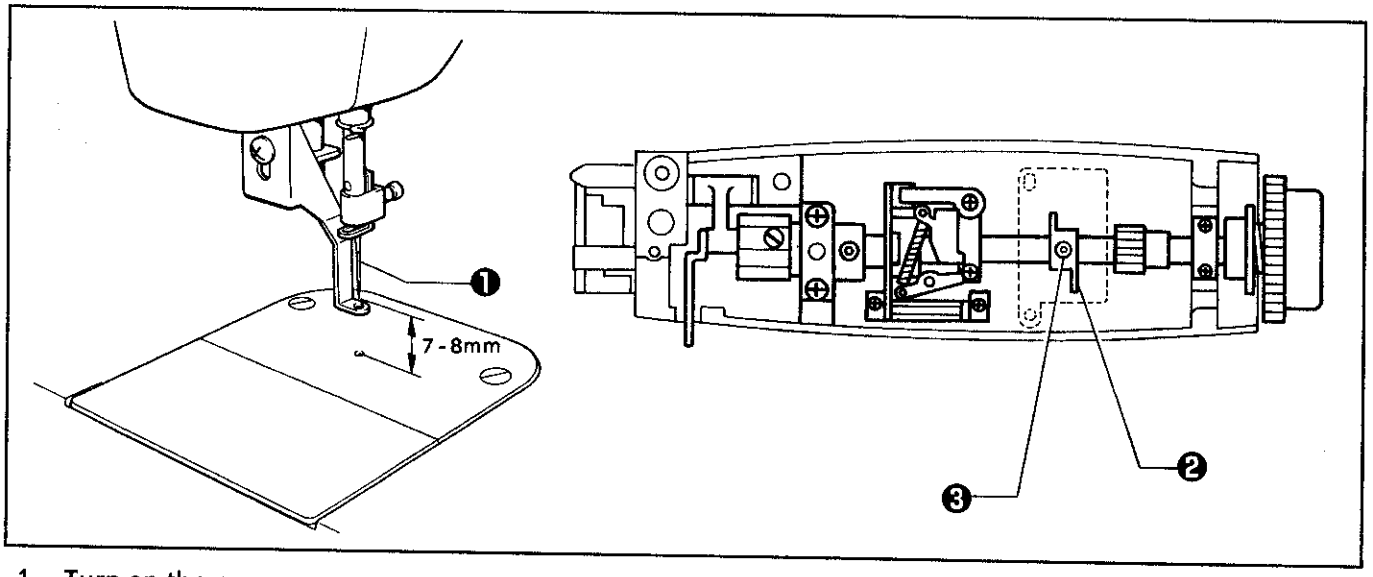


## 5 Inner rotary hook stopper plate position



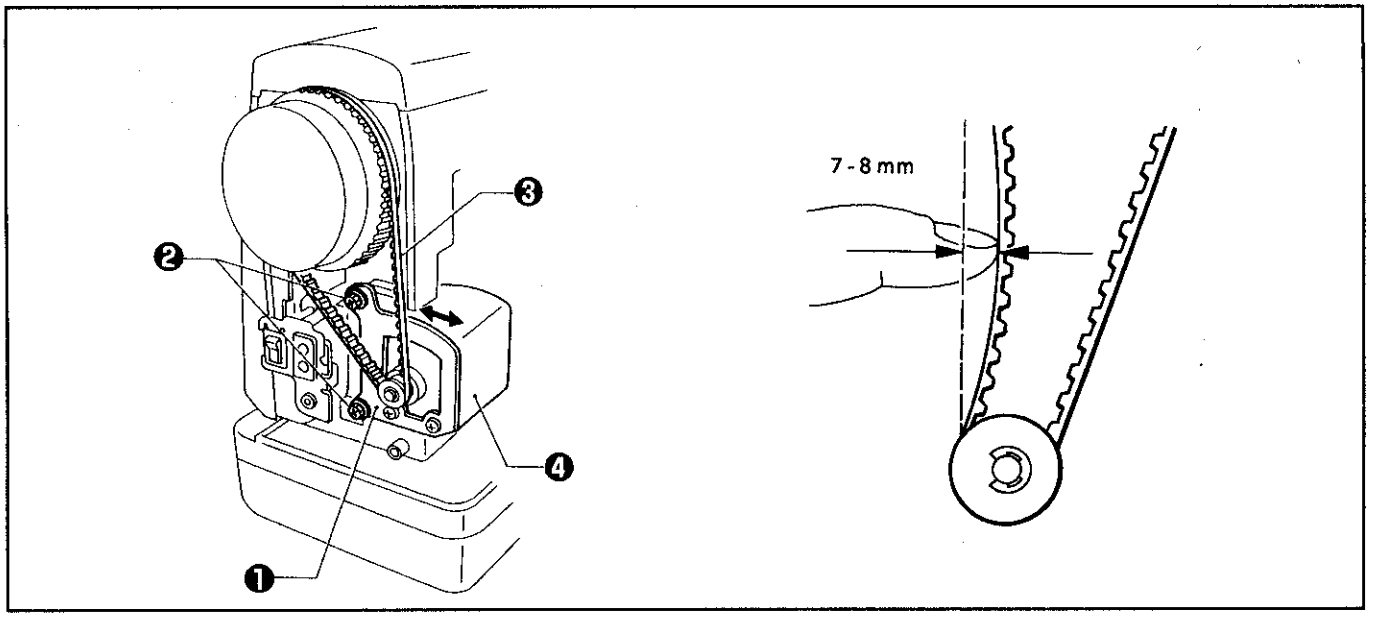

1. Loosen the bolt ❷ in the inner rotary hook stopper plate ❶.
2. Adjust the position of the inner rotary hook stopper plate ❶ in the back and forth direction as shown in the figure above.
3. Attach the inner rotary hook stopper plate ❶ so that it is centered in the needle. The needle should not make contact with the rotary hook.
4. Tighten the bolt ❷ in the inner rotary hook stopper plate ❶.

## 6 Rotary shutter position



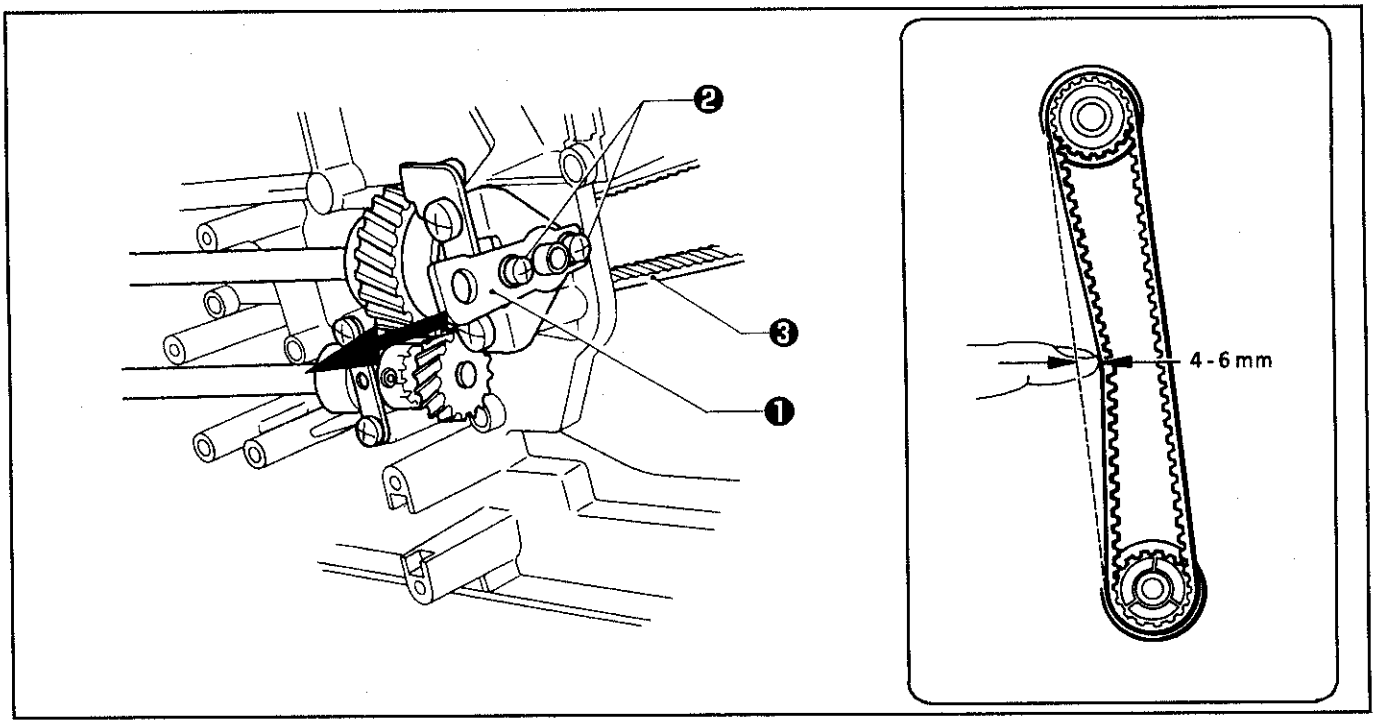

1. Turn on the power.
2. Input sewing data (of letters), and move the needle ❶ to the sewing start point.
3. Turn the pulley slowly toward you until the needle point almost reaches the needle plate top, then press the jog key.
4. A message asking that the pulley be turned will appear on the display along with a few beeps being issued. Turn the pulley in the opposite direction to raise the needle until the machine stops beeping and the message disappears. At this time, the needle should be 7 - 8 mm above the needle plate.
5. If the distance is not 7 - 8 mm, turn off the power, and make positioning adjustment.
6. Remove the three screws, and the top cover.
7. Turn the pulley, and set screw ❸ of the rotary shutter ❷ and try to adjustment move to shaft.
8. After checking the above items, tighten the set screw ❸ in the rotary shutter ❷.

## 7 Motor belt tension




1. Loosen the two screws ❷ of the motor holder ❶.
2. Move the motor ❹ in the direction of the arrow to adjust the timing belt tension so that the slack will be 4 - 7 mm when an approximately 500 g load is applied to the center of the timing belt ❸.
3. Securely tighten the two screws ❷ of the motor holder ❶.

## 8 Timing belt tension

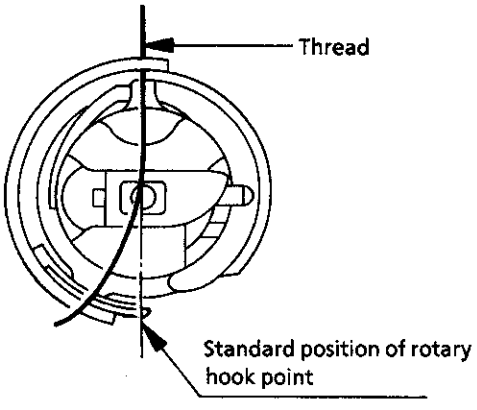


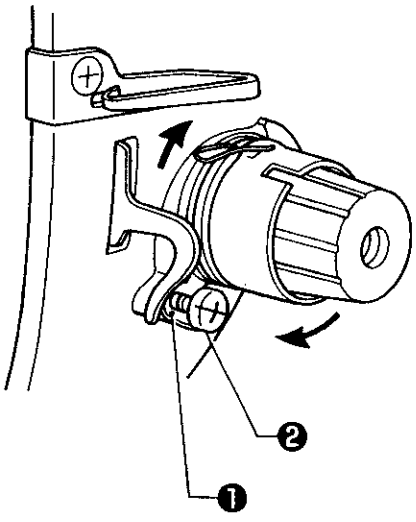

**NOTE**
Tilt the machine head until it stops, and remove the body base, the sewing machine fix bracket, and the bottom cover.

1. Loosen the screw ❷ of the tension adjust plate ❶.
2. Move the tension adjust plate ❶ backward or forward to adjust the tension of the timing belt ❸ so that the slack will be 4 - 6 mm when an approximately 500 g load is applied to the center of the timing belt ❸.
3. Tighten the screw ❷ of the tension adjust plate ❶.

## 9 Thread tension

■ Thread take-up spring working position



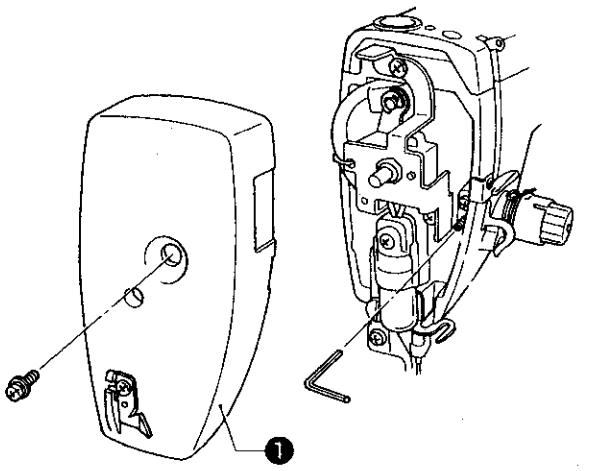




When the thread take-up spring working length is correct, it will start operating when the rotary hook point is positioned just past where it catches the thread.

[Adjusting the working length of the thread take-up spring]
Loosen the screw ❷ in the adjust plate ❶, and move the adjust plate ❶ to the left or right to adjust the spring working length.

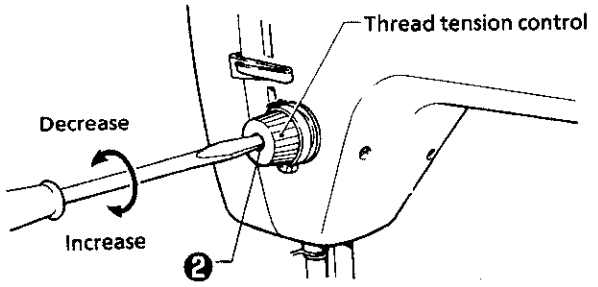
**NOTE**
If the length is too long, it may cause thread breakage.
If the length is too short, the thread may be apt to be caught in the rotary hook, and thread tension may worsen (the needle thread may not be taut).

■ Thread take-up spring tension

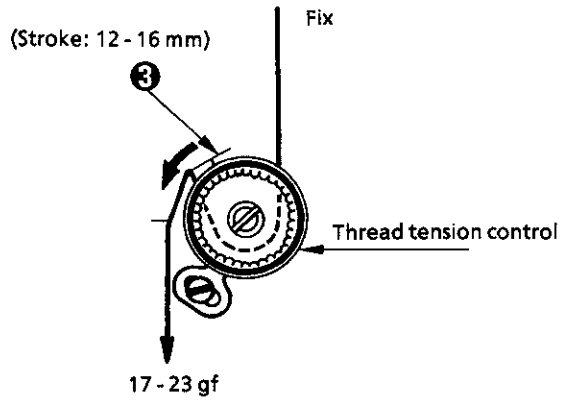



If the spring tension is too high, thread breakage may occur; if too low, thread may be apt to be caught into the rotary hook.

1. Remove the screw, and the face plate ❶.
2. Loosen the set screw ❷. (There is no need to remove it.)



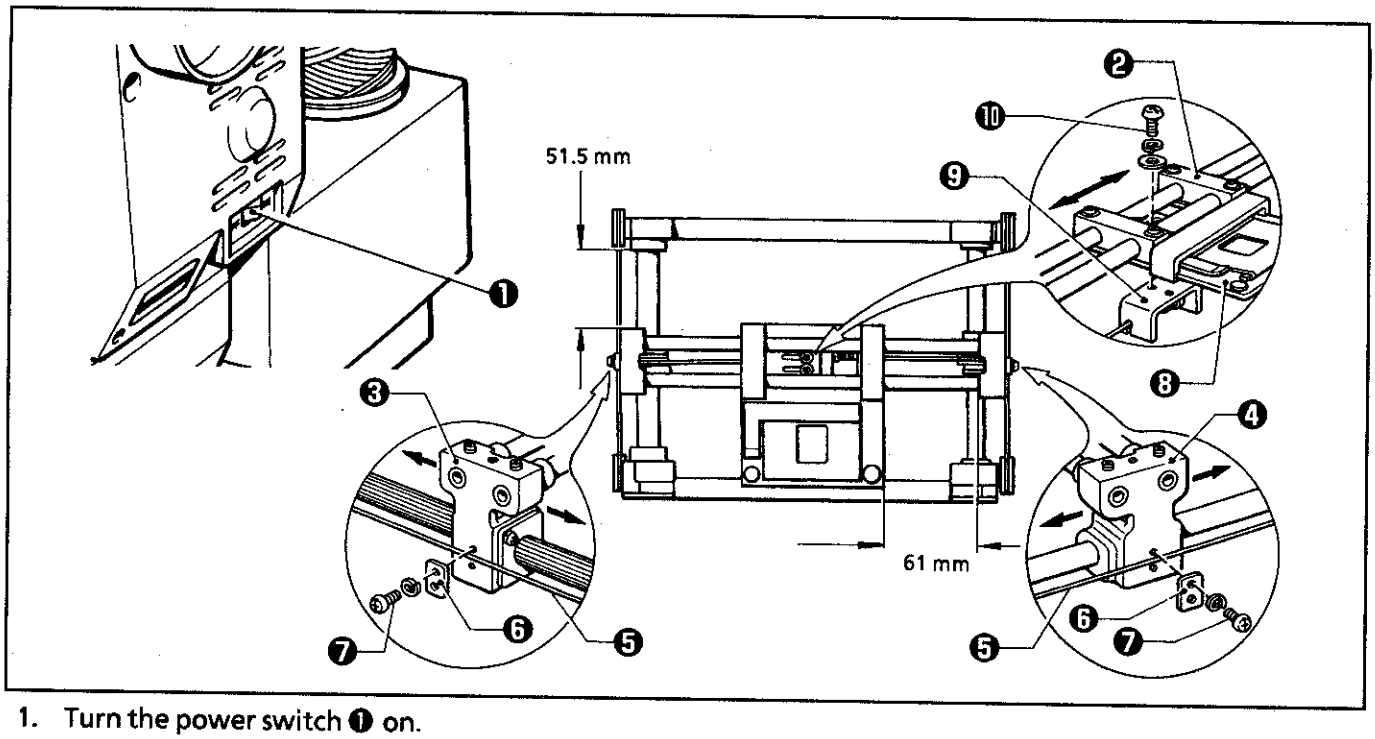

2. Insert a screwdriver into the slot of the tension stud ❷ to adjust the spring tension.
   - Turn the screwdriver clockwise to increase the tension of the spring ❸.
   - Turn the screwdriver counterclockwise to decrease the tension of the spring ❸.




* Standard tension
- Spring stroke is 12 - 16 mm.
- Spring tension is 17 - 23 gf when its stroke is correct.

3. After adjusting the tension, securely tighten the set screw ❶.

## 10 Feed guide mechanism




1. Turn the power switch ❶ on.
2. Set the positions for the sliders ❷ and bush holders L ❸ and R ❹ to measure as shown in the figure above.
3. Attach the left and right Y mini wires ❺ to bush holders L ❸ and R ❹ using the wire pressers ❻ and the four screws ❼.
4. Attach the slide plate ❽ to the wire hook ❾ using the two screws ❿.

# 7. Lubrication

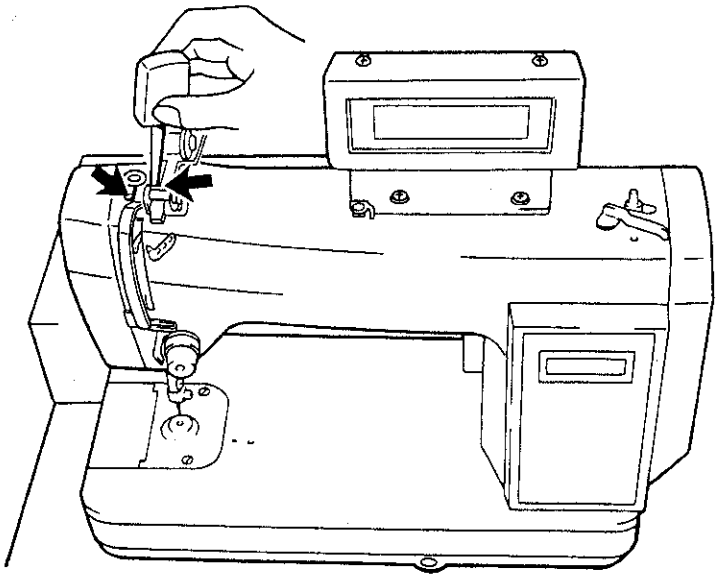
## 1 Machine head

**NOTES**

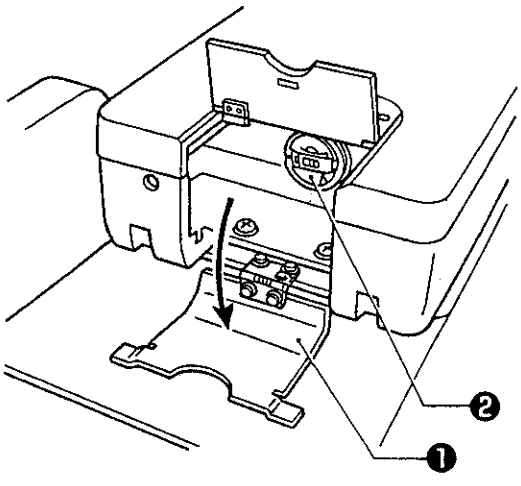
- Be sure to use the Brother-specified sewing machine oil for lubrication.
- Too much lubrication may cause the oil to drip on the material.

**NOTES**

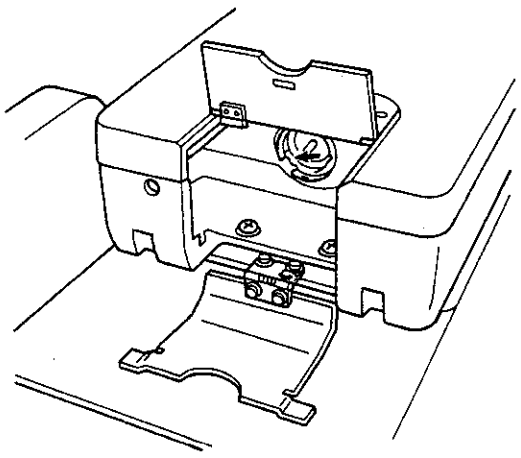
- When the machine is used for several hours every day, add 2 - 3 drops of oil at each position indicated by an arrow in the figure once a day.
- Be sure to lubricate before using the machine, and let the machine idle.



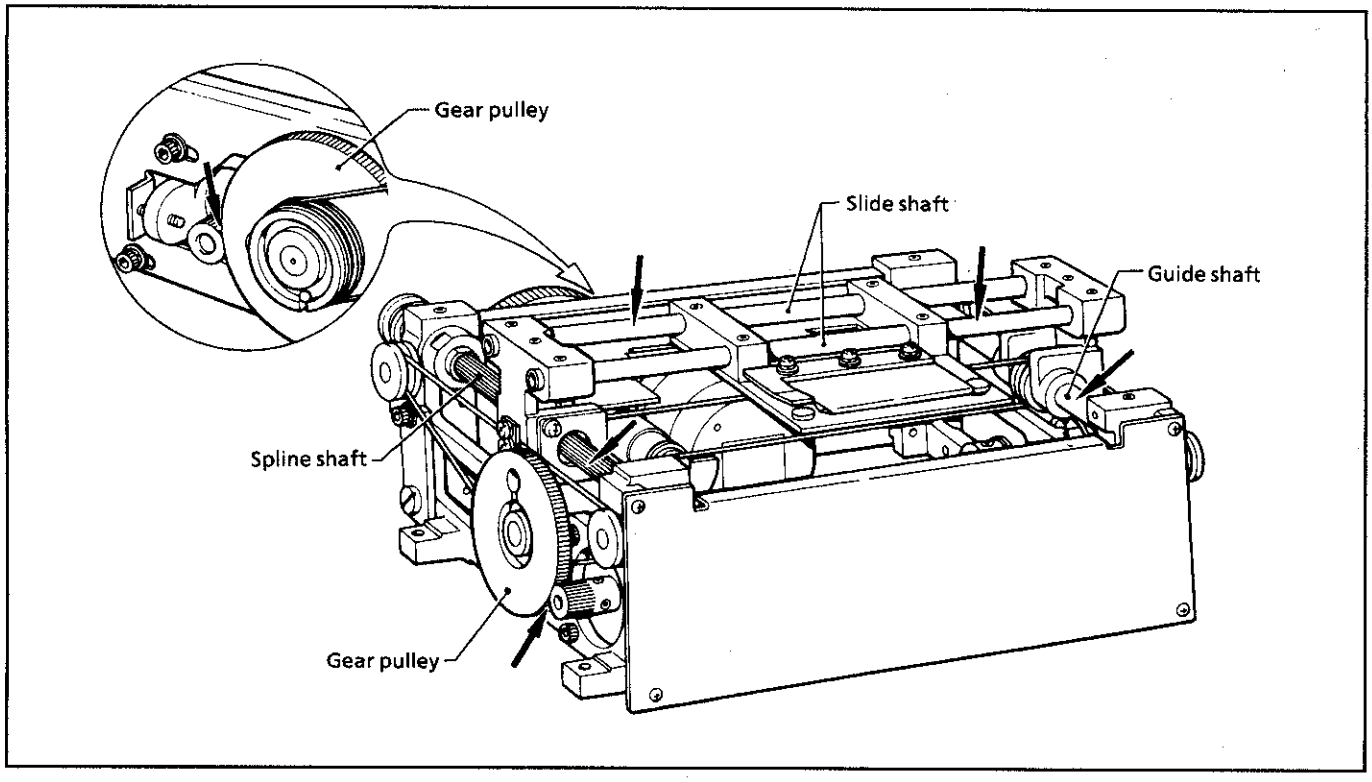
1. Open the needle plate side cover ❶.
2. Remove the bobbin case ❷.




3. Add a drop of oil on the rail of the rotary hook.
   **NOTE**
   Do not lubricate anywhere other than the rotary hook.



## 2 Feed guide mechanism




**NOTE**
Apply grease at the positions indicated by the arrows.

# 8. Electrical Systems

## 1 Connector descriptions

■ Main circuit board

| Connector No. | Connection | Main signal | What occurs with poor contact |
|---|---|---|---|
| P21 | Main circuit board – sensor cover | Low bobbin thread remainder detection sensor input signal | Low bobbin thread remainder indicator does not light. |
| P23 | Main circuit board – thread breakage detector sensor | Thread breakage sensor input signal | Thread breakage stop occurs even though upper thread is not broken. |
| P24 | Main circuit board – NP circuit board | Needle up/down signals<br>Sync signal<br>Needle up stop signal<br>Speed signal<br>+ 5V | Macnine pulley does not turn. (overload) |
| P25 | Main circuit board – LCD contrast control | Contrast input signal | Display does not come on. |
| P26 | Main circuit board – LCD module | LCD output signal | Display does not come on. |
| P27 | Main circuit board – 7-segment circuit board | 7-segment circuit board output signal | 7-segment display does not come on. |
| P28 | Main circuit board – 7-segment circuit board | LAMP display output signal | Low bobbin thread remainder indicator does not light.<br>Centering indicator does not light. |
| P29 | Main circuit board – relay circuit board (key panel) | Switch panel input signal | Does not accept key/switch input. |
| P30 | Main circuit board – FDD | FDD control signal | Disks cannot be read. (Disk error reported.) |
| P31 | Main circuit board – PMD circuit board | X-Y pulse motor control signal | · Home position cannot be detected.<br>· Monogrammed letters shift position.<br>· Carriage does not move. |
| P32 | Main circuit board – Y index circuit board | Y axis home position detection input signal | Y-axis home position cannot be detected. |
| P33 | Main circuit board – X index circuit board | X axis home position detection input signal | X-axis home position cannot be detected. |
| P34 | Main circuit board – power circuit board | Machine motor control signal | Machine pulley does not turn. (overload) |
| P35 | Main circuit board – speed sensor circuit board | + 35V | Macnine pulley does not turn. (overload) |
| P36 | Main circuit board – thread release solenoid | + 35V | Thread release solenoid does not operate. |
| P37 | Main circuit board – power circuit board | + 5V (all main circuit board)<br>+ 35V (thread release solenoid) | Control functions do not operate properly.<br>Thread release solenoid does not operate. |
| P38 | Main circuit board – bar-code reader | Bar-code reader control signal | Bar code cannot be read. |

■ Power circuit board

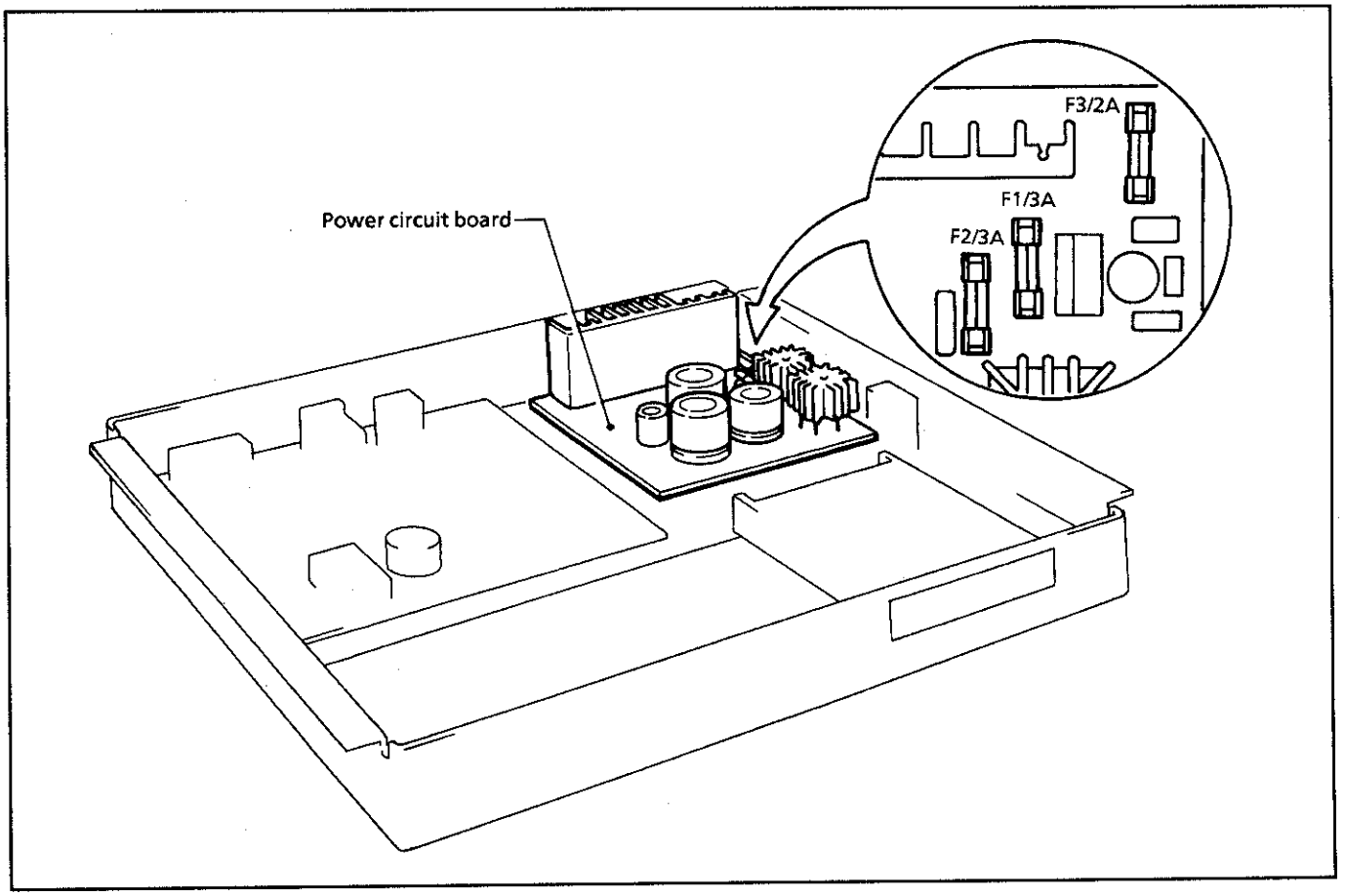
| Connector No. | Connection | Main signal | What occurs with poor contact |
|---|---|---|---|
| P10 | Power circuit board – transformer | 26V | Control functions do not operate properly. (No operation whatsoever.) |
| P11 | Power circuit board – circuit board | + 35V (brake solenoid) + 5V (all main circuit board) | Control functions do not operate properly. (No operation whatsoever.) |
| P12 | Power circuit board – FDD | + 5V | Disks cannot be read. (Disk error reported.) |
| P13 | Power circuit board – PMD circuit board | + 35V | · Home position cannot be detected. · Monogrammed letters shift position. |
| P14 | Power circuit board – transformer | 100V AC | Machine pulley does not turn. (overload) |
| P15 | Power circuit board – machine motor | 100V AC | Machine pulley does not turn. (overload) |
| P16 | Power circuit board – main circuit board | Macnine motor control signal | Machine pulley does not turn. (overload) |

■ PMD circuit board

| Connector No. | Connection | Main signal | What occurs with poor contact |
|---|---|---|---|
| P1 | PMD circuit board – main circuit board | Control signal | · Home position cannot be detected. · Monogrammed letters shift position. |
| P2 | PMD circuit board – power circuit board | + 35V | Home position cannot be detected |
| P3 | PMD circuit board – Y pulse motor | + 35V | · Y-axis home position cannot be detected. · Monogrammed letters shift position. |
| P4 | PMD circuit board – X-pulse motor | + 35V | · X-axis home position cannot be detected. · Monogrammed letters shift position. |

## 2 Fuse descriptions

■ Fuse locations



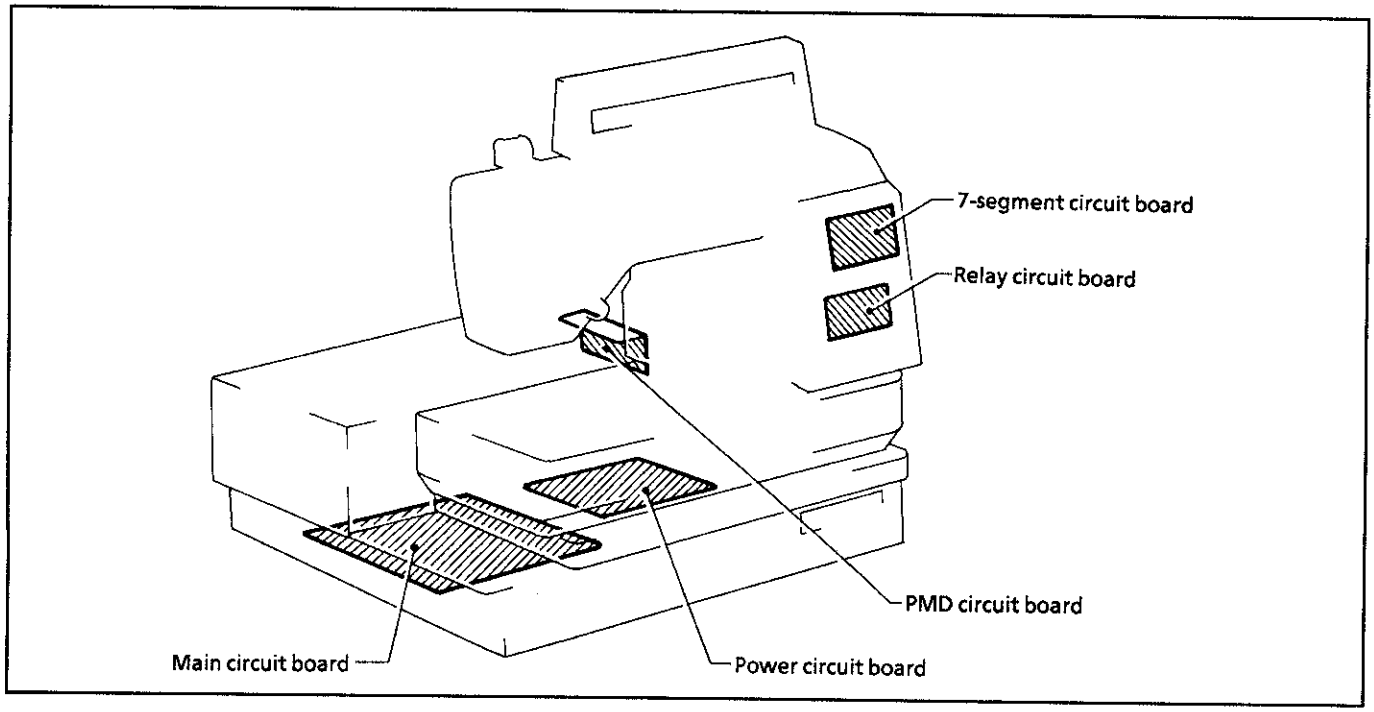

1. Replace fuses on the power circuit board with new ones. (See page 17.)
2. The fuse holder containing fuses F1, F2, and F3, is located near connector P10 at the right of the power circuit board.
3. Fuse type and capacity
   - Fuse F1: Slow blow fuse, 3A-250V (for pulse motor)
   - Fuse F2: Slow blow fuse, 3A-250V (for circuit board logic and solenoid)
   - Fuse F3: 3.15-250V (for machine motor)
4. Fuse replacement
   - When fuse F1 blows, the pulse motor will not turn (home position cannot be detected), and monogramming will not be performed correctly (position of letters will shift).
   - When fuse F2 blows, no machine response or operation is possible, the motor and pulley will not turn, and the machine motor will overload.
   - When fuse F3 blows, the machine motor will not turn, resulting in overload.
   - Replace the appropriate fuse should the above happen.

**NOTE**
Be sure to replace the fuses with ones of equivalent and capacity.

| Fuse | Part name | Part code |
|---|---|---|
| F1, F2 | G fuse SD6-3A-N1 | S0994-600 |
| F3 | G fuse MQ2-3.15N | S32050-000 |

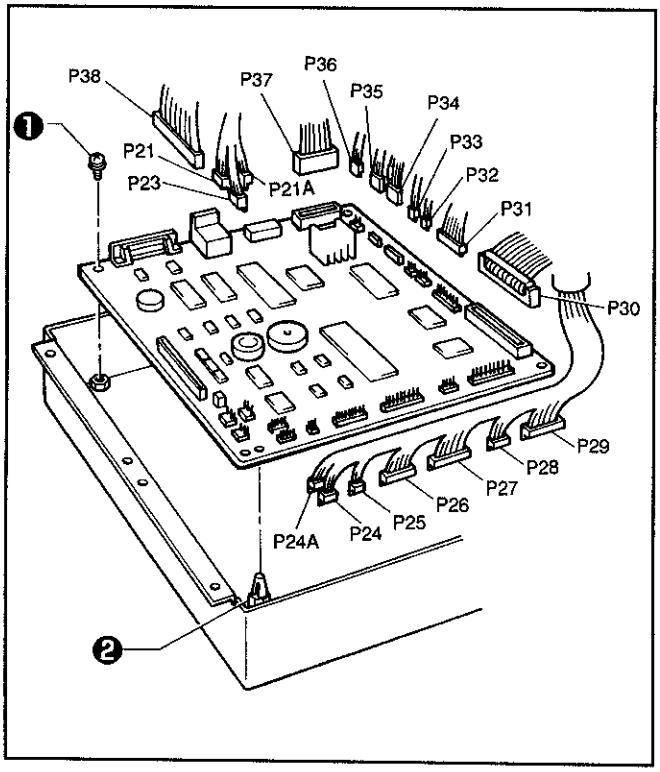
## 3 Circuit board descriptions

■ Circuit board locations




■ Circuit board function and replacement (Be sure to turn off the power, and then open the cover.)

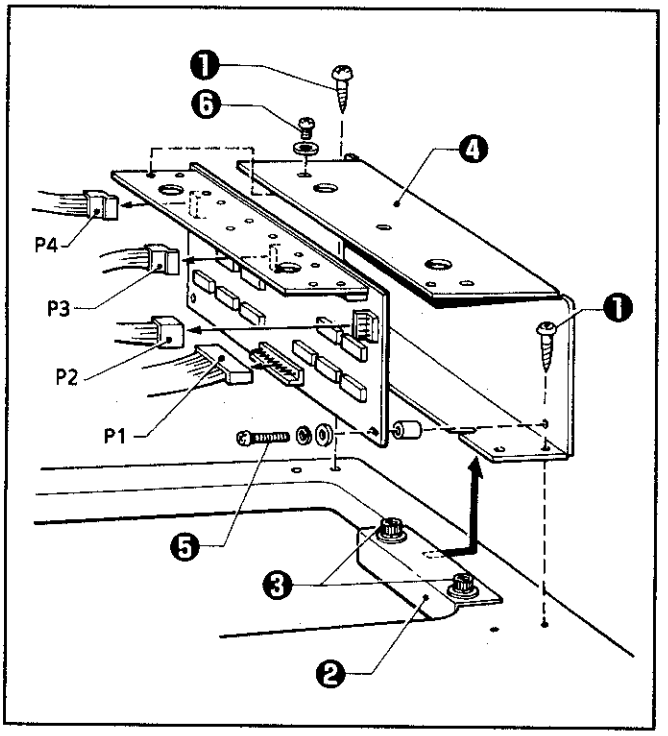
<Main circuit board>




= Function =
- Machine motor control
- Pulse motor circuit board control
- Floppy disk control
- LCD module control
- Key/switch panel input signal selector
- Solenoid drive
- Sensor input selector

= Replacement =
1. Remove connectors (19 connectors).
2. Remove the screw ❶, squeeze the tapping supports ❷ claws together to remove the circuit board.
3. To install, align the positioning holes in the circuit board with tapping supports ❷, and then press the circuit board onto the supports at the same time at last screw ❶.
4. Hold and press lightly at the back of the circuit board to connect. Do not apply excessive force.

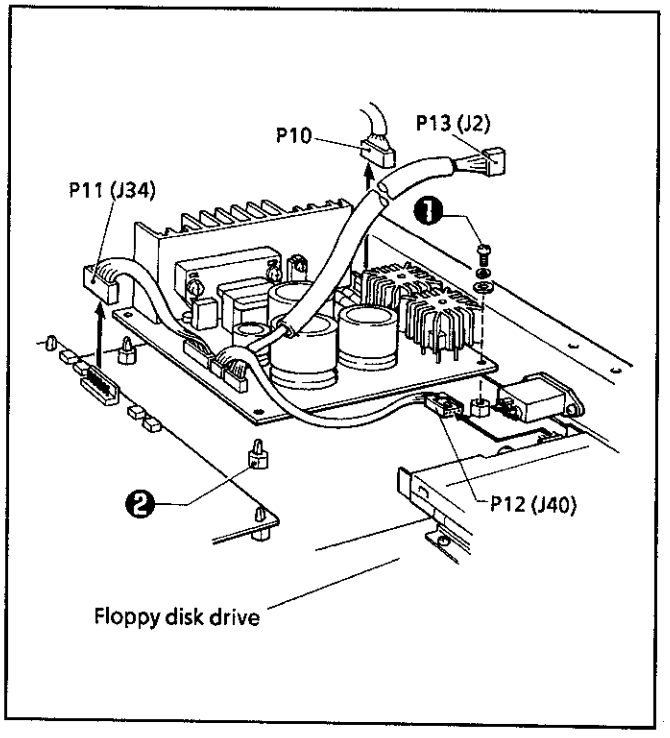
<PMD circuit board>




= Function =
· Pulse motor drive

= Replacement =
1. Remove the four screws ❶.
2. Loosen the two screws ❸ in the ground plate ❷, and pull the side cover ❹ off.
3. Remove connectors P1 - P4 ( four connectors).
4. Remove the four screws ❺ and the three screws ❻, and replace the circuit board.

<Power circuit board>



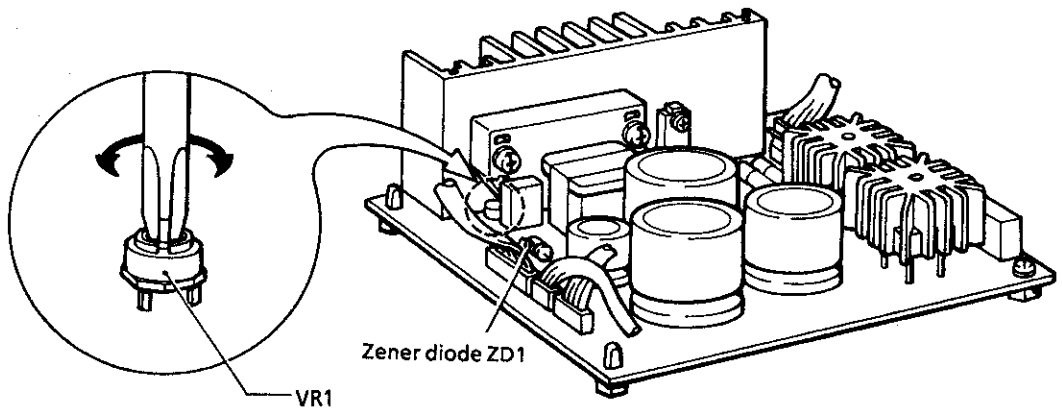

= Function =
· + 5V output for circuit board logic
· + 5V output for floppy disk drive
· AC100V output for machine motor
· + 35V output for solenoid
· + 35V output for pulse motor

= Replacement =
1. Remove connector P10.
2. Remove connector P11 from the main circuit board.
3. Remove connector P12 from the floppy disk drive.
4. Remove the X-Y feed unit assembly cover, and connector P13 from the PMD circuit board.
5. Remove the screw ❶.
6. Squeeze the tapping supports ❷ claws together to remove the circuit board.
7. To install, align the positioning holes in the circuit board with tapping supports ❷, and then press the circuit board onto the supports at the same time.
8. Tighten the screw ❶.
   Hold and press lightly at the back of the circuit board to connect. Do not apply excessive force.

## 4 Voltage control level adjustment

■ Power supply voltage control level adjustment

○ Use VR1 in the center of the power circuit board for adjustment.




1. Turn the power switch off, and remove the base cover so that adjustment control VR1 on the main circuit board can be turned with a screwdriver.
2. Turn the power switch on.
3. Measure the voltage at both poles of Zener diode ZD1 with a tester. Turn VR1 so that the measured voltage is 5.15 V ± 0.05 V.
4. Turn the power switch off again, and reinstall the base cover using the screws.

## 5 Test mode function description

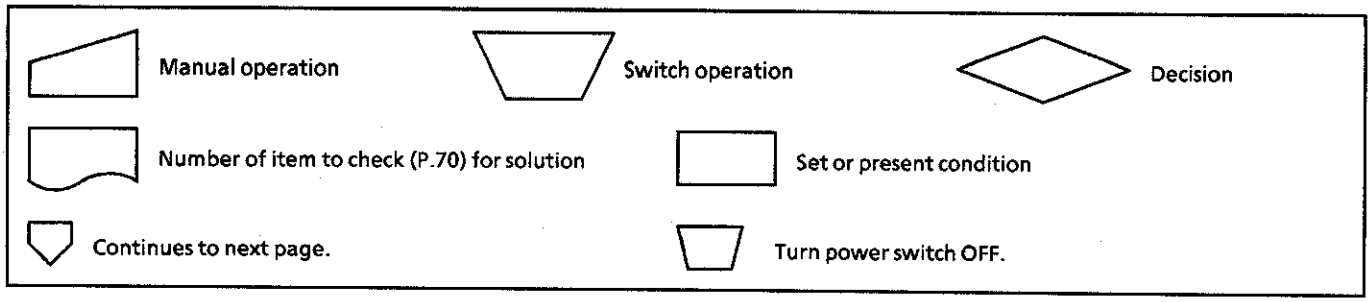
The test program is started by pressing and holding (START) and (ENTER), and then turning the power switch on.

* Press (END) to terminate the test mode. The machine will enter the default mode at this time (the same mode assumed when the power is first turned on).

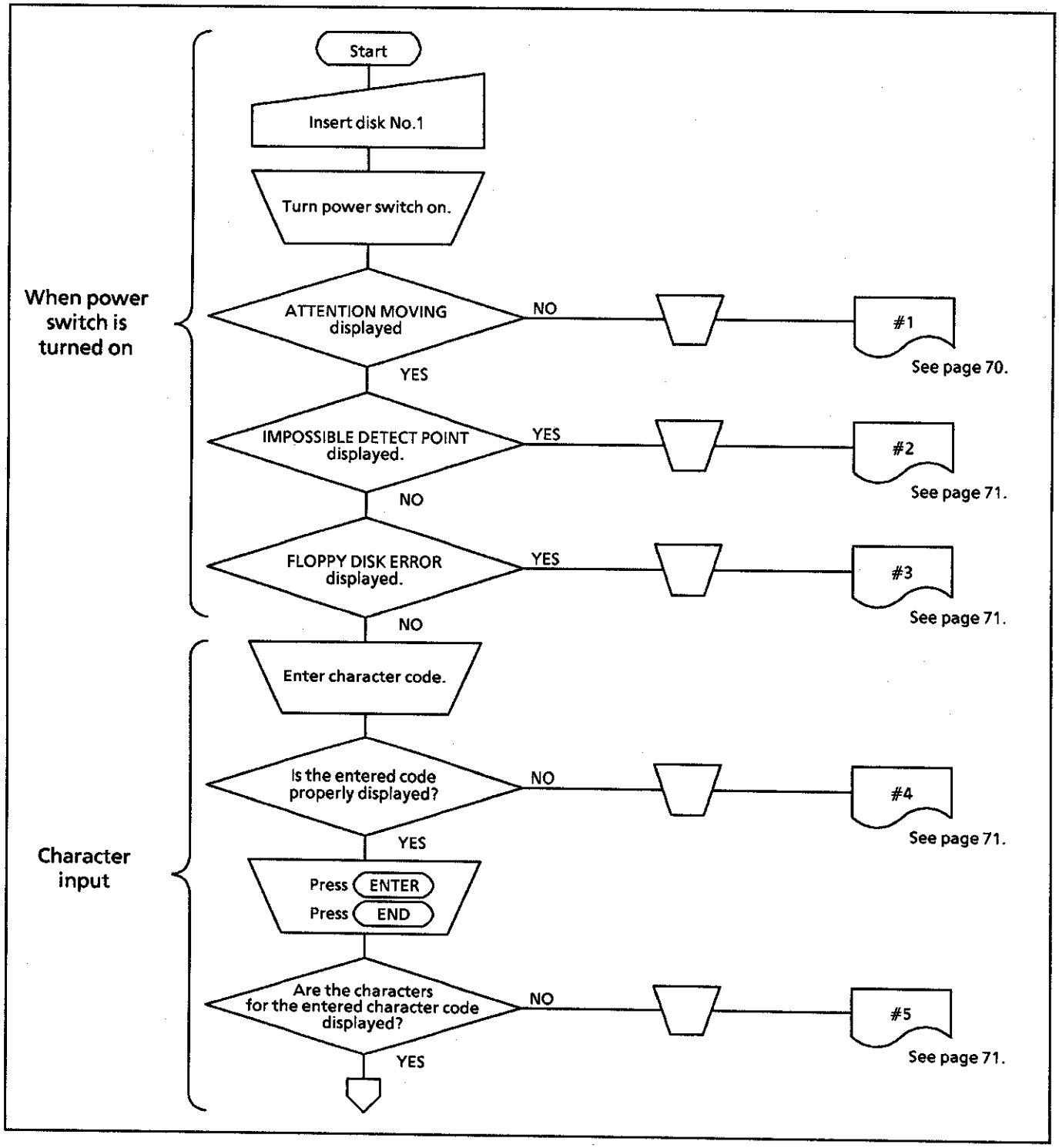
| Test number (key) | Display status | Function |
|---|---|---|
| (1) key | Test: sewing speed at 1000 rpm | The machine motor will turn at 1000 rpm $^{+10\ rpm}_{-50\ rpm}$<br>OVERLOAD will be displayed if the motor cannot turn. |
| (2) key | Test: sewing speed at 900 rpm | The machine motor will turn at 900 rpm $^{+10\ rpm}_{-50\ rpm}$<br>OVERLOAD will be displayed if the motor cannot turn. |
| (3) key | Test: sewing speed at 800 rpm | The machine motor will turn at 800 rpm $^{+10\ rpm}_{-30\ rpm}$<br>OVERLOAD will be displayed if the motor cannot turn. |
| (4) key | Test: sewing speed at 650 rpm | The machine motor will turn at 650 rpm $^{+10\ rpm}_{-30\ rpm}$<br>OVERLOAD will be displayed if the motor cannot turn. |
| (5) key | Test: sewing speed at 500 rpm | The machine motor will turn at 500 rpm $^{+10\ rpm}_{-30\ rpm}$<br>OVERLOAD will be displayed if the motor cannot turn. |
| (6) key | Test: sewing speed at 400 rpm | The machine motor will turn at 400 rpm $^{+10\ rpm}_{-30\ rpm}$<br>OVERLOAD will be displayed if the motor cannot turn. |
| (7) key | Test: sewing speed at 300 rpm | The machine motor will turn at 300 rpm $^{+10\ rpm}_{-30\ rpm}$<br>OVERLOAD will be displayed if the motor cannot turn. |
| (8) key | Test: sewing speed at 150 rpm | The machine motor will turn at 150 rpm $^{+10\ rpm}_{-10\ rpm}$<br>OVERLOAD will be displayed if the motor cannot turn. |
| (F) key | Test: sewing speed at 110 rpm | |
| (9) key | Test: 7 seg & lighting | The 7-segment display (4 digits) will appear as , and all indicators will light. |
| (A) key | Test: thread wind sensor | When the bobbin presser is pressed in, the lamp will turn off. |
| (B) key | P-ROM Ver. | The version of the P-ROM installed will be displayed for about 2 sec. |
| (D) key | RP:0 NP:1 TP:1 | When the pully is rotated, the signal indication will change between 1 and 0. |
| (E) key | BRK:1 | When the needle thread breakage sensor is rotated, the signal indication will change between 1 and 0. |
| (CLR) key | Start at test mode | Stops the motor during test operation.<br>Lighted indicators and the 7-segment display will go out. |
| (*) key | Nothing appears. (Screen pattern test only for new LCD) | When the 1 key is pressed, the display will shows full screen pattern, grid pattern, and 4-bit grid pattern in this order.<br>When the 2 key is pressed, dots indicated on the LCD will be inverted. |

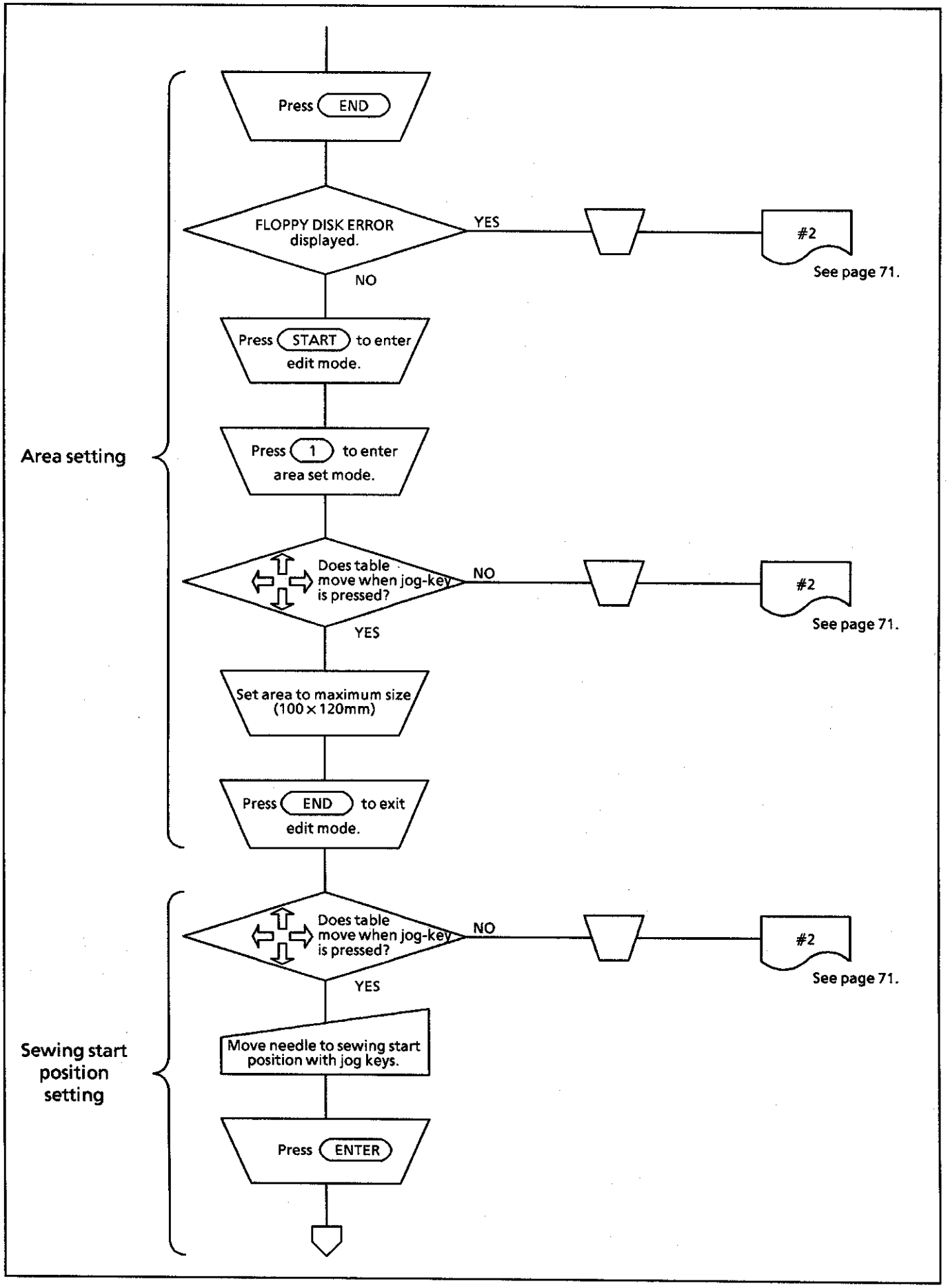
# 6 Troubleshooting flow chart

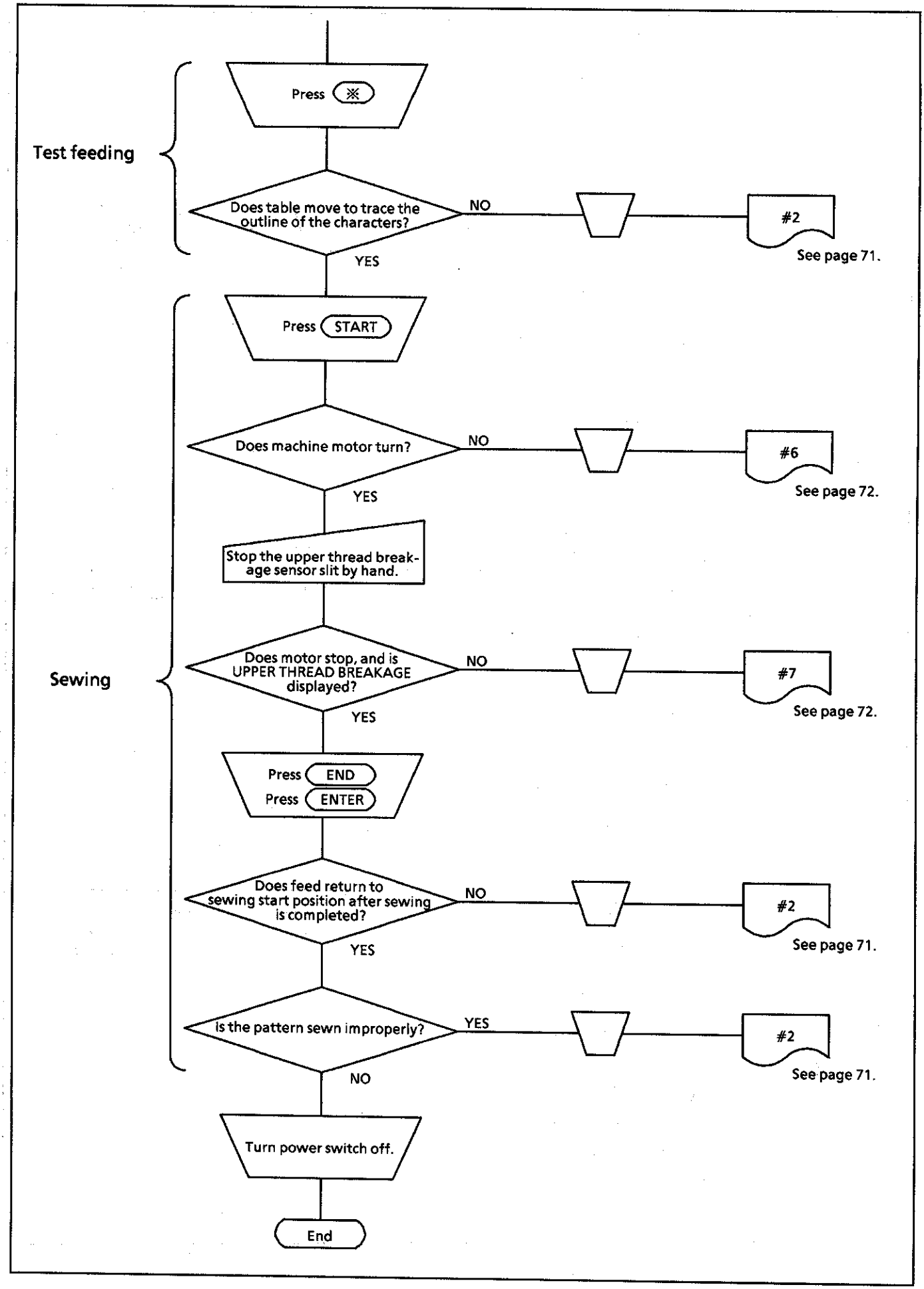
Legend



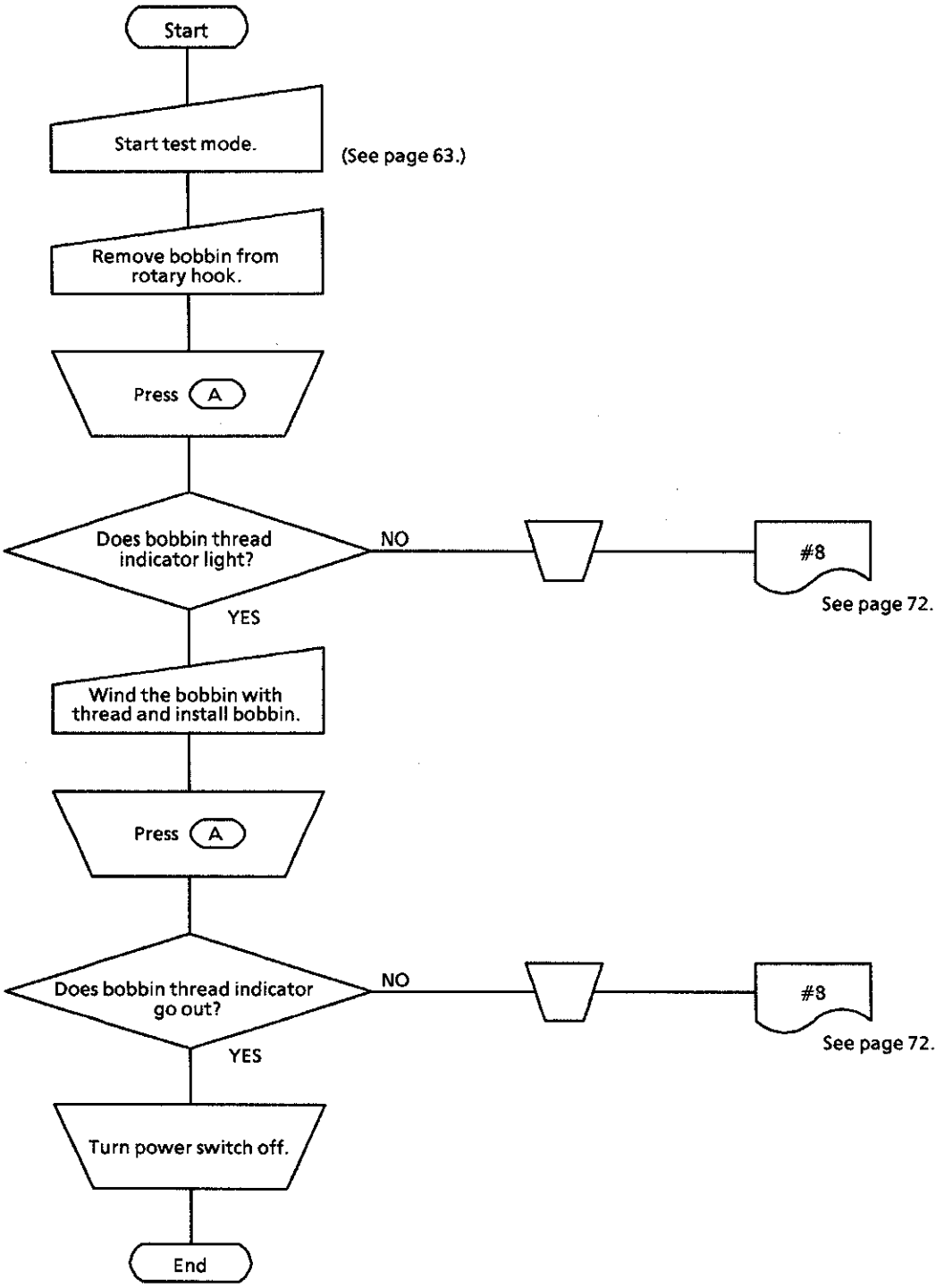

■ Machine control



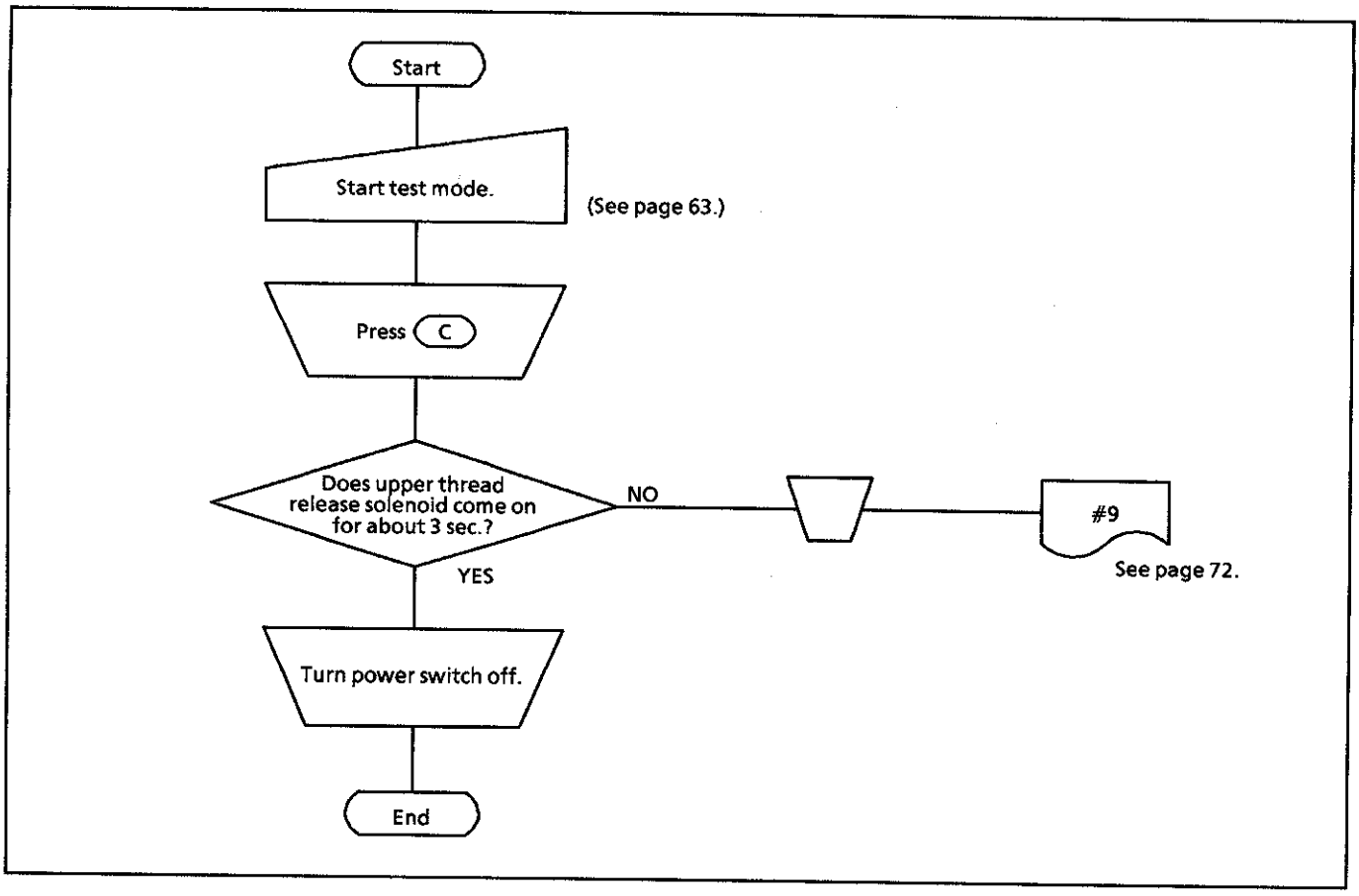

Area setting
Press END
FLOPPY DISK ERROR displayed.
YES
#2
See page 71.
NO
Press START to enter edit mode.
Press 1 to enter area set mode.
Does table move when jog-key is pressed?
NO
#2
See page 71.
YES
Set area to maximum size (100×120mm)
Press END to exit edit mode.
Sewing start position setting
Does table move when jog-key is pressed?
NO
#2
See page 71.
YES
Move needle to sewing start position with jog keys.
Press ENTER


Test feeding
Press ※
Does table move to trace the outline of the characters?
NO
#2
See page 71.
YES
Sewing
Press START
Does machine motor turn?
NO
#6
See page 72.
YES
Stop the upper thread breakage sensor slit by hand.
Does motor stop, and is UPPER THREAD BREAKAGE displayed?
NO
#7
See page 72.
YES
Press END
Press ENTER
Does feed return to sewing start position after sewing is completed?
NO
#2
See page 71.
YES
Is the pattern sewn improperly?
YES
#2
See page 71.
NO
Turn power switch off.
End

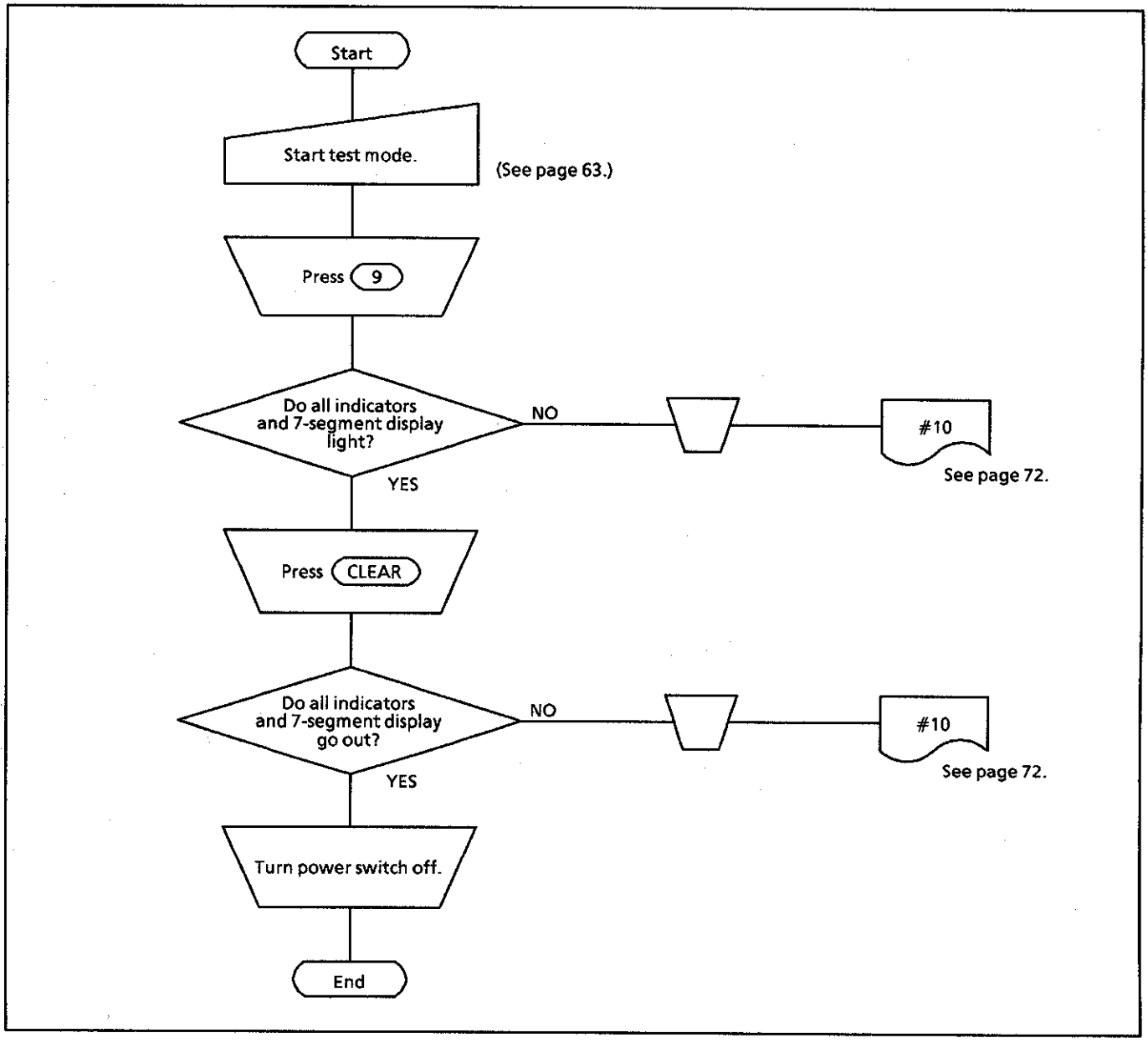
## ■ Bobbin thread remainder sensor



■ Upper thread release solenoid



■ Indicators, 7-segment display (4-digit number)



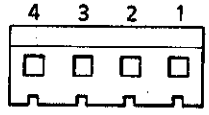
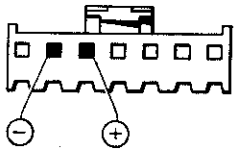
# 7 Troubleshooting

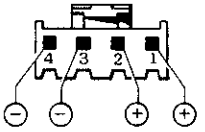
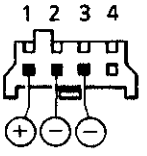
≪Cautions on problem diagnostics≫

1. Be sure to turn the power switch off before unplugging or plugging in the cord.
2. Turn the power switch off before opening the box cover.
3. Turn the power off and measure the resistance for items marked with a letter in a circle.
   Turn the power on and measure the voltage for items marked with a letter in a box.
4. When replacing the fuses, be sure to use ones of equivalent type and capacity.

≪Before adjustments≫

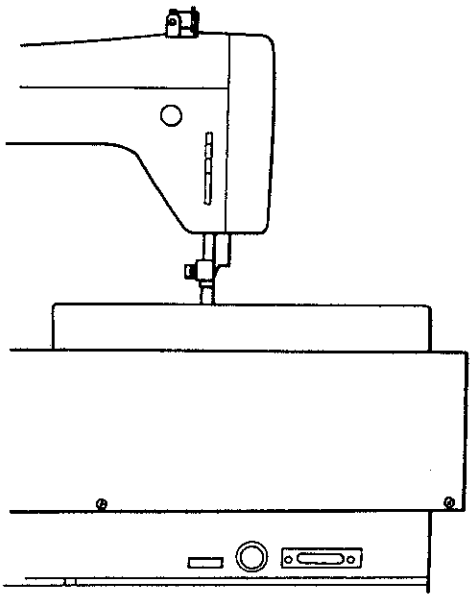
1. Check the fuses.
2. Make sure all plugs are properly connected.
3. Refer to the flow charts to identify the problem (indicated reference #number), and refer to that number in the following tables.

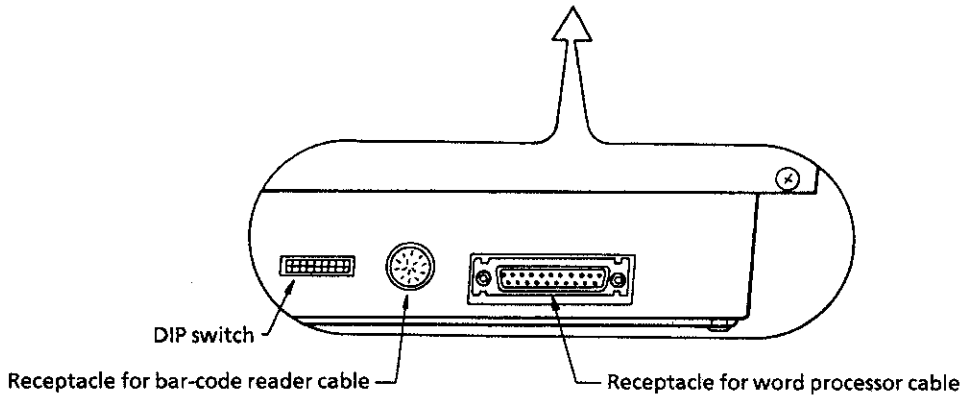
| Problem | Cause | What to check, repair, adjust | Parts to replace if defective | Reference page |
|---|---|---|---|---|
| #1<br><br>ATTENTION MOVING is not displayed. | 1. No power supply. | [A]. Check the single phase power supply voltage with a tester. | | |
| | 2. Defective power supply switch | (A). Turn power switch on, and measure for conductivity with tester probes at both poles of switch | Plug case WOJ assembly | 73 |
| | 3. Blown fuse | (A). Remove fuse F2, and check for conductivity.<br>OK if conductivity present. | Fuse F2 (3A) | 59 |
| | 4. Defective display | [A]. Replace LCD module circuit board. | LCD module circuit board assembly | 24 |
| | 5. Defective transformer<br>  | [A]. Disconnect plug P10 in the power circuit board, and measure the voltage.<br>OK if 26 - 28 VAC present at No.1 & 2.<br>OK if 26 - 28 VAC present at No. 3 & 4. | Transformer assembly | 73 |
| | 6. Defective power circuit board<br>  | [A]. Disconnect plug P37 in main circuit board, and measure the voltage.<br>OK if 5 VDC<br>No. 5 ····· ⊕<br>No. 6 ····· ⊖ | Power circuit board assembly | 73 |
| | 7. Defective main circuit board | Replace the main circuit board with a new one. | Main circuit board | 61 |

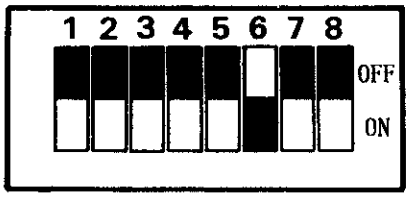
| Problem | Cause | What to check, repair, adjust | Parts to replace if defective | Reference page |
|---|---|---|---|---|
| #2<br><br>Carriage does not move. | 1. Defective pulse motor power supply (carriage does not move.)<br>  <br> | [A]. Disconnect plug P2 on PMD circuit board, and measure voltage with tester across P2 terminals. OK if +35 to +40 VDH | Power circuit board | 73 |
| | 2. Defective cable (carriage does not move.) | (A). Disconnect plugs P31 and P1 at both ends of the PMD harness, and check for conductivity. OK if conductivity present across corresponding terminals. | PMD harness | 73 |
| | 3. Defective PMD circuit board (carriage does not move.) | A. Replace PMD circuit board with a new one. | PMD circuit board | 61 |
| | 4. Blown fuse (carriage does not move.) | (A). Remove fuse F1 and check for conductivity. OK if conductivity present. | Fuse F1 (3A) | 59 |
| | 5. Defective positioning sensor (Carriage moves but cannot perform home position detection.) | A. Replace index circuit board. | X index circuit board<br>Y index circuit board | 26<br>38 |
| #3<br><br>Disk cannot be read. | 1. Defective floppy disk | A. Replace disk. | Floppy disk | 31, 32 |
| | 2. Defective FDD power supply<br>  <br> | [A]. Disconnect plug P4 (four pin) in the FDD, and measure the voltage at the plug terminals.<br>OK if 5 VDC<br>No. 1 ····· Open<br>No. 2 & No. 3 ··· ⊖<br>No. 4 ····· ⊕ | Power circuit board | 73 |
| | 3. Defective FDD cable | (A). Disconnect the plugs at both ends of the FDD cable, and check for conductivity. OK if conductivity present at corresponding terminals. | FDD cable | 73 |
| | 4. Defective main circuit board | (A). Replace floppy disk drive with a new one. | Main circuit board | 60 |
| | 5. Defective floppy disk drive | A. Replace floppy disk drive with a new one. | Floppy disk drive | 13 |
| #4<br>Entered code number is not properly displayed. | 1. Defective 7SEG circuit board | A. OK if all 7-segment characters are displayed in test mode 9. | 7SEG circuit board | 73 |
| | 2. Defective main circuit board | A. Replace main circuit board with a new one. | Main circuit board | 60 |
| #5<br>Characters corresponding to entered code is not displayed. | 1. Defective display | A. Replace LCD module circuit board. | LCD module circuit board assembly | 24 |
| | 2. Defective main circuit board | A. Replace main circuit board with a new one. | Main circuit board | 60 |

| Problem | Cause | What to check, repair, adjust | Parts to replace if defective | Reference page |
|---|---|---|---|---|
| #6<br>Machine motor does not turn. | 1. Machine not properly adjusted | A. Is pulley rotation stiff? | | |
| | 2. Defective main circuit board | A. Replace main circuit board with a new one. | Main circuit board | 60 |
| | 3. Defective machine motor | A. Replace machine motor with a new one. | Machine motor | 51 |
| #7<br>Thread breakage detector does not function (or remains always on). | 1. Defective thread breakage detector | A. Does sensor slit turn?<br>B. Poor contact at plug P23 in thread breakage detector.<br>C. Shorted sensor. | Thread breakage detector | 25<br>73 |
| #8<br>Bobbin monitor indicator does not light (or remains always on). | 1. Defective bobbin thread sensor | A. Replace bobbin thread sensor. | Sensor cover assembly<br>Bed cover assembly | |
| | 2. Improperly adjusted bobbin thread sensor | A. Adjust bobbin monitor indicator. | | 62 |
| | 3. Defective main circuit board | A. Replace main circuit board with a new one. | Main circuit board | 60 |
| #9<br>Thread release solenoid does not operate. | 1. Defective solenoid | (A). Disconnect solenoid plug P36, and measure resistance at plug terminals.<br>OK if 60Ω at No.1 and 2. | Solenoid | 73 |
| | 2. Defective main circuit board | A. Replace main circuit board with a new one. | Main circuit board | 60 |
| | 3. Improperly adjusted solenoid | A. Adjust solenoid. | | 54 |
| #10<br>Indication panel does not light (or remains always on). | 1. Defective LCD module circuit board | Replace LCD module circuit board with a new one. | LCD module circuit board | 24<br>40 |
| | 2. Defective main circuit board | A. Replace main circuit board with a new one. | Main circuit board | 60 |
| Operation panel display does not come on (or is always on). | 1. Defective panel circuit board | A. Replace panel circuit board with a new one. | Panel circuit board | 24<br>40 |
| | 2. Defective main circuit board | A. Replace main circuit board with a new one. | Main circuit board | 60 |

## 8 DIP switch functions



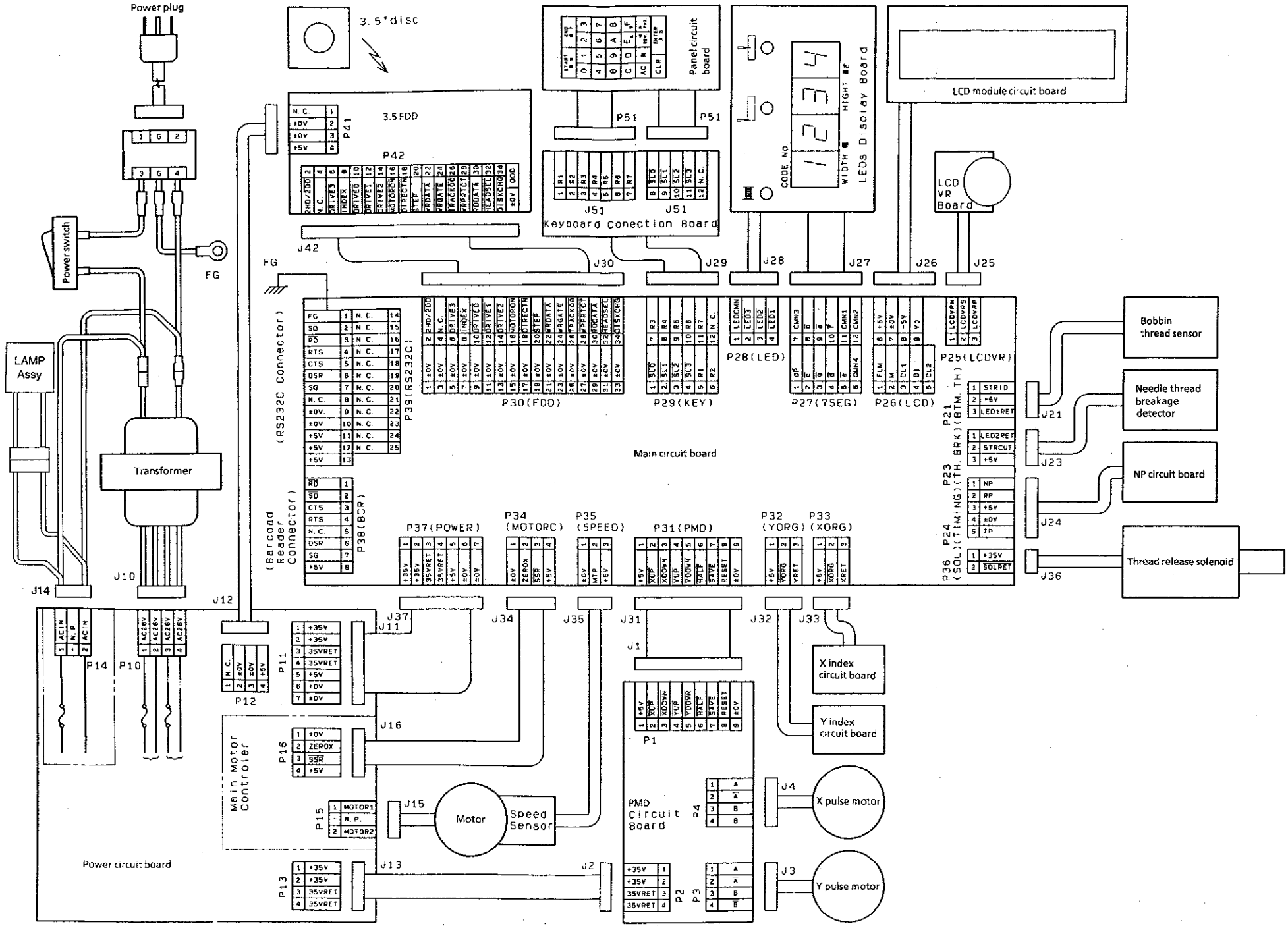


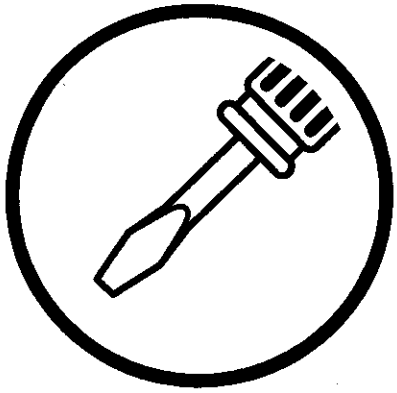

* All the DIP switches except No.6 are preset to OFF when shipped.

| DIP switch functions | | |
|---|---|---|
| SW | OFF | ON |
| 1 | Needle thread breakage detector is activated. | Needle thread breakage detector is not activated. |
| 2 | Unused (always set to OFF) | |
| 3 | 〃 | |
| 4 | 〃 | |
| 5 | 〃 | |
| 6 | 〃 | |
| 7 | 〃 | |
| 8 | 〃 | |

## Circuit block diagram



brother



SERVICE MANUAL

**BROTHER INDUSTRIES, LTD.** NAGOYA, JAPAN

Printed in Japan

155-110
I9110771H
1999.11. (2)