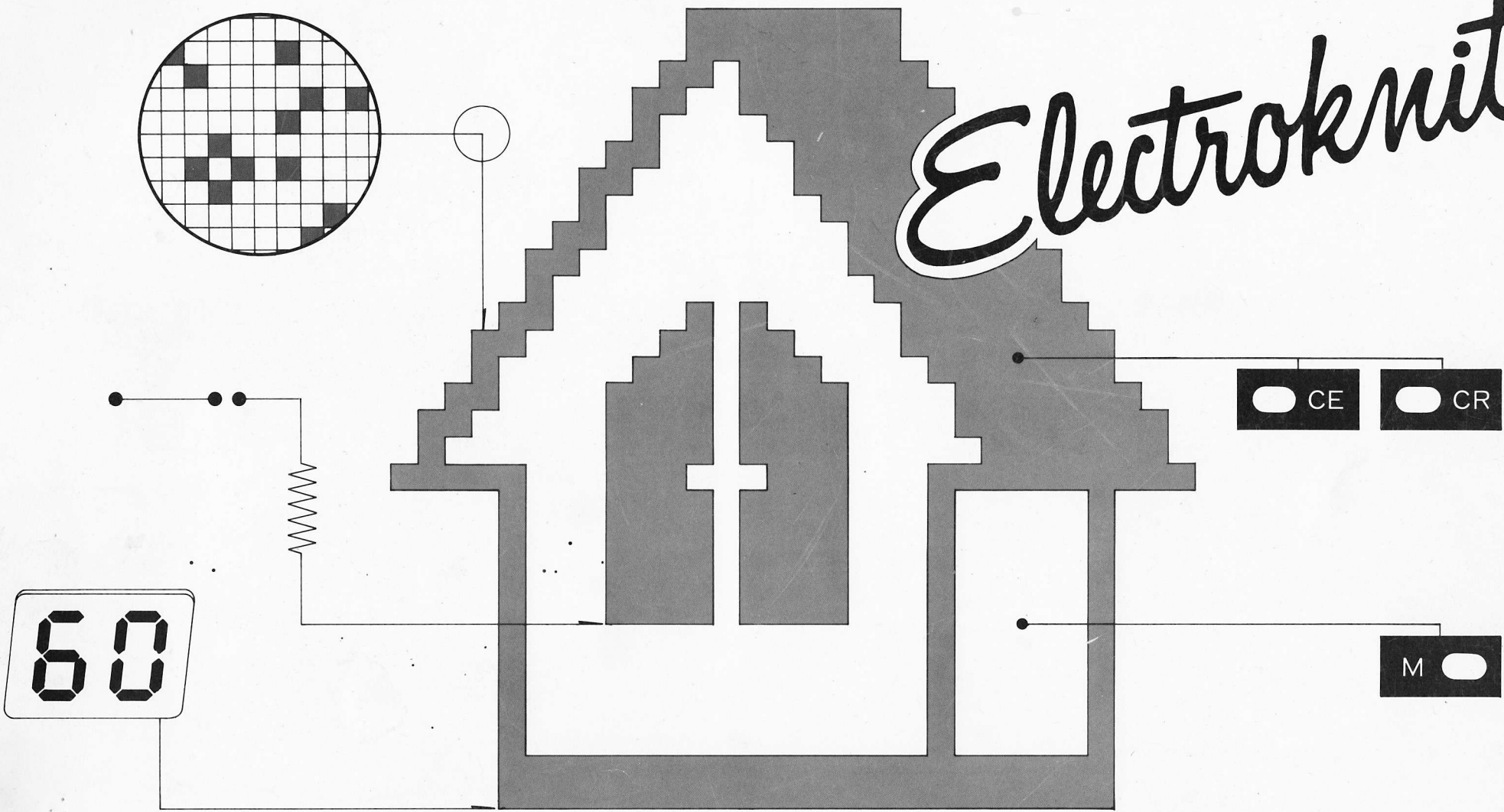


# Service Manual for

# KH-910

*Electroknit*



**brother**<sup>®</sup>

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## REMARKS

Pay attention to the following point to avoid creating more "faults".

1. The power supply cord should be removed from the wall outlet when replacing the mechanical parts and printed circuit boards, and when adjusting the mechanical parts.
2. When removing connectors take care not to pull the cords themselves.
3. The screws and nuts should be tightened properly.
4. Do not lose the screws, nuts and washers and do not leave them in the machine, they may cause a short circuit.
5. Take care not to damage the cords and the printed circuit boards with heat when soldering.
6. The electronic components used in this machine can be damaged by static electricity.  
Touch a point known to be earth before handling the printed circuit boards.  
Handle the boards by their edges, do not touch the components.
7. When carrying the printed circuit boards, pack them in an electric conductor like an aluminum foil or antistatic bag.  
Never pack in polyethylene or styrene.
8. Check the connectors in addition to the parts repaired, and then check the machine is in working order.
9. The main supply should be the same as the rating of the machine.

## I. CHECKING THE FUNCTION OF THE CARRIAGE

### 1. Change knob function.

When the change knob is changed to each position [N. L., KC(I) or KC(II)] it should move smoothly.

The right and left connecting plates, sensor magnet, separation cams and needle selector change cams should work without fail.

### 2. MC cam operation.

When the end of right or left MC cam are pressed fully down and the gently lifted with your finger while keeping the MC cam button depressed all the time, the right and left MC cams should return to their original position by spring pressure.

### 3. MC knitting change cam operation.

The right and left parts of MC cam should shift without fail while the MC cam button is kept depressed.

### 4. Raising cam operation.

When the end of the right or left part of the raising cam is lifted fully with the stitch dial at 0.5 or 10 position and gently lowered with your finger, the right or left parts of the raising cams should be returned to their original position without fail by the spring pressure.

### 5. Needle selection change cam operation.

When the change knob is set at "KC (I)" or "KC(II)", and when the end of the right or left part of the needle selection change cam is lifted fully and then gently lowered with your finger, the cams should be returned to their original position without fail by the spring pressure.

### 6. Separation cam operation.

When the change knob is set at "KC(II)", the separation cam should move freely. When the change knob is set at "KC(I)", the separation cam should not move. The clearance between the separation cam and the needle selection cam must be less than 0.5 mm.

### 7. Tuck cam operation.

When left and right tuck cam buttons are depressed, by gently lifting the left and right tuck cam, they should return to their original position when released. When the cam button is set to plain, the end of the tuck cam fingers can be gently moved and they should return to their original position when released.

### 8. Cam button unit function.

When the cam button is changed to "TUCK R & L", "MC" or "PART R & L", they should move smoothly. The tuck cam, MC cam or raising cam should work without fail.

### 9. Holding cam lever function.

When the holding cam lever is changed to "H" or "N", it should move smoothly.

### 10. Plain knitting cam function.

When the plain lever is moved to right while pressing "TUCK R & L", "MC" or "PART R & L" buttons, the lever should move smoothly and the cam buttons should return to their original position without fail.

### 11. Make sure that the needle butt passes smoothly through the following; (Fig. 1).

- 1). Between the separation cam and rear foot.
- 2). Between the tuck cam plate and guide cam C.
- 3). Between the guide cam C and slide cam.
- 4). Between the sub stitch cam and guide cam B.
- 5). Between the needle selection cam and guide cam A.
- 6). Between the needle selection cam and guide cam G.
- 7). Between the guide cam A and B.
- 8). Between the guide cam F and separation cam.

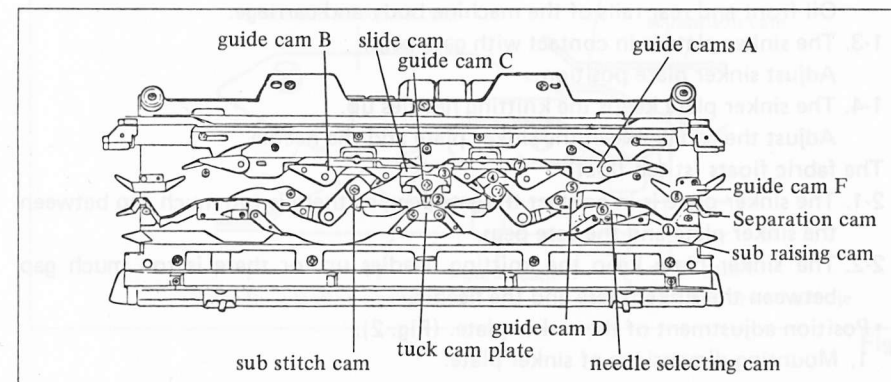


Fig. 1



## II. CHECKING THE FUNCTION OF THE MACHINE BODY

### 1. K carriage movement.

Set the sinker plate assembly on the carriage and set the change knob to position "N.L.". Bring forward all needles (200 needles) to position B and move the K carriage across and back to check its movement. The K carriage should move smoothly and gently.

### 2. Needle selector mechanism (mechanical part)

Set the change knob to position "KC(II)", and move the K carriage across and back slowly and/or quickly to check the needle selector mechanism.

After moving the K carriage to the other side of the machine, all the needles should be selected to position D.

## III. HOW TO ADJUST THE CARRIAGE

### 1. The K carriage does not move smoothly.

#### 1-1. Carriage rail lacks oil.

Oil needle butts and stitch cams.

#### 1-2. Needle bed rail lacks oil.

Oil front and rear rails of the machine body and carriage.

#### 1-3. The sinker plate is in contact with gate pegs.

Adjust sinker plate position.

#### 1-4. The sinker plate keeps the knitting needles up.

Adjust the gap between the sinker plate and the needle.

### 2. The fabric floats (stitch float)

2-1. The sinker plate is in contact the gate pegs, or there is too much gap between the sinker plate and the gate pegs.

2-2. The sinker plate keep the knitting needles up, or there is too much gap between the sinker plate and the needle.

#### \*Position adjustment of the sinker plate. (Fig. 2).

##### 1. Mounting dimensions of sinker plate.

The sinker plate should be 118.5 mm apart from the carriage rear leg.

If it is not correct, loosen screws and adjust.

##### 2. Mounting dimensions of yarn feeder.

The yarn feeder should be 120.5 mm apart from the carriage rear leg.

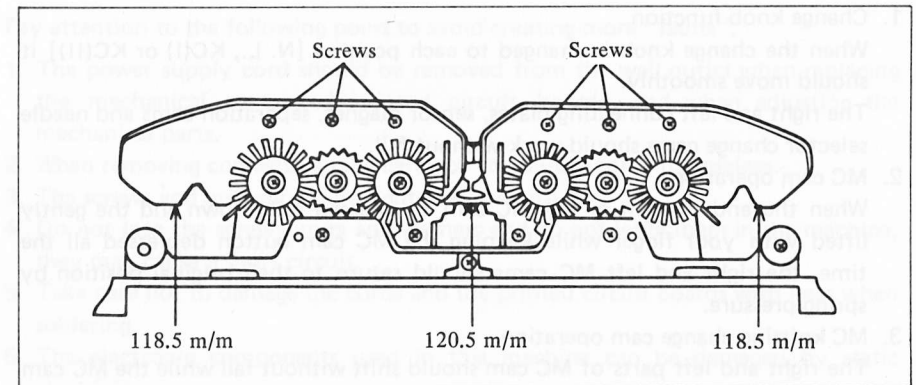


Fig. 2

#### \* Vertical adjustment of the sinker plate. (Fig. 3).

1. Fit the carriage on the needle bed and set the holding cam lever at "H".
2. Bring about five knitting needles each to position E at the left end, center and right end of the needle bed.
3. Bend the sinker plate to adjust the gap between the knitting needle stem and the sinker plate 0.5 mm or less.

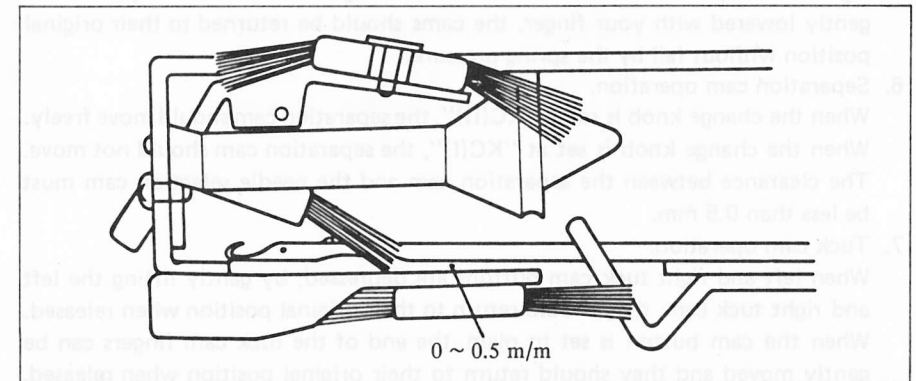


Fig. 3

3. A lateral stripe is produced every second row.  
The right and left parts of the stitch cam are positioned differently.  
\*The stripe adjusting plate is connected with the stitch cam, and the stitch cam guide plate is connected to the right and left stitch cams.

3-1. Loosen the stripe adjusting plate clamp screw. Use slide calipers to adjust the stripe adjusting plate so that the length (at a and a') of the right and left parts of the stitch cam are even. Then tighten the stripe adjusting plate clamp screw.

Note: The length difference at the stitch cam (between a and a') should not exceed 0.35 mm.

Hint: When the stitch dial is set at 5, the length at the stitch cam: 32.5 mm. (Fig. 4).

3-2. After adjustment, be sure to check it by knitting plain stitch using a medium yarn and the stitch dial set at 5.

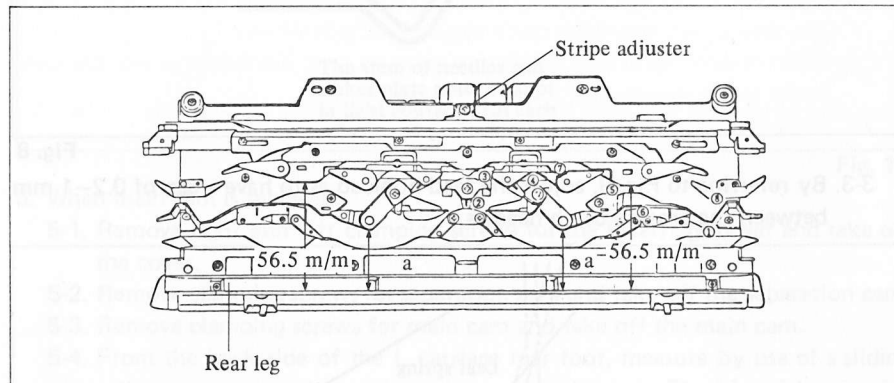


Fig. 4

4. The carriage does not move when needle selected B position.  
The latch of the knitting needle is bent.
- 4-1. Guide cam A is in wrong position.  
Mounting dimensions of guide cam A.
1. Loosen the right and left guide cam A clamp screws and the plate clamp nut. Clamp again after adjusting the distance between guide cam A and the carriage rear leg to 56.5 mm. (Fig. 4).

Note 1: If guide cam A is not more than 56.5 mm apart from rear leg, the gap between guide cams A and B will be too narrow for knitting needle.

Note 2: If the distance between guide cam A and the rear leg exceeds 56.5 mm, the yarn guide might damage the latch.

5. The end needles do not come out.  
Selection cam for end needle is broken.  
Replace the selection cam for end needle. (Fig. 5).
1. Remove the carriage cover.
  2. Remove the end needle selection cam spring.
  3. Set the change knob to position "N.L.", and remove the guide cam G and ~~F.~~  
~~needle selection change cam.~~
  4. Remove the needle selection cam and separation cam.
  5. Remove the valve cam F spring and valve cam F.
  6. Loosen the carriage rear leg clamp screws, and pull off the selection cam for end needle.

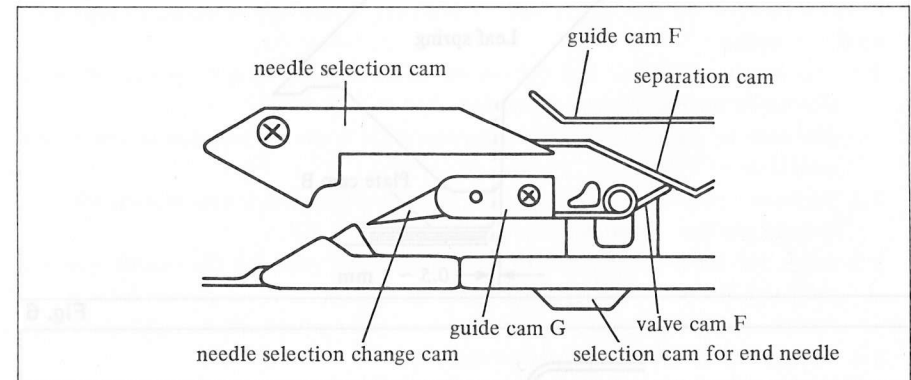


Fig. 5

#### IV. HOW TO ADJUST L CARRIAGE.

##### \*Stitch drops

1. Wrong bilateral position of the leaf spring.
  - 1-1. Remove L carriage cover and loosen right and left clamping screws for the leaf spring.
  - 1-2. By referring to Fig. 6, place the leaf spring at a distance of 1.0—1.2 mm inward from the cross section of the plate cam B and fasten with clamping screws.
2. Wrong vertical position of the leaf spring.
  - 2-1. By referring to Fig. 7, adjust the tip of the leaf spring to the same level as that of the plate cam B.
  - 2-2. Although you may use a pincers or pliers in making such adjustment, be careful not to damage the leaf spring.

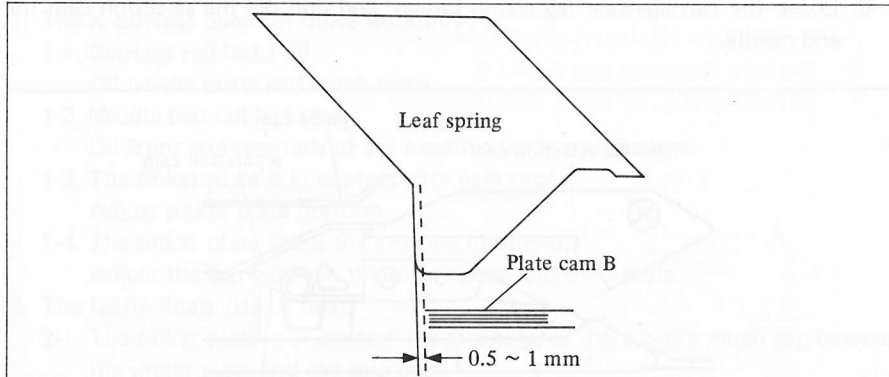


Fig. 6

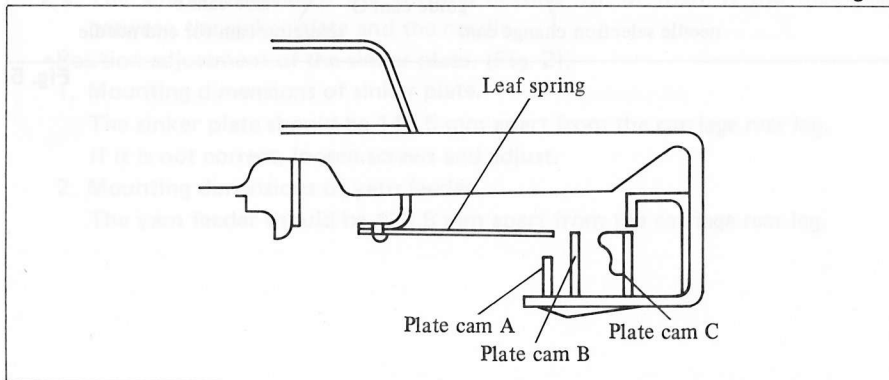


Fig. 7

3. Wrong position of the feed hook.

- 3-1. The feed hook is fixed with the feed hook clamping screw on the side of the sinker plate.
- 3-2. Loosen the feed hook clamping screw and move it inward and the amount of feed will get smaller but move it outward the amount of feed will get larger. (Fig. 8).

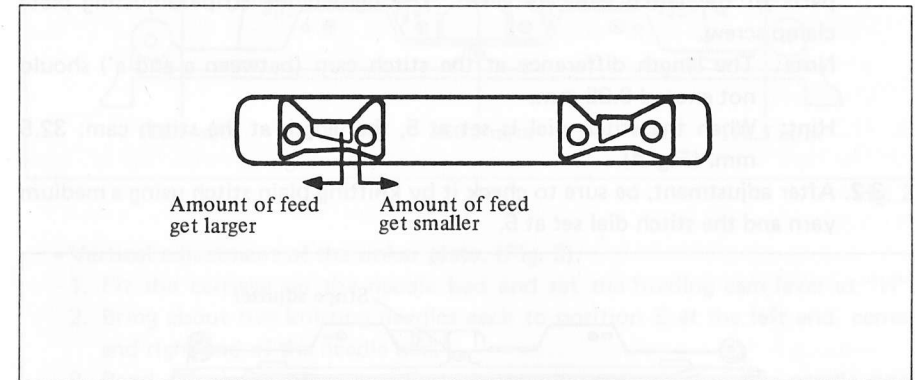


Fig. 8

- 3-3. By referring to Fig. 9, adjust the feed hook so as to have a gap of 0.2—1 mm between the crossed catch needles.

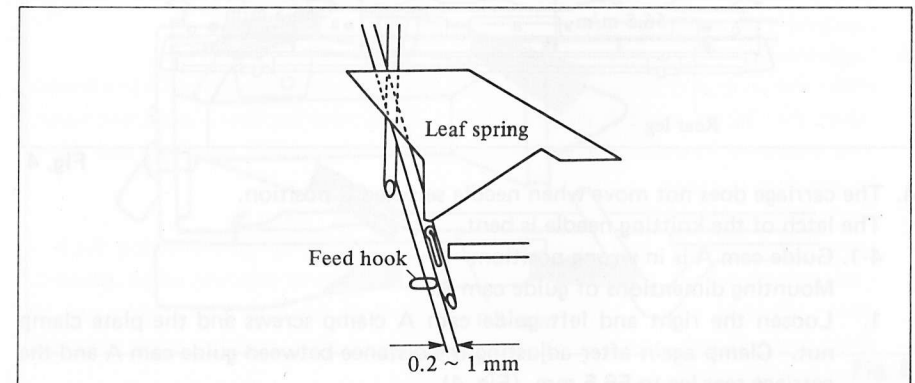


Fig. 9

4. When L carriage sinker plate is crooked. (Fig. 10).

- 4-1. Observe the sinker plate sideward and see if it is crooked.
- 4-2. After confirming it by visual observation, put L carriage onto the needle bed and pull out latch needles to the position D, then check the gap between the sinker plate and the stem of the latch needles. If latch needles are raised by the sinker plate (or there is a wide gap), adjust the "crooked" section.

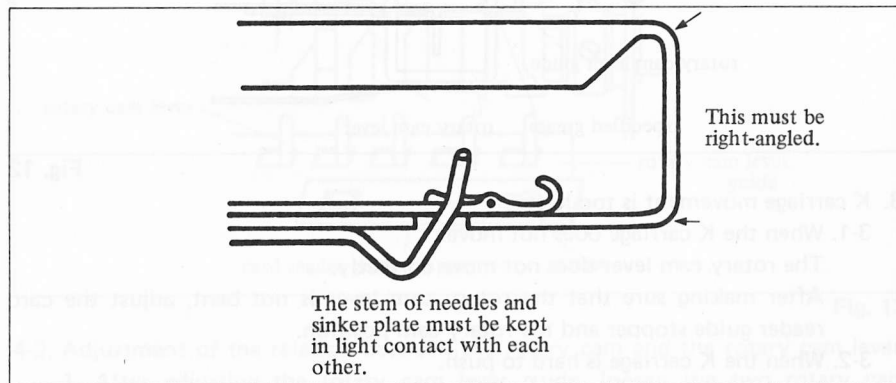


Fig. 10

5. When main cam is replaced.

- 5-1. Remove right and left clamping screws for the L carriage cover and take off the cover.
- 5-2. Remove clamping screws for separation cam and take off the separation cam.
- 5-3. Remove clamping screws for main cam and take off the main cam.
- 5-4. From the back side of the L carriage rear foot, measure by use of a sliding calipers to place main cam in such a way as shown in Fig. 11 and fasten with three clamping screws.
- 5-5. Mount right and left separation cam and clamp with screws.

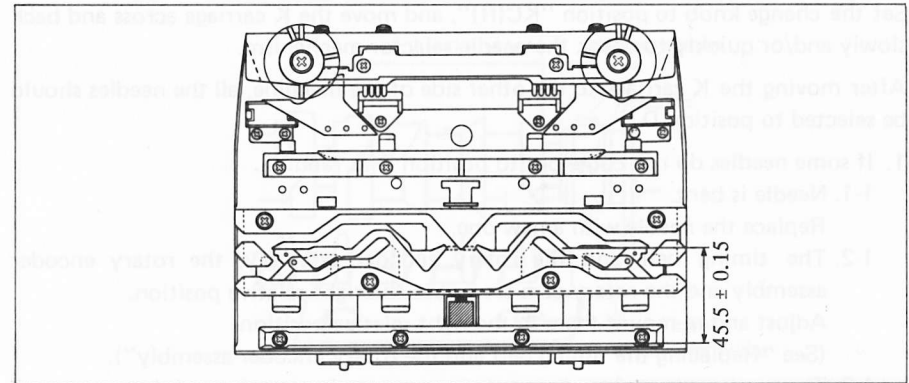


Fig. 11



## V. NEEDLE SELECTOR MECHANISM (MECHANICAL PART)

Set the change knob to position "KC(II)", and move the K carriage across and back slowly and/or quickly to check the needle selector mechanism.

After moving the K carriage to the other side of the machine, all the needles should be selected to position D.

1. If some needles do not come out to position D at random.
  - 1-1. Needle is bent.  
Replace the needle with a new one.
  - 1-2. The timing belt and the rotary encoder assembly, the rotary encoder assembly and the rotary cam are not in the right relative position.  
Adjust and re-mount them in the right relative position.  
(See "Replacing the timing belt and the rotary encoder assembly").
  - 1-3. The card reader guide stopper is not mounted correctly, and the position of the rotary cam and the rotary cam lever are not correct.  
Adjust the position of them.
2. If some needles do not come out to position D but are selected in eighth or sixteenth cycle.
  - 2-1. The rotary cam lever and the needle selector plate (N.S.P.) operation lever are not in the right relative position.  
(Be sure to place the N.S.P. operation lever is on the left side of the rotary cam lever.)
  - 2-2. Squeezed between the rotary cam lever and the rotary cam lever guide, the rotary cam lever does not move smoothly. (Fig. 12).
  - 2-3. Squeezed between the armature and solenoid yoke of the needle selector solenoid, the armature does not move smoothly.  
Put the specified grease on the armature sliding parts of the solenoid yoke.
  - 2-4. The spring for the armature is broken.  
Replace the spring with a new one.

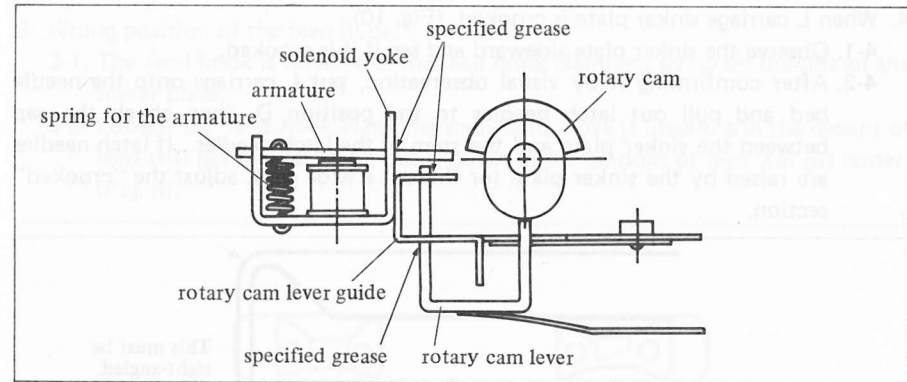


Fig. 12

3. K carriage movement is too heavy.
  - 3-1. When the K carriage does not move.  
The rotary cam lever does not move correctly.  
After making sure that the rotary cam lever is not bent, adjust the card reader guide stopper and the rotary cam position.
  - 3-2. When the K carriage is hard to push.  
The clearance between the rotary cam and the rotary cam adjuster collar is too wide.  
Adjust the rotary cam position.
4. Adjustment.
  - 4-1. Adjustment of the rotary cam lever guide.
    1. Remove the pattern card from the card inlet and the needle selector panel assembly.
    2. Plug the power supply cord into the AC inlet and the other side of it into the wall outlet.
    3. Turn on the power switch, set the pattern selector to the lower position and push CF key.
    4. Bring back all the needles to position A.
    5. Place the K carriage outside of the left turn mark "I C" and set the change knob to position "KC(I)" or "KC(II)".
    6. Move the K carriage across and back until all the needle selector solenoids are turned on and the mark sensor is on the left side.

7. Loosen the card reader guide stopper screw and slide the card reader guide stopper to left until the rotary cam levers touch softly to the right side of the window of the rotary cam lever guide. (Fig. 13).
8. Fasten the card reader guide stopper screw.

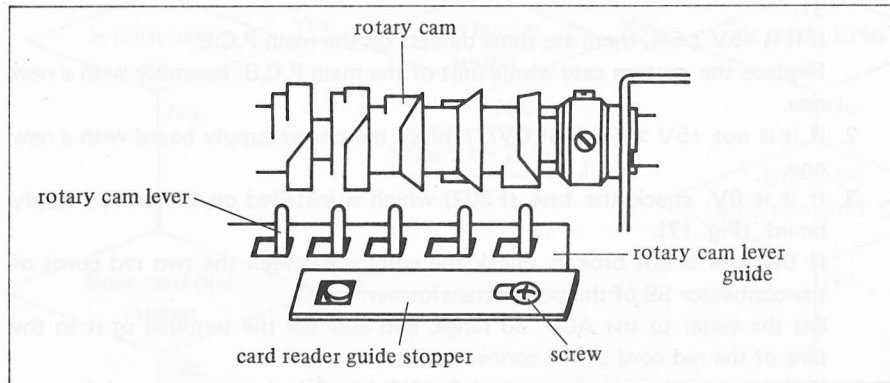


Fig. 13

4-2. Adjustment of the relation between the rotary cam and the rotary cam lever.

1. After adjusting the rotary cam lever guide, loosen the two rotary cam adjuster collar stopper screws. (The rotary cam slides to right.)
2. Take the clearance of 0.2–0.6 mm (TYP. 0.3 mm) between the rotary cam and the rotary cam adjuster collar, then fasten the two rotary cam adjuster collar stopper screws securely. (Fig. 14).

If the machine has not got a washer between the rotary cam adjuster collar and the rotary cam holder (R), the clearance must be 0.5–0.8 mm (TYP. 0.6 mm).

Note: When adjusting the this item, the encoder board must be mounted.

3. After adjusting the relation between them, turn off the power switch and set the change knob to position "KC(II)".
4. Bring forward all the needles to position B.
5. Move the K carriage slowly, all the B position needles must be selected to position D.
  - \*When the K carriage is hard to push, reduce the clearance between them to the proper spaces.
  - \*When the needles do not come out to position D, enlarge the clearance between them to the proper spaces.

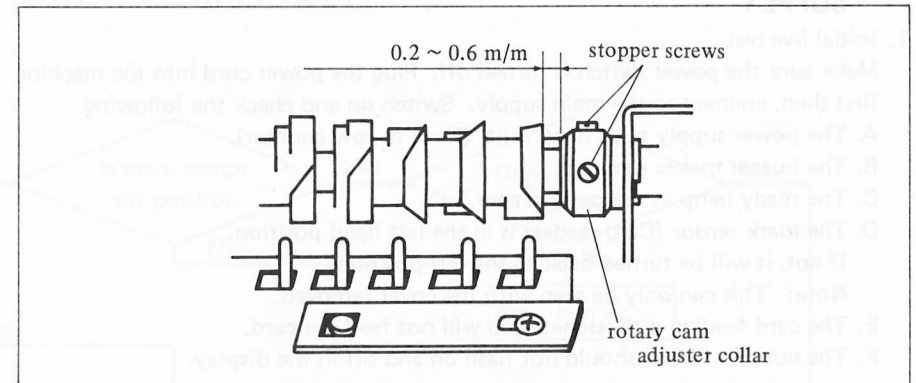


Fig. 14

## TESTING ELECTRICAL SECTION

### VI. CHECKING THE PARTS CONNECTED WITH THE POWER SUPPLY

#### 1. Initial live test.

Make sure the power switch is turned off. Plug the power cord into the machine first then, connect to the main supply. Switch on and check the following.

- A. The power supply pilot lamp is lit. (Next to row counter).
- B. The buzzer makes a sound.
- C. The ready lamp in the pattern case is lit.
- D. The mark sensor (Card reader) is in the left hand position.

If not, it will be turned back to the left position.

Note: This can only be seen with the cover removed.

- E. The card feeding dial ratchets and will not feed the card.
- F. The number "888" should not flash on and off in the display.

#### 2. Action required for fault symptoms detailed in 1.

##### 2-1. Pilot lamp does not light.

Check and repair by referring to Fig. 15.

##### 2-2. Buzzer does not make a sound.

Short-circuit the anode side (D205) and chassis by using the test lead. (Fig. 16).

Connect the end of the test lead to the anode side of the diode (D205) and the other end to the metal parts of the machine body.

If the buzzer makes a sound, it is working correctly. There are some defects on the control circuit for the buzzer which is installed on the main P.C.B. Replace the pattern case whole unit or the main P.C.B. assembly with a new one.

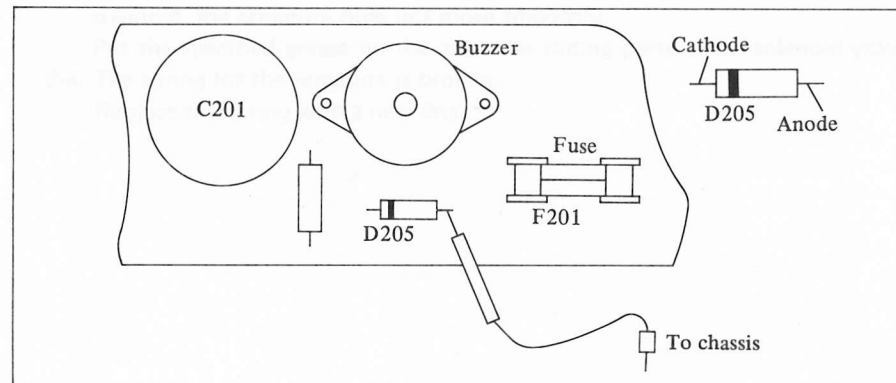


Fig. 16

#### 2-3. The ready lamp does not light.

1. Set the tester to the DCV. 10 range, connect the red terminal of it to the pin of the red cord and the black terminal to the pin of the black cord. Check the voltage between the red cord and the black cord of the connector S1.

If it is  $+5V \pm 5\%$ , there are some defects on the main P.C.B.

Replace the pattern case whole unit or the main P.C.B. assembly with a new one.

2. If it is not  $+5V \pm 5\%$  (not 0V), replace the power supply board with a new one.

3. If it is 0V, check the fuse (F202) which is installed on the power supply board. (Fig. 17).

If the fuse is not broken, check the voltage between the two red cords of the connector S9 of the power transformer.

Set the tester to the ACV. 30 range, and connect the terminal of it to the pins of the red cord of the connector S9.

If the voltage between them is  $AC. 10.6V \pm 10\%$ , there are some defects on the power supply board.

Replace the power supply board.

If not, there are some defects on the power transformer.

Replace the power transformer with a new one.

4. If it is 0V and fuse (F202) is broken, replace the fuse (F202) with a new one and repair the cause of the short-circuit.

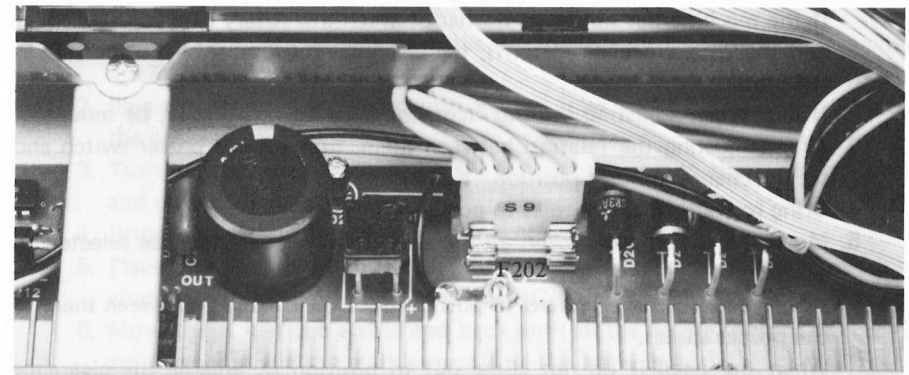


Fig. 17

## CHECKING THE PARTS CONNECTED WITH THE POWER SUPPLY

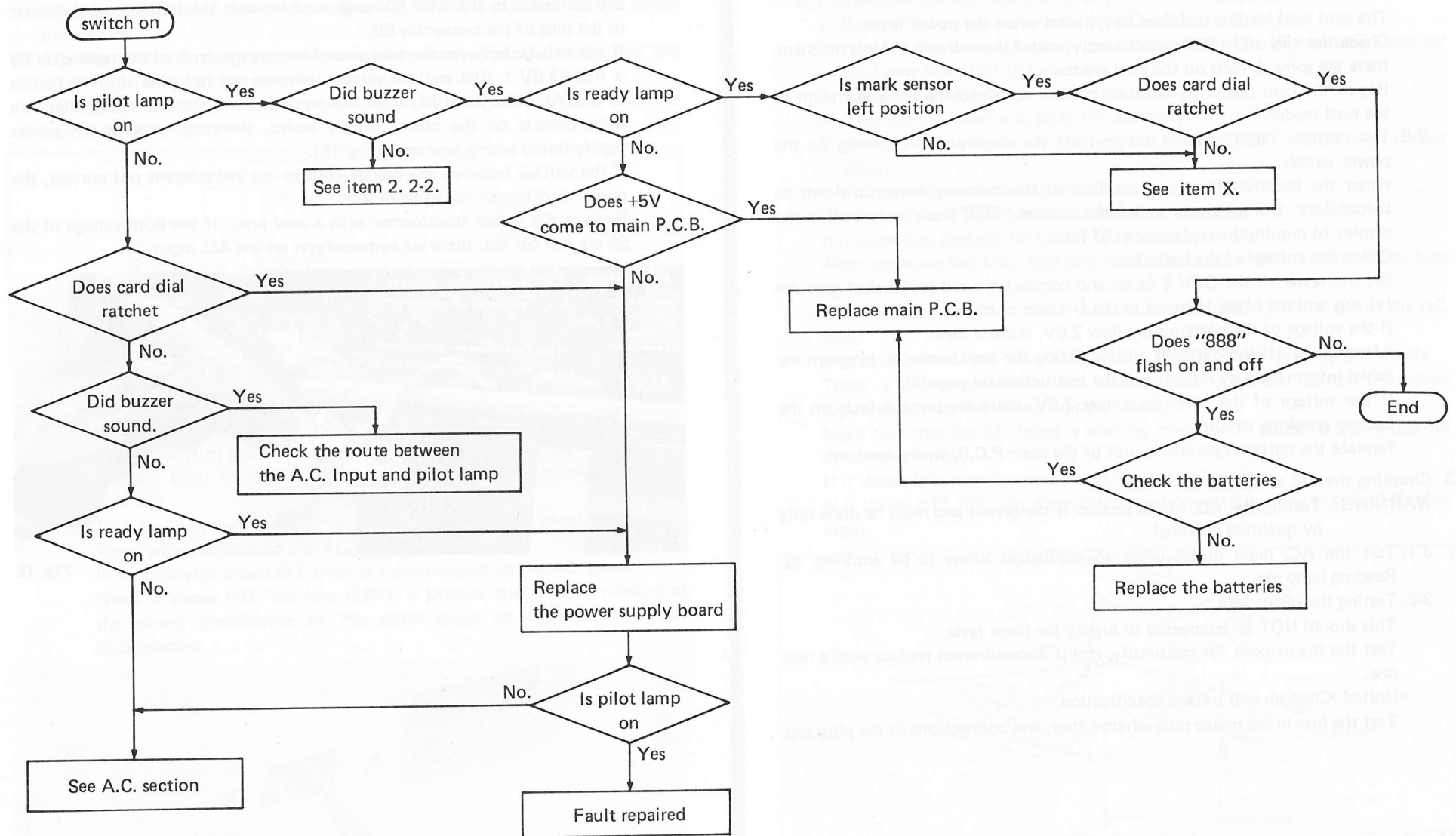


Fig. 15



2-4. The mark sensor is not turned back to the left side of the card reader and is not held in this position.

The card read feeding dial does not ratchet when the power is on.

Check the +5V and +12V power supply, and if there are no defects on them, there are some defects on the card reader.

Repair the card reader by referring to item X, "Checking and adjustment of the card reader."

2-5. The number "888" flashes on and off the display when turning on the power switch.

When the batteries for the protection of the memory have run down to below 2.6V, the computer makes the number "888" flash on and off in the display to require the replacement of them.

Check the voltage of the batteries.

Set the tester to the DCV.3 range and connect the red terminal of it to the (+) side and the black terminal to the (-) side of them.

If the voltage of the batteries is below 2.6V, replace them.

After taking off the batteries and/or fitting the new batteries, program the initial information by referring to the instruction on page 90.

If the voltage of the batteries is over 2.6V, there are some defects on the battery checking circuit.

Replace the pattern case whole unit or the main P.C.B. with a new one.

### 3. Checking the AC. section.

**WARNING:** Testing the AC. mains section is dangerous and must be done only by qualified personnel.

3-1. Test the AC. main outlet using an appliances know to be working. eg. Reading lamp etc. . .

3-2. Testing the mains lead.

This should NOT be connected to supply for these tests.

Test the mains cord for continuity, if it is discontinuous replace with a new one.

\*United Kingdom and Ireland specification.

Test the fuse in the mains plug where fitted, and connections in the plug top.

### 3-3. Testing the AC. low voltage circuit.

Set the tester to the ACV.30 range, and connect the terminal of the tester to the pins of the connector S9.

If the voltage between the two pins of the orange cords of the connector S9 is AC.  $12.6V \pm 10\%$  and the voltage between the two pins of the red cords of it is AC.  $10.6V \pm 10\%$ , there are no defects on the AC. input, there are some defects on the power supply board, therefore, replace the power supply board with a new one. (Fig. 18).

If the voltage between the orange cord or the red cords is not correct, the power transformer has some defects.

Replace the power transformer with a new one. If the both voltage of the S9 are not correct, there are some defects on the AC. input.

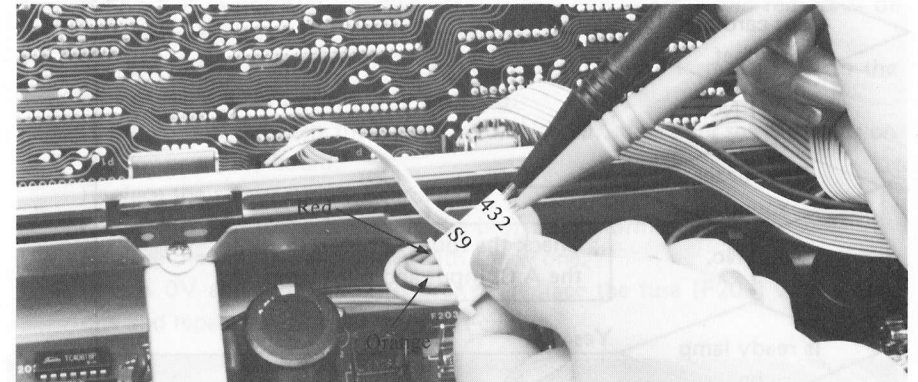


Fig. 18

### 3-4 Checking the AC. input.

AC. input consists of AC. inlet, noise filter board, power switch and power transformer.

AC. input reduces the voltage of the power supply from the wall outlet and supplies the reduced voltage to the power supply board.

AC. input and the power supply board are connected to each other with the connector S9. (Fig. 19).

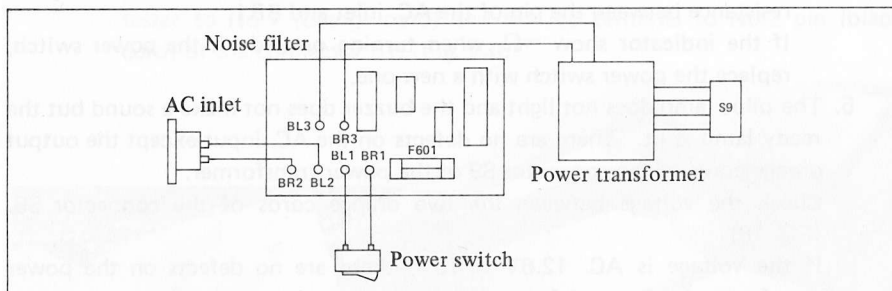


Fig. 19

#### 1. Checking the AC. input.

- Pull out the power supply cord.
- Set the tester to the  $\Omega \times 1$  range.
- Connect both terminals of the tester to both pins of the AC. inlet. (Fig. 20).
- Turn on the power switch, the indicator of the tester should show  $10\Omega$ . There are no defects on the AC. input.

If the indicator shows  $0\Omega$ , there is a short-circuit on the AC. input.

When it shows  $\infty\Omega$ , the fuse (F601) is broken, the primary winding of the power transformer or the other cords on the AC. input are disconnected.

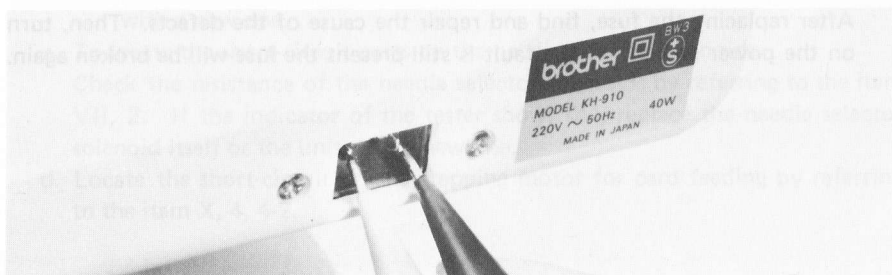


Fig. 20

#### 2. Checking the fuse (F601).

##### a. Disassemble the AC. input. (Fig. 21).

- Pull out the power cord from the AC. inlet.
- Remove the three screws for the needle bed and the three plastic rivets for the lower side plate (R) assembly.
- Remove the two screws for the AC. inlet.
- Take off the lower side plate (R) assembly.
- Remove the screw of the cord presser plate and take off the cord presser plate.
- Pull out the noise filter board.

##### b. Check the fuse (F601) which is installed on the noise filter board.

If it is broken, replace the fuse (F601) with a new one.

After replacing the fuse, find and repair the cause of the defects. Then, turn on the power switch.

\*After replacing the fuse, check the resistance between the both pin of the AC. inlet.

If the indicator of the tester shows  $10\Omega$ , the AC. input is working correctly.

There is a short-circuit on the circuit which is worked by the DC power supply including the power supply board.

Make sure that the AC. input is working correctly by checking the voltage for the connector S9.

If it shows  $0\Omega$ , there is a short-circuit on the AC. input.

If it shows  $\infty\Omega$ , there are some disconnections on the other circuit of the AC. input.

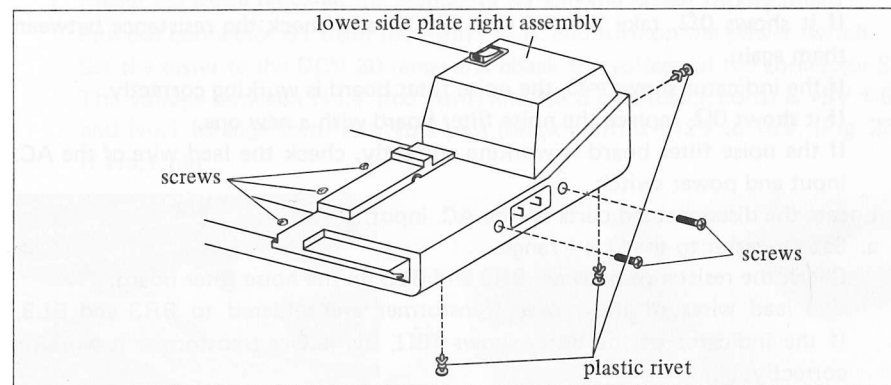


Fig. 21

3. Find out the short-circuit parts on the AC. input.
  - a. Disconnect the lead wire of the power transformer which is soldered at the position of BR3 and BL3 on the noise filter board. (Fig. 22).

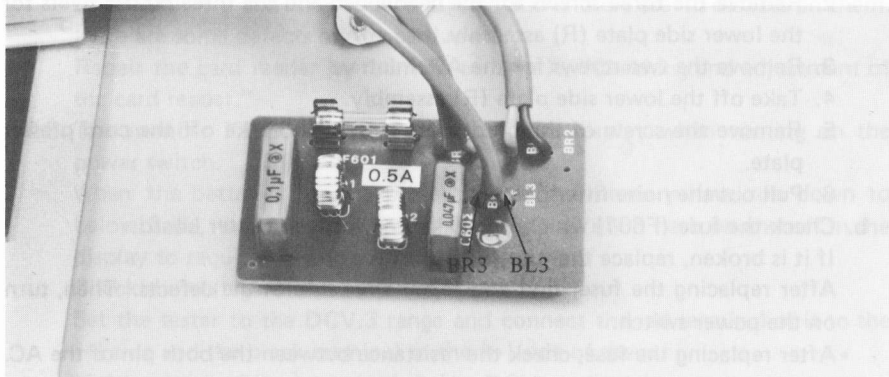


Fig. 22

- b. Set the tester to the  $\Omega \times 1$  range.  
Check the resistance between both lead wires of the power transformer. If it shows  $0\Omega$ , there is a short-circuit on the winding of the power transformer.  
Replace the power transformer with a new one.  
If it shows  $10\Omega$ , the power transformer is working correctly.
    - c. Check the resistance between the soldered face of BR3 and BL3.  
The indicator shows  $\infty\Omega$ .  
If it shows  $0\Omega$ , take off the fuse (F601) and check the resistance between them again.  
If the indicator shows  $\infty\Omega$ , the noise filter board is working correctly.  
If it shows  $0\Omega$ , replace the noise filter board with a new one.  
If the noise filter board is working correctly, check the lead wire of the AC. input and power switch.
4. Locate the disconnected parts on the AC. input.
  - a. Set the tester to the  $\Omega \times 1$  range.  
Check the resistance between BR3 and BL3 on the noise filter board. The lead wires of the power transformer are soldered to BR3 and BL3. If the indicator of the tester shows  $10\Omega$ , the power transformer is working correctly.

- If it shows  $\infty\Omega$ , replace the power transformer with a new one.
        - b. If the power transformer is working correctly, check the resistance between BL1 and BR2 on the noise filter board.  
If the indicator shows  $\infty\Omega$ , replace the noise filter board with a new one.
        - c. If the noise filter board is working correctly, check the resistance between BR1 and BL1.
        - d. As for AC100V, AC115V and AC127V input specifications, check the resistance between the pin of the AC. inlet and BR1.  
If the indicator show  $\infty\Omega$ , when turning on and off the power switch, replace the power switch with a new one.
  5. The pilot lamp does not light and the buzzer does not make a sound but the ready lamp is lit. There are no defects on the AC. input except the output orange cords of the connector S9 of the power transformer.  
Check the voltage between the two orange cords of the connector S9. (Fig. 18).  
If the voltage is AC.  $12.6V \pm 10\%$ , there are no defects on the power transformer but some defects on the power supply board.  
Replace the power supply board with a new one.  
If not  $12.6V \pm 10\%$ , there are some defects on the power transformer.  
Replace the power transformer with a new one.
- 3-5. Checking the fuse (F601).  
The fuse (F601) is installed on the noise filter board which is in the lower side plate (R) assembly.  
The capacity of the fuse is different according to the rated voltage.  
Replace the fuse by referring to the indication on the noise filter board.
- |                                 |             |
|---------------------------------|-------------|
| 100V – 115V input spec. . . . . | .1A Fuse.   |
| 127V input spec. . . . .        | .0.8A Fuse. |
| 220V – 240V input spec. . . . . | .0.5A Fuse. |
- After replacing the fuse, find and repair the cause of the defects. Then, turn on the power switch. If the fault is still present the fuse will be broken again.

1. How to find the short-circuits which break the fuse (F601).
  - a. Locate the short-circuit parts on the AC. input circuit by referring to the item VI, 3, 3-4, 3.
  - b. To locate the short-circuit parts on the power supply board.
    - 1). Pull out the connector S9, S11, and S8 from the power supply board and the connector S1 and S6 from the main P.C.B.
    - 2). Set the tester to the  $\Omega \times 1$  range and connect the black terminal of the tester to No.1 (orange cord) and the red terminal to No.2 pin (black cord) of the connector S1. (Fig. 23).

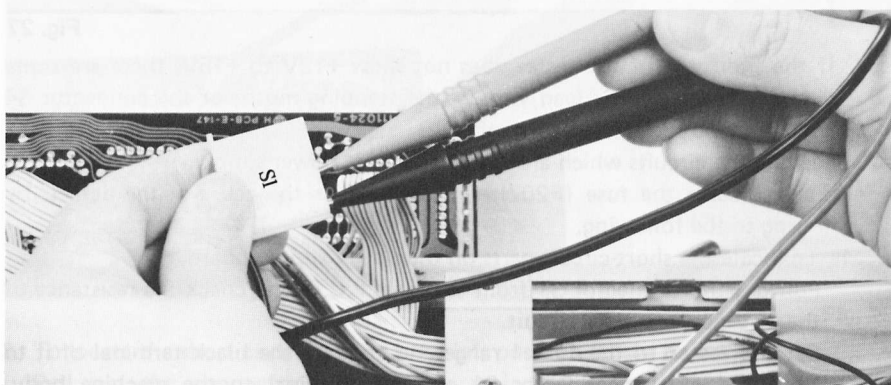


Fig. 23

- 3). The indicator of the tester moves to  $0\Omega$  at first and back to the  $\infty\Omega$ , Slowly.  
 If it does not stop  $0\Omega$ , there are no short-circuits on the power supply board.  
 If it show  $0\Omega$ , there is a short-circuit on the power supply board and if you can not find the short-circuit parts, replace the power supply board with a new one.
- c. To locate the short-circuit parts on the needle selector solenoids.  
 Check the resistance of the needle selector solenoids by referring to the item VII, 2. If the indicator of the tester shows  $0\Omega$ , replace the needle selector solenoid itself or the unit with a new one.
- d. Locate the short-circuit on the stepping motor for card feeding by referring to the item X, 4, 4-2.

#### 4. Checking the DC. section.

##### 4-1. The card feeding dial does not ratchet but buzzer makes a sound.

The power supply pilot lamp and the stepping motor for card feeding are worked by +12VDC REG. supply which is taken from the +12VDC UNREG. supply.

A fault on the +12VDC REG. power supply could be due to a fault on the supply itself, the +12VDC UNREG. supply or the route between them.

Check this route and if there are no defects, replace the power supply board.  
 \*Check the route between the AC. input and power supply pilot lamp. (Fig. 24).

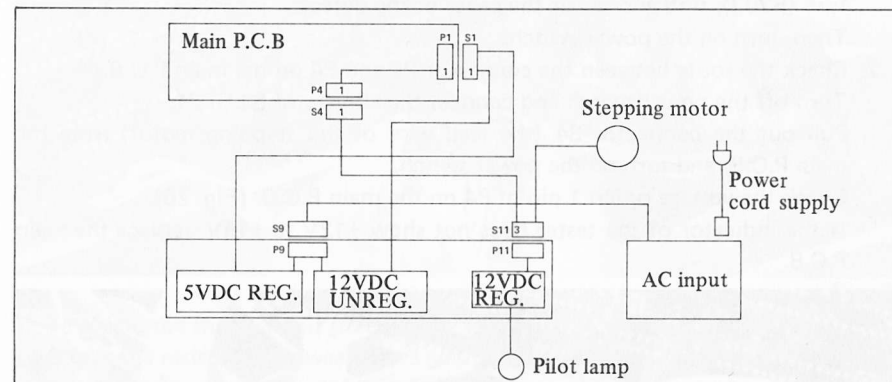


Fig. 24

1. Check the route between the connector S1 and the power supply board.  
 Pull out connector S1 from the main P.C.B. and turn on the power switch.  
 Set the tester to the DCV 30 range and check the voltage of the connector S1.  
 The voltage between No.4 (red cord) and No.3 pins (black cord) is  $+5V \pm 5\%$  and No.1 (orange cord) and No.2 pins (black cord) is  $+12V$  to  $15V$ . (Fig. 25).  
 If No.1 pin

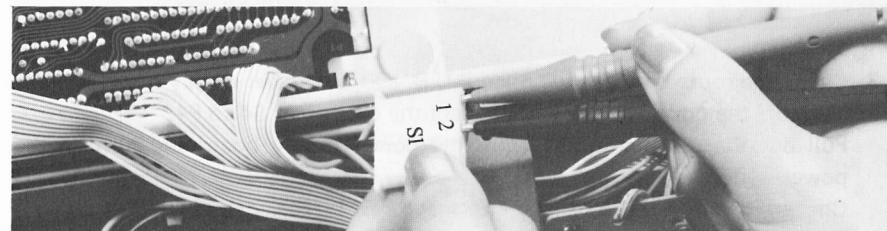


Fig. 25



If No.1 pin of the connector S1 is not above voltage, check the voltage of the fuse (F201) which is installed on the power supply board. If it is correct voltage, the orange cord is disconnected between the power supply board and the connector S1.

If not, the +12VDC UNREG. power supply is not working correctly.

Replace the power supply board with a new one.

\*For the AC. 115V input spec. the fuse (F203) is installed on the power supply board.

Check the fuse (F203), and if it is not defective, replace the power supply board with a new one. After replacing the power supply board and/or the fuse (F203), find and repair the cause of the defects.

Then, turn on the power switch.

2. Check the route between the connector P1 and P4 on the main P.C.B.

Turn off the power switch and connect the connector S1 to P1.

Pull out the connector S4 (the lead wire of the stepping motor) from the main P.C.B. and turn on the power switch.

Check the voltage of No.1 pin of P4 on the main P.C.B. (Fig. 26).

If the indicator of the tester does not show +12V to +15V, replace the main P.C.B.

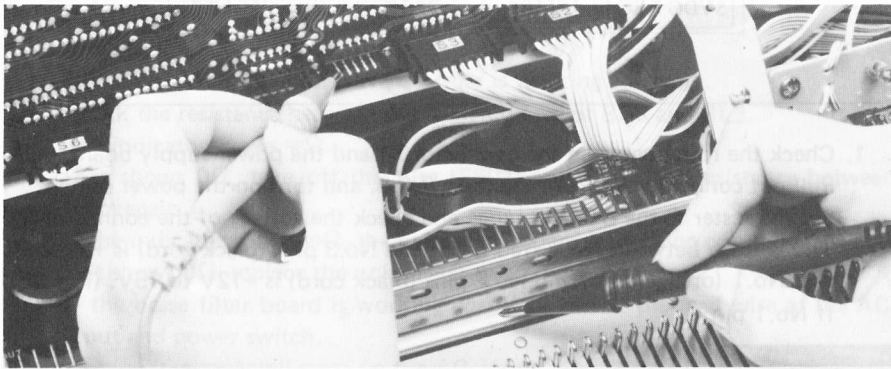


Fig. 26

3. Check the route between the main P.C.B. and the power supply board.

Turn off the power switch and connect the connector S4 to P4.

Pull out the connector S11 from the power supply board and turn on the power switch.

Check the voltage of No.3 of the connector S11. (Fig. 27).

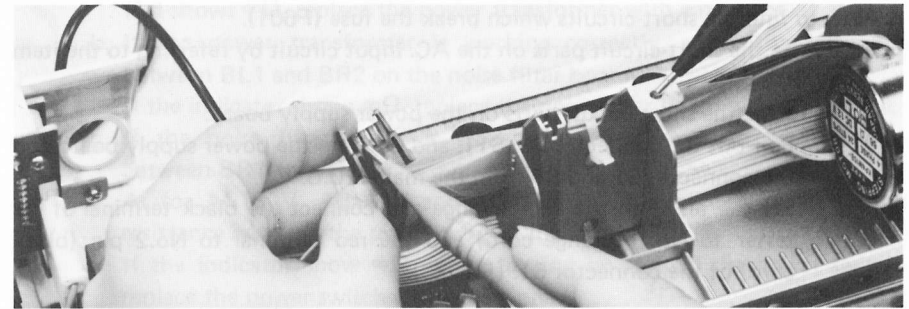


Fig. 27

If the indicator of the tester does not show +12V to +15V, there are some disconnections on the lead wire of the stepping motor or the connector S4 and P4 are not contacted correctly.

4-2. Checking the circuits which are worked by +5V power supply.

\* After replacing the fuse (F202), find and repair the cause of the defects by referring to the following.

1. To locate the short-circuit parts on the power supply board.

Pull out the connector S1 from the main P.C.B. and check the resistance of the +5V power supply circuit.

Set the tester to the  $\Omega \times 1$  range and connect the black terminal of it to No.4 pin of the connector S1 and red terminal to the machine body. (Fig. 28).

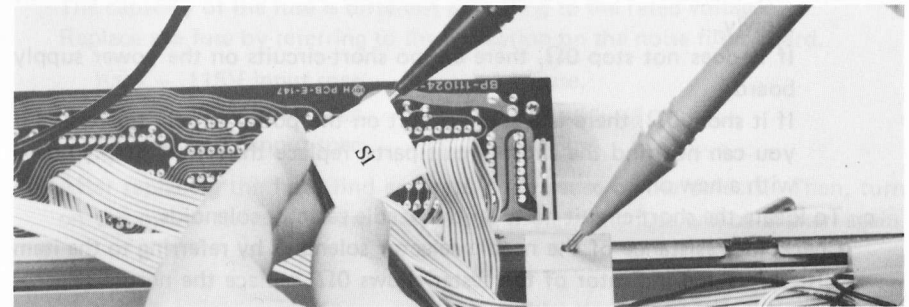


Fig. 28

If the indicator of the tester shows  $\infty\Omega$ , there are no short-circuit parts on the power supply.

Connect both terminals of the tester reversed, if it does not show  $0\Omega$ , there is no short-circuit on the power supply.

2. To locate the short-circuit parts on the main P.C.B.

Pull out the connector from the main P.C.B. and check the resistance between No.4 and No.3 pins of the connector P1.

Set the tester to the  $\Omega \times 1$  range and connect the black terminal to No.4 pin and the red terminal to No.3 pin. (Fig. 29).

If the indicator of the tester does not show  $0\Omega$ , there is no short-circuit on the main P.C.B.

**CAUTION:** Do not connect the terminals of the tester in reverse, it could break parts of the circuit.

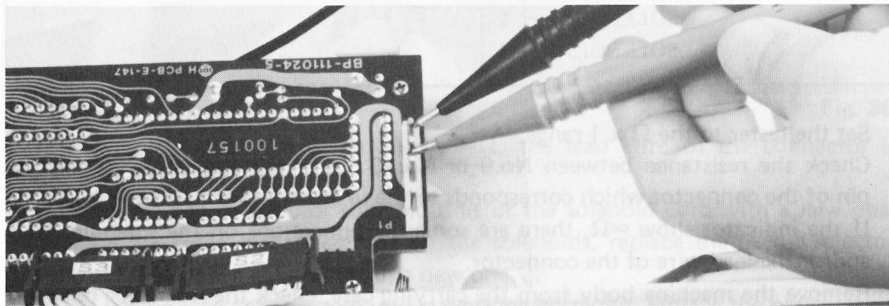


Fig. 29

3. To locate the short-circuit parts on the left position sensor board.

Pull out the connector S7 from the main P.C.B. and check the resistance between No.1 and No.2 pins.

Set the tester to the  $\Omega \times 1$  range and connect the black terminal to No.1 pin and the red terminal to No.2 pin. (Fig. 30).

If the indicator of the tester does not show  $0\Omega$ , there is no short-circuit on the left position sensor board.

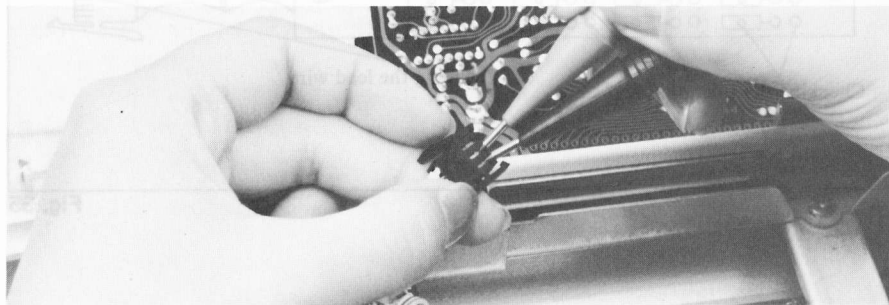


Fig. 30

4. To locate the short-circuit parts on the encoder board.

Pull out the connector S10 from the mark sensor and the connector S5 from the main P.C.B.

Check the resistance between No.1 and No.2 pins of the connector S5.

Set the tester to the  $\Omega \times 1$  range and connect the black terminal to No.1 pin and the red terminal to No.2 pin of the connector S5.

If it does not show  $0\Omega$ , there is no short-circuit on the encoder board (Fig. 31).

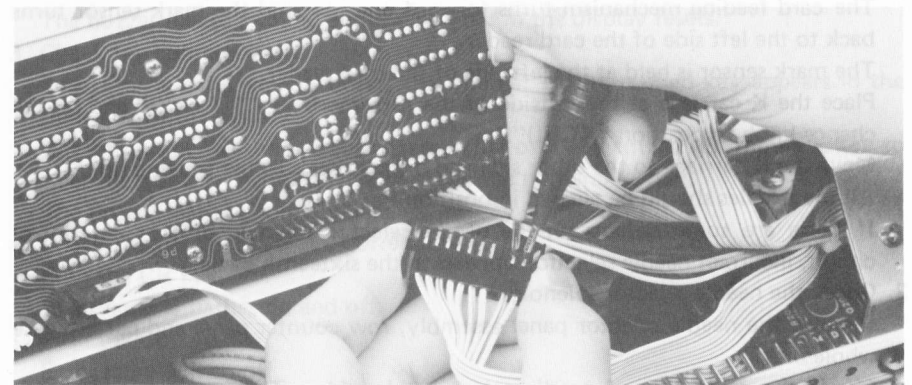


Fig. 31

5. To locate the short-circuit parts on the mark sensor.

Check the resistance between No.3 and No.2 pin of the connector S10.

Set the tester to the  $\Omega \times 1$  range and connect the black terminal to No.3 pin and the red terminal to No.2 pin. (Fig. 32).

If it does not show  $0\Omega$ , there is no short-circuit on the mark sensor.

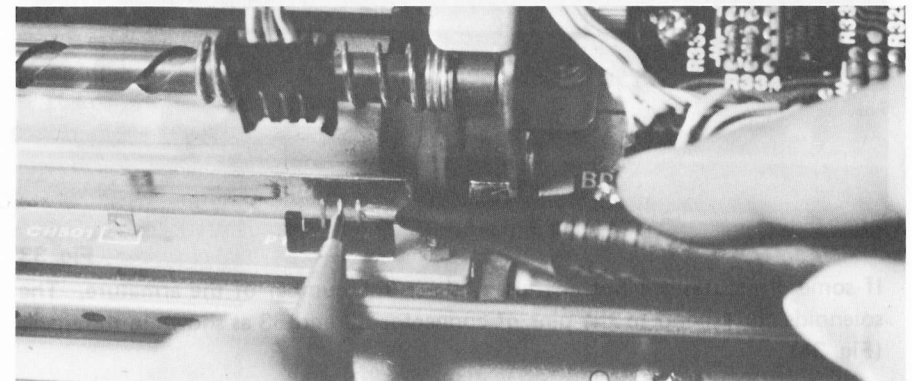


Fig. 32

## VII. CHECKING THE NEEDLE SELECTOR SOLENOID

### 1. Live test for the needle selector solenoid.

Remove the pattern card from the card inlet and turn on the power switch.

Set all pattern variation switch to the lower position.

Set the pattern selector switch to the lower position.

Push the CF key.

The buzzer makes a sound, the card feeding mechanism turns forward and mark sensor moves to the right side of the card reader.

The card feeding mechanism turns forward one row and the mark sensor turns back to the left side of the card reader.

The mark sensor is held at the left side of the card reader.

Place the K carriage at the outside of the turn mark "I C " or "I" and set the change knob to position "KC(II)".

Move the K carriage to the other side and bring it back to the starting side.

All the needles should be aligned in position B.

If there are some defects on the needle selector solenoid unit or its control circuit, incorrect needle selection appears in the sixteenth cycle.

### 2. Check the needle selector solenoids.

Remove the needle selector panel assembly, row counter panel and pattern case whole unit.

Check the armatures of needle selector solenoids. They must be energised. (Fig. 33).

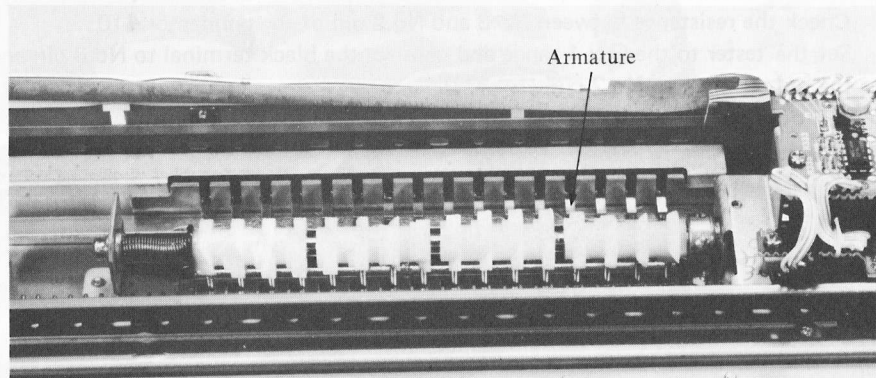


Fig. 33

If some armatures are not energised, check the number of the armature. The solenoids correspond to the pins of connector S2 and S3 as shown in the figure (Fig. 34).

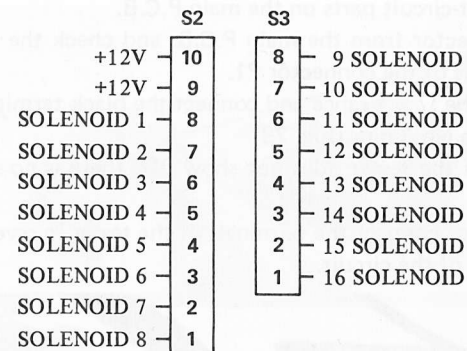


Fig. 34

Set the tester to the  $\Omega \times 1$  range.

Check the resistance between No.9 or No.10 pin of the connector S2 and the pin of the connector which corresponds to the unenergised armature.

If the indicator show  $\infty\Omega$ , there are some disconnections on the solenoid itself and/or the lead wire of the connector.

Remove the machine body from the carrying case, check the resistance between the pin of the connector and land to which the wire is soldered at the right side of the numbered land. (Fig. 35, 36).

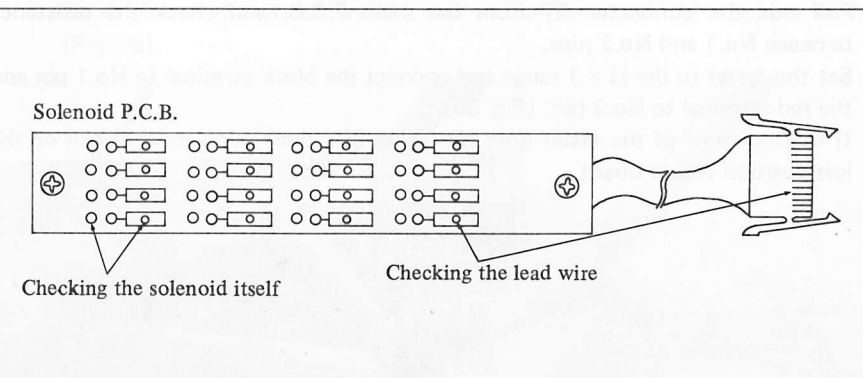


Fig. 35



IX. CHECKING THE NEEDLE POSITION DETECTING CIRCUIT

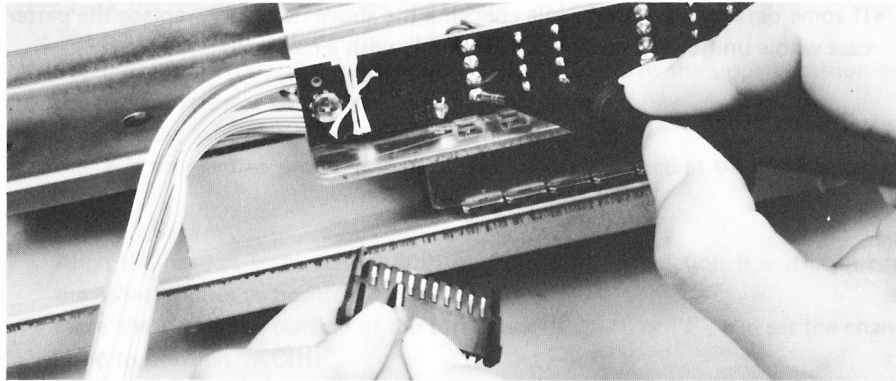


Fig. 36

If the indicator of the tester shows  $\infty\Omega$ , the lead wire of the connector is disconnected.

Replace the needle selector solenoid unit or the solenoid cord with a new one. If there are some disconnections on the solenoids, replace the needle selector solenoid unit or the solenoid with a new one.

If the needle selector solenoid unit is working correctly, replace the pattern case whole unit or the main P.C.B. assembly with a new one.

3. There are some needles selected to position D.  
There are some defects or poor adjustment of the position sensors.  
Check the right and left position sensor by referring to the item IX.

IIX. CHECKING THE PATTERN CASE  
(except the variation switches)

1. Check the display.  
Push the "8" key three times.  
The buzzer makes a sound and the number 8 appears in the display whenever it is pushed.
2. Check the CE key. (CE . . . Clear Entry)  
Push the CE key.  
The buzzer makes a sound and the number in the display resets.
3. Check the numeral keys.  
Push the numeral key in order, the number of the pushed key appears in the right side of the display.  
The computer will only accept a maximum of 3 key entries. Push the CE key to clear the display, then continue to check the numeral keys.  
The buzzer makes a sound whenever the key is pushed.
4. Check the CR key. (CR . . . Correction)  
Push the CR key.  
Error lamp is flashes on and off.  
Push the CE key.  
Error lamp will go off.
5. Check the CF key and RR key. (CF . . . Card feed, RR . . . Return & Reset)  
\*The CF key.  
Push the CF key.  
The card feeding mechanism turn forwards and mark sensor moves to the right and then comes back to the left side of the card reader.  
Note: The CF key can not be operated repeatedly. If the CF key does not work, operate it after pushing the RR key.  
\*The RR key.  
Push the RR key.  
The card feeding mechanism turns backward.
6. Check the M key and the step lamp. (M . . . Memory)  
Push the M key.  
The ready lamp goes off and the pattern selector lamp is lit up.  
Set the pattern selector switch to the middle position (A+B) and push the M key.



The pattern selector lamp goes off and the step lamp No.2 is lit up. Continue to push the numeral key and M key according to the illustration. (Fig. 37).

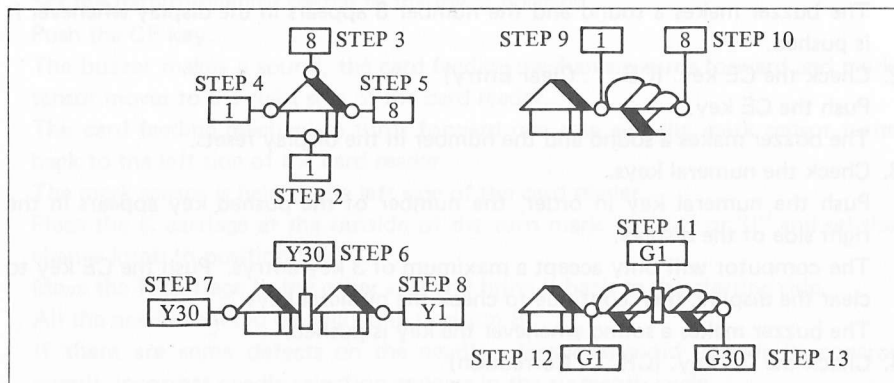


Fig. 37

The number in the display goes off and the step lamp is moved to the next step whenever the M key is pushed. Push the M key after entering the information for step No.13.

The ready lamp will be lit up.

When the step lamp No.6, 7, 8, 11, 12, or 13 is lit up, the pattern position key lamp which is located between the yellow and green key is also lit up.

While the pattern position key lamp is on, all the keys except the M key, yellow and green key do not work.

Push the pattern position key (yellow or green) according to the information (refer to the illustration) before entering the numeral key.

When the pattern position key is pushed, the pattern position key lamp goes off and pattern position pilot lamp (yellow or green) which is located at the left side of the display is lit up according to pushed key.

7. Check the contents of the memory.

Push the M key repeatedly.

The memorized number appears in the display and the step moves to the next when pushing the M key.

Check the number in the display, if you find some wrong numbers while checking, re-enter the correct number and check again.

Note: When the step moves from No.1 to No.2, no number appears in the display. Push the M key again, the number appears in the display.

\* If some defects are found while checking the above item 1-7, replace the pattern case whole unit or the main P.C.B. assembly with a new one.

## IX. CHECKING THE NEEDLE POSITION DETECTING CIRCUIT

### 1. Check the needle position detecting circuit.

\*The pattern card is not used for this checking.

Set the pattern variation switch No.6 (NEGATIVE) to the upper position and the pattern selector switch to the middle (A+B) position.

Program the information according to the item IIX.6.

There is no need to program if the programming finished at the checking of the item IIX.

Push the CF key.

Align the needles from yellow 60th to green 60th in position B and push back the other needles to position A.

Place the K carriage outside of the turn mark "I ⊂ " or "I", and set the change knob to position "KC(II)".

After moving the K carriage to the other side of the machine, the needles between the yellow 30th and green 30th are selected to position B and the other needles are selected to position D.

Place the K carriage outside of the other side turn mark and turn off the power switch and turn it on again.

Move the K carriage to the other side of the machine, all the needles should be selected as same as before.

Check the L carriage in the same manner as the K carriage.

Note: Align all the needles in position B before operating the L carriage.

The yellow 60th and the green 60th needles will not be selected to position D with the end needle selector mechanism.

### 2. All the needles are left in position B.

The pattern variation switch No.6 (NEGATIVE) does not work correctly.

Replace the pattern case whole unit or the main P.C.B. assembly with a new one.

### 3. There are many needles selected to position D.

If this incorrect needle selection appears when moving the K carriage from right to left, the adjustment of the level for the right position sensor is wrong.

If it appears when moving the K carriage from left to right, the adjustment of the level for the left position sensor is wrong.

### 4. If the position of the needle selection slides to the left or right.

4-1. The right and left position sensor are not mounted correctly.

4-2. Poor adjustment of the level for the right and left position sensors.

4-3. There are some defects on the rotary encoder and/or encoder board assembly.

### 5. Adjusting the right position sensor.

5-1. Bring back all the needles to position A and keep the sensor magnet of the L carriage away from the right position sensor.

5-2. Remove the needle selector panel assembly, turn on the power switch and check the voltage of the check pin (CH301) on the encoder board with the tester by setting it to the DCV.3 range.

Connect the black terminal of the tester to the metal part of the machine body and the red terminal to the check pin (CH301). (Fig. 38).

The indicator of the tester shows 1.6V – 2.0V.

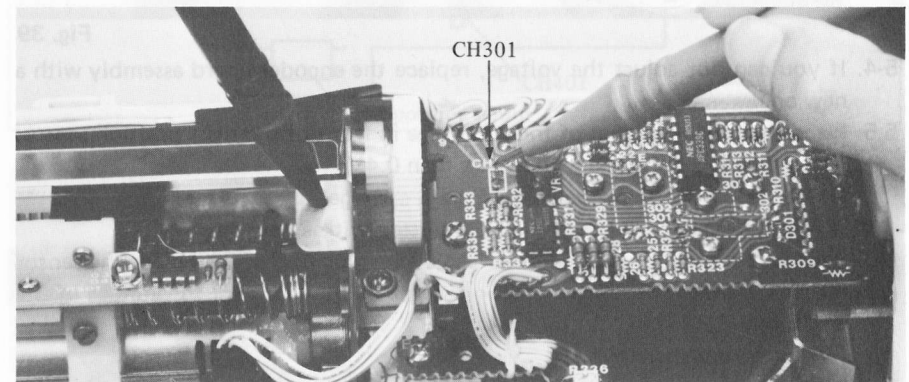


Fig. 38

5-3. If it does not show the above voltage, adjust the voltage to 1.8V by turning the variable resistor (VR301).

Turn the variable resistor, clockwise raise the voltage. (Fig. 39).

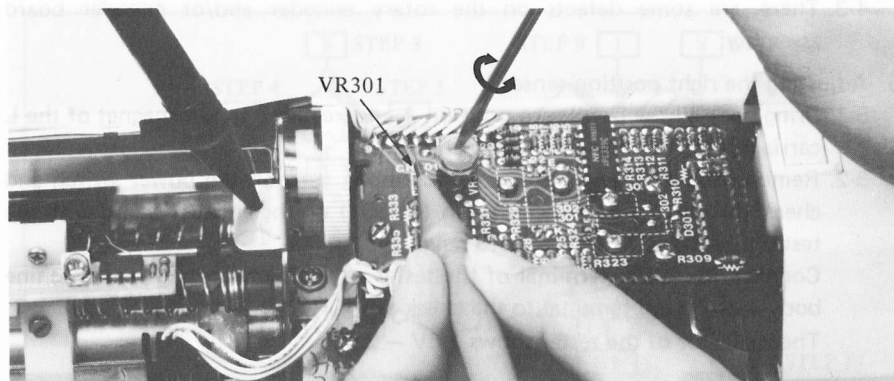


Fig. 39

5-4. If you can not adjust the voltage, replace the encoder board assembly with a new one.

5-5. Place the sensor magnet of the L carriage in front of the right position sensor. The indicator of the tester show less than 0.4V.

If not, check the sensor magnet of the L carriage.

If it is broken off, replace the release button with a new one.

5-6. Set the change knob of the K carriage to position "N.L." and place the sensor magnet in front of the right position sensor and then, check the voltage of the check pin (CH301).

It must be less than 2.7V.

5-7. If it is more than 2.7V, check the movement of the sensor magnet by changing the position of the change knob.

5-8. Set the tester to the DCV 10 range.

Set the change knob to position "KC(I)" and place the sensor magnet of the K carriage in front of the right position sensor.

5-9. The voltage of the check pin (CH301) is more than 3.4V.

If not, check the sensor magnet of the K carriage.

If it is broken off, replace it with a new one.

5-10. Set all the pattern variation switches to the lower position and remove the sinker plate assembly from the K carriage, then put reference mark on the center of the MC cam button. (Fig. 40).

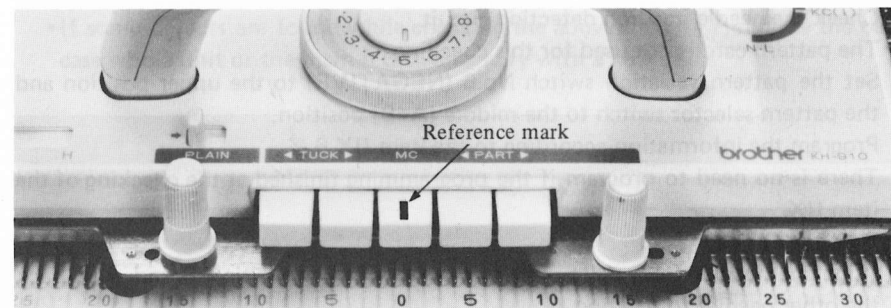


Fig. 40

5-11. Set the change knob to position "KC(I)" or "KC(II)" and pass the sensor magnet in front of the right position sensor.

Move the K carriage until the reference mark comes to the yellow 4 needle, and then operate it across and back between the yellow 4 needle and green 4 needle.

5-12. The mark sensor is moved when operating the K carriage slowly to the other side.

When the mark sensor is moved, the reference mark of the MC cam button must be placed on the green 1 needle.

The mark sensor must be moved while the reference mark of the K carriage is moving the inside of the yellow 1 needle and the green 2 needle. (Fig. 41).

If the mark sensor is moved outside of these needles, re-adjust the voltage of the check pin (CH301).

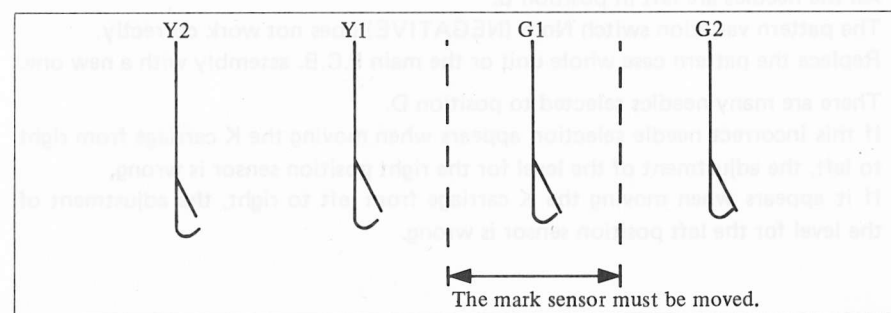


Fig. 41

1. If the mark sensor is moved outside (leftside) of the yellow 1 needle, lower the voltage of the check pin (CH301) to the 1.6V gradually.

Check the position where the mark sensor is moved by operating the item 5-11 and 5-12.

If the mark sensor is not moved at the correct position even if the voltage of the check pin (CH301) is lowered to 1.6V, adjust the mounting position of the right position sensor.

Slide it to the right and move backward, and then mount it securely.

2. If the mark sensor is moved outside (rightside) of the green 2 needle, raise the voltage of the check pin (CH301) to 2.0V gradually.

If the mark sensor is not move to the correct position even if the voltage of the check pin (CH301) is raised to 2.0V, adjust the mounting position of the right position sensor.

Slide it to the left and move forward, and then mount it securely.

## 6. Adjust the left position sensor.

6-1. Bring back all the needles at position A, and keep the sensor magnet of the L carriage away from the left position sensor.

6-2. Remove the needle selector panel assembly, row counter panel and pattern case whole unit.

When removing the pattern case whole unit, it is not necessary to pull out the connector from the main P.C.B.

Put the pattern case whole unit at the back of the machine and taking care not to short-circuit the main P.C.B. by touching it to the metal part of the machine body. (Fig. 42).

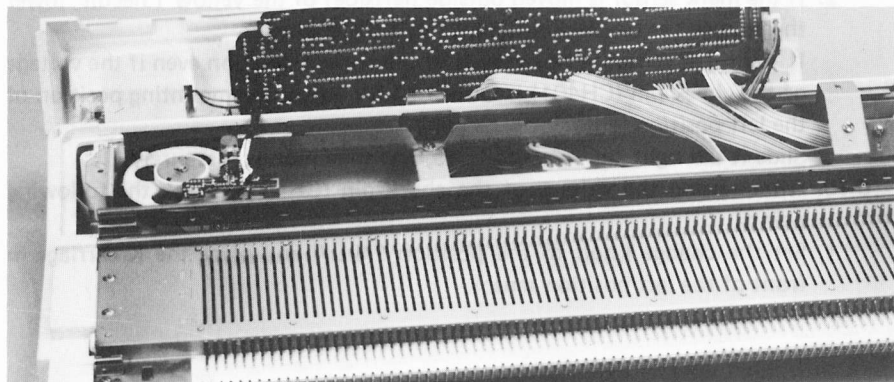


Fig. 42

## 6-3. Turn on the power switch.

Set the tester to DCV3 range and check the voltage of the check pin (CH401) on the left position sensor board assembly. (Fig. 43).

Connect the black terminal of the tester to the metal part of the machine body and the red terminal to the check pin (CH401). (Fig. 44).

The indicator of the tester shows 1.6V – 2.0V.

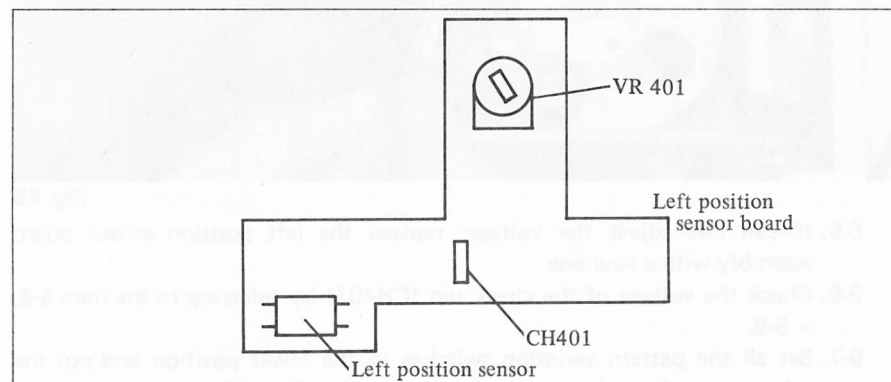


Fig. 43

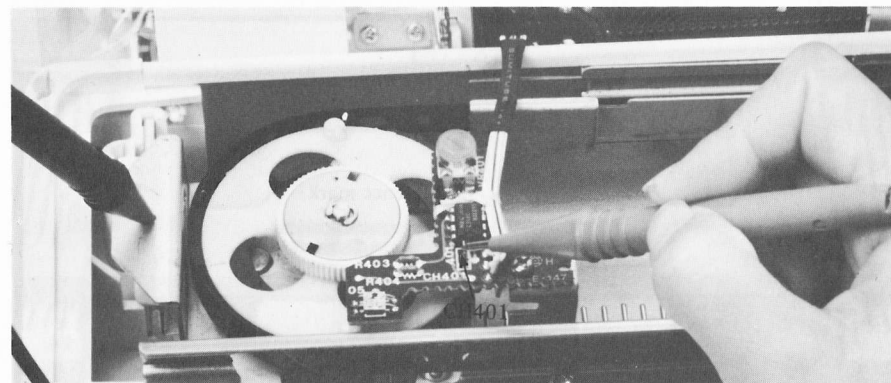


Fig. 44

6-4. If the indicator does not show the above voltage, adjust the voltage to 1.8V by turning the variable resistor (CH401).

Turn the variable resistor (CH401) counterclockwise, the voltage is raised up. (Fig. 45).



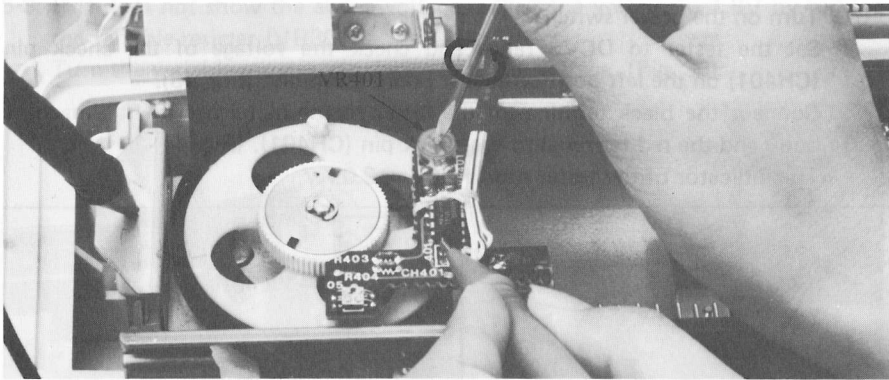


Fig. 45

- 6-5. If can not adjust the voltage, replace the left position sensor board assembly with a new one.
- 6-6. Check the voltage of the check pin (CH401) by referring to the item 5-5, - 5-9.
- 6-7. Set all the pattern variation switches to the lower position and put the reference mark on the center of the L carriage (Fig. 46).

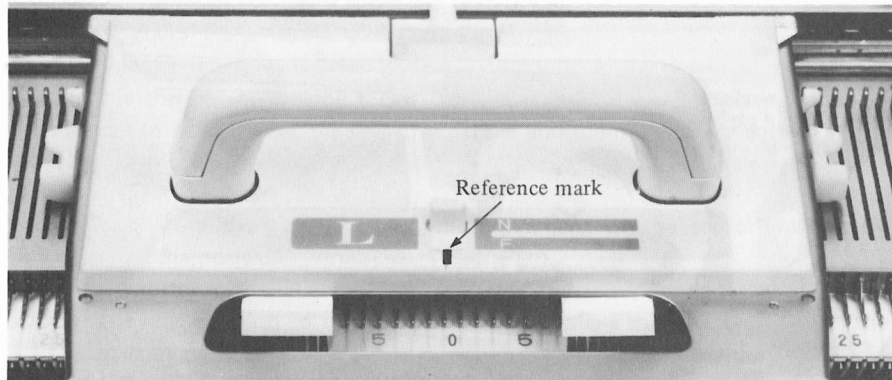


Fig. 46

6-8. Pass the sensor magnet of the L carriage in front of the left position sensor, and move the L carriage until the reference mark of it comes to the green 4 needle and operate it across and back between the yellow 4 needle and green 4 needle.

6-9. The mark sensor is moved when operating the L carriage slowly to the other side.

When the mark sensor is moved, the reference mark of the L carriage must be placed on the green 1 needle.

The mark sensor must be moved while the reference mark of the L carriage moving between the inside of the yellow 1 needle and green 2 needle. (Fig. 46).

If the mark sensor is moved outside (rightside) of those needles, re-adjust the voltage of the check pin (CH401) by turning the variable resister (VR401).

1. If the mark sensor is moved outside (rightside) of the green 2 needle, raise the voltage of the check pin (CH401) to 2.0V gradually.

After adjusting the voltage, check the position were the mark sensor is moved by operating the item 6-8, and 6-9.

If the mark sensor is not moved at the correct position even if the voltage of the check pin (CH401) is raised to 2.0V, adjust the mounting position of the left position sensor board assembly.

Slide it to the left and move backward, and then mount it securely.

2. If the mark sensor is moved outside (leftside) of the yellow 1 needle, lower the voltage the check pin (CH401) to 1.6V gradually.

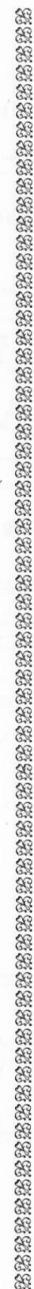
If the mark sensor is not moved at the correct position even if the voltage of the check pin (CH401) is lower to 1.6V adjust the mounting position of the left position sensor.

Slide it the right and move forward, and then mount it securely.

6-10. After raising the voltage of the check pin (CH401), check the following points.

1. Set the change knob to the position "N.L." and place the K carriage in front of the left position sensor.

2. Check the voltage of the check pin (CH401); and make sure that it is less than 2.7V.  
If it is more than 2.7V, lower the voltage of the check pin (CH401) to 2.7V and adjust the mounting position of the left position sensor board assembly.



**X. CHECKING AND ADJUSTMENT OF THE CARD READER.**

1. Checking the mark sensor.

Turn off the power switch and insert the pattern card guide.  
Insert the pattern card No.1 into the card inlet in a straight line with the figure facing you.  
Turn the card feeding dial toward you and set the set line of the pattern card at the card inlet.  
Make sure that the set line is parallel with the card inlet.  
Place the K carriage outside of the turn mark "1 C" or "1", and set the change knob to position "KC (1)".  
Turn on the power switch.  
Set the pattern variation No. 4 (DOUBLE HEIGHT) at the upper position and all the other switches at the lower position.  
Set the pattern selector switch to the middle (A-R) and program the formatter according to item IX, B, and then push the CF key.  
If the position of the pattern selector and programming are not changed after checking the item IX, B, there is no need to set any program after doing checking this item.  
Just push the CF key.  
The pattern card is fed into the card inlet until the number 1 of the 1 window comes to the card inlet and the mark sensor reads the first row of the pattern card twice.  
The same needle selection must be done after moving the K carriage to the other side and bringing back to the starting side.  
Check the number of D position's needles according to the following illustration.

(Fig. 47)

Y (yellow)	28, 22, 21, 18, 13, 11, 8, 3
G (green)	5, 4, 10, 15, 18, 20, 26, 28

The following needles are selected to position D at even rows of the pattern card.

(Fig. 48)

Y (yellow)	30, 28, 22, 20, 14, 12, 8, 3
G (green)	1, 3, 8, 11, 17, 18, 26, 27

## X. CHECKING AND ADJUSTMENT OF THE CARD READER.

### 1. Checking the mark sensor.

Turn off the power switch and insert the pattern card guide.

Insert the pattern card No.1 into the card inlet in a straight line with the figure facing you.

Turn the card feeding dial toward you and set the set line of the pattern card at the card inlet.

Make sure that the set line is in parallel with the card inlet.

Place the K carriage outside of the turn mark "I ⊂ " or " I ", and set the change knob to position "KC (II)".

Turn on the power switch.

Set the pattern variation No. 4 (DOUBLE LENGTH) at the upper position and all the other switches at the lower position.

Set the pattern selector switch to the middle (A+B) and program the information according to item IIX. 6, and then push the CF key.

If the position of the pattern selector and programming are not changed after checking the item IIX. 6, there is no need to set and program again before checking this item.

Just push the CF key.

The pattern card is fed into the card inlet until the number 1 of the L window comes to the card inlet and the mark sensor reads the first row of the pattern card twice.

The same needle selection must appear after moving the K carriage to the other side and bringing back to the starting side.

Check the number of D position's needles according to the following illustration.

(Fig. 47)

Y (yellow) . . . . . 29, 27, 21, 19, 13, 11, 5, 3,

G (green) . . . . . 2, 4, 10, 12, 18, 20, 26, 28

The following needles are selected to position D at even rows of the pattern card.

(Fig. 48)

Y (yellow) . . . . . 30, 28, 22, 20, 14, 12, 6, 4

G (green) . . . . . 1, 3, 9, 11, 17, 19, 25, 27

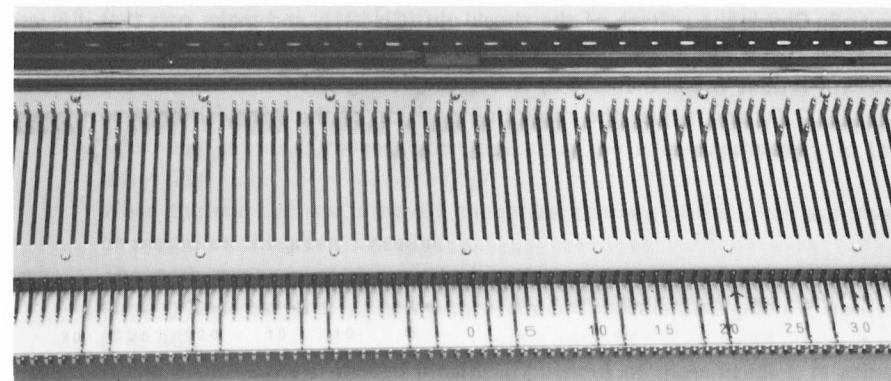


Fig. 47

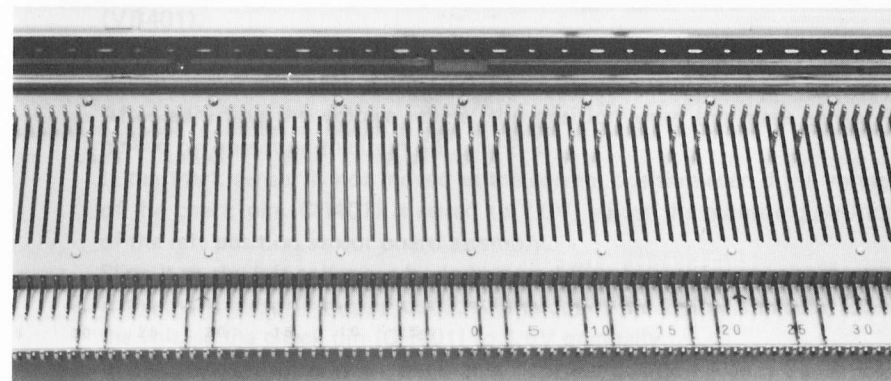
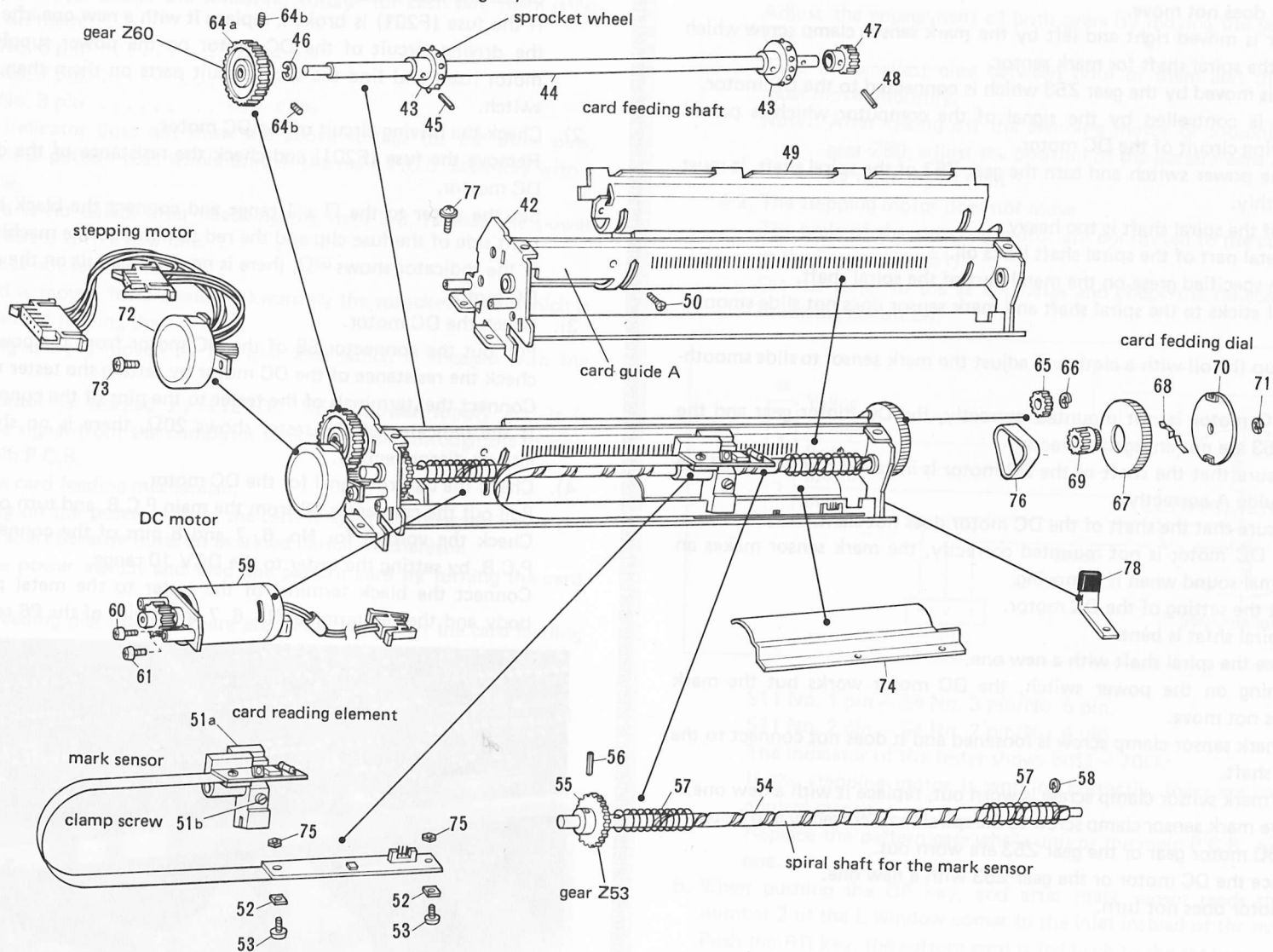


Fig. 48

2. Exploded diagram for the card reader.

(Please order the parts according to the parts catalogue.)





### 3. The mark sensor does not move.

The mark sensor is moved right and left by the mark sensor clamp screw which is connected to the spiral shaft for mark sensor.

The spiral shaft is moved by the gear Z53 which is connected to the DC motor. The DC motor is controlled by the signal of the computer which is passed through the driving circuit of the DC motor.

3-1. Turn off the power switch and turn the gear Z53 of the spiral shaft, it must move smoothly.

If turning of the spiral shaft is too heavy.

1). The metal part of the spiral shaft lacks oil.

Put the specified grese on the metal part of the spiral shaft.

2). The oil sticks to the spiral shaft and mark sensor does not slide smoothly.

Clean up the oil with a cloth and adjust the mark sensor to slide smoothly.

3). The DC motor is not mounted correctly, the DC motor gear and the gear Z53 are not engaged correctly.

Make sure that the shaft of the DC motor is installed to the hole of the card guide A correctly.

Make sure that the shaft of the DC motor does not slant.

If the DC motor is not mounted correctly, the mark sensor makes an abnormal sound when it is moving.

Adjust the setting of the DC motor.

4). The spiral shfat is bent.

Replace the spiral shaft with a new one.

3-2. When turning on the power switch, the DC motor works but the mark sensor does not move.

1). The mark sensor clamp screw is loosened and it does not connect to the spiral shaft.

If the mark sensor clamp screw is worn out, replace it with a new one.

Set the mark sensor clamp screw to the spiral shaft correctly and fasten it.

2). The DC motor gear or the gear Z53 are worn out.

Replace the DC motor or the gear Z53 with a new one.

3-3. The DC motor does not turn.

1). Check the fuse (F201) which is installed on the power supply board.

If the fuse (F201) is broken, replace it with a new one after replacing it, check the driving circuit of the DC motor on the power supply board or the DC motor itself and find the short-circuit parts on them then, turn on the power switch.

2). Check the driving circuit of the DC motor.

Remove the fuse (F201) and check the resistance of the driving circuit of the DC mortor.

Set the tester to the  $\Omega \times 1$  range and connect the black terminal of it to the right side of the fuse clip and the red terminal to the machine body.

If the indicator shows  $\infty\Omega$ , there is no short-circuit on the driving circuit of the DC motor.

3). Check the DC motor.

Pull out the connector S8 of the DC motor from the power supply board and check the resistance of the DC motor by setting the tester to the  $\Omega \times 1$  range.

Connect the, terminals of the tester to the pins of the connector S8.

If the indicator of the tester shows  $20\Omega$ , there is no short-circuit on it and also no disconnection.

4). Check the control signal for the DC motor.

Pull out the connector S6 from the main P.C.B. and turn on the power switch.

Check the voltage for No. 6, 7 and 8 pins of the connector P6 on the main P.C.B. by setting the tester to the DCV 10 range.

Connect the black terminal of the tester to the metal parts of the machine body and the red terminal No. 6, 7 and 8 pins of the P6 respectively. (Fig. 49)

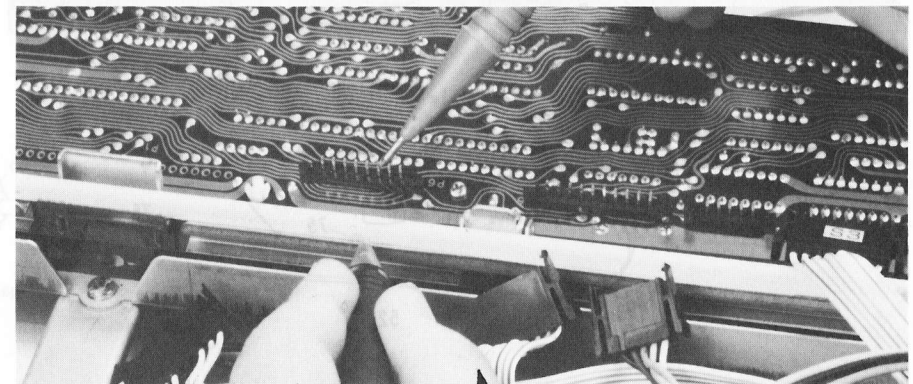


Fig. 49

If the indicator shows the following voltage for each pin, there is no defect on them.

P6 No. 6 pin . . . . . +5V ± 5%

P6 No. 7 pin . . . . . 0V

P6 No. 8 pin . . . . . +5V ± 5%

If the indicator does not show the above voltage for the three pins, replace the pattern case whole unit or the main P.C.B. assembly with a new one.

5). If there is no defect after checking the item 3-3, replace the power supply board with a new one.

4. The pattern card is not fed correctly.

The pattern card is moved forward and backward by the sprocket wheel which is connected to the card feeding shaft.

The card feeding shaft is moved by the gear Z60 which is engaged with the stepping motor.

The stepping motor is worked by +12VDC REG. power supply and it is controlled by the signal from the computer which is passed through the driving circuit of the main P.C.B.

4-1. Checking the card feeding mechanism.

When turning on the power switch, the card feeding dial does not move the card feeding shaft because it has an overload clutch mechanism.

Turn off the power switch and feed the pattern card by turning the card feeding dial.

If the card feeding dial ratchets there are some defects on the card feeding mechanism.

The encoder cords are fouling the card feeding dial or the gear Z60.

The gear for the stepping motor and the gear Z60 are engaged too tight. (Fig. 50)

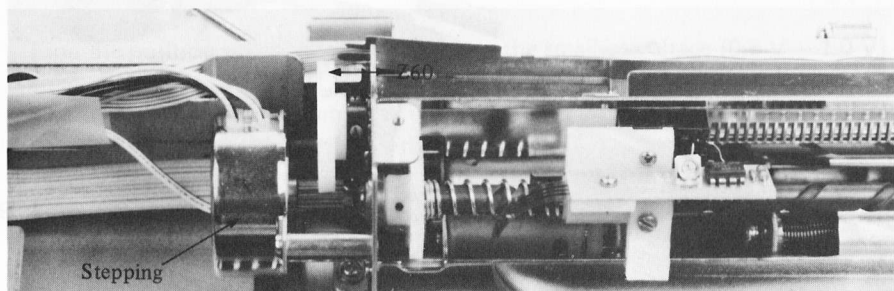


Fig. 50

Adjust the engagement of both gears by moving the gear Z60 to right and left.

Take the smallest play between both of them and the card feeding shaft must move smoothly.

Note: After taking off the stepping motor or loosening the screw of the gear Z60, adjust the position of the pattern card and the mark sensor by referring to item 7.

4-2. The stepping motor does not move.

The coils of the stepping motor are connected to the connector S4 as show in the figure. (Fig. 51)

Set the tester to the Ω x 1 range and check the resistance of each coils as following condition.

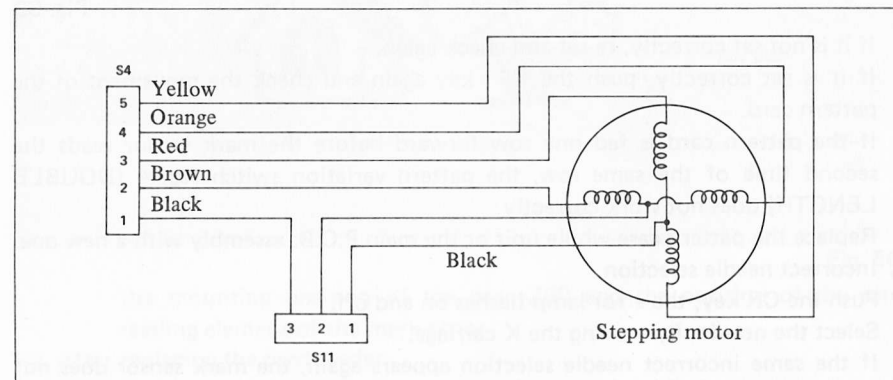


Fig. 51

S11 No. 1 pin – S4 No. 3 pin/No. 5 pin.

S11 No. 2 pin – S4 No. 2 pin/No. 4 pin.

The indicator of the tester shows 50Ω – 70Ω.

If the stepping motor is working correctly, there are some defects on the control circuit.

Replace the pattern case whole unit or the main P.C.B. assembly with a new one.

5. When pushing the CF key, and after mark sensor reads the card twice, the number 2 of the L window comes to the inlet instead of the number 1.

Push the RR key, the pattern card is fed back to the set line.

Make sure that the pattern card is set the card inlet correctly. (Fig. 52)

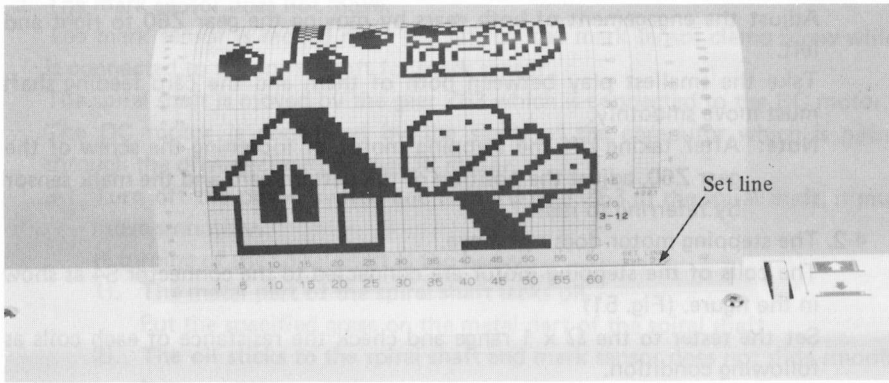


Fig. 52

If it is not set correctly, re-set and check again.

If it is set correctly, push the CF key again and check the movement of the pattern card.

If the pattern card is fed one row forward before the mark sensor reads the second time of the same row, the pattern variation switch No. 4 (DOUBLE LENGTH) does not work correctly.

Replace the pattern case whole unit or the main P.C.B. assembly with a new one.

6. Incorrect needle selection.

Push the CR key, the error lamp flashes on and off.

Select the needles by moving the K carriage.

If the same incorrect needle selection appears again, the mark sensor does not read the pattern card correctly.

Clean the specular surface of the card guide A and mark sensor and check the standstill position of the pattern card. (Fig. 53)

The first pattern's line of the pattern card should be on the same level as the bottom line of the windows. (Fig. 53)

If it is not, adjust the position of the pattern card.

If the position of the pattern card is correct, check the mark sensor circuit.

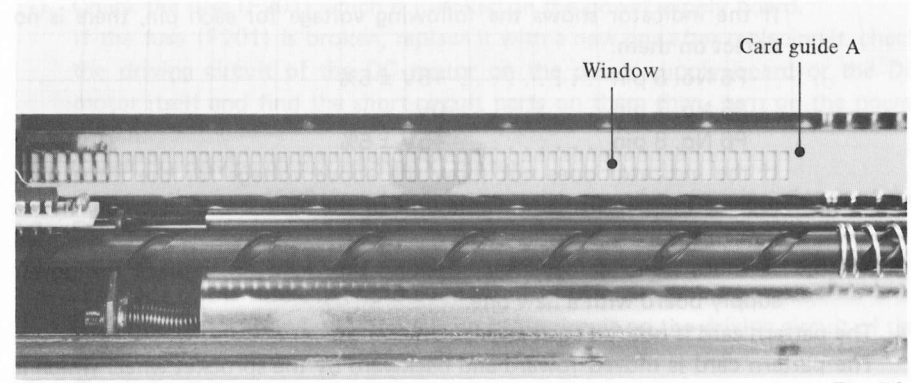


Fig. 53

7. Adjusting the card reader.

7-1. When taking off or replacing the stepping motor.

- 1). Mount the card reader to the body and connect the connector S4 of the lead wire for the stepping motor to P4 of the main P.C.B., the connector S11 to P11 of the power supply board, the connector S8 of the DC motor to P8 of the power supply board and the connector S10 of the encoder board assembly to P10 of the mark sensor.

- 2). Remove the fuse (F201) from the power supply board.

(The DC motor does not move.)

**CAUTION:** If the power switch is turned on without connecting the connector S8, the power supply board will be broken.

- 3). Loosen the screw of the gear Z60. (Fig. 54)

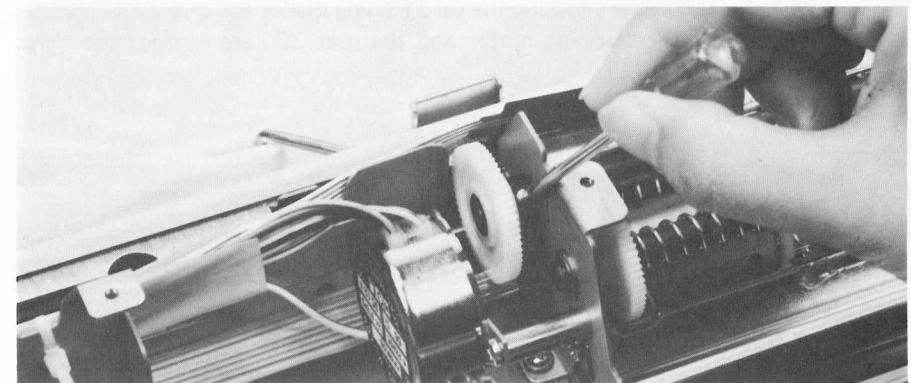


Fig. 54

4. Insert the pattern card No. 1 into the card inlet and feed it by turning the card feeding until the set line of the pattern card comes to the bottom line of the card guide A window.
5. Set the tester to the DCV 10 range, connect the black terminal of it to the metal part of the machine body and the red terminal to the check pin (CH501) of the mark sensor to check the output voltage of the mark sensor. (Fig. 55)

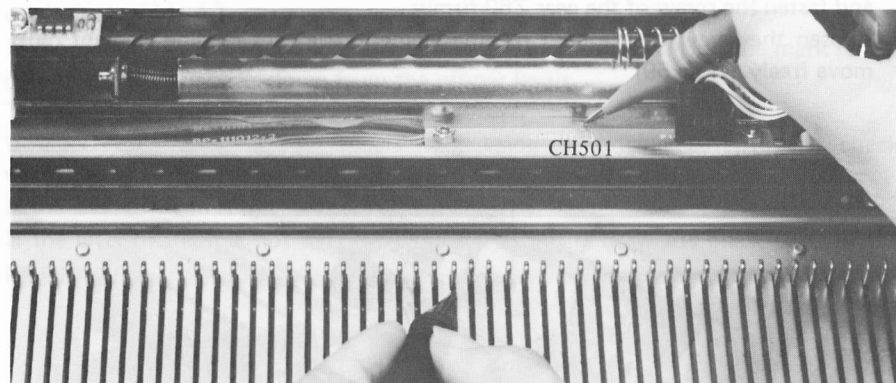


Fig. 55

6. Plug in the power cord and turn on the power switch.  
Slide the mark sensor to the left side of the card reader by turning the gear Z53.  
The mark sensor reads the specular surface of the card guide A and the indicator shows 3.4 – 3.8V.
7. Turn the gear Z53 slowly toward you by watching the tester and find the position where the indicator shows the smallest voltage (1.8V – 2.8V).  
The mark sensor reads the center of the first window of the card guide A.
8. Keep the mark sensor at this position and turn the card feeding dial slowly toward you.  
Find the position where the indicator shows the smallest voltage (0.5 V – 1.0 V), smallest voltage (0.5 V – 1.0 V).  
The indicator shows the smallest voltage at the position where the first blank line of the pattern card is fed to the same level of the bottom line of the card guide A window.
9. Fasten the screw of the gear Z60.  
When fastening the screw of the gear Z60, keep the mark sensor at the position

### 10. CHECKING THE PATTERN VARIATION

- 10). Turn off the power switch and make sure that the pattern card is fed smoothly by the card feeding dial.
- 11). Mount the needle selector panel assembly and insert the pattern card to the card inlet and set the set line of the pattern card to the card inlet correctly.  
Turn on the power switch and check the set line of the pattern card.  
If there is a gap between the set line and the card inlet, (Fig. 56) adjust

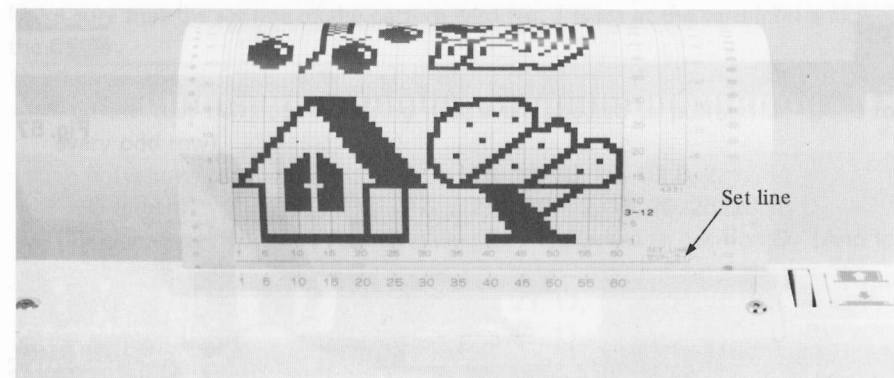


Fig. 56

- the mounting position of the gear Z60 and the position of the card-reading element of the mark sensor.
- 7-2. After replacing the card reader.
    - 1). Set the mark sensor at the center of the card guide A window. At this time, use the special card for level checking instead of the pattern card No.1 (Fig. 57)  
The mark sensor does not show 1.8 V– 2.8 V because it is not adjusted correctly.  
If the level of the mark sensor at the check pin (CH501) does not change from 3.4 – 3.8 V even if the mark sensor is moved, adjust the voltage of the check pin (CH501) by turning the variable resistor (VR501) which is on the mark sensor counterclockwise. (Fig. 58)



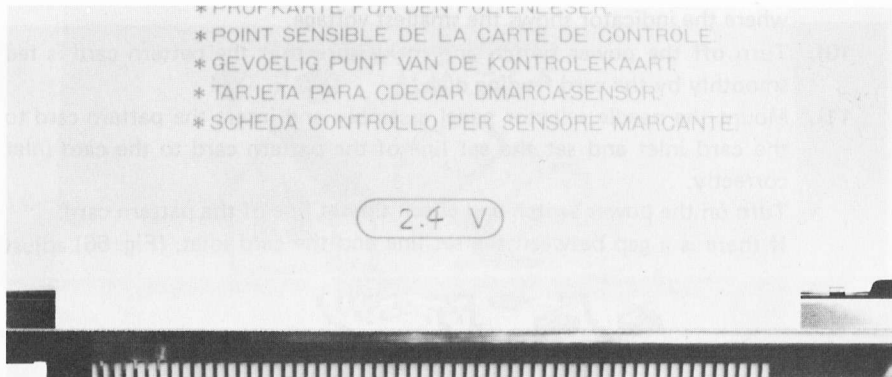


Fig. 57

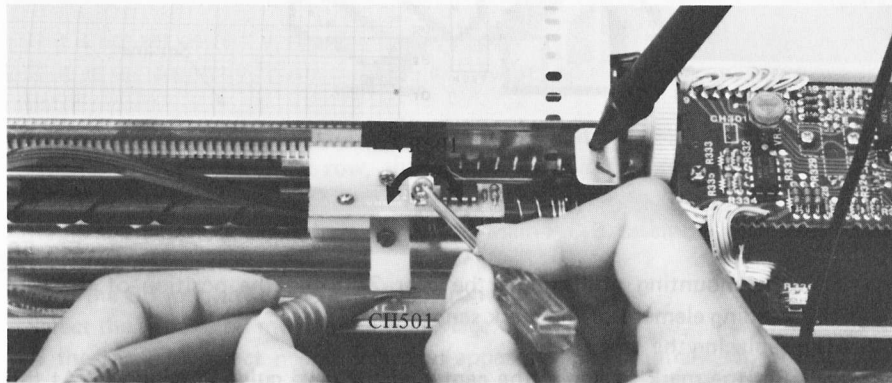


Fig. 58

2. After setting the mark sensor at the center of the card guide A window, keep it at this position and then, adjust the voltage of the check pin (CH501) according to the special card for level checking.  
 After adjusting the voltage, fix the level (VR501) by using locking paint on the variable resistor.
3. Remove the special card for level checking and set the pattern card No. 1.  
 Feed the pattern card by turning the card feeding dial until the first three blanks come into the window of the card guide A.

4. Fasten the screw of the gear Z60 provisionally at the position where the blank line of the pattern card meets the bottom line of the card guide A window.  
 When fastening the screw, reduce the clearance between the gear Z60 and the gear of the stepping motor.
5. Make sure that the set line of the pattern card is set to the card inlet correctly.  
 If there is a gap between them, adjust the mounting position of the gear Z60 and fasten the screw of the gear Z60 firmly.
6. Loosen the screw of the card reading element, the card reading element must move freely. (Fig. 59)

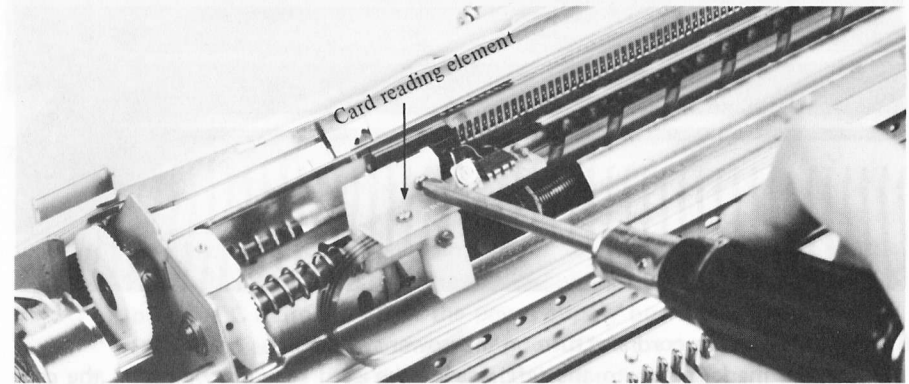


Fig. 59

7. Set the first three blanks of the pattern card in the window of the card guide A.  
 Set the mark sensor at the first window of the card guide A and move the card reading element up and down.  
 Fix the card reading element at the position where the indicator shows the smallest voltage.
- 7-3. Operation of the mark sensor.  
 The mark sensor reads the following three parts and the computer judges the reading position by the output voltage of the mark sensor. (the voltage of the check pin CH501)
- 1). Sepcular surface of the card guide A.  
 (parts of the chassis) . . . . . over 3.4 V

2. White parts of the pattern card . . . . . 2.4 V  
(1.4 V – 3.0 V)
  3. Black parts of the pattern card . . . . . less than 1.0 V
- The mark sensor stops reading after counting the 60 signals (sampling clock) of the card guide A.
- The output voltage of the mark sensor comes down to 3.0 V, if the specular surface of the card guide A is dirty or some dust sticks to the face of it.
- If the pattern card is soiled with the coffee, oil, etc., the voltage of the mark sensor goes over and /or comes down from the proper levels.
- They will cause the incorrect needle selection.
- If incorrect needle selection appears when using the original pattern card, check voltage of the mark sensor and adjust them to the proper levels.
- If the level of them is not within the proper levels.
- If the level of them is not within the proper range, re-draw the black parts of the pattern.

## XI. CHECKING THE PATTERN VARIATION SWITCHES.

If there are some defects on the pattern variation switches, replace the pattern case whole unit or the main P.C.B. assembly with a new one.

Pattern variation switch No. 4 (DOUBLE LENGTH) and No. 6 (NEGATIVE) are already checked by item IX and X.

Set the pattern variation switch which will be checked at the upper position and the other switches at the lower position.

If the position of the pattern selector switch and/or the programming are changed, re-program the information according to the item IIX. 6.

Make sure that the set line of the pattern card No. 1 is set at the card inlet and push the CF key.

- 1). Pattern variation switch No. 1 (PATTERN A REVERSE).  
For the first row, the following needle are selected to position D. (And for every odd row).  
Y (yellow) . . . . . 26, 24, 18, 16, 10, 8, 2.  
G (green) . . . . . 2, 4, 10, 12, 18, 20, 26, 28.  
For the second row, the following needles are selected to position D. (And for every even row).  
Y (yellow) . . . . . 25, 23, 17, 15, 9, 7, 1.  
G (green) . . . . . 1, 3, 9, 11, 17, 19, 25, 27.
2. Pattern variation switch No. 2 (PATTERN B REVERSE).  
\* Push "1" key and CF key.  
For the first and for every odd row.  
Y (yellow) . . . . . 29, 27, 21, 19, 13, 11, 5, 3.  
G (green) . . . . . 5, 7, 13, 15, 21, 23, 29.  
For the second row and for the every even row.  
Y (yellow) . . . . . 30, 28, 22, 20, 14, 12, 6, 4.  
G (green) . . . . . 6, 8, 14, 16, 22, 24, 30.
3. Pattern variation switch No. 3 (DOUBLE WIDTH)  
Make sure that the ready lamp is on.  
Set the pattern selector switch to the lowest position at first, and then re-set it to the upper position, (Full pattern – pattern A).  
Push the M key continuously until the step lamp No. 6 is lit up, and check if the number in the display is yellow 8.  
If the number in the display is yellow 4, the No. 3 pattern variation switch does not work correctly.

#### 4. Pattern variation switch No. 5 (REFLECTION).

Make sure that the ready lamp is on and push the "8" and "CF" keys.

The pattern card is fed to the number 8 of the L window and the mark sensor reads the 8th row of the pattern card.

The pattern card is fed backward and the mark sensor reads the 7th row of the pattern card.

If the pattern card is fed back to the number 1 of the L window after it is fed to the number 8 of the L window and mark sensor reads 8th row, the No. 5 pattern variation switch does not work correctly.

#### 5. Pattern variation switch No. 7 (KRC).

Push "1" key and the "CF" key.

The pattern card is fed to number 1 of the L window and the mark sensor reads the first row of the pattern card twice.

If the pattern card is fed one row forward after the mark sensor reads it only once, the No. 7 pattern variation switch does not work correctly.

## XII. REPLACEMENT

### 1. Replacing the pattern case whole unit.

#### 1-1. Disassembling the top covers.

Disassemble the needle selector panel assembly, row counter panel and pattern case whole unit in that order.

##### 1). Removing the needle selector panel assembly.

Remove the two needle selector panel clamp screws and lift the left side of the panel until the card feeding dial comes out from the slit of the panel.

Slide the panel to the left slightly and take it off from the lower side plate(R).

##### 2). Removing the row counter panel.

Remove the two row counter panel clamp screws and take off the row counter panel.

When removing the row counter panel, take care not to break the power supply pilot lamp.

##### 3). Removing the pattern case whole unit.

A. Lift the right side of the pattern case and pull it out to the right slightly. (Fig. 60)

B. Raise the back side of the pattern case and slide it backward until the main P.C.B. comes out from the left position sensor board assembly and then, turn it round. (Fig. 61)

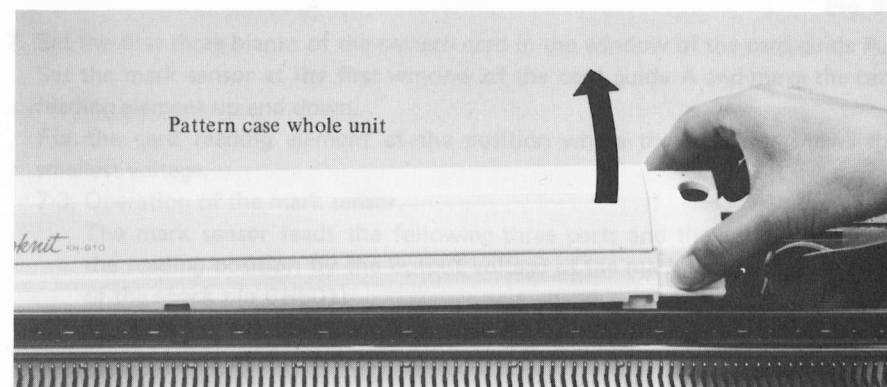


Fig. 60



Fig. 61

The left position sensor board assembly is put between the main P.C.B. and the operation P.C.B. (Fig. 62)

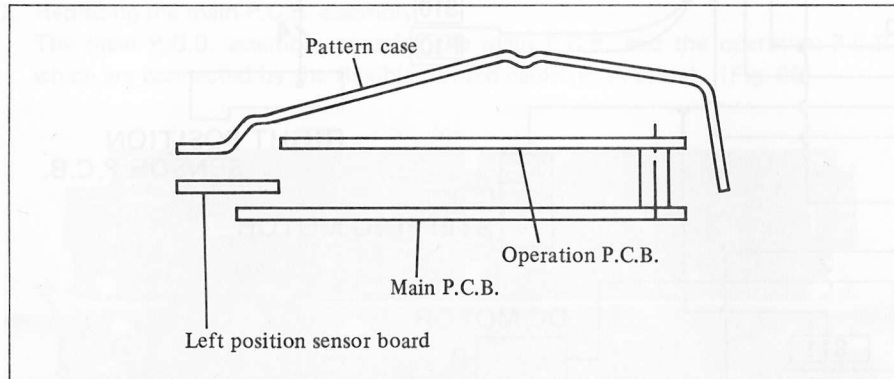


Fig. 62

When removing the pattern case whole unit, do not lift it upward and be careful not to break the main P.C.B.

The main P.C.B. has seven connectors, therefore do not handle the pattern case whole unit by force.

C. Pull out all the connectors.

All of the except the connectors S1 have locklevers, squeeze to release before removing connector (Fig. 63)

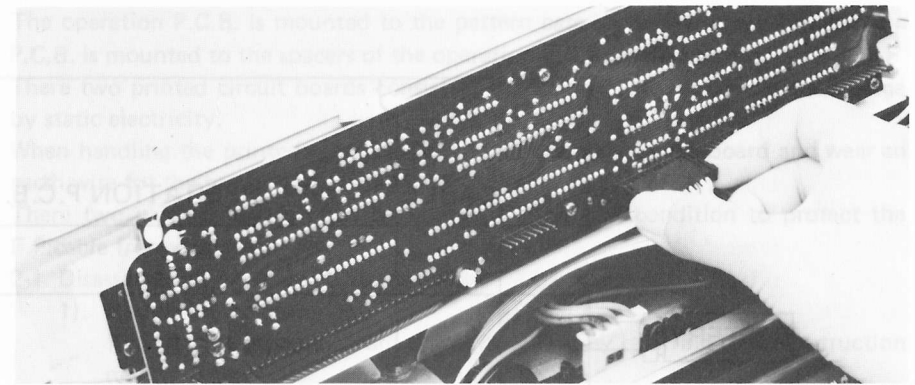


Fig. 63

1-2. Assembling the top covers.

(Needle selector panel assembly, row counter panel and pattern case whole unit)

Assemble these three panels in the reverse order.

1). Assembling the pattern case whole unit.

- A. For location of the connector, refer to the connector diagram. (Fig. 64) Connect the connector S1 first, and then connect the others. Arrange the lead wire of the connectors, do not twist them and then, connect them correctly.
- B. Place the lead wire of the connector at the back side of the condenser (C201), buzzer and transistor, and insert them under the timing belt cover L. (Fig. 65)

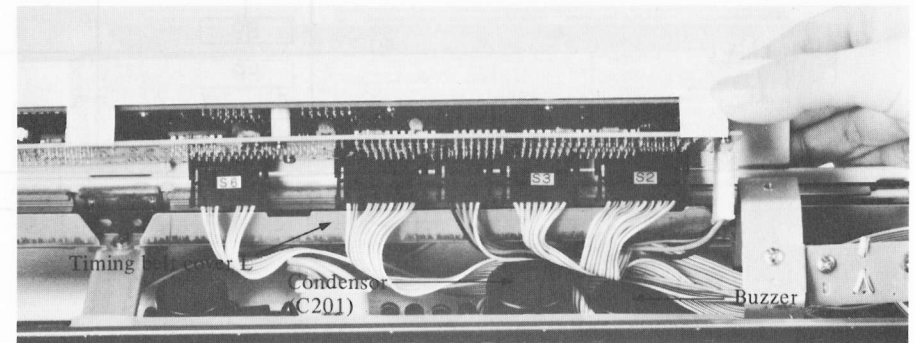


Fig. 65



### CONNECTION DIAGRAM

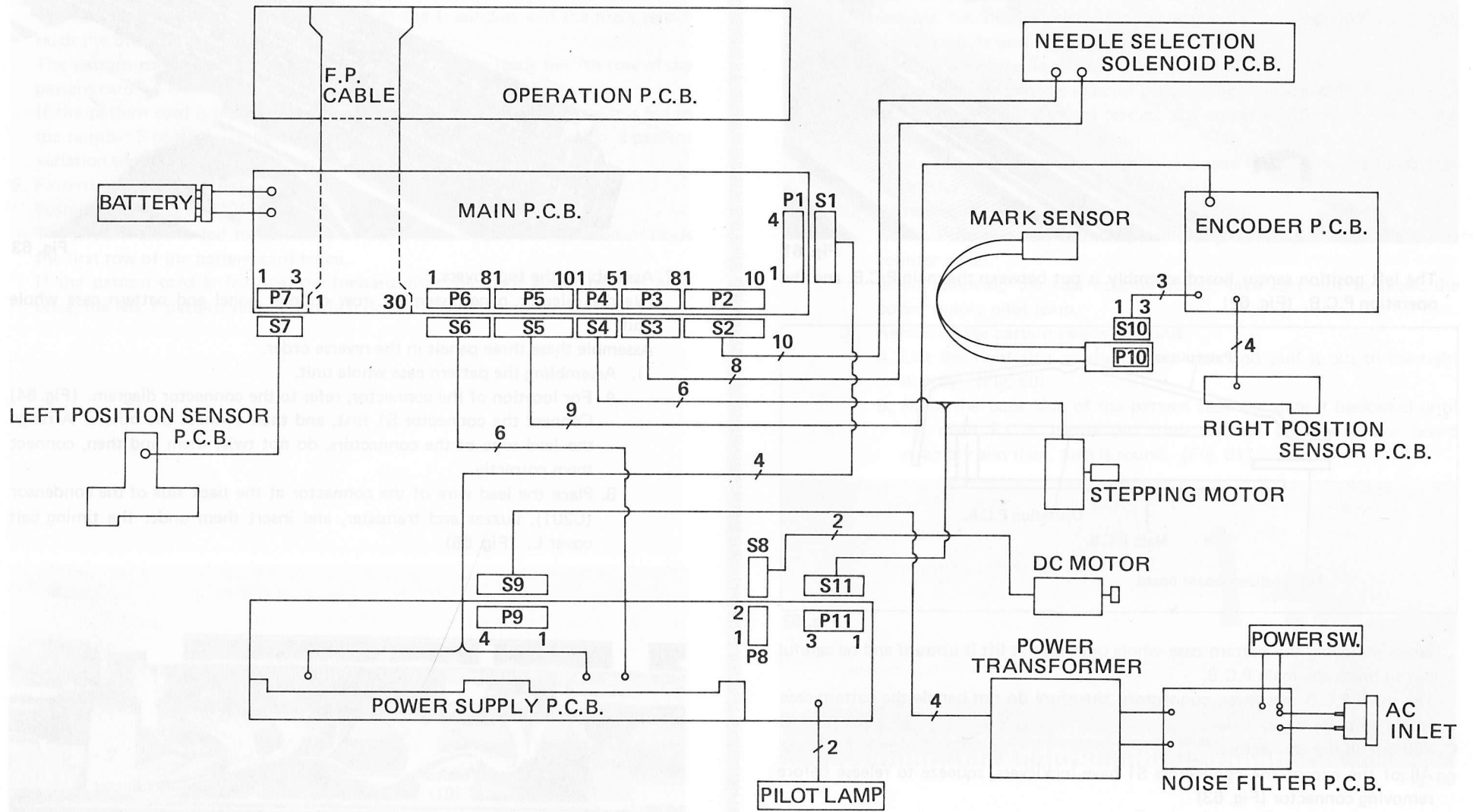


Fig. 64

C. Lower this side of the pattern case and insert the left position sensor board assembly between the main P.C.B. and the operation P.C.B. and put it on the machine body.

Insert the left side of the pattern case whole unit into the lower side plate (L) by sliding it to the left.

Make sure that the lead wire of the connectors do not lay on the buzzer.

If the lead wire of the connectors are laid on the buzzer, it can not make the proper sound.

2). Assembling the row counter panel.

Set the hole of the row counter panel to the yarn tension stand rod.

Fasten the two screws. (Use the long screw for the left side)

3). Assembling the needle selector panel assembly.

Insert the needle selector panel assembly into the lower side plate (R) and fasten the right screw first, and then fasten the left screw.

2. Replacing the main P.C.B. assembly.

The main P.C.B. assembly contains the main P.C.B. and the operation P.C.B. which are connected by the flexible printed cable (F. P. cable). (Fig. 66)

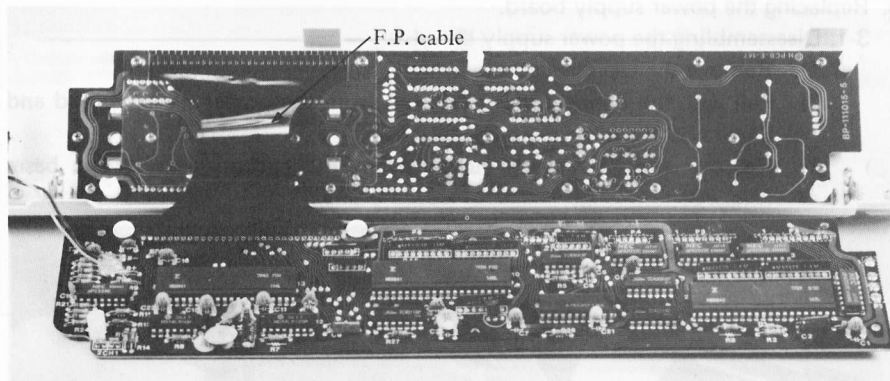


Fig. 66

The operation P.C.B. is mounted to the pattern case by twelve screw and the main P.C.B. is mounted to the spacers of the operation P.C.B. by five screws.

There two printed circuit boards consist of the LSI, IC, etc. which can be damage by static electricity.

When handling the printed circuit boards, hold the edge of the board and wear an earth wire for the prevention of static electricity.

There two printed boards must be kept in the parallel condition to protect the F.P.cable from damage.

2-1. Disassembling the main P.C.B. assembly.

1). Removing the batteries.

Remove the batteries from the battery box by referring to the instruction manual page 89.

2). Removing the main P.C.B.

A. Hold the pattern case whole unit with the rear side facing you and put the battery side of it on the left.

B. Take out the battery cord.

Take care when handling it to protect the battery cord from damage, especially, the parts which are soldered to main P.C.B.

C. Remove the five screws.

Take care not to damage the printed circuit board when using the screw driver. (Fig. 67)

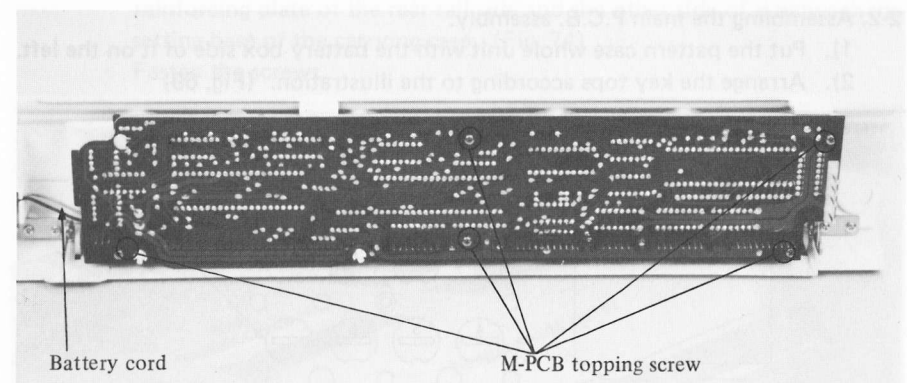


Fig. 67

D. Open out main and operation P.C.B.

Take care not to break the F.P.cable.

3). Removing the operation P.C.B. (Fig. 68)

A. Remove the twelve tapping screw marked A.

Remove the operation P.C.B. from the pattern case by lifting it upward slightly.

Take care not to break the eighteen LEDs which are mounted on the printed circuit board and do not loose the key tops and conductive rubber plate. Do not remove the screws for slide switches. (marked B.)

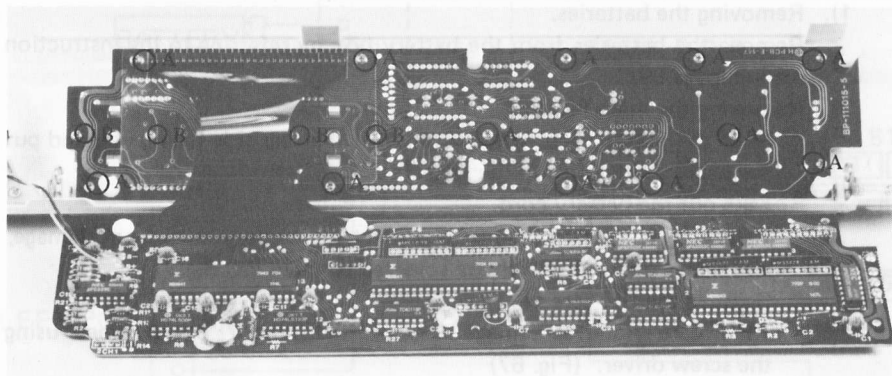


Fig. 68

2-2. Assembling the main P.C.B. assembly.

- 1). Put the pattern case whole unit with the battery box side of it on the left.
- 2). Arrange the key tops according to the illustration. (Fig. 69)

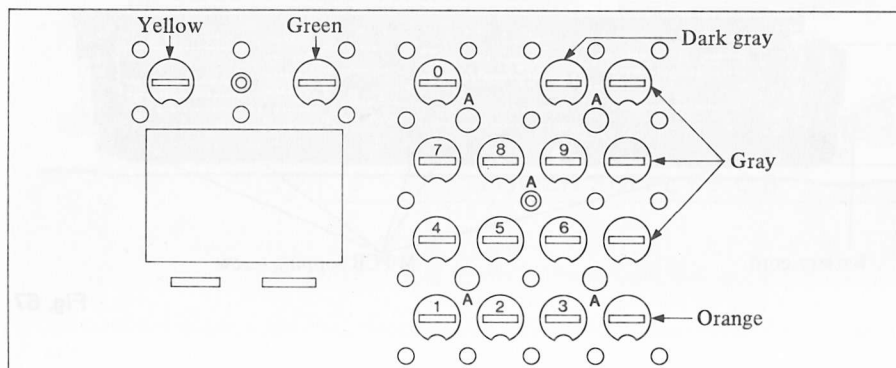


Fig. 69

3). Cover the key tops with the conductive rubber plate.

Set the hole of the conductive rubber plate to the boss (marked A) of the pattern case.

- 4). Insert the pattern position key lamp into the hole in the conductive rubber plate and put the operation P.C.B. on it.
- 5). Insert all the LEDs into the hole in the pattern case and fasten the screws.
- 6). Place the FP cable insulation board under the flat cable and faster the two screws.
- 7). Mount the main P.C.B. to the spacer of the operation P.C.B. and fasten the screws.
- 8). Stow the batteries in the battery case and put them in the plastic bag. Stow the battery cord in the battery box and connect it to the battery case, and then stow them in the battery box.

NOTE: After replacing the main P.C.B. assembly and mounting the pattern case whole unit on the machine, program the initial information by referring to the instruction manual page 90. referring to the instruction manual page 90.

3. Replacing the power supply board.

3-1. Disassembling the power supply board.

- 1). Remove the top covers.
- 2). Pull out the connector S8, S9 and from the power supply board and S1 and S6 from the main P.C.B.
- 3). Remove the pilot lamp holder from the pattern case setting base. (Fig. 70)

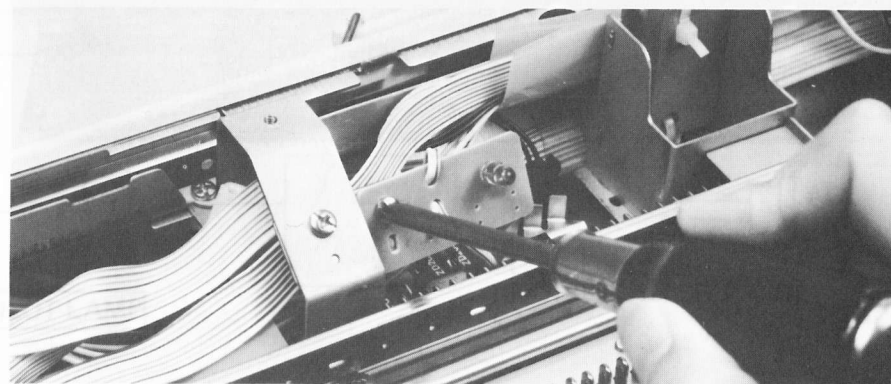


Fig. 70

4. Remove the pattern case setting base and carrying case reinforcing plate, then the needle shank cover will come off. (Fig. 71)



Fig. 71

5. Remove the three screws and take off the power supply P.C.B. (Fig. 72)

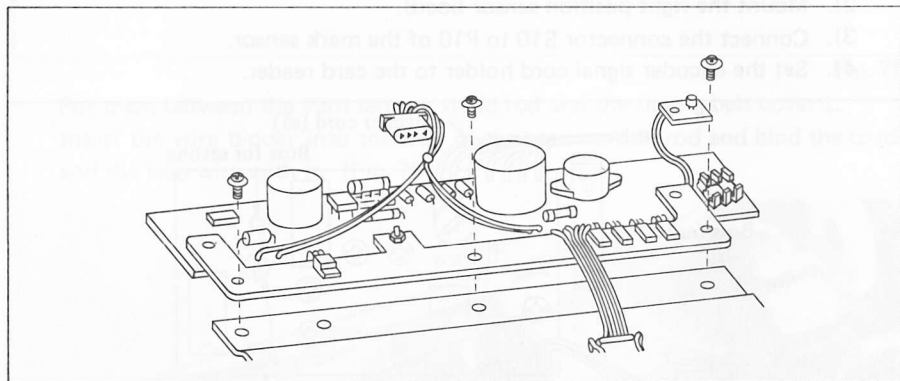


Fig. 72

### 3-2 Assembling the power supply board.

- 1). Mount the power supply board.
- 2). Connect the connectors S8, S9, and S11 of the power supply P.C.B.
- 3). Mount the pattern case setting base and the carrying case reinforcing plate.
  - A. Fasten the screws for the rear rail side provisionally.
  - B. For the carrying case side, insert them between the timing belt cover L and the setting plate of the carrying case and fasten the screws securely.

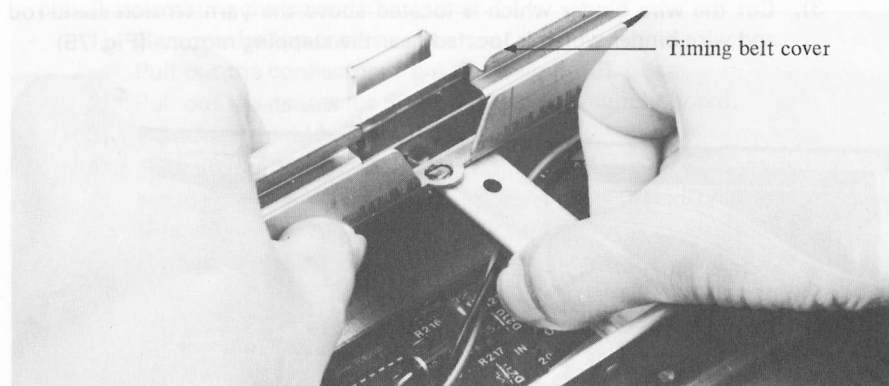


Fig. 73

- C. Insert the notch of the needle shank cover to the carrying case reinforcing plate of the rear rail side and the other side of it between the setting base of the carrying case. (Fig. 74)  
Fasten the screws.

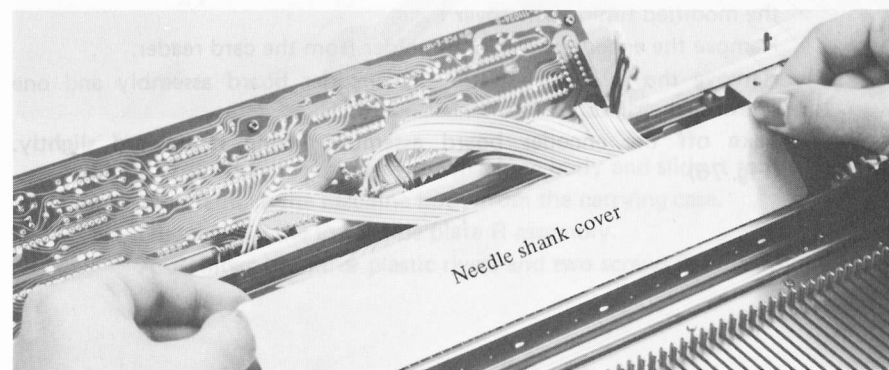


Fig. 74



- 4). Mount the power supply pilot lamp holder to the pattern case setting base.
  - 5). Mount the three panels.
4. Replacing the encoder board assembly.
- 4-1. Disassembling to encoder board assembly.
- 1). Remove the top cover.
  - 2). Pull out the connector S10 from the mark sensor and the connector S5 from the main P.C.B.
  - 3). Cut the wire binder which is located above the yarn tension stand rod and wire binder which is located near the stepping motor. (Fig. 75)

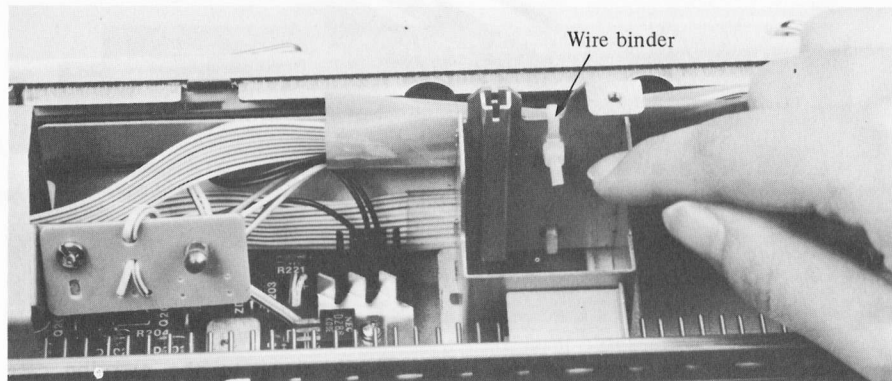


Fig. 75

Take off the encoder signal cord cover from the card reader.  
The wire binder for the lead wire of the stepping motor is not used for the modified timing belt cover L.

Remove the encoder signal cord holder from the card reader.

- 4). Remove the three screws for the encoder board assembly and one screw of the right position sensor board.  
Take off the encoder board assembly lifting it upward slightly. (Fig. 76)

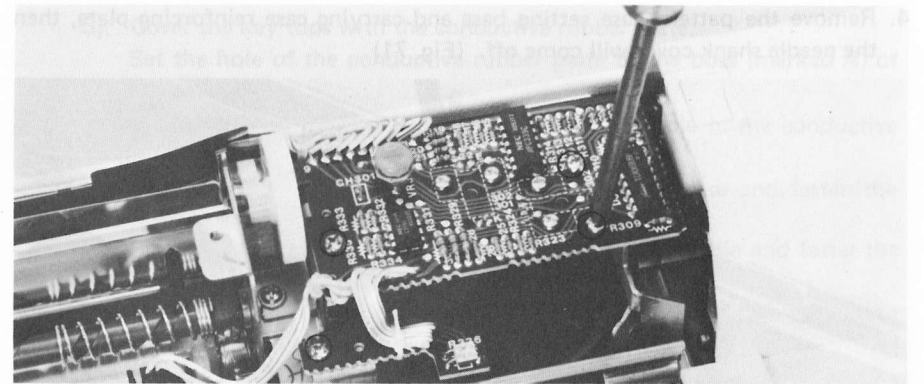


Fig. 76

4-2. Assembling the encoder board assembly. (Fig. 77)

- 1). Set the hole of the encoder board to the bosses of the encoder board holder, and then fasten the screws.
- 2). Mount the right position sensor board.
- 3). Connect the connector S10 to P10 of the mark sensor.
- 4). Set the encoder signal cord holder to the card reader.

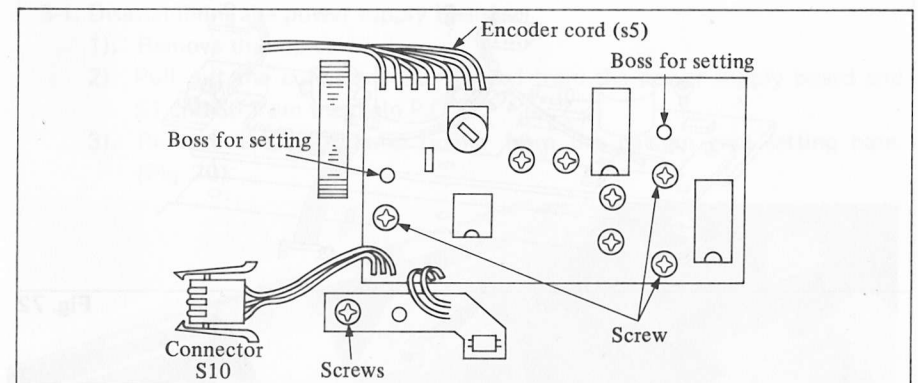


Fig. 77

- 5). Insert the encoder signal cord in the encoder signal cord holder, and pass it behind the cord stopper and the timing belt cover L.  
Hook the encoder signal cord by the hooks of the encoder signal cord holder. The encoder must not touch the card feeding gear Z60. (Fig. 78)
- 6). Arrange the encoder cord, the lead wire of the DC motor and the lead wire of the stepping motor in order and cover them with the encoder cord cover.

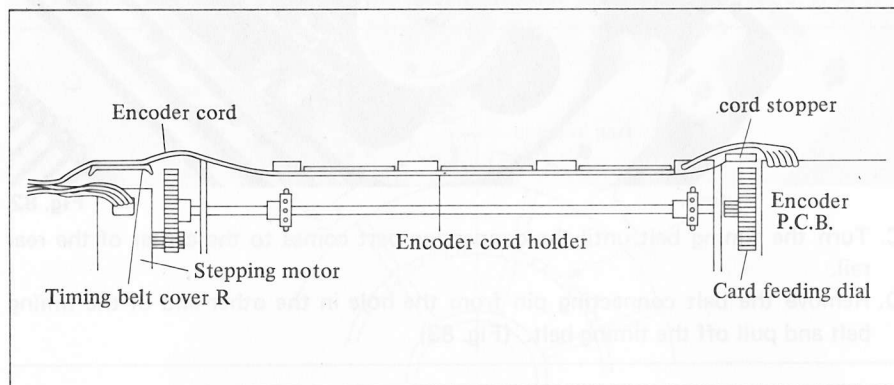


Fig. 78

Put them between the yarn tension stand rod and the timing belt cover L. Insert the wire binder into the hole of the yarn tension rod and bind the cords and the lead wire with it. (Fig. 79)

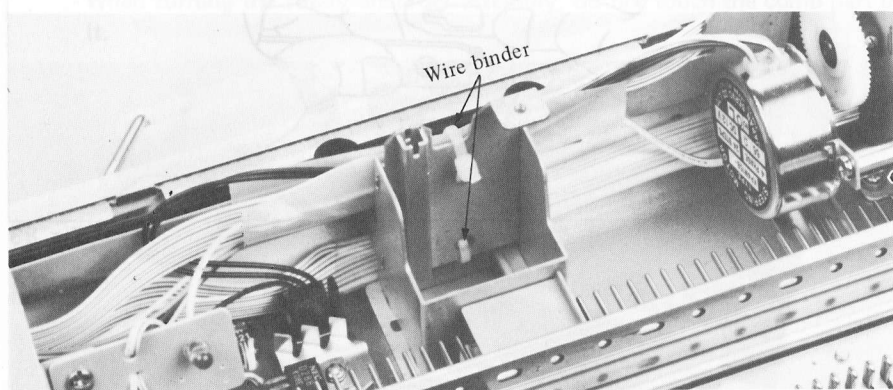


Fig. 79

When using the unmodified timing belt cover L, bind the encoder cord and the lead wire of the stepping motor with the wire binder so that it can not foul the gear Z60.

- 7). Pass the encoder cord under the pattern case setting base and connect the connector S5 to the main P.C.B.
  - 8). After replacing the encoder board assembly, adjust the voltage of the right position sensor.
5. Replacing the power transformer.

5-1. Disassembling the power transformer.

- 1). Remove the top covers.  
Pull out the connectors from the main P.C.B.
- 2). Pull out the connector S9 from the power supply board.
- 3). Remove the table clamp plates.
- 4). Remove the two yarn tension stand rod clamp screws, one pattern case setting plate clamp screw and one carrying case reinforcing clamp screw. (Fig. 80)  
Remove the six right and left needle bed clamp screws.

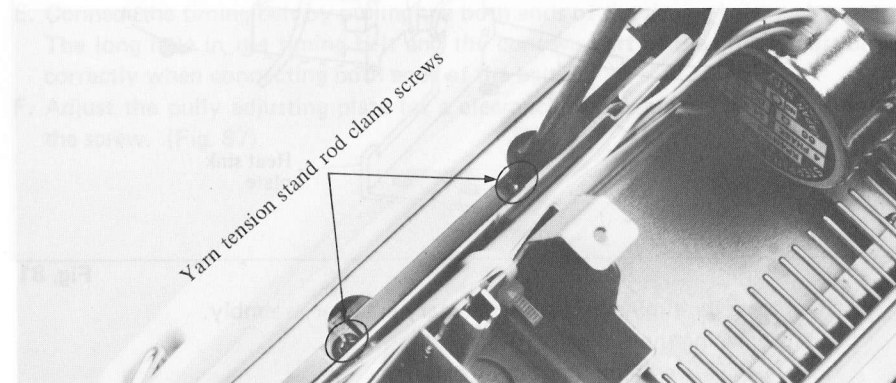


Fig. 80

- 5). Lift up the right side of the machine body and slide it to the right, and then remove the machine body from the carrying case.
- 6). Disassemble the lower side plate R assembly.
  - A. Remove the three plastic rivets and two screws for the AC inlet.

- B. Pull out the lower side plate R to the right.
- C. Remove the cord clamp screw and pull out the noise filter board.
- 7). Disconnect the lead wires of the power transformer from BR3 and BL3 of the noise filter board by soldering.
- 8). Cut off the two wire binders for the lead wire from the power transformer, to the connector S9.
- 9). Remove the four power transformer clamp screws and remove the power transformer from the heat sink plate. (Fig. 81)

5-2. Assembling the power transformer.

- 1). Assembling the power transformer in the reverse order of disassembly.
- 2). When binding the lead wire of the transformer with the wire binder, pull it to the left and do not leave slack.

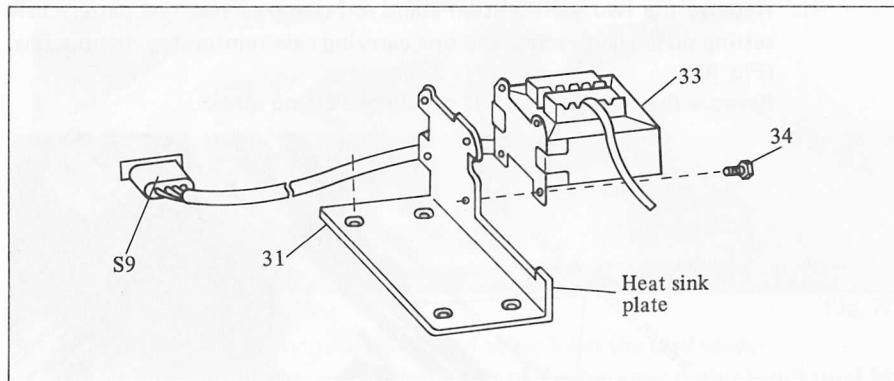


Fig. 81

6. Replacing the timing belt and the rotary encoder assembly.

6-1. Replacing the timing belt.

- 1). Disassembling the timing belt.
  - A. Remove the top covers.
  - B. Loosen the screw for the pully adjusting plate (Fig. 82)  
The pully adjusting plate must move freely.

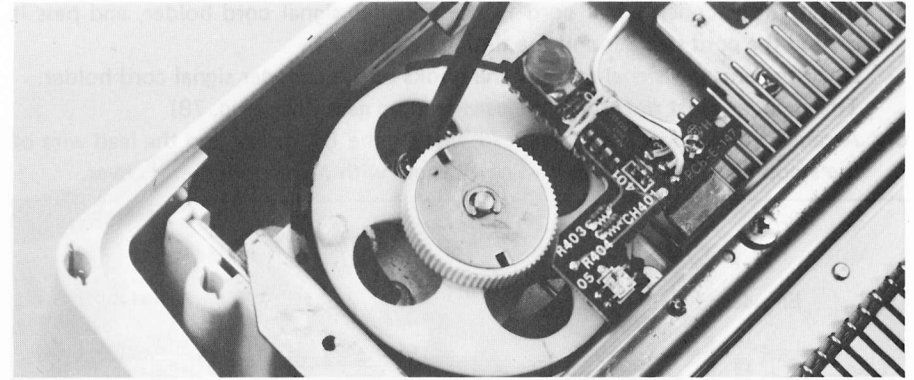


Fig. 82

- C. Turn the timing belt until the connecting part comes to the center of the rear rail.
- D. Remove the belt connecting pin from the hole in the other end of the timing belt and pull off the timing belt. (Fig. 83)

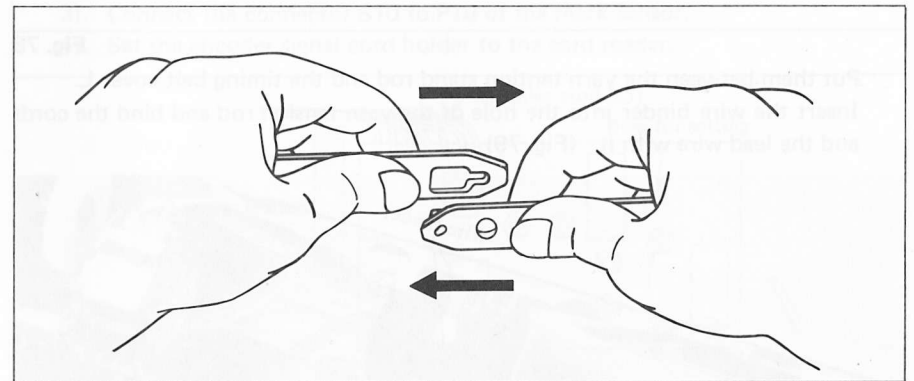


Fig. 83

2). Assembling the timing belt.

A. Pass the timing belt from the left side of the timing belt cover (R) which is installed under the back side of the card reader with the connecting pin face inside.

B. Move the timing belt to the rotary encoder and fit the belt connecting pin into the concave part of the rotary encoder as show in the figure. (Fig. 84)

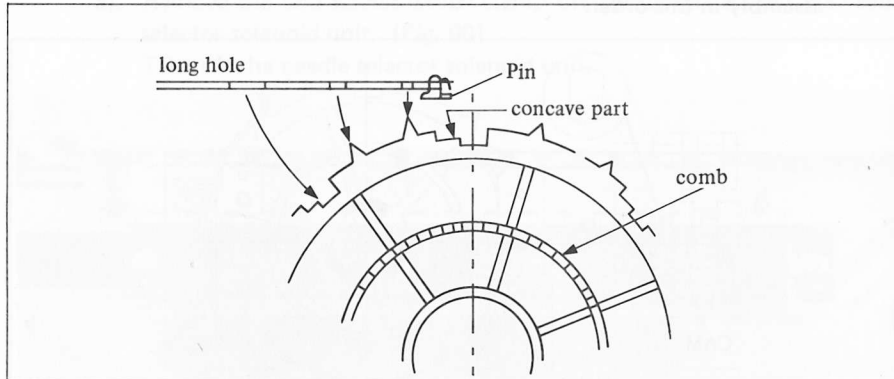


Fig. 84

C. Turn the rotary encoder assembly to the right and feed the timing belt to the rear rail side. (Fig. 85)

When turning the rotary encoder assembly, do not touch the comb part of it.

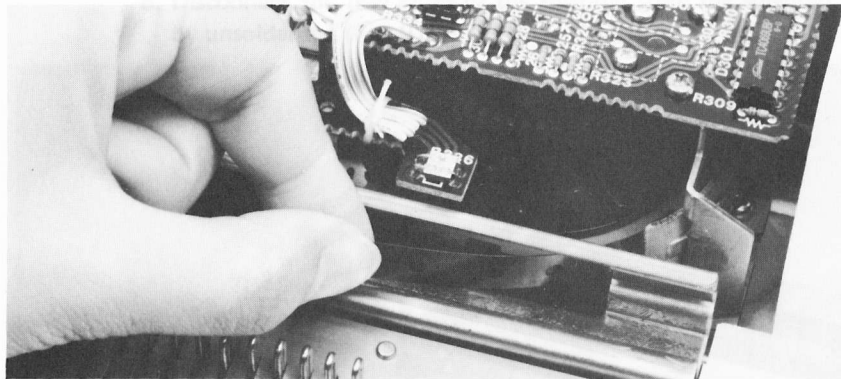


Fig. 85

D. On the pully side, pass the timing belt from the side of the machine body by fitting the belt connecting hole into the concave part of the pulley and feeding it to the rear rail side. (Fig. 86)

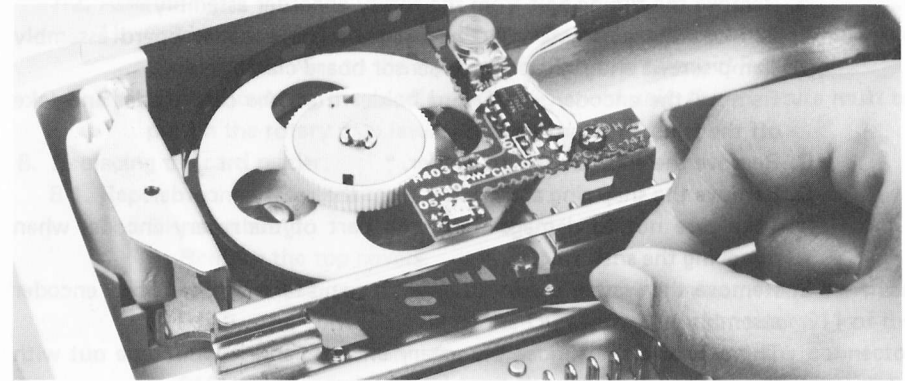


Fig. 86

E. Connect the timing belt by pulling the both ends of the timing belt.

The long hole in the timing belt and the concave part of the pulley must be set correctly when connecting both ends of the belt.

F. Adjust the pully adjusting plate for a clearance of 0.3 mm – 0.6 mm and fasten the screw. (Fig. 87)

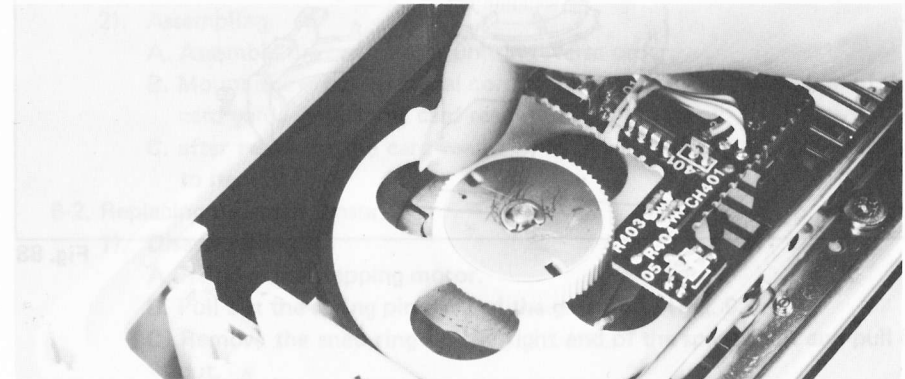


Fig. 87



G. Assemble the top covers.

6-2. Replacing the rotary encoder assembly. (Fig. 88)

1). Disassembling the rotaly encoder assembly.

A. Remove the timing belt from the rotary encoder assembly.

B. Pull out the connector S10 and remove the encoder board assembly clamp screws and right position sensor board clamp screw.

Remove the encoder signal cord holder from the card reader and take off the encoder board assembly.

C. Remove the encorder board holder.

D. Remove the snap ring and washer from the rotary encoder.

Take care not to damage the comb part of the rotary encoder when removing the snap ring.

E. Remove the washer under the snap ring and take off the rotary encoder assembly.

There is a washer under the rotary encoder and it will come out with the rotary encoder.

Take care not to loose the washer.

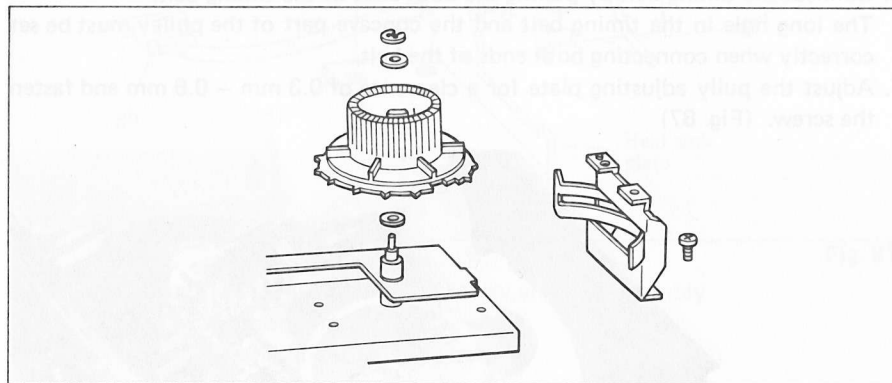


Fig. 88

2). Assembling the rotary encoder assembly.

A. Put the washer onto the rotary encoder shaft.

Adjust the relation between the rotary encorder assembly and the rotary cam correctly as show in the figure. (Fig. 89)

B. Put on the washer and set the snap ring.

C. Mount the timing belt, the encoder board holder and the encoder board assembly in this order.

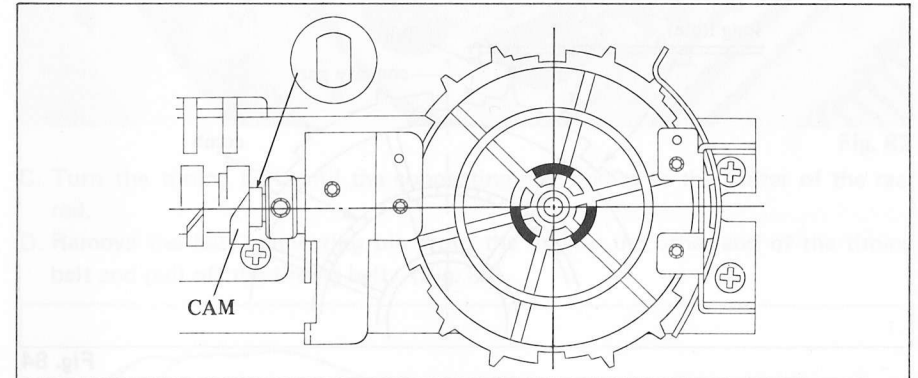


Fig. 89

## 7. Replacing the needle selector solenoid unit and solenoid itself.

### 7-1. Disassembling.

- 1). Take out the machine body from the carrying case by referring to the item XII. 5.
- 2). Cut off the wire binder which is located under the yarn tension stand rod.
- 3). Remove the two screws which clamp the belt cover (R) and the needle selector solenoid unit. (Fig. 90)

Take off the needle selector solenoid unit.

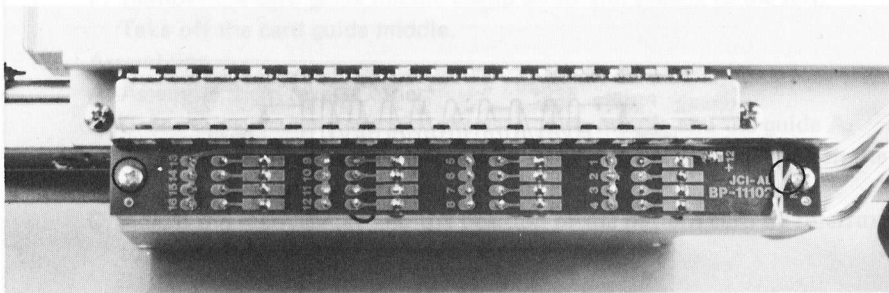


Fig. 90

### 4). Disassembling the needle selector solenoid.

The sixteen solenoids are mounted by a nut and the lead wires which are soldered to the solenoid P.C.B.

- A. Remove the two screws and collars mounting the solenoid P.C.B.
- B. Disconnect the lead wires of the solenoid from the solenoid P.C.B. by unsoldering. (Fig. 91)

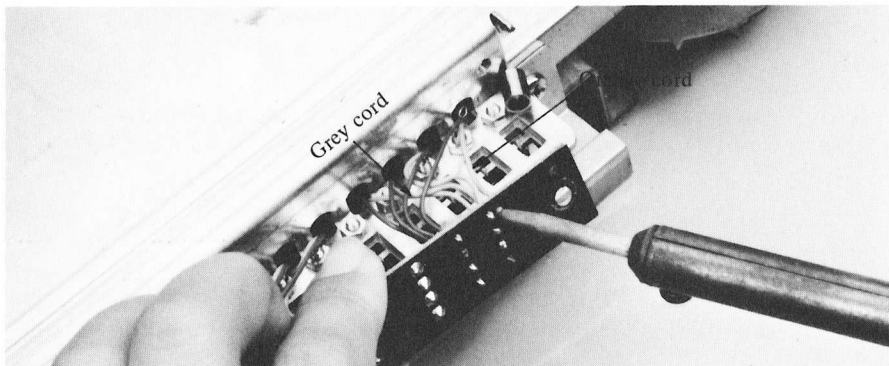


Fig. 91

### C. Take off the armature and the armature spring.

D. Remove the nut which holds the solenoid and then, take out the solenoid.

### 7-2. Assembling.

- 1). Solder the orange lead wire of the solenoid to the numbered land and the gray lead wire to the right side land of the solenoid P.C.B.
- 2). When mounting the needle selector solenoid unit, the armature must be put on the rotary cam levers correctly.

## 8. Replacing the card reader.

### 8-1. Replacing the card reader unit.

#### 1). Disassembling.

A. Remove the top covers.

B. Pull out the connector S4 of the stepping motor from the main P.C.B., the connector S8 of the DC motor, the connector S11 of the stepping motor from the power supply board and the connector S10 of the encoder board from the mark sensor.

C. Cut off the wire binder which is located above the yarn tension stand rod and take off the encoder signal cord holder from the card reader unit.

D. Remove the three card reader unit clamp screws and take out the card reader unit.

The encoder signal cord stopper will come off.

#### 2). Assembling.

A. Assemble the card reader unit in reverse order.

B. Mount the encoder signal cord stopper on the right side plate of the card guide A with the card reader unit clamp screw.

C. After replacing the card reader unit, check and adjust it by referring to item X.

### 8-2. Replacing the mark sensor.

#### 1). Disassembling.

A. Remove the stepping motor.

B. Pull out the spring pin BW2 of the gear Z53. (Fig. 92)

C. Remove the snap ring on the right end of the spiral shaft and pull it out.

- Do not loosen the mark sensor clamp screw.  
 D. Remove the nut of the mark sensor flexible cable. (Fig. 93)

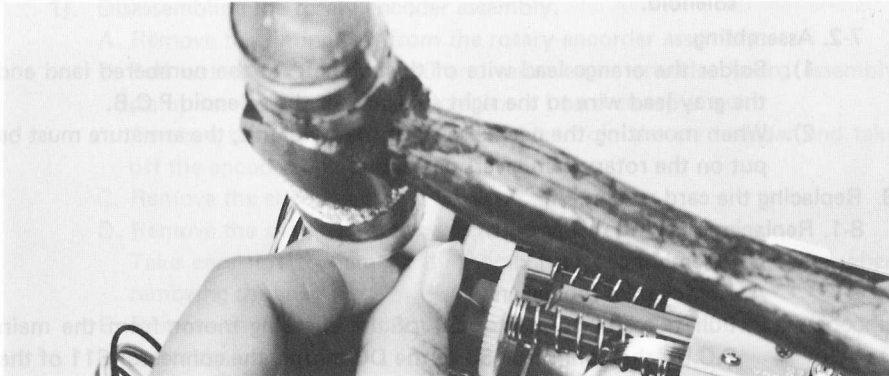


Fig. 92

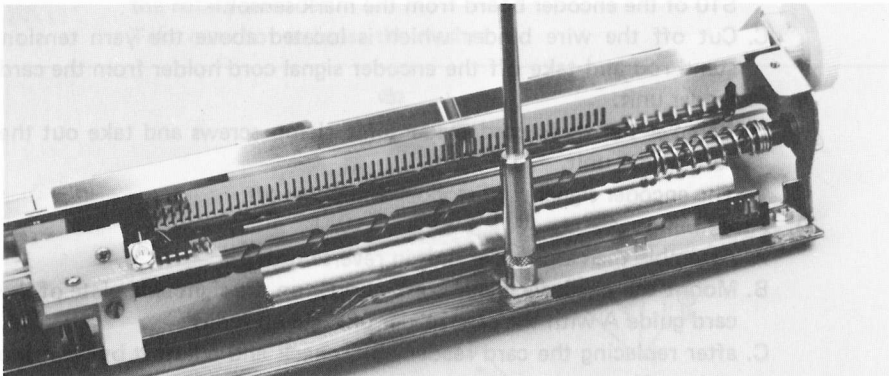


Fig. 93

- 2). Assembling.
- A. Insert the snap ring groove side of the spiral shaft from the left side of the card reader and set the boss side of the gear Z53 to the left side of the spiral shaft.
  - B. Mount the spring, mark sensor and the spring to the spiral shaft in this order and set the snap ring.
- The spring has a single winding side and a double winding side. (Fig. 94)

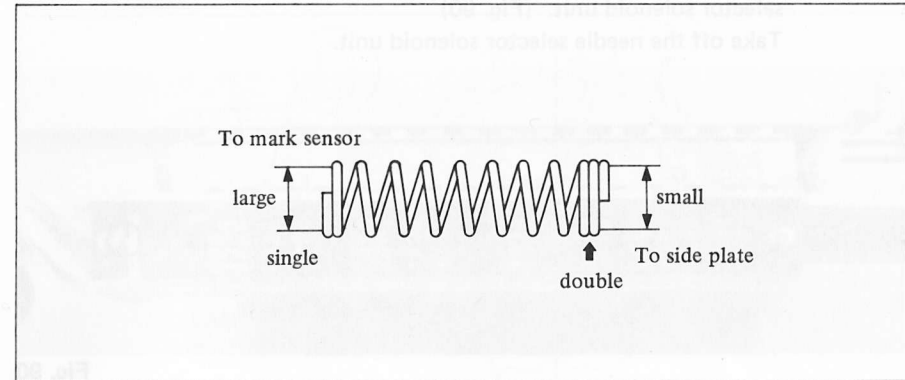


Fig. 94

When mounting the spring to the spiral shaft, set the double winding side of it to the side plate of the card guide A.

- C. Check the mark sensor and the position of the pattern card by referring to the item X.

8-3. Replacing the card feeding shaft and the card guide middle.

1). Disassembling.

- A. Remove the stepping motor and the gear Z60.
- B. Remove the snap ring which is mounted between the gear Z60 and the card guide A.
- C. Remove the snap ring of the card feeding dial and take off the card feeding dial.
- D. Pull out the spring pin of the sprocket wheel.
- E. Pull out the card feeding shaft to the right.
- F. Remove the card guide middle clamp screw and slide it to the left.  
Take off the card guide middle.

2. Assembling.

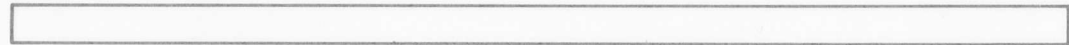
- A. Assemble them reverse order.
- B. Check the specular surface of the card guide middle and the guide A.  
When assembling the card guide middle, take the clearance between the card guide A and the card guide middle.
- C. Adjust the mark sensor and the position of the pattern card by referring to the item X.





- \* MARK SENSOR CHECK CARD.
- \* PRÜFKARTE FÜR DEN FOLIENLESER.
- \* POINT SENSIBLE DE LA CARTE DE CONTROLE.
- \* GEVOELIG PUNT VAN DE KONTROLEKAART.
- \* TARJETA PARA CDECAR DMARCA-SENSOR.
- \* SCHEDA CONTROLLO PER SENSORE MARCANTE.

Z.54 V



- \* PLEASE MAKE SURE NOT TO DIRTY THE ABOVE COLUMN.
- \* ACHTEN SIE BITTE DARAUF, DASS DIE OBIGE ZEILE NICHT VERSCHMÜTZT WIRD.
- \* VEILLET A NE PAS SALIR LA COLONNE SUPERIEURE.
- \* ZORG ERVOOR, DE BOVENSTAANDE KOLOM NIET TE BEVUILEN.
- \* ASEGURESE DE NO MANCHAR LA COLUMNA ARRIBA.
- \* FAVORISCANO DI NON SPORCARE LA COLONNA SOPRA.

- \* MARK SENSOR CHECK CARD.
- \* PRÜFKARTE FÜR DEN FOLIENLESER.
- \* POINT SENSIBLE DE LA CARTE DE CONTROLE.
- \* GEVOELIG PUNT VAN DE KONTROLEKAART.
- \* TARJETA PARA CDECAR DMARCA-SENSOR.
- \* SCHEDA CONTROLLO PER SENSORE MARCANTE.

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- \* PLEASE MAKE SURE NOT TO DIRTY THE ABOVE COLUMN.
  - \* ACHTEN SIE BITTE DARAUF, DASS DIE OBIGE ZEILE NICHT VERSCHMÜTZT WIRD.
  - \* VEILLET A NE PAS SALIR LA COLONNE SUPERIEURE.
  - \* ZORG ERVOOR, DE BOVENSTAANDE KOLOM NIET TE BEVUILEN.
  - \* ASEGURESE DE NO MANCHAR LA COLUMNA ARRIBA.
  - \* FAVORISCANO DI NON SPORCARE LA COLONNA SOPRA.

