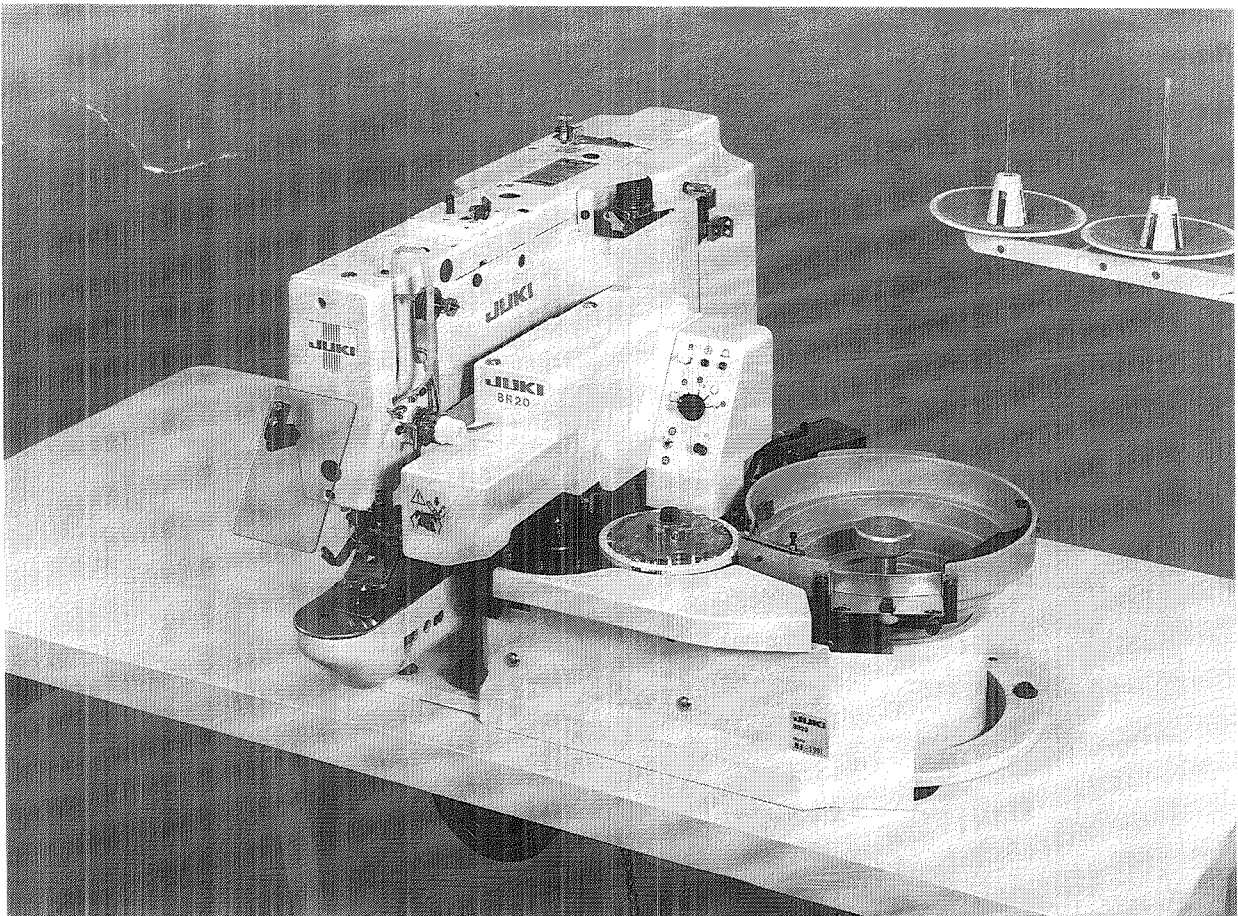


JUKI

High-speed, cylinder bed, lockstitch button attaching machine
with an automatic button feeder

LK-1851-555/BR20

ENGINEER'S MANUAL



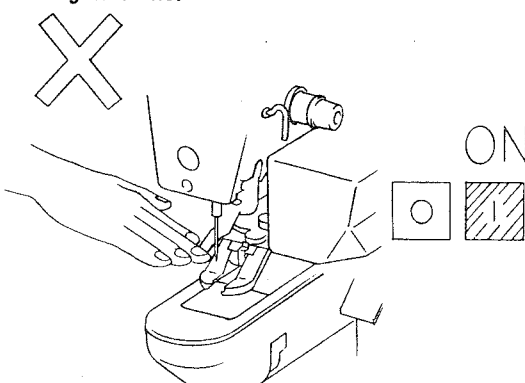
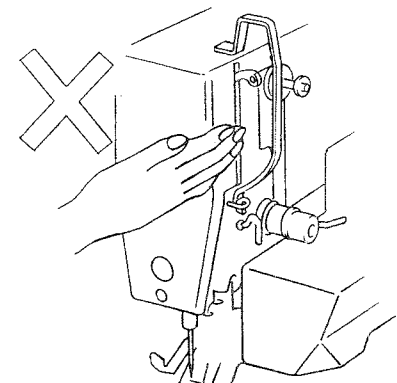
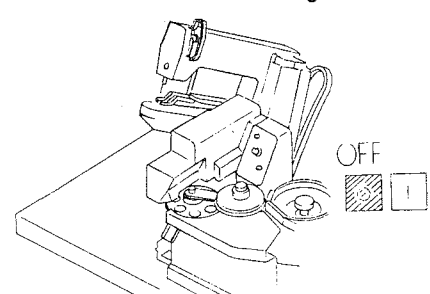
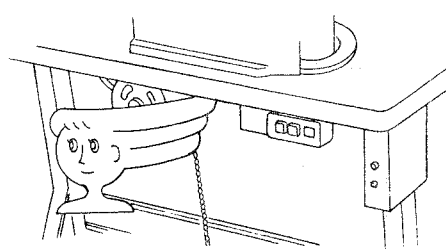
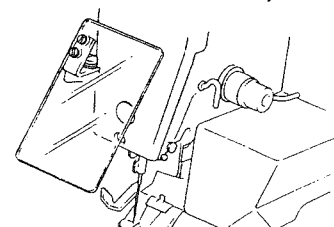
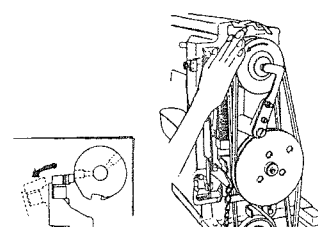
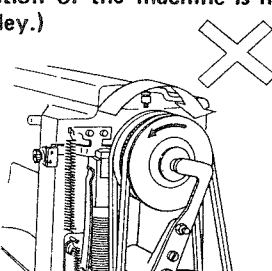
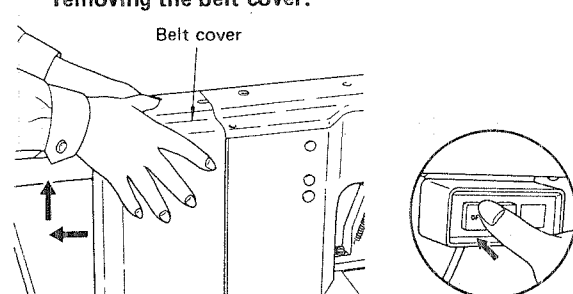
PREFACE

The Engineer's Manual is written for the technical personnel who are responsible for the service and maintenance of the machines.

The Instruction Manual for these machines intended for the maintenance personnel, and operators at an apparel factory contains detailed operating instructions. And this manual describes "How to Adjust", "Effects of Adjustment", and other information which are not covered by the Instruction Manual.

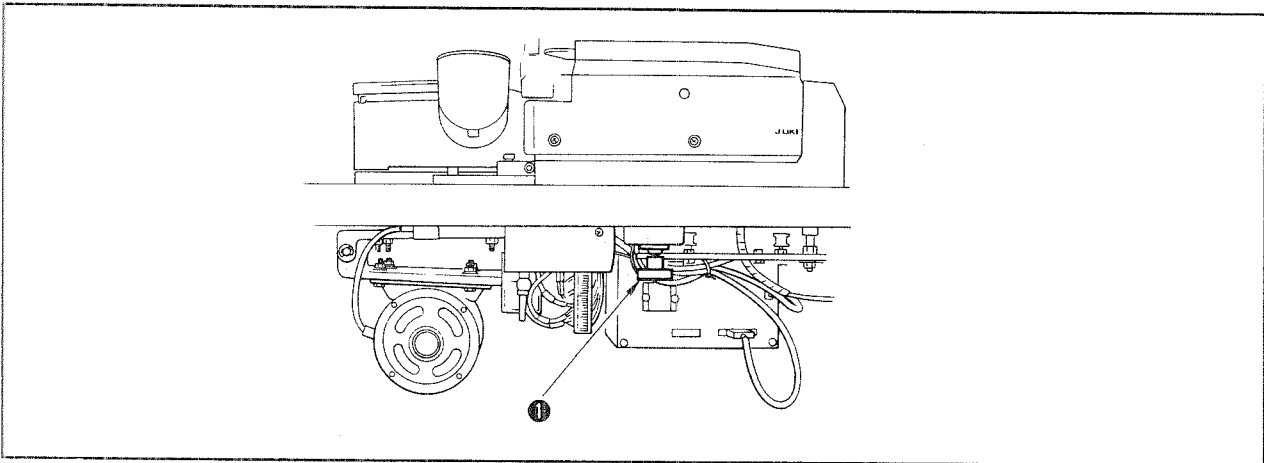
It is advisable to use the pertinent Instruction Manual and Parts List together with this Engineer's Manual when carrying out the maintenance of these machines.

CAUTION

<p>1. Never put your hand under the needle when you turn ON the power switch or operate the sewing machine.</p> 	<p>2. Do not touch the thread take-up with your hands while the machine is running.</p> 
<p>3. Be sure to turn the power switch OFF when tilting the machine head or removing the V belt.</p> 	<p>4. Never bring your fingers or hair close to, or place anything on the driving pulley, V-belt or motor during operation. It may lead to serious personal injuries.</p> 
<p>5. If your machine is provided with a belt cover, eye guard or any other protectors, do not operate your machine with any of them removed.</p> 	<p>6. Before applying power, release the stop-motion mechanism and turn by hand the needle driving pulley in order to ensure that the machine is in order.</p> 
<p>7. Make sure that the machine rotates backwards when viewed from the operator's side. Don't let it rotate in the reverse direction. (Rotational direction of the machine is indicated on the motor pulley.)</p> 	<p>8. Make sure to turn off the power switch before removing the belt cover.</p> 

Precaution

1. As long as the machine is set to the 2-holed button sewing mode, 4-holed buttons are not applicable and vice versa. Pay attention to the sewing mode before starting sewing buttons.
2. When using buttons of which holes are located at the position different from the buttons that are currently being used, select and use the carrier pin matching the buttons to be used. Refer to page 27 for the part numbers of the button carriers.
3. Position the individual feeding plate in accordance with the size of button to be sewn.
4. Use only buttons shown in the specifications of this device.
5. The terminal board is mounted on the right-hand side of the motor of the sewing machine which is located at the rear of the unit.
6. Be sure to confirm that the carrier arm is in its origin (the position where the button position is determined) before tilting the machine head. If not, turn manual rotating shaft ① until the carrier arm is brought to its origin.



7. Spinner oscillating arm error "4" and index unit error "5" cannot be reset using the reset switch so as to protect the mechanical components. So, if one of these errors occurs, first turn OFF the power to the sewing machine. Then, eliminate the cause of the error and re-turn ON the power to the machine.
8. This machine comes with the continuous cycle sewing function. When you keep depressing the pedal, therefore, the machine will continuously feed buttons from its button feeder. So be careful.
9. This machine has been designed to allow you to check the function of sensors or driving sources. Refer to "V. ERROR MESSAGE AND INSPECTION"
10. If an error occurs during sewing, the machine will stop running after the completion of the sewing. In this case, the button clamp is kept lowered. It is, therefore, necessary for you to press the reset switch to release the button clamp before taking out the material from under the button clamp. If the button clamp will not be released from its lowest position, raise the button clamp by hand.
11. If tightening screws too firmly in the resin when adjusting the height of the adjusting plate, etc., resin breakage may occur. So be careful.
12. Apply grease on the worm gear and cam periodically (every six months).

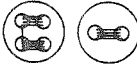

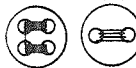


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Components for the LK-1851-555

I. SPECIFICATIONS

To Double number of stitches change CHIP to # HL 0087 30084

Subclass model	LK-1851-555	LK-1851-556	LK-1852-557	LK1851-558	LK-1853-559
Stitch system	Lockstitch				
Sewing speed	Normal: 2,000 s.p.m. Max.: 2,200 s.p.m. (Provided that Z155 of the attachment for small buttons is used and cotton thread or spun thread is used for sewing buttons)				
Number of stitches	18, 9	16, 8	22, 11	18, 9	30, 15
Sewing size (center-to-center distance between holes in the button to be sewn)	Length: 0 to 6.5 mm Width: 2.5 to 6.5 mm (Refer to specifications of button clamp jaw levers for the sewing sizes in detail.)				
Outside diameter of applicable buttons	φ10 to φ20 mm (Refer to the specifications of the button clamp jaw levers for the button size ranging from φ8 to φ32 mm.)				
Needle	DP x 17 #14				
Applicable types of button	Flat buttons (4-holed buttons or 2-holed buttons)				
Needle entry	 U-shape stitch	 Z-shape stitch	 U-shape stitch	 X-shape stitch	 U-shape stitch
Lift of the button clamp	13 mm (11 mm for Z165, Z166)				
Stitch adjusting method	Crosswise feed: Adjusted by fixing the nut Lengthwise feed: Adjusted by the one-touch utility lever				
Knot tying mechanism	Provided with a knot-tying device and a thread adjusting device				
Space pin mechanism	By the button clamp jaw lever				
Motor	Single-phase/3-phase, 200W				

Attachment for the single unit The following button clamp jaw levers can be respectively mounted to the aforementioned subclass models as attachments.

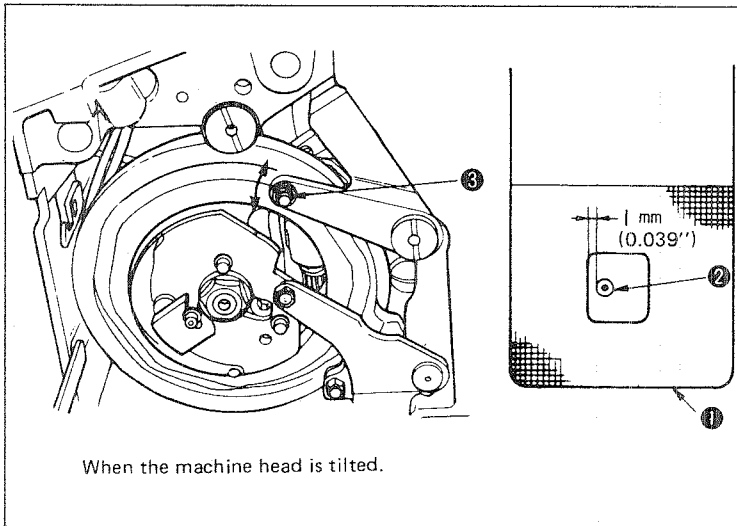
Model		Z155		Z156		Z157		Z158		
Name of model (attachment)		For small button		For medium-sized button		For large button		For extra small		
Outside diameter of applicable buttons (mm)		φ10 to φ20		φ10 to φ20		φ15 to φ32		φ8 to φ9 φ9 to φ10 φ10 to φ15		
Sewing size (mm)	Length	0 to 3.5		0 to 4.5		0 to 6.5		0 to 2.5	0 to 3	0 to 3.5
	Width	2.5 to 3.5		2.5 to 4.5		2.5 to 6.5		Max. 2.5	Max. 3	Max. 3.5
Button clamp jaw lever	Part No.	Thickness (mm)	2.2 (2.7)	En-graved marker	2.7 (2.2)	En-graved marker	2.7 (3.2)	En-graved marker	2.2 (1.7)	Engraved marker
			Right	MAZ155070B0	B	MAZ156070B0	C	MAZ157070BB	D	MAZ158070BA
			Left	(MAZ156070B0)	C	(MAZ155070B0)	B	(MAZ157070BA)	E	(MAZ158070BB)
				MAZ155080B0	B	MAZ156080B0	C	MAZ157080BB	D	MAZ158080BA
				(MAZ156080B0)	C	(MAZ155080B0)	B	(MAZ157080BA)	E	(MAZ158080BB)
Needle hole guide		MAZ15501000		MAZ15601000		MAZ15701000		MAZ15801000		

For BR20

Model		Z165		Z166		
Name of model (attachment)		For small button		For medium sized button		
Outside diameter of applicable buttons (mm)		φ10 to φ15		φ12 to φ18		
Sewing size (mm)	Length	0 to 3.5		0 to 4.5		
	Width	2.5 to 3.5		2.5 to 4.5		
Button clamp jaw lever	Part No.	Thickness (mm)	2.2 (2.7)	En-graved marker	2.7 (2.2)	En-graved marker
			Right	MAZ165070B0	H	MAZ166070B0
				(MAZ166070B0)	J	(MAZ165070B0)
			Left	MAZ165080B0	H	MAZ166080B0
				(MAZ166080B0)	J	(MAZ165080B0)
Needle hole guide		MAZ15501000		MAZ15601000		

II. ADJUSTMENT (Use the Engineer's Manual for the LK-1850 in together with this Engineer's Manual.)

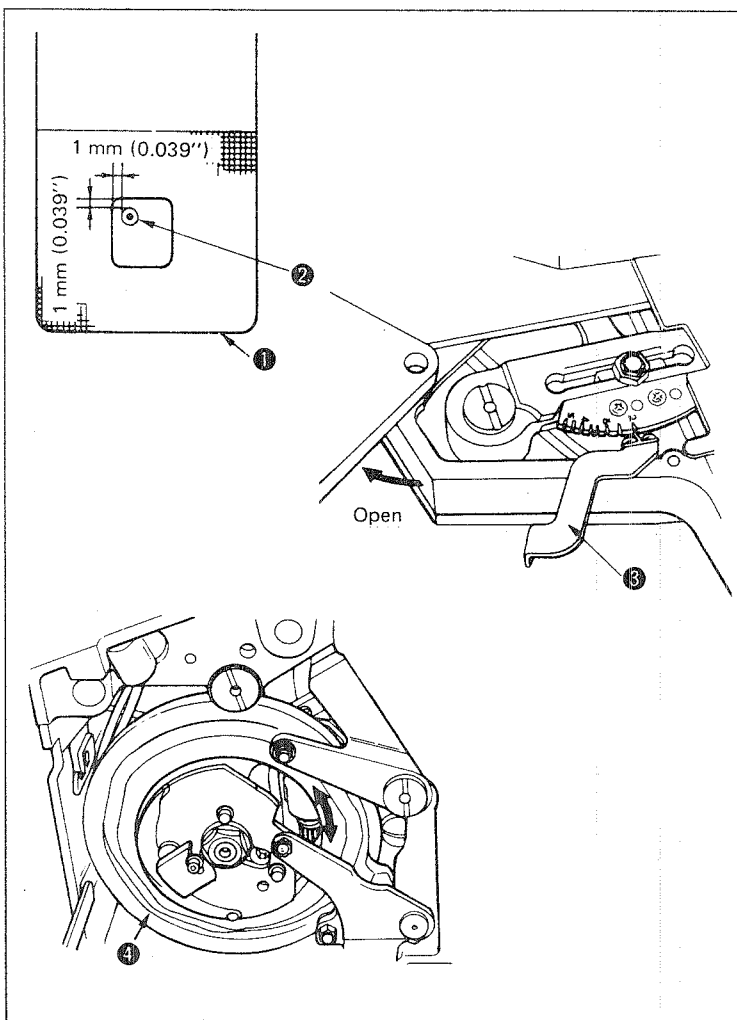
1. Adjusting the position of the feed plate



- 1) Set the lengthwise feed one-touch utility lever to the 2-holed button sewing position. If using the Z165 (attachment for small buttons) with the sewing size set to 3 mm (0.118"), loosen crosswise feeding nut ③ and adjust the lateral position of the feed plate so that a 1 mm (0.039") clearance is provided between the recessed part of feed plate ① and the boss of needle hole guide ② at the time of the first needle entry.
- 2) Adjust the longitudinal position of feed plate ① by moving it back or forth so that the needle hole guide comes to the center of the recessed part of feed plate ①.

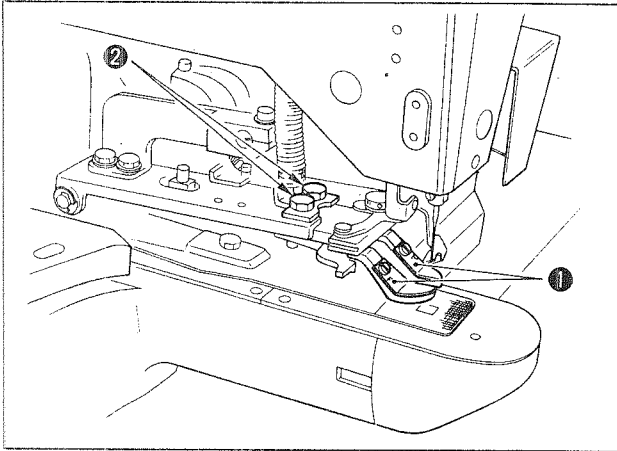
(Caution) If changing the feed plate or the sewing size exceeds 3 mm (0.118"), confirm that the recessed part of the feed plate does not hit the needle hole guide at the first and second stitches.

2. Adjusting the feed timing

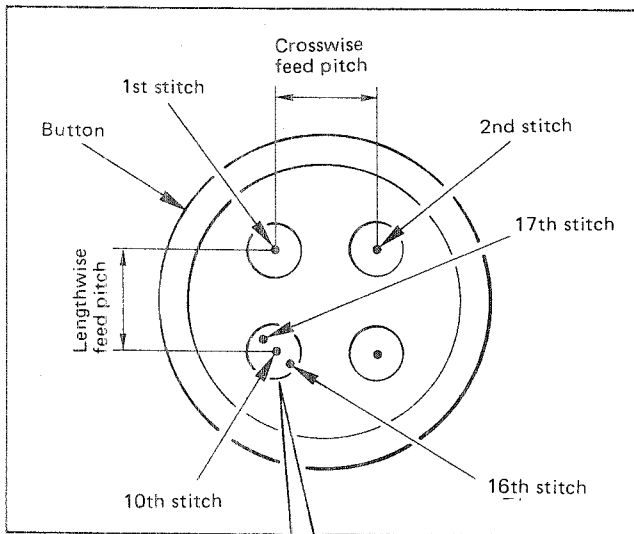


- 1) For the LK-1851-555, LK-1851-556, LK-1851-557 and LK-1851-558, move cloth feed cam ④ in the direction of the arrows (↔) to bring feed plate ① to the position where it does not move back or forth even by moving one-touch utility adjusting lever ③ to the right or left with the button clamp jaw lever lowered when the machine is in its stop-motion state. This adjustment automatically set the feed timing to the correct one. This adjustment makes needle hole guide ② go to the center of the recessed part of feed plate ① when the machine is in its stop-motion state. (Longitudinal direction)
- 2) Adjust the feed timing of the LK-1853-559 referring to the Instruction Manual for the LK-1850 (20. on page 6).

3. Adjusting the needle entry



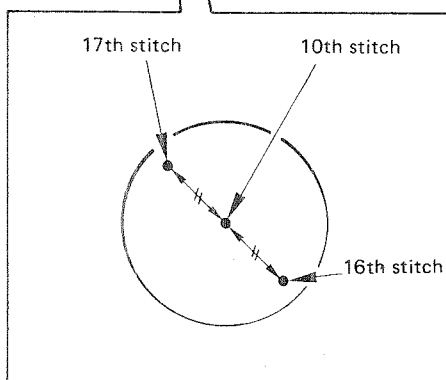
Place a button in between button clamp jaw levers ①. Then loosen screws ② in the button clamp mechanism base and adjust so that the needle enters the center of the holes in the button with respect to the crosswise and lengthwise directions when turning the pulley of the reduction gear by hand.



Adjust the needle entry, as an example, for sewing a button with 18 stitches using the U-shape stitching pattern following the below-stated procedure.

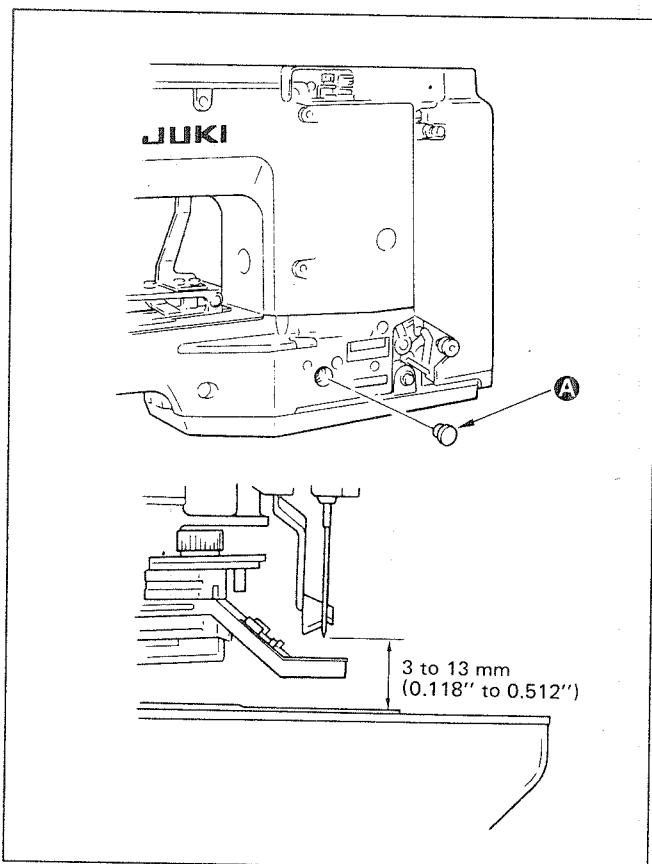
- 1) Finely adjust the crosswise feed pitch so that the needle enters the center of holes in the button when sewing 1st and 2nd stitches.
- 2) Further turn the sewing machine until the machine starts the lengthwise feed. Finely adjust the lengthwise feed pitch so that the needle enters the center of hole in the button at the 10th stitch. (You can adjust the lengthwise feed pitch by setting the lever at the center of the notch of the scale.)
- 3) Finally, adjust the button clamp jaw lever so that the needle enters the hole in button aslant to the 10th needle entry point when sewing the 16th and 17th stitches.

At this time, the 16th and 17th needle entries should be equidistantly spaced from the 10th needle entry.

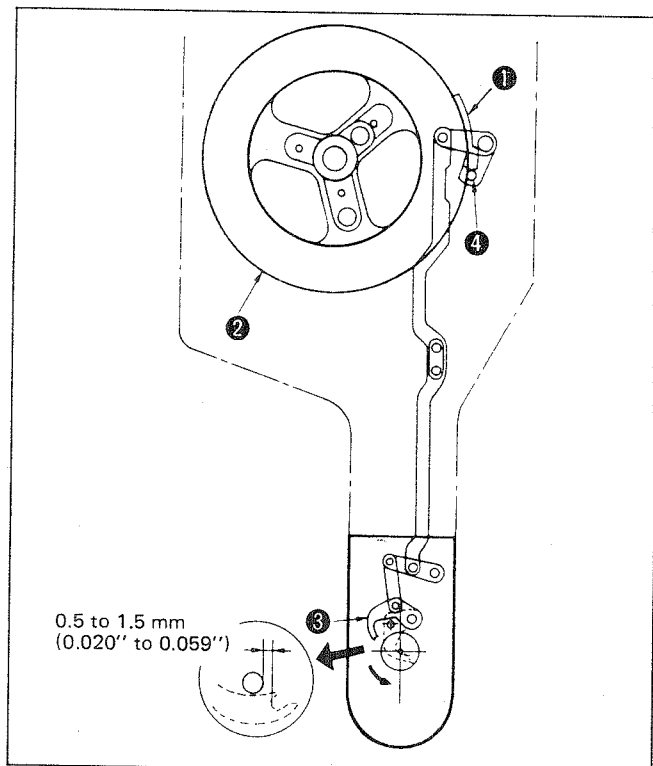


(Caution) The needle may come in contact with the button when adjusting the needle entry in accordance with the diameter of holes in the button. However, the needle enters the hole in the button at the position closer to the center of the hole when actually starting the sewing machine. So, you need not worry about the contact between the needle and the button when performing adjustment of needle entry.

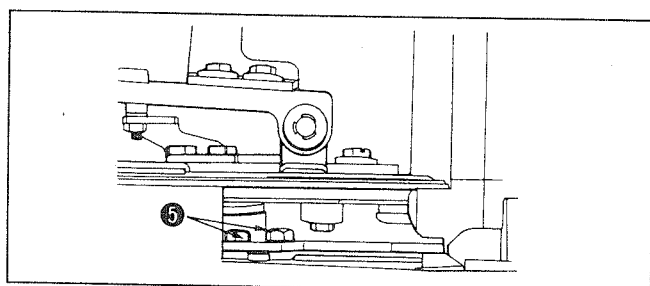
4. Adjusting the timing of the knot-tying plate



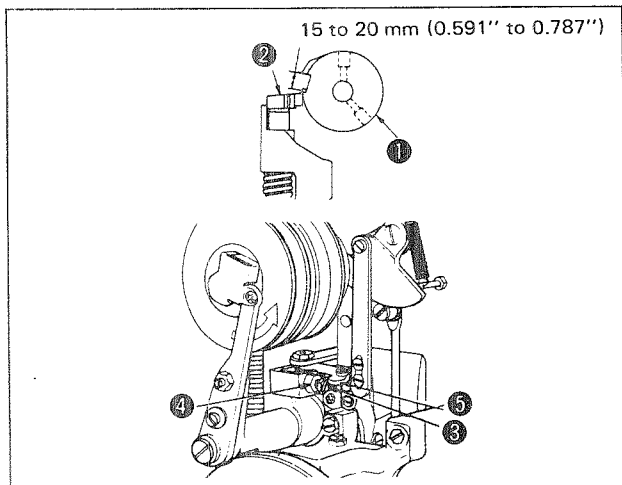
- 1) When sewing a button with 18 stitches, knot-tying plate ③ actuates at the 17th stitch. When sewing a button with 16 stitches, it actuates at the 15th stitch. It actuates at the 21st stitch when sewing a button with 22 stitches, and at the 29th stitch when sewing a button with 30 stitches. At this time, a difference in height between the feed plate and the tip of needle should be 3 to 13 mm (0.118'' to 0.512''). Tilt the machine head, remove larger plug ① located at the far right hand side of the machine head, and adjust the position of knot-tying notch ① mounted on cloth feed cam ② so that the aforementioned height difference is obtained.



- 2) Loosen screw ⑤ in knot-tying connecting plate, and adjust the front end position (indicated by the dotted line) of knot-tying plate ③ so that a distance of 0.5 to 1.5 mm (0.020'' to 0.059'') is provided between the end of the needle hole and the indented part of the hook-shaped threading point. (The knot-tying roller ④ is placed on knot-tying notch ① .)



5. Adjusting the timing to release the thread tension

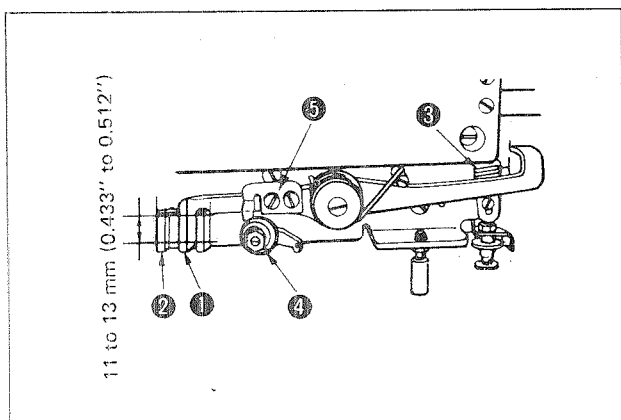


Adjust tension release adjustment screw ③ so that the tension disk starts floating to release the thread tension when stop-motion lever ② reaches 15 to 20 mm (0.591" to 0.787") before the stop position of stop-motion cam ① before the machine reaches its stop-motion position. Then fix the screw at that position using nut ④.

Tension release adjustment screw ③ presses tension release actuating link ⑤ until it is connected to the thread tension releasing lever. This makes the tension disk float to release the thread tension.

(Caution) When performing the adjustment, keep pressing stop-motion lever ② against stop-motion cam ① so that the lever always come in contact with the cam.

6. Adjusting the thread adjusting device

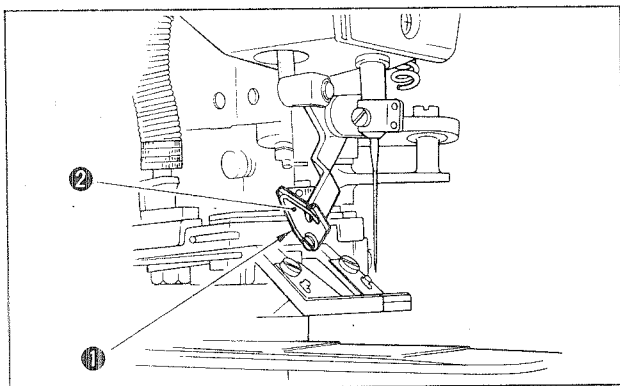


1) Adjust thread guide ② for the thread adjusting device so that the thread path hole in thread adjusting lever ① and thread path groove in thread guide ② for the thread adjusting device lie on a straight line when the sewing machine runs at high speed.

2) Then adjust stopper ③ so that a distance of 11 to 13 mm (0.433" to 0.512") is provided between the thread path hole in thread adjusting lever ① and the thread path groove in thread guide ② for the thread adjusting device when the machine is in its stop-motion state as illustrated in the figure. At this time, adjust tension release lever ⑤ so that the tension disk of tension controller ④ of the thread adjusting device rises enough to release the thread tension. The thread tension of tension controller ④ of the thread adjusting device is fixed to a uniform value. (Approximately 25g)

(Caution) If changing the thread tension of tension controller ④ of the thread adjusting device will greatly change the stitching performance. So be careful.

7. Adjusting the wiper spring



The needle thread, after thread trimming, is retained between wiper spring ① and wiper ②. Adjust wiper spring ① so that a 20 to 30g spring pressure (slightly higher than the pressure of the bobbin thread tension spring applied to the bobbin thread coming from the bobbin case) is applied to the needle thread.

(Caution) If the spring pressure is too high, the thread may appear above the button sewn.

Components for the BR20

I. SPECIFICATIONS

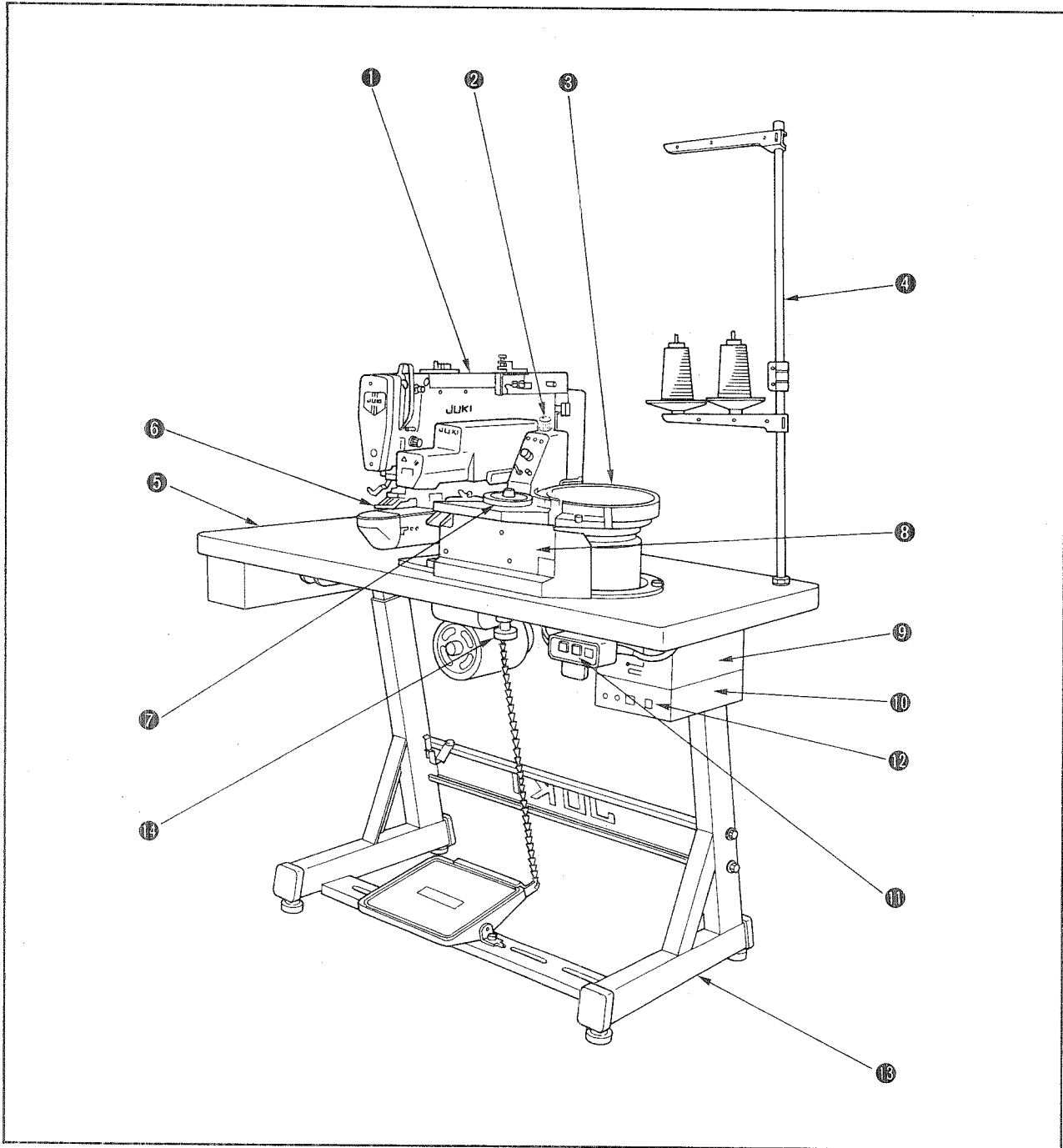
1. Mechanical specifications

1. Machine head used: LK1851-555/Z165 (Z166)
2. Sewing speed: Max. 2,200 s.p.m.
3. Needle: DP x 17 #14
4. Number of stitches: 9, 18
5. Buttons: Shape: Round button (2-holed or 4-holed)
Size: ϕ 10 to ϕ 15 mm (0.394" to 0.591"),
 ϕ 16 to ϕ 18 mm (0.630" to 0.709") . . . for subclass
6. Lift of the button clamp: 11 mm (0.433")
7. Space pin mechanism: By the button clamp jaw lever
8. Stitch adjusting method: Crosswise feed: Adjusted by the one-touch utility adjusting lever
Lengthwise feed: Adjusted by the one-touch utility adjusting lever
9. Knot tying mechanism: Provided with a forced knot-tying device and a thread adjusting device
10. Selection of buttons to be fed: By vibration system using a piezoelectric feeder
11. Button setting: Rear loading type
12. Individual feeding method: By the index method
13. Detection of button feeding failure: Provided with two detection points
 - The button detector checks whether a button is placed in the button positioning unit.
 - To confirm that a button is inserted into the carrier pin
14. Feeder driving unit: DC motor (24 Vdc)
15. "Without cross-over stitches" feature: Provided
16. Automatic button discharging function: Provided
17. Independent operation of the sewing machine: Possible
18. Small-lot sewing function: Provided
19. Time required to feed a button: 0.5 sec./pc.
20. Weight: 43 kg (machine head)

2. Electrical specifications

1. Power requirements: 3-phase: 200V, 220V, 380V, 415V, 440V
Single-phase: 100V, 110V, 220V, 230V, 240V
Voltage fluctuation: Rated value \pm 10% or less
2. Power consumption: 300W

II. CONFIGURATION

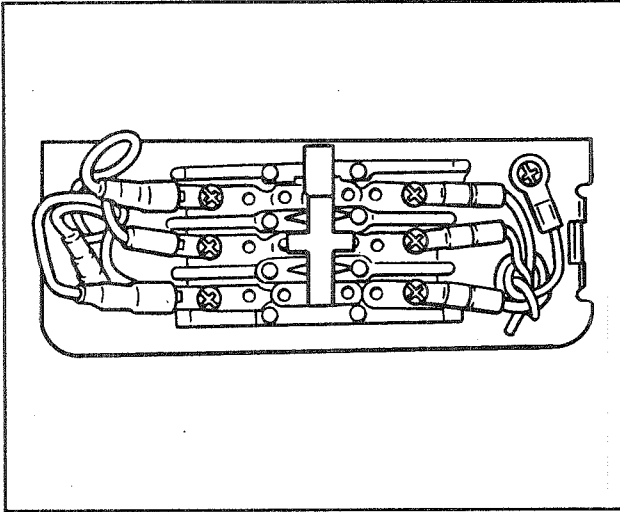


- | | | |
|---------------------|---------------------|-----------------------|
| ① Sewing machine | ⑥ Button clamp unit | ⑪ Power switch |
| ② Control panel (1) | ⑦ Index unit | ⑫ Control panel (2) |
| ③ Button feeder | ⑧ Front cover | ⑬ Pedestal |
| ④ Thread stand | ⑨ Control box | ⑭ Rotating motor knob |
| ⑤ Machine table | ⑩ P/F controller | |

III. OPERATION

1. Power to the machine and connection of power supply

Connect the power cable coming from the control board of the main unit of this device to the power supply (R.S.T.E.). Before connecting the device to the electric power supply, be sure to confirm that the sewing machine turns in its normal rotational direction.



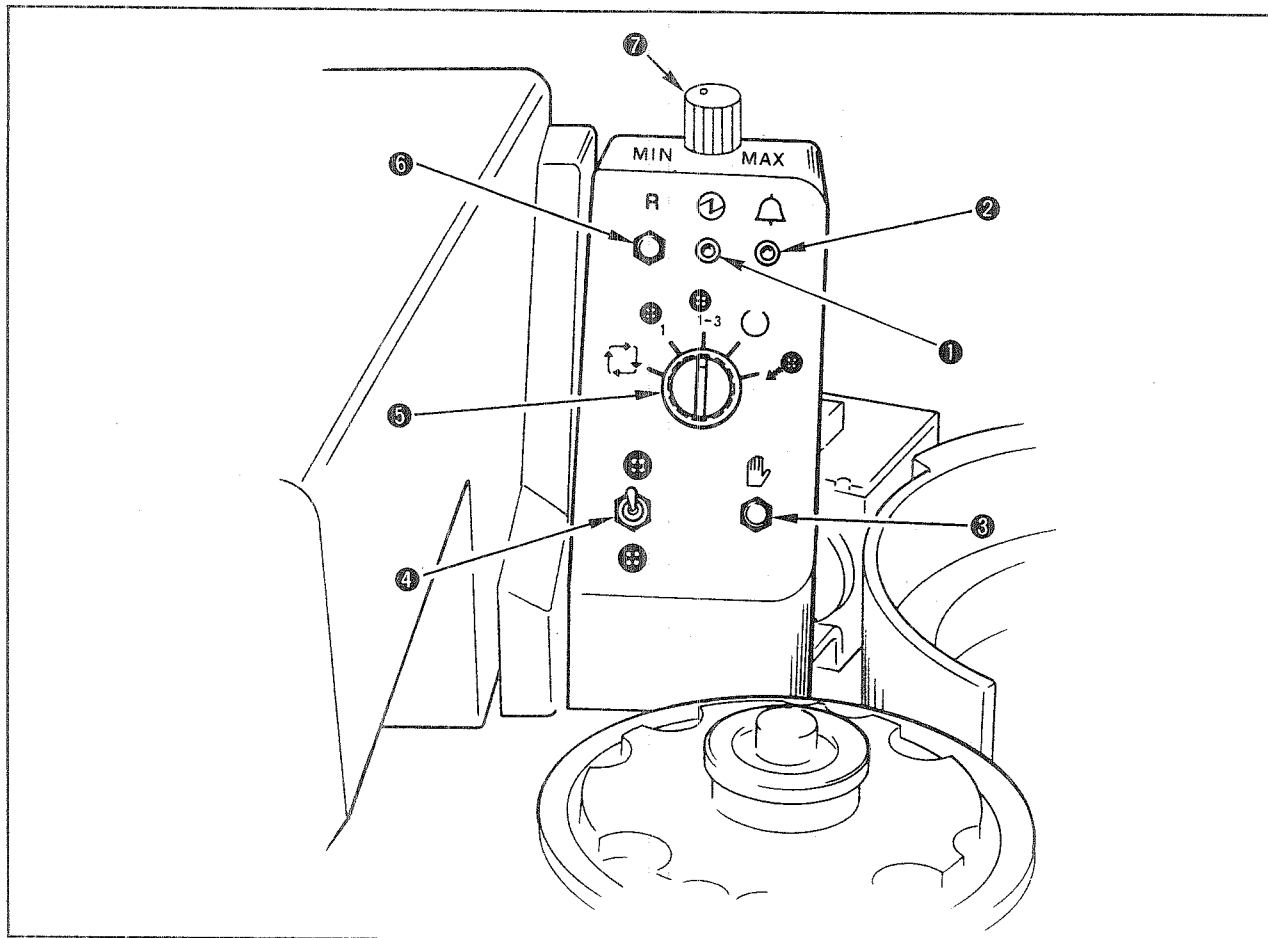
★ **How to confirm the normal rotational direction of the sewing machine**










The sewing machine should turn clockwise when viewed from the handwheel. If it turns counterclockwise, change round the wiring of the two power cables of the power supply (R.S.T.E.).

★ **Precautions in the electric connection**

- 1) Be sure to connect the ground wire to the earth without exception.
- 2) Precautions for power supply
 - Voltage fluctuation should not exceed $\pm 10\%$ of the rated voltage.
 - Rapid change of the power voltage may stop the machine.
 - Surge current load or electromagnetic by solenoid or the like in power supply cable may lead the machine to malfunction.

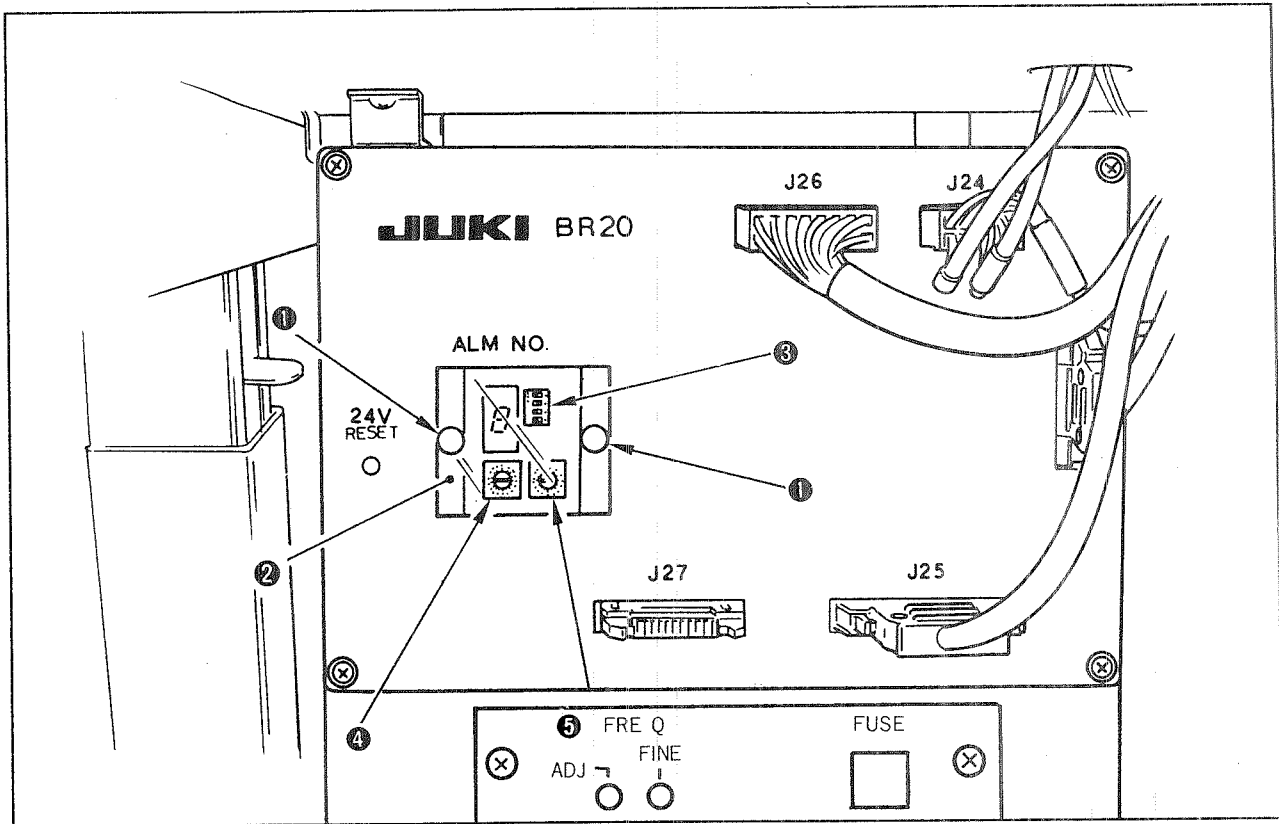
2. Control panel (1)



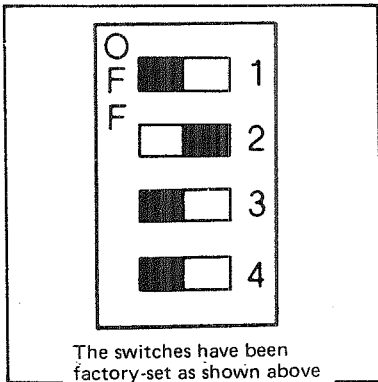
Symbol and name of switch	Function
<p>① Power indicator lamp (green)</p>  	<p>Lights up when the power switch is turned ON. If it fails to light up, check the power plug for secure connection and re-turn ON the power switch.</p>
<p>② Alarm indicator lamp (red)</p>  	<p>This lamp operates in two different ways. It slowly flashes on and off when a failure of the device occurs. (Refer to “V. ERROR MESSAGE AND INSPECTION”.) It quickly flashes on and off when the button sensor mounted on the index unit continuously detects button feeding failure over 10 times.</p>
<p>③ MANUAL operation switch</p>  	<p>Used to manually actuate the series of operations under respective operation modes (2. Independent sewing mode is excluded) which can be selected using mode selector switch ⑤.</p>
<p>④ Cross-over stitch selector switch</p>   	<p>Used to change over “with/without cross-over stitches” function. When it is set to its upper side With cross-over stitches When it is set to its lower side Without cross-over stitches</p>

IV. HOW TO SET THE DIGITAL SWITCHES AND DIP SWITCHES

Loosen two screws ① and open panel ② as illustrated in the figure. Now, change the setting of the switches.



1. DIP switch function table



The switches have been factory-set as shown above at the time of delivery.

Function	DIP switch ③			
	1	2	3	4
A Continuous cycle mode	○	△	×	×
B Double-stepped action of the button clamp	△	○	×	×
C Adjustment mode	△	△	○	△
D Action without button	×	△	×	○

○ ... ON △ ... ON/OFF × ... OFF

- (a) Continuous cycle mode
Buttons are continuously sewn by keeping the pedal depressed.
- (b) Double-stepped action of the button clamp
Depress the pedal to its middle position to make the button clamp come down. This function is used in this state to automatically raise the button clamp by returning the pedal to its home position. The sewing machine starts running when the pedal is fully depressed.
- (c) Adjustment mode
This function is used to make each of the driving sources independently actuate in combination with the operation switches. Under this mode, the indicator of "ALM ON" indicates ON/OFF of sensors using the numbers corresponding to the respective sensors.
Note that the power to the machine should be turned OFF once and re-turned ON after the DIP switches have been changed over since this function is specified when turning ON the power to the machine.
- (d) Action without button
The button detecting sensors are ineffective, and the functions of the sewing machine excluding the button feeder are operative. This function is used to check the performance of the sewing machine. (Do not place a button on the sewing machine.)

2. How to set the digital switches

- 1) The length of time from the completion of index to the actuation of the triple pawl can be changed by setting DEG1 ④ accordingly.

Deg 1-0	5 msec	8	680
1	85	9	765
2	170 (Factory-set)	A	850
3	255	B	935
4	340	C	1020
5	425	D	1105
6	510	E	1190
7	595	F	1270

(Caution) This switch has been factory-set to 2 at the time of delivery.

The purpose of this switch is to permit the adjustment of the period of time from the completion of index to the actuation of the triple pawl. If using buttons of which wrong side is round-shaped or performing continuous sewing under the continuous cycle mode, the buttons that drop from the feed plate to the shutter plate fail to be secured until the triple pawl actuates resulting in defective feed of buttons to the carrier pin. Furthermore, the button cannot be fed quickly enough from the feeder to the feeding plate of the index unit. As a result, button feeding error may occur. These problems can be prevented by changing the period of time from the completion of index to the actuation of the triple pawl by using the switch.

- 2) The period of time from turning ON the magnet of the triple pawl to the detection of the button can be changed by setting DEG2 ⑤ accordingly.

Deg 2-0	50 msec	8	130
1	60	9	140
2	70	A	150
3	80	B	160
4	90	C	170
5	100 (Factory-set)	D	180
6	110	E	190
7	120	F	200

(Caution) This switch has been factory-set to 5 at the time of delivery.

V. ERROR MESSAGE AND INSPECTION

(1) Alarm No. indication

If the alarm indicator lamp on the control panel starts flashing on and off slowly, the relevant alarm number indicated on the front face of the control box will be shown on the control panel.

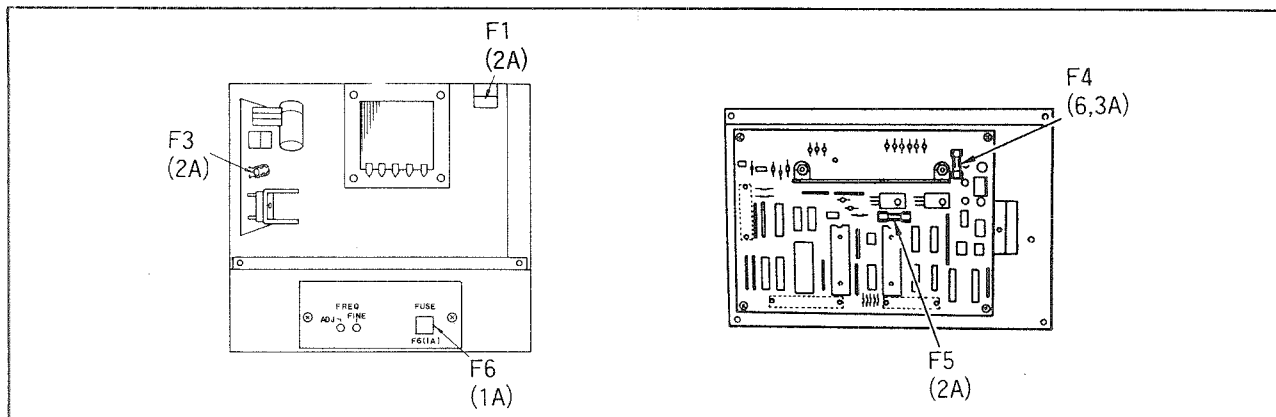
No.	Indi- cation	Troubles	Causes	Corrective measures	How to reset
0	0	Normal operation (given during the normal stand-by state of the sewing machine)	-	-	-
1	1	RAM check error CPU error	<ul style="list-style-type: none"> RAM in the CPU circuit board is defective. Self-diagnosis error 	Replace the CPU circuit board.	Re-turn ON the power to the machine.
2	2	Sewing machine starter is defective	<ul style="list-style-type: none"> If the machine can start up: L-SW is defective or disconnected. If the machine cannot start up: 24V trip. The starting magnet is defective or disconnected. 	Replace the L-SW. Replace the starting magnet.	Press the Reset button. Press the 24V RESET.
3	3	Fine positioning error (The fine positioning performance is not completed even after the second trial.)	<ul style="list-style-type: none"> The carrier does not match the distance between holes in the button. The fine positioning completion switch is defective. (Malfunction) The center of the fine positioning rod and that of the triple pawl carrier are not aligned with each other. 	Replace the carrier. Replace the RFIN sensor. (Adjust the RFIN sensor) Align the center of the rod with that of the triple pawl carrier.	Press the Reset button.
4	4	Spinner oscillating arm error (The motor is kept turned ON over a predetermined period of time.)	<ul style="list-style-type: none"> Overload of the motor (A button is caught in the spinner oscillating arm or the motor is mechanically locked.) F4 (6.3A) fuse has blown. 	Remove the button. Replace the fuse.	Turn OFF the power to the machine, remove the cause of the trouble and return ON the power to the machine.
5	5	Index unit error (The motor is kept turned ON over a predetermined period of time.)	<ul style="list-style-type: none"> Overload of the motor (A button is caught in the index unit or the motor is mechanically locked.) F5 (2A) fuse has blown. 	Remove the button. Replace the fuse.	Turn OFF the power to the machine, remove the cause of the trouble and return ON the power to the machine.
6	6	-	-	-	-
7	7	When the power switch is turned ON, the stop-motion mechanism is in its OFF state.	-	Set the machine head to its initial state.	Press the Reset switch.
8	8	Push-button switch for the positioning of button is defective or malfunction.	-	Re-adjust the Button positioning switch. Replace the Button positioning switch.	Press the Reset switch.
9	9	Start switch is defective or malfunction.	-	Re-adjust the Start switch. Replace the Start switch.	Press the Reset switch.
10	C	The sewing machine start condition error	<ul style="list-style-type: none"> The origin of the spinner oscillating arm has not been properly adjusted. The motor used to control the spinner oscillating arm is defective. 	Re-adjust the origin sensor properly. Replace the motor for the spinner oscillating arm.	Press the reset switch.
11	3	Button clamp jaw lever lifting condition error	<ul style="list-style-type: none"> The motor used to control the spinner oscillating arm is defective. The machine is not in its initial position when lifting the button clamp jaw lever. 	Replace the motor for the spinner oscillating arm. Set the machine to the initial state.	Press the reset switch.
12	U	Spinner oscillating arm condition error	The machine is not in its initial position when actuating spinner oscillating arm.	Set the machine to the initial state.	Press the reset switch.
13	C	Fine positioning performance condition error	The index unit is not in its origin. (The machine overruns due to a defective motor.)	Replace the motor for the index unit.	Press the reset switch.

(2) 24V trip

An overcurrent of the 24 Vdc line will trip the breaker mounted on the front face of the control box. To reset, press the white part of the breaker using a thin pin or the like until the part clicks.

(3) Confirm the input power terminal of the transformer. (Change round the terminal in accordance with the service voltage of the market where the sewing machine is to be used.)

(4) Replacing the fuse



You may find five fuses (F1, F3 through F6) as illustrated in the figure. (Remove the frame cover on the front face of the control box, and replace the fuses.)

(5) Inspection of the sensors and the driving sources should be carried out under the "adjustment mode".

To set the machine to the "adjustment mode", set the DIP switch 3 to its ON position. (Refer to "IV. HOW TO SET THE DIGITAL SWITCHES AND DIP SWITCHES")

Description of mode	Symbol	Cross-over stitches	Actuator	Description
Automatic sewing		With 	Starter	Whether the sewing machine starting magnet is turned ON within 150 msec.
Small-lot sewing			Fine positioner	Whether the fine positioner magnet is turned ON
Step-operation			Shutter	Whether the shutter magnet is turned ON
Discharging			Positioning	Whether the positioning magnet is turned ON
Automatic sewing		Without 	Button clamp jaw lever lifter	Button clamp jaw lifting magnet is set to ON
Independent sewing			Spinner oscillating arm	Spinner oscillating arm performs its cycle operation once
Small-lot sewing			Index	Index unit rotates to index a button
Step-operation			Fine positioner rotation	Whether the fine positioner rotates/stops
Discharging			Fine positioning performance	Whether the time required for fine positioning completes in 2.6 sec.

* Make the magnets actuate using the manual operation switches.

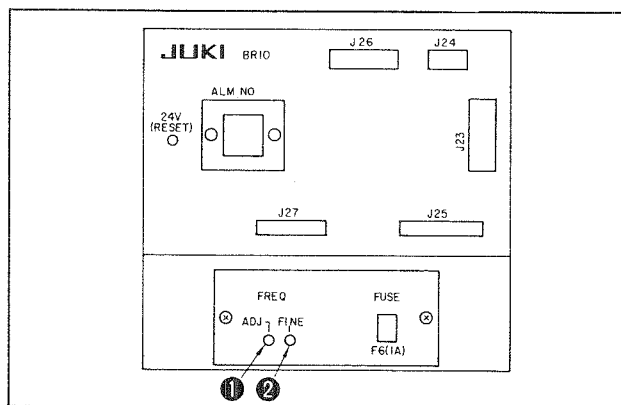
(6) Sensor check number table

NO.	Code of sensor	Name of sensor	State
1	STP	Stop-motion switch	ON
2	—	—	—
3	SORG	Double-stepped switch origin	Shielded
4	START	Double-stepped switch start	Transmitted
5	RFIN	Fine positioning completion switch	OFF
6	BUT	Positioning push-button detection	OFF
7	AORG	Spinner oscillating arm origin switch	Transmitted
8	IORG	Index origin switch	OFF

VI. ADJUSTMENTS

1. Adjusting the parts feeder

(1) Operation of the control panel (2)

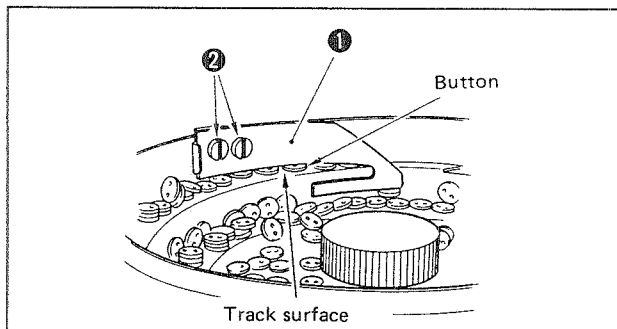


- 1) The control panel (2) is energized by turning ON the power to the device. (Turn ON the power to the sewing machine, too.)
- 2) Set the parts feeder adjusting variable resistor (Refer to III.2 Control panel (1)) to its intermediate position.
- 3) If the feeder does not vibrate adequately, turn sensitivity adjustment variable resistor ① until it reaches the position to allow the feeder to vibrate most. Then turn sensitivity adjustment variable resistor ② and make a fine adjustment so that vibration of the feeder is maximized.
- 4) Adjust the flow of buttons using the parts feeder adjusting variable resistor.

(Caution) Sensitivity adjusting variable resistor ② is very delicate. It is advisable to place buttons with flat bottom in the feeder bowl, and adjust the flow of buttons while checking the actual flow of the buttons. This will allow you to adjust the flow of buttons with ease.

2. Adjusting the attachments in the feeder bowl

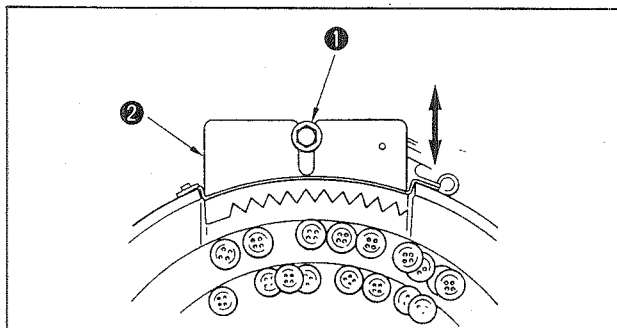
2-(1) Guide plate



The appropriate clearance between the button top face and the guide plate ① is approximately 0.7 mm (0.028").

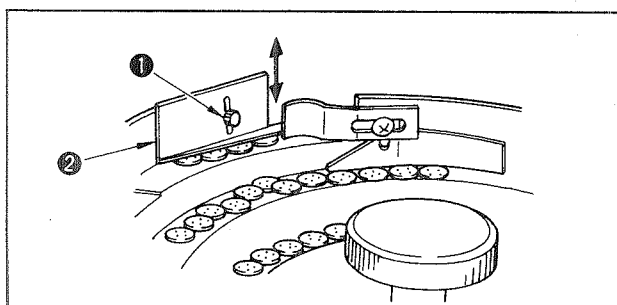
Loosen screws ②, and move guide plate ① up and down to adjust the clearance appropriately.

2-(2) Separation plate



Buttons with their wrong side up are sorted from those with their right side up when they pass the selector plate. So only the buttons with their right side up are fed into the index unit. To adjust the selector plate, loosen bolt ①, and move selector plate ② back or forth until it is properly positioned. Then tighten bolt ①. The selector plate comes in three different sizes, large, medium and small. Select an appropriate one from among the three different types of selector plate in accordance with the size of buttons to be used.

2-(3) In-line arrangement plate

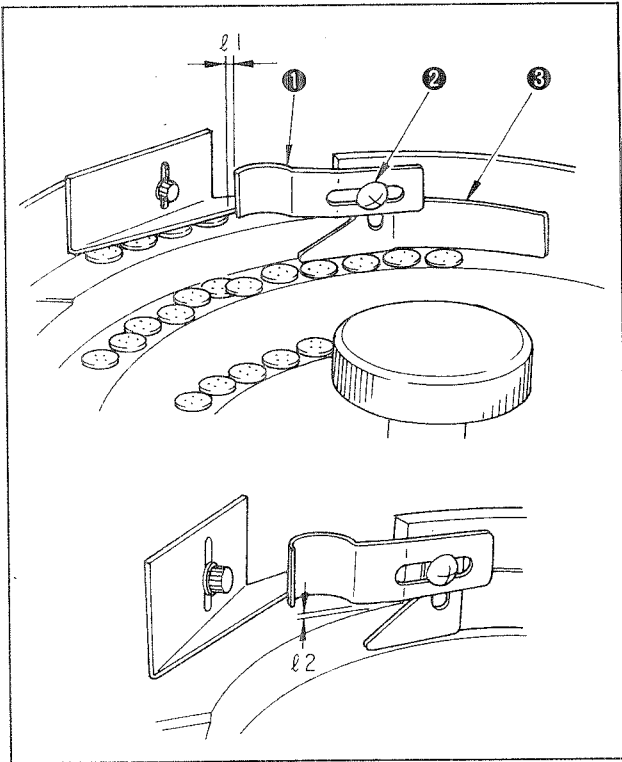


This plate prevents buttons which have passed the separation plate from piling up.

The appropriate clearance between in-line arrangement plate ② and the top face of a button is approximately 0.7 mm (0.028").

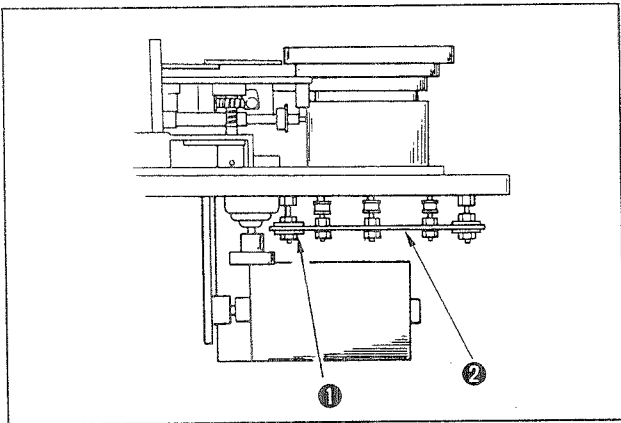
Loosen bolt ①, and move the in-line arrangement plate ② up or down to adjust the clearance to the correct value.

2-(4) Button guide



Appropriate clearance $\ell 1$ between the button guide (1) and the button is approximately 3 to 4 mm (0.118" to 0.157"). Loosen screw (2), and adjust the clearance to the correct value. A clearance which is larger than the value twice as thick as a button by approximately 0.7 mm (0.028") should be provided between overflow prevention plate (3) and the button. Loosen screw (2), and adjust the clearance to the correct value. Appropriate clearance $\ell 2$ between lower surface of the button guide and the track surface of the feeder bowl is 0.3 to 0.5 mm (0.012" to 0.020").

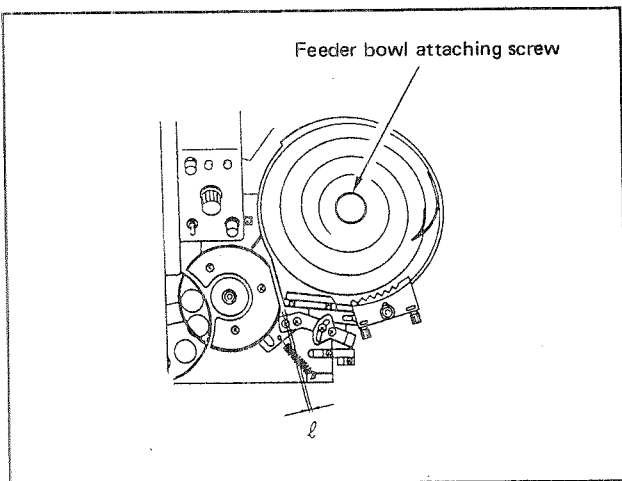
2-(5) Adjusting the height of the feeder bowl



Loosen six locknuts (1) of feeder base (2), and adjust height difference between the outlet for buttons and the feeder bowl to 0.5 mm (0.020") or less while the feeder bowl is positioned higher than the outlet for buttons.

If an excessive difference in height is provided, two buttons may enter the notch of the feed plate with overlapped. So be careful.

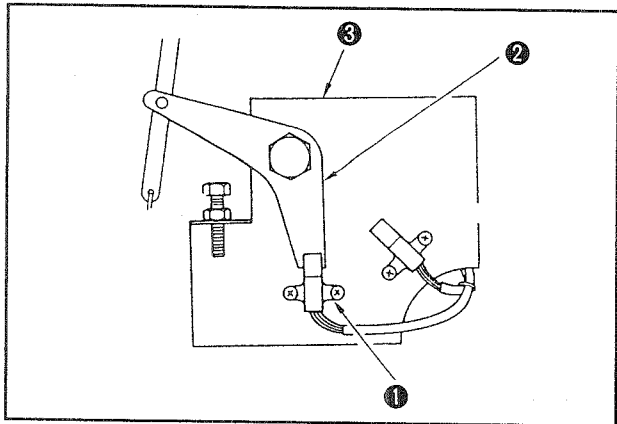
2-(6) Adjusting the position of the feeder bowl



Adjust clearance ℓ between the feeder bowl and the disk to approximately 1 to 1.5 mm (0.039" to 0.059"). Loosen nut (1) (above figure) and move the entire unit of the feeder bowl until it is properly positioned. The position of the feeder bowl can be finely adjusted by loosening the feeder bowl attaching screw and changing the position of the feeder bowl.

4. Adjusting the position of sensors (Set the mode selector switch on the control panel to the step-operation mode \cup .)

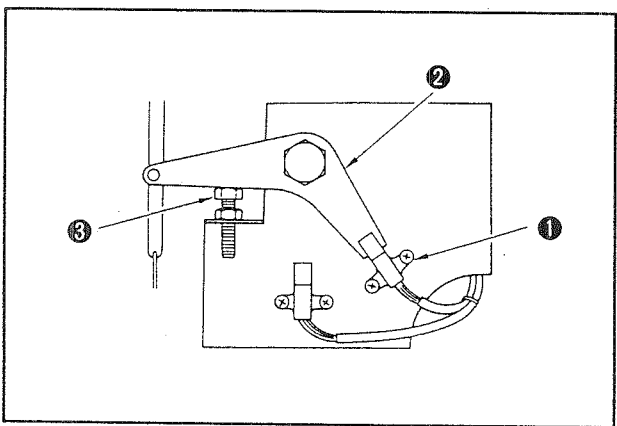
(1) Adjusting the start origin switch (SORG)



Start origin switch ① (hereinafter called "SORG") which incorporates a photo micro sensor (PM-T53B) is the sensor to detect the returning action of the foot pedal.

Adjust so that the SORG is shielded when the pedal is returned to its home position after it has been depressed to make the button clamp come down. If the SORG is not shielded, check whether two-stepped switch bracket ③ has been installed correctly. If two-stepped switch bracket has been installed with bent, switch shield plate ② may fail to smoothly operate preventing the SORG from being properly shielded.

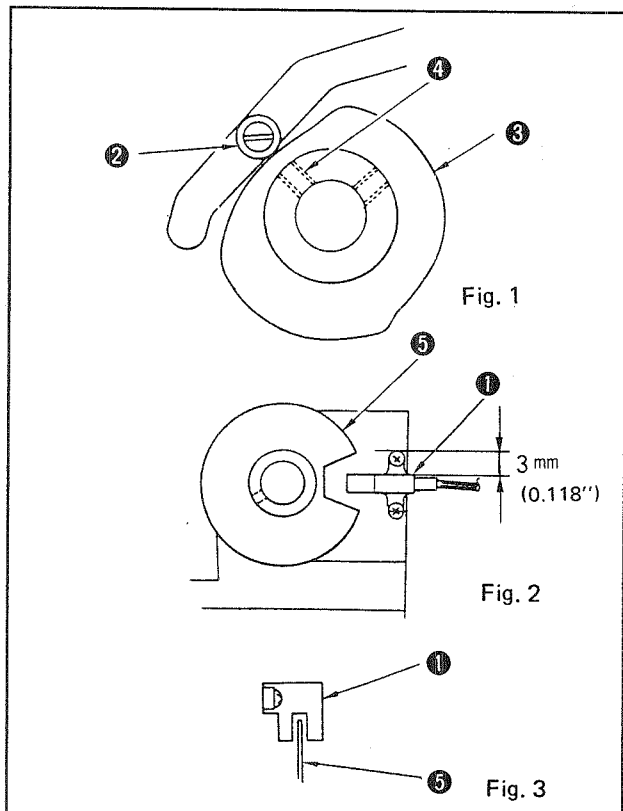
(2) Adjusting the start switch (START)



Start switch ① (hereinafter called "START") which incorporates a photo micro sensor (PM-T53B) is the sensor to detect the depressed foot pedal and to output the command to actuate the sewing machine.

Adjust so that the START is shielded when the pedal is depressed. If the START is not shielded or it overruns after it has once shielded, adjust stopper bolt ③ so that shielded plate ② comes just the center of the sensor.

(3) Adjusting the spinner oscillating arm origin switch (AORG)

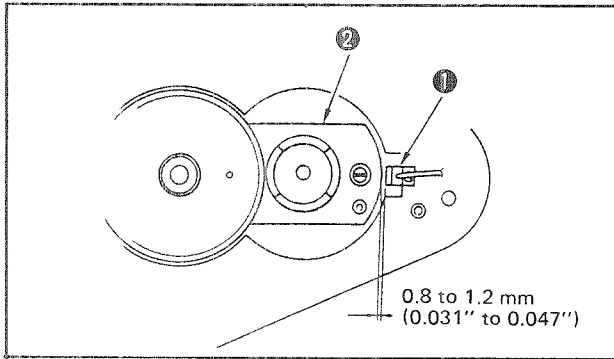


Spinner oscillating arm origin switch ① (hereinafter called "AORG") which incorporates a photo micro sensor (PM-T53B) is the sensor to detect the origin of the cam shaft.

Adjust so that cam follower ② for the button clamp jaw lever is located above attaching screw ④ in two-stepped cam ③ by turning the knob on the motor of the spinner oscillating arm origin switch, as illustrated in Fig. 1. Fix sensor dog ⑤ at that position as illustrated in Fig. 2.

At this time, note that sensor dog ⑤ should come the center of the sensor as shown in Fig. 3.

(4) Adjusting the index origin switch (IORG)



Index origin switch ① (hereinafter called IORG) which incorporates a proximity sensor (GXL-8F) is a sensor to detect the stop of feeding of the feed plate. Adjust the clearance between the periphery of Zeneva wheel ② and the detecting plane of the IORG to 0.8 to 1.2 mm (0.031" to 0.047").

(5) Adjusting the button positioning detection switch (BUT)

Button positioning detection switch ① (hereinafter called BUT) which incorporates a proximity sensor (GXL-8F) is a sensor to detect whether a button exists within positioner ② when actuating the positioner (triple pawl). (It turns OFF when a button exists in the positioner or turns ON when it does not detect any button there.)

Draw the iron core of positioning solenoid ③ when there is no button in positioner ②, and the triple pawl will be closed. In this state, loosen the fixing screw of triple pawl dog ④, and move triple pawl dog until BUT which has been in the OFF state turns ON. Then further move the triple pawl dog forward from the aforementioned position (① in Fig. a) by 1.5 mm (0.059") (② in Fig. a), and tighten the fixing screw of the triple pawl dog. Then, confirm that BUT turns OFF when the triple pawl clamps a $\phi 10$ button. Also confirm that BUT turns ON when the triple pawl is closed after taking out the button from it.

Be sure to remember that adjustment (6) should be carried out whenever the aforementioned adjustments have been carried out.

(6) Adjusting the fine positioning completion switch (RFIN)

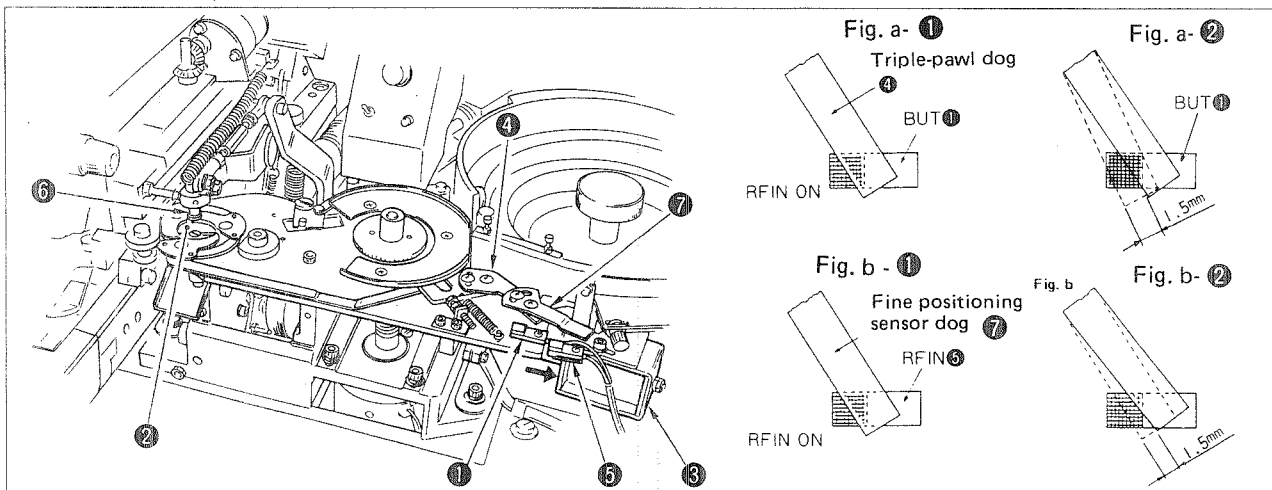
Fine positioning completion switch ⑤ (hereinafter called "RFIN") which incorporates a proximity sensor (GXL-8F) is the sensor to detect a button when the button is set on the carrier pin.

Place a $\phi 10$ mm (0.394") button in triple pawl ②, draw the iron core of positioning solenoid ③ toward you to make the triple pawl clamp ② the periphery of the button. In this state, loosen fixing screw of fine positioning sensor dog ⑦, and move the RFIN to the position where the RFIN changes from its OFF state to ON state (Fig. b- 1). Then move back the RFIN from the aforementioned position by 1.5 mm (0.059") (Fig. b- 2), and tighten the fixing screw.

Then confirm first that the RFIN turns OFF when the triple pawl clamps a $\phi 10$ mm (0.394") button. Remove the button from the triple pawl, and confirm that the RFIN turns ON when the triple pawl clamps the periphery of the lower section of the work attachment.

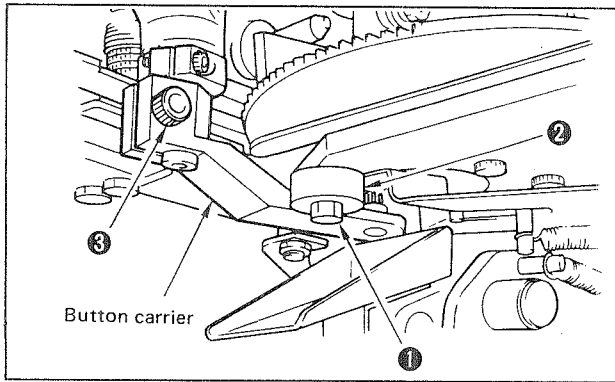
Note that adjustment (5) should have been completed before starting this adjustment.

(Caution) The RFIN functions to detect a button when the button is completely set on the carrier pin by turning itself ON/OFF in accordance with the difference between the outside diameter of the button and that of the work attachment and to open/close the shutter.



VIII. REPLACING THE COMPONENTS AND POSITIONING THEM

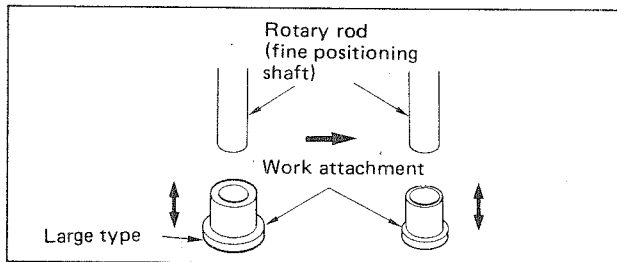
1. Replacing the button carrier and positioning it



To replace the button carrier, loosen screw ③, then remove the button carrier. Replace the button carrier with one with a proper center-to-center distance, and fit the button carrier with a proper center-to-center distance to the eccentric cam, and simultaneously make the top face of the carrier come in contact with the nut. Now fix the carrier by screw ③.

(Caution) The above-stated positioning procedure should be carried out with the sewing machine set to the origin.

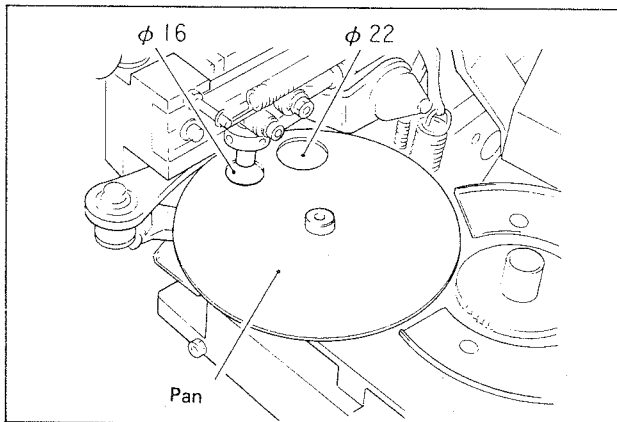
2. Replacing the work attachment



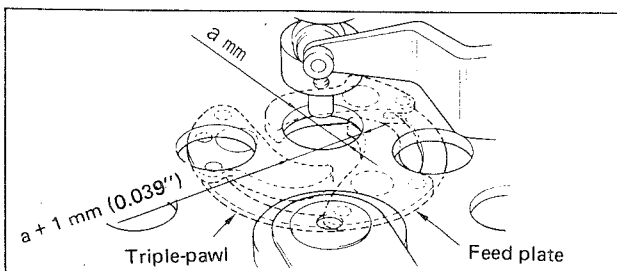
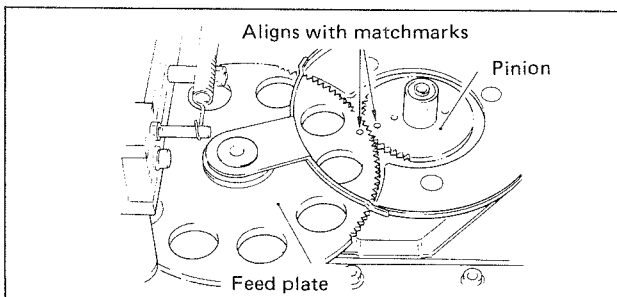
Remove the work attachment currently attached on the sewing machine from the rotary rod. Then attach the work attachment of another type on the machine. At this time, be sure to confirm that the work attachment securely fits in position.

This should be confirmed in the case of replacing any other components in the normal operation of the sewing machine.

3. Replacing the feed plate and positioning it



* A $\phi 22$ (0.866") feed plate is also applicable by turning the pan over.



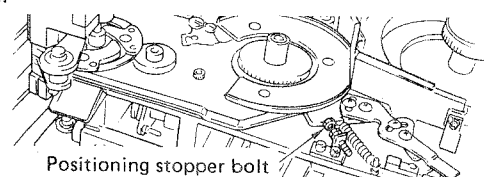
1) Pan

Use the feed plate of $\phi 16$ mm (0.630") (standard) when sewing buttons of which outside diameter is $\phi 10$ mm to $\phi 15$ mm (0.394" to 0.591"). If the outside diameter of the button is $\phi 16$ mm (0.630") to $\phi 18$ mm (0.709"), use the feed plate of $\phi 22$ mm (0.866") (optional). At this time, it is necessary to adjust the pan located under the feed plate to the diameter of the hole in the feed plate. The pan is provided with two holes, one is $\phi 16$ mm (0.630") hole and the other is $\phi 22$ mm (0.866") hole. When using the feed plate of $\phi 16$ mm (0.630"), attach the pan so that its $\phi 16$ mm (0.630") hole comes this side with respect to the rotational direction of the feed plate. On the other hand, if using the feed plate of $\phi 22$ mm (0.866"), attach the pan so that its $\phi 22$ mm (0.866") hole comes this side with respect to the rotational direction of the feed plate.

2) To adjust the position of the feed plate, confirm first that the pinion is in its origin and attach the feed plate at the position where the matchmark (countersinking) on the pinion aligns with the matchmark on the feed plate. At this time, align the hole in the pan with the hole in the feed plate on the triple pawl.

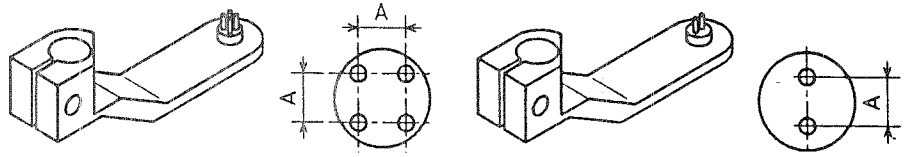
3) Adjust the initial diameter of the triple-pawl taking the value which is obtained by adding 1 mm (0.039") to the diameter of the button hole in the feed plate used as reference.

Make the adjustment using the positioning stopper bolt.



IX. OPTIONAL PARTS

1. Work attachment with a bottom of which diameter is larger than the standard type the standard type one is also available (part No. 16557704). Use this attachment for buttons with a larger diameter which cannot be smoothly turned by using the standard work attachment.
2. When using shell buttons, the edge of the buttons may break when triple pawl forcibly closes since the shape of the shell buttons are not uniform. When using small round-bottom buttons of $\phi 10$ (0.394") or so, they may not be securely placed on the work attachment and may be snapped out of position when the triple-pawl closes since the pawl cannot securely hold the round-bottom buttons.
To prevent the above-stated troubles, use the smaller button hole in the feed plate asm. (part No. 18200956) (dia. 13.5 mm (0.531")) and the smaller hole in the receiving plate (small) (18201103).
Replace and adjust the feed plate following the procedure same as that taken when replacing and positioning the feed plate $\phi 22$ to $\phi 9$ (0.866" to 0.354"). For buttons of $\phi 16$ to $\phi 18$ (0.629" to 0.709"), use the feed plate $\phi 22$ (0.866") asm. (part No. 16568651).
3. Button carrier
In addition to the two standard types of button carrier, 26 different types of button carrier are available in accordance with the number of holes in a button, the diameter of the holes in a button and the interval between the holes in a button. If either of the standard carriers does not match the button to be sewn, select an appropriate one from among the optional button carriers.
4. When sewing small buttons of which inside diameter is approximately $\phi 10$ mm, use the separation plate of the extra small size (18255153) if the right-sided buttons are not discriminated from the wrong-sided buttons with accuracy.



Code	Part No.	Dimension A	Number of lines	Number of holes in a button	Specification	
A	165-57902	2.6	1.0	4	Standard type	
B	165-58009	3.2	1.2	2		
C	165-87107	3.8	1.2	2		
D	165-87206	3.1	1.0	4		
E	165-87305	2.0	1.0	2		
F	165-87404	2.2	1.0	2		
G	165-87503	2.4	1.0	2		
H	165-87602	2.6	1.0	2		
J	165-87701	2.8	1.0	2		
K	165-87800	3.0	1.0	2		
L	165-87909	2.4	1.2	2		
M	165-88006	2.6	1.2	2		Special-order type
N	165-88105	2.8	1.2	2		
P	165-88204	3.0	1.2	2		
Q	165-90507	2.0	1.0	4		
R	165-90606	2.2	1.0	4		
S	165-88501	2.4	1.0	4		
T	165-88600	2.4	1.2	4		
U	165-88709	2.6	1.2	4		
V	165-88808	2.8	1.2	4		
W	165-88907	3.0	1.2	4		
X	165-89004	3.1	1.2	4		
* Y	165-89103	2.6	1.2	(Spacer) 4		
Z	165-89202	3.1	1.4	4		
E I	165-89707	4.0	1.2	4		
F I	165-89806	3.0	1.5	4		
G I	165-89905	3.2	Taper	4		
H I	165-90705	3.6	1.2	4		

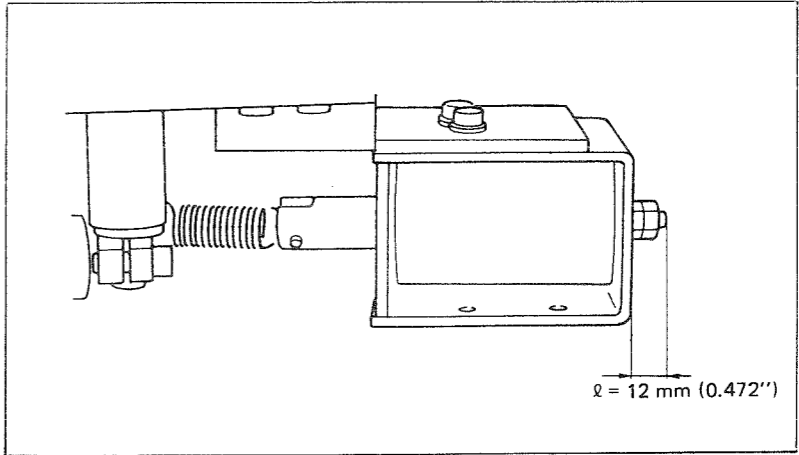
The standard spacing amount is 2 mm (0.079"). The parts to be spaced are as follows:
 B2555-372-ROJ Button clamp jaw lever (left)
 B2557-372-ROJ Button clamp jaw lever (right)


X, TROUBLES AND CORRECTIVE MEASURES

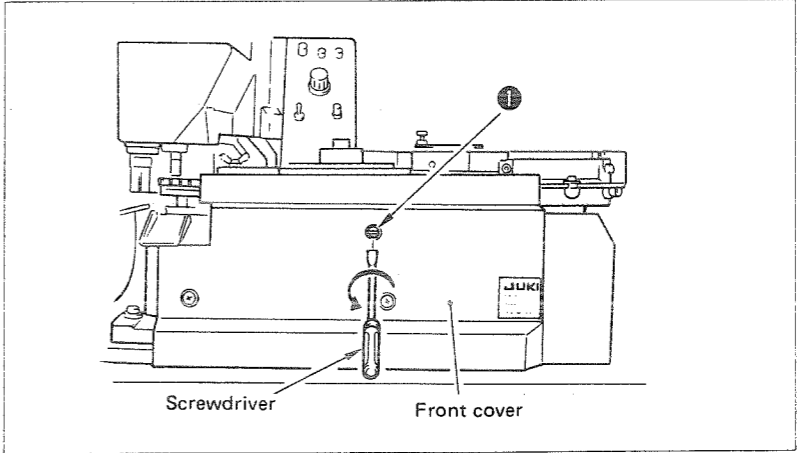
1. Mechanical components

Trouble	Cause (1)	Cause (2)	Checking procedure and adjustment
A button is not be fitted on the carrier pin after fine positioning of the button has been carried out twice.	Centers of the rotary rod is not aligned with that of the carrier pin.		Center the rotary rod and the carrier pin corectly.
	Center of the rotary rod is not aligned with that of the positioning unit.		Center the rotary rod and the positioning unit correctly.
	Defective position of the sensor for confirming the button is fitted on the carrier pin.		Adjust the position of the sensor.
	The button cannot be turned due to inadequate gripping force of the work attachment (soiled with oil or the like).		Replace the work attachment with a new one.
			Wipe out the gripping face of the work attachment.
	Celarance between the shutter plate and the carrier pin is too large.		Adjust the height of the carrier pin.
	Tips of the pins on the carrier pin are ot uniform.		Apply a carrier pin whose pin tips are uniform.
	Center-to-center distance of the holes in button used and that of the pins on the carrier pin are not equal.		Use a carrier pin with pins of which center-to-center distance is equal with that of the holes in button used.
	Height of the work attachment is defective.		Re-adjust the height of the work attachment.
	Button retaining force of triple pawl is too strong.		Check whether the output level of the positioning solenoid is adequate.
The button is not finely positioned even when the button is placed at the triple-pawl section. Fine positioning is performed with no button at the triple-pawl section.	Shutter plate is not opened or inadequately opened.		Check the shutter plate for smooth motion. Check whether the shutter plate is opened as wide as 22 mm (0.866") at the maximum.
	The triple-pawl dog is improperly positioned. As a result, the sensor fails to detect a button.		Adjust the position of triple-pawl dog properly.
Two pieces of button may enter tne notch in the feed plate.	Height difference between the feed plate and the outlet of the parts feeder is excessive.		Lower the parts feeder.
	The clearance in in-line adjustment plate is too large for the thickness of button used.		Adjust the clearance in accordance with the button thickness.
	Diameter of the notch is too large for the diameter of button used.		Select the notch suited to the button diameter.
The button is rejected when it is fed from the carrier to the button clamp jaw lever.	The carrier and the button clamp jaw lever are not flush with each other.		Flush the carrier with the button clamp jaw lever.
	The opening amount of the button clamp jaw lever is not appropriate to the button used.		Adjust the opening amount according to the button used.
	Center of the carrier is not aligned with that of the button clamp jaw lever.		Center the carrier and the button clamp jaw lever.
The button is attached to the work attachment.	The work attachment is worn out.		Replace the work attachment with a new one.
	The work attachment is soiled with oil, or the like.		Wipe the grip of the work attachment with a piece of dry cloth.

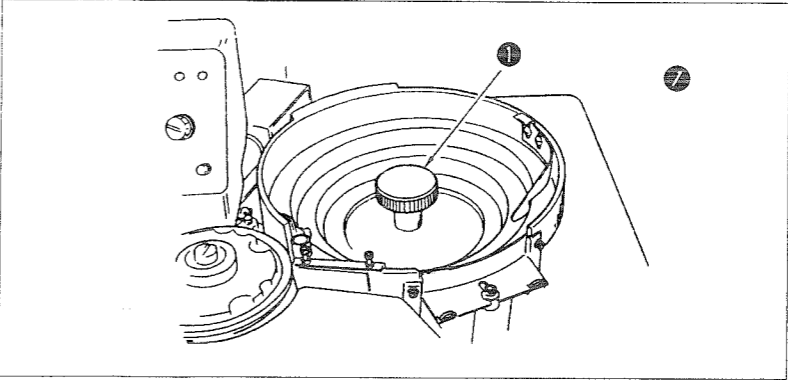
Trouble	Cause (1)	Cause (2)	Checking procedure and adjustment
The button is raised when it is clamped by the triple-pawl at the button positioning unit.	Triple-pawl moves too fast and the output level of the solenoid is excessive.		Check whether the solenoid has been adjusted as illustrated.
Triple-pawl fails to clamp the button at the button positioning unit.	The output level of the solenoid is too low to actuate the triple-pawl.		



Button is caught in between the feed plate and the parts feeder.	The distance from the feed plate to the parts feeder is too large.	Adjust the position of the parts feeder.
	The button is not smoothly carried to the feed plate.	Slightly lift the parts feeder.
	The button guide is improperly positioned.	Adjust the position of the button guide.
	The clearance between the button guide and the track surface of the parts feeder is too small.	Slightly lift the button guide.
	The button feeding speed is inadequate.	Turn the variable resistor on the control panel of the parts feeder to increase the button feeding speed.
Corrective measure to be taken when a button is jammed.	When a button is jammed, insert a screwdriver into hole  in the top of the front cover and turn it counterclockwise.	



Trouble	Cause (1)	Cause (2)	Checking procedure and adjustment
Buttons in the parts feeder are not smoothly run.	Screw ① which fixes the feeder bowl loosens.		Securely tighten screw ①.
Button from the feeder bowl does not enter the feed plate.	Defective position of the sensitivity adjustment variable resistor.		Adjust the position of the sensitivity adjustment variable resistor.
	Feeder bowl comes in contact with some component, thereby preventing the feeder bowl from properly vibrating.		Position the feeder bowl at the position where it does not come in contact with any component.
	Defective position of the feeder bowl.		Adjust the position of the feeder bowl.
A button drops from the clearance between the feeder bowl and the feed plate.	Defective position of the button guide.		Adjust the position of the button guide.
	Height or diameter of the feed plate is improper.		Adjust the position of the feed plate properly.
When the fine positioning mechanism works, the shutter opens though there is no button set on the carrier pin.	The feeder bowl is improperly positioned.		Adjust the position of the feeder bowl properly.
	The fine positioning completion sensor is improperly adjusted.		Adjust the fine positioning completion sensor properly.



2. Electrical components

Trouble	Cause (1)	Cause (2)	Checking procedure and adjustment
1. Turning ON the power to the machine			
Machine cannot be powered up. (The motor fails to rotate.)	Power cable has been unplugged.		Connect the power plug properly.
Motor of the sewing machine starts rotating, but the power indicator lamp on the control panel fails to light up.	Faulty AC power supply to the transformer	Fuses (F1, F2:2A) have blown.	Replace fuses F1 and F2 with new ones.
	Faulty +5V power supply to the CPU circuit board.	Connector (P21) on the CPU circuit board has been disconnected.	Connect the connector P21.
		Connectors (P11 and P12) on the power circuit board have been disconnected.	Connect the connectors P11 and P12.
		Faulty AC7.5V power supply on the power circuit board.	Check the transformer tap for proper connection, and check the AC input power voltage. Check for the output voltage (7.5 Vac) of the transformer. If the output voltage is not supplied to the power circuit board, replace the transformer.
		Fuse (F3: 2A) on the power circuit board has blown.	Replace the fuse with a new one.
		Defective power circuit board.	Replace the power circuit board with a new one.
	Faulty +5V power supply to the power indicator lamp.	Connector P23 on the CPU circuit board has been disconnected.	Connect the connector P23.
		Cable of the indicator lamp has been disconnected.	Connect the cable.
		Defective CPU circuit board.	Replace the CPU circuit board with a new one.
	Defective power indicator lamp.		Replace the power indicator lamp.
Numbers are not indicated on the alarm indicator lamp.	P-ROM has been improperly loaded on CPU circuit board.	Pins of the P-ROM have not been securely fitted on the CPU circuit board.	Securely press the P-ROM until it is securely fitted on the CPU circuit board.
		P-ROM has been installed on the CPU circuit board with its pins faced in the reverse direction.	Replace the P-ROM with a new one, and load it on the CPU circuit board taking care of the installing direction.
Following errors occur after energizing the machine.	Faulty +5V power supply to the CPU circuit board.		Perform troubleshooting following the steps stated above.
Error "1" occurs. (RAM check error, CPU error)	Faulty +5V power supply to the CPU circuit board.		Perform troubleshooting following the steps stated above.
	Defective RAM of the CPU circuit board or the malfunction of the CPU circuit board.	Defective CPU circuit board.	Replace the CPU circuit board with a new one.
Error "7" occurs. (The stop-motion mechanism comes off when turning ON the power to the machine.)	The sewing machine is not in its stop-motion state.		Make the machine enter its stop-motion state, and press the Reset switch. (The spinner oscillating arm may return to its origin. So be careful.)
	Stop-motion signal is not input.	Connector P24 on the CPU circuit board has been disconnected.	Connect the connector P24.
		Cable of the stop-motion switch has been disconnected.	Connect the cable.
		Defective stop-motion switch.	Replace the stop-motion switch with a new one.
	Defective input section of the CPU circuit board.	Replace the CPU circuit board with a new one.	

Trouble	Cause (1)	Cause (2)	Checking procedure and adjustment
Error "4" occurs. Spinner oscillating arm error (The motor has been kept in its ON state for the time longer than the predetermined one.)	Faulty +24V power supply to the CPU circuit board.	The +24V breaker on the power circuit board has tripped.	Reset the breaker properly.
		Faulty 18.5 Vac power supply to the power circuit board.	Check for the output voltage (18.5 Vac) of the transformer. If the output voltage is not supplied to the power circuit board, replace the transformer.
		Defective power circuit board.	Replace the power circuit board.
	Origin of the spinner oscillating arm has not been input.	Connector P25 on the CPU circuit board has been disconnected.	Connect the connector P25.
		Connector CN1 on the AORG sensor has been disconnected.	Connect the connector CN1.
		The light emitting window and light receiving window are stained.	Clean up the light emitting window and light receiving window.
		Defective AORG sensor.	Replace the spinner oscillating arm origin sensor (AORG) with a new one.
		Defective input section of the CPU circuit board.	Replace the CPU circuit board with a new one.
	Manual operation handle cannot be operated smoothly.	Cam shaft system has locked.	Inspect the worm components and cam components.
	Faulty +24V power supply to the motor of the spinner oscillating arm. (Pulse type voltage)	Connector P26 on the CPU circuit board has been disconnected.	Connect the connector P26.
		Terminal cable has broken.	Join the terminal cable.
		Defective CPU circuit board.	Replace the CPU circuit board with a new one.
Defective motor of the spinner oscillating arm.		Replace the motor of the spinner oscillating arm with a new one.	
Error "5" occurs. Index error (The motor has been kept in its ON state for the time longer than the predetermined one.)	Origin of the index has not been input.	Connector P36 on the IORG sensor has been disconnected.	Connect the connector P36.
		Iron chips have gathered on the IORG sensor.	Remove the iron chips.
		Defective IORG sensor.	Replace the index origin sensor (IORG) with a new one.
		Defective input section of the CPU circuit board.	Replace the CPU circuit board with a new one.
	The index unit cannot be manually released smoothly.	Buttons are jammed in the index unit.	Remove the buttons from the index unit.
		Zeneva components have locked.	Inspect Zeneva components and worm components.
	Faulty +24V power supply to the motor of the index unit.	Terminal cable has been disconnected.	Connect the cable on the terminal board.
		Defective CPU circuit board.	Replace the CPU circuit board.
	Defective motor of the index unit.		Replace the motor of the index unit with a new one.

- (Caution)
1. If error "4" or "5" occurs, it may be caused by some mechanical trouble. The error cannot be reset by pressing the Reset switch. Reset the error by turning OFF and ON the power.
 2. If error "4" or "5" occurs, check whether the error occurs while the motor is running or not.
 3. Check ON/OFF performance of the sensor under the adjustment mode.

Trouble	Cause (1)	Cause (2)	Checking procedure and adjustment	
2. Normal operation (sewing machine)				
The sewing machine fails to run.	Check whether the sewing machine has been set to the correct operation mode.		Set the sewing machine to the correct operation mode, and re-start the sewing machine.	
	Check whether DIP3 has been set to its ON position.		Set the DIP3 to its OFF position.	
	Check whether the sewing machine has been set to its stop-motion state.		Set the sewing machine to its stop-motion state, and re-start the sewing machine.	
	Start signal failure	Check whether connector P33 on the start switch has been disconnected.		Connect the connector P33.
		Check whether cable of the start switch has been disconnected.		Connect the cable of the start switch.
		Defective double-step switch mechanism.		Repair the double-step switch mechanism.
		Defective input section of the CPU circuit board.		Replace the CPU circuit board with a new one.
The spinner oscillating arm is not in its origin.		Manually bring the spinner oscillating arm to its origin.		
The sewing machine fails to run, and error "2" occurs.	Starter is inoperative.	Faulty +24V power supply to the starter.	Check whether connectors P24 and P31 have been disconnected. If any of the connectors has been disconnected, connect it properly. If +24V is not supplied to the CPU circuit board, perform troubleshooting referring to the aforementioned procedure relating to the trouble on the subject.	
		Defective starter	The output section of the CPU circuit board is defective. So, replace the CPU circuit board with a new one. Replace the starter with a new one.	
	The starter cannot be fully drawn back.	Projecting amount of the magnet is out of specification.	Adjust the projecting amount of the magnet to the specified value.	
	The sewing machine runs, and error "2" occurs.	The time required to make the starter fully draw back is longer than the predetermined length of time.	Projecting amount of the magnet is out of specification.	Adjust the projecting amount of the magnet to the specified value.
Clutch cannot be smoothly engaged with the sewing machine.			Inspect the clutch mechanism. If it is defective, replace it with a new one.	
Supply voltage is too low.			Measure the supply voltage. If it is out of specification, adjust it to the specified value.	
L-SW cannot be turned OFF.		The L-SW dog has been improperly adjusted.	Adjust the L-SW dog to the specified value.	
		Defective L-SW	Replace the L-SW with a new one.	
Defective input section of the CPU circuit board		Replace the CPU circuit board with a new one.		
The sewing machine fails to run, and error "6" occurs.	Check whether the belt has broken.		If the belt has broken, replace it with a new one.	
	The clutch fails to be engaged with the sewing machine.	Defective stop-motion mechanism.	Replace the stop-motion mechanism with a new one.	
The sewing machine runs, and error "6" occurs.	The sewing machine fails to enter its stop-motion state.	Defective stop-motion mechanism.	Replace the stop-motion mechanism with a new one.	

Trouble	Cause (1)	Cause (2)	Checking procedure and adjustment
3. Manual operation (button feeder)			
The button feeder cannot be manually operated.	Check whether the button feeder has been set to the correct operation mode.		Set the button feeder to the correct operation mode, and re-start it.
	Check whether DIP3 has been set to its ON position.		Set the DIP3 to its OFF position.
	The sewing machine has not been set to its stop-motion state.		Set the sewing machine to its stop-motion state, and re-start the sewing machine.
The button feeder runs without a button.	Check whether DIP4 has been set to its ON position.		Set the DIP4 to its OFF position.
Several buttons are fed to the positioner.	Button detecting sensor has been improperly adjusted.		Adjust the sensor properly.
Error "3" occurs.	Fine positioning error (The machine fails to complete fine positioning of a button after performing the procedure twice.)		
No button is placed in the positioner.	The positioner fails to operate.	Stroke of the positioning magnet has been improperly adjusted.	Adjust the stroke of the magnet properly.
		Faulty +24V power supply to the positioning magnet.	Measure the voltage supplied to the terminal board. If a +24V is not supplied to the terminal board, replace the CPU circuit board. If it is supplied to the terminal board, replace the magnet.
	The button detecting sensor is kept to its OFF state.	The positioning sensor has been improperly adjusted.	Adjust the positioning sensor properly. The sensor should turn ON when it detects a button, or it should turn OFF when it detects no button.
		Connector P35 has been disconnected.	Connect the connector P35 properly.
		Defective positioning sensor.	Replace the positioning sensor with a new one.
Defective CPU circuit board.	Replace the CPU circuit board with a new one.		
A button is placed in the positioner.	The fine positioner fails to rotate.	Check whether DIP4 has been set to its ON position.	Set the DIP4 to its OFF position.
		The fine positioning shaft has locked.	Inspect the bushing and gear system. If any of the components has locked, the motor may also be defective. So be careful.
		Faulty +24V power supply to the motor of the fine positioner.	Measure the voltage supplied to the terminal board. If a +24V is not supplied to the terminal board, replace the CPU circuit board. If it is supplied to the motor, replace the magnet.
	The fine positioner fails to come down.	The fine positioning shaft fails to move smoothly.	Inspect the fine positioning shaft.
		Faulty +24V power supply to the fine positioner lowering magnet.	Measure the voltage supplied to the terminal board. If a +24V is not supplied to the terminal board, replace the CPU circuit board. If it is supplied to the terminal board, replace the magnet.
	The positioner fails to operate.	Take the aforementioned corrective measure taken when error "3" occurs when no button is placed in the positioner.	
	The machine cannot complete the fine positioning a button.	The fine positioning completion sensor has been improperly adjusted.	Adjust the fine positioning completion sensor properly. The sensor should turn ON when a button is placed in the fine positioner.
		Connector P34 has been disconnected.	Connect the connector P34 properly.
		Defective fine positioning completion sensor.	Replace the fine positioning completion sensor with a new one.
		Defective CPU circuit board.	Replace the CPU circuit board with a new one.
Error "3" occurs in the case other than the cases where the power to the device is turned ON or the fine positioner operates.	A button is jammed in between the triple pawl and the shutter.	Remove the button.	
	The error cannot be reset with the Reset switch.	Defective fine positioning completion sensor.	Replace the fine positioning completion sensor with a new one.
		Defective input section of the CPU circuit board.	Set the operation mode to the automatic sewing mode.

Trouble	Cause (1)	Cause (2)	Checking procedure and adjustment	
Parts feeder fails to operate.	The button feeder has not been set to the correct mode.		Set the operation mode of the button feeder to the automatic sewing mode.	
	Check whether DIP4 has been set to its ON position.		Set the DIP4 to its OFF position.	
	Fuse 1A on P/F panel has blown.		Replace the fuse with a new one.	
	Faulty 100 Vac to the P/F controller.	Connector P1 has been disconnected.		Connect the connector P1.
				Check for the output voltage (7.5 Vac) of the transformer. If the output voltage is not supplied to the controller, replace the transformer with a new one.
Control signal is not output.	Defective CPU circuit board.		Open the rear cover of the P/F controller, and short-circuit the terminal boards 1 and 2. If the P/F controller is operative, replace the CPU circuit board with a new one, and wire the P/F controller as it has been. If the P/F controller is inoperative, replace the P/F controller with a new one.	
Error "8" occurs. Button positioning switch is defective or malfunctions.	BUT signal is kept in its ON state.	Defective button detecting sensor.	Replace the sensor with a new one.	
		Defective CPU circuit board.	Replace the CPU circuit board.	
		A button is jammed in between the triple pawl and the shutter.	Remove the button.	
Error "9" occurs. Start switch is defective or malfunctions.	Both steps of the double-step switch have been turned ON.	Defective double-step switch mechanism	Inspect the double-step switch mechanism.	
		Defective Start switch.	Replace the Start switch (asm.) with a new one.	
		Defective CPU circuit board.	Replace the CPU circuit board with a new one.	

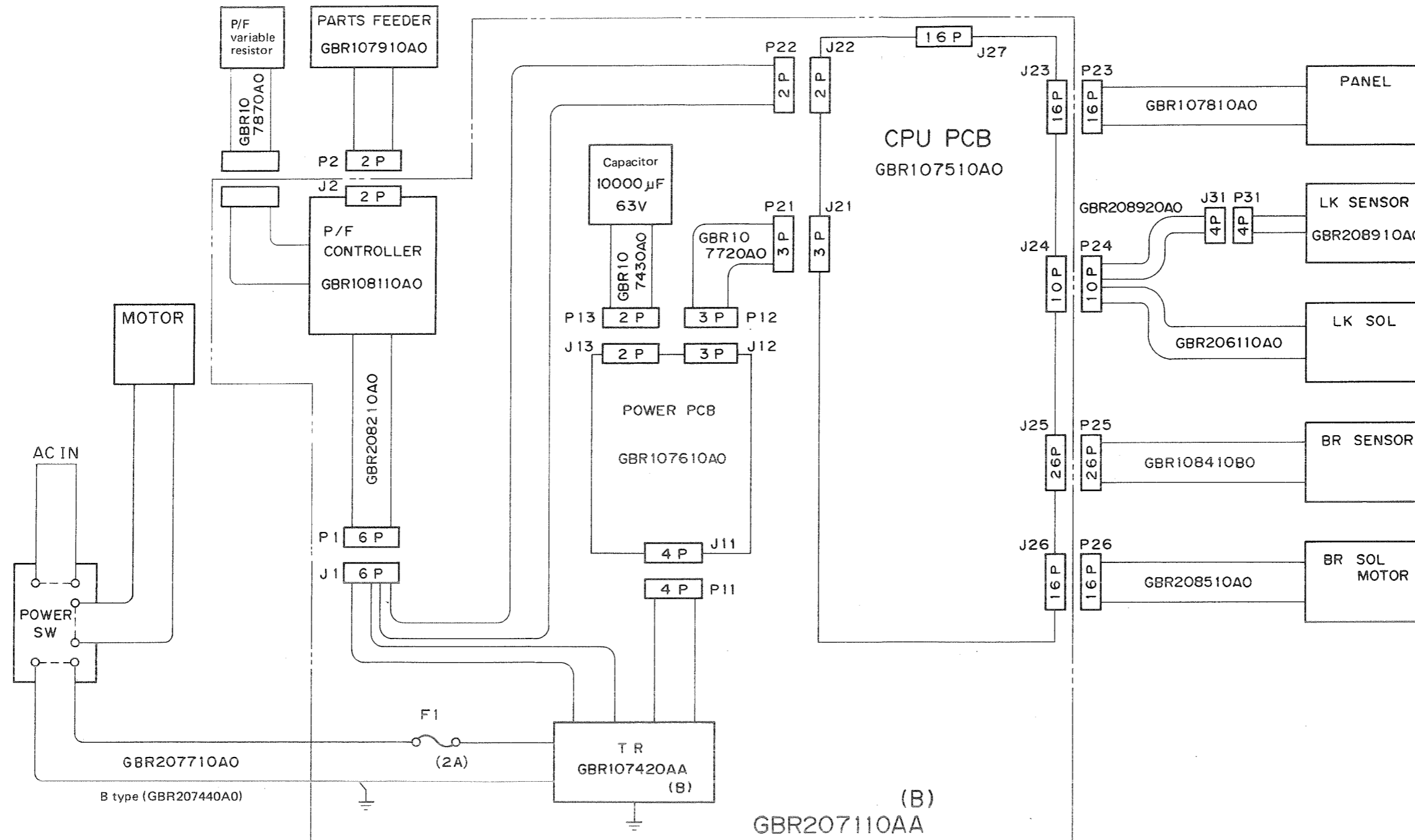
- (Remarks) 1. If error "4" or "5" occurs, take the corrective measure taken when error "4" and "5" occurs when turning ON the power to the device.
2. Inspect the sensor under the adjustment mode. When the sewing machine is in the normal standby state, "0" is indicated on the panel.
3. The terminal boards are mounted on the right hand side of the motor of the sewing machine which is located at the rear of the machine.

Error "E" occurs. Sewing machine start condition error	Origin of the spinner oscillating arm has been improperly adjusted.		Re-adjust the origin sensor properly.
	Defective motor of the spinner oscillating arm.		Replace the motor of the spinner oscillating arm.
Error "E" occurs. Button clamp jaw lever lifter operating condition error.	Defective motor of the spinner oscillating arm.		Replace the motor of the spinner oscillating arm.
	The sewing machine is not in its initial position when the button clamp jaw lever lifter actuates.		Set the sewing machine to its initial state.
Error "E" occurs. Spinner oscillating arm operating condition error.	The sewing machine is not in its initial position when the spinner oscillating arm actuates.		Set the sewing machine to its initial state.
Error "E" occurs. Fine positioner operating condition error	Index unit is not in its origin. (The index unit has overrun due to the defective motor.)		Replace the motor of the index unit.

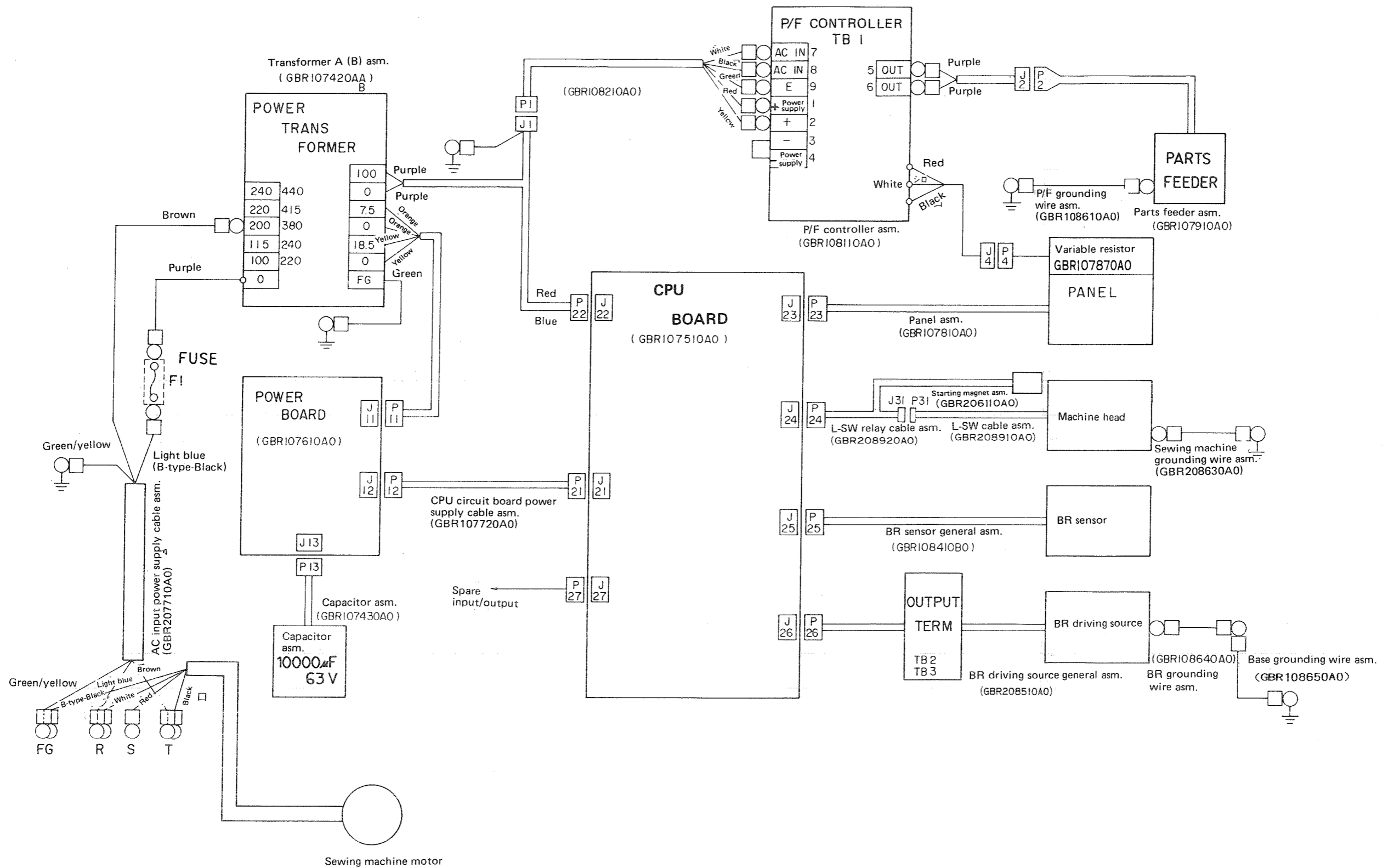
3. Sewing machine head components

Trouble	Cause (1)	Cause (2)	Checking procedure and adjustment
Thread slips off the needle eyelet at the sewing start. The sewing machine fails to start sewing a button from the predetermined start position of sewing.	Length of needle thread remaining at the needle eyelet at the time of sewing start is too short.		Lower the thread tension controlled by the tension post No. 1.
			Adjust the tension release timing of the tension post No. 2.
	The cloth flaps.		Use the needle hole guide whose boss is higher than the current one.
Needle frequently breaks.	Wiper fails to retain the thread.		Use the button clamp jaw lever which is thinner than the current one.
	The needle hits against the edge of holes in the button.		Correct the wiper spring.
	The needle hits against the edge of holes in the button.		Adjust the position of the button clamp jaw lever so that the needle enters the center of holes in the button.
Finished state of stitches on the wrong side of material is extremely poor.	The boss of the needle hole guide comes in contact with the recess of feed plate.		Adjust the position of the feed plate so that its recess does not come in contact with the boss of the needle hole guide. If the sewing size required to sew the button is too large for the current feed plate, replace it with the feed plate for medium-sized buttons or the one for large-sized buttons.
	The needle used is too thin.		Replace the needle with one whose number count is suited to the sewing product or the sizes of holes in the button to be used.
	Knot-tying plate hits against the needle.		Adjust the timing of knot-tying and the stroke of the knot-tying plate to prevent the plate from coming in contact with the needle.
	Length of needle thread remaining at the needle eyelet is too long.		Increase the thread tension controlled by the tension post No. 1 properly.
Thread knots are not made with consistency.	Thread catching force of the wiper is excessive. The bobbin thread idling amount is excessive.		Adjust the tension release timing of the tension post No. 2 properly.
	Stitches on the wrong side of the material entangle with each other when using a button with round bottom.		Decrease the pressure of the wiper spring.
	Timing of knot-tying is defective. Stroke of the knot-tying mechanism is defective.		Use the bobbin case (equipped with an idling prevention spring) exclusively designed for the LK-1851-555.
Button fails to be sewn at the predetermined position of the material.	The needle hits against the edge of holes in the button.		Replace the button clamp jaw lever with one which is thicker than the current lever.
	Thread tension controlled by the tension post No. 1 is too high.		Adjust the timing of knot-tying and the stroke of the knot-tying plate to prevent the plate from coming in contact with the needle.
	Tension disk of the thread adjusting device fails to rise at the time of stop-motion.		Adjust the position of the button clamp jaw lever so that the needle enters the center of holes in the button.
	Thread cannot be drawn up to make a knot when sewing a material with interlining.		Decrease the thread tension controlled by the tension post No. 1.
	The button is not securely held in place during sewing.		Adjust so that the tension disk properly rises at the time of stop-motion.
Button fails to be sewn at the predetermined position of the material.	Leaf spring of the button clamp jaw lever comes in excessive contact with the button.		Use a thinner needle.
	When using a button which has round bottom, thread may enter the section located between the bottom face of the button and the top surface of the boss of needle hole guide. As a result, the button fails to move smoothly.		Adjust the button clamp jaw lever so that its performance is improved.
			Correct the leaf spring of the button clamp jaw lever in order to decrease the pressure of the spring.
			Replace the button clamp jaw lever with one which is thicker than the current one.

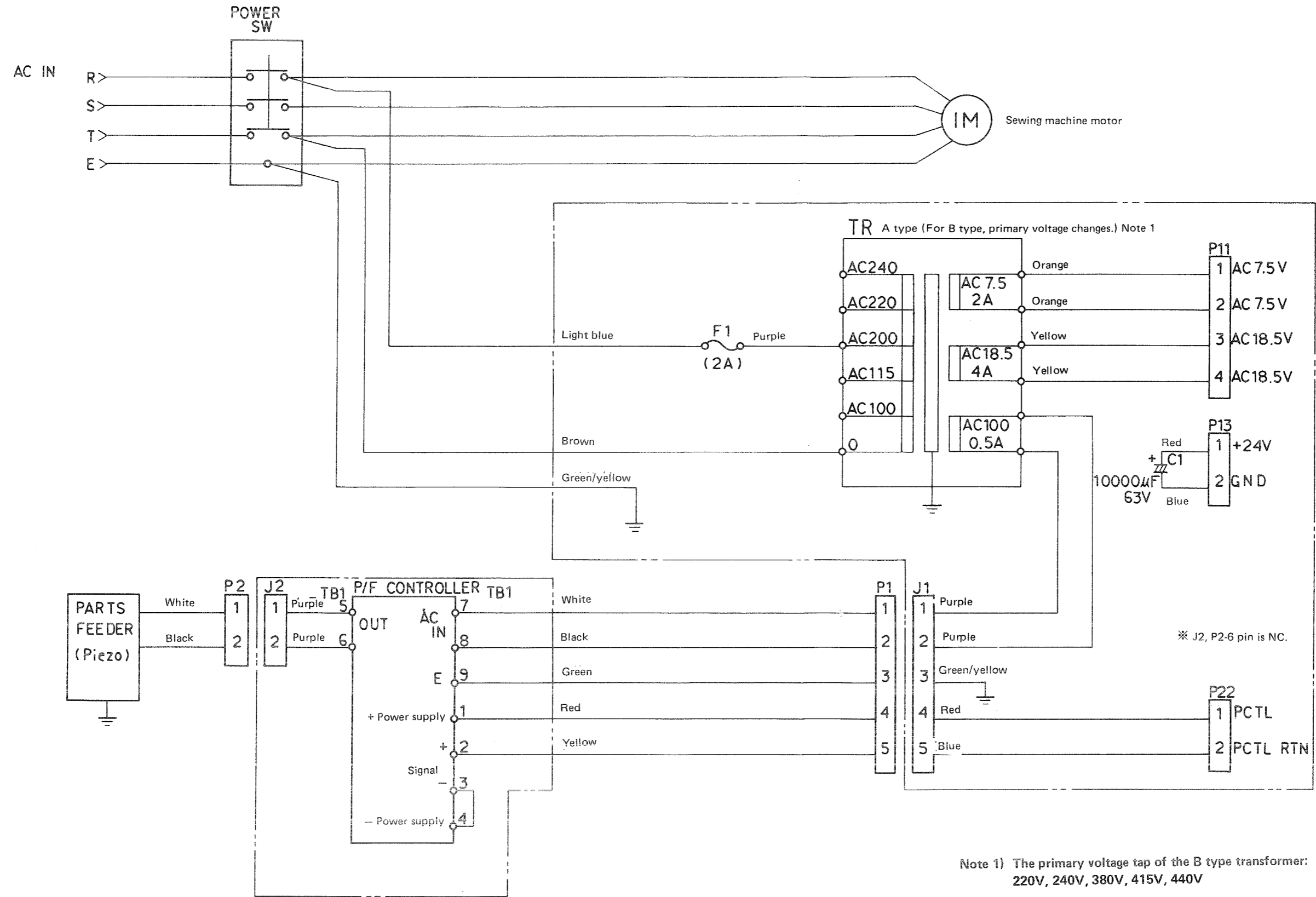
1. Block diagram



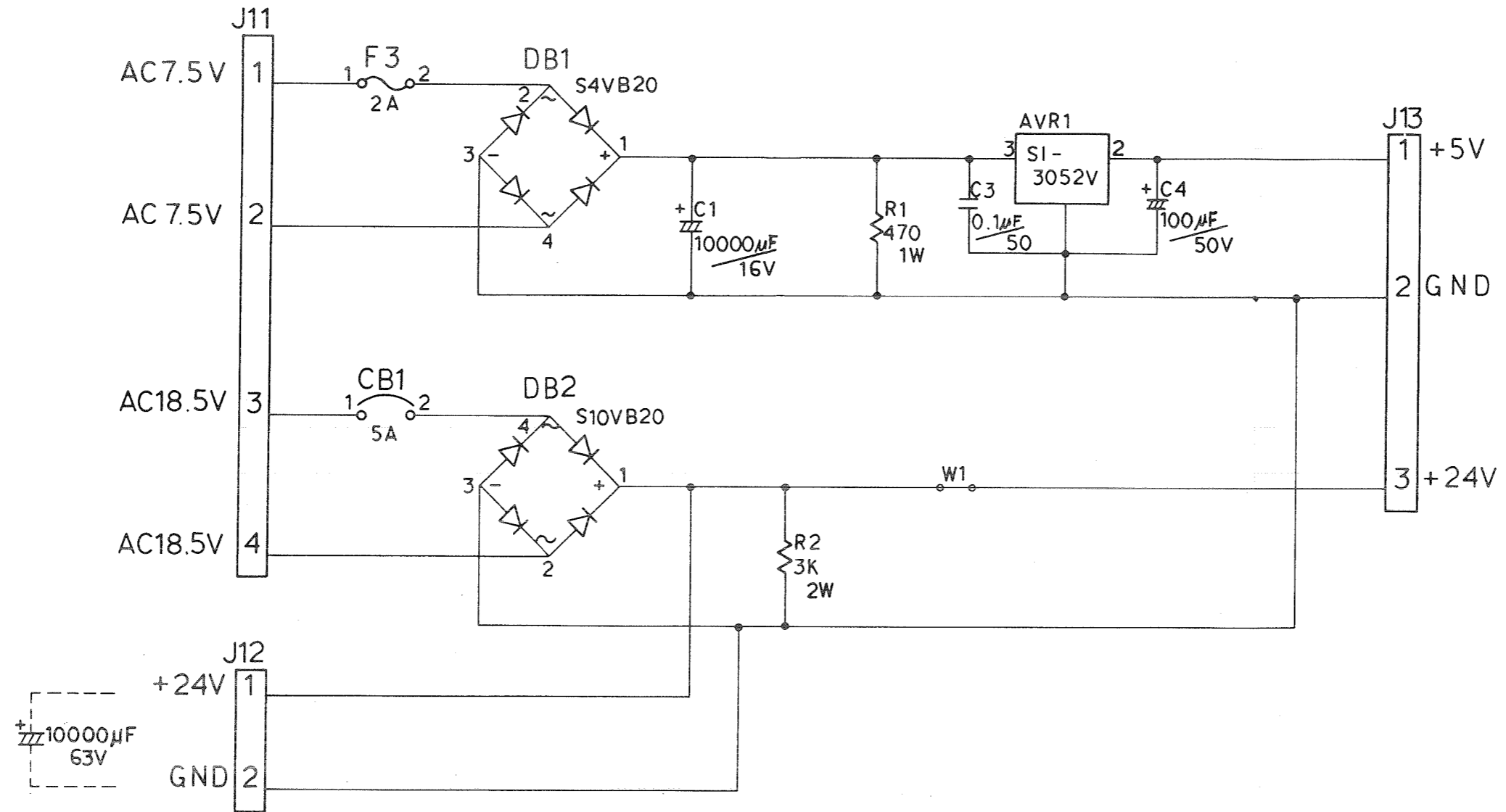
2. Control cable connection diagram



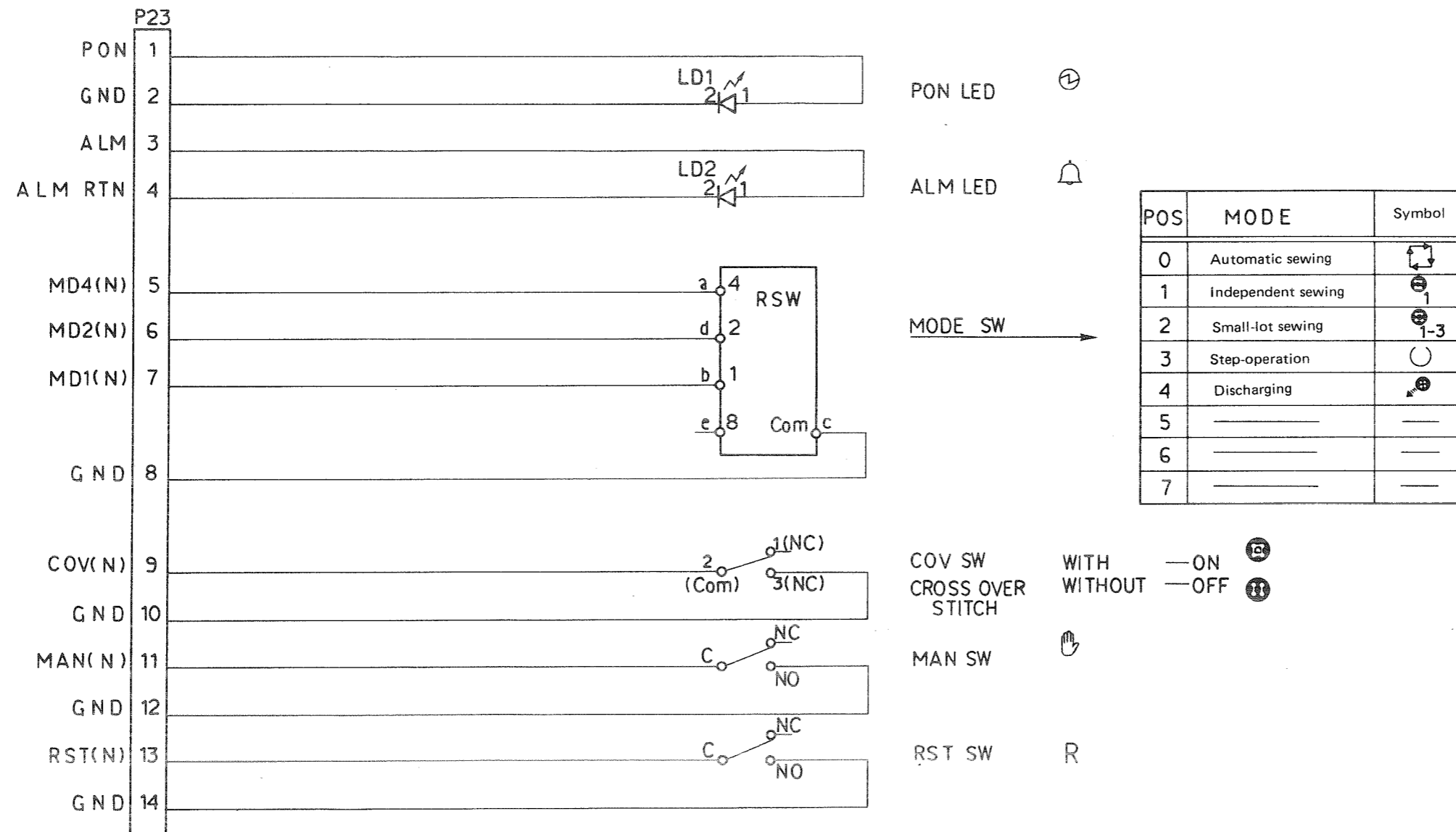
3. Electric circuit diagram



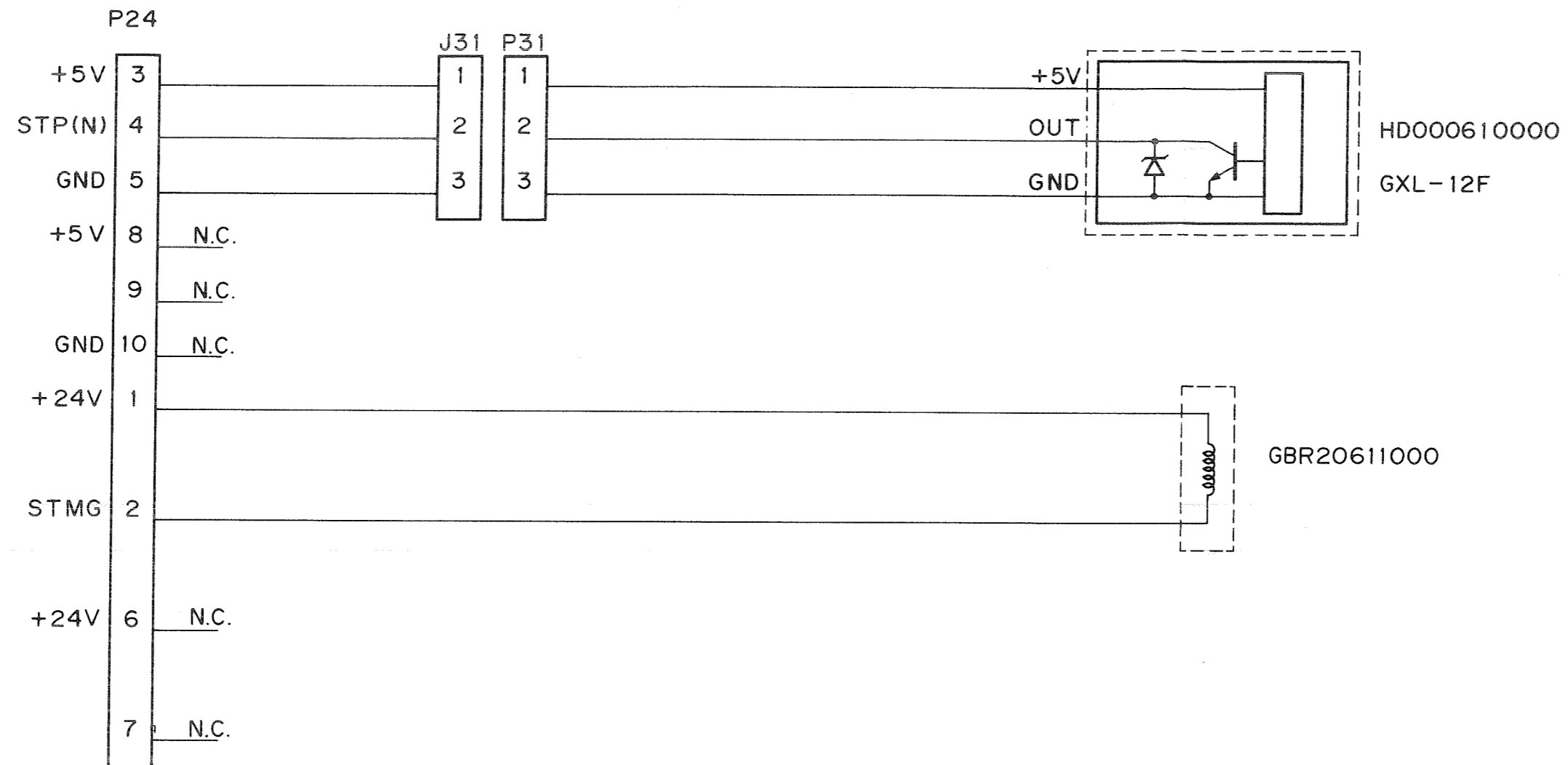
4. Power circuit board circuit diagram



5. Panel assembly circuit diagram

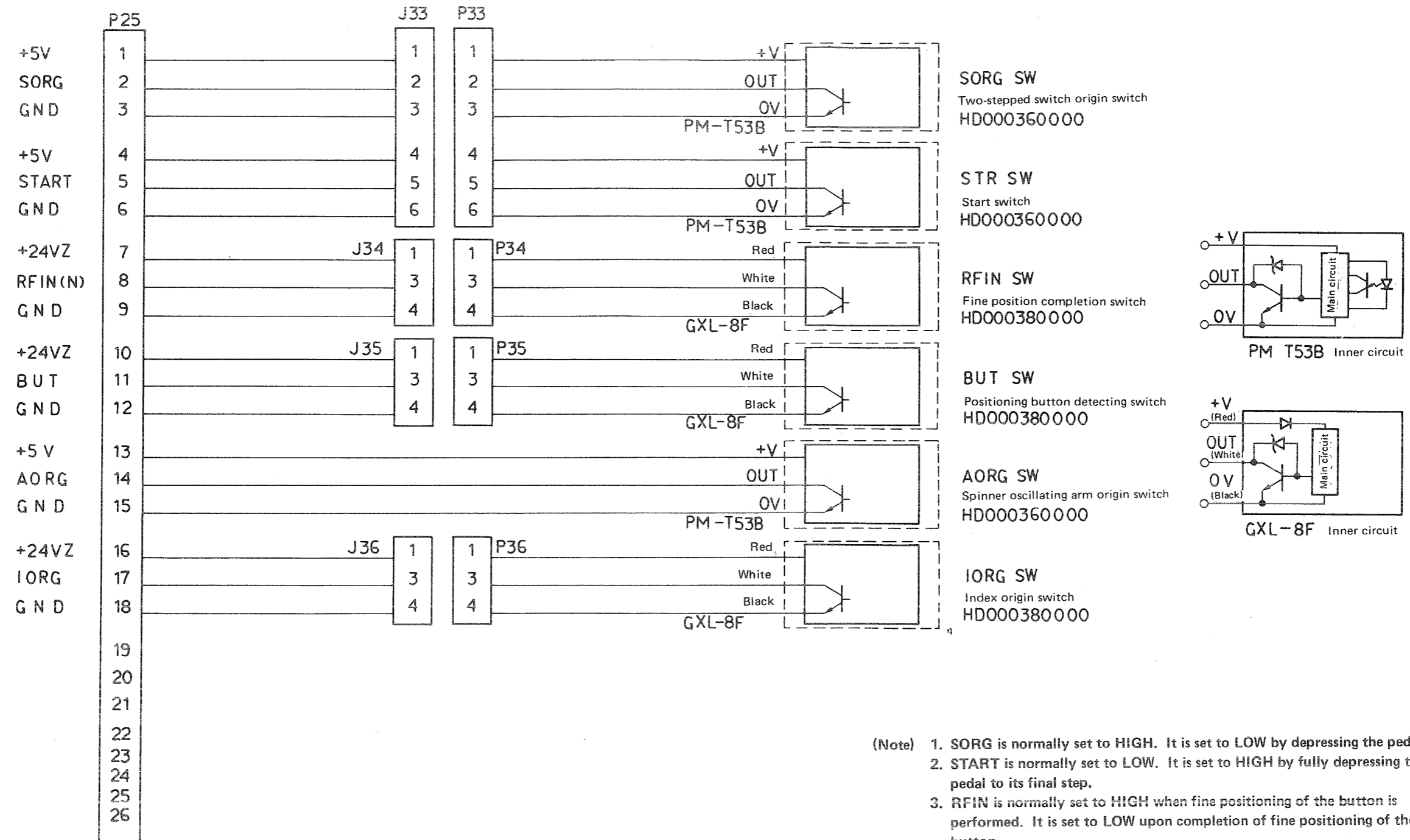


6. Machine head input/output circuit diagram



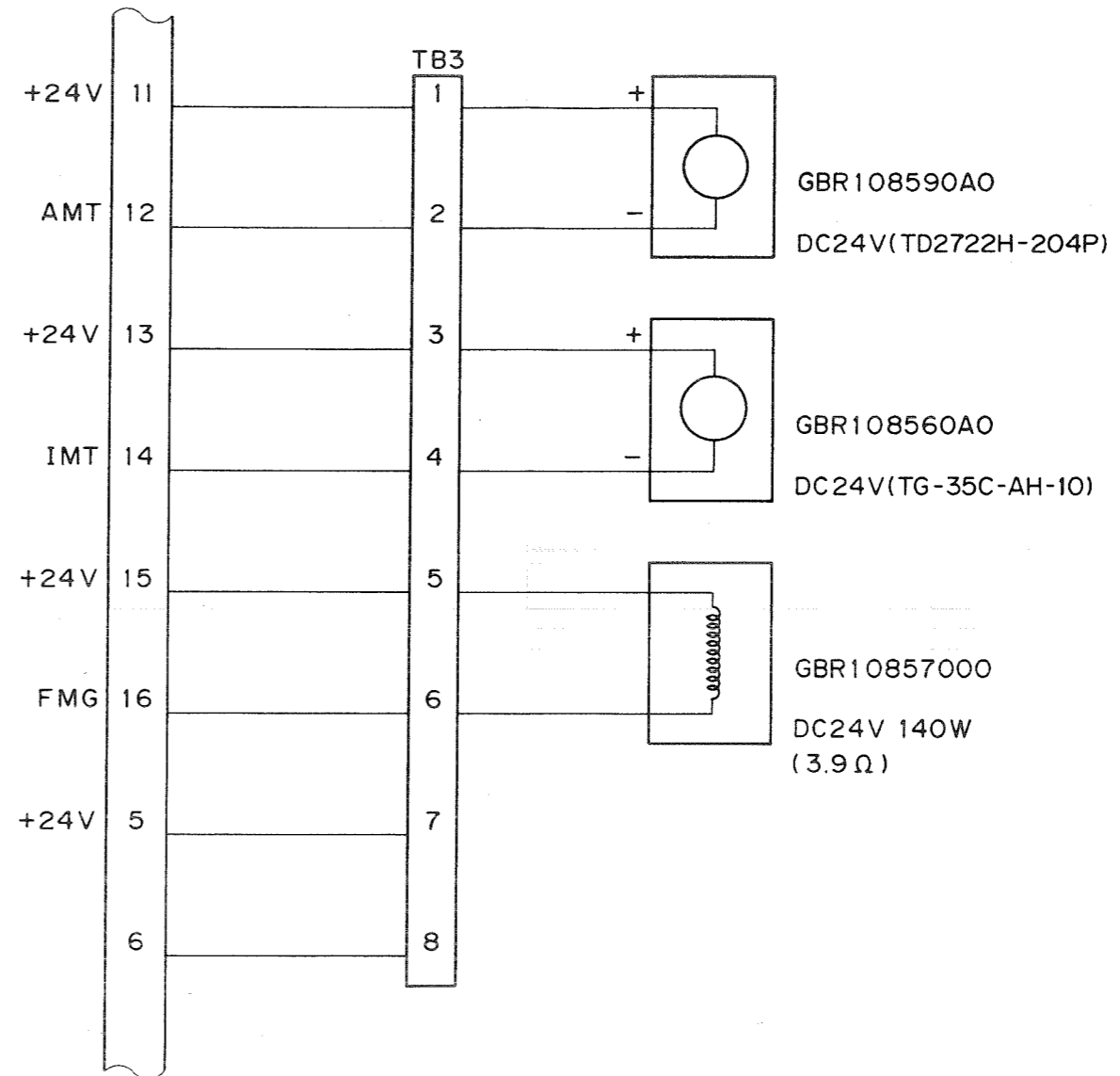
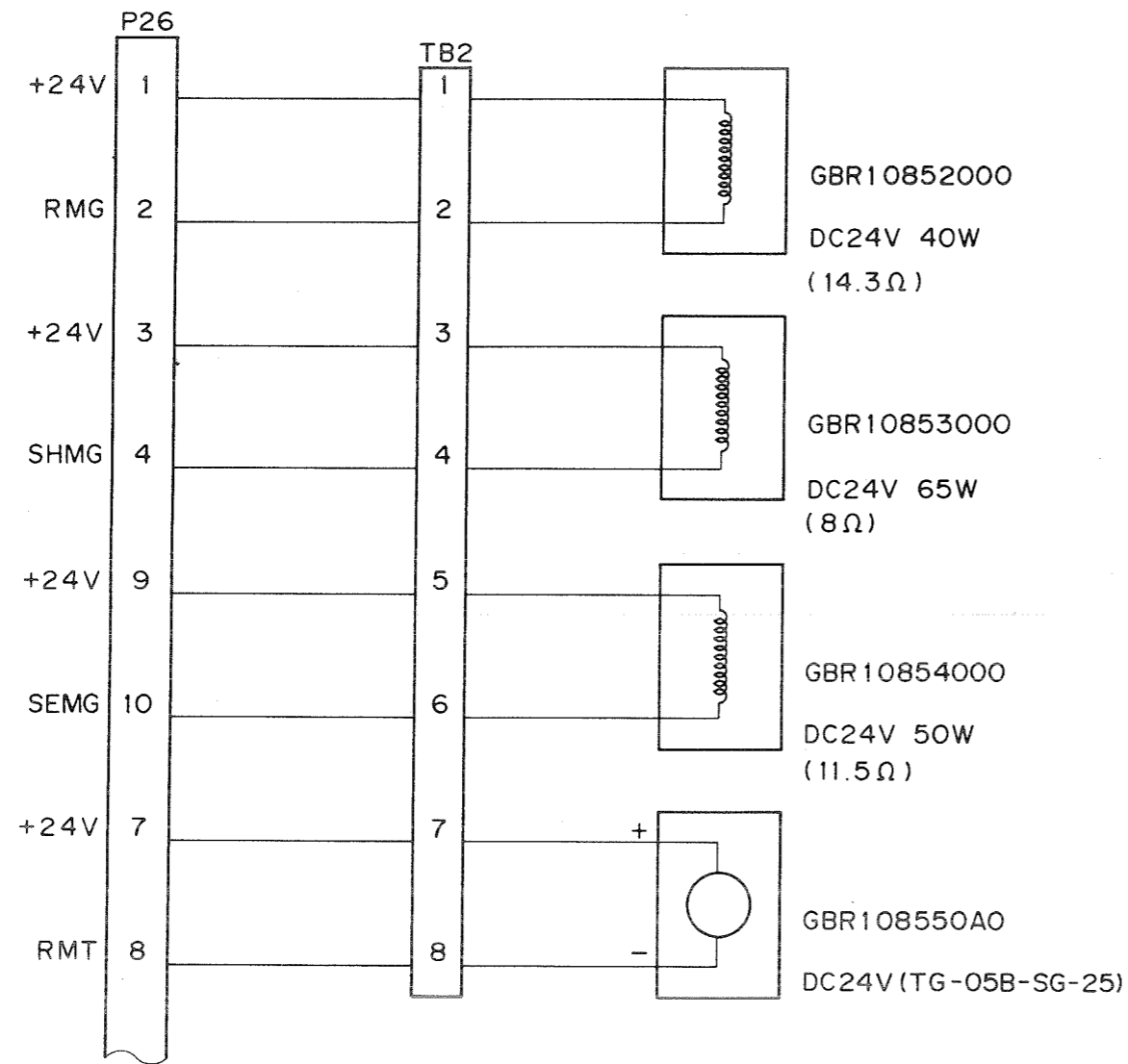
- (Note) 1. P24-6, 7, 8, and 9 pins are used for spare input.
 2. GXL-12F
 When the switch is OFF: OUTPUT HIGH VOLT
 When the switch is ON : OUTPUT LOW VOLT
 3. In the stop-motion state (the sewing machine stops): P24-4 pin LOW

7. BR sensor assembly circuit diagram

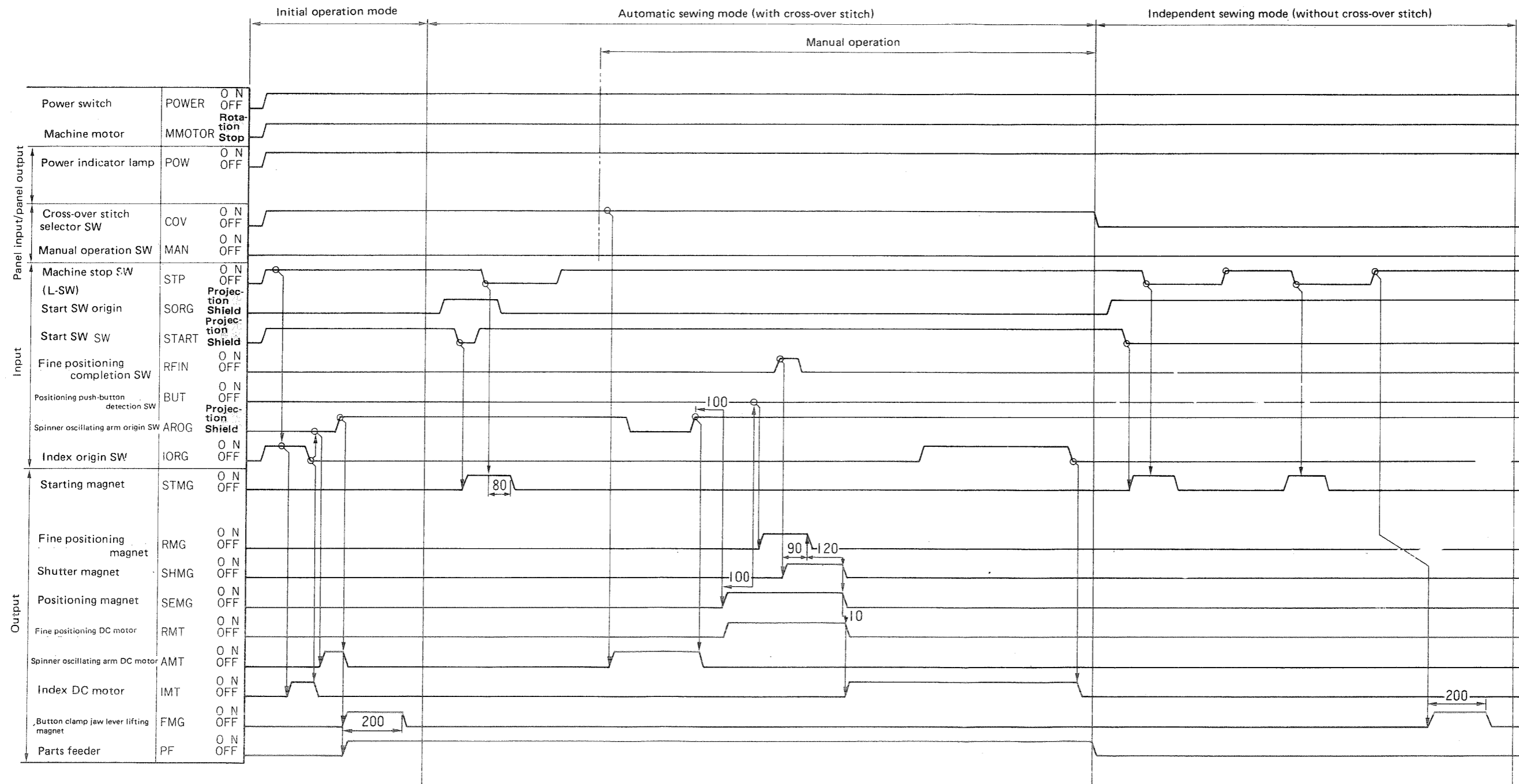


- (Note)
1. SORG is normally set to HIGH. It is set to LOW by depressing the pedal.
 2. START is normally set to LOW. It is set to HIGH by fully depressing the pedal to its final step.
 3. RFIN is normally set to HIGH when fine positioning of the button is performed. It is set to LOW upon completion of fine positioning of the button.
 4. BUT is normally set to HIGH. It is set to LOW when the positioning magnet actuates without a button.
 5. AORG is set to LOW when the spinner oscillating arm is in its origin.
 6. IORG is set to HIGH when the index unit is in its origin.

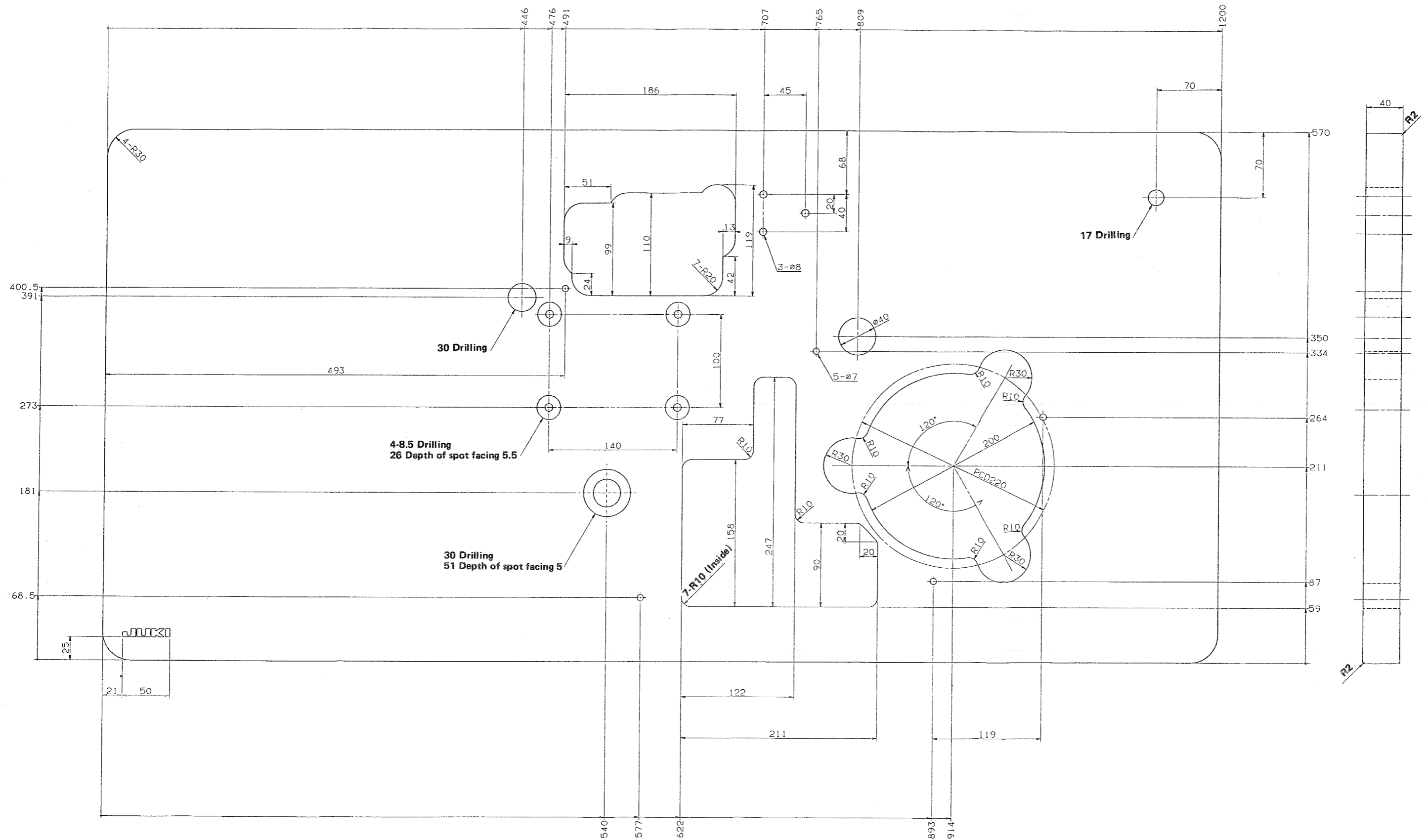
8. Magnet motor circuit board diagram



9. Time chart



XII. TABLE DRAWING



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