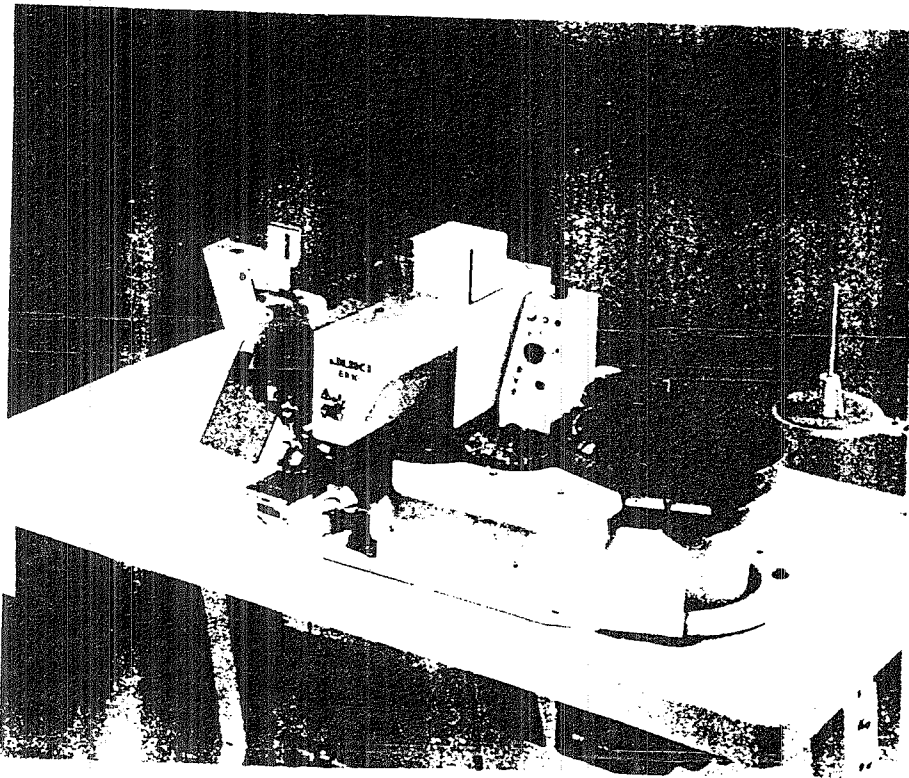


JUKI

Single-thread, Chainstitch, Button Sewing Machine with an
Automatic Thread Trimmer (and a Button Feeder)

MB-373N/BR10

ENGINEER'S MANUAL



PREFACE

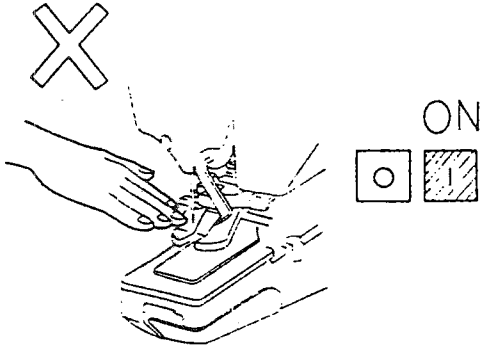
This Engineer's Manual is written for the technical personnel who are responsible for the service and maintenance of the machines. The Instruction Manual for these machines intended for the maintenance personnel, and operators at an apparel factory contains detailed operating instructions. And this manual describes "How to Adjust", "Results of Improper 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.

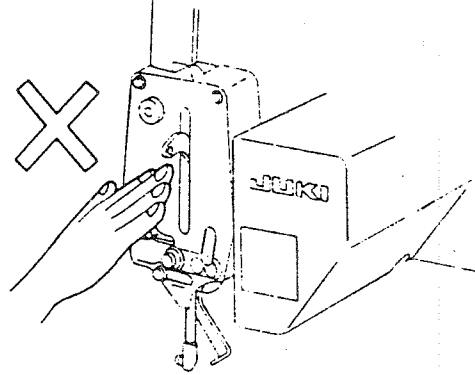
This manual mainly consists of three sections; the first section presents "Standard Adjustment", the second section, "How to Adjust", and the third, "Results of Improper Adjustment".

CAUTION

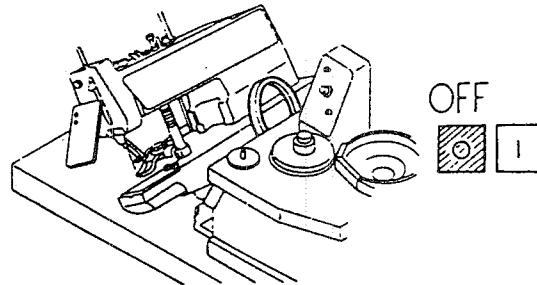
1. Never put your hand under the needle when you turn ON the power switch or operate the sewing machine.



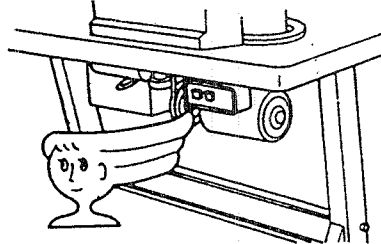
2. Do not touch the thread take-up with your hands while the machine is running.



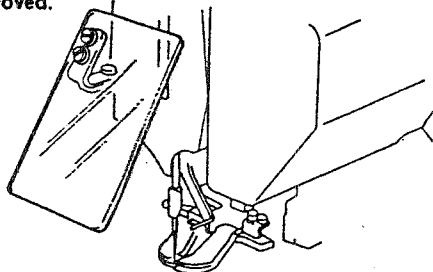
3. Be sure to turn the power switch OFF when tilting the machine head or removing the V belt.



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.



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.

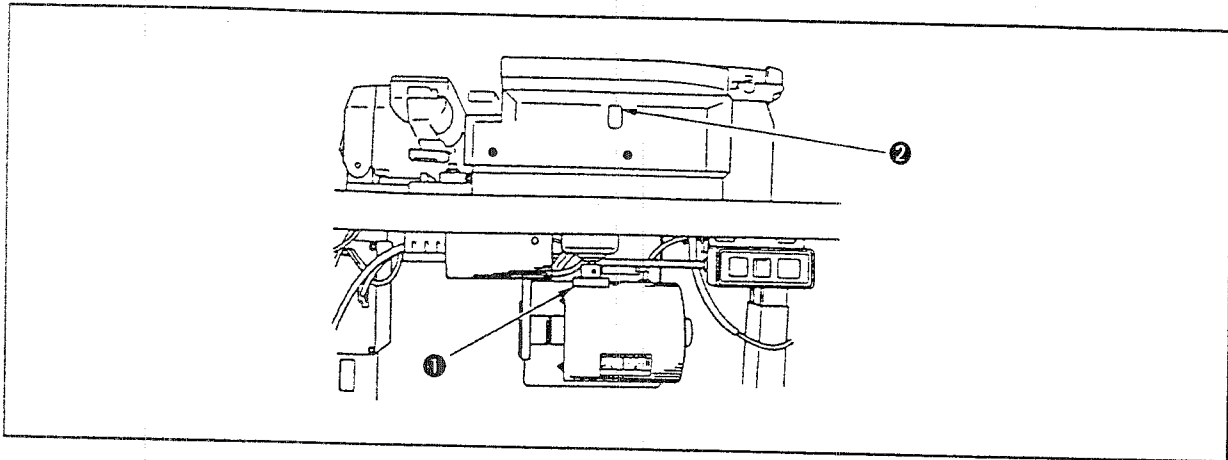


6. Before applying power, release the stop-motion mechanism and turn by hand the needle driving pulley in order to ensure that the machine is in order.

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.)

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 changing buttons to be sewn to those have holes in different positions from the button used at present, replace the button carrier with the one suitable for the buttons to be sewn. Refer to the description of "IX. OPTIONAL PARTS" on page 27 for the kinds of button carrier.
3. Use the feed plate which matches the size of button to be used.
4. Use only buttons shown in the specifications of this machine.
5. The terminal board is located behind the sewing machine motor at the rear section of the machine.
6. Be sure to confirm that the button carrier is in its origin (the position where the button position is determined) before tilting the machine head. If not, turn spinner oscillating arm motor knob ❶ until the button carrier 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" (5), (6) on page 12.
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 release 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, or feed plate etc., resin breakage may occur. So be careful.
12. Apply grease on the worm gear and cam periodically (every six months.)
13. The work attachment comes in two different types, the standard type and the large-button type (optionally available). Whenever you have replaced the work attachment, be sure to adjust the fine positioning completion switch.
14. If a button clogs in the index unit, turn first manual spinner oscillating shaft ❷ counterclockwise using a screwdriver until it is released.
15. Sensitivity of the button feeder is very delicate, so be sure to adjust it carefully.
16. Connect the connectors while checking the correct direction of the respective connectors.

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I. SPECIFICATIONS






1. Mechanical specifications

- | | | |
|---|--|---|
| 1. Machine head used | MB-373N/Z088 | |
| 2. Stitch system | 1-Needle, single-thread chainstitch | |
| 3. Sewing speed | Normal 1,500 s.p.m. | |
| 4. Sewing size | 0 ~ 6.5 mm (0 ~ 0.256") (L) × 2.2 ~ 6.5 mm (0.087" ~ 0.256") (W) | |
| 5. Lift of the button clamp | Max. 12 mm (0.472") | |
| 6. Feed system | By lateral and longitudinal feed cams | |
| 7. Needle bar stroke | 48.6 mm (1.913") | |
| 8. Thread take-up mechanism | Needle bar | |
| 9. Number of stitches | 16 (standard) | |
| 10. Needle | Standard TQ × 7 #16 (#14 through #20) | |
| 11. Thread | Cotton thread #50 through #30 Spun thread #60 through #20 | |
| 12. Applicable buttons | Type: Round-shaped, flat buttons (2-holed, 4-holed)
Size: $\phi 10$ (0.394") to $\phi 18$ mm (0.709")
Thickness: 1.8 (0.071") to 3.5 mm (0.138") | <p>Note) 1. For buttons of which diameter is $\phi 16$ mm (0.630") or more, the standard feed plate is required to be replaced with the feed plate ($\phi 22$ (0.866")) asm. (16568651).</p> <p>2. For buttons of which diameter is smaller than $\phi 9$ (0.354") to $\phi 10$ mm (0.394") or $\phi 18.1$ (0.713") to $\phi 26$ mm (1.024"), separately contact us for extra order parts.</p> <p>3. For buttons of which diameter is $\phi 16$ mm (0.630") or larger, use the button clamp jaw lever for large buttons.</p> |
| 13. Selection of buttons to be fed | By vibration system | |
| 14. Button feeding method | Horizontal forced feed mechanism | |
| 15. Button feeding mode | Automatic feeding mode, independent feeding mode, small-lot mode | |
| 16. Stitching without cross-over stitches | Can be changed over by means of the switch | |
| 17. Lubrication | With an oiler | |
| 18. Power requirement/power consumption | Single-phase, 100 V, 3-phase, 200 V/rating: 270 W | |
| 19. Weight | 80 kg | |
| 20. Machine time | 1.4 sec./piece (When a 4-holed button is sewn 16 stitches without cross-over stitches) | |

(1) Options

- Button clamp jaw lever for large buttons (left) MAZ088220AA
- Button clamp jaw lever for large buttons (right) MAZ088230AA

(2) Subclass models

Types of stitches	Number of stitches	Subclass
	8, 16, 32	MB-373N-/Z088
	8, 12, 24	MB-373N-4/Z088
	6, 16, 32	MB-373N-5/Z088
	8, 16, 32	MB-373N-10/Z088
	8, 16, 32	MB-373N-11/Z088

2. Electrical specifications

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

II. CONFIGURATION

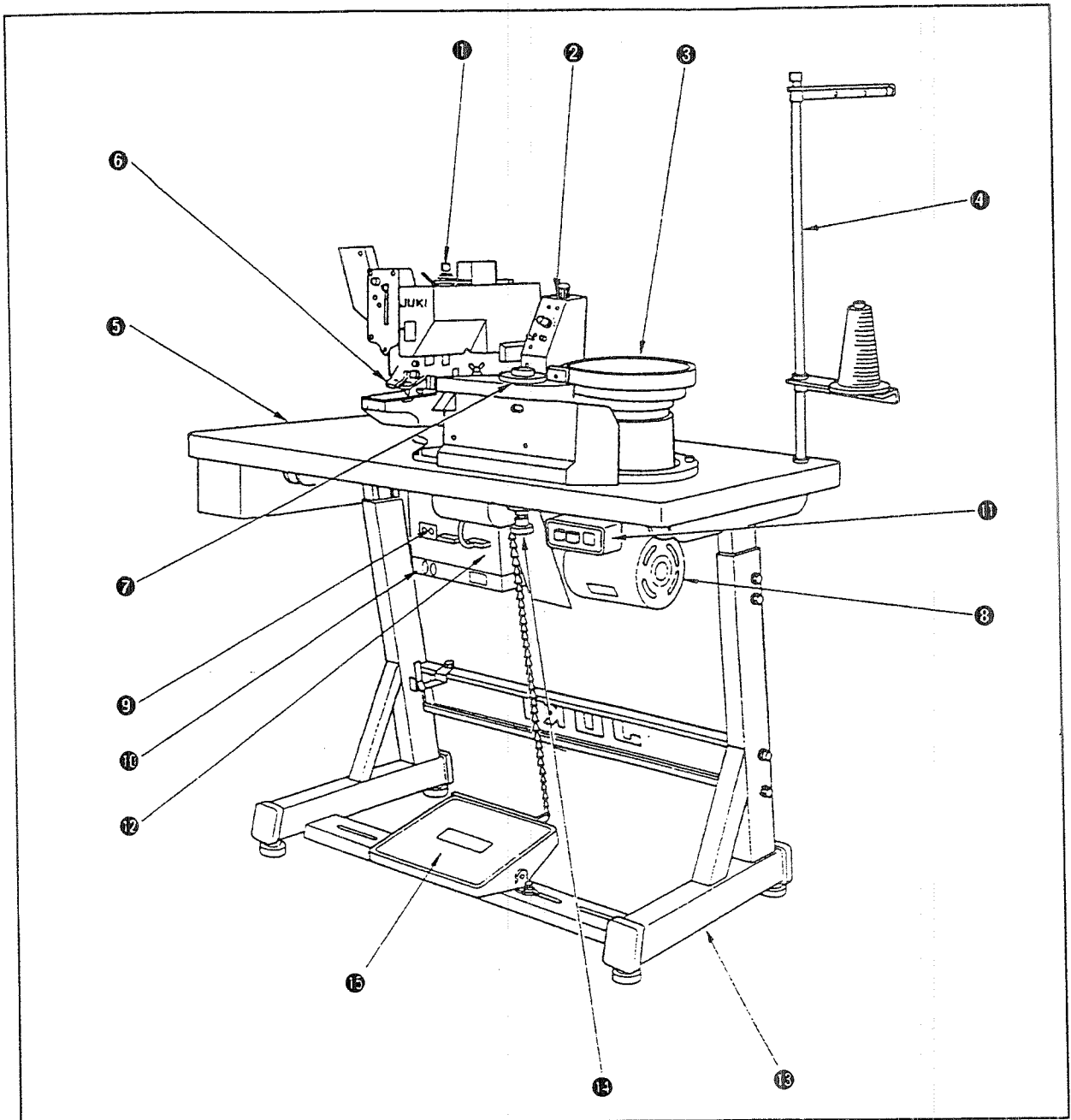


Fig. 2-1

- | | | |
|-----------------------|-----------------------|---|
| ① Sewing machine | ⑥ Button clamp unit | ⑪ Power switch |
| ② Operation panel (1) | ⑦ Index unit | ⑫ Control box (CPU) |
| ③ Button feeder | ⑧ Motor | ⑬ Pedestal |
| ④ Thread stand | ⑨ Operation panel (2) | ⑭ Turn spinner oscillating arm motor knob |
| ⑤ Machine table | ⑩ B/F controller | ⑮ Pedal |

III. OPERATION

1. Power to the machine and connection of power supply

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

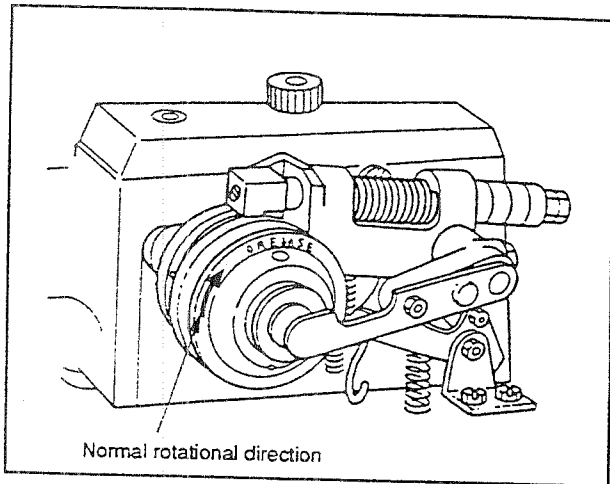


Fig. 3-1

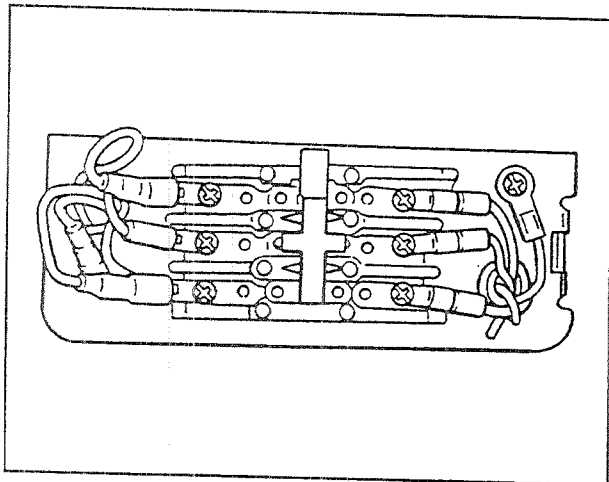


Fig. 3-2

★ How to confirm the normal rotational direction of the machine

The sewing machine should turn clockwise as observed from the handwheel. If it turns counterclockwise, change round the wiring of the two power cables of 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. Operation panel (1)

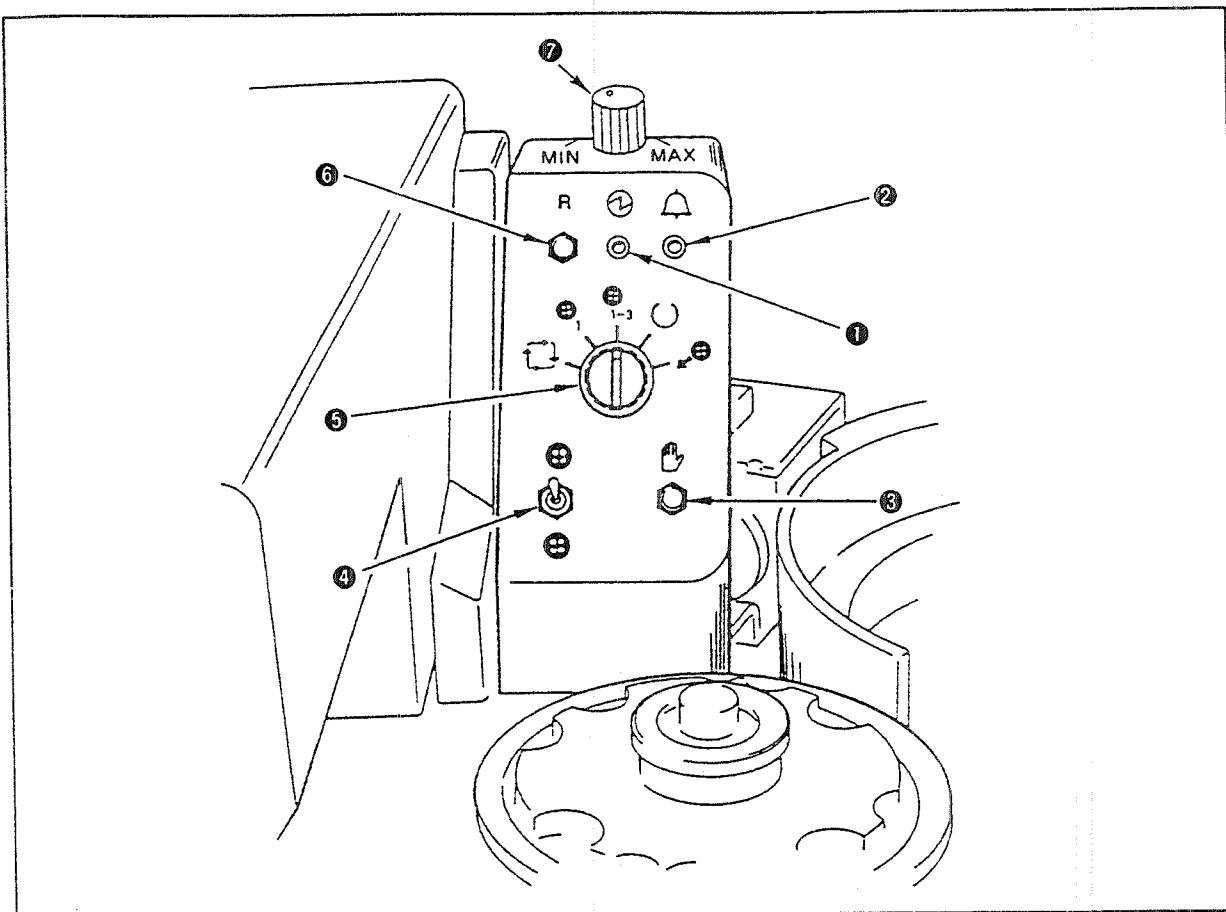









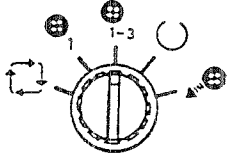




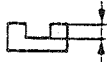


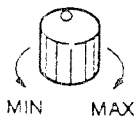


Fig. 3-3

Symbol and name of switch	Function
① Power indicator lamp (green)  	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.
② Alarm indicator lamp (red)  	This lamp operates in two different ways. It slowly flashes on and off when a failure of the device occurs. (Refer to "V. TROUBLE INDICATIONS AND INSPECTION" on page 11.) It quickly flashes on and off when the button sensor mounted on the index unit continuously detects button feeding failure over 10 times.
③ MANUAL operation switch  	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 .
④ Cross-over stitch selector switch   	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

Symbol and name of switch	Function
<p data-bbox="170 130 409 157">⑥ Mode selector switch</p> 	<p data-bbox="568 136 901 168">1. Automatic sewing mode </p> <p data-bbox="613 172 1372 325">The sewing machine and the button feeder operate with interlocked. Under this operation mode, depressing the pedal lowers the button clamp and makes the sewing machine start sewing a button. When the machine completes sewing of the button, the thread trimmer actuates, then the button feeder actuates to feed next button to be sewn. This series of operations is repeated under the automatic sewing mode.</p> <p data-bbox="568 346 893 378">2. Independent sewing mode </p> <p data-bbox="613 382 1372 535">This mode allows the sewing machine to independently operate. Under this mode, the operator sets the button to be sewn in place on the machine by hand. Then, depressing the pedal lowers the button clamp jaw lever and makes the machine start sewing the button. When the machine completes sewing of the button, the thread trimmer actuates then the button clamp jaw lever goes up.</p> <p data-bbox="568 546 885 577">3. Small-lot sewing mode ₁₋₃</p> <p data-bbox="613 581 1372 703">Basically, series of operations performed under this mode is same as that under the automatic sewing mode. The button feeder, however, does not operate under this mode. The operator manually feeds buttons by the number desired to be sewn to the gear of index unit and let the machine perform button sewing.</p> <p data-bbox="568 724 950 756">4. Prospective button feeding mode </p> <p data-bbox="613 760 1372 850">Under this mode, the fine positioning completion sensor function is stopped and the machine performs fine positioning of a button in a predetermined period of time (set by DEG-SW-2. Refer to page 9.).</p>  <p data-bbox="820 871 1372 913">a = Suited to buttons of which is 1 mm (0.039") or more</p> <p data-bbox="568 945 901 976">5. Button discharging mode </p> <p data-bbox="613 980 1372 1123">Under this mode, buttons in the index unit are automatically discharged by pressing manual operation switch . In this case, the button is discharged to the discharging chute located at the lower section of the fine positioner. So, place a pan to receive the discharged buttons at the exit area. Do not touch the button clamp jaw lever since the spinner oscillating arm actuates.</p>
<p data-bbox="170 1138 324 1165">⑥ Reset switch</p>	<p data-bbox="568 1144 1372 1207">Press this switch to reset the machine from its emergency stop state to its normal operative state.</p> <p data-bbox="568 1211 1372 1270">(Note that alarms No. 4 and No. 5 cannot be reset using the reset switch. Turn OFF the power once, eliminate the cause of the trouble and re-turn ON the power to the machine.)</p>
<p data-bbox="170 1281 479 1344">⑦ Button feeder (B/F) adjusting variable resistor</p> 	<p data-bbox="568 1291 1055 1323">Used to adjust the flow of buttons in the feeder bowl.</p>

3. Operating procedure

(1) Double-stepped action of the button clamp

The foot pedal of the BR-10 operates in the way as shown in the time chart given below. When you find that the material has been improperly positioned or a button has not been placed on the button clamp with the button clamp lowered, you can release the button clamp from its lowest position by returning the pedal to its home position.

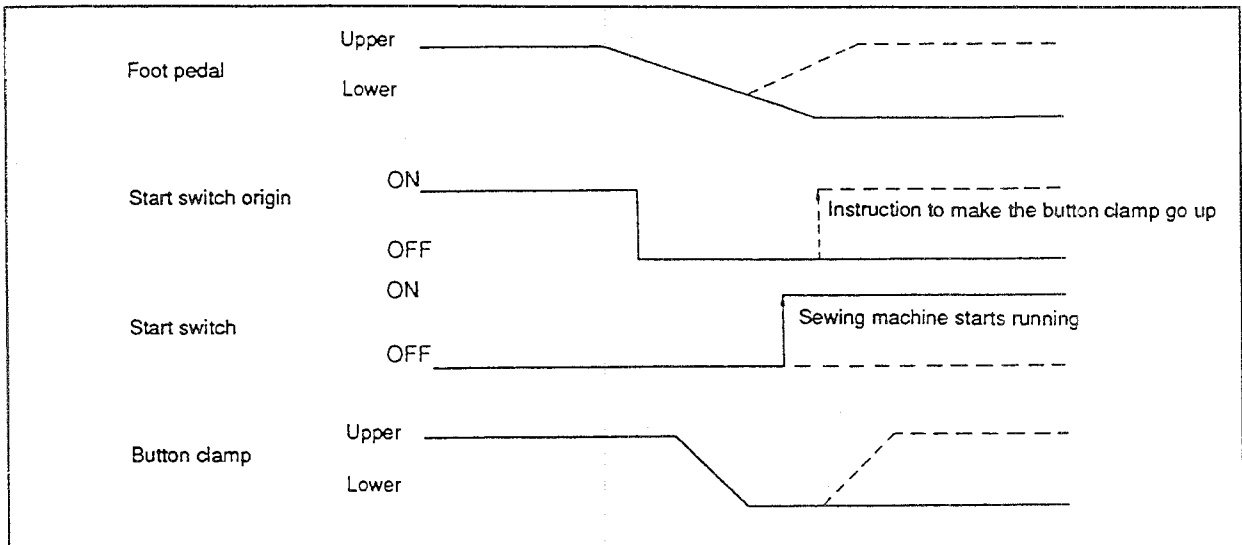


Fig. 3-4 Timing chart of the foot pedal

(Caution) The operation indicated with dotted lines is the timing of double-stepped action of the button clamp.

(2) Indexed button sensing function

The button positioning unit is provided with a sensor to detect a button. When the sensor detects a button, the button is finely positioned. When the sensor detects no button, the index unit repeats indexing until the sensor detects one. When the sensor does not detect a button after ten times of indexing, however, the alarm indicator will quickly flashes on and off. In this case, pressing the manual operation switch will make the index unit perform indexing again until the sensor detects a button.

4. Operating the switches for normal sewing work

- 1) Turn ON the power to the main unit of the sewing machine.
- 2) Set the mode selector switch on the operation panel to the "automatic sewing" mode.
- 3) Select with/without "cross-over stitch" feature.
 - ① For 2-holed buttons, set the switch to the "with cross-over stitch" side.
 - ② For 4-holed buttons, set the number of stitches to "16" on the sewing machine as long as you wish for the "with cross-over stitch" mode, or to "8" when you wish for the "without cross-over stitch" mode.
- 4) Press the manual operation switch, and confirm that a button rests on the button clamp jaw lever on the main unit of the sewing machine. If the button is not held on the button clamp jaw lever, press the manual operation switch again.

IV. HOW TO SET THE DIGITAL SWITCHES AND DIP SWITCHES

Loosen two screws ① and open panel ② in Fig. 4-1. Now, change the setting of the switches.

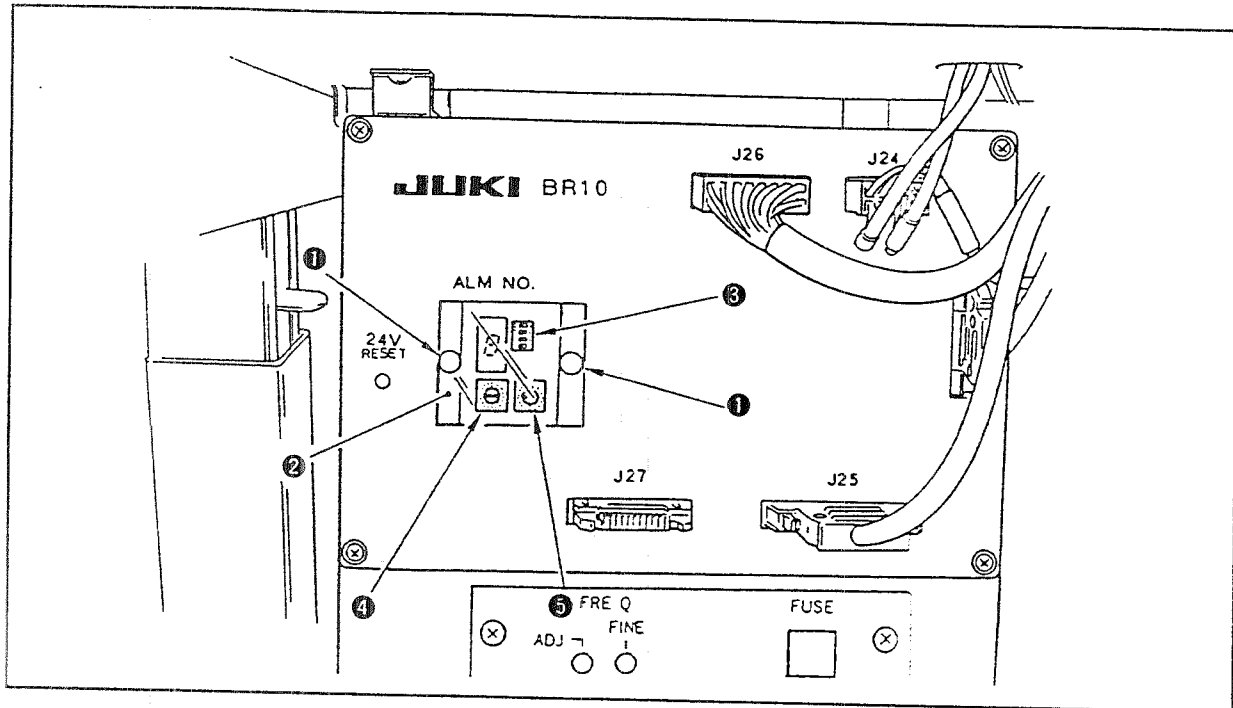


Fig. 4-1

1. DIP switch function and setting of the digital switch

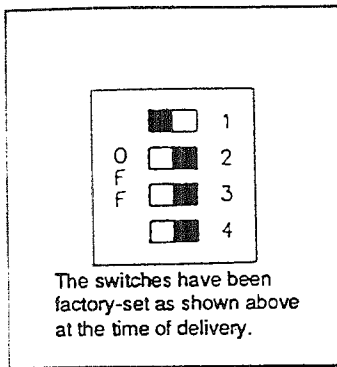


Fig. 4-2

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

○.....ON ×.....OFF

△.....The machine performs the operations described in the next page and beyond in accordance with combinations of the DIP switches.

- (a) Continuous cycle mode (Refer to page 8.)
Buttons are continuously sewn by keeping the pedal depressed.
Refer to the next page and beyond for the detailed description of the sewing machine operating intervals and the length of time during which the machine performs fine positioning of a button.
 - (b) Double-stepped action of the button clamp (Refer to page 6.)
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.
Refer to the next page and beyond for the detailed description of the timing at which the button carrier moves after the operation of the sewing machine and the time during which the machine performs fine positioning of a button.
 - (c) Adjustment mode (Refer to page 12.)
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.
 - (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.)
- Note)** To change the functions of the sewing machine by changing over the setting of DIP switch ③ and digital switches ④ and ⑤, turn OFF the power to the machine first, change the switch setting and turn ON the power to the machine. Change over the setting position of DIP switches between ON and OFF without fail.

No.	Function	Application	Automatic sewing mode Note 3)	Prospective button feeding mode Note 8)	Set pc
8	Double-step performance of the button clamp	Suited to be used exclusive for point stitching such as sewing hip pockets	<ul style="list-style-type: none"> • Normal operation function • Provided with a sensor which detects completion of fine positioning of a button. • Automatic button discharging function • Function of adjusting the length of time during which the button carrier operates Note 11) • Function of adjusting the length of time during which the fine positioning of a button is performed. 	<ul style="list-style-type: none"> • Normal operation function • Prospective button feeding function (Not provided with a sensor which detects completion of fine positioning of a button.) • Function of adjusting the length of time during which the button carrier operates • Function of adjusting the length of time during which the fine positioning of a button is performed. 	1
					×

Position of DIP switches			DEG.SW-1	DEG.SW-2	Cautions																		
2	3	4																					
○	×	○	<p>Note 8): Length of time during which the button carrier operates</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">0 → 0.20SEC</td> <td style="width: 50%;">8 → 0.20SEC</td> </tr> <tr> <td>1 → 0.50</td> <td>9 → 0.50</td> </tr> <tr> <td>2 → 0.80</td> <td>A → 0.80</td> </tr> <tr> <td>3 → 1.20</td> <td>B → 1.20</td> </tr> <tr> <td>4 → 1.60</td> <td>C → 1.60</td> </tr> <tr> <td>5 → 2.00</td> <td>D → 2.00</td> </tr> <tr> <td>6 → 3.00</td> <td>E → 3.00</td> </tr> <tr> <td>7 → Waiting for the input of switch</td> <td>F → Waiting for the input of switch ⇔</td> </tr> </table> <p style="text-align: right;">Note 12)</p> <p>(Length of time during which the indexer operates)</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">0 ~ 7 → 0.08SEC</td> <td style="width: 50%;">8 ~ F → 0.16</td> </tr> </table>	0 → 0.20SEC	8 → 0.20SEC	1 → 0.50	9 → 0.50	2 → 0.80	A → 0.80	3 → 1.20	B → 1.20	4 → 1.60	C → 1.60	5 → 2.00	D → 2.00	6 → 3.00	E → 3.00	7 → Waiting for the input of switch	F → Waiting for the input of switch ⇔	0 ~ 7 → 0.08SEC	8 ~ F → 0.16		<p>Note 9): High-speed operating function</p> <ul style="list-style-type: none"> • This function means that a button always rests on the shutter plate. • Since the button carrier operates with the shutter plate closed, a load is likely to be applied to the shutter plate and the button carrier when the machine is locked. <p>Note 10): Not provided with the stitching timing adjusting function</p> <ul style="list-style-type: none"> • In the double-stepped action of the button clamp (Nos. 5 to 7), the stitching timing adjusting function is not necessary. So, the DEG.SW-1 is used only to set the length of time required to make the triple pawl actuate after indexing a button. <p>Note 11): Function to adjust the button carrier operating timing</p> <ul style="list-style-type: none"> • If the sewing product may be caught in the button carrier when attaching buttons to hip pockets or the like, this function can be used to delay the actuation of the button carrier in accordance with the length of time specified by the DEG.SW-1. <p>Note 12): SW (Switch) stand-by</p> <ul style="list-style-type: none"> • The button carrier operates when the manual operation switch on the operation panel is pressed. • If the knee switch is used, connect it to J24 ⑨ and ⑩ on the control box. Then the "switch stand-by" function can be used. This feature is available by a special order. <p>Note):</p> <ul style="list-style-type: none"> • For all the functions controlled by the DIP switches, it is possible to stop the subsequent action of the button carrier by pressing the manual operation switch or the knee switch (optionally available) while the sewing machine is in operation, and to actuate the button carrier by pressing it again. • If a button comes off the index unit, the machine make the button carrier actuate, with no button, once after the completion of sewing to allow the operator to remove the material from the machine with ease. • If, when the automatic button discharging function works, the predetermined length of time for fine positioning of a button has passed before a button is placed on the button carrier, the shutter plate will be opened and the button will be discharged. At this time, it is possible that the discharged button is accidentally placed on the button carrier. In this case, the button carrier will be actuated twice. As a result, two buttons will be fed to the button carrier, causing needle breakage. To prevent this, the time for starting the sewing machine is retarded by 0.5 sec. if the automatic button discharging function has actuated. (It is possible to decrease the frequency of actuation of the automatic button discharging function by increasing the length of time during which the machine performs fine positioning of a button.) • When the double-stepped action of the button clamp is selected and the operator operates the pedal too quickly, the button clamp jaw lever will go up before it opens after the completion of sewing. In this case, the operator cannot smoothly move the material on the machine. To prevent this, the time for turning ON the button clamp jaw lever lifting magnet is delayed by 0.2 sec. to give priority to mechanical actions.
0 → 0.20SEC	8 → 0.20SEC																						
1 → 0.50	9 → 0.50																						
2 → 0.80	A → 0.80																						
3 → 1.20	B → 1.20																						
4 → 1.60	C → 1.60																						
5 → 2.00	D → 2.00																						
6 → 3.00	E → 3.00																						
7 → Waiting for the input of switch	F → Waiting for the input of switch ⇔																						
0 ~ 7 → 0.08SEC	8 ~ F → 0.16																						

V. ERROR MESSAGE AND INSPECTION

(1) Alarm No. indication

If the alarm indicator lamp on the operation 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 operation panel.

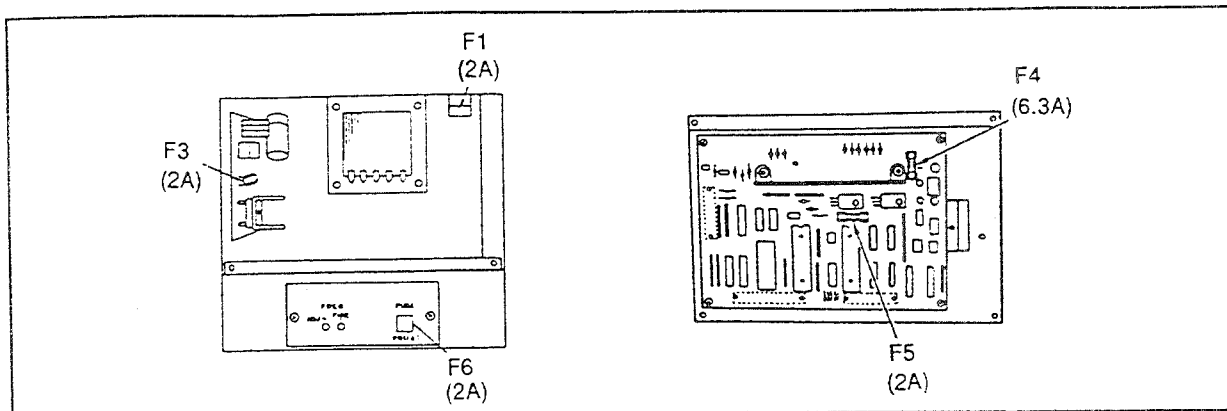
No.	Indication	Troubles	Causes	Corrective measures	How to reset
0	0	Normal operation (given during the normal stand-by state of the sewing machine)	_____	_____	_____
1	1	RAM check error CPU error	<ul style="list-style-type: none"> RAM in the CPU circuit board is defective. Self-diagnosis error 	Replace 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: 24 V trip. The starting magnet is defective or disconnected. 	Replace the L-SW. Replace the starting magnet.	Press the Reset button. Press the 24 V RESET button.
3	3	Fine positioning error Occurs when the automatic button discharging function continuously works three times.	<ul style="list-style-type: none"> The button carrier does not match the distance between holes in the button. The fine positioning completion sensor is defective. (Malfunction) The center of the fine positioning rod and that of the triple pawl and button carrier are not aligned with each other. 	Replace the button carrier. Replace the RFIN sensor. (Adjust the RFIN sensor) Align the center of the rod with that of the triple pawl and button carrier.	Press the manual operation switch.
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 (6.3 A) fuse has blown. 	Remove the button. (Refer to "14" of "Cautions during operation.") 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 (2 A) 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	Sewing machine belt error	<ul style="list-style-type: none"> The sewing machine belt slips out of the predetermined position or has broken. 	Install the belt on the machine properly and make the machine head to its initial state. (Turn OFF the power to the machine.)	Press the reset switch.
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.	_____	Re-adjust the Button positioning switch. Replace the Button positioning switch.	Press the Reset switch.
9	9	Start switch is defective.	_____	Re-adjust the Start switch. Replace the Start switch.	Press the Reset switch.
10	10	The sewing machine start condition error (The spinner oscillating arm motor origin switch has not been turned ON.)	<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	11	Button clamp lifter operating condition error (Spinner oscillating arm motor origin switch will not be turned ON.) (The stop motion switch has not been turned ON.)	<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	12	Spinner oscillating arm condition error (The stop-motion switch has not been turned ON.)	<ul style="list-style-type: none"> 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	13	Fine positioning performance condition error (The index switch has not been turned ON.)	<ul style="list-style-type: none"> 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" on page 7.)

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. (Check the rotation of the sewing machine.)
Independent sewing			Wiper	Whether the wiper magnet is turned ON
Small-lot sewing			Fine positioner	Whether the fine positioner magnet is turned ON
Prospective button feeding			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	Whether the button clamp jaw lever lifting magnet is turned ON
Independent sewing			Spinner oscillating arm	Whether the spinner oscillating arm carries out its one cycle operation
Small-lot sewing			Index	Whether the one division mode is specified for indexing function.
Prospective button feeding			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.

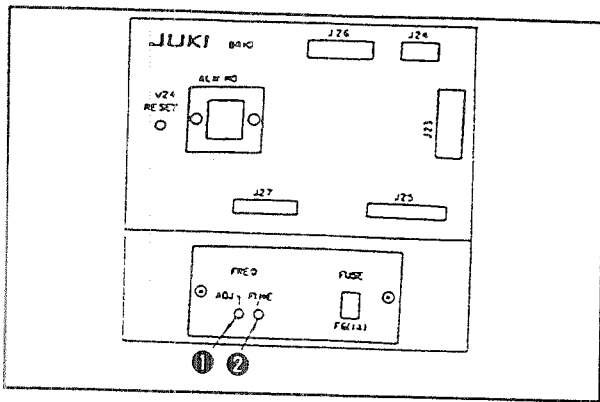
* Make the magnets actuate using the manual operation switches.

(6) Sensor check number table

Number	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 button feeder



- 1) The button feeder is energized by turning ON the power to the main unit.
- 2) Set the button feeder adjusting variable resistor (Refer to page 5 - ⑦) to its intermediate position.
- 3) If the button feeder does not vibrate adequately, turn sensitivity adjustment variable resistor ① until it reaches the position to allow the button feeder to vibrate most. Then turn sensitivity adjustment variable resistor ② and make a fine adjustment so that vibration of the button feeder is maximized.
- 4) Adjust the flow of buttons using the button feeder adjusting variable resistor.

(Caution) Sensitivity adjusting variable resistors ① and ② are 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

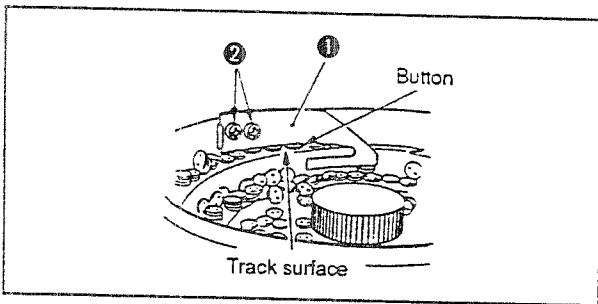


Fig. 6-2

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

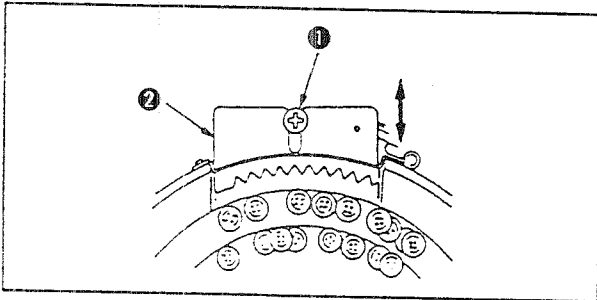


Fig. 6-3

This plate sorts the right-sided buttons from the wrong-sided buttons and feeds only the right-sided ones to the index unit. To adjust the selector plate, loosen screw ①, and move selector plate ② back or forth until it is properly positioned. Then tighten screw ①. The selector plate comes in two different sizes, large and small. Select an appropriate one from among the two different types of selector plate in accordance with the size of buttons to be used.

(2)-3 In-line arrangement plate

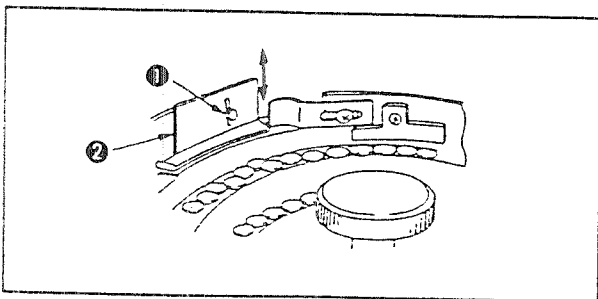
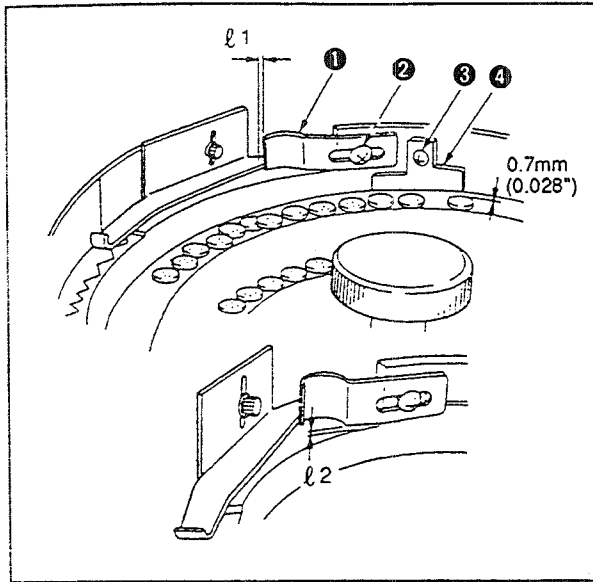


Fig. 6-4

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

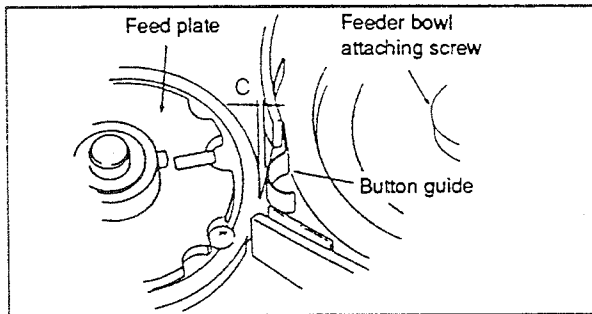
The appropriate clearance between in-line arrangement plate ② and the top face of a button is approximately 0.7 mm (0.028"). Loosen bolt ①, and move the in-line arrangement plate ② up or down to adjust the clearance to the correct value.

(2)-4 Button guide



Appropriate clearance $\ell 1$ between the button guide (1) and the button is approximately 3 (0.118") to 4 mm (0.157"). Loosen screw (2), and adjust the clearance to the correct value.

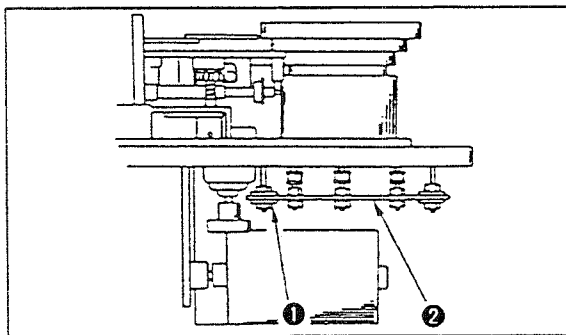
Appropriate clearance $\ell 2$ between the lower surface of the button guide and the track surface of the feeder bowl is 0.3 (0.012") to 0.5 mm (0.02"). A clearance which is larger than the value twice as thick as a button by approximately 0.7 mm (0.028") should be provided between overflow prevention plate (4) and the button. Loosen screw (3), and adjust the clearance to the correct value.



Adjust clearance C between the button guide and the feed plate to 2 ± 0.5 mm (0.079" \pm 0.02").

Adjust clearance C by bending the button guide appropriately.

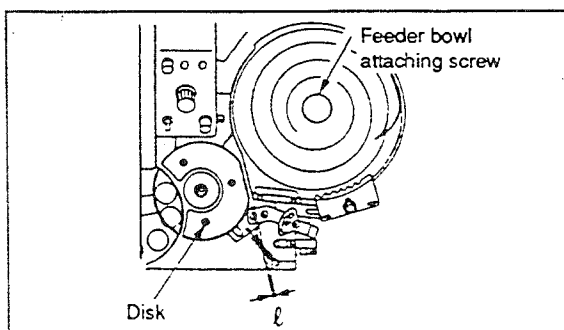
(2)-5 Adjusting the height of the feeder bowl



Loosen six locknuts (1) of feeder base (2), and adjust height difference ℓ between the outlet for buttons and the feeder bowl to 0.5 mm (0.02") 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.

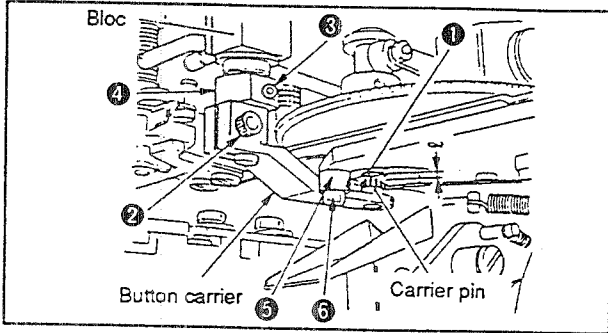
(2)-6 Adjusting the position of the feeder bowl



Adjust clearance ℓ between the feeder bowl and the disk to approximately 1 (0.039") to 1.5 mm (0.059"). Loosen nut (1) (figure of (2)-5) and move the entire unit of the feeder bowl until it is properly positioned. The position of the feeder bowl attaching screw and changing the position of the feeder bowl.

(3) Adjusting the fine positioning

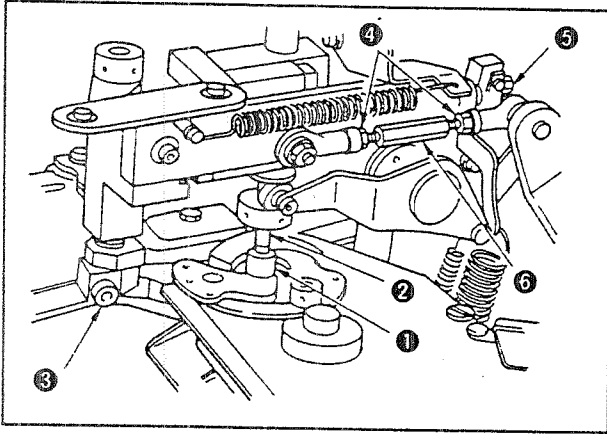
(3)-1 Adjusting the clearance between the carrier pin and the shutter plate



Loosen screws ② and ③. Adjust clearance ℓ between the carrier pin and shutter plate ① to 0.1 (0.004") to 0.3 mm (0.012") by turning adjusting stopper ④. (Make adjusting stopper ④ come in close contact with the button carrier.)

Then tighten screw ③ to fix adjusting stopper ④ in place.

(3)-2 Centering the carrier pin



Remove the work attachment from rotary rod ②. Insert the carrier pin into centering ring ①. (At this time, the shutter plate should be kept open.)

(Caution) Whenever the centering ring is used, set it with its smaller diameter side up.

- 1) Centering the carrier pin in lateral direction
Loosen screw ③ and screw ⑥ (figure of (3)-1), and adjust so that the button carrier freely swings to the right and left. Then, find a position where rotary rod ② can smoothly enter centering ring ①. Now, tighten screw ③ taking care to keep the related components at the adjusted position. Fit eccentric cam ((3)-1-⑤) against the button carrier and tighten screw ((3)-1-⑥) in the eccentric cam while taking care not to allow the button carrier to move from the correct position. Then, check the center of the button clamp jaw

lever meets that of the button carrier. If they are not aligned, refer to "(6) Centering the button clamp jaw lever and the button carrier."

2) Centering the carrier pin in longitudinal direction

If the carrier pin cannot be properly centered by following the procedure 1), keep screw ③ loosened and perform the following adjustment.

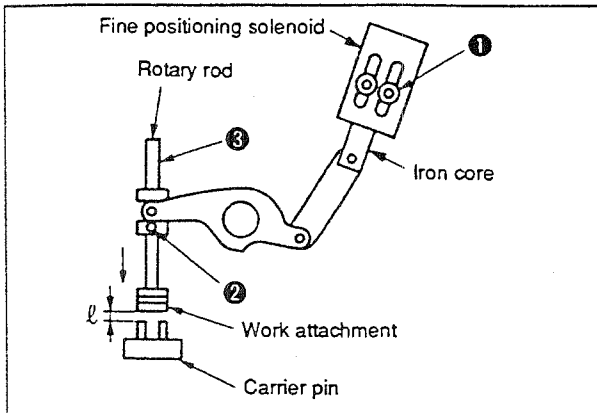
Loosen two locknuts ④ in the end of the rod (the left-handed screw is located in back of the locknut). Loosen screw ⑤, and move urethane rubber from the end face away from the LM guide. Move connecting rod ⑥ until rotary rod ② is brought to the position where it smoothly enters centering ring ①. Then press the urethane rubber against the LM guide so as to eliminate a longitudinal play. Confirm that the carrier pin is correctly centered then tighten nut ④ so that connecting rod ⑥ does not rotate any longer. Then tighten screw ⑤. After the carrier pin has been fixed with respect to its longitudinal position, the carrier pin should be laterally positioned and fixed in place by tightening screw ③. Remove centering ring ①, and check the carrier pin for smooth rotation by turning the manual knob. If the pin fails to rotate smoothly in part the following may be its cause. It is, therefore, necessary to re-center the carrier pin both in the lateral and longitudinal directions.

- The urethane rubber is excessively pressed against the LM guide. → Adjust so that the urethane rubber is adequately pressed against the LM guide, and check the torque of the motor.

(Caution) Perform the aforementioned adjustment only when it is necessary. If necessary, be sure to confirm the following points.

- ① The spinner oscillating arm does not have any longitudinal play when it is in its origin.
- ② The spinner oscillating arm is correctly centered when it is in its origin.
- ③ The spinner oscillating arm actuates and the button is set on the button clamp jaw lever.
- ④ The center of the button clamp jaw lever should be aligned with the center of the button carrier. If not, refer to "6. Centering the button clamp jaw lever and the button carrier".

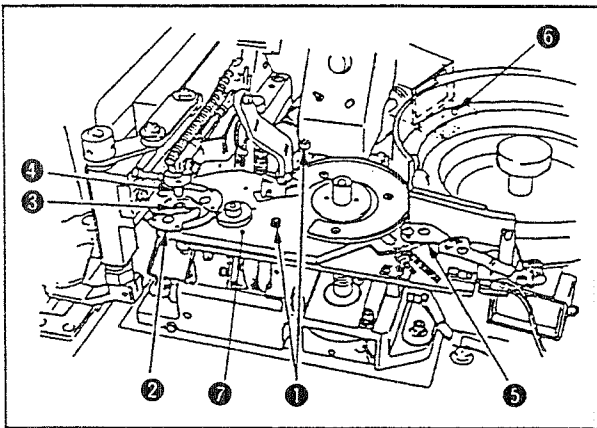
(3)-3 Adjusting the clearance between the work attachment and the carrier pin



Loosen screw ①. Adjust clearance ℓ between work attachment and the carrier pin to 0.1 mm (0.004") or less as long as the work attachment does not come in contact with the carrier pin when the work attachment is brought to its lowest position by drawing the iron core of fine positioning solenoid.

(Caution) Open the shutter plate, and perform the adjustment.

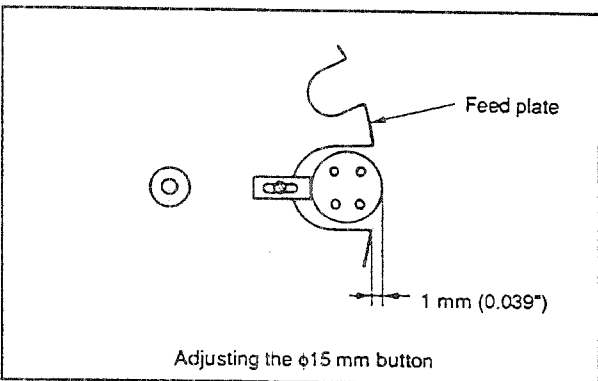
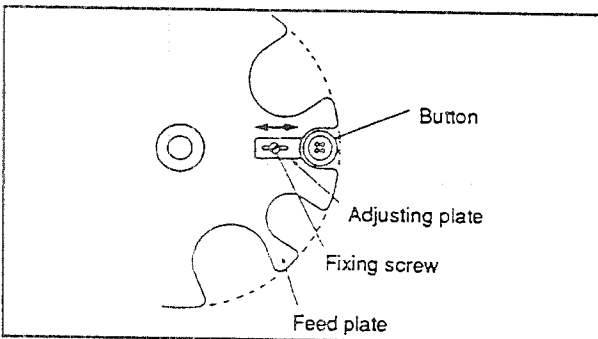
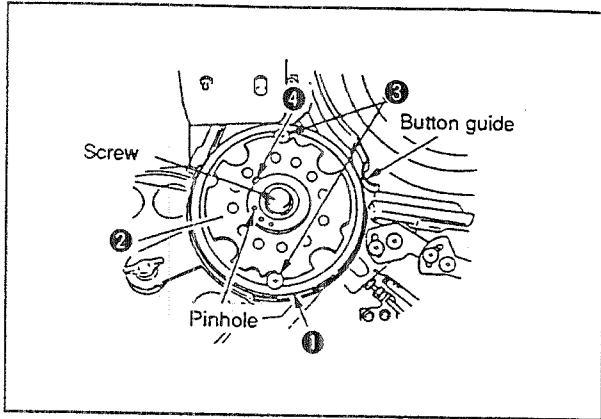
(4) Centering the positioning unit



- 1) Loosen bolts ① and bolt ⑥.
- 2) Fit centering ring ③ in the center of triple pawl ②. Draw out triple pawl dog ⑤ to allow centering ring ③ to be fitted in place. Move the index base plate ⑦ until a position where the rotary rod ④ (with the work attachment removed) smoothly enters centering ring ③ is reached.
- 3) After the positioning unit is correctly centered, tighten bolts ① and bolt ⑥.

(Caution) Tighten bolts ① taking care to keep the center of the triple pawl being aligned with the center of the fine positioning shaft.

(5) Adjusting the feed plate of the index unit



Adjusting the feed plate of the index unit

- 1) Confirm first that the index unit is in its origin.
- 2) Remove the screw which is used to fix the feed plate.
- 3) Loosen screws ③, and match the notch in choice ring ① to one of the holes (large, medium or small) in the feed plate in accordance with the diameter of buttons to be used. Then, tighten screws ③.
- 4) Adjust the clearance, using adjusting plate ②, in which the button is to be put. Loosen screw ④, and adjust the height of the adjusting plate so that a clearance in which only one piece of button can be put is obtained. The clearance should not be widened to allow two buttons to enter with overlapped. Now, tighten screw ④.
- 5) Finely adjust the feed plate, using the adjusting plate so that the button to be used is exactly fitted in the hole selected. Loosen the fixing screw with a screwdriver through the screwdriver hole in the feed plate. Adjust the adjusting plate so that the periphery of the feed plate is flush with that of the button. Then, fix the adjusting plate by tightening the fixing screw. Attach the feed plate which has been properly adjusted to the button feeder. At this time, install the feed plate to the button feeder so that the hole in the feed plate is brought to the exit of the feeder bowl.

(Caution) Carefully tighten the screws since the aforementioned components easily break.

- When sewing buttons of which diameter of $\phi 15$ mm (0.591"), move the adjusting plate outward from the above-stated position by 1 mm (0.039"). (This allows the button to fall smoothly down to the index gear.)

(6) Centering the button clamp jaw lever and the button carrier

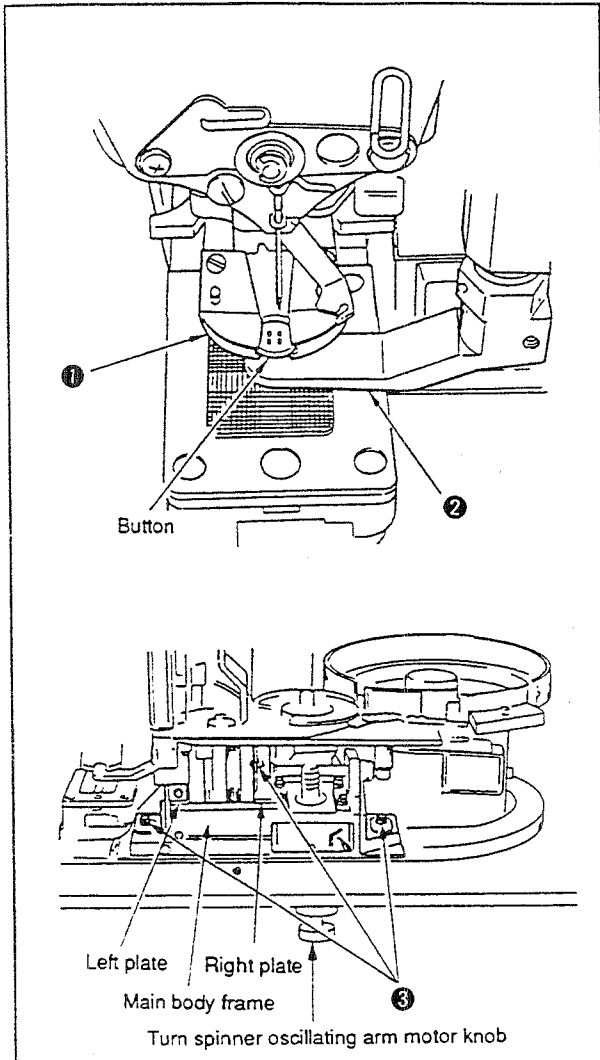


Fig. 6-13

- 1) Return button carrier to its origin, then, tilt the machine head.
- 2) Loosen three locking bolts ③ in the main body frame and bolt ④ (VI-4).
- 3) Raise the machine head. Turn the knob of the spinner oscillating arm motor until carrier plate ② on which the button is placed is brought to its front end position.
- 4) Adjust so that the button meets the button clamp jaw lever by moving the main body frame.
- 5) Once the button clamp jaw lever has been properly positioned, return carrier ② to its origin and tilt the machine again. Then, tighten bolts ③ and bolt ④ (IV-4).
- 6) Raise the machine head, and confirm again that the button clamp jaw lever is correctly positioned by turning the knob of the spinner oscillating arm motor by hand.

Note) This adjustment should be carry out after the adjustment (3)-2 has been completed.

(7) Adjusting the height of the button clamp jaw lever

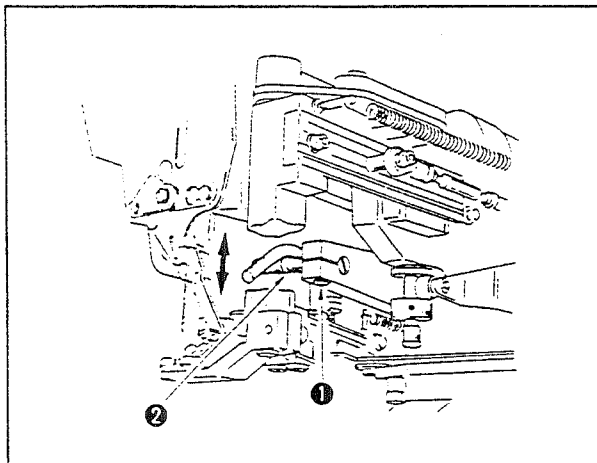
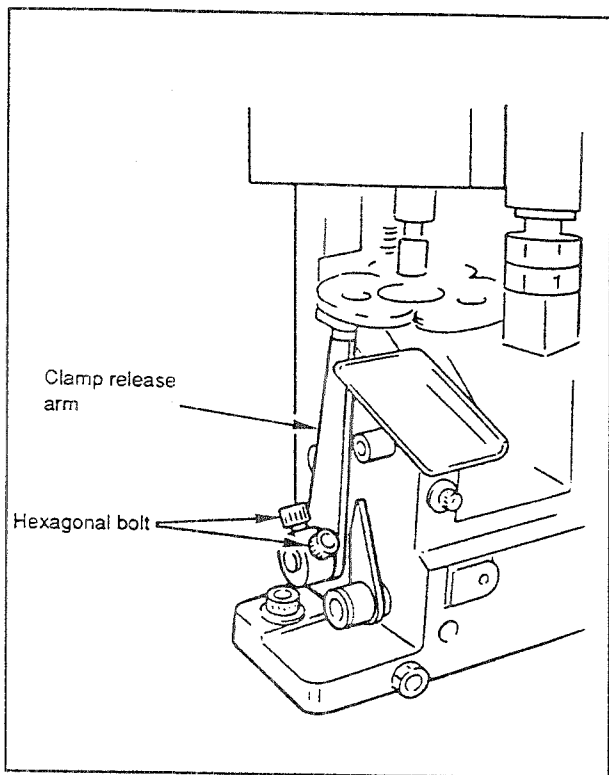


Fig. 6-14

Loosen screw ①, and raise/lower hook ② which is an eccentric shaft until the button receiving plane of the button clamp jaw lever is on a level with the top face of the set pin by turning the hook. Then, fix the button clamp jaw lever in place by tightening screw ①. Height of the button clamp jaw lever should be increased in accordance with the shape of the button to be used. Make sure that the button is fitted into the button clamp jaw lever without fail.

Note) This adjustment should be carry out after the adjustment (3)-1 has been completed.

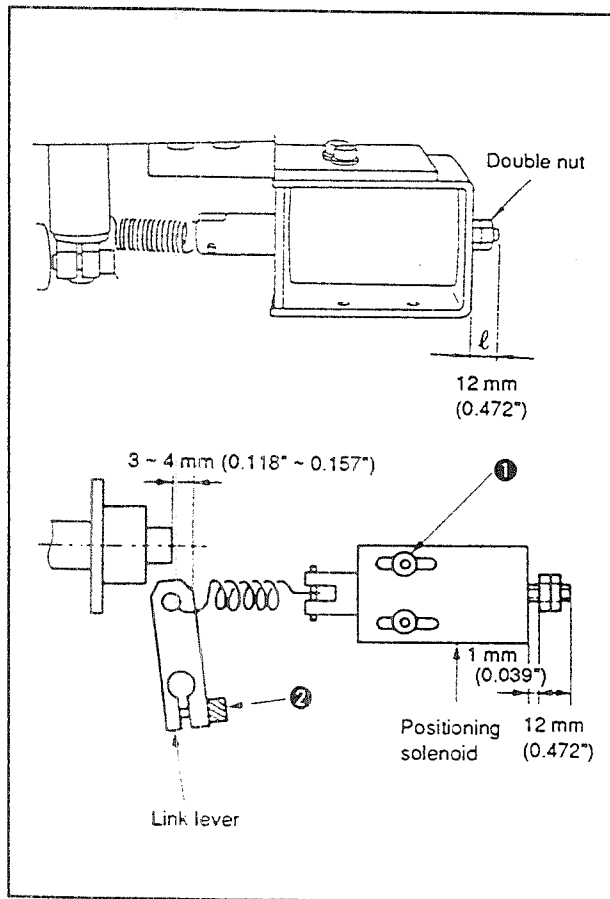
(8) Adjusting the opening amount of the button clamp jaw levers



This sewing machine has been designed to make the button clamp jaw levers automatically open to release the finished button at the very moment when the button has been sewing on the material. The opening amount of the button clamp jaw levers to release the button can be adjusted.

Manually turn spinner oscillating arm motor knob, and the clamp release arm will move and button clamp jaw lever will open. Adjust the position of the clamp release arm by loosening the hexagon head bolt so that a clearance of 1 to 2 mm (0.039" to 0.079") is provided between the button and the button clamp jaw lever when pressing the roller away from you until it will go no further. Then tighten the hexagon head bolt. If the clamp release arm comes in contact with the button clamp jaw lever from the sewing start, the button clamping force will be insufficient resulting in button setting failure or needle breakage. So be careful.

(9) Adjusting the output level of the positioning solenoid



If the output level of the positioning solenoid is excessive, the clamped button may be raised or broken. On the other hand, if the output level of the solenoid is inadequate, the button may fail to be clamped. It is, therefore, necessary to adjust the output level of the solenoid properly.

Loosen the double nut located at the rear of the solenoid, and adjust the protruding amount ℓ of the male screw properly so that an adequate output level of the positioning solenoid is provided. The standard protruding amount of the male screw is 12 mm (0.472"). At this time, position the magnet so that an approximately 1 mm (0.039") play is provided for the spring attached at the top of the iron core of the solenoid. If no play is provided between the spring and positioning solenoid or an excessive play is provided between them, loosen screws ① and adjust the play to the specified value by moving the positioning solenoid back or forth.

At this time, confirm that the cam shaft is spaced 3 (0.118") to 4 (0.157") mm away from the link lever.

(If the aforementioned distance is not provided between the cam shaft and the link lever, loosen screw ② and adjust the distance properly.)

(Caution) Adjust the distance between the cam shaft and the link lever at the position where the triple pawl of the feed plate of $\phi 16$ mm (0.630") (standard part).

VII. SENSOR MECHANISM AND ADJUSTMENT

1. Button detecting function at the positioning unit

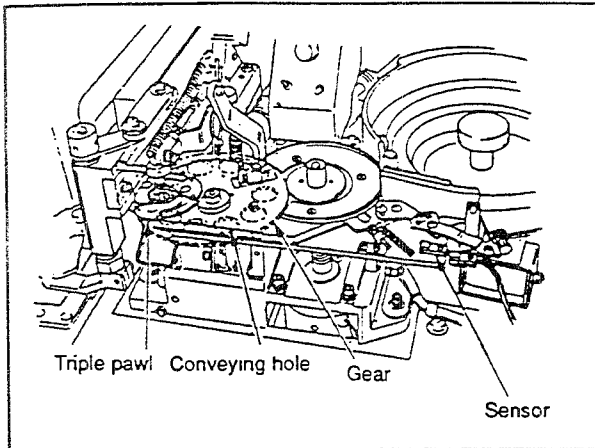


Fig. 7-1

This sensor detects a button at the button positioning point. When there is a button at the button positioning point, the button starts to be finely positioned. When there is no button, the feed plate repeats indexing until a button is brought to the button positioning point. However, if no button is brought to the button positioning point by performing indexing as many as 10 times, the alarm indicator lamp on the operation panel repeats flashing on and off. Press the manual operation switch, and the feed plate will re-start indexing. Then the sensor detects a button.

2. Function of confirming a button fitted on the carrier pin

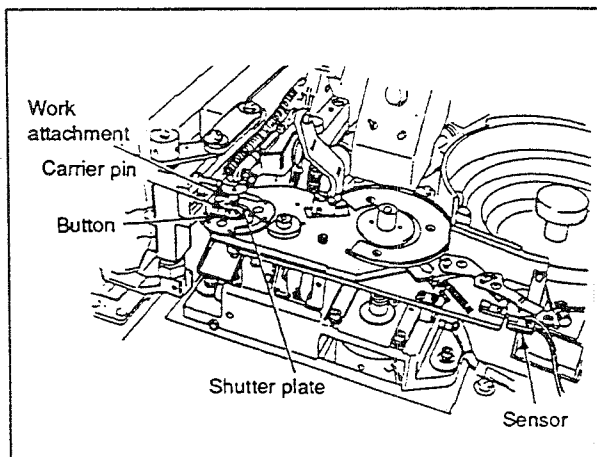


Fig. 7-2

This sensor detects whether a button is securely fitted on the carrier pin.

After the sensor detects a button, the spinner oscillating arm actuates to feed the button to the button clamp jaw lever on the main unit of the sewing machine. So, the spinner oscillating arm never actuates unless the button feeding failure is corrected.

3. Two-stepped foot pedal switch

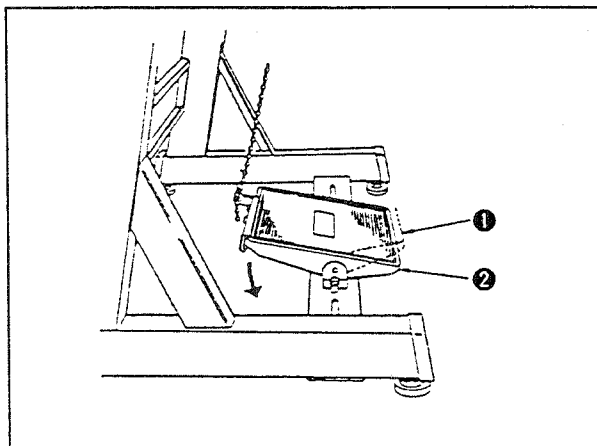


Fig. 7-3

Lightly depressing foot pedal (stage ①) makes the button clamp jaw lever on the main unit of the sewing machine come down. At this stage, the needle does not enter the holes in the button. If you release the pedal at this stage, the button clamp jaw lever automatically goes up.

When the pedal is further depressed (stage ②) from stage ① where the pedal is lightly depressed, the needle will enter the holes in the button.

This feature is very helpful when confirming the button sewing position, etc.

4. Adjusting the position of sensor (Set the mode selector switch on the operation panel to the step-operation mode (○).)

(1) Adjusting the start origin switch (SORG)

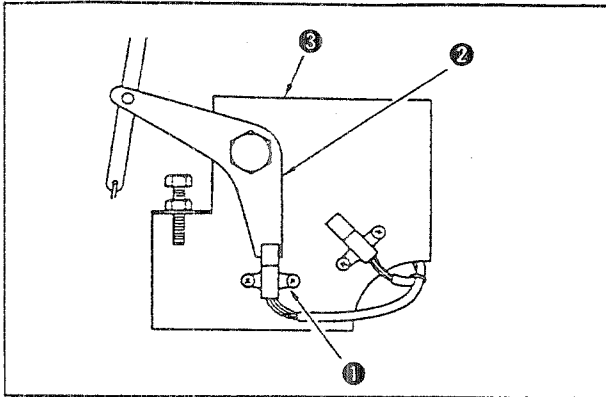


Fig. 7-4

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)

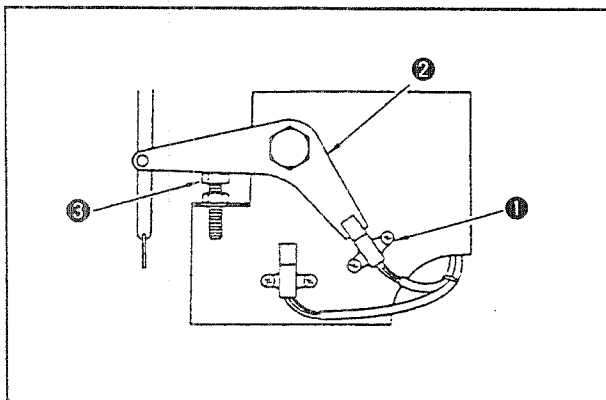
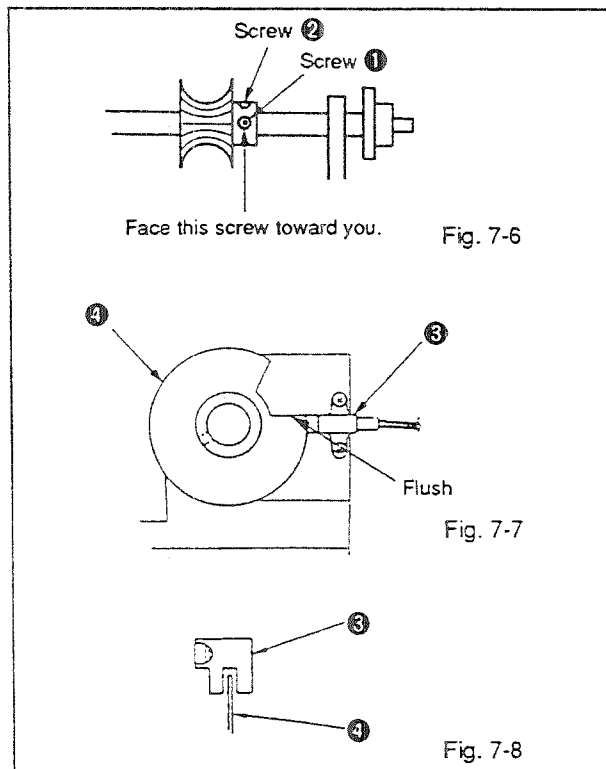


Fig. 7-5

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)



Face this screw toward you.

Fig. 7-6

Fig. 7-7

Fig. 7-8

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.

Turn the knob of the spinner oscillating arm motor until screw (1) in the worm wheel faces toward you as shown in Fig. 7-6. At this position, make the top surface of sensor (3) is flush with the lower edge of the notch in the sensor dog. Now, fix sensor dog (4) as shown in Fig. 7-7.

Adjust sensor dog (5) so that it is brought to the center of sensor (3) as shown in Fig. 7-8.

After the completion of the adjustment, bring the button carrier to its origin by turning the knob of the spinner oscillating arm motor.

(4) Adjusting the index origin switch (IORG)

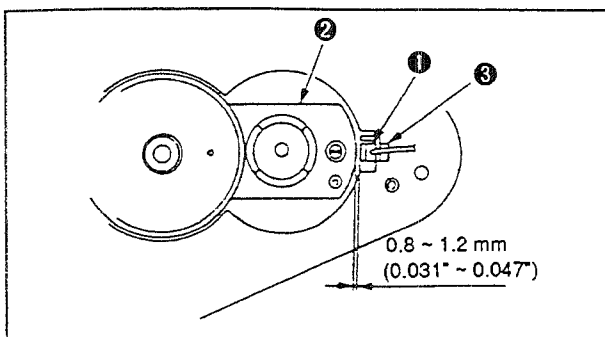


Fig. 7-9

Index origin switch ① (hereinafter called "IORG") which incorporates a proximity sensor (GXL-8F) is the sensor to detect the feed plate when its feeding operation is stopped. To adjust, loosen screw ③ and adjust a clearance of 0.8 (0.031") to 1.2 mm (0.047") is provided between the detecting plane of the IORG and the outside periphery of GENEVA wheel ②.

(5) Adjusting the button detecting switch (BUT) at the button positioning point

Button detecting switch at the button positioning point ① (hereinafter called "BUT") which incorporates a proximity sensor (GXL-8F) is the sensor to detect a button in positioning unit ② when actuating the positioner (triple pawl). (It turns OFF when a button is detected, or ON when no button is detected.)

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 (Fig. a-①) by 1 to 1.5 mm (0.039 to 0.059") (Fig. a-②), and tighten the fixing screw of the triple pawl dog.

Then, confirm that BUT turns OFF when the triple pawl clamps a $\phi 10$ mm (0.394") 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.

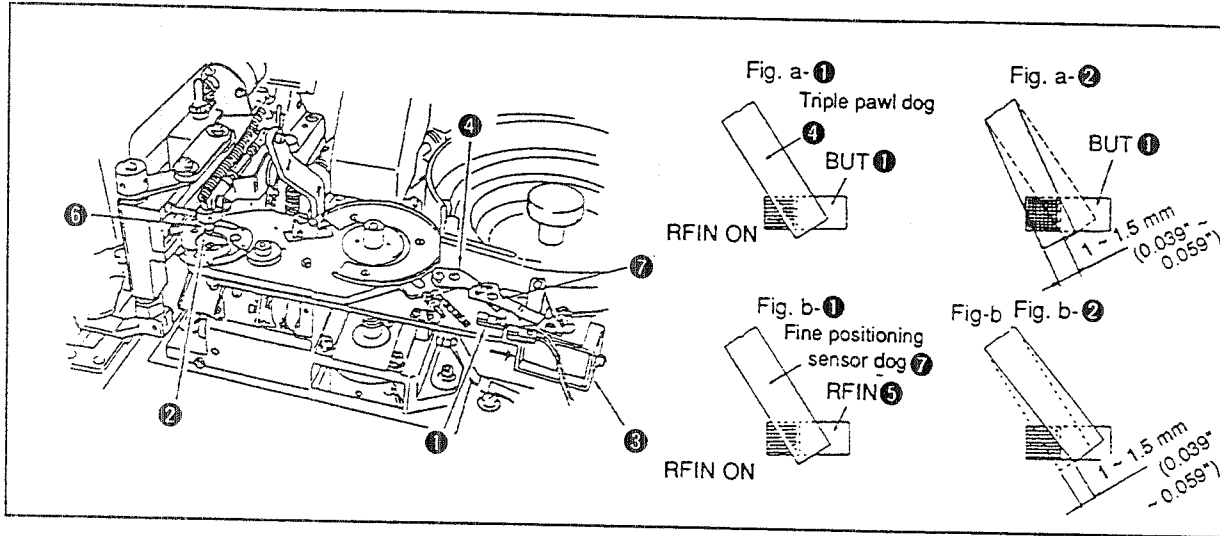
(6) Adjusting the fine positioning completion switch (RFIN)

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 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. a). Then move back the RFIN from the aforementioned position by 1 to 1.5 mm (0.039" to 0.059") (Fig. b), and tighten the fixing screw.

Then confirm 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 function of the RFIN is to detect whether the button has been completely set on the carrier pin and to open/close the shutter by turning ON or OFF according to the detected result (in accordance with the difference between the outside diameter of the button and that of the attachment).
 - When using the work attachment for large buttons, re-adjust the fine positioning completion detecting switch so that it turns OFF when the triple pawl clamps the smallest button that can be used and turns ON when it clamps the work attachment.



VIII. REPLACING THE COMPONENTS AND POSITIONING THEM

(1) Replacing the button carrier and positioning it

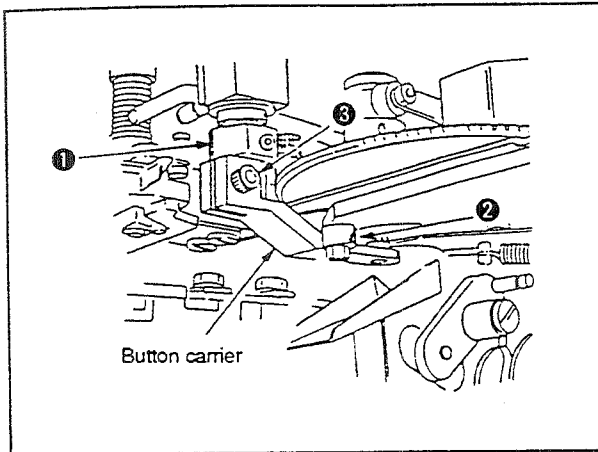
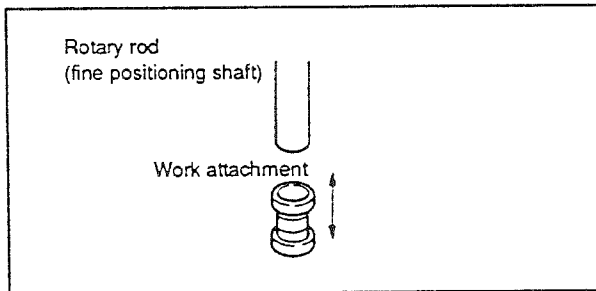


Fig. 8-1

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 (2), and simultaneously make the top face of the carrier come in contact with the nut (1). 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.

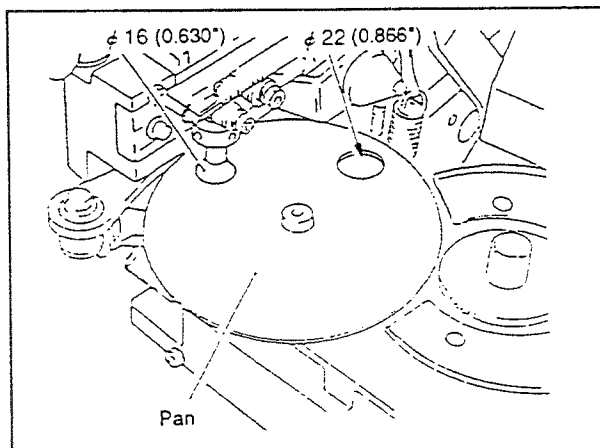
(2) Replacing the work attachment



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.

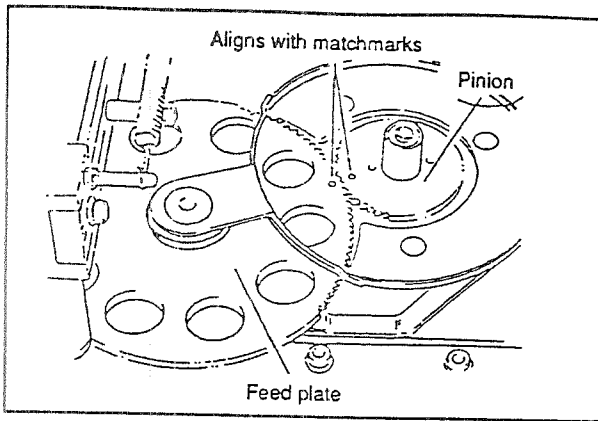
(3) Replacing the feed plate and positioning it



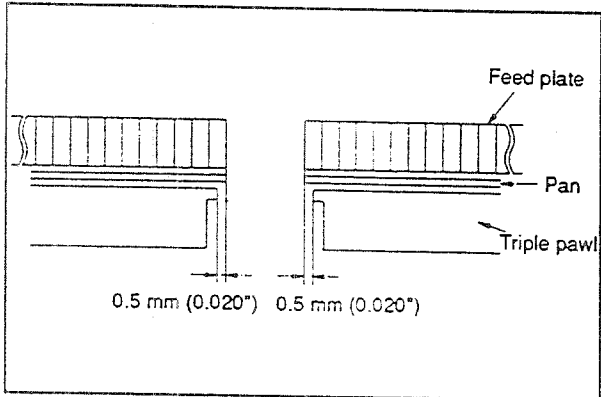
* A $\phi 22$ mm (0.866") feed plate is also applicable by turning the pan over.

1) Pan

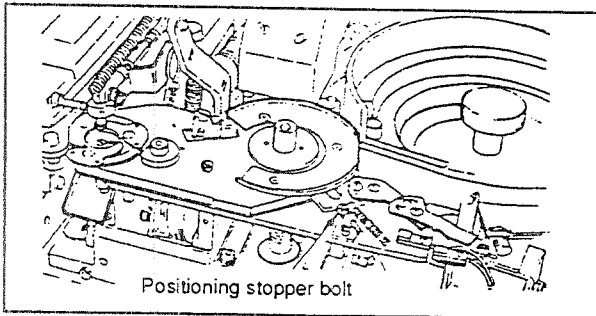
Use the feed plate of $\phi 16$ mm (0.630") (standard) when sewing buttons of which outside diameter is $\phi 10$ mm (0.394") to $\phi 15$ mm (0.591"). If the outside diameter of the button is $\phi 16$ mm (0.630") to $\phi 18$ mm (0.709"), use the feed plate of $\phi 22$ mm (0.866") (optional). At this 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.



How to replace the shutter plate

Replace the shutter plate in the whole unit. If the shutter plate has broken or deformed and it needs to be replaced, replace it in the whole unit (shutter plate asm.).

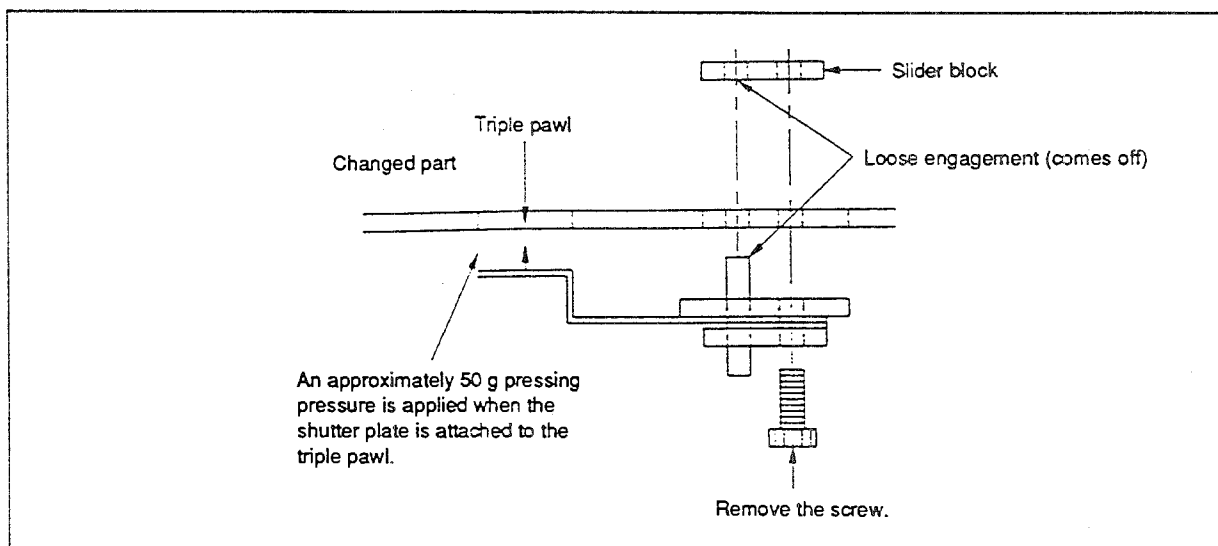
Parts required for replacement

- ① Shutter plate asm. (165-67166)
- ② Slider block (165-73305)

Replacement procedure

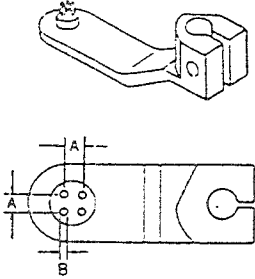
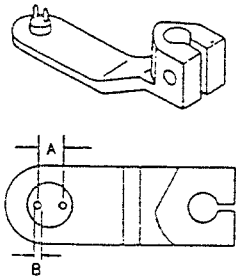
Remove the screw which fixes the top cover, and raise the top cover. Remove the hexagon socket head cap screw which fixes the shutter plate slider, replace the shutter plate with a new one, and fix it with the hexagon socket head cap screw. Then, fix the top cover in place. This completes the adjustment procedure.

- (Caution)
- ① Fix the top cover after removing the core from the triple pawl.
 - ② If a clearance is provided between the shutter plate and the triple pawl, button feeding failure will result. So, if a clearance is provided between them because of a play in the related components, install the shutter plate to the triple pawl with leaned so that the shutter plate applies a pressing pressure of approximately 50 g to the triple pawl.
 - ③ Lastly, confirm that the triple pawl operates smoothly.


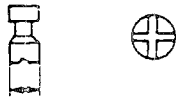



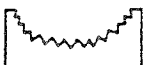
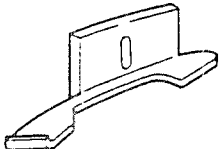



IX. OPTIONAL PARTS

1) Button carrier

	For 4-holed button				For 2-holed button			
Shape of button carrier								
	Dimension A (mm)	Dimension B (mm)	Part No.	Code	Dimension A (mm)	Dimension B (mm)	Part No.	Code
Standard type	2.6	1.0	165-57902	A	3.2	1.2	165-58009	B
Special-order type	2.0	1.0	165-90507	Q	2.0	1.0	165-87305	E
	2.2	1.0	165-90606	R	2.2	1.0	165-87404	F
	2.4	1.0	165-87501	S	2.4	1.0	165-87503	G
	2.4	1.2	165-87600	T	2.4	1.2	165-87909	L
	2.6	1.2	165-87709	U	2.6	1.0	165-87602	H
	2.8	1.2	165-87808	V	2.6	1.2	165-88006	M
	3.0	1.2	165-87907	W	2.8	1.0	165-87701	J
	3.0	1.5	165-88806	F1	2.8	1.2	165-88105	N
	3.1	1.0	165-87206	D	3.0	1.0	165-87800	K
	3.1	1.2	165-89004	X	3.0	1.2	165-88204	P
	3.1	1.4	165-89202	Z	3.8	1.2	165-87107	C
	3.6	1.2	165-90705	H1				
	4.0	1.2	165-89707	E1				

2) Optional parts

Part No.	Name of part	Shape
16557704	Work attachment, large	 9.5 mm (0.374")
18257006	Work attachment (with a groove)	 Bottom surface 8 mm (0.315")
18257105	Work attachment (with a recessed end)	 8 mm (0.315")
18257204	Work attachment (with a recessed end)	 9.5 mm (0.374")
18200956 18201103 (16568651)	Feed plate asm., $\phi 13.5$ mm (0.531") Pan, small (Feed plate asm., $\phi 22$ mm (0.866"))	 Hole diameter $\phi 13.5$ mm (0.531")
18251553 (GBR01424000)	Separation plate asm., extra-small (Separation plate, large)	
18213207	In-line arrangement plate A	
16558207	Centering ring, large	

Application

The shape of this work attachment is as same as that of the standard type of work attachment and has a large bottom diameter. It is suited to large buttons of which diameter is approximately $\phi 18$ mm (0.709").
When replacing the standard work attachment with this work attachment, re-adjust the fine positioning completion switch (see page 22).

This work attachment has a bottom of which diameter is standard but is provided with a cross groove. It is suited to special-shape buttons (such as marble buttons) which do not smoothly rotate when using the standard attachment.

This work attachment has a bottom of which diameter is standard but has a conic recess. It is suited to the buttons, such as marble buttons, which has a protruded top face.

This work attachment is same as 18257105 in shape but has a larger bottom diameter.
When replacing the standard work attachment with this work attachment, re-adjust the fine positioning completion switch (see page 22).

This feed plate has a smaller holes ($\phi 13.5$ mm (0.531")) for carrying buttons when compared with the standard feed plate. When a small button (shell button, in particular) of which diameter is $\phi 10$ mm (0.394") is to be fed, the button may be reversed when it is delivered to the triple pawl or crack when the triple pawl is closed, in accordance with the shape of the button.
To prevent the aforementioned troubles, this feed plate is used in combination with the ferrule disk (small).
If using buttons of which diameter is $\phi 16$ mm (0.630") or more, use the feed plate asm., $\phi 22$ mm (0.866"). In this case, the standard pan can be used.




This separation plate is smaller than the selection plate, small (GBR011220A0). It is suited to the flat buttons (shell buttons, in particular) of which diameter is approximately $\phi 10$ mm (0.394") since, when using such buttons, the separation plate (small) cannot discriminate the right-sided buttons from the wrong-sided ones with consistency.
When using large buttons, use the separation plate, large.

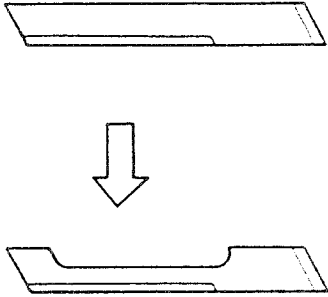

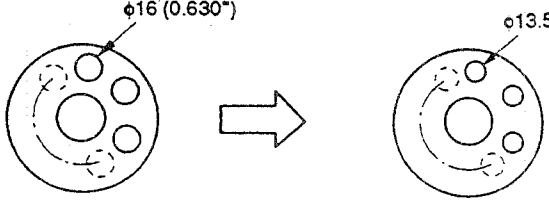
This in-line arrangement plate is suited when sewing buttons including marble-shaped buttons which are likely to be clogged in the standard in-line arrangement plate.
This plate is designed to prevent buttons from being clogged.

Use this ring when centering the origin of the button carrier, E, F, G or H.

3) Sewing marble buttons or the like

The BR10 has been designed for the sewing of flat buttons including buttons for men's shirts. If you want to sew marble buttons or some other special-shaped buttons, replace the parts listed below to improve effectiveness of the button feeder.

Shape of buttons (marble button , semi-marble button , shell button )

No.	Name of part (part No.)	Caution to be taken at the time of replacement
1.	In-line arrangement plate A (18213207)	 <p data-bbox="1230 373 1409 487">It is adjusted in the same way as in the case of the standard part.</p>
2.	Work attachment, small (with a groove) (18257006)	 <p data-bbox="799 877 1042 907">No adjustment is required.</p>
3.	Feed plate asm. (18200956) φ13.5 mm (0.531")	 <p data-bbox="750 1276 1458 1369">No adjustment is required. When this feed plate is used for sewing buttons of which outside diameter is φ10 (0.394") or φ11.5 mm (0.453"), effectiveness of the button feeder will be improved.</p>
3.	Pan, small (18201103)	No adjustment is required.

In addition, be sure to use the triple pawl asm. that is provided with a collar.

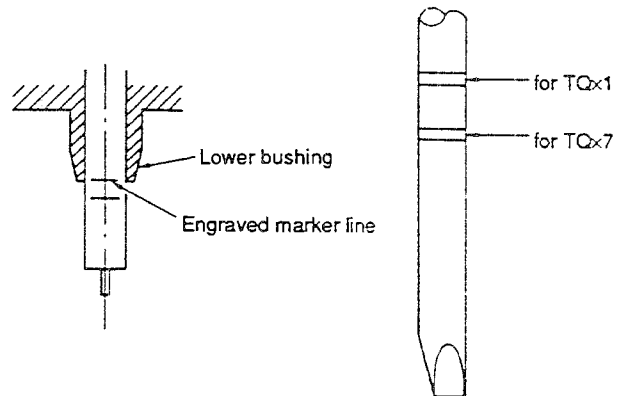
X. STANDARD ADJUSTMENT

1. Standard adjustment

Standard adjustment

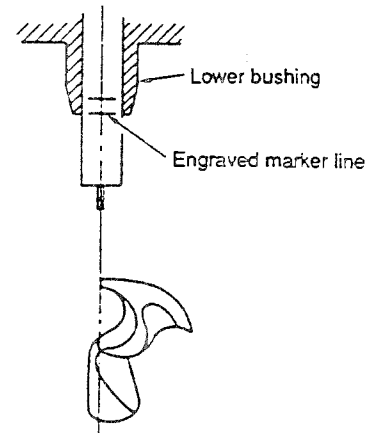
(1) Height of the needle bar

The second marker line as counted from the lowest one of the marker lines engraved on the needle bar should align with the bottom end of the lower bushing when the needle bar is brought to the lowest position of its stroke.



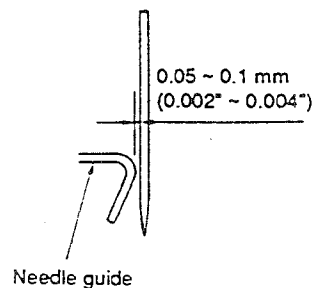
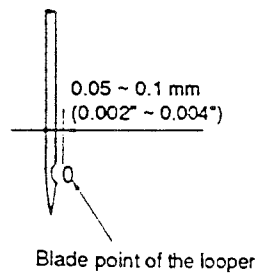
(2) Position of the needle and looper

The blade point of the looper should align with the center of the needle when the lowest marker line engraved on the needle bar is aligned with the bottom end of the lower bushing.



- ① Clearance between the needle and the looper:
0.05 to 0.1 mm (0.002" to 0.004")

- ② Clearance between the needle guide and the needle:
0.05 to 0.1 mm (0.002" to 0.004")



How to adjust	Results of improper adjustment
<p>Loosen the screw in the needle bar take-up, and adjust the height of the needle bar appropriately.</p>	<p>If the position of the needle bar is too high, stitch skipping may result. On the other hand, if the position of the needle bar is too low, the needle may come in contact with the looper.</p>
<p>Loosen the screw in the looper, and adjust the clearance between the needle and the looper.</p> <p>Loosen the screw in the needle guide, and adjust the clearance between the needle guide and the needle.</p>	

Standard adjustment

(3) Adjusting the yoke slide

① Timing of lateral motion of the yoke slide

The height of the descending needle bar should be adjusted to 15 to 18 mm (0.591" to 0.709") when the yoke slide starts moving from its left position to the right.

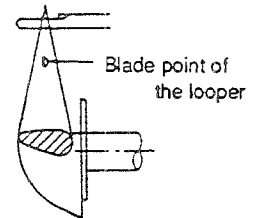
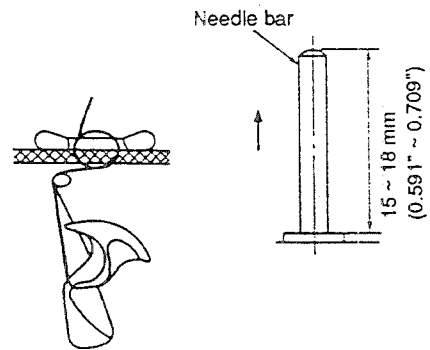
② Timing of the longitudinal motion of the yoke slide.

The yoke slide should start moving away from you immediately after the blade point of the looper passes the triangle of thread.

③ Adjusting the longitudinal position of the yoke slide

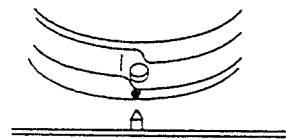
The blade point of the looper should pass at the center of the triangular section of the thread.

(This adjustment should be carried out on the premise that a 4-hole button is sewn and the blade point of the looper goes through the triangle of thread at the 9th or 10th stitch.)

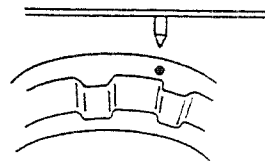


(4) Adjusting the cloth feeding cam

Align the marker dot engraved on the periphery of the cloth feeding cam with the pivot which is fixed on the bed. (At the time of stop-motion)



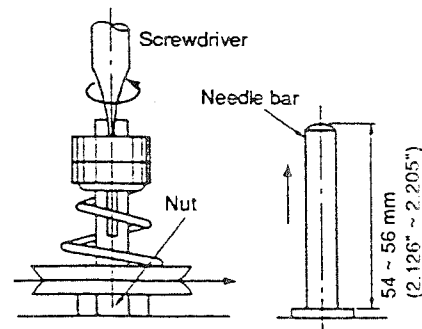
(Longitudinal feed cam)

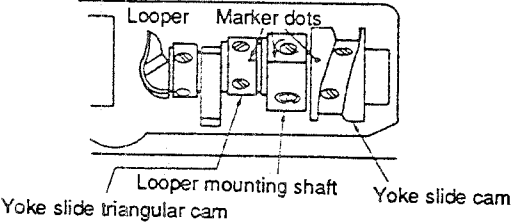


(Lateral feed cam)

(5) Timing of tension disc No. 2

The tension disc No. 2 should be released when the height of the ascending needle bar is 54 to 56 mm (2.126" to 2.205").

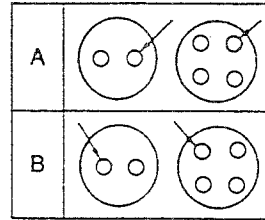
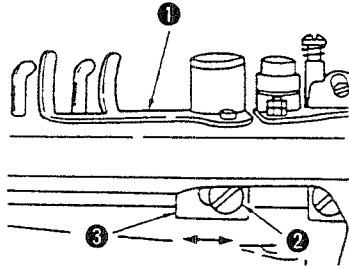


How to adjust	Results of improper adjustment
<p>① Adjust the yoke slide triangular cam in the rotational direction.</p> <p>② Adjust the yoke slide in the rotational direction.</p> <p>③ Move the yoke slide cam back and forth.</p>  <p>To adjust the position of the yoke slide triangular cam, tighten the screw with the marker dot engraved on the yoke slide cam, that on the looper mounting shaft and that on the triangular cam lay on the same straight line.</p>	<p>If the timing to make the yoke slide start its action is too late, thread may remain in the needle after thread trimming. In this case, thread breakage, isolated idling loop and improperly tensed stitches may result. On the other hand, if the timing is too early, the needle may come in contact with the yoke slide.</p> <p>If the timing of longitudinal motion of the yoke slide is too early, the looper may be threaded twice. On the contrary, if the timing is too late, the needle may come in contact with the yoke slide.</p> <p>If the yoke slide is improperly positioned, the looper may be threaded twice.</p>
<p>Make the machine stop in its stop-motion position, tighten the screws in the cam with the marker dot engraved on the cam aligned with the pivot of the bed.</p>	
<p>Loosen the adjustment nut of tension post No. 2. Then, fit a screwdriver into the tension post No. 2, and adjust the timing to release the tension disc No. 2 turning the screwdriver.</p>	<p>If the timing to release the thread tension controlled by the tension disc No. 2 is too early, a longer thread may remain in the needle after thread trimming or inadequately tensed stitches may result. On the other hand, if the timing of thread tension release is too late, thread will break.</p>

Standard adjustment

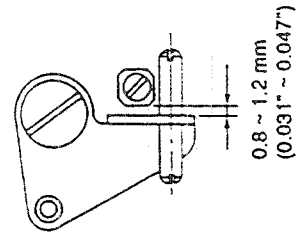
(6) Adjusting the thread pull-off lever

If the end of thread is drawn from arrow hole A in the button after sewing, change the position of thread pull-off lever block ③ to the left. Move the thread pull-off lever block ③ to the right when the thread end comes out from arrow hole B.



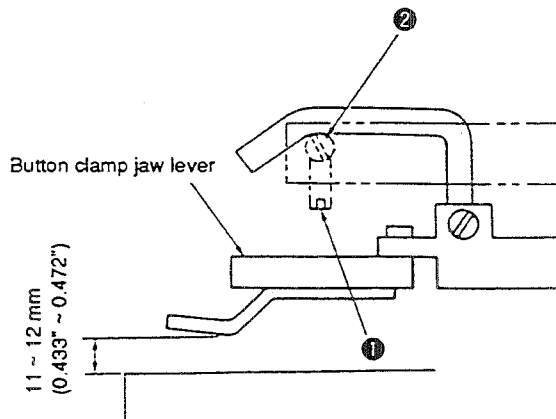
(7) Adjust the nipper

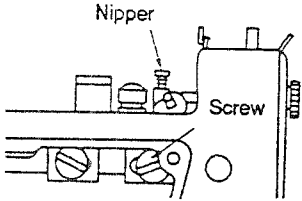
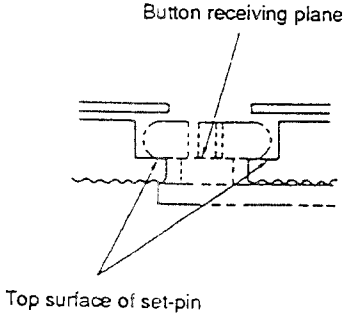
The clearance of 0.8 to 1.2 (0.031" to 0.047") should be provided between the nipper and the block when the machine is in operation.



(8) Height of the button clamp jaw lever

Standard height of the button clamp jaw lever is 11 to 12 mm (0.433" to 0.472").

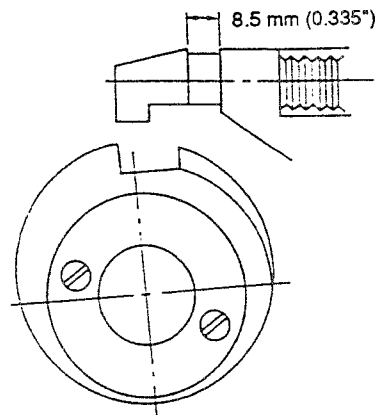


How to adjust	Results of improper adjustment
<p>Adjustment of the thread pull-off lever ❶, insert a screwdriver through an opening in the machine arm side cover (left), loosen screw ❷ and adjust the position of thread pull-off lever block ❸ to the left or the right.</p>	<p>The adjustment of the thread pull-off lever changes in accordance with the type of material, thickness of button, type of thread, etc. to be used. Consequently, it is necessary to confirm that the thread pull-off lever has been properly adjusted by performing test sewing.</p>
<p>Remove the arm side cover (left), loosen the screw in the nipper bar block and adjust the clearance between the nipper and the block properly.</p> 	<p>If the clearance between the nipper and the block is too large, the length of thread coming from the needle may be shortened. As a result, the last stitch is improperly tensed.</p>
<p>Adjust the height of the button clamp jaw lever first to 11 to 12 (0.433" to 0.472") as reference. Then, loosen screw ❶ and finely adjust the height of the button clamp jaw lever using eccentric screw ❷ so that the button receiving plane of the button clamp jaw lever is flush with the top surface of the set-pin of the button carrier.</p> <p>Confirm that a button is smoothly inserted into the button clamp jaw lever without fail.</p> 	<p>If the height of the button clamp jaw lever is not properly adjusted, a defective insertion of a button or a button breakage may result. When sewing 4-holed buttons, the button clamp jaw lever may rise from the correct position when it moves backward and fail to retain the material fabric. To prevent this, carefully adjust the button clamp jaw lever.</p>

Standard adjustment

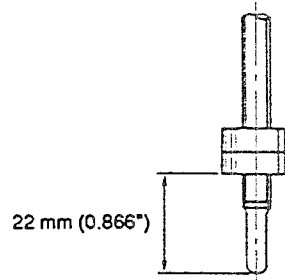
(9) Adjusting the stop-motion hook

The clearance of 8.5 mm (0.335") should be provided between the stop-motion lever and the stop-motion hook.



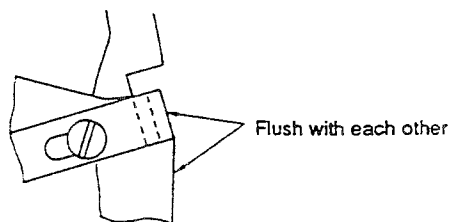
(10) Work pressing force

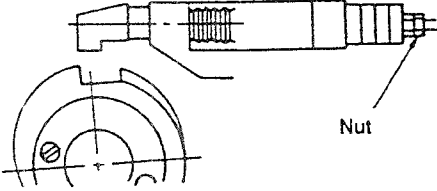
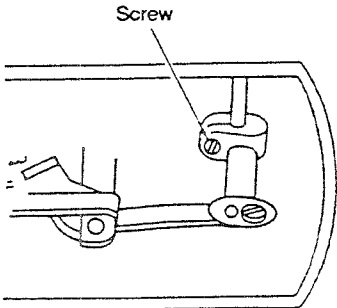
Adjust the pressure adjustment nut so that it is positioned 22 mm (0.866") above the bottom of the bar.



(11) Adjusting the button clamp lifting plate

The engagement depth between the button clamp lifting plate and the lifting hook when the machine has completely entered into its stop-motion state statically is such that the front end of the lifting hook is aligned with the ridge of the lifting plate.



How to adjust	Results of improper adjustment
<p>Adjust the clearance between the stop-motion lever and the stop-motion hook to 8.5 mm (0.335") using the stop-motion spring adjustment nut.</p>  <p>The diagram shows a side view of a mechanical assembly. On the left is a curved stop-motion lever with a small circular hole. To its right is a cylindrical stop-motion hook. A spring is positioned between the lever and the hook. At the end of the hook, there is a threaded section with a nut. A label 'Nut' with a leader line points to this nut.</p>	<p>If the clearance is not adjusted to 8.5 mm (0.335"), the compressed amount of the spring may change.</p>
<p>Adjust the work pressing force by turning the pressure adjustment nut.</p>	<p>If the work pressing force is insufficient, the end of thread may irregularly appear on the wrong side of the material by the length of 10 to 20 mm (0.394" to 0.787") at the sewing start.</p>
<p>Loosen the screw in the button clamp lifting plate guide rod, and adjust the button clamp lifting plate properly.</p>  <p>The diagram shows a side view of a button clamp mechanism. A vertical rod passes through a button clamp. A horizontal guide rod is attached to the clamp. A screw is shown on the guide rod, which is used to adjust the position of the button clamp. A label 'Screw' with a leader line points to this screw.</p>	<p>If the front end of the lifting hook excessively protrudes, stop-motion failure or maloperation of the thread trimmer may result. If it excessively recedes, start failure may result.</p>

Standard adjustment

(12) Adjusting the timing of clutch

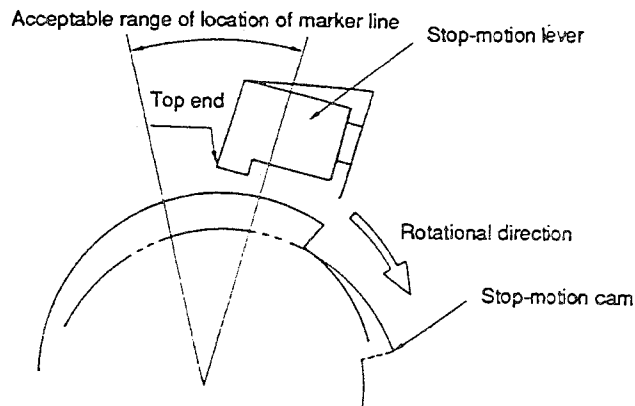


Fig. 1

At the last stitch of the sewing and before the stop-motion, top end of the stop-motion lever should lie on the area between the two marker lines engraved on the stop-motion cam, when letting out the clutch.

Furthermore, defective stop-motion should not occur and abnormal stop-motion noise should not be generated during operation. (When the sewing speed is set to 1,500 s.p.m.)

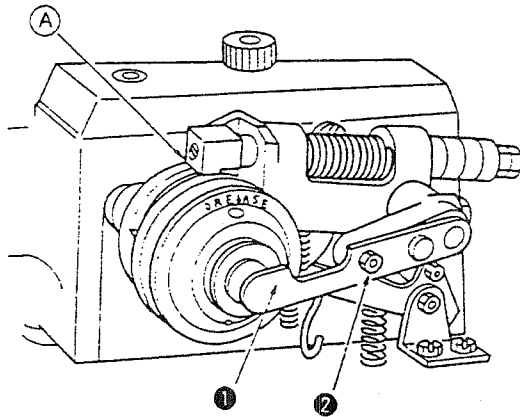


Fig. 2

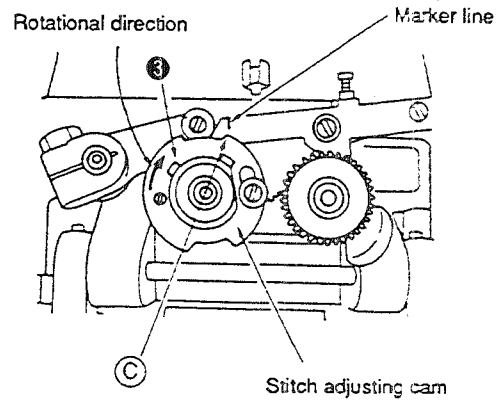


Fig. 3

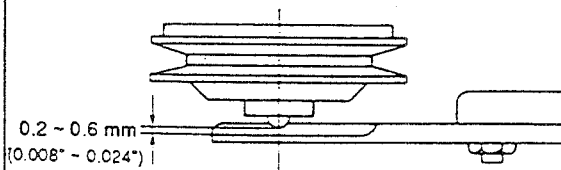
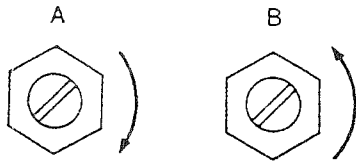


Fig. 4

How to adjust

- 1) Make the sewing machine enter into its normal stop-motion position. Be sure to turn OFF the power to the sewing machine in advance. (The correct stop-motion position is obtained when the stop-motion hook is fully lowered until the lever is aligned with claw **A**. (Fig. 2))
- 2) Then, check the stitch adjusting cam. (Fig. 3)
Under the stop-motion state, the marker line engraved on the stop-motion lever should align with corner **C** of the stitch adjusting cam.
- 3) Turn the sewing machine by hand to check when the clutch is thrown out. Then, loosen the nut and adjust adjustment screw **2** accordingly.



- A. Tighten the adjusting screw to advance the timing to let out the clutch. (Adjust the screw in this way when a large stop-motion noise is generated.)
 - B. Loosen the adjusting screw to retard the timing to let out the clutch. (Adjust the screw in this way in the case of defective stop-motion.)
- 4) Turn the sewing machine again by hand to check whether the timing to let out the clutch is correct.
 - 5) Finally, run the machine checking for defective stop-motion or abnormal stop-motion noise.

Results of improper adjustment

When adjusting the adjusting screw, a clearance within the range of 0.2 to 0.6 mm (0.008" to 0.024") should be provided between the driving pulley and the presser plate at the time of idling. (See Fig. 4)

If the clearance is out of the range stated above, the machine fails to start normally or the clutch may slip.

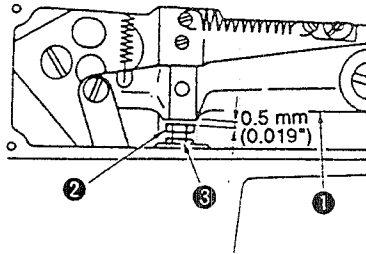
If it is impossible to make the adjustment within the range of 0.2 to 0.6 mm (0.008" to 0.024"), re-adjust the position of the stitch adjusting cam and then adjust the driving pulley and the presser plate.

If the clutch is thrown out too early, loosen screws **3** and turn the stitch adjusting cam counterclockwise. If the clutch is thrown out too late, loosen screw **3** and turn the stitch adjusting cam clockwise. (Fig. 3)

Standard adjustment

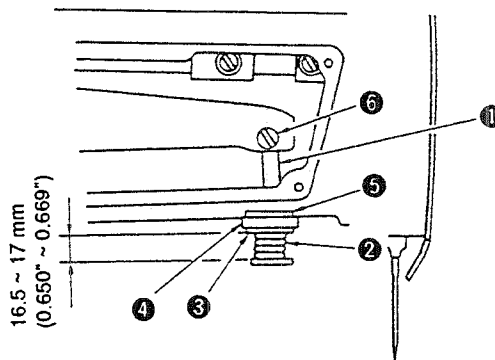
(13) Adjusting the clearance between the button clamp lifting lever and the adjusting screw

A clearance of 0.5 mm (0.019") should be provided between the button clamp lifting lever and the adjusting screw when the machine is in its normal stop-motion state.



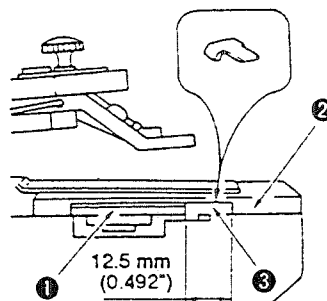
(14) Adjusting the spring guide shaft and the stop-motion cushion spring

When the machine is in its normal stop-motion state, the stop-motion cushion spring should be compressed until the length of the spring is as short as 16.5 to 17 mm (0.650" to 0.669").



(15) Positioning the moving knife

When the machine completely stops in the state of "stop-motion", there must be a 12.5 mm (0.492") interspace between thread trimming connecting link (front) (1) and the end of the slit in throat plate (2).

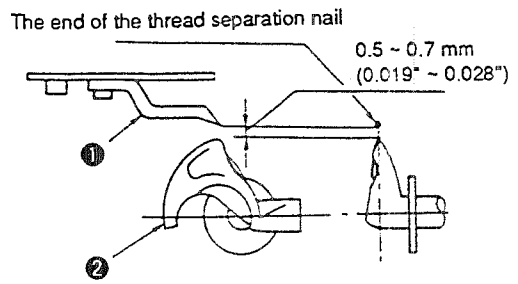


How to adjust	Results of improper adjustment
<p>Adjust the clearance between the end of button clamp lifting lever ① and adjusting screw ② to 0.5 mm (0.019"). Then tighten adjusting screw nut ③.</p>	
<p>Loosen screw ⑥ and carry out the adjustment by raising/lowering spring guide shaft ④. After the adjustment, be sure to securely tighten screw ⑥.</p>	<p>If the clearance is larger than 16.5 mm (0.650") to 17 mm (0.669"), the moving knife may fail to return properly at the start of sewing.</p>
<div data-bbox="305 1249 738 1575" data-label="Diagram"> </div> <p>Make the adjustment using a positioning gauge supplied in the accessory box. Loosen nut and screw ⑥ and ⑦, and adjust the clearance to the correct value by moving thread trimming lever ⑤ back and forth.</p>	<p>If the clearance between the thread trimming connecting link (front) and the end of the slit in the throat plate is too large, thread trimming timing will be delayed and the length of thread remaining on the wrong side of the material will be longer.</p> <p>If the above clearance is too small, thread trimming timing will be advanced. As a result, thread trimming failure may occur such as the last stitch is improperly tensed (likely to fray), two threads are trimmed at once due to defective separation of the threads, threads are not trimmed at all, etc.</p>

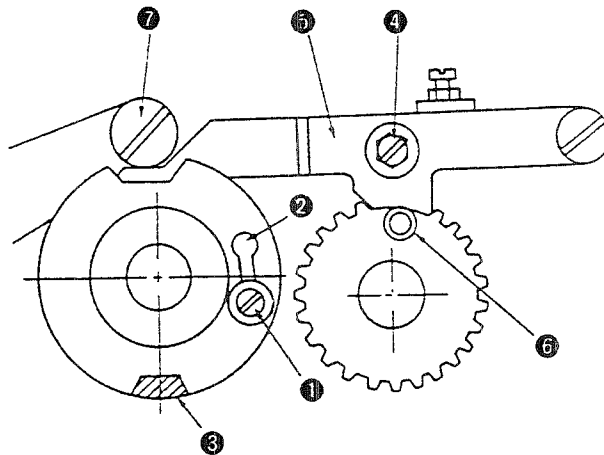
Standard adjustment

(16) Adjusting the height of the moving knife thread separation nail

A clearance of 0.5 to 0.7 mm (0.019" to 0.028") must be provided between the top end of thread separation nail ① and looper ②.

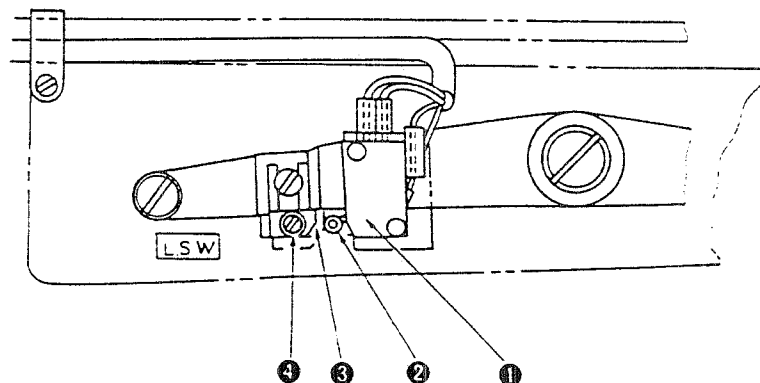


(17) Adjusting the number of stitches



(18) Adjusting the LSW (stop-motion) switch

When the machine stop in its stop-motion state, the switch must be fully pressed until it is turned ON without fail and actuator ② is not brought to its stroke end (it has not been fully pressed until it will go no further).

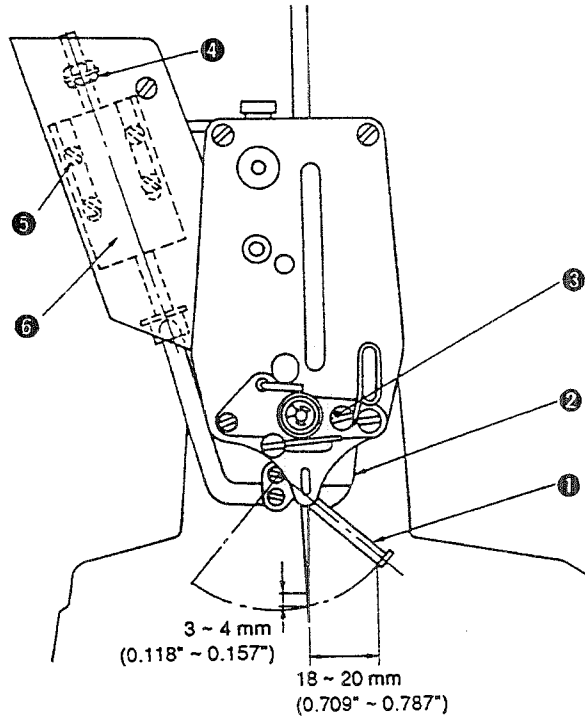


How to adjust	Results of improper adjustment
<p>If the height of the thread separation nail is not correct, bend the thread separation nail until it is properly positioned.</p>	<p>If the height of the thread separation nail is excessive, the nail is incapable of separating the thread on the needle side from that on the material side. As a result, the threads may not be trimmed or the both threads are simultaneously trimmed making the needle thread slipping off the needle eyelet at the start of next sewing.</p>
<p>① For 8 stitches (6 stitches) Move stitch adjusting knob ① to hole ② to provide an indented section for both sides of the knob.</p> <p>② For 16 stitches (12 stitches) Move stitch adjusting knob ① downward to fill indented section ③.</p> <p>③ 32 stitches (24 stitches) Set stitch adjusting knob ① for "16 stitches". Loosen bolt ④ in the stitch selecting lever joint, lower stitch selecting lever (small) ⑤ until roller ⑥ comes in contact with lever ⑤. If roller ⑥ has already come in contact with lever ⑤, adjust so that roller ⑦ is not further lowered.</p>	
<p>Loosen screw ④, and move LSW detecting plate ⑥ to the right or left until the LSW is correctly positioned in place.</p>	<p>The stop-motion signal cannot be detected unless the LSW is turned ON at the time stop-motion. If the signal is not detected, the BR10 cannot start its operation. If a sufficient stroke is provided for the actuator, the LSW may be failed.</p>

Standard adjustment

(19) Positioning the wiper

When the machine is in its normal stop-motion state, a longitudinal clearance of 3 to 4 mm (0.118" to 0.157") should be provided between the wiper and the tip of the needle (longitudinal position of the wiper) when the wiper passes under the needle, and a lateral clearance of 18 to 20 (0.709" to 0.787") should be provided between the wiper and the center of the needle (lateral position of the wiper). This is the standard position of the wiper.



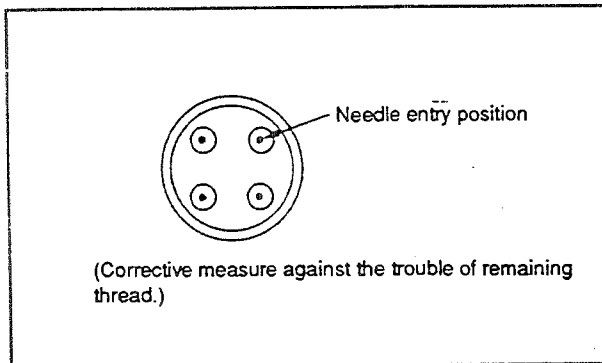
How to adjust	Results of improper adjustment
<p>Loosen screw ③ of wiper installing base ② and adjust the longitudinal position of the wiper.</p> <p>Loosen four screws ⑤ of the wiper magnet, and adjust the lateral position of the wiper by moving wiper magnet ⑥.</p> <p>(Caution) Although the stroke of the wiper magnet can be changed from 9 mm (0.354") by turning nut ④, do not make the stroke larger than 9 mm (0.354") because the attraction of the magnet will be changed accordingly.</p> <p>If the swing motion of the wiper is not enough to wipe the thread away, decrease the lateral clearance (18 to 20 mm (0.709" to 0.787")) between the wiper and the center of the needle.</p>	

2. Correction of troubles in sewing

(1) Thread breakage

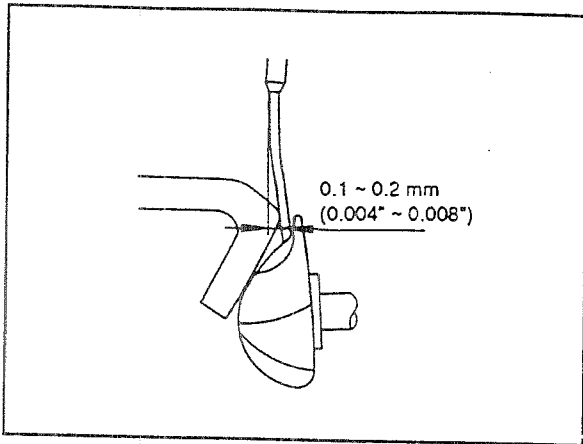
- ① The longitudinal position of the yoke slide is not correct. As a result, the looper is threaded twice.
 - Move the yoke slide cam back or forth so that the blade point of the looper goes through the center of the triangle of thread at 9th or 10th stitch.
- ② Tension of the tension disk No. 1 is too high.
 - Decrease the tension of the tension disk No. 1. (Approximately 7 to 15 g)
- ③ Timing to release the tension of the tension disk No. 2 is too late.
 - Adjust so that the tension disk No. 2 starts releasing tension when the height of the ascending needle bar becomes 54 to 56 mm (2.126" to 2.205").
- ④ Timing of the lateral motion of the yoke slide is not correct.
 - Adjust so that the yoke slide starts moving from its left position to the right when the height of the descending needle bar should be 15 to 18 mm (0.591" to 0.709"). Move the yoke slide triangular cam in the rotational direction.
- ⑤ Timing of the longitudinal motion of the yoke slide is not correct. As a result, the looper is threaded twice.
 - The yoke slide should start going backward immediately after the blade point of the looper goes through the triangle of thread.

(2) Loose stitches



- ① Tension of the tension disk No. 1 is too low.
 - Adjust the tension of the tension disk No. 1 to 7 to 15 g.
- ② Timing to release the tension of the tension disk No. 2 is too early.
 - Adjust so that the tension disk No. 2 starts releasing tension when the height of the ascending needle bar becomes 54 to 56 mm (2.126" to 2.205").
- ③ Timing of the lateral motion of the yoke slide is too late.
 - Adjust so that the yoke slide starts moving from its left position to the right when the height of the descending needle bar should be 15 to 18 mm (0.591" to 0.709").
- ④ The needle entry position with respect to holes in the button is improper.
 - Make the needle enter the holes in the button at the location which is slightly away from the center of the holes in order to prevent the needle from coming in contact with the front edge of the holes in the button.
- ⑤ The press-up height of the button clamp jaw lever is insufficient.
 - Adjust the press-up height of the button clamp jaw lever to 9 mm.

(3) Stitch skipping



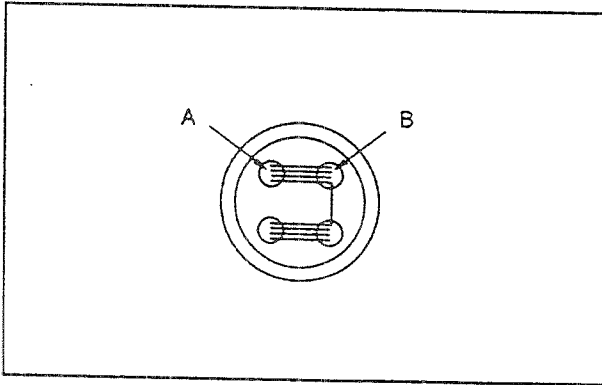
- ① Adjust the timing between the needle and the looper properly.
- ② When sewing a heavy-weight material or hard material, make the needle guide come in contact with the needle by the depth of 0.1 to 0.2 mm (0.004" to 0.008").

(4) Thread slips off the needle eyelet

(Thread slips off the needle eyelet at the sewing start.)

- ① Increase the amount of motion of the thread pull-off lever.
- ② The clearance in the nipper is too wide.
 - Adjust the clearance to 0.8 to 1.2 mm (0.031" to 0.047").
- ③ Prevent stitch skipping.

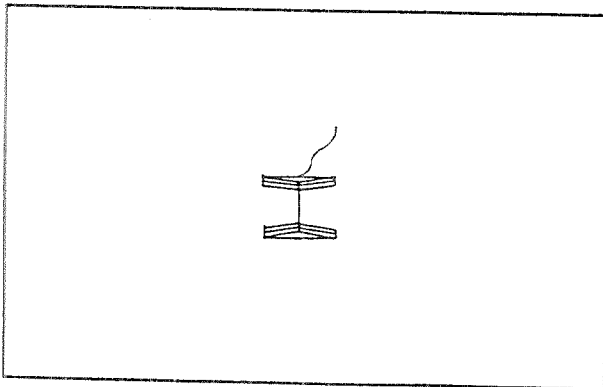
(5) Thread feeding amount is excessive



(A) Needle thread is fed excessively

(The end of needle thread appears on the top surface of the button at the sewing start.)

- ① The end of thread appears from hole A.
 - Decrease the amount of motion of the thread pull-off lever.
- ② The end of thread appears from hole B.
 - Increase the amount of motion of the thread pull-off lever.



(B) Looper thread is fed excessively

(The end of thread remains on the wrong side of the material at the sewing start.)

- ① Decrease the amount of motion of the thread pull-off lever.
- ② The end of thread at the sewing start appears from the position other than the needle entry point on the wrong side of the material.
 - Increase the pressure of the button clamp.

3. Mechanical troubles and corrective measures

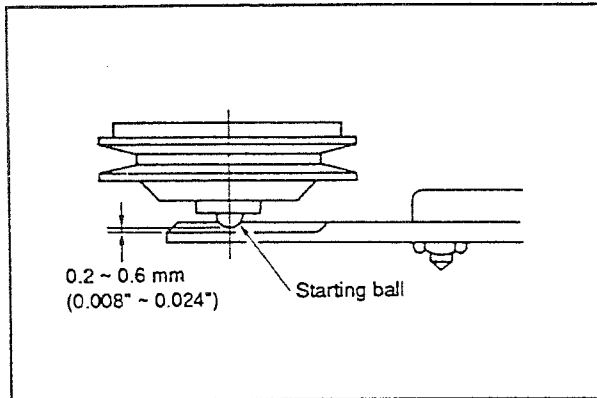
(1) The sewing machine is defective

- ① The stop-motion noise is very low, and the sewing machine stops before the predetermined stop position is reached.
 - Timing to let out the clutch is too early. (Adjust the driving pulley presser plate.)
 - Change the position of the stitch adjusting cam at the time of "stop-motion" from the engraved marker line toward left.

(2) The thread trimmer is defective (The button clamp cannot be raised.)

- ① The hook of the button clamp lifting plate is worn out.
 - Replace it with a new one.
- ② The button clamp lifting plate fails to engage with the lifting hook at the time of stop-motion.
 - Adjust the button clamp lifting plate guide rod.

(3) Clutch of the driving pulley slips



- ① Starting ball and driving pulley pressing plate are worn out.
 - Replace the two components stated above as well as the starting ball bracket.
- ② Decrease the clearance between the ball and the driving pulley pressing plate.
 - Adjust the clearance to 0.2 to 0.6 mm (0.008" to 0.024"). (After the adjustment, be sure to check when the clutch is let out.)

(4) The driving pulley is overheated

- ① Increase the clearance between the starting ball and the driving pulley pressing plate.
 - Adjust the clearance to 0.2 to 0.6 mm (0.008" to 0.024"). (After the adjustment, be sure to check when the clutch is let out.)

4. Troubles and corrective measures with respect to thread trimming

Trouble	Cause	Corrective measure
1. Thread trimming failure	The moving knife thread separation nail does not separate the thread on the fabric.	Adjust the position of the moving knife. Refer to the description given in the "(15) Positioning the moving knife".
	The needle fails to enter the position slightly away from the center of the hole in the button for the last stitch (at the sewing end.)	Adjust the button clamp jaw lever holders. (When the needle is caught in the material at the last stitch.)
	The last stitch skips.	Adjust the looper. Refer to the description given in the "(2) Position of the needle and looper".
	The height of the moving knife thread separation nail is too high or too low.	Adjusting the height of the moving knife thread separation nail. Refer to the description given in the "(16) Adjusting the height of the moving knife thread separation nail".
2. Both the needle thread and the thread on the wrong side of the material are trimmed.	The moving knife is set in wrong place.	Adjust the position of the moving knife when the machine is completely in the stop-motion state. Refer to the description given in the "(15) Positioning the moving knife".
	The moving knife thread separation nail is too high or too low.	Adjusting the height of the moving knife thread separation nail. Refer to the description given in the "(16) Adjusting the height of the moving knife thread separation nail".
3. Button trails too long thread after thread trimming on the wrong side of the material.	Timing of the moving knife to trim the thread is wrong.	Adjust the position of the moving knife. Refer to the description given in the "Positioning the moving knife".

(Caution) The position of the moving knife must be adjusted within the range of 11 to 14 mm (0.433" to 0.551"). If the clearance between the thread trimming connecting link (front) and the end of the slit in the throat plate is adjusted to 11 mm (0.433") or less, the thread separation nail may come in contact with the counter knife or the yoke slide holder mounting base due to the overrun moving knife. As a result, the thread separation nail may break. The thread (loop) which is being sewn may come in contact with the top end of the thread separating claw, resulting in thread breakage. On the other hand, if the said clearance is adjusted to 14 mm (0.551") or more, the thread separation nail may come in contact with the yoke slide holder when the machine is in operation. Furthermore, in this case, the thread separation nail may break.

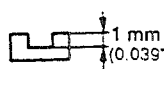

5. Supplying grease

For the machine head of the MB-373N/BR10, grease is applied to the below-stated parts. So, apply grease, ESSO LITHTAN 2 or equivalent, to them after disassembling or adjusting them or after 3- or 4-year use of the machine.

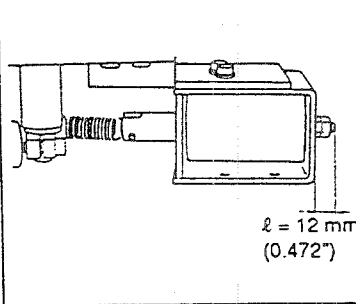



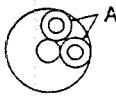
- ① B1408-373N-000 Groove in the fulcrum shaft of the needle bar connecting rod (page 11 in the Parts List)
- ② B3113-373N-000 Groove in the shaft of the needle bar connection (page 14 in the Parts List)
- ③ B2601-373N-000 Two grooves in the stop-motion shaft (page 15 in the Parts List)

IX. TROUBLES AND CORRECTIVE MEASURES

1. Mechanical components

Trouble	Cause	Checking procedure and adjustment
A button is not fitted on the carrier pin after fine positioning of the button has been carried out.	Centers of the rotary rod is not aligned with that of the carrier pin.	Center the rotary rod and the carrier pin correctly.
	Centers 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.
	Clearance 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 not 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.
	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 hole in the pan does not meet the triple pawl.	Align the center of the pan with that of the triple pawl.
	Length of time during which the machine performs fine positioning of a button is too short.	Increase the length of time for fine positioning of a button.
	 <p>The button illustrated on the left is used.</p>	Operate the machine under the  mode.
Two or more buttons are placed in the triple pawl.	The button detecting sensor is improperly positioned.	

Trouble	Cause	Checking procedure and adjustment
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.	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.
	The triple pawl fails to move smoothly.	Replace the triple pawl asm. (8202150) with a new one.
	The triple pawl solenoid fails to operate normally.	Check that the triple pawl has been properly adjusted.
Two pieces of button may enter the notch in the feed plate.	Height difference between the feed plate and the outlet of the button feeder is excessive.	Lower the button feeder.
	The clearance in the 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.
	Vertical play at the feed plate is too large.	Replace the feed plate (18201962) with a new one.
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 of the button clamp jaw lever 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 standard button clamp jaw lever is used when sewing large buttons (of which diameter is $\phi 16$ mm or more).	Replace the standard button clamp jaw lever with the button clamp jaw lever for large buttons.
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 work attachment with a piece of dry cloth.

Trouble	Cause	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 that the solenoid has been adjusted as illustrated in Fig. 9-1. (Refer to page 19 for detailed information on the adjustment.)
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.	 <p style="text-align: right;">$l = 12 \text{ mm}$ (0.472")</p>
		Fig. 9-1
	Marble buttons () , semi-marble buttons () or shell buttons are sewn.	Use the triple pawl with a collar asm. (18202150), feed plate asm. ($\phi 13.5 \text{ mm}$) (18200956) and pan, small (18201103) instead of the standard ones.
	Buttons do not fall down to the triple pawl unit with consistency.	 <p>If section A of pan (16568404) has scratches or unevenness, buff up section A or replace the pan with a new one.</p>
	The shutter plate has the poorly finished hole, or there are scratches and burrs around the hole.	Correct the hole, or replace the shutter plate with a new one.
When the button falls down to the triple pawl, the button is reversed.	The center of the pan and the feed plate fails to meet the center of the triple pawl.	Align the center of the pan with the center of the triple pawl.
	Section A of pan (16568404) has scratches or unevenness.	Buff up section A or replace the pan with a new one.
		

Trouble	Cause	Checking procedure and adjustment
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Button is caught in between the feed plate and the button feeder.

The distance from the feed plate to the button feeder is too large.

Adjust the position of the button feeder.

The button is not smoothly carried to the feed plate.

Slightly lift the button 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 button feeder is too small.

Slightly lift the button guide.

The button feeding speed is inadequate.

Turn the variable resistor on the operation panel of the button feeder to increase the button feeding speed.

The feed plate has a vertical play.

Place a washer between the screw and the feed plate of the index unit to eliminate a play.

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 (in Fig. 9-2) and turn it counterclockwise.

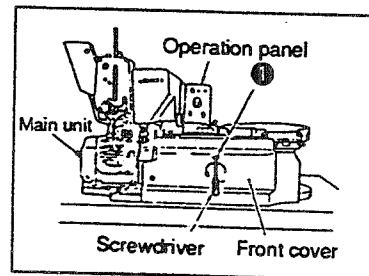
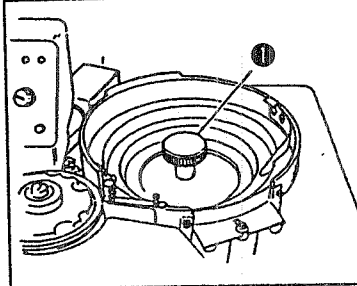


Fig. 9-2

Trouble	Cause	Checking procedure and adjustment
Buttons in the button feeder are not smoothly run.	Screw ① which fixes the feeder bowl loosens.	Securely tighten screw ①.
	 <p data-bbox="1227 579 1308 611">Fig. 9-3</p>	Adjust the position of the sensitivity adjustment variable resistor.
		Defective position of the sensitivity adjustment variable resistor.
Feeder bowl comes in contact with some component, thereby preventing the feeder bowl from properly vibrating.		
Button from the feeder bowl does not enter the feed plate.	Defective position of the feeder bowl.	Adjust the position of the feeder bowl.
	Defective position of the button guide.	Adjust the position of the button guide.
	Feed plate is improperly adjusted.	Adjust the position of the feed plate properly.
	The in-line arrangement plate has been improperly adjusted.	Properly adjust the position of the in-line arrangement plate.
	Marble buttons (○), semi-marble buttons (◐) or shell buttons are sewn.	Use in-line arrangement plate A (18213207) that is optionally available.
A button drops from the clearance between the feeder bowl and the feed plate.	Feeder bowls is improperly positioned.	Adjust the position of the feeder bowl properly.
When the fine positioning mechanism works, the shutter opens though there is no button set on the carrier pin.	The fine positioning completion sensor is improperly adjusted.	Adjust the fine positioning completion sensor properly.
	The clearance provided between the carrier pin and the shutter is too large.	Adjust the clearance properly.

2. Electrical components

Trouble	Cause (1)	Cause (2)	Checking procedure and adjustment
1. Turning ON the power			
The machine will not be energized. (The sewing machine motor will not rotate.)	The power plug is disconnected.		Connect the power plug.
The sewing machine motor rotates, however, the power indicator lamp on the operation panel does not light up.	The ac power source is not supplied to the transformer.	Fuse (F1: 2A) is blown out.	Replace F1.
		A +5V is not supplied to the CPU circuit board.	Connector (P21) on the CPU circuit board is unplugged.
	A +5V is not supplied to the CPU circuit board.	P11 and P12 on the power circuit board are unplugged.	Connect the P11 and P12.
		A 7.5 Vac is not supplied to the power circuit board.	Check the transformer tap for connection and ac input voltage. Check the transformer for output voltage of 7.5 Vac. If it is not output, replace the transformer.
		Fuse (F3: 2A) on the power circuit board is blown out.	Replace the fuse.
	A +5V is not supplied to the power indicator lamp.	Power circuit board failure.	Replace the power circuit board.
		P23 on the CPU circuit board is unplugged.	Connect the P23.
		The power indicator lamp cable is disconnected.	Connect the cable.
	Power indicator lamp failure.	CPU circuit board failure.	Replace the CPU circuit board.
			Replace the power indicator lamp.
Alarm indicator lamp does not show figures.	P-ROM on the CPU circuit board is improperly installed.	The pin of the P-ROM is not securely inserted.	Press the P-ROM carefully until it is securely fitted in place.
		The P-ROM is installed with the installing direction of the pin reversed.	Press the P-ROM with a new one, and install it in place taking care of the installing direction
	A +5V is not supplied to the CPU circuit board.	Perform troubleshooting according to the aforementioned description.	
When the power is turned ON, the following errors occur.			
ERROR indication "0" flashes on and off.	Soldered section of the connector (J12) of the power circuit board has cracked.		Replace the power circuit board with a new one, or re-solder the connector.
	Connection failure of the connector which connects the power circuit board and the CPU circuit board.		Replace the power cord asm. of the CPU circuit board with a new one, or connect and remove the connector repeatedly until it is securely connected.
ERROR "1" occurs. RAM check error CPU error	A +5V is not supplied to the CPU circuit board.		Perform troubleshooting according to the aforementioned description.
	RAM on the CPU circuit board is defective.	The CPU circuit board is failed.	Replace the CPU circuit board.
ERROR "7" occurs. (The stop-motion mechanism is ineffective when turning ON the power to the machine.)	The machine has not entered into its stop-motion state.		Make the machine enter into the stop-motion state, then press the reset key. (At this time, the spinner oscillating arm may return to its origin. So be careful.)
		Stop-motion signal fails to be input.	P24 on the CPU circuit board is unplugged.
	Stop-motion signal fails to be input.	The stop-motion switch cable is disconnected.	Connect the cable.
		The stop-motion switch failure.	Replace the stop-motion switch.
	Input mechanism of the CPU circuit board is defective.	Replace the CPU circuit board.	

Trouble	Cause (1)	Cause (2)	Checking procedure and adjustment
ERROR "4" occurs. Spinner oscillating arm error (The motor is kept in its ON state exceeding the predetermined length of time.)	A +24V is not supplied to the CPU circuit board.	The +24V breaker on the power circuit board has tripped.	Reset the breaker.
		A 18.5 Vac is not supplied to the power circuit board.	Check the transformer for output voltage of 18.5 Vac. If the voltage is not output, replace the transformer.
		Power circuit board failure.	Replace the power circuit board.
	Origin of the spinner oscillating arm has not been input.	Connector P25 on the CPU circuit board is unplugged.	Connect the connector P25.
		CN1 of the AORG sensor is unplugged.	Connect the connector CN1.
		Light emitting/receiving window of the AORG sensor is soiled.	Clean up the light emitting/receiving window of the sensor.
		AORG sensor failure.	Replace the spinner oscillating arm origin sensor (AORG).
		CPU circuit board failure.	Replace the CPU circuit board.
	Manual handle cannot be smoothly operated.	The cam shaft system is locked.	Check the worm components and cam components.
	A +24V is not supplied to the motor of the spinner oscillating arm. (Pulse voltage)	P26 on the CPU circuit board is unplugged.	Connect the connector P26.
Cable of the terminal is broken.		Join the terminal cable.	
CPU circuit board failure.		Replace the CPU circuit board.	
Motor of the spinner oscillating arm is failed.		Replace the spinner oscillating arm.	
ERROR "5" occurs. Index error. (The motor is kept in its ON state exceeding the predetermined length of time.)	Origin of the index has not been input.	P36 of the IORG sensor is unplugged.	Connect the connector P36.
		Iron fragments are accumulated on the IORG sensor.	Remove iron fragment dust from the sensor.
		IORG sensor failure.	Replace the index origin sensor (IORG).
		Input section of the CPU circuit board is failed.	Replace the CPU circuit board.
	The manual index mechanism cannot be smoothly released.	A button is caught on the index unit.	Remove the button on the index unit.
		GENEVA components are locked.	Check the GENEVA components and worm components.
	A +24V is not supplied to the index motor.	Cable of the terminal board is disconnected.	Connect the cable of the terminal board.
		CPU circuit board failure.	Replace the CPU circuit board.
	Index motor failure.		Replace the index motor.
	The index motor rotates by several turns and fails to stop at its origin.	IORG sensor failure.	Replace the index origin sensor (IORG).

(Caution)

1. ERRORS "4" and "5" cannot be reset using the reset key since these errors are given in the case of a mechanical trouble. So, reset these errors by turning ON/OFF the power switch.
2. In the case of ERRORS "4" or "5", check whether it occurs when the motor is rotating or when the motor is not rotating at all.
3. You can check ON/OFF of the sensor under the adjustment mode.

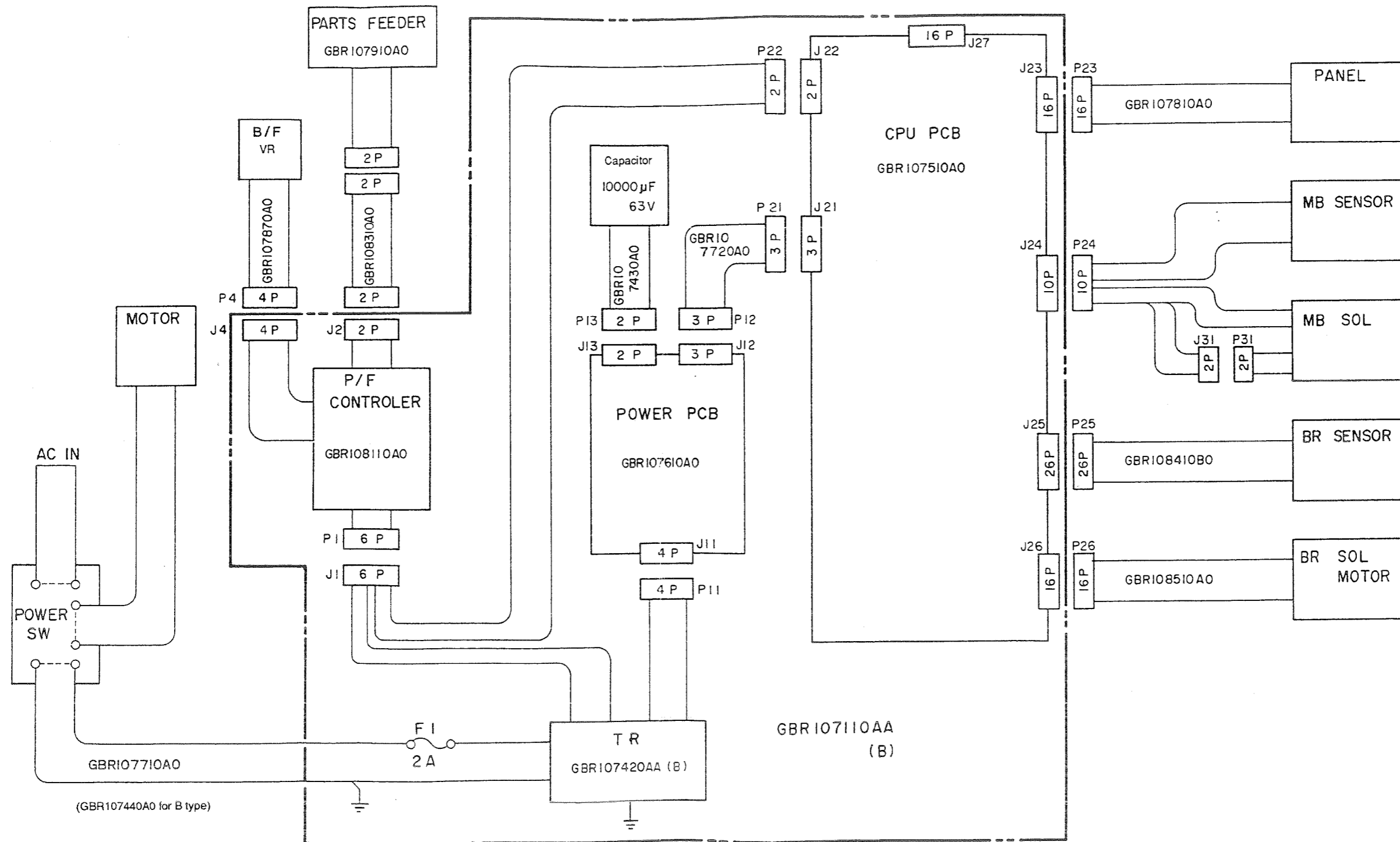
Trouble	Cause (1)	Cause (2)	Checking procedure and adjustment	
2. Normal operation (sewing machine)				
The sewing machine does not operate.	Check whether the sewing machine has been set to a proper operation mode.		Select the correct operation mode, and re-start the sewing machine.	
	Check whether the DIP 3 is set to its ON position.		Set the DIP 3 to its OFF position.	
	Check whether the sewing machine is in its stop-motion state.		Make the sewing machine enter into its stop-motion state, then re-start the sewing machine.	
	Signal is not input.	Check whether P33 of the start switch is unplugged.		Connect the P33.
		Check whether the cable of the start switch is disconnected.		Connect the disconnected cable of the start switch.
		Two-stepped switch mechanism is failed.		Correct the two-stepped switch mechanism.
Input section of the CPU circuit board is failed.			Replace the CPU circuit board.	
Spinner oscillating arm is not in its origin.		Manually return the spinner oscillating arm to its origin.		
The sewing machine does not operate, and ERROR "2" occurs.	The starter does not actuate.	A +24V is not supplied to the starter.	Check connectors P24 and P31. If any of them is unplugged, connect it. If a +24V is not supplied to the CPU circuit board, perform troubleshooting according to the aforementioned description.	
		Output section of the CPU circuit board is failed, so replace the CPU circuit board.		
		Starter failure.	Replace the starter.	
	Starter cannot be fully pressed.	The clearance in the magnet is out of specification.	Adjust the clearance in the magnet to the specified value.	
The sewing machine operates, and ERROR "2" occurs.	Time required to fully press the starter is too long.	The clearance in the magnet is out of specification.	Adjust the clearance in the magnet to the specified value.	
		The clutch cannot be smoothly engaged with the related components.	Check the clutch mechanism. If any defect is found, replace the clutch with a new one.	
		Supply voltage has dropped.	Measure the supply voltage. If it is out of specification, adjust it to the specified value.	
	L.SW will not be turned OFF.	Improper adjustment of the L.SW dog.	Adjust the L.SW dog to the specified value.	
		L.SW failure.	Replace the L.SW.	
Input section of the CPU circuit board is failed.		Replace the CPU circuit board with a new one.		
The sewing machine does not operate, and ERROR "6" occurs.	Check whether the belt is broken.		Replace the belt with a new one.	
	The clutch cannot be engaged with the related components.	Stop-motion mechanism failure.	Replace the stop-motion mechanism with a new one.	
The sewing machine operates, and ERROR "6" occurs.	The machine fails to enter into its stop-motion state.	Stop-motion mechanism failure.	Replace the stop-motion mechanism with a new one.	

Trouble	Cause (1)	Cause (2)	Checking procedure and adjustment
3. Normal operation (button feeder)			
Manual operation is inoperative.	Check whether the sewing machine has been set to a proper operation mode.		Select the correct operation mode, and re-start the sewing machine.
	Check whether the DIP 3 is set to its ON position.		Set the DIP 3 to its OFF position.
	Check whether the sewing machine is in its stop-motion state.		Make the sewing machine enter into its stop-motion state, then re-start the sewing machine.
The button feeder operates with no button.	Check whether the DIP 4 is set to its ON position.		Set the DIP 4 to the OFF position.
Several pieces of button enter the positioning unit.	Improper adjustment of the button detection sensor.		Adjust the sensor properly.
ERROR "3" occurs.	This error occurs when the automatic button discharging function works continuously three times under the automatic sewing mode.		
When a button is not in the positioning unit	The positioning mechanism fails to operate.	Improper adjustment of the positioning magnet stroke.	Adjust the stroke properly.
		A +24V is not supplied to the positioning magnet.	Measure the voltage of the terminal board. If a +24V is not supplied to the terminal board, replace the CPU circuit board. If it is supplied, replace the magnet.
	The button detecting sensor is kept to its OFF position.	Improper adjustment of the positioning sensor.	Adjust the positioning sensor. With button ·····▶ OFF Without button ·····▶ ON
		P35 is unplugged.	Connect the P35 properly.
		Positioning sensor failure.	Replace the positioning sensor.
		CPU circuit board failure.	Replace the CPU circuit board.
When a button is in the positioning unit.	Fine positioner fails to rotate.	Check whether the DIP 4 is set to its ON position.	Set the DIP 4 to the OFF position.
		Fine positioner shaft is locked.	Check the bushing and the gear system. If any of them is locked, the motor may be failed. So be careful.
		A +24V is not supplied to the motor of the fine positioner.	Measure the voltage of the terminal board. If a +24V is not supplied to the terminal board, replace the CPU circuit board. If it is supplied, replace the motor.
	Fine positioner will not come down.	Fine positioner shaft is stiff.	Check the fine positioner shaft.
		A 24V is not supplied to the fine positioner lowering magnet.	Measure the voltage of the terminal board. If a +24V is not supplied to the terminal board, replace the CPU circuit board. If it is supplied, replace the magnet.
	Positioning unit does not operate.		Corrective measures to the "when a button is not in the positioning unit" will also be applied.
	Fine positioning cannot be completed.	Improper adjustment of the fine positioning completion sensor.	Adjust the fine positioning completion sensor. It should turn ON when a button is brought to the fine positioner.
		P34 is unplugged.	Connect the P34.
		Fine positioning completion sensor is failed.	Replace the fine positioning completion sensor.
		CPU circuit board failure.	Replace the CPU circuit board.
ERROR "3" occurs when the button feeder is energized or in the case other than fine positioning.	A button is caught in between the triple pawl and the shutter.		Remove the caught button.
	ERROR "3" cannot be reset by pressing the reset switch.	Fine positioning completion sensor is failed.	Replace the fine positioning completion sensor.
		Input section of the CPU circuit board is failed.	Set the operation mode to the automatic operation mode.

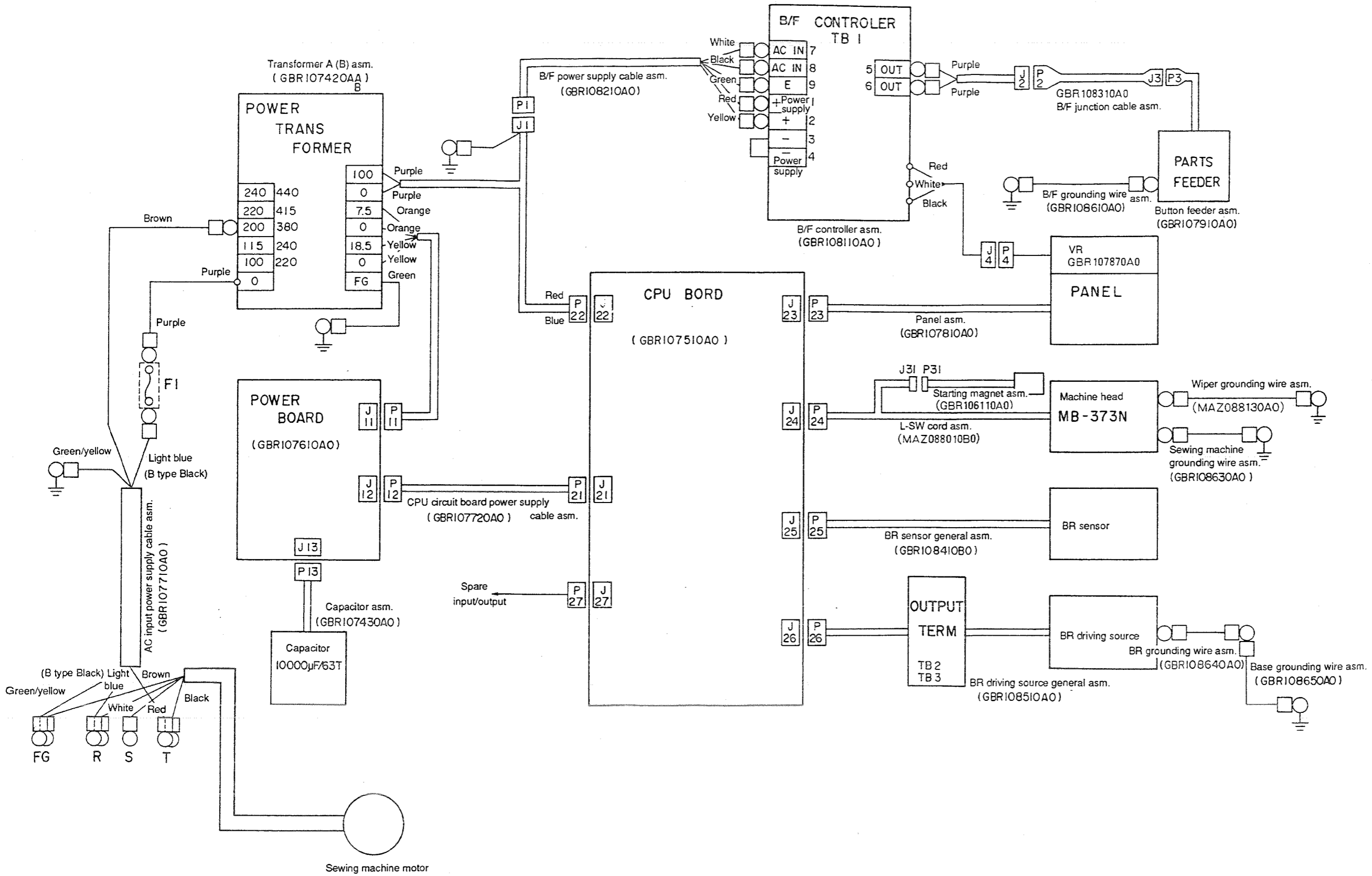
Trouble	Cause (1)	Cause (2)	Checking procedure and adjustment
Button feeder fails to operate.	Check whether the sewing machine has been set to a proper operation mode.		Select the automatic mode, and re-start the sewing machine.
	Check whether the DIP 4 is set to its ON position.		Set the DIP 4 to its OFF position.
	FUSE 1A on the B/F panel is blown out.		Replace the fuse.
	A 100 Vac is not supplied to the B/F controller.	P1 is unplugged.	Connect the P1.
			Check the transformer for output voltage of 7.5 Vac. If it is not output, replace the transformer.
	Control signal is not output.	CPU circuit board failure.	Open the rear cover of the B/F controller, and make terminal boards 1 and 2 shortcircuit. If they operate, replace the CPU circuit board. Then re-wire the CPU circuit board. If the B/F controller still does not operate, replace the B/F controller.
	Fine adjusting variable resistor has moved from the correct position.	Failed contact of the fine adjusting variable resistor.	Re-adjust the fine adjusting variable resistor. (P13) Replace the B/F controller with a new one.
ERROR "8" occurs. Failure or malfunction of the button positioning switch.	BUT signal is kept to its ON state.	Button detecting sensor failure.	Replace the sensor.
		CPU circuit board failure.	Replace the CPU circuit board.
		A button is caught in between the triple pawl and the shutter.	Remove the caught button.
ERROR "9" occurs. Failure or malfunction of the start switch	Both two-stepped switch ON.	The two-stepped switch mechanism failure.	Check the two-stepped switch mechanism.
		Start switch failure.	Replace the start switch assembly.
		CPU circuit board failure.	Replace the CPU circuit board. (Carefully check the direction of the connector)
IC on the CPU circuit board has burned.	CPU circuit board connector (P21) has been connected in the reverse direction.		Replace the CPU circuit board with a new one. (Carefully check the direction of the connector and align the red marks. The L-SW may be broken. If it breaks, replace the L-SW with a new one.)

- (Remarks) 1. For ERRORS "4" and "5", take the corrective measures same as that to the "1. Turning ON the power".
2. Check the sensors under the adjustment mode.
3. The terminal board is mounted behind the sewing machine motor at the rear of the machine.

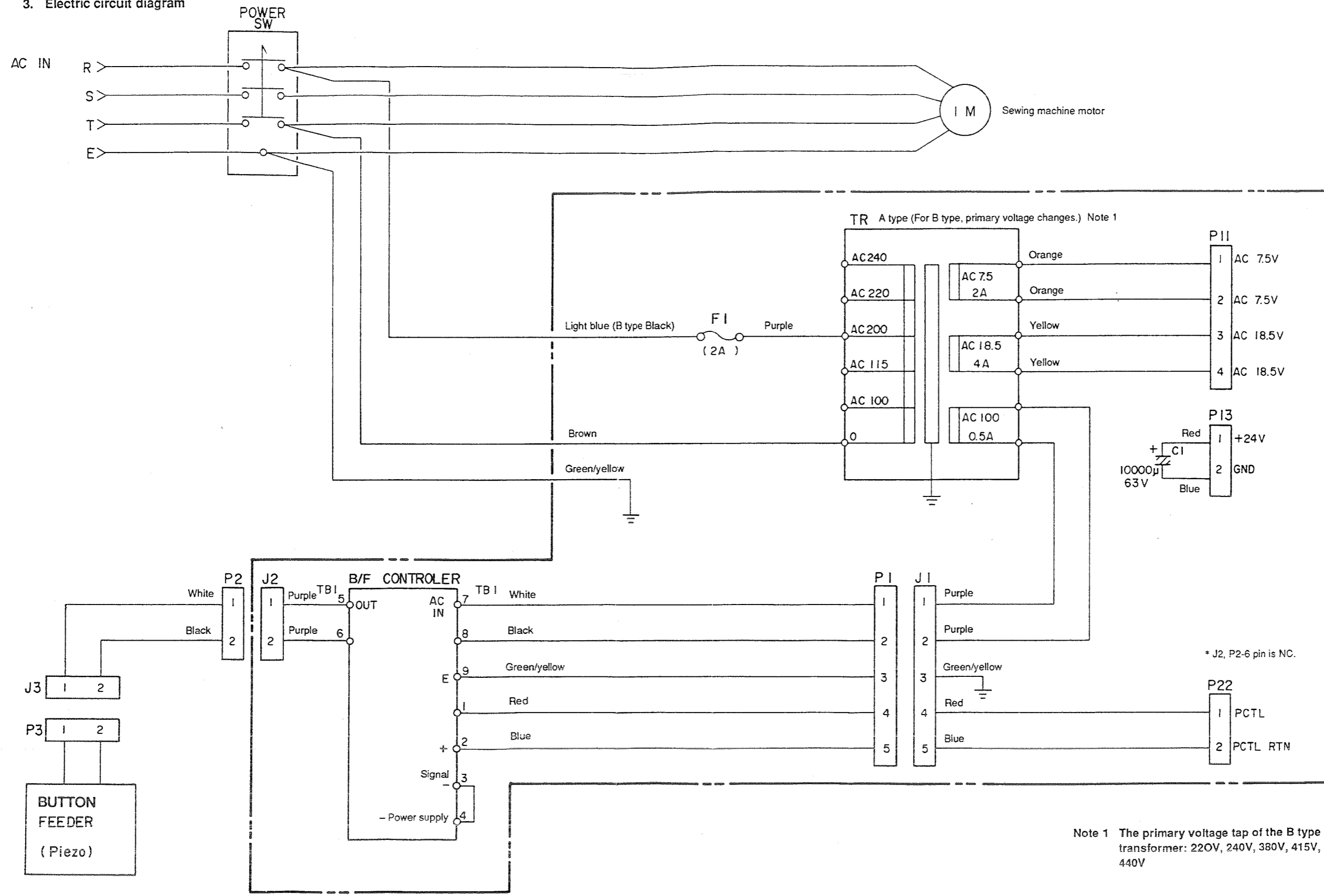
XII. CIRCUIT DIAGRAM
1. Block diagram



2. Control cable connection diagram

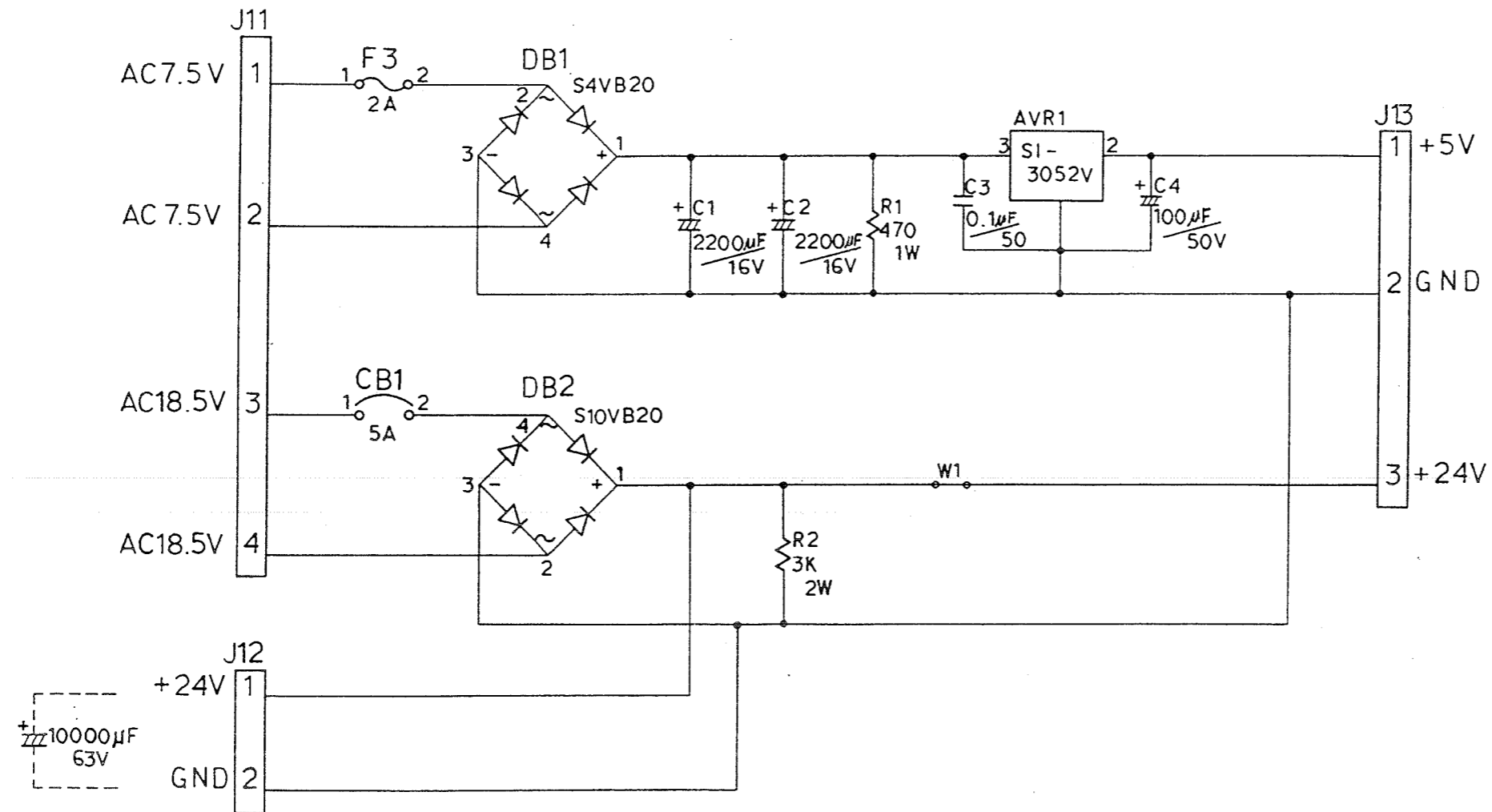


3. Electric circuit diagram

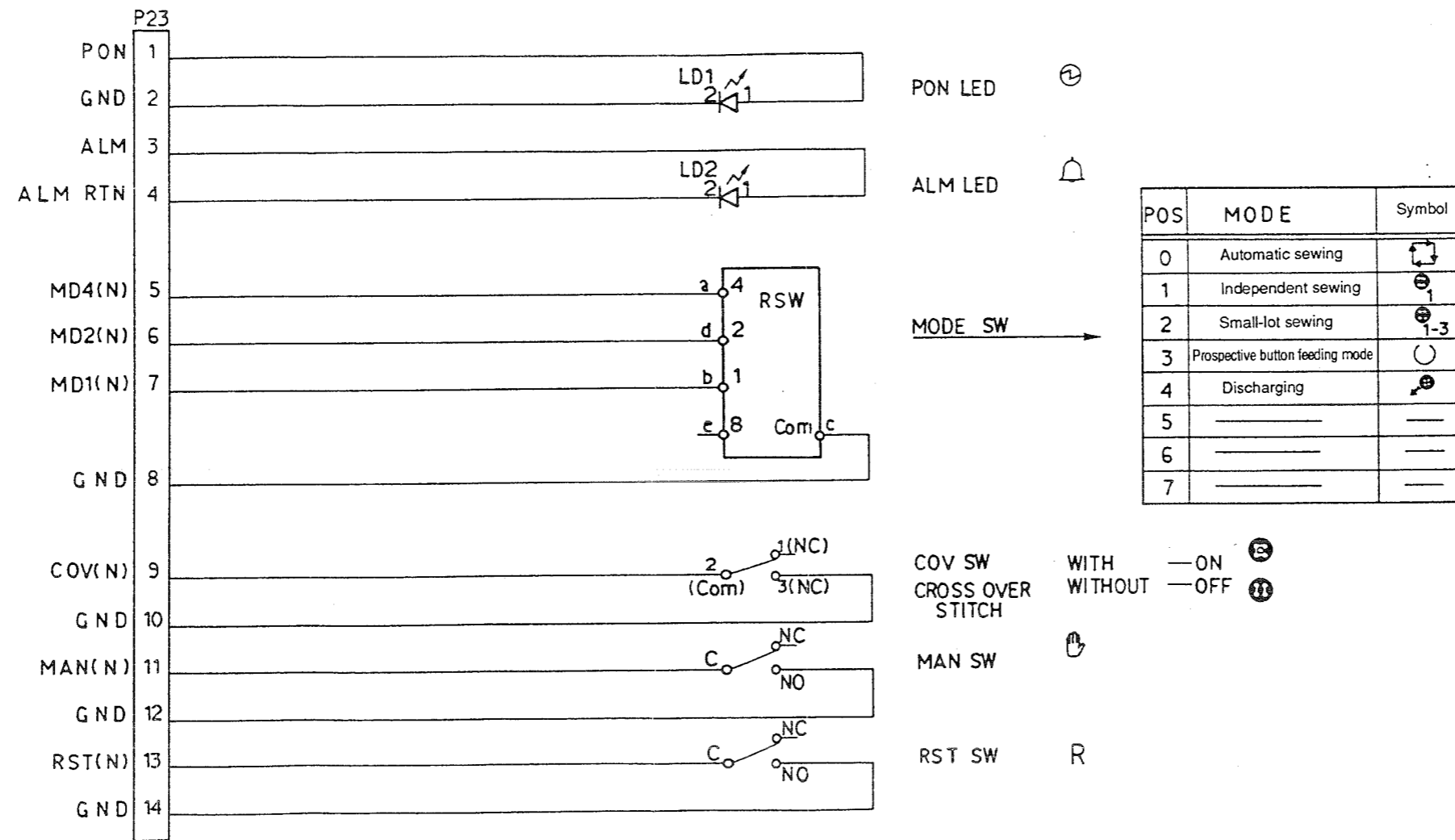


Note 1 The primary voltage tap of the B type transformer: 220V, 240V, 380V, 415V, 440V

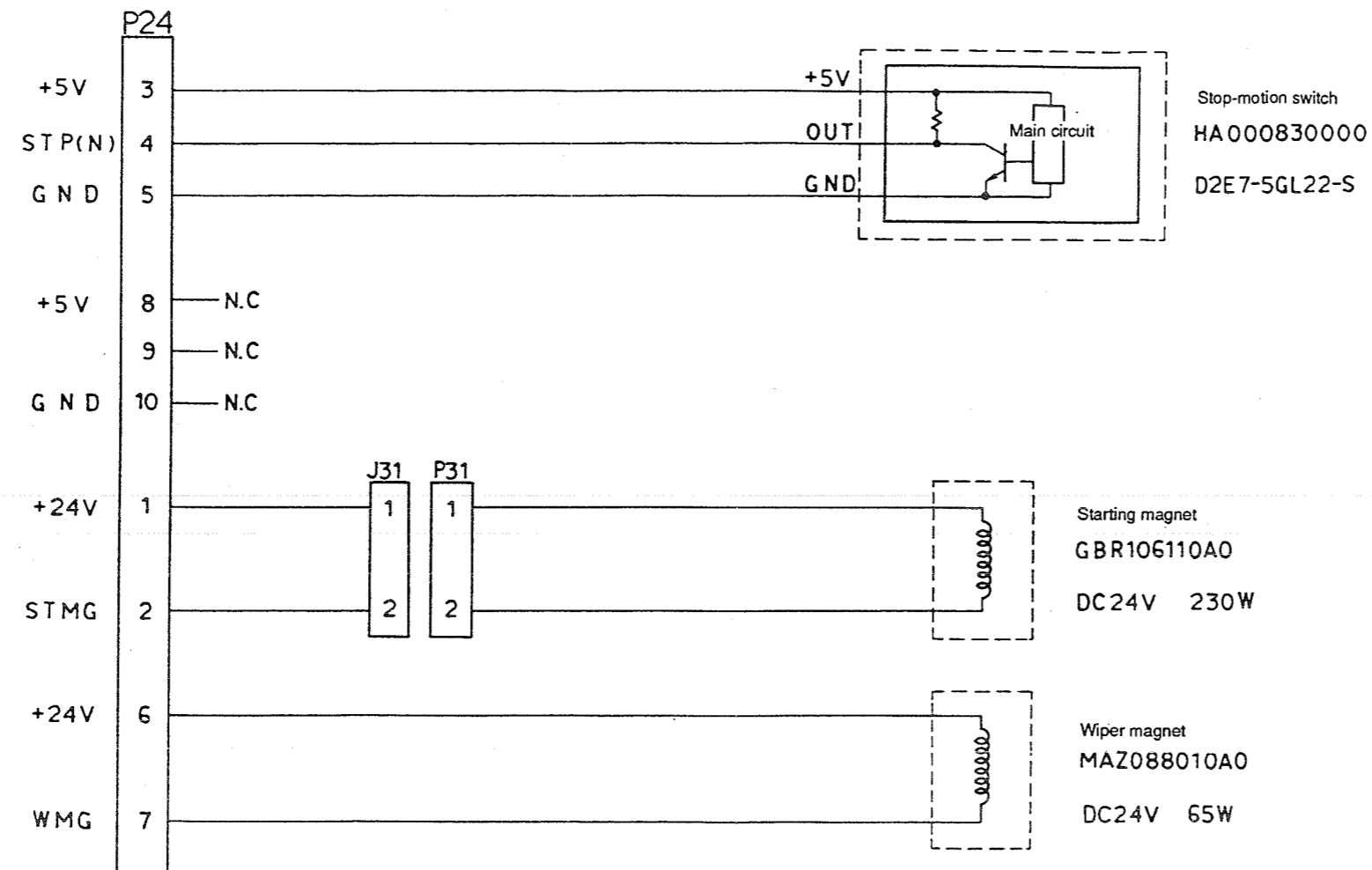
4. Power circuit board circuit diagram



5. Panel assembly circuit diagram

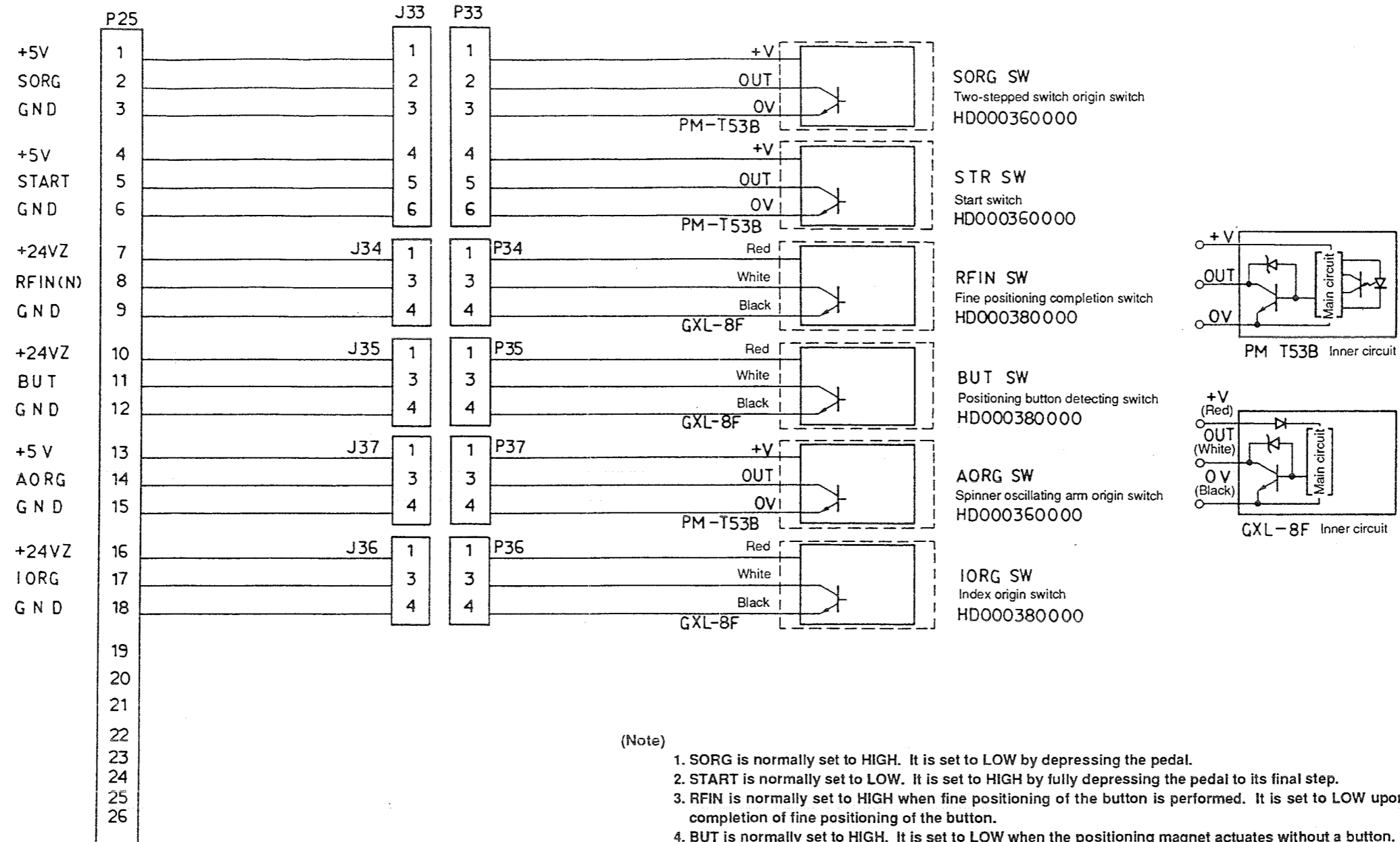


6. Machine head input/output circuit diagram



- (Note) 1. P24-8, -9, and 10 pins are used for spare input.
 2. D2EV-5GL22-S
 When the switch is ON: OUTPUT LOW VOLT
 When the switch is OFF: OUTPUT HIGH VOLT
 3. In the stop-motion state (the sewing machine stops): P24-4 pin LOW

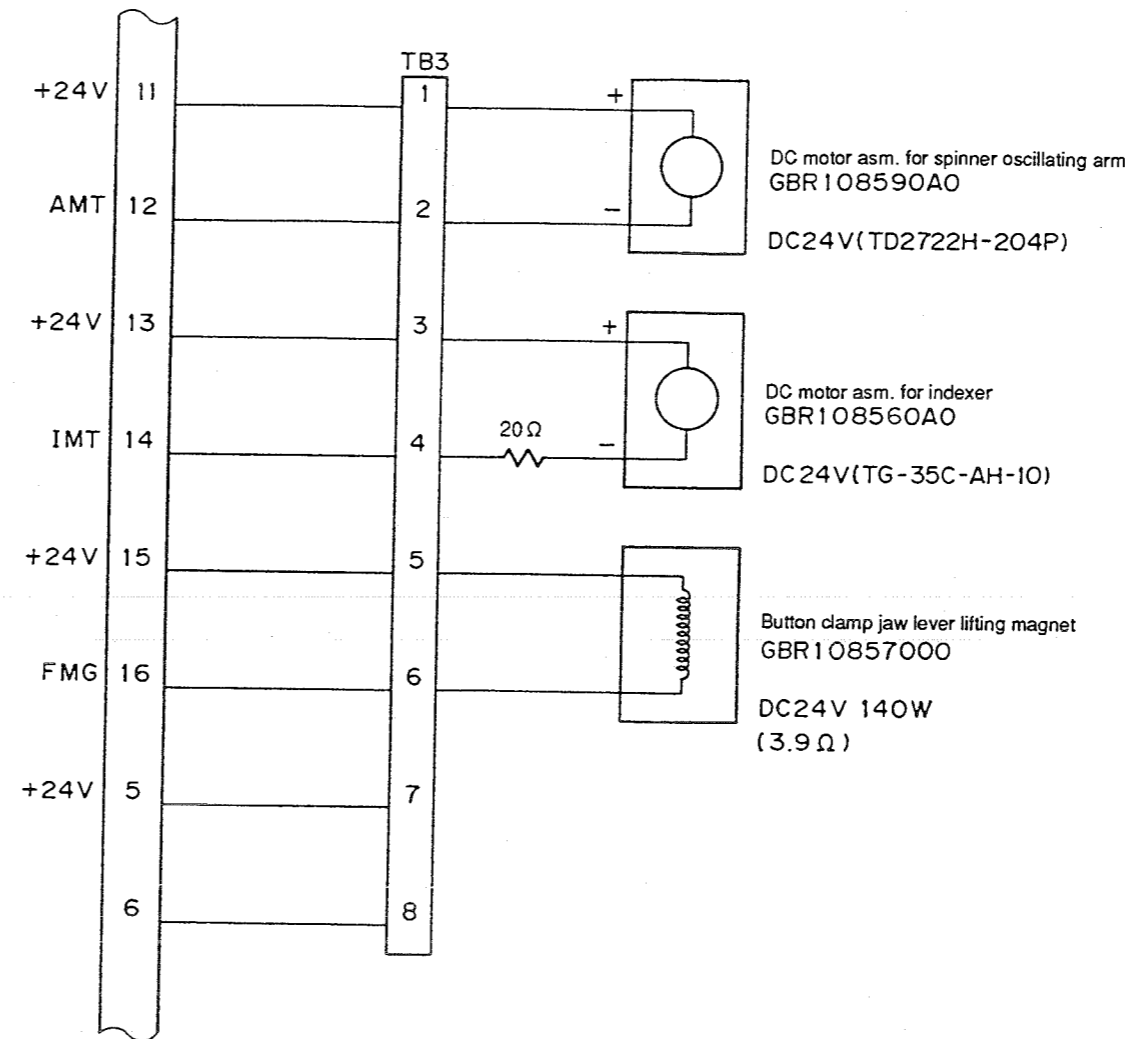
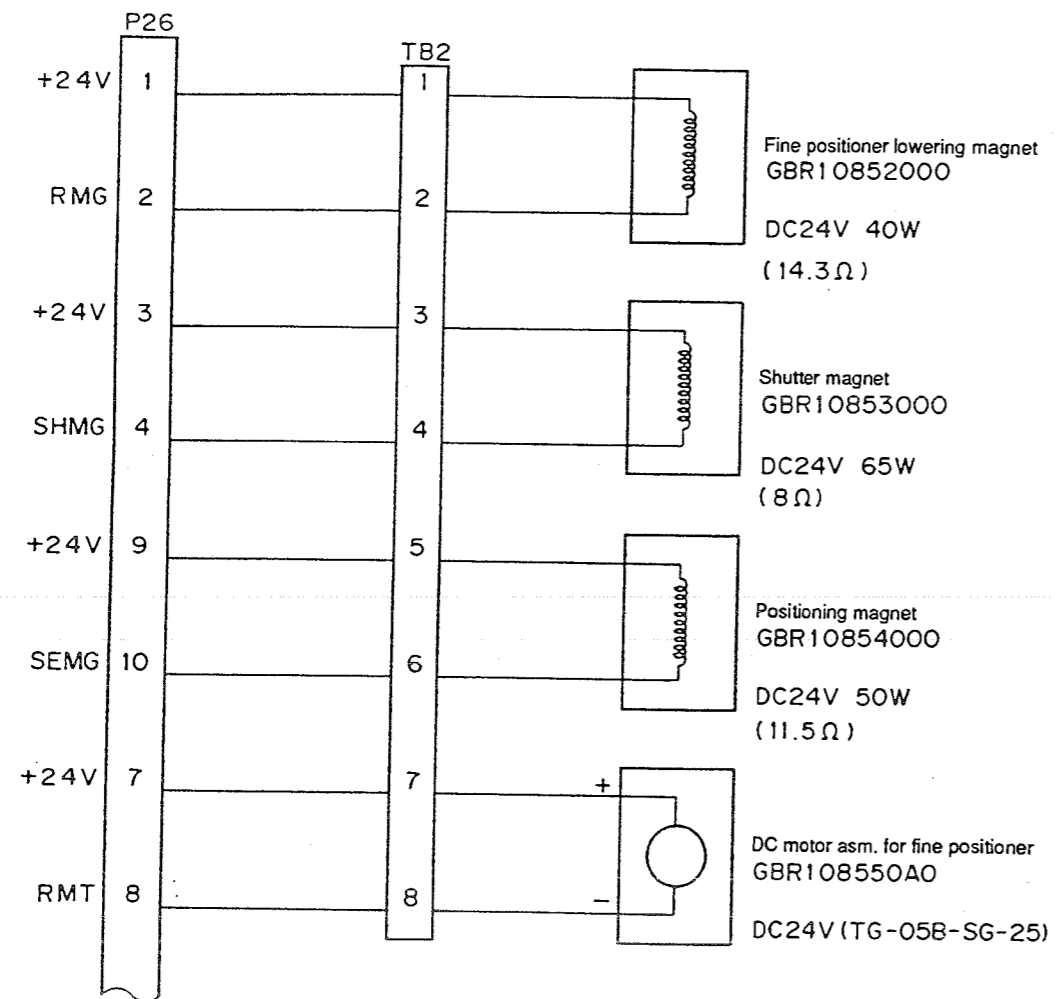
7. BR sensor assembly circuit diagram



(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

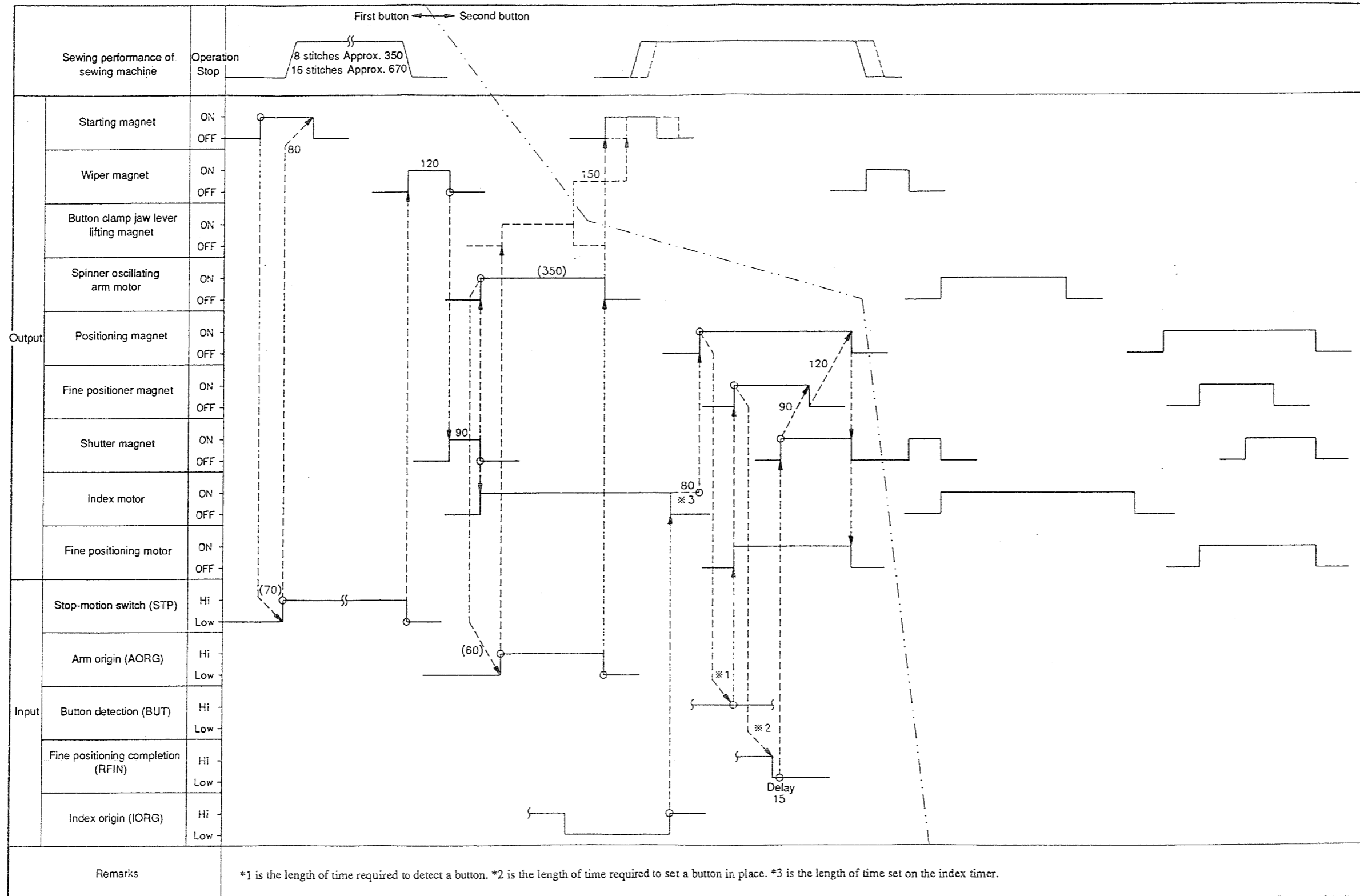


XIII. TIMING CHART

No button on the shutter plate

(Standard state at the time of delivery)

Unit [msec.]



A button is placed on the shutter plate

Unit [msec.]

