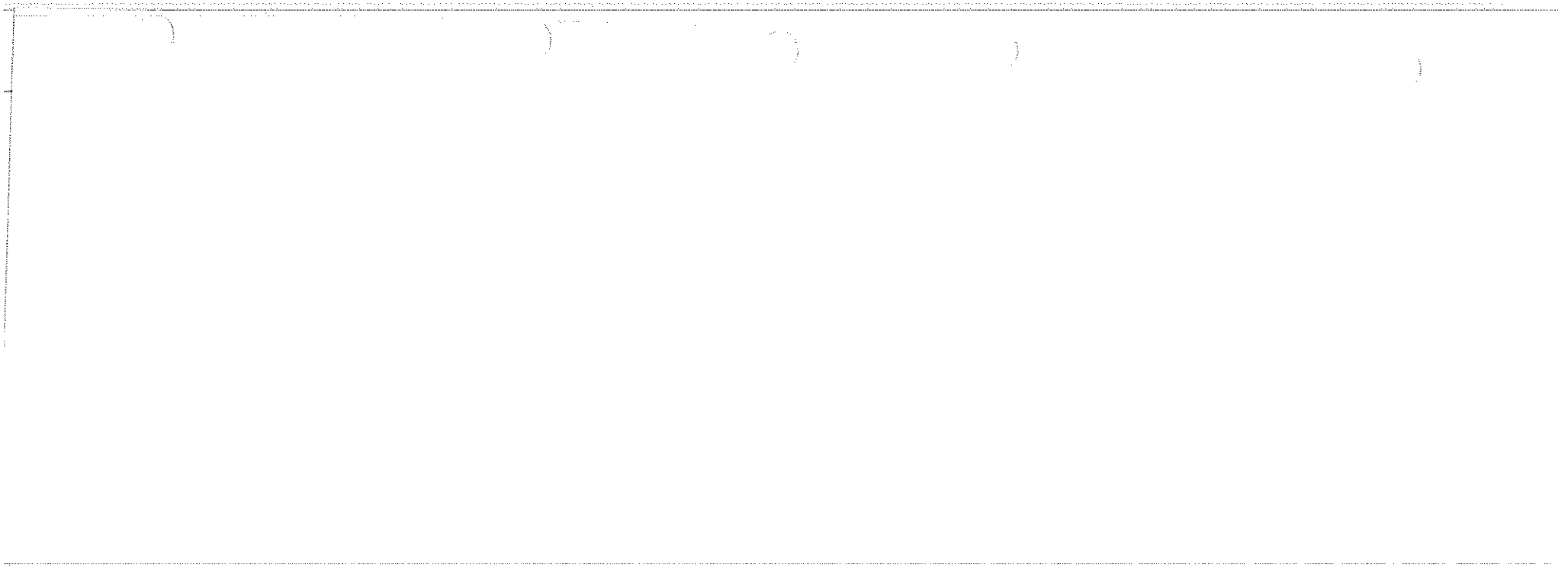
JUKI

4-needle, unison-feed lockstitch machine with an automatic thread trimmer

LU-2210-6

ENGINEER'S MANUAL

LHD-20
1992.12



PREFACE

This Engineer's Manual is written for the technical personnel who are responsible for the service and maintenance of the sewing machines.
The Instruction Manual for these machines intended for the maintenance personnel and operators at a factory contains detailed operating instructions. And this manual describes "How to Adjust", "Effects of Adjustment", and other information which are not covered by the Instruction Manual.
It is advisable to use the pertinent Instruction Manual and Parts List together with this Engineer's Manual when carrying out the maintenance of these machines.
This manual mainly consist of three sections; the first section presents "Standard Adjustment", the second section, "How to Adjust", and the thrid, "Results of Improper Adjustment".

PRECAUTIONS BEFORE OPERATION

1. Never operate the sewing machine unless it has been properly lubricated.
2. Before operating the machine for the first time, turn the handwheel by hand in order to lower the needle. Then turn ON the power switch while observing the handwheel, and check for the correct direction of the motor rotation.
   (The correct direction is counterclockwise as observed from the handwheel side.)
3. During the month following machine installation, operate the machine at low speed, i.e., 2,800 s.p.m. or less.
4. Check that the machine is operated in accordance with the specified voltage and phase as indicated on the name plate on the motor.

CAUTION DURING OPERATION

1. Keep your hands away from the area under the needles when you turn ON the power switch or while the machine is in operation.
2. During operation, be careful not to allow your fingers or any other person's fingers to enter the thread take-up cover.
3. Be sure to turn OFF the power switch before tilting the machine head or removing the V-belt.
4. Be sure to turn OFF the power switch whenever you leave this sewing machine.
5. During operation, be careful not to allow your or any other person's head or hands to come close to the handwheel, V belt, bobbin winder or motor. Also, do not place anything close to them. Doing so may be dangerous.
6. If your machine is provided with a belt cover, finger guard or any other protectors, do not operate your machine with any of them removed.

CONTENTS

1. SPECIFICATIONS

No.	Item	Specifications
1	Model	LU-2210-6
2	Model name	1-needle, unison-feed lockstitch machine with an automatic thread trimmer(with a touch-back device, auto-lifter and lifting device)
3	Applications	For medium-weight materials, car seats and furniture
4	Sewing speed	Max. 3,500 s.p.m. (Varies according to the sewing conditions)
5	Needle	134x35R (Nm100 to Nm180), Standard 134x35R #130
6	Thread	#4 to #30
7	Stitch length	Max. 9 mm (0.354") for both normal feed stitching and reverse feed stitching
8	Presser foot lift	By hand lifter: 9 mm (0.354") By knee lifter: 16 mm (0.630") (equipped with a reversing device)
9	Stitch length regulating method	By dial
10	Reverse feed stitching	Externally mounted air pressure cylinder (touch-back switch and hand lever)
11	Thread take-up lever	Link type
12	Needle bar stroke	33.8 mm (1.331")
13	Hook	Vertical-axis large hook (1.6 times) (automatic lubrication hook)
14	Opener	Opener shaft eccentric cam speed reduction system (The opener travels by one stroke while the hooks rotates twice.)
15	Feed mechanism	By arc block slider
16	Hook driving system	Screw gear
17	Thread trimmer	Rocks around the hook (peripheral cam and solenoid)
18	Tension release system	By peripheral cam of main shaft
19	Adjustment of the amount of alternating vertical movement of the walking foot and presser foot	By dial (peripheral cam)
20	Main shaft and hook driving shaft driving system	By timing belt
21	Bobbin winder	Built in the arm
22	Lubrication	By lead pump
23	Oil return flow	Circulated by plunger and felts
24	Lubricating oil	New Defrix Oil No. 1
25	Space under the needle	263.5 mm (10.374") (distance from the center of presser bar to the bottom of arm)
26	Bed size	517 mm (20.354") x 178 mm (7.008")
27	Auto lifter	Externally mounted air pressure cylinder
28	Lifting device (DL)	Air pressure cylinder with a built-in type speed controller to control the speed corresponding to the amount of alternating vertical movement of the walking foot and presser foot
29	Weight of machine head	Approx. 55 kgf
30	Transmission belt	M type V belt

o Model designation of the LU-2210 machine head

LU－2210－□□□－6－0□／□

Walking foot code | Presser foot code | Feed dog code | Type of thread trimmer | One-touch type reverse feed | Options

Example: For urethane, with a thread trimmer (with a servo motor), a one-touch type reverse feed, an auto-lifter, and an amount of alternating vertical movement of the walking foot and presser foot change-over device (knee-switch type)

(LU－2210－BCS－6－OB／AK－79B／DL－16A)

Code	Walking foot
A	Standard
B	For urethane
C	Right-single-sided foot
D	Left-single-sided foot foot
E	For piping ø3
F	For piping ø4
G	For piping ø5
H	For piping ø6
J	Adjustable type for piping ø3
K	Adjustable type for piping ø4
L	Adjustable type for piping ø5
M	Adjustable type for piping ø6

Code	Presser foot
A	Standard
B	For overlapped section
C	For urethane
D	Right-single-sided foot
E	Left-single-sided foot
F	For piping ø3
G	For piping ø4
H	For piping ø5
J	For piping ø6

Feed dog	
S	Standard

Thread trimmer	
6	With a servo motor

One-touch type reverse feed	
O	Not provided
B	Provided

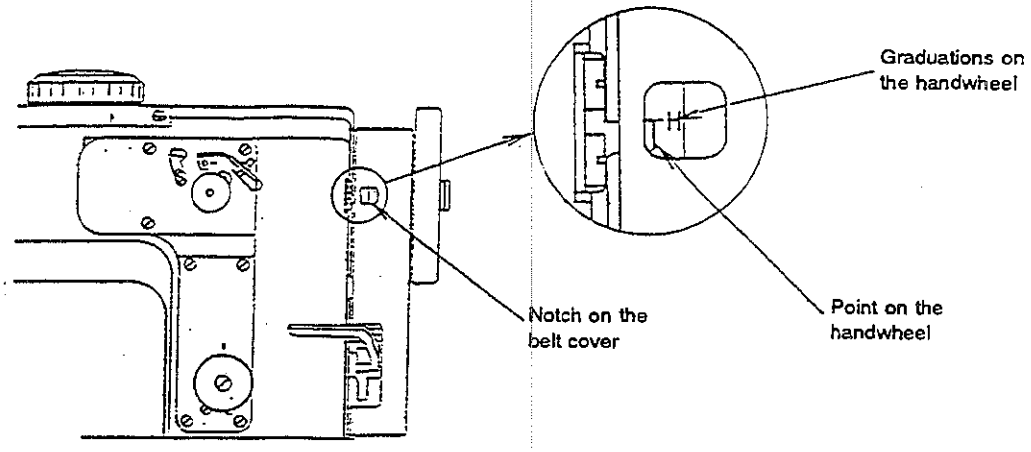
Options	
B	AK-79B
C	AK-79B/DL-16A
D	AK-79B/DL-16B

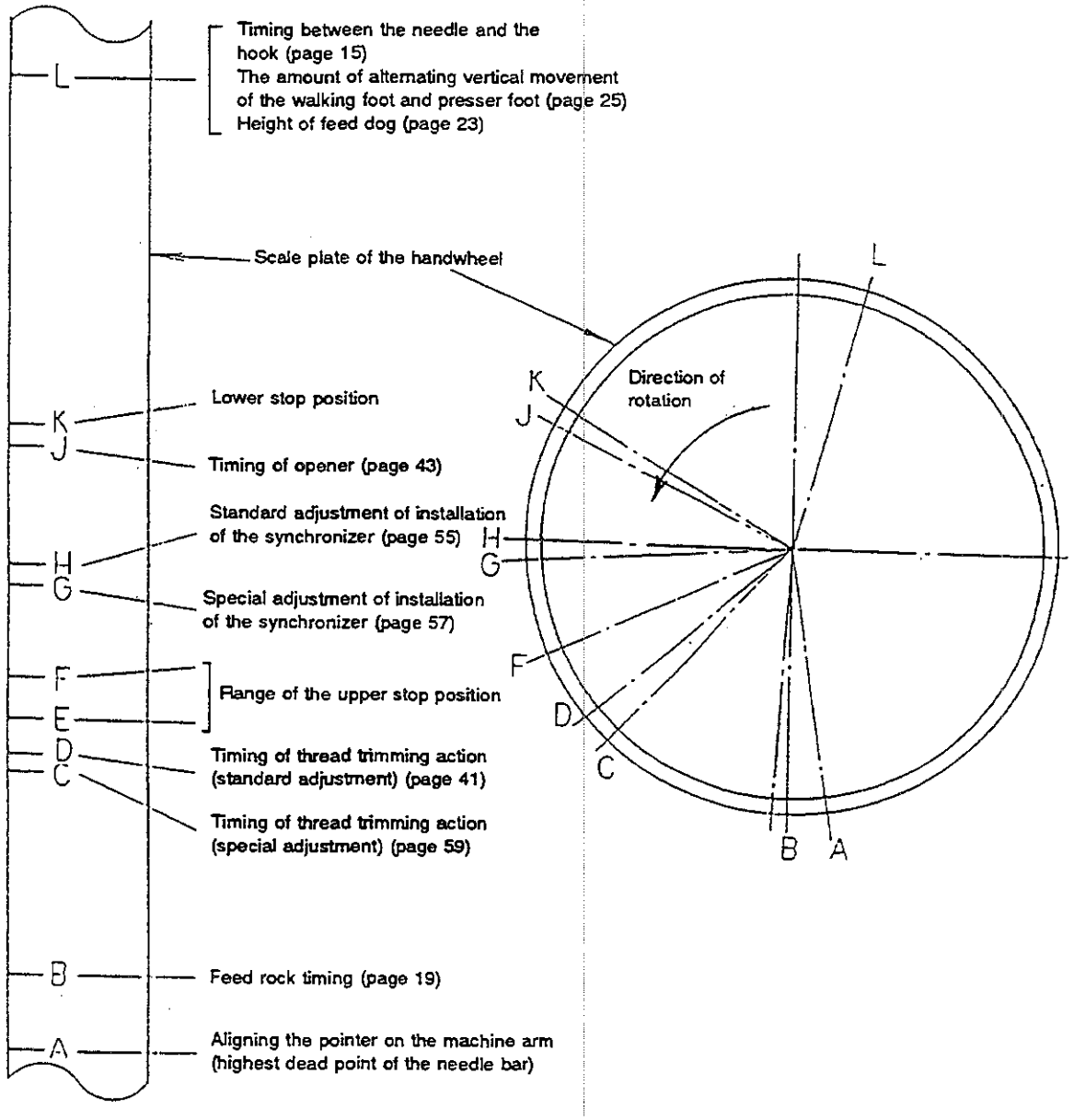
Specifications	
X	For domestic use
ST2	For export

2. STANDARD ADJUSTMENT

(1) Kinds and names of graduations on the handwheel

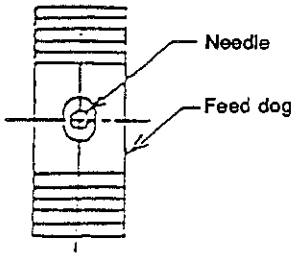
Adjust the timing of each operation of sewing machine while aligning the handwheel pointer with the corresponding graduation on the handwheel. The graduations on the handwheel and the pointer on it can be observed through the notch on the belt cover.





(2) **Needle entry**

1) Needle entry in the needle slot of the feed dog in the lateral direction



Needle entry point

The center of the needle slot in the feed dog should be aligned with the center of the needle.

Requirements:

- Needle bar should be brought to the lowest dead point.
- The stitch dial should be set at "0" on the scale.

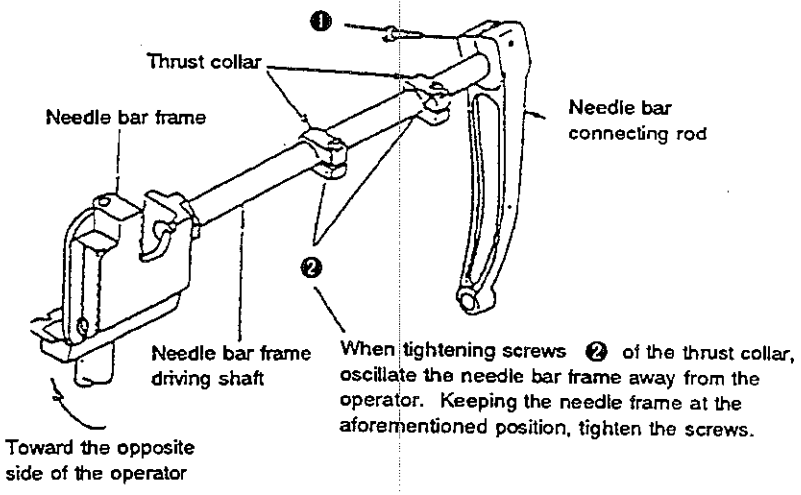


Fig. 1

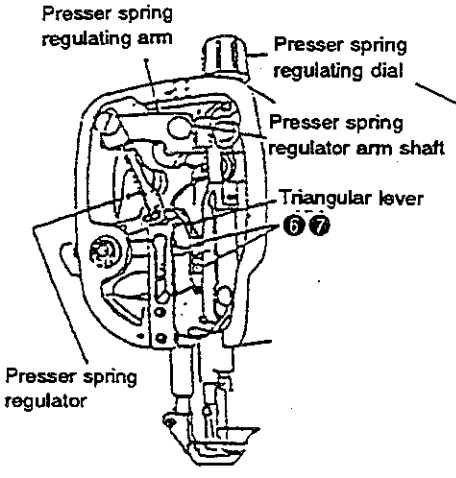


Fig. 2

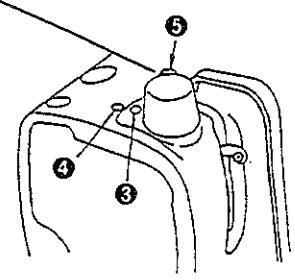


Fig. 3

How to adjust	Result of improper adjustment
1) Needle entry in the needle slot of the feed dog in the lateral direction	
1. Set the dial to adjust the amount of alternating vertical movement of the walking foot and presser foot to "1" on the scale.	
2. Remove the top cover.	
3. Set the stitch dial to "9" on the scale.	
4. Loosen the screw in the reverse feed cylinder.	4', 5' Perform the adjustment steps 4 and 5 only for the sewing machine equipped with an auto-lifter.
5. Remove the reverse feed cylinder.	
6. Remove the side plate.	
7. Loosen screw ❶ in the needle bar connecting rod. (Fig. 1)	
8. Loosen screw ❷ in the thrust collar of the needle bar frame driving shaft. (Fig. 1)	
9. Remove the presser spring regulating dial. (Fig. 2)	
10. Loosen screw ❸ in the presser spring adjusting arm shaft. (Fig. 3)	
11. Remove the presser adjusting arm. (Fig. 2)	
12. Remove the presser spring regulator. (Fig. 2)	
13. Remove the presser spring regulating arm shaft. (Fig. 2)	
14. Loosen screw ❹ in the thread take-up crank shaft. (Fig. 3)	
15. Draw out the thread take-up crank shaft. (Fig. 4)	
16. Loosen screw ❺ in the thread take-up crank shaft support. (Fig. 3)	
17. Remove triangular lever shafts ❻ and ❼. (Fig. 2)	17' Tilt the triangular lever, which is set free, toward the presser bar lifting lever. At this time, eliminate a thrust play at the needle bar frame driving shaft and tighten the screw while oscillating the needle bar frame toward the operator.
18. Adjust the needle entry in the needle slot of the feed dog in the lateral direction.	
19. Tighten screws ❷ of the thrust collar. (Fig. 1)	
20. Adjust the position of the thread take-up crank shaft support in accordance with the position of the the thread take-up crank.	20' At this time, adjust so that their end faces come in slight contact with each other while providing no play between them by moving the thread take-up crank shaft support.
21. Tighten screw ❺ in the thread take-up crank shaft support. (Fig. 3)	21' Tighten the screw while making the contact point of the thread take-up crank shaft support and the screw straight up.
22. Put the thread take-up crank shaft in the thread take-up crank until the shaft reaches the end face of the thread take-up crank. (Fig. 4)	
23. Tighten screw ❹ in the thread take-up crank shaft. (Fig. 3)	
24. Attach the triangular lever shafts ❻ and ❼ in place. (Fig. 2)	
25. Attach the presser spring regulating arm in place.	
26. Attach the presser spring regulating arm shaft in place.	
27. Tighten screw ❸ in the presser spring regulating arm shaft. (Fig. 3)	
28. Attach the presser spring regulator in place.	
29. Attach the presser spring regulating dial in place.	
30. Set the stitch dial to "0" on the scale.	

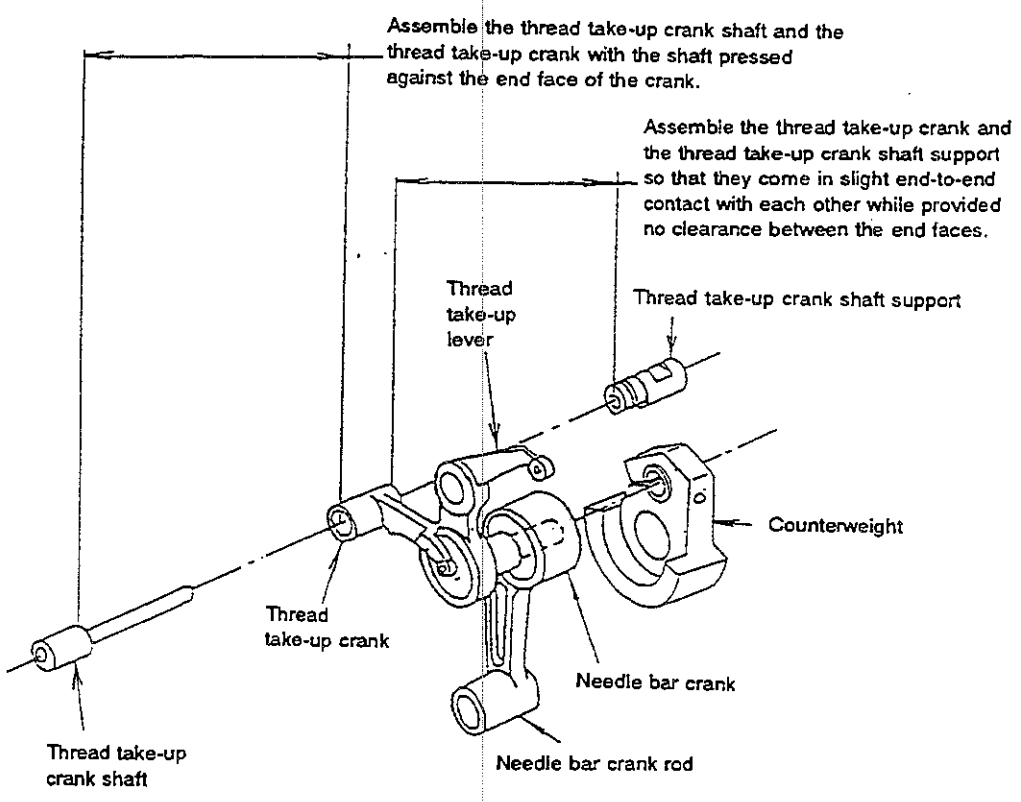

Assemble the thread take-up crank shaft and the thread take-up crank with the shaft pressed against the end face of the crank.
Assemble the thread take-up crank and the thread take-up crank shaft support so that they come in slight end-to-end contact with each other while provided no clearance between the end faces.
Thread take-up lever
Thread take-up crank shaft support
Counterweight
Thread take-up crank
Needle bar crank
Thread take-up crank shaft
Needle bar crank rod

Fig. 4

How to adjust	Result of improper adjustment
31. Adjust the needle entry in the needle slot of the feed dog in the feeding direction.	31' Refer to "Needle entry in the needle slot of the feed dog in feeding direction" on page 9.)
32. Tighten clamping screw ❶ in the needle bar connecting rod. (Fig. 1) **(Caution)** **Tighten the screw with a tightening torque of 80 to 90 kgf.cm.**	32' At this time, fluctuate the needle bar connecting rod to the right or left until the needle bar connecting rod is placed approximately at the center of the play, and tighten the clamping screw.
33. Attach the side plate in place.	
34. Attach the reverse feed cylinder in place, and tighten the screw in it.	34' Perform this step of adjustment only for the sewing machine equipped with an auto-lifter.

2) Needle entry in the needle slot of the feed dog in feeding direction

Needle entry point

The center of the needle slot in the feed dog must align the center of the needle. (Fig. 1)

Requirements:

- Needle bar should be brought to the lowest dead point.
- The stitch dial should be set at "0" on the scale.
- The needle feeding arm should be made perpendicular. (Fig. 2)
- A clearance of 5.7±0.2 mm (0.224"±0.008") should be provided between operator's side end of the slot in the throat plate and the edge of the feed dog. (Fig. 3)

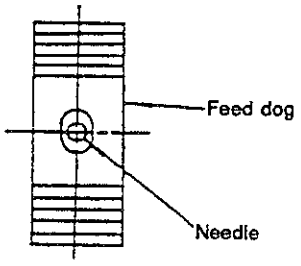


Fig. 1

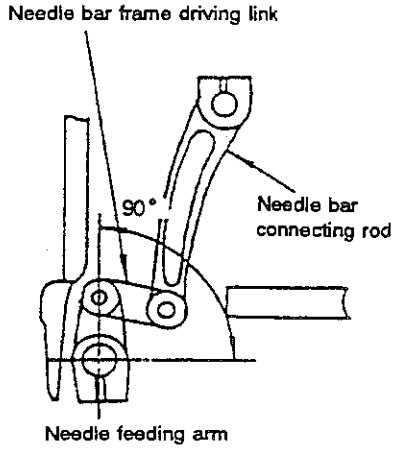


Fig. 2

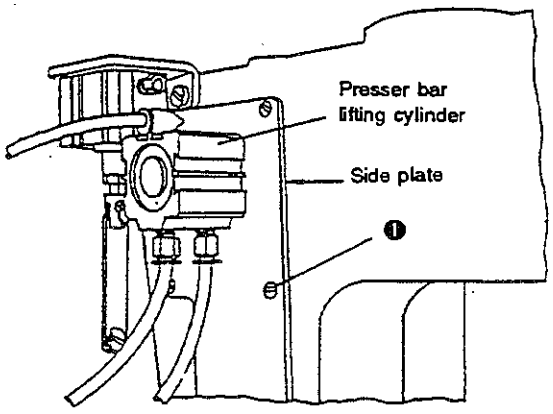


Fig. 4

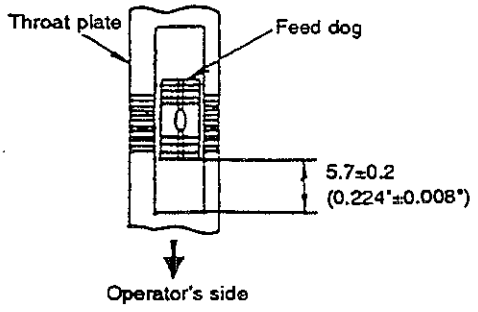


Fig. 3

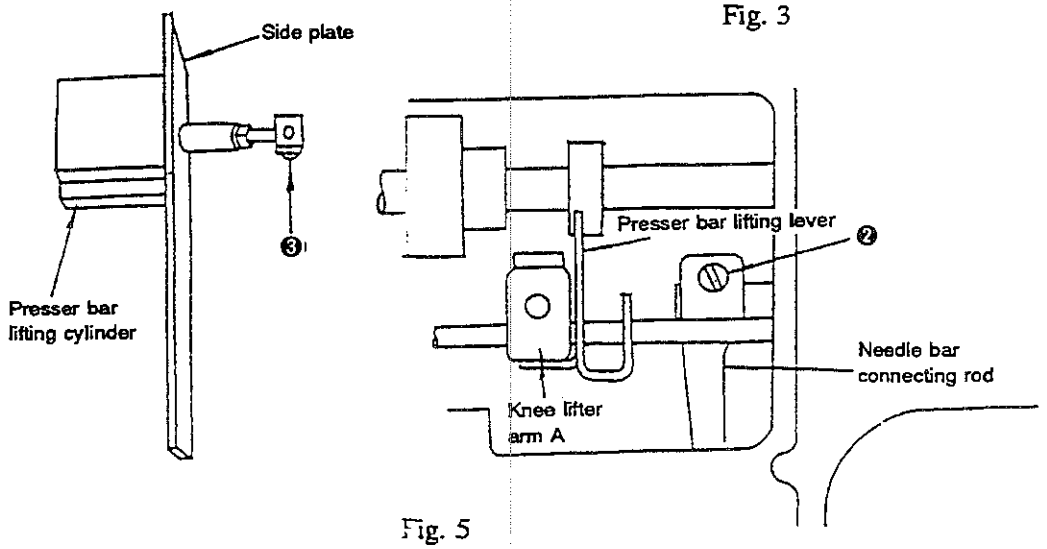


Fig. 5

How to adjust	Result of improper adjustment
1. Set the stitch dial to "0" on the scale. 2. Loosen attaching screws ❶ in the side plate. (Fig. 4) 3. Remove the side plate. (Fig. 4) 4. Loosen clamping screw ❷ in the needle bar connecting rod. (Fig. 5) 5. Bring the needle bar to the lowest position of its stroke. 6. Align the center of the needle with the center of the slot in the throat plate.	☆ If the needle entry is adjusted too close to the operator: o The needle may interfere with the feed dog, resulting in needle breakage. ☆ If the needle entry is adjusted too far from the operator: o When the needle comes out of the slot in the throat plate, the needle may interfere with the feed dog, resulting in thread breakage. o The needle may come in contact with the feed dog during the reverse feed stitching, resulting in needle breakage.
7. Tighten screw ❷ in the needle bar connecting rod. (Caution) **Tighten the screw with a tightening torque of 80 to 90 kgf.cm.**	7' At this time, move the needle bar connecting rod to the right of left until the needle bar connecting rod is positioned approximately at the center of the play. → If the needle bar connecting rod is not correctly positioned, an excessive torque may result. For the sewing machine equipped with an auto-lifter, attach the side plate in plate following the steps of procedure described below.
8. Attach the side plate in place.	8. Raise the presser bar lifting lever. 9. Put hinge screw ❸ of the presser bar lifting cylinder in the forked section of the presser lift lever. 10.Confirm that the bottom face of the knee lifter arm A is engaged with the presser lift lever. 11.Attach the side plate in place.
(Caution) **The feed amount of the needle is mechanically larger than the feed amount of the feed dog by 5%.**	

(3) **Needle-to-hook relation**

1) Height of the needle bar

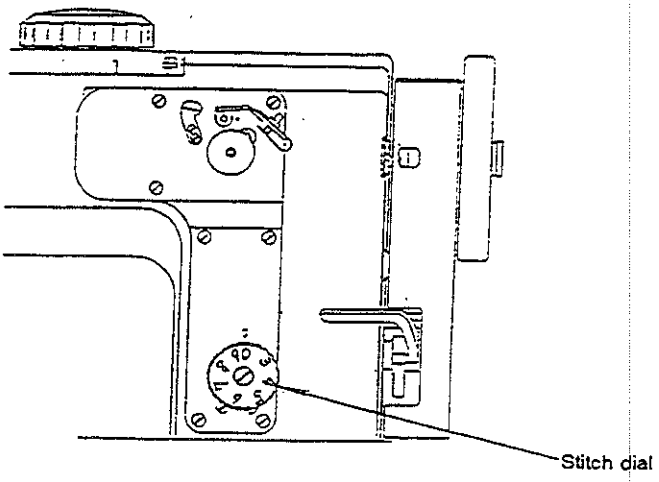


Fig. 1

Needle bar height:
a = 19.4±0.1 mm (0.764"±0.004")
(Refer to Fig. 3)

Requirements
The stitch dial should be set at "0" on the scale. (Refer to Fig. 1)
Needle bar should be brought to the lowest dead point.

[Height of the needle bar is set to 16.8±0.1 mm (0.661"±0.004") above the top surface of the throat plate in the Instruction Manual.]

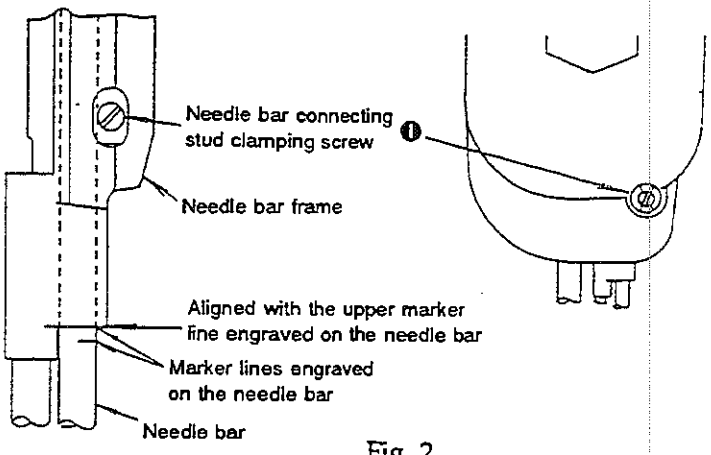
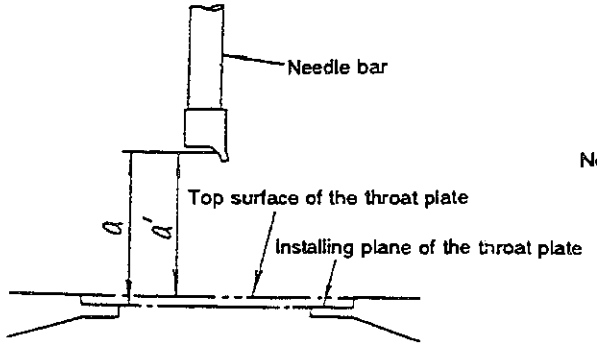


Fig. 2

As long as the height of the needle bar has been properly adjusted to the specified dimension, a distance of 1.4± 0.2 mm (0.055"±0.008") will be provided between the top end of the needle eyelet and the blade point of the hook when the needle bar is raised from its lowest dead point by turning the handwheel. (Refer to Fig. 4.)



Height of the needle bar: a=19.4±0.1 mm (0.764"±0.004")
(as measured from the installing plane of the throat plate)
Height of the needle bar: a'=16.8±0.1 mm (0.661"±0.004")
(as measured from the top surface of the throat plate)

Fig. 3

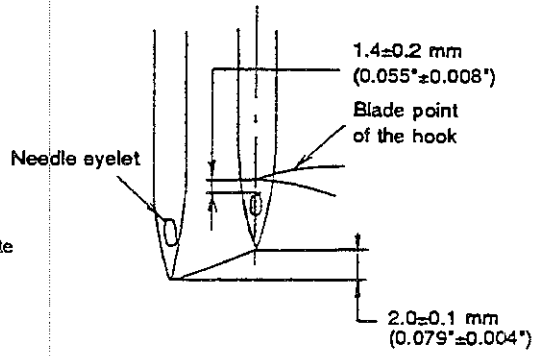


Fig. 4

How to adjust	Result of improper adjustment
1. Set the stitch dial at "0" on the scale. (Fig. 1) 2. Turn the handwheel to bring the needle bar to the lowest dead point. 3. Loosen clamping screw ❶ of the needle bar connection. (Fig. 2) 4. Adjust the height of the needle bar to the specified dimension (19.4±0.1 mm (0.764"±0.004") is provided between the installing plane of the throat plate and the top end of the needle bar). (Fig. 3) 5. Tighten needle bar connecting stud clamping screw ❶. (Fig. 2)	o Stitch skipping and thread breakage may result. 4'. At this time, align the bottom face of the needle bar frame with the marker line engraved on the needle bar (the upper one of the two marker lines engraved on the needle bar). This will enable you to adjust the height of the needle bar almost to the specified dimension.

2) Clearance between the needle and the blade point of hook

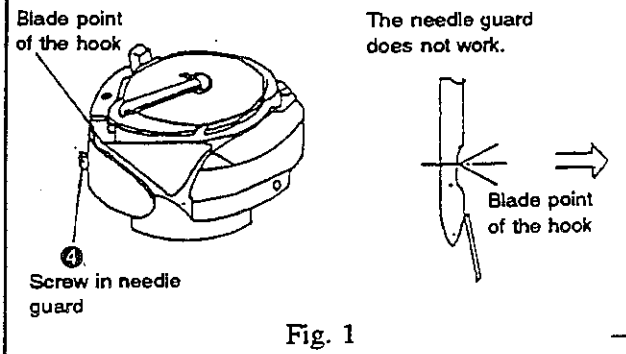


Fig. 1

Clearance between the needle and the blade point of hook:
0.02 to 0.1 mm (0.001" to 0.004")

Requirements

- The timing between the needle and the hook should have already been adjusted.
- Effective amount of the needle guard: 0.15 to 0.2 mm (0.006" to 0.008")
- The stitch dial should be set at "0" on the scale.

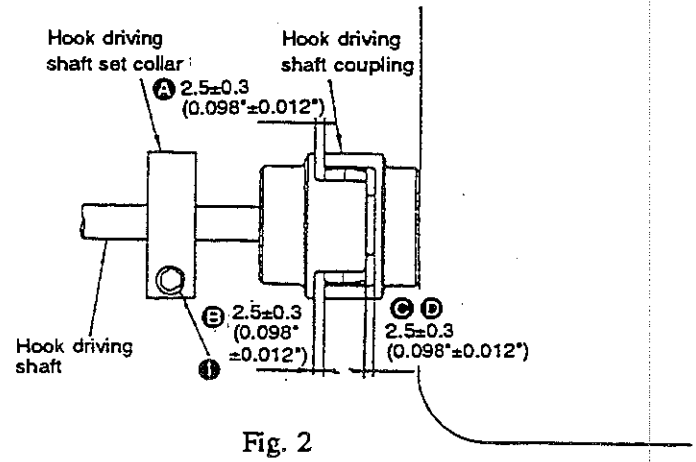


Fig. 2

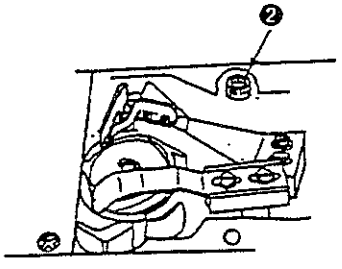


Fig. 3

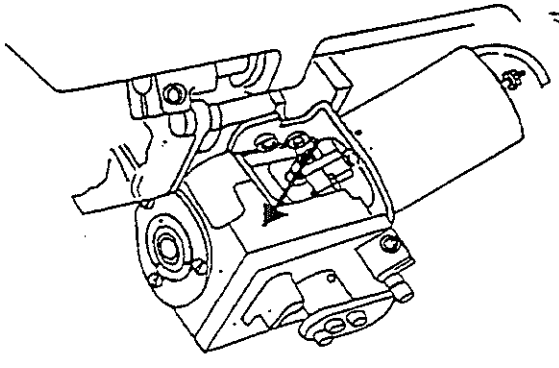


Fig. 4

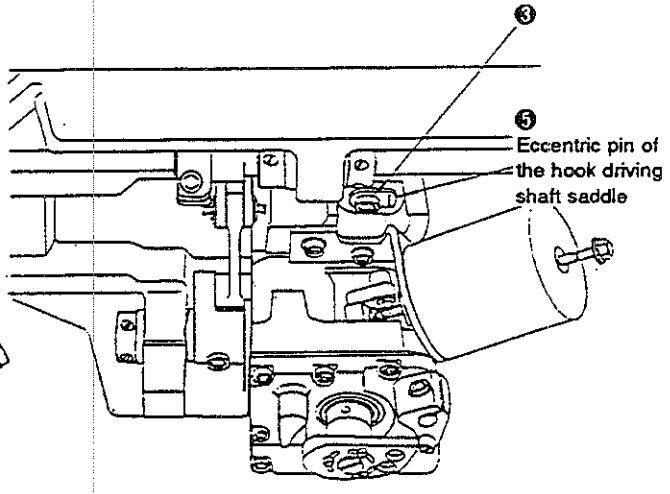


Fig. 5

How to adjust	Result of improper adjustment
1. Remove the throat plate. 2. Set the stitch dial at "0" on the scale. 3. Loosen clamping screw ❶ in the hook driving shaft set collar. (Fig. 2) 4. Loosen attaching screws ❷ and ❸ in the hook driving shaft saddle. (Fig. 3) 5. Move the hook driving shaft saddle in the right or left to adjust the clearance provided between the needle and the blade point of hook to 0.02 to 0.1 mm (0.001" to 0.004"). (Fig. 1) 6. At this time, adjust the effective amount of the needle guard to 0.15 to 0.2 mm (0.006" to 0.008") by turning adjustment screw ❹. (Fig. 1) 7. Turn eccentric pin ❺ of the hook driving shaft saddle with a screwdriver to move the hook driving shaft saddle in the opposite direction of the operator (in the direction of arrow) until it will go no further. (Fig. 5) 8. Fix the hook driving shaft saddle holding it in the state described in step 7 by tightening screws ❸ and ❷ in the hook driving shaft saddle in the written order. (Fig. 5) 9. Confirm that the needle-to-hook timing is correct. If the timing is correct, tighten clamping screw ❶ in the hook driving shaft set collar. (Fig. 2) If not, adjust the timing between the needle and the hook properly. (Refer to "Timing between the needle and the hook" on page 15.)	☆ If the clearance between the needle and the blade point of hook is too large: o Stitch skipping and improper threading may result. ☆ If the clearance between the needle and the blade point of hook is too small: o The needle may interfere with the blade point of hook. As a result, the blade point of hook may be damaged and thread breakage may be caused. At this time, confirm that clearances Ⓐ, Ⓑ, Ⓒ and Ⓓ in the hook driving shaft coupling are respectively adjusted to 2.5±0.3 mm (0.098"±0.012"). If not, adjust the clearances properly.

3) Timing between the needle and the hook

Align the center of the needle with the blade point of the hook. (Fig. 2)
Requirements

- Graduation "L" on the handwheel is aligned with the handwheel pointer.
- The stitch dial should be set at "0" on the scale.
- This adjustment should be carried out after the needle bar has been adjusted to the correct height.

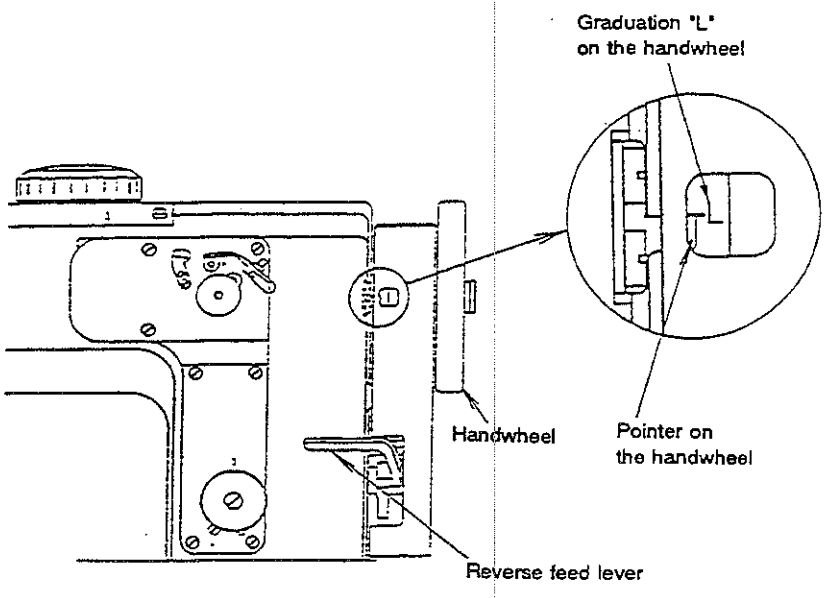


Fig. 1

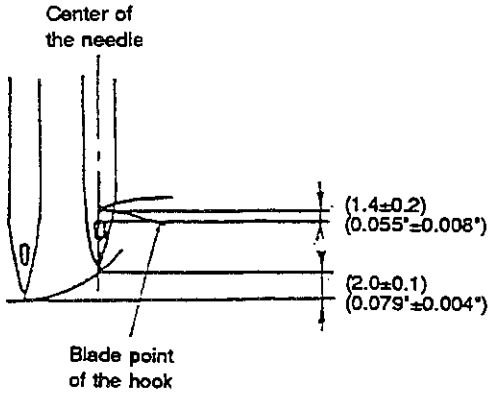


Fig. 2

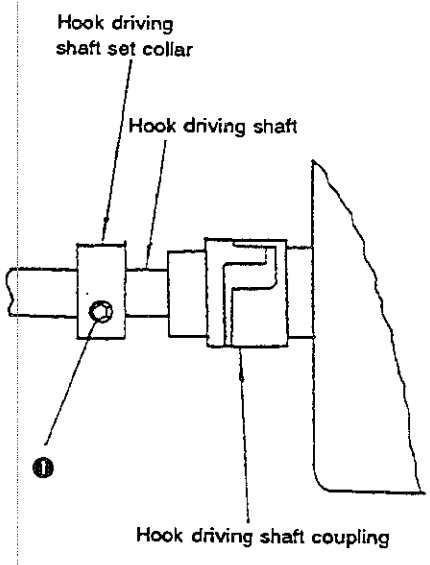


Fig. 3

How to adjust	Result of improper adjustment
1. Set the stitch dial at "0" on the scale. (Fig. 1) 2. Loosen screw ❶ the thrust collar of the hook driving shaft. (Fig. 3) 3. Align the graduation "L" on the handwheel with the handwheel pointer. (Fig. 1) 4. Turn the hook in the normal direction of rotation until the blade point of the hook is aligned with the center of the needle. 5. Tighten screw ❶ . (Caution) **Adjust the needle entry in the needle slot of the feed dog in terms of the feeding direction in prior to the adjustment of "Timing between the needle and the hook."**	☆ Loose stitches, stitch skipping and thread breakage may result. 3'. Refer to "(1) Kinds and names of graduations on the handwheel" on page 3. At this time, hold the hook by hand at the correct position to maintain the aceurate needle-to-hook timing.

(4) **Clearance between the throat plate and the bobbin case stopper**

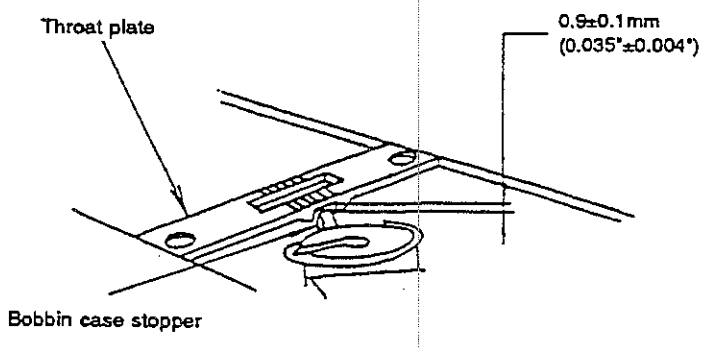
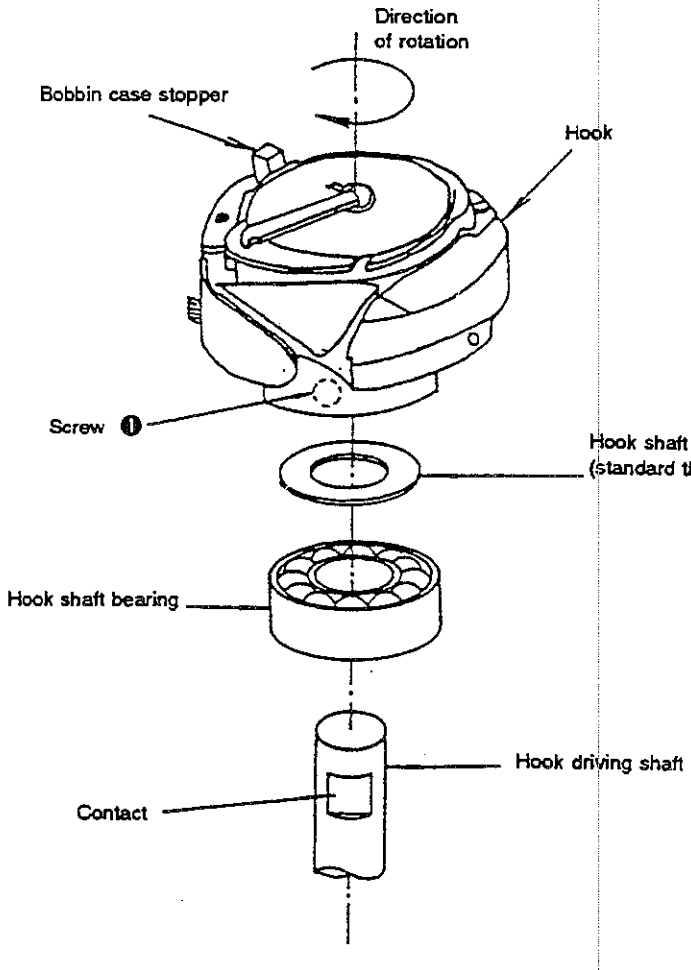


Fig. 1



Thickness (mm)	Part No.
1.2 (0.047")	10111003
1.3 (0.051")	10111102
1.4 (0.055")	10111201
1.5 (0.059")	10109809
1.6 (0.063")	10112506

Fig. 2

How to adjust	Result of improper adjustment
1. Select an appropriate thrust plate of the hook shaft, and adjust the clearance at the thrust plate. (Fig. 1) 2. Put the hook over the hook shaft while pressing the hook down to prevent an axial play. When tightening screws ❶ in the hook, first tighten the screw No.1, in terms of the direction of rotation, of screws on the contact plane (flat section) of the hook shaft. Then tighten the screw No.2, in terms of the direction of rotation, of screws. (Fig. 2) 3. Refer to page 35 for how to adjust the thread trimmer after the completion of the adjustment of the clearance between the throat plate and the bobbin case stopper.	☆ If the clearance between the throat plate and the bobbin case stopper is too large: o The bobbin case may come off the throat plate. ☆ If the clearance between the throat plate and the bobbin case stopper is too small: o Loose stitches (isolated idling loops) may result. o The moving knife may interfere with the hook at the time of thread trimming.

(5) **Timing of cloth feed action**

1) Feed rock timing

- Set the stitch dial to "9" on the scale.
- Align the graduation "B" on the handwheel with the handwheel pointer. In this state, move the reverse feed lever up and down until the position where the feed dog does not move in the feeding direction. Now, tighten screw ❷ in the feed rock cam.
- Reference:
  When the graduation "B" on the handwheel is aligned with the handwheel pointer, screw No. 1 (in terms of the direction of rotation) on the feed rock cam is nearly brought to the top.

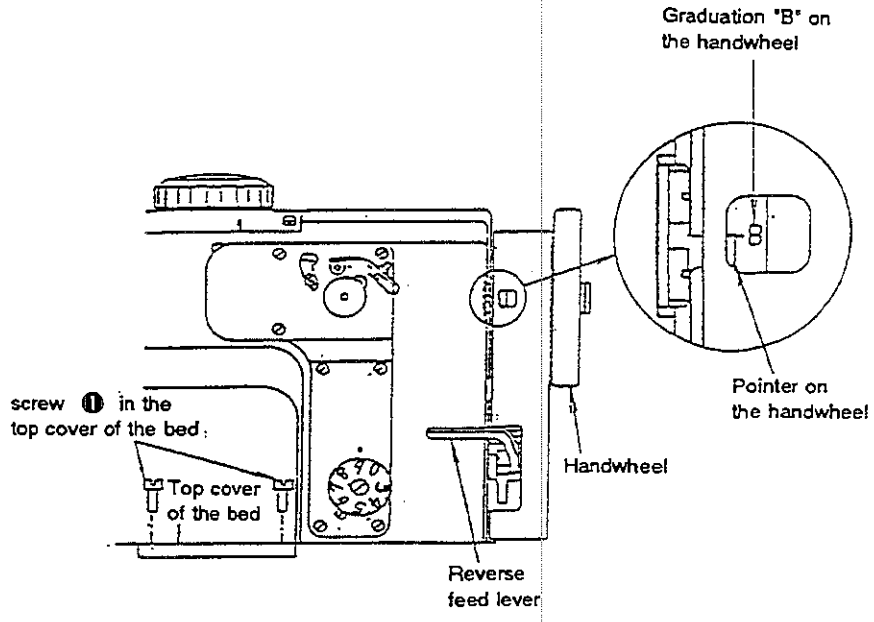


Fig. 1

2) Feed driving timing

Adjust so that marking ❸ (marker dot in the end face of the feed rock cam) on the feed rock cam is flush with marking ❹ (marker dot on the feed driving cam), and tighten screw ❺.

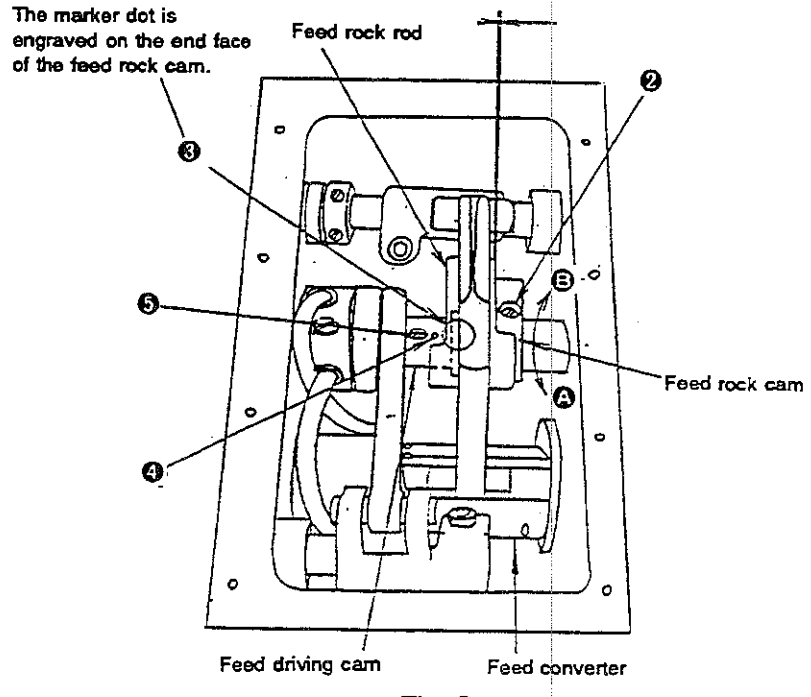
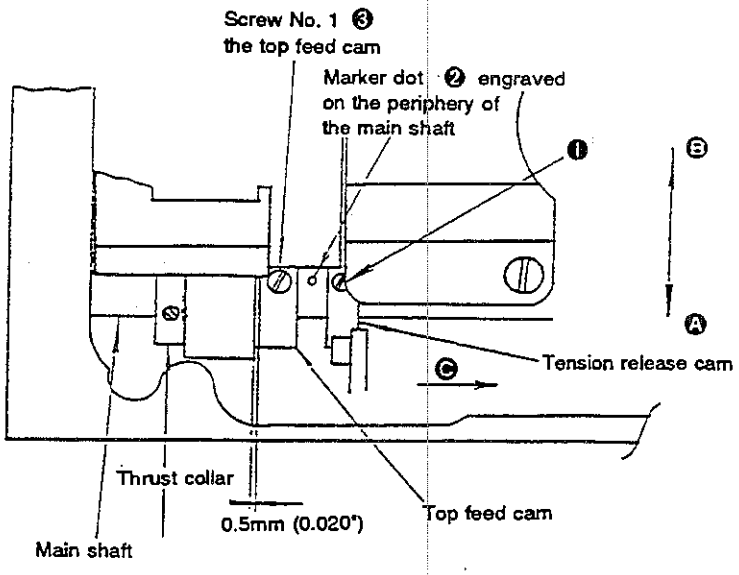


Fig. 2

How to adjust	Result of improper adjustment
1) Feed rock timing 1. Loosen screws ❶ in the top cover of the bed. (Fig. 1) 2. Remove the top cover of the bed. (Fig. 1) 3. Loosen screw ❷ in the feed rock cam. (Fig. 2) 4. Observing the notch on the belt cover, turn the handwheel until the graduation "B" on the handwheel is aligned with the handwheel pointer. 5. Turn the feed rock cam by hand while moving the reverse feed lever up or down until the feed dog will not fluctuate. Now, fix the feed rock cam at that position. 6. A clearance of 1 mm (0.039") should be provided between the end face of the feed rock rod and the end face of the periphery of the feed rock cam. 7. Tighten screw ❷ in the feed rock cam. **(Caution)** **1) Take care not to allow any foreign matter such as a screw to enter the bed tank.** **2) Adjust the timing within the range of ±5° from the standard timing.** **3) After the feed rock timing has been adjusted, re-adjust the feed driving timing.**	☆ Improper stitch length may result when making the machine run at high/low speed. ☆ Thread tension may change from the correct one. ☆ Normal stitch length and reverse stitch length may be different from each other. 4' Refer to "(1) Kinds and names of graduations on the handwheel" on page 3. 5' At this time, screw No.1 in the feed rock cam, in terms of the direction of rotation, is almost straight up. • Fix the feed rock cam after turning it toward the operator (in the direction of arrow Ⓐ) from the standard adjustment position to advance the feed rock timing. Fix the feed rock cam after turning it away from the operator (in the direction of arrow Ⓑ) from the standard adjustment position to retard the feed rock timing.
2) Feed driving timing 1. Perform the adjustment after adjusting the feed driving timing. 2. Loosen screw ❺ in the top feed cam. (Fig. 2) 3. Adjust so that marking ❸ (marker dot in the end face of the feed rock cam) on the feed rock cam is in line with marking ❹ (marker dot) on the feed driving cam. **(Caution)** **1) Take care not to allow any foreign matter such as a screw to enter the bed tank.** **2) Adjust the timing within the range of ±5° from the standard timing.**	☆ Improper stitch length may result when making the machine run at high/low speed. 3' If the feed driving timing is properly adjusted, the feed dog is positioned on the side of the operator and the top surface of the feed dog is almost flush with the top surface of the throat plate. • Fix the feed driving cam after turning it toward the operator (in the direction of arrow Ⓐ) from the standard adjustment position to advance the feed driving timing. Fix the feed driving cam after turning it away from the operator (in the direction of arrow Ⓑ) from the standard adjustment position to retard the feed driving timing.

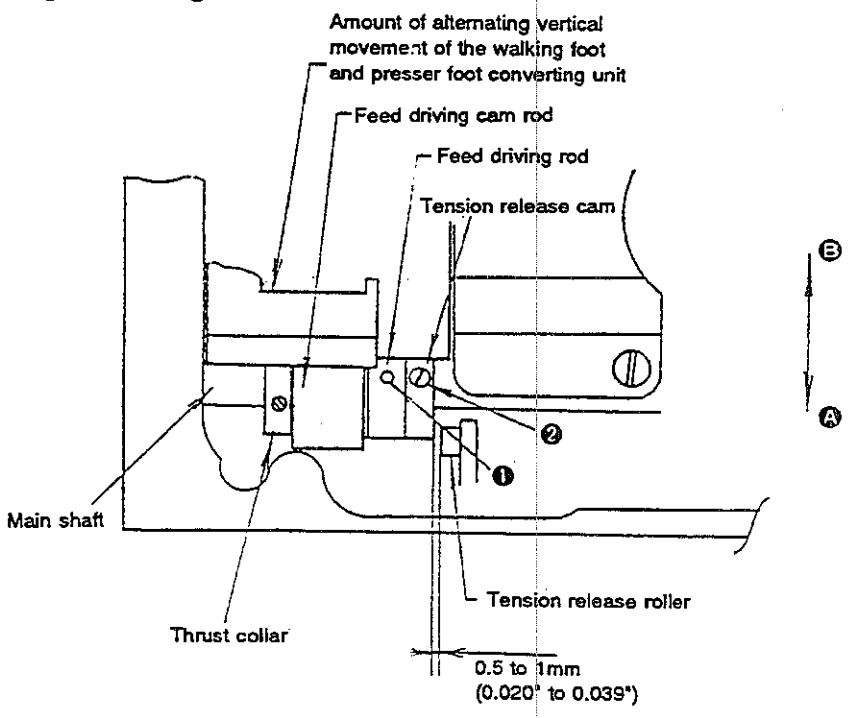
3) Top feed timing

Top feed timing
Set marker dot ❷ engraved on the periphery of the main shaft in line with screw No. 1 ❸ in the top feed cam, and tighten screw ❸ .



4) Timing of releasing thread tension

Timing of releasing thread tension
Set marker dot ❶ engraved on the top feed cam in line with screw ❷ in the tension release cam, and tighten screw ❷ .
In this case, the top feed timing should have been properly adjusted in prior to the adjustment of the timing of releasing the thread tension.



How to adjust	Result of improper adjustment
Top feed timing 1. Loosen the screw in the top cover. 2. Remove the top cover. 3. Loosen screw ❶ in the tension release cam, and shift the tension release cam in direction Ⓒ as illustrated in Fig. 4. Turn the handwheel to bring the marker dot ❷ engraved on the periphery of the main shaft to the top. 5. Align the marker dot engraved on the periphery of the main shaft with the screw No. 1 in the top feed cam. 6. Press the top feed cam against the thrust collar. 7. Tighten screws No. 1 ❸ and No. 2 in the top feed cam. **(Caution)** **1) Take care not to allow any foreign matter such as a screw to enter the arm.** **2) Adjust the timing within the range of ±5° from the standard timing.** **3) After adjusting the top feed timing, re-adjust the timing of releasing the thread tension.**	• Improper stitch length may result when making the machine run at high/low speed. • Turn the top feed cam toward the operator (in the direction of arrow Ⓐ), and the top feed timing will be earlier than the standard timing. Turn the top feed cam away from the operator (in the direction of arrow Ⓑ), and the top feed timing will be later than the standard timing. 4' At this time, confirm that a clearance of 0.5 mm (0.020") is provided between the end face of the top feed cam rod and the end face of the periphery of the top fed cam.
Timing of releasing the thread tension **(Caution)** **Adjust the timing of releasing the thread tension after the top feed timing has been properly adjusted.** 1. Align marker dot ❶ engraved on the top feed cam in line with screw ❷ in the tension release cam. 2. Press the end face of the tension release cam against the top feed cam. 3. Tighten screw ❷ in the tension release cam. 4. Confirm that a 0.5 to 1 mm (0.020" to 0.039") clearance is provided between the end face of the tension release cam and the end face of the tension release roller. **(Caution)** **Take care not to allow any foreign matter such as a screw to enter the arm.**	☆ If the timing of releasing the thread tension is excessively advanced: The needle thread may not be clamped properly. ☆ If the timing of releasing the thread tension is excessively retarded: The timing of making the tension controller open is too late. As a result, the motor may stop. Turn the tension release cam toward the operator (in the direction of arrow Ⓐ), the timing of releasing the thread tension will be earlier than the standard adjustment. Turn the tension release cam away from the operator (in the direction of arrow Ⓑ), the timing of releasing the thread tension will be later than the standard adjustment.

5) Height of feed dog

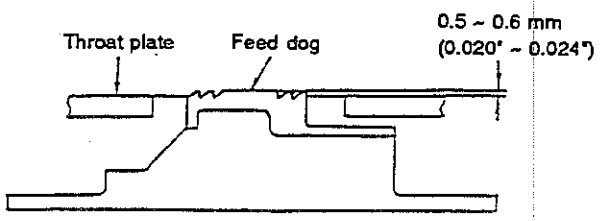


Fig. 1

Height of the feed dog:
0.5 to 0.6 mm (0.020" to 0.024")
Requirements:

- Set the stitch dial to "6" on the scale.
- Align the graduation "L" on the handwheel with the handwheel pointer.

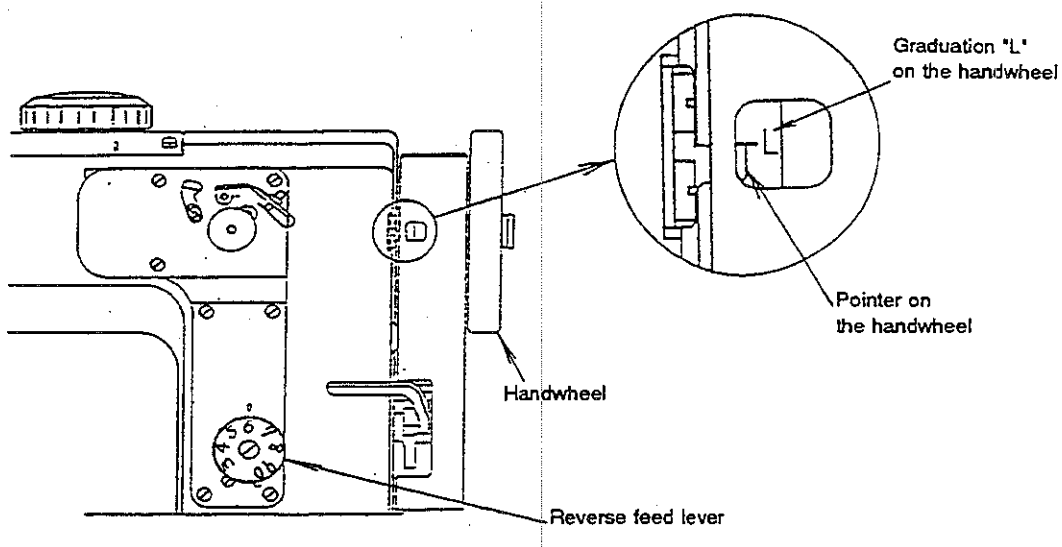


Fig. 2

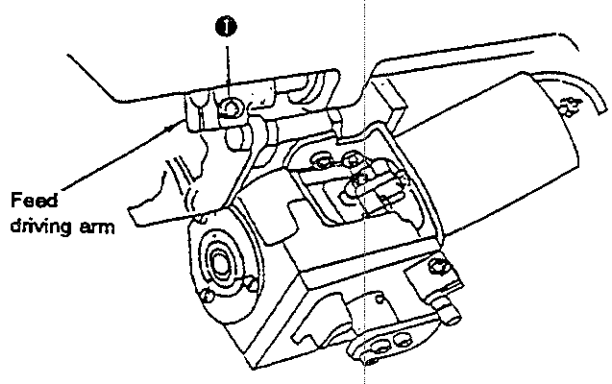


Fig. 3

How to adjust	Result of improper adjustment
5) Height of feed dog 1. Set the stitch dial to "6" on the scale. (Fig. 2) 2. Slightly loosen clamping screw ❶ in the feed driving arm. (Fig. 3) 3. Align the graduation "L" on the handwheel with the handwheel pointer. (Fig. 2) 4. Adjust the height of the feed dog to 0.5 to 0.6 mm (0.020" to 0.024"). (Fig. 1) 5. Tighten clamping screw ❶ in the feed driving arm. (Caution) Tighten the clamping screw with a tightening torque of 60 to 70 kgf.cm.	☆ If the height of the feed dog is excessive: The material may be fed backward under the normal feed mode. ☆ If the height of the feed dog is insufficient: The stitch length may become shorter than the specified value. 3' Refer to "(1) Kinds and names of graduations on the handwheel" on page 3.

6) The amount of alternating vertical movement of the walking foot and presser foot (Balance between the lifting amounts of presser foot and walking foot)

Align the graduation "L" on the handwheel with the handwheel pointer. Now, tighten top feed arm clamping screw ❶.

Requirements:

- The dial for setting the amount of alternating vertical movement of the walking foot and presser foot should be set to "1" on the scale.
- The stitch dial should be set to "9" on the scale.
- The sole of the presser foot should rest on the throat plate. Make the walking foot come in contact with the feed dog.
- The top feed timing should have been properly adjusted in prior to the adjustment of the amount of alternating vertical movement of the walking foot and presser foot.

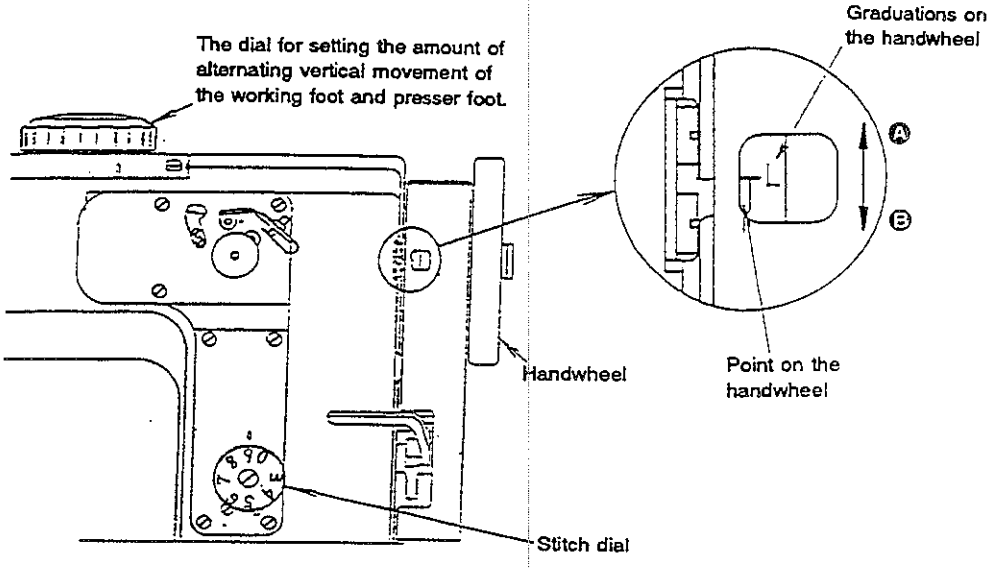


Fig. 1

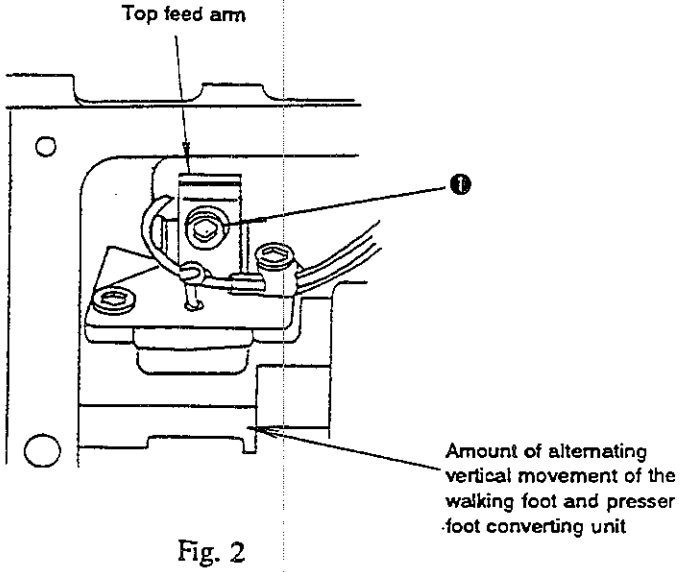


Fig. 2

How to adjust	Result of improper adjustment
1. Set the stitch dial to "9" on the scale. 2. Set the dial for setting the amount of alternating vertical movement of the walking foot and presser foot to "1" on the scale. 3. Remove the rubber plug from the top cover. 4. Loosen clamping screw ❶ in the top feed arm through the hole in the top cover from which the rubber plug has been removed. (Fig. 2 illustrates the top feed arm after removing the top cover.) 5. Align the graduation "L" on the handwheel with the handwheel pointer. (Fig. 1) 6. In the state described in step 5, make the walking foot rest on the feed dog and make the presser foot come in contact with the throat plate. 7. Tighten clamping screw ❶ in the top feed arm. (Fig. 2)	☆ Improper stitch length may result when making the machine run at high/low speed. ☆ The lifting amount of the presser foot or the walking foot will be decreased. As a result, the material may not be fed smoothly. 5' If the graduations on the handwheel shift in direction Ⓐ from the handwheel pointer, the lifting amount of the walking foot will decrease and the lifting amount of the presser foot will increase. If the graduations on the handwheel shift in direction Ⓑ, the former will increase and the latter will decrease.

(6) Adjustment of the feed mechanism

1) Zero (0) point of feed adjusting mechanism

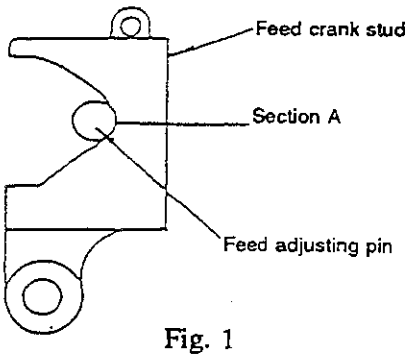


Fig. 1

- Align the feed adjusting pin with section A of the feed crank stud. (Fig. 1)
- Check that the marking of the feed adjusting eccentric pin faces in the direction same as the slot in the feed adjustment converting arm. (Fig. 2)
- Tilt the feed crank stud in the direction Ⓒ or Ⓓ until the position where the feed amount of the feed dog becomes zero (0). Tighten screw ❷ at this position. (Fig. 3)
- Align marking ❹ of the side plate on the front face of the machine with "0" on the scale of the stitch dial. (Fig. 4)

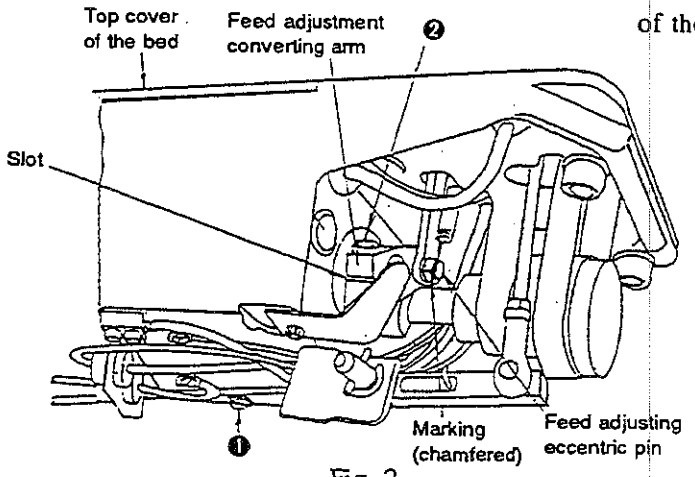


Fig. 2

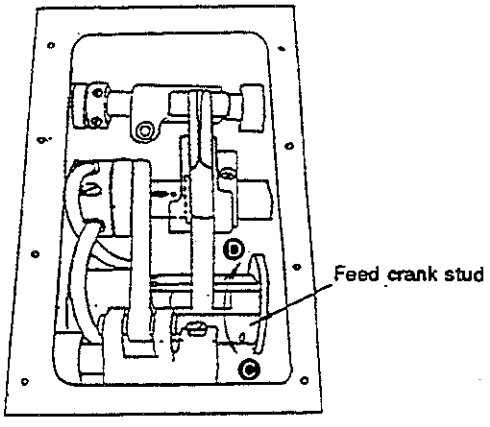
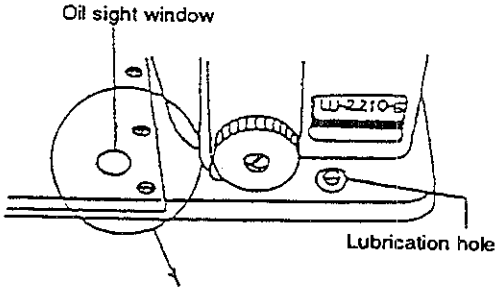


Fig. 3



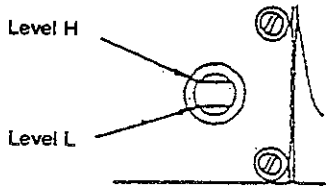


Fig. 5

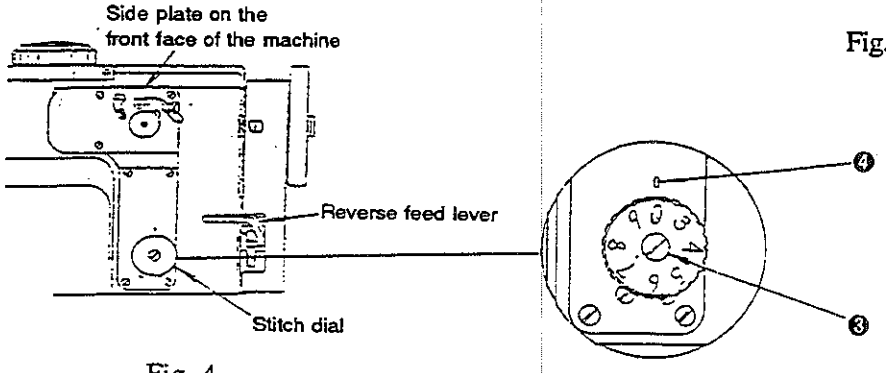


Fig. 4

How to adjust	Result of improper adjustment
1. Turn the stitch dial clockwise while moving the reverse feed lever up and down, until the feed adjusting pin meets section A of the feed crank stud. At this time, the feed adjusting pin and the feed crank stud cannot be observed. Performing the adjustment mentioned above, however, allows the operator to feel by hand that the reverse feed lever will no longer come down.	☆ The actual stitch length will greatly differ from the value set on the stitch dial.
2. Check that the marking (chamfered) of the feed adjusting eccentric pin faces in the direction same as the slot in the feed adjustment converting arm. (Fig. 2)	
3. Loosen drain cock ❶, and expel oil from the drain opening. (Fig. 2)	
4. Remove the top cover of the bed. (Fig. 2)	
5. Loosen release screw ❷ in the feed adjustment converting arm.	
6. Turn the handwheel in the normal direction of rotation to adjust the feed converting unit so that the feed amount of the feed dog is set to zero (0). (Fig. 3)	6' Tilt the feed converting unit in the direction of arrow Ⓒ, and the feeding amount in the normal direction will increase. Tilt the unit in the direction of arrow Ⓓ, and the feeding amount in the reverse direction will increase.
7. Tighten clamping screw ❷ in the feed adjustment converting arm at the aforementioned position. (Fig. 2)	
(Caution) **Tighten the screw with a tightening torque of 35 to 45 kgf.cm.**	
8. Supply oil to the machine. (Fig. 5)	8' Pour oil from the lubrication hole while checking the oil level through the oil sight window. The amount of oil is sufficient when level H is reached.
9. Loosen attaching screw ❸ of the stitch dial. (Fig. 4)	
10. Align zero (0) on the scale of the stitch dial with marking ❹ on the side plate of the front face of the machine. (Fig. 4)	
11. Tighten screw ❸ in stitch dial.	11' At this time, take care not to allow the stitch dial to move to make the zero (0) on the scale of the dial shift from marking ❹ on the side plate.

2) Stitch length in the normal feed and reverse feed

Stitch length will change in accordance with the position of the marking (chamfered section) of the feed adjusting eccentric pin with respect to the slot in the feed adjustment converting arm are positioned as described below.

- If the marking is tilted in the direction of arrow Ⓐ
  ..... The stitch length for the normal feed stitching will decrease, and stitch length for the reverse feed stitching will increase.
- If the marking is tilted in the direction of arrow Ⓑ
  ..... The stitch length for the normal feed stitching will increase, and stitch length for the reverse feed stitching will decrease.

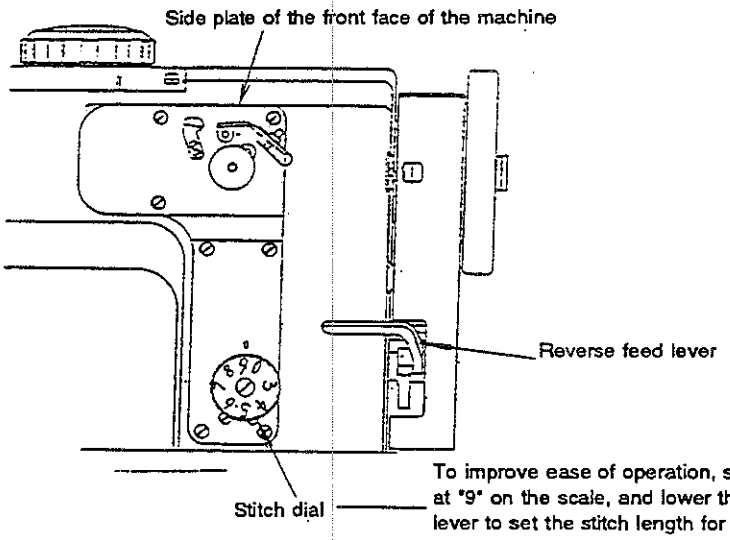


Fig. 1

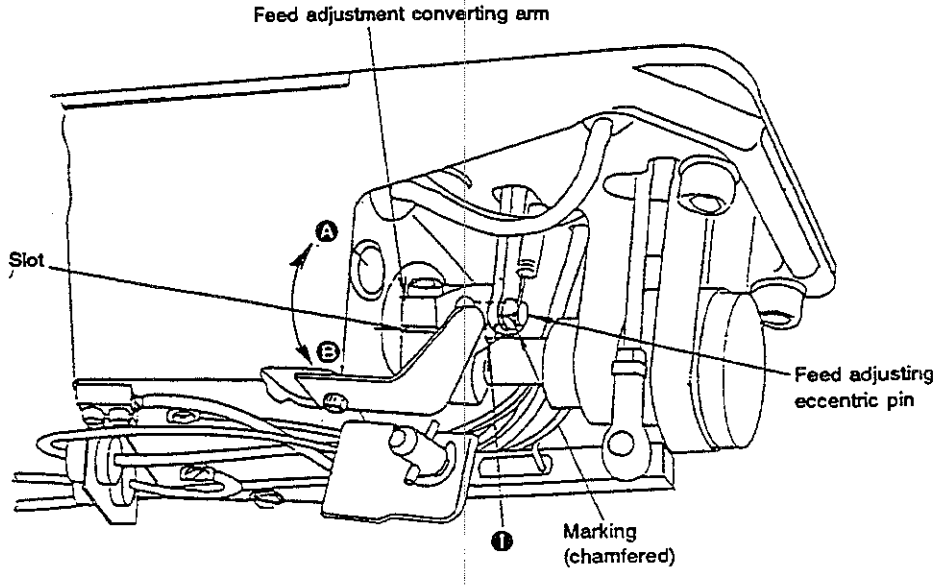
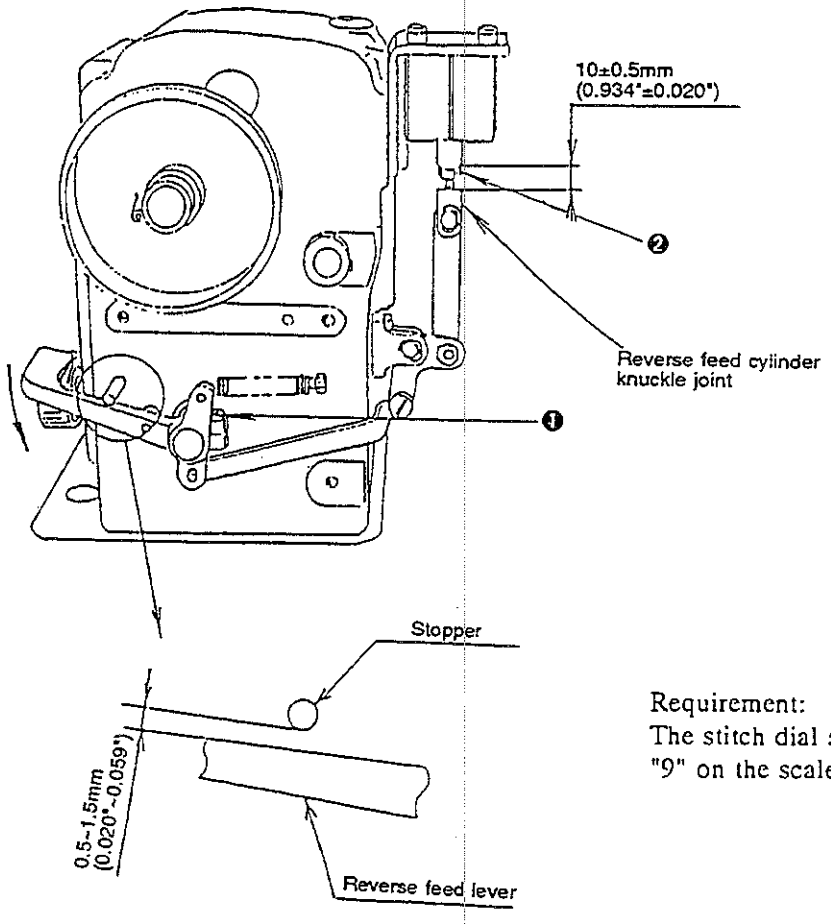


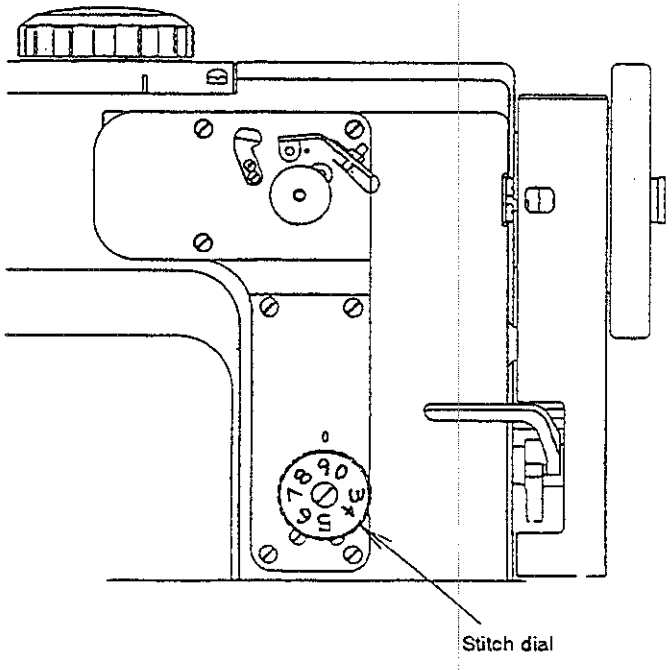
Fig. 2

How to adjust	Result of improper adjustment
1. Set the stitch dial at "9" on the scale. 2. Lower the reverse feed lever. 3. Slightly loosen screw ❶ in the feed adjusting eccentric pin. 4. Set the stitch dial at "0" on the scale.	☆ The stitch length specified may not be equally obtained in the normal feed stitching and the reverse feed stitching, resulting in excessive stitch length error between the normal feed stitching and the reverse feed stitching.
5. Make the marking (chamfered section) of the feed adjusting eccentric pin face in the direction of the slot in the feed adjustment converting arm.	5' • Turning the feed adjusting eccentric pin A upward (in the direction of arrow Ⓐ) decreases the stitch length for the normal feed stitching and increases the stitch length for the reverse feed stitching. Turning the feed adjusting eccentric pin A downward (in the direction of arrow Ⓑ) increases the stitch length for the normal feed stitching and decreases the stitch length for the reverse feed stitching. • The machine has been factory-adjusted so that stitch length error in the normal/reverse feed stitching does not exceed ±10% of the specified value when the stitch dial is set to "6" on the scale.
6. Tighten screw ❶ in the state described in the aforementioned item 2.	

(7) **Position of the reverse feed connecting arm**



Requirement:
The stitch dial should be set at "9" on the scale.



How to adjust	Result of improper adjustment
Adjusting the position of the reverse feed lever 1. Set the stitch dial at the maximum value of "9" on the scale. 2. Loosen clamping screw ❶ in the reverse feed connection arm. 3. Adjust so that a clearance of 0.5 to 1.5 mm (0.020" to 0.059") is provided between the reverse feed lever and the stopper when the reverse feed lever is slightly pressed down, and tighten clamping screw ❶. (Caution) **For the sewing machine equipped with a touch-back mechanism, a clearance of 10±0.5 mm (0.394"±0.020") should be provided between the top end of the reverse feed cylinder rod and the reverse feed cylinder knuckle joint.** **Securely tighten locknut ❷ in the knuckle joint.**	☆ If the clearance between the stopper and the reverse feed lever is too large: o The top end of the reverse feed lever will interfere with the bed. As a result, stitch length for the reverse feed stitching may be shortened. ☆ If the clearance between the stopper and the reverse feed lever is too small: o The reverse feed lever will interfere with the stopper. As a result, stitch length for the normal feed stitching may be shortened.

(8) **Bobbin winder**

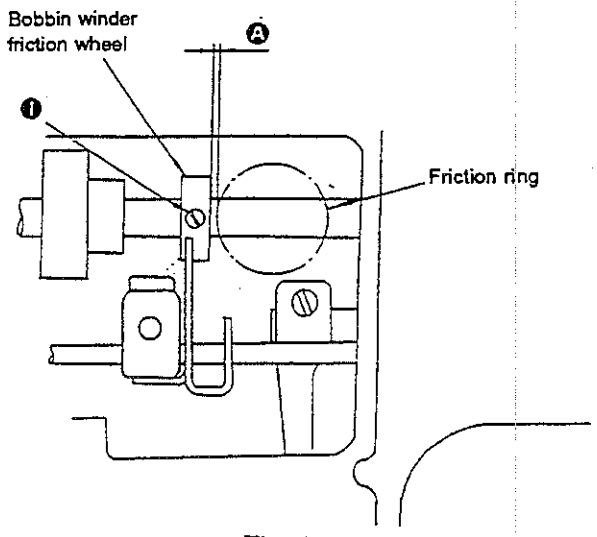


Fig. 1

Ⓐ : 0.3 ~ 0.6 (mm)
(0.012"~0.024")
Ⓑ : 24±1 (mm)
(0.945"±0.039")
Ⓒ : 8.5±1 (mm)
(0.335"±0.039")
Note that Ⓐ and Ⓑ are in the reset state.

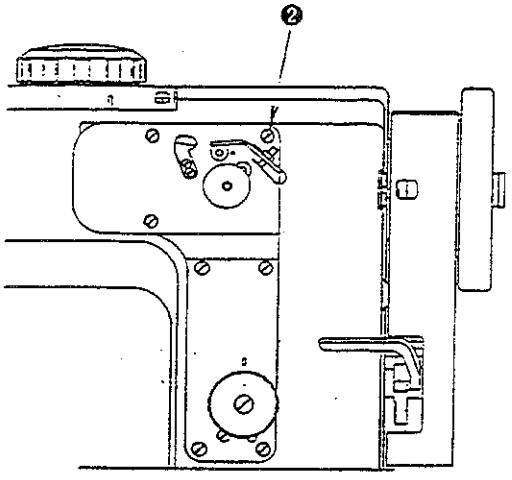


Fig. 2

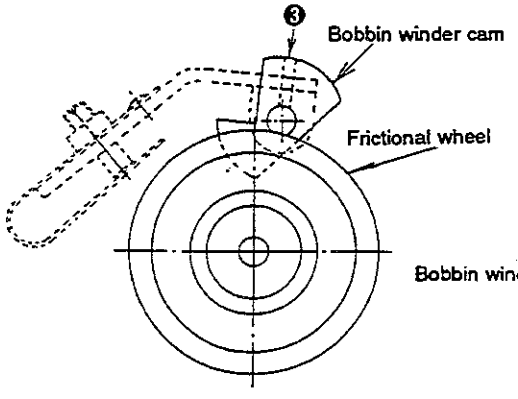


Fig. 3

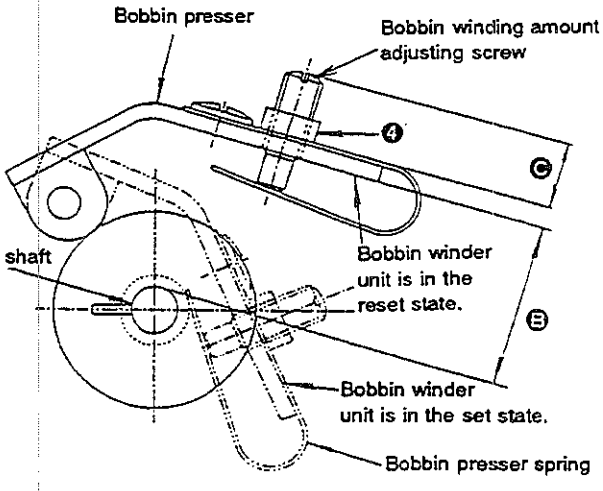


Fig. 4

Note) Fig. 3 is illustrated as observed from the rear side of the machine head with the side plate on the front of the machine head removed.

How to adjust	Result of improper adjustment
1) Adjusting the bobbin winder friction wheel	
1. Loosen the screw in the reverse feed cylinder.	These steps of procedure are not necessary for the sewing machine that is not equipped with an auto-lifter.
2. Remove the reverse feed cylinder.	
3. Remove the side plate.	
4. Set the bobbin winder in its released state. (Fig. 4)	
5. Loosen screws ❶ in the bobbin winder friction wheel. (Fig. 1)	
6. Adjust the clearance Ⓐ between the bobbin winder friction wheel and the friction ring to 0.3 to 0.6 mm (0.012" to 0.024"). (Fig. 1)	
7. Tighten screw No. 1 ❶ in the friction wheel. Then tighten the screw No. 2. (Fig. 1)	
8. Set the bobbin winder in the operating position, and check that the bobbin winder shaft rotates normally.	8' If the bobbin winder fails to rotate normally, finely adjust the clearance provided between the bobbin winder friction wheel and the friction ring properly.
9. Attach the side plate in place.	9' If your sewing machine is equipped with an auto-lifter, attach the side plate in place while referring to "8" of "Needle entry in the needle slot of the feed dog in the feeding direction" on page 9.
2) Adjusting the bobbin winding amount	
1. Loosen screw ❷ in the side plate on the front of the machine head. (Fig. 2)	
2. Remove the side plate from the front of the machine head. (Fig. 2)	
3. Loosen screw ❸ in the bobbin winder cam. (Fig. 3)	
4. Adjust distance Ⓑ from the bobbin winder shaft to the bobbin presser to 24±1 mm (0.945"±0.039"). (Fig. 4)	
5. Loosen screw ❸ in the bobbin winder cam. (Fig. 3)	
6. Attach the side plate on the front of the machine head. (Fig. 2)	
7. Adjust distance Ⓒ from the top surface of the bobbin presser plate to the bobbin winding amount adjusting screw to 8.5±1 mm (0.335"±0.039") by turning the bobbin winding amount adjusting screw. (Fig. 4)	
8. Make the sewing machine perform bobbin winding.	8' Adjust so that the bobbin is wound with thread approximately up to 80% of its capacity (diameter of the bobbin wound with thread: 23.3 mm (0.917")) by turning the bobbin winding amount adjusting screw.
9. Securely tighten hexagon nut ❹. (Fig. 4)	

(9) **Thread trimmer**

1) Counter knife
2) Clamp spring

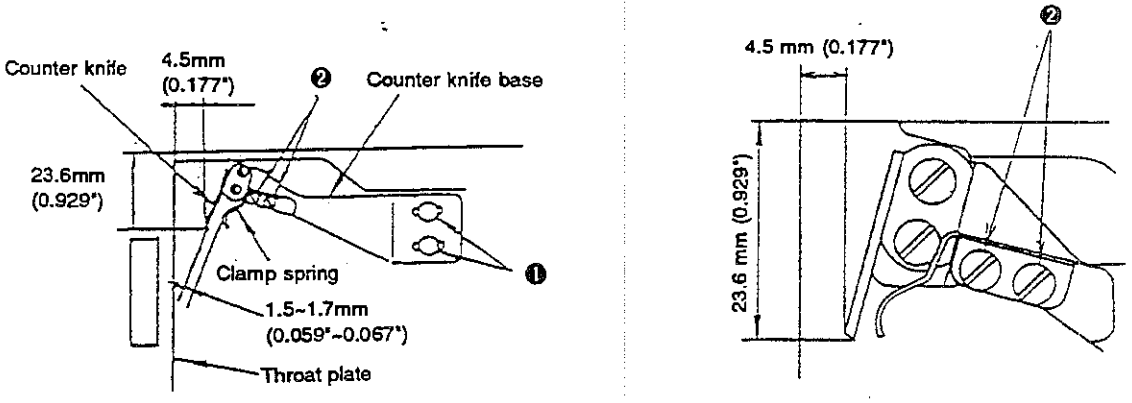


Fig. 1

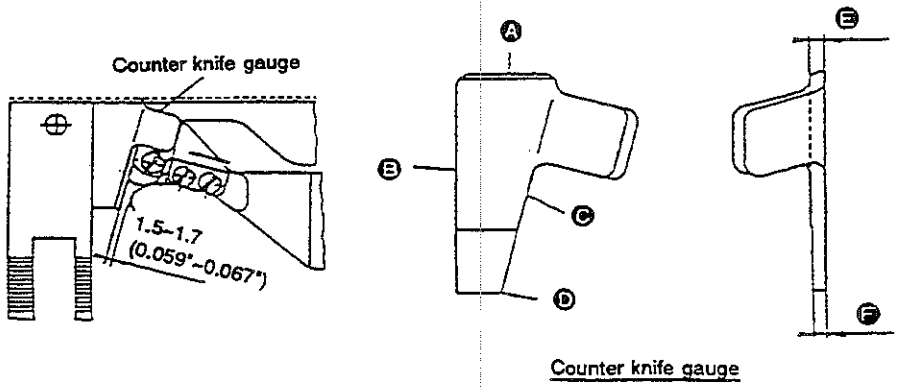


Fig. 2

How to adjust	Result of improper adjustment
1) Counter knife (1) Loosen attaching screw ❶ in the counter knife base. (Fig. 1) (2) Bring the counter knife to the position shown in Fig. 1 using the counter knife gauge supplied with the machine. At this time, adjust the counter knife gauge so that section Ⓐ of the counter knife gauge should come in contact with the attaching groove on the bed slide plate, and section Ⓑ should come in contact with the end face of the throat plate. (Fig. 1 and Fig. 2) (3) Move the counter knife base to adjust so that the counter knife comes in contact with sections Ⓒ and Ⓓ of the counter knife gauge. Then, tighten attaching screw ❶.	If dimension A is larger than the specified value (4.5 mm (0.177")): • Knife pressure will be higher. As a result, the motor may be unnecessarily stopped. If dimension A is smaller than the specified value (4.5 mm (0.177")): • Knife pressure will be lower, resulting in thread breakage. If dimension B is larger than the specified value (23.6 mm (0.929")): • The length of bobbin thread to be clamped will be shortened, resulting in stitch skipping. If dimension B is smaller than the specified value (23.6 mm (0.929")): • Thread trimming failure may result.
2) Clamp spring (1) Loosen attaching screw ❷ of the clamp spring. (Fig. 1) (2) Adjust the clearance provided between the clamp spring and the counter knife by sliding the clamp spring along the surface of the counter knife installing base on which the clamp spring is to be attached. At this time, adjust the clearance using sections Ⓔ and Ⓕ of the counter knife gauge. Thickness of section Ⓔ is 1.7 mm (0.067") and that of section Ⓕ is 1.5 mm (0.059"). Adjust the position of the clamp spring so that section Ⓔ of the gauge does not smoothly pass through the clearance provided between the clamp spring and the counter knife and so that section Ⓕ of the gauge smoothly pass through it. (3) Tighten attaching screw ❷ of the clamp spring. (Fig. 2)	If the clearance provided between the clamp spring and the counter knife is too large: • Bobbin thread clamping failure may result. If the clearance provided between the clamp spring and the counter knife is too small: • The clamp spring may clamp the needle thread. This means that the material may not be taken out from the sewing position with ease. As a result, the bobbin thread clamped may be removed together with the material.

3) Knife pressure

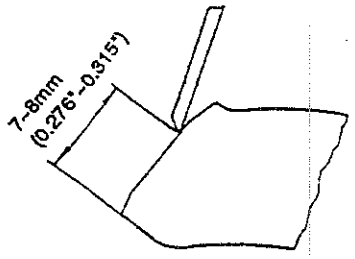


Fig. 3

4) Moving knife driving arm A and B

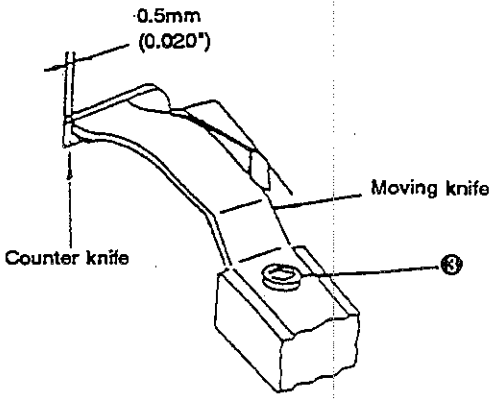


Fig. 4

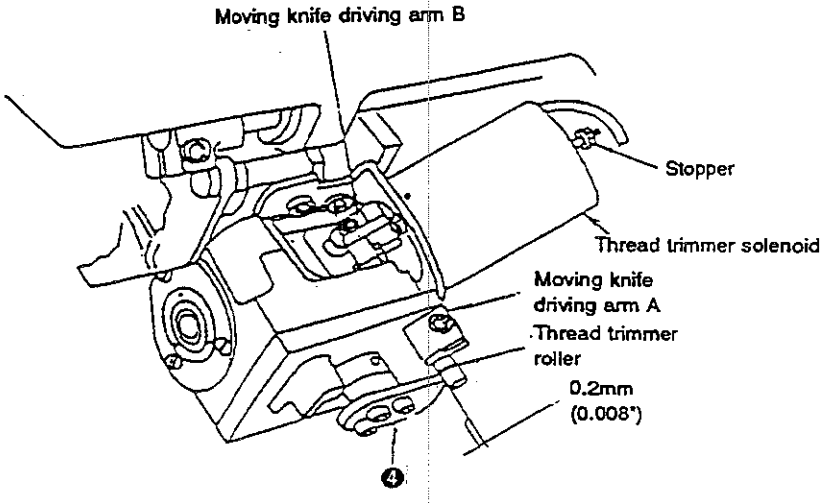


Fig. 5

How to adjust	Result of improper adjustment
3) Knife pressure Adjust, when the moving knife and the counter knife come in contact with each other, the attaching position of the moving knife so that the moving knife starts coming in contact with the counter knife at the position that is 7 to 8 mm (0.276" to 0.315") away from the top end of the knife. (Fig. 3 and Fig. 4) At this time, perform the aforementioned adjustment after loosing attaching screw ❸ of the moving knife. (Fig. 4)	• If the knife pressure is too high: The counter knife blade and the moving knife blade may break. • If the knife pressure is too low: Thread trimming failure may result.
4) Moving knife driving arms A and B (1) Adjust so that the top end of the moving knife is spaced 0.5 mm (0.020") from the top end of the counter knife. (Fig. 4 and Fig. 5) (2) Adjust so that a clearance of 0.2 mm (0.008") is provided between the thread trimming cam and the thread trimming cam roller when the thread trimming cam is brought to the highest position of its stroke. (Fig. 5) (2) Put the stopper of the plunger of the thread trimmer solenoid onto the main body of the solenoid. (Fig. 5) (3) Tighten the clamping screws in the moving knife driving arms A and B. (Fig. 5) Item to be confirmed: Turn the handwheel by hand to make the sewing machine perform thread trimming and align the top end of the moving knife with the top end of the counter knife. This is the initial position of the thread trimming mechanism. At this time, confirm that a clearance of 0.05 to 0.15 mm (0.002" to 0.006") is provided between the stopper of the thread trimming solenoid and the main body of the thread trimming solenoid.	If the distance from the top end of the counter knife to the top end of the moving knife is larger than the specified value: • The moving knife may overrun after trimming the thread, resulting in clamping failure. If the distance from the top end of the counter knife to the top end of the moving knife is smaller than the specified value: • The main body of the solenoid may come in contact with the stopper of the plunger at the time of thread trimming.

5) Height of the moving knife

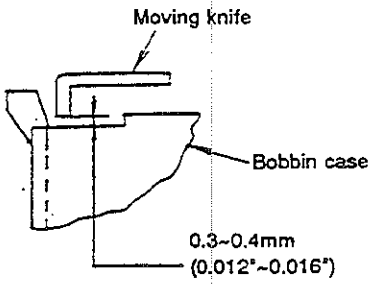


Fig. 1

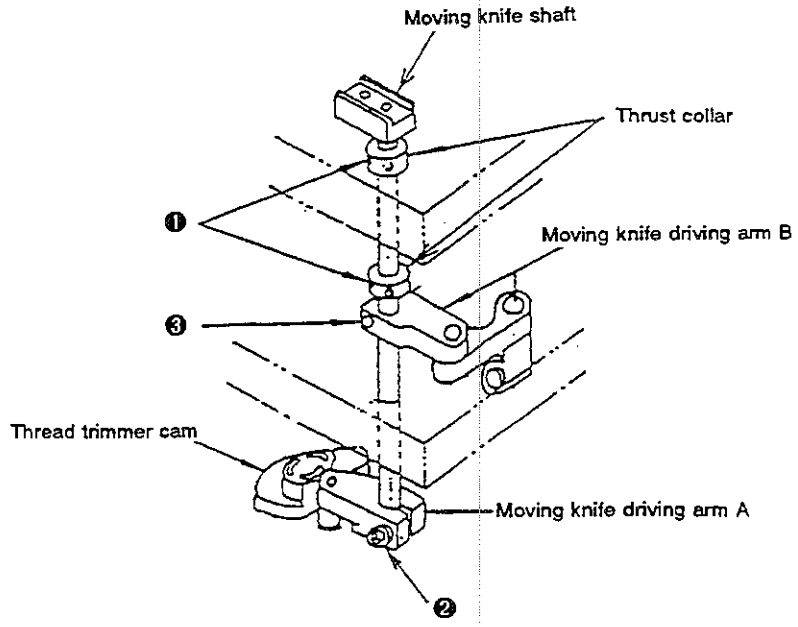
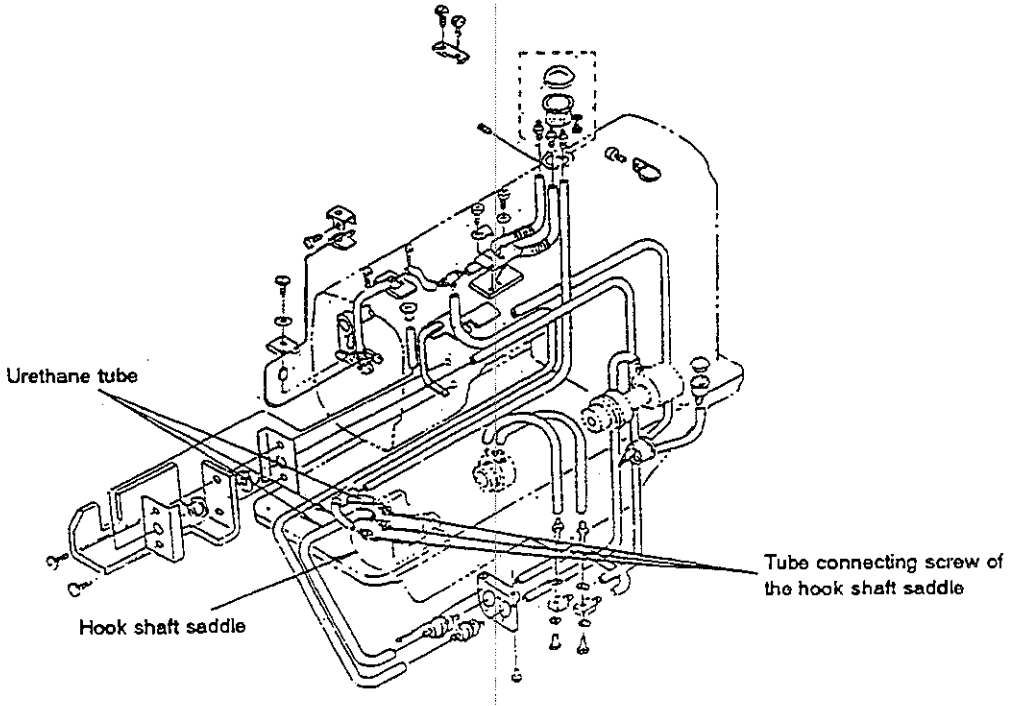
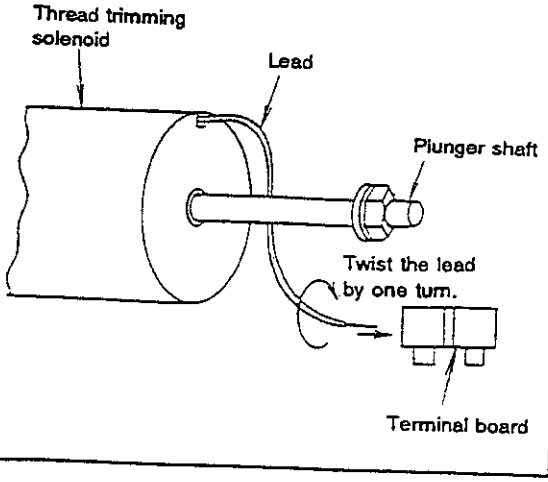


Fig. 2



How to adjust	Result of improper adjustment
5) Height of the moving knife (1) Remove the lead of the thread trimmer solenoid from the terminal board. (2) Loosen the the clamping screw in the hook driving shaft set collar. (3) Remove urethane tube from the tube connecting screws of the hook driving shaft saddle.	If the clearance provided between the moving knife and the bobbin case is too large: • The needle thread and bobbin thread may fail to be caught by the knife. If the clearance provided between the moving knife and the bobbin case is too small: • The moving knife may interfere with the bobbin. (In the standard adjustment, the machine has been designed so that the moving knife slightly comes in contact with the bobbin.) (4)' Widen the space in the hook driving shaft coupling, then remove the hook driving shaft saddle.
(4) Loosen the attaching screw in the hook driving shaft saddle, and remove the hook driving shaft saddle. (5) Loosen the screw ❶ in the thrust collar of the moving knife. (Fig. 2) (6) Loosen screw ❷ in the moving knife driving arm A. (Fig. 2) (7) Loosen screw ❸ in the moving knife driving arm B. (Fig. 2) (8) Adjust the clearance provided between the moving knife and the bobbin case properly by moving the moving knife shaft up and down. (Fig. 1) (9) Tighten screw ❶ in the thrust collar of the moving knife. (10) Adjust moving knife driving arm A, and tighten screw ❷. (Refer to "Moving knife driving arm A and B" on page 37.) (11) Adjust moving knife driving arm B, and tighten screw ❸. (Refer to "Moving knife driving arm A and B" on page 37.) (12) Temporarily fix the hook driving shaft saddle. (13) Attach the lead of the thread trimmer solenoid to the terminal board. (14) Attach an urethane tube to the tube connecting screw of the hook shaft saddle. At this time, use the tube connecting screw to which the urethan tube has been attached before removing it. (15) Adjust the clearance provided between the needle and the blade point of the hook. (Refer to "Clearance between the needle and the blade point of hook" on page 13.) (16) Adjust the needle-to-hook timing. (Refer to "Timing between the needle and the hook" on page 15.)	13' Give the lead a clockwise turn and connect it to the terminal board while routing it along the back of the solenoid. At this time, take care not to allow the lead to come in contact with the plunger shaft. (See the figure shown below.) 

6) Thread trimmer cam

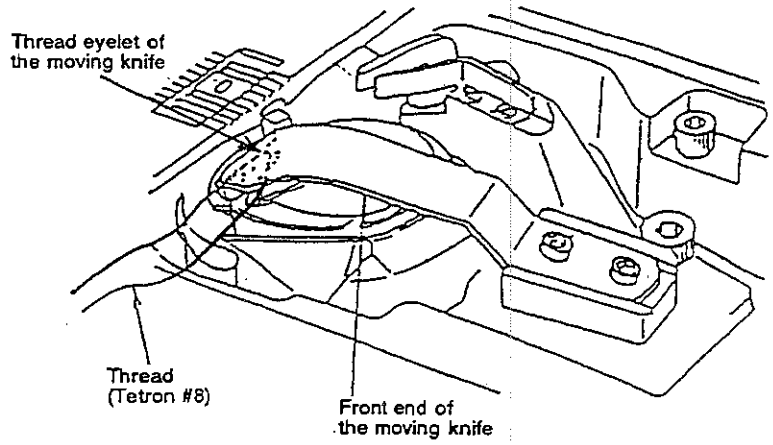


Fig. 1

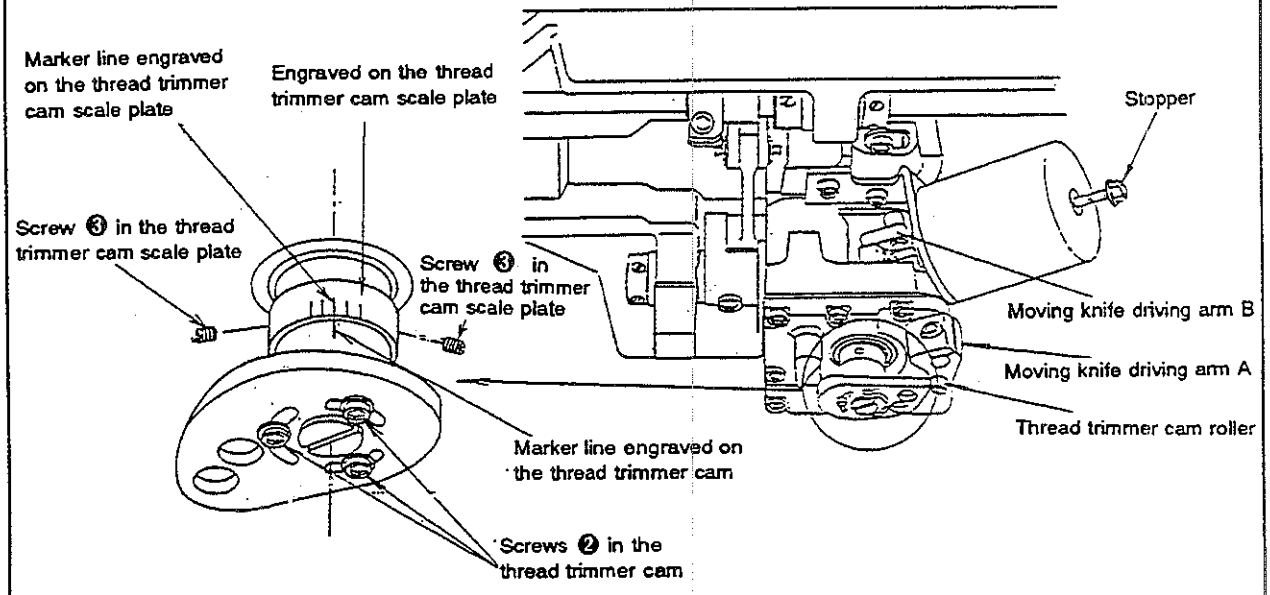


Fig. 2

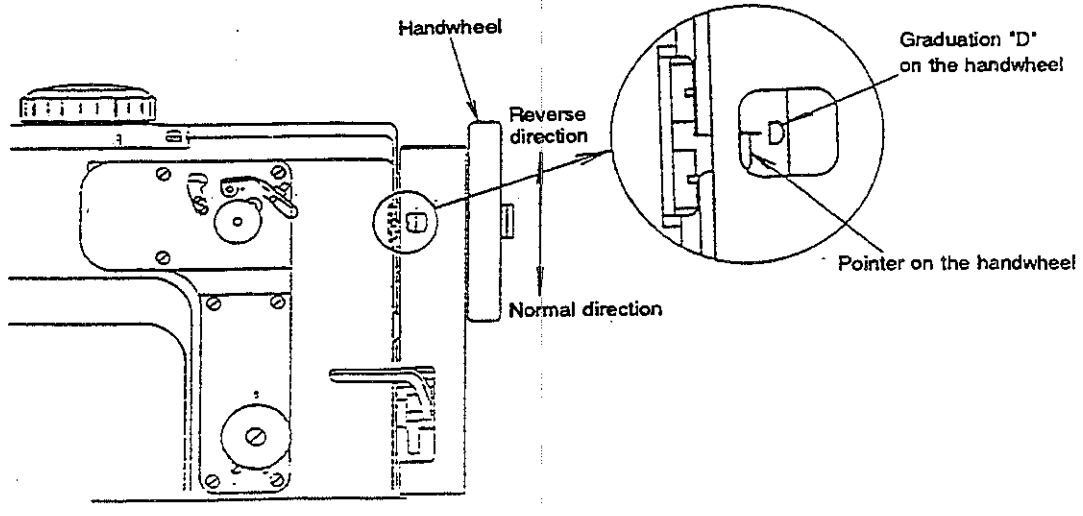


Fig. 3

How to adjust	Result of improper adjustment
(1) Tilt the machine head, and make the head support bar hold the head at that position. (2) Move the moving knife forward by hand until it will go no further. (Fig. 1) (Draw the moving knife forward from its initial position. While turning the handwheel by hand, and the moving knife will move.) (3) Put a thread (tetron #8) onto the thread eyelet of the moving knife. (The thread should be held slackened until the machine completes thread trimming.) (4) Turn the handwheel slowly by hand in the normal direction of rotation. (Fig. 3) (5) The moving knife engages with the counter knife, and the knives trim the thread. Now, stop turning the handwheel. (6) Turn the handwheel from the position described in step (5) slightly in the reverse direction of rotation. Turn it to the extent where the thread trimmer cam does not come in contact with the thread trimmer cam roller. (Fig. 2) (7) Loosen screw ❷ in the thread trimmer cam. (Fig. 2) (8) Securing the thread trimmer cam by hand so that it does not come in contact with moving knife driving arm A, turn the handwheel until the graduation "D" on the handwheel meets the handwheel pointer. (Fig. 2) (9) In the state described in step (7), turn the thread trimmer cam until it slightly come in contact with the cam roller of moving knife driving arm A. (Fig. 2) (10) Tighten screw ❷ in the thread trimmer cam. (Fig. 2) (11) Check that the timing of thread trimming action has been properly adjusted. Repeat the steps (3) and (4), and make the sewing machine perform thread trimming. Now, check that the graduation "D" on the handwheel meets the handwheel pointer since they meet with each other if the timing of thread trimming action has been properly adjusted. (12) Loosen screws ❸ in the thread trimmer cam scale plate. (Fig. 2) (13) Turn the thread trimmer cam scale plate, align the marker line (the center line of the five marker lines) engraved on the thread trimmer cam scale plate with the marker line engraved on the thread trimmer cam. (Fig. 2) (14) Tighten screws ❸ in the thread trimmer cam scale plate.	☆ If the timing of thread trimming is too early: • The length of thread remaining at the needle after thread trimming will be insufficient. As a result, the thread may slip off the needle eyelet at the sewing start or after thread trimming. • Stitch skipping may occur at the start of sewing. ☆ If the timing of thread trimming is too late: o Thread trimming failure may result. (8)' Refer to "(1) Kinds and names of graduations on the handwheel" on page 3. (12), (13), (14) The thread trimmer cam scale plate is used when changing the adjustment value from the standard one to the special one.

(10) Opener

1) Timing of opener

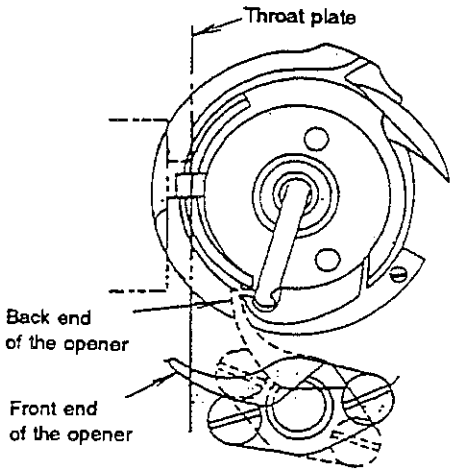


Fig. 1

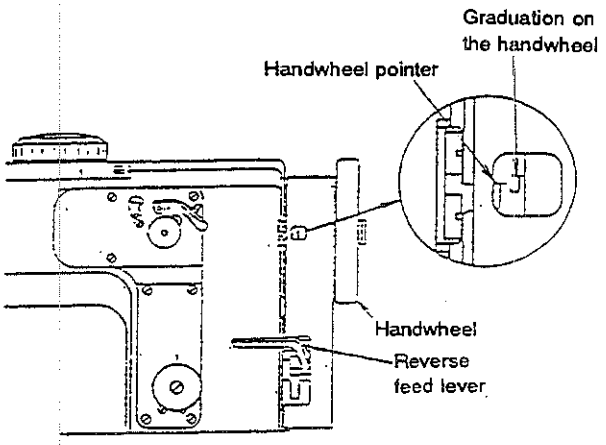
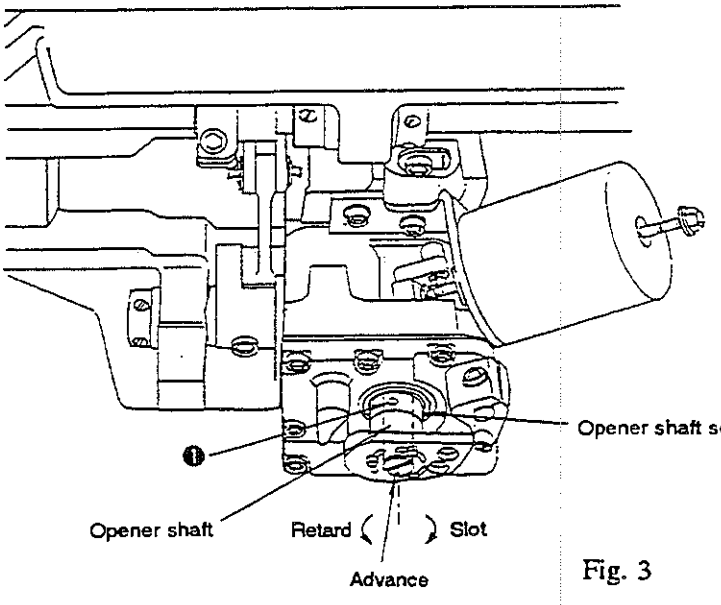


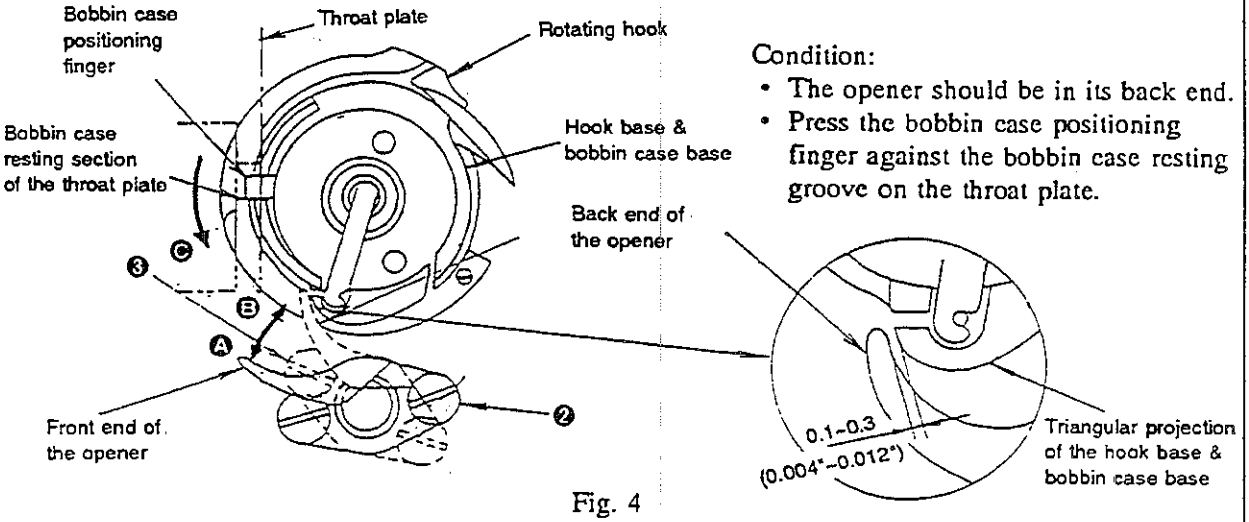
Fig. 2



Condition:
The opener should be brought to its back end when the graduation "J" on the handwheel meets the handwheel pointer.

Fig. 3

2) Clearance between the opener and the protruding section of the bobbin case



Condition:
- The opener should be in its back end.
- Press the bobbin case positioning finger against the bobbin case resting groove on the throat plate.

Fig. 4

How to adjust	Result of improper adjustment
1) Adjusting the timing of opener 1. Loosen two screws ❶ in the screw gear of the opener shaft. (Fig. 3) 2. Align the graduation "J" on the handwheel with the handwheel pointer. (Fig. 2) 3. Turn the opener shaft using the slot provided on the bottom end of the opener shaft. (Fig. 3) 4. For the standard adjustment, adjust so that the opener is brought to the extreme forward position in the state described in item 2 by turning the opener shaft. Then, tighten screw ❶ in the screw gear of the opener shaft. (Figs. 1 and 3) **(Caution)** **Re-adjust the thread trimmer cam after the completion of the adjustment of the opener timing. (Refer to "Thread trimer cam" page 41.)**	☆Loose stitches may result. 2' Refer to "(1) Kinds and names of graduations on the handwheel" on page 3. 4' At this time, tighten screws ❶ while pressing down the screw gear of the opener shaft so as to eliminate a play. Turn the opener shaft clockwise as viewed from underside, and the timing of the opener will be advanced. Turn the opener shaft counterclockwise, and it will be retarded.
2) Adjusting the clearance between the opener and the projection of the bobbin case 1. Turn the handwheel to move the opener in the direction of arrow Ⓐ. Then, loosen opener attaching screw ❷. (Fig. 4) 2. Turn the handwheel to move the opener in the direction of arrow Ⓑ. Then, loosen opener attaching screw ❸. At this time, be sure to loosen the screw with the opener positioned at its back end. (Fig. 4) 3. Turn the bobbin case in the direction of arrow Ⓒ until the bobbin case positioning finger against the bobbin case resting section of the throat plate. (Fig. 4) 4. Move the opener to adjust so that a clearance of 0.1 to 0.3 mm (0.004" to 0.012") is provided between the opener and the triangular projection of the bobbin case. (Fig. 4) 5. Tighten opener attaching screw ❸. 6. Turn the handwheel to move the opener in the direction of arrow Ⓐ. Then tighten opener attaching screw ❷. (Fig. 4)	☆ If the clearance provided between the opener and the protruding section of the bobbin case is too large: • Loose stitches may result. ☆ If the clearance provided between the opener and the protruding section of the bobbin case is too small: • The bobbin case may break.

(11) Presser lifting unit (Manual type)

1) Presser bar lifting lever

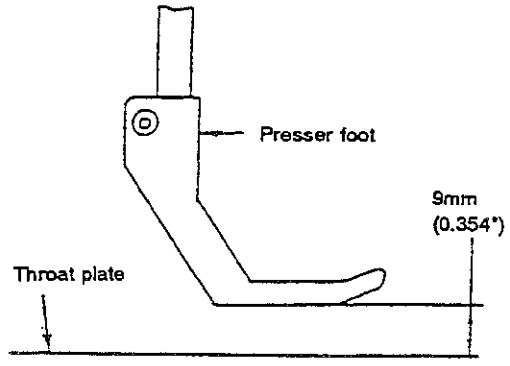


Fig. 1

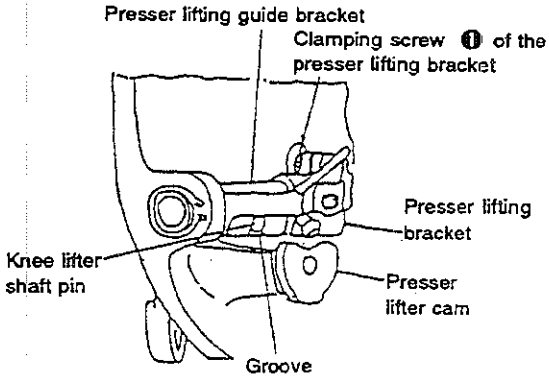


Fig. 2

2) Knee lifter arm A

Requirement:
Height of the presser foot should be 9 mm (0.354").

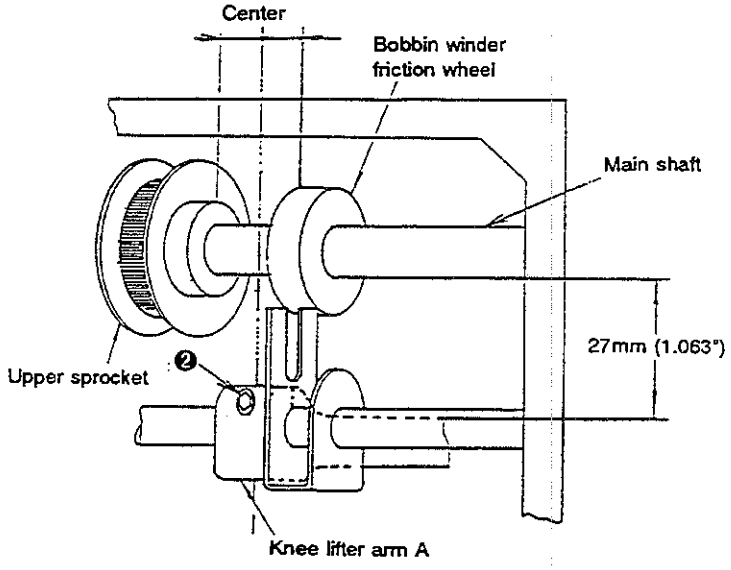


Fig. 3

3) Knee lifter arm B

Requirement: The presser foot should rest on the throat plate.

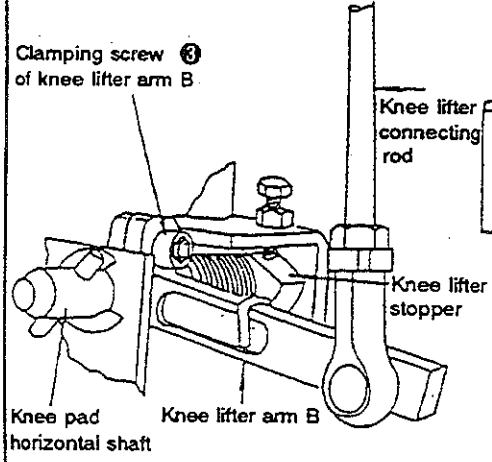


Fig. 4

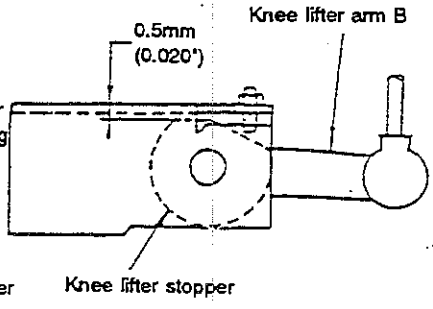


Fig. 5

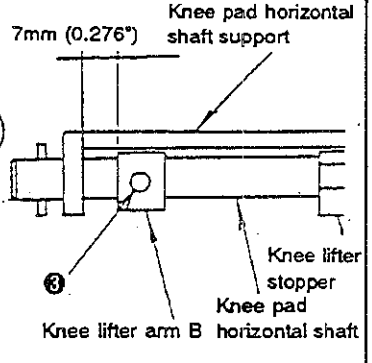
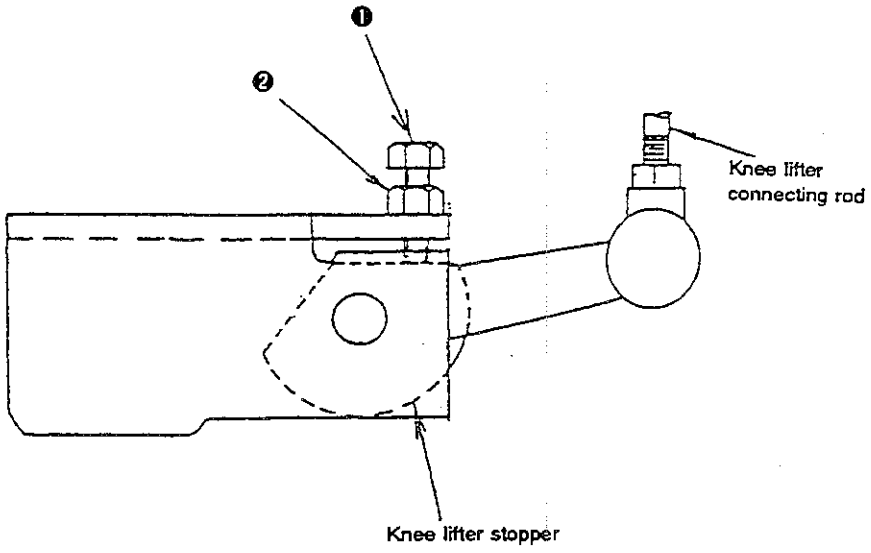


Fig. 6

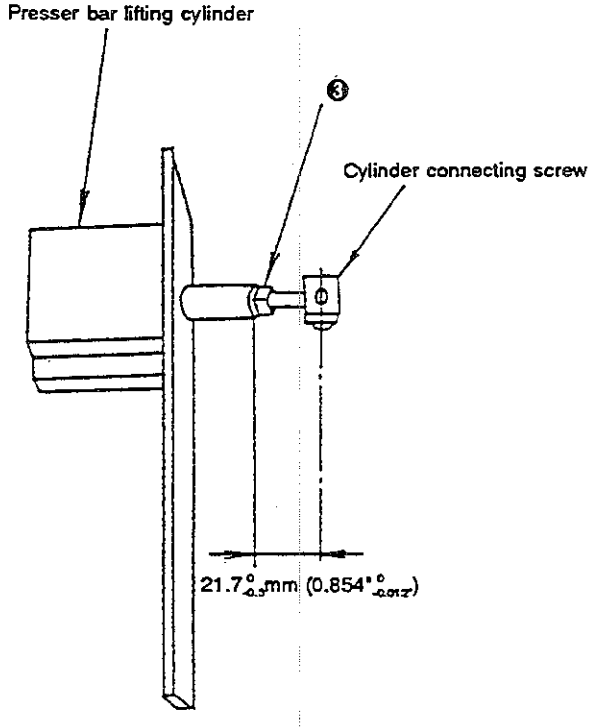
How to adjust	Result of improper adjustment
1) Presser bar lifting lever (1) Loosen screws in the face plate, and remove the face plate. (2) Adjust the height of the presser foot is set to 9 mm (0.354"). (Fig. 1) (3) In the state described in step (2), make the presser lifter cam come in contact with the presser lifting bracket pin as illustrated in Fig. 2. When the presser bar lifting lever is raised, the presser lifter cam should be positioned as illustrated in the figure. (Fig. 2) (4) Adjust so that the knee lifter shaft pin comes in contact with the end of groove in the presser bar guide arm. (Fig. 2) (5) Align the end of the presser bar guide arm with the end of presser lifting bracket. (6) Tighten clamping screw ❶ in the presser lifting bracket. (Fig. 2) 2) Knee lifter arm A (1) Raise the presser bar lifting lever to lift the presser foot as high as 9 mm (0.354"). (Fig. 1) (2) Adjust so that the top end of the knee lifter arm A is spaced 27 mm (1.063") from the main shaft. Adjust the lateral position of the knee lifter arm A so that the arm is brought to the center of the upper sprocket and bobbin winder friction wheel. (Fig. 3) (3) Tighten clamping screw ❷ in the knee lifter arm A. (Fig. 3) **(Caution)** **Tighten the clamping screw with a tightening torque of 40 to 50 kgf.cm.** 3) Knee lifter arm B (1) Lower the presser bar lifting lever to make the presser foot rest on the throat plate. (2) Raise the knee lifter connecting rod, and turn the knee pad horizontal shaft to adjust so that a clearance of 0.5 mm (0.020") is provided between the knee lifter stopper and the knee lifter plate horizontal shaft support when the presser foot starts going up. (3) Adjust the clearance between the knee lifter arm B and the knee lifter plate horizontal shaft support to 7 mm (0.276"). (4) Tighten clamping screw ❸ in the knee lifter arm B. **(Caution)** **Tighten the clamping screw with a tightening torque of 40 to 50 kgf.cm.**	

4) Knee lifter stopper

Requirement:
Height of the presser foot should be 16 mm (0.630").



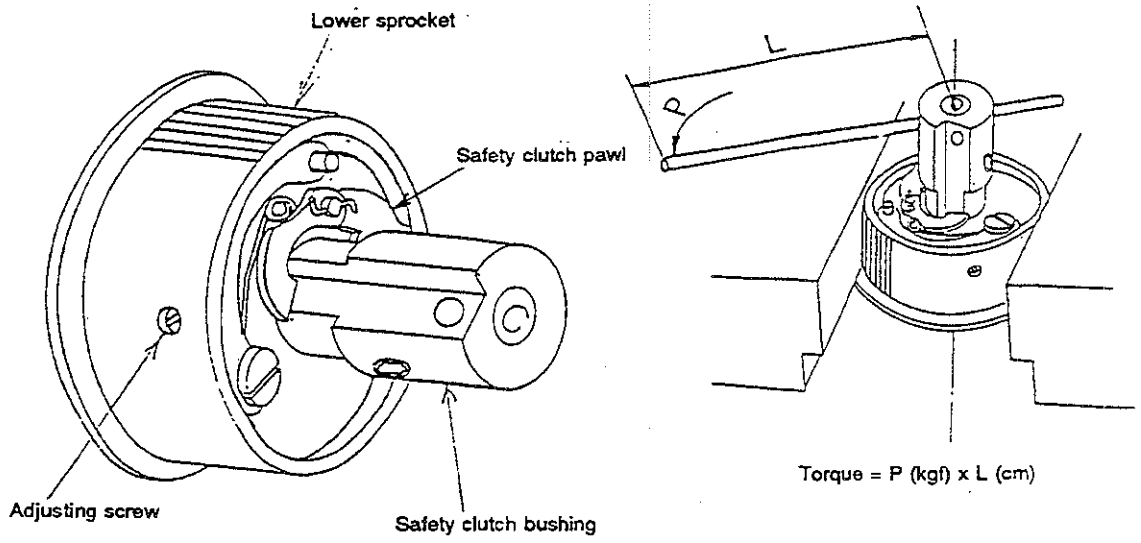
5) Presser bar lifting cylinder



How to adjust	Result of improper adjustment
4) Knee lifter stopper (1) Raise the presser lifter connecting rod by hand to lift the presser foot as high as 16 mm (0.630"). (2) In the state described in step (1), adjust so that the top end of screw ❶ of the stopper comes in contact with the knee lifter stopper. (3) Tighten lock nut ❷. 5) Presser bar lifting cylinder **(Caution)** **This adjustment is not necessary for the sewing machine that is not equipped with an auto-lifter.** (1) Loosen locknut ❸ in the cylinder connecting screw. (2) Adjust so that the top end of the rod of the presser bar lifting cylinder is spaced $21.7^{0}_{-0.3}$mm (0.854" $^{0}_{-0.012}$") from the center of the cylinder connecting screw. (3) Tighten locknut ❸ in the cylinder connecting screw.	

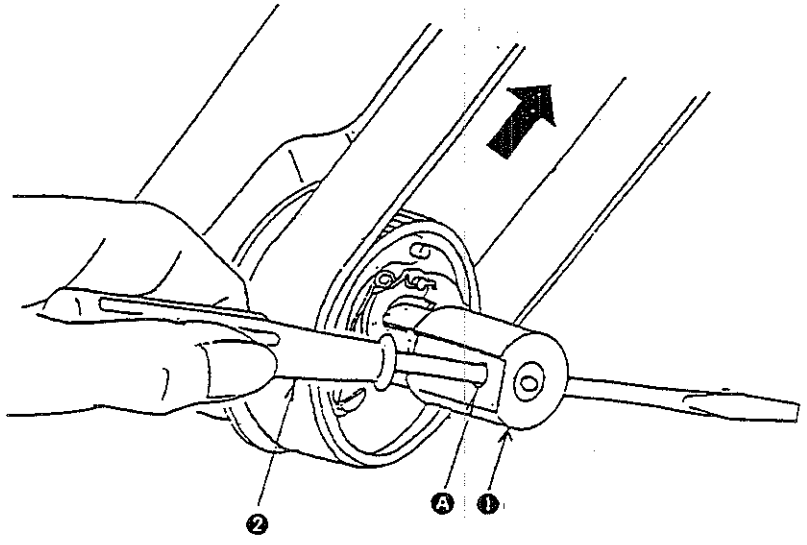
(12) Safety mechanism

1) Adjusting the releasing torque



Standard specification of the releasing torque: 85 to 115 kgf.cm

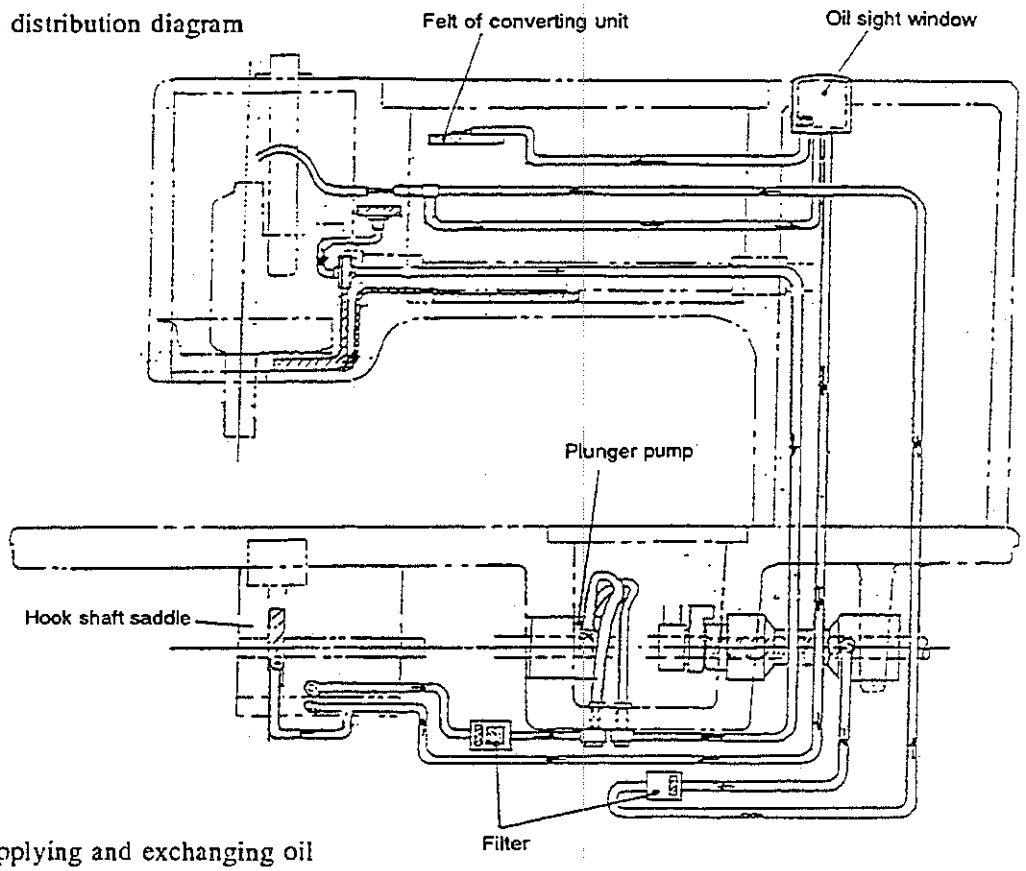
2) Releasing the safety mechanism



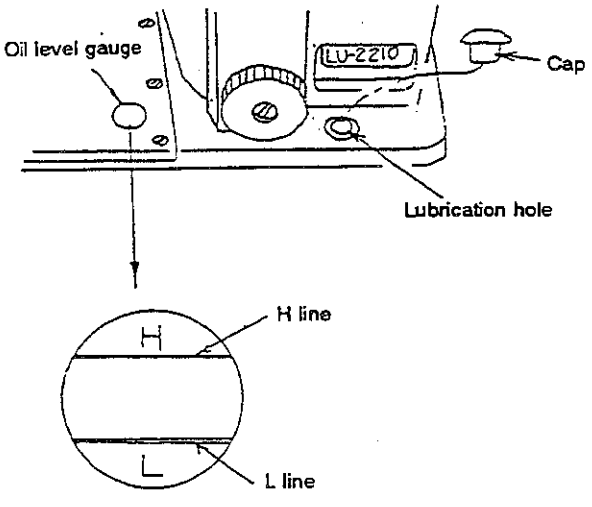
How to adjust	Result of improper adjustment
1) Adjusting the releasing torque Change the pressure of the safety clutch (if the safety clutch is hard to be released or it is released too easily) following the procedure described below. 1. Remove the timing belt from the lower sprocket. 2. Tightening the adjusting screw will increase the pressure of the safety clutch or loosening the adjusting screw will decrease it. 3. Fixing the lower sprocket, turn the safety clutch bushing until the safety clutch pawl comes off the groove on the safety clutch bushing. A torque developed at the time when the safety clutch pawl comes off the groove is taken as the releasing torque. 4. Adjust the standard releasing torque to 100±15 kgf.cm. 5. After the adjustment, put the timing belt on the lower sprocket. (Refer to "Replacing the timing belt" for how to put the timing belt on the lower sprocket.)	If the releasing torque is set to an excessively high value, the hook, hook driving shaft gear or related components will break. If the releasing torque is set to an excessively low value, the safety clutch will be released too easily. This will impair smooth operation of the sewing machine.
2) Resetting the safety clutch If an excessive load is applied to the hook driving shaft, the safety clutch will be released. In this case, the hook will not rotate even if turning the handwheel. 1. Reset the safety clutch with the machine head tilted. 2. Put screwdriver (medium) ❷ supplied with the machine in hole Ⓐ in safety clutch bushing ❶. 3. Hold screwdriver ❷ by hand to prevent safety clutch bushing ❶ from turning, make the handwheel rotate in the reverse direction until the safety clutch clicks. 4. Now, the safety clutch pawl fits in the groove on safety clutch bushing ❶. This completes the resetting procedure of the safety clutch.	

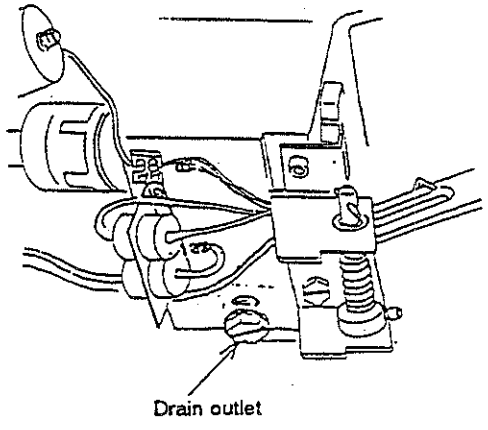
(13) Lubricating unit

1) Oil distribution diagram



2) Supplying and exchanging oil





1) Oil distribution diagram

1. The oil distribution diagram is shown on the left.

2) Supplying and exchanging oil

Take care of the following points when operating the sewing machine.

(1) Check whether or not the amount of oil reaches the specified level on the oil level gauge. Supply oil to the tank until the H line on the oil level check window is reached. Make the machine perform running-in until the oil flow from the hook driving shaft saddle is confirmed. Then, stop the sewing machine.
At this time, the oil surface in the tank should reach a level within the range of "H" and "L" to satisfy the specified amount of oil. If the oil surface fails to reach the specified level, supply oil from the lubrication hole.
(Caution) Be sure to close the lubrication hole with the cap.

(2) Inspect the oil sight winder to confirm that oil is supplied to the hook (oil spouts from the oil reservoir and flows toward the hook driving shaft saddle).
(Oil should always accumulate by the depth approximately of 1 mm (0.039") on the bottom of the oil sight window. This is the proper amount of oil to spout from the oil reservoir.)

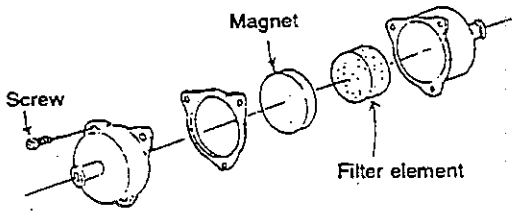
(3) Observe the oil flow in the urethane tube from the lower section of the bed to check whether or not oil is fed to the hook driving shaft saddle and circulated as shown in the circulation diagram.

(4) Carefully observe the filter to check whether or not oil changes in color due to oxidization and deterioration. If oil has changed in color obviously, change the deteriorated oil with a new oil without delay. To change oil, loosen the drain cock (hexagon head bolt) and expel the deteriorated oil from the drain opening. Remove the top cover of the bed, clean inside the bed tank with cleansing oil and dry it up with an air blower. At this time, take care not to allow foreign materials including a screw to enter the bed tank. After the bed tank is drained and cleaned, securely tighten the drain cock. (As reference, exchange the oil, for the first time, when two month have passed after the set-up of the machine, then exchange it every 500 hours of operation of the sewing machine.) When replacing the oil, also replace the filter with a new one. (Refer to the next page for how to replace it.)

(Note) **When replacing the oil, also replace the packing (part No. R0-0681901-00) for the drain cock and the packing (part No. 10701209) for the top cover of bed with new ones.**
Be sure not to use any oil other than JUKI New Defrix Oil No. 1.

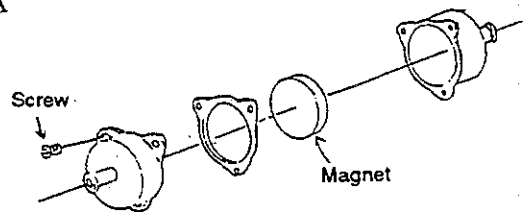
3) Replacing the filter

Filter B



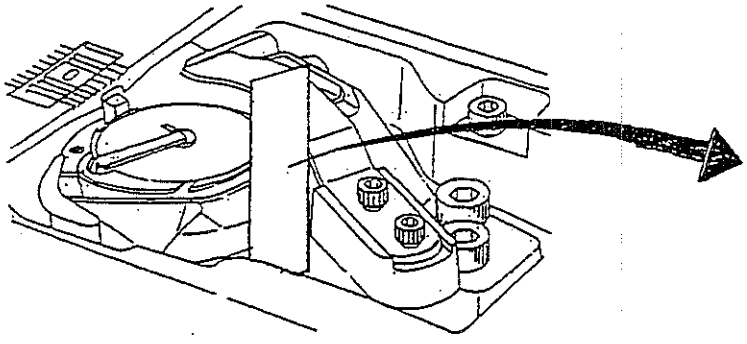
⇨ Hook shaft saddle circulation filter

Filter A

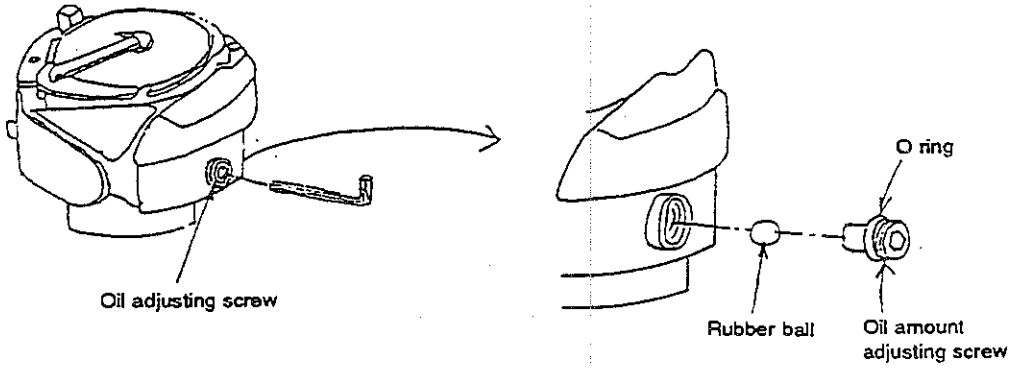


⇨ Lubrication filter

4) Adjusting the oil amount in the hook and cleaning the hook filter



Requirement:
Run the sewing machine for 5 seconds at the speed of 3,500 s.p.m.



3) Replacing the filter

Remove the magnet and filter element installed in the filter and wash it once a month after the first operation of the machine. If the filter element is clogged with dust or the like, return oil flow failure may result. In this case, oil may overflow the top of the hook driving shaft saddle, resulting in oil leakage.

4) Adjusting the oil amount in the hook and cleaning the hook filter

Amount of oil in the hook

(1) Oil splashes from the race surface as illustrated in the sketch.

(2) Tighten the oil adjusting screw (or turn the screw clockwise) to decrease the amount of oil in the hook. If the amount of oil in the hook is insufficient, the hook may generate heat. As a result, the hook will soon wear out causing seizure.

(3) Loosen the oil adjusting screw (or turn the screw counterclockwise) to increase the amount of oil in the hook.
If the amount of oil is excessive, the thread or material may be stained with oil. Also, the oil consumption will be larger.

(Caution) The adjusting screw can be turned by a quarter revolution, within which the amount of oil in the hook can be adjusted from the minimum value to the maximum value.
If the adjusting screw is excessively tightened, the rubber ball placed inside the tapped hole will be crushed and the amount of oil in the hook will no longer be adjusted. So, be careful.

Cleaning the filter in the hook

If the filter is clogged, the machine cannot be oiled. So, it is necessary to clean the filter periodically. Clean the filter following the procedure described below. (Clean the filter approximately every two months.)

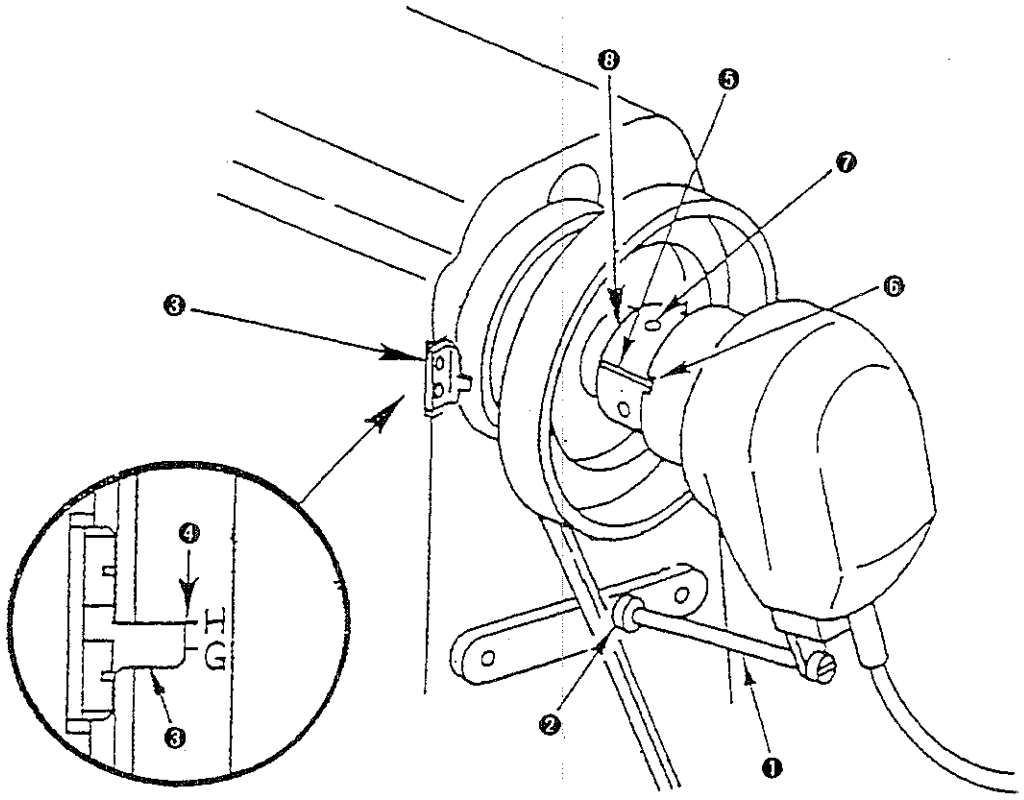
(1) Remove the hook from the main unit of the sewing machine. Loosen the oil amount adjusting screw and take out the rubber ball placed inside the tapped hole.

(2) Blow air to the tapped hole of the oil amount adjusting screw.

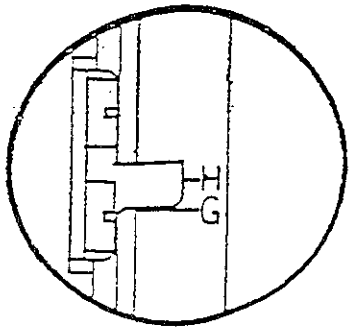
(14) **Synchronizer**

1. Screw synchronizer support rod ❶ into the tapped hole (the second tapped hole as counted from the rightmost tapped hole facing you), and fix the rod there with attaching nut ❷.

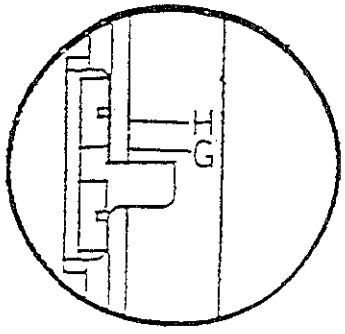
2. Turn the handwheel by hand until handwheel pointer ❸ meets the marker line of graduation "H" ❹ on the scale of the handwheel.



A: In the case where the synchronizer timing is too late



B: In the case where the synchronizer timing is too early



How to adjust	Result of improper adjustment
1. Keeping marker line ❺ engraved on the flange of the synchronizer held aligned with notch ❻ at the edge of the synchronizer case, fit flange ❽ on the handwheel as illustrated in the figure on the left. Then, tighten screw ❼.	
2. Confirm that handwheel pointer ❸ is aligned with marker line ❹ when marker line ❺ is aligned with notch ❻.	Be sure to securely install the synchronizer in position.
	• If the synchronizer is installed at a position where the synchronizer timing is retarded, the marker line of the graduation "H" will positioned lower than handwheel marker ❸ when marker line ❺ is aligned with notch ❻. (A in figure shown on the left.) • If the synchronizer is installed at a position where the synchronizer timing is advanced, the marker line of the graduation "H" will positioned higher than handwheel marker ❹ when marker line ❺ is aligned with notch ❻. (B in figure shown on the left.)
If the upper and lower stop positions of the sewing machine are not correct even when the synchronizer is properly positioned as illustrated in the figure on the left, refer to the Engineer's Manual for the motor of the sewing machine.	If the synchronizer timing is too late, the following troubles will result. o The needle will come down at the upper sop position and enter the material. o The material will be caught at the tip of the needle when drawing out the material on the machine. If the synchronizer timing is too early, thread trimming failure will result.
* Change the installing position of the synchronizer when using the special adjustment value (to trim a thick thread of #5 or #4).	

3. SETTING THE SPECIAL ADJUSTMENT VALUES

If you wish to raise the position of the tip of the needle (the upper stop position before the reverse rotation) after thread trimming, when using a thick thread (#5 to #4), change the installing position of the synchronizer and the timing of thread trimmer cam.

☆ Difference between the standard adjustment value and the special adjustment value

Item to be changed / Adjustment value	Installing position of the synchronizer (The point at which the marker line meets the notch)	Timing of the thread trimmer cam (Thread trimming point)
Standard adjustment value (The machine has been factory-set to the standard adjustment value at the time of delivery.) Thread count #30 to #4	Graduation "H" on the handwheel	Graduation "D" on the handwheel
Special adjustment value Thread count #5 to #4	Graduation "G" on the handwheel	Graduation "C" on the handwheel

1) Changing the installing position of the synchronizer

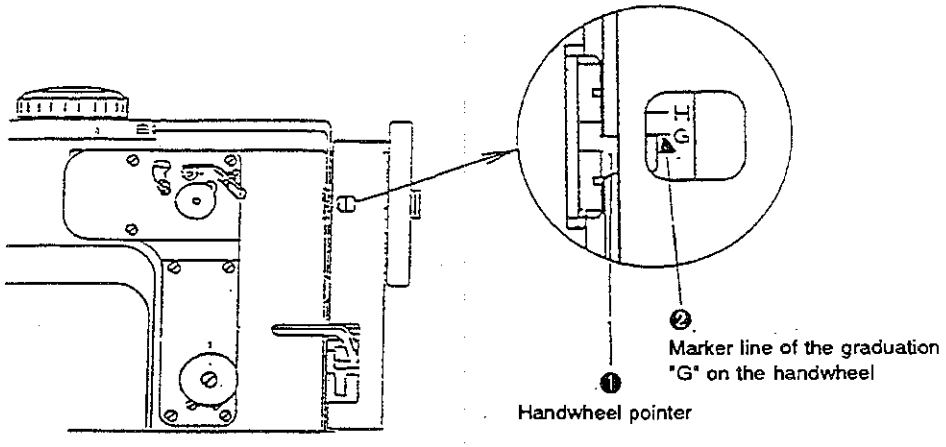


Fig. 1

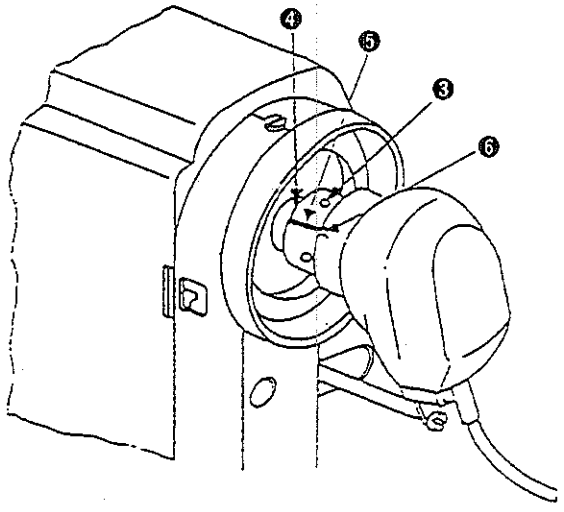
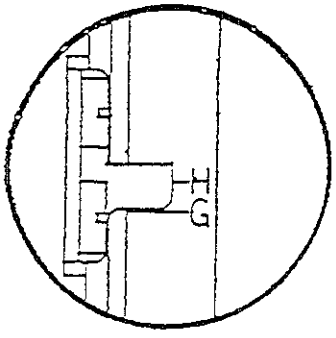
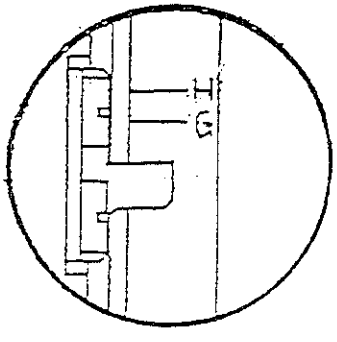


Fig. 2

How to adjust	Result of improper adjustment
(Caution) 1. When changing the standard adjustment value to the special adjustment value, and vice versa, be sure to change the installing position of the synchronizer. At the same time, change the timing of the thread trimmer cam. 2. Do not perform the adjustment other than those described above.	
1) Changing the installing position of the synchronizer (Caution) Change the position of the synchronizer with the power to the machine turned OFF. (1) Turn the handwheel by hand until handwheel pointer ❶ meets marker line ❷ of the graduation "G" on the handwheel. (Fig. 1) (2) Loosen screw ❸ in the synchronizer. Move flange ❹ of the synchronizer until marker line ❺ engraved on the flange is aligned with notch ❻ at the edge of the synchronizer case. (Fig. 2) (3) Keeping the marker line ❺ held aligned with the notch ❻, tighten screw ❸. (4) Confirm that pointer ❶ meets marker line ❷ of the graduation "G" when marker line ❺ on the flange meets notch ❻ at the edge of the case.	☆ If the timing of the sewing machine with respect to the installing position of the synchronizer is too late, the following troubles may result.  • The upper stop timing of the sewing machine before the reverse rotation will be retarded, and the needle may leave marks on the material. • The upper stop timing of the sewing machine at the time of reverse rotation will also be retarded, and the material will be caught at the tip of the needle when drawing out the material on the machine. ☆ If the timing of the sewing machine with respect to the installing position of the synchronizer is too early, the thread trimming point will be closer to the position from which the motor stop controller starts working. In this case, thread trimming failure may result or the motor may stop during thread trimming. 

2) Changing the timing of the thread trimmer cam

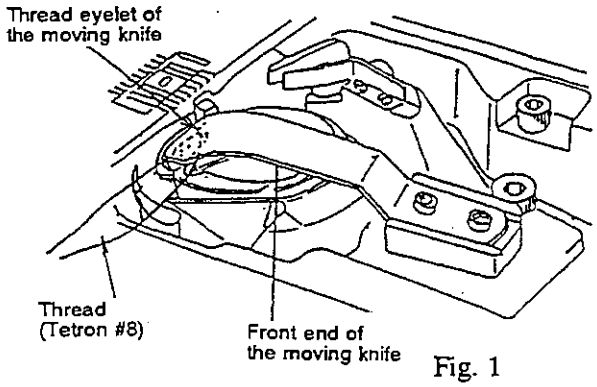


Fig. 1

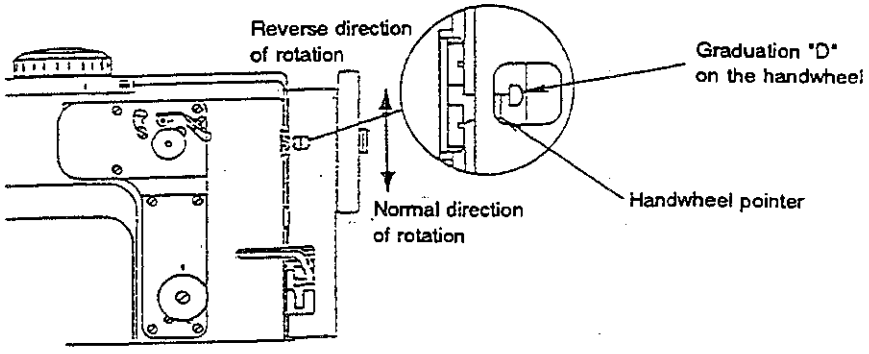


Fig. 2

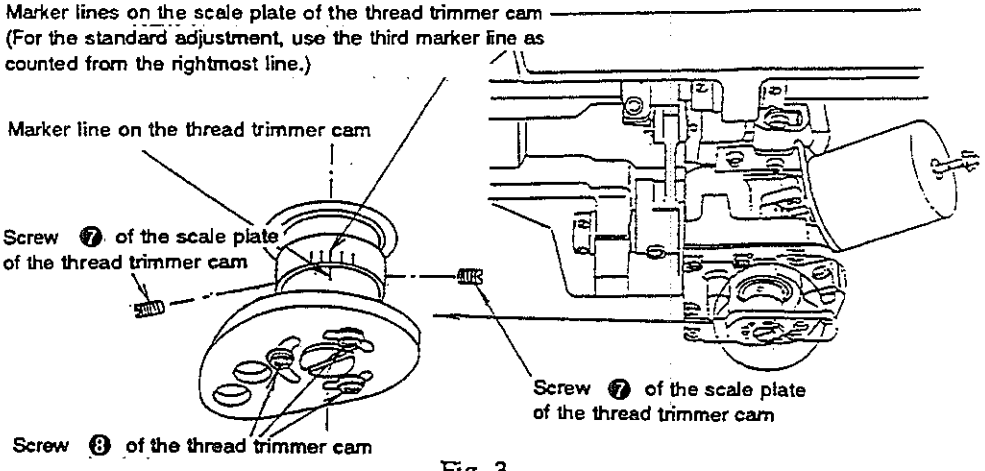


Fig. 3

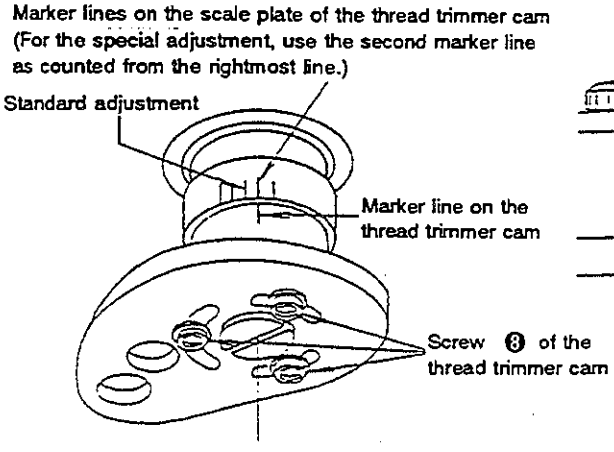


Fig. 4

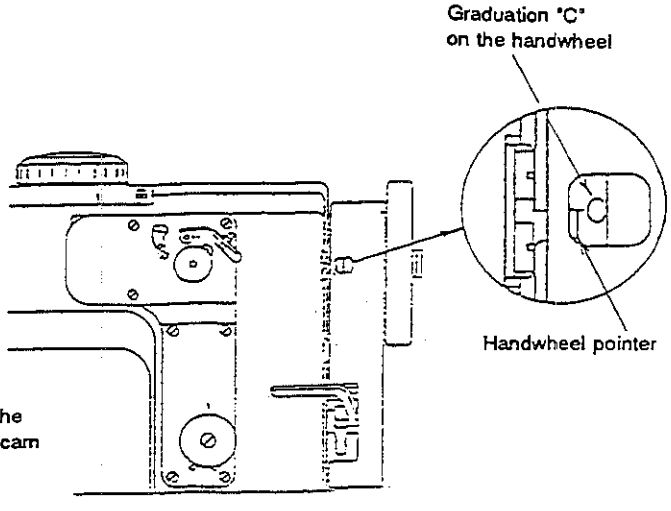
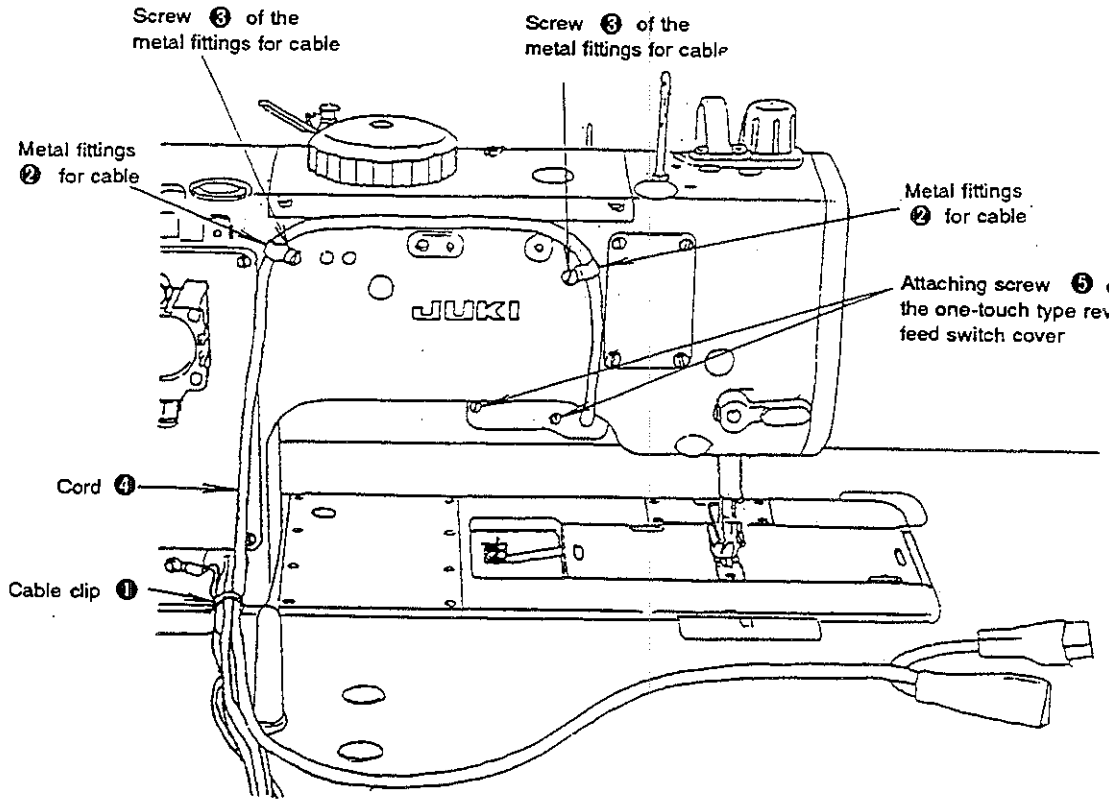
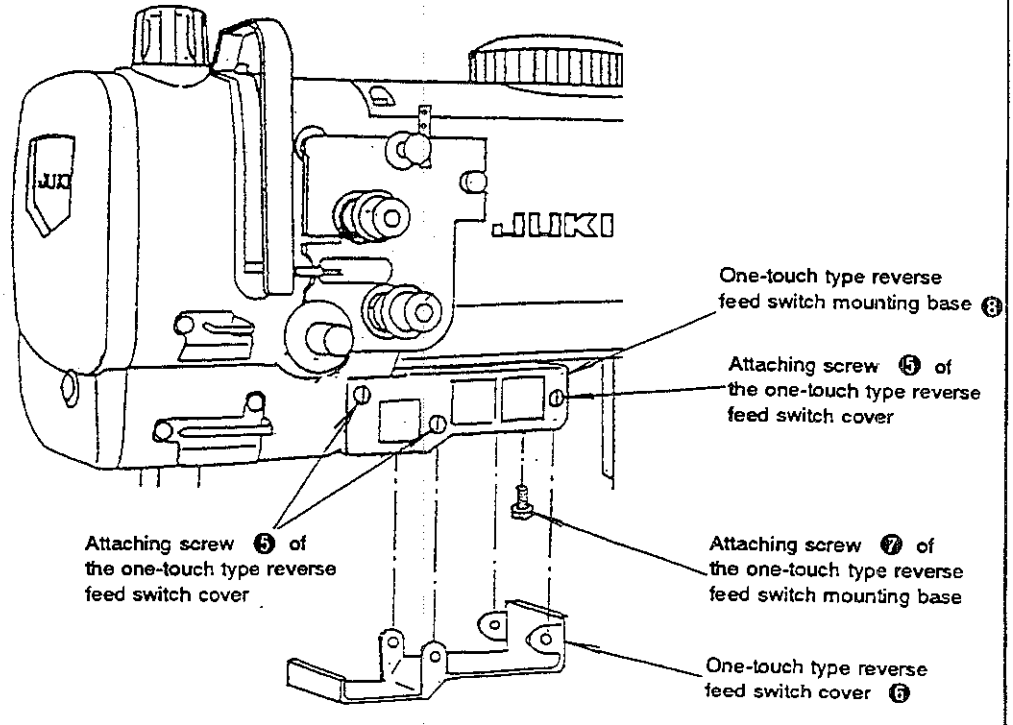


Fig. 5

How to adjust	Result of improper adjustment
2) Changing the timing of the thread trimmer cam	
(1) Tilt the machine head and support it with the machine head support rod.	
(2) Move the moving knife forward by hand until it will go no further. (Fig. 1) (Turning the handwheel by hand, draw the moving knife forward from its initial position. This will move the moving knife.)	
(3) Put a thread (tetron #8) onto the thread eyelet of the moving knife. (The thread should be held slackened until the machine completes thread trimming.)	
(4) Turn the handwheel carefully by hand to make it rotate in the normal direction.	
(5) The moving knife engages with the counter knife, and the knives trim the thread. Now, stop turning the handwheel. At this time, confirm that the graduation "D" on the handwheel is aligned with the handwheel pointer. (Fig. 2)	(5)' If the graduation "D" is not aligned with the handwheel pointer, re-adjust so that they are aligned with each other referring to "6) Thread trimmer cam" on page 41.
(6) Confirm that the marker line engraved on the thread trimmer cam is aligned with the third marker line, as counted from the rightmost marker line, on the scale plate of the thread trimmer cam.	(6)' If the marker line on the thread trimmer cam fails to meet the marker line on the scale plate, loosen screw ❼ in the scale plate of the thread trimmer cam and move the scale plate until they meet with each other. Then, tighten screw ❼.
(7) Loosen screws ❽ in the thread trimmer cam. (Fig. 4)	
(8) Turn the thread trimmer cam by hand until the marker line engraved on the cam meets the second marker line, as counted from the rightmost one, on the scale plate of the thread trimmer cam. (Fig. 4)	
(9) Tighten screws ❽ in the thread trimmer cam. (Fig. 4)	
(10) Perform the aforementioned adjustment steps (2) through (5). In the state described in step (5), confirm that the graduation "C" on the handwheel is aligned with the handwheel pointer.	(10)' If the graduation "C" on the scale fails to meet the handwheel pointer, finely adjust the thread trimming cam taking the scale plate of the thread trimming cam and the marker lines engraved on the cam as reference so that the graduation "C" aligns with the handwheel pointer.
(11) Raise the machine head.	
(12) Pass a thick thread (#4 to #5) through the sewing machine head. Turn ON the power to the machine. Make the sewing machine actually trim the thread to confirm that no thread trimming failure occurs.	

4. REPLACING THE SWITCH UNIT





How to adjust	Result of improper adjustment
(1) Cut cable clip ❶. (2) Loosen screws ❸ of the metal fittings for cable, remove metal fittings ❷, then remove cord ❹. (3) Loosen attaching screw ❺ of the one-touch type reverse feed switch cover, and remove one-touch type reverse feed switch cover ❻. (4) Loosen attaching screw ❼ of the one-touch type reverse feed switch mounting base, and remove one-touch type reverse feed switch mounting base ❽. (5) Prepare a new one-touch type reverse feed switch unit. Install it while following the aforementioned procedure (2) through (4) in the reverse order. (6) Arrange the cord with a new cable clip.	

5. REPLACING THE TIMING BELT

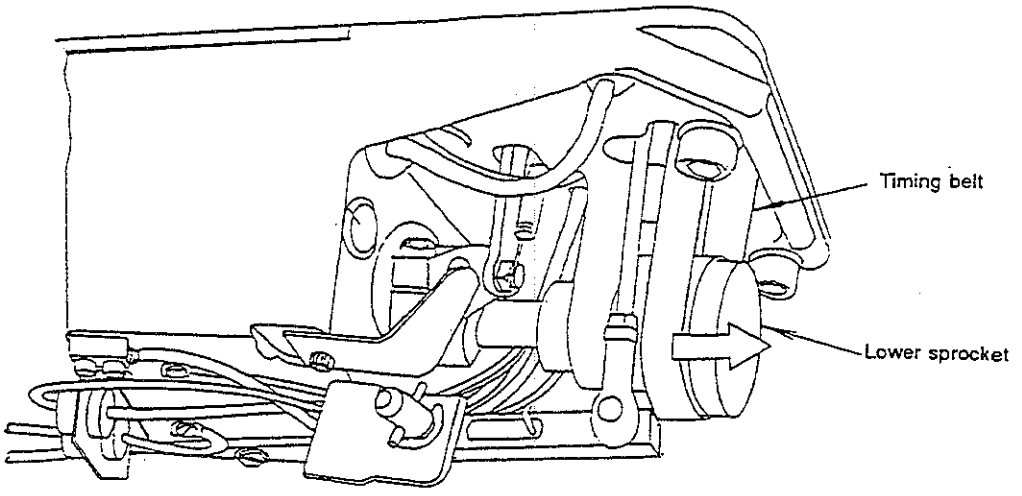


Fig. 1

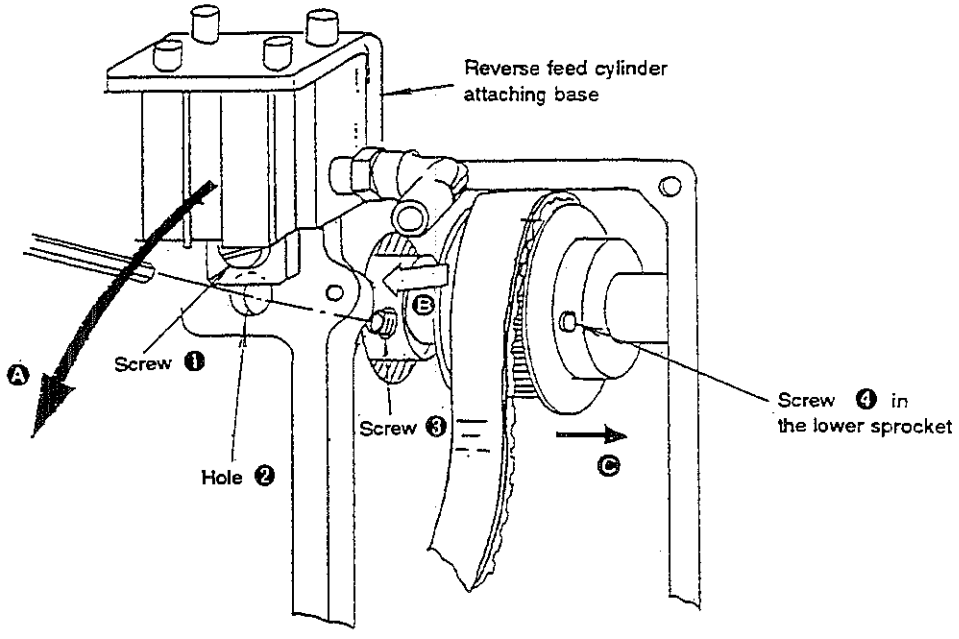


Fig. 2

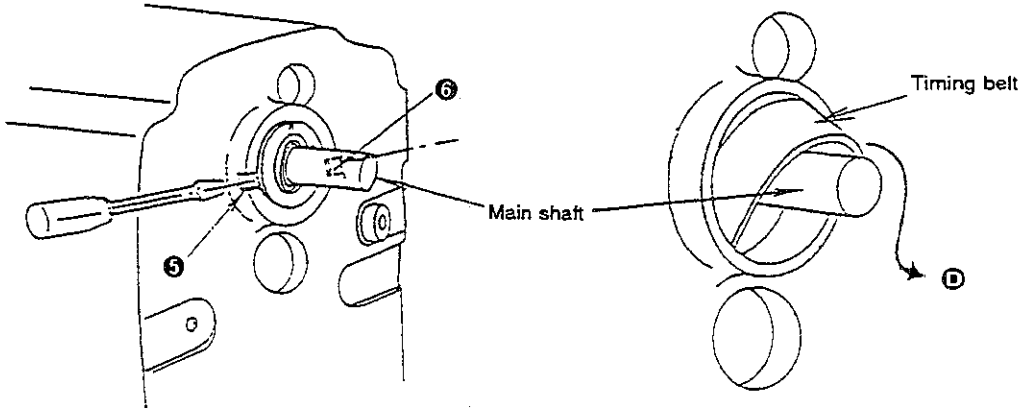


Fig. 3

Fig. 4

How to adjust	Result of improper adjustment
1. Remove the timing belt from the lower sprocket. (Fig. 1) 2. Remove the handwheel. 3. Remove the side plate. (Fig. 2) 4. Remove screw ❶ of the reverse feed cylinder attaching base, and lower the attaching base in the direction of the arrow Ⓐ until hole ❷ in the machine arm can be observed. (Fig. 2) 5. Put a hexagon wrench key (3 mm (0.118")) from hole ❷ and loosen screw ❸ in the main shaft bearing bush. (Fig. 2) 6. Loosen screw ❹ in the sprocket. (Fig. 2) 7. Fit the top end of a screwdriver in notches ❺ and ❻ on the arm, and draw out the main shaft bearing bush (asm.). (Fig. 3) 8. Shift the sprocket in the direction of arrow Ⓒ as illustrated in Fig. 2 and shift the timing belt in the direction of arrow Ⓑ. (Fig. 2) 9. Push the timing belt out from the hole in the machine arm and draw it in the direction of arrow Ⓓ to detach it from the main shaft. (Fig. 4)	

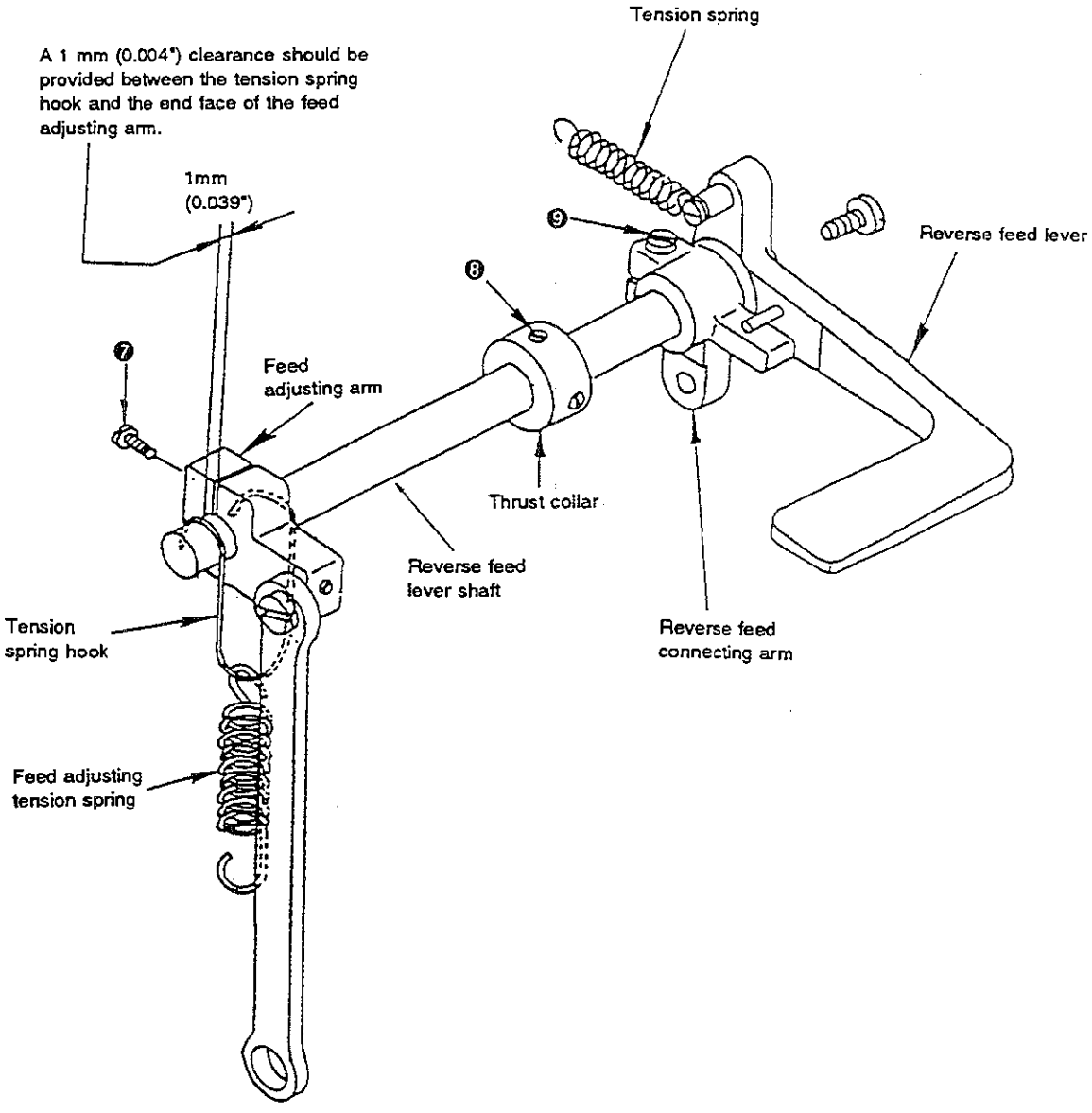

A 1 mm (0.004") clearance should be provided between the tension spring hook and the end face of the feed adjusting arm.
1mm (0.039")
Tension spring
Reverse feed lever
Feed adjusting arm
Thrust collar
Reverse feed lever shaft
Reverse feed connecting arm
Tension spring hook
Feed adjusting tension spring

Fig. 5

How to adjust	Result of improper adjustment
10. Loosen clamping screw ❼ in the feed adjusting arm.	Fit a screwdriver from the side plate side.
11. Loosen screw ❽ in the thrust collar.	Fit a screwdriver from the side plate side and from the under surface of the bed.
12. Loosen clamping screw ❾ in the reverse feed connecting arm.	
13. Set stitch dial to "9" on the scale. Then remove the side plate on the front face of the sewing machine.	
14. Remove the tension spring of the reverse feed lever. Draw out the reverse feed lever shaft to the position where the timing belt can be removed. Now, remove the tension spring hook, the feed adjusting tension spring and the feed adjusting arm.	
15. Replace the timing belt with a new one, and put it on the upper sprocket.	
16. Put the reverse feed lever shaft inside the periphery of the timing belt. Attach the tension spring hook and the feed adjusting arm on the reverse feed lever shaft.	
17. Fit the reverse feed lever shaft in the shaft hole in the machine arm. Tighten screw ❽ in the thrust collar.	17' Tighten the screw in the thrust collar while eliminating a thrust play at the reverse feed lever shaft.
18. Tighten clamping screw ❼ in the feed adjusting arm. At this time, fluctuate the feed adjusting arm to the right and left until the feed adjusting arm is placed almost at the center of the play, and tighten the clamping screw.	18' If the feed adjusting arm is not correctly positioned, the feed connecting rod may fail to operate normally, the feed adjusting arm may interfere with the inner wall of the arm and the feed adjusting arm may be pushed against the side face of the feed crank stud. In this case, the reverse feed lever may not be lifted/lowered smoothly.
(Caution) **Tighten the clamping screw with a tightening torque of 40 to 50 kgf.cm.**	
19. Put the feed adjusting arm tension spring and the spring hook on the feed adjusting eccentric pin.	
20. Tighten clamping screw ❾ in the reverse feed connecting arm, and attach the side plate on the front face of the machine.	20' Set stitch dial to "9" on the scale. Now, tighten clamping screw ❾ so that a clearance of 0.5 (0.020") to 1.5 mm (0.059") is provided between the reverse feed lever and the stopper. (Refer to "Position of the reverse feed connecting arm" on page 31 for detail.)
21. Attach the tension spring of the reverse feed lever in place.	

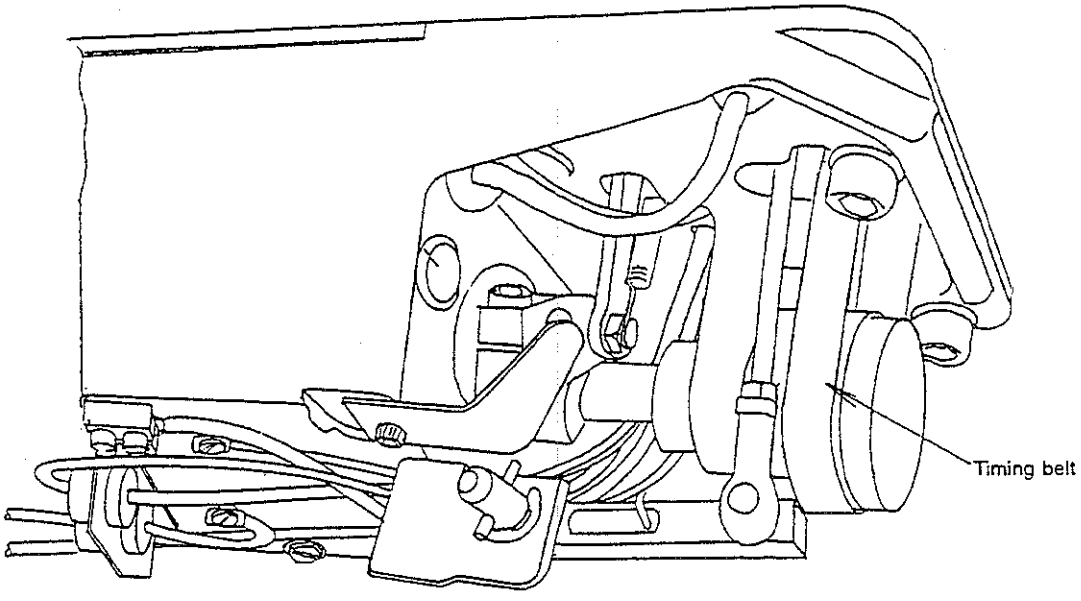


Fig. 6

Put the timing belt on the lower sprocket taking care to provide the correct timing between the needle and the hook.
After the timing belt has been properly set on the machine, check the "timing between the needle and the hook," "feed rock timing," "feed driving timing" and "height of the feed dog."

How to adjust	Result of improper adjustment
22. Put the timing belt on the lower sprocket. At this time, take care not to change the needle-to-hook timing from the correct timing. (Fig. 6)	Refer to "Timing between the needle and the hook" on page 15.
23. Check the timing between the needle and the hook.	
24. Check the feed rock timing.	Refer to "Feed rock timing" on page 19.
25. Check the feed driving timing.	Refer to "Feed driving timing" on page 19.
26. Check the height of the feed dog.	Refer to "Height of feed dog" on page 23.
27. Tighten the screw while pressing the handwheel against the main shaft bearing.	

6. REPLACING THE VARIABLE RESISTOR FOR DETECTING THE AMOUNT OF ALTERNATING VERTICAL MOVEMENT OF THE WALKING FOOT AND PRESSER FOOT

< Note > Refer also to the Engineer's Manual for the motor of the sewing machine when you replace the variable resistor for detecting the amount of alternating vertical movement of the walking foot and presser foot.

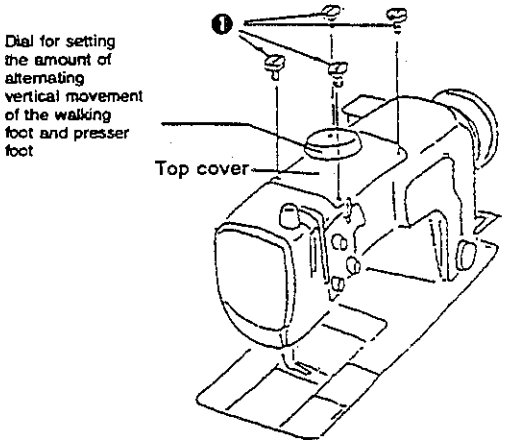


Fig. 1

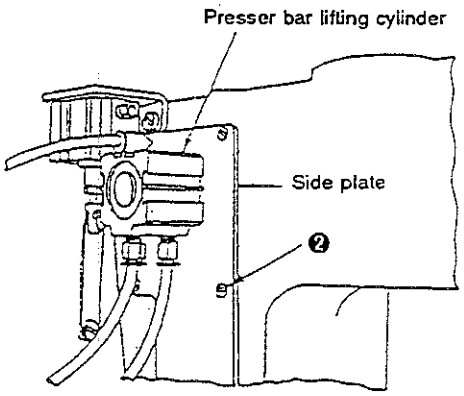
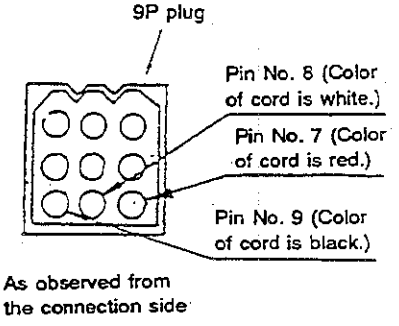


Fig. 2



Red - Pin 7 8 kΩ
White - Pin 8

Red - Pin 7 17 kΩ
Black - Pin 9

Fig. 3

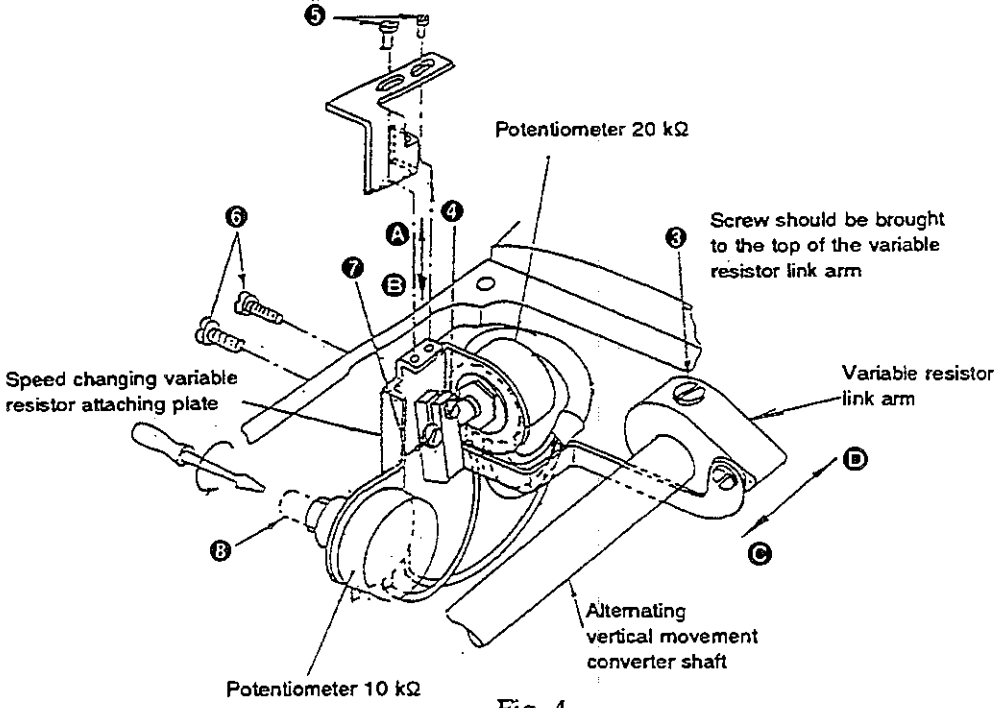


Fig. 4

How to adjust	Result of improper adjustment
1. Set the dial for setting the amount of alternating vertical movement of the walking foot and presser foot to "1." Now, loosen screws ❶ in the top cover and remove the top cover. (Fig. 1) 2. Loosen screws ❷ in the side plate, and remove the side plate. (Fig. 2) 3. Remove the three pin terminals (male) that are attached to the end of the potentiometer cord from the 9P plug. (Fig. 3 and Fig. 6) 4. Cut the cable clip that is used to bundle the cords coming from the cable bush located on the lower section of the rear side of the machine head. (Fig. 6) 5. Loosen screw ❸ in the variable resistor link arm. (Fig. 4) 6. Loosen screw ❹ in the variable resistor arm. (Fig. 4) 7. Loosen screws ❺ in the variable resistor presser plate, and remove the variable resistor presser plate. (Fig. 4) 8. Loosen the hexagon nut used to attach the potentiometer (20 kΩ) until it comes off. (Fig. 4 and Fig. 5) 9. Loosen attaching screws ❻ of the speed changing variable resistor. (Fig. 4 and Fig. 6) 10. Lift the speed changing variable resistor attaching plate in the direction of arrow Ⓐ as illustrated in Fig. 4. (Fig. 4) 11. In the state described in step 10, draw out variable resistor shaft ❼ of the potentiometer (20 kΩ) from the variable resistor arm. (Fig. 4) At this time, take care not to drop the hexagon nut, spring washer and plain washer in the arm. Moving the variable link arm in the direction of arrow Ⓒ as illustrated in Fig. 4 will allow you to draw out the shaft with ease. 12. Remove the speed changing variable resistor attaching plate, 20 kΩ potentiometer and 10 kΩ potentiometer from the machine head. At this time, also remove the potentiometer cord that passes through the machine arm. 13. Loosen the attaching hexagonal nut of the 10 kΩ potentiometer from the speed changing variable resistor attaching plate, and remove the 10 kΩ potentiometer. (Fig. 5) 14. Attach the potentiometer (10 kΩ) to be used on the speed changing variable resistor attaching plate. (Fig. 5) Now, insert the protruding portion on the detent of the potentiometer (10 kΩ) through the notch in the speed changing variable resistor attaching plate. 15. Assemble the washer, spring washer and potentiometer attaching hexagon nut in the written order. Then tighten the hexagon nut. (Fig. 5)	☆ The sewing speed may not be changed even by turning the dial for setting the amount of alternating vertical movement of the walking foot and presser foot.

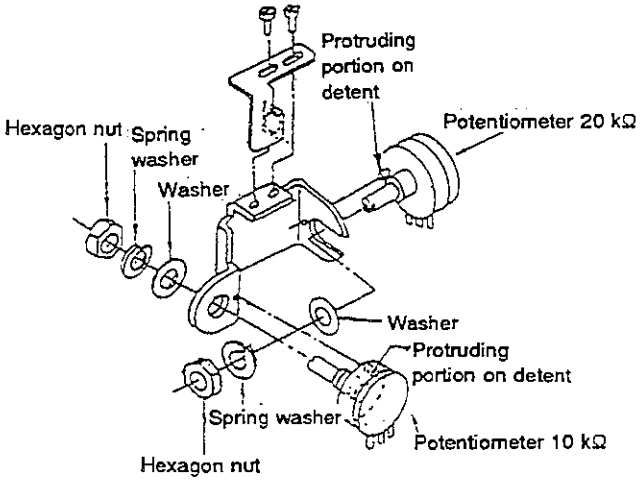


Fig. 5

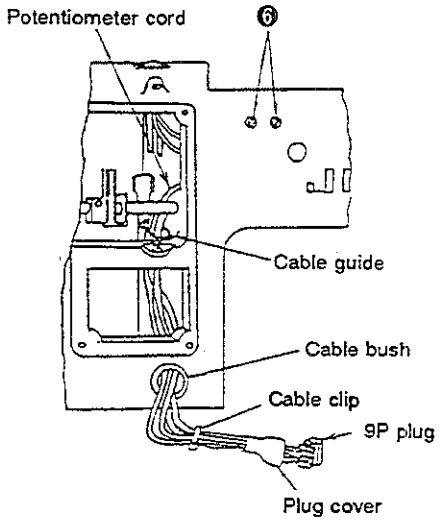


Fig. 6

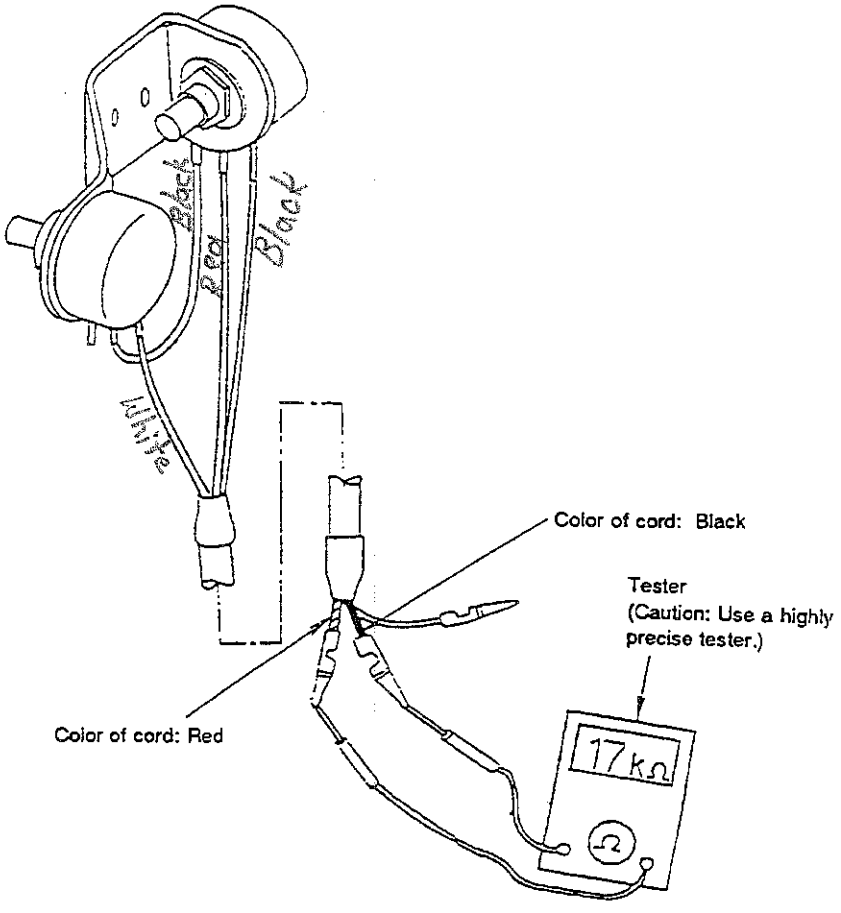


Fig. 7

How to adjust	Result of improper adjustment
16. Pass the potentiometer cord in the arm to route it through the cable bush located on the rear side of the machine arm. (Fig. 6) Be sure to pass the cord in the cable guide when passing the cord in the arm. 17. Attach the potentiometer (20 kΩ) to be used on the speed changing variable resistor attaching plate. (Fig. 5) 18. Assemble the washer, spring washer and potentiometer attaching hexagon nut in the written order. (Fig. 5) Then tighten the hexagon nut by one turn. 19. In the state described in step 18, fit variable resistor shaft ❼ of the potentiometer (20 kΩ) in the variable resistor arm. (Fig. 4) At this time, moving the variable link arm in the direction of arrow C as illustrated in Fig. 4 will allow you to fit the shaft in the variable resistor arm with ease. 20. Securely tighten the potentiometer (20 kΩ) attaching hexagon nut. (Fig. 5) At this time, fit first the protruding portion on the detent of the potentiometer (20 kΩ) in the hole in the speed changing variable resistor attaching plate, and tighten the hexagon nut. 21. Attach the speed changing variable resistor attaching plate on the machine arm. (Fig. 4) Now, tighten screws ❻ while pressing the top face of the speed changing variable resistor in the direction of arrow Ⓑ as illustrated in Fig. 4. 22. Tighten screw ❸ in the variable resistor link arm. First, make the end face of the variable resistor link slightly touch the end face of the oscillating shaft bushing, and turn the variable resistor link arm to bring the screw to the top. Then tighten the screw. (Fig. 4) 23. Adjust the resistance between the two potentiometer cords (the red cord and the black cord) to 17 kΩ by turning variable resistor shaft ❼ of the potentiometer (20 kΩ) while checking the resistance with a tester. (Fig. 4 and Fig. 7) (Use a highly precise tester.) 24. Tighten clamping screw ❹ in the variable resistor arm. (Fig. 8) At this time, fit variable resistor arm while pressing it slightly in the direction of arrow as illustrated in Fig. 8.	

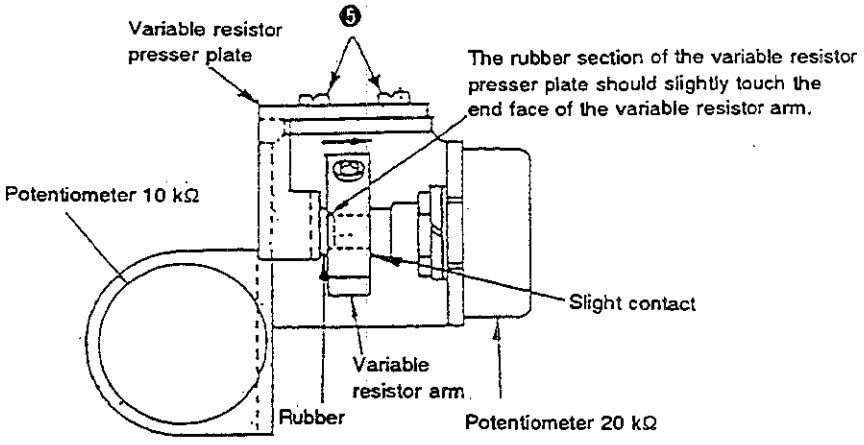
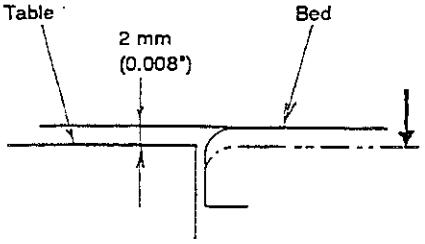

Variable resistor presser plate
The rubber section of the variable resistor presser plate should slightly touch the end face of the variable resistor arm.
Potentiometer 10 kΩ
Slight contact
Variable resistor arm
Rubber
Potentiometer 20 kΩ

Fig. 8

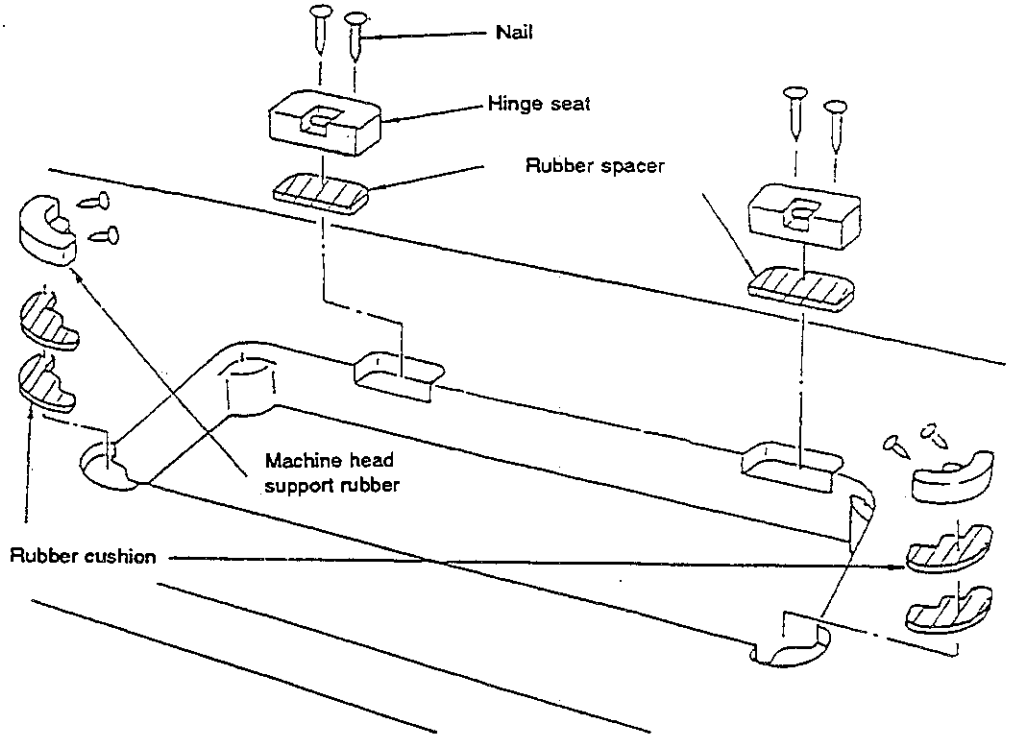
How to adjust	Result of improper adjustment
25. Attach the variable resistor presser plate in place. (Fig. 8) Adjust the variable resistor presser plate so that the rubber of the variable resistor presser plate slightly touches the variable resistor arm. Then tighten screws ❺. 26. Connect the pin terminal (male) of the potentiometer cord to the 9P plug. (Fig. 3) Be sure to connect the pin terminal to the correct position. 27. Bundle the potentiometer cords with a cable clip together with other cords coming from the cable bush. (Fig. 6) 28. Attach the top cover in place and fix it by tightening screws ❶. (Fig. 1) 29. Attach the side plate in place and fix it by tightening screws ❷. (Fig. 2)	

7. ADJUSTING THE HEIGHT OF THE BED



When the sewing machine head is installed on the sewing machine table in the standard state, the top surface of the sewing machine bed is 2 mm (0.008") higher than the top surface of the table.

If you want to use the sewing machine with the bed lowered as shown by the arrow, remove rubber spacers (2 pcs.), rubber cushions (4 pcs.) shown with oblique lines and attach the hinge seat and the machine head support rubber pieces in place. Then set the machine head on the table.

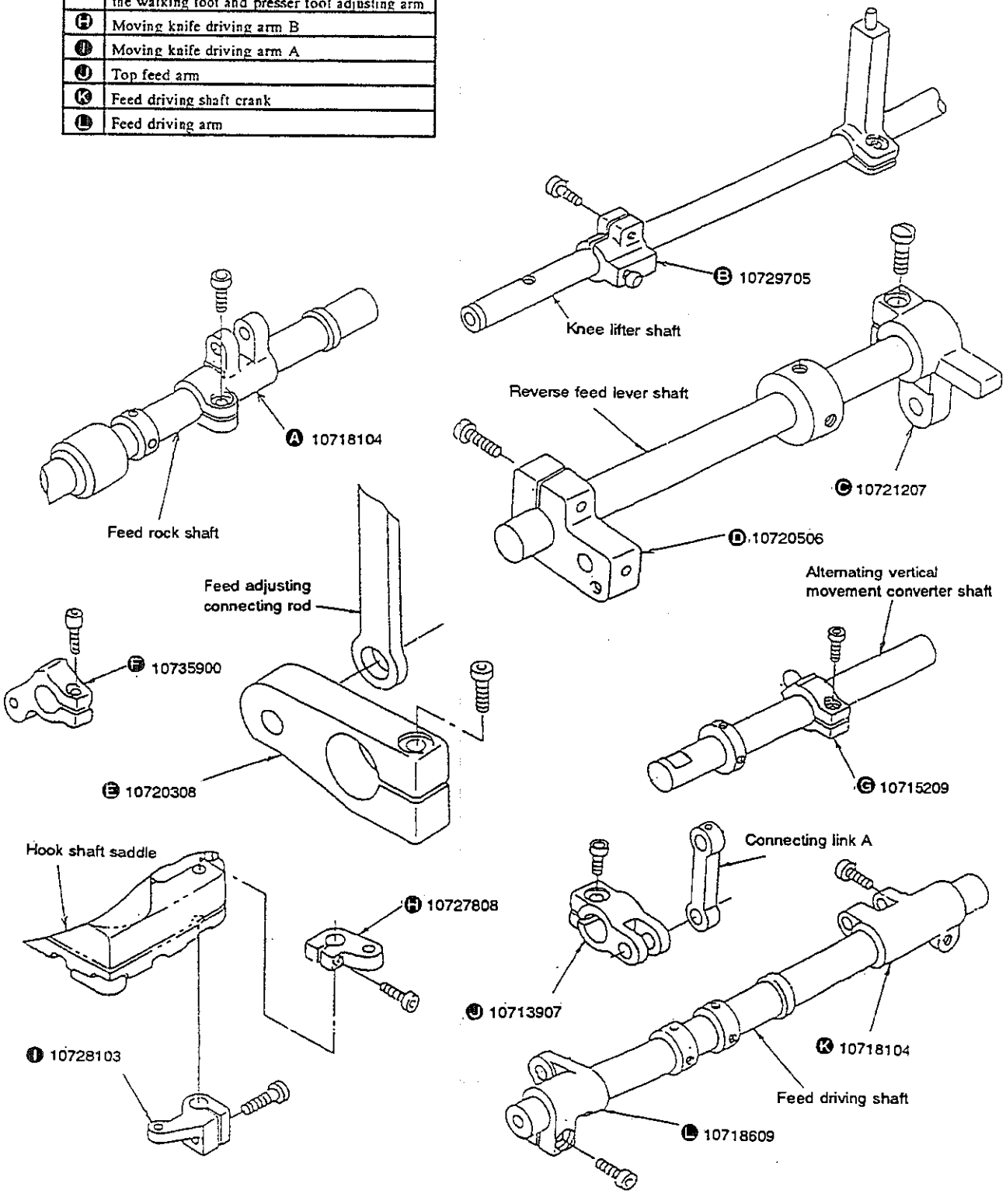


Name of part	Part No.
Rubber spacer	10742005
Rubber cushion	10740900

8. PARTS TO BE CAREFULLY TIGHTENED

The following parts will break if they are excessively tightened. So, carefully tighten the screws in the respective parts.

Ⓐ	Feed rock shaft crank
Ⓑ	Presser lifter arm
Ⓒ	Reverse feed connecting arm
Ⓓ	Feed adjusting arm
Ⓔ	Feed adjustment converting arm
Ⓕ	Cylinder arm for the alternating vertical movement of the walking foot and presser foot
Ⓖ	Amount of alternating vertical movement of the walking foot and presser foot adjusting arm
Ⓗ	Moving knife driving arm B
Ⓘ	Moving knife driving arm A
Ⓙ	Top feed arm
Ⓚ	Feed driving shaft crank
Ⓛ	Feed driving arm



9. PARTS TO BE FIXED BY "LOCK-TITE" PAINT

The following parts are fixed with "LOCK-TITE" paint.

If these parts are disassembled, remove residual paint thoroughly using paint thinner and assemble them applying "LOCK-TITE" after removing moisture from the mating surface.

If the screw which has been fixed with the "LOCK-TITE" paint is too hard to loosen, it is advisable to warm it up using a torch lamp. This will make the screw easily come off.

No.	Description	Part No.	LOCK-TITE type No.
1	Hinge screw of moving knife driving link	SD0500481TP	LOCK-TITE #638
2	Hinge screw of cam roller shaft	SD0500721SP	LOCK-TITE #638
3	Screw in feed adjusting base	SS2111010TP	LOCK-TITE #638
4	Hinge screw in feed adjustment connecting rod	SD0800402TP	LOCK-TITE #638
5	Engaging section of feed adjusting arm and feed adjusting pin	10720506, 10721504	LOCK-TITE #638
6	Screw in feed adjusting pin	SS7110810SP	LOCK-TITE #638
7	Screw in top feed connecting link B support pin	SM8050602TP	LOCK-TITE #242
8	Screw in top feed converting unit support pin	SM8050602TP	LOCK-TITE #242
9	Screw in top feed converting unit	SM8050602TP	LOCK-TITE #242
10	Hinge screw in reverse feed connecting arm	SD0800352SP	LOCK-TITE #638
11	Screw in hook driving shaft bearing holder	SS8080610SP	LOCK-TITE #242
12	Thread take-up crank pin	10524106	LOCK-TITE #638
13	Amount of alternating vertical movement of the walking foot and presser foot adjusting arm and converting unit arm pin	10715209, 10715308	LOCK-TITE #638
14	Hinge screw in variable speed variable resistor link	SD0550271TP	LOCK-TITE #242
15	Top cover and dial bush of alternating vertical movement of the walking foot and presser foot	10742609, 10715100	LOCK-TITE #638
16	Needle bar frame and needle bar frame driving shaft	10708402, 10708709	LOCK-TITE #638
17	Needle bar frame and the screw in roller guide base	10708469, SM6041012TP	LOCK-TITE #638
18	Feed adjusting arm and feed adjustment connecting rod pin	10720506, 10725307	LOCK-TITE #638
19	Tension release presser pin and tension release setscrew	10702702, 10702801	LOCK-TITE #242
20	Presser lifter arm and converter arm pin	10729705, 10715308	LOCK-TITE #638
21	Tension release arm and tension release arm pin	10729903, 10730000	LOCK-TITE #638
22	Alternating vertical movement stopper plate and hinge screw in the stopper plate	1071440, B3416552000	LOCK-TITE #638
23	Spring suspension bracket of alternating vertical movement shaft and hinge screw of the spring	10714905, B3416552000	LOCK-TITE #638
24	Side plate on the front face and positioning pin of the side plate	10737005, 10704302	LOCK-TITE #638
25	Cylinder connecting screw and hinge screw of the cylinder connecting screw	10737005, SD0720331SP	LOCK-TITE #638
26	Hook shaft saddle lower plate and opener shaft oil seal	10724300, 10726107	LOCK-TITE #638
27	Hook driving shaft and screw in the gear of the hook driving shaft	10722304, SS2090710SP	LOCK-TITE #638

10. MAINTENANCE PARTS LIST

Basic maintenance parts

Part No.	Name of part	Remarks on installation
10722551	Needle Hook (asm.)	• Orientation of the needle Refer to "Timing between the needle and the hook" on page 15 and "Clearance between the needle and the blade point of hook" on page 13.
10723609	Bobbin	
10726305	Moving knife	• Refer to "Knife pressure" on page 37.
10726404	Counter knife	• Refer to "Counter knife" on page 35.
10726906	Clamp spring	• Refer to "Clamp spring" on page 35.
10701209	Packing for top cover of bed	• Refer to "Lubricating unit" on page 51.
R0068190100	O ring for drain bolt	• Refer to "Lubricating unit" on page 51.
10727303	Filter	• Refer to "Lubricating unit" on page 51.

[Maintenance parts to be rarely replaced]

Part No.	Name of part	Remarks on installation
107024045	Thread take-up spring	
10725000	Opener	• Refer to "Opener" on page 43.
10738052	Potentiometer	• Refer to "Replacing the variable resistor for detecting the amount of alternating vertical movement of the walking foot and presser foot" on page 69. • Engineer's Manual for motor.
10706703	Timing belt	• Refer to "Replacing the timing belt" on page 63.
B3212210000	Bobbin winder friction wheel	• Refer to "Adjusting the bobbin winder friction wheel" on page 33.
10744308	Stitch dial	• Refer to "Zero (0) point of feed adjusting mechanism" on page 27.

11. MECHANISM ADJUSTING PROCEDURE CHART AT A GLANCE

When you have adjusted items 1) through 8), adjust also the related components according to the arrows.

1) "Top feed timing" on page 21 → "Timing of releasing thread tension" on page 21

2) "Clearance between the needle and the blade point of hook" on page 13 → "Timing between the needle and the hook" on page 15

3) "Clearance between the throat plate and the bobbin case stopper" on page 17 → "Clearance between the needle and the blade point of hook" on page 13 → "Thread trimmer" on page 35

4) "Feed rock timing" on page 19 → "Feed driving timing" on page 19

5) "Top feed timing" on page 21 → "Timing of releasing thread tension" on page 21

6) "Timing of opener" on page 43 → "Thread trimmer cam" on page 41

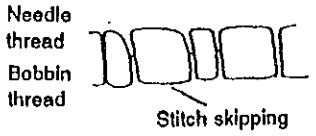
7) "Height of the moving knife" on page 39 → "Clearance between the needle and the blade point of hook" on page 13 → "Timing between the needle and the hook" on page 15 → "Moving knife driving arm A and B" on page 37 → "Thread trimmer cam" on page 41

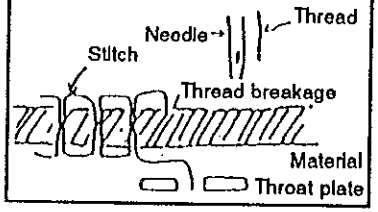
8) "Replacing the timing belt" on page 63 → "Timing between the needle and the hook" on page 15 → "Feed rock timing" on page 19 → "Feed driving timing" on page 19 → "Height of feed dog" on page 23

12. TROUBLES IN SEWING AND CORRECTIVE MEASURES

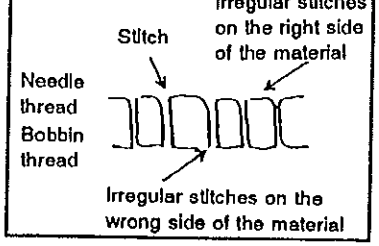
TROUBLE	DESCRIPTION	CAUSE (1)	CAUSE (2)	CORRECTIVE MEASURE
1. Isolated idling loop (loose stitches and looped stitches)	Knots of sewing threads are suddenly made on the right side or wrong side of the material as isolated idling loops.  Isolated idling loop	Needle thread tension is too low.		Increase the needle thread tension.
		Tension of the thread take-up spring has been improperly adjusted.	Stroke of the thread take-up spring is too small.	Increase the stroke of the thread take-up spring sufficiently.
			The thread take-up spring is insufficiently tensed.	Increase the tension of the spring.
		The amount of thread to be fed by thread take-up lever is excessive.		Move the take-up thread guide to the right to decrease the amount of thread to be fed by the thread take-up lever.
		Hook components are defective.	Clearance between the hook and the bobbin case stopper is too small.	Re-adjust the height of the hook. (Refer to page 17.)
			Hook is defective. (Scratches on the hook)	Replace the hook.
		Thread path is defective.	The thread path is not smooth on the surface.	Smoothen the thread path.
			The thread path has scratches on the surface.	Smoothen the thread path.
			The thread is caught in some part of the thread path.	Correct the thread path.
		Bobbin or bobbin case is defective.	The bobbin is engaged with the bobbin case in a defective way. The thread is caught in the defective engaging section.	Replace the bobbin or the bobbin case.

TROUBLE	DESCRIPTION	CAUSE (1)	CAUSE (2)	CORRECTIVE MEASURE
			Tension adjusting spring of the bobbin case is defective.	Replace the bobbin case.
			The bobbin runs idle in the bobbin case.	Increase the effective amount of the idling prevention spring.
		Bobbin is not wound properly.	Bobbin winder spring pressure is too high or too low.	Adjust the spring pressure to an adequate value.
		Needle slot in the feed dog is too small.		Use a feed dog with a larger needle slot.
		Needle used is too thin for the thread used.		Replace the needle or the thread properly.
		Defective needle	Tip of the needle has burrs.	Replace the needle with a new one.
			Installing direction of the needle is defective.	Re-install the needle properly.
		Feed timing is defective.	Feed timing is earlier than the standard timing.	Re-adjust the feed timing properly. (Refer to pages 19 ~ 22.)
			Height of the feed dog differs from the standard value.	Re-adjust the height of the feed dog properly. (Refer to page 23.)
		Hook timing is defective.	Hook timing is too early.	Retard the hook timing.
		Needle entry is defective.		Adjust so that the needle enters just the center of the needle slot in the feed dog.
		Bobbin case opening lever is defective.	Clearance between the hook and the bobbin case opening lever is too large.	Decrease the clearance properly.

TROUBLE	DESCRIPTION	CAUSE (1)	CAUSE (2)	CORRECTIVE MEASURE
2. Stitch skipping	Stitches are not completely finished since sewing threads are not made into stitches in part. 	Needle is defective.	The needle is bent.	Replace the needle with a new one.
			The needle is installed with faced toward the wrong direction.	Re-install the needle in the correct manner.
			The tip of the needle is blunt.	Replace the needle with a new one.
			The needle is too thick or too thin for the thread used.	Replace the needle with a one suited to the thread used.
		The hook components are defective.	Blade point of the hook is blunt or has worn out.	Correct the blade point of the hook, or replace the hook with a new one.
			The hook timing is defective.	Re-adjust the hook timing properly.
			Height of the needle bar is defective.	Re-adjust the vertical position of the needle bar with respect to the blade point of the hook.
			Clearance between the blade point of the hook and the needle is not proper.	Minimize the clearance.
			Effective amount of the needle guard is improper.	Adjust the effective amount of the needle guard properly.
			Thread loops are not made with consistency.	Wind the thread round the needle.
		The needle thread tension is too high.		Decrease the needle thread tension.
		The number of revolutions is too high.		Decrease the number of revolutions.

TROUBLE	DESCRIPTION	CAUSE (1)	CAUSE (2)	CORRECTIVE MEASURE
3. Needle thread breakage	The needle thread splits finely or breaks during sewing. 	Height of the needle bar is not correct.	Height of the needle is not adjusted to provide the specified dimension.	Re-adjust the height of the needle bar properly.
		Presser foot is defective.	The presser foot fails to rest on the throat plate.	Height of the presser foot is defective.
		Feed timing is defective. (The needle is bent.)		Re-adjust the feed timing properly.
		Thread take-up spring has been improperly adjusted.	Stroke of the thread take-up spring is too high.	Increase the stroke of the thread take-up spring sufficiently.
			The thread take-up spring is insufficiently tensed.	Increase the tension of the spring.
		Needle entry is defective.	The needle comes in contact with the needle hole in the throat plate.	Adjust the needle entry properly.
		Pressure of the presser foot is defective.	Pressure of the presser foot is too low.	Increase the pressure of the presser foot.
		Thread path is defective.	The thread path is not smooth on the surface.	Smoothen the thread path.
			The thread path has scratches on the surface.	Smoothen the thread path.
			The thread is caught in some part of the thread path.	Correct the thread path.
		Needle thread tension is improper.	The needle thread tension is too high or too low.	Adjust the needle thread tension properly.
			The tension controlled by the tension controller No. 1 is too low.	Adjust the thread tension controlled by controller No. 1 to a value which prevents the thread from flapping.

TROUBLE	DESCRIPTION	CAUSE (1)	CAUSE (2)	CORRECTIVE MEASURE
		Needle is defective.	The needle is bent.	Replace the needle with a new one.
			The needle has scratches.	Replace the needle with a new one.
			The tip of the needle is blunt.	Replace the needle with a new one.
			The needle is installed with faced toward the wrong direction.	Re-install the needle in the correct manner.
			The needle is too thick or too thin for the thread used.	Replace the needle with a one suited to the thread used.
		The hook components are defective.	The thread path of the hook has scratches.	Smoothen the thread path.
			Blade point of the hook is blunt or has worn out.	Correct the blade point of the hook, or replace the hook with a new one.
			Clearance between the blade point of the hook and the needle is too small.	Widen the clearance to allow the thread to come off the hook smoothly.
			The hook timing is too early.	Re-adjust the hook timing properly.
			The bobbin case opening lever provides an excessive clearance.	Adjust the clearance properly.
			The needle interferes with the blade point of the hook.	Adjust the needle-to-hook relation properly.

TROUBLE	DESCRIPTION	CAUSE (1)	CAUSE (2)	CORRECTIVE MEASURE
4. Irregular stitches	Knots of the needle thread and the bobbin thread irregularly appear on the right side or wrong side of the material. 	Thread take-up spring has been improperly adjusted.	Stroke of the thread take-up spring is too large or too small.	Re-adjust the stroke of the thread take-up spring sufficiently.
			Tension of the thread take-up spring is too high or too low.	Re-adjust the tension of the spring properly.
		The number of revolution is excessive.	The needle generates heat, resulting in thread breakage.	Decrease the number of revolutions.
				Wind the thread round the needle.
		The installing position of the needle is too low.	The height of the needle bar is insufficient.	Raise the needle bar.
			The needle is not attached in the needle bar in the correct manner.	Attach the needle in the needle bar properly.
		The pressure of the presser foot is too low.	Stitches gather on the overlapped section of a material, resulting in thread breakage.	Increase the pressure of the presser foot.
		Defective needle entry.	The needle interferes with the needle hole edge of the throat plate.	Re-adjust the needle entry point properly. (Refer to page 5.)
		The hook components are defective.	The amount of oil in the hook is insufficient.	Adjust so that a sufficient amount of oil is supplied to the hook. (Refer to page 51.)
			Dust gathers on the reverse side of the bobbin case.	Clean up the bobbin case.
			Hook timing is too early.	Retard the hook timing.
			Hook is defective. (The hook has scratches or the thread path is defective, etc.)	Replace the hook with a new one and/or correct the thread path.

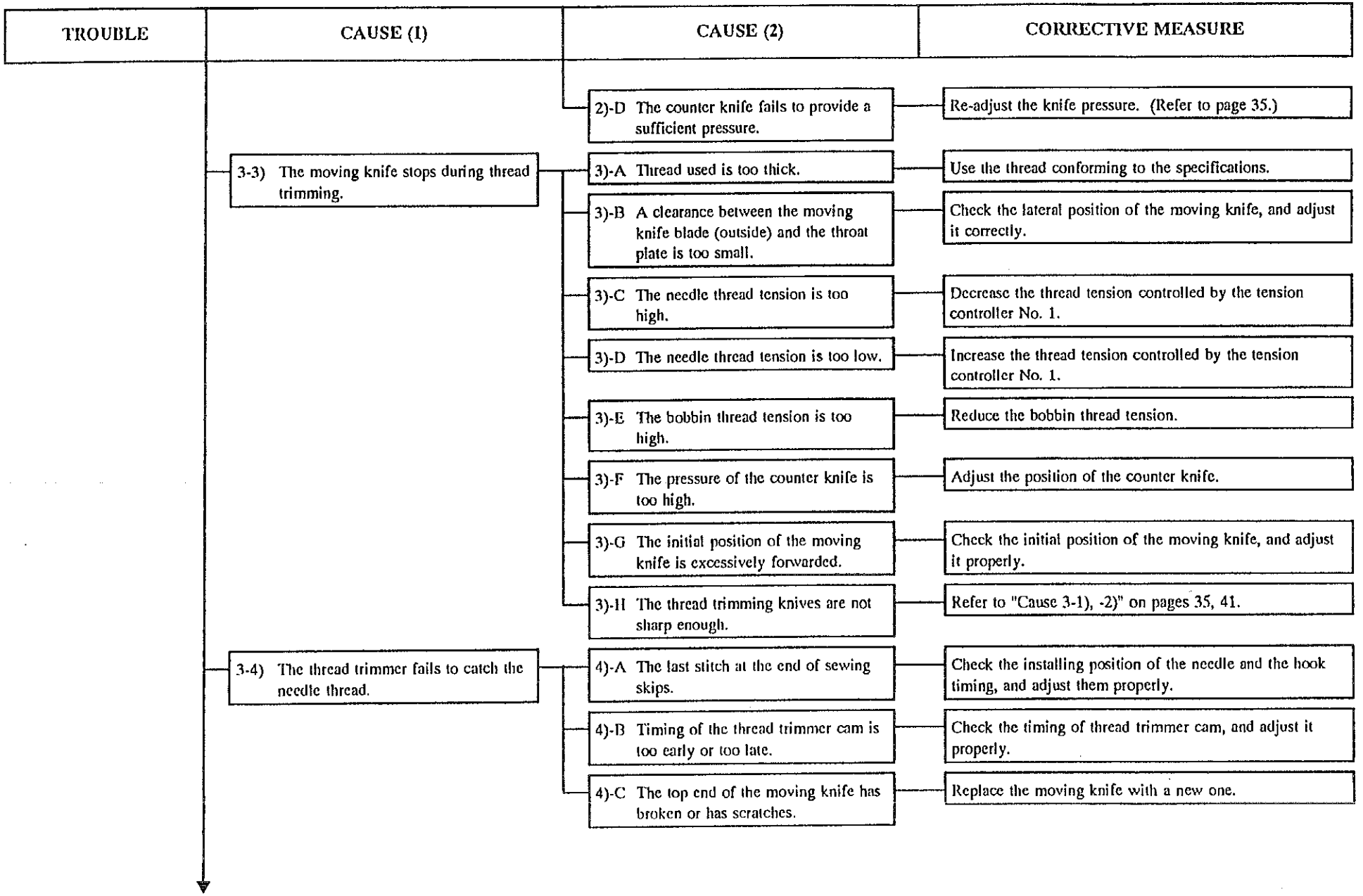
TROUBLE	DESCRIPTION	CAUSE (1)	CAUSE (2)	CORRECTIVE MEASURE
			The bobbin case opening lever provides and excessive clearance.	Decrease the clearance at the bobbin case opening lever.
			The clearance between the throat plate and the bobbin case stopper is too small.	Re-adjust the height of the hook. (Refer to page 17.)
		The bobbin and the bobbin case are defective.	The bobbin is improperly engaged with the bobbin case. As a result, the bobbin thread cannot be fed smoothly.	Replace the bobbin or the bobbin case.
			The bobbin has not been wound properly. As a result, the bobbin thread fails to be fed smoothly.	Adjust the tension of the bobbin winder or the position of the bobbin winder tension controller.
			The bobbin runs idle in the bobbin case.	Increase the idling prevention spring pressure.
			The tension adjusting spring of the bobbin case has been poorly adjusted.	Replace the bobbin case with a new one.
			The bobbin is wound with an excessive amount of thread.	Re-wind the bobbin to the extent where the thread wound round the bobbin does not protrude the periphery of the bobbin.
		The needle thread tension and bobbin thread tension are too low.		Increase the thread tension properly.
		Thread take-up spring has been improperly adjusted.	Stroke of the thread take-up spring is too large or too small.	Re-adjust the stroke of the thread take-up spring sufficiently.

TROUBLE	DESCRIPTION	CAUSE (1)	CAUSE (2)	CORRECTIVE MEASURE
			Tension of the thread take-up spring is too high or too low.	Re-adjust the tension of the spring properly.
		Thread path is defective.	The thread path is not smooth on the surface.	Smoothen the thread path.
			The thread path has scratches on the surface.	Smoothen the thread path.
			The thread is caught in some part of the thread path.	Correctly thread the thread path.
		The length of thread fed by the thread take-up lever is excessive or insufficient.		Move the take-up thread guide to the right, and adjust the length of thread to be fed by the thread take-up lever appropriately.
		The feed timing is defective.		Adjust the feed timing properly. (Refer to pages 19 ~ 22.)

13. Troubles with functions of the thread trimmer and corrective measures

TROUBLE	CAUSE (1)	CAUSE (2)	CORRECTIVE MEASURE
1. One or two stitches skip at the start of sewing.	1-1) Length of thread remaining at the needle tip after thread trimming is too short.	1)-A The needle thread path is defective in part, resulting in excessive needle thread tension at the time of thread trimming.	Check the needle thread path for a defective part. Remove the thread tangling round the thread guide rod and correct the position of the thread guide of the spool rest rod.
		1)-B Tension of the tension disk No. 1 is too high.	Turn the thread tension nut No. 1 counterclockwise to reduce the thread tension.
		1)-C The tension disk No. 3 fails to release the thread insufficiently.	Re-adjust the timing of releasing the thread tension properly. Also, check that the tension releasing solenoid actuates while the sewing machine is being energized.
		1)-D The timing of thread trimming is too early.	Check the timing of thread trimming and adjust it properly referring to page 41.
		1)-E The moving knife and/or the hook has scratches.	Check the hook and the knife for scratches, and buff them up if any. If the knife and/or the hook is seriously damaged, replace them with a new one.
	1-2) The bobbin thread fails to be clamped.	2)-A The installing position of the clamp spring is wrong.	Adjust the installing position of the clamp spring referring to page 35.
		2)-B The clamp spring pressure is too low.	Adjust the clamp spring pressure or replace the clamp spring with a new one referring to page 35.
		2)-C The clamp spring has scratches, or has broken.	Replace the clamp spring with a new one.
		2)-D The needle thread on the material side removes the bobbin thread.	Increase the thread tension of the thread tensioner No. 1.
	1-3) The needle, walking foot and feed dog used are not suitable. Or the pressure of the walking foot is too low.	3)-A The needle is too thick.	It is advisable to use the thinnest needle as long as loose stitches do not occur.
		3)-B The needle slot in the feed dog is too large.	Replace the feed dog with one which has a smaller needle slot.

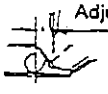
TROUBLE	CAUSE (1)	CAUSE (2)	CORRECTIVE MEASURE
		3)-C The pressure of the presser foot is too low.	Increase the pressure of the presser foot, by turning the presser spring regulator clockwise, to the extent where the feed dog scratches the material.
		3)-D Walking foot fails to clamp the needle thread.	Replace the walking foot with one which does not have a slit. (See on page 95)
2. The thread is likely to slip off the needle eyelet.	2-1) The needle thread slips off the needle eyelet immediately after thread trimming.	1)-A Length of thread trailing from the needle eyelet is too short.	Refer to "Cause 1 - 1)-A through E" on page 41.
	2-2) The needle thread slips off the needle eyelet at the start of sewing.	2)-A Length of thread trailing from the needle eyelet at the sewing start is too short.	Refer to "Cause 1 - 1)-A through E" on page 41.
3. Thread trimming faiture	3-1) The thread trimmer fails to cut the threads.	1)-A The moving knife blade fails to match the counter knife blade in height and direction.	Check the height of the moving knife and counter knife.
		1)-B The moving knife blade and counter knife blade have worn out or have broken.	Replace the moving knife blade and the counter knife blade with new ones.
		1)-C The counter knife fails to provide a sufficient pressure.	Re-adjust the knife pressure. (Refer to page 35.)
	3-2) Single yarn of the thread remains untrimmed.	2)-A The moving knife blade and counter knife blade have worn out or have broken.	Replace the moving knife blade and the counter knife blade with new ones.
		2)-B The moving knife blade fails to match the counter knife blade in height and direction.	Check the height of the moving knife and counter knife.
		2)-C The timing of thread trimming is too late.	Check the cam for correct timing.

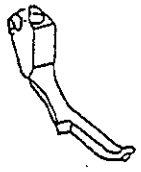

TROUBLE
CAUSE (1)
CAUSE (2)
CORRECTIVE MEASURE
2)-D The counter knife fails to provide a sufficient pressure.
Re-adjust the knife pressure. (Refer to page 35.)
3-3) The moving knife stops during thread trimming.
3)-A Thread used is too thick.
Use the thread conforming to the specifications.
3)-B A clearance between the moving knife blade (outside) and the throat plate is too small.
Check the lateral position of the moving knife, and adjust it correctly.
3)-C The needle thread tension is too high.
Decrease the thread tension controlled by the tension controller No. 1.
3)-D The needle thread tension is too low.
Increase the thread tension controlled by the tension controller No. 1.
3)-E The bobbin thread tension is too high.
Reduce the bobbin thread tension.
3)-F The pressure of the counter knife is too high.
Adjust the position of the counter knife.
3)-G The initial position of the moving knife is excessively forwarded.
Check the initial position of the moving knife, and adjust it properly.
3)-H The thread trimming knives are not sharp enough.
Refer to "Cause 3-1), -2)" on pages 35, 41.
3-4) The thread trimmer fails to catch the needle thread.
4)-A The last stitch at the end of sewing skips.
Check the installing position of the needle and the hook timing, and adjust them properly.
4)-B Timing of the thread trimmer cam is too early or too late.
Check the timing of thread trimmer cam, and adjust it properly.
4)-C The top end of the moving knife has broken or has scratches.
Replace the moving knife with a new one.

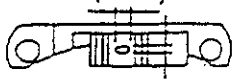
TROUBLE	CAUSE (1)	CAUSE (2)	CORRECTIVE MEASURE
	3-5) The thread trimmer fails to catch the bobbin thread.	5)-A Stroke of the moving knife is too small.	Adjust the stroke of the moving knife referring to page 35.
		5)-B Bobbin thread path is defective. (The thread slips off the bobbin thread guide of the bobbin case.)	Check the bobbin thread path.
		5)-C The top end of the moving knife has broken or has scratches.	Replace the moving knife with a new one.
		5)-D The position of the moving knife is too high or too low.	Check the moving knife for the correct height referring to page 41.
	3-6) The thread trimmer fails to trim the needle thread and bobbin thread.	6)-A The moving knife blade fails to match the counter knife blade in height and direction.	Check the height of the moving knife and counter knife.
		6)-B The moving knife blade and counter knife blade have worn out or have broken.	Replace the moving knife blade and the counter knife blade with new ones.
		6)-C The counter knife fails to provide a sufficient pressure.	Re-adjust the knife pressure. (Refer to page 35.)
		6)-D The moving knife fails to operate.	Check the installing position of the moving knife driving arm A, and adjust it correctly.
			Check the performance of the thread trimmer solenoid.
			Check the timing of the synchronizer, and adjust it correctly.

14. REPLACEABLE GAUGE TABLE

Presser foot \ Walking foot				
		10711653	10711752	10711851
	10712552	Standard 		
	10712651	For overlapped sections of material * To be used when the material is not fed smoothly under the standard walking foot and presser foot. 		
	10712750	For light-weight sponge * To be used when sewing resilient materials including sponge. 	For heavy-weight sponge * To be used when sewing more resilient materials. 	
	10712859			Right-single-sided foot * To be used when sewing the edges of a material. 
	10712958			
	ϕ3 10747350 ϕ4 10747459 ϕ5 10747558 ϕ6 10747657			

Presser foot \ Walking foot				
		10711950	ϕ3 10745354 ϕ4 10745453 ϕ5 10745552 ϕ6 10745651	ϕ3 10746352 ϕ4 10746451 ϕ5 10746550 ϕ6 10746659
	10712552			
	10712651			
	10712750			
	10712859			
	10712958	Left-single-sided foot * To be used when sewing the edges of a material. 		
	ϕ3 10747350 ϕ4 10747459 ϕ5 10747558 ϕ6 10747657		For piping * To be used for piping process in general. 	For piping * The position of the needle with respect to the pipe can be adjusted. 

Presser foot \ Walking foot		
		10712354 Walking foot with no slit Use this type of walking foot when stitch skipping frequently occurs.
	10712552	○
	10712651	○
	10712750	○
	10712859	
	10712958	
	ø3 10747350 ø4 10747459 ø5 10747558 ø6 10747657	

Feed dog		
3.3mm (0.130")  2.2mm (0.087")	3.3mm (0.130")  2.2mm (0.087")	2.5mm (0.098")  1.6mm (0.063")
10717106	10717205	10717304
Standard	With no grooves * To be used when the needle thread and the bobbin thread do not smoothly interlace with each other at the start of sewing.	For thin threads

15. TABLE DIMENSIONAL DIAGRAM