

# **JUKI®**

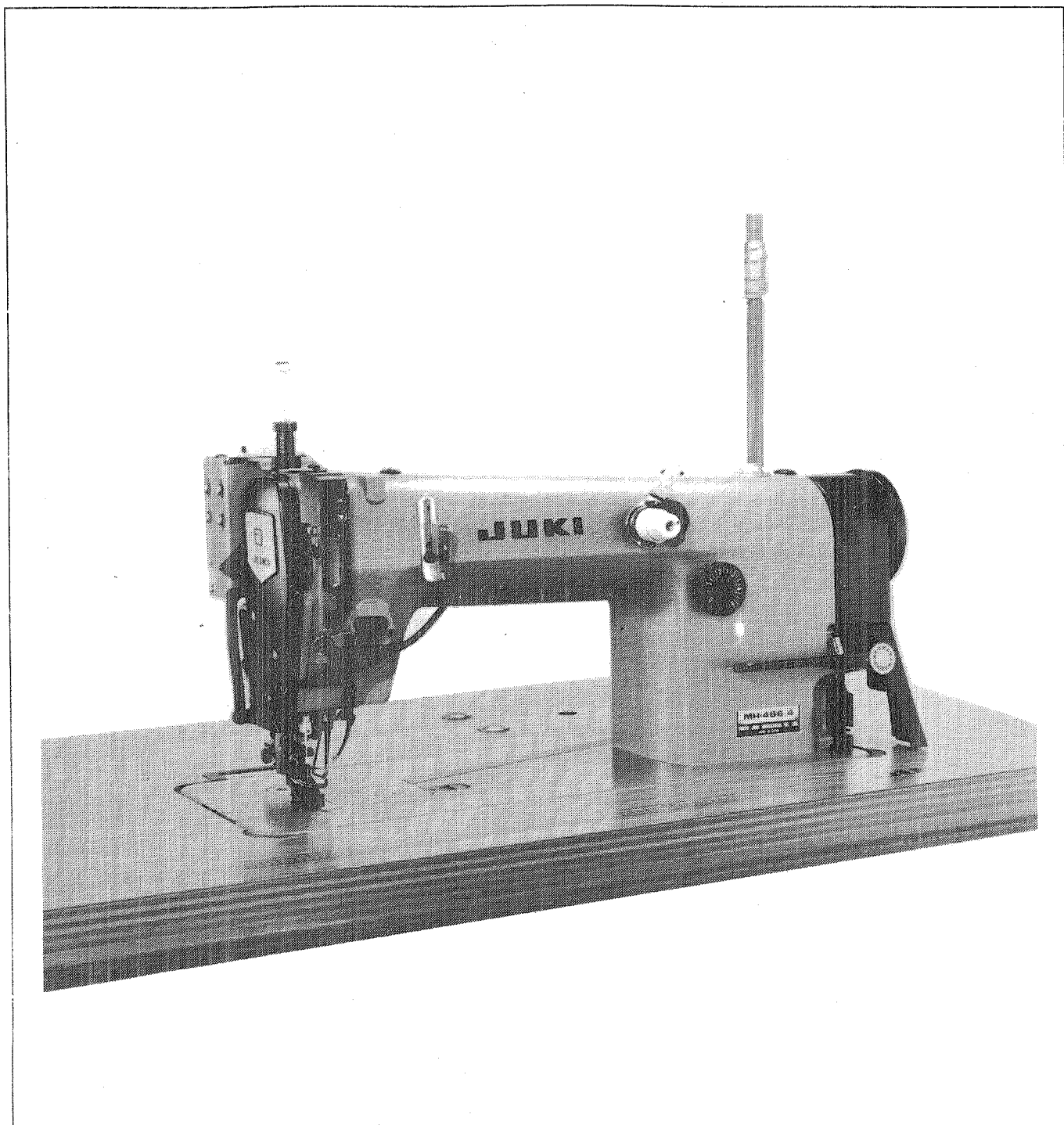
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# **MH-486-4**

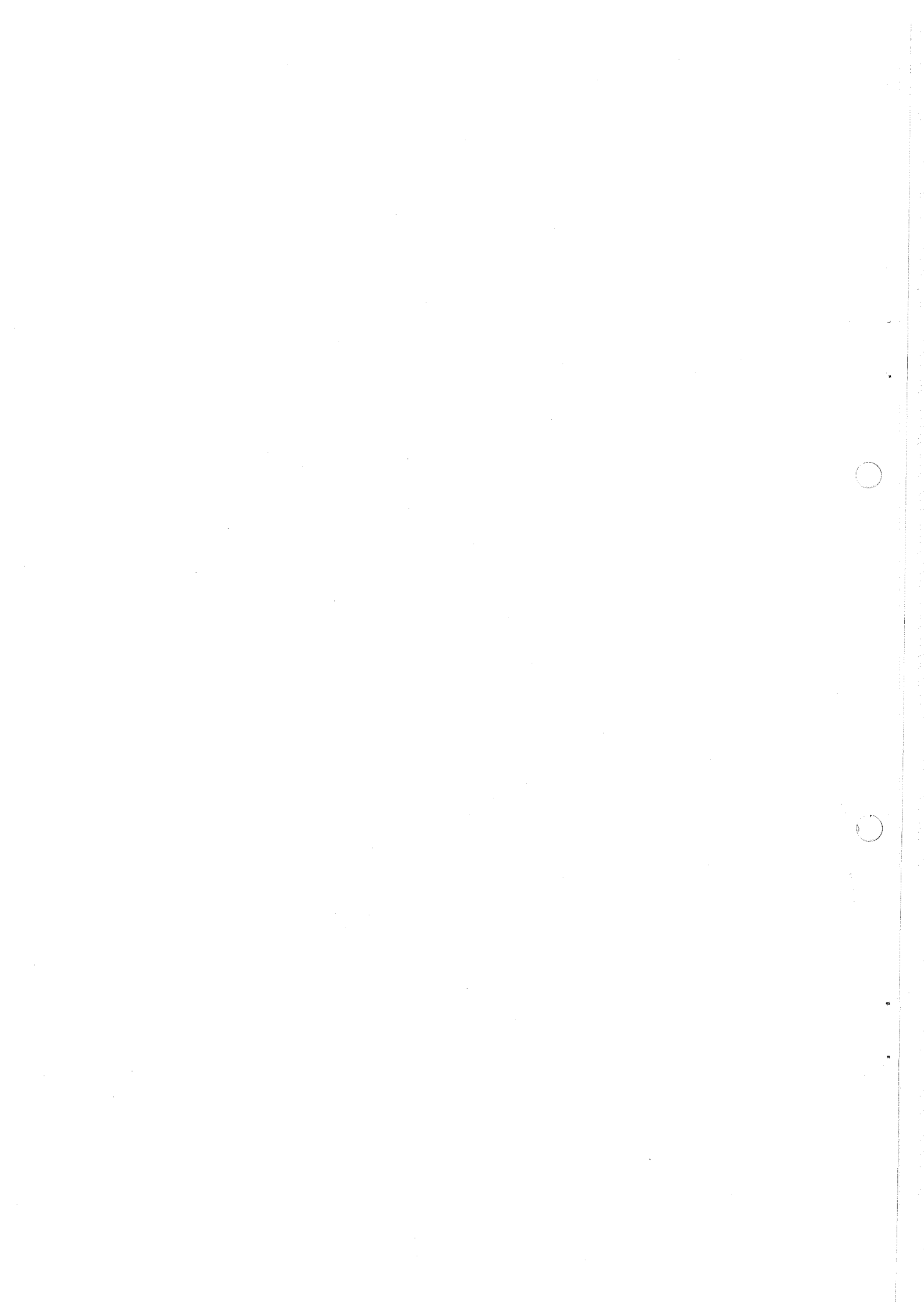
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**1-Needle, Bottom Feed & Variable Top Feed Double-chain Stitch  
Machine with Automatic Thread Trimmer**

## **ENGINEER'S MANUAL**



**TOKYO JUKI INDUSTRIAL CO., LTD.**  
**FOREIGN TRADE BUSINESS DIV.**



## **PREFACE**

This Engineer's Manual is written for the technical personnel who are responsible for the service and maintenance of the sewing machine.

The Instruction Book for this sewing machine, which are intended for the operators and maintenance personnel at apparel factories contains detailed instructions. This Engineer's manual describes "Standard Adjustment", "Adjustment Procedures", "Results of Improper Adjustment", and other necessary information which are not covered by the Instruction Book. It is advisable to use the relevant Instruction Book and Parts Book together with this Engineer's Manual when carrying out the maintenance of this sewing machine.

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## 1. SPECIFICATIONS

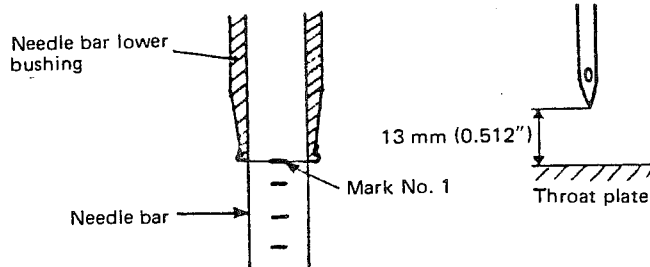
1	Model	MH-486-4
2	Name of machine	1-Needle, Bottom Feed & Variable Top Feed Double-chain Stitch Machine with Automatic Thread Trimmer
3	Sewing speed	Max. 4500 s.p.m.
4	Stitch length	Max. 5 mm (0.197")
5	Max. reverse feed stitch length	5 mm (0.197") (Condensation stitch available)
6	Needle	ORGAN TV x 7 #9 ~ #21 (SCHMETZ 145 x 7 #65 ~ #130)
7	Lift of presser foot	5.5 mm (0.217") by hand lifter (7 mm (0.276") by knee lifter)
8	Top feed amount	0 to 7 mm (0" ~ 0.276")
9	Needle bar stroke	33 mm (1.299")
10	Thread take-up stroke	33 mm (1.299") (needle bar thread take-up)
11	Looper drive system	Driven by tilting crank
12	Looper stroke	21.5 mm (0.847")
13	Looper avoiding stroke	3.2 mm (0.126")
14	Needle guard stroke	3 mm (0.118") (movable needle guard)
15	Loop guide	Movable
16	Loop stroke	3 mm (0.118")
17	Thread spreader	Driven by 4-pivot link
18	Thread spreader stroke	28 mm (1.102")
19	Lubrication system	Fully automatic lubrication by impeller pump
20	Lubricating oil	New Defrix Oil No. 1
21	Oil return system	Plunger pump
22	Electro-stop motor	Electro-stop motor
23	Weight	37.5 kg
24	Thread trimmer	Under-trimmer system
25	Wiper	Needle thread clamp system
26	Auto-lifter	Option (AK-4)
27	Intermittent gathering device	Option (PF-3)

## 2. STANDARD ADJUSTMENTS

### Standard Adjustment

#### (1) Height of the needle bar

The first marker line must be aligned with the bottom end surface of bushing when the needle bar reaches the lowest point of its stroke.

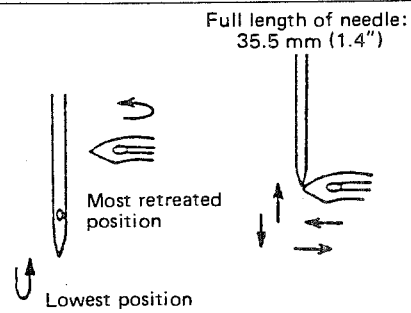


(Reference)  
The needle point is 13 mm (0.512") above the throat plate surface when the needle bar reaches the highest point of its stroke.

#### (2) Timing of the needle and the looper

##### 1) Timing of the looper with respect to the needle

The looper must be in the most retreated position when the needle bar is in the lowest position of its stroke.



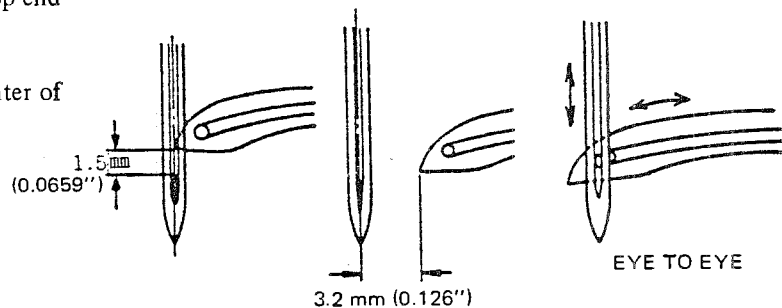
##### 2) Position of the looper point when catching the needle thread

When catching the needle thread:

1.5 mm (0.0659") from the top end of the needle eye

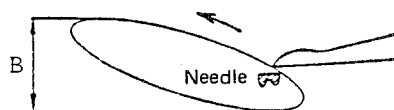
When returned:

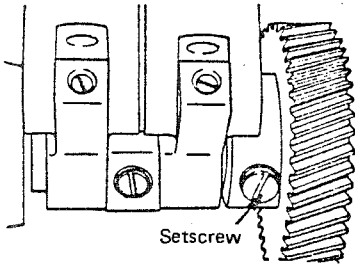
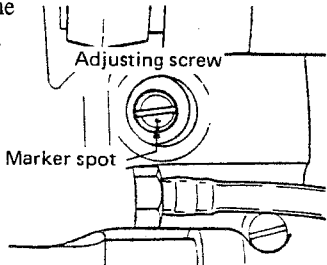
3.2 mm (0.126") from the center of the needle



##### 3) Looper avoiding motion

B = 3.2 mm (0.126")

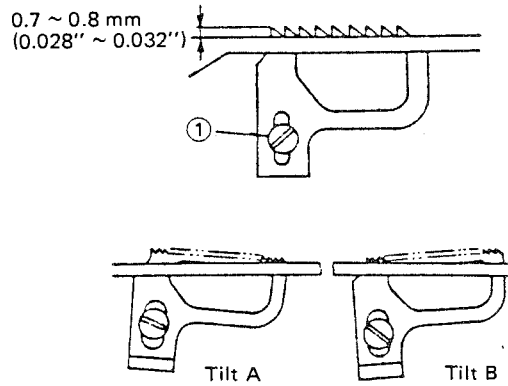


How to Adjust	Effect of Adjustment
<ul style="list-style-type: none"> <li>○ Loosen the clamp setscrew of the needle bar connection and adjust the needle bar height.</li> </ul>	<ul style="list-style-type: none"> <li>● It is advisable not to frequently change the height of the needle bar because it will disturb the timing of the feed eccentric cam, the thread spreader, and the looper thread take-up components, height of the needle guard, looper stroke, etc.</li> </ul>
<ul style="list-style-type: none"> <li>○ Loosen the setscrew of the looper gear (lower) to adjust the timing.</li> </ul>  <p style="text-align: center;">Setscrew</p> <ul style="list-style-type: none"> <li>○ The best way for this adjustment is to prepare a needle (gauge needle) whose overall length is 35.5 mm (1.4") in order to adjust the position of the looper so the looper point meets the needle point in both forward and backward strokes of the looper.</li> </ul>	<ul style="list-style-type: none"> <li>● If the timing of the looper is earlier than that of the needle, uneven thread triangular loop may be produced and stitches may be skipped on the rear of the material.</li> <li>● If the timing of the looper is later than that of the needle, loose stitches may result.</li> </ul>
<ul style="list-style-type: none"> <li>○ Move up the needle bar until the second marker line on the needle bar is leveled with the bottom end of the lower bushing of the needle bar. Then, make the point of the looper meet the center of the needle.</li> <li>○ <b>After adjustment, confirm that the eye of the needle meets the eye of the looper as shown at left.</b></li> </ul>	<ul style="list-style-type: none"> <li>● If the height of the looper point from the upper end of the needle eye is less than 1.5 mm (0.059"), needle-thread stitches may be skipped in the use of synthetic filament thread excepting mixed-fiber threads.</li> <li>● If the height of the looper point from the upper end of the needle eye is more than 1.5 mm (0.059"), needle-thread stitches may be skipped in the use of mixed-fiber threads.</li> </ul>
<ul style="list-style-type: none"> <li>○ Loosen the two black screws of the looper crank (do not loosen the first screw too much) and adjust the looper crank by turning the plated adjusting screw.</li> <li>○ The distance "B" is increased as the marker spot is moved to the right.</li> <li>○ <b>In general the looper avoiding motion needs not to be adjusted according to the thickness of needle.</b></li> </ul>  <p style="text-align: center;">Adjusting screw Marker spot</p>	<ul style="list-style-type: none"> <li>● If the distance "B" is too small, the needle point may hit the top edge or the back of the looper, causing scratches on the needle point or the looper.</li> </ul>

## Standard Adjustment

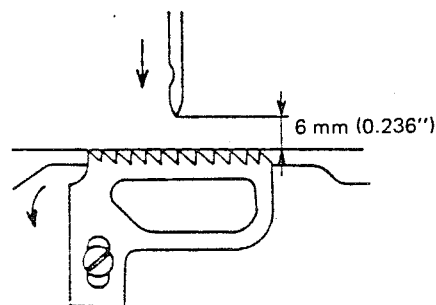
### (3) Height and tilt of the feed dog

The feed dog must be 0.7 (0.028") to 0.8 mm (0.032") above and in parallel to the throat surface.



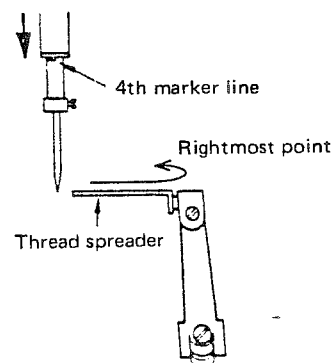
### (4) Feed timing

When the needle point is 6 mm (0.236") above the throat plate surface, the top of the feed dog must be flush with the throat plate surface (in case of a 5 mm (0.197") stitch length).

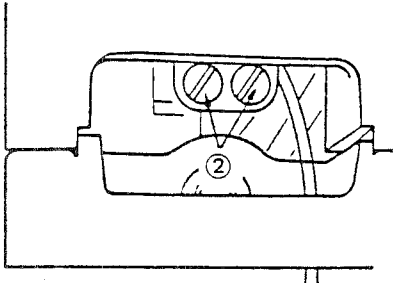
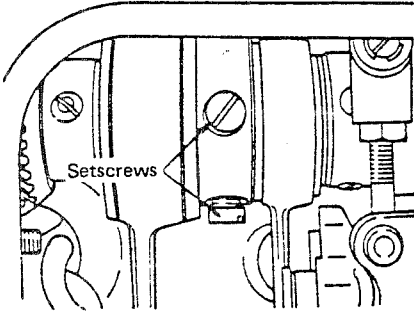
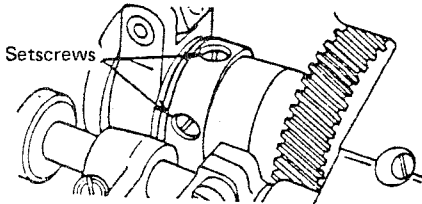


### (5) Timing of the thread spreader with respect to the needle

The rightmost point of the swing of the thread spreader must be at an angle of 60° with the needle point (needle in its highest position) taken as 0°.



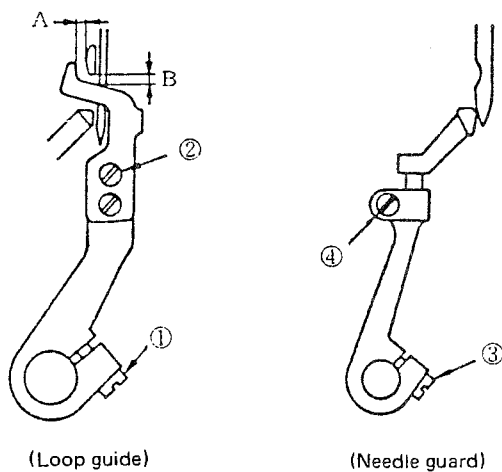


How to Adjust	Effect of Adjustment
<ul style="list-style-type: none"> <li>○ Turn screw ① to adjust the height of the feed dog.</li> <li>○ Turn screw ② to adjust the tilt (A or B) of the feed dog.</li> </ul> 	<ul style="list-style-type: none"> <li>● If the feed dog is too high, the needle stays in the throat plate long and may be broken or bent.</li> <li>● If the feed dog is too low, it may fail to feed the material in a regular pitch.</li> <li>● The tilt "A" will effectively prevent puckering by pulling the material.</li> <li>● The tilt "B" will prevent uneven material feed of some kinds of cloths.</li> </ul>
<ul style="list-style-type: none"> <li>○ Loosen the two setscrews of the feed eccentric cam to adjust the feed timing. After adjustment, tighten the two setscrews.</li> </ul> 	<ul style="list-style-type: none"> <li>● A late lowering timing of the feed dog may allow the needle to come down farther and to stay in the throat plate. As a result, the needle will break or bend.</li> </ul>
<ul style="list-style-type: none"> <li>○ Loosen the setscrews of the thread spreader eccentric cam and adjust so the thread spreader reaches its rightmost position at the moment the needle bar comes down to show its 4th marker line at the bottom end of the lower bushing of the needle bar.</li> </ul> 	<ul style="list-style-type: none"> <li>● If the angle is smaller than 60°, the thread spreader will often release the needle thread earlier than required, resulting in stitch skipping.</li> <li>● If the angle is greater than 60°, the thread spreader holds the thread too long, resulting in formation of loose needle thread stitches.</li> </ul>

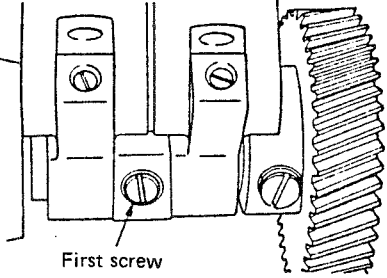
## Standard Adjustment

### (6) Positioning the needle guard and the loop guide

- Position of the loop guide  
A = 0.2 ~ 0.5 mm (0.008" ~ 0.02")  
B = 0.5 ~ 1.0 mm (0.02" ~ 0.04")



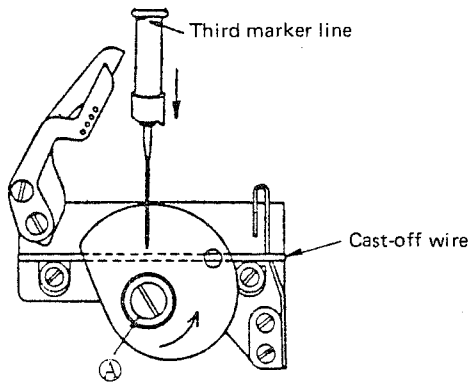
- Position of the needle guard : As high as possible as long as it does not deform the needle thread loop.

How to Adjust	Effect of Adjustment
<p>○ Adjust the timing of the needle guard cam with respect to the needle by setting the first screw to the flat of the shaft.</p>  <p>○ Turn screw ① and screws ② to adjust interspaces A and B, respectively.</p> <p>○ The height of the needle guard is restricted by the bottom of the loop guide. Turn screw ④ to adjust so the needle guard is set as high as possible but to such an extent that it neither touches the loop guide nor deforms the needle thread loop. Then, make additional adjustment of the needle guard by turning screw ③ so it properly guides the needle when the looper takes up a thread loop from the needle.</p>	<ul style="list-style-type: none"> <li>● If interspaces A and B are too large, the loop guide will not work effectively and may cause stitch skipping especially in reverse stitching.</li> <li>● If interspace A is too small, it may be harmless as long as the loop guide does not come in contact with the looper. If the loop guide is allowed to strike the looper, it will cause scratches on the looper.</li> <li>● If interspace B is too small, it may be harmless when thin threads are used. But the loop guide may hook the thread when thick thread are used.</li> <li>● If the needle guard is set to excessively press the needle, it may cause the needle point to wear out or cause the needle point to strike the needle guard, leading to needle breakage when the handwheel is turned in the reverse direction for adjustment.</li> </ul>

## Standard Adjustment

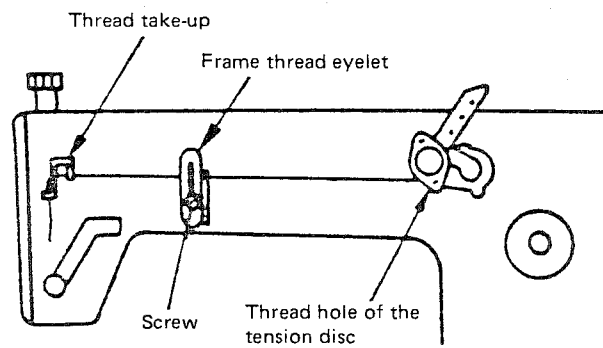
### (7) Timing of the looper thread take-up

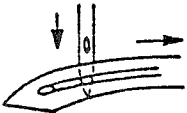
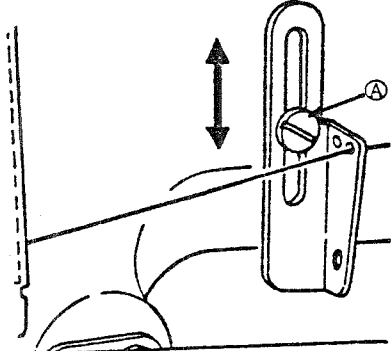
When the looper thread take-up has turned  $110^\circ$  from the start point at which the needle bar is in the highest position, the cast-off wire must be seen through the adjustment hole in the looper thread take-up.



### (8) Positioning the frame thread eyelet

When the needle bar is in its highest position of its stroke, the thread hole of the tension disc, frame thread eyelet, and the hole of the thread take-up lever must be horizontally aligned with each other.



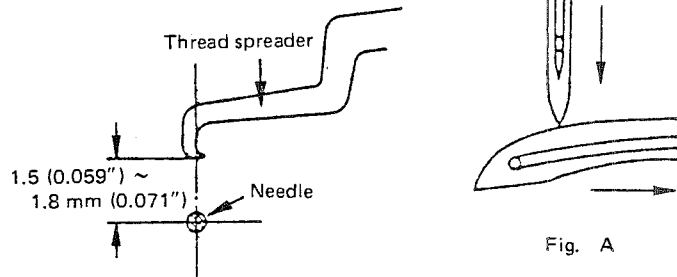
How to Adjust	Effect of Adjustment
<p>○ Turn setscrew (A) of the looper thread take-up to adjust so the cast-off wire appears in the middle of the adjustment hole when the third marker line on the needle bar is coming out of the bottom end of the needle bar lower bushing (equivalent to 110° turn).</p> <p>○ After making the above adjustment, confirm that the looper thread take-up keeps on holding the looper thread until the needle point comes down to the bottom surface of the looper and passes entirely through a triangular thread loop.</p> 	<ul style="list-style-type: none"> <li>● If the timing is set earlier than specified, the looper thread may be released the needle point completely enters the triangular thread loop and stitch skipping may result.</li> <li>● If the timing is very late, uneven stitch tightness or looper thread stitch skipping may result.</li> <li>● It is recommendable to set the timing of the looper thread take-up comparatively earlier than the standard adjustment in order to obtain moderate looper thread tension which leads to formation of good stitches.</li> </ul>
<p>○ Move up or down screw (A) to adjust so 2/3 of the necessary length of the needle thread is drawn out through the tension disc while the needle bar is going up and the remaining 1/3 is drawn out while the needle bar is coming down.</p> 	<ul style="list-style-type: none"> <li>● If screw (A) is set too high, the needle thread tension is increased when the needle bar reaches its lowest position.</li> <li>● If screw (A) is set too low, the needle thread tension is increased when the needle bar reaches its highest position.</li> <li>● If the needle thread is often untwisted, set screw (A) to the highest position.</li> </ul>

## Standard Adjustment

### (9) Positioning the thread spreader

#### a) Lateral position

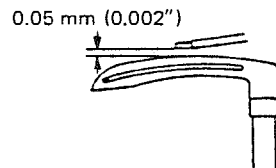
The inside face of the thread spreader must be aligned with the center of the needle when the positions of the looper and the needle point are as shown in Fig. A.



#### b) Longitudinal position

The tip of the thread spreader must be 1.5 (0.059") to 1.8 mm (0.071") from the center of the needle.

#### c) Height : 0.05 mm (0.002") from the edge of the looper



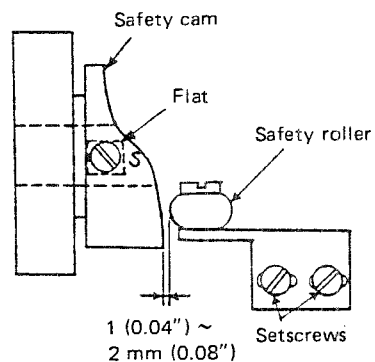
### (10) Positioning the safety cam and the safety roller

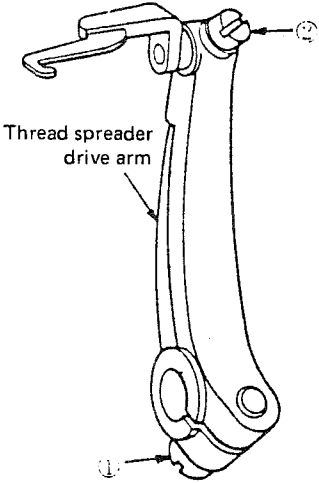
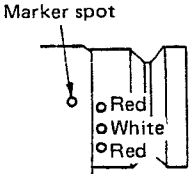
#### 1) Position of the safety cam

The second screw (marked with "S") on the safety cam must be set to the flat of the looper shaft.

#### 2) Position of the safety roller

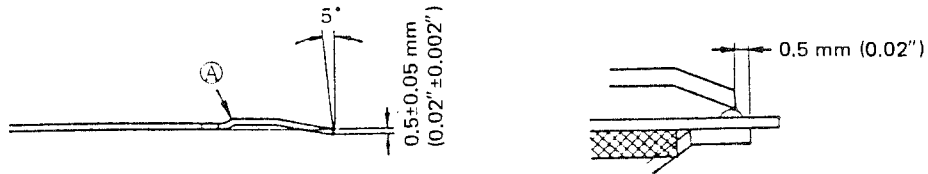
The clearance between the safety roller and the blocking wall surface of the safety cam must be 1 mm (0.04") to 2 mm (0.08").



How to Adjust	Effect of Adjustment
<p>a) Loosen setscrew ① and adjust the position of the thread spreader drive arm so the inside face of the thread spreader is aligned with the center of the needle point comes down to meet the upper edge of the looper.</p>  <p>b) Make the white marker dot on the handwheel meet the one on the machine arm. Then, loosen setscrew ① and adjust the longitudinal position of the thread spreader.</p> <p>c) Loosen setscrew ② and adjust the clearance between the tip of the thread spreader and the looper to a minimum, but do not allow the spreader to touch the looper.</p>	<ul style="list-style-type: none"> <li>● If the thread spreader is set deflected to the right, needle thread stitches may be often skipped.</li> <li>● If the thread spreader is set deflected to the left; <ul style="list-style-type: none"> <li>○ The needle thread may often break when a thin thread is used.</li> <li>○ Needle thread stitches may be often skipped in reverse stitching.</li> </ul> </li> <li>● If the distance is greater than 1.5 mm (0.059"), starting stitches may be frequently skipped.</li> <li>● If the distance is smaller than 1.5 mm (0.059"), the thread spreader may take up three threads. This will lead to formation of loose stitches and also stitch skipping at the sewing start since the three threads taken up by the thread spreader are cut at the time of thread trimming, leaving an insufficient length of the remaining needle thread.</li> <li>● If the clearance is too large, the thread spreader may fail to catch the looper thread at the sewing start, resulting in stitch skipping, or the looper thread may not be trimmed when sewing without materials.</li> </ul>
<ul style="list-style-type: none"> <li>○ Positioning the safety cam Fix the second screw (marked with "S") to the flat of the looper shaft.</li> <li>○ Positioning the safety roller Loosen the setscrews of the safety roller and adjust to provide the specified clearance. &lt; Confirmation to be made after adjustment &gt; Align the marker spot on the machine arm with the white marker spot on the handwheel. With the safety roller pressed against the safety cam, turn the handwheel in the forward direction until it stops. At this time, be sure that the marker spot on the arm is aligned with the upper red marker spot on the handwheel.</li> </ul> 	<ul style="list-style-type: none"> <li>● If the safety cam is improperly positioned, the thread trimmer will not be actuated and threads will not be trimmed.</li> <li>● If the clearance is extremely larger or smaller than the standard adjustments, the tip of the moving knife will come in contact with the feed dog.</li> </ul>

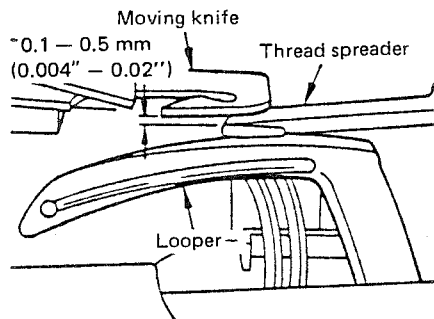
## Standard Adjustment

### (11) Dimensions and mounting position of the counter knife

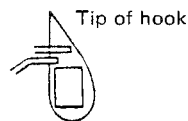
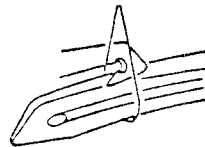


### (12) Positioning the moving knife

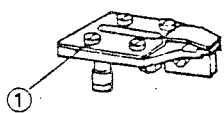
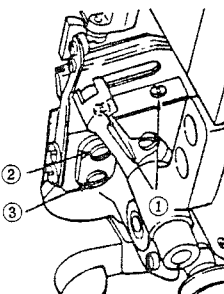
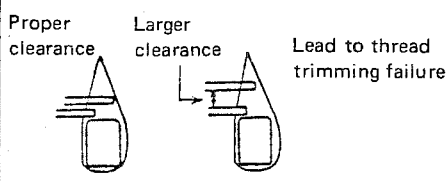
- Height : The moving knife must be 0.1 (0.004'') to 0.5 mm (0.02'') above the thread spreader.



- Longitudinal position :  
With the stitch length set to the maximum, the hook of the moving knife must pass by the needle thread nearer to the hook as closely as possible without hooking the needle thread loop on the looper.



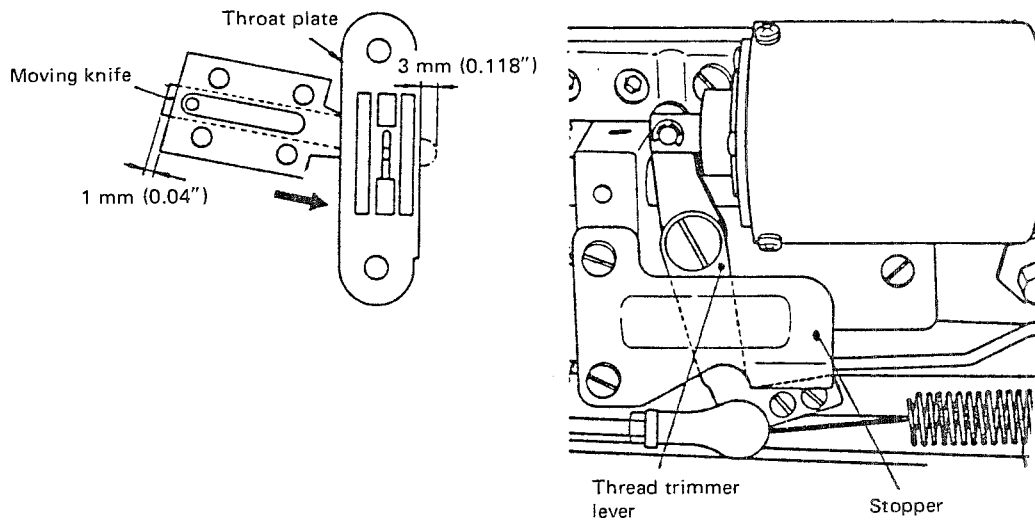


How to Adjust	Effect of Adjustment
<ul style="list-style-type: none"> <li>○ Whenever the counter knife has been resharpened, adjust ① to provide a height of 0.5 mm (<math>\pm 0.05</math>) mm. [ 0.02" (<math>\pm 0.002</math>" ) ].</li> <li>○ Position the counter knife so its end is recessed 0.5 mm (0.02") from the end of the clamp spring and tighten setscrews ① .</li> </ul> 	<ul style="list-style-type: none"> <li>● If the height is smaller than 0.05 mm (0.002"), the counter knife will be blunt.</li> <li>● If the height is larger than 0.5 mm (0.02"), the knife will not work properly.</li> <li>* If the end of the counter knife is recessed less than 0.5 mm (0.02") from the end of the clamp spring or if it extends beyond the end of the clamp spring, the looper thread may not be clamped.</li> </ul>
<ul style="list-style-type: none"> <li>○ Loosen setscrews ① and advance the moving knife to adjust the clearance between the bottom face of the moving knife hook and the top face of the thread spreader hook to 0.1 (0.004") to 0.5 mm (0.02").</li> </ul>  <ul style="list-style-type: none"> <li>○ The hole of screw ② is round while that of screw ③ is oblong. Turn the moving knife around screw ② to adjust the position of the moving knife.</li> </ul>	<ul style="list-style-type: none"> <li>● If the clearance is not enough, the thread path will be scratched.</li> <li>● If the clearance is too large, the moving knife may fail to catch and trim the threads.</li> </ul>  <ul style="list-style-type: none"> <li>● If the hook of the moving knife is too close to the needle thread loop, the hook will catch and trim the three threads, leaving an insufficient length of the remaining threads with resultant thread slippage from the needle at the subsequent sewing start.</li> <li>● If the hook of the moving knife is too far from the needle thread loop, the loop may not be caught by the hook, causing the needle thread or looper thread not to be trimmed.</li> </ul>

## Standard Adjustment

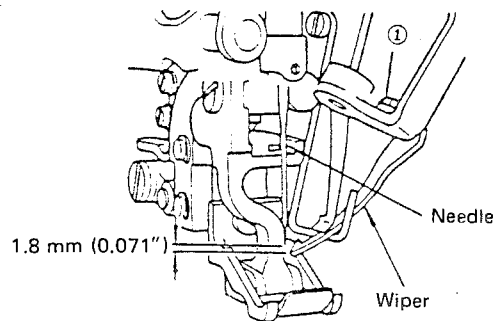
### (13) Stroke of the moving knife

- Position of the moving knife when retreated farthest :  
1 mm (0.04") from the trailing edge of the moving knife base
- Position of the moving knife when advanced farthest :  
3 mm (0.118") from the right edge of the throat plate

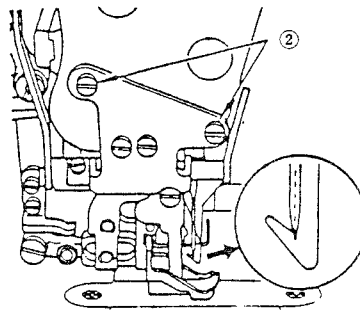


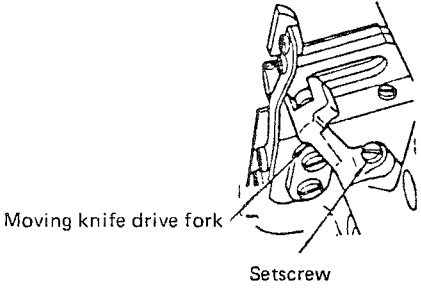

### (14) Adjusting the wiper

- 1) Adjust the height of the wiper so its end is 1.8 mm (0.071") below the point of the needle.



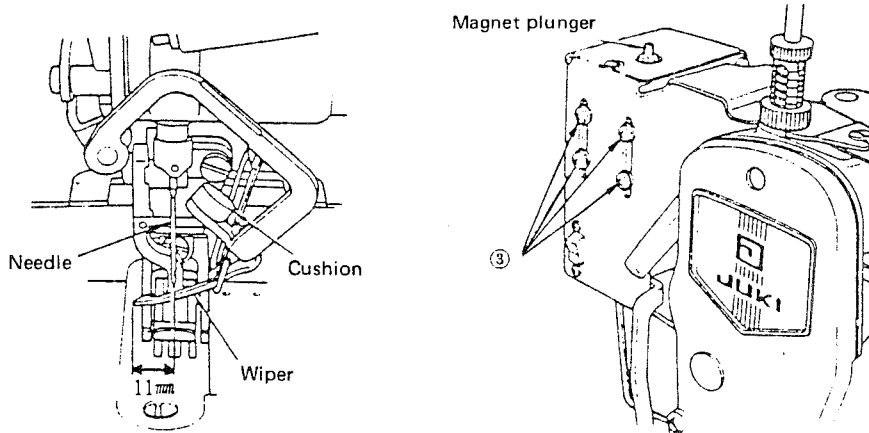
- 2) Adjust the longitudinal position of the wiper so it meets the center of the needle.



How to Adjust	Effect of Adjustment
<ul style="list-style-type: none"> <li>○ Remove the knife returning spring</li> <li>○ With the moving knife in its most retreated position, adjust to make the trailing edge of the moving knife project 1 mm (0.04") from the trailing edge of the moving knife base and tighten the setscrew of the moving knife drive fork. After adjustment, confirm that the thread trimmer lever is in contact with the stopper.</li> <li>○ Loosen the three screws for mounting the solenoid and adjust so the end of the moving knife projects 3 mm (0.118") from the right edge of the throat plate when the moving knife advances farthest.</li> </ul> <div style="text-align: center;">  <p>Moving knife drive fork</p> <p>Setscrew</p> </div>	<ul style="list-style-type: none"> <li>● If the projection of the moving knife from the moving knife base is less than 1 mm (0.04"), the engagement of the knife blades will be less than 1 mm (0.04"). As a result, the knives may fail to trim thick threads.</li> </ul> <div style="text-align: center;"> <p>Approx. 1 mm (0.04")</p>  </div> <ul style="list-style-type: none"> <li>● If the above projection is more than 1 mm (0.04"), the moving knife will be allowed to move in a greater stroke after thread trimming. This often causes stretchy threads or thin threads to slip off the looper thread clamp.</li> <li>● If the projection of the moving knife in its most advanced position is less than 3 mm (0.118"), the moving knife may fail to hook and trim the thread.</li> </ul>
<ul style="list-style-type: none"> <li>○ Loosen setscrew ① of the wiper and adjust the clearance between the wiper and the needle.</li> <li>○ Loosen setscrews ② of the wiper bracket on the face plate side and adjust to make the wiper meet the center of the needle.</li> </ul>	<ul style="list-style-type: none"> <li>● If the clearance is set larger than 1.8 mm (0.071"), the wiper may be broken when sewing thick materials.</li> <li>● If the wiper does not meet the center of the needle, the wiper will not work properly.</li> </ul>

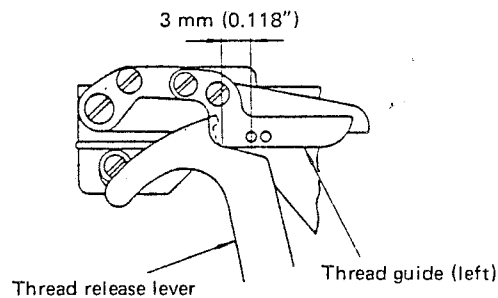
## Standard Adjustment

### 3) Wiper in its most advanced position : 11 mm (0.433") from the needle center



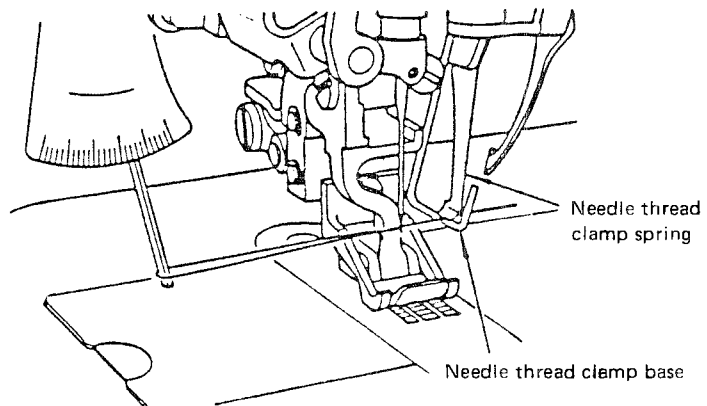
### (15) Amount of the looper thread to be drawn out

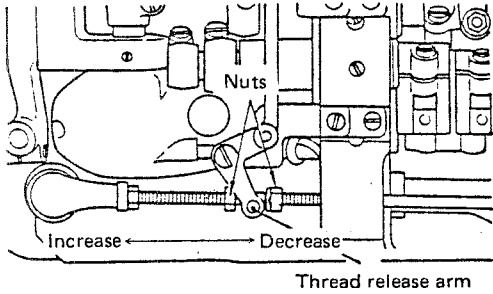
The thread release lever must be positioned 3 mm (0.118") from the center of the left hole in the thread guide.



### (16) Clamping pressure applied by the needle thread clamp

Clamping pressure : 30 to 40 g

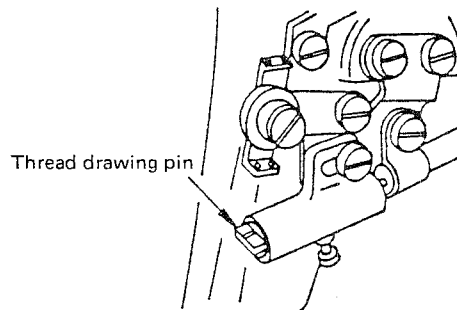


How to Adjust	Effect of Adjustment
<ul style="list-style-type: none"> <li>○ Loosen setscrews ③ and adjust so the end of the wiper is 11 mm (0.433") from the center of the needle when the magnet plunger is fully pushed up.</li> <li>○ After adjustment, be sure that the wiper does not strike the needle and that the cushion on the wiper arm is in contact with the bottom face of the machine arm when the wiper is in its home position.</li> <li>○ Set the stroke of the magnet to 8.5 mm (0.335").</li> </ul>	<ul style="list-style-type: none"> <li>● If the distance of the wiper from the needle center is less than 11 mm (0.433"), the wiper may not work properly.</li> <li>● If the above distance is more than 11 mm (0.433"), the wiper may hit the needle thread clamp spring or operator's fingers.</li> </ul>
<ul style="list-style-type: none"> <li>○ Loosen the two nuts and move the thread release arm to the right or left for adjustment. Move the thread release arm to the right to decrease the amount of thread to be drawn out or to the left to increase it.</li> </ul>  <p style="text-align: center;">Thread release arm</p> <ul style="list-style-type: none"> <li>* For some types of threads that are liable to slip off the looper, adjust to allow more looper thread to be drawn out.</li> </ul>	<ul style="list-style-type: none"> <li>● If excessive looper thread is drawn out, starting stitches may be skipped or the looper blade point may be entangled with the thread.</li> <li>● If insufficient looper thread is drawn out, the looper thread is trimmed with the tension left applied to the looper thread, resulting in slippage of the thread from the looper.</li> </ul>
<ul style="list-style-type: none"> <li>○ Adjust the wire portion of the needle thread clamp base to adjust the clamping pressure. Make measurement of the clamping pressure, using a gauge as illustrated. (The standard clamping pressure is for a cotton thread of #60.) After adjustment, be sure that the clamping pressure is evenly applied by the clamp.</li> </ul>	<ul style="list-style-type: none"> <li>● It is unnecessary to adjust the pressure of the clamp spring for each type of thread. If the clamping pressure is too high, the needle thread remaining on the materials will be longer. On the contrary, if the clamping pressure is not high enough, the needle thread slips off the clamp.</li> </ul>

## Standard Adjustment

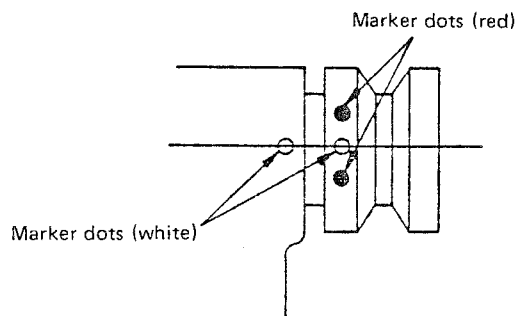
### (17) Adjusting the needle thread draw-out solenoid component

- ① When the needle thread clamp is in operation:  
Draw-out length = 0 mm (0")
- ② When the needle thread clamp is not operated:  
Draw-out length = 0 ~ 10 mm (0" ~ 0.4")



### (18) Stop angle at the time of thread trimming

The stop angle at the time of thread trimming should be  $8^\circ \pm 8^\circ$

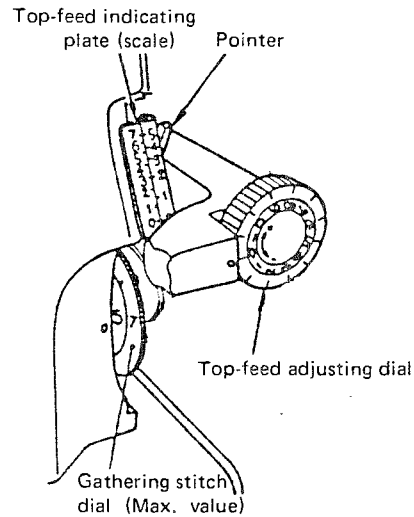


How to Adjust	Effect of Adjustment
<p>○ Loosen screw ① and move it to the right or left to adjust the position of the wire link for adjustment or the stroke of the thread drawing pin.</p> <div data-bbox="486 488 774 750" data-label="Image"> </div>	<ul style="list-style-type: none"> <li>● This adjustment is unnecessary if the needle thread clamp is used.</li> <li>● When the needle thread clamp is not used; If the needle thread draw-out solenoid component is not set properly according to the type of thread, elastic threads such as tetoron thread and nylon thread will contract after they are once stretched to be trimmed and an insufficient length of thread will be left on the needle, causing starting stitches to be skipped or the thread to slip off the needle. [ Normally, the necessary length of the thread to be left on the needle after thread trimming is 42 (1.653") ~ 43 mm (1.693") ]</li> </ul>
<ul style="list-style-type: none"> <li>○ Align the marker dot (white) on the machine arm with the one on the handwheel (Alignment of these marker dots provides the 8° stop-position).</li> <li>○ The red marker dots on either side of the white marker dot on the handwheel indicate 8° points from the white marker dot, respectively.</li> </ul>	<ul style="list-style-type: none"> <li>● If the sewing machine stops before the 8° point for thread trimming, the moving knife may fail to catch and trim the thread.</li> <li>● If the sewing machine stops beyond the 8° point, the looper will be too far away from the thread spreader, causing starting stitches to be skipped or the thread to slip off the looper.</li> </ul> <div data-bbox="1050 1563 1423 1697" data-label="Image"> </div>

## Standard Adjustment

### (19) Relation between the top-feed indicating plate (scale) and the pointer

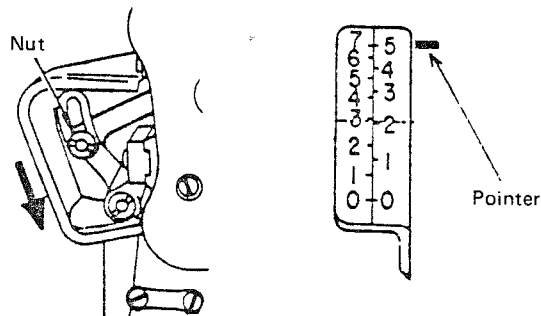
When the gathering stitch dial and the top feed dial are set to the maximum values, the pointer must point at "7-5" on the top-feed adjusting dial.



### (20) Actual top-feed amount when the top-feed adjusting dial is set to the maximum figure

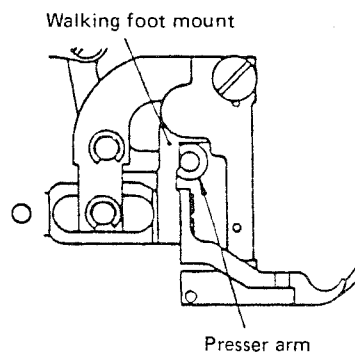
Top feed amount (Max.) : 7 mm (0.276")

(Fix the nut at the bottom end and set the pointer to the maximum value "7 - 5" on the top-feed adjusting dial.)

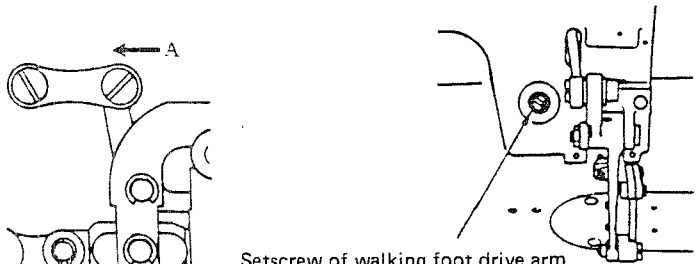


### (21) Timing of the vertical motion of the walking foot

When the stitch dial is set for "3" and when the sole of the presser foot touches the throat plate surface, the top end of the presser arm must come into contact with the bottom end of the walking foot mount.



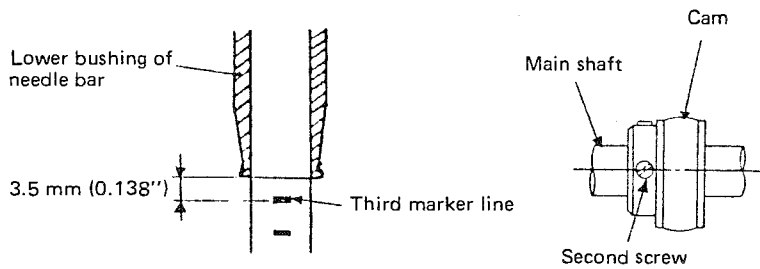


How to Adjust	Effect of Adjustment
<ul style="list-style-type: none"> <li>○ With the pointer set to “7 – 5” on the top-feed indicating plate (scale), loosen the setscrews of the top-feed indicating plate on the rear of the machine arm and adjust the position of the indicating plate.</li> </ul>	<ul style="list-style-type: none"> <li>● If the pointer does not accurately indicate the amount of top feed, it will confuse the operator.</li> </ul>
<ul style="list-style-type: none"> <li>○ Remove the rubber plug located under the side cover and properly position the adjusting arm located on the reverse feed control lever.            Note : A spring tension is applied to the adjusting arm for the return motion of the arm. Therefore, loosen the setscrew of the spring suspension to set the adjusting arm free from the spring tension before adjusting the position of the arm.            (Refer to 4 – (5) “How to adjust the top feed drive mechanism”.)</li> </ul>	<ul style="list-style-type: none"> <li>● If the maximum top feed amount exceeds 7 mm (0.276”), the top feed feed components may strike the adjacent components.            If it is smaller than 7 mm (0.276”), the gathering stitch capability is reduced.</li> </ul>
<ul style="list-style-type: none"> <li>○ Bring the presser foot in contact with the throat plate and loosen the setscrew of the walking foot drive arm.            Push the presser arm in direction <b>(A)</b> until it touches the walking foot mount and retighten the setscrew.</li> </ul> <div style="display: flex; align-items: center; margin-top: 20px;">  <div style="margin-left: 10px;"> <p>Setscrew of walking foot drive arm</p> </div> </div>	<ul style="list-style-type: none"> <li>● If the walking foot goes up before the presser foot touches the throat plate, the gathering amount will be reduced.</li> <li>● If the walking foot goes up after the presser foot comes in contact with the throat plate, the upper cloth will be pushed back with a consequent reduced gathering amount. If the rise of the walking foot is extremely delayed, the cloths may be scratched.</li> </ul>

## Standard Adjustment

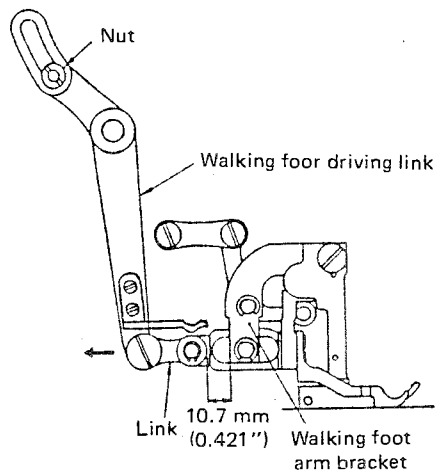
### (22) Timing of the horizontal motion of the walking foot

The second screw on the cam must meet the axis of the main shaft when the third marker line on the needle bar is 3.5 mm (0.138") below the bottom end of the lower bushing of the needle bar.



### (23) Longitudinal position of the walking foot

There must be a 10.7 mm (0.421") interspace between the link and the walking foot arm bracket when the walking foot driving link has fully retreated in the direction of the arrow, with the top feed amount set to the maximum.



How to Adjust	Effect of Adjustment
<ul style="list-style-type: none"> <li>○ Open the side cover and loosen the two screws on the cam located at the rear of the main shaft. Set the third marker line on the needle bar 3.5 mm (0.138") below the bottom end of the lower bushing and fix the main shaft. When fixing the main shaft, tighten the second screw on the cam so the screw meets the axis of the main shaft.</li> </ul>	<ul style="list-style-type: none"> <li>● If the second screw is higher than the main shaft axis, the cloth will be pushed back, and if it is lower than the main shaft axis, the cloth may be scratched by the walking foot.</li> </ul>
<ul style="list-style-type: none"> <li>○ Turn the top feed adjusting dial to set the top feed amount to the maximum (keep the nut locked at the lowest position). Turn the handwheel until the walking foot driving link retreats farthest in the direction of the arrow and loosen the setscrew of the walking foot driving crank arm. Move the walking foot driving link forward or backward to provide a 10.7 mm (0.421") interspace between the link and the walking foot arm bracket, then tighten the screw of the walking foot driving crank to secure the set interspace.</li> </ul> <div data-bbox="555 1167 724 1330" data-label="Image"> </div> <p data-bbox="507 1339 759 1384">Walking foot driving crank fastening screw</p>	<ul style="list-style-type: none"> <li>● If the walking foot has been improperly positioned longitudinally, the walking foot will interfere with its adjacent components, causing abnormal noises.</li> </ul>

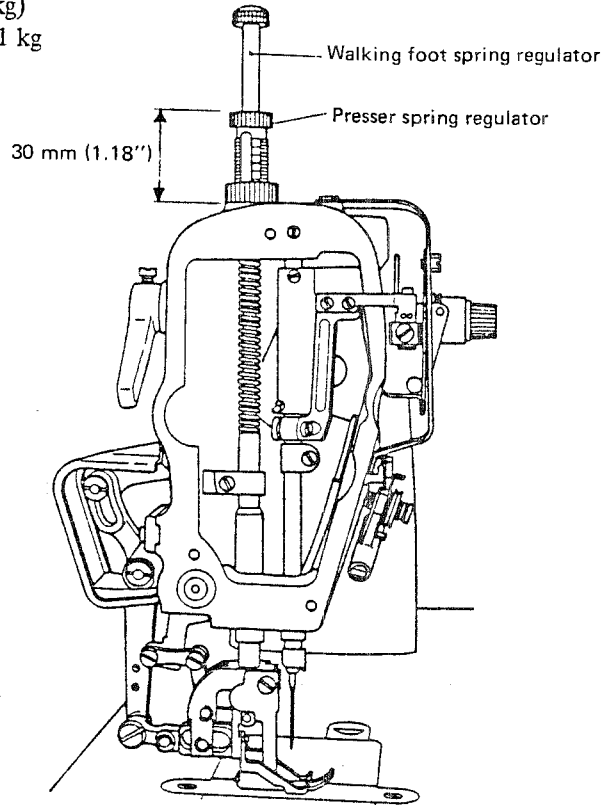
## Standard Adjustment

### (24) Pressure of the presser foot

Height of the presser spring regulator for general fabrics:

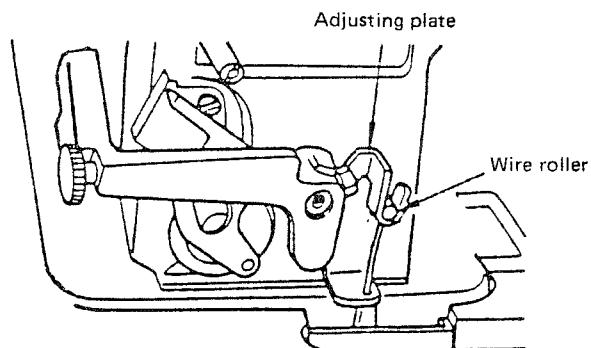
30 mm (1.18") (Pressure of presser foot: 6 kg)

Pressure of the walking foot for general fabrics: 1 kg



### (25) Positioning the PF-3 intermittent gathering stopper

There must be "0" clearance between the adjusting plate and the wire roller when the feed lever is set for the reverse feed, with the gathering stitch dial and the top feed amount set to "3".

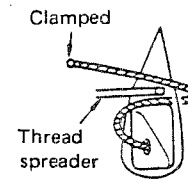


How to Adjust	Effect of Adjustment
<ul style="list-style-type: none"> <li>○ Turn the presser spring regulator clockwise to increase the pressure of the presser foot or counterclockwise to decrease it.</li> <li>○ Turn the walking foot spring regulator clockwise to increase the pressure of the walking foot or counterclockwise to decrease it.</li> </ul> <p>To standard pressure (1 kg) of the walking foot for general fabrics is obtained by loosening the fully tightened walking foot for general fabrics is obtained by loosening the fully tightened walking foot spring regulator by seven turns.</p>	<ul style="list-style-type: none"> <li>● If the pressure of the walking foot is set too high or if the pressure of the walking foot, otherwise the material may be scratched by the walking foot.</li> </ul>
<ul style="list-style-type: none"> <li>○ Turn in or out the intermittent gathering stopper screw under the machine table to adjust the clearance between the adjusting plate and the wire roller to "0". When the zero clearance is obtained, lock the nut on the screw.</li> </ul> <div data-bbox="438 1435 694 1646" data-label="Image"> </div> <ul style="list-style-type: none"> <li>○ Turn the stopper screw clockwise to decrease the clearance or counterclockwise to increase it.</li> </ul>	<ul style="list-style-type: none"> <li>● If a clearance is left between the wire roller and the top-feed regulator plate, the intermittent gathering control pedal (knee-controlled) will have an excessive play and may not be operated properly.</li> <li>● If the clearance is too small, the top feed amount will be reduced in reverse feed stitching, causing scratches on the material.</li> </ul>

### 3. OTHER IMPORTANT POINTS

#### (1) Function of the looper thread guide

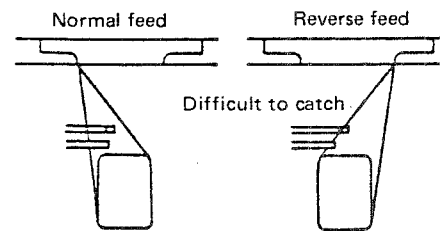
The stationary thread guide located under the looper thread tension disc functions to prevent the looper thread from being pulled out excessively by the moving knife at the time of thread trimming. If more looper thread than required is drawn out by the moving knife, the looper thread will slack and come in close contact with the top face of the looper as illustrated. As a result, the looper thread will not be hooked by the thread spreader and the starting stitch will not be formed. To prevent this problem, the looper thread guide is designed to apply a low pressure (3 g for a #60 cotton thread) to the looper thread.



For proper looper thread spreading action, it is necessary to keep the sharpness of the tip of the thread spreader and also the 0.05 mm (0.002") clearance between the thread spreader and the looper.

#### (2) Thread trimming in reverse stitching

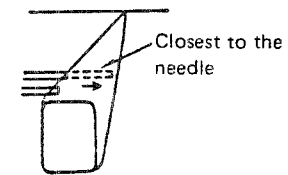
Theoretically, the thread trimming is not possible in the reverse stitching (with the reverse feed control lever depressed) because reverse feed stitches are formed in the opposite direction from that of normal feed stitches, therefore the thread loops formed in reverse feed are hardly caught by the hook of the moving knife. Accordingly, it is necessary to reset the machine for normal feed to give at least one normal feed stitch in order to trim the thread. However, the thread trimming is possible if;



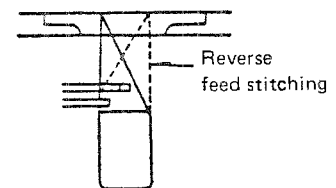
- ① The thread trimmer is operated only in reverse feed stitching.

In the standard adjustment of the longitudinal position of the moving knife is positioned to pass by the near side of the needle thread loop on the looper as closely as possible but not to touch or hook the thread loop, with the feed pitch set to the maximum value "5" (normal feed).

In this case where the thread trimmer is operated only in reverse feed stitching, bring the moving knife closest to the needle thread to be actually trimmed in the reverse feed. By so doing, the thread can be trimmed in the reverse feed stitching. However, it must be remembered that, with this adjustment made, the three threads will be trimmed in normal feed.



- ② Only stitch lengths of 2 mm (0.08") or less are used both in the normal feed and reverse feed stitchings. With the feed pitch set to a 2 mm (0.08") normal feed pitch, adjust the longitudinal position of the moving knife to bring it closest to the front needle thread in the same manner as in ①. Minimize the clearance (0.1 to 0.5 mm) (0.004" to 0.02") between the moving knife and the thread spreader and also set the stop angle at the time of thread trimming closer to +8 degree.



\* The position of the moving knife is adjustable for a specific purpose but not freely adjustable with the stitch length set to the maximum.

### (3) Condensation stitch

In the MH-481/486-5 sewing machine, reverse feed stitching can be performed by operating the reverse feed control lever. Reverse feed stitching may be unsuited for some kinds of workpieces since it gathers more thread on the wrong side of a cloth, making the wrong side look clumsy. To solve such problem, these models are designed to allow the operator to partially produce condensation stitches for stop stitching or reinforcement stitching by using the reverse feed control lever and its stopper.

To perform the condensation stitching, follow the steps described below:

- ① Set the stitch dial to a desired condensation stitch length. However, do not set it to less than 1.4, or stitches will be too dense and may cause the needle to break.
- ② Move the stopper up till it comes in contact with the bottom face of the lever and lock it with the nut.
- ③ Reset the stitch dial to the desired normal stitch length.

Now, you can make condensation stitches for stopping stitch at the start and end of a seam or for reinforcement stitch as desired by using the reverse feed control lever. The machine will produce condensation stitches whenever the reverse feed control lever is depressed.

### (4) Thread trimming in condensation stitching

The stitch length must be set to 1.6 or more when trimming chain-off thread.

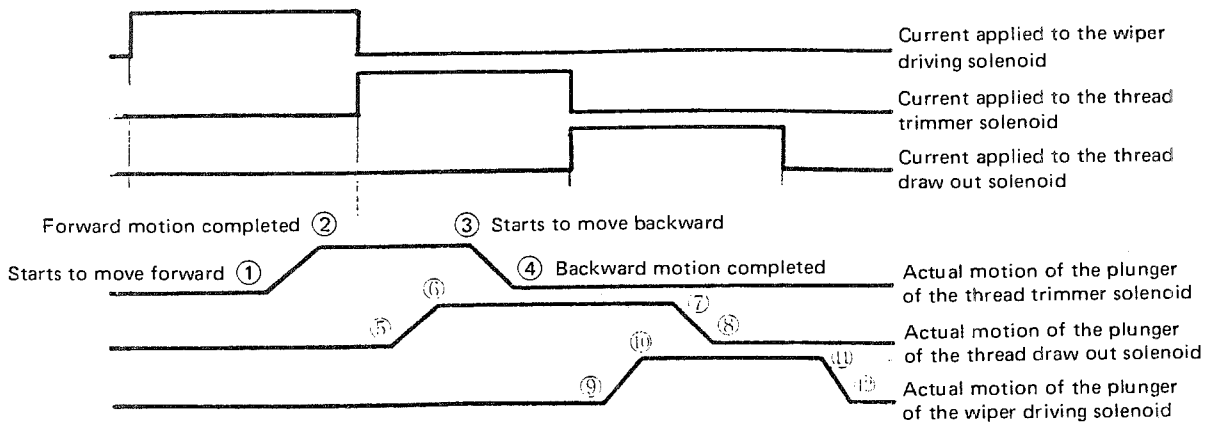
Although thread can be trimmed in the condensation stitching, there are some restrictions when trimming chain-off thread. In most chain-off thread stitchings with their stitch lengths set to 1.6 mm (0.063") or less, the chain-off threads are liable to drop below the throat plate. Since the chain-off threads which have dropped below the throat plate are trimmed, the threads will often slip off the loopers.

To prevent the above trouble, be sure to set the stitch length to more than 1.6 mm (0.063") when trimming chain-off thread which extends beyond the edge of the material in the condensation stitching.

### (5) Needle thread clamp

Do not form more than 2 idle stitches before starting to seam. When a seamline has to be started from the very end of a material, apply some reverse stitches if it is allowed. However, if it is not preferable to form reverse stitches, you will have to set the material to the first needling spot exactly by your hand, but you may fail to set it sometimes and may produce some idle stitches. Should it happen, the needle thread clamp will work to hold the needle thread so as not to allow it to slip out of the needle eye. However, we recommend you not to form 3 or more such idle stitches, because such idle loops will be gathered on the bottom face of the throat plate, entangle with the looper blade and pull out the looper thread from its clamp.

## (6) Timing of each solenoid



The above timing chart shows the relation between the current signal applied to each solenoid and the actual motion of each plunger. These solenoids drive the linked components in the following sequence :

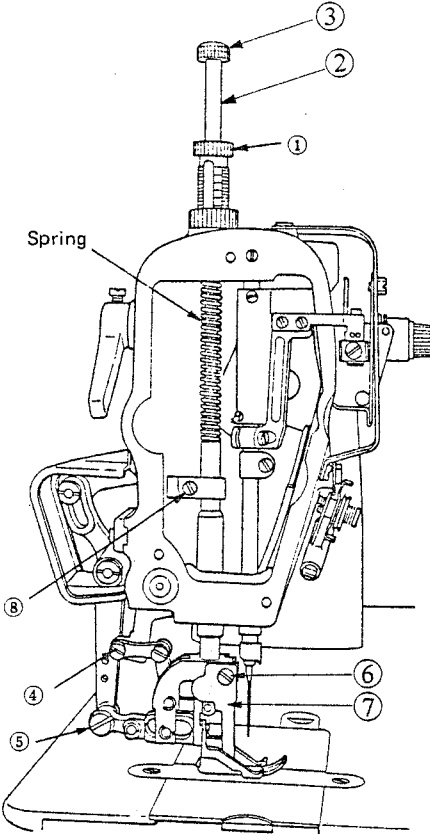
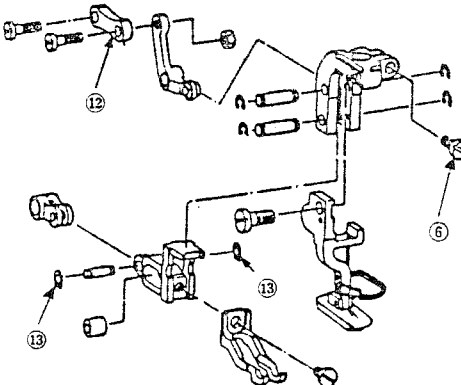
- i) When the moving knife has reached its front end, the thread tension disc must be closed.  
 ( ② is earlier than ⑤ )  
 Reason: Even if the hooked end of the moving knife clears the thread away in its forward motion, the thread will come back to the original position as far as it is tightened by the tension disc. Thus, failure in thread trimming will be prevented.
- ii) When the moving knife starts to move backwards, the thread tension disc must be loosened.  
 ( ⑥ is earlier than ③ )  
 Reason: The moving knife catches a needle and a looper threads and takes them back in its backward motion to cut with the counter knife. In this process, the threads are not tightened by the disc.
- iii) When the thread guide pin is in the position to draw out a thread, the wiper must move to the front position.  
 ( ⑩ is earlier than ⑦ )  
 Reason: If the thread guide pin has moved back to slacken a thread, such a thread will not come back to its original position when the wiper may sweep it away in the forward motion. Thus, the wiper will not fail to take up the thread.
- iv) The wiper sweeps the needle thread away after the thread tension disc has been closed.  
 ( ⑧ is earlier than ⑪ )  
 Reason: If the wiper sweeps a thread while the thread tension disc is loosened, the thread is drawn out of the spool and the wiper will fail to draw in the thread on the material.

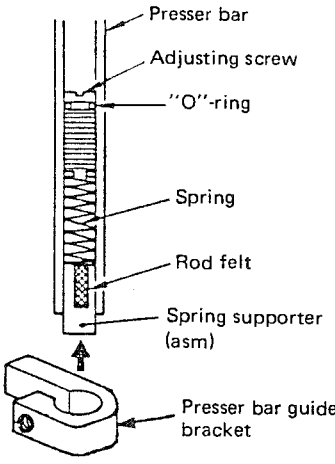
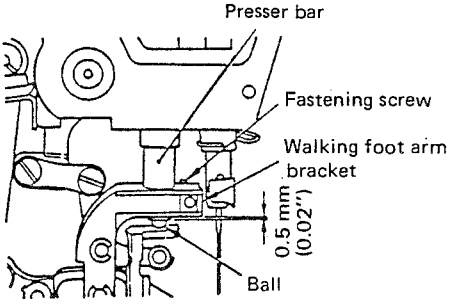
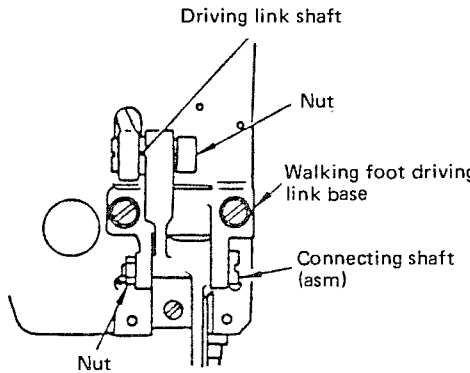
The above sequential operation is performed by the solenoids even with a slight voltage fluctuation and you do not need to change the tension of respective springs and stroke of plungers.

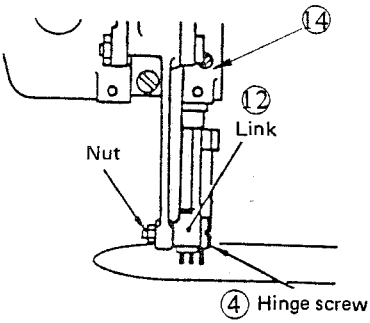
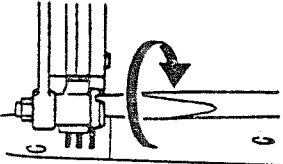


#### 4. HOW TO DISASSEMBLE AND REASSEMBLE THE MACHINE

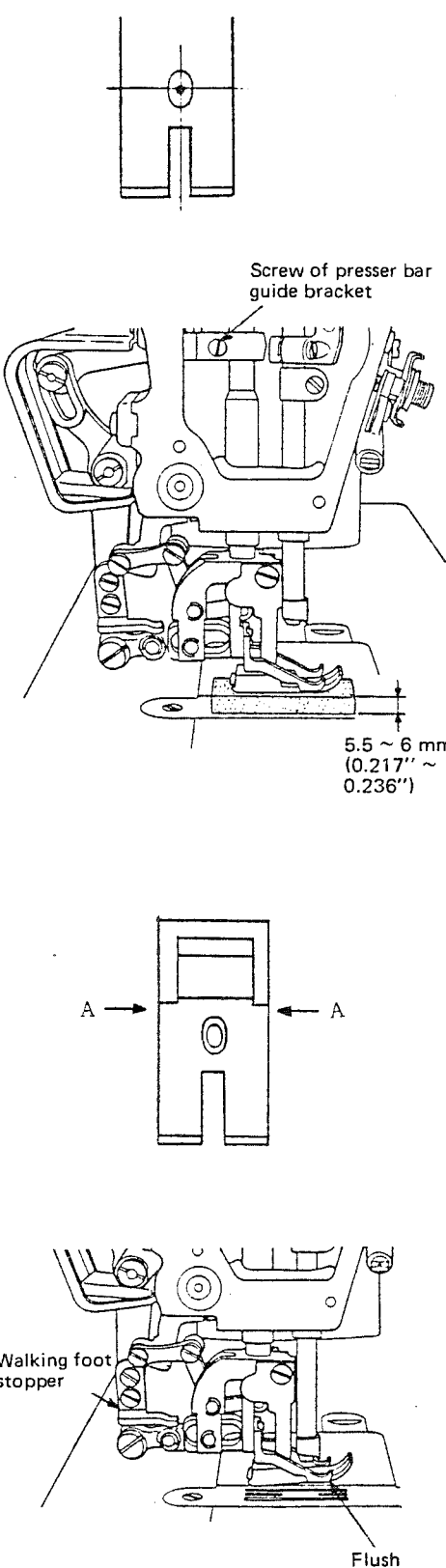
##### (1) Top feed mechanism in the face plate

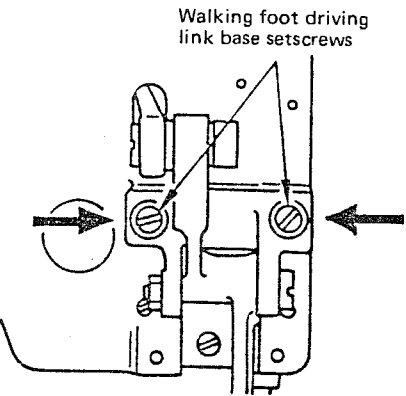
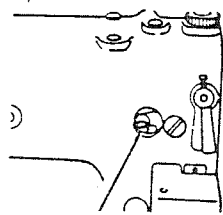
How to Disassemble		Remarks
<ol style="list-style-type: none"> <li>1. Push in guide bar ② and turn counterclockwise walking foot spring regulator ③ to decrease the pressure of the walking foot spring.</li> <li>2. Remove presser spring regulator ① and remove the guide bar and the spring.</li> <li>3. Loosen the nuts of hinge screws ④ and ⑤, respectively and remove these hinge screws.</li> <li>4. Loosen setscrew ⑥ of the walking foot arm bracket.</li> <li>5. Remove the face plate from the machine and lift presser bar guide bracket ⑧ to draw it out of walking foot arm bracket ⑦. By so doing, you can remove the walking foot arm bracket as an assembly.</li> <li>6. Loosen the setscrew of presser bar guide bracket ⑧ and draw out the presser bar.</li> </ol>	<p>See Fig. 1 on page 34.</p> 	<p>You can smoothly pull out the presser bar by gently twisting walking foot arm bracket ⑦.</p> <p>* While you disassemble this unit take care not to lose the parts especially ball ⑨, spring supporter ⑩ and spring ⑪ which slip off easily.</p>
<p>The walking foot arm bracket assembly can be disassembled as illustrated on the right.</p>		<p>When you assemble the walking foot arm bracket, make sure that the oil holes in walking foot link ⑫ face upwards.</p> <p>When you set snap rings ⑬ on to the pins of the walking foot arm bracket, take care not to open or distort them too much in order to prevent them from dislocating during operation.</p>

How to Assemble		Remarks
<p>○ <b>Attaching the presser bar</b> Assemble the presser bar as illustrated on the right, pass it through the presser bar guide bracket and connect it to the presser bar bushing (lower). (This spring supporter contains a rod felt impregnated with grease.)</p>		
<p>○ <b>Connecting the presser bar to the walking foot arm bracket assembly.</b> Put the ball on top of the walking foot arm bracket assembly and put the presser bar assembly into the walking foot arm bracket. Insert the presser bar until its bottom end just out about 0.5 mm (0.02") from the bottom face of the walking foot arm bracket and tighten its fastening screw. screw.</p>		<p>Don't tighten too much the screw which fastens the walking foot arm bracket, otherwise the spring pressure may not be applied to the walking foot even when the adjusting screw is turned in.</p>
<p>○ <b>Attaching the walking foot driving link</b> Set the walking foot driving link base temporarily to the machine arm and connect the walking foot driving link to it by means of the connecting shaft (asm) and a nut. For positioning of the walking foot driving link base, see page 33. (This must be done after temporarily fixing the driving link shaft with a nut to the oval hole in the walking foot driving link.)</p>		<p>Don't tighten too much the nut of the driving link shaft, or it may hinder the smooth action of the walking foot driving link. After fixing this unit, loosen the screw which fastens the walking foot driving crank and ensure that the walking foot driving link moves smoothly without resistance.</p>

How to Assemble		Remarks
<p>○ Connecting the walking foot arm bracket (asm) to the walking foot driving link and the walking foot driving arm</p> <ol style="list-style-type: none"> <li>1. Connect the link to the walking foot driving link by the hinge screw and the nut.</li> <li>2. Connect the walking foot driving arm ⑭ to the walking foot link ⑫ by hinge screw ④ and the nut.</li> </ol> <p>(Caution) Whenever reassembling the presser bar components, take care not to cause them to bind after tightening the screws of the walking foot arm bracket and the presser bar guide bracket.</p>	 <p>Remove the spring from the presser bar and make sure that the presser bar comes down by its own weight.</p>	<p>Tighten the nuts on the hinge screws in the following way:</p> <ol style="list-style-type: none"> <li>1. Tighten the hinge screw fully, then loosen it slightly.</li> <li>2. Hold the hinge screw by a screwdriver to prevent it from turning and tighten the nut.</li> </ol> 

## (2) Adjusting the top feed mechanism

How to Assemble		Remarks
<p>Perform the following adjustments after assembling the top feed components in the face plate.</p> <ul style="list-style-type: none"> <li>○ <b>Adjustment for the needle entry point and positioning the presser bar guide bracket</b></li> </ul> <p>Position the presser bar guide bracket so the needle hole in the throat plate is located at the center of the needle entry slot in the presser foot and loosely tighten the screw of the presser bar guide bracket for preliminary installation.</p> <p>With the presser foot lifting lever raised to its highest position, place a plate which is 5.5 mm (0.217") to 6 mm (0.236") thick between the presser foot and the throat plate.</p> <p>Push down the presser bar and the presser bar guide bracket and securely tighten the screw of the presser bar guide bracket.</p> <p>Now, you can lift the presser foot 5.5 mm (0.217") to 6 mm (0.236") through the presser foot lifting lever.</p> <p>If the needle entry point is extremely dislocated after the above adjustment, loosely tighten the screw of the walking foot arm bracket and tap the presser foot on portions A to properly adjust the needle entry point. Then, securely tighten the screw of the walking foot arm bracket.</p> <ul style="list-style-type: none"> <li>○ <b>Positioning the walking foot stopper</b></li> </ul> <p>Adjust the stopper so the walking foot becomes flush with the presser foot when the presser foot is 6 mm (0.236") above the throat plate surface.</p>	<p>See Fig. 1 on page 34.</p>  <p>Screw of presser bar guide bracket</p> <p>5.5 ~ 6 mm (0.217" ~ 0.236")</p> <p>A → ← A</p> <p>Walking foot stopper</p> <p>Flush</p>	<p>Be sure that a clearance is provided between the presser bar guide bracket and the hook of the lifting plate when the presser foot lifting lever is lowered. If there is no clearance between them, the presser foot will "float", resulting in poor feeding power.</p>

How to Assemble		Remarks
<p>○ <b>Smooth and straight motion of the presser foot</b>            Lift the presser foot using your fingers and release it to let it down, and make sure that the presser foot comes down straight and smoothly. If not, fasten the walking foot driving link base by temporarily tightening its two screws, and adjust it laterally by gently tapping on its both ends alternately until the presser bar moves smoothly.</p>		<p>Make this adjustment after loosening the fastening screw of the walking foot driving crank. Also loosen adjusting screw ③ so that the spring does not act on the top feed dog.</p> 

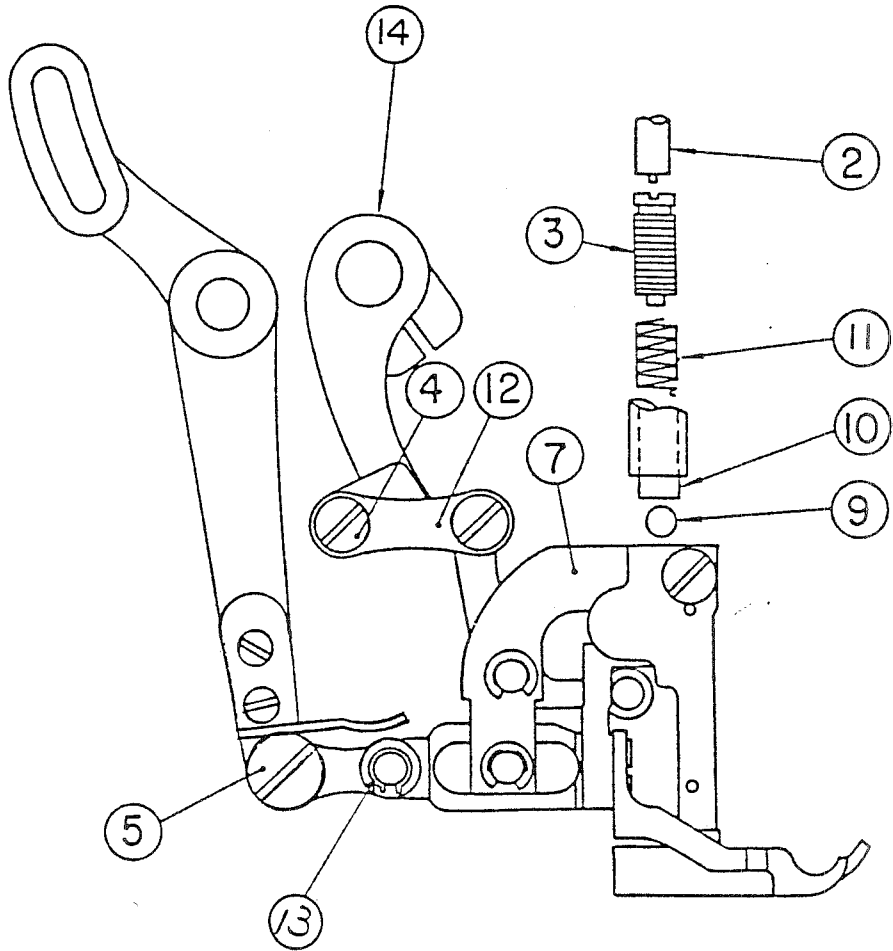


Fig. 1

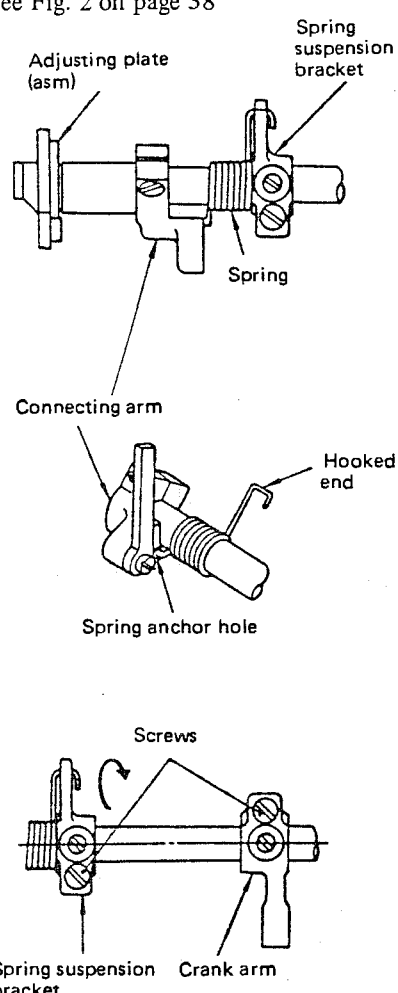
**(3) Disassembling and assembling the top feed driving mechanism**

How to Disassemble		Remarks
<p>○ <b>Disassembling the reverse feed shaft</b></p> <p>Loosen the screws which fasten connecting arm ②, spring suspension bracket ③, and crank ⑩, respectively.</p> <p>Remove rubber plug ④ from the reverse feed shaft and screw ⑤, then pull out the reverse feed shaft together with adjusting plate assembly ⑥.</p>	<p>See Fig. 2 on page 38</p>	<p>Prior to this disassembling work, detach the reverse feed lever tension spring from its anchor on the machine bed, and you will be able to disassemble the reverse feed shaft more easily.</p>
<p>○ <b>Disassembling the walking foot rock shaft</b></p> <p>Loosen the setscrew and pull out pin ⑦ from the walking foot driving rod. Loosen screw ⑧ which fastens the walking foot driving crank and also a screw ⑨ which fastens the walking foot driving crank arm and the walking foot rock shaft will rotate freely. Remove the rubber plug from the rear face of the machine arm and pull out the walking foot rock shaft.</p> <p>After this process, you can take out link arm ⑪, walking foot driving crank arm ⑫, slide block ⑬, etc. as an assembly.</p> <p>When necessary, you can remove feed driving rocker ⑭ after removing its setscrews ⑮ which are accessible through a rubber-plugged opening in the rear face of the machine arm.</p>	<p>See Fig. 2 on page 38</p>	<p>Pull out thrust collar ⑯ from the shaft when the shaft has been removed from the machine.</p>

**(Caution)** Since the rock shaft bushing (rear) has been accurately positioned on the walking foot rock shaft in our factory don't change its place under any circumstances.

How to Assemble		Remarks
<p>○ <b>Assembling the reverse feed shaft</b></p> <p>As shown in Fig. 2, set adjusting plate (asm) 28 , thrust bearing 26 , and thrust washer 27 onto reverse feed shaft 29 (with ring 32 ) and insert the assembly into the machine.</p> <p>In the machine, further attach connecting arm 22 , spring 29 , spring suspension bracket 25 , and crank 30 to the reverse feed shaft in the order in which they are listed and attach screw 33 to the end of the reverse feed shaft.</p> <p>On completion of the above assembly, remove the play in accordance with the paragraph “ Reverse feed shaft” page 40.</p> <p>After removing the play, tighten the setscrew of crank 30 in the position where it rests on the flat of the reverse feed shaft 29 .</p> <p>Then, install and adjust the spring. (See the page 37.)</p>	<p>See Fig. 2 on page 38.</p>	<p>Set the stitch dial for “5”, and you will be able to easily tighten the setscrew.</p> <p>If crank 30 deflects to either direction, it will cause a backlash in the reverse feed shaft.</p> <p>Therefore, carefully tighten the setscrew by push up and down the reverse control lever several times to obtain a proper position.</p>



How to Assemble		Remarks
<p>○ <b>Fixing the spring to the spring suspension bracket</b>  Put one end of the spring into an anchoring hole in the connecting arm and the other end over the spring suspension bracket, push the spring suspension bracket forward until its setscrew is aligned with that of the crank, and tighten the setscrews and the fastening screws in this position.</p> <p>* When you put the spring end into the anchoring hole, hold up the other end of the spring (hooked end) to make your work easier.</p>	<p>See Fig. 2 on page 38</p>  <p>The diagrams illustrate the assembly process. The top diagram shows a side view of the adjusting plate, spring suspension bracket, and spring. The middle diagram shows the connecting arm with the spring anchor hole and the hooked end of the spring. The bottom diagram shows the spring suspension bracket and crank arm with screws being tightened.</p>	<p>When fastening the connecting arm and the spring suspension bracket to the shaft, tighten their screws by pushing them to the left, in order to prevent the spring from coming off or giving an excessive load on the reverse control lever.</p>

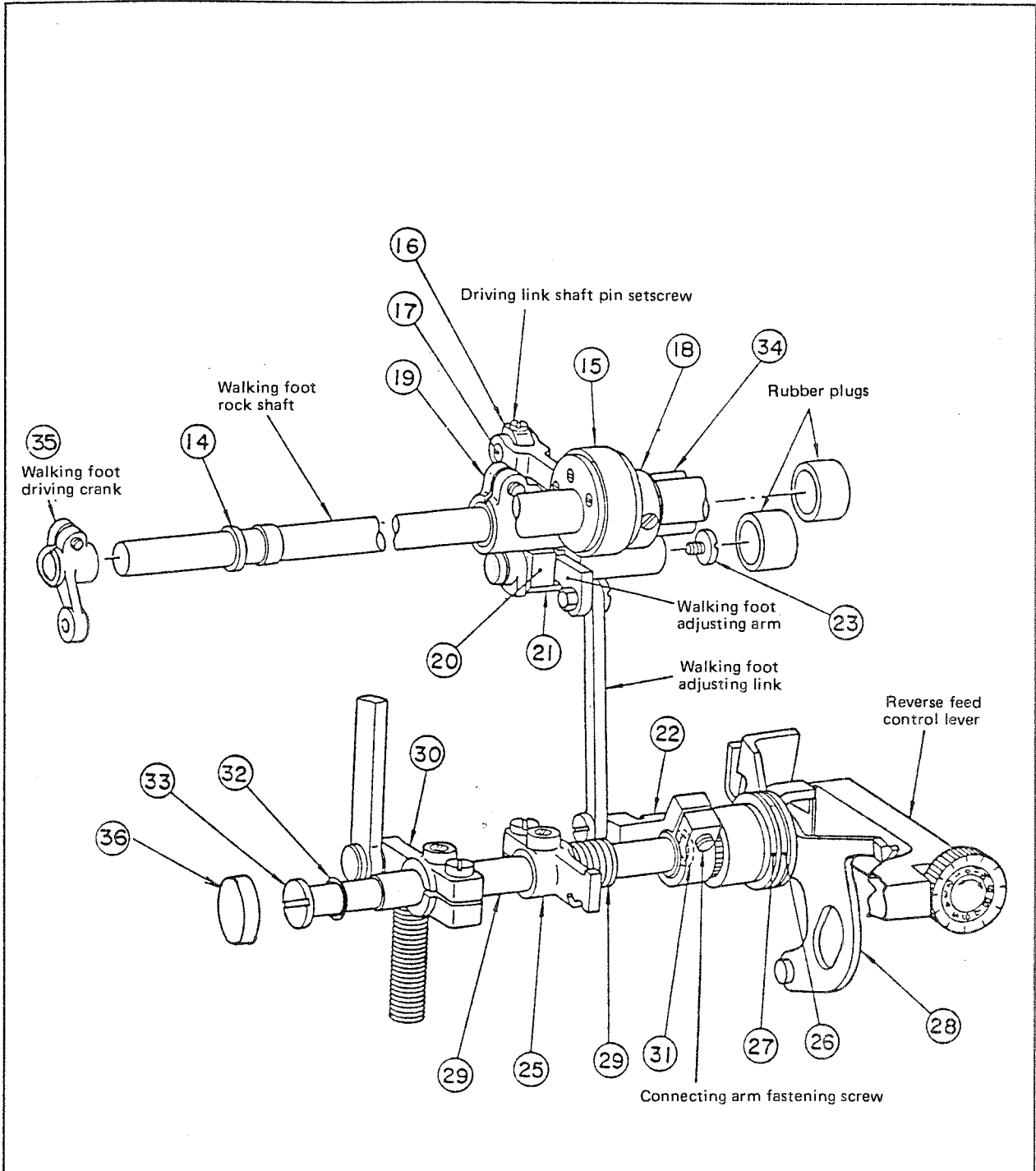
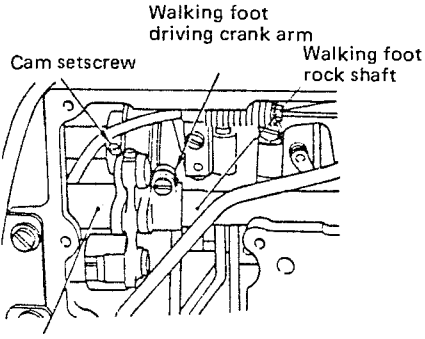
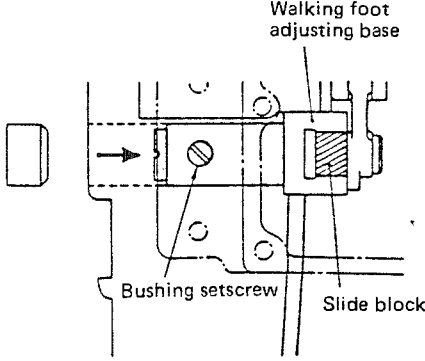
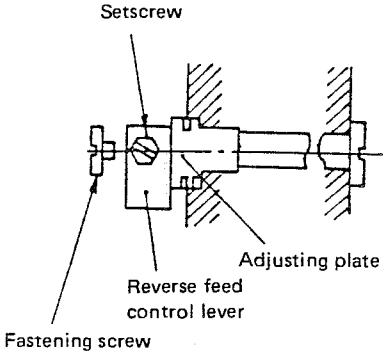


Fig. 2

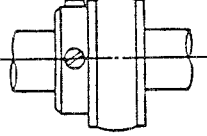
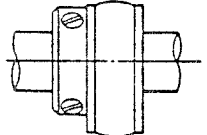
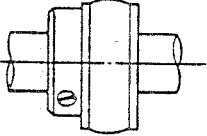
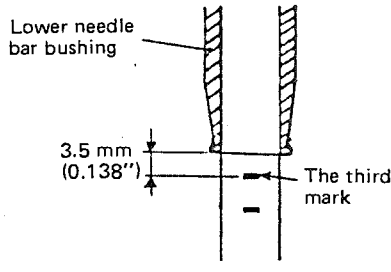
#### (4) HOW TO REMOVE EXCESSIVE PLAY AND JARRING

In order to operate the machine smoothly and efficiently, you must remove excessive play and jarring from the following components.

Components and Methods		Remarks
<p>○ <b>Walking foot rock shaft</b> Loosen two cam setscrews and one screw which fastens the walking foot driving crank arm, and the walking foot rock shaft will be able to move freely in the axial direction. Push the shaft in the direction of its bushing (front) as far as it will go (stops with a click) and fasten the walking foot driving crank arm while pressing it against the rock shaft bushing (rear).</p>	<p>See Fig. 2 on page 38.</p>  <p>Labels in diagram: Cam setscrew, Walking foot driving crank arm, Walking foot rock shaft, Rock shaft bushing rear.</p>	<p>Use a screw driver (large) and firmly tighten the screw to fasten the walking foot driving crank arm.</p>
<p>○ <b>Walking foot adjusting base</b> Notes: Do this only after the play in the walking foot rock shaft has been removed.</p> <p>Release the bushing by loosening its setscrew and carefully tap on either side of the walking foot adjusting base or the back of the machine arm so that the bushing permits the slide block to move smoothly without providing any play sideways, and tighten the setscrews.</p>	 <p>Labels in diagram: Walking foot adjusting base, Bushing setscrew, Slide block.</p>	<p>It is advisable to keep the cam setscrew loosened during this adjustment, because it makes you judge easily if the slide block is jarring or not.</p> <p>In order to prevent the bushing setscrew from loosening during operation, tighten it very carefully.</p>

Components and Methods		Remarks
<p>○ <b>Reverse feed shaft</b> Tighten temporarily the reverse feed control lever setscrew into the V-groove on the reverse feed shaft and fasten the shaft by tightening the fastening screw.</p> <p>By so doing, the reverse feed shaft does not have any play in the axial direction and accordingly does not allow the adjusting place to move at all.</p> <p>○ In the above state of the reverse feed shaft, loosen gradually the reverse feed shaft fastening screw until the adjusting plate comes to move smoothly and firmly tighten the setscrew of the reverse feed control lever using a hex, spanner.</p>	<p>See Fig. 2 on page 38.</p> 	<p>This adjustment must be made after loosening the screws of the crank, spring suspension bracket, and connecting arm.</p> <p>After excessive plays have been removed from the reverse feed shaft, tighten these screws taking care not to hinder the smooth operation of the shaft and the reverse feed control lever.</p>

(5) How to adjust the walking foot drive mechanism

How to Adjust	Effects of Adjustment
<p>○ <b>Adjusting the cam</b> (Refer to "Standard Adjustment" on page 22.)</p> <p>Proper positioning of cam is the key to the proper motion timings of the walking foot and feed dog. The following show the correct and wrong positions of the second screw on the cam and the results.</p> <p>a)  (The second screw is aligned with the axis of the main shaft when the third marker line on the needle bar is 3.5 mm (0.138") below the bottom end of the lower bushing of the needle bar.)</p> <p>The walking foot and feed dog simultaneously start and end, their feed motion providing the normal feed timing.</p> <p>b)  (The second screw is higher than the axis of the main shaft when the third marker line on the needle bar is in the position as mentioned above.)</p> <p>The walking foot starts to feed the cloth earlier than the feed dog and starts to go back before the feed dog completes its forward feed action. As a result, the cloth which has been gathered will be stretched.</p> <p>c)  (The second screw is lower than the axis of the main shaft when the third marker line on the needle bar is in the position as mentioned above.)</p> <p>The walking foot starts to feed the cloth later than the feed dog and accordingly finishes its feed action later than the feed dog. This may cause scratches on the cloth.</p>	<p><b>Cam</b> The second screw on the cam should be aligned with the axis of the main shaft when the third marker line engraved on the needle bar is 3.5 mm (0.138") below the bottom end of the lower needle bar bushing of the needle bar.</p> 

## How to Adjust

## Effects of Adjustment

### ○ Position of the connecting arm

Accurate positioning of the connecting arm is required since the position of the connecting arm has direct effect on the horizontal top feed motion.

#### 1. Perform the following settings:

- ① Set the bottom feed to "5" on the bottom feed indicating plate.
- ② Set "5 ~ 7" on the gathering stitch dial to the red dot.
- ③ Set the pointer to "7 ~ 5" on the top feed indicating plate.
- ④ Move the nut of the walking foot driving link assembly to the lowest position.

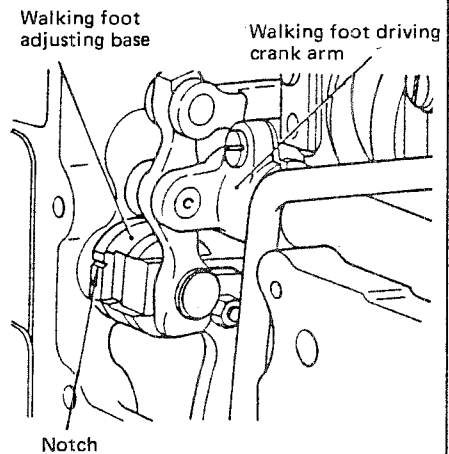
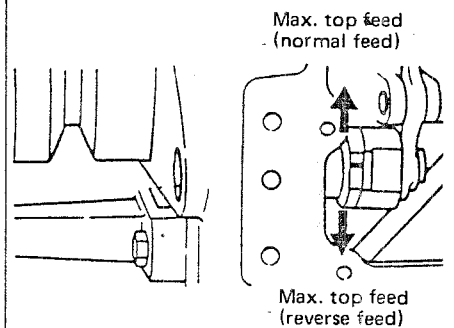
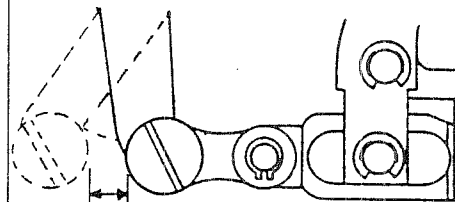
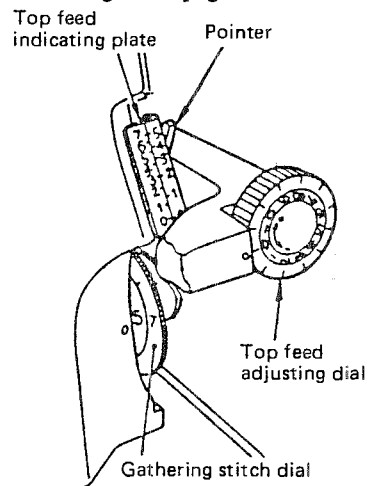
#### 2. After completion of the above settings, adjust as follows:

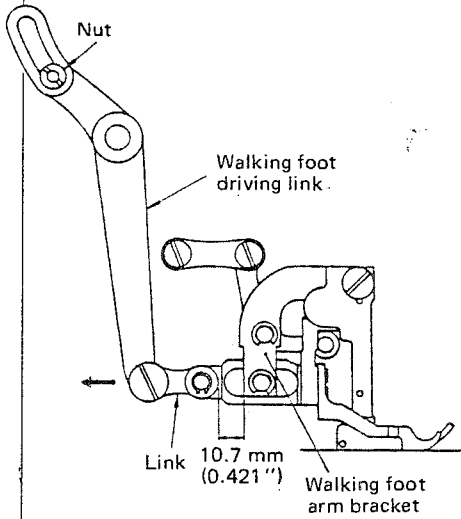
Loosen the setscrew of the connecting arm and adjust the tilt of the walking foot adjusting base so the connecting arm moves approx. 6.5 mm (0.256") from its home position when it advances farthest with the presser foot up. After adjustment, firmly tighten the setscrew of the connecting arm.

- As you move the notch on the walking foot adjusting base upward, the horizontal stroke of the walking foot increases. As you move the notch downward, the feed is changed to reverse feed.

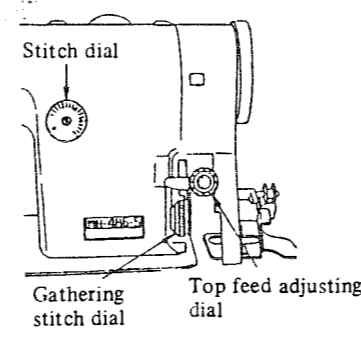
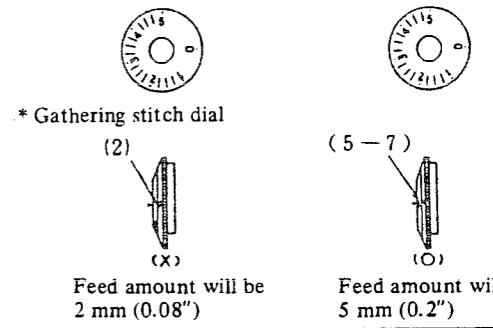
- \* If the movement of the connecting arm (standard movement: approx. 6.5 mm (0.256")) is too large, the top-feed components hit other parts. If it is too small, the gathering capability will be affected.

See Fig. 2 on page 38.

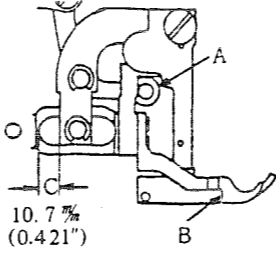
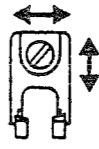



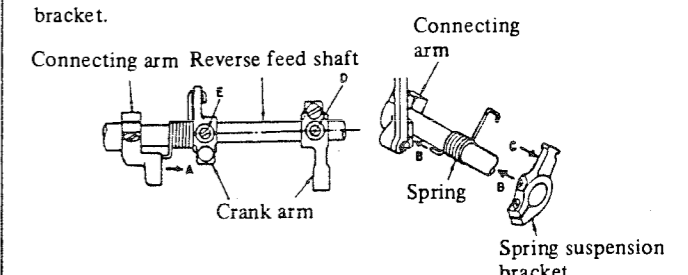
How to Adjust	Effects of Adjustment
<p>○ <b>Longitudinal position of the walking foot</b>            After properly positioning the connecting arm, loosen the setscrew of the walking foot driving crank and adjust so the end face of the link is 10.7 mm (0.421") from the rear end face of the walking foot arm bracket when the walking foot is in the most retreated position.</p> <p>* If the set interspace between the end face of the link and the rear end face of the walking foot arm bracket exceedingly deviates from the standard value 10.7 mm (0.421"), the top-feed components hit other parts, producing abnormal noises.</p> <p>○ <b>Timing of the vertical motion of the walking foot</b>            (Refer to "Standard Adjustments" on page 20.)            If the ascending timing of the walking foot is set too early, the walking foot will go up higher than specified. On the contrary, if the descending timing of the walking foot is set too late, the walking foot will go up lower than specified. Properly adjust the timing, referring to the standard adjustment.</p> <p>After finishing the above adjustment, run the sewing machine at a speed of 3500 s.p.m. and listen for any striking sounds.</p>	

5. TROUBLES AND CORRECTIVE MEASURES (MECHANICAL COMPONENTS)

Trouble	Cause (1)	Cause (2)	Corrective measures
1. Cloth feed failure	1-1) The pressure of the presser foot or the walking foot is not correct (the presser foot is "floating").		Correct the height of the presser spring regulator or the walking foot spring regulator. (See 2(24).)
	1-2) The gathering stitch dial has been set incorrectly.  <p>Stitch dial Gathering stitch dial Top feed adjusting dial</p>		If the gathering stitch dial is set for a smaller figure than that of the stitch dial, you can not obtain your desired stitch length even when you set the stitch dial. Set the gathering stitch dial for "5-7". (Example) ○ Stitch length: 5 mm (0.2")  <p>* Gathering stitch dial (2) (X) Feed amount will be 2 mm (0.08") (5-7) (O) Feed amount will be 5 mm (0.2")</p>
	1-3) The presser bar does not move up and down smoothly. (The presser foot "floats".)	3)-A The top feed mechanism is jarring.	Remove the jarring from the top feed mechanism. (See 4-(1))
		3)-B The teeth of the walking foot or the main feed dog have worn out.	Replace the worn feed dog or walking foot.
2. Scratches on the fabric	2-1) The walking foot or the main feed dog has burrs on its edge.	Remove the burrs from the edge using a buffing wheel or an oil stone. (Caution) Do not buff the faces of the teeth.	
	2-2) The pressure of the walking foot or the presser foot is not correct. (Scratches caused by improper feed)	Correct the height of the presser spring regulator or the walking foot spring regulator. (See 2-(24).)	
	2-3) The timing of the horizontal or vertical motion of the walking foot is not correct.	3)-A The ascending timing is too late.	Correct the timing of the vertical motion of the walking foot. (See 2-(21).)
3)-B The timing of the horizontal motion is bad.		The walking foot starts moving backwards while the feed dog is still feeding the fabric forwards, causing the walking foot teeth to damage the surface of the fabric. (See 2-(22).)	
3. When gathering the top fabric, the bottom fabric is also gathered.	3-1) The pressure of the walking foot is too high for the presser foot.	1)-A The walking foot teeth rake in the bottom fabric, too. Correct the height of the presser spring regulator and the walking foot spring regulator. (See 2-(24).)	
	3-2) The surfaces of the top and bottom fabrics attract each other while being fed.	Use the separation plate, Z064 (Part No. MAZ06400A0).	

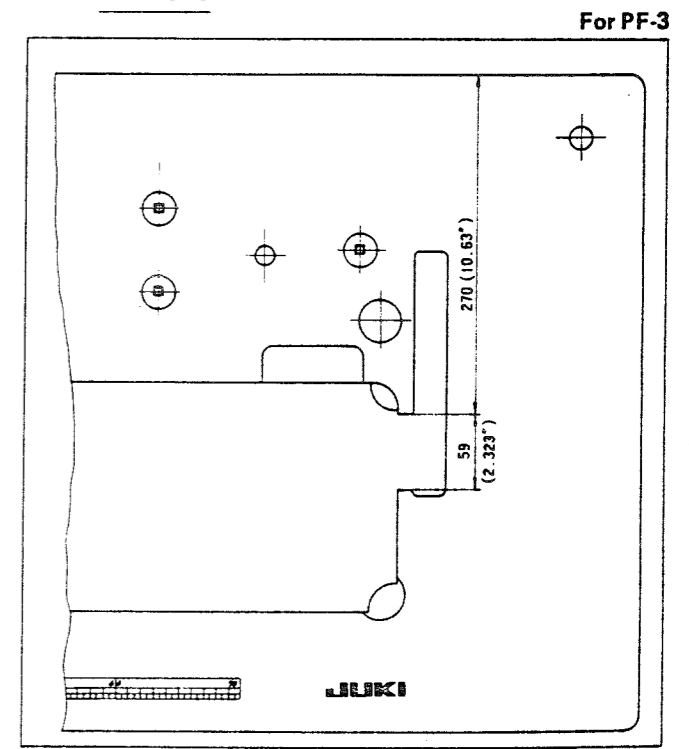
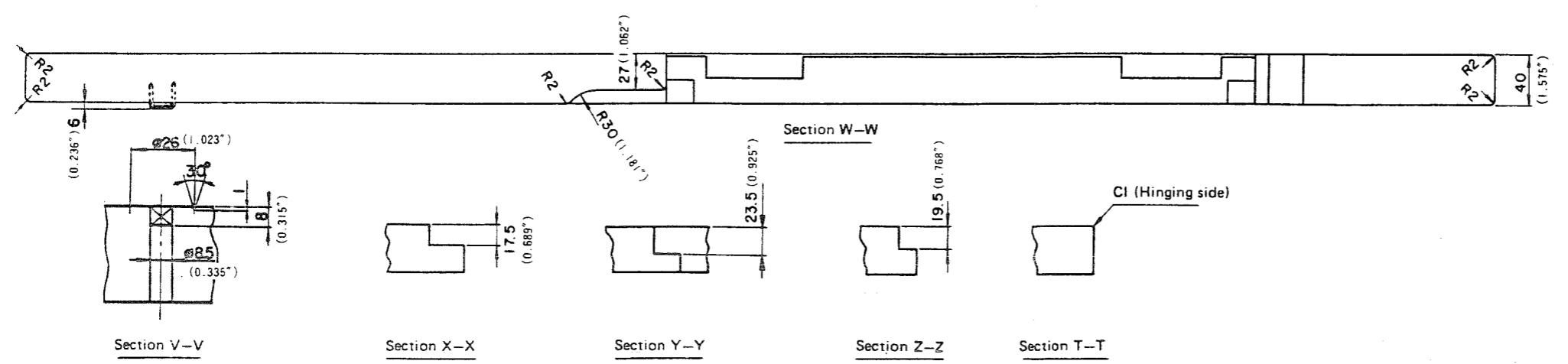
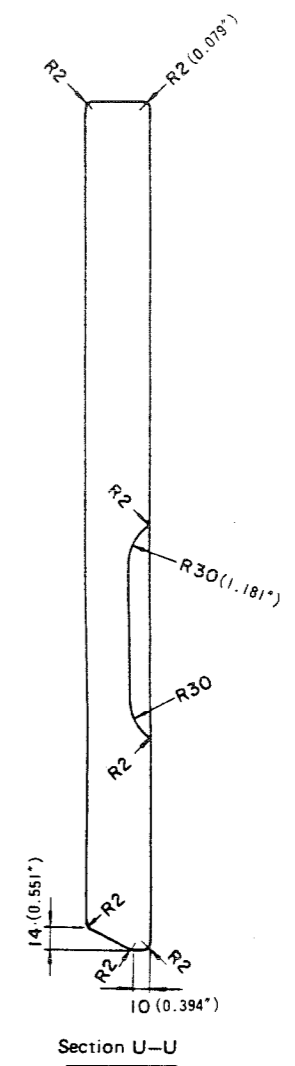
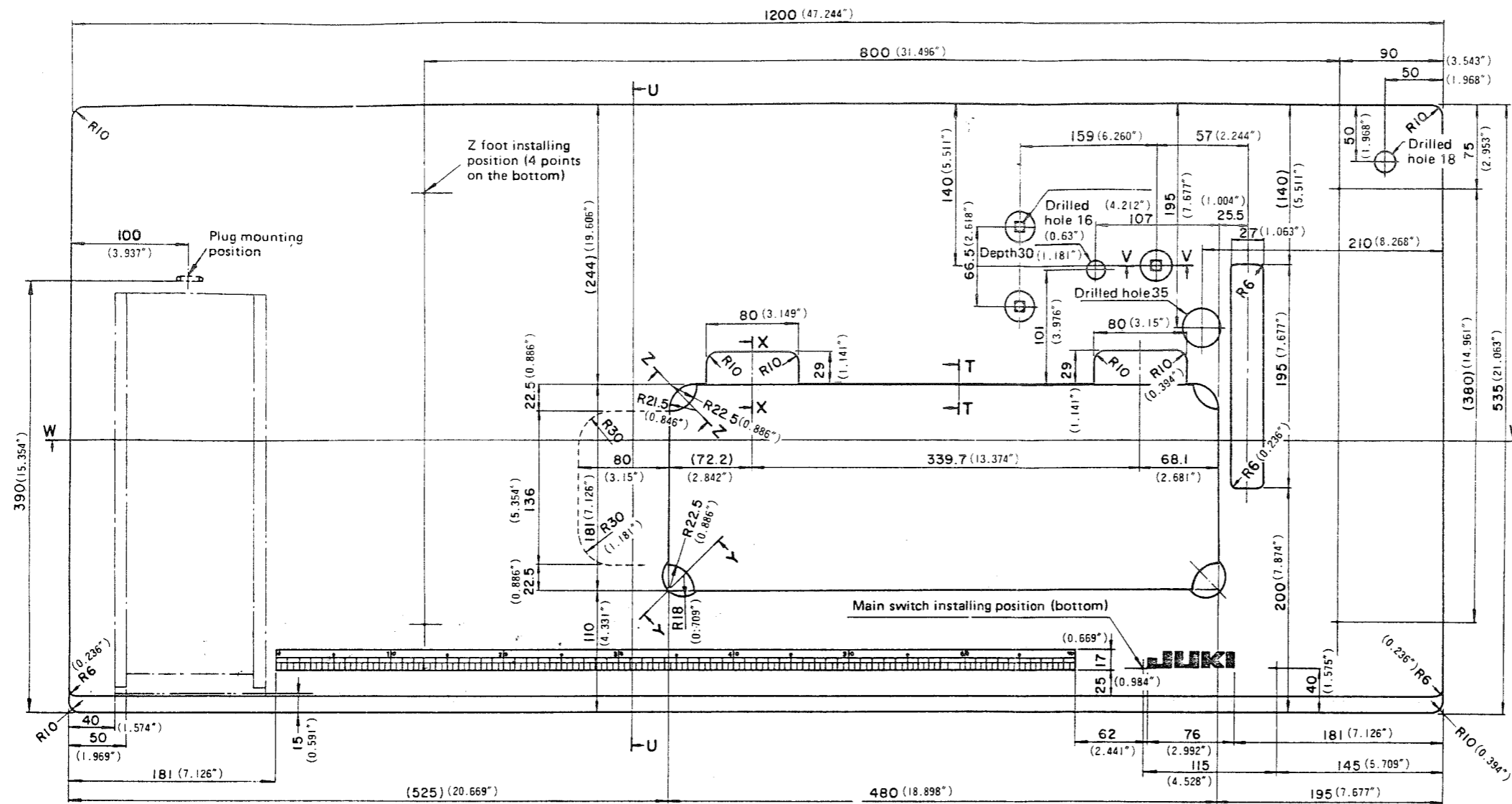


Trouble	Cause (1)	Cause (2)	Corrective measures
4. The top feed components hit the adjacent parts.	4-1) The top feed components hit other parts when they are set for the maximum feed amount.	1)-A The horizontal stroke of the walking foot exceeds 7 mm (0.276") when it is set for the maximum feed pitch.	Correct the position of the walking foot connecting arm. (See "Position of the connecting arm".)
		1)-B The walking foot comes in contact with A or B shown below. 	Correct the longitudinal position of the walking foot. (See 2-(23).) The clearance at C must be approx. 10.7 mm (0.421") when the walking foot has fully retreated.
5. Workpieces are not fed straight. (Workpieces fed are deflected to the right or left).	5-1) The walking foot has been positioned incorrectly.		Correct the position of the walking foot. 
	5-2) The pressure of the walking foot is too low or the pressure of the presser foot is too high. (Workpieces are not fed straight since the walking foot fails to feed them satisfactorily.)		Correct the height of the presser spring regulator or the walking foot spring regulator. (See 2-(24).)
6. Failure in gathering stitch	6-1) The top feed amount is not enough.	1)-A The nut of the walking foot driving link has been locked in the highest position.	Lock it in lowest position to provide the 7 mm (0.276") maximum feed amount.  <ul style="list-style-type: none"> <li>○ Highest position: Max. 5 mm (0.2")</li> <li>○ Lowest position: Max. 7 mm (0.276")</li> </ul>
		1)-B The gathering stitch dial has been set for a small value.	Set the gathering stitch dial to 5-7 (maximum figure). (See the corrective measures (Mechanical components) 1-2.)
	6-2) The walking foot teeth have worn out.		Replace the walking foot
	6-3) The pressure of the walking foot is too low or the pressure of the foot is too high.		Correct the height of the presser spring regulator or the walking foot spring regulator. (See 2-(24).)
	6-4) The top feed components hit the adjacent parts.		See the corrective measures (Mechanical components) 4.
	6-5) The gauge installed on the machine is not for gathering.		Replace it with B-type gauge for gathering.
6-6) The material of the workpiece is not suitable for gathering.		Use the separation plate Z064 (Part No. MAZ064000A0).	

Trouble	Cause (1)	Cause (2)	Corrective measures
7. The reverse feed control lever does not come back smoothly to its original position.	7-1) The reverse feed control lever is rubbing against the adjusting plate.	1)-A The reverse feed control lever has been fixed pressed firmly against the adjusting plate.	Loosen the setscrew of the reverse feed control lever and properly install the lever.
	7-2) The spring has been disengaged from A of the connecting arm.	2)-A The reverse feed shaft has an axial play.	Loosen the setscrew of the spring suspension bracket and remove the axial play. Insert one end of the spring into the anchoring hole in the connecting arm and push the bracket in direction B. At this time align screw D of the crank arm with screw E of the spring suspension bracket. Finally hook the other end of the spring onto C of the spring suspension bracket. 
8. The gathering mechanism (PF-3) does not work properly.	8-1) The wire roller is not in the hooked end of the adjusting plate.		Place the wire roller in the hooked end of the adjusting plate.
	8-2) The gathering stitch dial has been set incorrectly.		Set the gathering stitch dial correctly (maximum figure: 5 - 7).
9. The fabric is scratched in reverse stitching.	9-1) There is no play between the wire roller and the adjusting plate. (during normal feed stitching)		Make correction according to 2-(25).
	9-2) The timing of the horizontal motion of the walking foot is wrong.		Correct the timing of the horizontal motion of the walking foot. See 2-(22).)
10. Looper thread escape (The looper thread is not clamped after thread trimming and the following starting stitch is not formed.)	10-1) The thread path is defective and the thread is stretched before trimmed. This causes the thread to slip off the clamp.	1)-A Wrong threading.	Perform correcting threading according to the Instruction Book.
		1)-B The looper thread path has scratches, rust, etc.	Make the thread path smooth by removing the scratches, rust, etc.
	10-2) The moving knife, counter knife, or the clamp spring has been installed improperly.	2)-A The counter knife has been improperly positioned.	Correct the position of the counter knife. (See 2-(11).)
		2)-B The longitudinal position and the stroke of the moving knife are not correct.	Correct the position and the stroke of the moving knife. (See 2-(12) and -(13).
	10-3) The position of the thread tension release lever is not correct. (Insufficient looper thread is drawn out.)		Increase the amount of the looper thread to be drawn out. (See 2-(15).)
	10-4) The looper thread tension release latch has been improperly positioned.	4)-A The looper thread tension release latch does not work because it sticks.	Remove the cause for the sticking.
		4)-B The looper thread tension discs are not release due to improper installation.	Correct the position of the looper thread tension release latch.
	10-5) The stop angle at the time of thread trimming is not correct.		Correct the stop angle by the synchronizer. (See 2-(18).)

Trouble	Cause (1)	Cause (2)	Corrective measures	
11. Looper thread escape (The thread slips off the looper thread clamp at the time of chain-off thread trimming in condensation stitching.)	11-1) The stitch length set is too small.		Set the stitch length to 1.6 mm (0.063") or more.	
12. Looper thread escape at the time of stitching start (At the time of producing idle stitches)	12-1) Too many idle stitches are formed at the sewing start.		Limit the number of idle stitches to one or two.	
13. Needle thread escape (The needle thread slips out of the needle eye at the start of sewing after thread trimming.)	13-1) The drawn-out thread is too short. (when the needle thread clamp is not in operation)		Adjust the wire link to draw out longer needle thread.	
	13-2) The pressure applied by the needle thread clamp is not enough.		Increase the clamping pressure (See 2-(16).)	
	13-3) The moving knife has been improperly positioned longitudinally and it trims the three threads.		Properly position the moving knife. (See 2-(12).)	
	13-4) The thread spreader has been improperly positioned longitudinally.		The three threads are trimmed because the clearance between the end of the thread spreader and the needle center is less than 1.5 mm (0.059")	
	13-5) The position of the needle thread tension release latch is wrong.	5)-A The needle thread tension release latch sticks and does not work.		Correctly position it.
		5)-B The needle thread tension disc is not released due to improper position of the needle thread tension release latch.		Correct the position of the needle thread tension release latch.
	13-6) The needle thread is cut due to scratches or burrs on the hooked end of the moving knife or the thread spreader.		Remove the scratches or burrs.	
13-7) The thread take-up lever is too high.	7)-A The thread loop grows so large that it can not stand firmly and falls down, allowing the three threads to be trimmed.		Lower the thread take-up lever.	
14. The needle thread and looper thread are not trimmed.	14-1) The moving knife has been improperly positioned.		Correct the position of the moving knife. (See 2-(12).)	
	14-2) The safety cam has been improperly positioned.		Correct the position of the safety cam. (See 2-(10).)	
	14-3) The moving knife does not work properly.		Check whether the moving knife sticks or is interfered with other components or not and correct it.	
	14-4) The stroke of the moving knife is too small.		Correct the stroke of the moving knife. (See 2-(12).)	

Trouble	Cause (1)	Cause (2)	Corrective measures
15. The looper thread is not trimmed.	15-1) The moving knife has been improperly positioned.	1)-A The moving knife has been improperly positioned longitudinally.	Correct the longitudinal position of the moving knife. (See 2-(12).)
		1)-B The moving knife has been improperly positioned vertically.	Correct the vertical position of the moving knife. (See 2-(12).)
	15-2) Correct chain-off thread is not formed. (If a stitch is skipped with resultant poor formation of chain-off thread, the looper thread is not hooked by the moving knife.)	2)-A The thread spreader has been improperly positioned.	Correct the position of the thread spreader. (See 2-(9).)
		2)-B The timing of the looper thread take-up is inaccurate.	Correct the timing. (See 2-(7).)
		2)-C The height of the needle bar and the timing between the needle and looper are inaccurate.	Correct the height and the timing. (See 2-(1) and -(2).)
		2)-D The timing of the thread spreader is inaccurate.	Correct the timing. (See 2-(5).)
	2)-E The needle guard and the loop guide have been improperly positioned.	Correct their positions. (See 2-(6).)	
16. The needle thread is not trimmed.	16-1) Stitch skipping.		See 15-2) of Troubles and Corrective Measures (Mechanical Components).
17. Starting stitches are skipped.	17-1) The thread spreader has been improperly positioned.		Correct the position of the thread spreader. (See 2-(9).)
	17-2) The needle thread drawn out is too short. (when the needle thread clamp is not in operation)		Adjust the wire link to draw out more needle thread.
	17-3) The clamping pressure of the needle thread clamp is not high enough.		Increase the clamping pressure. (See 2-(16).)
	17-4) The needle thread tension release latch has been improperly positioned.	4)-A The needle thread tension release latch sticks and does not work.	Correctly position it.
		4)-B The needle thread tension disc is not released due to improper position of the needle thread tension release latch.	Correct the position of the needle thread tension release latch.
	17-5) The needle thread is cut due to scratches or burrs on the hooked end of the moving knife or the thread spreader.		Remove the scratches or burrs.
17-6) Looper thread escape		See 10, 11, and 12 of Troubles and Corrective measures (Mechanical Components).	
18. Needle thread breakage	18-1) The thread spreader has been improperly positioned.		Correct the position of the thread spreader. (See 2-(9).)
	18-2) The thread path has rust or scratches.		Remove the rust or scratches.
	18-3) The thread (synthetic fiber thread) breaks due to heat generated on the needle.		Use the needle cooler or reduce the sewing speed.
	18-4) The height of the needle bar and the timing between the needle and the looper are inaccurate.		Correct the height and the timing. (See 2-(1) and -(2).)
	18-5) The needle guard and the looper guide have been improperly positioned.		Correct their positions. (See 2-(6).)
19. Looper thread breakage	19-1) The timing of the looper thread take-up is too early.		Correctly set the timing. (See 2-(7).)



(Note)  
When PF-3 is used, rework the table (D8201555E00) shown above.

