CONTENTS:

# 1. NAMES OF MACHINE PARTS.

## 1-1 Machine Body:

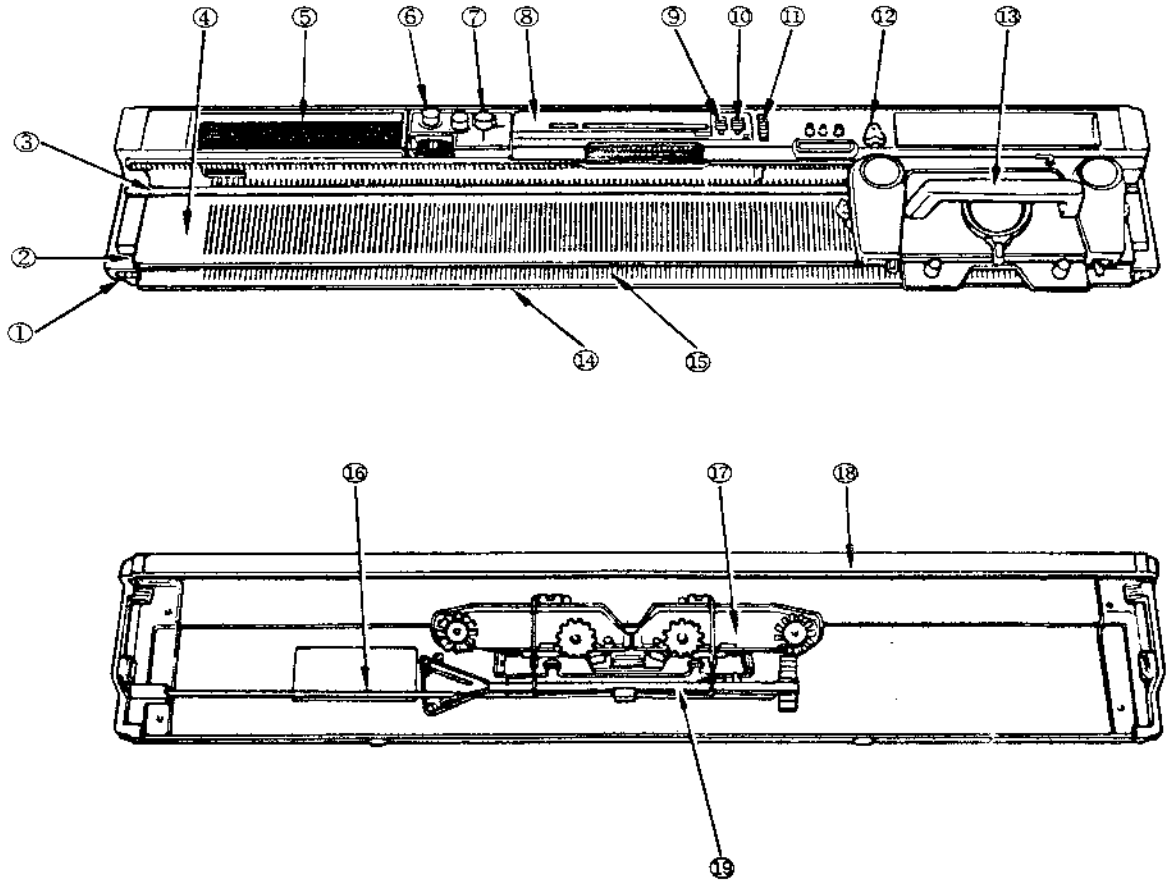



Fig. 1

1. Yarn Clip
2. Needle Retainer
3. Carriage Rail
4. Needle Bed
5. Knit Radar (Contour)
6. KR Dial Unit
7. Change Dial
8. Centre Panel
9. Stop Knob
10. L Knob
11. Feeding Dial
12. Row Counter
13. Carriage
14. Sinker Post
15. Needle
16. Yarn Rod
17. Carriage Arm
18. Top Cover
19. Tension Arm Unit

## 1-2 Carriage (Inside):

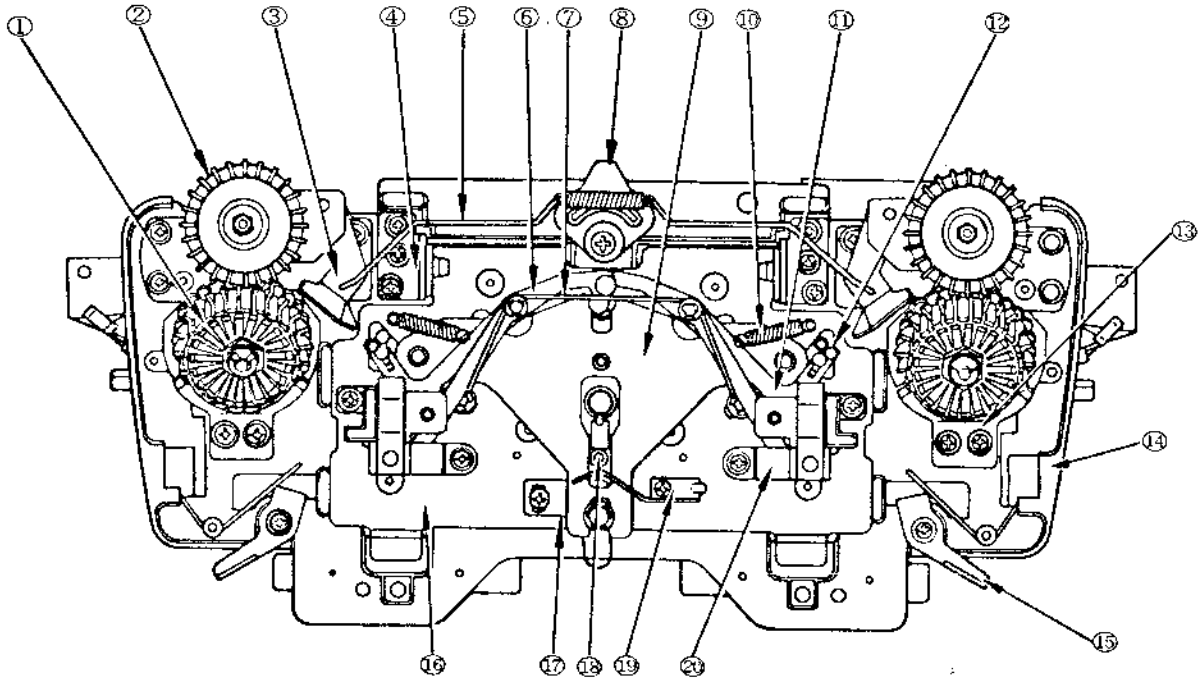



Fig. 2

1. Sub Drum
2. Main Drum
3. Sub Clear Cam (L)
4. Carriage Plate A Holder (L)
5. Clear Wire (L)
6. Rising Cam Lever (L)
7. Rising Cam Lever Spring
8. Clear Cam
9. Travelling Plate
10. Sub Lever Spring
11. Sub Lever (R)
12. Cam Spring
13. Sub Drum Holder
14. Carriage Plate B
15. Russel Lever (R)
16. Carriage Plate A
17. Adjustment Plate
18. Moving Plate Pin
19. Dial Spring
20. Handle Holder (R)

1-4 Arm:

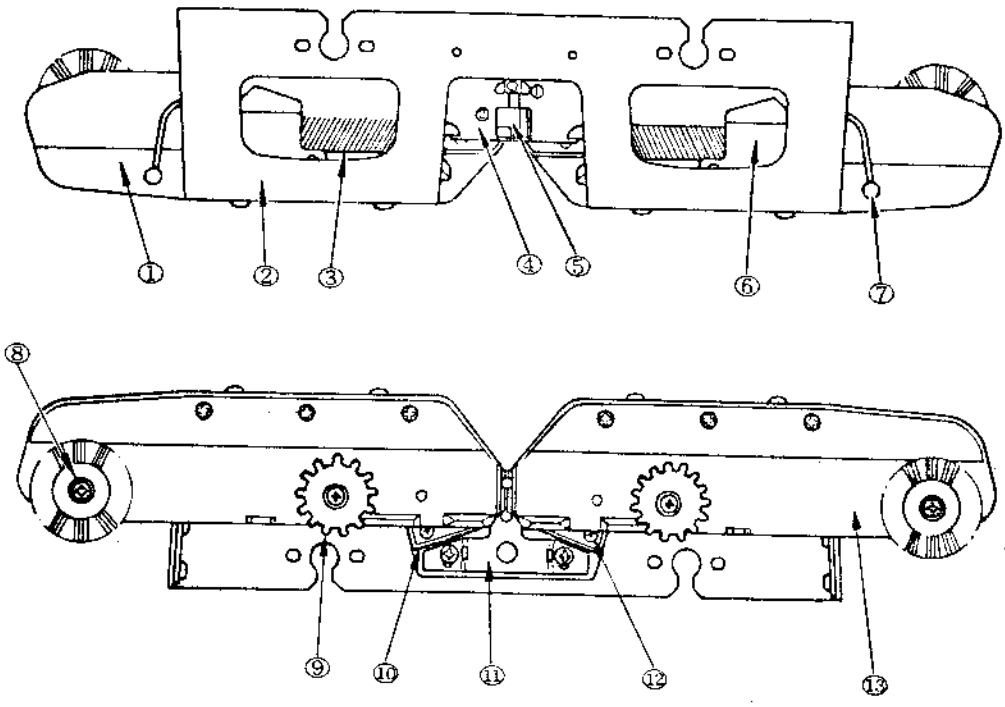



Fig. 4

1. Fabric Presser (L)
2. Arm
3. Clearing Brush
4. Yarn Feeder
5. Guide Pin
6. Latch Opener (R)
7. Yarn Holder
8. Round Brush B
9. Fabric Gear
10. Magnet B (L)
11. Platting Yarn Feeder
12. Magnet B (R)
13. Fabric Presser (R)

## 1-3 Carriage (Back):

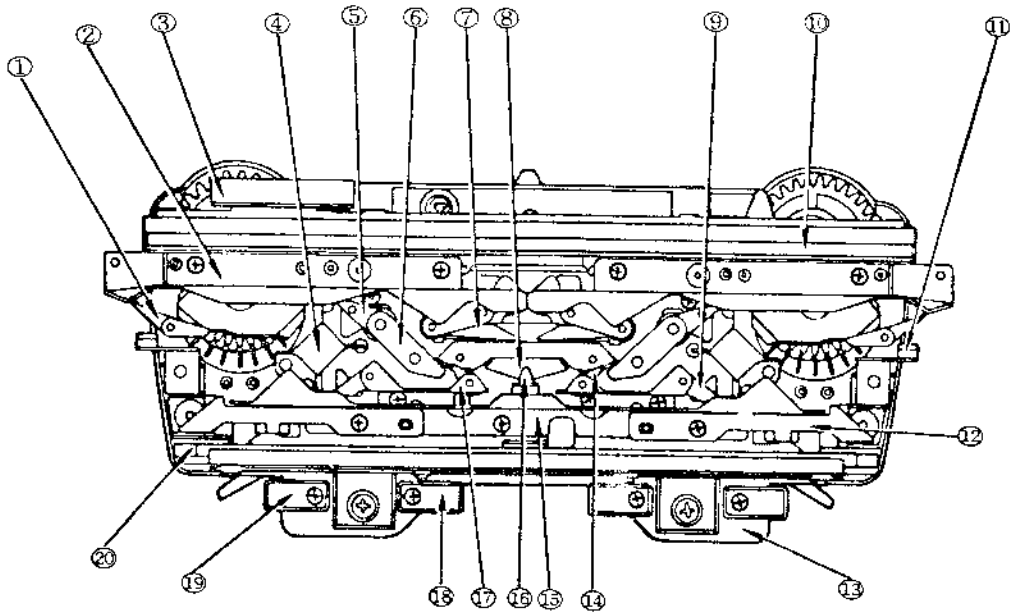



Fig. 3

1. Side Cam (R)
2. Guide Plate (R)
3. Driving Cam
4. Separation Cam
5. Sub Cam
6. Main Cam
7. Knit-in Cam
8. Centre Cam
9. Rising Cam
10. Carriage Pipe
11. Guide Cam (L)
12. Russel Cam
13. Carriage Plate B
14. Lowering Cam
15. Needle Guide
16. Lowering Cam C
17. Middle Course Cam
18. Magnet A
19. Magnet C
20. Slider

1-3 Carriage (Back):

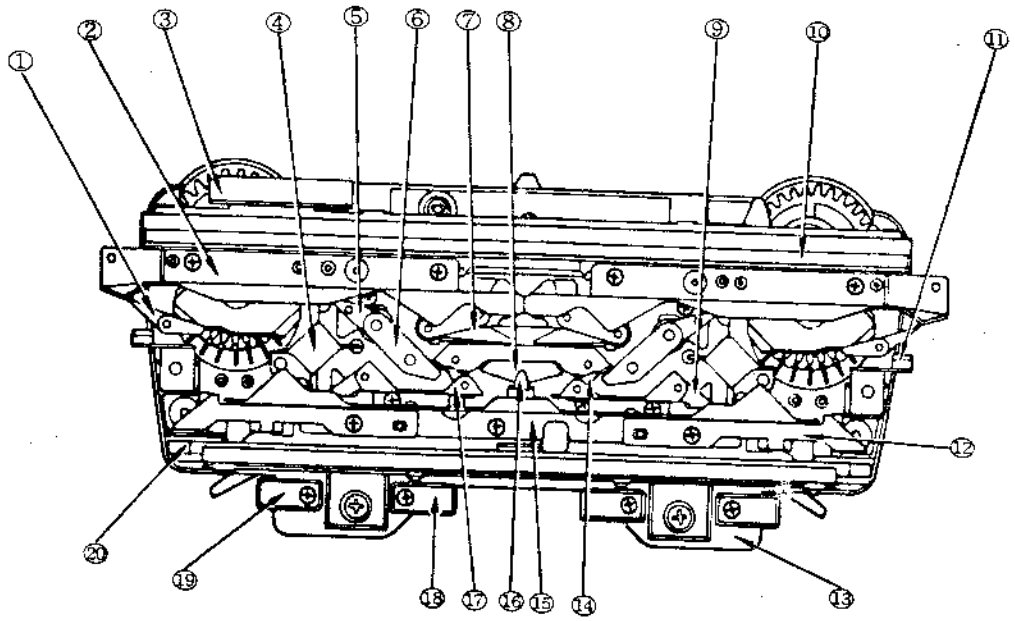



Fig. 3

1. Side Cam (R)
2. Guide Plate (R)
3. Driving Cam
4. Separation Cam
5. Sub Cam
6. Main Cam
7. Knit-in Cam
8. Centre Cam
9. Rising Cam
10. Carriage Pipe
11. Guide Cam (L)
12. Russel Cam
13. Carriage Plate B
14. Lowering Cam
15. Needle Guide
16. Lowering Cam C
17. Middle Course Cam
18. Magnet A
19. Magnet C
20. Slider

1-4 Arm:

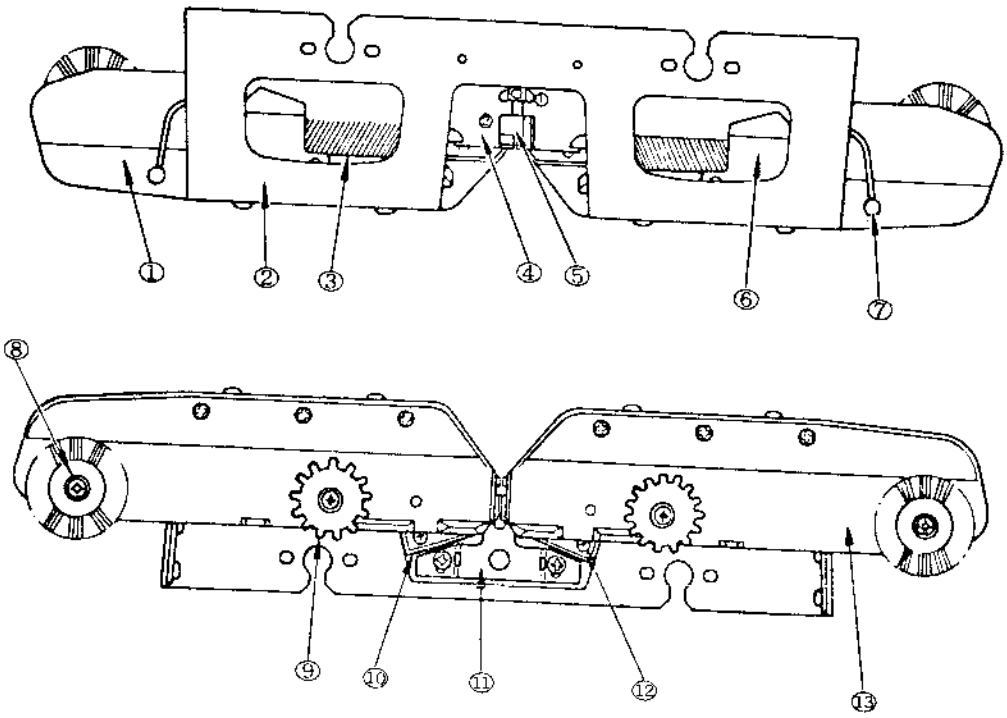



Fig. 4

1. Fabric Presser (L)
2. Arm
3. Clearing Brush
4. Yarn Feeder
5. Guide Pin
6. Latch Opener (R)
7. Yarn Holder
8. Round Brush B
9. Fabric Gear
10. Magnet B (L)
11. Platting Yarn Feeder
12. Magnet B (R)
13. Fabric Presser (R)

## 2. HOW A NEEDLE FORMS A STITCH.

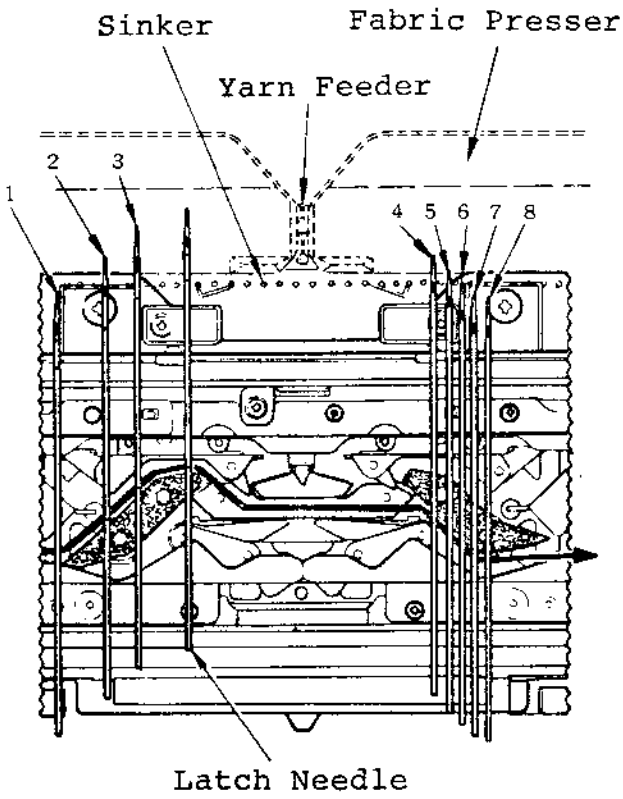



Fig. 5

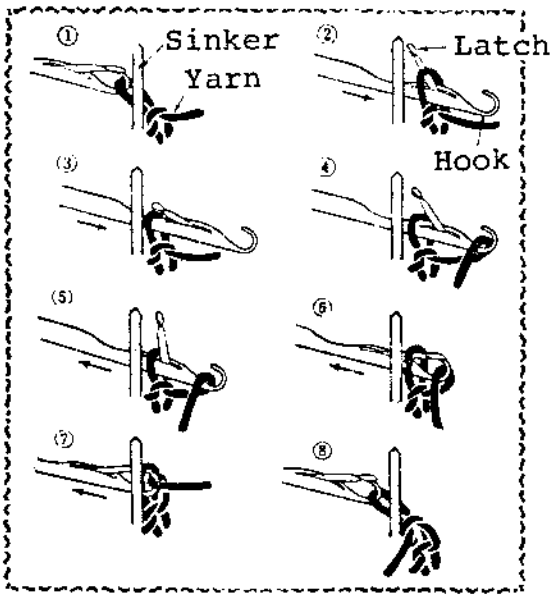



Fig. 6

1. An old stitch is hanging on the hook of a needle.
2. The needle is pushed forward by a Main and Sub Cam. The fabric is also carried forward but is stopped by the Fabric Presser and only the needle is pushed forward getting its latch opened by the stitch.
3. As the needle goes further forward, the stitch goes over and behind the latch.
4. Yarn is fed on the hook of the needle through the Yarn Feeder to form a new stitch.
5. The needle begins to move back as it is pushed by the other Main Cam.
6. As the needle goes back, the fabric pushes the latch causing it to close.
7. When the needle is led further back, the latch closes on the hook completely, confining the yarn under it.
8. When the needle is back in its original position, the old stitch slips from the hook, passing over the latch. (The Sinker Posts serve to make even the size of the stitches.)
   Now a new stitch is on the needles.

# 3. MECHANISM OF NEEDLE SELECTION AND FUNCTION OF EACH MAIN PART.

## 3-1 Punch Card:

A Punch Card is made from vinyl chloride and has many punched holes that represents a pattern.

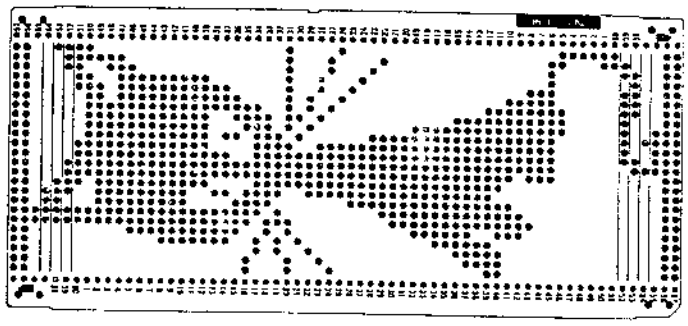


Fig. 7

## 3-2 Pattern Unit:

The Pattern Unit reads a pattern from a Punch Card and conveys it to the Main Drum on the Carriage.
When the Carriage is moved across the needle bed, the Feeding Lever, on the Pattern Unit, is raised by the Driving Cam, secured to the rear side of the Carriage, and the Touch Levers are moved by spring action.

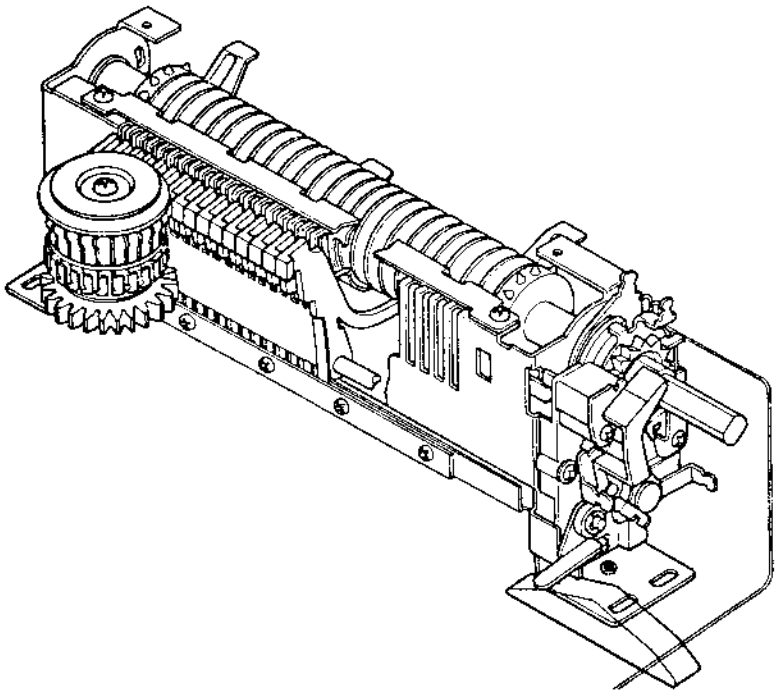


Fig. 8

Main Drum:

The Main Drum transmits to the Sub Drum, the patterns registered from the Touch Levers.

Sub Drum:

The Sub Drum memorizes the patterns, conveyed via the Main Drum from the Touch Levers, and selects the needles accordingly.

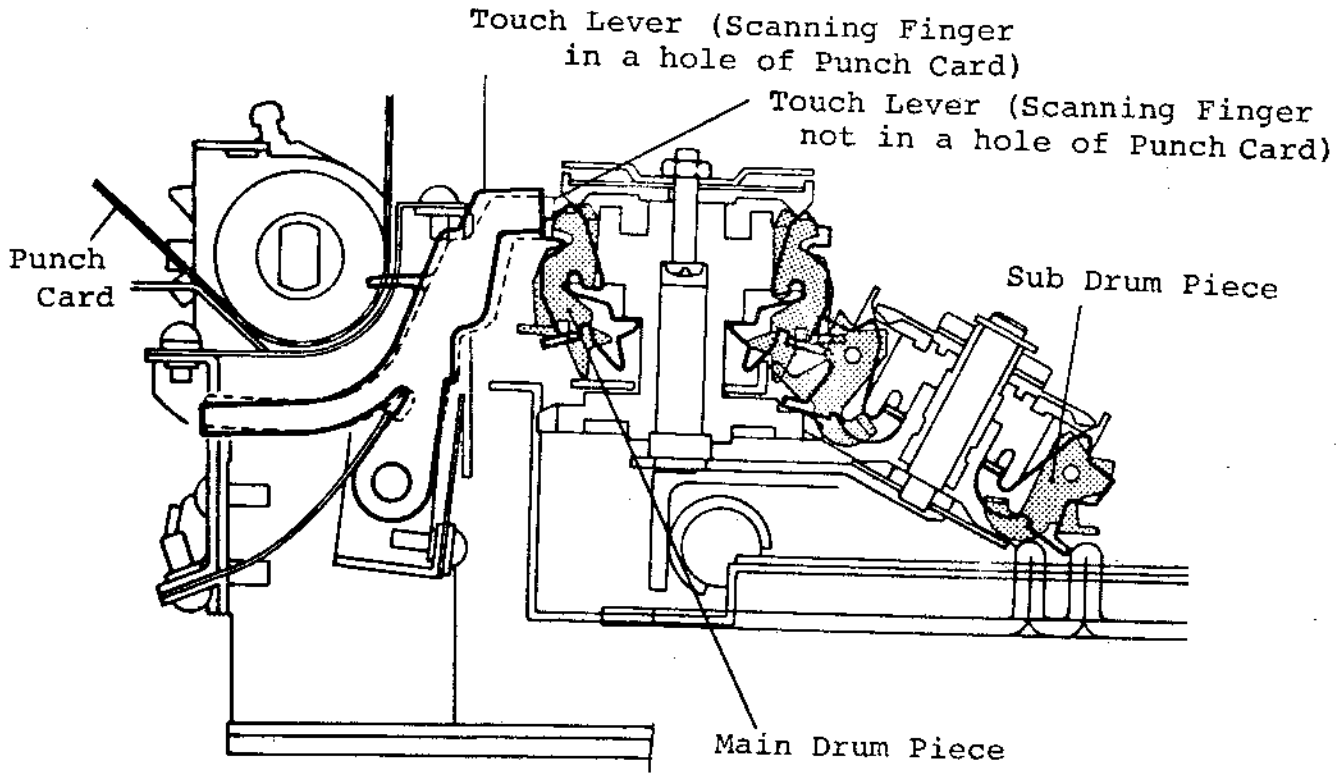



Fig. 10

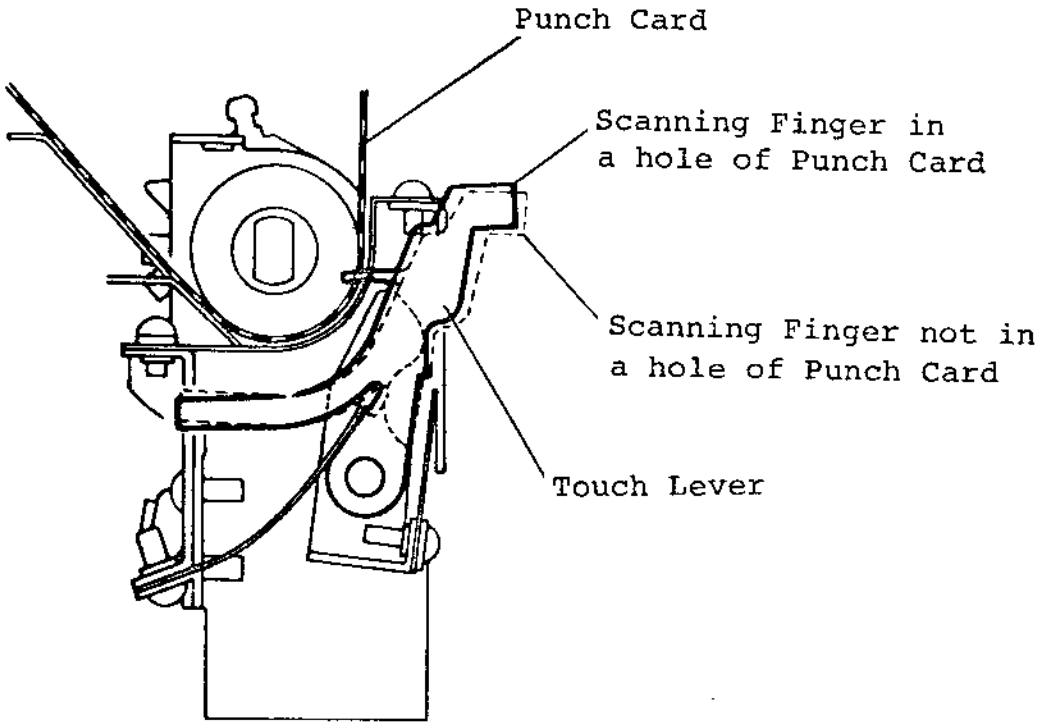



Fig. 9

3-3 Drum:

The Drum reads and memorizes the pattern from the Punch Card transmitted by the Touch Levers, on the Pattern Unit, and according to its memory, selects the appropriate needles. The Drum can only memorize a pattern which requires up to 24 needles. The range of needle selection available from a Punch Card is from 2 to 24 stitches.
Those Touch Levers remaining in a lower position, hit respectively the upper parts of their corresponding Drum Pieces located in the Drum Unit, which brings about a convex-concav condition around the Drum.

Drum Unit:

The Drum Unit reads the pattern, transmitted by the Touch Levers of the Pattern Unit, memorizes it and then selects the needles accordingly.

2. When the Scanning Finger of a Touch Lever does not enter the hole of a Punch Card, the Touch Lever will remain in a lower position and push the upper part of a Main Drum Piece, making the lower part of the Piece come out to push the upper part of the Sub Drum Piece. The lower part of the Sub Drum Piece will not touch the needle butt, but leave the needle between the teeth of the Sub Drum Gear to be led behind the Separation Cam as illustrated below.

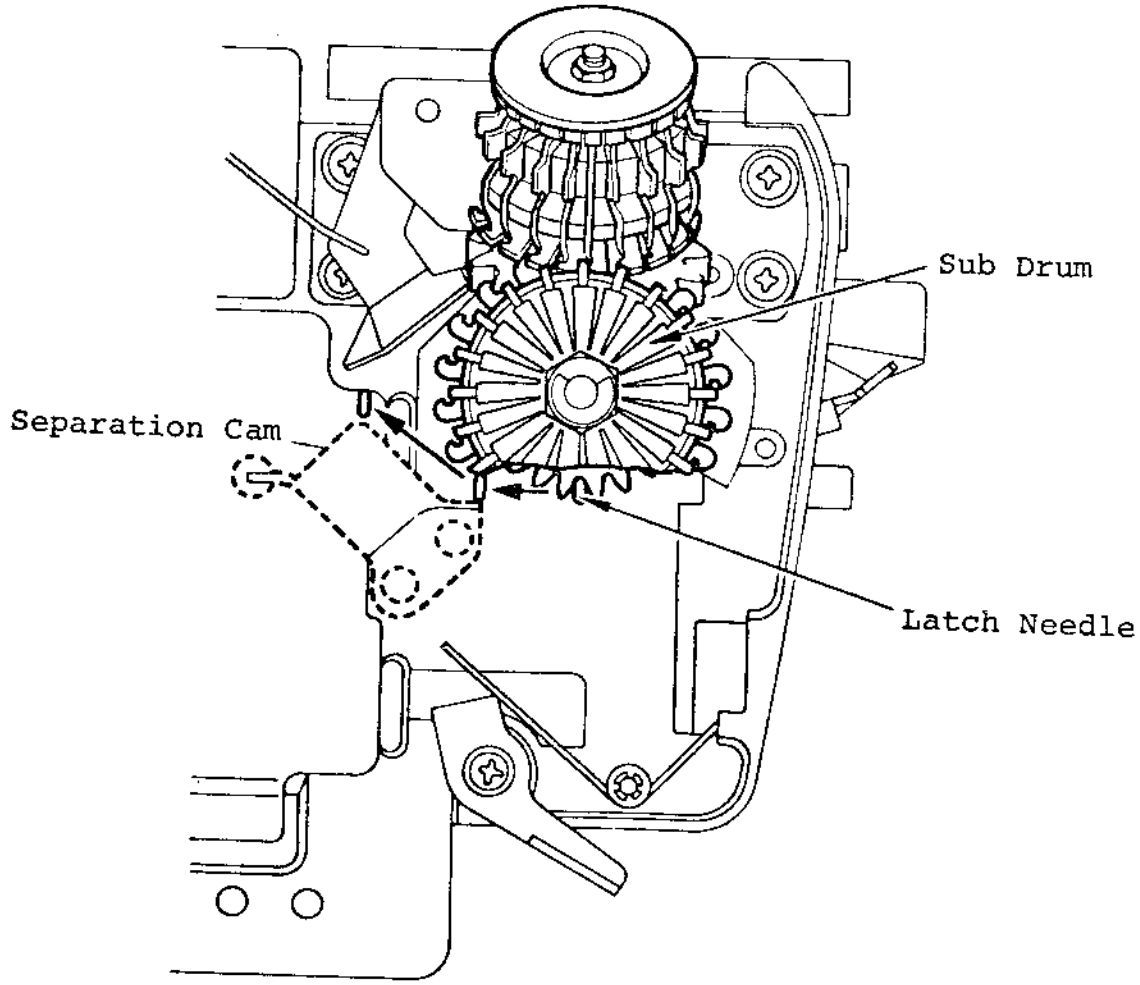



Fig. 12

1. When the Scanning Finger of a Touch Lever finds and enters a hole in the Punch Card, that Touch Lever will be at a higher position and will not contact the upper part of a Main Drum Piece (leaving the lower part in an inactive position) and, therefore, does not activate the Sub Drum Piece. Accordingly, the lower part of the Sub Drum Piece remaining in a lower position, will push the butt of a corresponding needle forwards so that it will proceed along the front edge of a Separation Cam, to be pushed more forward to the selected course.

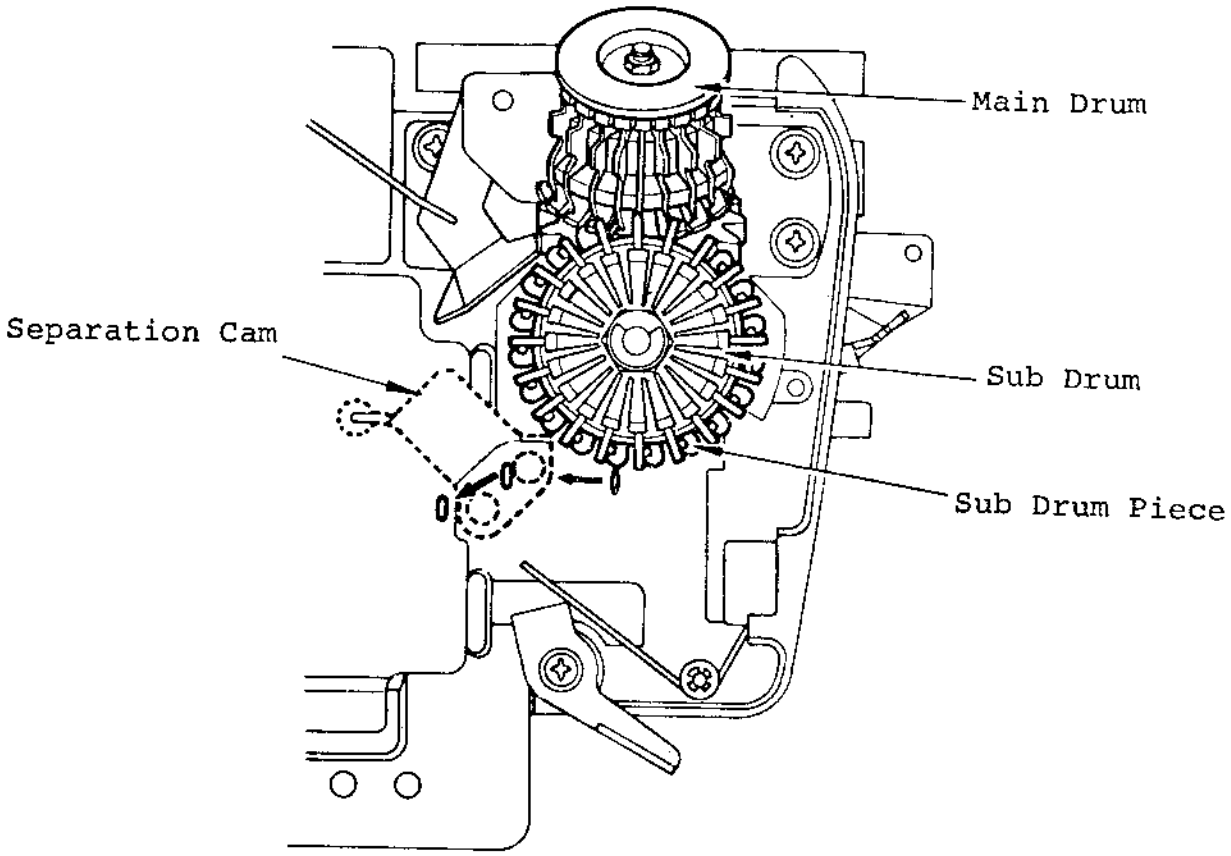



Fig. 11

3. Turn the Stitch Dial in an anti-clockwise direction until it stops and then remove it by lifting.

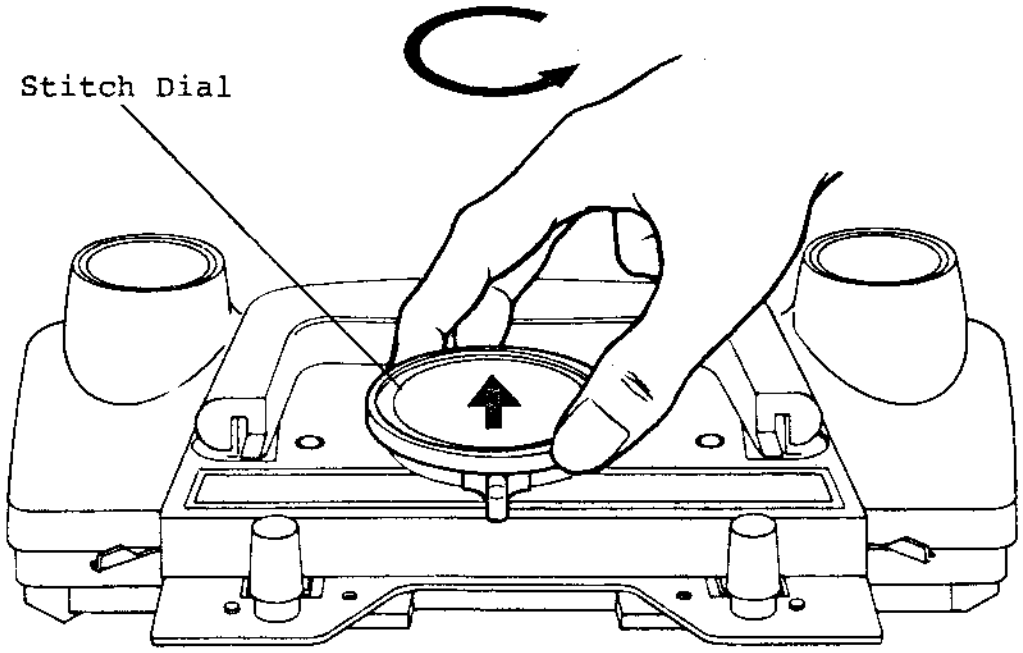



Fig. 14

4. Remove two ± Truss Head Screws (3x6), each on the inside of the Carriage Holders, on both sides of the Carriage Cover A.

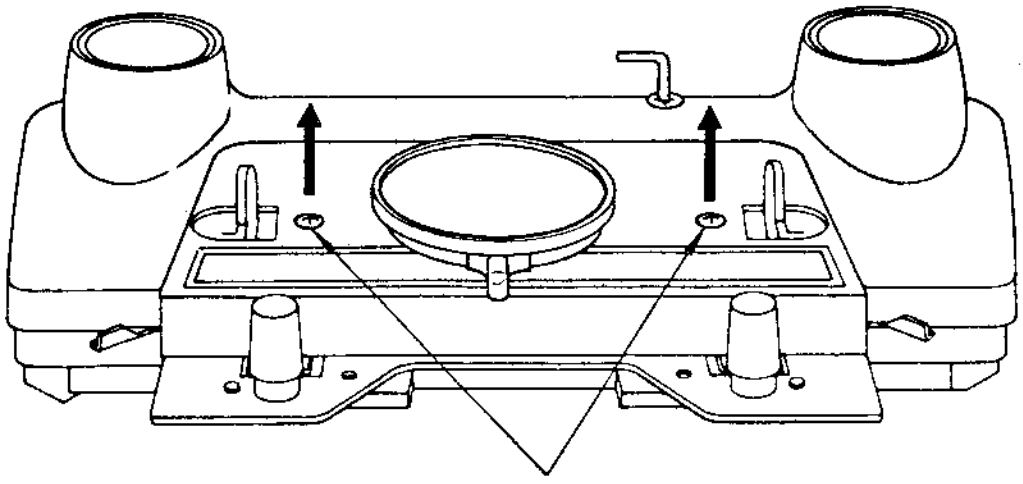



Fig. 15

## 4-1 Disassembly of Carriage (up to Carriage Cover):

1. Fold the Carriage Handle backwards as indicated in the figure below.

2. Remove the two Carriage Screws, both of which located in a recess at the foot of both sides of the Handle. Use a Philip's Screw Driver as shown in Fig. 13 below.

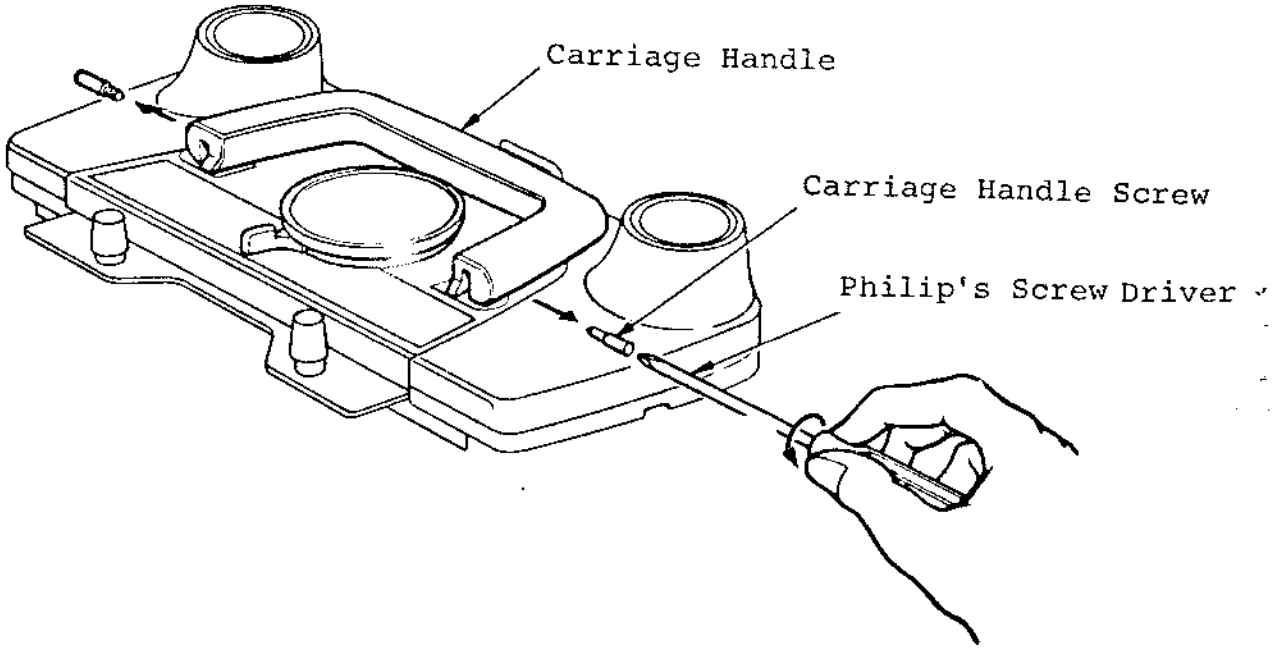



Fig. 13

5. Remove the Cam Lever while pushing out the Dial Spring with the tip of a Screw Driver. The Carriage Cover A will be removed at the same time.

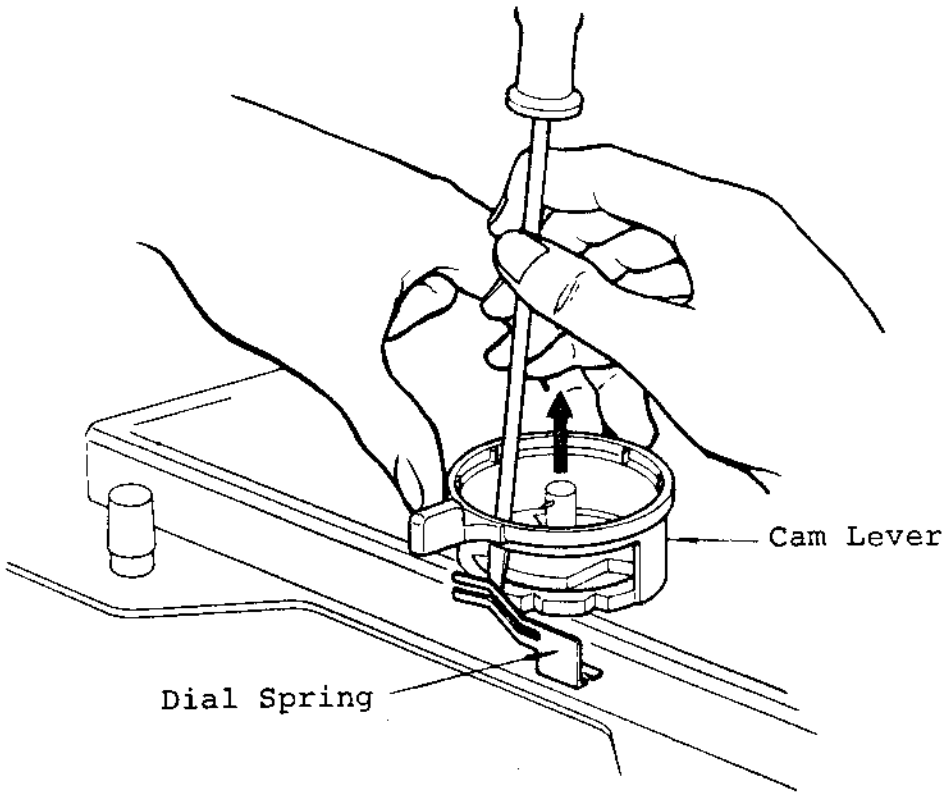



Fig. 16

6. Remove Carriage Cover B by removing two ± Truss Head Screws (3x6) which secures the Cover to the Carriage at its rear side.

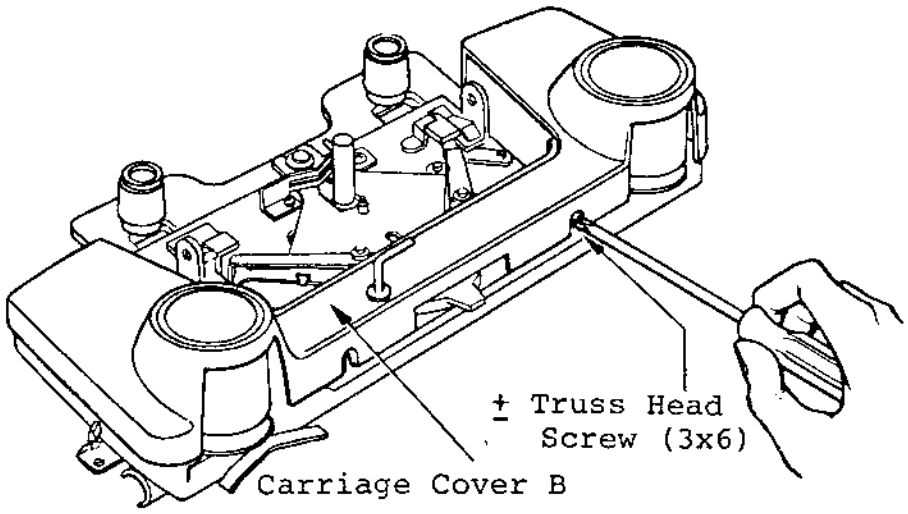



Fig. 17

7. Remove Carriage Cover B by squeezing slightly the two sides of the Cover.
   NOTE: Do not remove the Cover unless you apply a slight squeeze, as it is possible for the Cover to break.

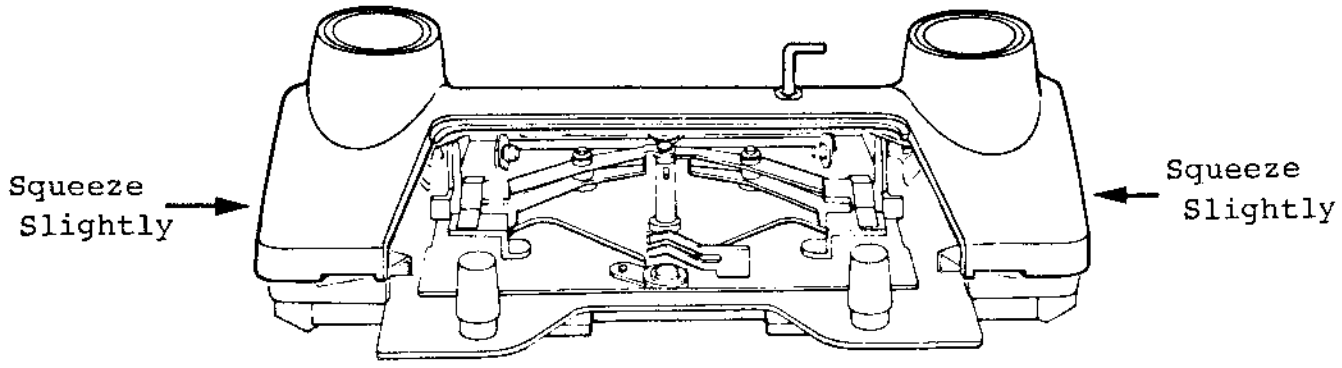



Fig. 18

## 4-2 Disassembly of Machine Body (down to Case Cover):

1. Turn over the machine body, as shown in Fig. 19, and remove two + Binding Head S Tight Screws (3x6) located between the two Rubber Pads as illustrated in Fig. 20.

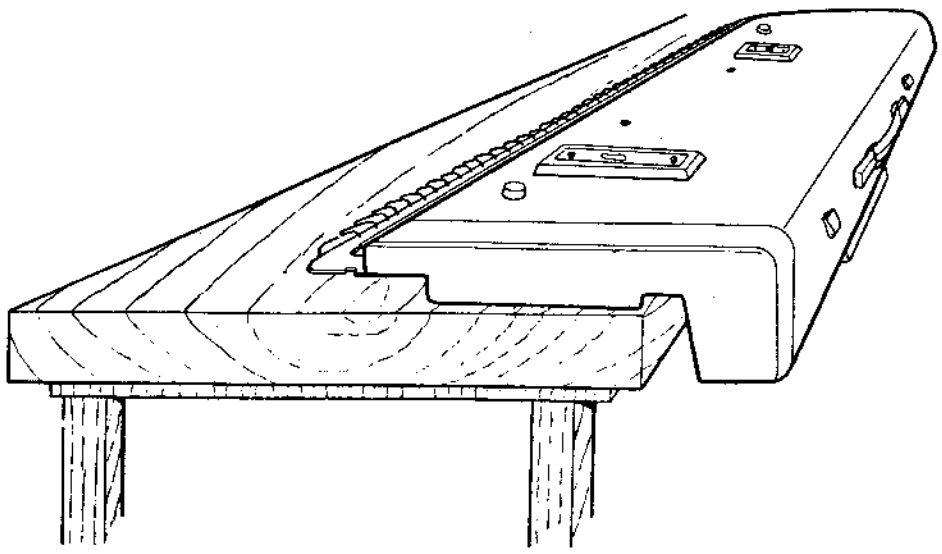


Fig. 19

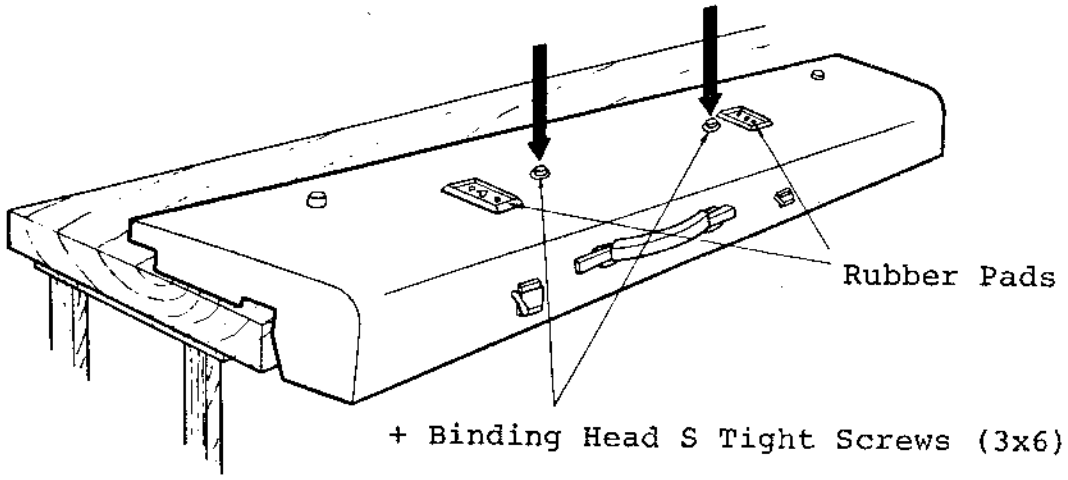



Fig. 20

2. Remove one + Binding Head S Tight Screw (3x6) ( to the rear and below the Knit Radar). Remove two + Binding Head Screws (3x12) from the Handle Supports and two + Truss Head Screws (3x8) from between the Carrying Handle Supports.

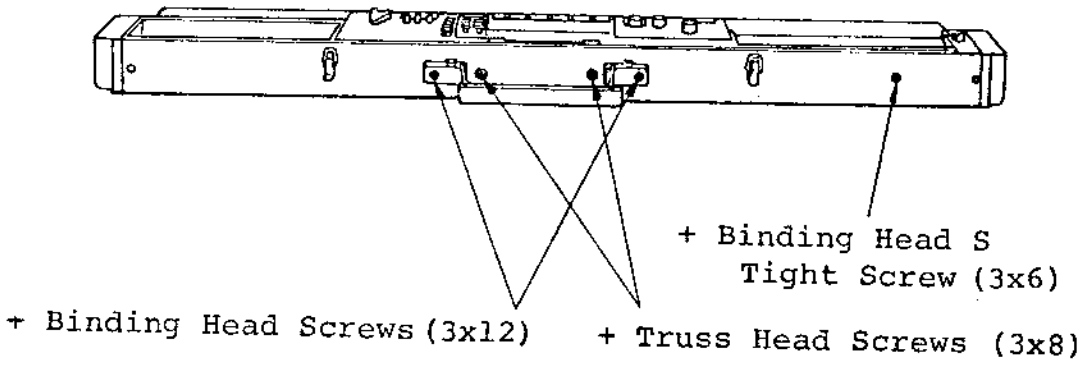



Fig. 21

3. Dismantle the KR Feeding Dial Unit, Change Dial, Stop Knob and L Knob from the Centre Panel, as illustrated in Fig. 22.

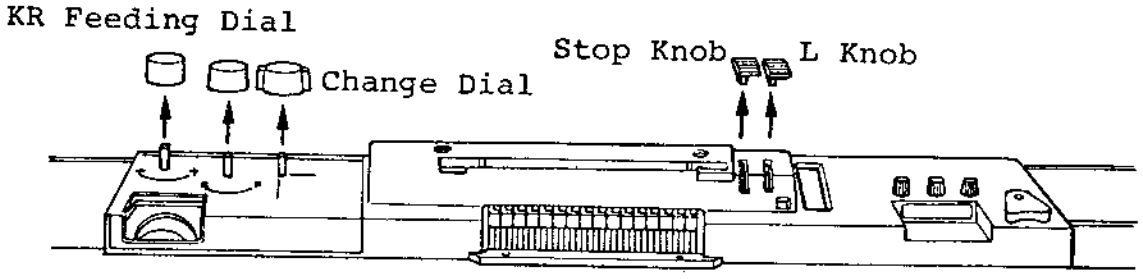



Fig. 22

4. Remove one + Truss Head Screw (3x8) from the Side Panel (L) and two Panel Screws from the Centre Panel.

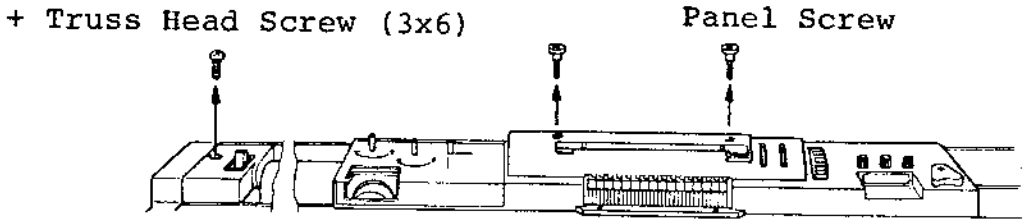



Fig. 23

5. Remove the Side Panel (L) and the Centre Panel Unit. The Centre Panel Unit must be removed in the arrowed direction as shown in Fig. 24.

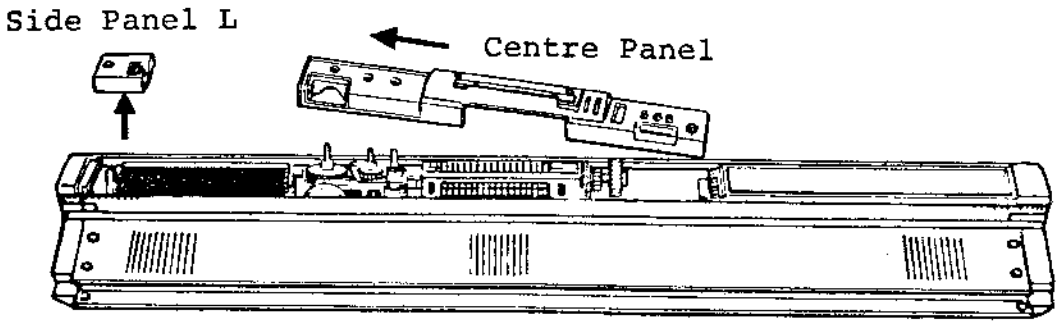



Fig. 24

6. After the removal of the Centre Panel Unit, remove one + PW Pan Head Screw (3x6) from the Side Panel (R).

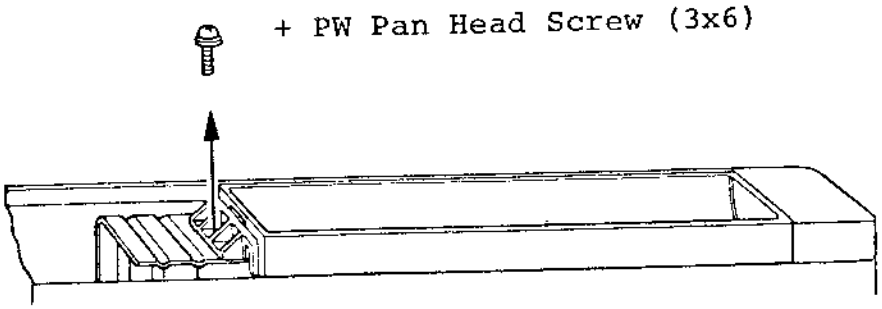



Fig. 25

7. To remove the Side Panel (R), slide it to the left, as indicated in Fig. 26, below.

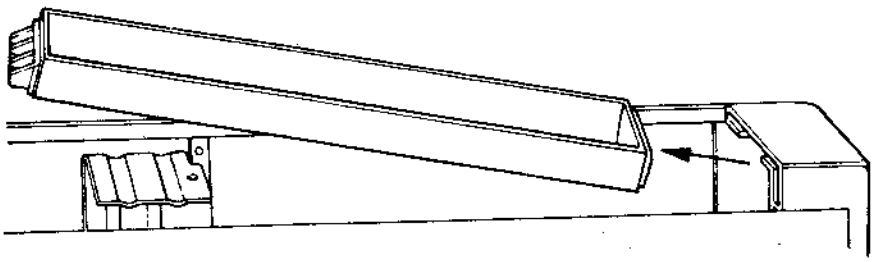


Fig. 26

8. Remove four + Special Flat Head S Tight Screws (4x10) and two + Binding Head S Tight Screws (3x6) used to secure the needle bed and front edges of the needle bed respectively.

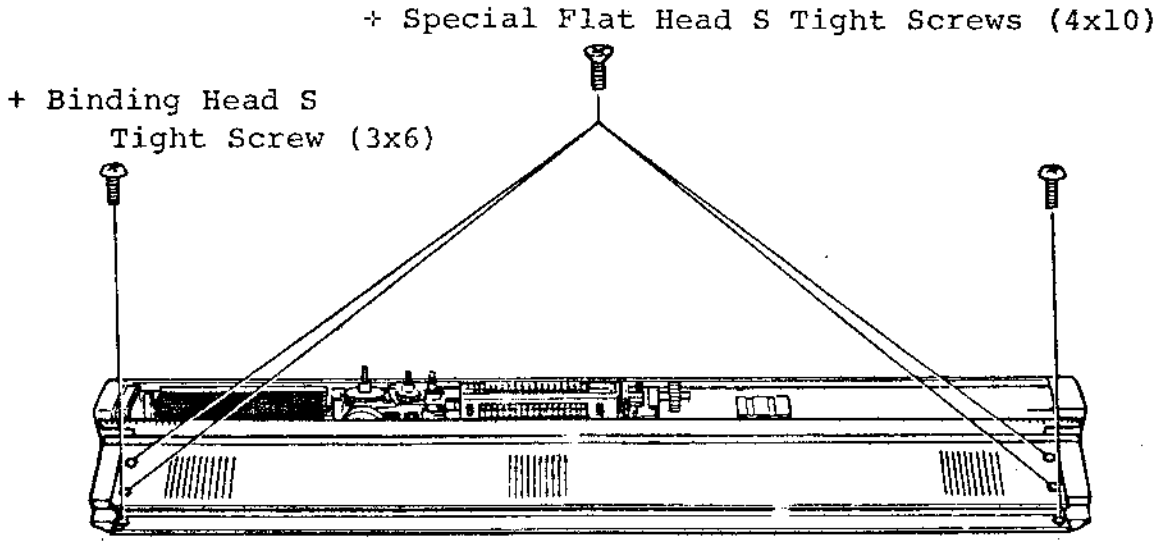



Fig. 27

9. Move the needle bed towards the left while lifting its front edge slightly, and draw it towards you. The needle bed will then become separated from the Case.

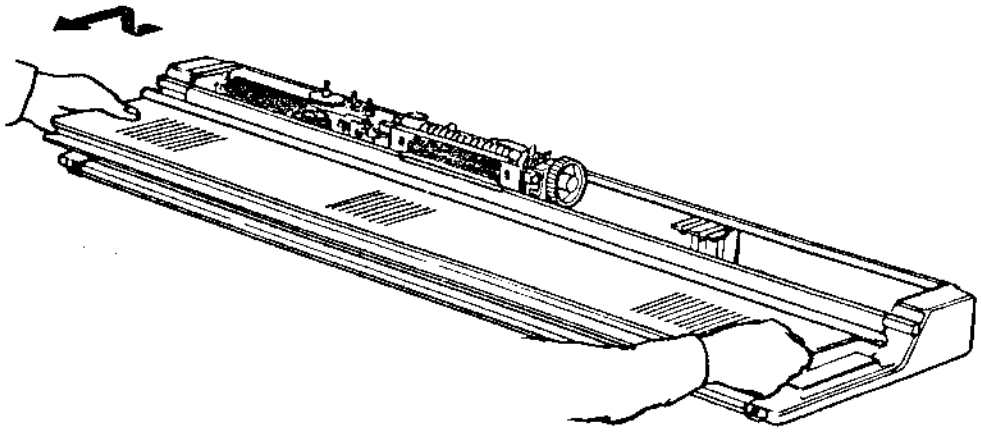


Fig. 28

## 5-1 Drum Adjustment:

1. Remove two + PW Pan Head Screws (3x6) that secures the Sub Drum Holder.
2. Remove an E Snap Ring 4 which secures the Sub Drum.

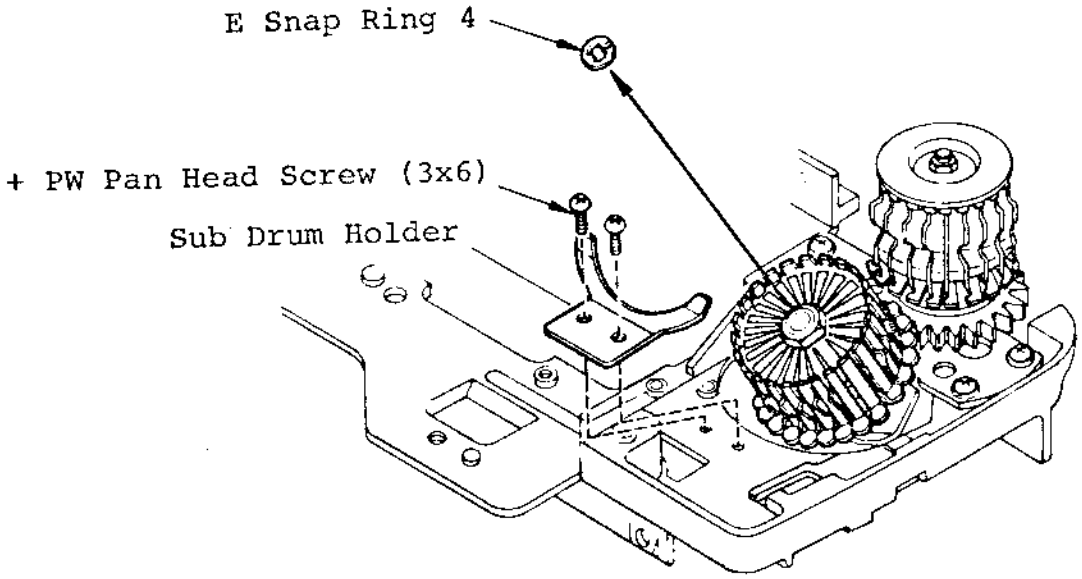



Fig. 29

3. Remove the Sub Drum and place the Drum Adjusting Gear onto the Drum Base.
4. Loosen four ± Special PW Binding Head Screws (3x7) which secures the Main Drum Base.

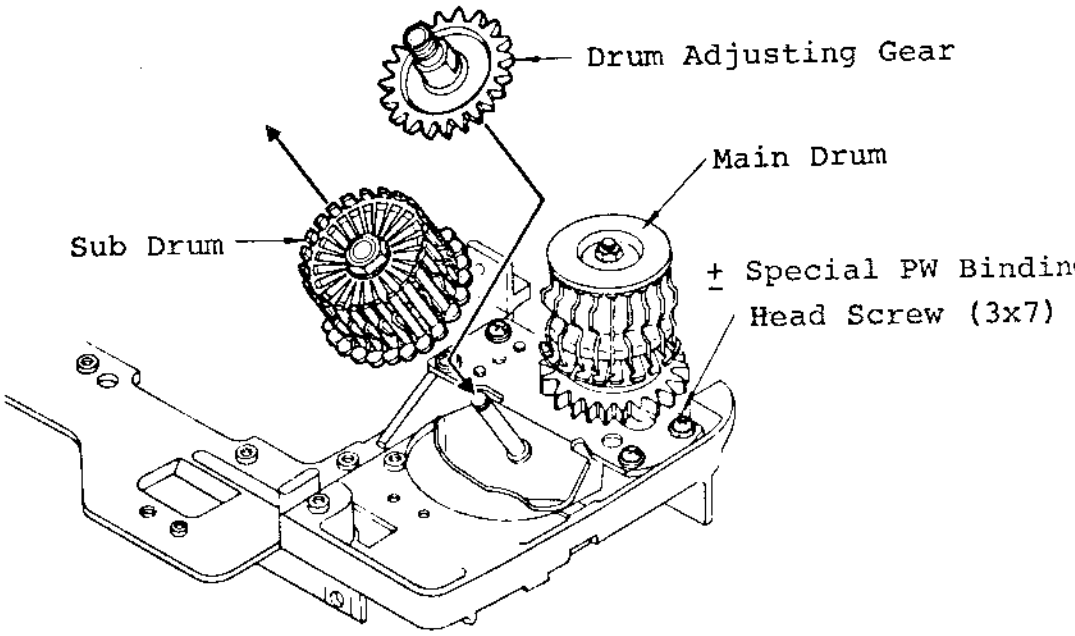



Fig. 30

5. Adjust the position of the Sub Drum so as the Sub Drum Axis and the Drum Adjusting Gear are aligned on the vertical line as indicated in Fig. 31, below.

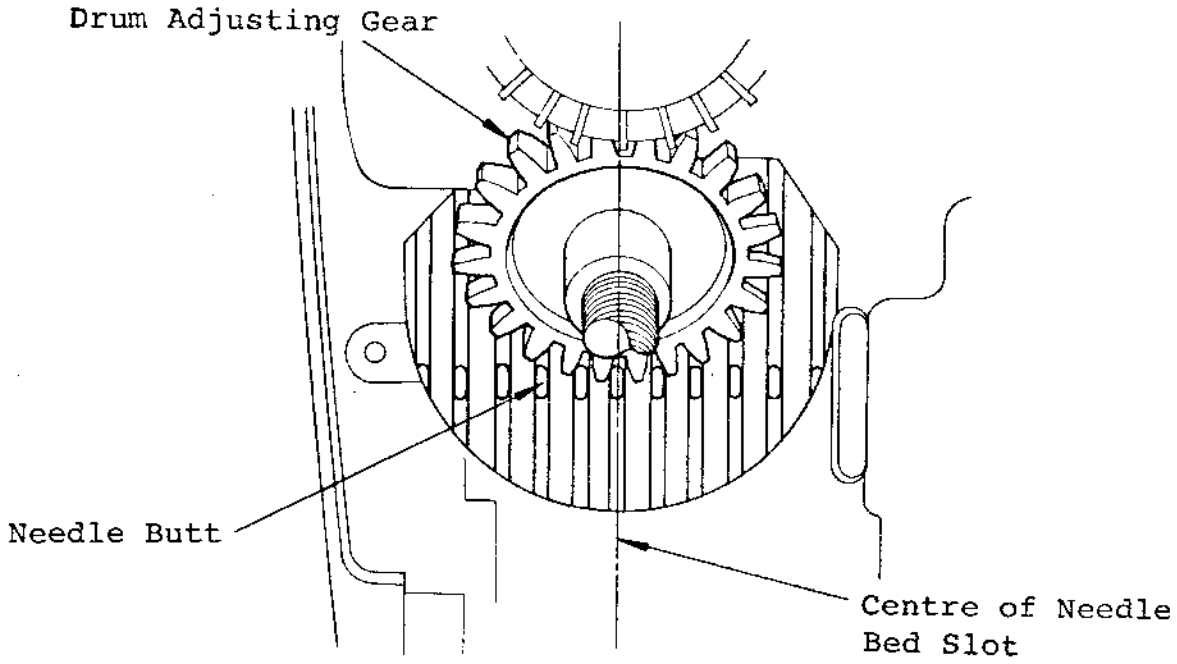



Fig. 31

6. After the adjustment has been made, secure the Main Drum Base to the Carriage Plate B with four ± PW Binding Head Screws (3x7).
Push some needles to between B and C position on the needle bed, to check to see whether or not the needles move laterally when the Drum Adjusting Gear is engaged with the needle butts. The needles should not move laterally.

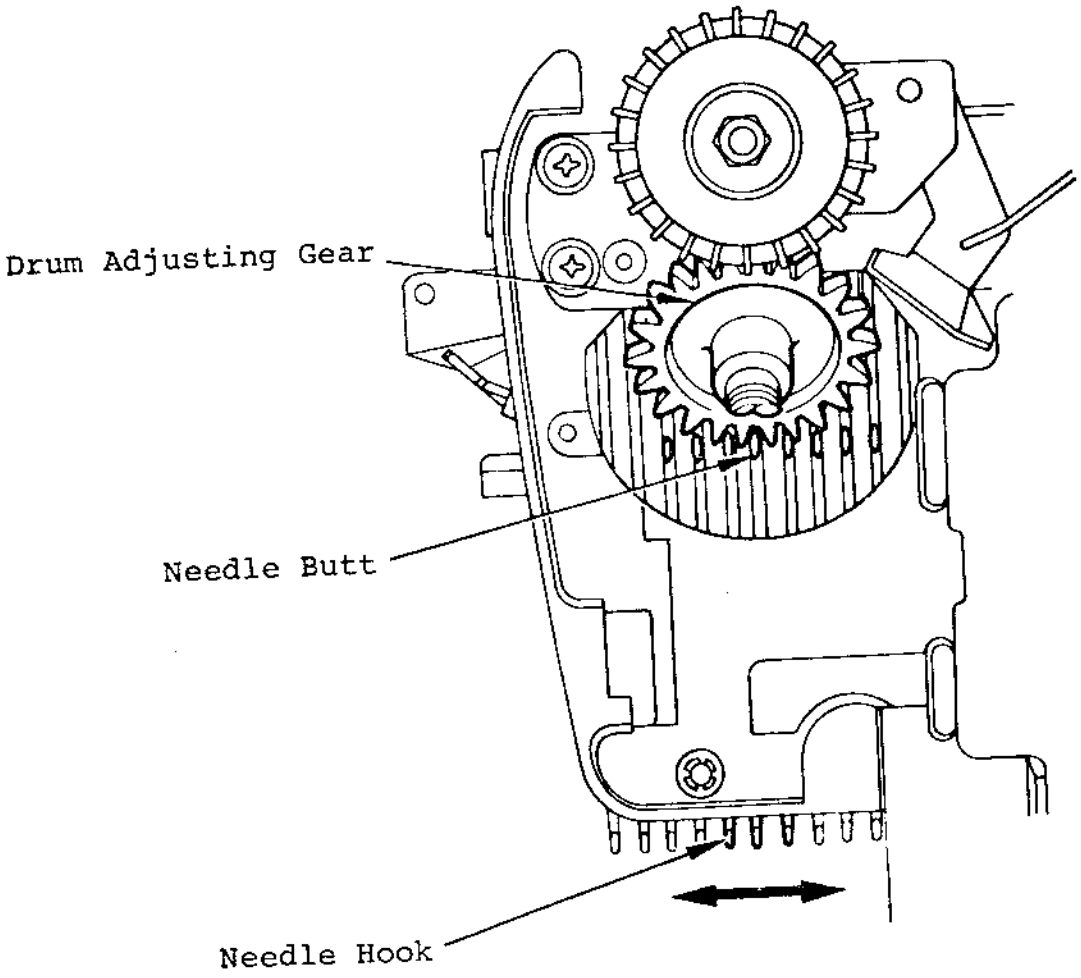



Fig. 32

* No lateral movement is allowed when the Drum Adjusting Gear is engaged with the needle butts.

7. The Drum Adjusting Gear must be removed and the Sub Drum replaced on its axis and be secured with an E Snap Ring 4.

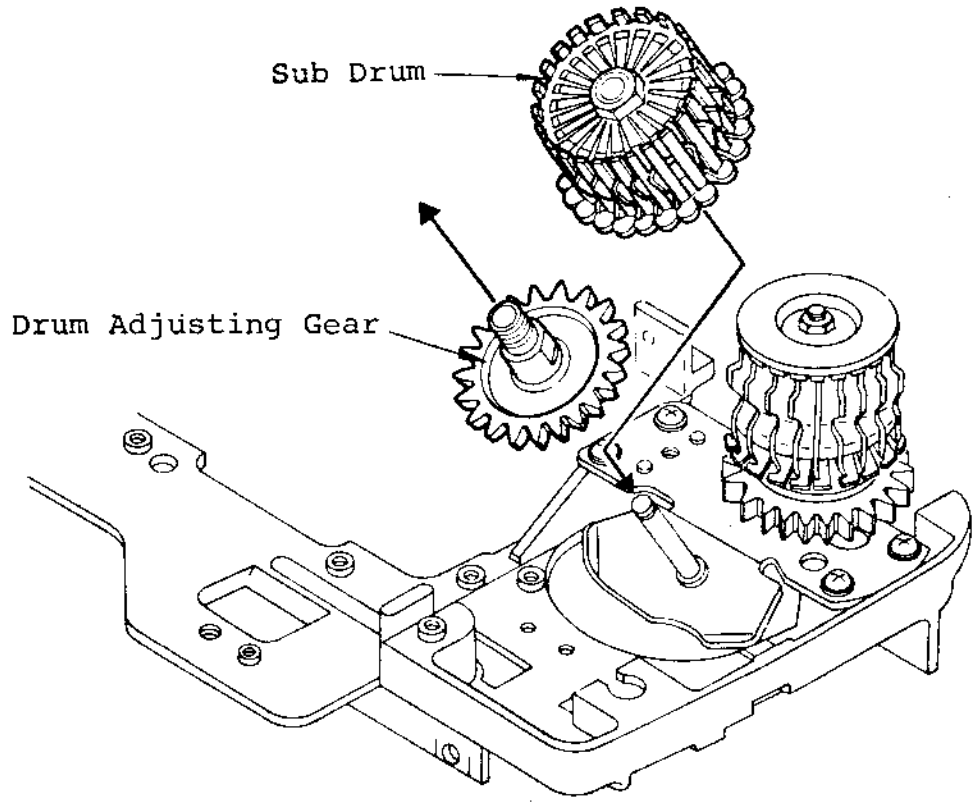



Fig. 33

8. For testing the movement of the Carriage, insert a Punch Card into the Centre Panel Unit and move the Carriage slowly across the needle bed. If the Carriage is moved fast, this would result in an uneven needle selection and could cause damage to the needles, if they were strongly hit against the Needle Guide.

   NOTE: Remove a Hexagonal Nut from the Sub Drum and then pull out the Sub Drum Gear, which can be used as a Drum Adjusting Gear.

(1). Imperfect Positioning of Drum Unit:

Conditions: Incorrect alignment of the Drum Unit causes the needles, which are guided by the Sub Drum Gear, to collide with the Separation Cam as shown in Fig. 34, below.

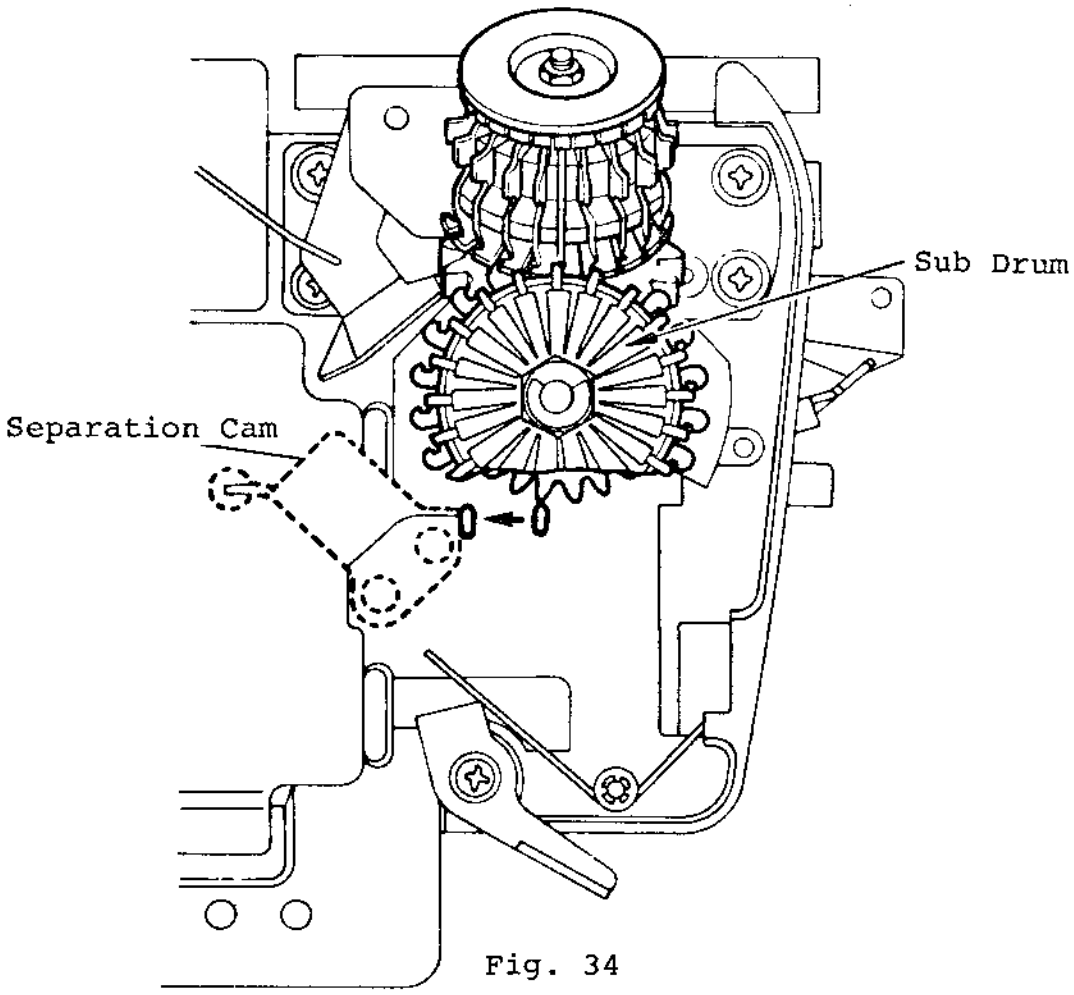



Fig. 34

Correcting Method: Readjust the positioning of the Drum Unit.

## 5-2 Clear Wire Adjustment:

The length of the Clear Wire, which works to clear the stored memory of the Sub Drum, must be adjusted after the Drum Unit adjustment has been made.
The Clear Wire becomes active, through the function of the Clear Cam, when the Carriage is moved past the centre of the needle bed.
Adjust the length of the Clear Wire by stretching or folding the bent portion of the Wire, by using either Needle-Nose Pliers or a pair of Duck Bill Pliers, so as no clearance exists between the Sub Drum Clear Cam and Sub Drum Pieces.

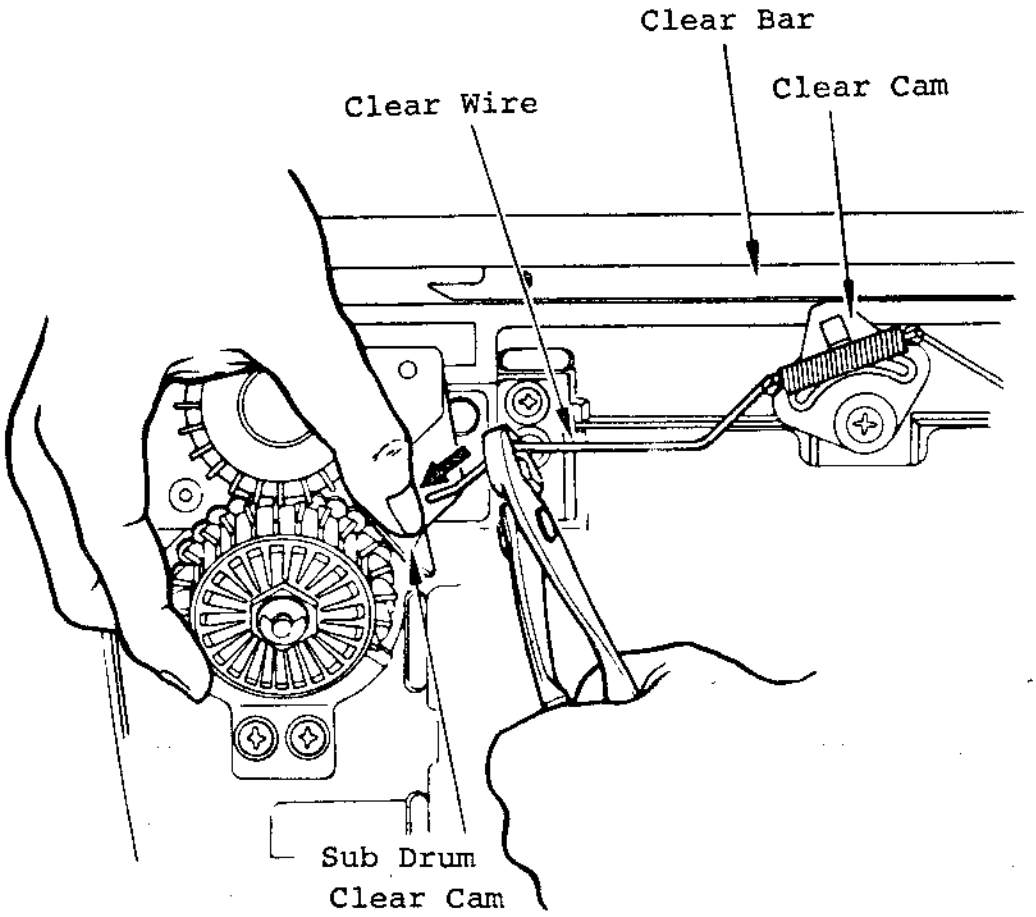



Fig. 35

## 5-3 Course Stripes:

1. The measurement between the inner surface of the Carriage Pipe and both Main Cams must be 34.10 ± 0.2 m/m, when the Stitch Dial is set at 5.

   Both Main Cams should be located at an equal distance from the inner surface of the Pipe (standard level).
   The Course Standard Gauge is used to correct the distance.

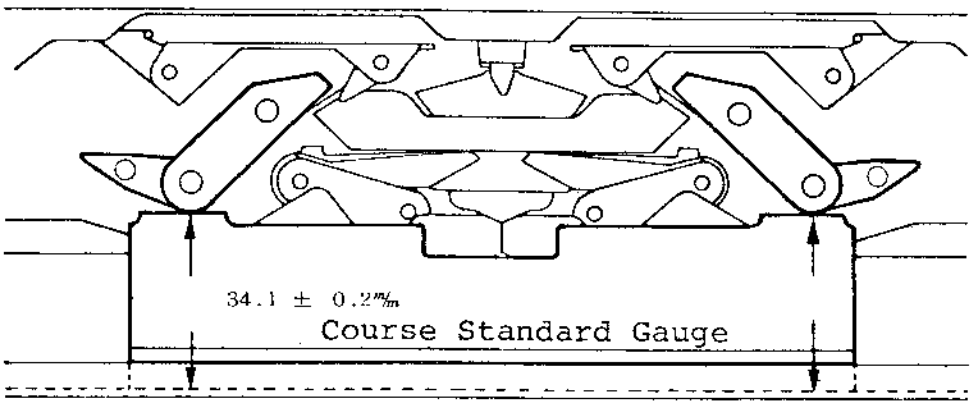



Fig. 36

In the case that the distance between the Carriage Pipe and one Main Cam differs from that between the Carriage Pipe and the other Main Cam, Course Stripes (irregular traverse stitches), becomes the result.

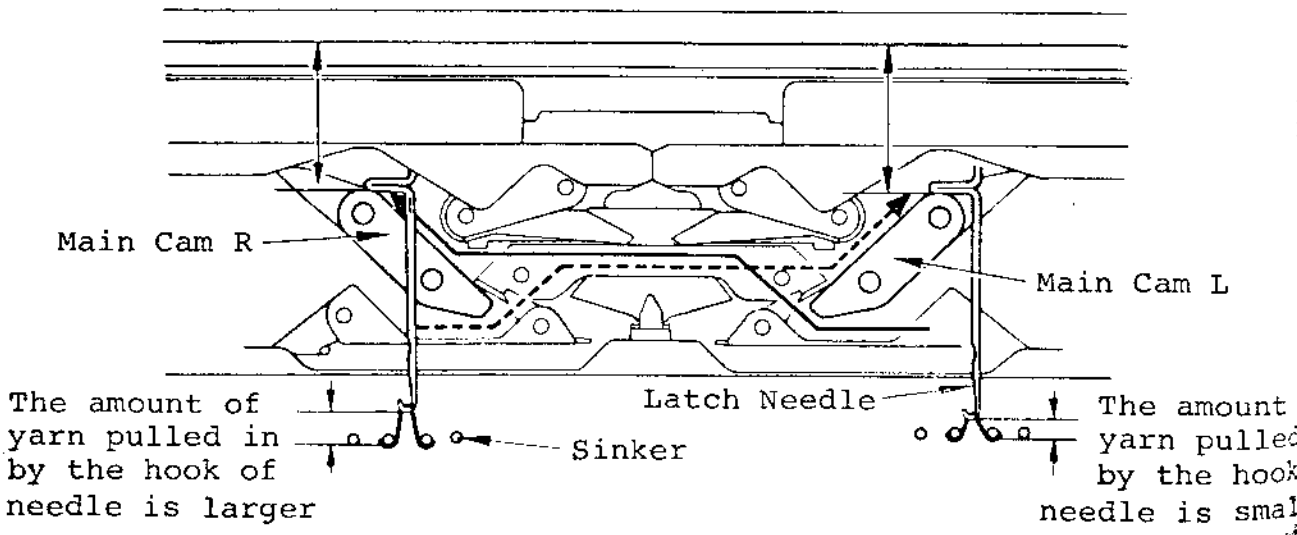



Fig. 37

When the distance between the standard level (Carriage Pipe) and a Main Cam is larger, the amount of yarn pulled in by a needle is smaller and stitches become smaller. Conversely, when the distance is smaller, the stitches become larger owing to,the larger amount of yarn pulled in by a needle. If you continue knitting with the two Main Cams unevenly positioned, the tightness of the stitches by a stroke of the Carriage from left to right differs from that made by a right to left stroke. The tight and loose row appear alternately. This is called "Course Stripes" (irregular traverse stripes).

Correcting Methods:

Turning over the Carriage, loosen a small + Binding Head Screw (3x5) which secures the Stitch Adjusting Plate, and adjust the position of the Main Cam by moving the Stitch Adjusting Plate to and fro, so that the Main Cams move in the same direction simultaneously.

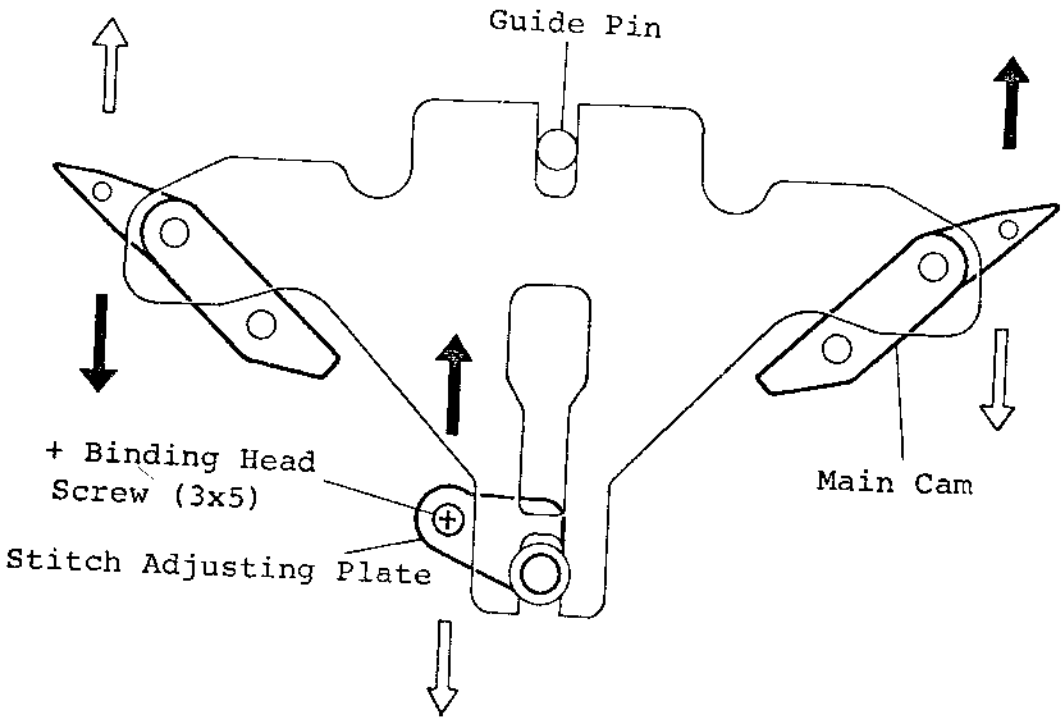



Fig. 38

Turn the Cam Lever to the Slip Stitch position so as the Sub Cams are positioned as those shown in Fig. 39, below, and set the Stitch Dial to 1. Turn the Carriage over and insert the Course Standard Gauge into the Carriage sideways.

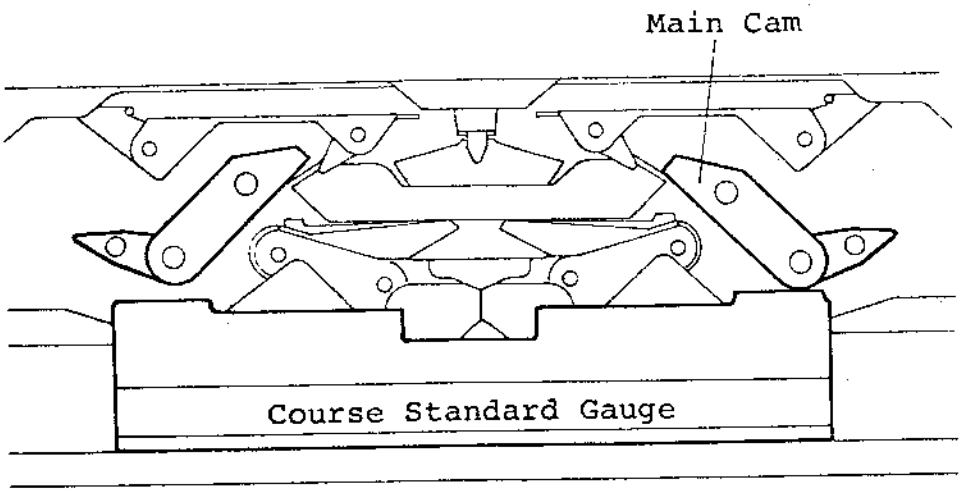



Fig. 39

By turning the Stitch Dial, the Main Cams will move towards the Course Standard Gauge and will come into contact with the Gauge when the Stitch Dial is at 5. At this point the adjustment will be made. Fasten the + Binding Head Screw (3x5) that secures the Stitch Adjusting Plate.

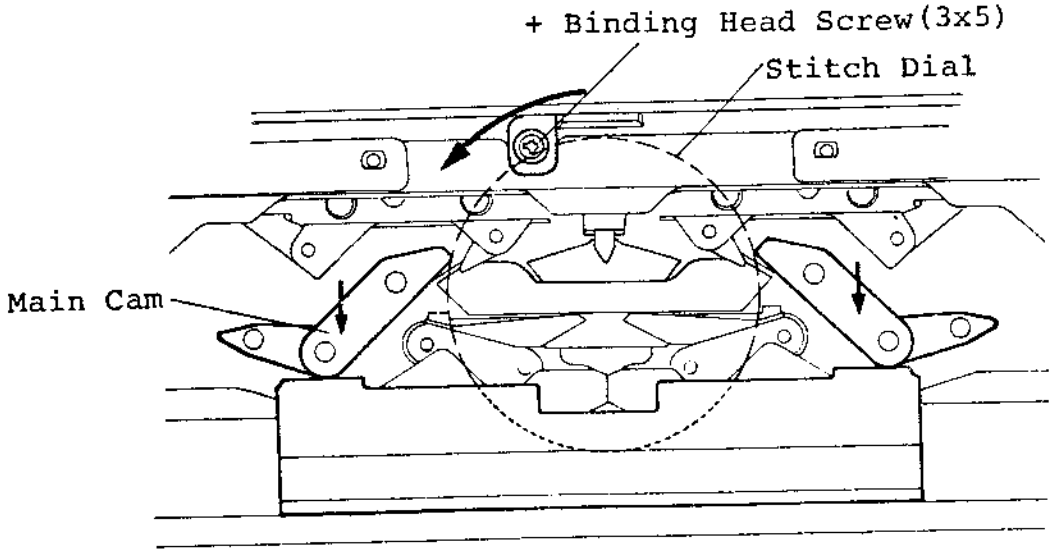



Fig. 40

## 5-4 The Measurement Between Needle Guide & Middle Course Cams:

The clearance between the Middle Course Cam and Needle Guide must be more than 5 m/m and must also be parallel.

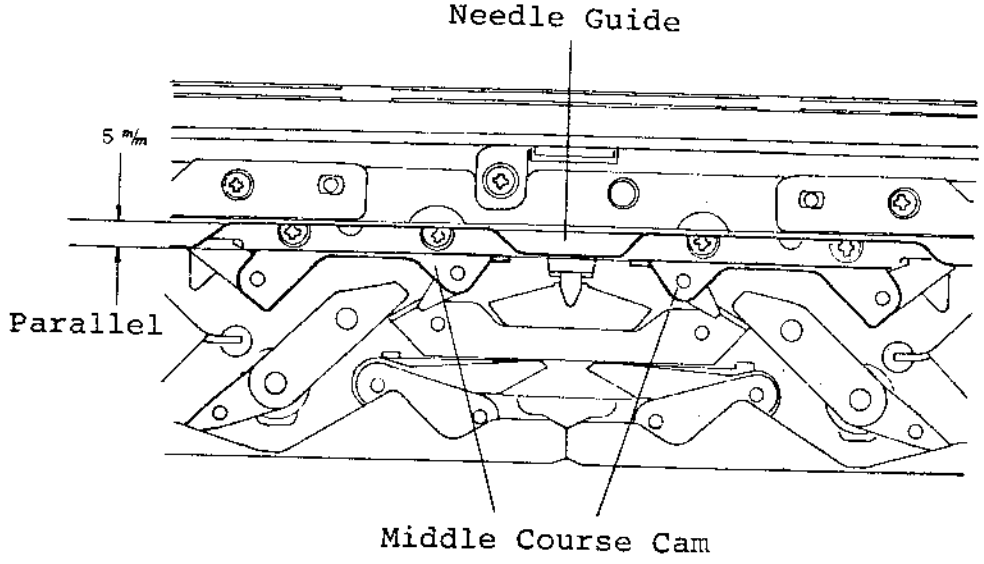



Fig. 41

When knitting in Punch Lace or Knit-in stitches, the selected needles move between the Needle Guide and Middle Course Cam. If the clearance is too narrow, the needle butts are unable to go through their selected course.

## 5-5 Joining Carriage Plates A & B:

* In joining Carriage Plates A and B, follow carefully the instructions set out below.

1. Attach Carriage Plate A to Carriage Plate B. Fasten six + SPW Pan Head Screws (3x8), so that the Carriage Plate A Holder moves slightly.

2. Set the Cam Lever to Slip so that the Course Standard Gauge can be inserted along the Carriage Pipe.

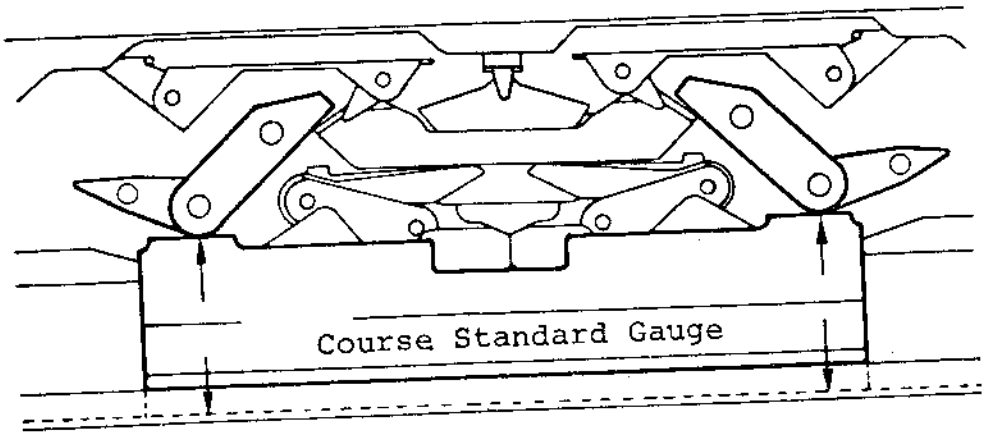



Fig. 42

3. Turn the Stitch Dial to 5 and fasten the six + SPW Pan Head Screws (3x8), while pushing the Carriage Plate A against the Carriage Pipe.

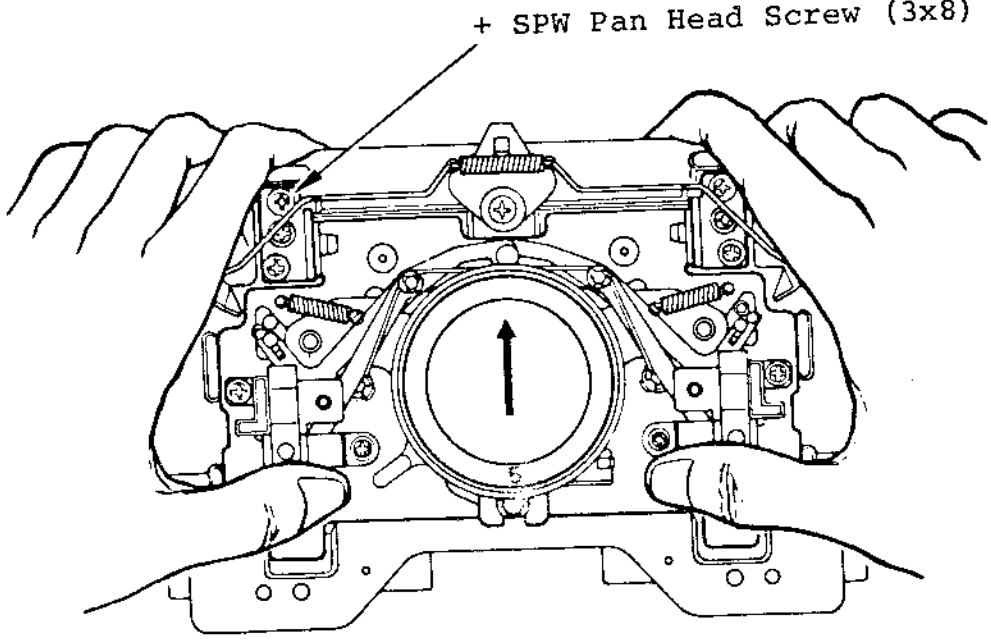



Fig. 43

Play Between Carriage Plates A & B:

The play between Carriage Plates A and B must be within 0.3 m/m.

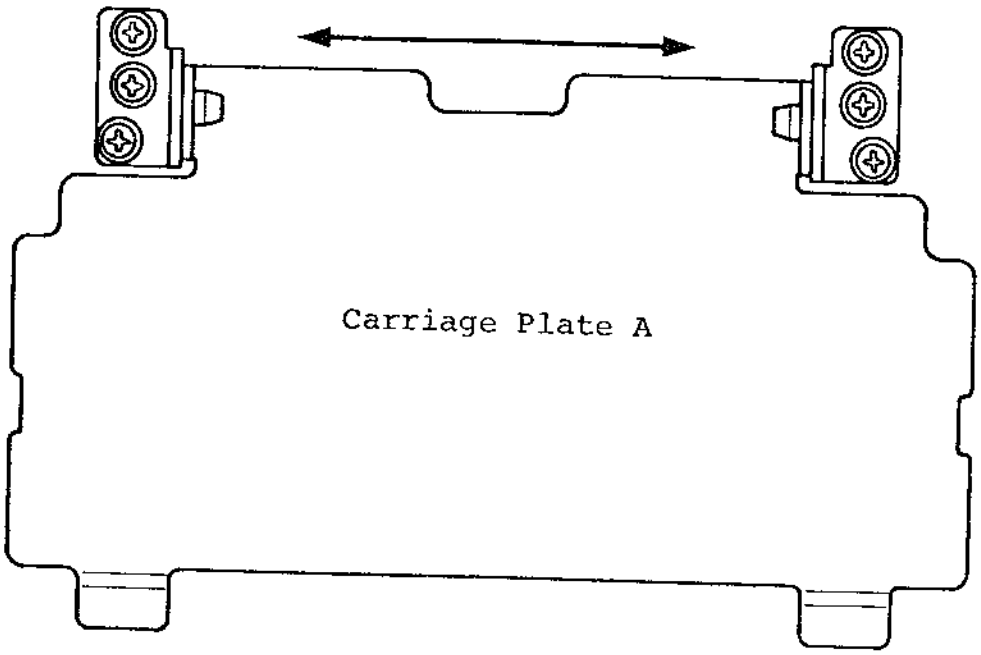



Fig. 44

If there is too much play between the two Carriage Plates, the position of each of the Cams for the Yarn Feeder, moves to the right or left during operation of the Carriage thus causing stitches to float.

5-6 Drum Assembly:

1. If it is necessary to remove all parts of the Drum Unit in order to disassemble the Main Drum, do so, following the diagram below.

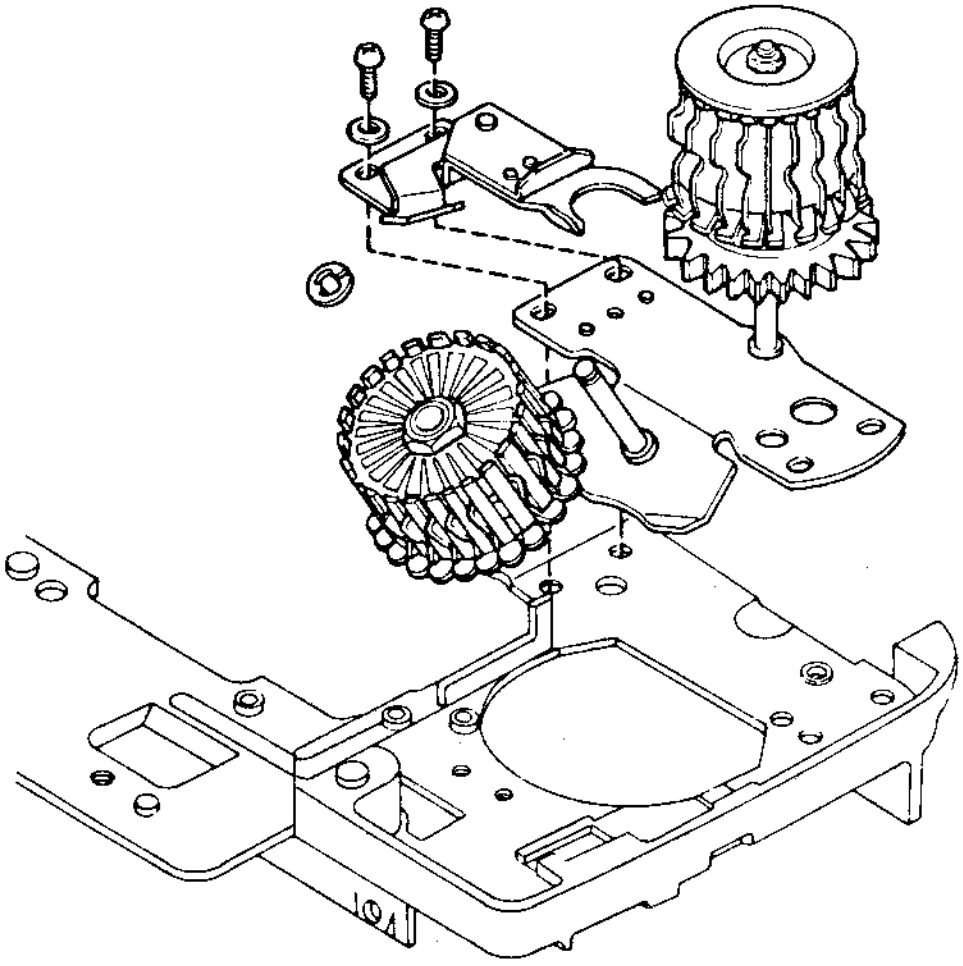


Fig. 45

2. Insert into the Main Drum a No. 1 Screw Driver and unscrew the Hexagonal Nut with a Box Driver. The Main Drum can now be disassembled.

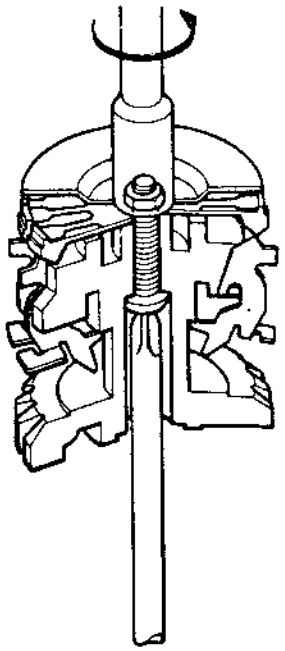


Fig. 46

3. To assemble the Main Drum, care must be taken so that the Main Drum Pieces, the Main Drum Rebound Spring and the Plastic Gear Wheel are aligned correctly.

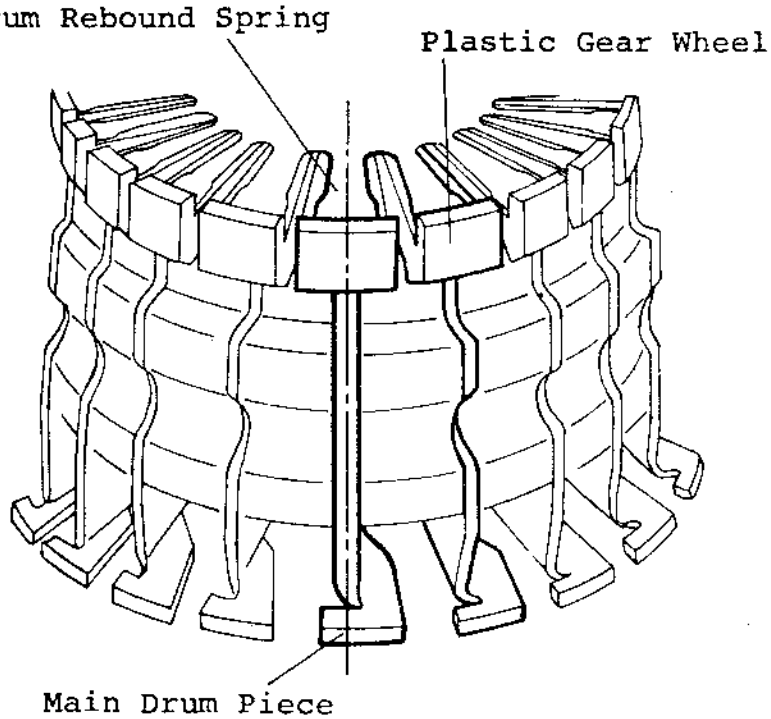



Fig. 47

1. Place Carriage Cover B over Carriage Plate B. While doing so, squeeze it slightly at both sides before pushing it down over the Carriage. Secure the Cover with two ± Truss Head Screws (3x6).

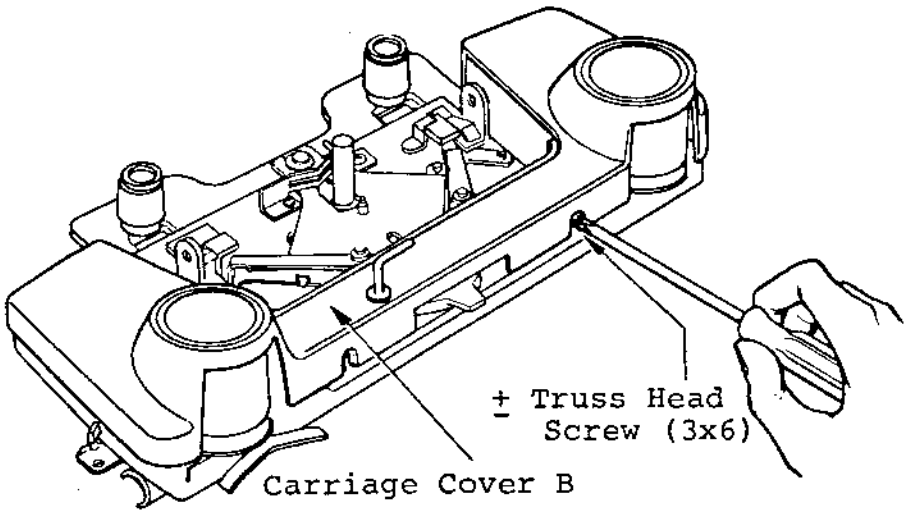



Fig. 48

2. Place the Cam Lever through Carriage Cover A and secure it in the Dial Arbour.

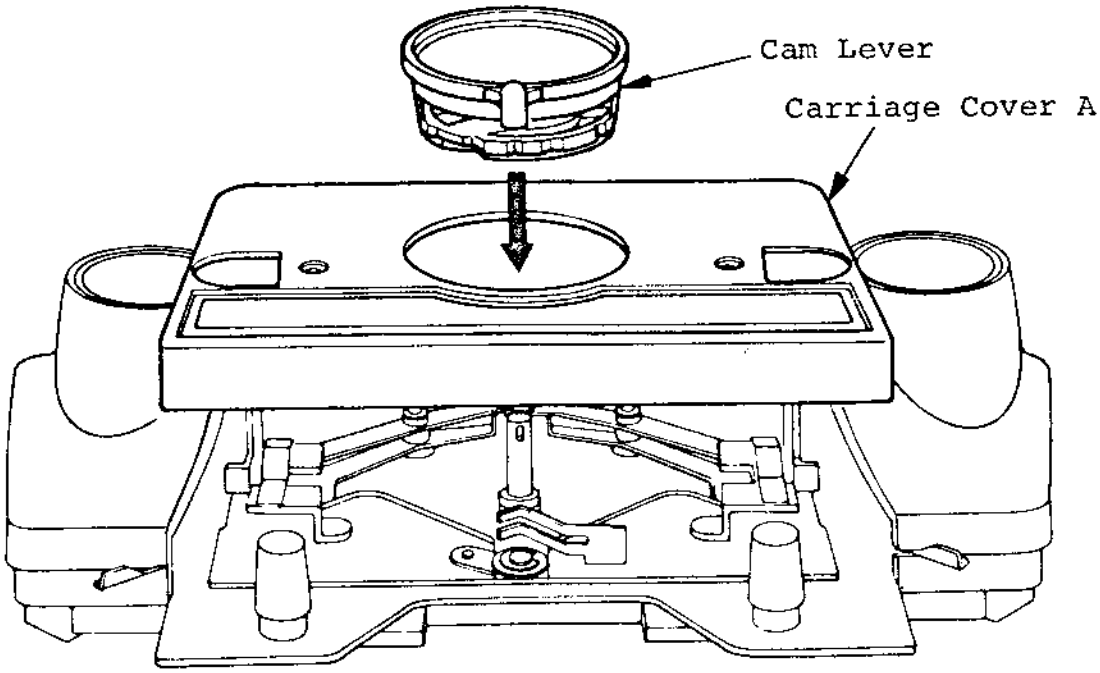



Fig. 49

3. Set the Cam Lever at the point for Punch Lace and the upper part of the Dial Spring will interlock with the wavy part of the Cam Lever. At this point, turn the Cam Lever to Stockinet, while pushing down, and the wavy part of the Cam Lever will fit in between the two leaves of the Dial Spring.

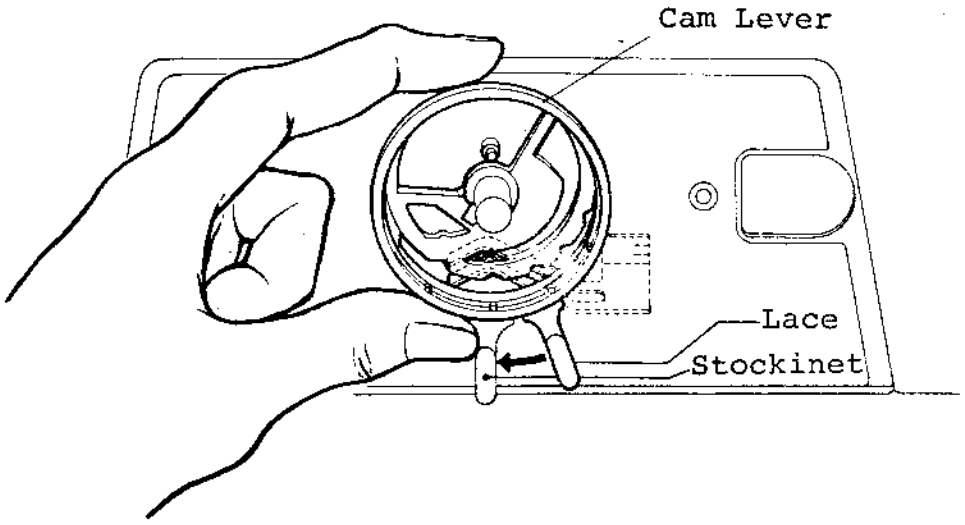



Fig. 50

4. Turn the Cam Lever to Knit-in and push down, so as the wavy part of the Cam Lever becomes engaged with the lower leaf of the Dial Spring. Afterwards, turn the Cam Lever to Stockinet.

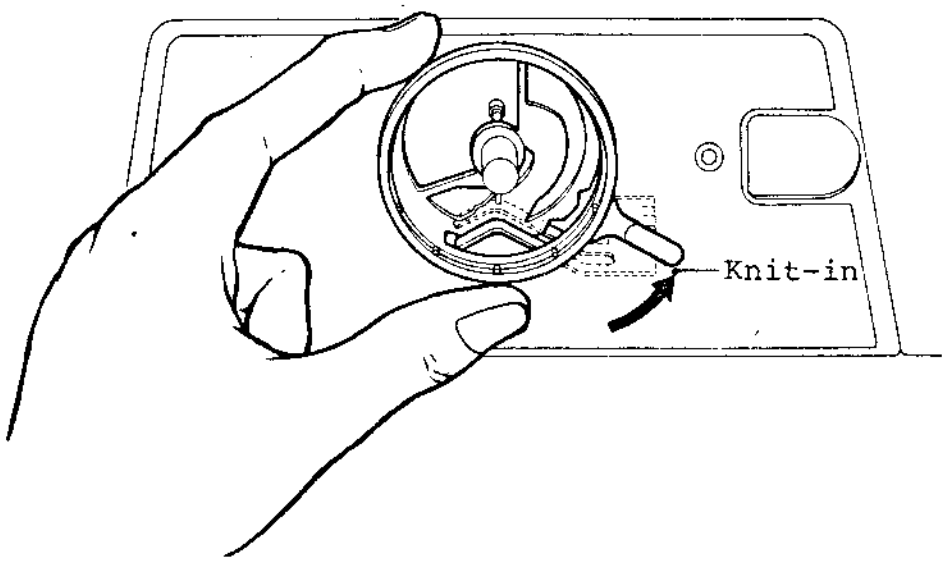



Fig. 51

5. Secure Carriage Cover A with two ± Truss Head Screws (3x6) as indicated in Fig. 52.

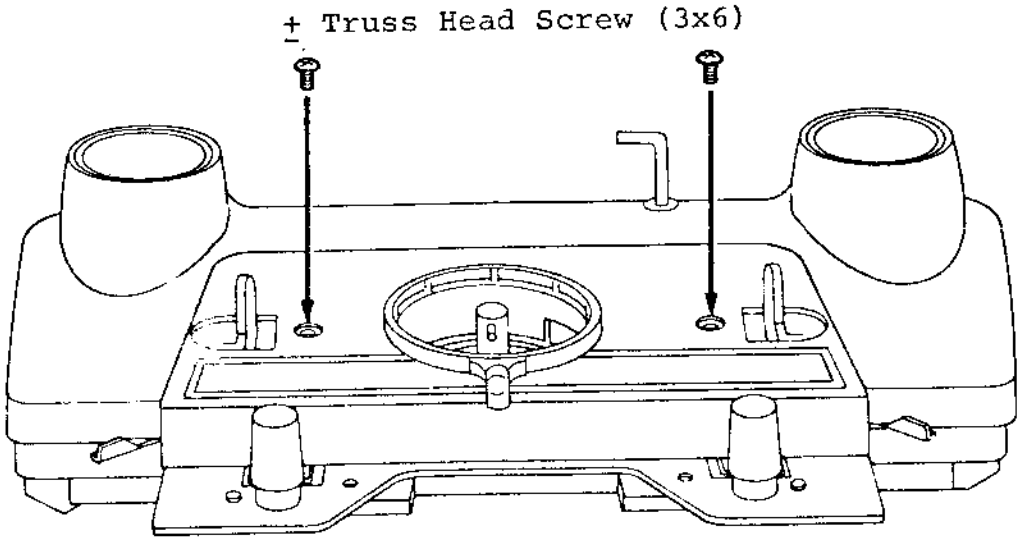



Fig. 52

6. With the Carriage Handle down, as illustrated in Fig. 53, secure it by inserting and fastening the two Carriage Handle Screws.

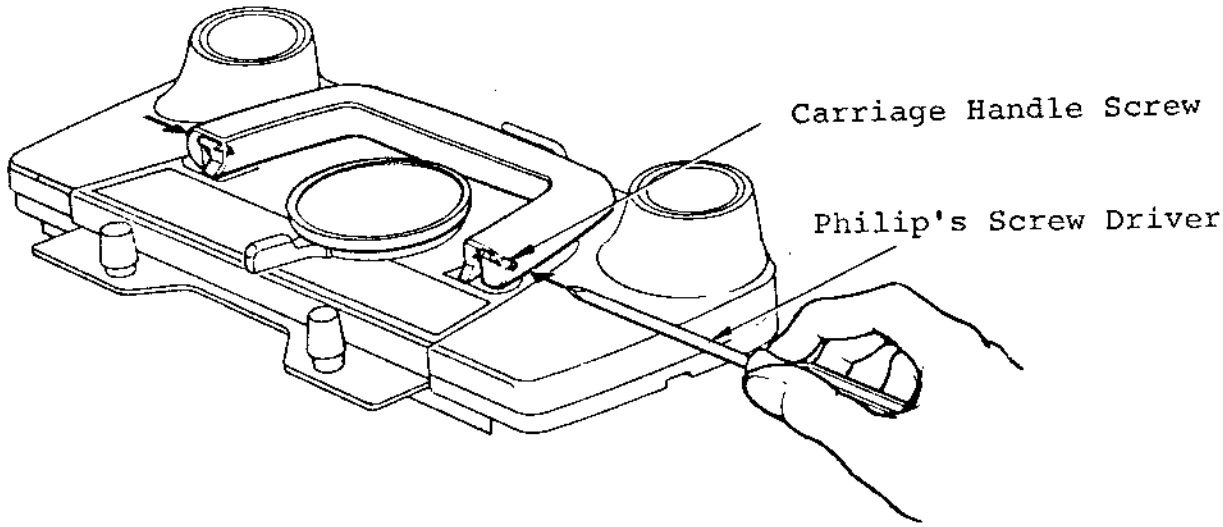



Fig. 53

7. Push the Travelling Plate Pin towards the Dial Arbour.

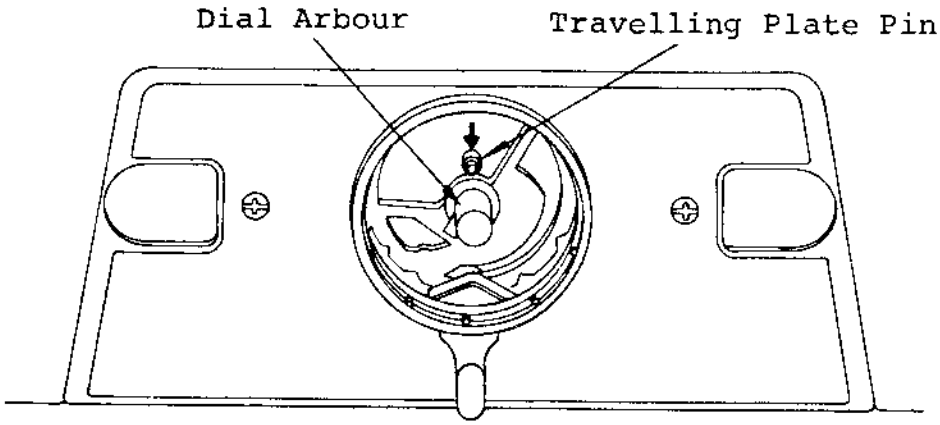



Fig. 54

8. Place the Stitch Dial over the Cam Lever making sure that the pin on the Dial Arbour clears the groove in the Stitch Dial.

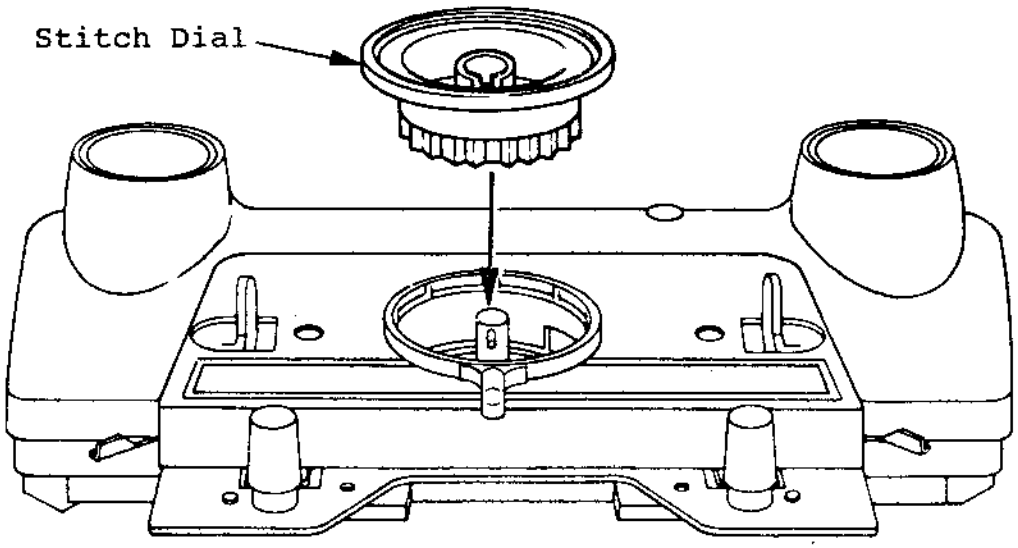



Fig. 55

## 7-1 How to Disassemble the Knit Radar Unit:

1. After the removal of four + Binding Head S Tight Screws (3x8), securing the Needle Bed Bracers A and C, the unit will become separated from the machine.

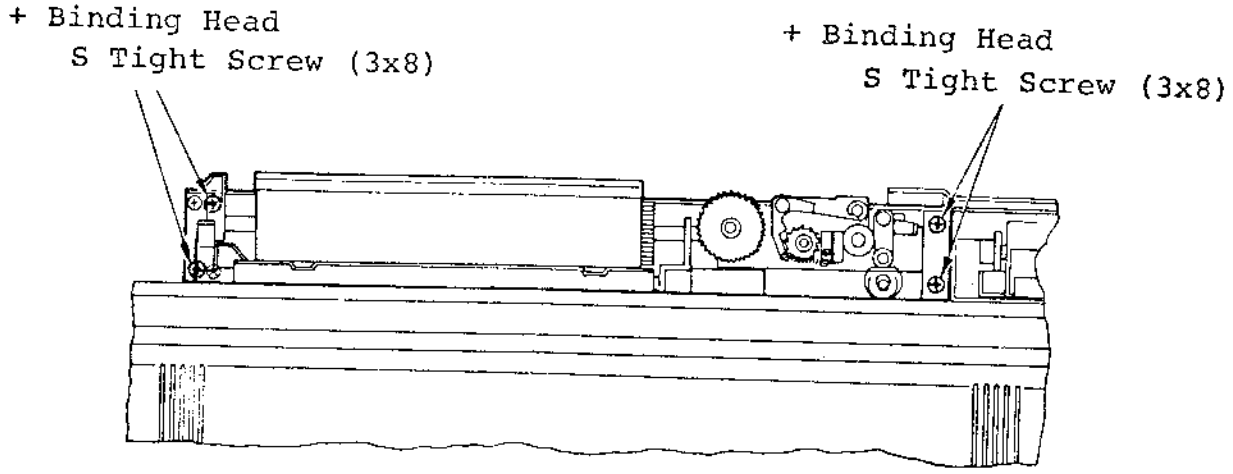



Fig. 56

2. To remove the Knit Radar Unit, push the needles that run the length of the Unit to D position and push back the KR Feeding Lever. The Unit will now, with ease, lift out of the machine.

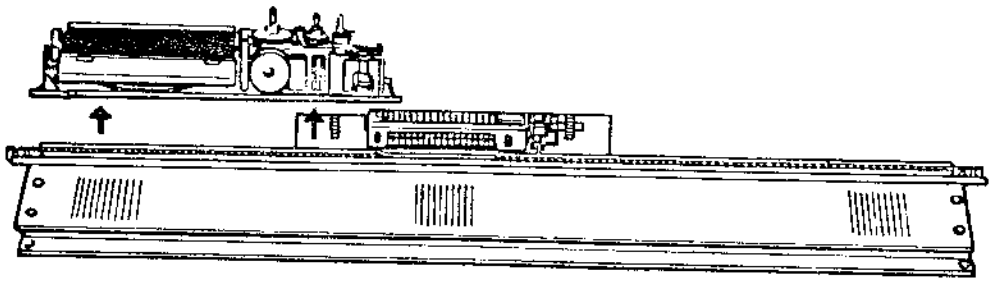


Fig. 57

## 7-2 How to Disassemble the Pattern Unit:

1. Turn over the needle bed as shown in the below diagram.

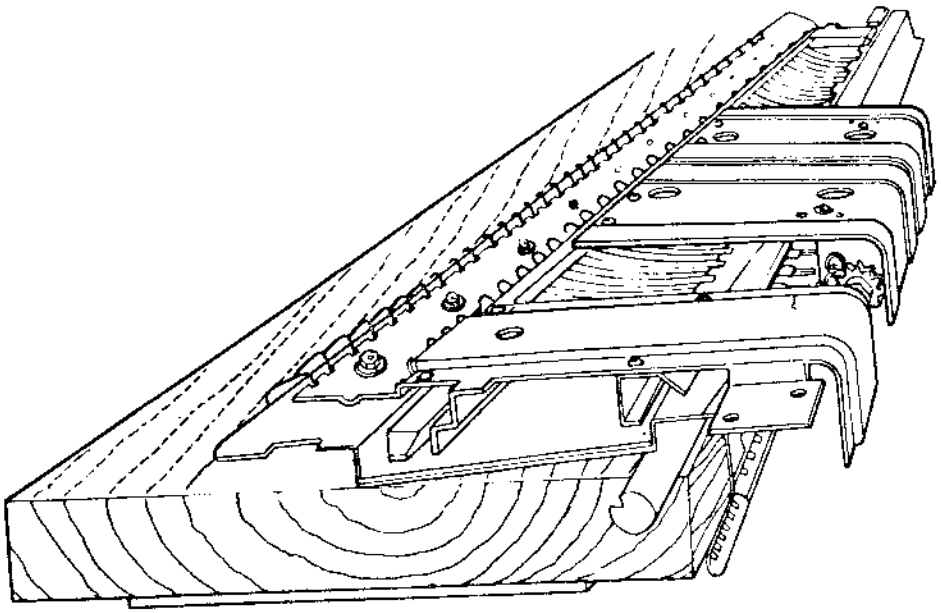


Fig. 58

2. Remove four + Binding Head C Tight Guide Screws (3x8) and two Needle Retainer Screws (which keeps the Needle Retainer in a secure position under the needle bed), and the Pattern Unit will become separated from the needle bed.

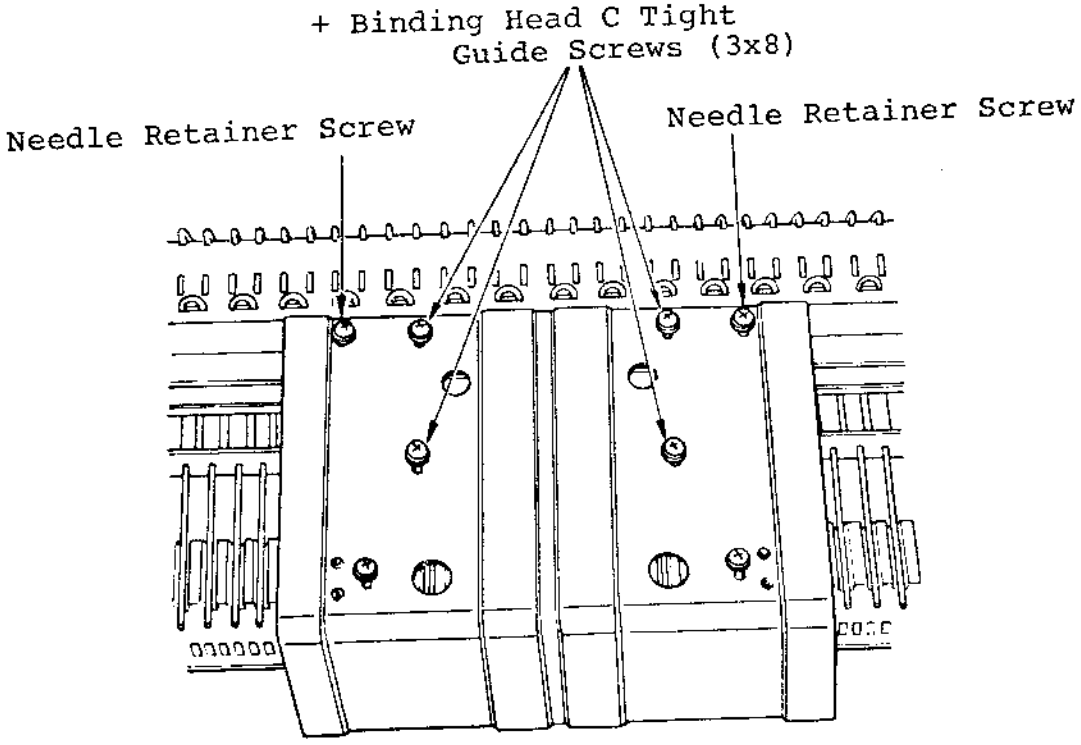



Fig. 59

3. From the Needle Bed Bracer A, remove two + PW Pan Head Screws (3x6).

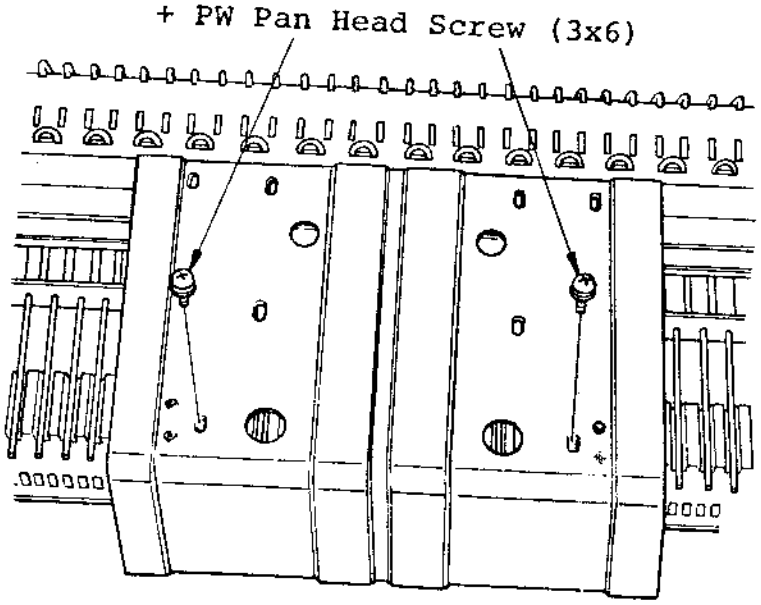



Fig. 60

4. Remove four + PW Pan Head Screws (3x6) which secures the Pattern Unit Base Plate to the Needle Bed Bracer A.

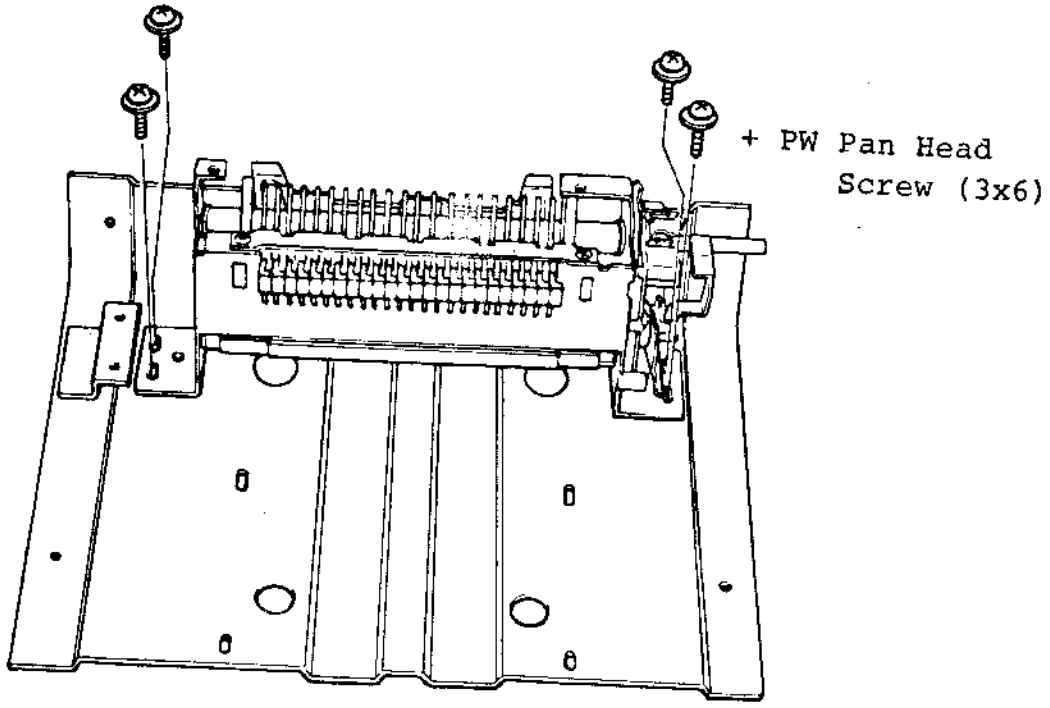



Fig. 61

5. The Pattern Unit will now separate from the Needle Bed Bracer.

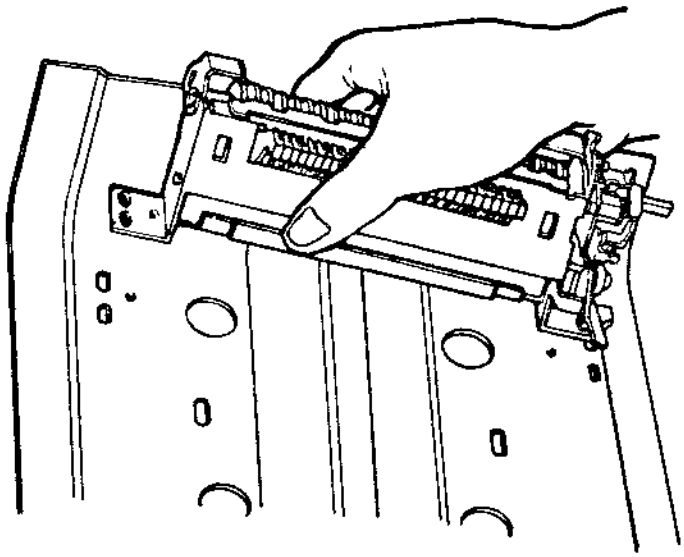


Fig. 62

## 8. ADJUSTMENT & REMOUNTING OF PATTERN UNIT.

### 8-1 How to Adjust or Repair the Pattern Unit:

* The Touch Lever Scanning Fingers protrude through the Punch Card holes to read the pattern and to transmit it to the Main Drums. If the Punch Card holes are positioned so that the Scanning Fingers are unable to protrude through them, then the Touch Levers cannot function correctly and the Pattern will be incorrectly knitted on the fabric.

  In order to confirm whether or not the Scanning Fingers enter the Punch Card holes smoothly, read carefully the following instructions.

1. Insert Punch Card No. 1 into the Pattern Unit.

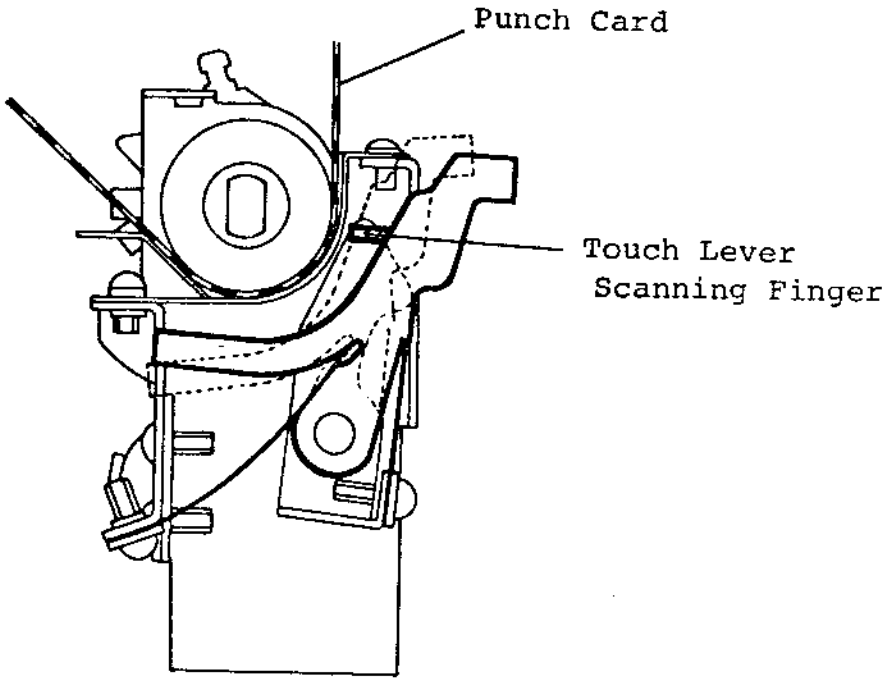



Fig. 63

2. Looking through the Adjustment Confirmation Aperture, raise the end Touch Lever to check as to whether or not the Scanning Finger smoothly enters the Punch Card hole.

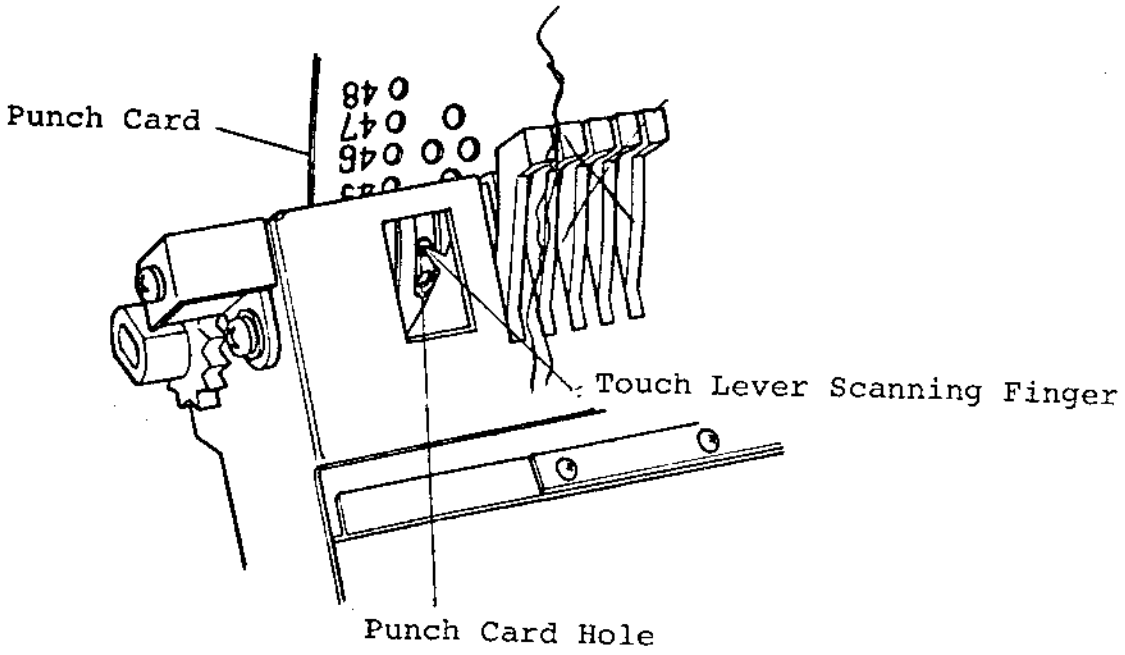



Fig. 64

3. If a Scanning Finger does not enter through the centre of a Punch Card hole, remove the Feeding Lever Spring, on the right side of the Pattern Unit, and remove one + Binding Head S Tight Screw (3x14) and remove the Feeding Ratchet Stopper Plate.

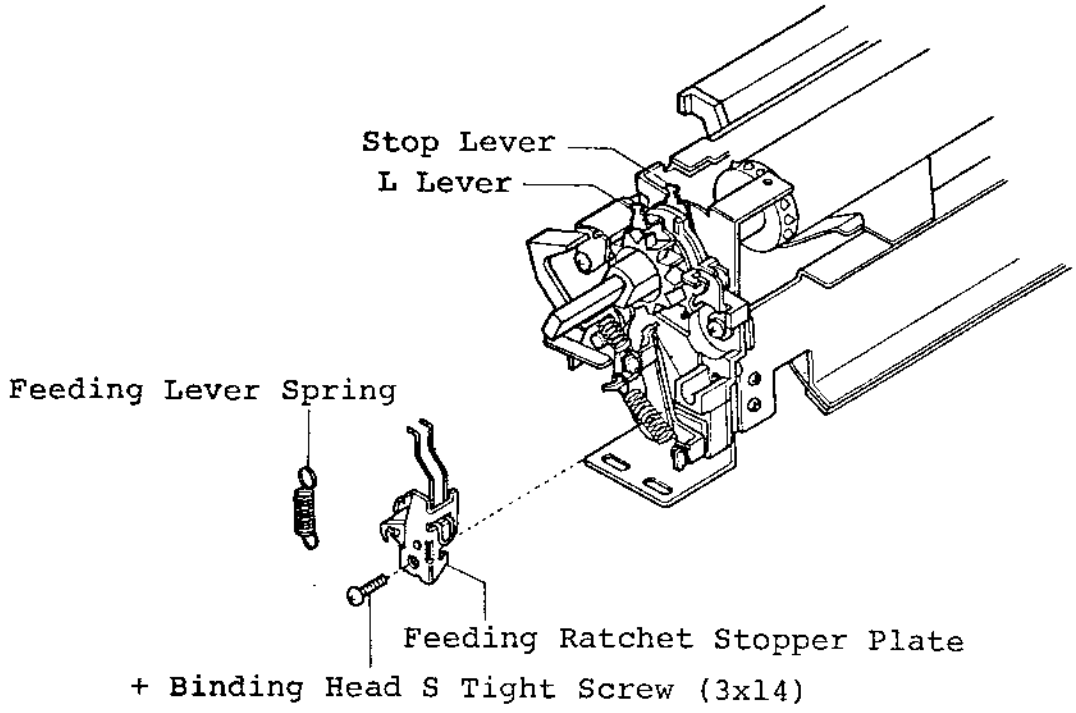



Fig. 65

4. After removing the parts mentioned above, loosen three screws which secure the Stop Lever Holder. While closely watching the position of the Punch Card holes and the projection of the Touch Lever, move the Stop Lever Holder in the arrowed direction (see Fig. 66). To gain smooth entry of the Scanning Fingers, into the Punch Card holes, the graduation (as shown in Fig. 66) is usually set within 2-4.

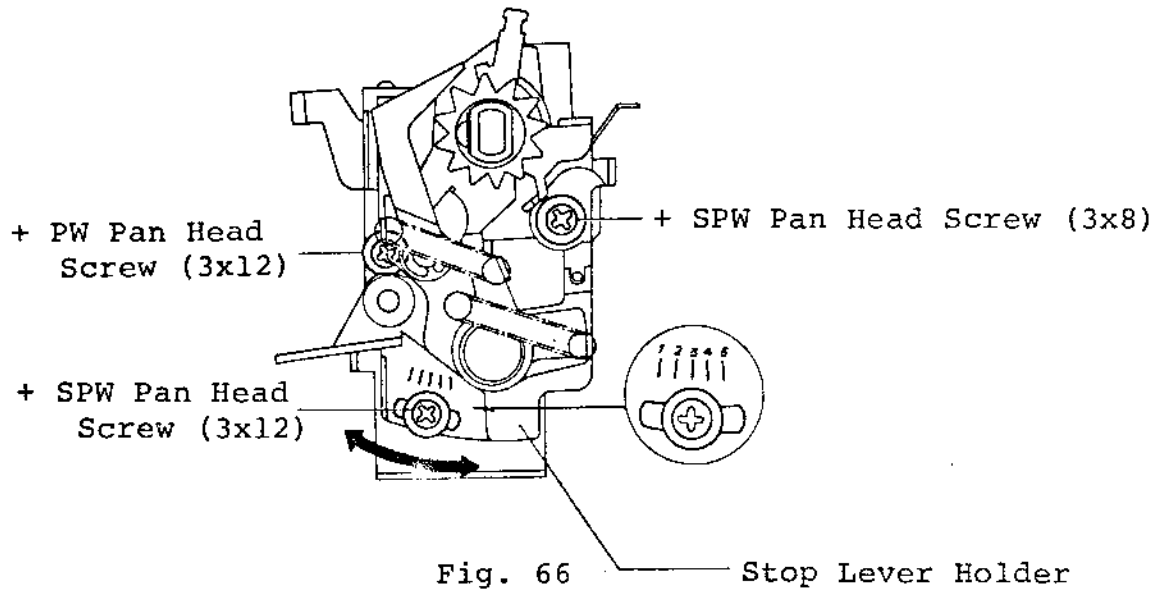



Fig. 66

5. After the adjustment has been completed, move towards you the Stop Lever and L Lever and removing the Feeding Lever Collar, install the Feeding Ratchet Stopper Plate. The purpose of moving the Stop Lever towards you, is to make the setting of the Stop Lever Spring more easy. The removal of the Feeding Lever Collar is to prevent the Pawl on the Feeding Ratchet Stopper Plate from being damaged.

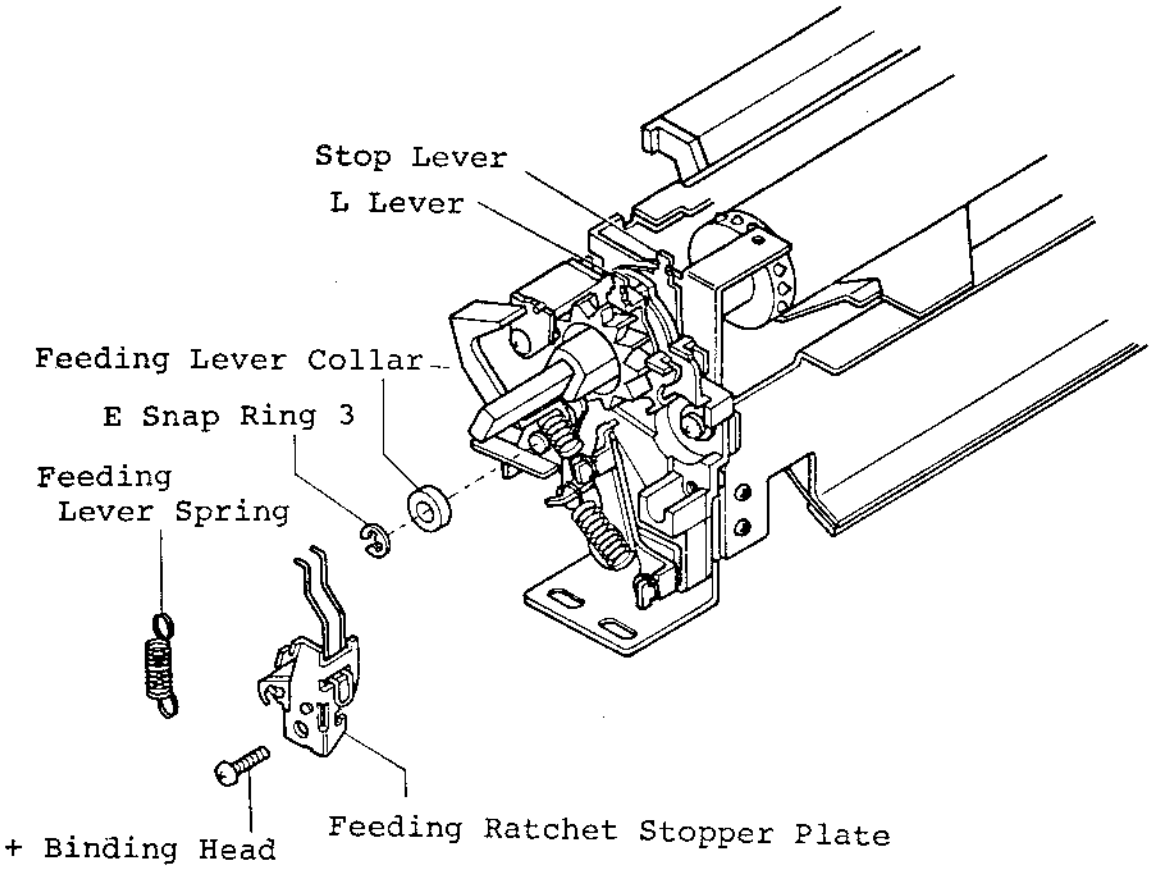



Fig. 67

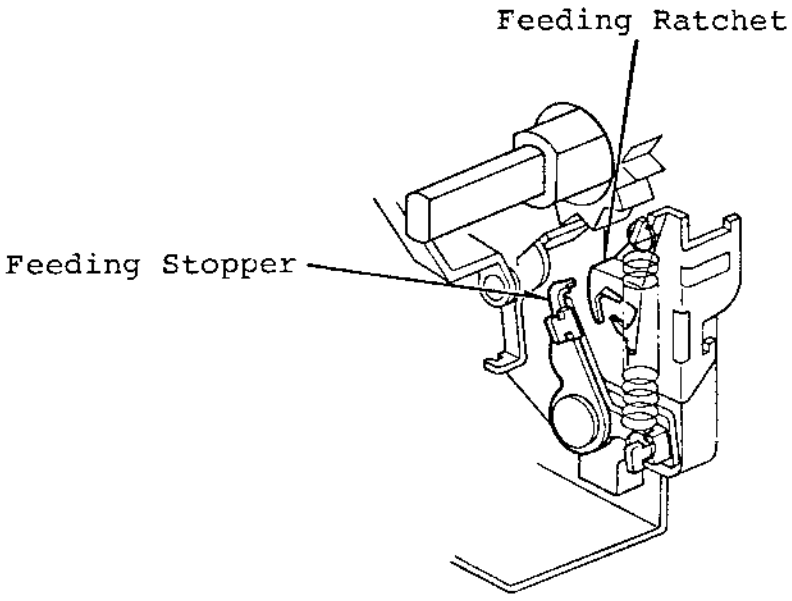



Fig. 67-1

## 8-2 Remounting of Pattern Unit:

1. Align the holes on the Pattern Unit Base Plate with those corresponding holes on the Needle Bed Bracer A and insert four + PW Pan Head Screws (3x6) and fasten them.

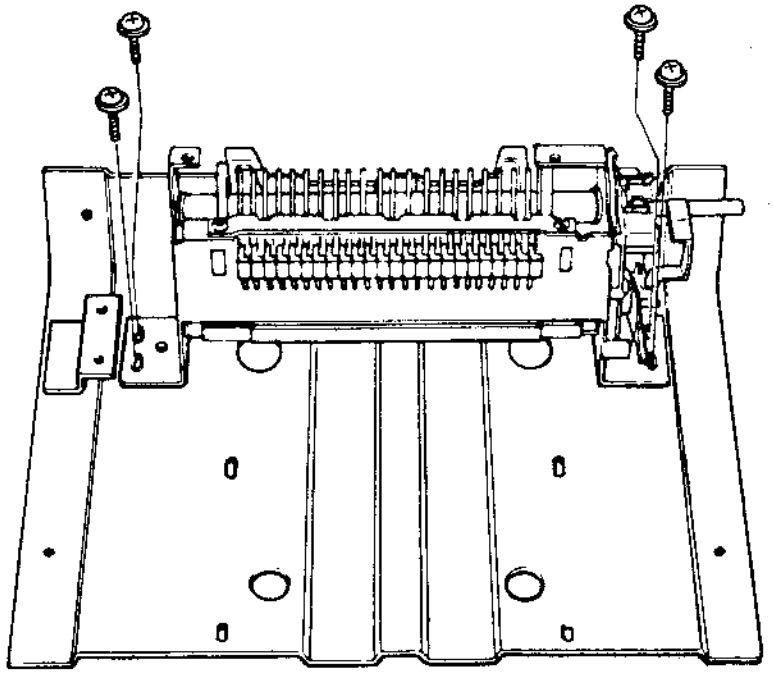


Fig. 68

2. On the rear side of Bracer A, insert two + PW Pan Head Screws (3x6), and fasten them.

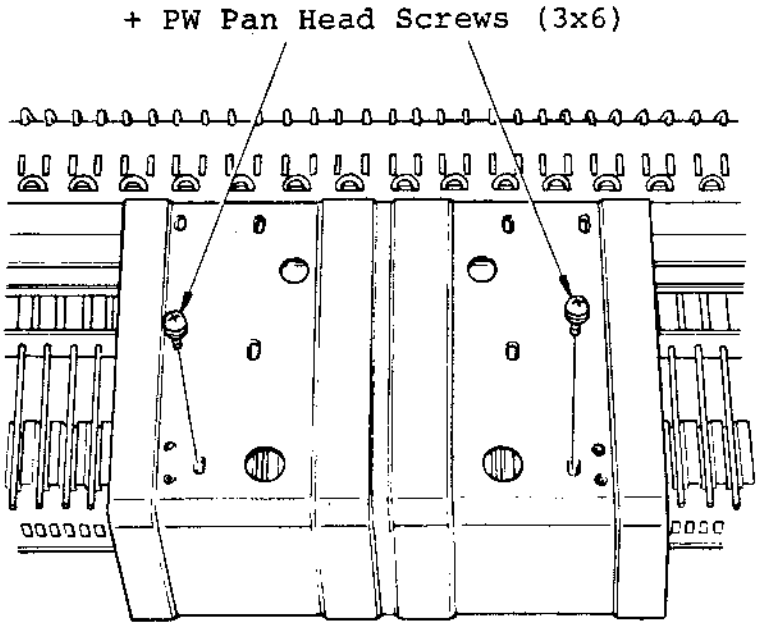



Fig. 69

8-3 How to Reassemble the Bracer A:

1. Assemble the Needle Bed Bracer A to the needle bed so that the distance between the Rack and the Bracer A is kept even at 62.3 m/m (see Fig. 70).

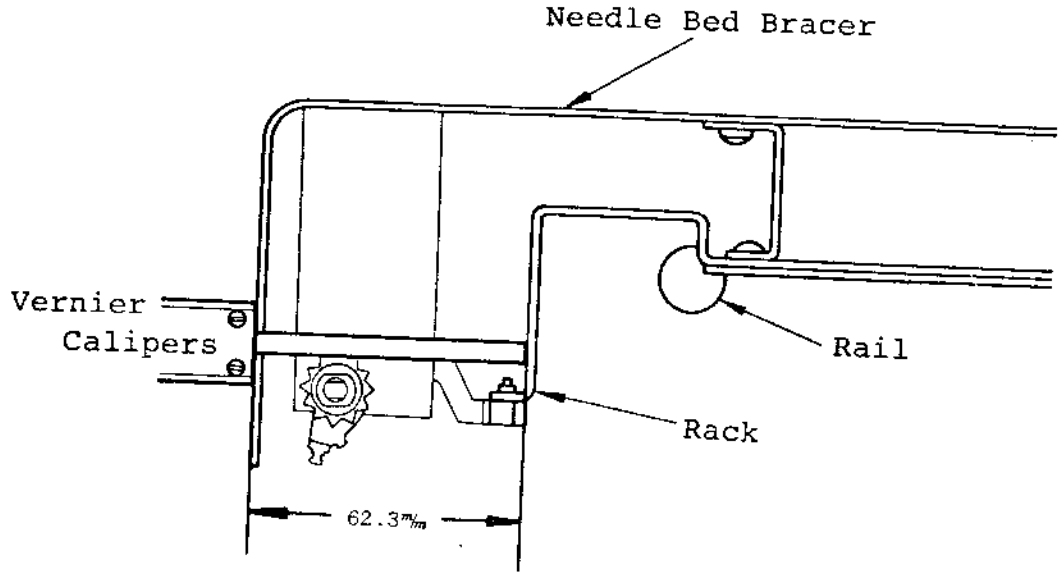



Fig. 70

2. Secure Needle Bed Bracer A to the needle bed with four + Binding Head C Tight Guide Screws (3x8).

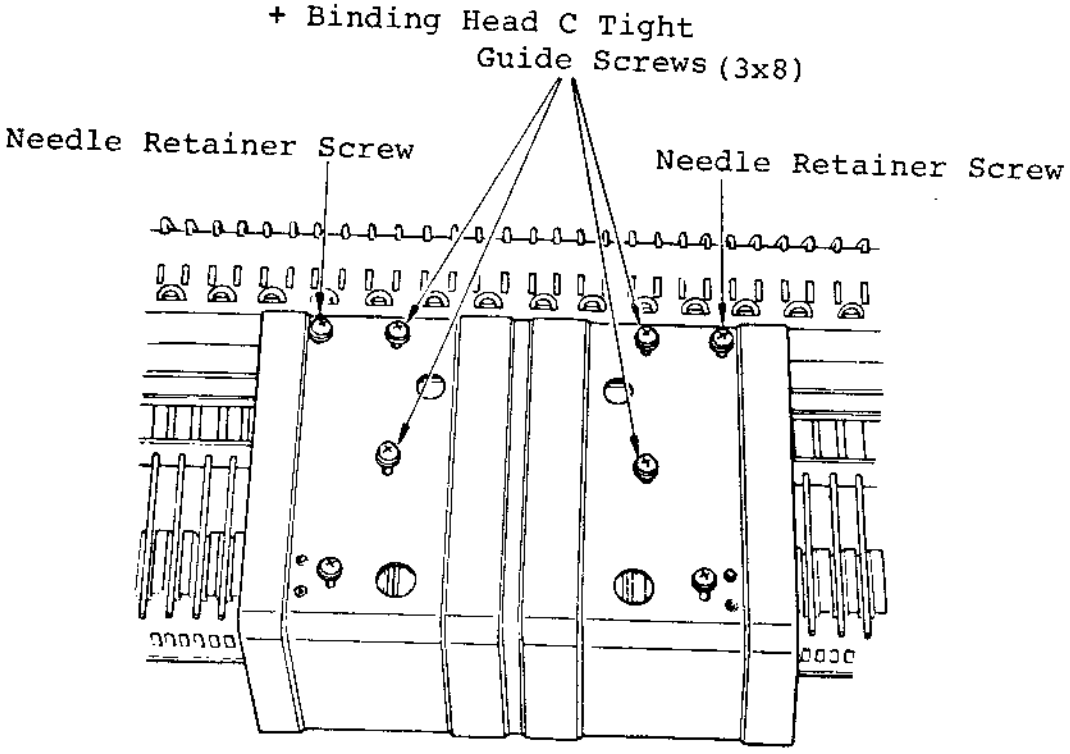



Fig. 71

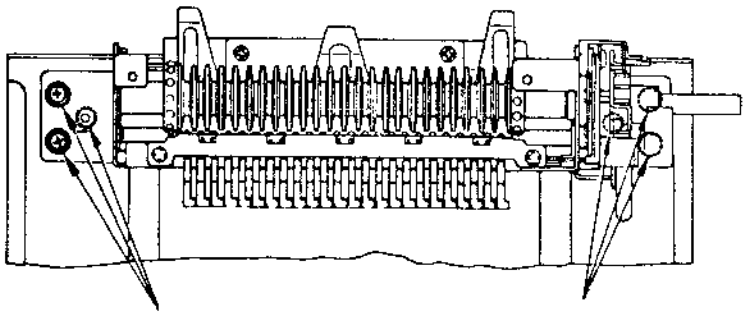
## 8-4 Adjusting the Clearance Between the Touch Lever and Main Drum Piece:

* In case of imperfect adjustment of the clearance:

When a Punch Card is inserted into the Centre Panel, the Touch Levers read the pattern by pushing their Scanning Fingers into the Card holes. Those Touch Levers remaining in a lower position, push the Main Drum Pieces. However, in the case that there is too much clearance between the Touch Levers and the Main Drum Pieces, the Touch Levers are unable to transmit the pattern to the Main Drum.

Correcting Methods:

1. Insert an NP Card into the Centre Panel. Loosen six +PW Pan Head Screws (3x6), which secures the Pattern Base to the Needle Bed Bracer A.



+ PW Pan Head Screws (3x6)

Fig. 72

2. As shown in Fig. 73, move the Carriage so that the Main Drum is aligned with a Touch Lever. Move the Pattern Unit towards the Main Drum so that the clearance between the Main Drum Piece and the Touch Levers will fall within a range of 0.2 m/m.

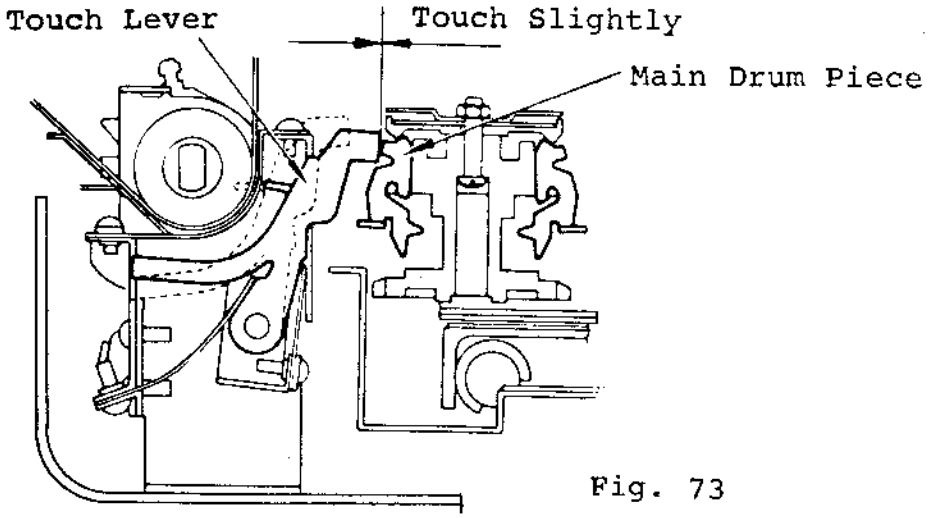



Fig. 73

3. After the adjustment has been completed, fasten the six screws and examine whether or not the Touch Levers work correctly.
   NOTE: Whenever the Pattern Unit is removed from the machine, be sure to adjust the clearance between the Touch Levers and Main Drum Pieces, when remounted.

## 8-5 Adjustment of Feeding Lever:

* As the Feeding Lever is moved up and down, the Punch Card will be fed every row. If the movement of the Feeding Lever is irregular, the holes on the Punch Card will be out of position for the Scanning Fingers to enter and the pattern will not be formed correctly on the fabric.

1. The Feeding Lever is operated by a Driving Cam on the rear side of Carriage Plate B, on the Carriage.

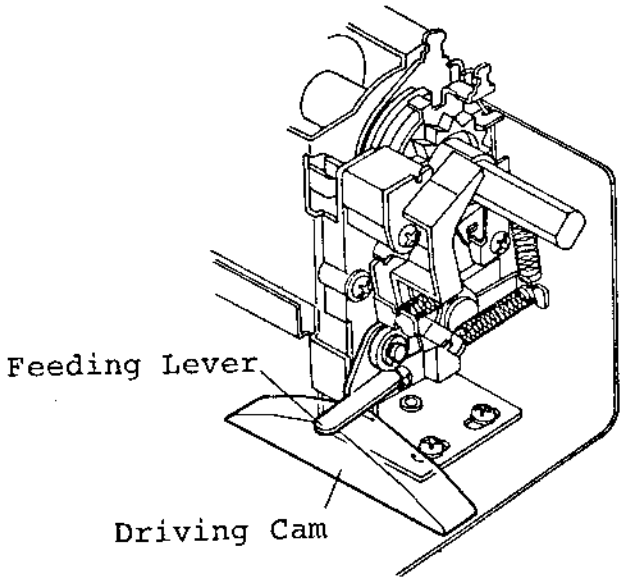



Fig. 74

2. When the Feeding Lever is raised to a position on the top of the Driving Cam, the Feeding Lever Collar is also raised. At this point it is the best time to measure the clearance between the Feeding Lever and the Feeding Lever Collar of which the clearance should measure between 0-0.25 m/m.
In the case that the clearance is more than 0.25 m/m, adjust it by changing the Feeding Lever Collar for a larger one.

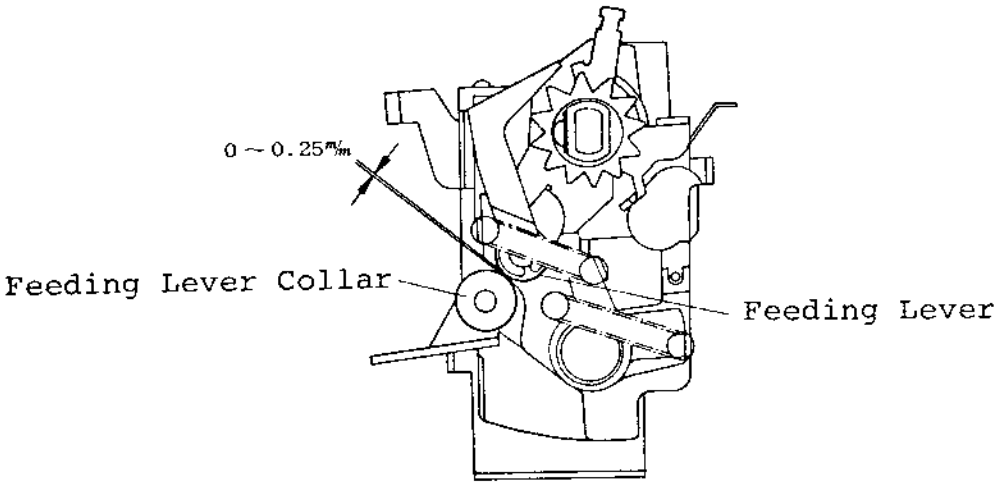



Fig. 75

3. In case there is too much clearance between the Feeding Pawl and a cog on the Ratchet Wheel, remove an E Snap Ring 3 attached to the Stop Lever Base, in order to exchange the Adjustment Collar with a more suitable one.

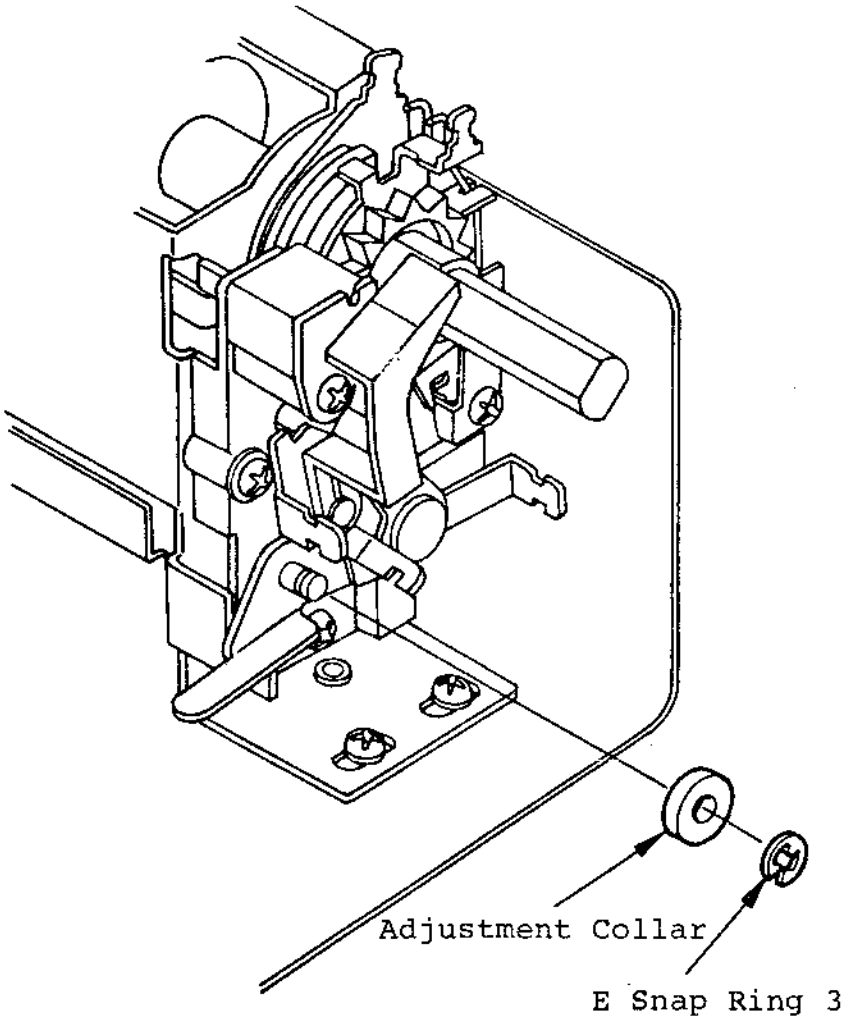



Fig. 76

9-1

The dimension between the back surface of the Rail and the Needle Bed Rack is 19.0 ± 0.2 m/m.
(The difference between the maximum and minimum measurement should be within 0.2 m/m).

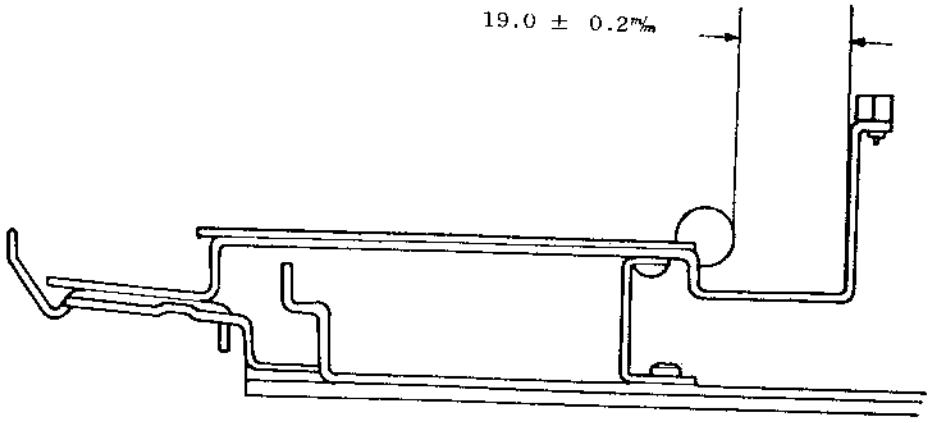



Fig. 77

1. In case the dimension between the Rail and Rack is too large:

a) If the dimension is too large it gives too much play to the Main Drum engaged with the Rack and causes the needles to collide with the Separation Cam during pattern knitting.

b) As the position of the Drum Unit recedes further backwards than the standard position, the needles selected by the Sub Drum come out insufficiently and collide with the Separation Cam.

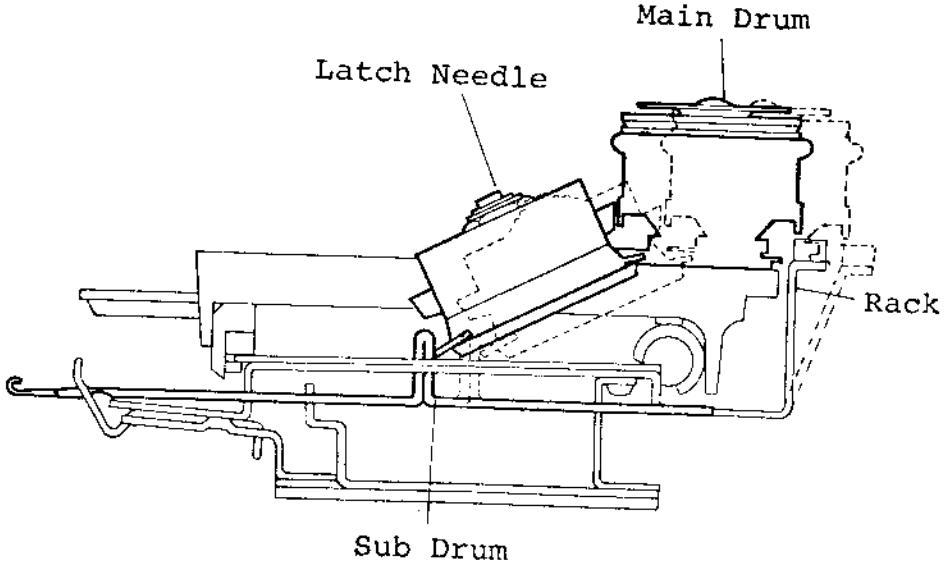



Fig. 78

2. In Case the dimension is too small:

a) The Main Drum Gear becomes engaged with the Rack too much which results in the Carriage becoming too heavy during operation.

b) The position of the Drum Unit becomes more forward than the standard position so that the selected needles, when moved back, will collide with the Separation Cam.

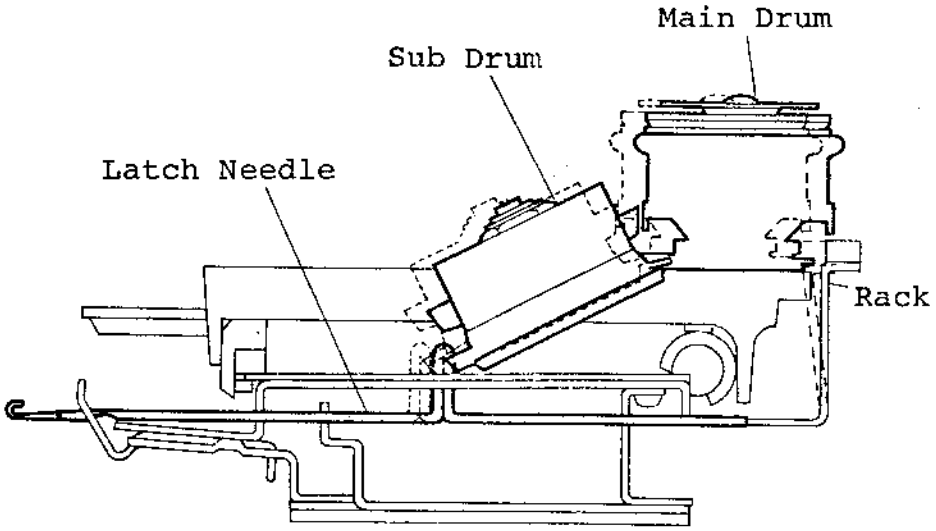



Fig. 79

Correcting Methods:

When the dimension is smaller or larger than the standard measurement:

Bend the Needle Bed Rack backwards or forwards, as the case may be, with the Rack Adjusting Tool, as shown in Fig. 80, below. Check the eveness of the Rack after adjustment.

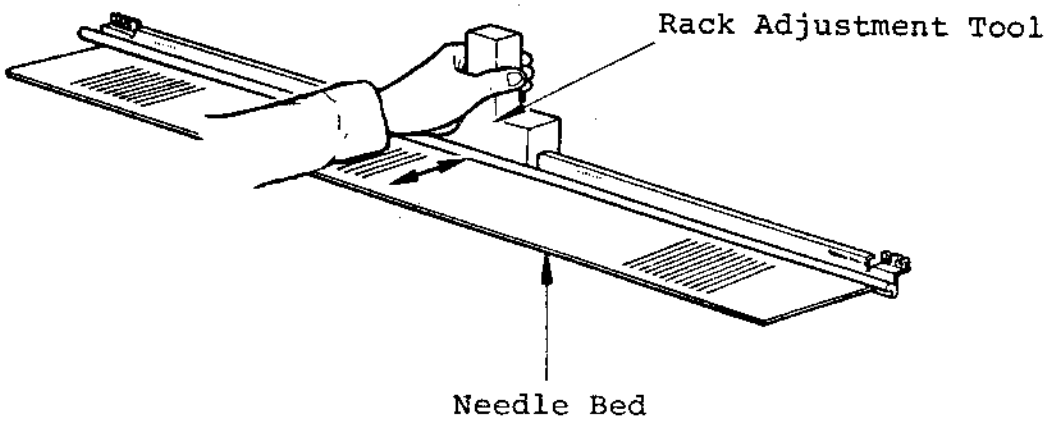



Fig. 80

9-2 Dimension L ( from the Rail to tips of Sinkers):

The L dimension is 121 $\pm$ 0.25 m/m.
(The range between the maximum and minimum measurement should be within 0.2 m/m).

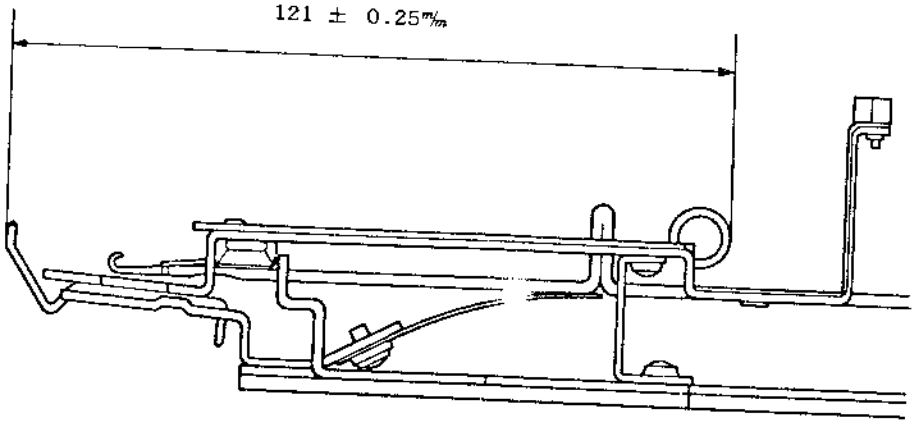



Fig. 81

As shown in the below diagram, the length of the fabric coming from the part with a longer dimension becomes longer, while the length of the fabric on the opposite side with a shorter dimension becomes shorter. Therefore, if both ends of the dimension L are equal, then the fabric on both sides will also be equal.

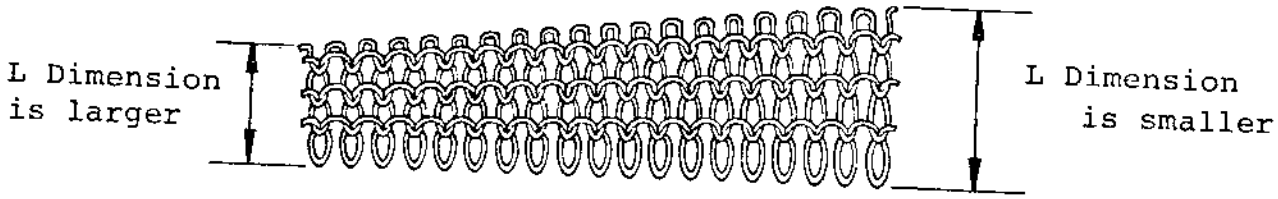



Fig. 82

If the maximum distance between the Rail and Sinker Posts differs by more than 0.2 m/m from the minimum distance, the size of stitches will be uneven.

For instance: Max. 121.5 m/m
Min. 120.5 m/m 121.5 - 120.5 = 1

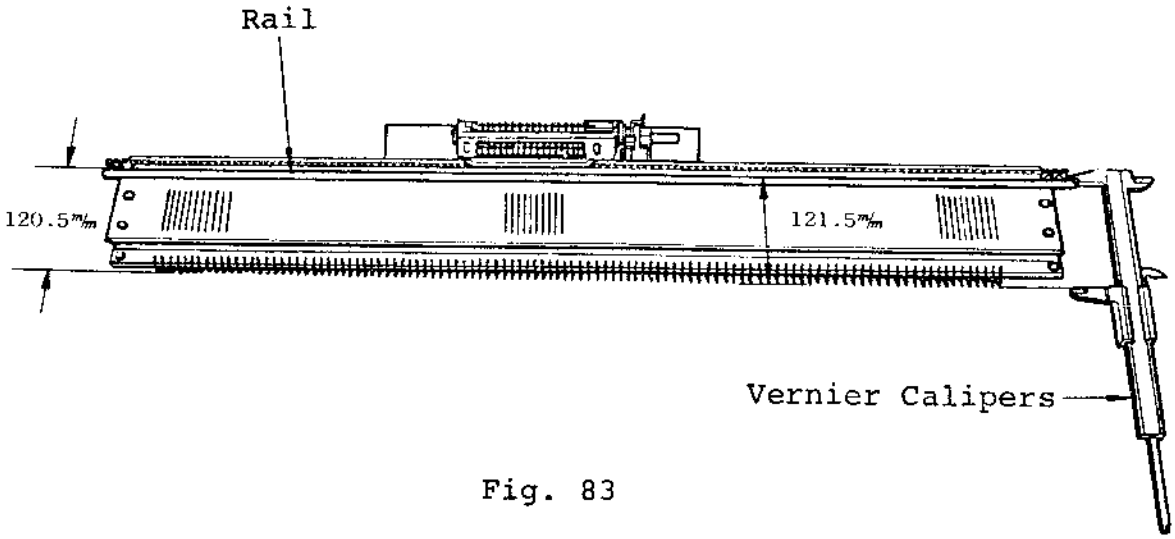



Fig. 83

Correcting Methods:

1. The difference between both lengths of the fabric can be corrected by moving forward or backwards the Sinkers, so as to reduce the difference of measurement to 0.2 or 0.0 m/m. In order to do this, loosen, by a 1/4 turn, the Hexagonal Nut below the portion of Sinkers to be adjusted.

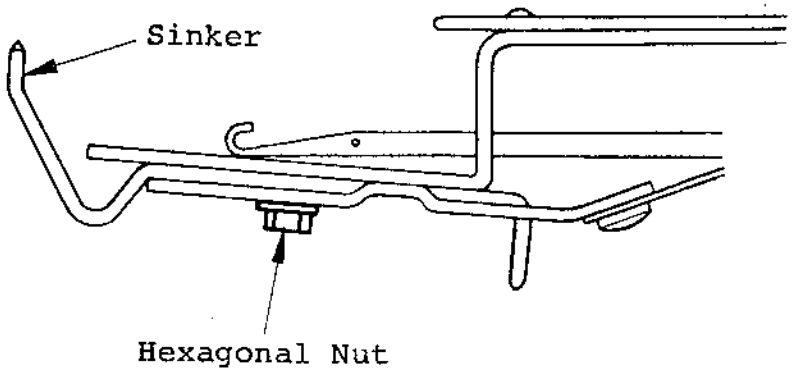



Fig. 84

2. Loosen + Binding Head C Tight Guide Screws (3x8), which are used to secure the Needle Bed Bracers A, B and C to the needle bed.

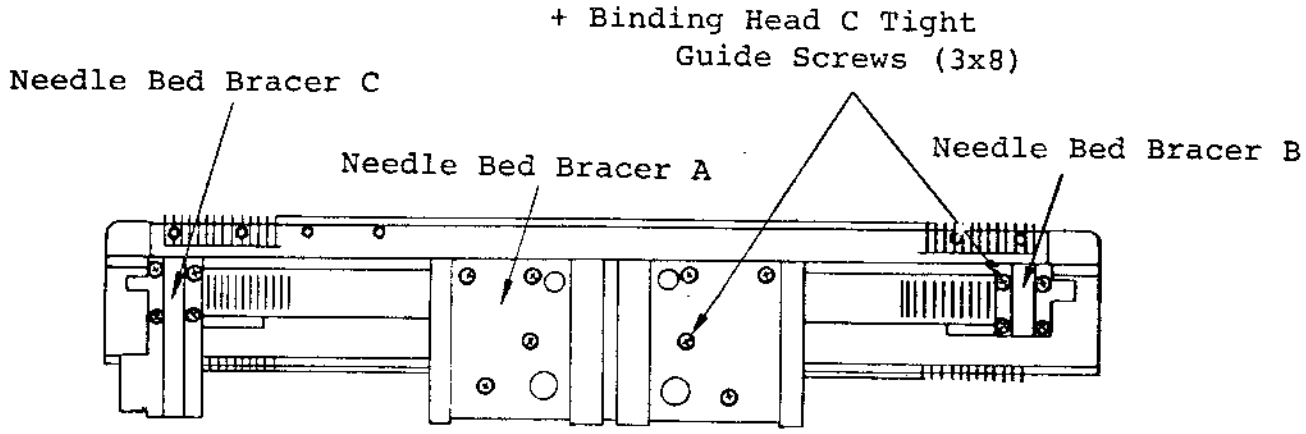



Fig. 85

3. Insert a 1 m/m thick steel plate between the Front Edge of the Needle Bed and the Sinkers, as shown in Fig. 86. While pressing downwards, push it in the arrow-marked direction and the Sinkers will be moved forwards. Repeat the above procedure for correct alignment of the Sinkers.

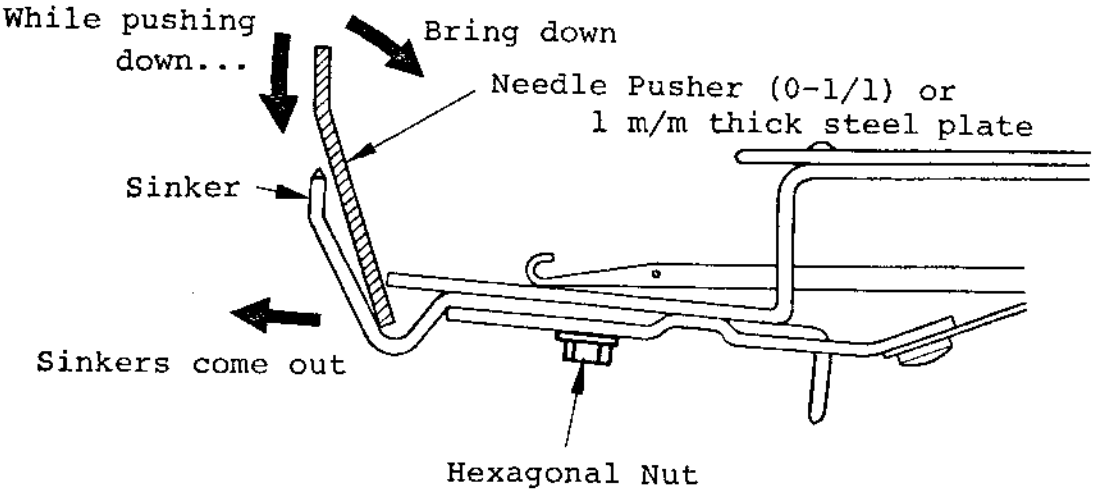



Fig. 86

4. After tightening the Hexagonal Nut, measure the L dimension.

5. Once the adjustment has been completed, tighten the + Binding Head C Tight Guide Screws (3x8) previously loosened in procedure (2).

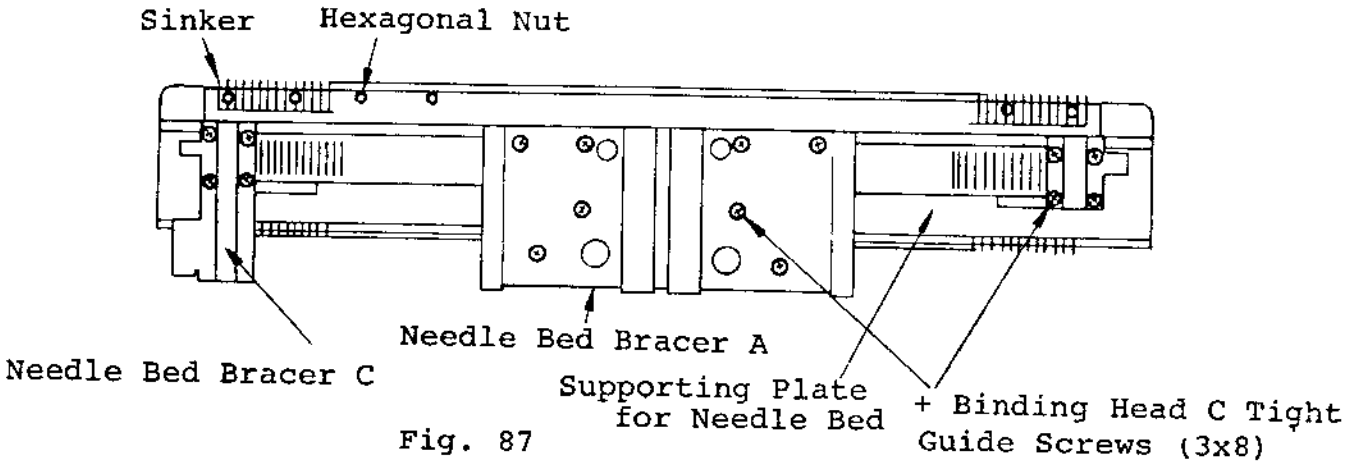



Fig. 87

In case it is necessary to move the Sinkers backwards:

1. Loosen, by a 1/4 turn, a Hexagonal Nut located below the portion of Sinkers which require adjustment.

2. Loosen + Binding C Tight Guide Screws (3x8), which secures the Needle Bed Bracers A, B and C to the needle bed.

3. Press the Sinkers, indicated by the white arrow in the below figure, with the rounded part of a wooden hammer (or with any wooden material with a rounded surface), and the Sinkers will be moved backwards.

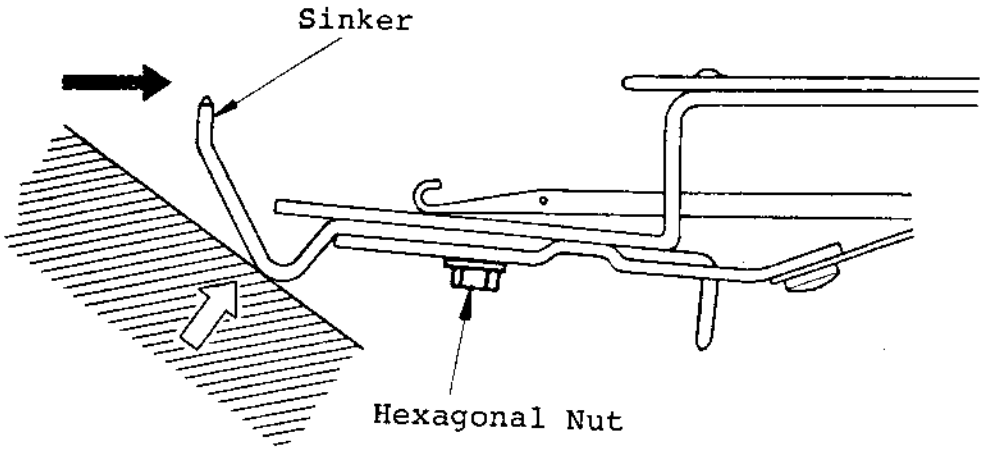



Fig. 88

4. Measure the L dimension after securing the Hexagonal Nut, loosened in procedure (1).

5. After the adjustment has been completed, fasten + Binding C Tight Guide Screws (3x8) that were loosened in procedure (2).

10-1 How to Reassemble the Knit Radar Unit:

1. Once the adjustment of the Pattern Unit to the main body of the machine has been made, assemble the Knit Radar Unit using the reverse method of that used for the disassembly. (Refer to page 40 Fig. 56.)

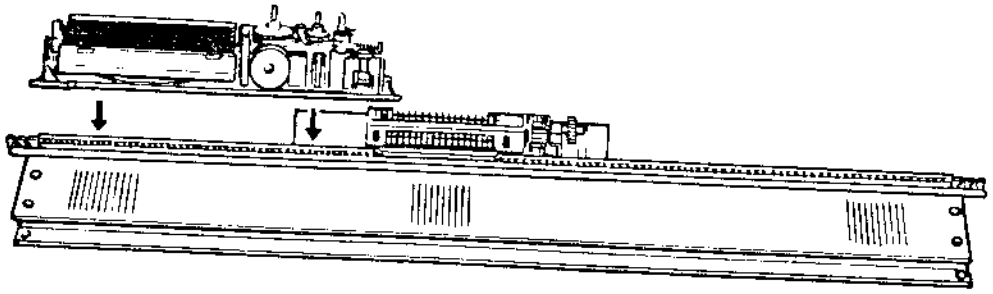


Fig. 89

2. Insert and tighten four + Binding Head S Tight Screws (3x8), to secure the Knit Radar to the machine.

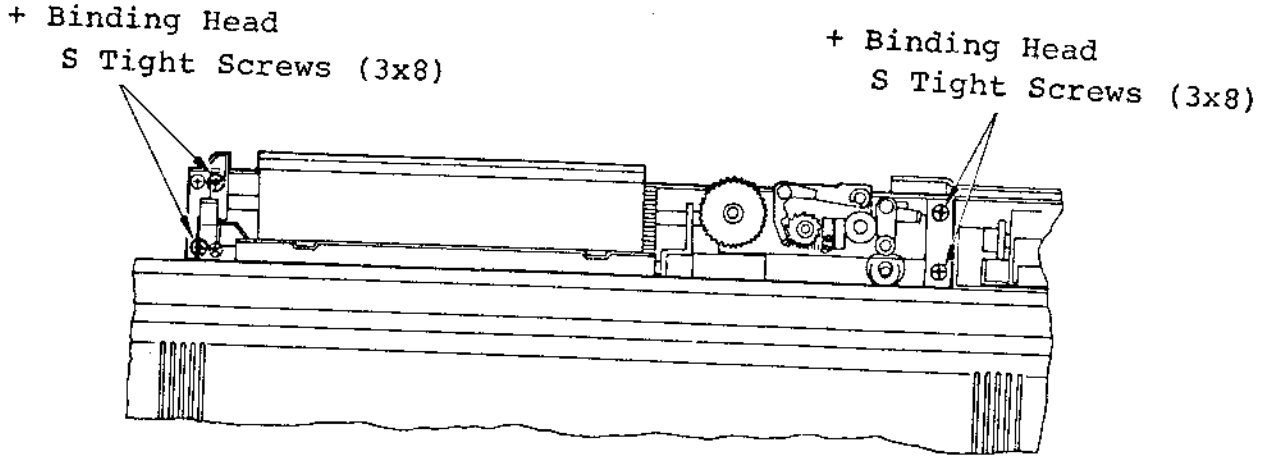



Fig. 90

10-2 Reassembly of the Needle Bed to the Casement:

1. Place the needle bed into the Casement as shown below.

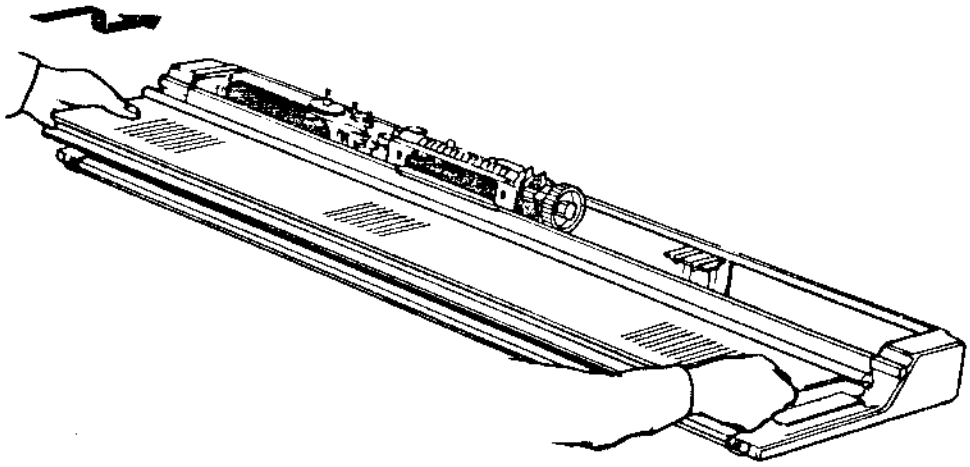


Fig. 91

2. Insert and secure two + Binding Head Screws (3x12), into the Handle Supports, two + Truss Head Screws (3x8) between the Handle Supports and one + Binding Head S Tight Screw (3x6) to the rear of the Knit Radar Unit.

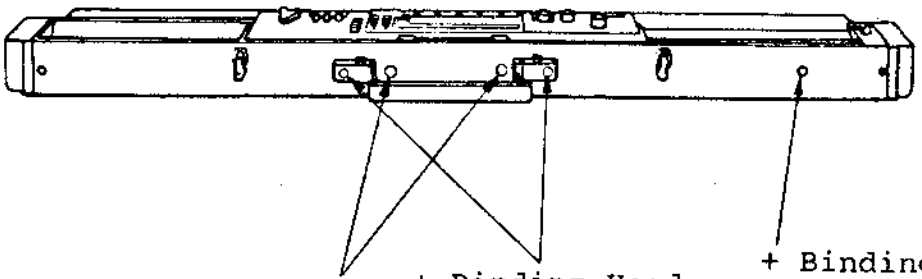



Fig. 92

3. Secure both ends of the needle bed with four + Special Flat Head S Tight Screws (4x10) and two + Binding Head S Tight Screws (3x6).

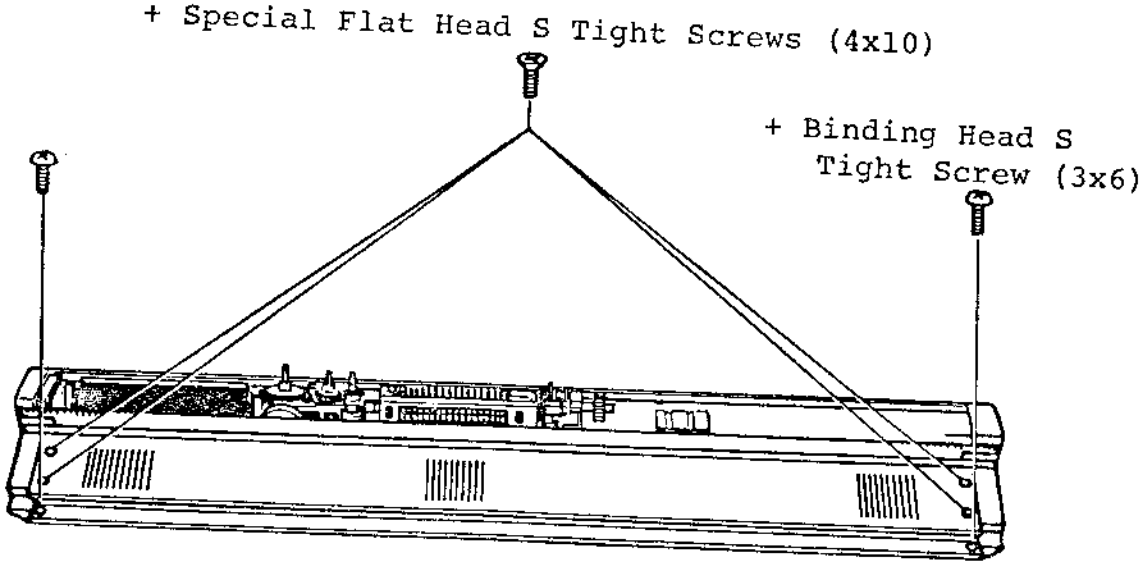



Fig. 93

4. Insert the Side Panel (L) and secure it with one Special + Truss Head Screw (3x8). Insert Side Panel (R) and secure it with one + PW Pan Head Screw (3x6).

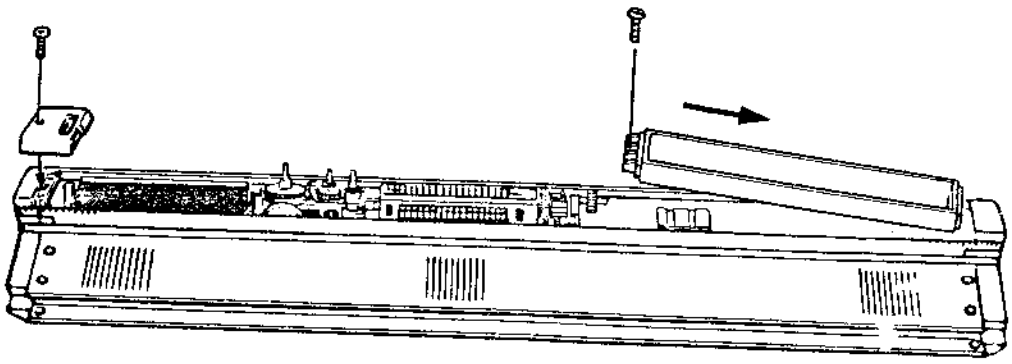


Fig. 94

5. Replace the Centre Panel and secure it with two Panel Screws. Replace also the KR Dial Unit and Change Dial onto the Knit Radar Unit and the Stop Knob and L Knob onto the Centre Panel.

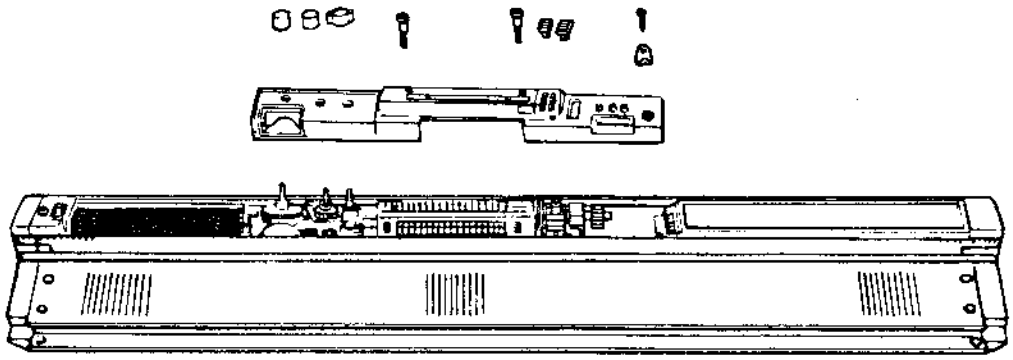


Fig. 95

6. Turning over the body, secure the needle bed to the Casement by inserting and fastening two + Binding Head S Tight Screws (3x6).
   NOTE: When turning over the machine, be sure to keep the Knit Radar Dials and Pattern Unit Knobs away from the table edge. (See diagram below.)

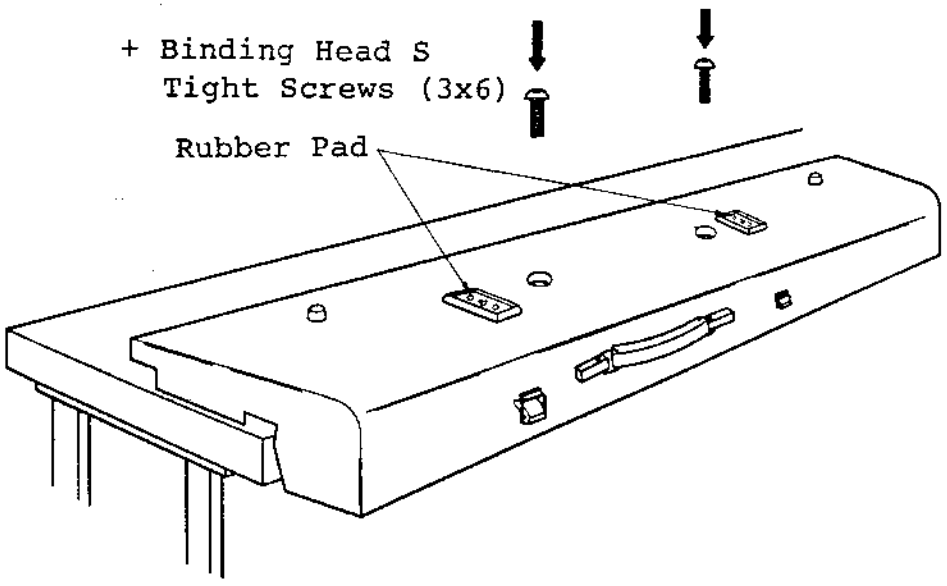



Fig. 96

## 11. CORRECT POSITION OF ARM FOR NEEDLE & NEEDLE BED.

* P.N..... 0-0.3 m/m

(Fabric Presser touches bottom surface of Needle.)

* P.S.....1.5-2.0m/m

(The clearance between Sinkers and edge of Fabric Presser.)

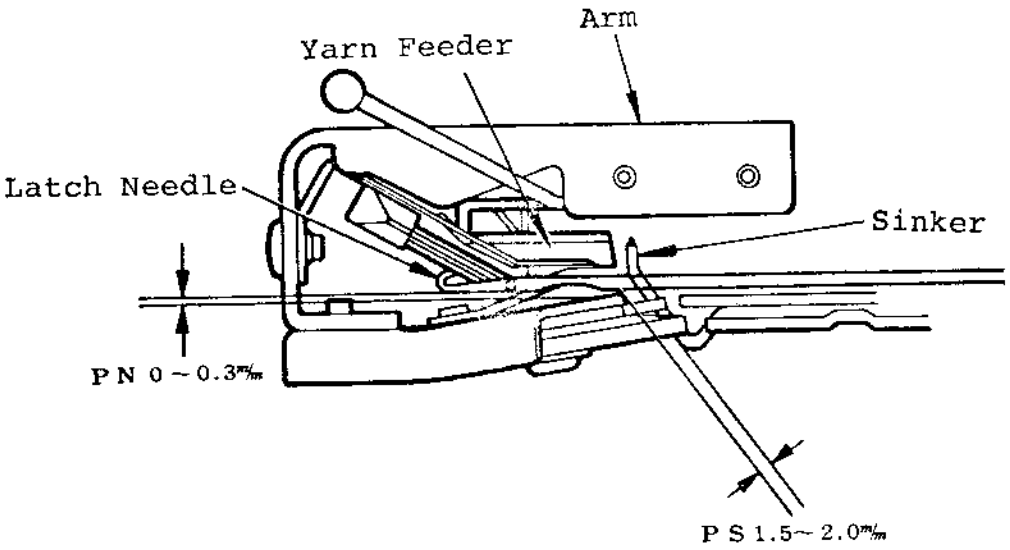



Fig. 97

* Y.S..... 0.3-1.0m/m

(The clearance between rear edge of Yarn Feeder and Sinkers.)

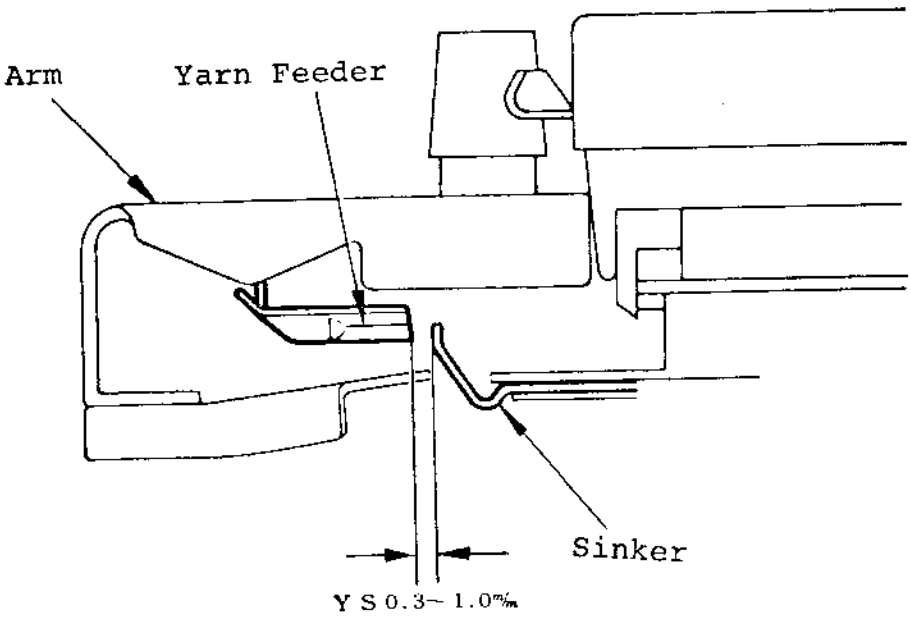



Fig. 98

* W.P..... -0.3-0m/m
(The clearance between the Weaving Brush and the Fabric Presser when the Auxiliary Arm is set at a Weaving position. Make sure that the tip of the brush will fill the clearance between the Sinkers and the edge of the Fabric Presser.)

* W.S..... 0-0.5m/m
(The clearance between the rear edge of the Yarn Feeder and Sinkers.)

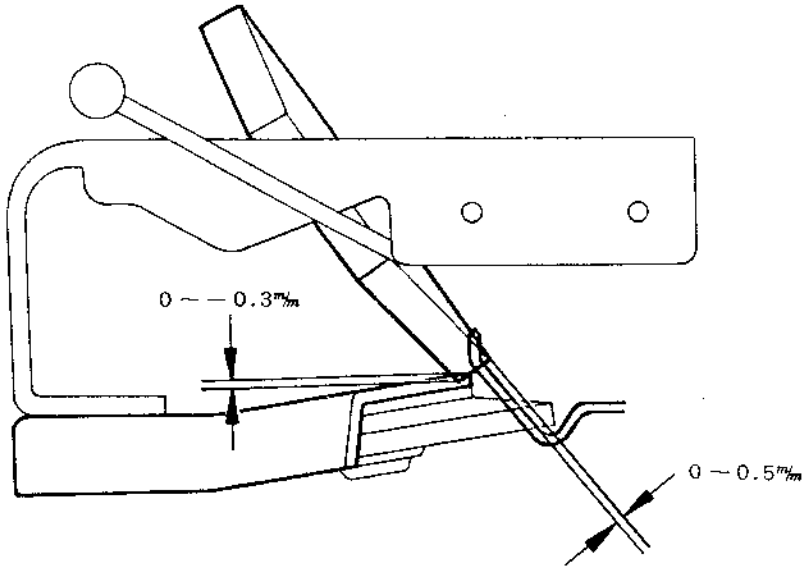



Fig. 99

11-1 P.N. Clearance:

1. In case a clearance exists between the Fabric Presser and needles as shown in Fig. 100, the stitches will float and this sometimes makes knitting impossible.

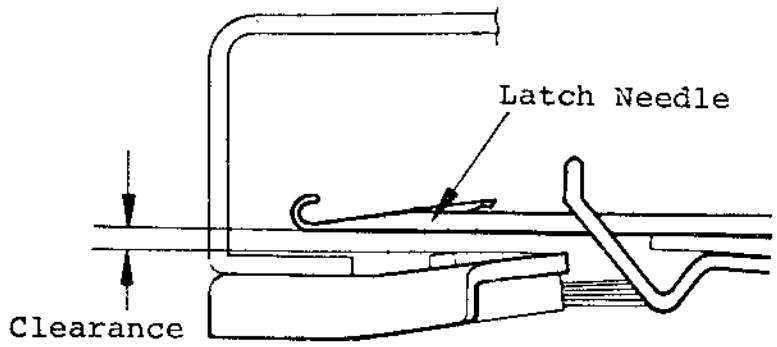
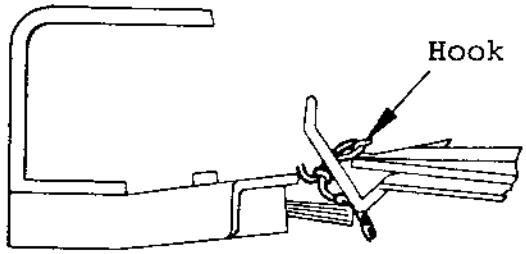
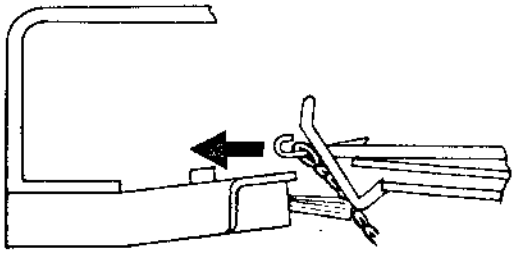



Fig. 100

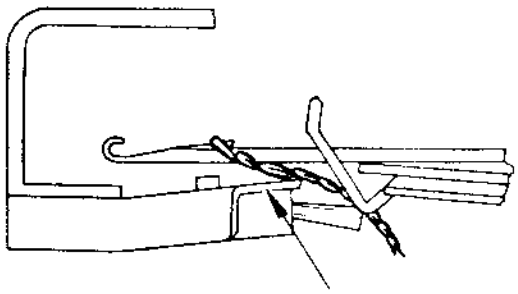
The process in this case is illustrated in the diagrams below.




a) A stitch is caught by the hook of a needle.



b) The stitch advances with the needle as it moves in the arrowed direction.




c) The Fabric Presser serves to stop the stitches advancing with the needles, and also to push the fabric behind the latches of the needles. But if a clearance exists between the Fabric Pressers and needles, the force to hold down the fabric becomes too weak to stop the fabric completely, followed by the needles which move back before the stitches have been pushed behind the needle latches. This makes it impossible to knit effectively.

Fig. 101

2. If the Fabric Presser is positioned lower than the standard requirement, it cannot push up the needles. Therefore, the relative position of the needles becomes lower for the Yarn Feeder and that causes the stitches to drop or fail to knit.

<u>In Case the Needles are lifted too much by the Fabric Presser:</u>

a) The Carriage becomes heavy during operation.

b) The Yarn Feeder will hit the needle hooks and consequently bend them.

P.N. Adjustment:

Adjust the Fabric Presser in such a way so that its edge will touch the needles and so that it will push against them to the extent not exceeding 0.3 m/m.

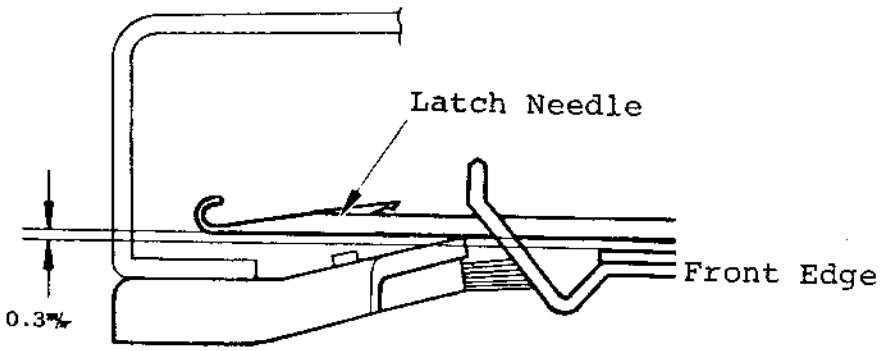



Fig. 102

1. Push about 60 needles to D position and set both Russel Levers to the I position.

2. Check how the edge of the Fabric Presser touches the needles while moving the Carriage from left to right.

3. When the edge of the Fabric Presser does not touch the needles, remove the Arm from the Carriage, place the Arm, with its face downwards, and with your hands, push downwards.

NOTE: If too much force is applied, the Arm will become so bent that the needles will be pushed up more than necessary. Therefore, the adjustment should be made so that the edge of the Fabric Presser will be gently brought into contact with the needles by degrees.

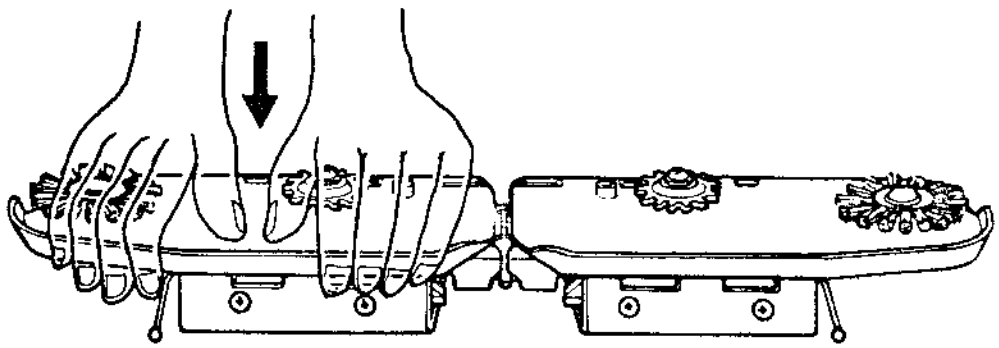


Fig. 103

4. Adjust the P.N. clearance to within 0.0-0.3 m/m (to the extent that the edge of the Fabric Presser touches the lower part of the needles gently), and at the same time there must be a clearance between the Yarn Feeder and needles (as shown in Fig. 104).

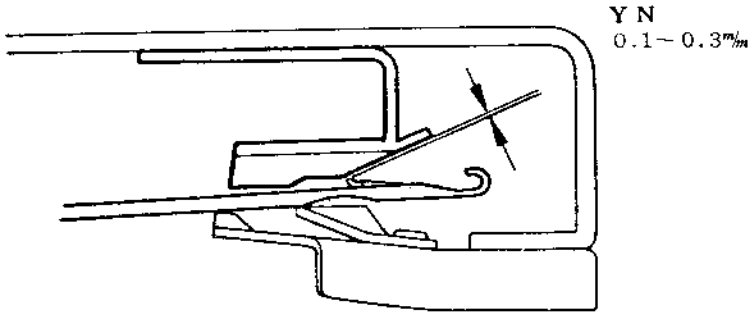



Fig. 104

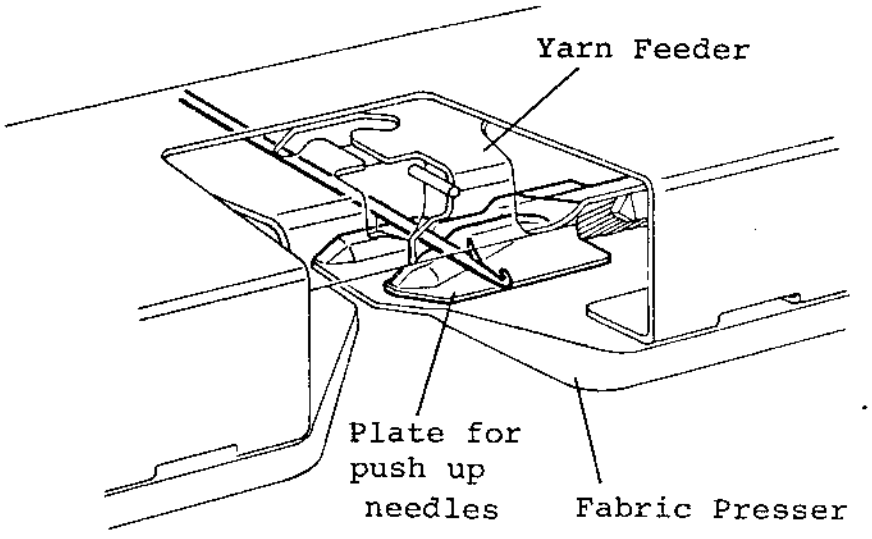



Fig. 105

5. In case the Fabric Presser touches the needles too much, move the Carriage to the end of the needle bed (in the direction of the part of the Fabric Presser that requires adjustment) and pull the edge of the Presser downwards with your hand, as indicated in Fig. 106.

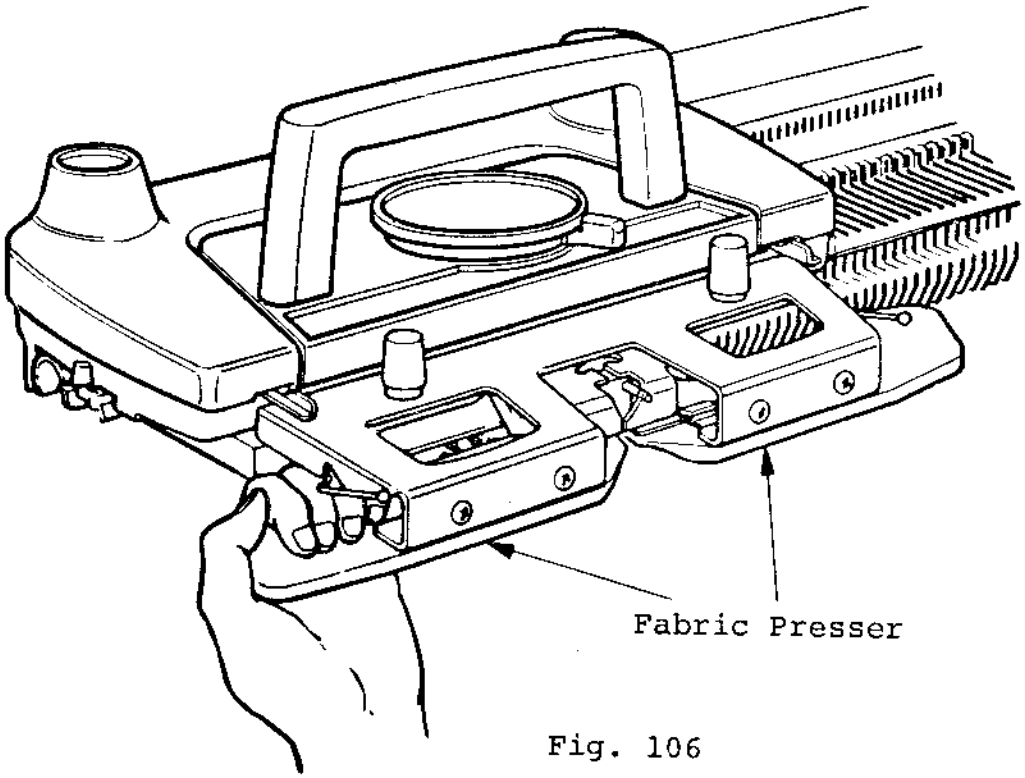



Fig. 106

6. Adjust both Fabric Pressers so that they are horizontal (as illustrated below).

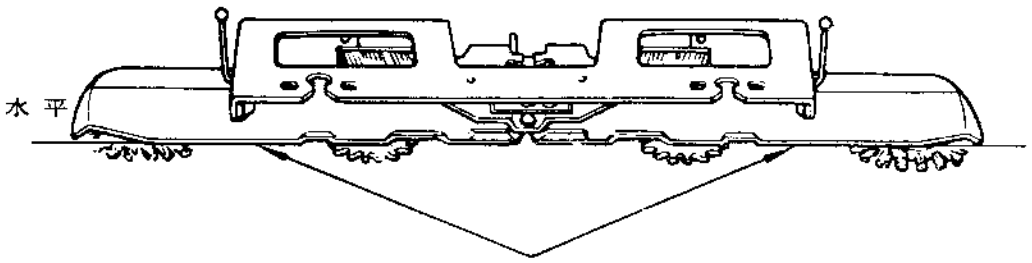



Fig. 107

11-2 P.S. Clearance:

1. If a clearance exists of more than 2.0 m/m between the front edge of the Fabric Presser and Sinkers, the stitches will float and cannot be knitted.

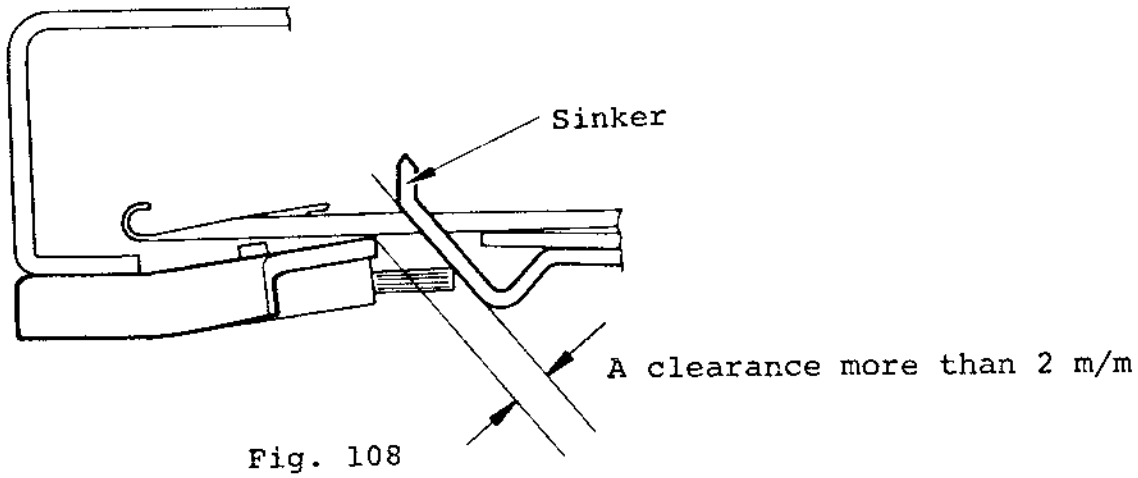
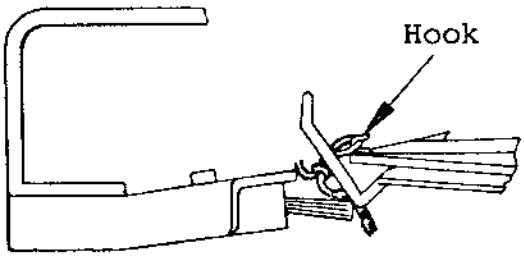
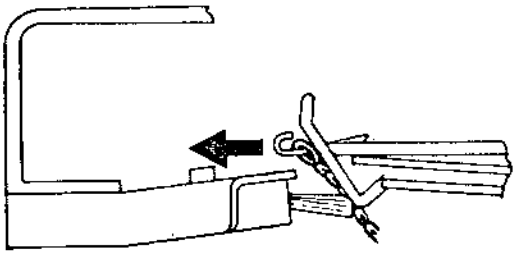



Fig. 108

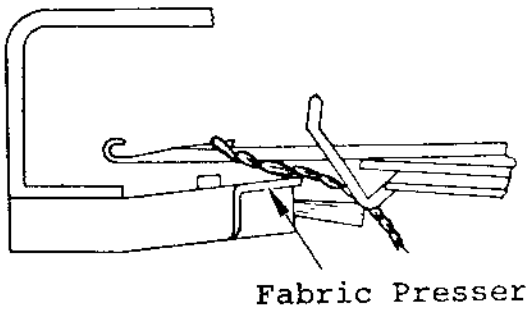
2. The process is illustrated in the diagram below.




a) A stitch is caught by the hook of a needle.



b) The stitch advances with the needle as it moves in the arrowed direction.




c) The Fabric Presser serves to stop the stitches advancing with the needles and also to push the fabric behind the needle latches. But if a clearance exists between the Fabric Presser and needles, the force to hold the knitted fabric is too weak to stop it completely, followed by the needles which move back before the stitches have been pushed behind the needle latches. This makes it impossible to knit effectively.

Fig. 109

P.S. Adjustment:

Adjust the clearance between the edge of the Fabric Presser and the Sinkers so that it will fall within the range of 1.5-2.0 m/m, as shown in Fig. 110.

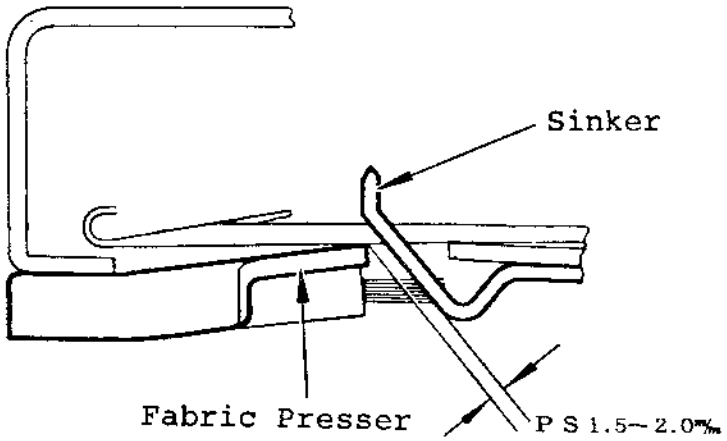
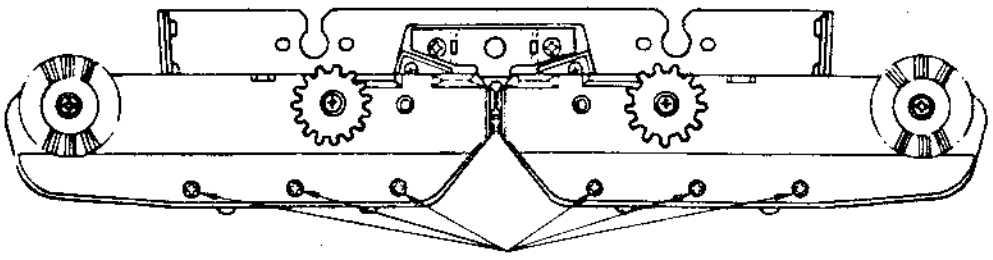



Fig. 110

1. Loosen six + Binding Head Screws (3x5) (three on each side), on the back of the Fabric Pressers. Make a clearance of more than 2.0 m/m and tighten the screws to the extent that you can adjust the Fabric Pressers by tapping them slightly with a Screw Driver handle.



+ Binding Head Screws (3x5)

Fig. 111

2. Adjust the P.S. clearance to within the range of 1.5-2.0 m/m, while tapping with the handle of a Screw Driver, the Fabric Presser as described in the diagram below.

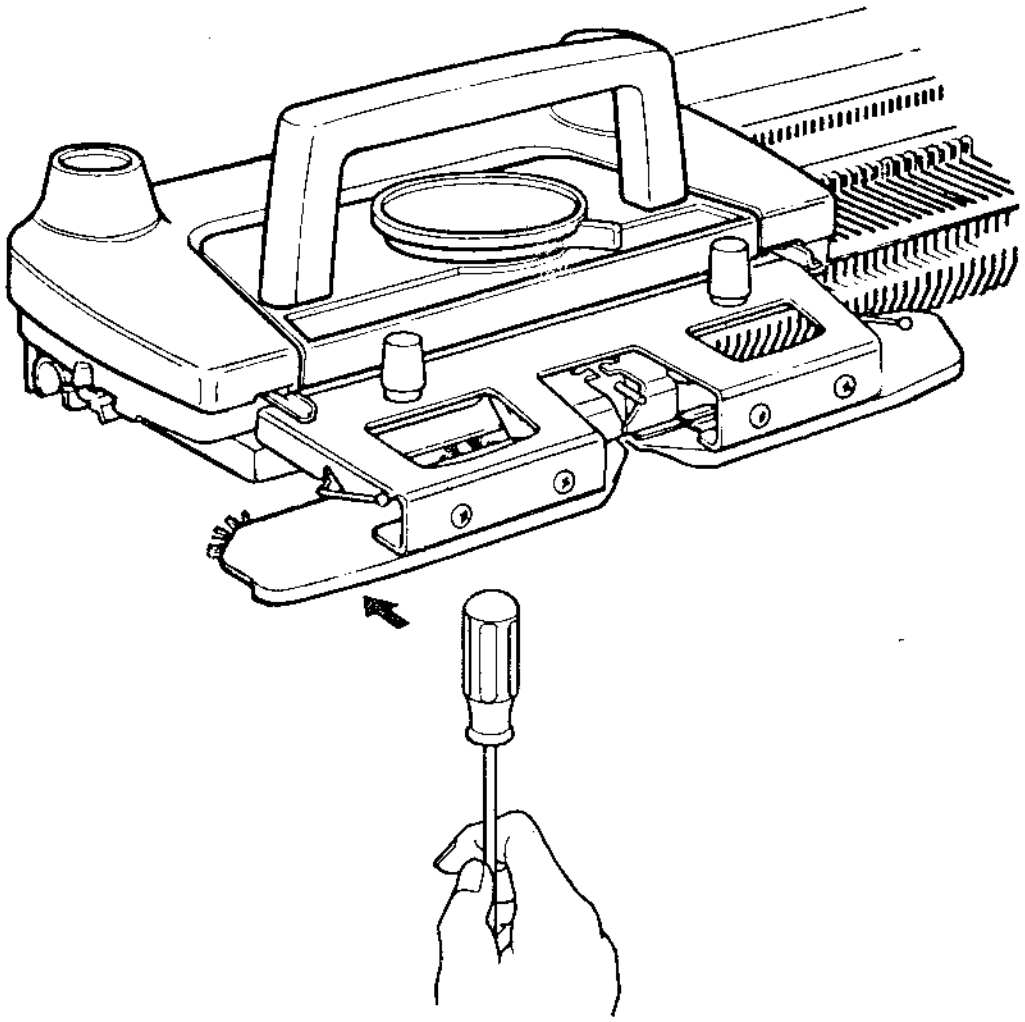


Fig. 112

11-3 Y.S. Clearance (the position of the Yarn Feeder):

* The clearance between the rear of the Yarn Feeder and the Sinkers should be within 0.3-1.0 m/m.

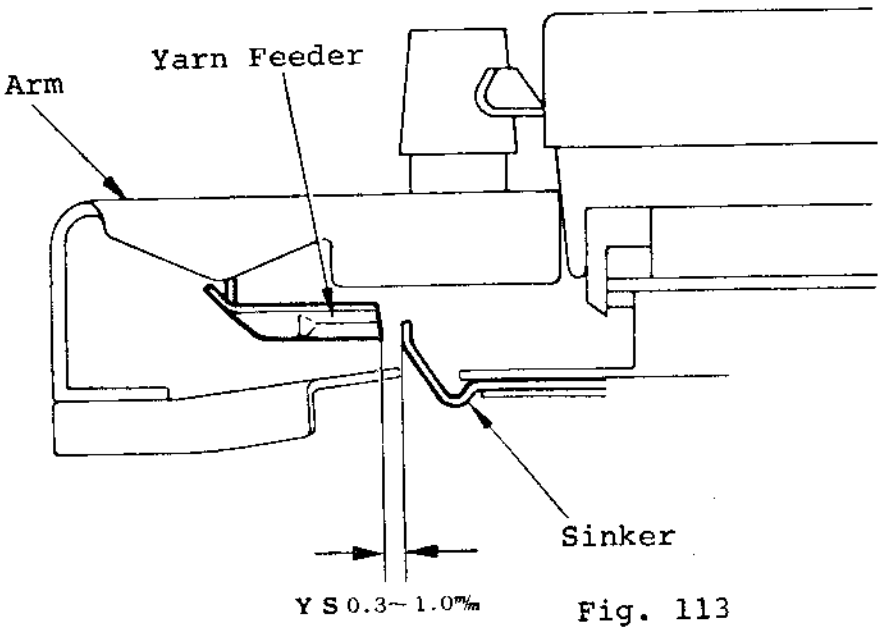



Fig. 113

1. In case the Y.S. clearance is narrower than the required distance:

   The Yarn Feeder touches the Sinkers and the Carriage becomes too heavy to operate.

2. In case the Y.S. clearance is more than 1.0 m/m:

a) In knitting Punch Lace, the Nylon Thread cannot be caught in the hook of the needles which are to knit the main yarn.

b) In knitting the Weaving and Punch Lace patterns, the needles to knit with the contrats yarn, touch the Yarn Feeder.

3. Adjustment of Y.S. clearance:

   Loosen a + Binding Head Screw (3x4.5) and a + Binding Head Screw (3x6), which secures the Yarn Feeder. Move the Yarn Feeder backwards and check the clearance with a Feeler Gauge, as shown in Fig. 114, below.

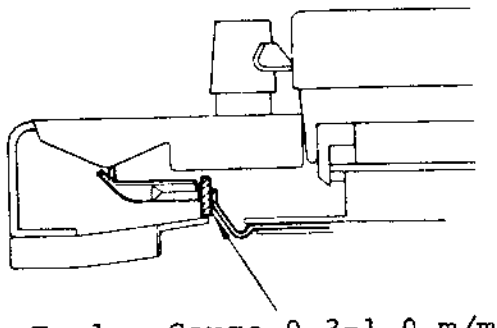



Fig. 114

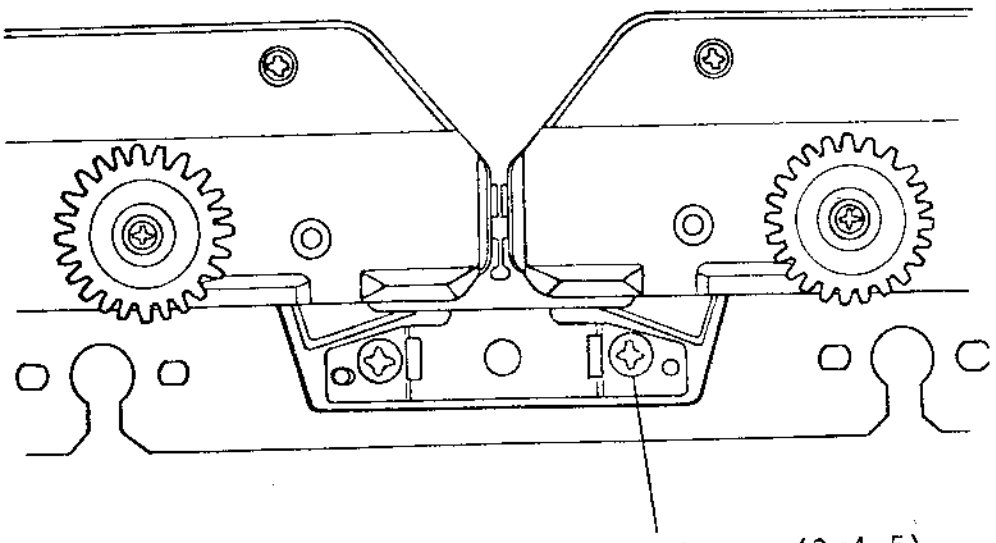



Fig. 115

NOTE:
The Yarn Feeder must not be bent when adjusting. Adjust the Y.N. clearance in the same way is done for the P.N. adjustment. The P.N. clearance should be adjusted to within the range of the standard requirement (0-0.3 m/m). If the clearance between the Yarn Feeder and the needles is wider, adjust it by inserting a thin plate washer between the Yarn Feeder and the Arm.

11-4 Adjustment of Auxiliary Arm (W.S. & W.P. Adjustment):

* The clearance between the Weaving Brush and the Fabric Presser should be between -0.3-0.0 m/m.

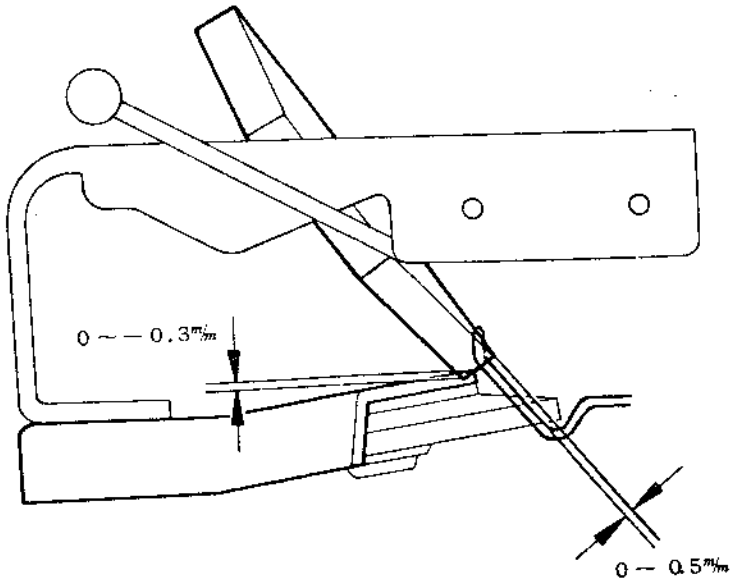



Fig. 116

As shown in Fig. 117, a weaving yarn is threaded by the Weaving Brush under the needles which do not come forward through a needle selection operation. (These needles do come out later.)

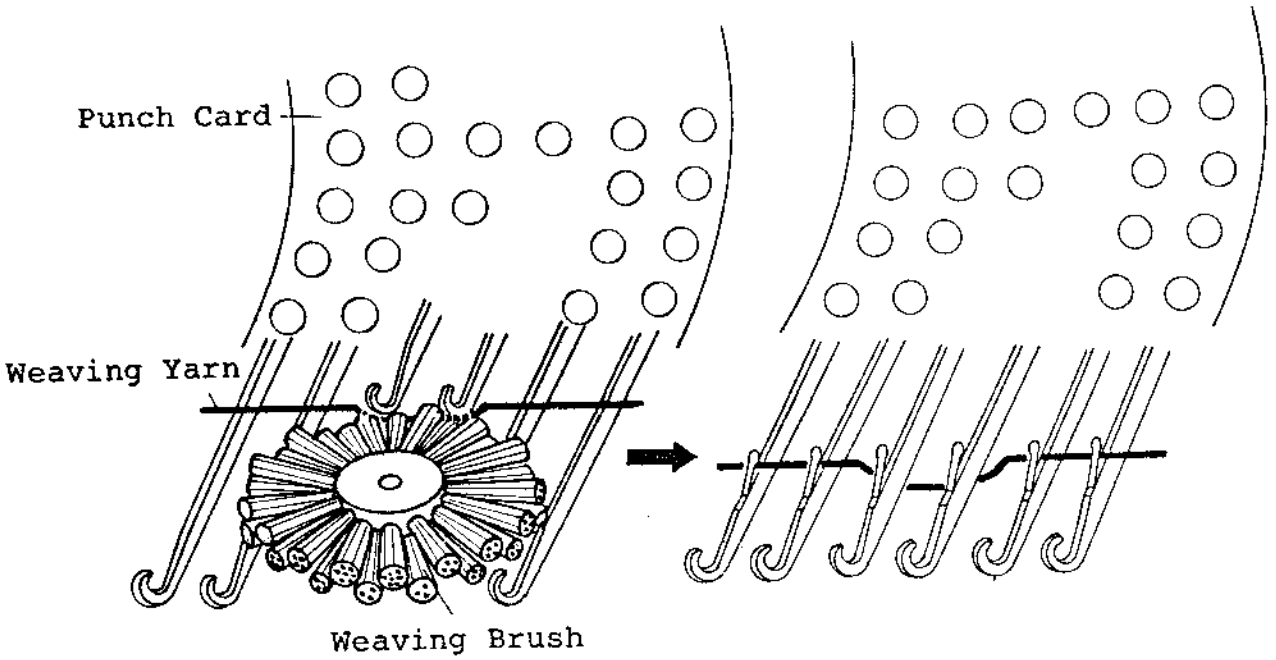



Fig. 117

1. Causes of Failure:

Imperfect adjustment of the Weaving Brush:

In case the Weaving Brushes are inadequately adjusted, as in the diagram below, they cannot push the weaving yarn under the needles. Consequently, the knitted fabric looks like Stockinet knitting or knitting with just an added yarn.

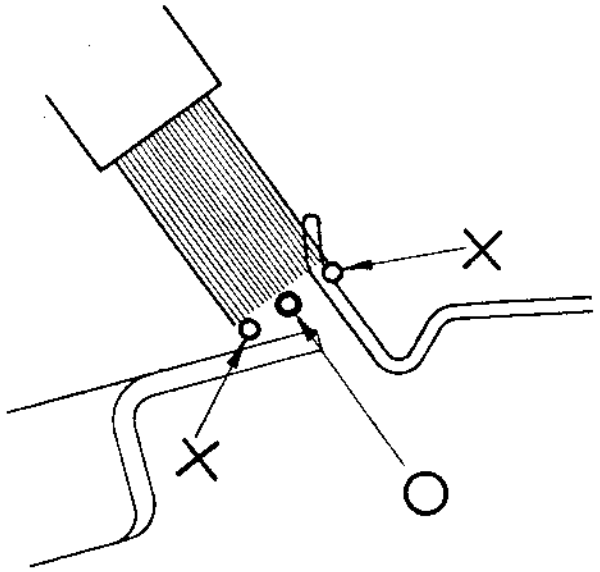


Fig. 118

2. Vertical Adjustment of the Weaving Brush:

If the Weaving Brushes are positioned higher or lower than the required position, the weaving pattern cannot be correctly knitted.

Correcting Method:

Loosen the + Binding Screws (3x8), securing the Weaving Brushes and adjust the clearance between the Fabric Presser and the Brushes to within the range of -0.3-0.0 m/m.

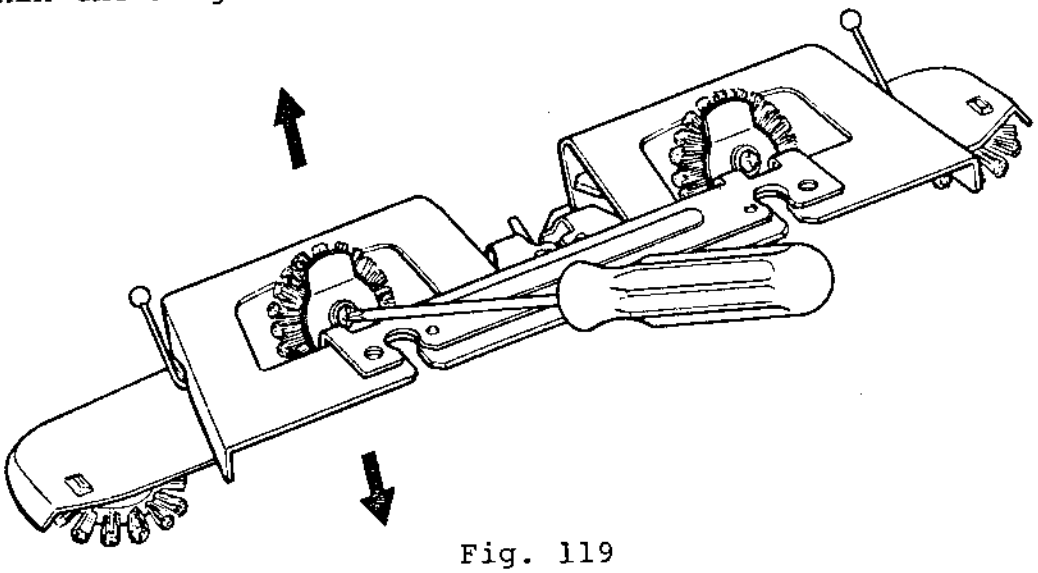


Fig. 119

3. To adjust the Weaving Brushes, move them, with the aid of a pair of Pliers, forwards or backwards as the case may be, so that the adjustment can be achieved

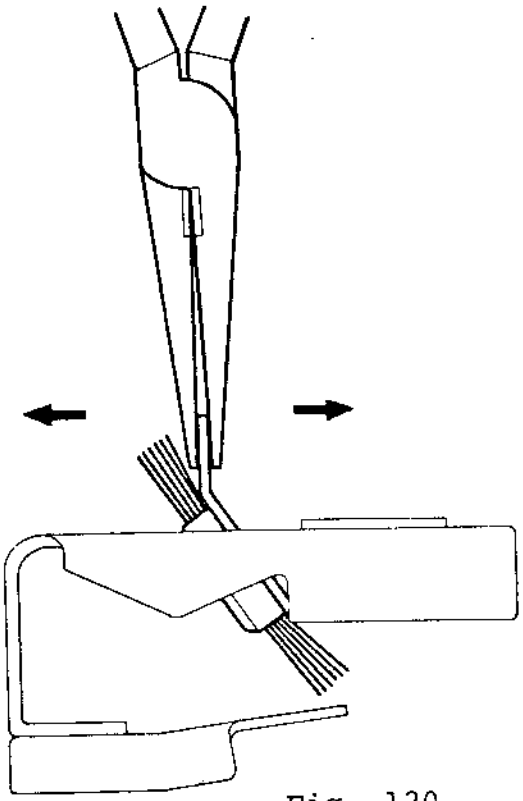


Fig. 120

## 12. HOW TO ADJUST WHEN STITCHES DROP DURING KNITTING.

Causes:

1. Insufficient yarn tension.
2. The needle latches do not open smoothly.
3. Speed of knitting.
4. The Accessory Weights are not used.
5. P.N. and P.S. adjustment.
6. If there is a burr on the cutting edge of the Fabric Presser.

Correcting Methods:

Cause 1.

a) If the tension put on the yarn is too weak, the stitches will come off the when the Carriage returns owing to an imperfect take up of slack yarn. To correct this, adjust the Tension Spring with the Tension Dial, so that it will stop within the range illustrated in Fig. 121, depending on the thickness of yarn used.

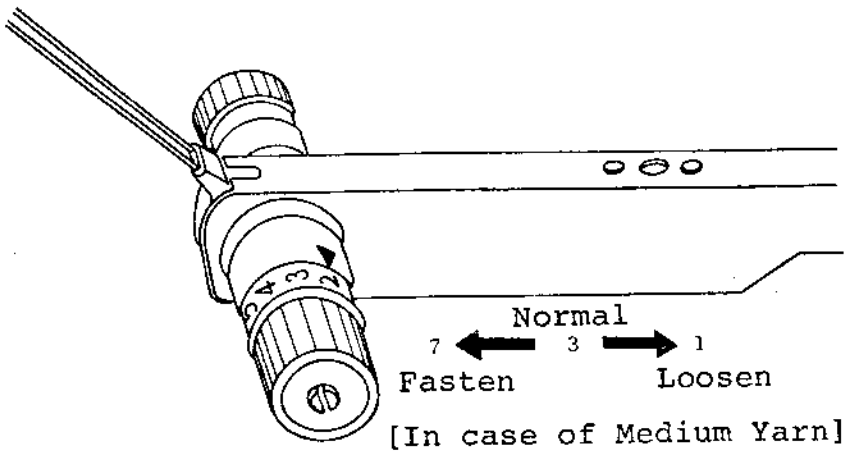



Fig. 121

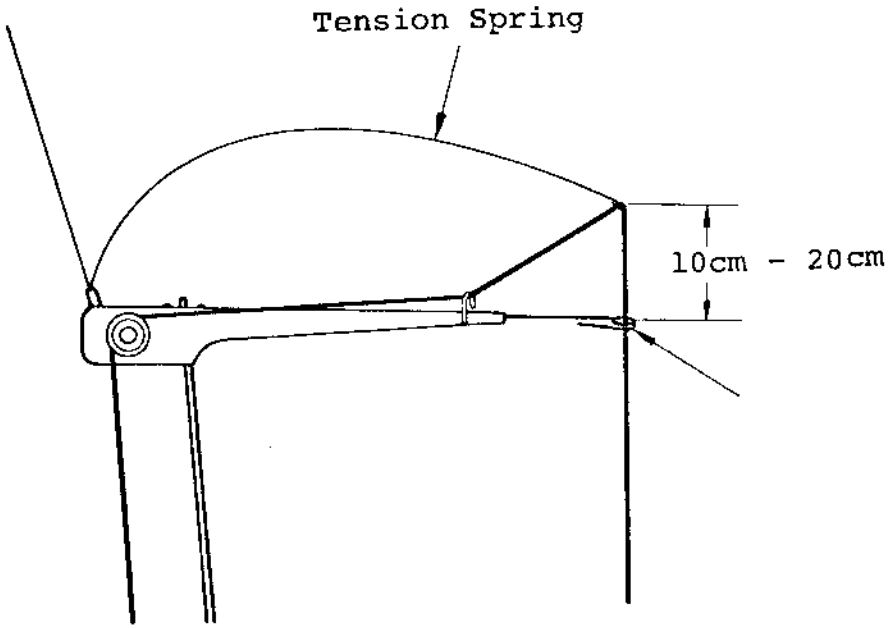



Fig. 122

b) If the yarn is wrongly threaded through the Tension, it will sag and the stitches will drop from the hooks due to insufficient tension. If this happens, rethread the yarn correctly.

Cause 2.

If the latch of the needle is bent, it cannot open or close and this causes the stitches to drop. Straighten the latch with a pair of Pliers or, if irreparable, replace it with a new one.

Cause 3.

If the Carriage is moved extremely fast, the stitches will become tight and the stitches on both sides tend to drop when the Carriage is returned. Move the Carriage evenly and with a reasonable speed.

A stitch by normal speed

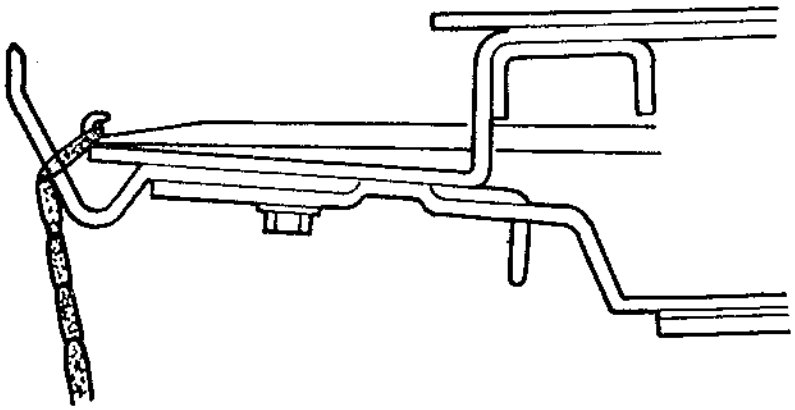


Fig. 123

A stitch by extremely fast speed

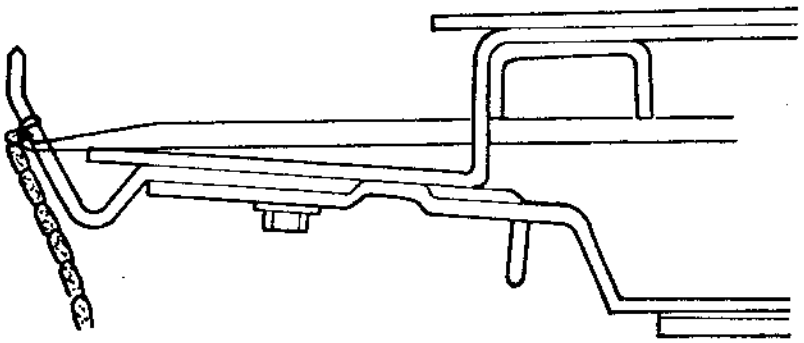


Fig. 124

Cause 4.

If the stitches on both sides of the fabric are loose or seem to drop easily, hang the Accessory Weights on the fabric as illustrated in Fig. 125.

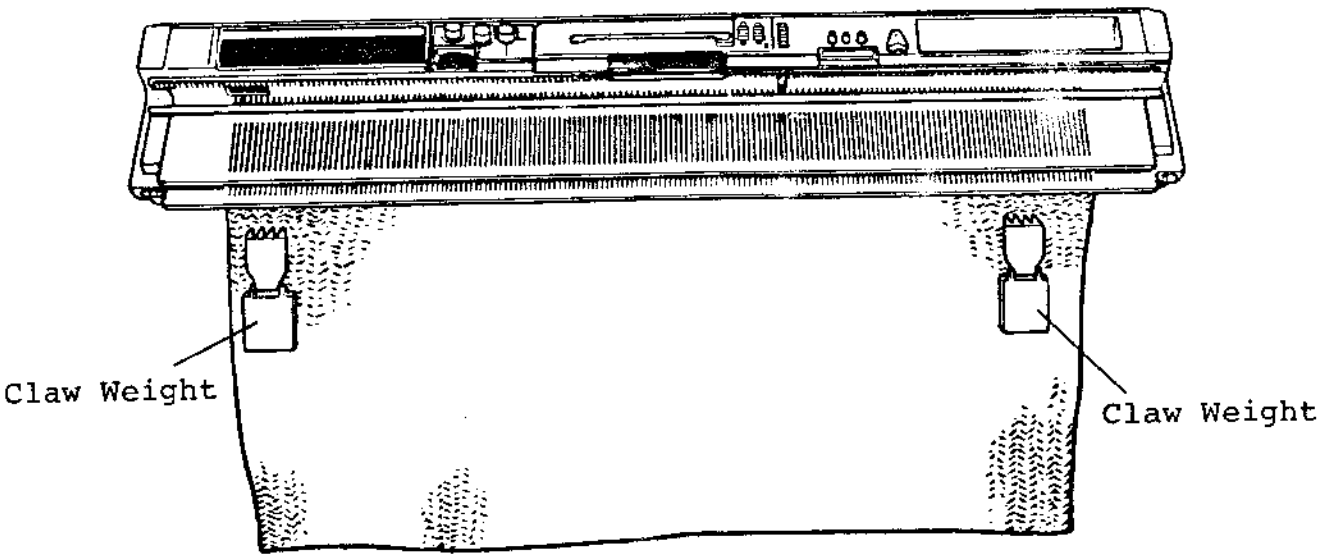



Fig. 125

Cause 5.

Please see pages 65 to 70.

Cause 6.

If there is a burr on the cutting edge of the Fabric Presser, the yarn may get caught, and, consequently, the stitches may drop. File such a burr with either Emery Paper or with an oil stone.

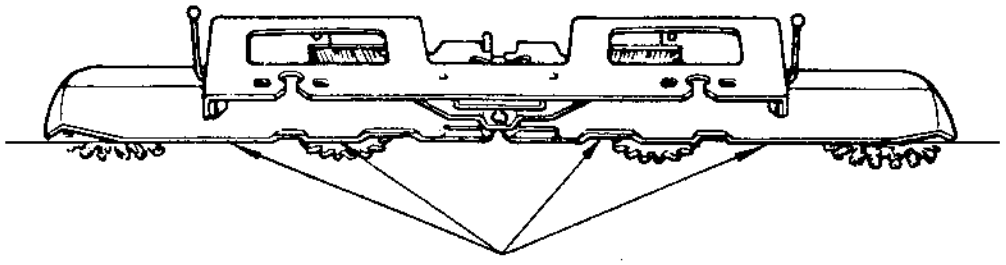



Fig. 126

1. Nomenclature of Main Parts:

1-1 Frame (L) Unit:

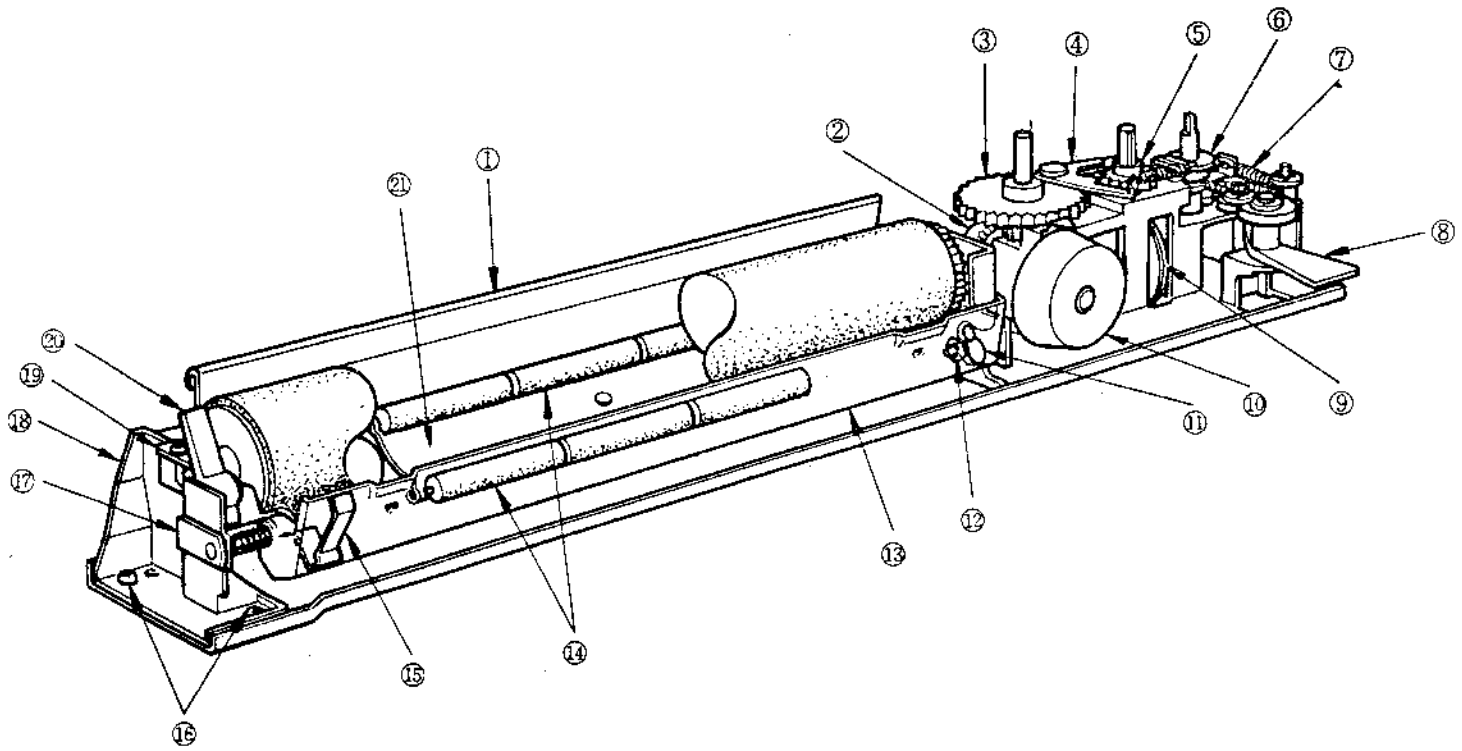



Fig. 127

1. Roller Pan
2. Crown Wheel
3. Set Wheel
4. KR Feeding Lever
5. Ratchet Wheel
6. Change Cam
7. KR Feeding Lever Spring
8. Row Feeding Lever
9. Friction Disc
10. Row Scale
11. Pan Holder Spring
12. CS Snap Ring 3
13. Paper Holder
14. Roller
15. Scale Holder
16. + Pan Head Screw (3x6)
17. Paper Holder Adjusting Plate
18. Frame (L)
19. Platen Holder
20. Paper Lever
21. Roller Holder

## 1-2 Frame (R) Unit:

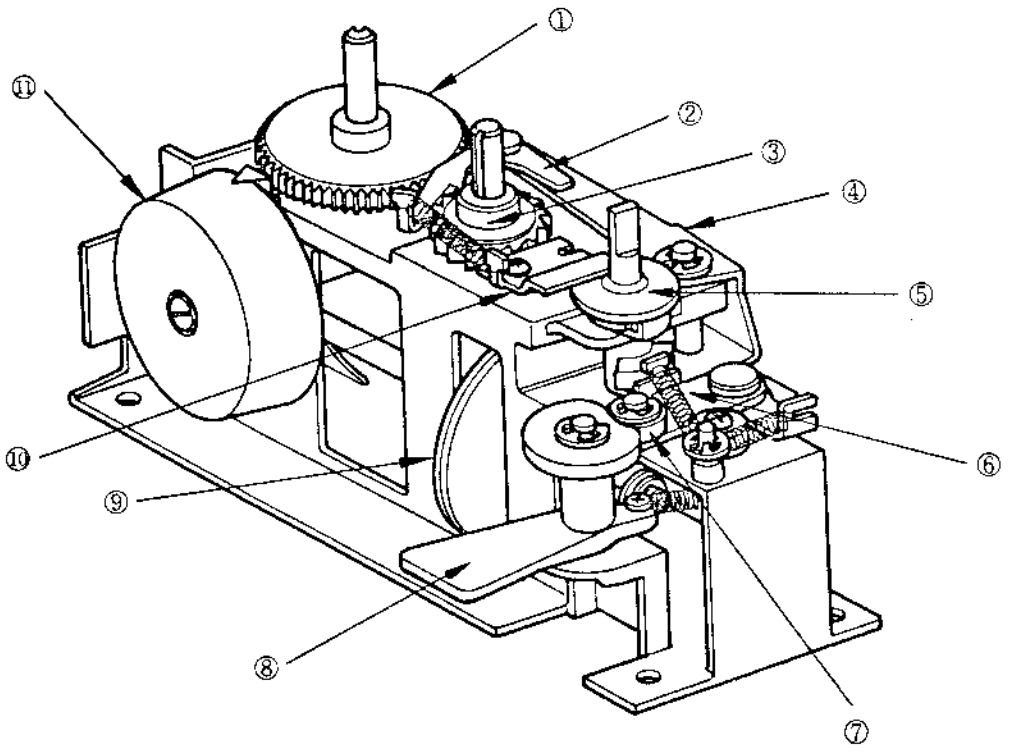



Fig. 128

1. Set Wheel
2. Feed Pawl
3. Ratchet Wheel
4. KR Feeding Lever
5. Change Cam A
6. KR Feeding Lever Unit
7. Feeding Lever Collar
8. Row Feeding Lever
9. Friction Disc
10. Spring Holder
11. Row Scale

## 2. Principle and Mechanism:

### 2-1 Knit Radar (Contour):

The Knit Radar (Contour) is a device used for shaping a garment, where to increase, decrease the stitches and so on, necessary for knitting.

#### Pattern Paper.

20 sheets of ready-to-use Pattern Paper are included with the machine. These patterns are reduced to half-size. Refer to the Knitting Machine Instruction Book for usage.

#### Stitch Scale:

7 Stitch Scales are included in the Accessory Box of the machine, ranging from 23 to 50 stitches per 10 cms. Refer to the Knitting Machine Instruction Book for knowledge on how to use them.

## 2-2 Mechanism of Row Scale:

### Principle:

The marks on the Row Scale comply with the feeding amount of the Platen.
Supposing you set the Row Scale at 44, the Platen will feed the Pattern Paper 5 cms. (actual size 10 cms.) 44 times, which means 44 rows are knitted per 10 cms.

### Mechanism:

The movement of the Carriage revolves the Friction Wheel at a constant pace through the KR Feeding Lever, then the Friction Wheel transmits the movement to the Friction Disc affixed to the Platen Shaft. Therefore, the feeding amount of the Platen is determined by the position of the Friction Wheel relating to the Friction Disc, as shown in the diagram. The farther the Friction Wheel stays away from the centre of the Friction Disc, the smaller the feeding amount of the Platen.
Therefore, the feeding amount (number of rows) is set by the turning of the Row Number Dial.

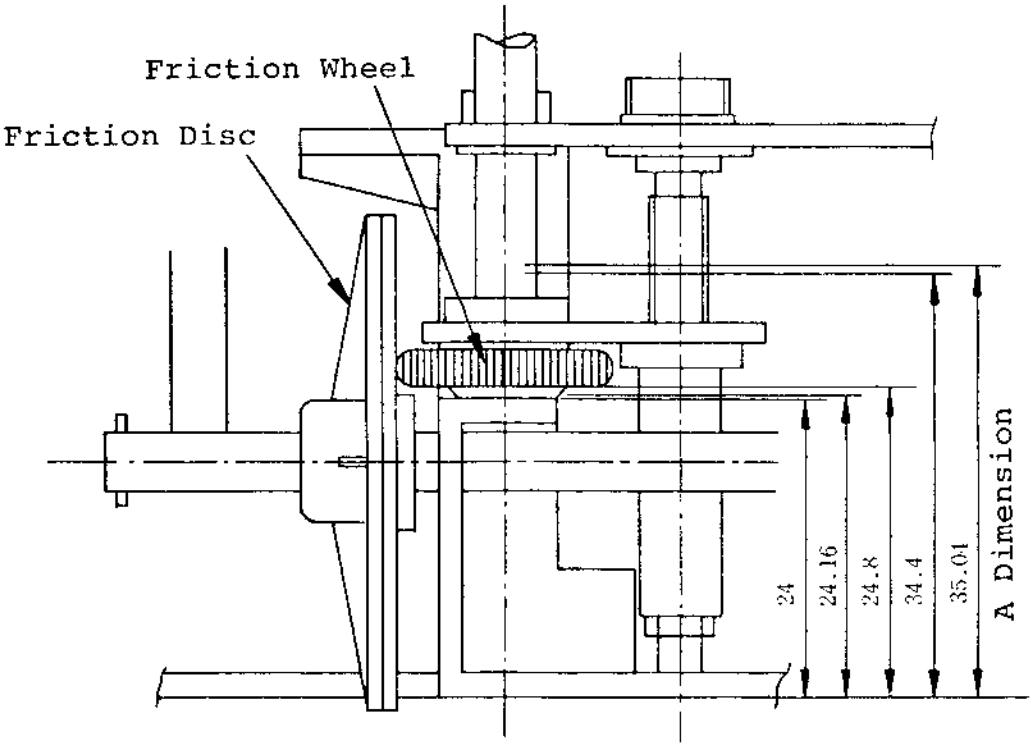



Fig. 129

## 2-3 Mechanism of Control Unit:

### Mechanism of Feeding Pattern Paper.

Feeding Dial (R)

↓

Row Feeding Lever

↓

KR Feeding Lever

↓

Ratchet Wheel

↓

Friction Disc and Wheel

↓

Reducing Mechanism

↓

Platen

### Mechanism of Set Wheel.

Row Number Dial

↙ ↘

Friction Disc (Operation System) Gears

Gears

↓

Row Scale

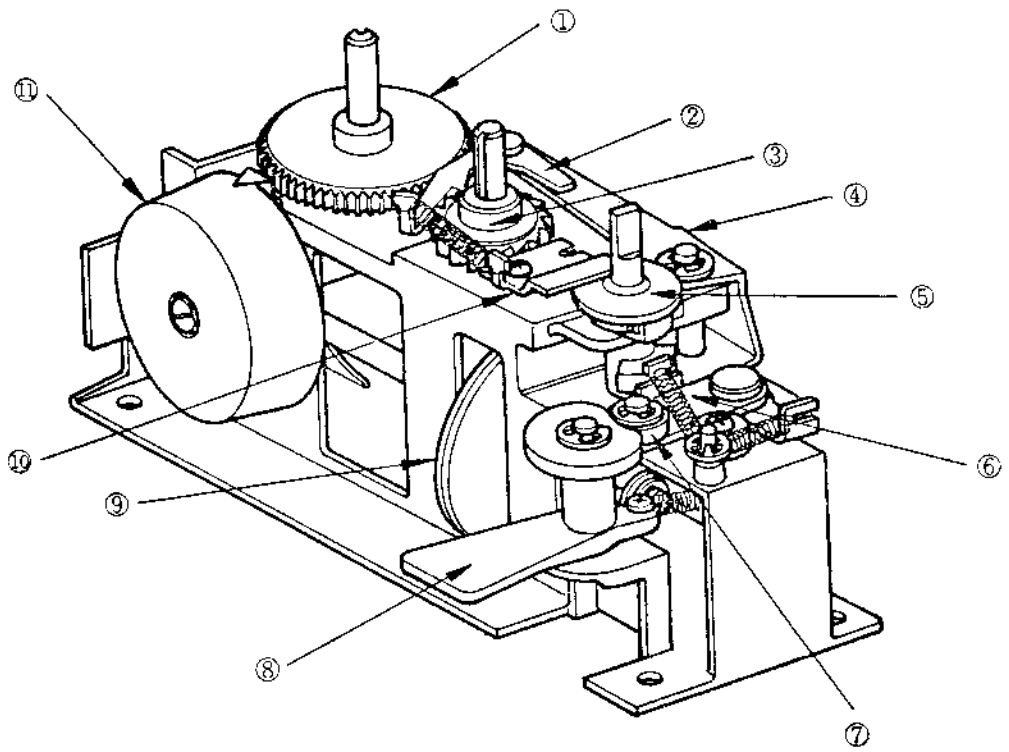



Fig. 130

2-4 How to Adjust the Row Scale:

If the Row Scale is removed or loosened by mistake, adjust it in the following manner:-

1. Turn the Row Number Dial clockwise, to its extremity, in order to move the Friction Disc down as far as it will go.

2. Loosen the Hexagonal Screw as shown in Fig. 131, and turn the Set Wheel so that the Row Scale is set between 30 and 60. Afterwards fasten the Hexagonal Bolt temporarily.

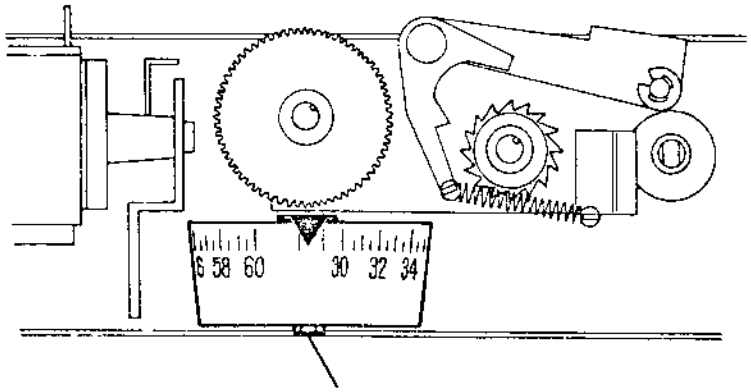



Fig. 131

3. Test the function of the Row Scale (rows to feed the pattern by 25 cms.). With the Row Scale set at 44, you are able to knit 220 ± 4 rows within 25 cms. If the rows knitted are less than the standard number (220 ± 4), loosen the Hexagonal Screw and move the Row Scale in a clockwise direction to correct its position. On the other hand, if the number of rows knitted are more than the standard number, move the Row Scale in an anti-clockwise direction.

Example:

| Row Scale | No. of Rows within 25 cms. |
|---|---|
| 30 | 150 ± 3 |
| 44 | 220 ± 4 |
| 60 | 300 ± 6 |

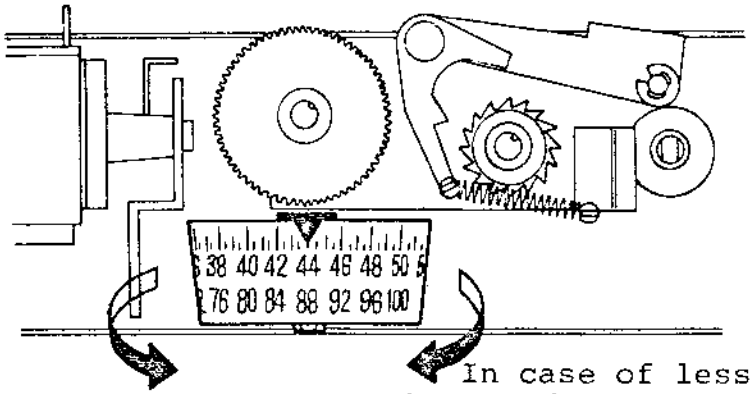



Fig. 132

## 2-5 If the Knitted Garment Differs from the Size of Pattern Paper:

Causes:

1. The size of the Feeding Lever Collar is incorrect.
2. Platen, Roller Holder, Friction Disc and Friction Wheel are oily and the Pattern Paper cannot be fed correctly.
3. Incorrect adjustment of the Row Scale.

Correcting Methods:

In the case of cause 1., an incorrect sized collar is used.

The Feed Pawl engages the Ratchet Wheel incorrectly and the Notch Roller will come to the wrong position. If the Feeding Lever Collar is larger than the correct sized collar, the feeding amount will be larger. If the Feeding Lever Collar is smaller, the Feed Pawl cannot feed the Ratchet Wheel.

Correctly sized Collar

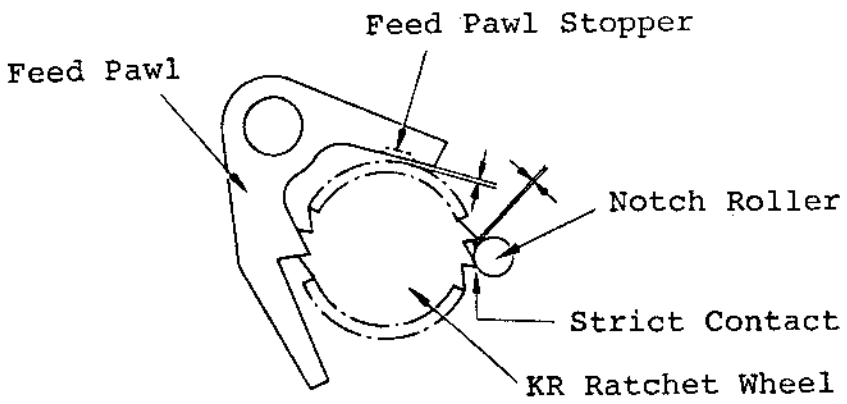



Fig. 133

In case the Notch Roller stays, as shown in Fig. 134A when the Feed Pawl engages with the Ratchet Wheel, exchange the Feeding Lever Collar for a larger one.

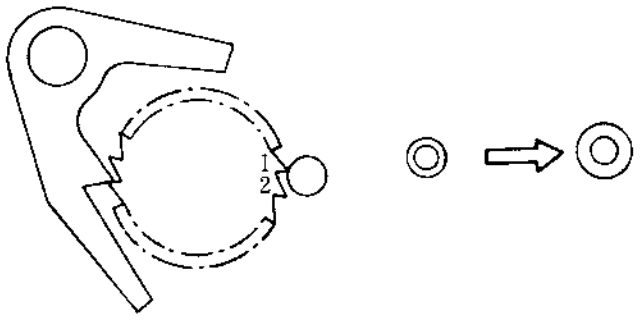



Fig. 134 A

In case the Notch Roller stays, as shown in the Fig. below when the Feed Pawl engages with the Ratchet Wheel, exchange the Feeding Lever Collar for a smaller one.

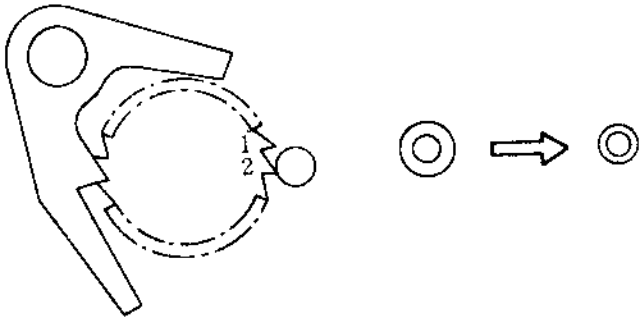



Fig. 134 B

In case of cause 2:

Clean the oily parts with alcohol or a thinner.

In case of cause 3:

Adjust the Row Scale referring to page 84.

## 2-6 If the Pattern Paper slips Sideways:

Causes:

1. Incorrect insertion of the Stitch Scale.
2. Incorrect insertion of the Pattern Paper.
3. Incorrect adjustment of the Paper Holder.

Correcting Methods:

In case of cause 1.

Insert the Stitch Scale into the Stitch Scale Holder correctly as far as it will go.

In case of cause 2.

Insert the Pattern Paper so that the horizontal lines on the Pattern Paper meet with the Stitch Scale, and both ends of Centre Line meet together.

In case of cause 3.

Loosen the + Pan Head Screw (3x5) securing the Paper Holding Adjusting Plate on the Frame (L), and move it as shown in Fig. 135 so that the horizontal lines on the Pattern Paper meet with the lines on the Stitch Scale.

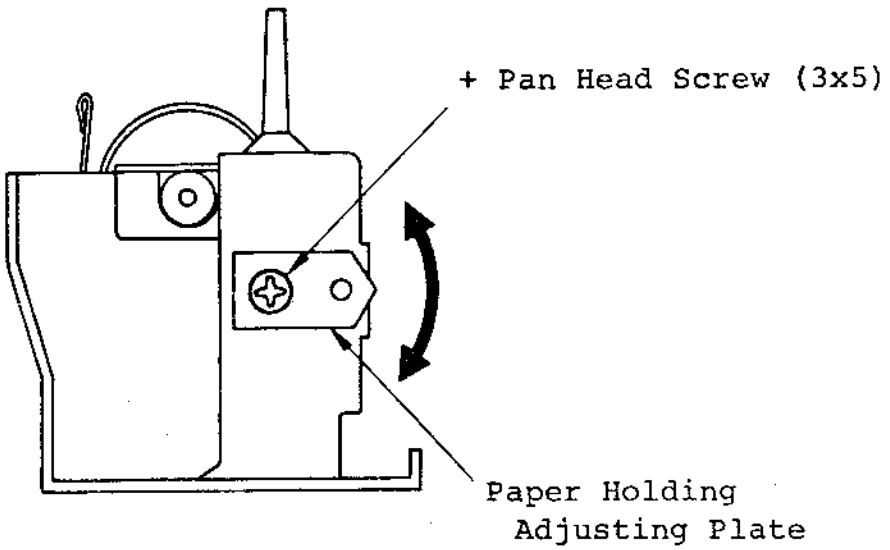



Fig. 135

## 2-7 If the Pattern Paper is Fed Crookedly:

Causes:

The Platen is incorrectly assembled and moves laterally.

Correcting Methods:

If the Platen moves laterally, insert washers as shown in Fig. 136. The allowance for movement is limited to between 0.1-0.3 m/m.

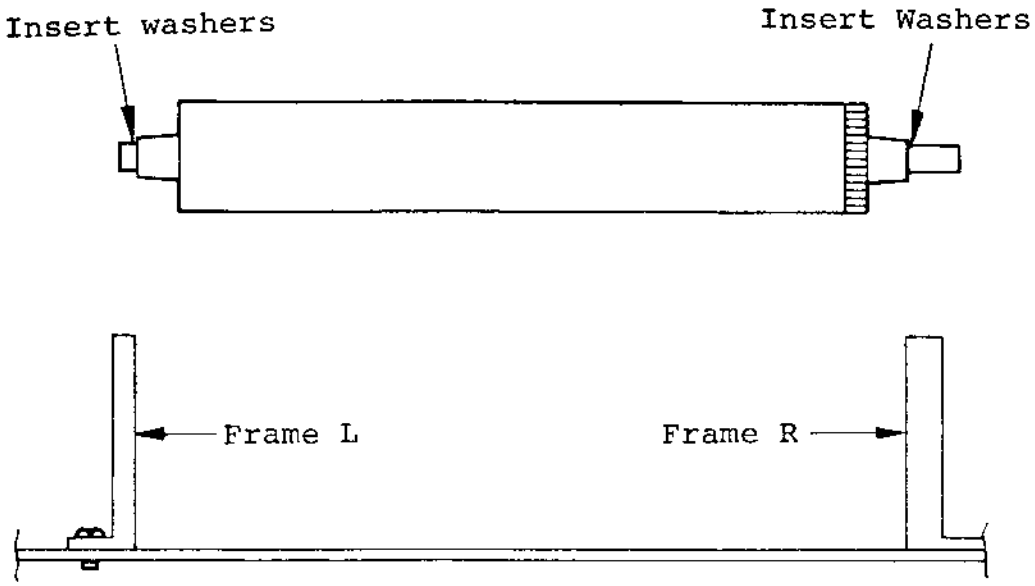



Fig. 136

14. CAUSES AND REMEDIES FOR MAIN MACHINE FAILURE:

| Nature of Trouble | Places to be Inspected | Causes | Remedy |
|---|---|---|---|
| BOTH LENGTHS OF THE FABRIC DIFFER | Check the dimension between the Rail and Sinkers.<br><br>(Dimension L) | Dimensional differences at some points between the Rail and Sinkers, causes a knitted fabric to have different sized stitches, resulting in differences of length on both sides of the fabric. | Adjust the dimension between the Rail and Sinkers to be precisely equal at all points. |
| | Check the speed at which you start and finish a stroke of the Carriage. | Difference in speed between the time you start and finish a stroke, causes a knitted fabric to have different sized stitches due to the variable tension of the yarn. Consequently, on both sides of the fabric there will be different lengths. | Instruct the operator to operate the machine at as even a speed as possible, both at the start and end of a stroke. |

| Nature of Trouble | Places to be inspected | Causes | Remedies |
|---|---|---|---|
| Stitches Float. | Check how the Arm is attached to the Carriage. | The position of the Fabric Pressers against the Needle Bed gets out of order unless the Arm is properly attached to the Carriage. If it is not properly attached, it will result in the floatation of the stitches and this makes knitting impossible. | Attach the Arm properly to the Carriage. |
| | Check how the edge of the Fabric Pressers touch the needles. | If a clearance exists between the edge of a Fabric Presser and the needles, the yarn is prevented from slipping off of the latches due to insufficient pressing force on the fabric by the Pressers. This also causes the stitches to float. | Adjust the Fabric Pressers. (P.N. Clearance) |
| | Check the clearance between the edge of the Fabric Pressers and the Sinkers. | If the clearance between the edge of the Fabric Pressers and the Sinkers is too wide, the stitch is prevented from coming over and behind the latches because of insufficient pressing force on the fabric. This causes stitches to float. | Adjust the Fabric Pressers. (P.N. Clearance) |
| | Check the condition of the needles. | If the needles get their hooks and latches bent, the yarn can neither pass over the hooks nor can it be pushed behind the latches, and stitches float as a result. | Correct the bent hooks and latches. If they are irraparable, replace those needles with new ones. |

| Nature of Trouble | Places to be inspected | Causes | Remedies |
|---|---|---|---|
| The Stitches on both edges of Fabric Drop. | Auto-Tension. | If you continue knitting without noticing that the Tension Spring (a spring to take up the slack yarn) is jumping to its extremity and is not functioning, the yarn sags at the starting point of knitting and the needles cannot pick up the yarn. The stitches drop. (This often takes place when you change yarn.) | Adjust the yarn tension through turning the Tension Dial. |
| | Check if the yarn is wrongly threaded through the Auto-Tension. | If the yarn is wrongly threaded through the Auto-Tension, the yarn sags and stitches come off the hooks due to insufficient yarn Tension. | Instruct the operator to correctly thread the yarn through the Auto-Tension. |
| Open holes in Knitted Fabric (Dropped Stitches) | Check how needle latches open and close. | When the needle latches do not open or close smoothly, stitches drop. | Correct the latches so that they open and close smoothly. If irraparable, replace the needles with new ones. |
| | Check the clearance between the Fabric Pressers and the needles (P.N. Clearance.) | If there is a clearance between the Fabric Pressers and the needles, the needles become lower in position than the standard position, and Y.S. (Yarn Feeder and Sinkers) clearance becomes wider. So the needles will not catch the yarn. | Adjust the P.N. Clearance. |

| Nature of Trouble | Places to be inspected | Causes | Remedies |
|---|---|---|---|
| A Knitted Fabric shows Course Stripes (Irregular Traverse Stitches). | Check if both Main Cams are located at an equal distance from the inner surface of the Carriage Pipe (Standard Level). | If the dimension between the Carriage Pipe (Standard Level) and one Main Cam is different from that of the other, Course Stripes occur. | Adjust the Main Cams so that they may be correctly positioned. |
| | The speed at which the Carriage is moved. (Speed at wich knitting is done.) | Speed difference between starting and finishing a stroke, or between one stroke and another. | Instruct the operator to knit at as even a speed as possible. (Even if the machine is in order, Course Stripes happen depending upon the operator or operating methods adopted.) |

| Nature of Trouble | Places to be inspected | Causes | Remedies |
|---|---|---|---|
| Poor Needle Selection throughout the Fabric. | Pattern Unit | If the perforated holes on a Punch Card are not aligned with the Scanning Fingers of the Touch Levers, the Scanning Fingers get caught by the holes, making the Touch Levers unable to work in accordance with the Punch Card and an irregular pattern is knitted on the fabric. | Adjust the Card Drum so that the perforated hole on the Punch Card may be aligned with the Scanning Fingers of the Touch Levers. |
| | Clearance between the Touch Levers and the Main Drum Pieces. | If there is too wide a clearance between the Touch Levers and Main Drum Pieces, Touch Levers are prevented from pushing the Main Drum Pieces sufficiently and a poor memory results, accompanied by poor needle selection. | Adjust the clearance between the Touch Levers and Main Drum Pieces. |
| | Check the Clear Wire. | If the length of the Clear Wire is not correct, the Sub Drum Pieces cannot clear the used memory on the Sub Drum. | Adjust the lendth of the Clear Wire. |
| | Check if the Ratchet Wheel is properly fed. | If a clearance exists between the Ratchet Wheel and the Feed Pawl a Punch Card cannot be fed smoothly, causing poor needle selection to occur. | Adjust the Stop Lever Holder and Feeding Lever. |

| Nature of Trouble | Places to be inspected | Causes | Remedies |
|---|---|---|---|
| Poor Needle Selection appears every 24th stitch. | Main & Sub Drums.<br><br>Touch Levers. | 1. Breakage of Drum Piece.<br>2. Inactiveness of Drum Pieces.<br>3. Loss of Drum Piece.<br>4. Loss of Steel Ball.<br>5. Rebound Spring is bent.<br>6. Inactiveness of Touch Levers.<br>7. Touch Lever Spring is weak. | Replace Drum Piece.<br>Replace Drum Piece.<br><br>Replace Drum Piece.<br>Replace Steel Ball.<br>Replace Spring.<br>Check Touch Lever Shaft.<br>Replace the Spring. |
| Needle Butts Collide with Carriage. | Drum Unit. | The mutual position of the Needle Bed Rack is incorrect along with the Needle Bed Grooves and Drum Unit. | Adjust the position of the Drum Unit. |
| | The clearance between the Rail and Needle Bed Rack. | If the clearance between Rail and Needle Bed Rack is incorrect, the Needle Butts will collide with the Separation Cam. | Adjust the Needle Bed Rack and Drum Unit. |
| Weaving cannot be achieved. | Check if the Weaving Brush is correctly positioned and W.P. clearance is also correct. | In case the Weaving Brush is not correctly placed or the W.P. Clearane is not correct, it becomes impossible to weave due to an insufficient pressure on the weaving yarn. | Adjust the Weaving Brush to be right in position and adjust the W.P. Clearance. |

| Nature of Trouble | Places to be inspected | Causes | Remedies |
|---|---|---|---|
| Carriage is Heavy during Operation. | Check if the Rail of the Needle Bed, Slider, Carriage Pipe and Cams etc. are properly lubricated. | In case the Rail, Slider Carriage Pipe and Cams etc. are poorly lubricated, the Carriage becomes heavy during operation. | Clean the soiled surfaces of those parts and apply the machine oil contained in the Accessory Box. |
| | Check the position of the Fabric Pressers. | If the edge of the Fabric Pressers are too high or come in contact with the Sinkers, the Carriage gets heavy to operate because of an increased resistance upon a Fabric Presser. | Adjust the P.S. Clearance. |
| Latch and Hook of Needle easily bend. | Yarn Feeder. | In case the Yarn Feeder is positioned too low, you will get the hook of a needle caught by the Yarn Feeder when knitting at a higher speed. | Adjust the Y.N. Clearance. |