Standard Horizon SRN-9x Suction Feed Rotary Numbering Machine

Instruction Manual

SERVICE MANUAL

Standard - Morgana FRN-6 and SRN-9x

Read this manual, and thoroughly familiarize yourself with its contents before operating or servicing this equipment.

STANDARD

Morgana

FRN & FSN

ROTARY NUMBERING MACHINES

SERVICE MANUAL

i ..... Introduction

The purpose of this Manual is to explain the procedure for dismantling and re-assembly of the major assemblies on both the Friction-Feed and Suction Feed Rotary Numbering Machines.

All the engineering adjustments are shown at the end of each relevant section.

Operator's adjustments and routine maintenance are explained in the appropriate Operators Guide which should always be used in conjunction with this manual.

It is always a good idea to have a copy of the machines Illustrated Parts Manual available when servicing, as its illustrations provide an invaluable reference to the construction of the individual assemblies used to build the machine.

ii ..... Fasteners

Most of the pulleys on the machines use dog-point screws, which engage in holes in the shafts to ensure reliable drive. They must be fully withdrawn prior to dismantling.

All threaded fasteners are ISO-Metric & all nuts are ISO-Metric Hexagon. All screws are hardened high tensile steel.

Cap Head, Button Head, Socket Countersunk, Shoulder Bolts and Grub-Screws have internal hexagon drives which require ISO-Metric Hexagon Wrenches (Allen Keys). Ball Drivers may be used, but care should be taken -particularly when releasing screws for dismantling- to avoid breaking the driver as they cannot cope with full tightening torques.

NOTE..... Do not substitute fasteners with low grade alternatives which may fail or become irremovable.

Pan Head and Cross-Head Countersunk Screws all have ISO-Metric Taptite Threads and Pozi-Drive Recesses. Use No.2 Point Pozidriv or Supadriv Drivers for all screws M4 & above, and No.1 Point Drivers for M3 & below.

WARNING
DO NOT USE PHILLIPS DRIVERS - THESE WILL DAMAGE THE SCREWS & MAY SLIP, CAUSING DAMAGE OR INJURY.

iii ..... Identification

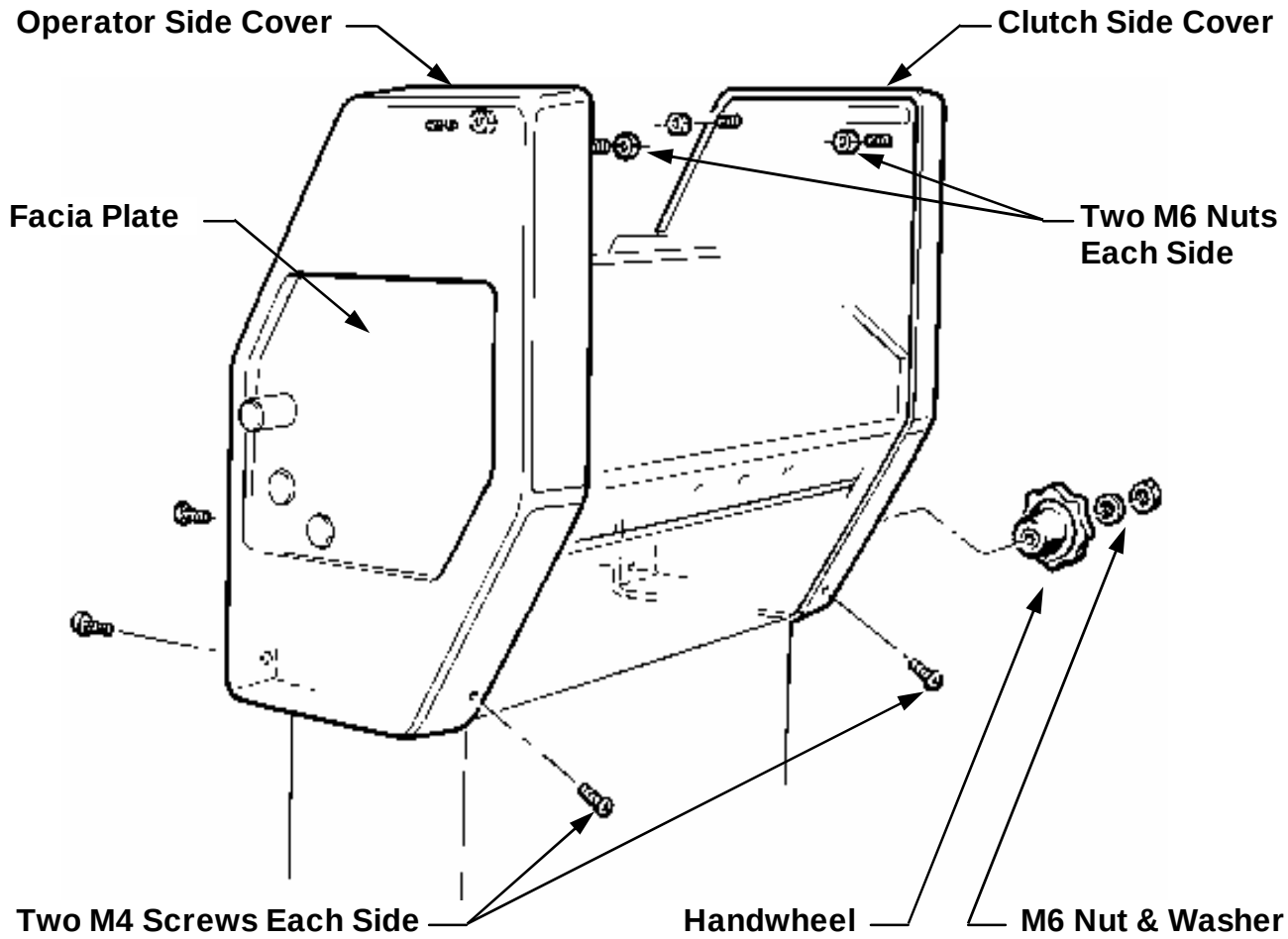
For general identification of areas of the machines, the following terms are used:-

Operator Side

Clutch Side (opposite Operator Side)

Feeder End (on your Left)

Delivery End (on your Right)



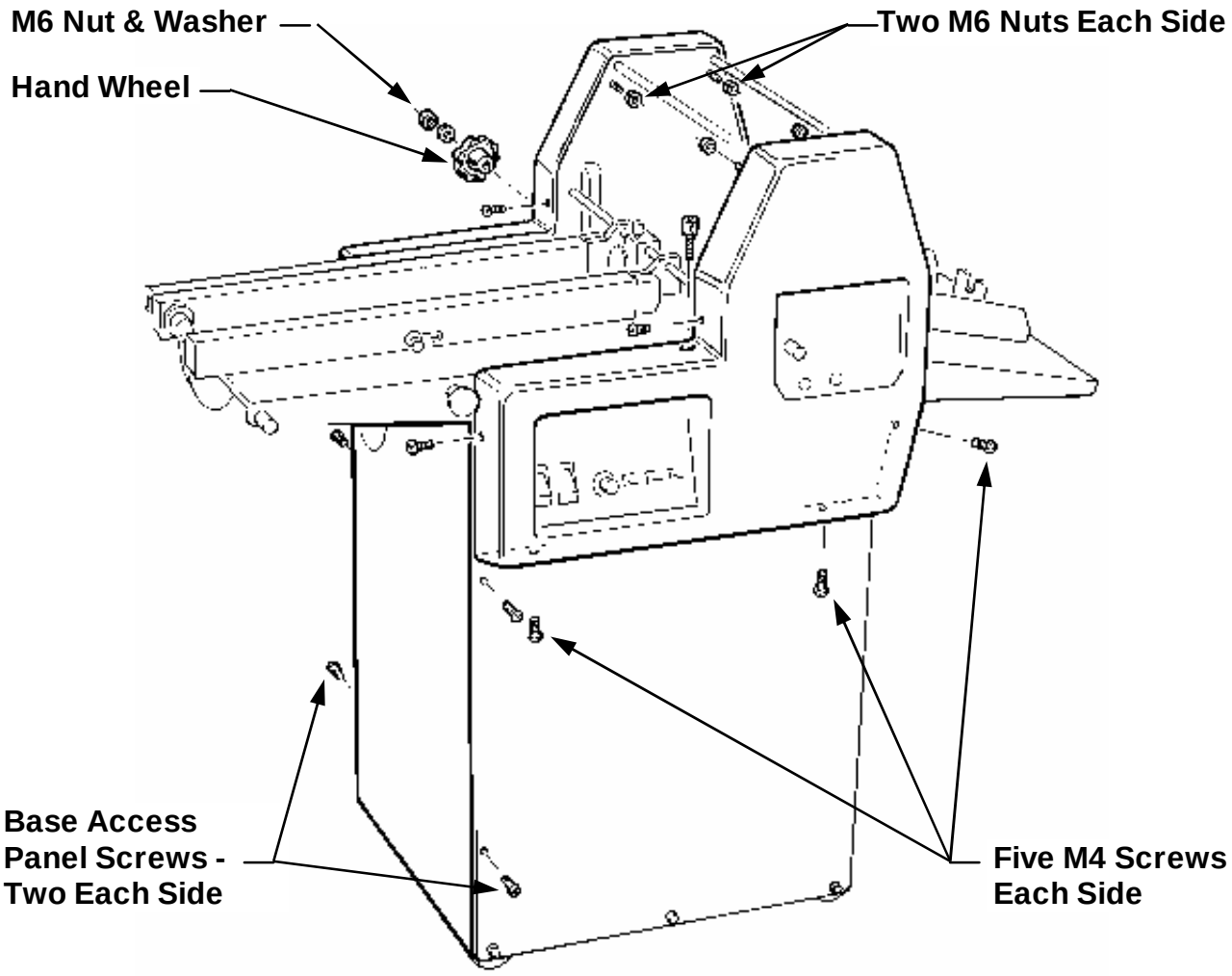
Side Covers - Friction Machine..... Fig 1.11

1.1 ..... Friction Machine

Each of the side covers is secured by two screws and two nuts as shown in Fig.1.11. Before removing the clutch cover, remove the handwheel, using a 10mm socket wrench.

After releasing the operator side cover, but before removing it completely, you will need to dis-connect the 6 way Trident plug *(which connects the switches on the facia plate to the control system)* from it's socket on the side frame under the cover.

Note.....Do not allow dirt to enter the handwheel bore as it contains a one-way clutch which operates directly on the shaft.



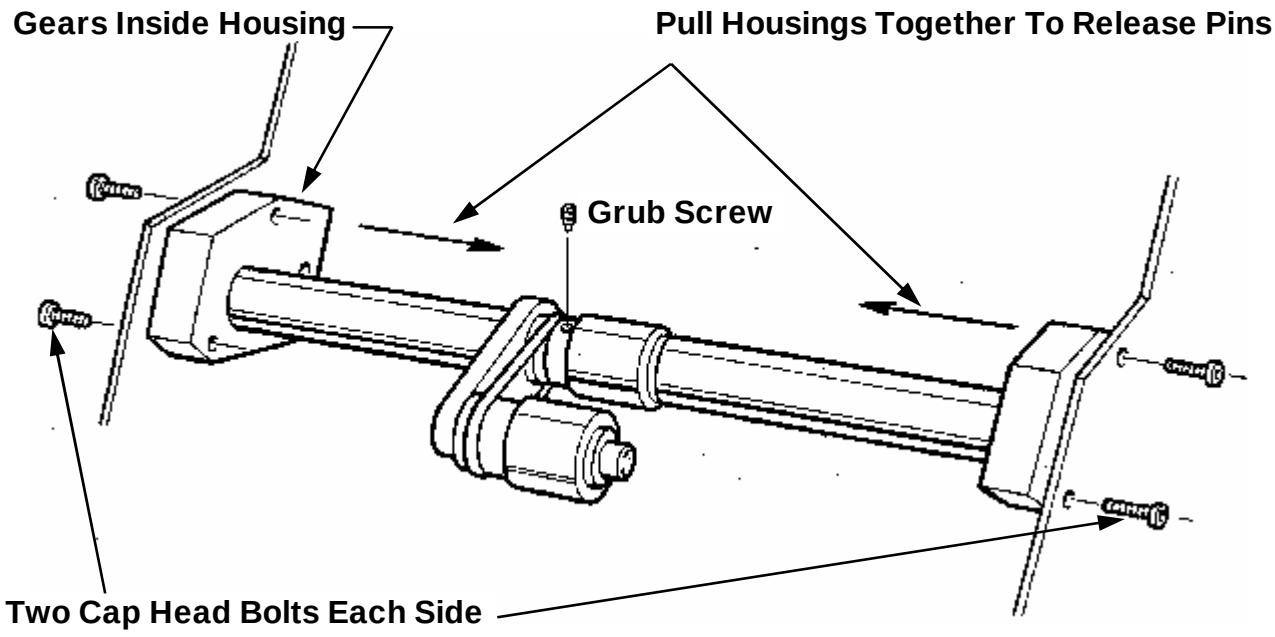
Covers - Suction Machine..... Fig 1.21

1.2 ..... Suction Machine

Each side cover is secured by five screws and two nuts as shown in Fig.1.21. Before removing the clutch side cover, remove the handwheel, using a 10mm socket wrench.

Note ..... Do not allow dirt to enter the handwheel bore as it contains a one-way clutch which operates directly on the shaft.

The base access panel is removed by releasing the four screws, (two through each side frame) pulling the panel out and then upwards. Take care not to pull the fan lead which may be easily unplugged from the control box, inside the machine. (See section 17 on page 53)



Friction Feed ..... Fig 2.11

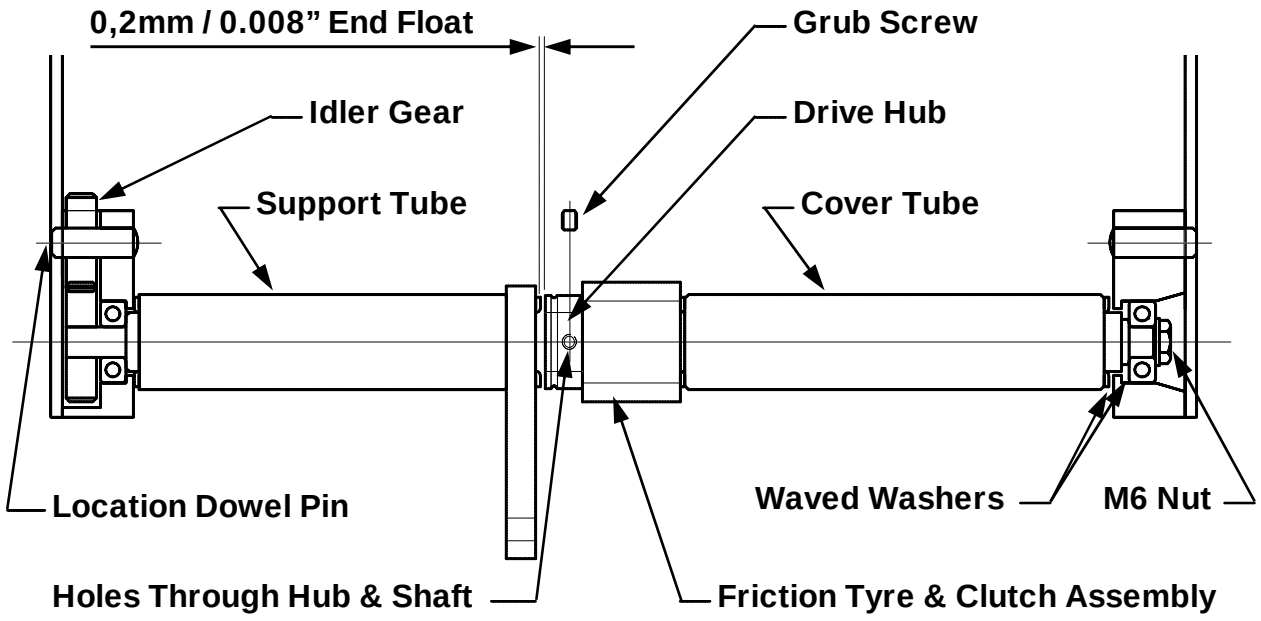
2.1 ..... Friction Feed Drive Shaft

The friction feed drive shaft is removed after unscrewing the four cap head bolts as shown in Fig. 2.11. The bearing housings are located on dowel pins and must be pulled inwards as shown to release them but take care not to lose the idler gear and washer from inside the clutch side housing.

To replace the friction feed tyre, the friction feed shaft is dismantled as follows:- (See Fig. 2.21)

-Remove the grub screw from the drive hub and rotate the drive hub to align the holes in both hub & shaft so that a 2.5mm hexagon wrench / allen key will pass through both. This will enable you to hold the shaft whilst releasing the M6 nut at the end, (using a 10mm socket wrench) and withdraw all components from the shaft.

Note:.....During dismantling and certainly before re-assembly, ensure that all components are kept clean and handled carefully to avoid damage. The drive has to be sensitive to all stocks - particularly lightweight NCR -& it's sensitivity will be impaired if the components are



Drive Shaft ..... Fig 2.21

contaminated or damaged.

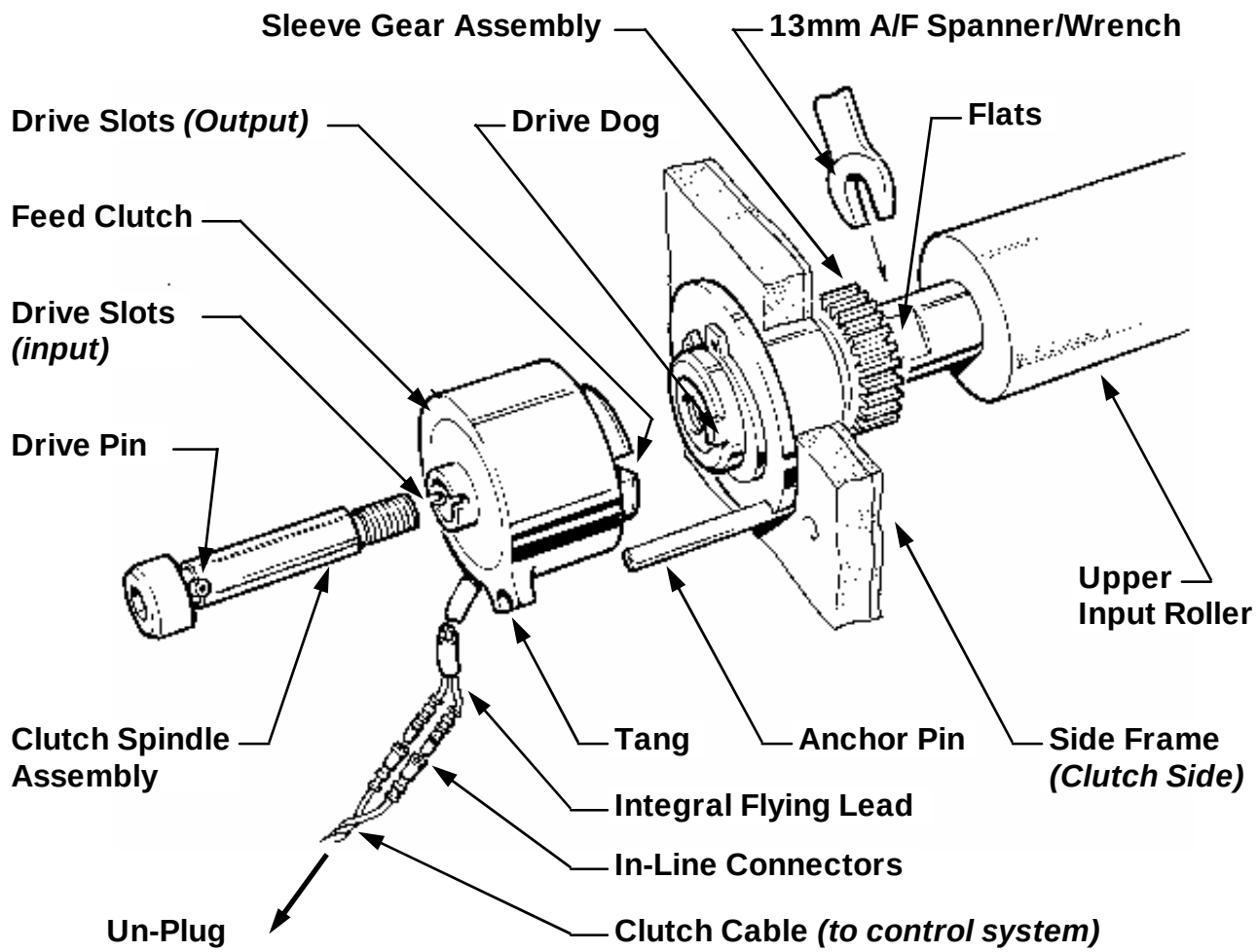
2.2 ..... Drive Shaft Adjustment

Re-assemble the shaft in reverse order but set the position of the drive hub only after the assembly has been fitted into the machine and the four cap head bolts fully tightened. (See Fig. 2.11).

It is important that the drive hub is positioned laterally on the shaft so that the support tube has 0.2mm or 0.008" of sideways movement *(end float)* so tighten the grub screw so that it is radially well clear of the hole in the shaft.

Note ..... If the grub screw is positioned too close to the hole in the shaft, it may be impossible to achieve the correct amount of clearance for the support tube.

Note ..... Take care to make sure the one-way clutch within the friction tyre operates in the correct direction, & waved washers have been replaced in their correct positions.



Feed Clutch..... Fig 2.31

Note.....It's worth consulting the relevant section in the appropriate illustrated parts manual to ensure that this assembly is correctly re-constructed.

2.3 ..... Feed Clutch

The feed clutch is removed from the machine by unplugging it's wires (taking care not to strain them), and using a 5mm allen key to unscrew the clutch spindle assembly. (Hold the input roller using a 13mm spanner/wrench on the flats while releasing the spindle).

Upon re-assembly, ensure that the tang on the clutch back-plate engages with the anchor pin, the drive dog on the sleeve gear

3.1 ..... Vacuum Roller Assembly *(See Fig. 3.11 Overleaf)*

The vacuum roller is mounted on the bed stiffener beneath the loading table. To replace the vacuum roller, the loading table, manifolds, and papergate must be removed.(See Fig 3.11)

-Remove the side-covers and the base access panel. (See fig.1.21)

-Remove the two M8 bolts (item 1) which secure the papergate shaft-and disconnect the hoses from the manifold elbows.

-Remove the four M6 Hex Head screws (item 2) which secure each manifold mounting bracket to it's mounting link.

-Remove the hose support beam, by releasing it's two fixing screws (item 3) and the three nuts (item 4) below the loading table.

-Remove the two M4 nuts (item 5), which secure the underside of the loading table to the bed stiffener.

-Remove the six M8 bolts (item 6) which secure the loading table to the side frames and lift the loading table, manifolds and papergate off the machine as one unit.

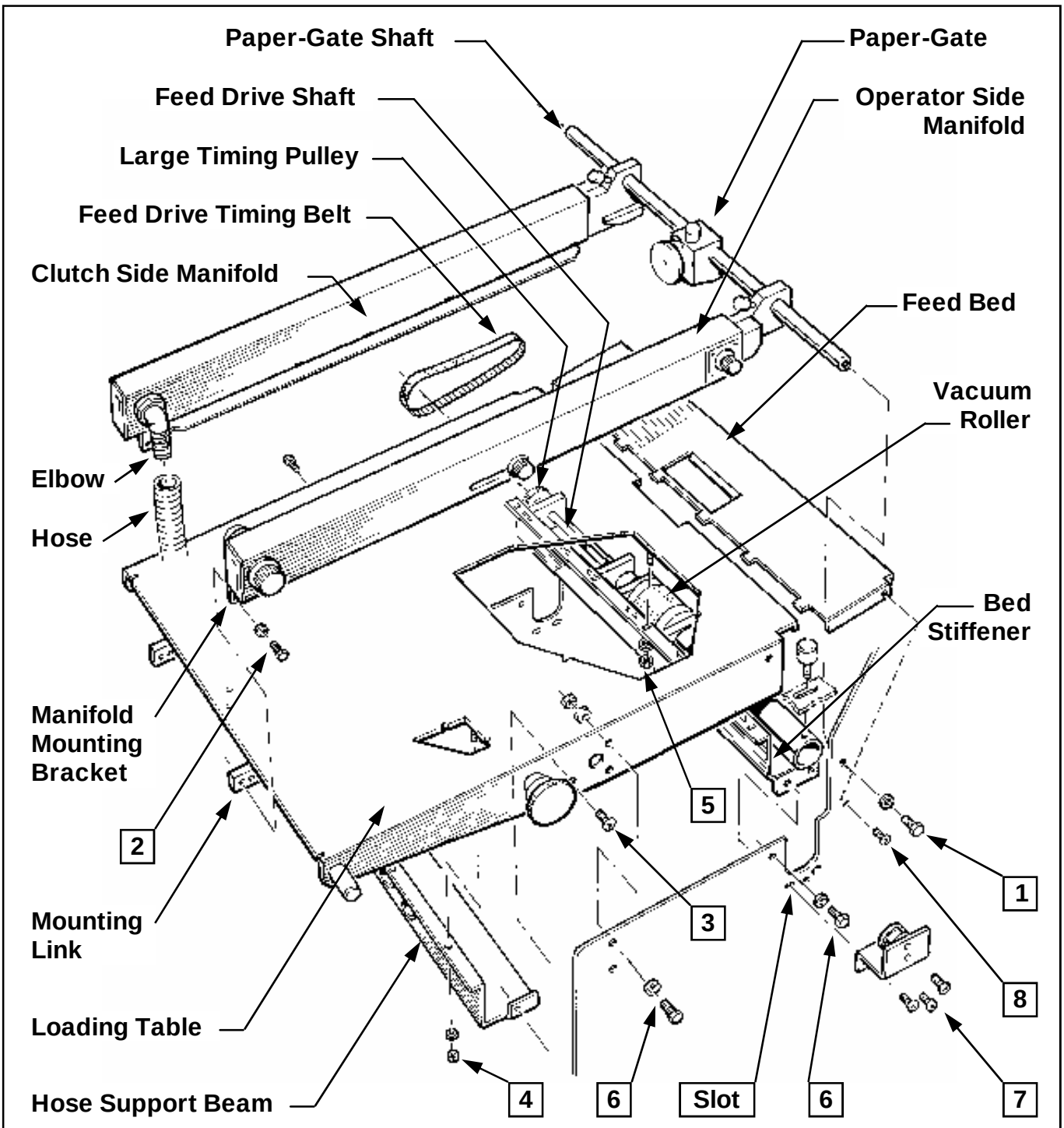
-Remove the feed drive timing belt by winding it carefully off the larger of the two timing pulleys.

-Remove the five screws (item 7) from the bed stiffener (three on operator side & two on the clutch side), and the two screws (item 8) from the feed bed.

-Cut all cable ties (taking care not to damage the cables) and lift the vacuum roller assembly and feed bed from the machine.

-Remove the vacuum roller from the subframe by removing the hose & connecting tube and then releasing the 4 screws holding the two roller support blocks (See fig.3.31 on page 14)

Replacing the assembly is a reversal of the above but care should be taken to align all fixing holes *BEFORE* attempting to replace the fasteners as damage to the threads will result from mis-aligned components.



Vacuum Roller Assembly ..... Fig 3,11

3.2 ..... Vacuum Roller Adjustment

If the vacuum roller is not set parallel to the input rollers, paper will always be driven to one side whilst it is feeding.

In order to identify this problem use the following procedure :-

-The op side manifold must be set accurately by measuring it's position on the loading table. (Do not rely on the printed scales because they may not be accurate enough due to limitations of the printing process).

-Load some paper and set the clutch side manifold so that there is no side-ways movement of the paper.

-Run a few sheets with the numbering '*ON*', and watch carefully the edge of the sheet whilst it is feeding.

The edge should always run straight as this indicates that the vacuum roller is correctly adjusted.

If the edge runs off to one side while the suction is on, and then runs straight whilst the suction is off (listen to the sound of the suction while watching the edge of the sheets), the vacuum roller will require adjusting.

The vacuum roller assembly is set at the factory with it's adjustment as far forward as possible (to the delivery end of the machine).

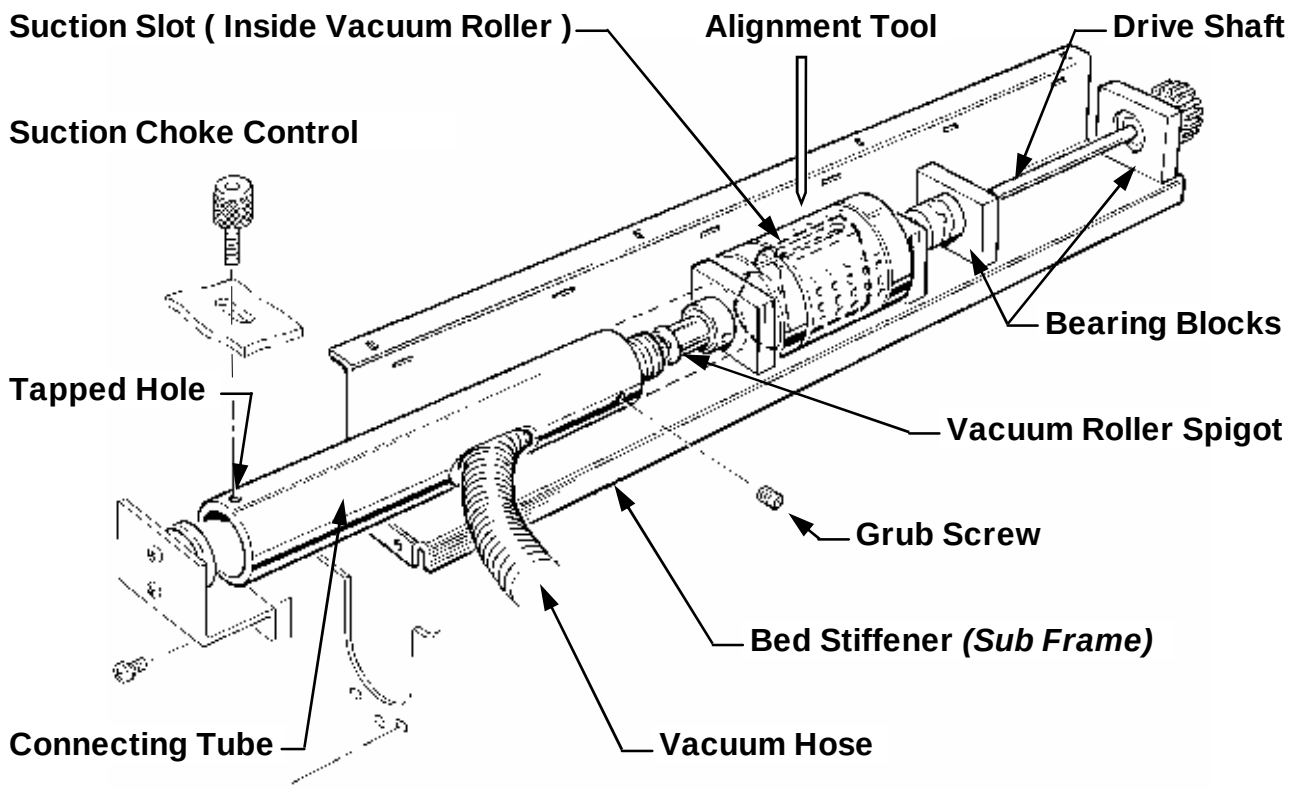
This means that if the sheet edge runs towards the operator side, the clutch side of the vacuum roller assembly must be adjusted rearwards (towards the feeder end).

Conversely, if the sheet runs away from the operator side, the operator side of the vacuum roller assembly must be adjusted rearwards (towards the feeder end).

The vacuum roller assembly is adjusted by re-positioning the screws (item 7) in the slots in the side-frames. The M4 nuts (item 5) under the loading table will also have to be released before adjusting the vacuum roller assembly. (Ensure they are re-tightened after adjustment is completed).

The feed drive timing belt may also require adjustment (See section 3.4).

Note ..... Don't attempt to stretch the drive belt over pulley flanges.



Vacuum Hose ..... Fig 3.31

3.3 ..... Vacuum Hose

To disconnect the vacuum hose, remove the grub screw as shown in Fig.3.31 and slide the connecting tube over the hose. The hose is then twisted off the vacuum roller spigot.

After replacing the hose & connecting tube the grub screw in the tube *MUST* be locked-up so that the suction choke control knob is in vertical alignment with the suction slot (inside the vacuum roller).

To achieve this, an alignment tool *(a piece of ¼" dia. (Ø6,35mm) bar at least 2" / 50mm long will do)* may be *carefully* inserted through one of the holes in the vacuum roller and into the suction slot.

The suction choke control knob may now be temporarily screwed into it's tapped hole in the connecting tube and brought into vertical alignment with the alignment tool in the vacuum roller before finally locking the grub screw tight.

Note ..... Remove the tool and the knob before continuing assembly

3.4 ..... Vacuum Belt Adjustment

The vacuum drive belt takes the drive from the lower input roller to the feed drive shaft and is tensioned by adjusting the bearing blocks.

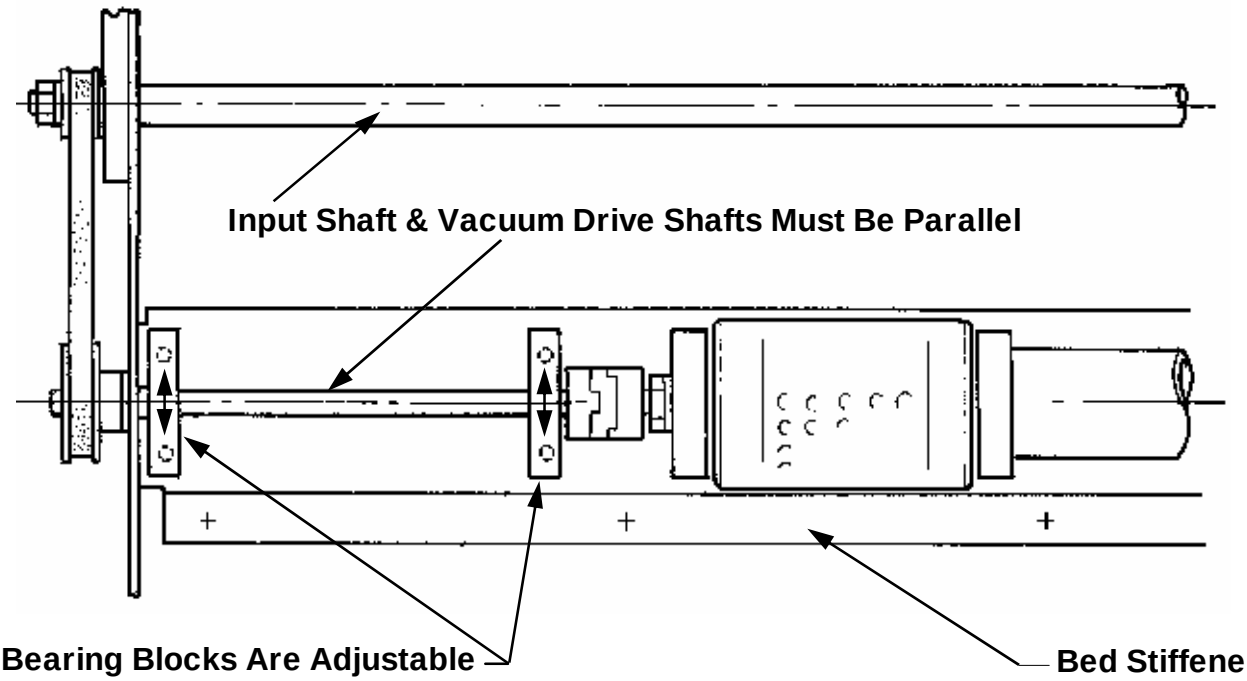
Release the two screws in each bearing block and move the screws in their slots until the belt is tensioned.

Care must be taken to ensure that the vacuum drive shaft remains parallel to the input shafts. (When the feed drive shaft is parallel, all the adjusting screws will be in similar positions in their slots.)

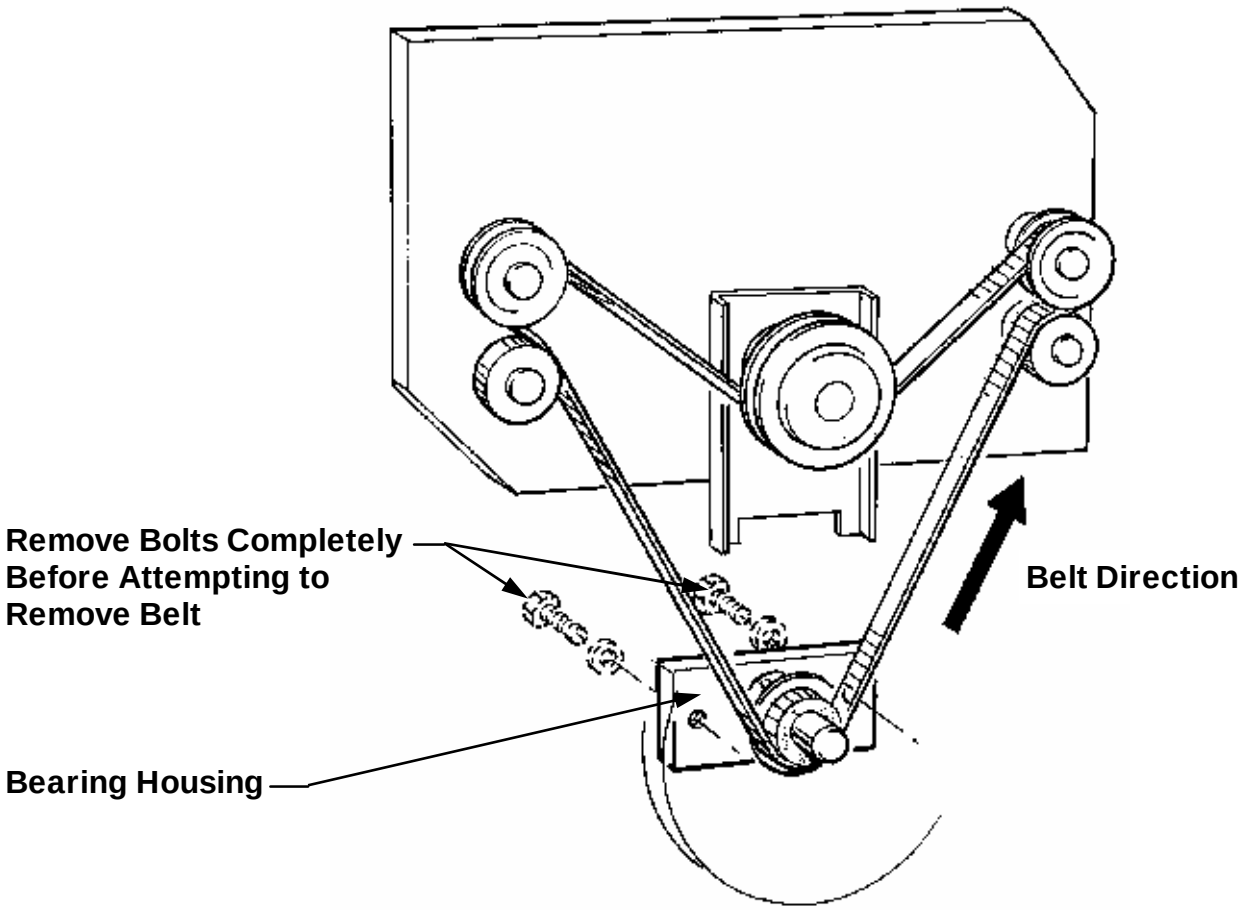
Failure to set the feed drive shaft correctly will result in the toothed belt tracking badly and may result in premature belt failure.

WARNING

DO NOT ADJUST THE BELT BY MOVING THE BED STIFFENER AS THE RESULTING MISALIGNMENT WILL CAUSE FEEDING PROBLEMS.



Vacuum Belt Adjustment..... Fig 3.41



Twin - Grip Drive Belt..... Fig 4.11

4.1 Twin Grip Drive Belt

Remove the operator side cover to gain access to this belt which is removed only after taking out the bearing housing bolts. This allows the bearing housing more travel to give extra slack on the belt which may then be wound off the pulleys in the direction shown. (See fig.4.11).

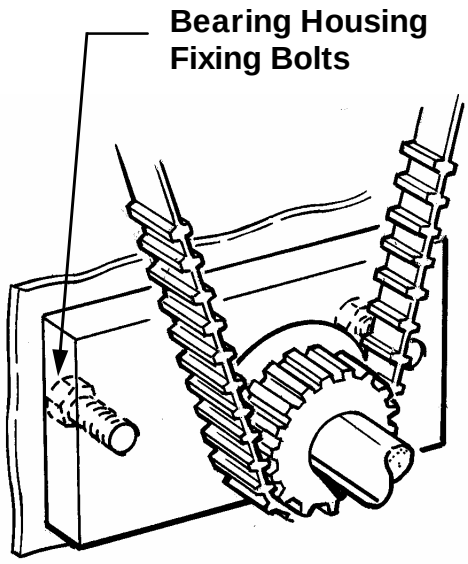
When replacing the belt, wind it back on to the pulleys in the same direction, being careful not to strain the belt.

WARNING

DO NOT ATTEMPT TO REMOVE OR REPLACE THE BELT WITHOUT FIRST REMOVING THE BOLTS.

4.2 ..... Adjustment - Twin Grip and Clutch Drive Belts

These belts are tensioned by adjusting the bearing housings after slackening their fixing bolts. *(see note below)*



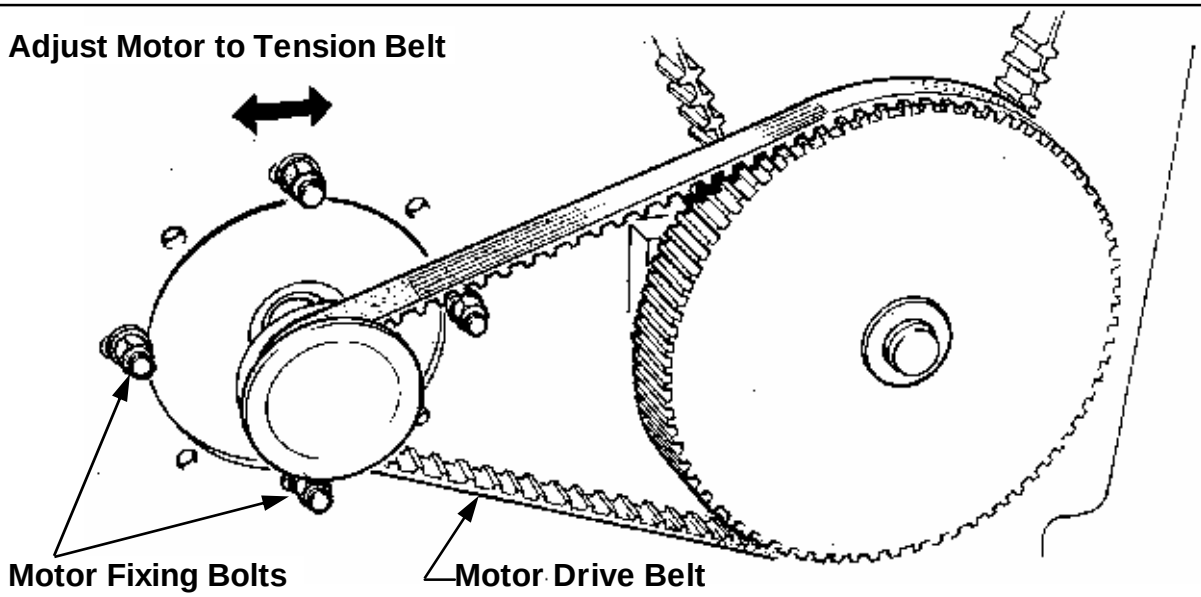
The fixing bolt nearest to the feeder end of the machine acts as a pivot whilst the delivery end bolt runs in a slot in the side frame and allows adjustment to be made.

The belts should not be over tensioned, but note that an under tensioned belt will cause poor registration.

4.3 ..... Adjustment - Motor Drive Belt

The motor drive belts are tensioned by adjusting the motor position after slackening the motor fixing bolts which all run in slots in the side frame.

Note ..... On the friction machine, the clutch side bearing housing is on the outside of the side frame and the clutch drive



Motor Drive Belt..... Fig 4.31

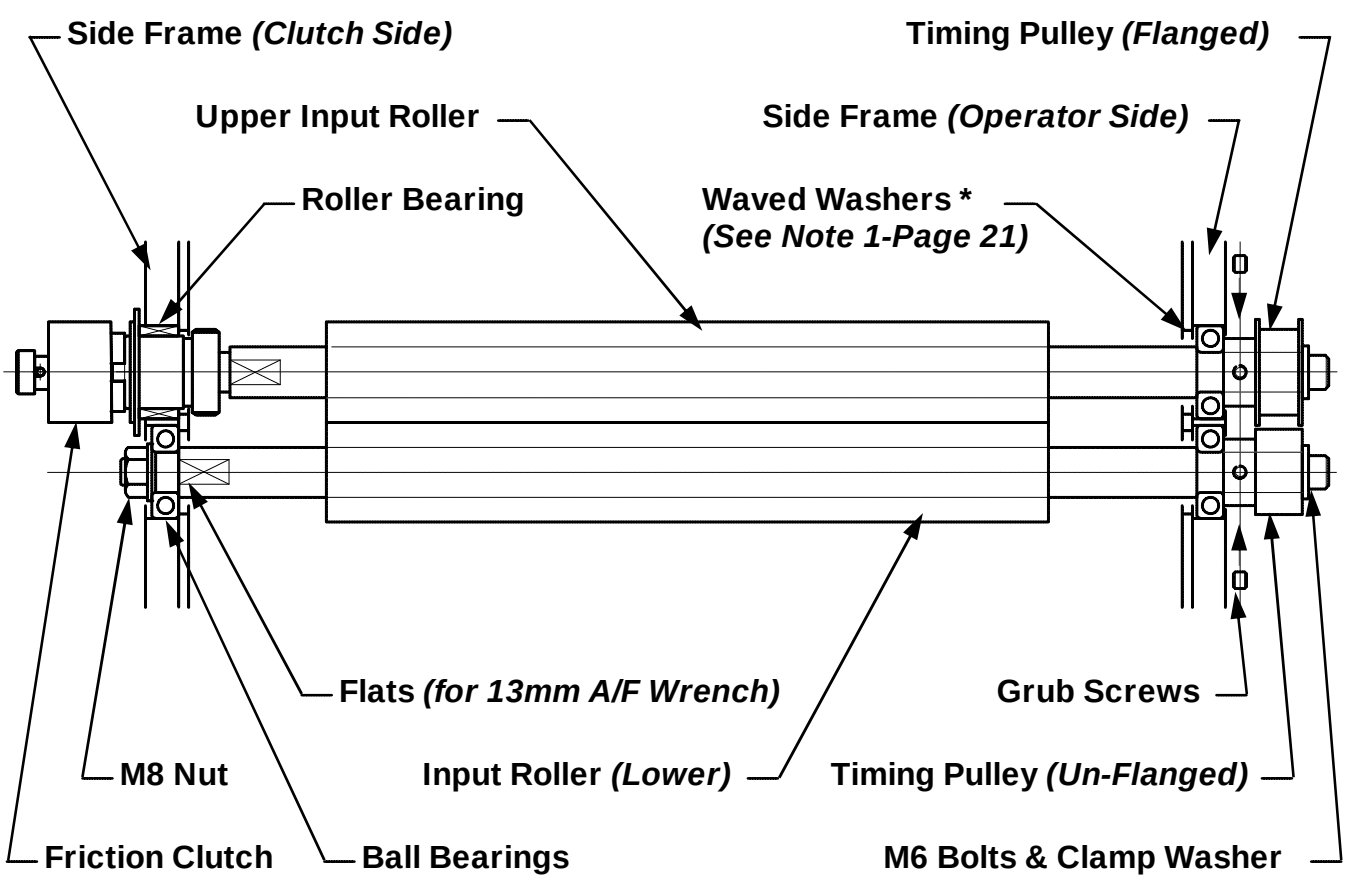
5.1 ..... Input Rollers - Dismantling

Before dismantling the input rollers, remove the twin grip belt (Section 4) and, on the friction machine, the feed clutch (Section 2)

Remove the M8 nuts from the ends of the input rollers, (clutch side), and, on the suction machine, the feed drive belt and pulley from the lower input roller. Work on one roller at a time, starting with the top roller.

Remove the pulley from the operator end of the roller by releasing the M6 bolt in the end of the roller shaft and the M4 grub screws in the pulley.

Note:.....In order to stop the rollers turning, use a 13mm spanner / wrench on their flats.



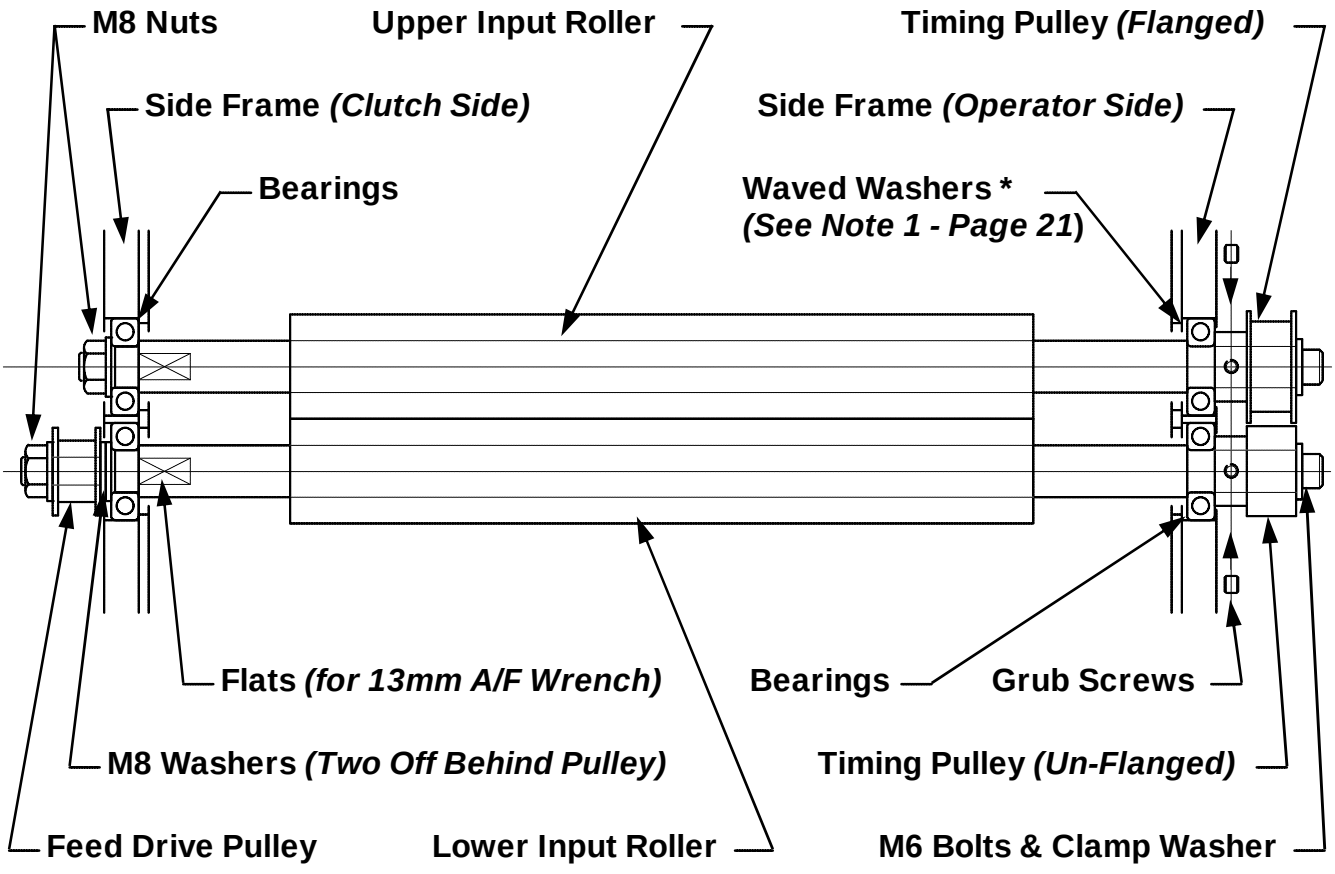
Input Rollers - Friction Machine..... Fig 5.11

Slide the roller assembly out of it's clutch side bearing towards the operator side of the machine and remove the operator side bearing and waved washers* *(see Note 1 on page 21)* from the end of the shaft.

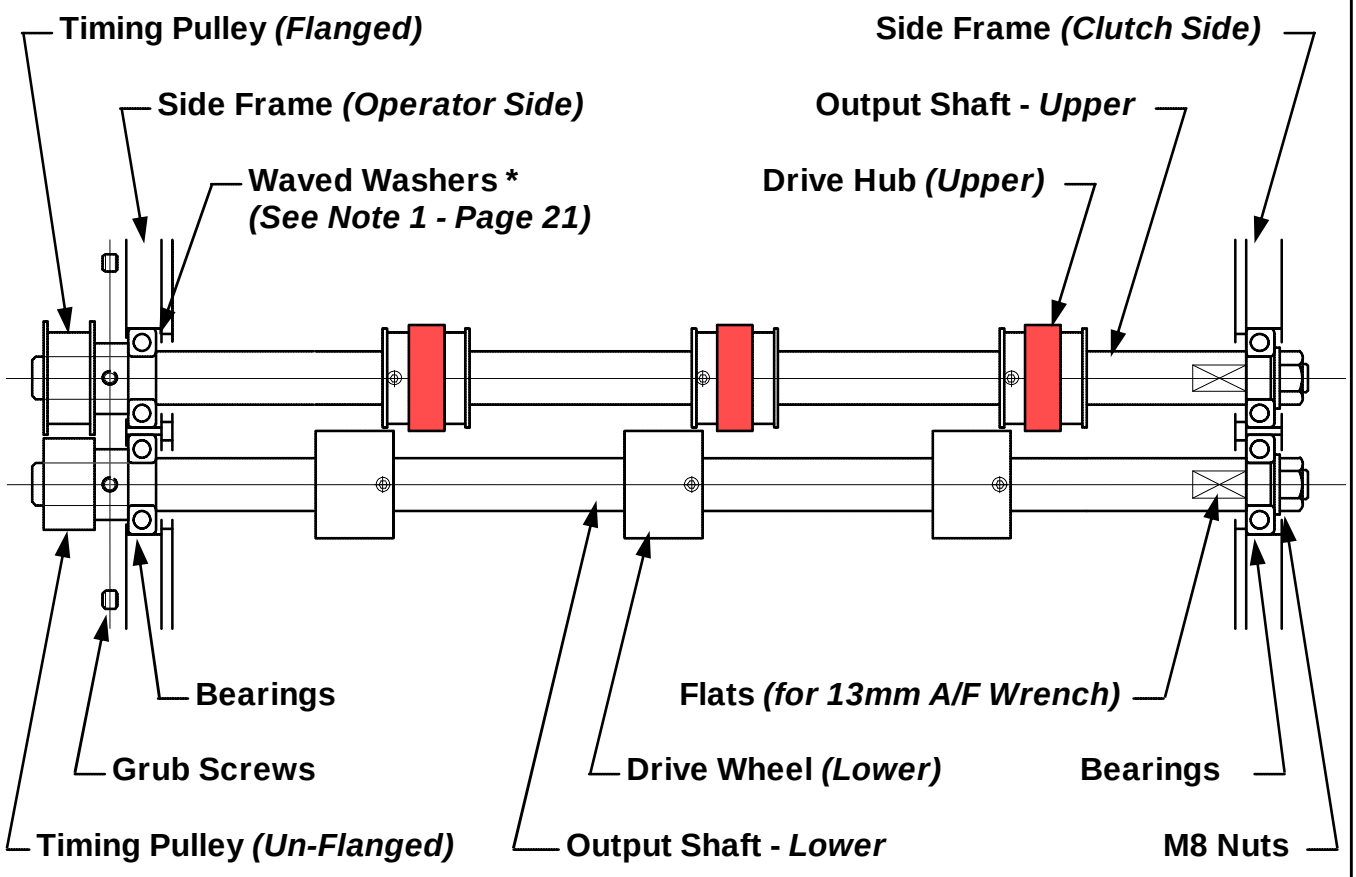
Finally swing the clutch side of the roller forward & clear of the sideframe and withdraw the operator side of the roller from the machine. The same procedure may now be used for removing the bottom roller.

Re-assembly is carried out in reverse order but take care not to force anything.

Note ..... Ensure that all parts are clean and free from damage before re-assembly, particularly the clutch end of the top roller shaft on the friction machine as it is hardened and runs directly in the sleeve gear needle roller bearing.



Input Rollers - Suction Machine ..... Fig 5.12



Output Shafts..... Fig 6.11

6.1 ..... Output Shafts - Removal

Remove the twin grip drive belt (See section 4.1), and any perforating, slitting or scoring blades and anvils from the shafts.

Slacken all the upper and lower drive hubs by using a 2mm allen key in the grub screws & remove the M8 nuts from the ends of the shafts.

Note:.....To stop the shafts turning, use a 13mm spanner/wrench on the flats.

Slide the lower output shaft out of its clutch side bearing towards the operator side and remove the lower drive hubs while doing so. (See following note). Unlike the input rollers the output shafts are drawn through the operator side frame completely. Repeat this procedure for the upper output shaft.

Note: ..... Before removing the upper & lower hubs from their shafts, study the hubs and note the orientation of the tapped holes in the hub faces. It is important that the orientation is maintained during re-assembly as it will be impossible to follow the setting instructions for perforating & slitting (See the operators guide), if the hubs are incorrectly installed.

Re assemble in reverse order *(see Note above)*, but note that bearings are a slide fit in their housings so if *ANY* force is required, something is wrong and should be investigated before proceeding.

There are no adjustments for the input rollers or output shafts, but you should ensure that the shafts are free to move sideways under the control of their springs *(waved washers or disc springs -Note 1)*.

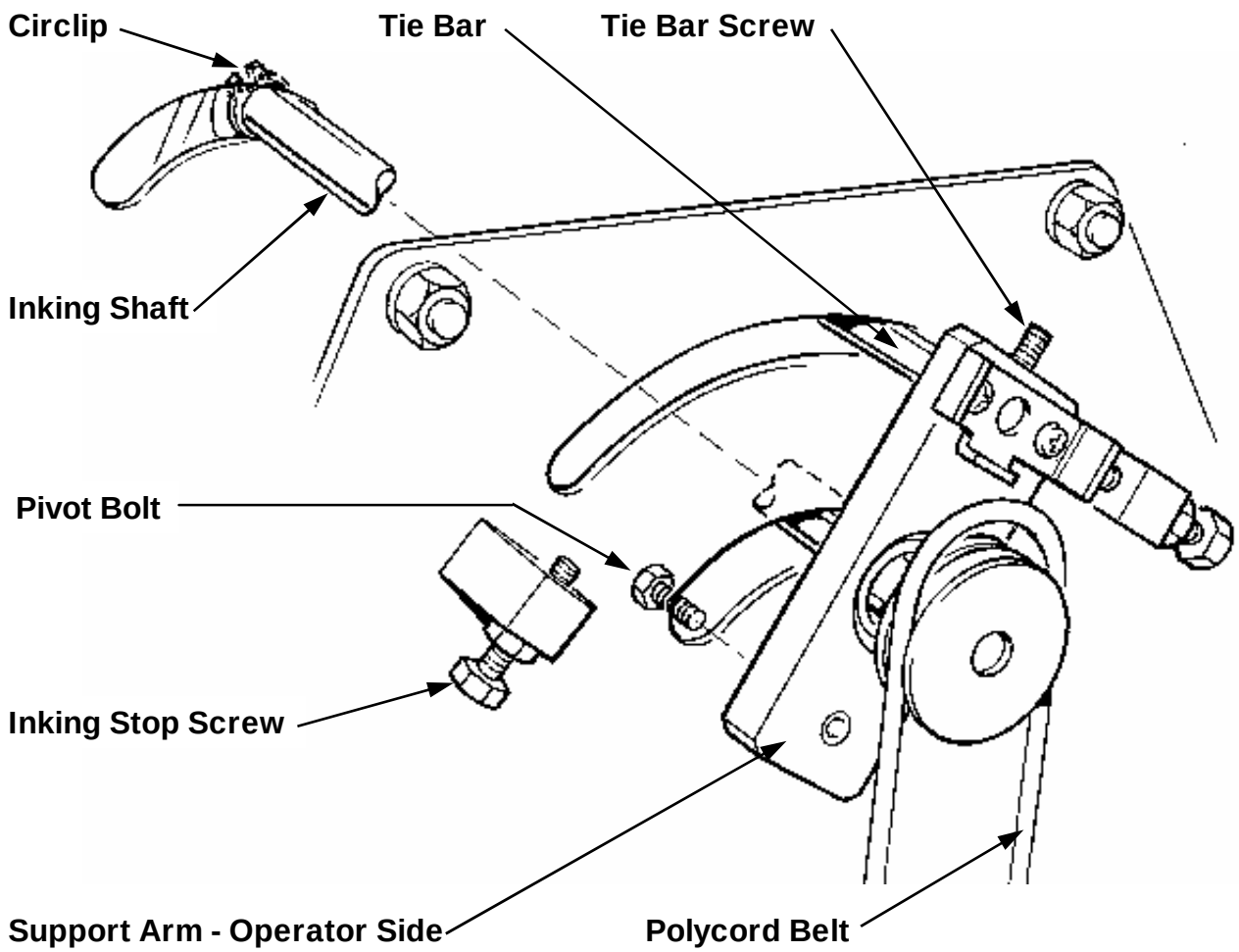
Check this by holding each shaft or input roller in turn & pulling it against it's springs. The shafts should return to their operating positions upon release.*(See Note 3 below)*

Note 1* ... Some machines may have their control springs (waved washers or disc springs) on the clutch side.

Note 2..... Before carrying out this check, you should ensure that any perforating, slitting or scoring units are separated.

Note 3..... Input rollers may not return to their operating position immediately, due to the friction between them so rotate the machine by hand and they should move back within a few turns.

Note 4..... The operator side bearings on the output shafts are a press fit and do not normally need replacing, but if they do, they should be pressed off and on to the shaft using a proper bearing press and following the bearing manufacturers guide-lines.



Inking..... Fig 7.11

7.1 ..... Removal of Ink Transfer Rollers & Shaft

Release the transfer roller clamp screws using a 2mm Allen key.

Remove the green polycord drive belt from the operator side.

Remove the pivot bolt from the operator side only, using a 10mm spanner/wrench.

Remove the tie bar screw *(from operator side only)* using a 2mm Allen key.

Slide the inking shaft together with the support arm towards the operator side. The shaft should slide out of the clutch side bearing (which is retained in the clutch side support arm by the side frame).

Care should be taken to guide the circlip through the radial slot in the sideframe. (The operator side support arm will slide off the tie bar which will remain in the machine).

Remove the circlip and continue to draw the support arm and shaft out of the machine from the operator side whilst sliding the transfer rollers off the shaft.

Care should be taken not to damage the shaft on the side frame slots, as this will cause the transfer rollers to jam on the shaft.

Re-assembly is a reverse of the above, but don't forget to replace the circlip after re-installing the transfer rollers, as it retains the shaft laterally between it's bearings.

If you experience any difficulty in sliding the shaft into the clutch side bearing (which remained in it's support arm during dismantling), use a 6mm cap head bolt & large washer to draw the shaft into the bearing. *DO NOT USE A HAMMER.*

7.2 ..... Adjustment - Transfer Roller Pressure

Remove the green polycord drive belt from the operator side.

Position one transfer roller near each of the two side-frames & set a numbering collar below each transfer roller.

Set a numbering head loosely on a collar and, holding it firmly seated to the base of the collar with your hand, adjust the inking stop screw until a slight contact is made between the numbering head and the transfer roller.

Repeat for the opposite side and double-check the adjustments as adjusting one side may affect the opposite side.

Move the inking assembly to the secondary position (or primary position - see operators guide for details), and repeat the steps above.

Finally increase the pressure at each inking stop screw by 1½ turns (counter- clockwise, viewed from head end of screw).

8.1 ..... Numbering Registration

The main clutch installed in all machines is an incremental control unit and contains four wrap springs.

Like all precision components it has to work to a tolerance which is ± ½° and this will allow for a maximum registration error of 1,2mm / 0.048”

Whilst a faulty clutch or an incorrectly adjusted clutch will cause registration problems, there may be other causes which should be investigated before dismantling the clutch. Points to check that will cause registration problems are divided into three sections as follows :-

8.2 ..... Operational Problems

The feeder should be set so that the paper feeds regularly and reliably, and the job should have been printed accurately, so feed paper through twice to ascertain such stock errors and remember that the machine speed affects the printing position and should not be adjusted whilst running a job.

Badly curled sheets, poor printing registration, inaccurate paper cutting and sets with a very wavy lead edge, can cause registration problems. Again, ignore any problems with such stocks and ascertain this by numbering flat, well cut stock, twice.

If the numbering head is not fully secured on it's collar, or the numbering collar is not fully secured to the shaft, registration errors will occur.

If the nip wheel (on friction machines) or the papergate (on suction machines) is set too loose, double sheet feeding may result and cause registration problems.

8.3 ..... Machine Problems

If the twin grip or clutch drive belts are slack, or there is a loose drive pulley, especially on the main drive shaft, registration errors are likely to occur.

The small pulley that drives the clutch belt (under the cover, next to the handwheel), has it's grub screw outside the cover and can be released by the operator, so must therefore be carefully checked.

Loose pulleys may be detected by holding the large clutch pulley whilst carefully trying to turn the machine backwards and forwards by hand.

Insufficient drive on the paper between the input rollers will also cause registration errors so wind a sheet between the rollers while holding the paper tight to see if this is the case. Check for a complete revolution of the rollers to check for any low spots on the rollers.

Due to the input rollers manufacturing tolerances, some eccentricity (maximum of 0,03mm / 0.12") is inevitable, but it's effects can often be minimised by adjusting the relative radial position of the upper and lower rollers.

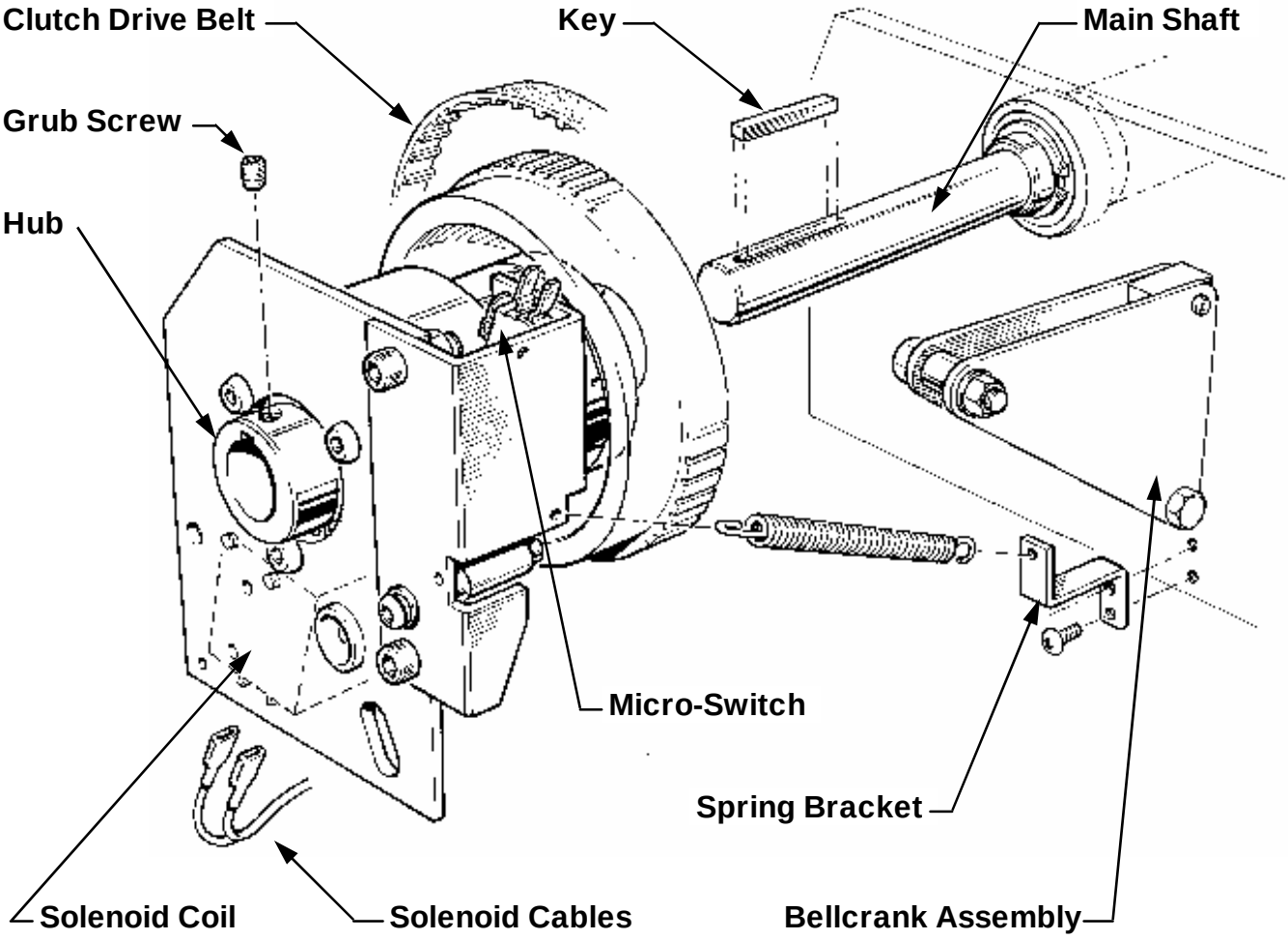
To carry out radial re-positioning of the input rollers, remove the twin grip belt (see section 4) and turn each input roller in turn until the highest point is at the top. Hold the rollers in this position and replace the belt.

Note: ..... This procedure is only likely to be necessary if the input rollers are worn and can only be considered as a temporary measure.

Also check for loose or rough parts that may impede the paper travel, including a sticking wheel on the hold-down wheels. Lift hold-down wheels clear of the platen and spin them to ensure there are no tight spots.

8.4 ..... Clutch Problems

Registration errors caused by clutch problems such as a loose securing screw or the over-travel or actuator requiring adjustment, are described fully in section 9 but don't forget that the clutch unit does have a working tolerance as stated at the beginning of this section.



Clutch Assembly ..... Fig 9.11

9.1 ..... Removal of the Clutch Assembly

Remove all numbering heads from the machine, (*to avoid them swinging down and damaging the platen*) and remove the clutch drive belt from the clutch pulley.

Remove the wiring from the solenoid coil, the rotation sensing micro switch, and the feed clutch on the friction machine and release all cable ties securing the cables to the clutch back plate.

Remove the two screws securing the spring bracket to the side frame and slacken the grub screw in the clutch hub using a 2.5mm Allen key.

Grasp the clutch firmly by it's back plate and pulley (*it's fairly heavy*) and slide it off the main shaft taking care not to lose the key.

9.2 ..... Over-travel - Measurement

The clutch and brake springs have a combined adjustment to ensure that when the brake spring engages, the clutch spring is released.

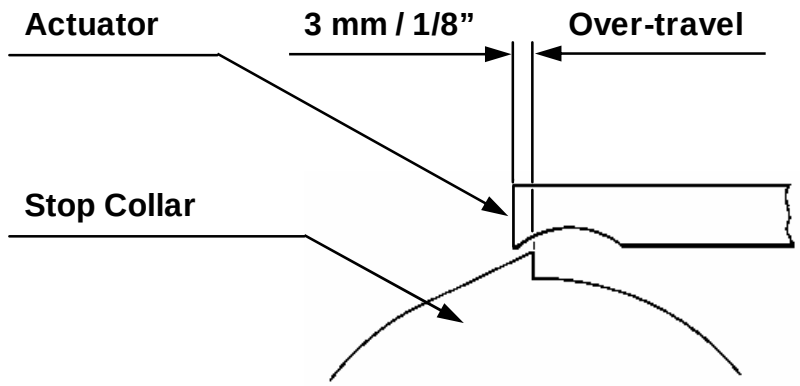
Note ..... This adjustment is critical to the accuracy of the numbering machine and is measured by the over-travel which is checked as follows:-

Rotate the output hub (Fig. 9.31) until the brake spring is fully engaged. (This is the normal stopping position of the clutch).

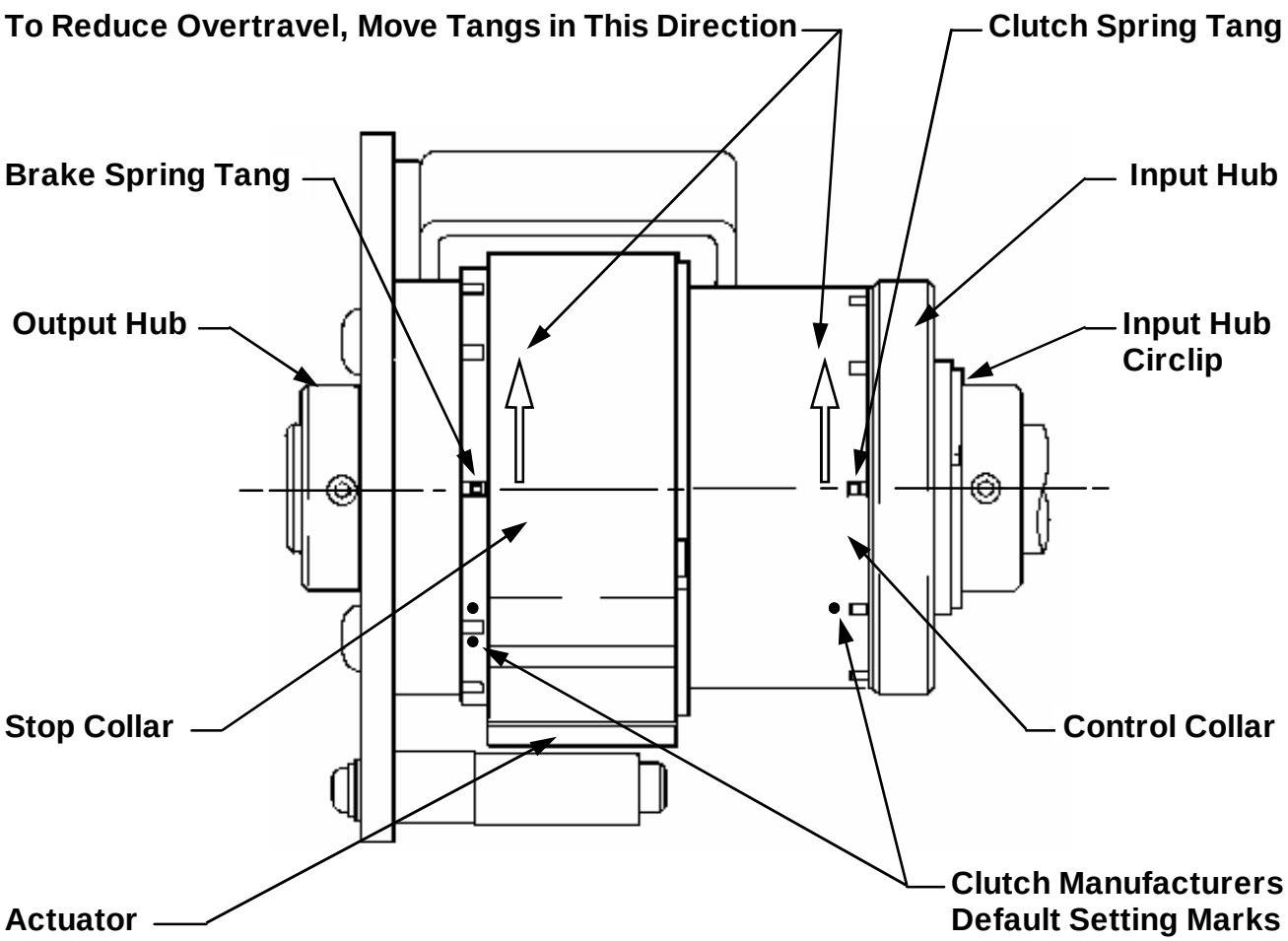
Operate the actuator without rotating any parts. The stop collar will spring forward the distance shown in Fig. 9.21 as over-travel.

This adjustment may be checked with the clutch on the machine by marking the stop collar after completing the two steps above.

The over-travel should be 3mm or 1/8" maximum.



Over-travel Measurement..... Fig 9.21



Over-travel Adjustment (Old Style Clutch).....Fig 9.31

9.3A .... Over-travel - Adjustment (Old Style Clutch)

Remove the clutch from the machine *(See Fig. 9.11)*

Remove the large pulley from the clutch using a 4mm Allen key to release the three countersunk screws and then remove the input hub circlip.

Ensure that the clutch is in it's normal stopping position with the output hub turned hard against the stop collar, and remove the input hub by rotating counter - clockwise.

Operate the actuator *(see section 9.2)* to release the drive springs, and rotate the output hub to locate the tang of the brake spring.

Carefully dis-engage the control collar from the tang of the brake spring and replace the tang in the next slot as shown in Fig. 9.31.

Move the tang of the clutch spring into the next slot in the control collar as shown in Fig 9.31.

Rotate the output hub sharply against the actuator stop and replace the input hub by rotating anti-clockwise and pushing in at the same time.

Check the over-travel and repeat the procedure until the over-travel is minimised.

Note: ..... If the over-travel is reduced too much, it will not be possible to replace the input hub.

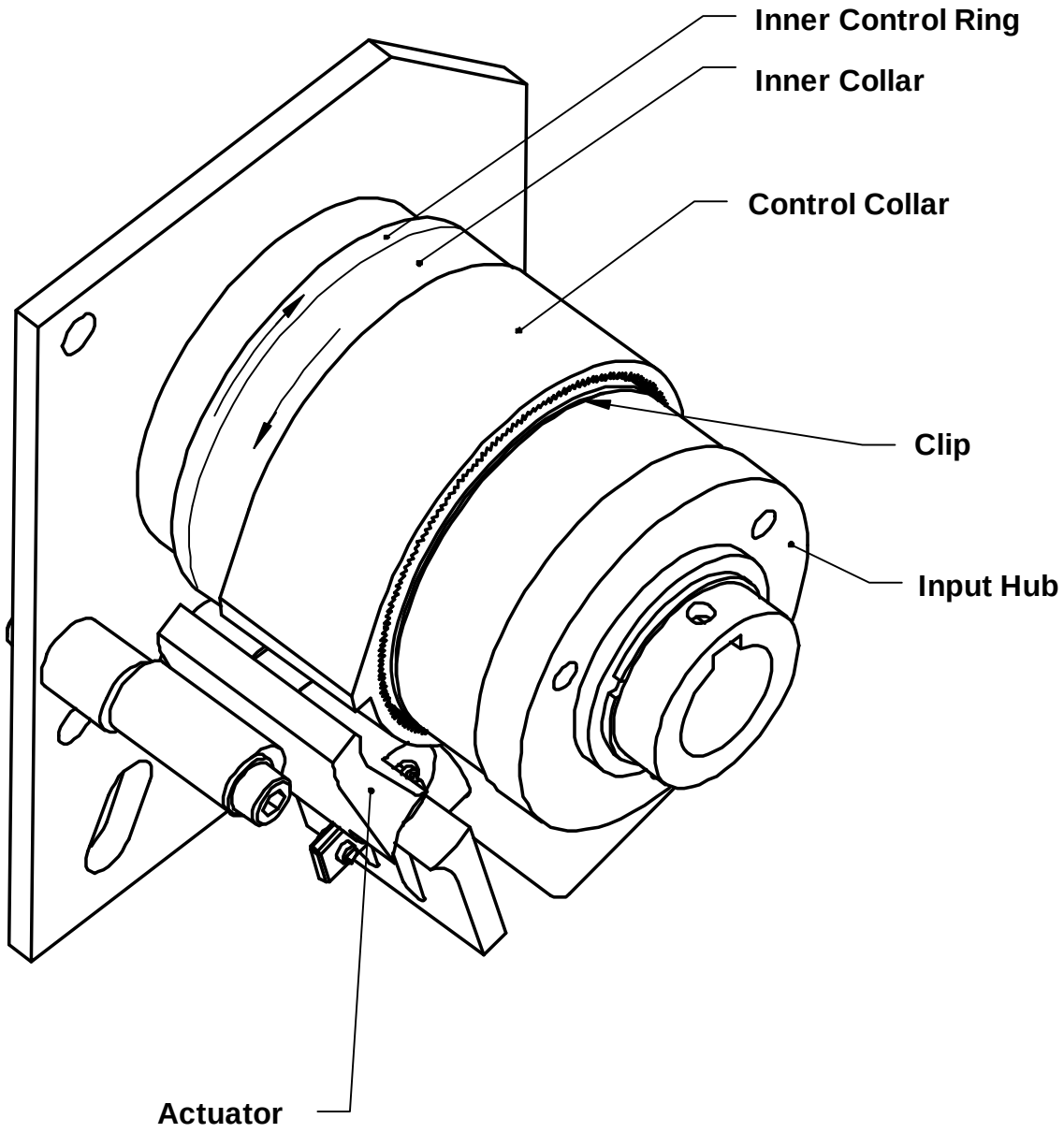
If the over-travel is reduced to the point where the input hub does not rotate freely when the clutch is idling, increase the over-travel by moving the clutch and brake springs back one position. *(The opposite direction to that shown in Fig. 9.31.)*

If the position of the tangs is lost or the over-travel wildly excessive, the clutch manufacturers setting marks may be utilised to restore the tangs to the default position. The tangs are generally factory set three notches past the manufacturers setting marks.

Note ..... Using the clutch manufacturers default setting marks is likely to impair performance so should only be used as a starting point before using the above procedure to adjust the over-travel.

WARNING:

THE INTERNAL CLEARANCES WITHIN THE CLUTCH/ BRAKE UNIT ARE PRACTICALLY ZERO. ANY INGRESS OF DIRT OR OTHER CONTAMINATES WILL SERIOUSLY AFFECT THE PERFORMANCE OF THIS UNIT. EXTREME CARE SHOULD BE TAKEN TO PROTECT ALL COMPONENTS DURING DISMANTLING & RE-ASSEMBLY. DO NOT USE LUBRICANTS



Over-travel Adjustment (New Style Clutch)……Fig 9.32

9.3B …. Over-travel - Adjustment (New Syle Clutch)

The over-travel adjustment on the new style clutch can be done without removing the clutch from the machine as follows:- (See Fig 9.32).

1. **Remove the clip from its groove.**
2. **Operate the actuator to release the control collar.**
3. **Slide the control collar at least 5mm outwards.**
4. **Slide the inner collar off the inner control ring.**
5. **Turn the inner control ring and the inner collar as indicated, until they stop and re-engage both.**
6. **Check that the over-travel is minimised without the clutch binding. Re-adjust if required.**
7. **Adjust control collar by sliding off of its splines, to obtain the stopping position shown in Fig 9.21 on page 27; so that the machine prints accurately to scales on collars.**
8. **Replace clip.**

WARNING:
THE INTERNAL CLEARANCES WITHIN THE CLUTCH/ BRAKE UNIT ARE PRACTICALLY ZERO. ANY INGRESS OF DIRT OR OTHER CONTAMINATES WILL SERIOUSLY AFFECT THE PERFORMANCE OF THIS UNIT. EXTREME CARE SHOULD BE TAKEN TO PROTECT ALL COMPONENTS DURING DISMANTLING & RE-ASSEMBLY.
DO NOT USE LUBRICANTS

9.4 ..... Actuator Measurement

The actuator controls the stopping and starting position of the numbering heads.

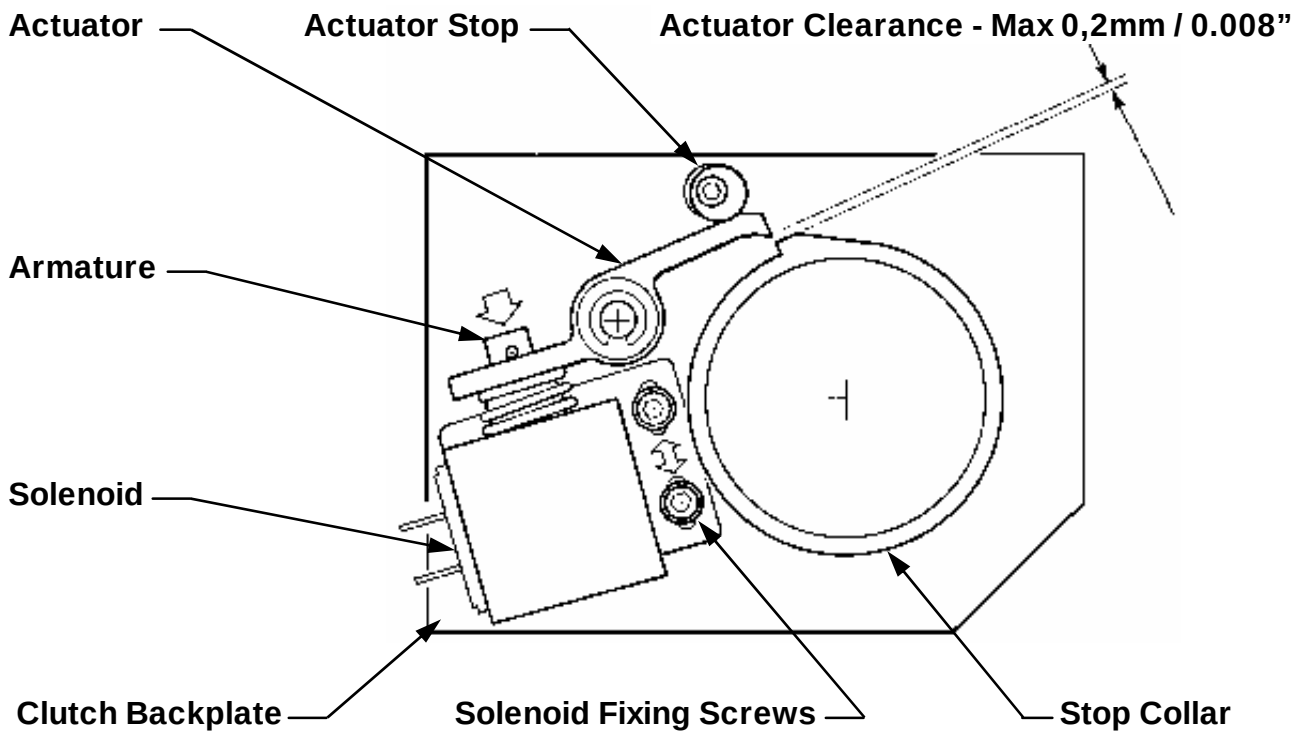
If the actuator is adjusted too far away from the stop collar, the solenoid will not have enough power to operate the clutch consistently. The adjustment is therefore critical and is measured as follows:-

Remove the clutch from the machine (See Section 9.1).

Remove the large drive pulley using a 4mm Allen key to release the three countersunk screws.

Slacken the actuator stop *(which is eccentric)* and rotate it so that it is well clear of the actuator.

Press the solenoid armature as indicated. (*Not the actuator*), and measure the clearance as shown in Fig. 9.41.



Actuator Measurement..... Fig 9.41

9.5 ..... Actuator Adjustment

The actuator should only be adjusted after the over-travel has been checked and if necessary adjusted, see sections 9.2 and 9.3.

Slacken the two solenoid fixing screws, using a 4mm allen key, and move the solenoid body "up" to reduce the actuator clearance and "down" to increase the actuator clearance.

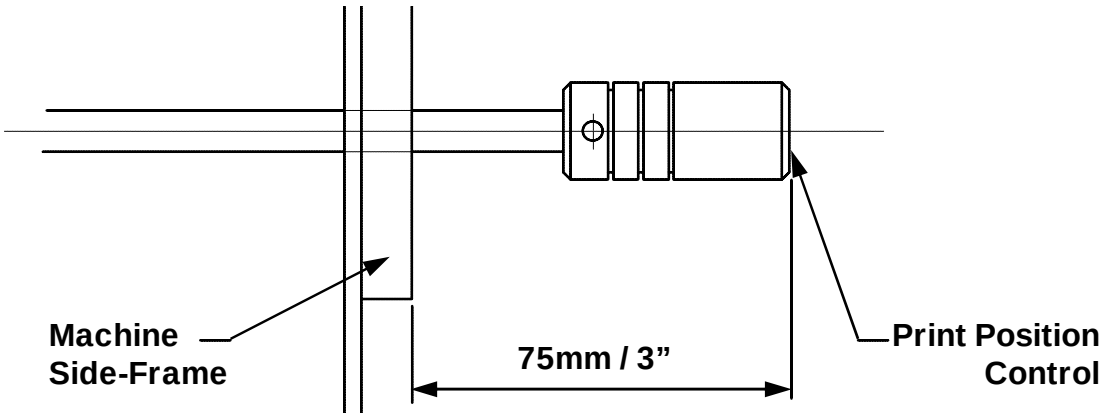
Tighten the screws and check the actuator clearance. Re-adjust if the clearance is not correct and ensure that the solenoid screws are fully tightened after adjustment.

Finally adjust the actuator stop so that it just touches the actuator when the solenoid is operated.

9.6 ..... Collar Position - Measurement

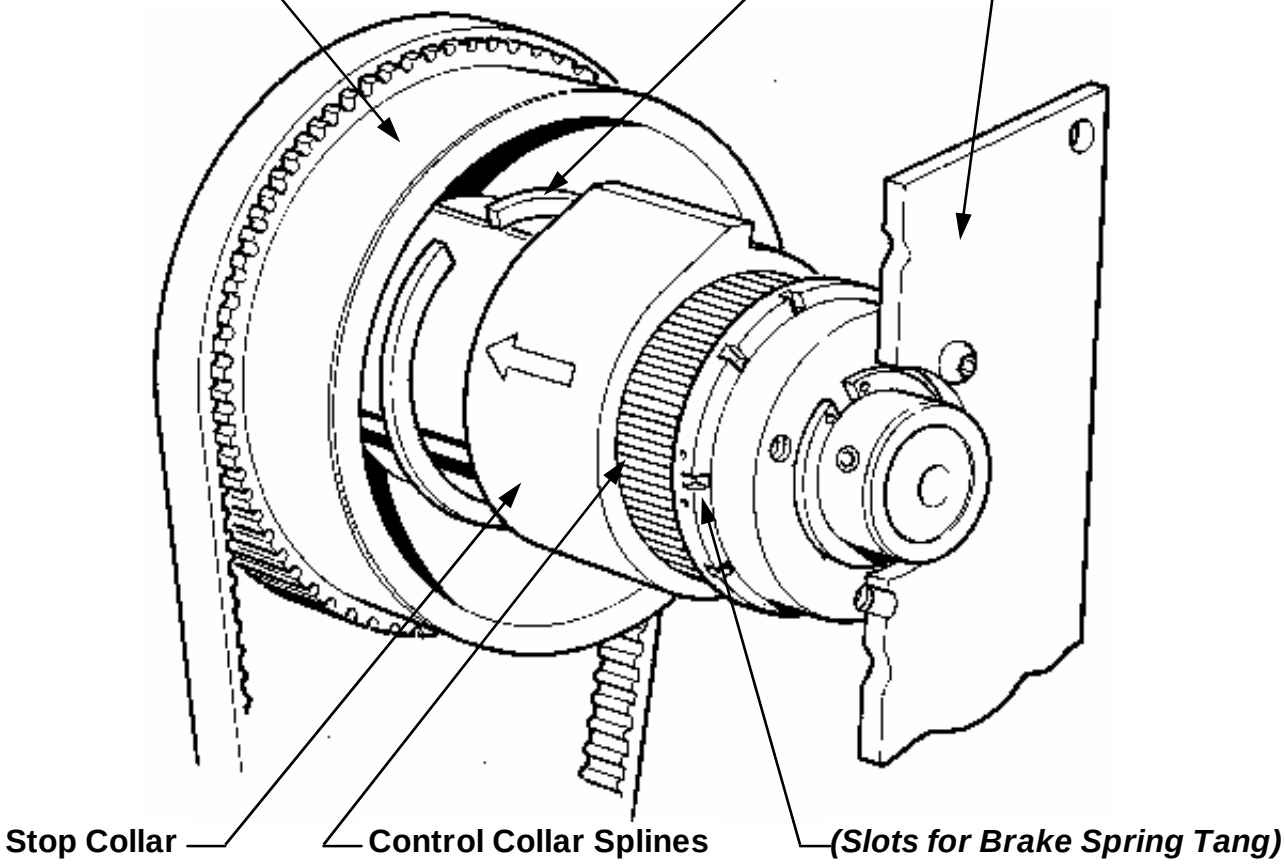
The machine should print the top of a number at the required distance from the top of the sheet and this distance corresponds to the scale on the numbering head collars.

The scale is read off the back edge of the numbering head, and is affected by the print position adjustment, so the print position control must be in it's mid-point which is with the end of the knob 75mm / 3" away from the side-frame of the machine.



On the suction machine the print position is greatly affected by the machine speed so should be set with the speed control at posn. '3'.

Adjustment of the stop collar position is always necessary after adjusting the over-travel or fitting a new clutch and is achieved with the machine fully assembled. (See section 9.7 on page 32)



Collar Position..... Fig 9.61

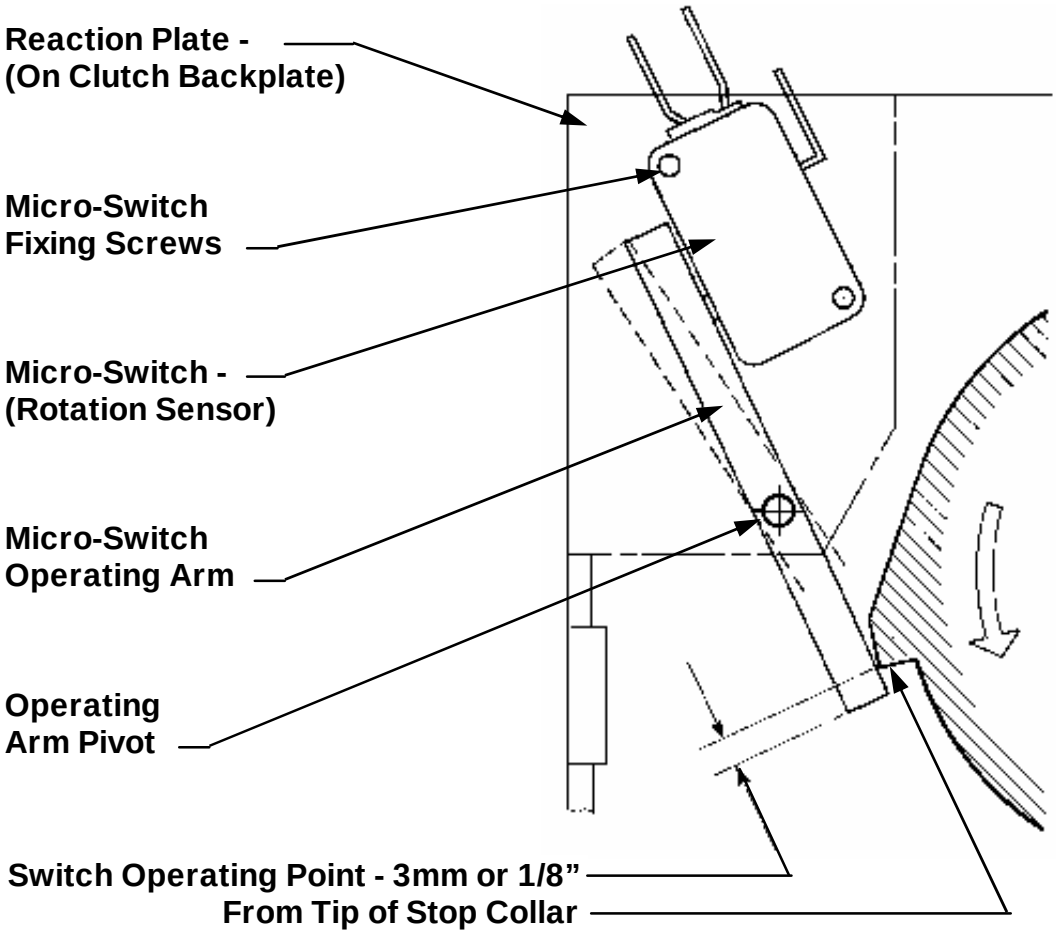
9.7 ..... Collar Position - Adjustment

Locate the stop collar and lever the retaining ring out of it's groove in the control collar using a small screwdriver under the shaped end of the ring.

Slide the stop collar in towards the pulley until it comes off the splines, rotate the collar enough to adjust the numbering position, and then slide the collar back on to the control collar splines.

The effect on the numbering position is approximately double the movement of the stop collar on it's splines (1 spline = 2mm/0.080").

Run the machine briefly and check that the head position corresponds to the distance from the top of the sheet to the top of the printed number. Replace the retaining ring into the groove in the control collar when the correct position is obtained.



Clutch Position Switch ..... Fig 9.81

9.8 ..... Clutch Position Switch

The clutch position switch controls the feed so that only one sheet at a time is numbered. It is adjusted as shown in Fig. 9.81.

Using a 5.5mm wrench or spanner, loosen the two micro switch fixing screws and move the switch up or down so that the tip of the stop collar operates the micro switch 2 to 3mm (3/32” to 1/8”) before the end of the lever.

The clutch must be operated and the machine turned by hand to check this adjustment. You will hear a "click" as the switch operates, or, if this is not possible, a meter may be used between the common and one of the other terminals on the switch.

Note ..... Before using a meter, switch the power off at the mains and set the meter to read resistance (W)

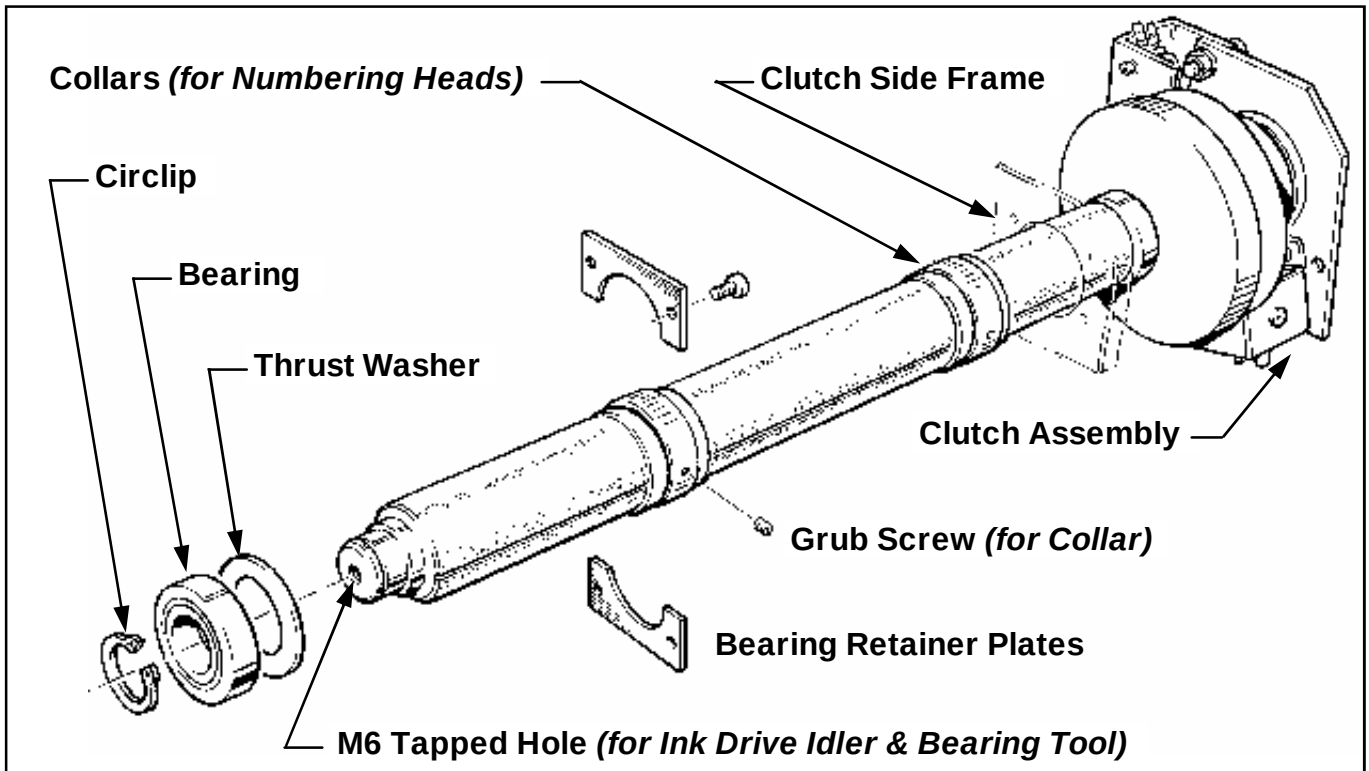
10.1….. Main Print Shaft - Removal

The main print shaft may be removed with the clutch assembly in place, but you should remove any numbering heads and loosen the grub screws in the collars.

Remove the clutch drive belt, the spring and it's retainer bracket and all the wiring. (See Fig. 9.11). On the friction machine also remove the ink drive idler pulley from the operator end of the main shaft by un-screwing it's shoulder bolt using a 4mm Allen Key.

Remove the circlip and the four bearing retainer plates located on the inside of the frame plates (both sides), using a 3mm Allen key. (See Fig. 10.11). The main shaft may now be partly withdrawn to the clutch side of the machine, allowing the room between the side frames to be used to remove the operator side bearing using a suitable hub puller.

Remove the thrust washer, and the numbering head collars, *(make a note of the orientation of their scales to ensure correct re-assy.)* whilst withdrawing the main shaft through the clutch side frame.



Main Print Shaft……Fig 10.11

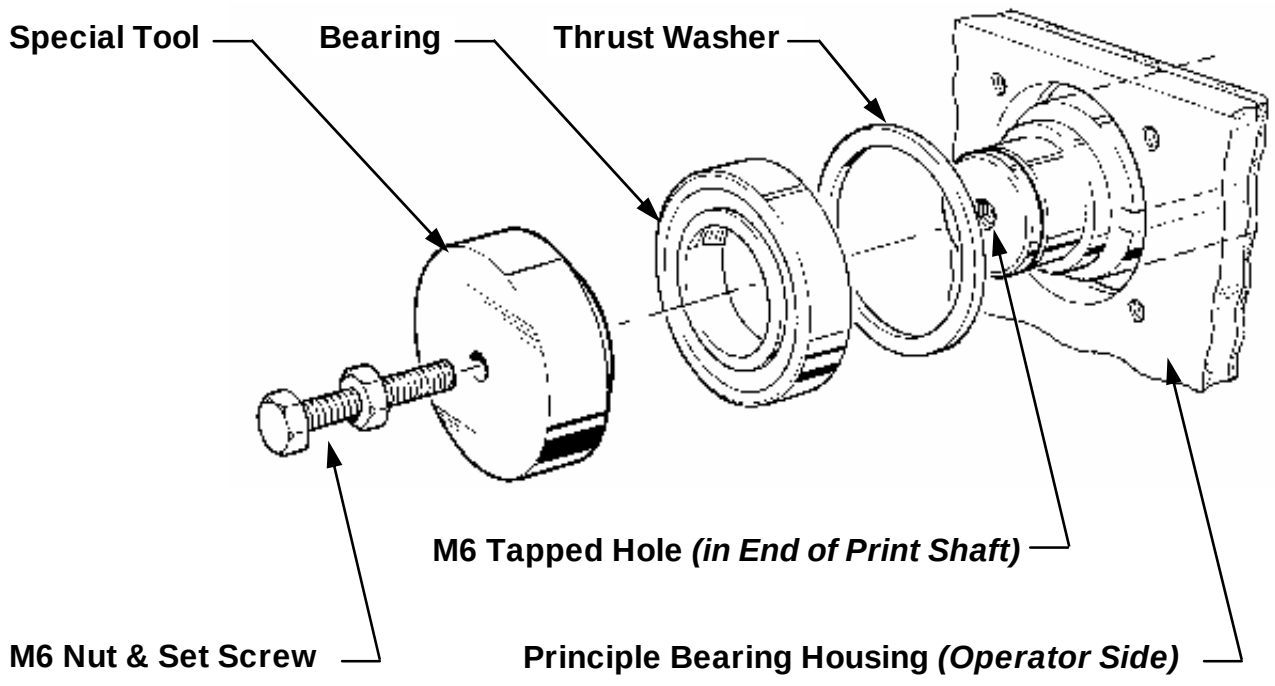
Note ..... Always support the shaft and use a hub puller to remove the operator-side bearing from the shaft and take care not to lose the keys from the collars

10.2 .... Main Print Shaft - Re-assembly

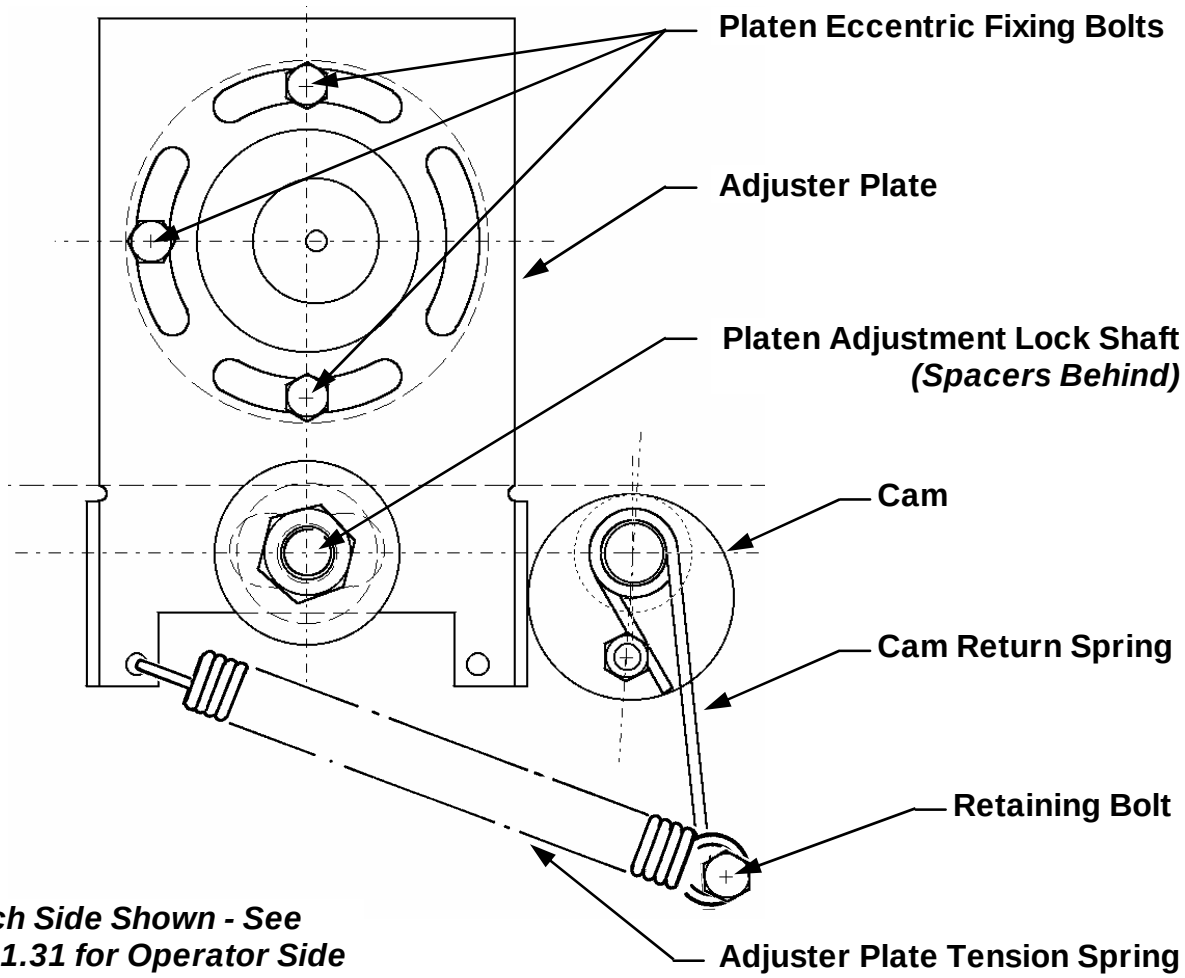
The main print shaft is replaced in reverse sequence, but make sure the collars are the right way round or you won't be able to set the numbering heads. Also make sure that the thrust washer is placed over the shoulder on the main shaft before replacing the bearing.

To fit the operator side bearing without damage, special tool T040 should be used as shown in fig 10.21 below. The tool is fitted over an M6 bolt which is screwed into the tapped hole in the end of the main shaft. The nut is then tightened to press the bearing into position.

Remove the special tool and finally replace the circlip, the bearing plates,and all the other items removed (not forgetting the ink drive



Bearing Replacement - Print Shaft ..... Fig 10.21



Clutch Side Shown - See Fig 11.31 for Operator Side

Platen Mechanism .....Fig 11.11

11.1..... Platen - Removal

Remove the twin drive belt (see section 4), and remove the leg of the cam return spring from the retaining bolt.

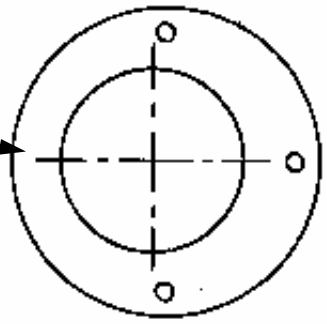
Remove the lock shaft by releasing the two M8 lock nuts and unscrewing the lock shaft fully from the machine. (Beware of the spacers falling as the lock-shaft is withdrawn).

Remove the tension springs from the adjusting plates each side and, using a 7mm spanner/wrench, remove the three platen eccentric fixing screws from the *CLUTCH SIDE ONLY* and remove the adjusting plate. Some machines will have a shim fitted behind the adjusting plate. (Keep it safe)

The platen may now be withdrawn through the operator side-frame with the pulley and eccentric housings in place.

WARNING:
THE PLATEN SURFACE IS EASILY DAMAGED. TAKE EXTRA CARE DURING REMOVAL AND REPLACEMENT NOT TO DAMAGE THE SURFACE OF THE PLATEN.

The Narrow Side of the Eccentric *(without a fixing hole)* Must Face the Feeder End of the Machine on Both Sides



This View is of the Operator Side Eccentric - *Clutch Side Should Be Mirror Image*

Platen Eccentric ..... Fig 11.21

11.2 .... Platen - Re-assembly

Re-assemble with both eccentrics facing as shown in Fig. 11.21, ensuring that any shims that were removed are replaced.

Replace the adjustment lock-shaft with it's associated parts and set the adjusting plates so that their slots are clear of, and do not stick on, the lock-shaft.

Replace the pulley *after* the platen pressure has been set as in section 11.3.

Once again, be very careful with the platen as it is easily damaged.

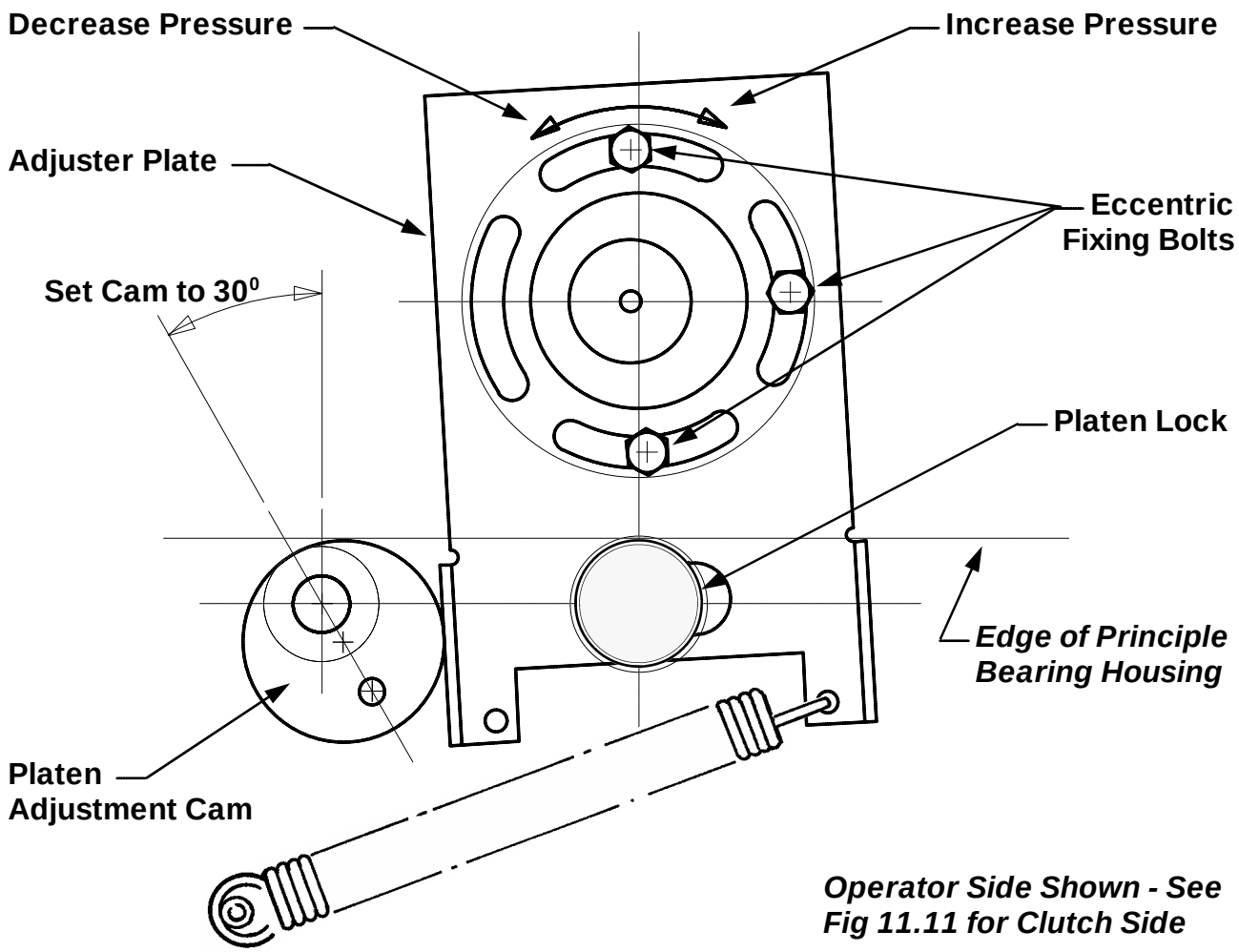
11.3..... Platen - Adjustment

Set the operator adjuster cam shaft to the position shown in Fig. 11.31, and tighten the lock.

Set the numbering head mounting collars towards the sides of the machine and lay a piece of 80gsm/20lb paper over the platen on each side.

Hold a numbering head loosely on the collar and, holding it firmly seated to the base of the collar, check the contact with the paper on each side of the machine.

If adjustment is required on either side, use the following procedure-



Platen Adjustment .....Fig 11.31

Loosen the eccentric fixing bolts and use the bolts to rotate the eccentric behind the adjusting plate until the numbering head makes light contact with the paper.

Note ..... This adjustment can be difficult to do, but please persevere - it is important.

To increase pressure, rotate the operator side eccentric clockwise and the clutch side eccentric counter-clockwise.

Adjusting one side affects the other, so always double check the adjustment and tighten the bolts securely.

On a machine that appears to have unequal pressures, the platen may be levelled off by adjusting only the clutch side eccentric.

Finally, if the platen has been replaced, re-fit the drive pulley and twin grip belt. (See section 4).

Tip..... The illustrated parts manuals and operators guides for each machine are an invaluable reference when using this manual.

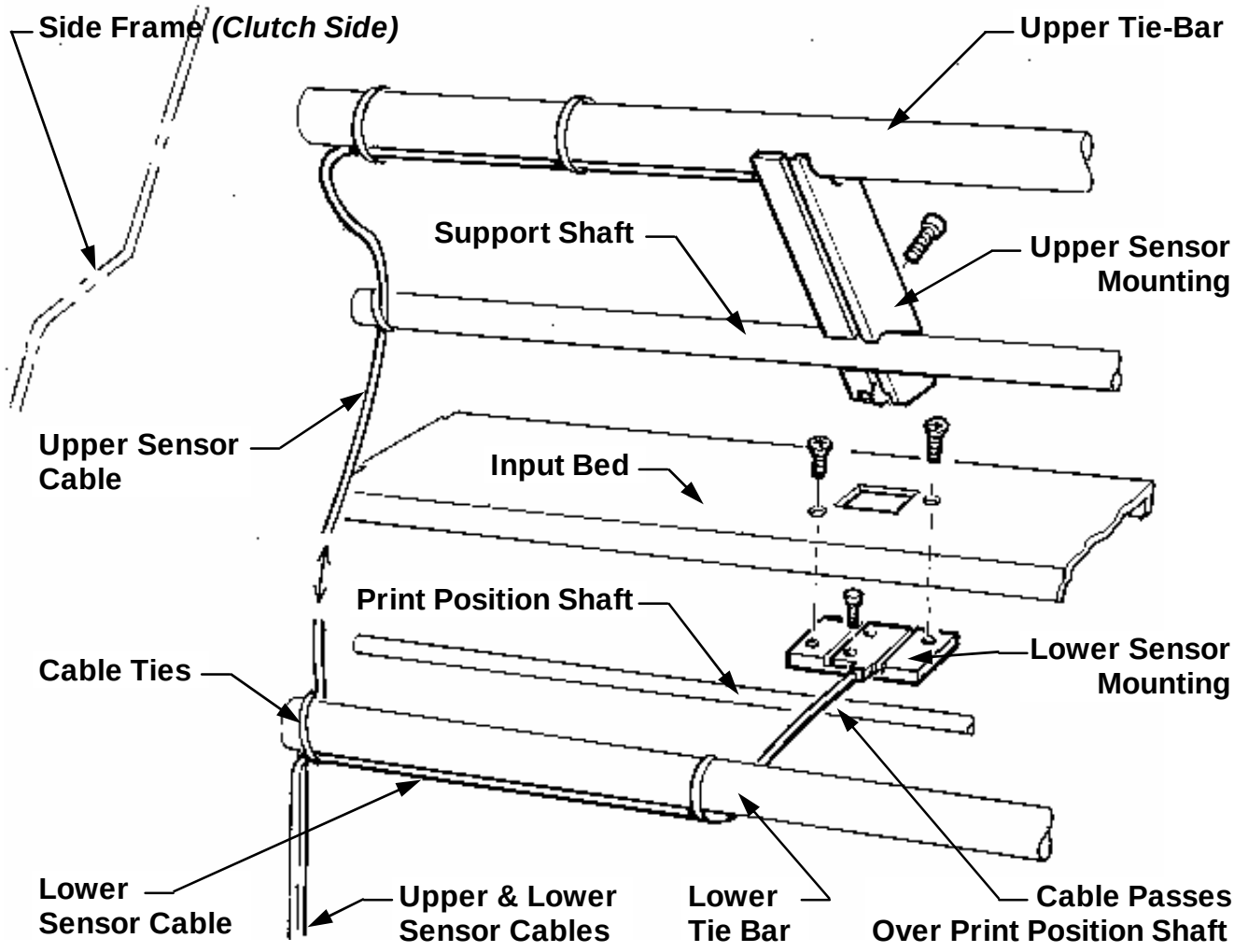
12.1….. Sensor - All Machines

Sensor maintenance is dealt with in the operators manual and only involves careful cleaning of both units and their lenses.

The sensors are mounted so that they are exactly aligned without any adjustment so no provision is made to adjust them.

Sensor alignment can only be measured using an oscilloscope, but if you suspect misalignment, first check that all fixing screws are secure and that none of the relevant components are damaged.

When swinging the upper sensor assembly away from its mounting take great care not to strain or trap it's cable and if you are clearing a paper jam avoid bending the input bed as this may result in an excessive gap between upper and lower sensors.



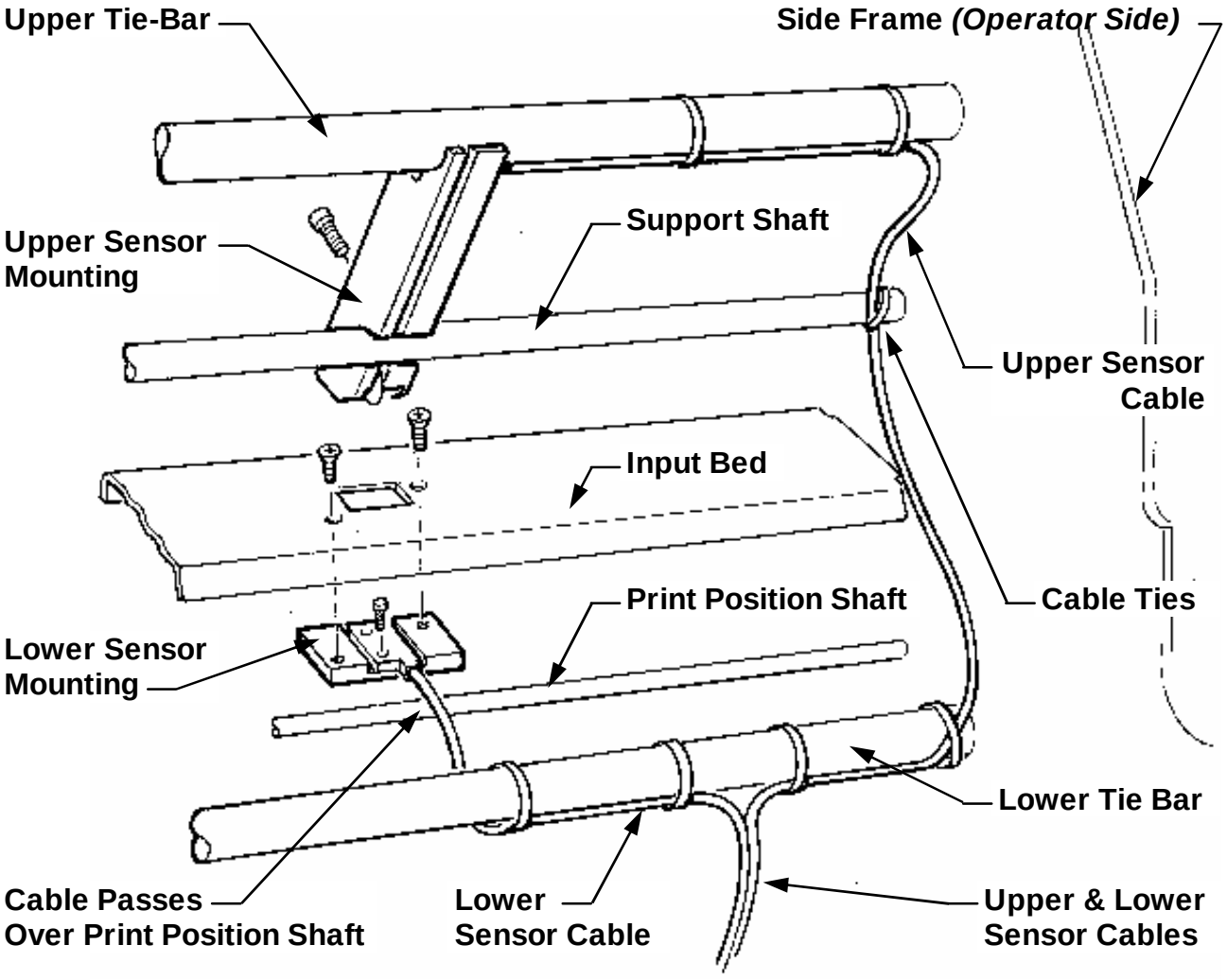
Sensor Installation - Friction Machine ……Fig 12.11

12.2 .... Sensor Replacement

If you need to replace the sensors the diagrams in this section will help you, as although all machines use the same arrangement, the wiring to the sensor assemblies follows different routes.

You are advised to replace the sensors as an assembly with their mounting hardware to ensure correct alignment. *NEVER REPLACE UPPER OR LOWER UNITS INDIVIDUALLY AS THEY ARE SUPPLIED AS A MATCHED PAIR.*

Take great care when routing the sensor cables as they are fragile and any damage normally results in failure. Ensure that the cables are clear of moving parts - particularly around the input rollers - and that they do not get trapped when fitting covers or closing



Sensor Installation - Suction Machine..... Fig 12.12

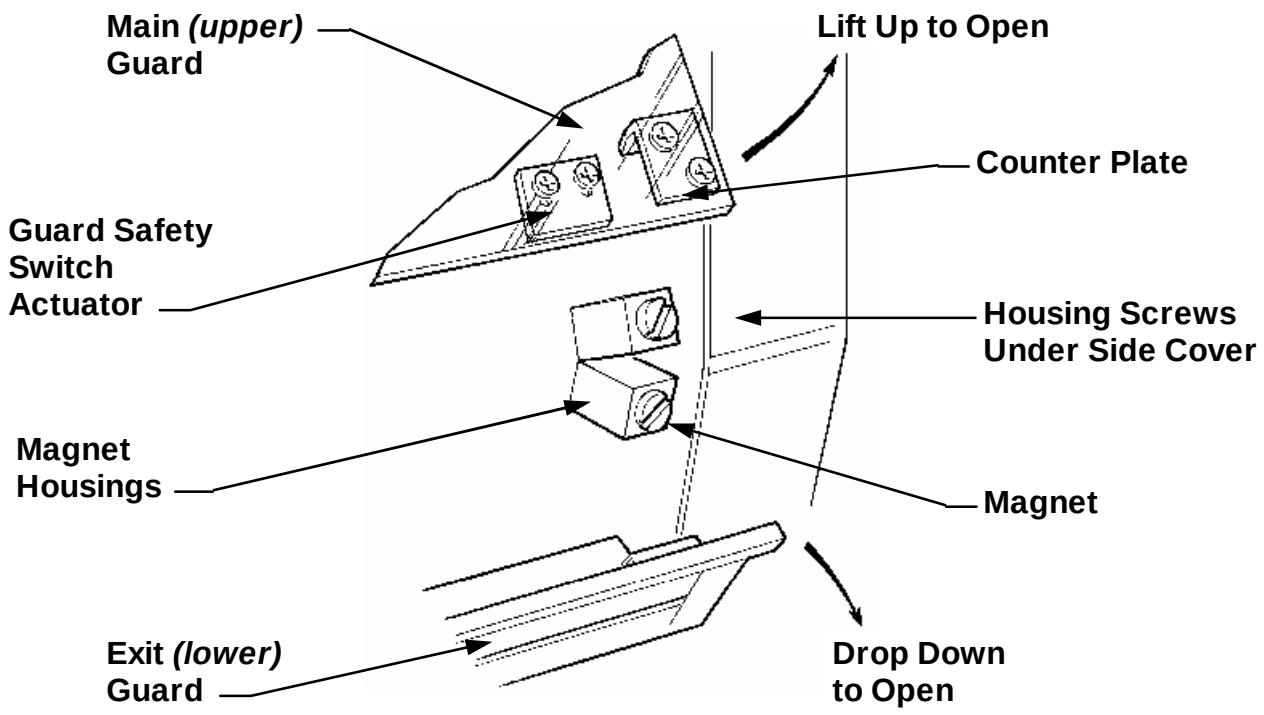
13.1….. Guard Position

Both the main guard and the exit guard are held in place by magnets which are adjustable, to allow the guards to close correctly.

Lateral height adjustment is achieved by screwing the magnets in or out of their mounting blocks as required. *(A large thick blade screwdriver may be used to turn the magnets if they cannot be moved by hand but take care not to force them).* The gap between the two guards should be 3mm/ 1/8".

Angular adjustment is achieved by loosening the two M3 screws which hold each magnet housing. It is important that the magnets sit squarely on their keep plates - particularly on the exit guard - and this is best achieved by setting the height first (as in the previous paragraph) and then loosening the housing screws and closing the guard.

The magnets should now self align, allowing the housings to be held whilst the screws are tightened in the correct position.



Guard positioning……Fig 13.11

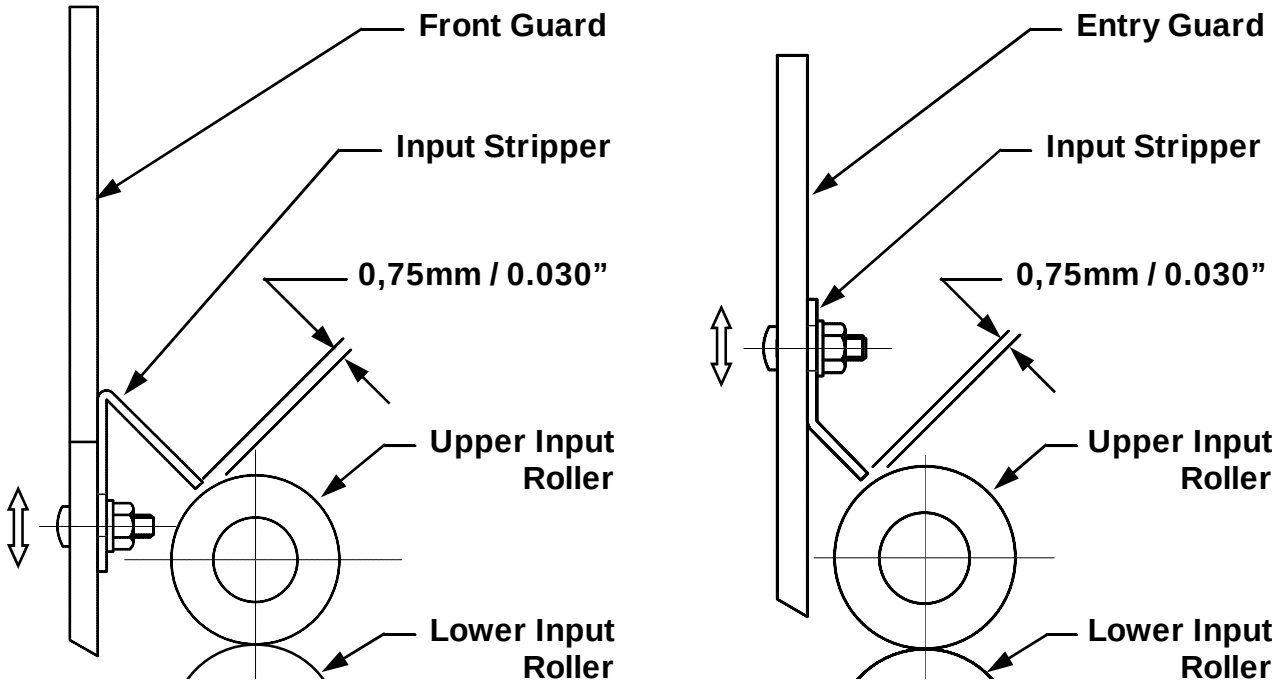
13.2 .... Stripper

The guard at the feed end supports the stripper plate which has been designed to minimize the risk of damaged stock wrapping around the input rollers.

It is important that the stripper is correctly adjusted and this can be achieved by releasing its three fixing screws to obtain a clearance of 0.75mm or 0.030" between the edge of the stripper and the upper input roller.

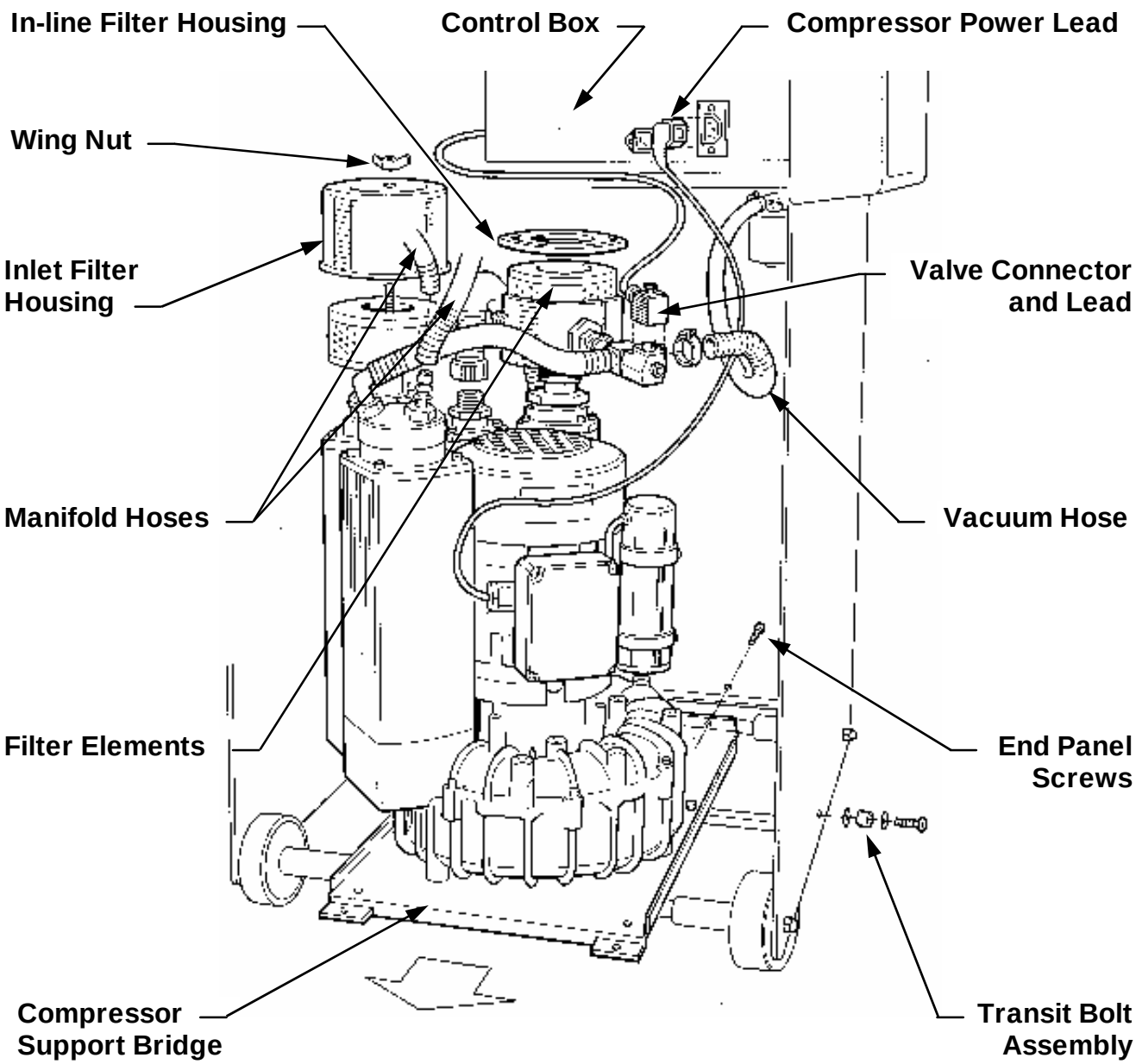
Note ..... It is important to check this with the guard closed.

WARNING
DO NOT OPEN THE GUARDS WHILST THE MACHINE IS RUNNING, AS YOU COULD INADVERTENTLY FORCE THE STRIPPER INTO THE ROLLER BEFORE THE SAFETY SWITCH HAS STOPPED THE MACHINE



Friction Machine *Suction Machine*

Stripper ..... Fig 13.21



Compressor Installation .....Fig 14.11

14.1..... Compressor - Suction Machine

Note:.....The compressor is a very reliable unit and rarely gives any trouble, so is unlikely to need removing from the machine. If you do suspect a problem, be sure to check all electrical connections and hoses (including the suction valve), before removing it.

14.2 .... Filters

It is important that the filter cartridges are replaced when necessary as they can have a dramatic affect on performance.

DO NOT TRY TO CLEAN THEM. **Knocking dust out of them only gives a short term improvement - they re-clog very quickly.**

NEVER RUN WITHOUT THEM **- the internal clearances are small and any foreign particles entering the chamber can cause the impeller to seize -** ***an expensive mistake.***

The inlet filter may be removed by releasing the wing nut from the top of it's fixing bolt.

The in-line filter housing is secured by two spring clips which can be released by hand.

The filter cartridges are of the same type and should normally be replaced as a pair.

14.3 .... Compressor Removal

-Remove the compressor power lead from the control box .

-Remove the valve connector from the valve.

-Remove the two manifold hoses from the compressor adaptor.

-Remove the vacuum hose from the valve port.

-Remove the three screws through the end panel.

-Remove the two transit bolts *(one each side)* through the side plates, taking care not to lose the spacer and washer.

-The compressor and it's support bridge may now be lifted out of the machine.

Note ..... Don't try to remove the compressor on your own - the unit is very heavy.

15.1….. Suction Control Valve

The Suction Control Valve is mounted on the Compressor Filter Vacuum port by a short piece of reinforced hose which protects it to some extent from heat and vibration.

Although generally reliable, these valves operate in a relatively harsh environment at speeds of up to 150 Hz. Dust ingress is likely to be the most likely cause of trouble, but before dismantling the unit check all electrical connections and fuses.

15.2….. Suction Control Valve - Dismantling

Remove the electrical connection by releasing the small fixing screw on the top of the connector and pulling it off the coil.

Release all three hose clips and remove the valve from its hoses. To ease re-assembly, it's worth making a note of which ports the hoses are connected to.

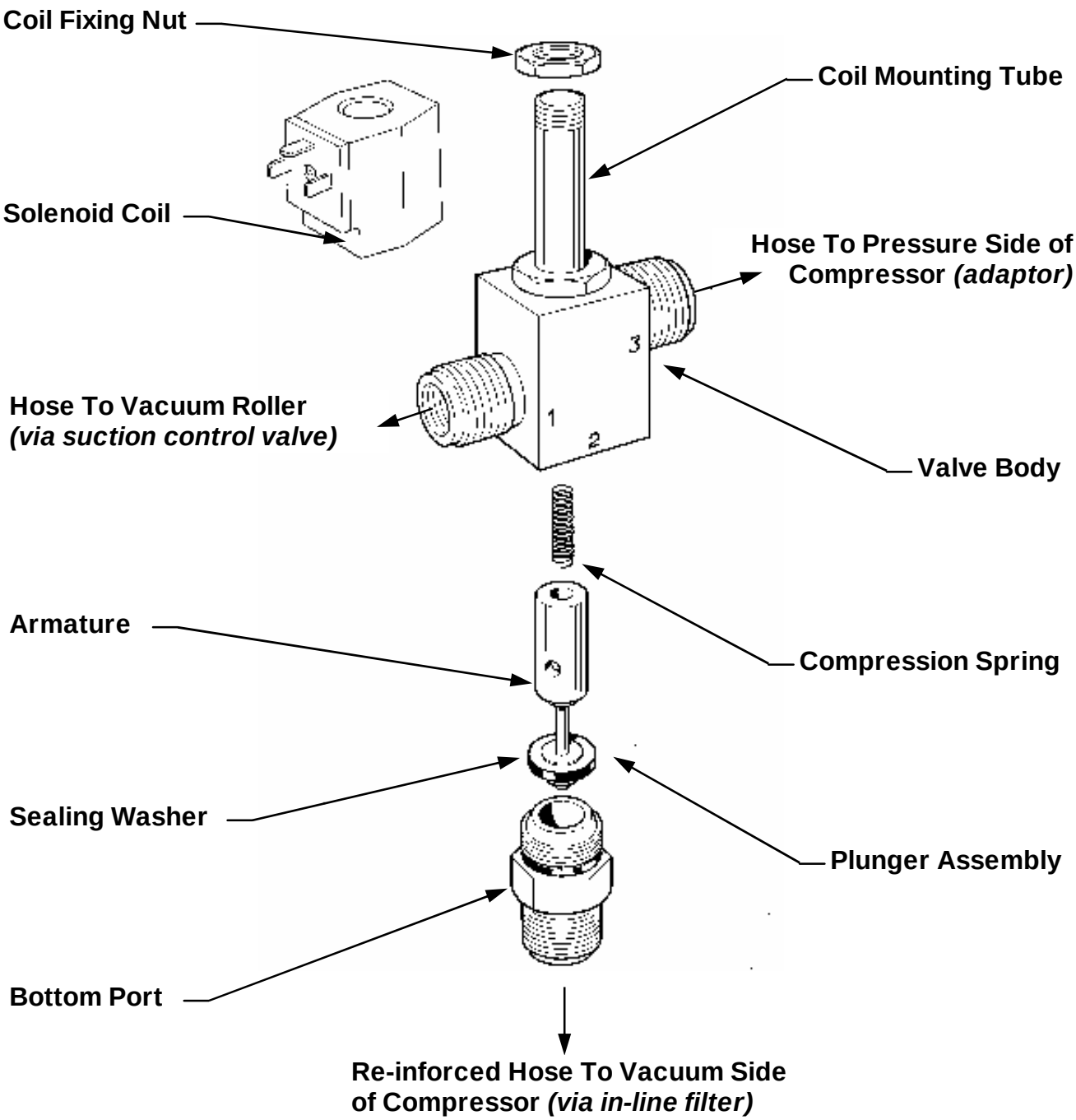
Hold the valve body securely (preferably in a vice) and remove the coil if necessary. Its held in place by a thin nut.

Unscrew the bottom port (this is the vacuum port) and remove it carefully, followed by the plunger assembly, taking care not to lose the spring.

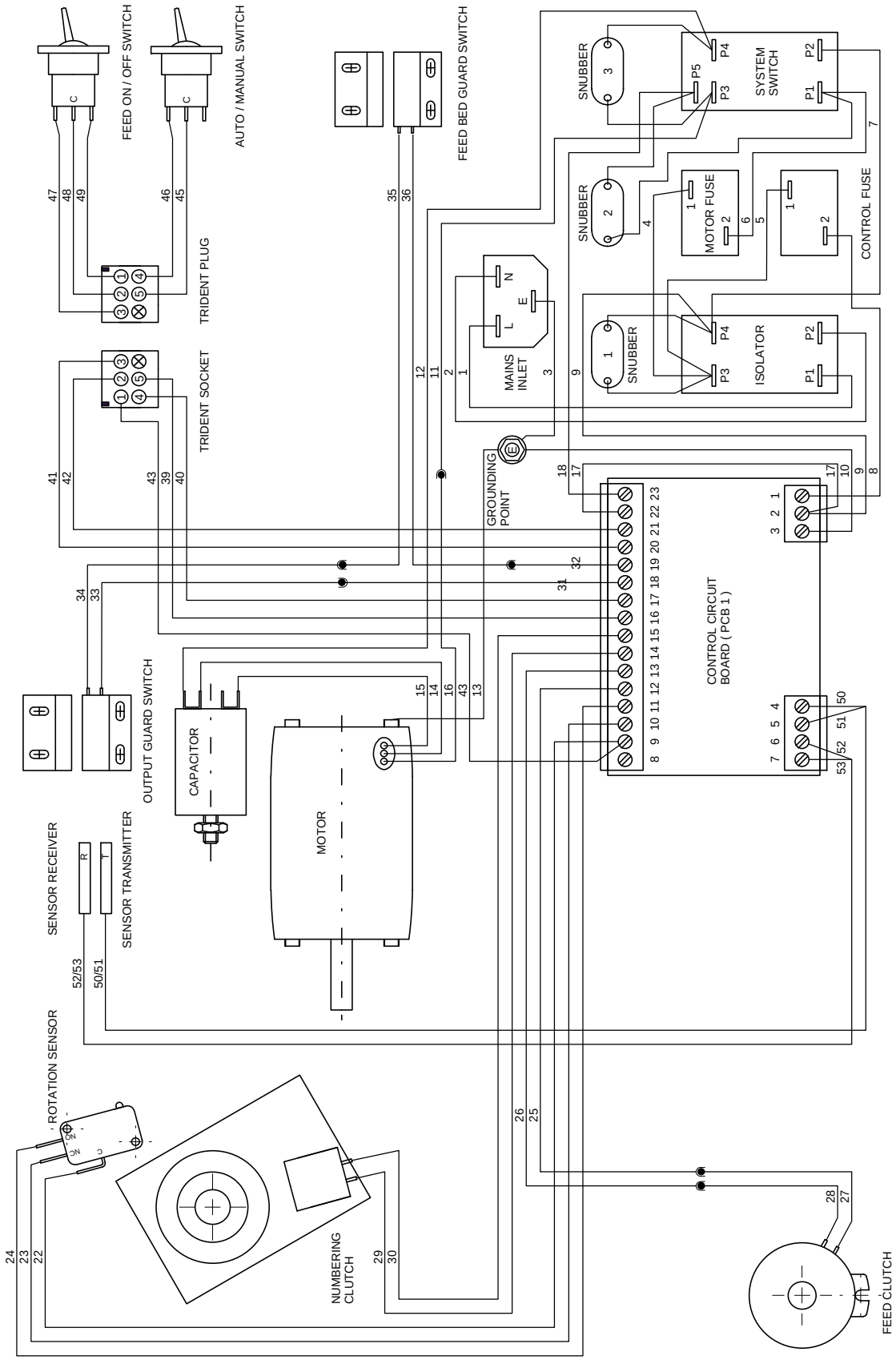
All the valve's components may now be cleaned, examined, and replaced as required before re-assembling in reverse order but be sure to check that the plunger assembly is fully intact and that the rubber washer is properly secured between its two fixing nuts.

Note…….Do not lubricate any part of the valve as this will lead to premature failure. The plunger is PTFE coated to resist wear.

Note…….Do not over tighten the coil fixing nut or the connector fixing screw.



Suction Control Valve ..... Fig 15.11



Wiring Diagram - Friction Control.....Fig 16.11

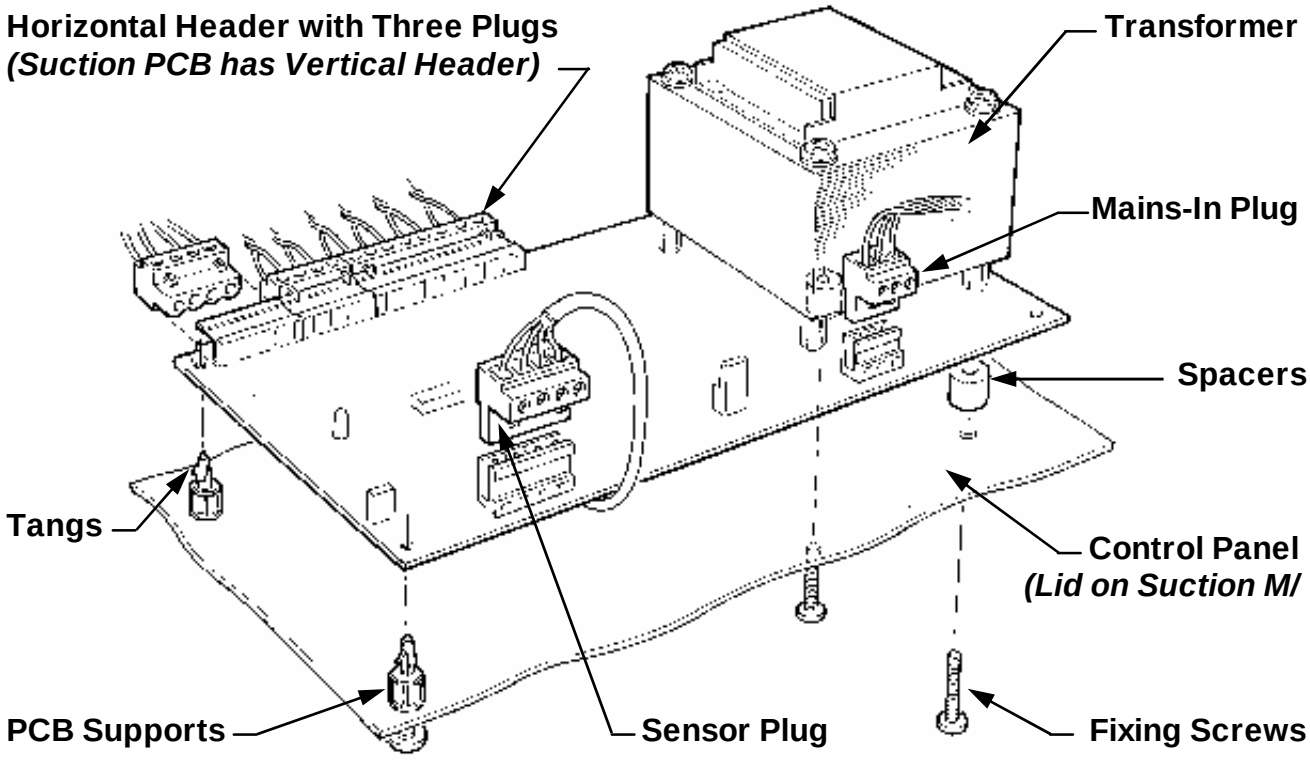
16.1 .... Control System - Access

The control system circuit board (PCB) is mounted on the inside of the control panel which is under the feed bed and also houses the mains power inlet socket, isolator, system switch & fuses.

To gain access to these items, carefully lower the panel onto it's support strap by removing the two upper screws. The right hand side of the panel has an additional screw below the panel fixing screw which retains the support strap and should not be removed

To remove the PCB, disconnect all five wiring plugs by easing them out of their headers. (The main header is mounted horizontally and has three separate plugs.) Cut any cable securing ties that are on the PCB, and partly release the PCB from it's two supports by depressing their tangs.

Firmly support the PCB by holding the large transformer, remove the two fixing screws from the outside of the panel, and withdraw the board.



Circuit Board - Friction Control ..... Fig 16.12

The following sections should be used in conjunction with the troubleshooting section in the operators guide.

16.2….. Trouble Shooting - *Machine Will Not Run*

System Switch does not latch **Check that the guards and feed bed are correctly fitted and that both fuses are intact and firmly installed.**

Lower the control panel (see section 16.1), and check the security of the two blue wires to terminals 22 and 23 and the two white wires to terminals 18 and 19.

Check the continuity through white wires to terminals 18 and 19 (remove wires from PCB first). If there is no continuity, trace the fault to a defective switch connection or a defective switch.

If the PCB 'clicks' when a guard is opened or closed, replace the system switch. If there is no audible 'click' then replace the PCB.

System Switch Latches **Is the machine jammed ?. It should rotate freely by using the handwheel.**

To minimise starting loads, ensure that the 'Feed' switch is 'Off' and that the main clutch is not still engaged. This can happen if the machine was switched off during a numbering cycle before the heads had stopped. Turn the machine by hand to position the heads in their starting position.

Check the mains voltage to the motor and the connections to the capacitor.

If all else fails, replace the motor.

16.3….. Trouble Shooting - *Machine Will Not Feed*

Friction Feed Tyres do not rotate **Check the wiring between the feed on / off switch on the side-cover and terminals 20 & 21 on the PCB and check the wiring between the feed clutch and terminals 12 & 13 on the PCB.**

Check the coil resistance of the feed clutch, which should be between 206 ohms and 248 Ohms, and replace the clutch if this is incorrect

Check the voltage to the feed clutch which should be 24VDC and replace PCB if this is incorrect.

Feed wheels operate for one sheet and fail to operate thereafter.
Check that the rotation sensor micro-switch (which is located on the main clutch back plate), is operated by the clutch stop collar when the clutch rotates *and* when the clutch stops. Check the wiring to the micro-switch and to terminals 9, 10, 11, 20 & 21 on the PCB.If all else fails, replace the PCB.

16.4 …. Trouble Shooting - *Machine Will Not Number*

Sheets feed but will not number:- **Release the upper sensor and clean both lenses.**

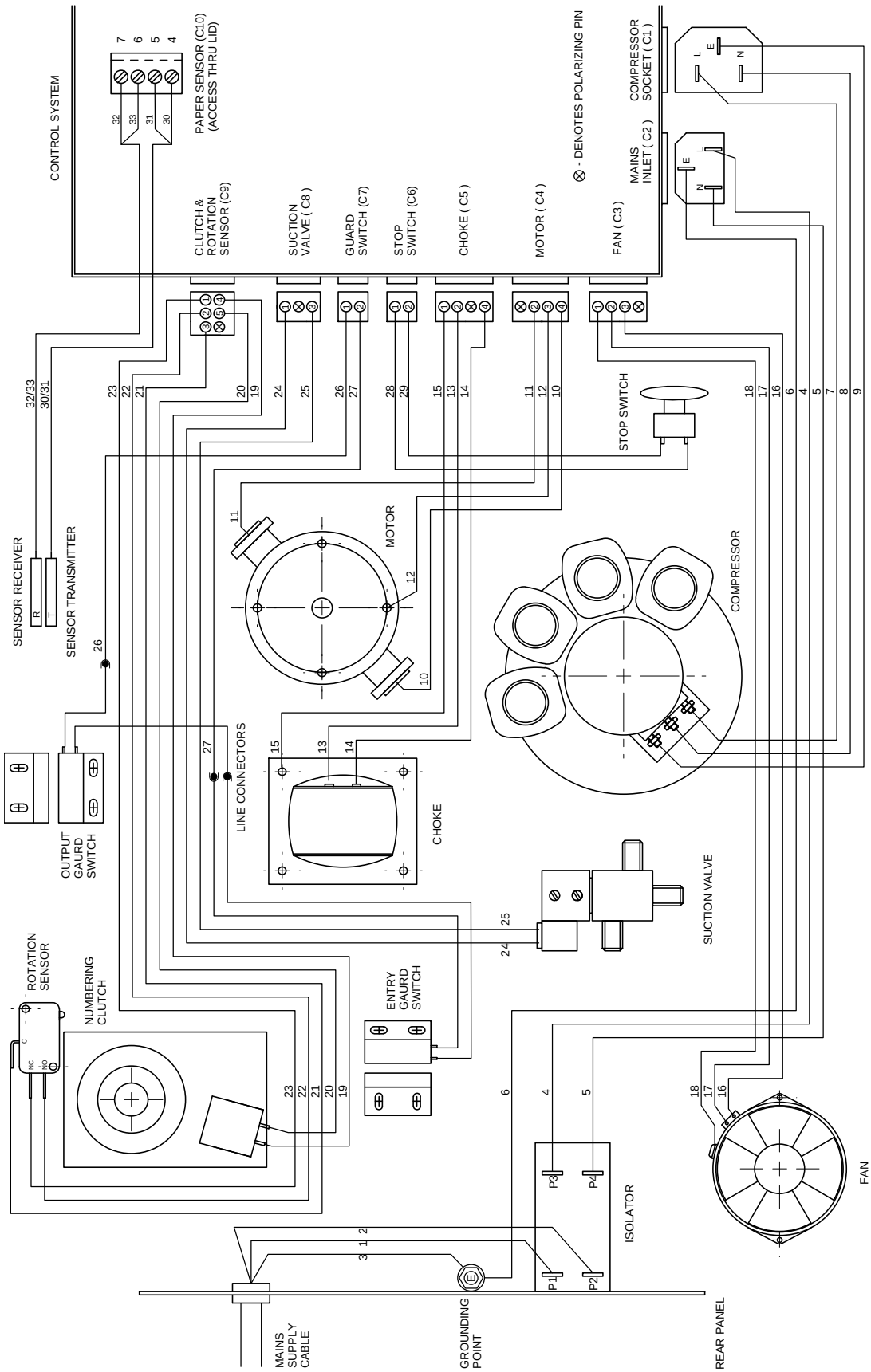
Check that the LED on the control PCB is not illuminated. This indicator should only illuminate when paper is between the upper & lower sensors, but it will also illuminate if the sensors or their cables are damaged.

If the LED is illuminated, check the connections to terminals 4, 5, 6 & 7 on the PCB and check that these wires are not shorting. Replace the PCB and / or the sensors.

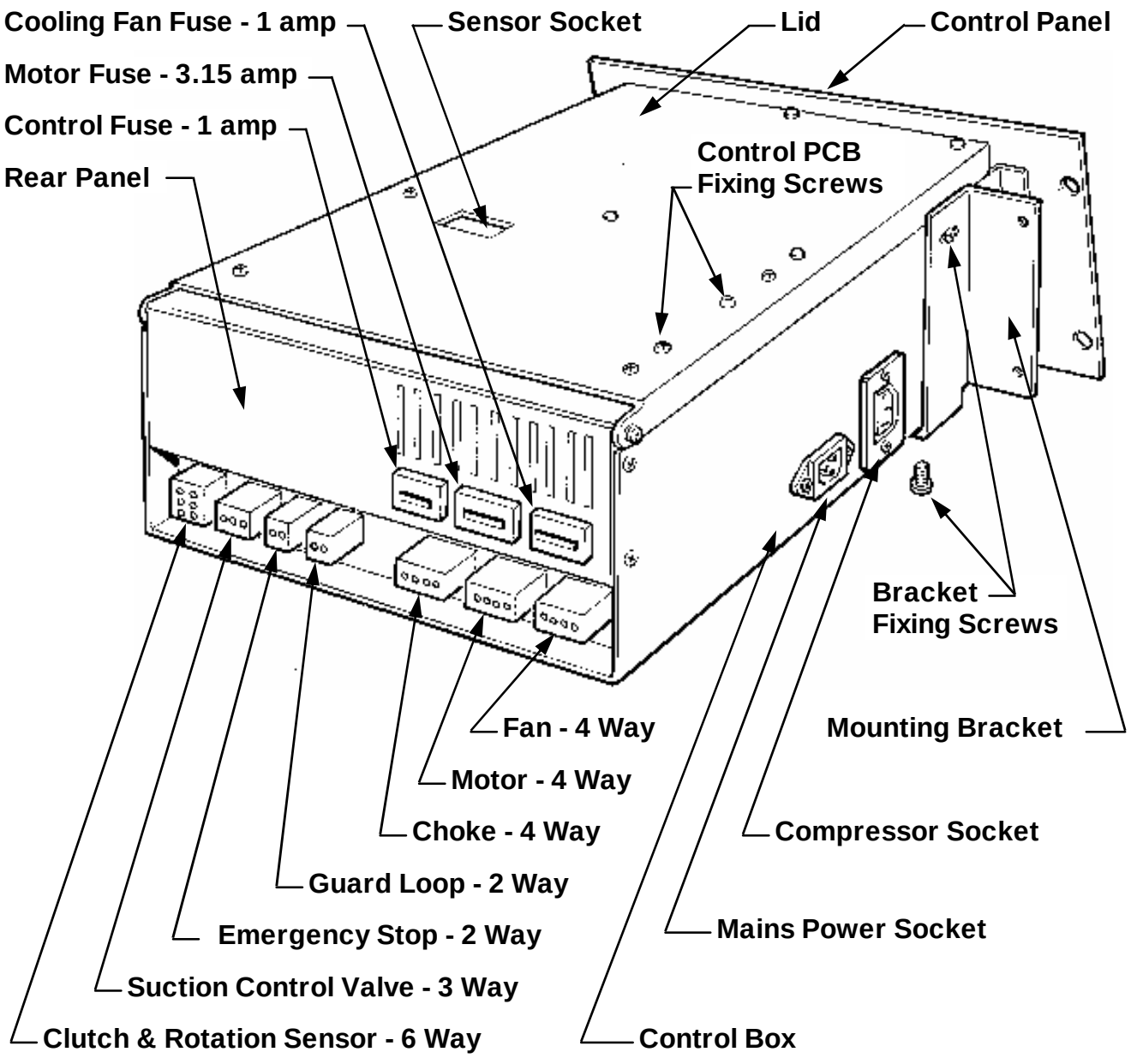
If the LED is not illuminated, Check the security of the wires to terminals 9, 10, 11, 14, 15 & 16 on the control PCB and check the connections to the main clutch coil (red & black wires).

Check the main clutch coil resistance which should be 10 Ohms and replace the coil if this is incorrect otherwise replace the PCB.

If the clutch does not operate in 'manual' mode, check the wiring between the auto / man switch on the side-cover and terminals 16 & 17 on the PCB.



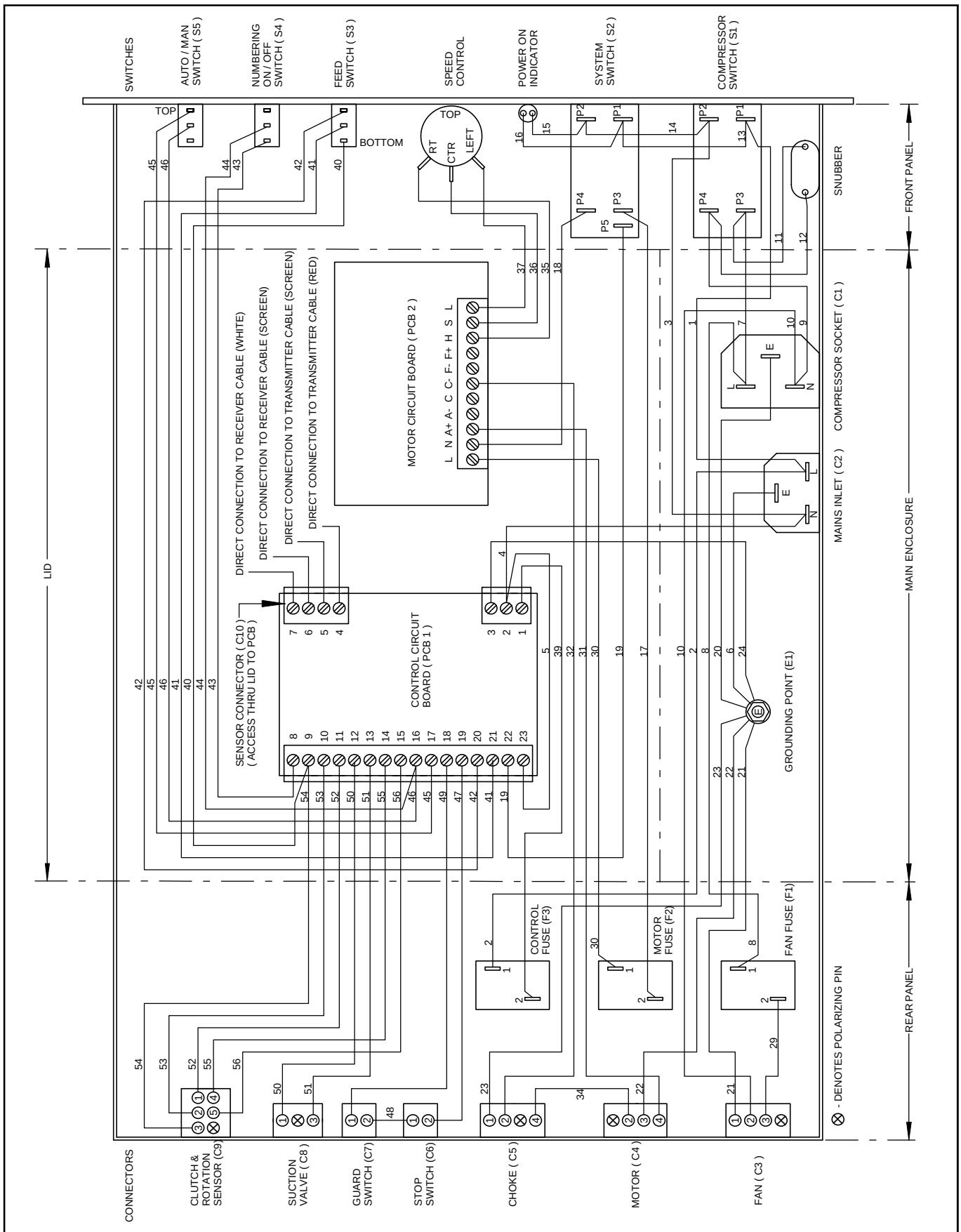
Wiring Diagram - Loom .....Fig 17.11



Control Box..... Fig 17.12

17.1 .... Control Box

The suction machine's control system is housed in an enclosure which has a front panel accessible to the operator and can be removed from the machine as a complete unit. It is connected to the machine by a wiring loom whose individual circuits are terminated by 'Trident' plugs which mate with corresponding sockets at the rear of the control box. The fuses are also housed at the rear of the box. The sensors are connected directly to the PCB through the lid.



Wiring Diagram - Suction Control.....Fig 17.13

17.2 .... Control System - Access

Access to the control box is by removing the base access panel under the loading table. To remove the unit you will also need to remove the operator side cover (see section 1.2), and disconnect all the plugs from their sockets on the rear panel and from the side of the enclosure. Also disconnect the sensor connector from the lid.

If a replacement control box is fitted, it may be necessary to adjust the alignment of the front panel to suit the aperture in the side cover. This can be achieved by loosening the four screws which fix the mounting brackets to the enclosure, and adjusting the position of the entire box.

The control system enclosure houses all of the switches, fuses, sockets and other components including the suction control circuit board (PCB 1) and the motor speed control circuit board (PCB 2) which are mounted on the underside of the lid. To gain access to these items, after removing the control box from the machine, simply lift the lid and hinge it right back.

17.3 .... Suction Control Board - Removal

To remove the control PCB, disconnect the four remaining wiring plugs by easing them out of their headers. (The main header has three separate plugs, but unlike the friction control PCB they are mounted on a vertical header like the mains- in plug.)

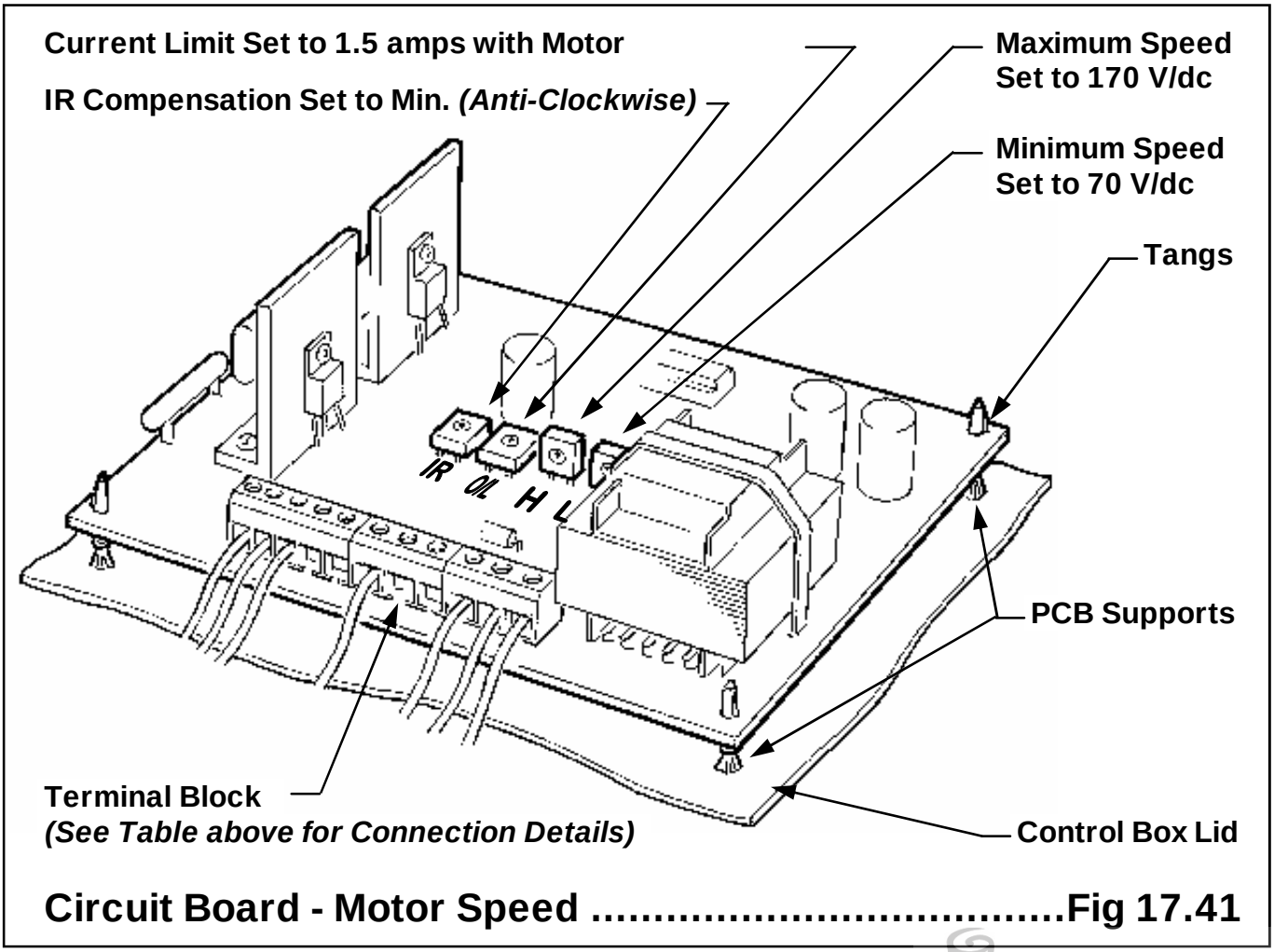
Cut any cable securing ties that are on the PCB, taking care not to damage any of the cables and partly release the PCB from it's two supports by depressing their tangs.

Firmly support the PCB by holding the large transformer, remove the two fixing screws from the outside of the lid and withdraw the board. (See Fig 16.12 on page 49)

17.4..... Motor Speed Control Board

The motor speed control board (PCB 2)) is mounted on four supports and may be removed by depressing their tangs after disconnecting all the cables from the terminal block. To help with re-installation of the PCB the following table, together with the circuit diagram on the previous, page will help you to re-connect the cables correctly:-

Wire colour	Wire Number	Terminal Ident
Orange	30	L
Grey	18	N
Red	31	A+
Black	32	C-
Red	35	H
White	36	S
Blue	37	L



Circuit Board - Motor Speed .....Fig 17.41

The following sections should be used in conjuction with the troubleshooting section in the operators guide.

17.5 …. Trouble Shooting - *Machine Will Not Run*

'Mains Power on' Does Not Illuminate. **Check that mains power of the correct voltage is reaching the machine and rear isolator. Check that the mains input lead is securely plugged into it's socket in the side of the control box. (remove base access panel to check).**

Compressor Does Not Run **If the Switch does not illuminate check the connections from the mains inlet socket to the switch and if sound replace the switch.**

If the switch does illuminate, remove the base access panel and check the compressor lead is securely plugged into it's socket in the side of the control box. Check the connections between the switch and the socket and check the mains voltage at the compressor motor.

Finally check that compressor is not seized by rotating the fan on top of motor before replacing the unit. -

WARNING

DON'T DO THIS WITH THE POWER ON.

'*System' switch will not latch* **Check that the guards are correctly closed and the emergency stop switch is released by turning it counter clockwise. Check the security of both 2 way plugs at the rear of the control box and check both motor and control fuses.**

Check the continuity through each 2 way plug and if not sound trace the fault to defective connection or switch. If continuity is sound check the security of connections between both 2 way sockets and terminals 18 & 19 on the suction control board (PCB 1). Also check the blue wires at terminals 22 and 23 on PCB 1.

If the PCB 'clicks' when a guard is opened or closed, replace the system switch. If there is no audible 'click' then replace the PCB.

Motor will not run **Check the motor fuse is intact and rated at 3.15 amps. Check the security of the choke and motor 4 way plugs and check the connections to the choke & motor.**

Check the connections inside the control box to the 4 way sockets and system switch and check all connections to the motor speed PCB. Check the input voltage to the motor speed PCB (mains AC voltage across orange & grey). If not correct, trace the fault to a switch or connector.

Check the output voltage from the motor speed PCB (170 V DC across Red and Black at the max speed setting on the front panel). If output voltage is incorrect, replace motor PCB. If output voltage is correct, check voltage at the motor and if okay replace motor brushes. If this fails replace the motor.

Note.....Voltage checks need to be carried out with all connections intact as the motor load will affect the

voltage drop.

17.6 …. Trouble Shooting - *Machine Will Not Feed*

Suction Valve Will Not Operate **- Check the security of the 3 way plug at the rear of the Control Box, and the valve connector on the valve coil**

Check the wiring to the valve connector, the 3 way plug & socket and to terminals 12 & 13 at the control PCB inside the Control Box.

Check the wiring between the feed 'On' / 'Off' switch on the front panel and terminals 20 & 21 on the control PCB

Check the voltage at the valve with the feed switch 'on' (it should be 4VDC). If the Voltage is incorrect, replace the control PCB.

If the Voltage is correct, check the coil resistance (it should be 10 Ohms). If it's incorrect replace the coil. If the coil resistance is correct, dismantle the valve (See Section 15) and inspect the plunger assembly for failure or sticking.

If the valve is okay then replace the control PCB.

Machine feeds one sheet and fails to feed thereafter: **-Check the security of the 6 way connector at the rear of the Control Box.**

Check that the rotation sensor micro-switch (which is located on the main clutch back plate), is operated by the clutch stop collar when the clutch rotates *and* when the clutch stops.

Check the wiring to the micro-switch, the 6 way plug and socket on the rear of the control box, and to terminals 9, 10, 11, on the control PCB.

If all else fails, replace the control PCB.

17.7….. Trouble Shooting - *Machine Will Not Number*

Sheets feed but will not number:- **Check that the numbering 'on/off' switch on the control panel is down to the 'on' position.**

Check that the sensor cables are properly installed and clamped into the correct positions in their 4-way plug and that there are no stray strands of wire which could short out on the lid. Also ensure that the 4-way sensor plug is firmly installed into its mating header on the control PCB.

Release the upper sensor and clean both sensor lenses.

Check that the LED on the control PCB is not illuminated. This indicator should only illuminate when paper is between the upper & lower sensors, but it will also illuminate if the sensors or their cables are damaged.

If the LED is illuminated, check the connections to terminals 4, 5, 6 & 7 on the PCB and check that these wires are not shorting. Also check the soldered connections to the phono plugs and sockets to ensure they are not shorting. Finally replace the PCB and / or the sensors.

If the LED is not illuminated, Check the security of the 6 way socket on the rear of the control box and the wires from the socket to terminals 9, 10, 11, 14, 15 & 16 on the control PCB.

Check the connections to the main clutch coil (red & black wires).

Check the main clutch coil resistance which should be 10 Ohms and replace the coil if this is incorrect otherwise replace the PCB.

If the clutch does not operate in 'manual' mode, check the wiring between the numbering auto / man switch on the control panel and terminals 16 & 17 on the PCB.

Standard Business Systems
10 Connector Road, Andover, MA 01810
(978) 470-1920 (978) 470-2771