CHAPTER 2

TELEPRINTERS

THE central item in any radio teleprinter station is the teleprinter. There are many types available but they follow the same basic principle, that is, they have a mechanism for receiving incoming dc signals and converting these into a printed copy, either in the form of a message on a long paper tape or on a roll of paper. They are driven by a motor, the speed of which must be held steady within close limits. Most have a keyboard to enable the generation of a message in the form of dc pulses, although some are manufactured as receiving only (RO) machines and have no keyboard. All types must operate for considerable periods of time with the minimum of maintenance.

In this chapter various teleprinters are covered in some detail and the mechanical means by which the basic requirements are obtained are described. It should be understood that teleprinters are complex machines and although built to high engineering standards they require careful adjustment and lubrication to obtain the best results. Therefore, before attempting any adjustment the operating principles of the machine should be fully understood. A well maintained teleprinter in the amateur's shack with low duty cycle compared with a commercial circuit will give years of trouble-free service.

The purpose of fitting motors to teleprinters, reperforators etc is to provide power to operate the transmission and receiving machinery. To provide a satisfactory function the motor must run at a constant speed; so that the local and distant machines do not go out of synchronism, it should have a high starting torque and should run with minimum maintenance.

The three types of motor commonly used on teleprinters are ac mains synchronous; dc shunt field, governed; and ac or dc series field, governed.

Shunt Field Motor

Fig 2.1 shows the connections of a shunt field motor. In this arrangement the field is connected directly to the supply and so the current in the winding is constant. Because of this the speed is nearly constant under all conditions of load, but the starting torque is rather low.

To obtain the best performance from a shunt field motor the arrangement of **Fig 2.2** is normally used. In this method of operation, a high field current gives a low speed and a lower field current gives a higher speed. At rest, the starting contacts are closed, shorting the governor resistor. When power is applied, because there is no armature motion and consequently no back emf generated, the flux developed between the armature and the field is high, resulting in a high starting torque. As the motor rotates, the starting contacts, under the influence of a very light spring, open and place the governor resistor in series with the field. This causes the field current to fall, reducing the armature back emf, increasing armature current and so increasing the speed.

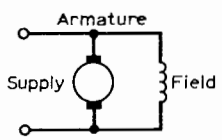


Fig 2.1.
Shunt field motor, basic circuit.

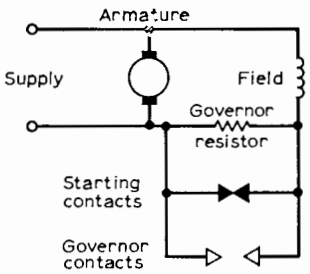


Fig 2.2. Shunt field motor, circuit showing governing arrangement

When the motor reaches its intended governed speed, which would be rather lower than if the motor were not governed, the governor contacts close due to centrifugal force and so switch the governor resistor out of circuit. When this happens the field current is increased and consequently so is the armature back emf, resulting in lower armature current and a reduction in speed. This in turn allows the governor contacts to open, again placing the resistor in circuit, so increasing the speed. This action is continuous all the time the motor is running and produces a very slight oscillatory motion of the governor contacts. The speed may be held to within $\pm$ 0·5 per cent both for supply variations of approximately 10 per cent and for all the varying loads imposed by the teleprinter mechanism. **Fig 2.3** shows the general arrangement of a shunt field motor governor.

Series Field Motor

The series field motor circuit is shown in **Fig 2.4**. The field and armature windings are in series so that any change in the load will reflect a change in both the armature and field currents. This in turn will produce a flux variation. When the load is light, the motor runs at high speed because the current is low and, therefore, so is the flux. If the load is

increased the speed decreases, resulting in a higher current and, therefore, a higher torque due to the increased flux. It can, therefore, be seen that the starting torque is high. The normal series motor governor circuit is shown in **Fig 2.5**. When the motor is at rest the governor contacts are closed and so short out the governor resistor which is in series with the

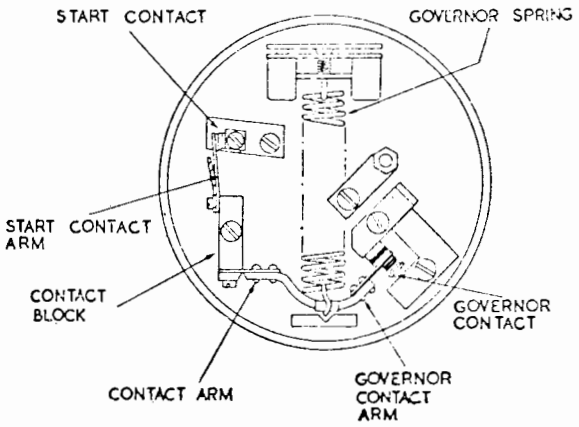


Fig 2.3. Creed shunt field motor governor.

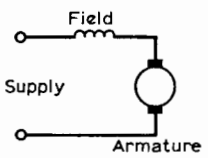


Fig 2.4. Series field motor, basic circuit.

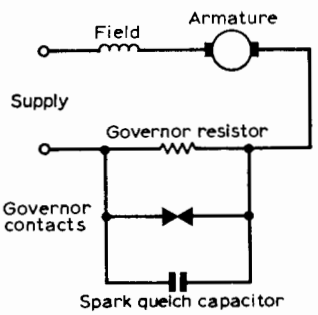


Fig 2.5. Series field motor, circuit showing governing arrangement.

armature and field. As the motor reaches control speed the centrifugal force acting on the contact arm overcomes the tension spring, allowing the contacts to open, and so places the governor resistor in circuit. When this happens the current falls, reducing the torque, and so the speed drops, enabling the governor contacts to make again and increase the speed.

Because the governor has to control an inductive circuit it is essential that spark quenching is fitted to reduce contact wear. **Fig 2.6** shows a typical Creed series motor governor.

Synchronous Motors

Little need be said about synchronous motors. As their speed is determined by the supply mains frequency no governors are required. Also, as no brushes are fitted there are no electrical connections to any moving part, resulting in a motor which requires minimal maintenance.

Maintenance

When used in amateur service the motor is subjected to much less duty than would be encountered in commercial service, but the conditions under which it operates may be much more severe. Because of these conditions, maintenance on the motor, in addition to that of the machine, is essential.

If the motor has greasing points, these should be lubricated with the correct grease at regular intervals. Some motors, especially those used on many Creed machines, require that the ball races be repacked with new grease every 3,600 hours. The old grease should be removed by soaking in white spirit. The races should then be dried thoroughly before repacking with grease, such as Shell Nerita Grease 3. Oil should not be used on ball races unless specified by the manufacturer.

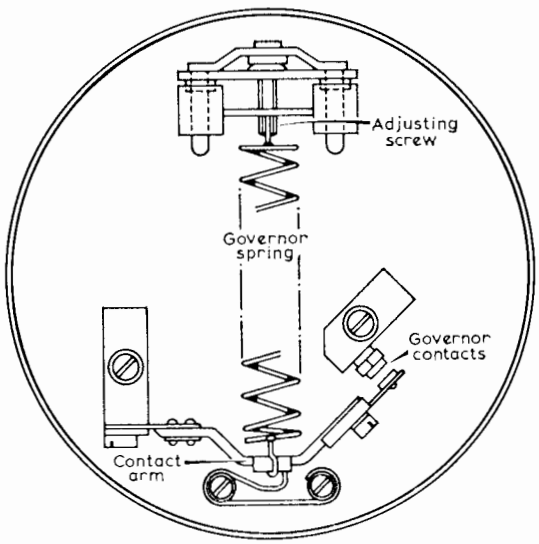


Fig 2.6. Creed series field motor governor.

Brushes should be inspected and replaced if worn down to less than two-thirds of their new length. If the motor has two brush tracks the brushes should be fitted so that they are offset.

Unless the commutator is worn the black deposit on the copper should not be removed. This blackening is an indication of case hardening and its removal will increase wear. If the commutator is worn or grooved it should be skimmed in a lathe using a sharp pointed tool. The mica insulation between the segments should be checked that it is 15 to 25mil below the surface of the commutator. If less than this it should be undercut while the armature is in the lathe by means of a thin square-edge tool.

After skimming and undercutting, the commutator should be polished to as high a degree as possible, as this minimizes brush wear. For polishing, glass paper only should be used. Emery cloth should never be used.

Governor slip rings should be treated in a similar manner to the commutator. Governor contacts should be clean and smooth. If pitted, they may be lightly filed to shape and then burnished with a jeweller's pivot file and burnisher.

ELECTRICAL NOISE SUPPRESSION CIRCUITS

Electrical noise generated by the teleprinter is quite a problem in rtty service. Much attention must be paid to the suppression of commutating and contact signalling circuits, or the operator will find his radio reception is being heavily jammed by his own teleprinter equipment. Even the electrolytic action arising from the rubbing together of many metallic parts in the teleprinter can cause interference if a "hot" aerial wire passes close to the machine. It is essential to get the aerial well away from the telegraph apparatus, and to use coaxial cable for some distance.

A common earth wire to teleprinter and receiver can display standing waves arising from interference noise and cause a great deal of obscure trouble. It is a good idea to provide a direct capacitance earth to the teleprinter by connecting it to a large sheet of metal laid flat on the floor by the shortest possible wire. The metal sheet should also be connected to the mains earth as a safety precaution, but its capacitance to true earth will short-circuit interference voltages that may otherwise get back into the receiver's input via the earthing system. Mains wiring in the vicinity of the equipment should be screened and filtered. Not all teleprinters available to the amateur have suppression devices built in, so a check of these is well worth while.

If motor hash is a problem an improvement may be made by by-passing the motor brushes to earth right at the point at which they are mounted, via a 0·01μF disc ceramic capacitor of 1,000V min working volts. Further improvement may be effected by the use of the small ferrite-cored chokes used for suppression of interference from domestic electrical appliances. These should be placed in each of the motor leads and decoupled on both sides by the special capacitors designed for use with these chokes.

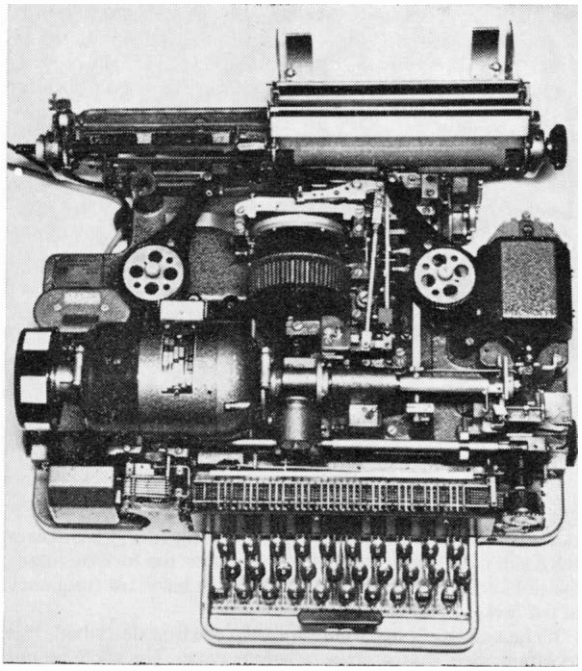
Interference from the telegraph loop must be very carefully investigated before adding suppression components as these will alter the loop time constants and could cause other troubles. Attention should be paid to the condition of the teleprinter keyboard contacts and any polar relay contacts, and if they are at all pitted or tarnished they should be smoothed down and burnished.

THE CREED 7B

Introduction

The Creed 7B teleprinter, which has been released in large quantities during the past few years, is on the face of it a complex machine. However, it can be sub-divided into easily appreciated assemblies.

The essential functions of a teleprinter, not only the 7B, are to originate and receive the mark-space combinations. Much useful information can be obtained by turning the motor by hand while operating the electromagnet and the keys and watching the ensuing motions. Do not turn the motor backwards and do not force anything.

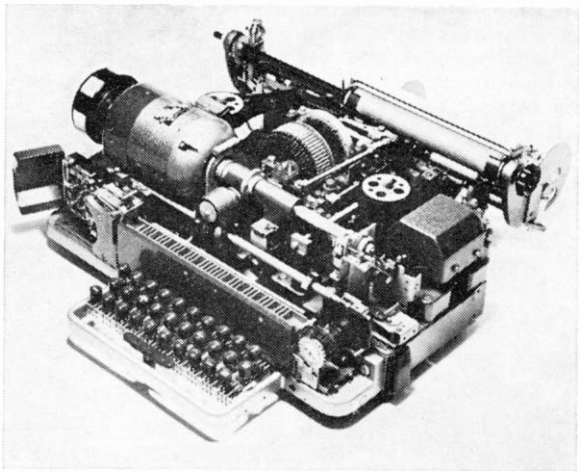


The Creed Model 7B teleprinter.

Speed Adjustment

While most of the Creed Model 7 and 54 family of teleprinters are fitted with governed type motors, there are some to which synchronous motors have been fitted. These synchronous motors run at a fixed speed of 3,000rpm for use on 50Hz mains and the speed cannot be adjusted. It becomes necessary, in these cases, to effect a gear change on the machine, sometimes a costly and difficult task if it is required to run the machine at 45 bauds. The purchase of a machine with a synchronous motor should be avoided unless it is intended to operate the machine at the speed for which it has been manufactured or unless modern electronic interface units are available to correct the speed. The following comments are therefore intended to apply to machines with governed motors, generally running at 3,000rpm for either dc or 50Hz ac mains.

Correct speed of the motor is the first requirement. Early teleprinters have a large white spot painted on the typehead spindle gear wheel, just above the keyboard and facing the operator. This rotates quite slowly. A stroboscope consisting of a shutter mounted on a reed which may be made to vibrate at its resonant frequency, so opening and closing the shutter, is used to view the spot. If it appears stationary, speed is correct, but if the spot appears to move clockwise or anti-clockwise the speed is fast or slow respectively. When the speed discrepancy is large, this is a difficult and frustrating device to use. Modern teleprinters running at 50 bauds have five equal white spots painted around the circumference of the governor cover, and these are viewed through a shutter consisting of two light plates mounted



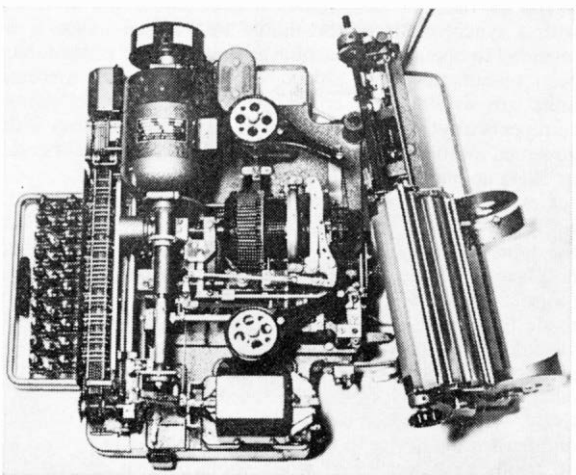
The Creed Model 7B without orientation device.

at the tips of the arms of a 125Hz tuning fork. Each plate has a slot in line with the fork arms, and as the fork oscillates the slots become briefly coincident at the resonant frequency of the fork.

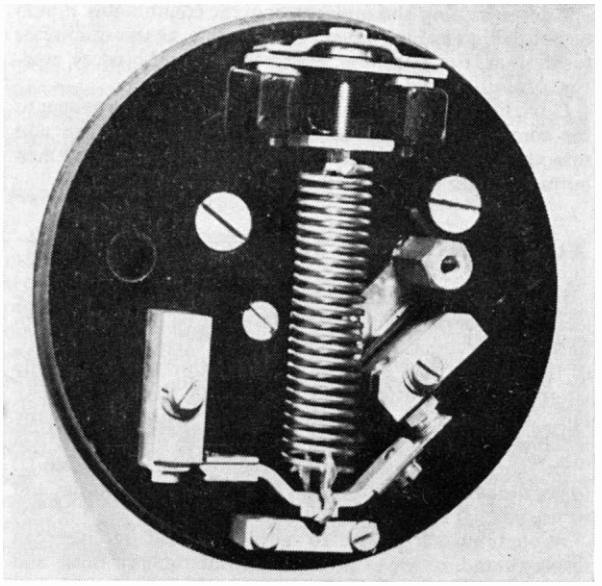
If the amateur's machine is of the type first described, it is recommended that a strip of white paper ½in wide be cut to the exact length of the governor circumference, and divided into 10 equal parts, five of which are coloured black. This can then be stuck around the governor with a powerful adhesive. For 45·5 baud operation, there should be 11 black, 11 white spots when used with a 125Hz tuning fork.

A simpler method of checking and adjusting the speed of a 3,000rpm governed motor, especially where a tuning fork is not available, is to observe a white line on the end face of the governor by means of a bright neon lamp powered from 50Hz mains.

A 0·25in wide strip of white paper should be gummed to the end face of the governor from the centre to the outer circumference. Switch the motor on and hold the magnet armature over so that the machine "races" and by so doing



The Creed Model 7B with carriage swung back to the stops. The carriage may now be removed by simply lifting off.



Creed series motor governor.

"loads" the motor. When observed by the light of the neon the white strip will be seen as a two-bladed "fan". If the fan is stationary the machine is running at the correct speed for 50 bauds. If the fan is moving in the direction of rotation of the motor the speed is high and if the reverse, it is low.

The governors fitted to later machines have an adjusting screw which is accessible without removing the cover, but in earlier machines it may be necessary to take the cover off to gain access. In both cases, turning the adjusting screw towards "−" will reduce speed and towards "+" will increase speed. The supply should be turned off at the mains while adjusting this screw as it is "live" even when the motor is not turning. Assuming that the machine has been correctly set to 50 bauds, experience has shown that turning the governor screw 7½ full turns towards "−" will set the machine on 45 bauds to a degree of accuracy adequate enough to give correct operation.

The Creed 6S6 tape reader dealt with in Chapter 3 may be adjusted in a similar manner but the motor for this runs at 1,500rpm when set to 50 bauds and so a four-bladed fan will be seen on the governor end. The governor screw will however still require to be turned 7½ full turns to "−" to adjust to 45 bauds.

In conclusion it must be pointed out that the fact that the machine, when adjusted by either method, produces good local copy is not an indication that the speed setting is correct. The motor is common to both transmitter and receiver and will therefore produce good local copy no matter what the speed.

The Transmitting Mechanism

The principle of operation from the keyboard is illustrated in **Fig 2.7.** There are five combination bars (CB), one for each element in a character. These bars have a series of projections along their upper edges arranged so that, if a character key is pressed, the keybar (K) associated with it will impede movement to the right of such combination

bars as have projections at that point. The combination bars are each spring-loaded towards the right, but are held against the springs by the common returning lever (RL) while the keyboard is at rest.

The vertical member of each keybar has a projection which forces down the trip bar (TB) as soon as a key is pressed, and this causes the trip lever (TL) to move in a clockwise direction, so lifting the pawl abutment out of engagement with the one-revolution clutch pawl (P).

The one-revolution clutch is shown in **Fig 2.8**, and its purpose is to provide one rotation of the transmitting cam shaft (TC) whenever a key is pressed. Its latching action prevents a second rotation in the event that the key is held down longer than the time taken to transmit the character. Operation of the keybar (b) forces down the trip bar (a) and the bell-crank (c) moves in a clockwise direction, causing the pawl abutment (d) to move in an anti-clockwise direction, so raising its tip out of engagement with the pawl (e). The pawl therefore drops down under the pressure of its spring and engages a tooth on the ratchet wheel, which is continuously rotating under motor drive. This causes the cam shaft to rotate. In rotating, the cam (f) forces the link (g) between the bell crank and the pawl abutment out of engagement with the pawl abutment, which therefore moves back into position to arrest and trip the pawl out of engagement with the ratchet when the single revolution has been completed. If the key is held down after this time, the pawl abutment will not again release the pawl because the link remains out of engagement, and will not re-engage the pawl abutment until the trip bar has been released by the raising of the keybar when the character key is released from pressure by the operator.

Reverting to **Fig 2.7** when the camshaft starts to rotate, the common returning lever (RL) is allowed to move in an anti-clockwise direction on its spindle by the profile of its cam (C), thus releasing the combination bars, which can then move to the right under their spring tensions. Due to the projections on the combination bars, some will move freely, while others will be arrested by the keybar, according to which key has been pressed. The combination bars therefore set up the character combination by their relative positions. The process which follows is that of transforming this simultaneous condition of five elements into a sequential string of signals on the single wire output from the transmit tongue contact.

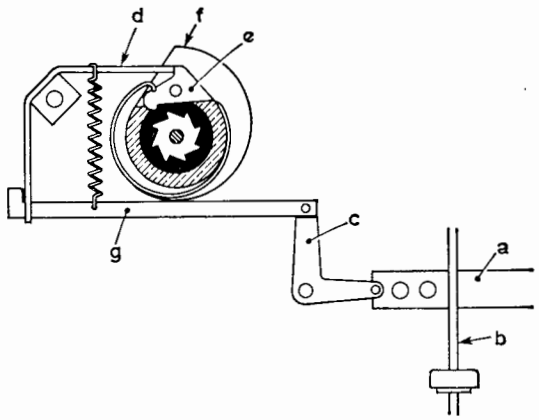


Fig 2.8. Creed Model 7 teleprinter, one revolution clutch.

As the cam shaft rotates, the shape of the front cam on the shaft forces up the start-stop lever (SSL), which allows the common operating lever (CL) to move in a clockwise direction on its spindle under the tension of its spring (TCS).

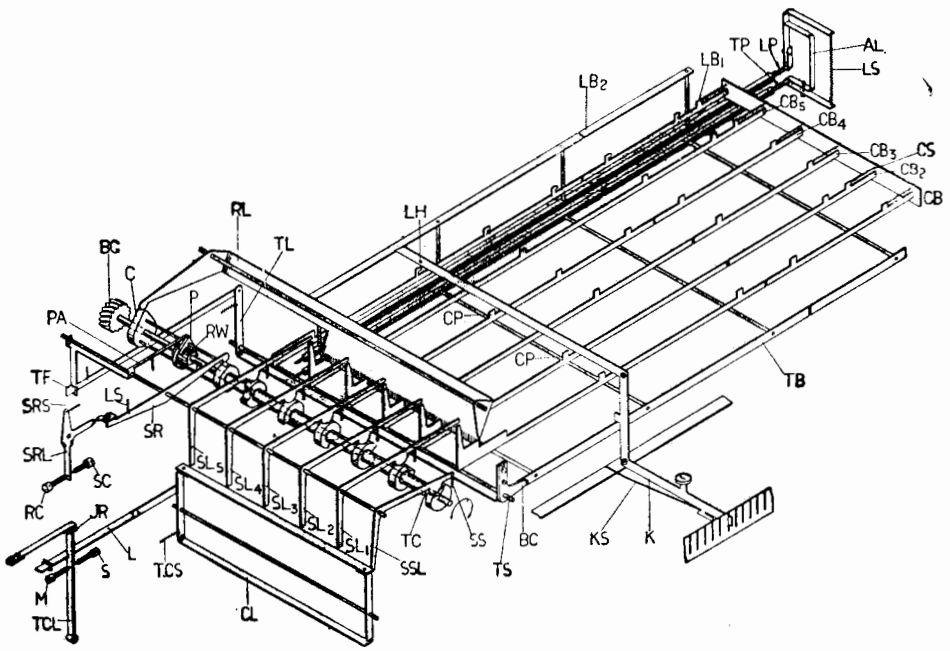


Fig 2.7. Creed Model 7 teleprinter, transmitting mechanism.

The link (L) moves to the right and pulls over the transmit contact tongue (TCL) to space, thus sending a start signal. The tongue has a jockey roller (JR) giving a toggle action to the contact, which improves its transit time and provides a firm contact pressure.

Each of the element cams has a dimple in its profile, and these dimples are staggered in relation with each other. When the dimple on the first cam becomes coincident with the projection on the first selector lever (SL1), this lever will drop under its spring tension, provided the combination bar has moved to the right so that its tip does not impede the movement of the selecting lever. Dropping of the selector lever will force the common operating lever to move in an anti-clockwise direction on its spindle, and its link will switch the tongue contact to mark. If the selector lever is prevented from dropping by its combination bar, the contact will remain at space.

This process is repeated for each element in turn, as their individual cams offer movement to the selector levers. After the combination has been transmitted, the front cam profile again allows the start-stop lever to drop, so forcing the common operating lever to mark for the stop signal. The clutch latches at the completion of one revolution, and the cam at the rear end of shaft causes the common returning lever (RL) to reset the combination bars.

There are two locking bars associated with the keyboard. The first (LB1) moves and locks the keybar as soon as a character key has been pressed, so that the key will remain operated for the duration of the character transmission, irrespective of when the operator removes his finger from the key. The second (LB2) moves forward when a key is pressed and takes up position between the operated keybar and all the others, thus preventing operation of a second key while a character is being transmitted. A fast typist can feel the action of this locking bar holding back the speed of typing.

The modern "N" series keyboards differ from the type described above. They are available with three or four rows of character keys. In the latter case figures are on a separate row, just like a typewriter keyboard, and an interlocking arrangement prevents a key in either upper or lower shift case being pressed unless the appropriate shift key has been pressed previously.

The Selection and Printing Mechanism

Fig 2.9 illustrates the selection and printing mechanism. The movement of the armature extension of the receiving magnet (RA) causes the trip shaft (TS) to move on its spindle, clockwise for a space and anti-clockwise for a mark. The trip shaft is linked to the pawl abutment (D) of the receiving cam clutch, which works in rather a similar manner to the transmitter clutch. The first space received trips the pawl and the cam makes one revolution.

The striker blade (SB), which is a thin steel spring leaf, is arranged to oscillate in the horizontal plane by the movement of the finger setting lever (STL) running in cam slot T1. At the same time a vertical oscillatory movement is imparted to the striker blade by the movement of the trip shaft, which is

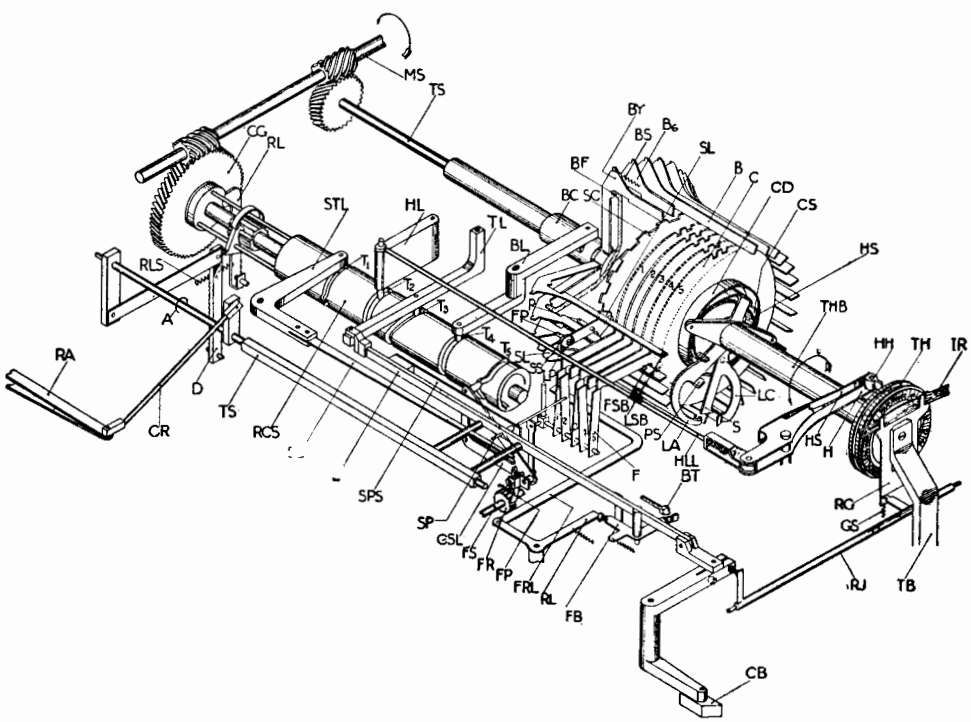


Fig 2.9. Model 7 teleprinter, selection and printing mechanism.

under control of the magnet, and whose movement thus follows the marks and spaces of the character combination being received. The striker pin (SP) is held in position by the traversing link (L), and the latter is driven by the traversing lever (TL), running in cam slot T3, which causes the link to move parallel to the trip shaft, carrying the striker pin with it. The timing of the traversing link, relative to the striker blade, is such that the striker pin is in line with one of the selector fingers (F1 to F5) every time the striker blade moves towards it. If the striker blade is in the upper position of its vertical plane movement, occasioned by a mark, the edge of the blade will strike the striker pin and move it forward, thus pushing back the coincident selector finger. When a space is being received, the striker blade will be in its lower position and will pass beneath the striker pin, so that the coincident selector finger will not move. In this manner the combination of the character is recorded on the positions taken up by the selector fingers.

So far the operation of the mechanism has reached the stage of converting the sequential movements of the magnet armature into five steady state conditions of the selector fingers. The next step is to convert these five separate conditions into one of the 32 possible conditions which together they provide. This is done by the translating mechanism. Five combination discs (C1 to C5) are mounted in an assembly, each able to move radially. Around their peripheries are a series of slots, and around the assembly are grouped 64 bellcranks (B), each tensioned by its own spring (BS) towards the assembly. The combination disc setting lever (CSL) is driven from slot T5 in the cam, and raises the spindle on which the five selector fingers pivot, after all the fingers have been set to the combination. Simultaneously the bellcrank lifting lever (BL), operating from cam slot T4, pushes the sliding sleeve (BC) up against the bottom ends of the bellcranks, lifting them and so freeing the combination discs from their pressure. The combination discs are spring-loaded and will rotate if their extension arms are not impeded by the selector fingers. Those selector fingers which have been pushed back by the striker pin into the mark position will obstruct the combination disc movement, while those which are in space position will be clear of the combination disc extensions, and those discs will move. For any combination there will always be one channel formed by a slot in each combination disc in line with all the others, allowing one of a pair of adjacent bellcranks (upper and lower case of the character) to drop into the channel so formed. A disc mounted at one end of the combination disc assembly and slotted regularly about its periphery (SC), is set in one of two positions by either the letter-shift bellcrank (LSB) or the figure-shift bellcrank (FSB), and the positioning of its slots determines which one of the character bellcranks will drop into the channel formed by the combination discs.

At the time the bellcranks are lifted by the sleeve (BC), the typehead clutch is engaged. This is a friction device which drives the typehead round until it is stopped by the position of the selected bellcrank. In this position, the character set up by the combination is presented to the type hammer (HH) ready for printing. By this time, however, the cam has almost completed its full revolution, and the actual striking of the type by the hammer, initiated by cam slot T2, takes place during the next selection process just before the bellcranks are lifted for setting of the combination discs. Consequently the printing is always one character behind the transmission.

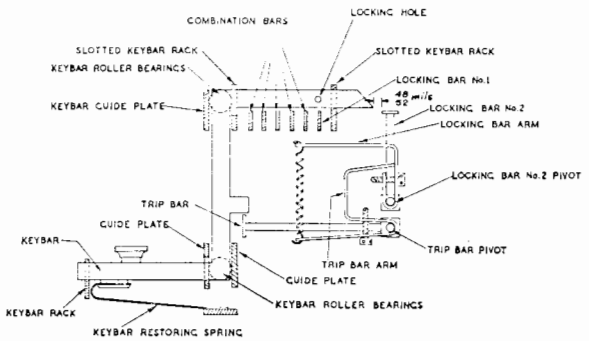


Fig 2.10. Keybar locking mechanism.

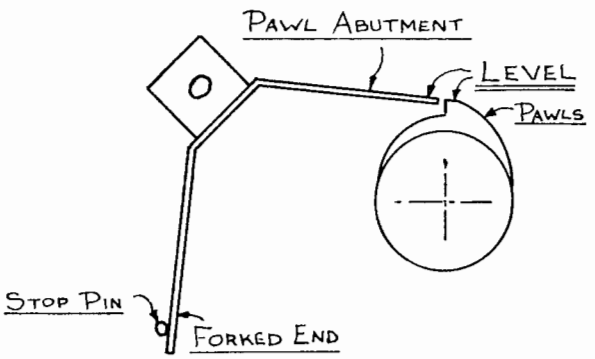


Fig 2.11. Transmitter pawl abutment.

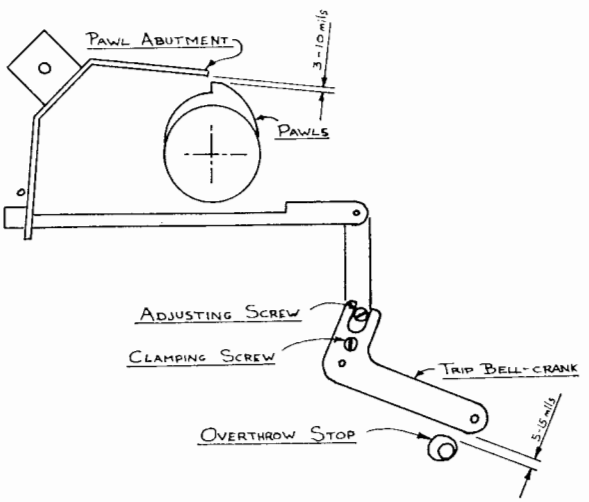


Fig 2.12. Transmitter pawl abutment.

Letter feed of the page carriage is accomplished by the action of the feed lever (CB), driven by the traversing link (L). Combinations resulting from letter-shift, figure-shift, carriage-return, upper case of J (bell) or all spaces, must not cause the carriage to feed. The bellcranks proper to these functions operate control levers, all of which operate a common non-feed lever, which inhibits operation of the feed mechanism for such non-printing combinations.

A pawl (FP), mounted at one end of the combination disc setting lever (CSL), steps a ratchet wheel (FR) to provide the feeding action of the inked ribbon.

Mechanical Construction

The 7B is unit-built, that is, there are several units which can be taken off the main base casting and treated as self contained units. These units have locating abutments, frequently painted red (P.O. machines may have yellow ones), which should not be adjusted as they have been accurately set in the factory in a jig.

Brief instructions are given for the removal of the units that present some special trick or difficulty. Those not mentioned can be removed in a straightforward way. These instructions are included so that the units can be removed for cleaning, if necessary. In order to adjust the machine no units need be removed. Further instructions for dismantling the units are not included, being out of the scope of this chapter. In most cases the units are simply built up and should be easily dismantled if necessary.

When the machine is completely reassembled, all abutment screws must touch their fellows and the cam unit casting must abut against the rear bearing block of the combination head. Further, no fixing screws should be tightened unless the unit they are securing is seated firmly and squarely on the base. If any unit casting is felt to give, it indicates that the unit is not seated properly.

Remove Keyboard Unit

Support keyboard and remove the two fixing screws. Remove by pulling straight forward—not bending the contacts.

Remove Transmitting Unit

Remove transmitting contact block, by removing screws at top R.H. and bottom L.H. Depress letter shift key, rotate transmitting cam to allow combination bars to clear the resetting lever. Remove transmitting unit fixing screws. Tilt unit forward to disengage trip bellcrank from keyboard trip bar. Pull unit to the left, raising it slightly clearing the resetting lever from the combination bars—turn it back to vertical, pulling to left till the driving shaft is drawn out of the ballrace.

Remove Motor

Remove governor. Withdraw the fixing screws of the L.H. end plate. Lift L.H. end of motor and slide to the left, minding the governor brush springs.

Remove Typehead

Remove screw securing the typehead bearing bracket to the control lever casting—draw the bracket clear of pin—raise it and draw clear of ribbon jumper. Draw typehead off driving pins.

Remove Control-Lever Unit

Turn the safety catch to hold control levers away from bellcranks. Remove two fixing screws—lift unit and remove, watching the "J"-bell contact rod.

Remove Receiving Cam Unit

Remove electromagnet bias spring (if fitted) and the electromagnet link from the electromagnet, lift ribbon feed pawl over dead centre. Remove receiving cam unit fixing screws and carefully remove unit.

Remove Combination Head

Remove main shaft and starter switch control unit. Withdraw dowel pin from keyboard and bearing, remove that fixing screw and those fixing the strap at the other end. Hold back answer back release shaft from the bellcranks—remove. Do not adjust eccentric screw on L.H. side.

Mechanical Adjustments

All the necessary adjustments can be carried out with the minimum of special tools. Those that are essential are: a set of BA spanners, a screwdriver, a set of feeler gauges—preferably small ones—and a tension gauge, say up to 1lb.

Before starting to work with the tool kit on the 7B it is well worth while sitting back and considering just what is wanted. Most machines are in reasonably good condition when obtained; however if a complete overhaul, clean and adjustment is needed it would be better to find a comprehensive manual that covers all the necessary details.

Keyboard Locking Bar No. 2

Slacken the trip bar arm clamping screw and, while holding the trip bellcrank fully anti-clockwise, adjust the trip bar arm to give a clearance of 5–6mil between the locking bar arm and the forked back stop. See **Fig 2.10.**

Slacken the locking bar arm clamping screw, and, with the keybars in the up position, adjust the locking bar arm to give a clearance of 48–52mil between the keybar extensions and the locking bar No. 2. Tighten both clamping screws. See **Fig 2.10**.

Transmitter Pawl Abutment

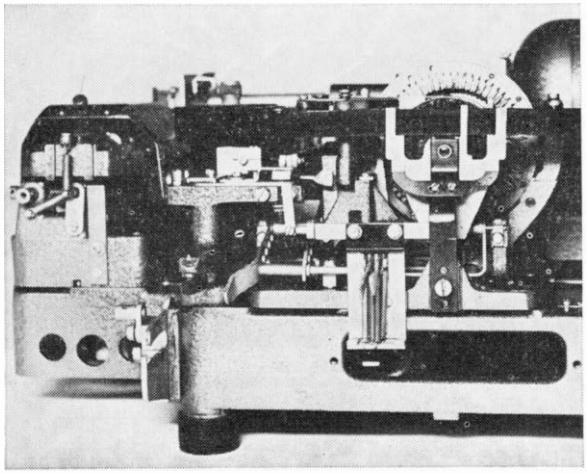
To make the pawl abutment level with the top of the pawls, when the forked end is touching the stop pin, slightly bend the forked end. See **Fig 2.11**.

Depress a key and turn the motor slightly manually. Slacken the trip bellcrank clamping screw and adjust the eccentric adjusting screw until a clearance of 3–20mil between the pawl abutment and the pawls is obtained. Tighten the clamping screw. See **Fig 2.12**.

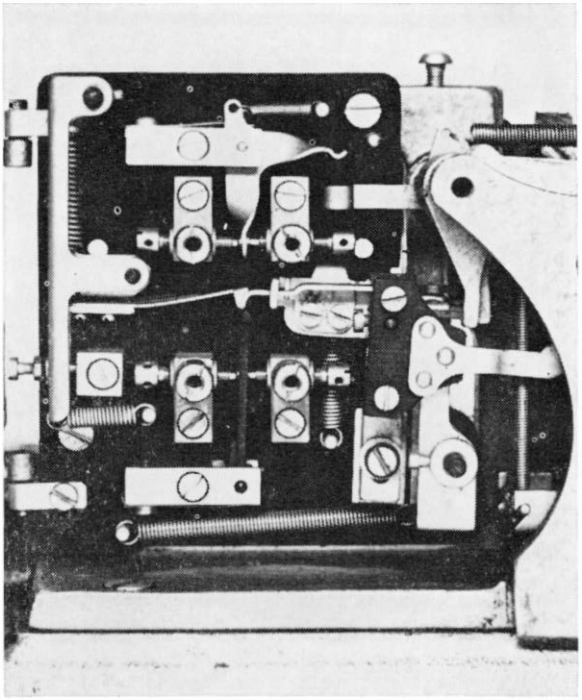
Slacken the overthrow stop clamping screw and adjust the knurled overthrow stop to give a clearance of 16–50mil between the overthrow stop and the trip bellcrank when a keybar has been operated.

THE CREED MODEL 7B TELEPRINTER

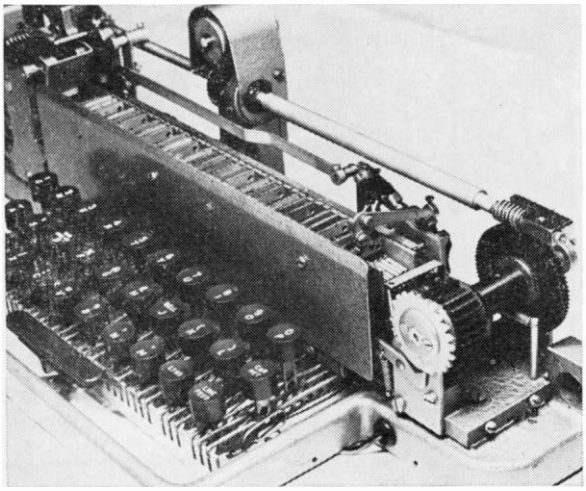
Design and construction details



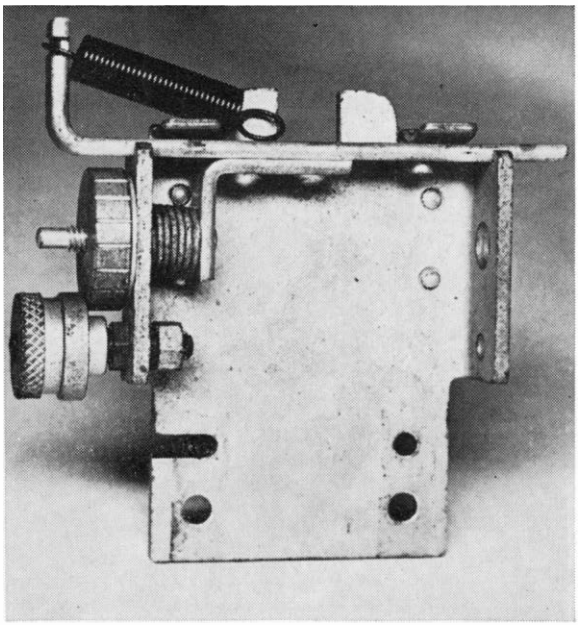
The Creed Model 7B teleprinter, rear view with carriage removed showing letter feed lever, feed throwout lever and carriage return and line feed levers.



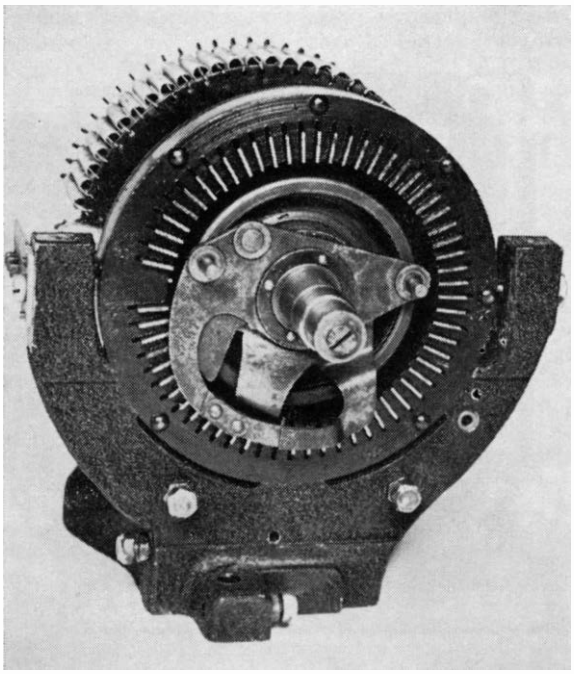
The 7B transmitter assembly.



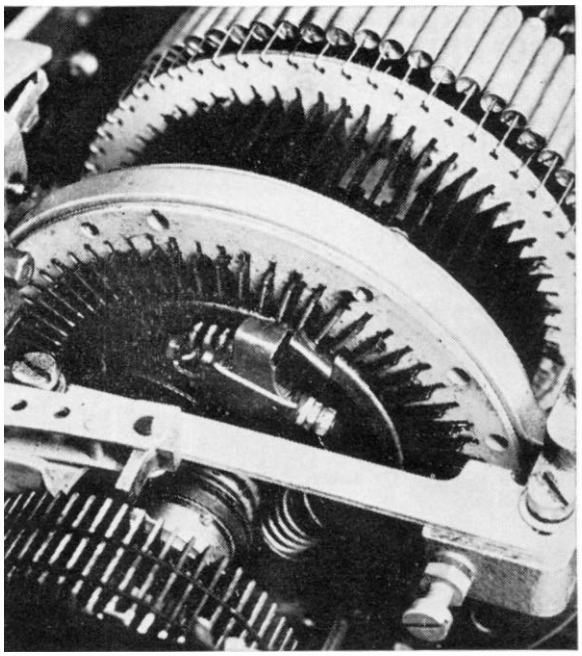
The Creed character counter fitted keyboard, showing long counter lever and the short resetting lever. At right front is the answer-back drum.



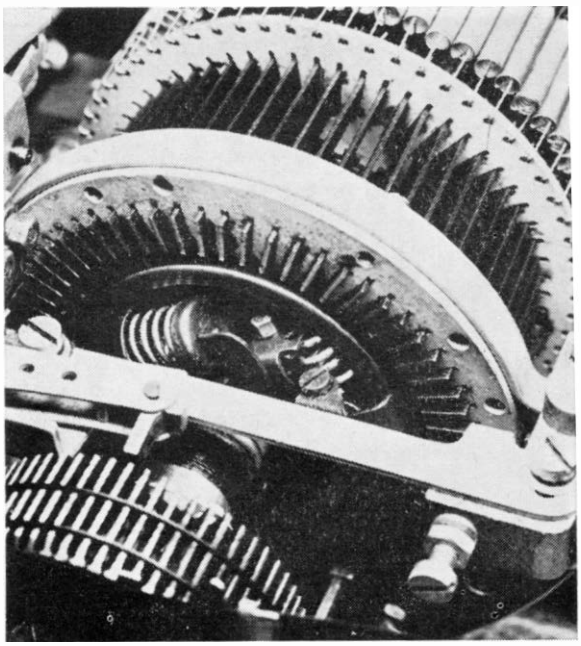
Creed 7B single current bias spring and mounting bracket.



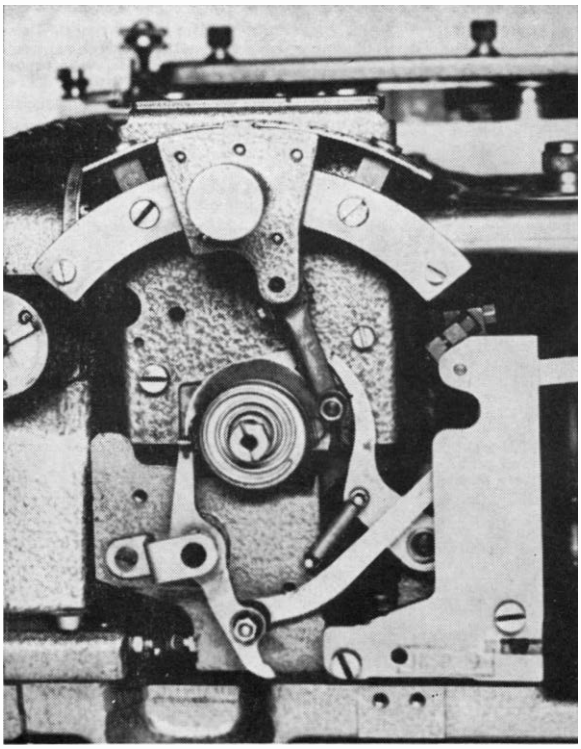
The Creed 7B older pattern typehead clutch.



The 7B typehead clutch, later version, showing latches.



The Creed 7B typehead, later version showing damper springs.



Creed orientation device as fitted to a 7B teleprinter.

Resetting Lever

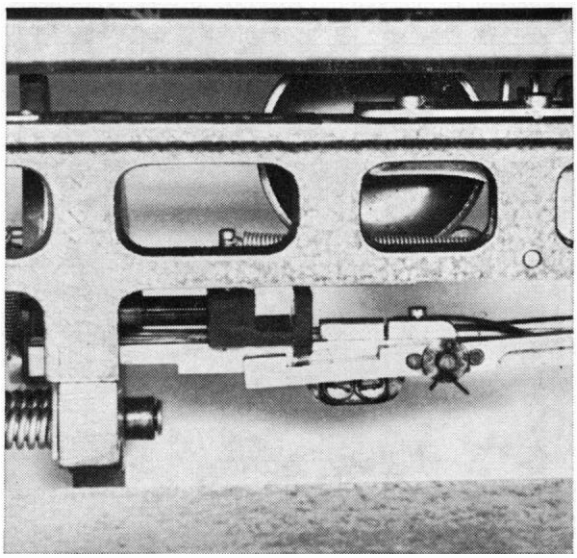
With motor running, slacken the re-setting lever spindle clamping screw and adjust by turning the eccentric spindle to give a clearance of 6–20mil between a combination bar projection and a keybar extension. Tighten clamping screw. See **Fig 2.13**.

Transmitter Contacts (Striker Type)

The striker type was introduced in 1939 and produces a less distorted signal than the previous type. For a general view of the striker mechanism see **Fig 2.14**.

Depress a key and turn motor manually until the striker timing lever is riding on a crest of the timing cam. Slacken the striker timing lever assembly block fixing screw, **Fig 2.15**, and adjust the clearance between the striker and transmitting tongue knife edges, when directly in line, to 15mil. Tighten the fixing screw.

Manually turn the motor until the third and fourth selecting levers are both touching the insulated edge of the contact operating lever. To check, push the bottom of the contact operating lever to the left and note if both the select-



The Creed Model 7 teleprinter carriage showing letter feed dog and crosshead.

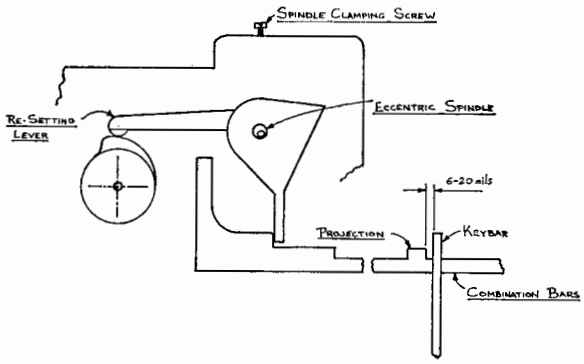


Fig 2.13. Resetting lever.

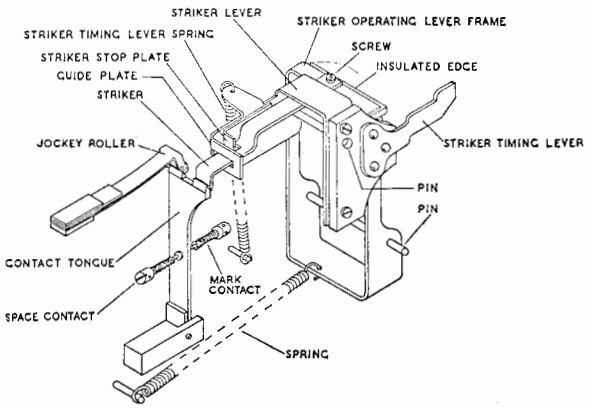
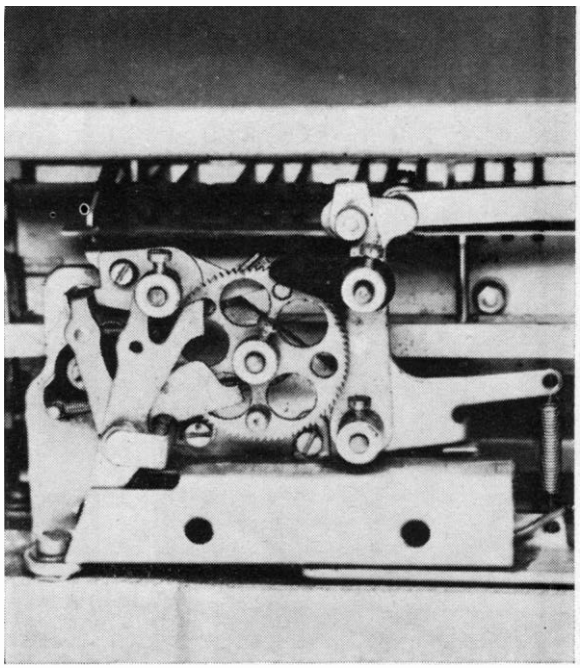
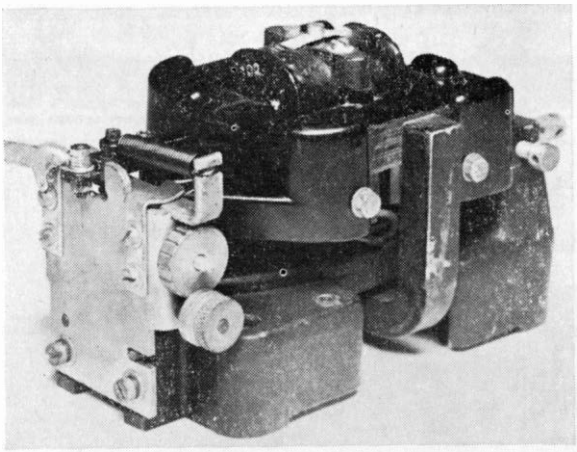


Fig 2.14. Transmitting mechanism.

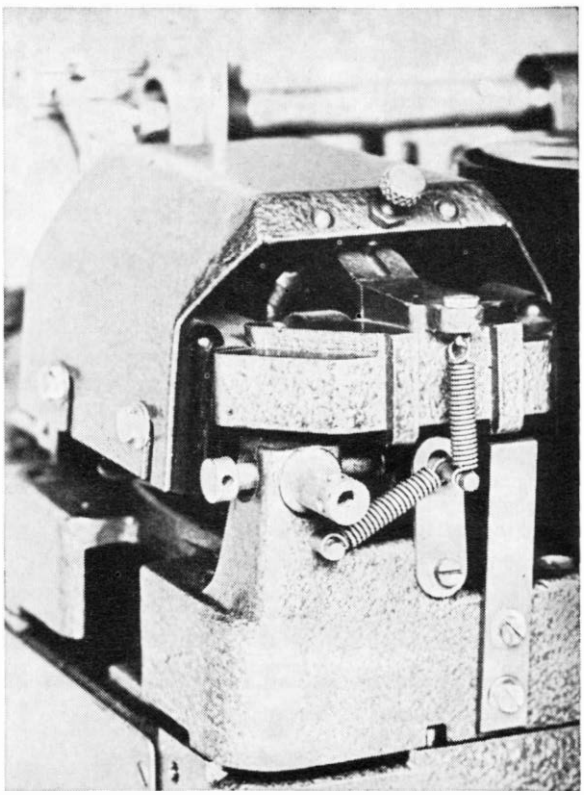
CREED MODEL 7 DETAIL



Character counter as fitted to some keyboards on Creed models 7 and 85.

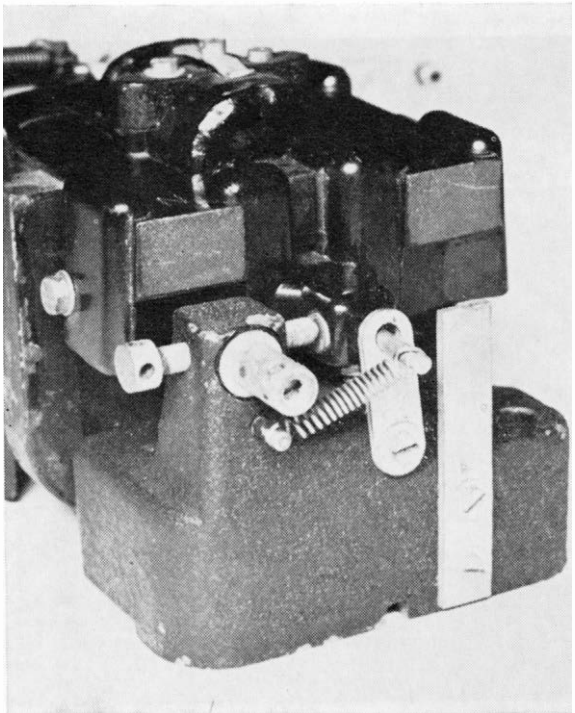


Model 7B teleprinter electromagnet showing single current bias spring adjuster.

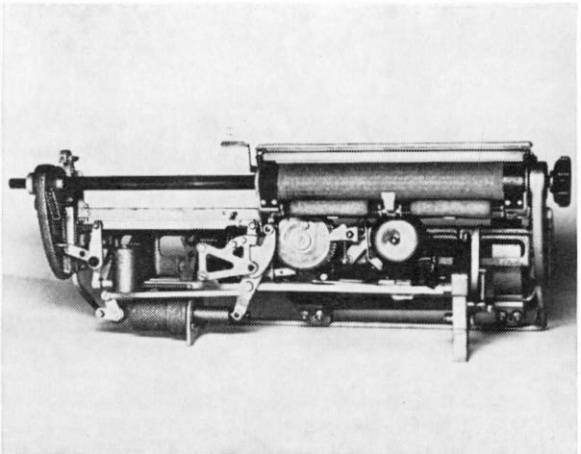


The 7B later type electromagnet, showing adjustment screws.

CREED MODEL 7 DETAIL



The 7B electromagnet, rear view, showing adjusting screws.



The Creed 7B teleprinter carriage, front view, showing air damper cylinder, return spring drum and bell.

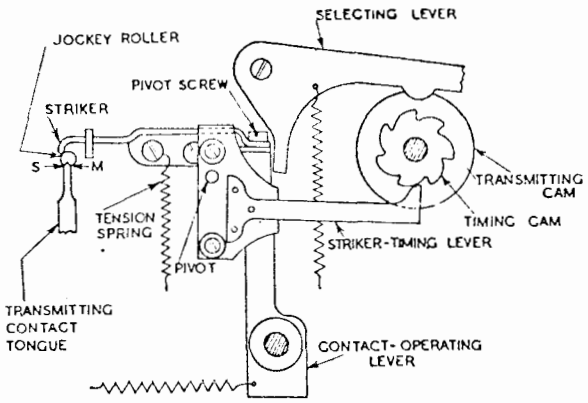


Fig 2.15. Striker timing lever.

ing levers move the same amount in an upward direction. If they do not, repeat until correct. Insert a 15mil feeler gauge between the selecting levers and this insulated edge. Slacken the two striker stop plate fixing screws and position the stop plate so that it just touches against the R.H. edge of the slot in the striker. Tighten the fixing screws and remove the gauge.

Keeping the third and fourth selecting levers still just touching the insulated edge, slacken the contact clamping screws. Now clamp the transmitting tongue between the contacts, with the knife edge directly under the striker knife edge. This adjustment is critical and should be adjusted accurately. Withdraw one contact to give a gap of 3mil and clamp. Withdraw the other contact 3mil to give a total gap of 6mil. Tighten the clamping screws. The striker should now ride down each side of the transmitting tongue knife edge to an equal amount, when the motor is turned and the "Y" keybar depressed.

The jockey frame bias screw locknut (or clamping screws) is slackened and the bias adjusting screw is adjusted to give equal force, 4¼–4½oz, between the transmitting tongue and both contacts. Tighten the locknut (or clamping screws). See **Fig 2.16a**. **Fig 2.16b** shows the general layout of the complete transmitter.

With the striker at its maximum height the force to lift it further should be 4½–5½oz. There is no adjustment for this; if the value is outside the limits this shows that the spring needs changing.

With the Rx/Tx switch resting on the Rx contact and with the motor running there should be 3mil clearance between the ebonite stud and the switch blade, with a gap between the Tx contact and the switch blade contact of 6mil. See **Fig 2.17**.

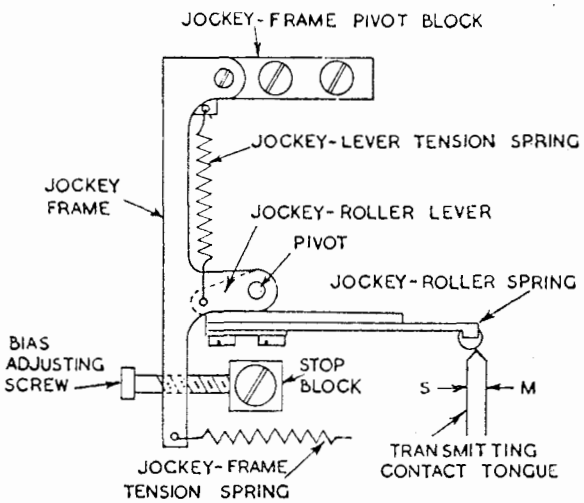
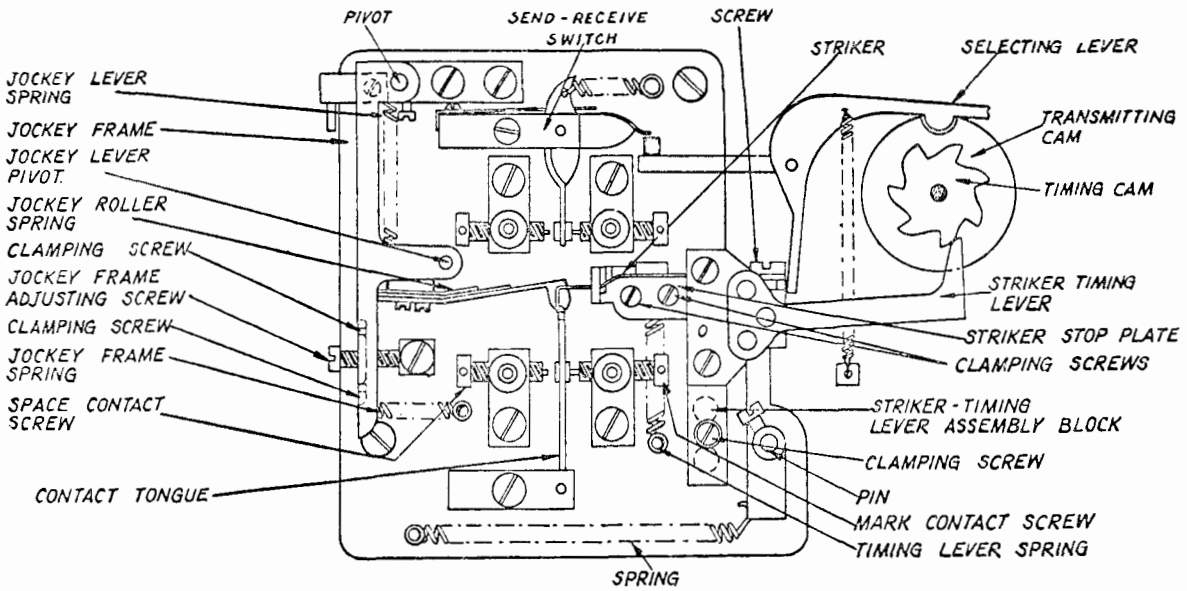


Fig 2.16a. Jockey roller.
Below: Fig 2.16b. General arrangement of transmitter assembly.



Receiving Side: The Electromagnet

The electromagnet armature should have a travel of 22–25mil measured at the stop plates. See **Fig 2.18**.

Remove the electromagnet link, slacken the bias adjusting screw clamp screw and adjust the bias adjusting screw, situated at the rear of the electromagnet, until the forces to move the armature in both directions are equal and between 8–12oz. Tighten clamping screw. Replace electromagnet link.

If an accurate tension gauge is not available it is possible to set the bias correctly by measuring the current necessary to throw the electromagnet armature in both directions, and adjusting the screw to obtain equal readings.

Electromagnet Mk II

This electromagnet can be adjusted off the machine and can be identified by the armature stop plate which is secured to the electromagnet casting.

The Finger-setting Blade

Move the electromagnet armature to space (RHS), rotate the motor manually, returning the electromagnet armature to mark (LHS), until the blade just touches the finger-setting pin, when this is opposite the central finger. Slacken the trip shaft lever clamping screw and, holding the electromagnet armature against the mark (LHS) stop, rotate the trip shaft until the finger-setting blade strikes the centre of the finger-setting pin. Tighten the clamping screw. See **Fig 2.19**. If this is adjusted then the receiving cam pawl adjustment must be checked.

Rotate motor manually and by moving the electromagnet armature to the mark (LHS) position set up LTR shift (MMMMM). The distance between the 5th finger and the slotted stop plate, or the resetting link if this is closer, should be 2–5mil. To adjust—release the finger-setting blade clamping screw and adjust the position of the blade, so that when the motor is again turned the above condition is met. Tighten the clamping screw. See **Fig 2.20**.

Rotate the motor until the receiving cam pawls are clear of the abutment and the finger-setting blade is clear of the finger-setting pin. Check that the forces to move the electromagnet armature in both directions are within 2oz of the figure obtained without the electromagnet link connected. They should also be within ½oz of each other. To obtain neutrality the finger-setting blade is given a set by careful stroking. The blade can easily be removed by removing the two screws on the blade guide and removing the top plate. See **Fig 2.20.** The blade and its bellcrank can then be lifted off its pivot, after removing pivot retaining screw. Beware that the roller follower does not drop off the small pin at the end of the bellcrank.

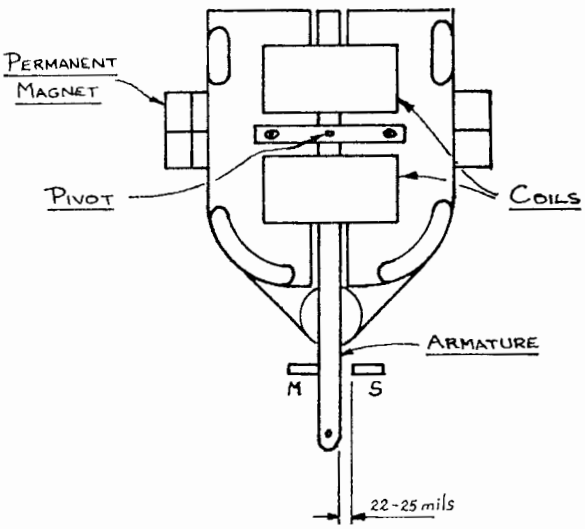


Fig 2.18. Receiving electromagnet.

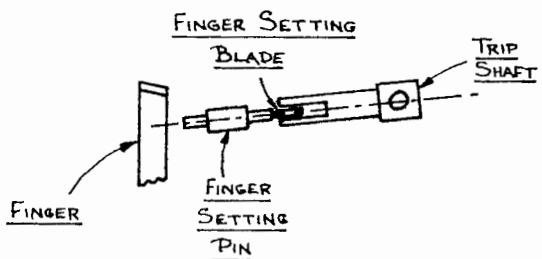


Fig 2.19. Finger-setting blade, height setting.

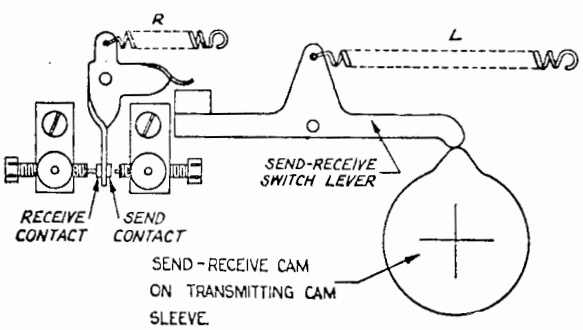


Fig 2.17. Send-receive switch.

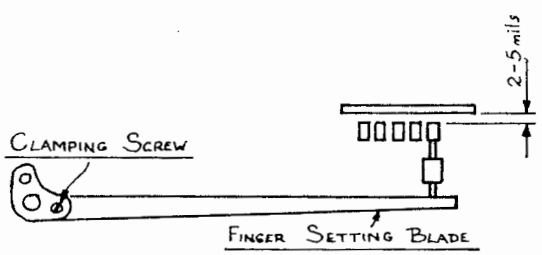


Fig 2.20. Finger-setting blade, height setting.

The Receiving Cam

The receiving cam bearings need very critical adjustment as the maximum end play allowable is 1·5mil. However, there must be no initial end loading of the bearings. To adjust—slacken the rear bearing screw clamping screw and adjust the rear bearing screw until the above conditions are fulfilled. Tighten the clamping screw securely after adjustment.

Rotate the motor manually, with the electromagnet armature in the mark (LHS) position, until the receiving cam is arrested, with the retention lever fully embedded in its recess. The force to move the pawls away from the pawl abutment should be $2\frac{1}{2}$–$3\frac{1}{2}$oz. The gap behind the pawls is adjusted to 3mil by slackening the retention pivot locking nut and rotating the eccentric pivot. Tighten locknut. See **Fig 2.21.**

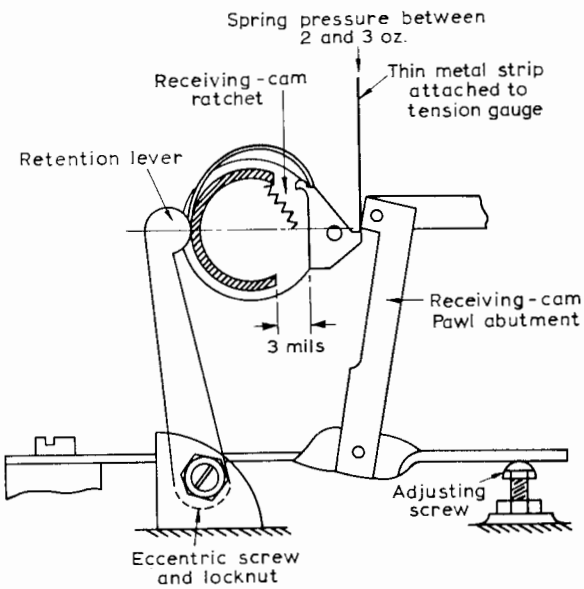


Fig 2.21. Receiving cam pawl abutment.

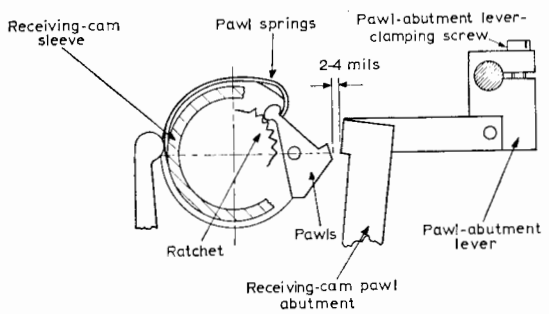


Fig 2.22. Receiving cam pawl abutment.

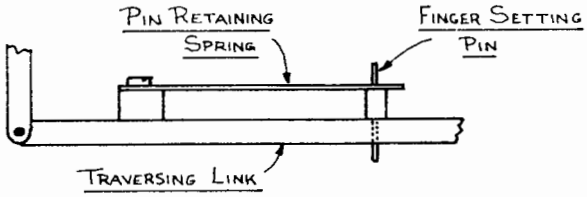


Fig 2.23. Finger setting pin.

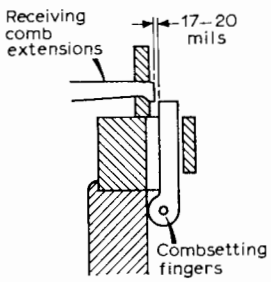


Fig 2.24. Fingers.

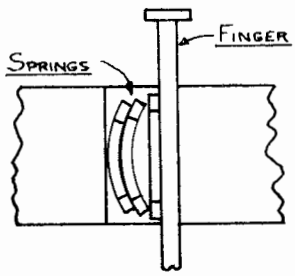


Fig 2.25. Finger springs, method of assembly.

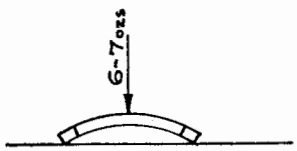


Fig 2.26. Finger springs, tension measurement.

With the position as above move the electromagnet armature to space (RHS) position. Slacken the pawl abutment clamping screw and adjust the lever on the trip bar to give a clearance of 2–4mil between the pawls and the pawl abutment. Tighten the clamping screw. See **Fig 2.22.**

The Finger-setting Pin

Rotate the motor by hand and ensure that the finger-setting pin is directly in line with each finger when the pin has been pushed fully in. To adjust—slacken the pin retaining spring fastening screw and move the pin retaining spring. Tighten the fastening screw. See **Fig 2.23.**

The Fingers

Remove the R.H. ribbon bracket in order to measure the force required to push each finger inwards. To adjust this force to 3–5oz remove the retaining plate from the finger block and remove the offending set of springs. Place each individual spring on a hard, flat surface and the force to depress the centre to touch the surface should be 6–7oz. Set the spring to obtain this, **Fig 2.26.** Re-assemble as shown in **Fig 2.25.** See also **Fig 2.24.** Remount the ribbon bracket.

Slacken the eccentric pin clamping screw on the comb-setting lever, with the fingers in the lowered position, adjust the eccentric pin so that when the fingers are pushed inwards and lifted the slots in the periphery of the combs be exactly centrally under the bellcranks for the code selected. Tighten the clamping screw. When in proper adjustment, with all of the fingers raised there should be a clearance between the comb extensions and the comb stop plate. See **Fig 2.27.**

Manually turn the motor until the fingers have just reset. Adjust the horizontal clearance between the comb extensions and the fingers to 17–20mil by slackening the finger-resetting trip bellcrank adjusting screw clamping screw, and adjusting the resetting trip bellcrank adjusting screw. Tighten the clamping screw. See **Fig 2.28.**

The Bellcrank Lifting Collar

Select letter "N" (SSMMS) as being convenient, by hand. Adjust the clearance between the bellcrank lifting collar and the fallen bellcrank to 6–8mil by slackening the eccentric coupling screw clamping screw, and adjusting the eccentric coupling screw. Tighten the clamping screw. The force to lift each bellcrank should be $1\frac{1}{2}$–$1\frac{3}{4}$oz measured at the type head end of the bellcrank. See **Fig 2.29.**

The Ribbon Mechanisms

Slacken the feed pawl pivot clamping screw on the comb-setting lever and adjust the feed pawl pivot so that each character feeds the ratchet wheel more than one whole tooth, about $1\frac{1}{4}$ teeth being optimum. Also check that the ratchet retention pawl is preventing excess reverse turning. Tighten the clamping screw. See **Fig 2.27.**

Manually turn the motor until the ribbon and jumper are at their highest position. Slacken the lock nut on the jumper abutting screw, adjust the screw until the top of the ribbon is level with the top of the type bars when a type bar touches the ribbon. (Unless the large fractional type bars are used, when the ribbon must be $\frac{1}{32}$in higher.) Tighten the locknut. See **Fig 2.30.**

Typehead and Clutch Latch

Slacken the bearing screw clamping screw and adjust the bearing screw to give an end play of the typehead, measured

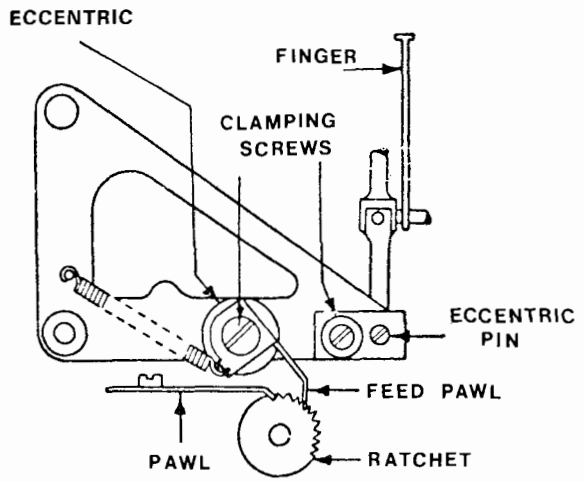


Fig 2.27. Comb-setting lever.

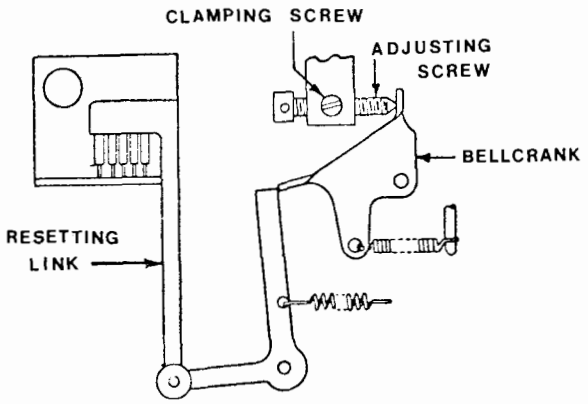


Fig 2.28. Finger-setting trip bellcrank adjustment.

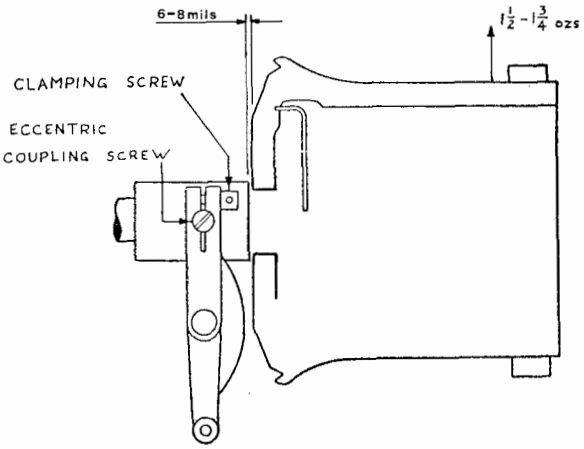


Fig 2.29. Bellcrank lifting collar adjustment.

at the engagement pins of 5–10mil. Tighten clamping screw. See **Figs 2.31** and **2.32**.

To give clearance of 30–35mil between the cam spring and the bellcranks, with the clutch unlatched, insert washers between the clutch drum and the combination head body. See **Fig 2.33**.

To give a clearance of 8–14mil with the clutch unlatched between the latch and the bellcranks, set the cam spring. See **Fig 2.33**.

Set the latch spring to give a force of 2–3oz with the clutch unlatched, to push the latch spring away from the cam spring, measured at the latch.

With the motor running at correct speed and the clutch unlatched, the tangential force, measured at the typehead periphery, necessary to hold the typehead should not be less than 3½lb. The tangential force measured at the typehead periphery necessary to latch the clutch should be between 3 and 4½lb.

Typehead Hammer

Manually select the letter "N" (SSMMS) and latch the typehead clutch. Adjust the two locknuts on the type hammer link to obtain the clearance of 32mil between the hammer head and the type bar. See **Fig 2.34**.

Slacken the type hammer spring clamping screw and with the letter "N" still latched adjust the position of the type hammer spring to bring the type hammer head exactly central with the "N" type bar. Tighten the clamping screw. See **Fig 2.34**.

To adjust the type hammer shock absorber spring, remove the type hammer and type hammer link, screw up the type hammer link until the spring is fully compressed and then release one turn. Refit the type hammer assembly back in position.

To obtain the clearance of 19–30mil between the bottom of the type hammer head and the type rack, pack under the type hammer pivot with washers. See **Fig 2.35**.

Carriage Adjustments

It is easier to make the first few adjustments with the carriage assembly removed from the teleprinter.

Feed Pawls

With the carriage at the extreme R.H. end of its travel, slacken the feed pawl pivot clamping screw and adjust the

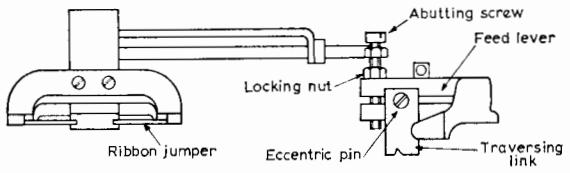


Fig 2.30. Ribbon jumper adjustment.

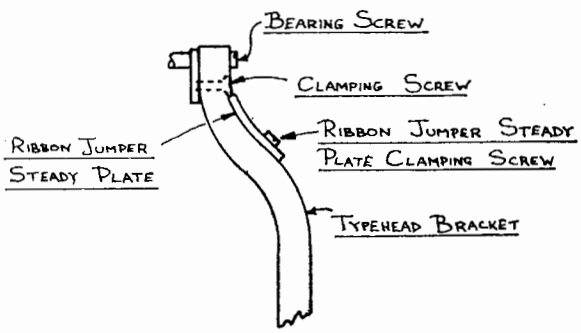


Fig 2.31. Typehead bracket.

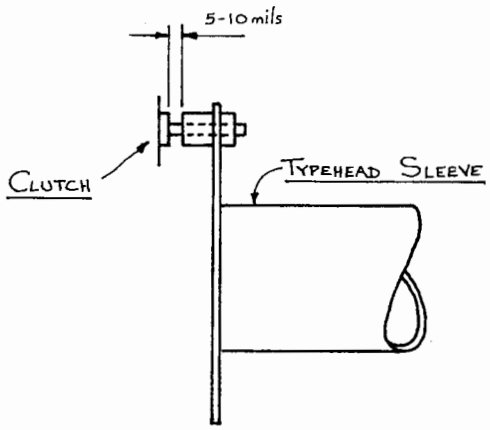


Fig 2.32. Typehead sleeve clearance.

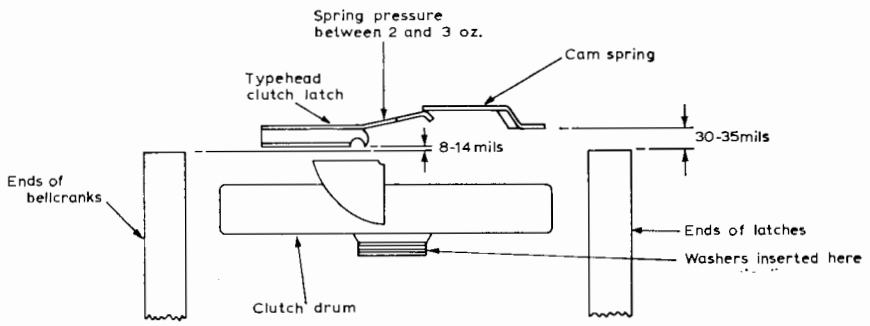


Fig 2.33. Clutch drum adjustment.

eccentric pivot to give 10mil clearance between the feed pawl and the next ratchet tooth. Tighten the clamping screw. See **Fig 2.36**.

Manually feed the carriage forward a few spaces (by operating the crosshead). With the retention pawl engaged in the ratchet and holding the carriage, slacken the retention pawl pivot clamping screw and adjust the eccentric pivot (both of these are at the rear of the casing) to give a clearance of 5–8mil between the feed pawl and the adjacent tooth on the ratchet. Tighten the clamping screw. See **Fig 2.37**.

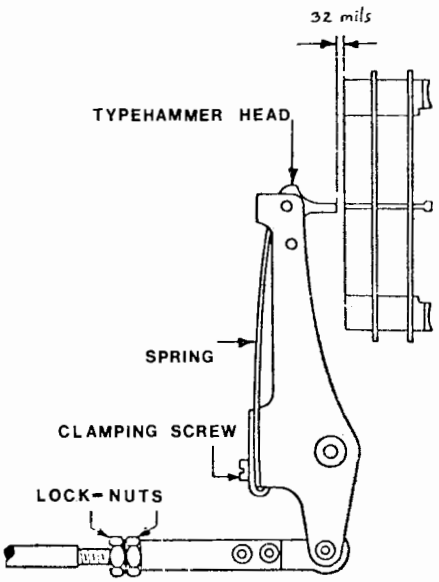


Fig 2.34. Typehammer.

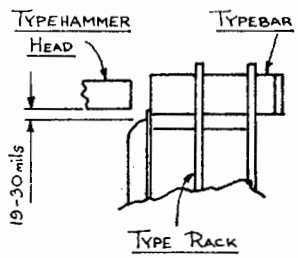


Fig 2.35. Typehammer, vertical adjustment.

Carriage Return and Line Feed Dogs

With the crosshead in its natural L.H. position, slacken the eccentric pin locking nut and adjust the eccentric pin (at rear of casting) to give a clearance of 10–15mil between the crosshead and the line feed and carriage return dogs. Tighten the locknut. See **Fig 2.38**.

With the carriage assembly back on the teleprinter, manually rotate the motor to bring the traversing link to its foremost position, ie with the finger-setting pin near No. 1 finger. Slacken the pivot locking screw on the feed lever and adjust the eccentric pivot to give a clearance of 15–25mil between the line feed or carriage return dog and the crosshead pawl. This is easiest measured from behind the carriage. Tighten the clamping screw. If this adjustment is altered radically then the ribbon jumper abutting screw may have to be readjusted as previously described. See **Figs 2.39** and **2.30**.

Set up:
Carriage return (SSSMS)
Line feed (SMSSS)
Bell (MMSMS)
Letter shift (MMMMM)
Fig shift (MMSMM)
in turn and check that the feed dog is thrown well clear of the

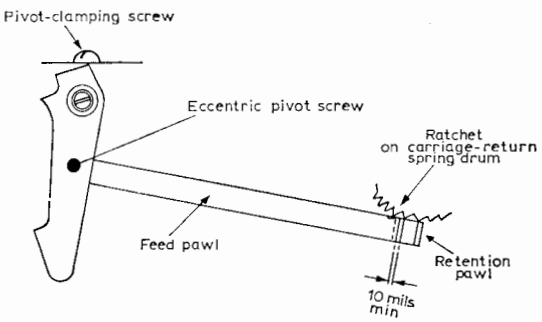


Fig 2.36. Letter feed pawl adjustment.

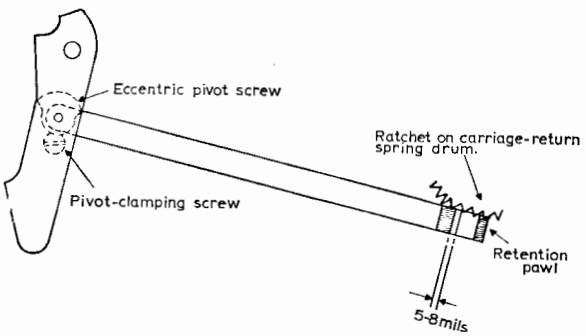


Fig 2.37. Retention pawl adjustment.

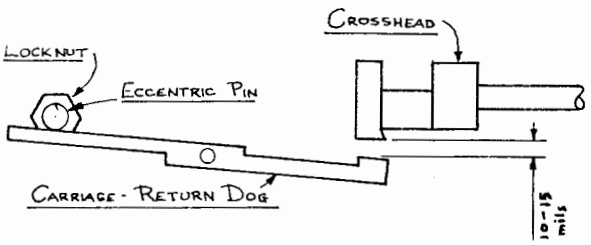


Fig 2.38. Line feed and carriage return dog adjustment.

crosshead. On the first two operations the appropriate dogs should engage fully with the crosshead.

Line Feed Mechanism

Slacken the jockey roller lever pivot locknut and adjust the pivot to place the jockey roller in the centre of its travel. Tighten locknut. Manually turn the motor and set up the line feed combination (SMSSS), with the line feed control set for double spacing, ie the line feed pawl nearest the ratchet. Turn the motor until the line feed pawl is at the bottom of its stroke. Slacken the feed pawl eccentric clamping screw and adjust the feed pawl eccentric until the jockey roller fully beds into the correct notch. Tighten the clamping screw. Set the line feed control for single spacing, again set up line feed and turn the motor until the line feed pawl is at the bottom of its travel. Slacken the lock nut on the line feed control and adjust the control eccentric relative to the spring disc until both single and double spacing are allowing the jockey roller to bed in its notches correctly. Tighten the lock nut. These adjustments sometimes need *slight* re-adjustment when the paper is inserted and the motor is run at full speed. See **Figs 2.40** and **2.41**.

Carriage Return Mechanism

Slacken the chariot rail clamping screws and adjust the rail so that the chariot will run freely without shake. Tighten the clamping screws. The spring on the chariot should lightly touch the chariot rail when the chariot is at the extreme R.H. end.

Move the carriage to the extreme L.H. end of its travel and depress the carriage return key. (At the rear L.H. end of the carriage.) The force required to hold the carriage in this L.H. position should be between $2\frac{1}{2}$–$3\frac{1}{4}$lb. With the piston about to enter the carriage cylinder the force required to hold the carriage should differ from the previous one by no more than $1\frac{1}{4}$lb.

To adjust the spring to obtain the required figures—remove the platen knob, jockey roller spring and the bell hammer assembly. Set the carriage halfway along its travel, remove the L.H. bearing bracket, move the platen spindle to the left and remove the carriage assembly. Hold the spring drum, release the two pawls and let the drum unwind slowly, counting the turns. If only a small adjustment is needed remove the screw holding the bearing spindle (at the rear of the casting) and withdraw the spring drum. Turn it through $\frac{1}{2}$ a turn and replace, refit the bearing spindle-screw. Now wind up the drum $\pm \frac{1}{2}$ turn as required. If however a larger adjustment is needed do not remove the drum but rewind to $\pm$ 1 turn as required. Manually operate the crosshead until the drum stops turning. Now replace the carriage at its extreme L.H. position. Refit the bell hammer assembly, jockey roller spring and platen knob. See that the carriage feeds correctly and that it does not hit the L.H. bearing bracket if the crosshead is operated continuously. Check the forces again, reset if necessary.

Shock Absorber

Slacken the carriage shock absorber valve plate clamping screw and adjust the valve plate until the carriage will return from any position without shock and without bounce. Tighten the clamping screw. The clamping screw is accessible

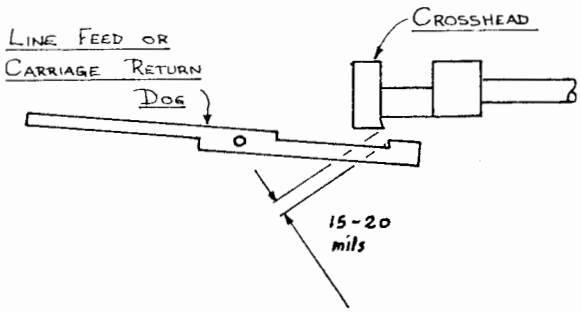


Fig 2.39. Clearance, line feed/carriage return dogs and cross head pawl.

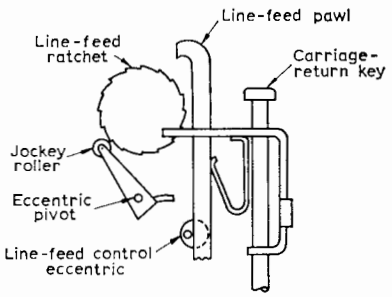


Fig 2.40. Line feed mechanism, side view.

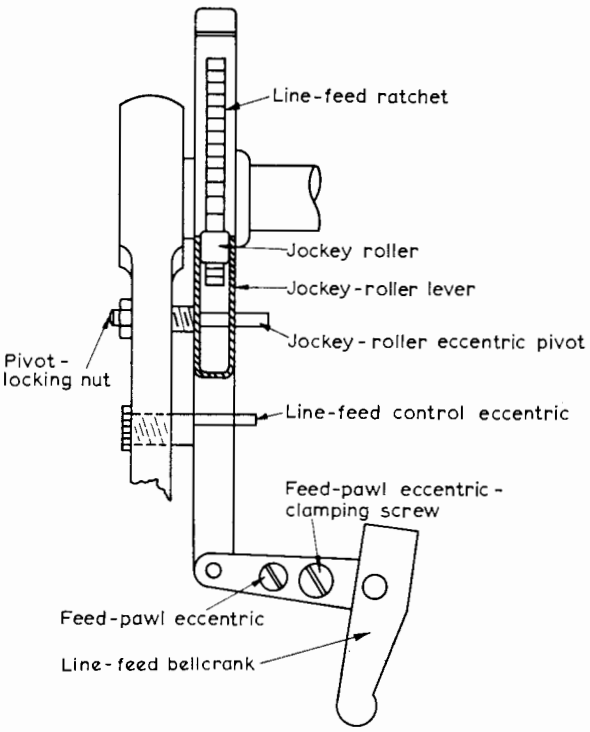


Fig 2.41. Line feed mechanism, end view.

through a hole in the R.H. end bearing bracket—some machines also have a hole in the platen knob—otherwise the knob must be removed.

Carriage Latch

Slacken the carriage stop eccentric sleeve locking screw and adjust the eccentric sleeve to obtain a clearance of $\frac{1}{8}$in between the typebars and the platen with the carriage held against the stop. Tighten the locking screw.

Slacken the latch stop eccentric sleeve locking screw and adjust the sleeve until the carriage locks securely and without play. Tighten the locking screw. See **Fig 2.42.**

Other Units:
The Auto Start-stop Switch

With the electromagnet held in the mark position (L.H.) and the weight lifting pin fully engaged in one of the worm wheel holes, slacken the trip spindle clamping screw and adjust the spindle so that it just touches the end thrust spring (a leaf spring). Tighten the clamping screw. See **Fig 2.43.**

With the pin still fully engaged in the worm wheel hole, slacken the starter boss clamping screw and adjust the starter boss to obtain a clearance of 5–10mil between the starter boss and the starter trip lever extension, with the electromagnet armature still at the mark position. Tighten the clamping screw on to the flat on the spindle. See **Fig 2.43.**

To obtain a clearance equal to the diameter of one hole between the weight-lifting pin and the shroud, with the weight in the down position, release the locking screws on the weight and locating collar, move the weight as required and lock the locking screws with the locating collar just touching the weight. See that the starter trip lever extension moves freely into the slot in the starter boss. See **Figs 2.44** and **2.45.**

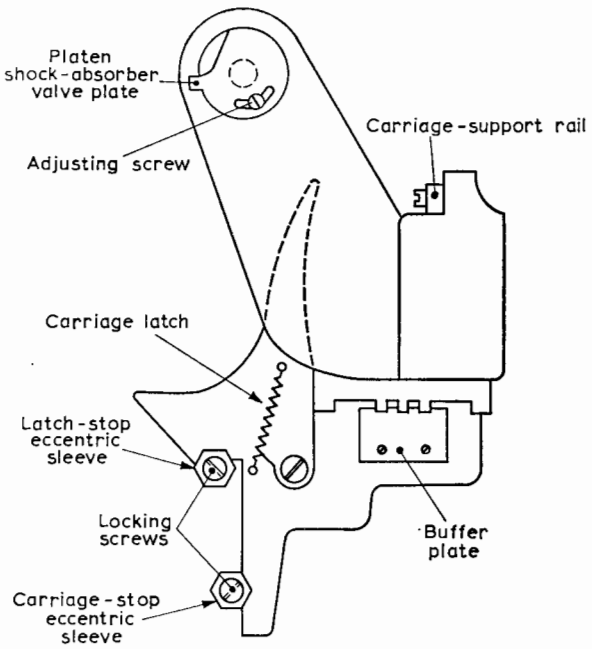


Fig 2.42. Carriage latch.

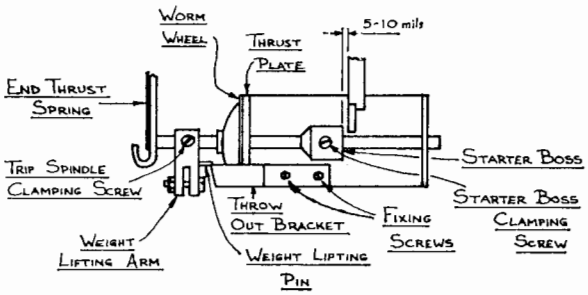


Fig 2.43. Starter switch trip mechanism.

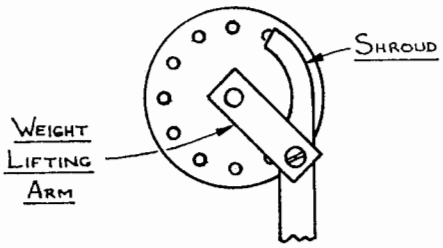


Fig 2.44. Starter switch weight lifting arm.

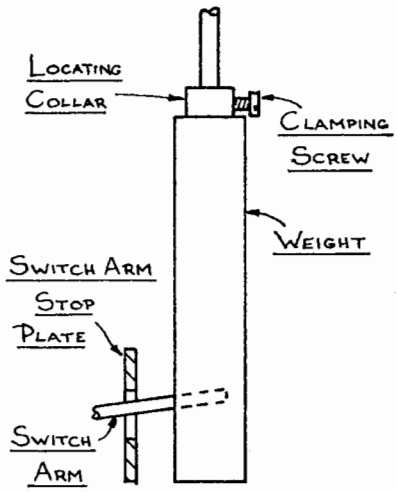


Fig 2.45. Starter switch weight assembly.

With the weight lifted and the weight-lifting pin fully engaged in the hole exposed at the top of the shroud the force required on the end of the trip spindle to disengage the weight lifting pin from the worm wheel should be less than 3oz. With the end thrust spring removed this should drop to $\frac{3}{4}$oz. If the values are not these, check that everything is free to move, then set the end thrust spring. With the weight in the down position the force required should be less than 1oz with the end thrust spring in place.

Remove the switch cover and bend the switch arm so that when the motor is running and the electromagnet armature

is in the mark (L.H.) position, the motor is stopped with the weight-lifting pin coming to rest $\frac{1}{2}$ a hole diameter from the shroud top.

Let the auto start-stop switch switch off the motor. Slacken the throw-out bracket fixing screws and adjust the throw-out bracket to obtain a clearance of 15–20mil between the throw-out bracket and the weight-lifting arm screw. Tighten the fixing screws. With the switch contacts shorted out the throw-out bracket should release the weight before the switch arm hits the switch arm stop plate. See **Fig 2.45.**

Answer Back Unit

With the unit in the rest position slacken the answer back unit fixing screws and adjust the position of the answer back unit to give a clearance of 10–20mil between the ends of the combination bars and the edge of any answer back ward. It may be necessary slightly to adjust the abutment screws in the answer back unit. Tighten the fixing screws.

Manually turn the motor and release the answer back detent, stop turning the motor when the third ward is just below the top of the combination bars. Slacken the trip cam fixing screws and alter the trip cam relative to the drum so that the trip lever is fully bedded in the third notch, with the ward still in the same position. Tighten the fixing screws. With this adjustment correct—switch on the motor, lift the answer back detent and the drum should revolve without binding. See **Fig 2.46.**

Select WRU on the teleprinter receiver (MSSMS) manually. When the answer back detent has been operated, slacken the release shaft lever adjusting screw locking nut and adjust the adjusting screw to give a clearance of at least 10mil between the answer back detent and the face of the answer back drum. Tighten the locking nut. See **Figs 2.47** and **2.48.**

Slacken the guide bracket clamping screw and adjust the position of the guide bracket to give a clearance of 5mil between the keybar extension and the cutaway portion of the detent link, with the WRU key depressed. Tighten the clamping screws. It may be necessary to set the keybar extension to obtain free movement. See **Fig 2.48.**

To Change the Code

Remove the answer back cover. Loosen the ward clamping plate locknut, which is on the electromagnet side of the ward drum; use a tommy bar to hold the spindle. Turn the ward clamping plate until the slot is opposite the required ward and slide the ward out.

To cut a ward remember that a slot represents a mark element. The individual slots should be $\frac{1}{10}$in wide and $\frac{3}{32}$in deep.

It is advisable to start the code with carriage return, line feed and letters, unless some special code is envisaged.

When the wards have been replaced in their correct positions, turn the ward clamping plate so that the slot does not line up with a ward and tighten the locknut. See **Fig 2.49.**

Motor Governor: Series Governor

Slacken the contact clamping screw and adjust the contact to obtain an armature movement of 15–20mil measured at the contact. Tighten the clamping screw.

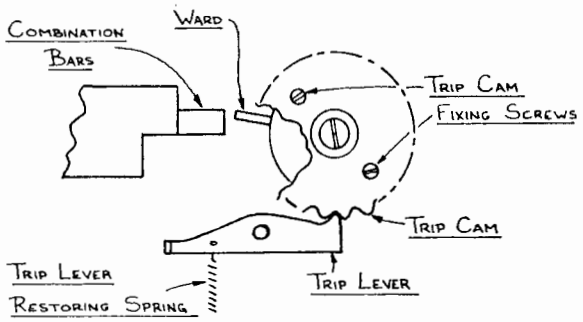


Fig 2.46. Answer-back, trip cam.

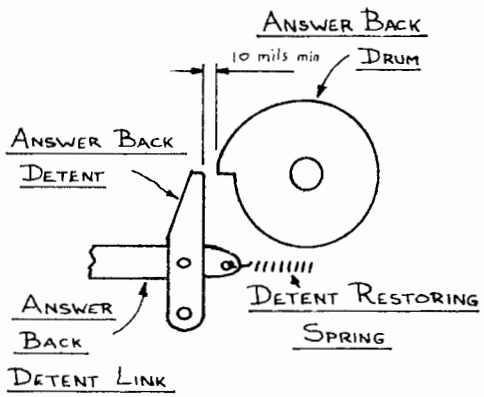


Fig 2.47. Answer-back trip, shaft.

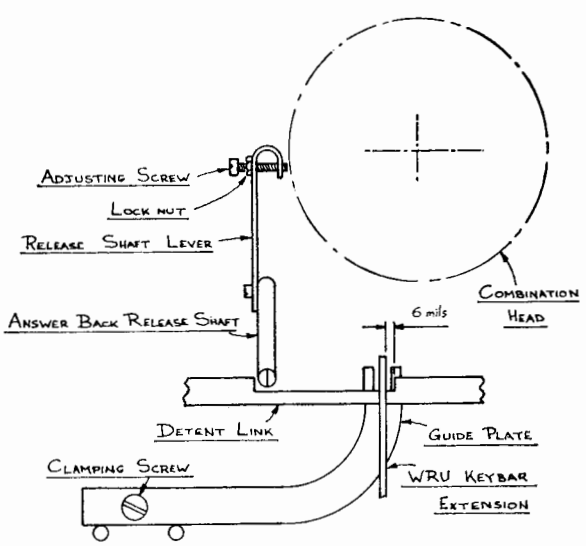


Fig 2.48. Answer-back release.

Shunt Governor

Slacken the contact clamping screw and adjust the contact to give a clearance of 20–25mil between the two contacts. Tighten the clamping screws.

Differences Between New and Old Machines

The modern Creed type 7 teleprinters are basically the same machine as the older type 7B. However, there are some differences, the most noticeable being: the modern machines have an orientation device, or range finder; they have a modified carriage shock absorber; the electromagnet assembly is slightly different; the clutch and typehead assembly is re-designed; the motor is slightly different, and there are several different types of keyboard that can be fitted. Also the modern machines can be fitted with a reperforator attachment.

In the main the adjustments follow the same pattern as already indicated; however, included below are the adjustments which are radically different.

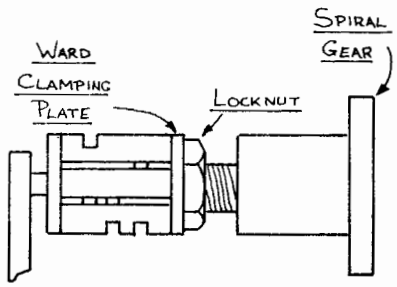


Fig 2.49. Answer-back drum.

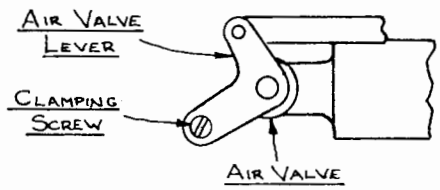


Fig 2.50. Air valve adjustment.

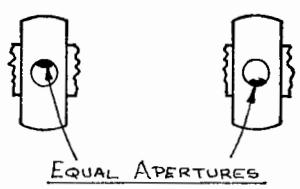


Fig 2.51. Air valve adjustment.

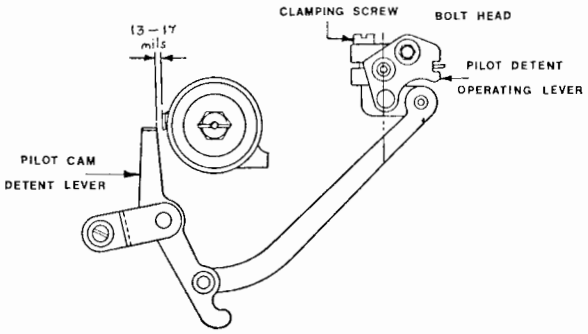


Fig 2.52. Pilot cam detent.

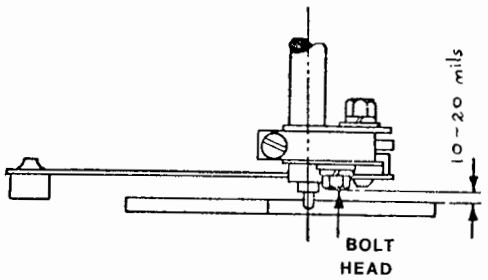


Fig 2.53. Pilot cam detent.

The Carriage Shock Absorber

Slacken the air valve lever clamping screw and adjust the position of the air valve lever relative to the air valve, to obtain equal apertures in the air valve at the extremes of the carriage travel. Tighten the clamping screw. See **Figs 2.50** and **2.51**.

Pilot Cam Detent

Slacken the pilot cam detent operating lever clamping screw and adjust the position of the pilot cam detent operating lever so that there is a clearance of 10–20mil between the plate and the bolt head and also, with the electromagnet armature held against the space (R.H.) stop, there is a clearance of 13–17mil between the pilot cam detent lever and the pilot cam lug. Tighten the clamping screw. See **Figs 2.52** and **2.53.**

Receiving Cam Abutment

To check the receiving cam abutment a special tool is normally used. This comprises a double ended plug gauge, one end being 47mil diameter, the other 53mil diameter. However, for the adjustment two drills of appropriate size could be used—a $\frac{3}{64}$in diameter drill for the 47mil diameter size and a No. 55 for the 53mil diameter size.

Slacken the abutment lever clamping screw and adjust at the screwdriver adjustment point, so that the relative positions of the abutment and the sickle lever fulfil the following conditions.

With the orientation device set at 50, manually turn the motor until the receiving cam is arrested by the abutment, withdraw the abutment, allowing the pawls to drop into their ratchet. Return the abutment so that it touches the pawls. The 47mil diameter gauge should pass between the retaining ring lug and the sickle lever without moving the sickle lever. However, the 53mil diameter gauge should move the sickle lever when tried in the same position. Tighten the clamping screw. See **Figs 2.54** and **2.55**.

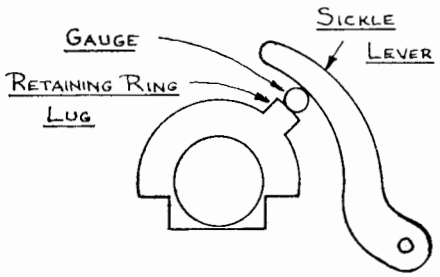


Fig 2.54. Receiving cam detent.

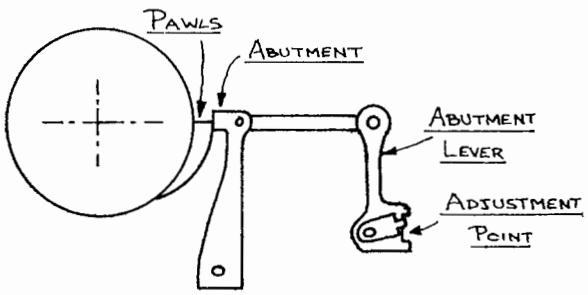


Fig 2.55. Receiving cam detent.

THE 'OVERLAP' CAM UNIT

This unit is used in Creed Model 7E and the later Model 54. Three sequentially operated cams cause the printing of a character immediately following the reception of the code for the character, instead of being printed one behind the received character, as with machines earlier than the 7E.

An orientation device with pilot cam is fitted, but the main receive camshaft is split into two sections, and a friction clutch driven cam-line is added, driven through auxiliary gearing at the same speed. The sequence is that the pilot cam operates the friction drive "selector" cam, which near the end of the selection, releases the "translator" cam. This, after setting the code into the combination head, releases the "function" cam to print and to feed the carriage. While the translator and function cams are finishing their actions, the selector mechanism is restored, and a further character can be received. Although each cam section revolves in 130ms, the total time from the beginning of reception of any character to the end of the action initiated is 280ms.

Reception of the start space signal pivots the rockshaft clockwise, releasing the pilot clutch, which subsequently releases the friction clutch on the selector cam.

Mounted on the selector cam sleeve are five code cams, which operate five associated code levers, sequentially at 20ms intervals. Each code lever carries the lower end of the sequential lever, the upper end of which is pivoted in a finger push rod. When a code lever is moved clockwise, it takes the lower end of the sequential lever with it.

The rockshaft carries a compliant rocker blade. When a spacing signal operates the magnet, the magnet link pivots the rocker blade upwards, deposits the hollow in the sequential lever, which is not obstructed in its movements, and pivots in the push-rod, without imparting any motion to the latter.

On receipt of a marking signal, the rocker blade is moved downwards to a horizontal position opposite the step on the sequential lever. When a code lever moves outwards, the sequential lever comes into contact with the edge of the rocker blade, which acts as a pivot for that lever. The top end moves to the left, taking the pushrod and associated finger with it.

A series of code signals, operating the magnet, result in comb setting fingers being set under the comb ring extensions for a "mark" but not for a "space".

As possible signal distortion could change the position of the rockshaft during the read-off of a code element, giving a partially finished condition of the pushrod movement, a "chopper" cam is added behind the selector cam.

The chopper cam controls the action of the knife edged chopper. Immediately before the start of each read-off period, the cam profile allows the chopper to move in sharply against the rocker blade knife edge. This action assists the magnet action and firmly locks the rocker blade in the condition determined by the magnet, until the read-off of the signal element is finished, when the chopper lock is removed.

As the rocker blade is compliantly mounted on the rockshaft, the magnet can move the rockshaft in accordance with the next element, the rocker blade following sharply when the chopper lock is removed.

At the end of the read-off of the third element, a trip cam, mounted behind the selector detent, operates a trip linkage. This pivots clockwise, and moves the detent holding out the ratchet clutch pawls on the translator cam sleeve. As soon as the pawls engage fully in the ratchet teeth, the translator cam sleeve rotates anti-clockwise.

The translator cam sleeve carries two tracks, one controlling the bellcrank lift, and the other the action of the finger lift lever and its associated ribbon feed pawl.

Immediately the fifth code element read-off has been completed, the bellcrank lift collar is pushed in against the tails of the spring-load combination bellcranks. These are raised, releasing the pressure on the comb rings, which restore clockwise under their springs, and the typehead is released. The finger lift lever is then operated, and marking fingers, rising under the comb ring extensions, move the latter anti-clockwise. The ribbon feed pawl, attached to the finger lift lever, moves to engage the next tooth on its drive, ready to feed the ribbon as the lever restores, after setting the code on the comb rings.

Around the periphery of each comb ring, slots are cut in such a way that, for every combination into which the rings can be moved, an unobstructed slot is opened by all five comb rings beneath a pair of bellcranks.

Immediately after the bellcranks have dropped in, a node on the retention cam, just behind the pawl assembly, depresses the retention lever against its spring. This lever pivots anti-clockwise the trip linkage associated with the function cam sleeve trip detent: this is removed from under

the clutch pawls which engage with their associated ratchet toothed gears.

The function cam sleeve now commences to rotate anti-clockwise. It carries two tracks, one for the traverse lever and one for the type hammer. The traverse lever initially moves towards the front of the machine, during which movement it resets the marked fingers from under the comb ring extensions. This is done via a spring loaded pivoted lever, mounting on the rear of the traverse lever, which operates on to the pivoted finger reset linkage. An adjustable stop throws the two out of engagement, just as the fingers are reset.

It should be noted that all variants of the Model 7 teleprinter, and indeed the Model 54 teleprinter, may be fitted with a reperforating (RP) attachment.

A SIMPLE WAY TO MAKE A 7B GOVERNOR DUAL SPEED

Looking at the governor it will be noticed that on the block holding the fixed contact there is a 4BA tapped hole $\frac{7}{16}$in away from the contact, **Fig 2.56**.

Cut a piece of $\frac{1}{16}$in (approximately) steel $\frac{5}{16}$in by $\frac{3}{4}$in and drill a 4BA clearance hole $\frac{1}{4}$in from one end. Then cut a piece of insulated material, eg PCB without the copper, the same size with the hole in the same position.

Taking a 1in 4BA cheesehead screw, first put a large washer on, then a light compression spring (about four turns), then put the metal plate on followed by the insulated material. Add one or two nuts—to space the strips away from the block. Some governors use two full nuts and others one full and one half nut.

Screw the assembly gently into the existing tapped hole so that the two plates can be swung round, either over the moving contact, thus giving extra pressure, or 180 degrees away to leave the contact with its normal pressure applied.

Set the governor up for 45·5 bauds with the plates away from the contact, then swing the plates over the moving contact and adjust the pressure on top of the contact with the screw to 50 bauds. Then lock the nuts tightly and re-check the 50 bauds speed.

Once this is done it is a simple matter to change speed by swinging the plates either over the contact or completely clear of the contact for either speed.

This method has been used successfully for many months and has not called for any readjustment. A piece of card with one side marked 50 bauds and the other 45·5 bauds is displayed under the clip on the front of the machine to indicate at which speed the machine is set.

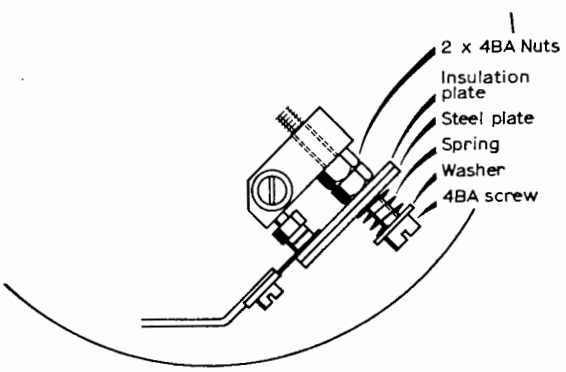


Fig 2.56. Creed series motor governor two-speed modification.

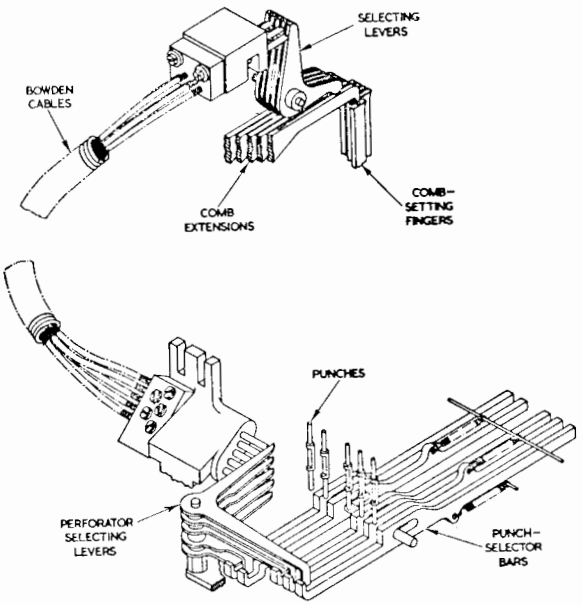


Fig 2.57. Diagram of perforator linkage, Creed 7/RP.

THE 7/RP TELEPRINTER REPERFORATOR

The 7/RP is a telegraph machine, developed to perform the functions of teleprinter, reperforator and perforator. The basic machine is a Model 7B page teleprinter, fitted with a sawtooth keyboard, transmitter and answer-back unit as used on the Model 47 teleprinter and a perforating mechanism similar to that used on the Model 7P.

The machine provides the following facilities.

1. Normal teleprinter operation. The perforator mechanism is cut out by moving a perforator throw-out lever to the left.
2. Reperforator working, producing fully punched tape as well as a page printed copy. The perforator is brought into operation by moving the throw-out lever to the right. Punched tape is made for all signals except "who are you?", "bell" and the "answer-back".
3. Perforator working, with no signal to line.

The perforator mechanism is mounted to the left of the keyboard and is controlled by a system of levers and Bowden cables from the combination head and an extension from the traversing link in the receiving cam-unit.

Perforator Mechanism

The perforator mechanism is set up for a particular code combination by transferring the settings of the comb extensions to the punch selector bars via levers and Bowden cables as shown in **Fig 2.57.** The punch-selector bars are spring tensioned to the right and through the perforator selecting levers and cables hold the selecting levers against

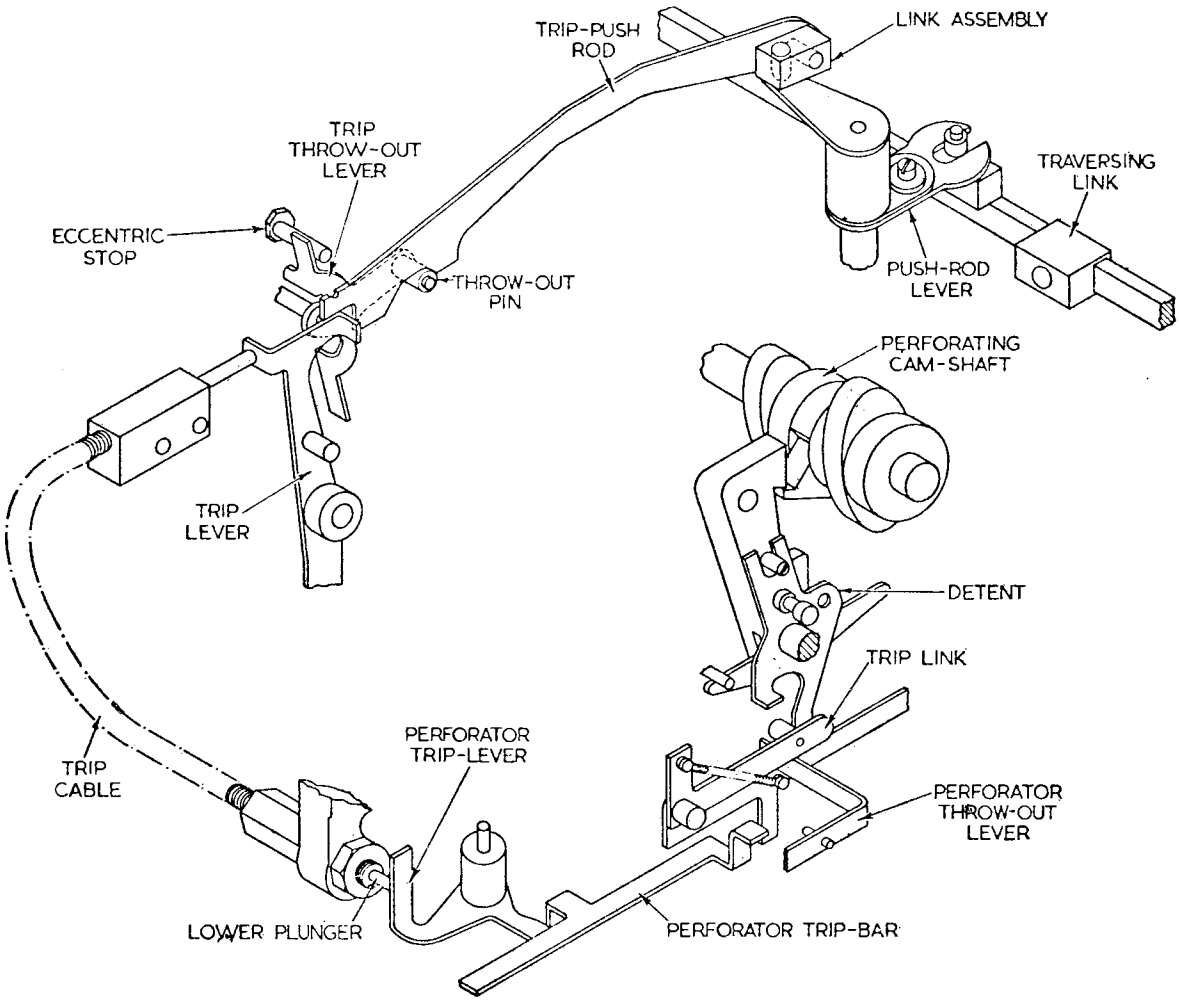


Fig 2.58. Diagram of perforator trip mechanism, 7/RP.

the comb extensions. When a comb extension is lifted, the movement is transmitted through the levers and cable to move the punch-selector bar to the left. The anvil portion of the bar is then moved underneath the punch in readiness to punch the tape. If there is no comb extension movement the selector bar remains in its normal position and does not engage a punch.

Perforator Trip Mechanism

The perforator unit is initiated by the traversing link on the receiving-cam as shown in **Fig 2.58**. As the traversing link moves forward, the motion is transmitted via levers and the trip cable to a second trip lever located on the perforator unit. The perforator trip-lever moves the trip-bar to the right to release the detent from the pawls on the perforating cam-shaft. The cam-shaft rotates and operates the mechanism to punch the tape with the character set-up during the previous operation of the receiving cam-sleeve.

Procedure for Dismantling and Reassembly of Perforator Unit

Remove keyboard from machine, and, withdrawing two ch/hd screws from extreme ends of keyboard, note nylon coupling.
Remove keyboard cover, two screws.
Slacken hexagon headed screws on tape guide tube.
Remove tube.

To remove perforator unit from keyboard
Remove cuttings box.
Remove outer damping spring by inserting a spring extractor in the top loop of inner spring, take up the tension of the spring and withdraw spring anchor screw.
Remove cuttings box spindle and three guard plate csk/hd screws. Compress and remove outer spring.
Remove the three fixing screws from the rear of the keyboard casting.

Pull the upper end of the punch withdrawing bracket away from the punches and lift off the punch block unit carefully.

To remove anvil bracket

Remove two fixing screws, spring washers and plate washers, situated endwise on the casting and lift out. Place keyboard unit to one side.

To dismantle anvil bracket

Unhook back-space lever spring.
Remove clamping screw and withdraw spindle.
Remove back-space key assembly.
Remove locking collar from spindle of selector levers and lift off the selector levers in sequence.
Remove tape feed pawl assembly by withdrawing two ch/hd screws, the spring washers and plate washers.
Remove springs from punch withdrawing bracket.
Remove pivot screws from either side of punch withdrawing bracket. NOTE: Ensure that the eccentric spindle is locked before removal of pivot screws.
Remove punch withdrawing bracket.
Remove springs from Nos. 2 and 4 selector bars.
Remove guide pins.
Remove front circlip from selector bar locating pin and push out locating pin towards the rear of casting. Hold the selector bars to the left to facilitate removal of pin.
Remove selector bars Nos. 2 and 4.
Remove selector bars Nos. 5, 3 and 1, by lifting the left-hand end of selecting bars and sliding the springs from their anchor pin.
Remove spring from perforator throw-out lever (manual).
Remove locking collar from perforator throw-out lever.
Remove perforator throw-out lever (manual).
Remove locking collar from perforator trip lever.
Remove perforator trip lever. NOTE: Observe felt lubricating pad.

Reassembly of anvil bracket assembly.

NOTE: Before proceeding to assemble the unit remove any paper chads, surplus oil and grease from unit.
Replace perforator trip lever to engage with the perforator trip bar.
Replace locking collar and ch/hd screw. *Check for freedom of movement.*
Replace perforator throw-out lever (manual).
Replace locking collar and ch/hd screw. *Check for freedom of movement.*
Anchor tension spring.
Replace selector bars Nos. 1, 3 and 5 by first placing the springs on anchor pin and positioning selector bars in their respective guides.
Replace selector bars No. 2 and 4 in their respective guides.
Replace selector bar locating pin by inserting it at the rear of casting.
Replace front circlip.
Replace selector bar guide pins.
Replace selector bars Nos. 2 and 4 springs on near guide pin.
Replace withdrawing bracket, two shouldered screws ch/hd.
Replace two tension springs on anchor pins on both sides of the punch withdrawing bracket.
Replace tape feed pawl assembly, two ch/hd screws spring washers and plate washers.
Replace back-space key assembly complete with spindle and retaining bracket one ch/hd screw and washer. NOTE: Position back space pawl *beneath* the stop pin on tape feed pawl.
Replace back space pawl spring on its anchor.
Replace selector levers, ensure that they engage with the selector bar extensions.
Replace locking collar one ch/hd screw. NOTE: *Check for freedom of movement.*

Dismantling the perforator unit

Punch block assembly

Remove cuttings chute by slackening two ch/hd screws.
Remove punch block assembly by withdrawing two ch/hd screws between chute and tape roller. Place cam-assembly to one side.
Remove latch spring (light).
Remove latch, one clamping unit, spring washer and plate washer.
Remove tape guide frame spring (heavy).
Remove tape guide frame (two pivot screws). NOTE: Distance washer between frame and assembly on front of casting.
Remove punch cover plate two ch/hd screws.
Remove two die plates in sequence, tape guide plate then four die plates.
Lift out the five punches and the feed hole punch in order. NOTE: Reassemble the punches in the correct manner, narrow shoulder to the bottom.
Remove the four lower punch-guide plates, two ch/hd screws.
Remove latch support plate, two ch/hd screws beneath casting.
Remove tape "tear-off" stripper spring, two ch/hd screws on side of casting. Lift off gently to avoid damage to spring mounted on casting.
Remove bearing blocks, two ch/hd screws on either side of block.
Remove tape feed spindle from bearing blocks.

Reassemble punch block assembly

Clean casting of chads, surplus oil and grease.
Replace tape feed spindle together with the two bearing blocks on the casting.
Replace screws in the bearing blocks and tighten. NOTE: *Check for freedom of movement.*
Replace tape "tear-off" spring and its pivot screws. NOTE: *Check for freedom of movement.*
Replace latch support plate, two ch/hd screws.
Replace four upper die plates, tape guide plate, two die plates and punch cover plate two ch/hd screws.
Replace punches in correct order narrow shoulder at the bottom.
Replace four lower guide plates. NOTE: *Check for freedom of movement.*
Replace tape guide frame, two pivot screws. NOTE: Distance washer to be placed between casting and the frame on front. *Check for freedom of movement.*
Replace latch, eccentric screw, plate washer, spring washer, and nut.
Replace latch spring.
Replace tape guide frame spring.

Dismantling of cam-assembly

Remove triangular front plate four nuts and washers. NOTE: Shims are fitted between the front plate and cam-shaft.

Remove two distance locking collars from the detent pillars.
Remove the detents by turning the cam so that the upper cam roller is raised clear of the left-hand detent.
Release retention pawl springs from their anchor pin.
Remove retention pawls, one nut and washer and eccentric bushes.
Remove cam and cam-shaft, from its rear bearing.
Remove cam from its shaft by pressing the pawl backwards against its spring and withdraw cam.
Remove locking collar, which retains the punch block casting on its spindle.
Remove punch block casting.
Remove spring on the retention lever on punch block casting.
Remove retention lever.
Remove retention lever adjusting plate and its eccentric, one ch/hd screw, plate washer and spring washer.
Slacken the locking nuts on the detent stop and withdraw stops.

Reassembly of cam-assembly

NOTE: Before assembling the unit, clean the casting of chads, surplus oil and grease.

Replace detent stop.
Replace retention lever adjusting eccentric.
Replace retention lever.
Replace retention lever spring.
Replace punch block casting on its pivot.
Replace locking collar on spindle. NOTE: *Check for freedom of movement.*
Replace cam on its cam-shaft.
Replace cam and cam-shaft in rear bearing. NOTE: Gear wheel towards rear.
Replace rear eccentric for retention pawl. NOTE: Nut of eccentric bush to rear of casting.
Replace rear retention pawl on eccentric bush, add washer, and front retention pawl, eccentric bush. NOTE: Nut of eccentric bush to face frontwards.
Replace plate washer, spring washer and nut.
Replace springs on retention pawls. NOTE: Check retention pawls for freedom of movement.
Replace detents.
Replace two locking collars on detents.
Replace front plate. NOTE: Shims fitted between cam-shaft and front plate.
Replace four sets of nuts, plate washers and spring washers.
Fix cam-assembly to punch block assembly by replacing two ch/hd screws between cuttings chute and tape roller.

LUBRICATION INSTRUCTIONS

Creed Model 7 Series

After Each 300 Hours of Operation

No. 1 Lubricant

1. Clean the platen spindle and running bar with a cloth dipped in paraffin oil. Apply a few drops of lubricant to the platen spindle and the running bar.
2. Apply a small quantity to the following parts:
   (*a*) Starter trip spindle
   (*b*) Starter trip lever pivot
   (*c*) Ribbon feed change rods (excessive lubrication may cause sticking).

No. 2 Lubricant

1. Fill all oil cups and oil holes, paying special attention to the following:
   (*a*) Finger setting block (oil sump)
   (*b*) Cam sleeve oil hole (cam unit)
2. Saturate all lubricating felts, paying special attention to the following:
   (*a*) Oil cover over the cam levers
   (*b*) Typehead lubricator felt
   (*c*) Typehammer pivot felt
3. Lubricate all pivots, friction faces and couplings, paying special attention to the following:
   (*a*) Cam ratchet and pawls (cam unit)
   (*b*) Cam tracks (cam unit)
   (*c*) Finger setting pin (cam unit)
   (*d*) Pilot cam clutch (cam unit)
   (*e*) Orientation link spring (cam unit)
   (*f*) Bellcrank lifting collar engagement face (combination head)
   (*g*) Typehead clutch lining (*N.B.* Avoid surplus oil (typehead unit).)
   (*h*) Clutch band engagement with typehead driving spring (typehead unit)
   (*i*) Latch pivot (typehead unit)
   (*j*) Steel worm gears (starter switch control unit)
   (*k*) Overthrow stop engagement face
   (*l*) Ribbon driving shaft, ratchet and crown wheel
   (*m*) Ribbon jumper grooves in typehead support bracket
   (*n*) Link guide block (page attachment unit)
   (*o*) Spring drum ratchet wheel (page attachment unit)
   (*p*) Platen spindle ratchet (page attachment unit)
   (*q*) Platen end bearings (page attachment unit)
   (*r*) Felt washers on the lock bar and air valve connector (page attachment unit)
   (*s*) Pivots of the rollers at the top and bottom of the dashpot lever (page attachment unit)
   (*t*) Control lever bearing bushes and the pivots of the feed throw-out lever (control unit)

   N.B. An excess of oil is liable to cause some sluggishness in the operation of the carriage.

No. 4 Lubricant

1. Apply a little grease to the following parts:
   (*a*) Trip shaft cone pivots (cam unit)
   (*b*) Hammer head spring engagement and shock-absorber spring (typehammer unit)
   (*c*) Working faces of the ears on the stop plates (typehead unit)
   (*d*) Working faces between spring anchors and retaining plate (typehead unit)
   (*e*) Working edges of the control levers and the feed throwout lever (control unit)
   (*f*) Carriage rack and spring drum gear wheel (page attachment unit)

No. 5 Lubricant

1. Apply a little grease to the following parts:
   (*a*) Striker blade guides on the cam unit
   (*b*) Mainshaft, cam unit and typehead gears, and the fibre starter worm
   (*c*) Jockey bush on the ribbon driving shaft
   (*d*) Outsides of the rollers on the dashpot lever

After Each 3,600 Hours of Operation

Dismantle and clean the machine. Lubricate all points as above, with the following additions:

No. 2 Lubricant

1. Soak the following parts for 2–3 hours in the lubricant:
   (*a*) Typehead clutch friction washers (typehead unit)
   (*b*) Latch arm (typehead unit)
   (*c*) Stop arm (typehead unit)
   (*d*) Clutch body (typehead unit)
   (*e*) Typehead support bracket (control unit)
   (*f*) Cam release lever bracket (cam unit)
   (*g*) Pilot cam friction washers (cam unit)
2. Lubricate the following parts:
   (*a*) Receiving comb bearings and spring pivots (combination head)
   (*b*) Shift comb lever pivot and jockey spring (combination head)
   (*c*) Counter gear bearing pin (if a period of operation counter is fitted)
3. Apply a trace of oil to the ribbon guide pins on the ribbon feed brackets, taking care that none reaches the outside of the rollers.
4. Soak the bellcrank bearing oiling wick in the lubricant for a few minutes.
5. Apply a few drops of the lubricant to the following parts:
   (*a*) All oilite bearings (page attachment unit)
   (*b*) Leather piston washer (page attachment unit)
   (*c*) Oiling pads in the pressure roller release lever bearing blocks (page attachment unit)

No. 4 Lubricant

1. Repack the following ball bearings:
   (*a*) Combination head (2)
   (*b*) Main shaft (2)
   (*c*) Motor (2)
2. Apply a light smear of grease to the ground faces of the armature extension and of the gap in the armature stop plate.

No. 5 Lubricant

1. Smear a little of the lubricant on the following parts:
   (*a*) Periphery of bellcrank bearing (combination head)
   (*b*) Both ends of the bellcranks (combination head)
   (*c*) Magnet armature pivots after cleaning
   (*d*) Adjusting block friction spring (cam unit)
   (*e*) Counter driving gear and counter driving worm (if a period of operation counter is fitted)
   (*f*) Counter driving pin on the counter driving gear (if a period of operation counter is fitted)

Lubricants

The following lubricants are recommended:

No. 1 Lubricant—thin oil, such as:
Clavus Oil 17 (Shell Oil J.Y.1)

No. 2 Lubricant—medium oil, such as:
Talpa Oil 30 (Shell Oil C.Y.2)

No. 4 Lubricant—grease, such as:
Shell Nerita Grease 3 (Shell VW)

No. 5 Lubricant—grease, such as:
Mobilgrease No. 2.

TABLE OF RECEIVER FAULTS—Creed Model 7

All receiver faults, whether they are of the obvious kind that do not require systematic localization or are of the less obvious kind that do, produce specific fault symptoms on some part of the receiver.

The main kinds of fault symptoms with their possible causes are listed in the following table. This table is not meant to be exhaustive, or to convey the idea that all the faults listed are likely to occur on any given machine.

Fault	Possible Causes
	SELECTING MECHANISM
A Frequent failures on selecting fingers	1. Spacing bias on electromagnet 2. Finger-setting blade too low 3. Spacing reaction on armature 4. Finger-setting blade too far from pin 5. Finger resetting adjustment wrong 6. See Fault Section C
B Frequent extras	1. Marking bias on electromagnet 2. Finger-setting blade too high 3. See also Fault Section C
C Occasional extras and/or failures	1. Bias on electromagnet 2. Magnet strength incorrect 3. Receiving cam sleeve loose 4. Receiving pawls sluggish, pawl springs faulty 5. Finger-setting blade vertical adjustment faulty 6. Detent adjustment faulty 7. Reaction on armature faulty 8. Finger-setting blade horizontal adjustment faulty 9. Finger-setting blade worn or bent 10. Finger springs with wrong tension 11. Cam sleeve driving ratchet teeth broken 12. Slackness of trip shaft bearings 13. Cam rollers worn
D First finger failing	1. Finger resetting adjustment wrong 2. Finger spring tension incorrect
E Fifth finger giving extras	1. Receiving cam sleeve loose 2. Finger adjustments incorrect 3. Fingers badly aligned
	TRANSLATING MECHANISM
F Correct bellcrank not dropping	1. Finger lift adjustment not correct 2. Bellcrank lift adjustment incorrect 3. Combs sticky
G Typehead spinning	1. Bellcrank lift adjustment incorrect 2. Bellcrank lifting collar worn 3. Cam roller or cam track worn
H Shift not properly working	1. Shift lever spring binding on anchor pins 2. Shift lever binding on pivot 3. Springs on shift bellcrank weak 4. Shift lever spring too strong
	PRINTING MECHANISM
I Bad impression	1. Typehammer adjustments incorrect 2. Ink ribbon needs changing 3. Height of ink ribbon jumper incorrect 4. Ribbon feed or feed change mechanism faulty 5. Distance between typehead and platen wrong
J Typehead clutch not latching	1. Worn clutch lining 2. Worn clutch band
	FUNCTION FAULTS (PAGE ATTACHMENT UNIT)
K Carriage not returning	1. Crosshead adjustment incorrect 2. Dog spring too strong 3. Dog loose on pivot 4. Engaging tooth of dog worn
L Carriage partially returning	1. Carriage return trip bellcrank spring weak 2. Trip bellcrank damaged or worn
M Carriage returning with too much force	1. Air valve adjustment faulty
N Line feed failing	1. Crosshead adjustment incorrect 2. Dog spring too strong 3. Dog loose on pivot 4. Engaging tooth of dog worn 5. Line feed pawl worn
O Irregular line feed	1. Line feed adjustments incorrect 2. Line feed pawl worn

TABLE OF RECEIVER FAULTS—Continued

Fault	Possible Causes
P Letter feed failing	1. Carriage feed pawl adjustment incorrect 2. Carriage retaining pawl adjustment incorrect 3. Crosshead adjustment incorrect 4. Carriage feed pawl tooth worn 5. Spring drum teeth worn 6. Letter feed dog engagement tooth worn 7. Carriage return trip bellcrank preventing feed
Q Non-feed function failing	1. Crosshead adjustment incorrect 2. Buffer spring adjustment incorrect
R Overprinting	1. Air valve adjustment incorrect
	MOTOR, GOVERNOR AND STARTER SWITCH UNITS
S Motor not starting	1. Motor or governor brushes need renewing 2. Commutator requires cleaning 3. Starter switch unit adjustment incorrect
T Motor not stopping	1. Starter switch unit adjustment incorrect
U Motor overheating	1. Brush rocker adjustment incorrect 2. Excessive load from teleprinter (check bearings)
V Governor not governing	1. Contacts require adjusting or changing 2. Governor brush broken 3. Carbon dust between governor brush connections 4. Carbon dust between slip rings
W Excessive sparking	1. Grooves in the commutator 2. Brush springs weak 3. Brushes worn 4. Disconnection in armature windings 5. Brush rocker adjustment incorrect
X Excessive brush wear	1. Carbon dust between commutator segments 2. Mica needs undercutting 3. Worn commutator

TELEPRINTER No. 7B STANDARD ADJUSTMENTS

Adjustment	Pressure or Gauging	Remarks
TRANSMITTER STRIKER TYPE		
Striker timing lever	10–20mil	Striker in highest position
Striker stop plate	15mil	Gauge between heels of third and fourth selecting levers and contact operating lever
Transmitter contact gap	6mil	Striker lever to fall equal distances on either side of tongue
Jockey roller pressure and tongue neutrality	4–5oz	Neutral
Striker timing lever spring	4½–5½oz	Measured at left-hand side of striker. Spring on right-hand side of its anchor
Selecting lever springs	4½–6oz	Measured at right-hand end
SEND-RECEIVE SWITCH		
(*a*) Lever and buffer	4–6mil	*Motor running:* buffer tight in lever
(*b*) Contact gap	6mil	
Contact operating lever spring	5–8oz	All selecting levers spacing
Pawl abutment lift	3–20mil	Check on several keys
Resetting lever	6–20mil	*Motor running*
Keybars	6–8½oz	*Motor running:* not more than 1½oz difference between all keys
TRIP BAR BACK STOP		
Locking bar No. 2	5–6mil	
Comb bars and springs	3½–4½oz	Free in guide plates
Locking bar No. 1	4–5oz	Free in guide plates
RECEIVER		
Fitting abutments		Abutments must be in contact
Receiver-cam sleeve	1·5mil max	Free, minimum end play
Cam unit clutch mechanism	1oz	To disengage the pawl abutment from the pawls. *Motor running*
Pawl abutment (tension)	2½–3½oz	
Electromagnet armature travel	22–25 mil	Electromagnet No. 1
Electromagnet armature travel	28–32 mil	Electromagnet No. 2
Field unit spring	3lb min	Gauge on heel of field unit
Electromagnet neutrality No. 1	8–12oz 9–11 Unit No. 2	Electromagnet link disconnected below centre of pin
Adjustment of tripshaft and blade	5 mil approx	
Finger-setting blade (horizontal)	80mil	To include backlash of blade
Pawl abutment	2mil max	
Electromagnet neutrality No. 2	—2oz	Reduction should not be more than 2oz
Finger-setting blade reaction	—2½ Unit No. 2	
Finger-setting pin	—	Central with finger, when finger is half-set
Finger-lift	—	Comb plates should be level
Finger resetting	17–20mil	Released during start signal
Finger pressure springs	6–10oz	Measured on flat surface
Finger pressure	3–5oz	
Bellcrank lifting lever		Use "N" bellcrank
CONTROL LEVER-UNIT		
Shoe on control lever	central	Bellcrank central on shoe
Control levers	18–44mil	Between front body plate and control lever tips
TYPEHEAD UNIT		
Types	3–4oz	To just move type retaining plate
Typehead end play	5–10mil	Measure in tightest position
Typehead latch cam	30–55mil	Unlatched + or — shims
Typehead clutch latch	8–14mil	Typehead unlatched
Typehead latch spring	2–3oz	Clutch unlatched
Clutch latch	13–20mil	Use "N" bellcrank
Clutch torque A	3½lb min	To rotate the typehead backwards
Clutch torque B	3–4½lb	To latch on selected bellcrank
Printing hammer head	central	Rear end of type central with hammer head
Printing hammer shackle spring	1 turn	Release spring one complete turn
Printing hammer head	$\frac{1}{32}$in	Between typehammer and type face. Use "N" type
Ribbon feed ratchet	1⅓ teeth	
Ribbon jumper	—	Jumper free in guide
Ribbon jumper steady plate	2mil approx	Between each arm of steady plate
Ribbon lift	$\frac{3}{32}$in	Top of ribbon above type
Ribbon jumper clearance	functional	Clear of typehead
Ribbon feed spindle jockey spring	12–16oz	At ends of spindle
AUTOMATIC START STOP SWITCH		
Starter boss	6–10mil	Check that switch will operate on the incoming signal
Spindle pressure	¾–2¾ oz	
Throwout bracket	functional	
Position of boss (switch on)	functional	
ANSWER BACK UNIT		
Ward clearance	10–20mil	Adjust fitting abutment on keyboard
Trip cam	functional	Ward to engage top of combination bars
Release shaft	10mil	Detent held to the right
Trip mechanism "D" extension	6mil	
CARRIAGE		
Chariot rail	functional	
Carriage friction	1¾lb	Not more than 1¾lb
Carriage return spring	2½–3½lb	End to end variation 1½lb
Characters per line	69chtrs	Check by operation of crosshead
Letter feed pawl	10mil min	Carriage at extreme right

Adjustment	Pressure or Gauging	Remarks
Retention pawl	5–8mil	Carriage fed a few spaces to left
Carriage unit dashpot	functional	For satisfactory damping
Carriage latch	$\frac{1}{8}$in	Between type face and platen
Clutch crosshead	10–25mil	Vertical measurement
Letter-feed dog	6–10mil	Between feed throw-out lever and plate
Carriage-return and line dogs	10–15mil	Horizontal measurement
LINE-FEED MECHANISM		
Line feed pawl	0–10mil	Pawl in maximum forward position
Line feed pawl movement	functional	Check on double line spacing
Jockey roller	functional	Jockey roller fully-bedded
Line feed pawl buffer	functional	Buffer lightly touching pawl

Adjustment	Pressure or Gauging	Remarks
Pressure rollers	functional	
Chariot buffer spring	functional	Should just touch rail. Check that chariot is central
End of line bell	55 times	Operate crosshead 55 times
Pawl throw-out lever	1–5mil	Observe clearance
Spring tensions	functional	
Functional tests		
MOTOR		
Governor contacts	20–25mil	Use governor contact clamp
Governor brush springs	5 ± $\frac{1}{2}$oz	Reduces to 3oz for worn brushes
Measurement of motor speed	3,000rpm	
Motor maintenance		
Teleprinter lubrication		Tables 1 and 2

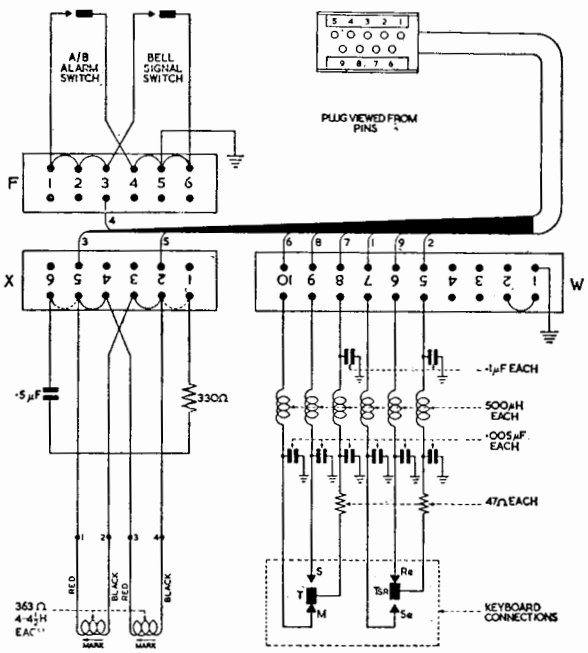


Fig 2.59a. Model 7, nine-pin plug wiring.

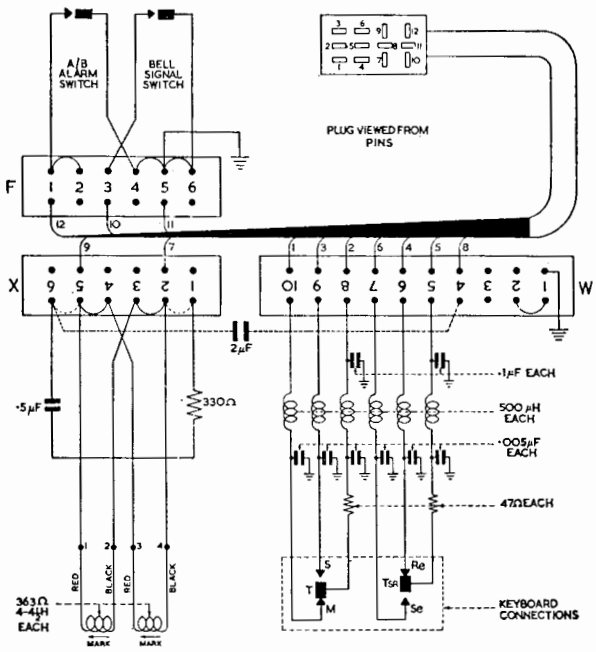


Fig 2.59b. Model 7, twelve-pin plug wiring.

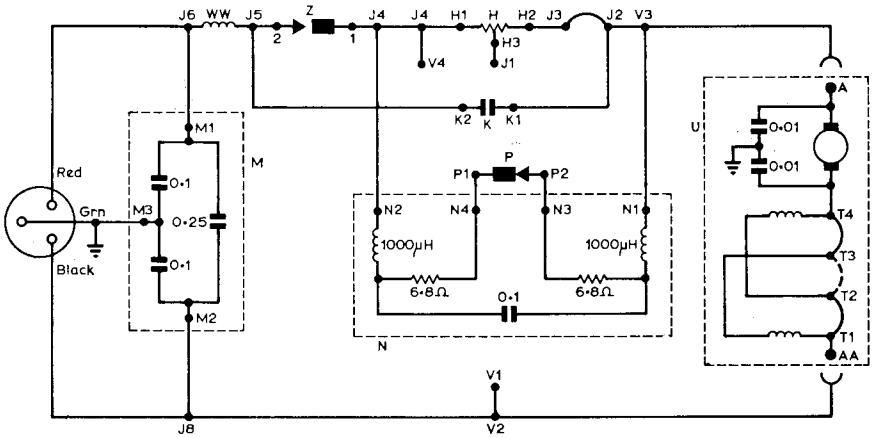


Fig 2.60. Model 7, motor wiring.