BELL & HOWELL-GAUMONT

35 & 16 mm. STANDARD SEMI-AUTOMATIC AND CONTINUOUS FILM PRINTER MODEL 607 (D & J)

DESCRIPTION
OPERATION
MAINTENANCE

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C O N T E N T S

SECTION I

PACKING OF EXPORT PRINTERS

A. UNPACKING

In order that breakage on export printers can be eliminated, the following method of packing has been developed.

The butterfly casting plus other heavy parts that may have been putting strain on the pedestal castings have been removed. These parts have been packed in cartons and secured in the wood box in such a manner as to distribute the weight evenly throughout. The pedestal is mounted on four rubber washers and secured in place by four carriage bolts. In order to prevent any side motion of the pedestal it has been held erect by four 2" x 4" wooden blocks. These blocks have been slotted to fit the curvature of the pedestal and covered with 1/4" sponge rubber to absorb shock and prevent damage to the enamel finish.

To re-assemble the machine, in addition to replacing the casting, which is secured by four screws, the footage counter must be connected and also the circuit interrupter.

The shutter operating lever, which connects the clutch mechanism with the light control shutter must be re-connected, and in such a manner that the back shutter opening corresponds correctly with the desired light settings on the pointer dial. The method of setting this up is described in detail on page 21 under heading LIGHT CONTROL SHUTTER.

B. SETTING UP FOR USE

1. (See figure 2.) Attach the footage counter in its place on the back of the card holder, using the four fillister head screws which will be found in their respective locations.
2. (See figure 4.) Install the feed reel assembly, fastening it in position by means of the taper pin as shown.
3. (See figure 4.) Insert the table bracket shaft into the receptacle in the printer pedestal, locate and fasten it in position by means of the taper pin as shown.
4. (See figure 2.) Attach the electric motor to the motor belt automatic take-up mechanism by means of the four bolts provided, so that the motor pulley is towards the back of the printer.
5. (See figure 2.) Loosen the screw in flange and slide each of the take-up flanges onto their respective hubs. Tighten the screw so that it engages in the slot in hub. This screw also serves as a stop to the flanges.
6. (See figure 4.) Place the drive belts on their respective pulleys as shown. Note that the motor is so mounted that the automatic belt take-up mechanism applies the necessary amount of tension to the drive belt.
7. The pedestal base is sufficiently large and the entire printer is balanced so that the printer need not be fastened to the floor. However, holes in the pedestal allow for such fastening in permanent installations.
8. Connect the motor lead cord to the proper current supply as specified on motor name plate.
9. Connect the printing lamp lead cord to any 110-volt D.C. supply.
10. Connect the Magnet Cable to the same mains supply as that for the motor.

SECTION II

ACCESSORIES

A. The following accessories are supplied with each continuous semi-automatic, Model J and Model D printer.

1. Negative Notching Cutter. The negative notching cutter is used to cut a notch in the margin of negative film. These notches are for the purpose of operating the Magnetic Clutch, automatically adjusting the light volume to each new scene.
2. Printer Index Cards. The index cards are used to record the footage advance of each scene of a certain negative and serve as a guide to the operator for setting the light control shutter.
3. Power Points. A 3-pole socket is required for connection of Motor and Magnet Cables to the mains.
4. A 2-pole socket is required for connection of the lamp cable to D.C. Mains; to prevent current reversal through the D.C. Ammeter a non-reversable type of plug and socket should be used.

SECTION III

DESCRIPTION

A. GENERAL

1. The Bell & Howell-Gaumont Semi-Automatic Continuous Film Printer 35mm Model D figure 2A and 16mm Model J figure 2, are designed to print all sound or silent motion picture films.

2. Five methods of printing are possible.

(a) To print on one positive film the picture area and sound track from two separate negatives. This method necessitates two separate operations, in which the positive film is run through the printer twice.

(b) To print the picture area and sound track in two operations, even though both the picture area and sound track are on the same negative film.

(c) Or, as it rarely if ever occurs, to print both the picture area and sound track simultaneously if the two records are on the same negative film.

(d) To print the picture area only.

(e) To print the sound track only.

3. The printer's film moving mechanism is designed to unwind the positive and negative films from the feed hubs, and move them past the printing aperture without longitudinal or horizontal slippage onto their respective take-up hubs. All this action is a continuous uniform motion which will cause no undue strain on the perforations.

4. A 300-watt lamp furnishes the illumination for exposures. The light intensity is mechanically controlled in order to ensure instantaneous light changes that can be duplicated exactly on all prints. Predetermined changes in light intensity enable the operator to be one step ahead of the operation. Hence, the designation "Semi-Automatic."

5. The pedestal to which the complete printing mechanism and motor is mounted is of sufficient size and weight to prevent it from tilting or tipping, and can readily be moved from one location to another. Holes have been drilled into the base so that it can be anchored to the floor when a permanent installation is desired.

B. DETAILED

1. Electric Motor. (figure 2.)

(a) The printer is ordinarily driven by a 230-volt constant speed, 50-cycle, single phase induction motor. However, motors of other electrical specifications are sometimes used. The electrical specifications for the motor are governed by the current supply available.

(b) The motor is capable of continuously operating the film moving mechanism under normal operating conditions for a period of eight hours without loss of efficiency.

(c) The motor is spring mounted (located under the wooden work table), and the mount permits easy displacement toward or away from the main drive pulley while maintaining proper alignment.

(d) The motor is started by a switch mounted on the pedestal, and is connected by a belt to a main drive pulley. The main drive pulley is in turn connected to three auxiliary pulleys by a single flat belt. An adjustable take-up pulley and a belt tightener are provided for controlling the belt friction on the auxiliary pulleys.

2. Combination Interlocking Switch and Starting Lever (figure 2.)

(a) The combination interlocking switch and starting lever is hand operated and in the same circuits with the magnets and printing lamp, and controls the flow of current to the operating parts of the printer independent of the motor. Thus the motor will run at all times and will not lose efficiency (because of cooling) even though the printer mechanism is not operating. When the lever switch is pointed downward it is in the "off" position and when moved one-quarter turn to the right it is in "operating" position.

(1) The lever switch performs three distinct operations, when the lever is moved one-quarter turn to the "operating" position; 1, the component parts for each operation are assembled to the lever shaft in such a manner and position that the printing light and blower motor are turned on; 2, electric current is transmitted to the circuit interrupter; 3, the belt tension pulley engages the drive belt at the proper time.

(2) When the starting lever is shifted from the "operating" position to the "off" position, the belt tension pulley shifts and releases the tension on the drive belt, a stop engages the brake arm, causing the mechanism to stop instantly, and the current to the printing lamp and magnets is cut off.

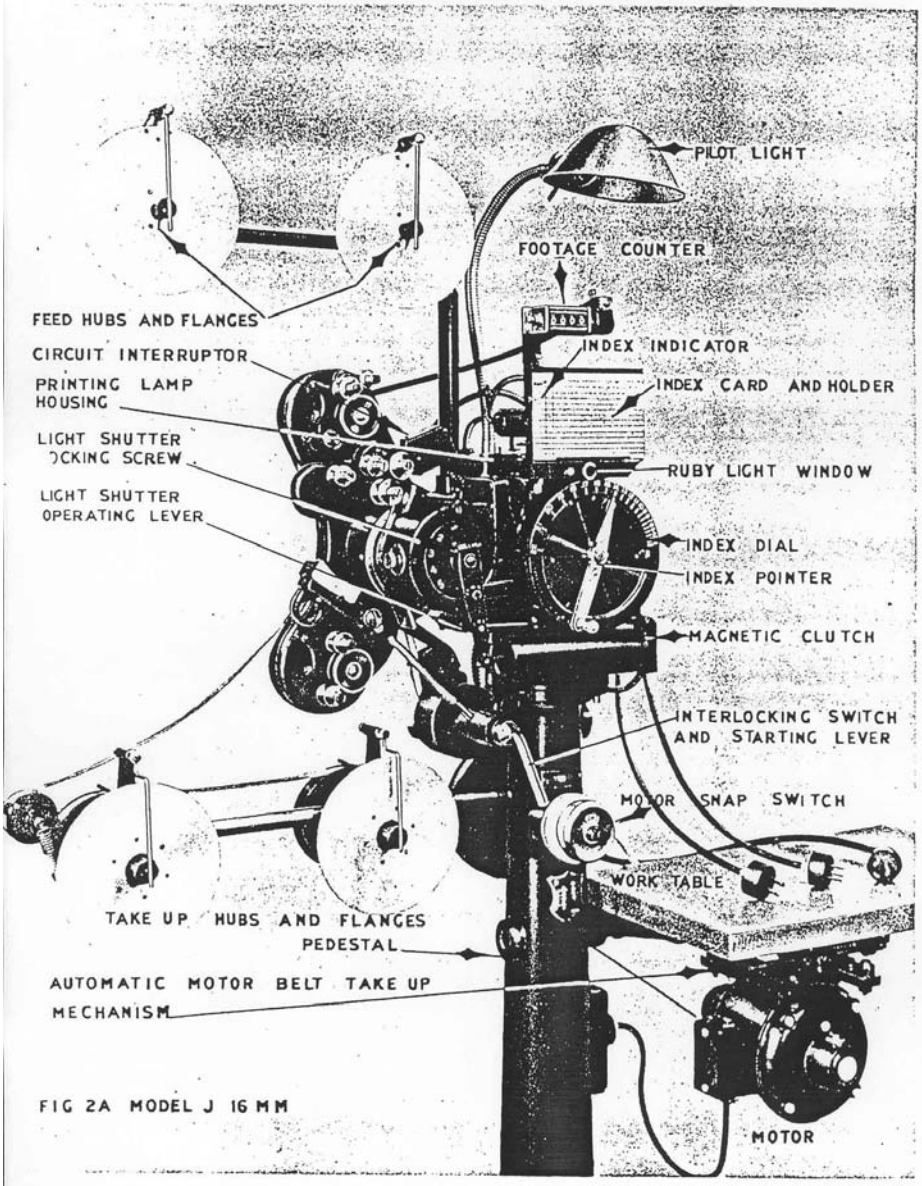


FIG 2A MODEL J 16 MM

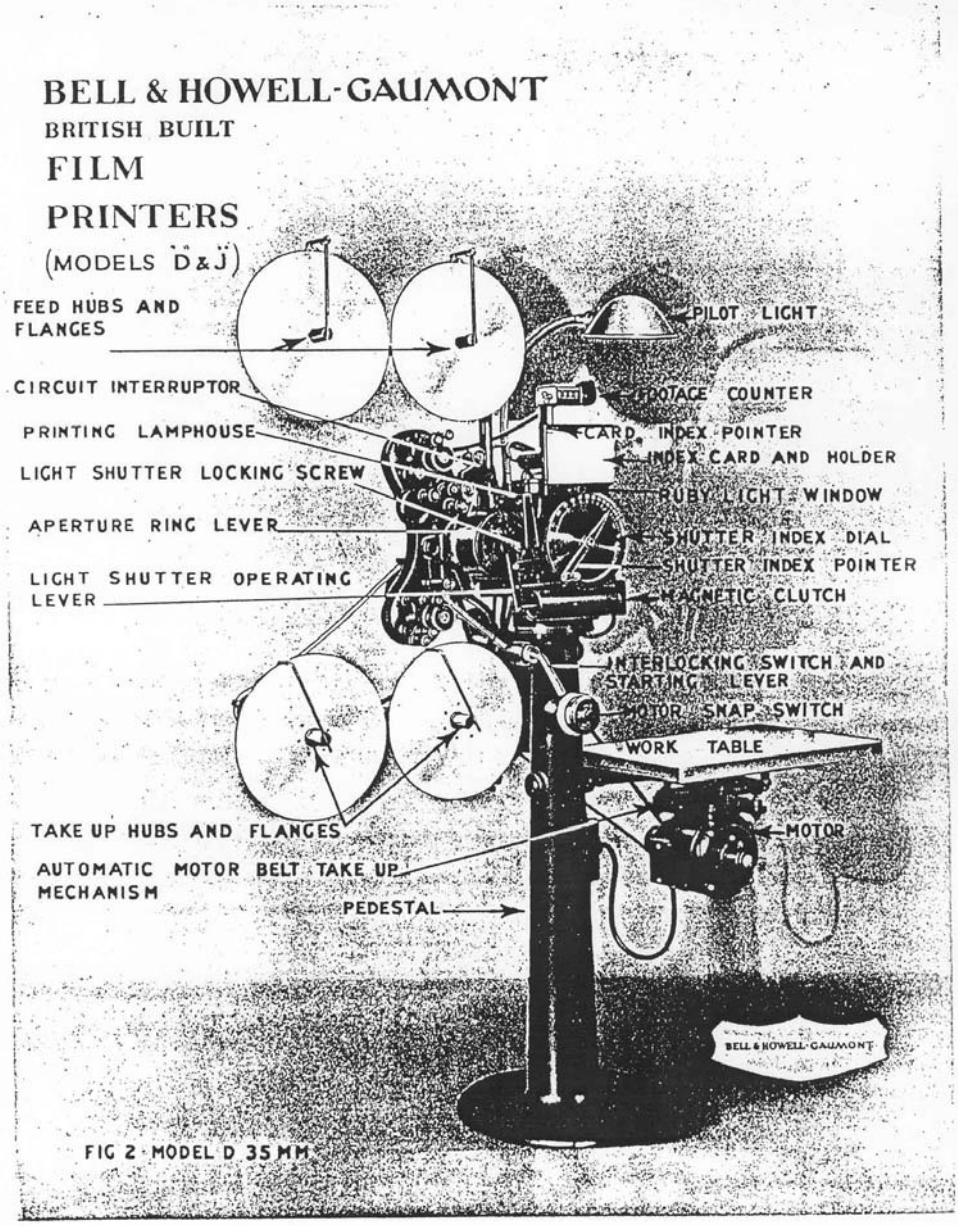


Figure 2 - Model D 35 mm PROFESSIONAL SEMI-AUTOMATIC CONTINUOUS FILM PRINTER

(3) The lever is interlocked with the printing gate so the gate cannot be opened until the lever is switched to the "off" position.

3. FILM MOVEMENT MECHANISM (figure 3)

(a) The film moving mechanism includes a feed sprocket, a printing sprocket, and a take-up sprocket. All the sprockets are positively geared together and so driven as to move the film at a uniform linear speed (normally 40, 60 or 100 feet per minute for the Model D Printer; the Model J 16 mm Printer runs at 60 feet per minute only). The alterations in speeds are obtained by means of stepped belt-pulleys; for 40 fpm a spare motor belt-pulley is clipped underneath the work table.

(b) In the printer, care has been taken to avoid frictional contact between the film and the mechanism employed to move it. The film feed sprocket, located below the feed reels, receives the film from the reels, and, working in synchronization with the aperture sprocket, maintains a loop between the feed sprocket and the tension rollers. These rollers, mounted on a weighted lever, are automatically adjusted to exert sufficient tension on the film to keep it taut at all times. The weighted rollers maintain a proper degree of tension against the teeth of the printing aperture sprocket, thereby providing the means for the correct registration and eliminating a possibility of creepage or slippage between the negative and positive films. The tension is in direct proportion to the pressure exerted upon the films. It is sufficient to take all curl from the film and to keep it in perfect alignment. The rollers in conjunction with the printing sprocket, the teeth of which engage with the film as it comes from the tension rollers, bring the film into proper registration before the printing aperture. This method assures steady pictures.

(c) The film is accurately registered just before it reaches the printing aperture, and remains thus until printing is accomplished. The film loops between the printing and the take-up sprocket absorb any jerking motion of the film, and the adjustable clutch take-up ensures smooth winding of the film onto the take-up flanges, making impossible any transmission of jerky motion to the printing aperture.

(d) Further to ensure smoothness of the film take-up action, the driving belts are constructed of a continuous, seamless, flat fabric, and are kept under tension by means of adjustable pulleys, while the motor belt tension is adjustable through the motor support bracket.

(e) It is self-evident that proper threading of the film is essential. The threading operation has been made as simple and fool-proof as is possible.

(f) All rollers and sprockets are properly aligned. The rollers are flanged, and the feed and take-up sprockets are equipped with film guards.

4. Film Gate (figure 3)

(a) The positive and negative films are held in close contact at the printing sprocket by means of a film gate.

(b) The gate is pivoted in the centre to permit the passage of splices, and is mounted on a hinged lever to permit ease in opening for the purpose of threading films on the printing sprocket.

(c) The film gate has a gate shoe shaped to fit the printing sprocket, and is highly polished to eliminate the possibility of scratching, abrading, or otherwise injuring the films.

(d) The film gate is interlocked with the combination switch lever, which prevents an accidental opening while the mechanism is in operation and the printing light turned on. To open the film gate it is necessary to stop the printing mechanism, which automatically turns out the printing light. The switch lock for the film gate is assembled to the front of the printer with one end attached to the lower portion of film gate casting and the opposite end resting in the casting which houses the shaft of the interlocking switch and starting lever.

5. Film Rollers (figure 3)

(a) A sufficient number of rollers is used to confine the film to its proper path. The guide rollers are perfectly aligned, and present a minimum of friction to the passage of the film.

(b) A tension roller is provided for each film to produce the proper tension at the printing sprocket.

6. Feed Hubs (figure 2)

(a) Two freely rotating feed hubs are mounted on the printing frame above the feed sprocket. The feed hubs are equipped with flanges and guards, sufficient to accommodate 400 feet of film. Flanges to accommodate 1200 feet of film are standard on Model D and are also available for Model J, which is normally fitted with 400 ft. flanges. The hubs will accommodate commercial film spools having an inside diameter of one inch. The feed hubs have neither key nor key ways.

7. Take-up Hubs. (figure 2)

(a) Two belt-driven take-up hubs are mounted on the printer frame below the take-up sprocket and are equipped with flanges and guards which will accommodate 400 feet of 16 mm film for the Model J (1200 ft. flanges are also available for the Model J); or 1200 feet of 35mm film for Model D.

(b) The take-up mechanism is equipped with adjustable friction take-up spindles and flat belt pulleys.

(c) The take-up hubs will accommodate commercial film spools having an inside diameter of one inch, and are fitted with 1/8-inch key slot so the flanges can be pulled outward to strip the rolls of film from the hubs.

(d) The take-up assembly is so designed that the tension necessary to take up the film is adjustable. This is accomplished by seven steel driving and six canvas friction discs which operate under spring tension, and the amount of tension applied is adjustable by a screw cap which covers the driving discs.

8. Footage Counter (figure 2)

(a) The film footage counter is a film measuring device and is connected with the feed sprocket shaft, automatically registering every foot of film that passes through the mechanism. It is of great value in checking the progress of the printing operation, as the footage registered is made to check with the footage indicated for each scene on the printing index card.

(b) The counter has a reset knob and registers up to 10,000 feet of film.

9. Illumination - (See Supplement)

10. Light Control Shutter

(a) An automatic curved light shutter encloses the lamp side of the printing sprocket. The shutter has twenty-two exposure positions which vary from adjacent positions by approximately 10%. This range of exposures is sufficient to permit printing all normal negatives.

(b) Control of exposure is obtained by varying the volume of light allowed to reach the film rather than by varying the brilliance of the light by means of a resistance in the light circuit. In other words, light control is by means of a variable shutter instead of an electrical control on the light intensity.

(c) As a result of this arrangement, the printing lamp is constantly burning at full candle power, and extreme changes of illumination at the printing aperture, as from minimum to maximum, are accomplished instantaneously.

(d) This method of light changes ensures a range of light steps representing an increase of 10% for each succeeding step, thus permitting the application of sensitometric procedure without consideration to color variations of the lamp filament from step to step as would be the case with an electrical control.

(e) All normal adjustments of the light volume are taken care of by the shutter, set by means of the manually operated index pointer on the index dial, which is marked with the 22 shutter opening positions. The actual change in the size of shutter opening is actuated by a circuit interrupter which rides against the edge of the negative. Thus the setting of the shutter is always one step ahead of the actual operation, and an instantaneous change in the light volume is made as soon as the scene changes.

(f) The shutter is located approximately half way between the lamp and the actual printing aperture, just in front of the ground glass diffuser. The advantage of controlling the light at this point is to obtain even distribution over the entire printing aperture. The operating range of the light shutter is divided into twenty-two steps. The actual opening of the first step (No. 1. on index dial) is set at .250 of an inch on Model J and .156 of an inch on the Model D.

11. Magnetic Clutch and Circuit Interrupter. (figure 2)

(a) The chief function of the magnetic clutch is to complete instantaneously and automatically the operation of regulating the size of the light control shutter aperture. It consists of an electro-magnet, the armature of which, when in operation, releases the shutter operating mechanism at the desired instant, thus allowing the shutter to occupy the position previously determined by the setting of the time regulator index dial.

(b) The circuit interrupter is mounted just above the printer aperture and is so mounted as to permit accurate adjustment toward and away from the printing aperture while maintaining proper alignment. The circuit interrupter consists of a set of tungsten points, actuated by a roller which rides against the edge of film. As soon as the roller engages a notch in the edge of film, the two points close and transmit an electrical impulse to the magnetic clutch (230-volt A.C. coil) and the 230-volt A.C. coil which operates the index card pointer. It is mounted on a holder just above the printer aperture, and can be pivoted so the distance between the roller and aperture can be set to ensure its engaging the notch in the edge of film at the time when a light change is to take place at the aperture.

(c) Upon coming in contact with a notch, the roller of the circuit interrupter follows the indentation of the negative film, closing the circuit and causing the magnetic clutch to trip, which in turn trips the light shutter control mechanism and automatically sets the shutter to its predetermined position.

12. Printing Aperture Jaw (figure 3A) (Model J)

(a) The printing aperture jaw is located inside the drum portion of gear case as shown in figure 3A. A sliding jaw, operated by the aperture jaw setting knob permits the locating of three individual aperture openings in printing position. The purpose of each opening is as follows:

(1) When the knob is set so the pointer is at "Sound Only," the width of the printing aperture permits the printing of only the sound tracks.

(2) When the knob is set so the pointer is at "Picture Only," the width of the printing aperture permits the printing of only the picture area. This opening is used for printing the picture area from either sound or silent negatives.

(3) When the knob is set so the pointer is at "Sound Picture," the width of the opening permits the printing of the sound track and picture area simultaneously. It is obvious that the simultaneous printing of picture and sound track can be done only from master 16mm sound negatives in which the density of the sound and picture area have been matched to permit their being run through the printer at one light setting.

(b) The opening of each printing aperture is 9/64 of an inch high.

(c) A slot is milled in the main casting at the left of the aperture and main sprocket to permit printing the footage markings and trade-marks (key printing) which identify each roll of negative film.

5-Way Aperture Ring (figure 3) (Model D)

(a) The aperture ring is mounted inside the printing sprocket. The five apertures permit printing silent pictures, sound pictures forward, sound pictures backward, sound records forward, and sound records backward. An auxiliary aperture is provided on one side of the printing aperture to permit printing key number forward or backward.

(b) The locating of the printing aperture is controlled by the ring assembly which is made to rotate to set any of the five different apertures at its printing position by means of an aperture ring lever with 5 carefully located positions.

(1) The five apertures correspond to:

a. Full width picture and sound aperture.

b. Masking out sound track at right side.

c. Masking picture area at right side.

d. Masking sound track at left side.

e. Masking picture area at left side.

(2) The combination of apertures permits printing:

a. Silent full aperture pictures or composite picture and sound.

b. Picture area when negative film is led to the aperture head first.

c. Sound track led to the aperture head first.

d. Picture area when negative is led to the printing aperture tail first.

e. Sound track led to the aperture tail first.

(c) The above arrangement of aperture openings permits running the negative many times in succession without rewinding. Each picture aperture is 5/16 inch high and each sound aperture 1/8 inch high and located to permit printing the whole width of the film at setting as indicated in paragraph (1) a. and to print a narrow baffle line between picture and sound tract at settings as described in paragraphs (1) b.c.d. and e.

(d) A slot is milled in the main casting at the left of the aperture and main sprocket to permit printing the footage markings and trade-marks (key printing) which identify each roll of negative films.

13. Card Holder and Indicator (figure 2)

(a) A printing card holder is mounted on the printer housing just above the light control shutter index dial. Above the card holder is the footage counter.

(b) The index card holder consists not only of a holder for the card but also a register bar to indicate the light change of scener, and is controlled by a 230 volt A.C. coil which receives its electrical impulse from the circuit inter-

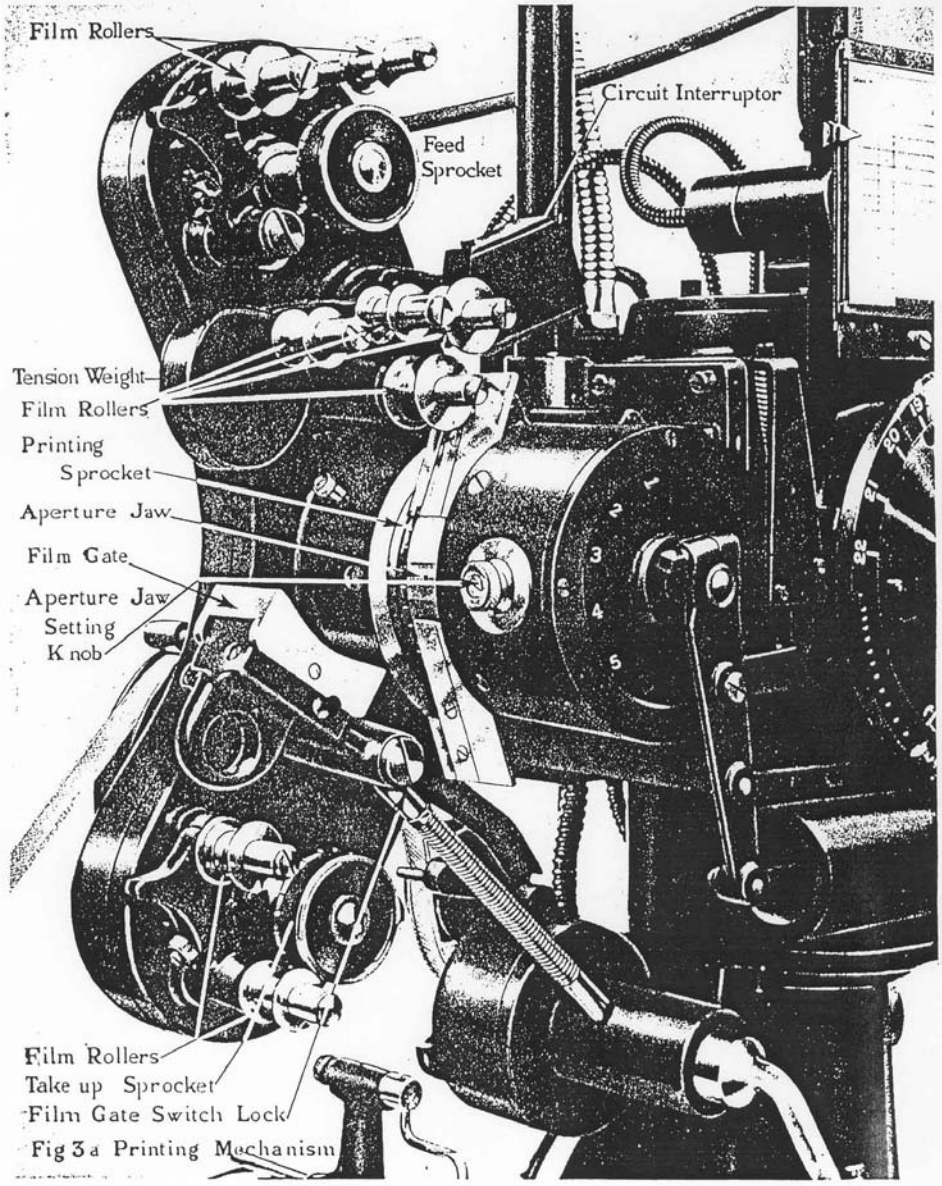


Fig 3a Printing Mechanism

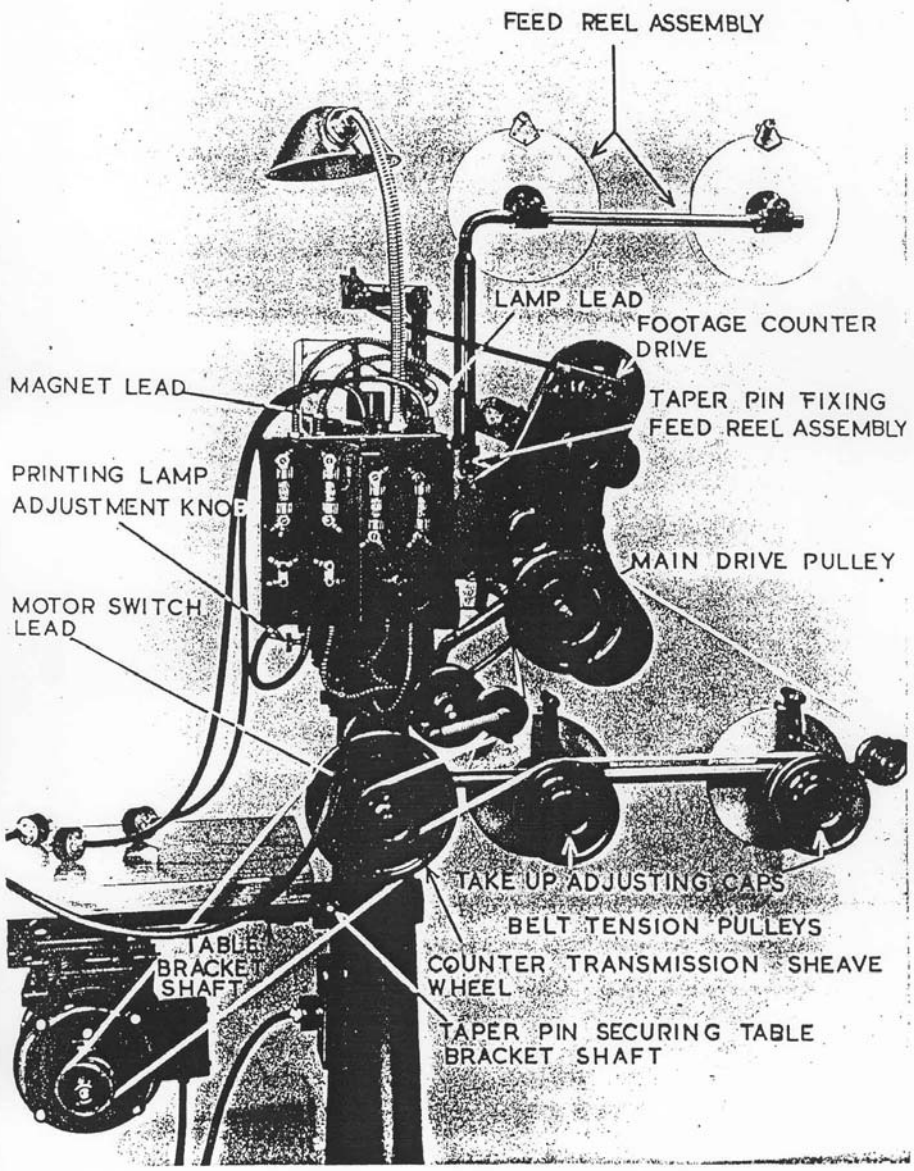
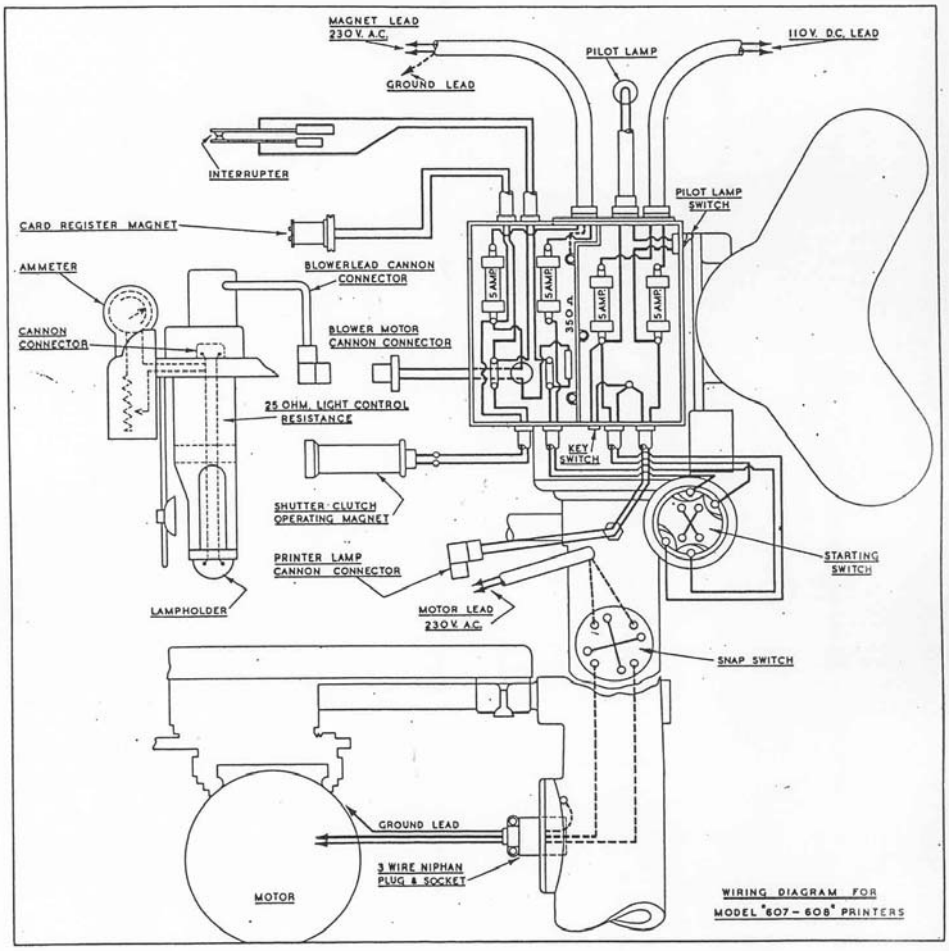


FIGURE 4 - REAR VIEW OF PRINTER


MAGNET LEAD
230 V. A.C.
GROUND LEAD
PILOT LAMP
110 V. D.C. LEAD
INTERRUPTER
PILOT LAMP
SWITCH
CARD REGISTER MAGNET
AMMETER
BLOWERLEAD CANNON
CONNECTOR
CANNON
CONNECTOR
BLOWER MOTOR
CANNON CONNECTOR
5 AMP.
5 AMP.
350 A.
5 AMP.
5 AMP.
25 OHM LIGHT CONTROL
RESISTANCE
KEY
SWITCH
SHUTTER CLUTCH
OPERATING MAGNET
PRINTER LAMP
CANNON CONNECTOR
STARTING
SWITCH
LAMPHOLDER
MOTOR LEAD
230 V. A.C.
SNAP SWITCH
GROUND LEAD
3 WIRE NIPHAN
PLUG & SOCKET
MOTOR
WIRING DIAGRAM FOR
MODEL "607 - 608" PRINTERS

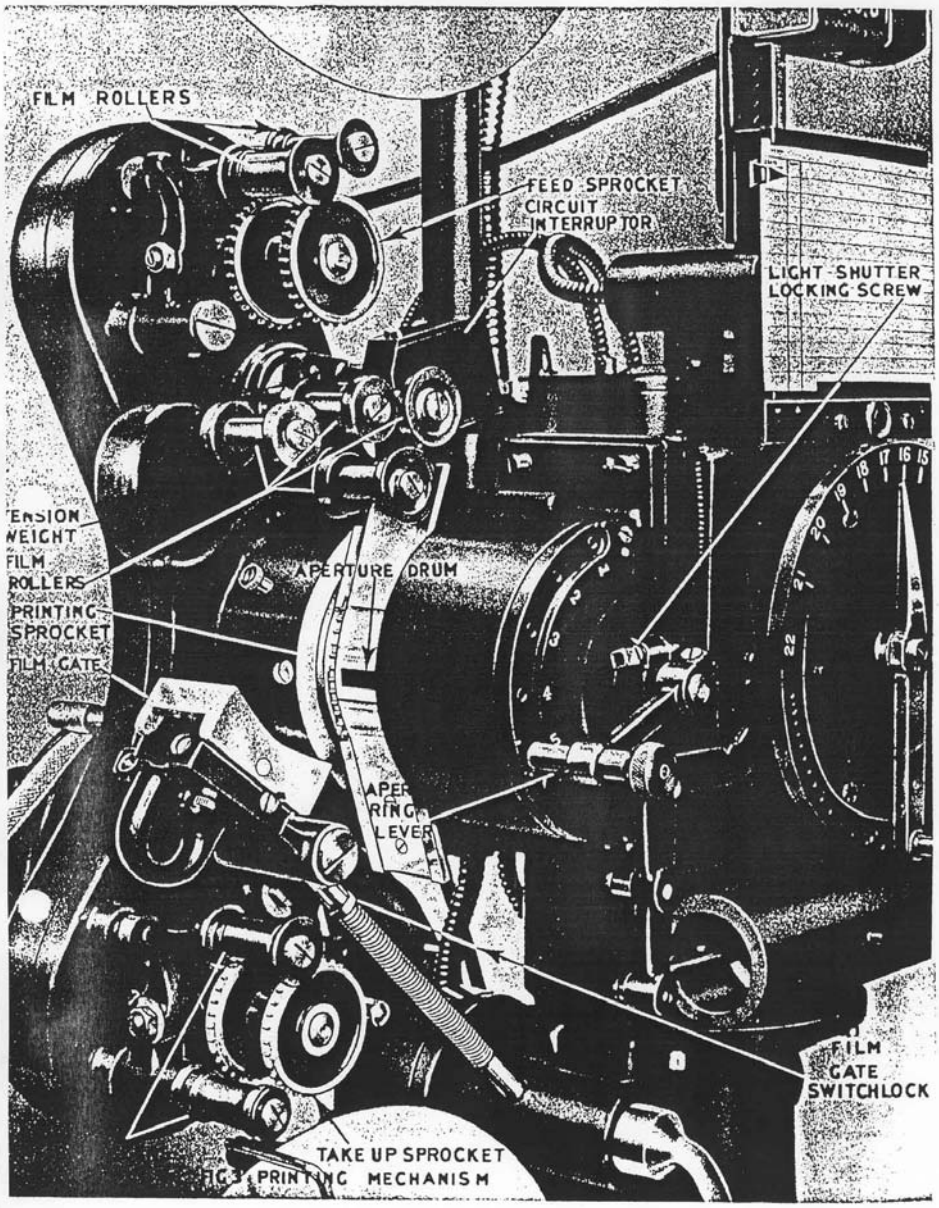


FIG 1 PRINTING MECHANISM

rupter. When the roller on the circuit interrupter comes in contact with the notch in edge of film, it transmits an electrical impulse to the A.C. coil of index register which in turn actuates a register bar operating pawl and moves the index indicator to the next recorded scene in the aperture opening required for the scene immediately following the one being printed.

(c) The mechanism makes an audible click each time its position changes, thereby giving an audible, as well as a visual, signal to the operator to set the index pointer on the index dial for the ensuing light change.

(d) A supply of printing index cards is furnished with each machine. These cards have spaces for showing the footage of each scene and the correct light that should be used in printing.

14. Film Notcher (figure 6)

(a) A film notcher is supplied with each printer.

(b) Before making the density tests, it is essential that the negative film be notched at the margin for controlling the change of light at the printing aperture.

15. Electrical Connectors.

(a) (See figure 4.) The printer is supplied with all necessary electrical connectors. The connectors for the printer lamp, the motor, and the magnets are rubber covered. The conductors for the ruby pilot lamps, the clutch coil, and the card index coil are covered with flexible metal armour.

(1) Electrical Connections. (See figure 5.) The electrical connections of the printer comprise three separate circuits.

a. Motor Switch Cord. The motor switch cord supplies current to the motor only, and is controlled by the round snap switch located near the top of the pedestal.

b. Magnet Cord. The magnet cord supplies current to the magnetic clutch, the magnet on the card holder, and the circuit interrupter. Likewise, the combination interlocking switch and starting lever is in the magnet circuit, and current does not reach the magnets until the starting lever is in the operating position.

c. Lamp Cord. The lamp cord supplies current to the printing lamp and pilotlamp. The combination interlocking switch and starting lever is also in the same circuit with the printing lamp so that the light is immediately turned on when the starting lever is switched to the operating position, and turned off when the handle is in the off position.

(b) Fuses are provided on each separate electrical circuit, so that a maximum of protection is obtained under all conditions.

(c) For convenience, a switch is installed at the D.C. side of the electrical control box to permit the operator to open or close the printing light circuit independently from the general operation of the printer.

SECTION IV

OPERATION

A. GENERAL

These instructions presuppose that the negative has been edited and assembled in sequence of scenes and titles and that it is in readiness for printing.

B. NOTCHING FILM (figure 6A)

1. The film notching cutter serves as a gauge as well as a notcher. The film is placed EMULSION UP between the guides G with the splice separating two scenes to coincide with the edge of the metal plate of the notcher, as shown. The distance D corresponds to fifteen picture frames (six frames for 35mm film) from splice to centre of notch and coincides with the separation between interrupter roller and the aperture of the film mechanism. Notches can be cut in the film following a splice, or at any point in any scene where a light change is desired.

C. MOTOR AND MECHANISM CONTROLS

1. General. To ascertain that the printer is in readiness for an uninterrupted run, it is advisable that the following precautionary check be made.

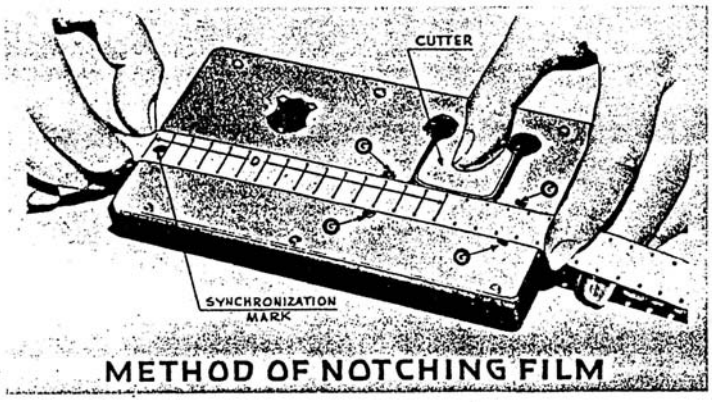
2. Electrical Connections. See that all cords are plugged into the proper current supply outlets. Refer to Section III, paragraph B 15.

3. Starting. To start the printer turn on the motor switch, close the film gate, and move the starting lever one-quarter turn to the right.

CAUTION

If a motor generator is used to supply direct current to the printing lamp, set it at the lowest voltage before starting the printer, and bring it gradually up to the 110 volts after the printer is operating.

4. After ascertaining that the machine is operating correctly, it is suggested that trial films be threaded and run in full daylight to permit the experienced operator to make sure that everything is operating correctly, and for the non-experienced operator to familiarize himself with the actual operation of the machine.



METHOD OF NOTCHING FILM

D. SETTING OF PRINTING APERTURE (figure 3)

1. Set the aperture jaw setting knob to the position desired. Refer to Section III, paragraph B 12. (Aperture Ring Lever, on Model D).

E. THREADING FILMS

1. Figure 7 shows the printer fully threaded. Note that in the photograph two unprocessed films have been used to facilitate discerning the film paths. In actual practice the negative film would be black, and difficult to see on a photograph.

2. Place the negative film, wound EMULSION SIDE OUT, on the right-hand feed reel spool A, keeping it securely against the flanges by means of the right feed reel guard.

3. Place the positive film wound EMULSION SIDE IN, on the left-hand feed reel spool B, keeping it securely against the left flange by means of the left feed reel guard.

4. The emulsion of the negative and positive films will then contact each other when the films are drawn together for threading through the printing aperture.

5. Take the end of the negative film and pull it approximately one foot in advance of the positive film (a two-foot leader is spliced in front of all negatives). Then take hold of both films, and pull them down until the positive film is approximately at the height of the take-up reel flange. With both films hanging loose, raise the feed sprocket lever C, taking both films and pressing them around the film guide roller D, and over the feed sprocket E, engaging the film perforations on the sprocket teeth. Lock the film on the sprocket by closing the feed sprocket lever C.

6. Place the NEGATIVE FILM ONLY under the negative tension roller F and over the negative aperture guide roller G. Then place the POSITIVE film under the positive tension roller H and over the positive aperture guide roller J.

7. Open the film gate K, drawing both negative and positive films over the main printing sprocket, and engage the perforations in the sprocket teeth so that the tension weights of F and H are sufficiently raised to be in an intermediate

position, avoiding the possibility of getting tension beyond, or lower than, that indicated by the limit pin provided to limit the position of the weights. Note that the correct degree of tension is of extreme importance, as it is one of the means provided to secure film shrinkage accommodations. Then gently close the film gate.

8. Raise take-up sprocket roller lever L and pass both negative and positive films under take-up sprocket guide roller M and over take-up sprocket N, engaging the film perforations on the sprocket teeth. Note that a loop O must be formed between the printing sprocket and take-up sprocket, and the loop made by the negative film is a trifle longer than that of the positive film. With the loop thus formed the feed sprocket lever L can be closed, locking the films onto the take-up sprocket.

9. Take the end of the negative film and insert it in the hub of the negative take-up flange P, keeping the film securely against the flange while turning it to take up slack, and set the take-up reel guard over the end of hub.

10. Insert the end of the positive film in the hub of the positive take-up flange Q, observing the same precautions as for the negative film. If the end of the film does not reach the positive flange hub, operate the printer by hand through the handle at the main drive pulley.

11. Insert printer index card in index card holder, raising indicator to starting point.

NOTE

The starting point for the first scene is always one scene above the point to which index indicator is set. The index indicator must always be set to make sure that it corresponds to the description of the notation on the index card.

12. Set the index pointer, figure 2, to the first index number indicated on index card. Insert index finger of right-hand in the end opening of magnetic clutch case, figure 2, pushing clutch so that clutch rod is released, thus adjusting aperture shutter opening to first density change.

13. Again take the index pointer and set for the next number indicated by the card.

NOTE

The index pointer setting now corresponds to the scene to which the index indicator points, so that in effect the light change aperture shutter is always set by the operator one scene in advance of its change.

14. Turn on snap switch, starting motor. Start the printer mechanism by turning the interlocking switch and starting lever to the right.

15. Look through the ruby light window, figure 2, immediately above index dial, and make sure that the printer lamp is burning.

16. Just before the first scene has passed through the printing mechanism, the notched film passes the circuit interrupter, figure 7, momentarily closing a circuit which causes the magnetic clutch to set the aperture shutter opening at the start of the new scene and the index pointer to the next number indicated on the printer index card. Concurrently, this action causes a signal to be sounded, warning the operator to set the shutter setting lever to the number indicated on the index card. This operation is repeated until the negative roll is finished.

17. When the end of the negative roll passes the film gate K, figure 7, immediately turn off the interlocking switch and starting lever to stop the printing mechanism.

NOTE

It is advisable not to turn off the snap switch as the motor operates more efficiently while warm.

18. Cut or tear off positive film at a point below film gate, and put in position for succeeding prints. Then release film from take-up sprocket and release take-up reel guards. Pull out stripping flange, which will remove the rolls of film.

19. After the printing of each roll, rub over the aperture openings, the printing sprocket, the upper aperture plate, and the lower aperture plate with a dry cloth. Once or twice an hour (oftener if necessary), saturate a small piece of cheese cloth, with acetone or any quick drying cleaner, and wipe all of these parts, making certain that no accumulation of dirt or any foreign substance is allowed to adhere to them. Occasionally (about twice a day), rub the same parts with an oily cloth. Then, with a dry cloth remove all oil from the shutter, plates and sprocket. Oil all bearings once a day. (See Section V).

20. For use in connection with the teaching of new operators, it is recommended that two rolls of scrap stock of approximately 200-foot lengths be utilized to familiarize the beginners with the important stages of operation. One roll may be notched, and printing index card prepared, the same as for regular printing.

SECTION V

MAINTENANCE AND LUBRICATION

A. GENERAL

1. In order to ensure long life and trouble-free operation, the printer should be inspected, oiled, and meticulously cleaned at regular intervals. Precautions to guard against corrosion or damage to the highly polished parts with which the film comes in contact must likewise be taken.

2. At no time should a pointed, or hard, sharp instrument be used to remove dirt from any of the parts which come in contact with the film. Usually a pointed piece of soft wood will suffice to remove any dirt accumulation.

B. AFTER-USE INSPECTION

1. Upon completion of the daily run, use a piece of clean, lintless cloth, and wipe the polished surface of the gate shoe, the printing sprocket, and the convex surface over which the film runs. This will remove all the loose dirt, which, if left to accumulate, would eventually adhere to the surfaces and in many instances scratch or pit these polished surfaces to such an extent that the parts would have to be replaced.

2. After thoroughly cleaning, as described, thread a piece of paper leader, which has previously been moistened with oil, over the printing sprocket and the convex surface over which the film rides. Then close the gate so the gate shoe bears against the leader and holds it in position.

   (a) The paper leader should not be saturated to a point where it will drip oil, but only moistened so that it will not spread oil to parts other than those with which it comes in contact. This has proved to be a very satisfactory method of preventing corrosion of the polished surfaces.

   (b) The above procedure is particularly effective when the printer is not used constantly, but left standing idle several days between runs. However, we recommend that this be made a part of the daily maintenance procedure. This procedure will be found indispensable particularly in climates where the humidity is excessive, as in tropical localities.

C. PRE-USE INSPECTION

The daily inspection before the day's run is started should proceed as follows:

1. Properly oil the printer as specified in this section, paragraph F.

2. Remove the oiled paper leader from between the printing sprocket and gate, (which was placed there at the end of the previous day's use). Using a clean, soft, lintless cloth, thoroughly wipe the polished surface of gate shoe, printing sprocket, and convex surface on which the film rides. This will remove any dirt, as well as oil left by the paper leader.

3. Using a soft camel's hair brush, thoroughly clean the printing apertures. Any dirt in these apertures will leave a fuzzy frame line that may extend into the picture or sound area. Make certain that the apertures are perfectly clean.

4. Check the sprocket teeth to see that they are clean. Remove any accumulated dirt.

5. Thoroughly wipe the entire printer. Daily cleanliness will ensure longer life for all operating parts, and will assure more satisfactory results.

6. Thread a loop of film through the printer mechanism and run for several minutes. This will not only enable you to see that the mechanism is operating properly, but will likewise remove any oil that may have been left in the film channel.

D. 90-DAY INSPECTION

At the end of each 90-day period, proceed as follows:

1. Properly oil the printer as specified in this section, paragraph F.

2. Remove the film rollers by unscrewing the screws in the ends of the shafts. Do not attempt to remove the shafts, as they are pressed into the casting. Using a rag moistened with naphtha, wipe the shafts clean of oil or accumulated dirt. The rollers can be cleaned in a can of naphtha. Before replacing the rollers, carefully oil the shafts and inside bearings of rollers with just enough oil so that it is evenly distributed over the entire surface, but will not spread to the outer surfaces of rollers with which the film comes in contact. Upon replacing the rollers make certain they revolve freely.

3. Very rarely a roller may stick. If one does, and unless the operator notices it in time, the passage of the film over the stationary roller will wear a flat surface on the radius and may result in film scratch. If this should happen, replace the worn roller with a new one.

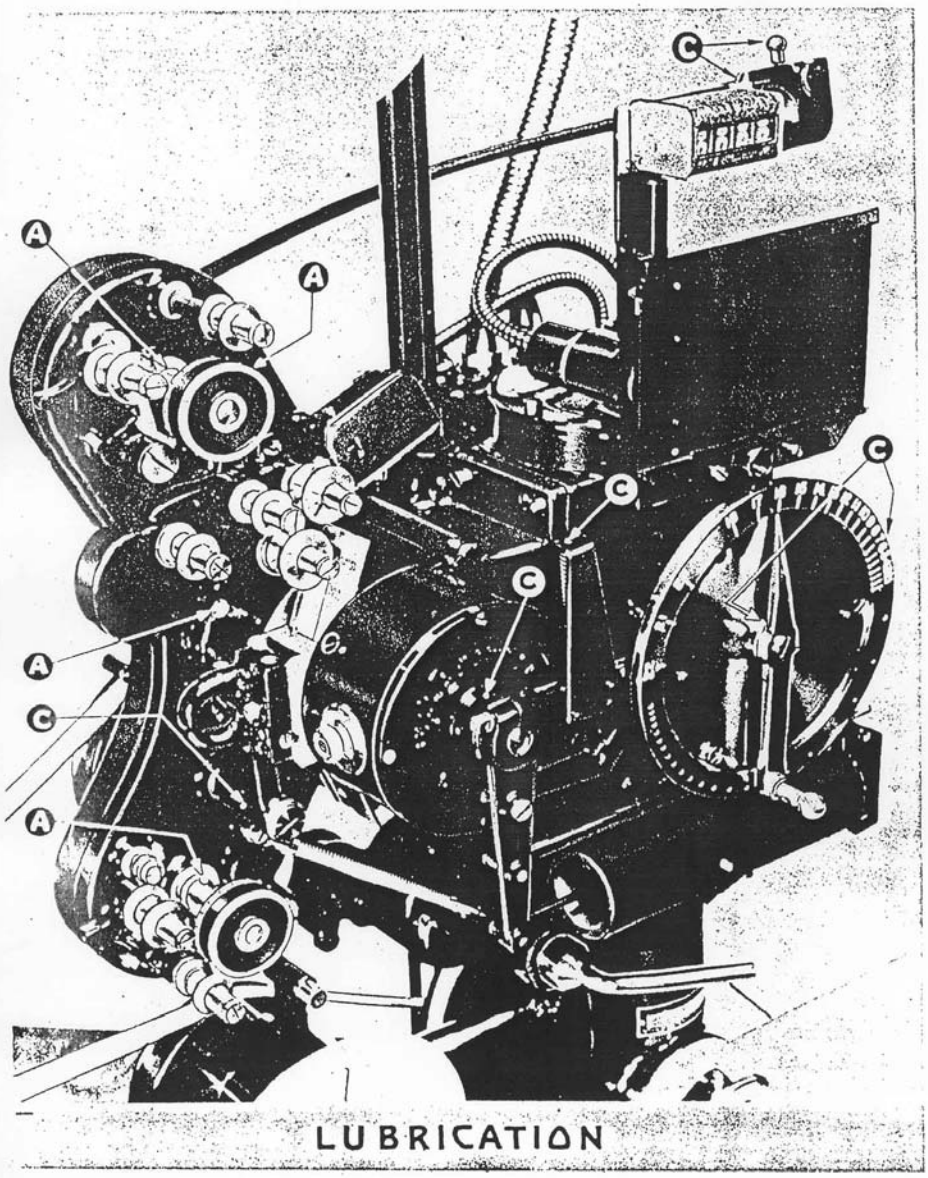


FIGURE 8

4. Again, as during the daily inspection period, the printer should be carefully cleaned, and any dirt that may have accumulated in the film channel removed.

5. Carefully examine the drive belts for signs of wear or weakness that may not stand up until the next 90-day inspection. The condition of the belts and the necessity for replacement can be determined only by the inspector.

6. The printer should be threaded with film by the inspector, in the usual manner, and any irregularities in operation which may show up should be corrected immediately.

E. LONG-PERIOD INSPECTION

1. In addition to the inspection and maintenance listed in previous paragraphs, the printer should again be thoroughly inspected, cleaned, and further greased after approximately each two and one-half million feet of the film have been run, or, if this volume of film is not run within a period of one year, the long-period inspection should take place at the end of each year's use.

2. Thoroughly clean and oil printer as previously instructed in this section. In addition, remove the gear cover, remove the old grease from the gears and coat the gear-tooth surfaces with fresh grease as specified in this section, paragraph F. It is not necessary to remove the gears in order to grease them.

F. LUBRICATION

1. Only two lubricants are required for the lubrication and maintenance of the printer. If in doubt about the specifications listed below, write to The Maintenance Department, G.B.Kalee Ltd., Aintree Road, Perivale.

2. When grease is specified, only General Electric Ball Bearing Grease or, if not available, a high grade NLGI or ABEC No.2. ball and roller bearing grease should be used.

3. When oil is specified, only Houghton AAA oil, or if not available a high grade oil of the following characteristics should be used. Viscosity at 100°F, 80 to 90 SUS (16 to 18 centistokes) and a maximum pour point of -50°F. In addition this material shall have a low viscosity temperature coefficient.

G. LUBRICATION POINTS

1. Figures 8 and 9 A, B, C, D, E clearly indicate the points to be lubricated, and the following chart gives the necessary information.

Photographic Reference	Periods	Lubricant
A-Figure 8-9	Daily	Oil (3 drops)
B-Figure 9	20 hr.	Oil (3 drops)
C-Figure 8-9	40 hr.	Oil (4 drops)
All film rollers Figure 8	x Quarterly	Oil

2. The above oiling chart is based on daily, or continuous, use of the printer, and does not apply when the printer is permitted to stand idle for several days or longer. When such is the case, all oil cups and holes should be oiled before use. A drop of oil should also be applied to each end of the rollers so that it will spread in on the roller stud. All excess oil must be wiped from the outer surfaces of operating parts.

3.x The film rollers shown in figure 8 should be removed from the studs on which they revolve, thoroughly cleaned, and both the shafts and inner bearing surface re-oiled. These rollers must revolve absolutely free.

4. The main drive gears require grease only at the end of each year's use. The old grease should be thoroughly cleaned from the gears, and a small amount of new grease added to the gear teeth only.

SECTION VI

ADJUSTMENTS

A. APERTURE GATE (See figure 10.)

1. The aperture gate (gate shoe) is adjustable on the gate casting and must be precisely adjusted in relation to the aperture drum. The adjustment can be made only when the gate assembly is assembled to the gear case.

2. The film gate is so constructed that the gate shoe pivots in the centre and operates against spring tension to permit the passage of splices and still maintain contact with the film.

3. Adjusting screws A and B are used to set the gate so the concave surface of gate matches the surface of the aperture drum and so that the gate shoe is parallel to the printing aperture.

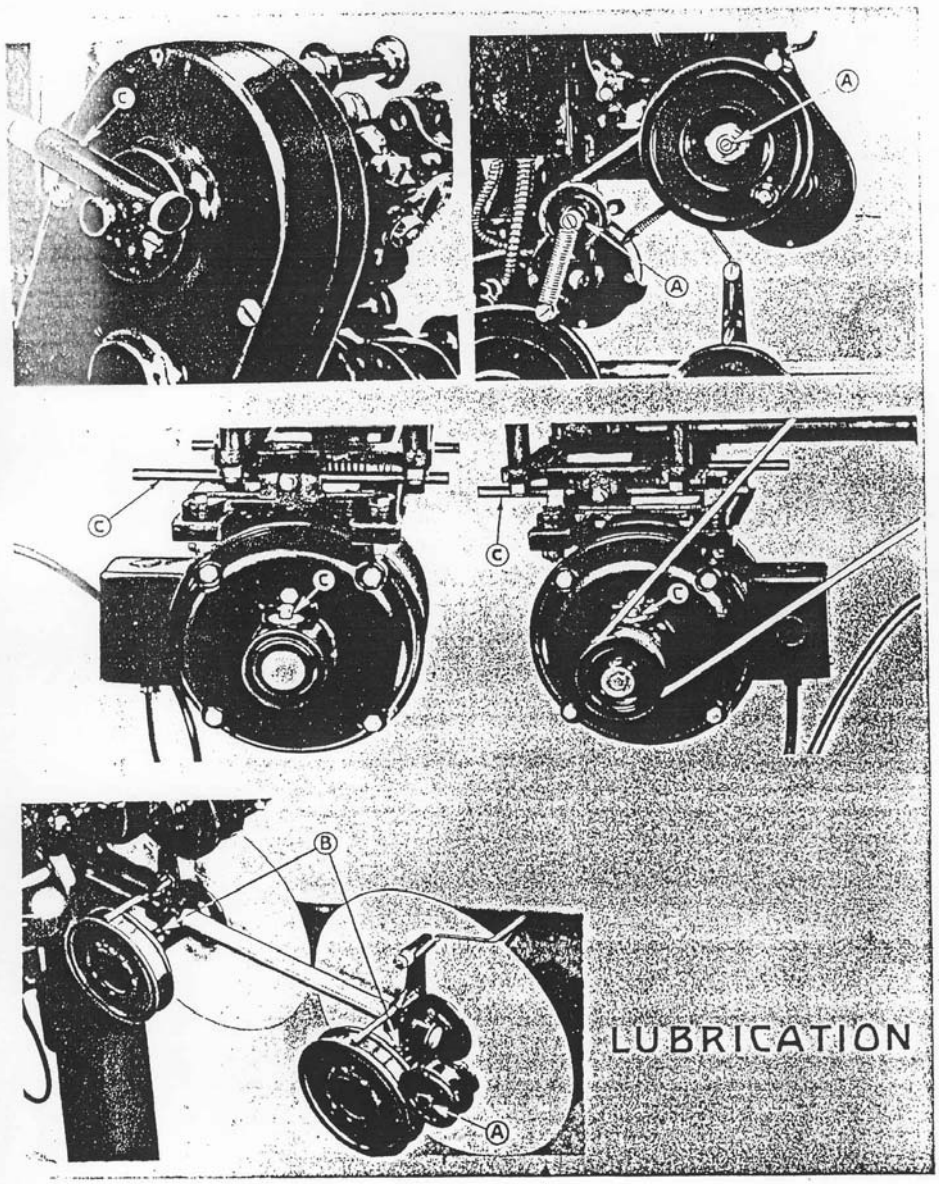


FIGURE 9

4. The first step is to set the shoe so that it is horizontally parallel to the aperture drum. Close the film gate and use a feeler gauge .012 of an inch thick and check at the two points D and E. Turn adjusting screw A until the clearance between the gate shoe and the aperture drum is the same at both points D and E. Once the correct setting is attained, lock the adjusting screw A in position with screw A1.

5. The second step is to adjust the shoe so the concave surface matches the surface of aperture drum. Use the same feeler gauge and adjust screw B until the clearance between the shoe and drum is equal at points D, E, F and G. Lock the adjusting screw in place with screw B1.

6. The third step is to adjust the entire film gate so there is a definite amount of clearance between the gate shoe and aperture drum. Adjusting screw C is used for this purpose. Thread two thicknesses of test film through the printing mechanism as instructed in Section IV, making certain that the negative and positive tension weights are in the intermediate position as instructed. Next grip both thicknesses of film below the printing sprocket, and pull downward on the film as far as the size of the perforation will permit. (The perforations in film are larger than the sprocket teeth.) As this is done, it will slightly raise the tension weights. At this point the film gate should be adjusted by turning screw C, so the tension weights will draw the film back to its original position when the film is released. This adjustment is very critical, and the gate must be set so it is not tight enough to hold the film when it is released, but just to the point that will permit the weights to draw it back. When the proper adjustment is secured, lock in place with screw provided, at point C1.

7. The fourth step is to set the gate so that when it is closed and locked in place the switch lock lever will permit the gate to open from 1/64 to 1/32 inch when interlocking switch is on. This can be adjusted by turning the end of film gate switch lock, figure 3.

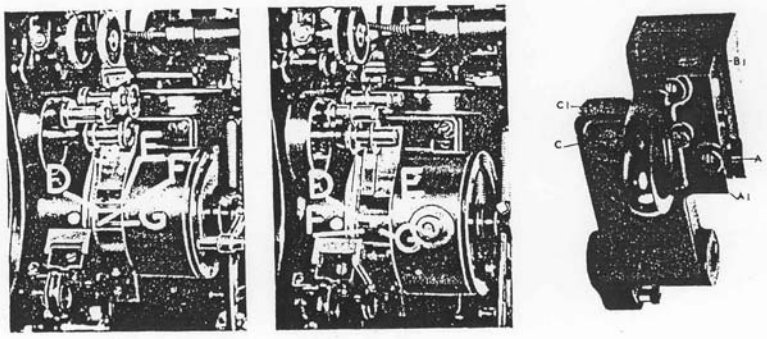


FIGURE 10 - ADJUSTMENT OF GATE SHOE

B. NEGATIVE AND POSITIVE FILM TAKE-UP ADJUSTMENT

1. The only parts of this assembly that may wear or slip are the canvas friction discs. If they become glazed, replace with new ones. If oil is the reason for slipping, wash thoroughly with naphtha.

2. It is very important that the take-up tension be correctly set. The film perforations must not be strained at the beginning of a run when the take-up diameter is small, but still there must be sufficient tension to take up a full 1000-foot roll of film.

3. The most satisfactory method of checking is to run a 1000-foot roll of test film and watch the progress of the take-up. If the tension at the beginning is too strong, loosen the adjustment cap to weaken the tension. If the tension is too week as the size of the film roll on the take-up increases, tighten the adjustment cap until the film takes up securely and evenly.

C. LIGHT CONTROL SHUTTER

1. The light control shutter is located approximately half way between the lamp and the actual printing aperture, just in front of the ground glass diffuser. The only approach to the shutter is through the top of the lamp housing. It is necessary that the light shutter be set so that the size of the opening which admits the light from the printing lamp to the light drum corresponds to the numbers on the index dial. The normal opening of the shutter is .250 of an inch for the Model J and .156 of an inch for the Model D when the index pointer is set to the No.1. position on the index dial.

2. Set the index pointer, figure 2, so the pointer rests at the No. 1. position on face of index dial. Use a small metal gauge, .250 of an inch thick for Model J and .156 of an inch for Model D and insert (through the top of lamp housing) into the back shutter opening so that it rests between the top edge of mask and the top edge of light shutter. To remove the end movement of light shutter, grip the shutter operating lever until all movement has been taken up. Hold the shutter securely in position, and lock the split end of shutter operating lever around the end of shutter shaft with the square head light shutter locking screw.

3. The light shutter opening can be increased or decreased in size to permit a larger or smaller volume of light to reach the printing aperture if the printing conditions warrant such a change in light volume.

D. REPLACEMENT AND ADJUSTMENT OF SWITCH BRUSH ASSEMBLY

1. The switch brush assembly No. 0487 should be considered as a unit and replaced as such. As the switch brush assembly is placed on the shaft, positioned for proper location of contact blades and then drilled for the taper pin (all of this being done without the use of special fixtures or gauges), it is necessary in the replacement of the switch brush assembly that the following precautions be taken and the procedure as outlined be carefully followed in order to ensure accurate alignment and the correct positioning of the new assembly on the starting lever shaft.

2. Before removing the old assembly from shaft, use a pointed instrument or scribe and mark the hub of the switch brush assembly and the shaft at corresponding points. A direct line from the hub onto the shaft is the most satisfactory method of marking.

3. Use a drift punch and drive the taper pin from hub and shaft. The switch brush assembly can now be withdrawn from end of shaft. Do not destroy the old switch brush assembly No. 0487, but lay to one side until ready for reassembly.

4. Refer to the old switch brush assembly removed and scribe on the replacement assembly the alignment mark in exactly the same location as the mark on the old part. This ensures the proper location of the contact blades when the assembly is placed on and matched to the mark which was made on lever shaft.

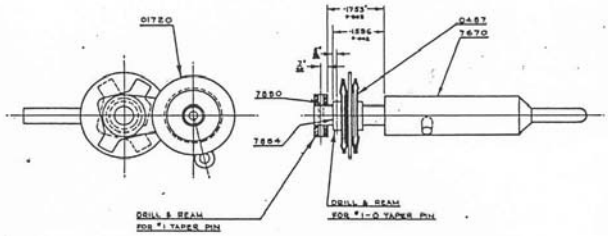


FIGURE II. INTERLOCKING SWITCH ASSEMBLY

5. Place switch brush assembly onto the lower shaft and match the alignment marks. Refer to figure 11 and space the assembly so that the outer edge of the switch brush assembly hub is 1.596 inches (± .002 inch) from the large diameter of starting lever. Hold securely in this position and drill and ream a hole diagonally to the old hole in shaft. The hole is to receive a No.1-0 taper pin.

E. REPLACEMENT AND ADJUSTMENT OF CLUTCH MAGNET (figure 12)

1. The clutch magnet No. 01711 should be replaced as a complete assembly when necessary.

2. If the original clutch magnet No. 01711 is installed it is necessary only to slip it into the cylinder so that the hole drilled into the brass end is lined up with the hole in cylinder wall. Secure in place with the keyed taper pin. However, if the magnet is replaced with a new assembly, it is necessary that it be properly located in the cylinder to ensure correct operation. Slip the magnet into the cylinder until the contact end of magnet is .006 of an inch in from the end of cylinder casting. A hole can now be drilled into the brass end of magnet, through the hole in cylinder wall, to receive a No.1 taper pin.

3. The replacement of the clutch magnet necessitates adjustment of the light shutter aperture change mechanism. Make sure all screws are securely tightened.

4. Screw A adjusts the stroke on armature which holds the aperture change mechanism rod. Screw B is the lock screw for same. To lengthen stroke of armature, re-

lease screw B and turn screw A clockwise a fraction of a turn; to shorten stroke, turn screw A counterclockwise a fraction of a turn. Do not fail to tighten screw B before making test. The length of the armature travel should operate best with about a 1/16-inch stroke.

5. The air dampening plunger C has a screw which controls the air escaping and entering the cylinder chamber.

6. The best way to check this adjustment is to make a film loop from six feet of film and notch it at short intervals. Start the machine and operate the aperture change pointer, setting it from 1 to 22 and from 22 to 1. Make adjustment as previously instructed until plunger completes its stroke on one notch.

7. Make sure no foreign matter interferes with the plunger in the cylinder chamber, also inspect the locking rod for rough places and see that all moving parts are well lubricated.

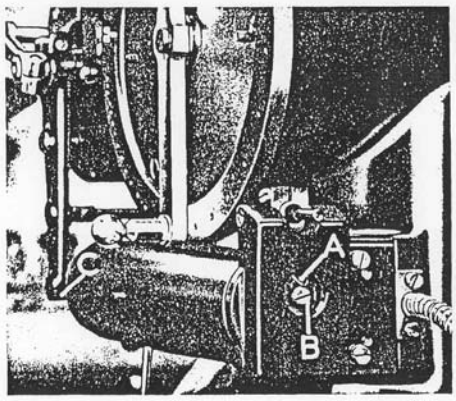


FIGURE 12 - ADJUSTMENT OF CLUTCH MAGNET

F. REPLACEMENT AND ADJUSTMENT OF CONTACTS IN CIRCUIT INTERRUPTER

1. The replacement of the upper and lower contact supports (01462 and 01463) can very easily be accomplished. However, it is essential that the points and position of circuit interrupter be accurately adjusted.

2. To adjust, use a test loop of film notched with a Bell & Howell film notcher and thread through the printer in the usual manner.

3. With the film roller on circuit interrupter resting against the edge of the film (not in the notch) adjust the two sets of contact points by slightly and carefully bending the copper point holders until the contact points are evenly spaced, thus assuring a simultaneous make and break of the circuit.

4. Move the lower contact and support assembly by turning the knurled screw on back of interrupter until there is between 1/32 and 1/16 of an inch clearance between the upper and lower contact points.

5. The printer mechanism should now be operated by means of the main drive pulley until the interrupter roller engages and rests in the notch in edge of film. When in this position, the roller should rest on the bottom of the notch, and the upper contact points should be in contact with the lower contact points and force the lower points slightly to the back of the case. This action can best be seen by turning the main drive pulley so the roller rides in and out of the notch. A further adjustment can now be made to ensure positive contact, keeping in mind that the interrupter roller must ride against the bottom of the notch when the points are in contact and must have sufficient clearance when the roller rides against the inner edge of film so that any slight weaving or unevenness in the edge of film will not cause the two points to make contact.

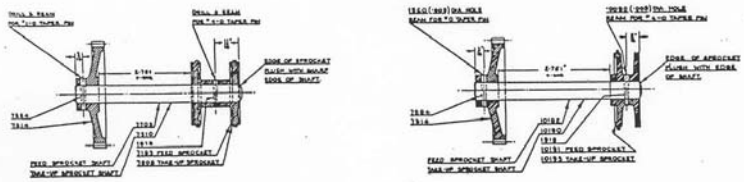
WARNING

Unless these points are adjusted properly, they may not make contact long enough to permit the 230 volt A.C. coil (magnetic clutch) to release the clutch mechanism and complete the change of light, thus causing under-exposure. This can be determined only by running the notched test loop of film and watching the operation of the magnetic clutch and operating mechanism to see that each time the index pointer is set for a change of light the clutch mechanism will complete its stroke when the interrupter roller engages the notch in edge of film.

6. The circuit interrupter mounting bracket can now be pivoted so the interrupter roller will engage the notch in edge of negative at the precise time the frame at which the light change is to be made is in front of the aperture. If the negative is correctly notched, the centre of the notch will appear at the fifteenth frame line above the point where the light change is to take place. A piece of printed film can be threaded into the printer mechanism and the circuit interrupter set accordingly. Once the correct setting is attained, tighten the interrupter bracket in place with the flat head screw located in the disc that holds bracket in position.

G. SPROCKET REPLACEMENT

1. Sprockets must be accurately located on the sprocket shaft to ensure correct alignment. Figure 13 shows the dimension that must be maintained.



MODEL 'D' MODEL 'J'

FIGURE 13. SPROCKET ASSEMBLY.

H. MECHANISM DRIVING GEARS

1. Note that all the mechanism driving gears are stamped with the numbers 0, 1, 2, and 3. If for any reason these gears are removed, they must be replaced so the corresponding numbers on each gear are directly opposite each other.

PARTS FOR MODELS D & J PRINTERS

0457	35 mm negative notching cutter assembly (Model D only)
0487	Switch brush assembly
01462	Upper contact support (circuit interrupter)
01463	Lower contact support (circuit interrupter)
02404	230-volt card register coil complete
02403	230-volt clutch magnet
01787	Aperture gate shoe lever assembly (Model D only)
02643	Aperture gate shoe lever assembly (Model J only)
10199	Aperture gate shoe (Model J only)
10193	Feed sprocket (Model J only)
10191	Take-up sprocket (Model J only)
7193	Feed sprocket (Model D only)
7509	Take-up sprocket (Model D only)
7566	Driving belt
7567	Motor belt
7972	Fuse - 5 amps, 250 volts
8105	Aperture gate shoe (Model D only)
01695	35mm main printer sprocket (Model D only)
10223	16 mm main printer sprocket (Model J only)
107-B	Index cards.