# ARRIFLEX 35

## Motion Picture Camera for 35 mm Film

## TECHNICAL INSTRUCTIONS

**NOTE:** ALTHOUGH REFERENCE IS MADE IN THE TEXT TO MODEL II A, THE INSTRUCTIONS CONTAINED HEREIN ARE ALSO APPLICABLE TO THE MODEL II B CAMERA.

ACKNOWLEDGMENT

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# TECHNICAL INSTRUCTION

## *Arriflex 35-mm Motion-picture Camera*

*First issued May 1960*

## AMENDMENT RECORD

| *Amendment Sheet No.* | *Initials* | *Date* | *Amendment Sheet No.* | *Initials* | *Date* |
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# KEY TO ANNOTATION OF ILLUSTRATIONS

1 Aluminium square runner
2 Guide
3 Raised mark on magazine body
4 Magazine latch
5 Spool holders
6 Film tension indicator roller
7 Film tensioning arms
8 Magazine door
9 Locking spring
10 Film gate back plate
11 Retaining screw for gear cover
12 Sockets
13 Pressure plate
14 Gear cover
15 Side tension rail
16 Trip arm
17 Side tension lock rail
18 Aperture plate
19 Lower film guide
20 Spool spindles
21 Knurled film tensioning disks
22 Indicator arm
23 Knurled knob for magazine release
24 Magazine fixing key plate
25 Cover shield
26 Catches
27 Sprocket housing
28 Magazine clamp plate
29 Sunshade fixing stud
30 Clip
31 Spring cord
32 Fibre pulley
33 Arm
34 Pulley
35 Fibre gear
36 Metal gear
37 Gear (on forward sprocket shaft)
38 Bearing plate
39 Gear
40 Anti-reflection masks
41 Gear (on rear sprocket shaft)
42 Shutter glass
43 Shutter bearing bracket
44 Flanged bush on shutter shaft
45 Shutter drive gear
46 Drive housing
47 Gear with rubber flexible coupling
48 Toggle switch
49 Handwheel on ' hi-hat ' inserting screw
50 Motor–handgrip
51 Battery lead connector
52 Control cover
53 Press button
54 Trip lever
55 Microswitch
56 Tachometer clamp
57 Tachometer
58 Claw shaft
59 Lead
60 Compound gear for magazine drive
61 Rubber eye piece
62 Viewfinder focus adjustment
63 Latch mechanism
64 Camera door casting
65 Slide carrier knob
66 Locking toggle on viewfinder
67 Latch
68 Support arm
69 Lens release catches
70 Lens retaining latches
71 Turret levers
72 Sunshade and filter holder support casing
73 Sunshade bellows
74 Clip
75 Metal frame
76 Endless cotton belt
77 Belt tension pulley
78 Tension adjusting plate
79 Footage indicator
80 Gear cover
81 Turret indexing wheels
82 Lens mount keys
83 Tension springs
84 Focus ring grips
85 Centre-hole in turret casting
86 Metal plate
87 Steel ribs
88 Latch
89 Lever
90 Take-up spool holder (of colour magazine)
91 Pressure plates
92 Feed spool holder (of colour magazine)
93 Triangular plates
94 Claw arm
95 Link
96 Screw (securing claw arm to link)
97 Guiding roller for link
98 Double cam
99 Groove in double cam
100 Claw pin

101 Keyway
102 Groove in focus ring
103 Focus ring
104 Iris ring
105 Brass gearwheel on shaft of synchronising tone generator
106 Synchronising tone generator
107 Cannon connector on synchronising tone generator
108 Intermediate gear in motor unit
109 Removable cover over flywheel of motor unit
110 Flywheel of motor unit
111 Vertical shaft of new camera drive
112 Special gear and ballrace to adapt drive gear and ballrace assembly of camera
113 Tapped holes in underside of camera housing
114 Film marking lamp connector on modified camera door
115 Connector on motor unit lead
116 Viewfinder adaptor on modified camera door
117 Film marking lamp-holder
118 Inserting screw of motor unit
119 Frame counter re-set knob
120 Idler pinion in motor unit
121 Hollow stub shaft in motor unit
122 Screws securing motor unit to camera
123 Tension spring
124 Weight
125 Movable contact
126 Fixed contact
127 Capacitor C4 (Fig. 6.6)
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129 Red pilot light
130 Viewfinder optical system of blimp
131 Pilot light inside blimp
132 Connector to motor unit, on lead in blimp
133 Socket on triangular frame in blimp
134 Studs on triangular frame in blimp
135 Clamps to secure camera and motor unit to triangular frame in blimp
136 Connector to film marking lamp, on lead in blimp
137 Connector to synchronising tone generator, on lead in blimp
138 Shaft coupling follow-focus handwheel at rear of blimp to follow-focus mechanism
139 Triangular frame, forming base for camera and motor unit in blimp
140 Hinged arm on rotatable drum
141 Focusing scale on rotatable drum
142 Lever actuating front door plungers
143 White-painted dots to facilitate lining-up of rotatable drum
144 Inching wheel
145 Recorder lead connector on blimp
146 Slating unit
147 Power lead connector on blimp
148 Motor switch
149 Battery box
150 Pilot light switch
151 Window at rear of blimp, showing frame counter
152 Window at rear of blimp, showing tachometer
153 Screw retaining shaft of follow-focus handwheel at rear of blimp
154 Follow-focus handwheel at rear of blimp
155 Spirit level

# ARRIFLEX 35-mm MOTION-PICTURE CAMERA MODEL IIA

## SECTION 1

### INTRODUCTION

**General**

The Arriflex camera Model IIA is a motion-picture camera for use with standard 35-mm film stock. It is intended primarily as a portable channel for hand-held operation, but can also be used on a specially-designed tripod supplied by the manufacturers. The film is contained in detachable magazines holding 200, 400 or 480 feet, giving approximately two, four or five minutes of continuous filming at the television film speed of twenty-five frames per second. The fitting and removal of magazines is rapid and easy.

The shutter of the camera is of the mirror reflex type, enabling the taking lens to be used as part of the viewfinder system. It has a fixed exposure angle of 180 degrees, giving an exposure of one-fiftieth of a second when the camera is running at normal speed.

A wide range of lenses, in Arriflex mounts, is available for use with the camera; these lenses are listed, and the mount described, in Section 3. The camera has a rotatable turret accommodating up to three of the smaller lens mounts together; some mounts, however, have physical dimensions which prevent others from being fitted with them.

The camera is normally driven by a variable-speed motor powered by a sixteen-volt battery of secondary cells contained in a carrying box. A governor speed-controlled motor is available as an alternative to the variable-speed type; changing the motors involves the removal and re-insertion of four screws.

In the description of the camera given in this Instruction, the terms right-hand, left-hand, forward and rear are used to denote these directions as seen by the operator from his position behind the camera. The use of initial capital letters in the text indicates the manufacturers' nomenclature for the parts mentioned. A parts list (Appendix A) is included, in which the manufacturers' part numbers and nomenclature are given for various components, to facilitate the ordering of spares.

**Summary of Equipment**

*Camera*

Weight (with motor and 400-ft magazine, but without lenses): 10 lb 10 oz.

Supplies: 16-volt battery. (Cells Type VPT7/9 have sufficient capacity per charge for approximately 6,000 feet of filming.)

Film Stock: 35-mm standard, in 400-ft darkroom loads. Winding sense B.

Lens Mounting: Triple turret, accepting Arriflex lens mounts.

Camera Mounting: Special Arriflex 'Hi-hat' adaptor.

*Sound System*

Sepmag. (Tape recorder Type RD4/501, in conjunction with sync tone generator on camera; dual tracks recorded on standard ¼-inch tape.)

*Sound Apparatus: Tape Recorder Type RD4/501*

Weight: 18 lb.

Dimensions: 15¼ in. by 7½ in. by 8¼ in.

Tape Speed: 7½ in./sec.

Supply: 12 volts d.c. (from self-contained batteries).

Input: Single 30-ohm microphone.

*Ancillary Equipment*

Tripods: (a) Arriflex 35-mm Types, standard and short (baby legs).

(b) Heavy Duty Type required when blimp is used.

Blimp: Arriflex Blimp 120 (used with specially modified camera).

# SECTION 2

## CONSTRUCTION

The camera can be divided for consideration into the following assemblies:

01 Camera housing
02 Viewfinder and door
03 Lens turret
04A New motor–handgrip
Alternative governor speed-controlled motor–handgrip
05 Camera drive
06 Mirror reflex shutter
08 Gate
09 Sunshade (Compendium) and filter holder
Alternative new sunshade and filter holder
10 200-ft magazine
11 400-ft magazine
Alternative ' colour ' magazine
12 180-degree film gate
13 New camera drive
14 Heart-shaped cam claw system
15 Claw bearing

The battery and its method of connection to the camera are also described in this Section.

### 01. Camera Housing

This is a cast light-alloy box, forming the main body of the camera. The left-hand side is open, to permit the camera to be laced; a completely detachable door (assembly 02) is provided (64, Fig. 2.1). An aperture at the top of the housing permits film from the magazine to pass through the camera, and means are provided for the rapid and easy attachment and removal of magazines. The right-hand side of the camera housing is machined and drilled to form mounting surfaces for the mirror shutter (assembly 06), the camera drive (assemblies 05 and 13) and the claw bearing (assembly 15), all outside the housing, and the claw system (assembly 14) inside. A semicircular projection to the left front of the housing gives the width necessary to accommodate the lens turret (assembly 03). A hood 25 (the Cover Shield) is attached to the upper left-hand region of this projection to cover the gap between the camera housing and the sunshade (assembly 09).

The top of the camera housing and the upper edge of the Gear Cover which encloses the right-hand side of the housing have machined surfaces, on which slides the Magazine Clamp Plate 28 (Fig. 2.2). This plate, the purpose of which is to lock the magazine in position, is actuated by a shaft, designated the Shaft for Magazine Release, to which it is attached by a small screw tapped into it; the tip of this screw engages with a groove near the end of the shaft. A pin in the shaft, in conjunction with a keyhole-shaped hole in the Magazine Fixing Key Plate 24 (Fig. 2.3) which carries the shaft, enables the clamp plate to be locked against the magazine by the rotation of a knurled knob 23 pinned on to the shaft. A Torsion Spring encircling the shaft biases the latter so as to maintain the locked condition when this has been established, but acts as a compression spring to force the shaft and clamp plate free of the magazine when the knob is turned slightly anticlockwise, bringing the pin on the shaft into line with the slot of the keyhole-shaped hole in the Magazine Fixing Key Plate.

A Cover Plate is secured over the Magazine Clamp Plate by two screws tapped into the camera housing.

A pair of flock-coated plates 40 (Fig. 2.2), the Anti-reflection Masks, are mounted in the front of the camera housing, in front of the mirror shutter 42, above and below the aperture of the camera gate. The masks prevent light from the taking lens from falling on any area of the shutter other than that from which it is reflected into the viewfinder; thus troublesome reflections of stray light inside the camera are minimised.

The mechanism on the right-hand exterior of the housing is protected by the Gear Cover, a light-alloy casting secured by four screws. Its shape includes a forward projection 80 (Fig. 2.3) to accommodate the mirror shutter, a thumb-grip for the camera operator's right hand, and a conical projection, designated the Protection Nose, which prevents accidental hand contact with the inching knob when the camera is running. (The inching knob, as described on page 2.15, is on the end of the claw shaft which projects through a hole in the

Gear Cover.) In some instances, the Protection Nose is detachable to enable the camera to be used in the blimp (Section 6); stowage for the nose is then provided in the form of a tapped hole above the thumb grip. The Protection Nose can be seen in its stowed position in Fig. 6.1.

The bottom of the camera housing, behind the Motor–Handgrip 50, contains a tapped hole to receive the inserting screw of an Arriflex tripod or 'hi-hat' (see page 4.1) or of the motor unit employed when the camera is used in the blimp (see Section 6). A stud projecting from the front underside of the camera housing engages in a notch in the tripod or hi-hat to give positive location in the horizontal plane.

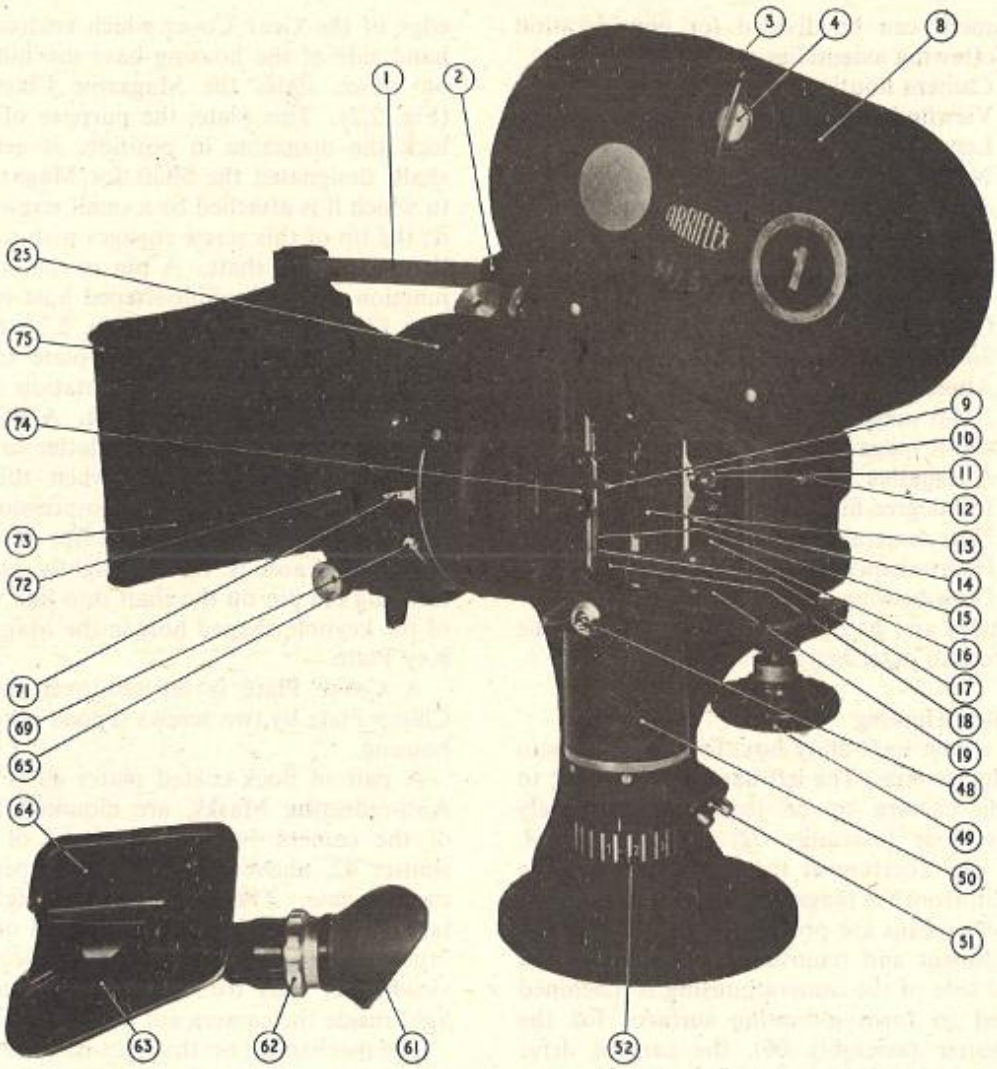



*Fig. 2.1. Arriflex 35-mm Camera with Door Removed*

The cast shape of the Gear Cover follows approximately that of the mechanism it covers; a bulge towards the rear accommodates the tachometer (page 2.7), and a circular hole in the end of this bulge enables the instrument to be observed from the rear of the camera.

Loops at the top rear of the Gear Cover and on the top of the lens turret projection of the camera housing permit the camera to be suspended from a neck strap if desired.

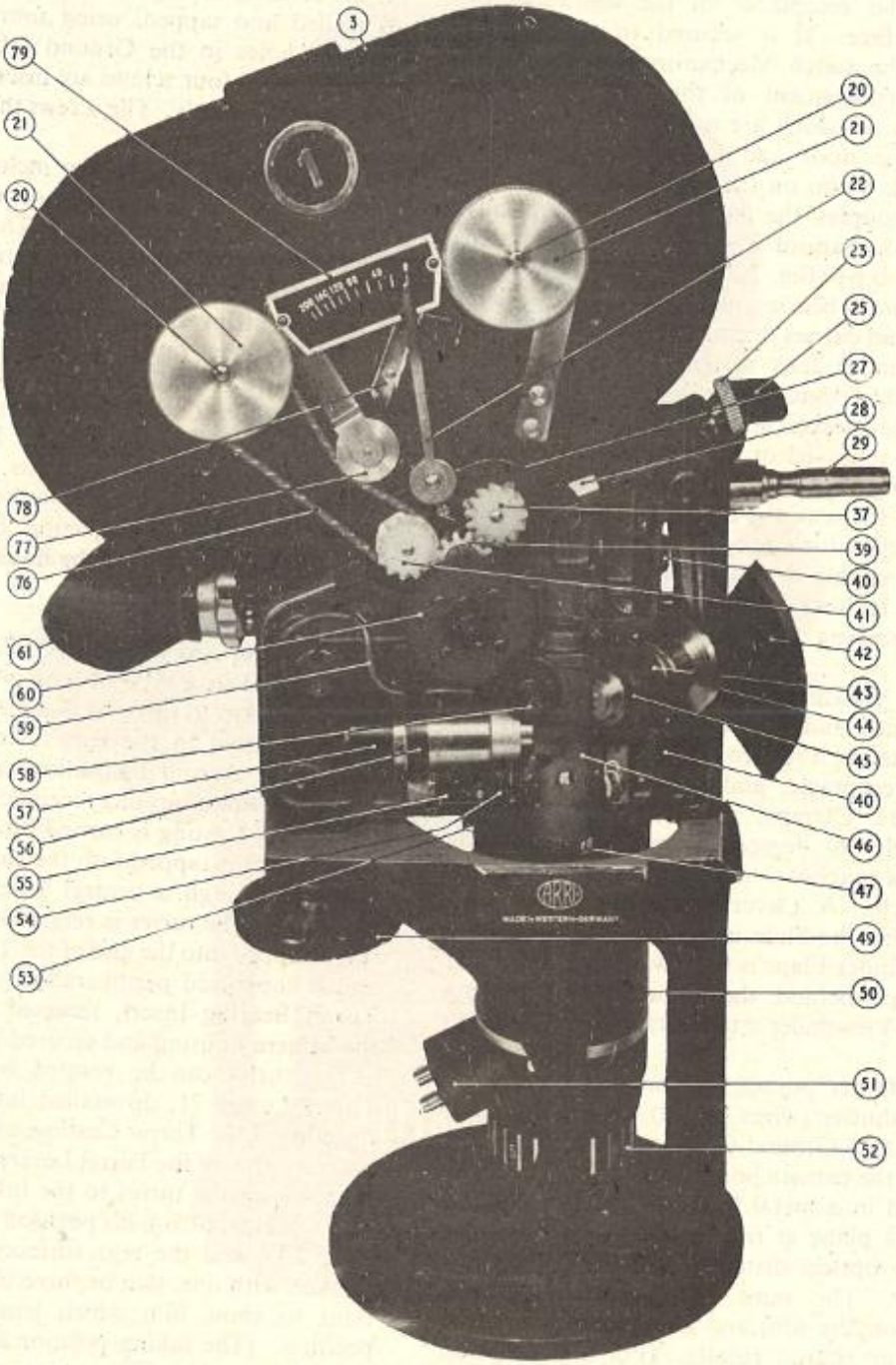



*Fig. 2.2. Arriflex 35-mm Camera, with Gear Cover and Magazine Mechanism Cover Removed*

### 02. Viewfinder and Door

The camera door is a light-alloy casting, with an integral tubular receptacle for the viewfinder on its outer surface. It is secured to the camera housing by the Latch Mechanism (63, Fig. 2.1); this is an arrangement of three levers, jointed together, two of which are mounted on the inner surface of the door and form rotatable blades engaging with a rim on the camera housing. The third lever couples the other two mechanically. The Latch Mechanism is actuated by the Latch, a winged knob 67 (Fig. 2.3) on a stub shaft which works in a brass bearing at the rear lower corner of the door and carries one of the levers.

The viewfinder lens system is supplied as a complete unit, designated the Viewfinder, which is secured in the receptacle cast on to the door, and must not be removed or dismantled. A rotatable castellated ring 62 of bright metal is fitted, by means of which the focus of the eyepiece can be adjusted to suit the operator's eye; a locking toggle 66 is provided to enable a desired focus setting to be retained. A Rubber Eye Piece 61 is secured by a threaded clamping ring to the eyepiece of the Viewfinder.

A pair of Viewfinder Flaps is provided in front of the forward end of the Viewfinder; these are accommodated in a square-sectioned portion of the viewfinder receptacle, and are mounted on two vertical Wire Clamps, each rotatable through approximately 90 degrees by means of a Slide working in a machined recess on the underside of the receptacle. A Cover Plate, secured by two screws, retains the Slide in position. The purpose of the Viewfinder Flaps is to prevent light from any bright source behind the camera from passing through the Viewfinder into the camera and fogging the film.

The viewfinder optical system is completed by the mirror shutter (when closed) and by a ground glass screen (the Ground Glass) and a Mirror, both mounted in the camera housing. The Ground Glass is supported in a metal frame (the Ground Glass Holder) in a plane at right-angles to the film and at the same optical distance as the film from the taking lens. The same image is thus formed alternately on the film and on the Ground Glass as the mirror shutter rotates. (For a description of the mirror shutter and its action, see page 2.7). The Ground Glass Holder is provided with a pair of slotted holes through which, initially, a pair of screws are inserted into a pair of holes tapped into the camera housing to enable the optical distance from the taking lens to the Ground Glass to be adjusted. When the correct position of the Ground Glass Holder has been found, the camera housing is drilled and tapped, using four further normal circular holes in the Ground Glass Holder as a template, and four screws are inserted to secure the holder permanently. The screws through the slotted holes are then removed.

The Ground Glass Holder includes five strips of metal, set vertically and edge-on to the right-hand surface of the Ground Glass. These prevent stray light from the taking lens from striking the surface of the Ground Glass and being reflected on to the film. The strips appear as five dark vertical lines in the viewfinder image.

The Mirror is set at an angle to the ground glass screen, to reflect the image formed on the screen into the viewfinder lens system. It is supported in the turned-over edges of a brass plate (the Mirror Mounting), which is secured to the camera housing, inside the lens turret projection, by a screw tapped into it through a wall of the housing.

### 03. Lens Turret

The lenses used with the Arriflex 35-mm camera are supplied in a type of lens mount described in Section 3. Up to three of these lens mounts can be accommodated in the lens turret of the camera, which is a discoid light-alloy casting, with three cylindrical holes forming receptacles for the mounts. The Turret Casting is carried on the Turret Centre Stud, which is tapped into the camera housing and projects through a central hole 85 in the turret (Fig. 2.4). The turret is retained by a washer on a screw tapped into the end of the Turret Centre Stud, and is supported peripherally by a brass ring, the Turret Bearing Insert, recessed into the front of the camera housing and secured by pins.

The turret can be rotated by means of three Turret Levers 71, dovetailed into a raised rim at the edge of the Turret Casting, and each secured by a screw. One of the Turret Levers, that diametrically opposite on the turret to the taking lens, is visible to the operator from his position behind the camera (Fig. 2.1), and the rear surfaces of the levers are marked with one, two or three black-filled indentations to show him which lens is in the taking position. (The taking position for a lens is to the right-hand side of the camera, the other two lenses being vertically in line on the left-hand side).

The turret is located positively in each of the three axial alignments bringing a lens into the taking

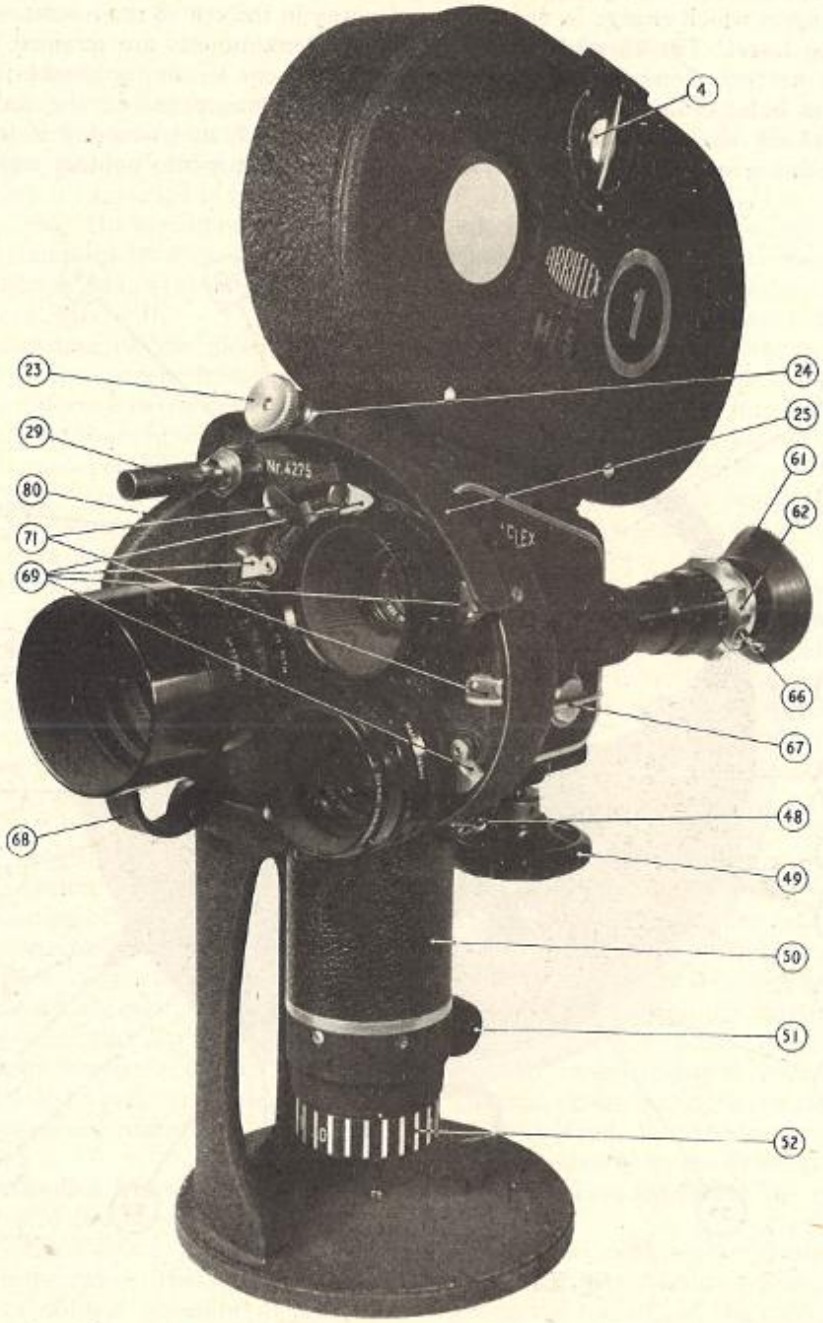



*Fig. 2.3. Arriflex 35-mm Camera*

position by three Turret Indexing Wheels 81 (Fig. 2.4). These wheels are mounted on spring-loaded Turret Indexing Plungers which engage in notches in the Turret Bearing Insert. The Turret Indexing Wheels and plungers and their Compression Springs are accommodated in holes drilled radially in the edge of the Turret Casting, and are retained only by the presence of the bearing insert; when the turret is

two screws, and the other projecting into a lens mount receptacle of the turret to engage with the keyway in the cell of the mount.

The lens mounts are retained in the turret by pairs of Lens Retaining Latches; these are blades 70 riding in grooves in the focus rings of the mounts. Each latch of a pair is drawn towards the other, and thus into contact with the mount, by

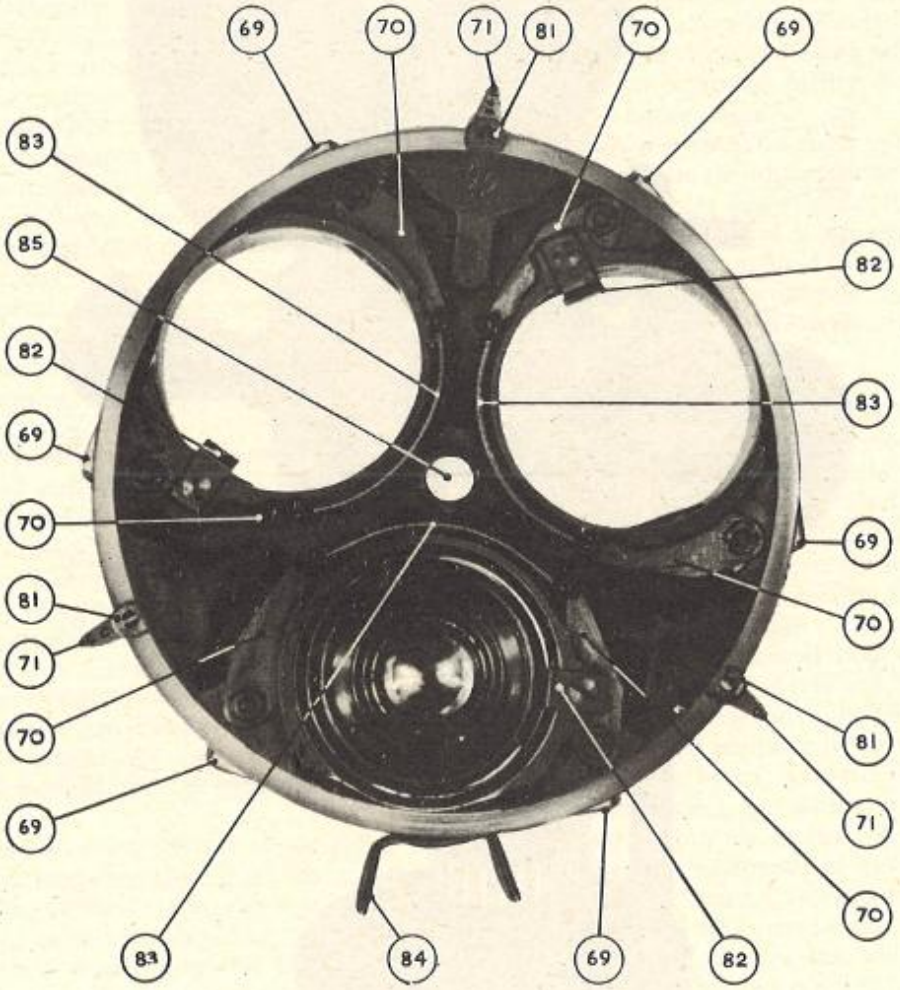



*Fig. 2.4. Rear View of Lens Turret*

being removed from the camera housing, care must be taken to ensure that these parts are not ejected by the force of the Compression Springs and lost.

The cells of the lens mounts are prevented from rotating in the turret by the Lens Mount Keys 82; these are angle brackets, each having one arm secured to the rear surface of the Turret Casting by

Tension Springs 83 linking their free ends. The other ends of the latches are mounted on stub spindles in bearing holes in the turret casting, the spindles being parts of Lens Release Latches 69. The release latches are small levers with upturned tabs; when the two latches associated with one of the lens mount receptacles are squeezed together

between a finger and thumb, the lens retaining latches are forced apart, enabling a lens mount to be inserted or removed.

**04A. New Motor–Handgrip**

The motor of the camera is mounted on the bottom of the camera housing, with the motor spindle vertical; the motor housing forms a grip by which the camera is supported in the operator's left hand (50, Fig. 2.1). The assembly is designated the New Motor–Handgrip to distinguish it from one of slightly different design (assembly 04) fitted to an earlier camera, Model II.

The upper end-casting of the motor housing, which is secured to the camera housing by four screws, is recessed to form a cavity between the end of the motor and the bottom of the camera housing. Into this cavity the motor spindle projects, and the pinion on it meshes with a drive gear (part of assembly 13) on a retaining pin mounted on the bottom of the camera housing; this gear conveys the drive from the motor to the camera mechanism.

The motor switch is a Toggle Switch 48 mounted in the left-hand side wall of the upper end-casting of the motor; in parallel with it is another switch, operated by a Press-button 53 (Fig. 2.2) working in a hole in the rear side wall of the casting, conveniently adjacent to the thumb of the operator's left hand. Thus the motor can be run continuously by operating the Toggle Switch, or 'inched' by means of the Press-button Switch.

The lower end-casting of the motor incorporates a two-pin male connector 51 which mates with a corresponding female connector on the battery lead. It also contains a rheostat, which is variable by means of a rotatable end cap 52 on the motor having a ribbed circumference for ease of manipulation and inscribed with an arbitrary scale. This end cap forms the motor speed control.

**Governor Speed-controlled Motor–Handgrip**

As an alternative to the New Motor–Handgrip assembly 04A, described above, a governor speed-controlled motor is available. This has a fixed end cap covering the centrifugal governor in place of the rotatable cap which forms the speed control of assembly 04A. The electrical circuit of the governor speed-controlled motor contains an electrolytic capacitor, and it is therefore important that the battery should be connected with the correct polarity; to ensure this, the battery lead connector is fitted with pins of unequal size. A special battery lead must therefore be provided when the governor speed-controlled motor is used.

**05. Camera Drive**

Assembly 05 is the camera drive mechanism of an earlier camera, Model II, but includes a tachometer also used in Model IIa. Only the tachometer need be described here.

The Tachometer (57, Fig. 2.2) indicates film speeds from zero to fifty frames per second; the standard motion-picture speed of twenty-four frames per second is marked in red on the dial (although for BBC purposes the standard television film speed of twenty-five frames per second is used). The Tachometer is supported in the Tachometer Clamp 56, a saddle of metal strip secured by two screws tapped into the wall of the camera housing. Its spindle carries a bevel gear of plexiglass, which is driven by a further bevel gear mounted on the vertical shaft (assembly 13).

**06. Mirror Reflex Shutter**

The shutter employed in the camera is of the mirror reflex type, consisting of a disk of mirrored glass with two vertically opposite 90-degree peripheral areas cut away to form a pair of blades (42, Fig. 2.2). It is mounted on a shaft at an angle of 45 degrees to the principal dimensions of the camera, between the taking lens and the gate, and rotated so that as the film is being pulled down in the gate one of the blades passes between lens and film, cutting off the passage of light. The 90-degree angle of the shutter blades fixes the exposure angle at 180 degrees, i.e., one-fiftieth of a second.

While the shutter is closed, light from the taking lens is reflected from the mirrored surface into the viewfinder optical system; thus the camera operator sees an image identical with that being photographed. Each shutter blade carries a radial stripe of black paint; this divides the reflecting area into two and so doubles the flicker rate of the viewfinder image, making the flicker less objectionable to the operator.

The shaft carrying the shutter runs in ballraces supported in the Shutter Bearing Bracket 43; the bracket is located on the camera housing by two pins, and secured by four screws tapped into the housing. The shutter is carried by a flanged bush mounted on the forward end of the shaft; a screw tapped into the flange and cushioned by a Plastic Sleeve engages with a hole in the shutter to give positive axial location. A large-headed screw tapped into the end of the shaft retains the shutter

in place; the head of this screw is recessed to accommodate a felt washer which cushions the glass shutter.

A fibre drive gear 45 is mounted at the rear end of the shutter shaft, and driven by the worm gear of the vertical shaft (assembly 13).

**08. Gate**

This assembly is primarily the gate of an earlier camera, Model II, but it includes a number of other components which are retained in Model IIa, and must therefore be described in this Instruction.

The gate (assembly 12) employed in the Model IIa camera is a completely detachable unit, retained in the camera housing by two Leaf Springs mounted near its right-hand edge which engage with a rim in the housing. Its left-hand edge is retained by a Clip, 74 (Fig. 2.1), secured to the camera housing by screws passing through two slotted holes; when these screws are loosened slightly, the Clip may be slid to the left to release the edge of the gate.

Film guides are provided in the interior of the camera housing; these are skids of German silver, the width of the film, with their edges slightly raised to ensure that any rubbing contact with the film shall occur here, and not in the picture area. The Upper Film Guide is loop-shaped, and situated above and forward of the camera gate. It is strengthened by the addition of a right-hand side wall, which lies against the interior of the right-hand wall of the camera housing. The guide is secured by two small screws tapped into it through holes in the top of the camera housing, at the edge of the magazine opening, and also by the Film Loop Indicator Plate (described below) which overlaps the side wall of the guide and is riveted in place; thus the Upper Film Guide cannot normally be removed.

The Lower Film Guide 19 extends from the rear edge of the magazine opening down the back and along the bottom of the camera housing interior. It is secured at the edge of the magazine opening in the same manner as the upper film guide, at the bottom by a single screw tapped through it into the camera housing, and also by the lower edge of the gate, under which it extends.

The Film Loop Indicator Plate is shaped to fit the curvature of the Upper Film Guide, and printed with an indication of the correct path of the film when the camera is laced. The plate is riveted to the right-hand wall of the camera housing, and as mentioned above, traps the Upper Film Guide.

**09. Sunshade (Compendium) and Filter Holder**

The sunshade is constructed of sheet metal, and its rear end is riveted to a cast frame. The horizontal sides of the frame are slotted, and its vertical sides are grooved internally, so that it forms a receptacle for filter holders. A Leaf Spring is riveted in the groove of the right-hand side to steady the filter holders, and a second leaf spring (the Leaf Spring with Button) is secured to the outside of the frame, on the left-hand side, by two screws. The ends of this spring are bent over the ends of the slot of the receptacle to retain filter holders, and its upper end is fitted with a button, enabling it to be drawn back for their insertion or removal. A notch in the lower side of the frame facilitates the removal of a filter holder by permitting a finger to be inserted to give an initial upward thrust. A hinged cover is provided to prevent the entry of light into the receptacle from above.

The sunshade and receptacle are mounted on the Sunshade and Filter Holder Support Casing, which is a shallow circular box-shaped casting covering the area of the lens turret, with a rectangular aperture in front of the taking lens. Six screws are tapped into the filter holder receptacle through holes at the edges of this aperture. A split tubular guide is cast on to the upper right-hand edge of the casing, and a Knurled Clamp Screw is fitted to tighten the guide on to the Sunshade Fixing Stud 29 (Figs. 2.2, 2.3), which is tapped into the top right-hand corner of the front of the camera housing. The assembly is also located by the Sunshade Guide Stud, mounted on a Support Arm 68 (Fig. 2.3) of bent metal strip secured to the front underside of the Gear Cover (assembly 01); the stud engages with a socket cast on to the Sunshade and Filter Holder Support Casing near the lower right-hand corner of the filter holder receptacle.

The gap between the Sunshade and Filter Holder Support Casing and the camera housing is shielded against light from above and to the left by the Cover Shield 25 (assembly 01) mounted on the camera housing. The sunshade and the support casing are flock-coated internally to prevent unwanted reflections of stray light.

**New Sunshade and Filter Holder**

A more elaborate sunshade and filter holder is supplied with some later specimens of the camera instead of assembly 09; the new model is shown fitted in Fig. 2.1. It has leather bellows 73 in place of the rigid sunshade, and its length can be adjusted to suit lenses having different angles of view. The

bellows are mounted between a filter holder support casing 72 similar to that described above, and a rectangular cast metal frame 75, mounted at the end of a square-sectioned aluminium runner 1. The projection from the filter-holder support casing which forms the guide fitting the Sunshade Fixing Stud of the camera is extended to form a further guide 2, which carries the aluminium runner. The length of the sunshade is variable by adjustment of the runner in the guide. The runner is engraved with markings indicating its correct positions when 28-mm and 35-mm lenses are used. When very long focus lenses are used, the front opening of the sunshade can be restricted by sliding a metal plate, pierced with a rectangular aperture, into grooves provided in the cast frame.

Cylindrical bearing housings are cast on to the wall of the magazine to accommodate the spool spindles 20 (Fig. 2.2), which carry spool holders 5 (Fig. 2.5), each with a spring-loaded driving key, to accept standard spool centres. The take-up spool shaft runs in ballraces supported in corrugated insulation strips in the rear bearing housing. The feed spool shaft runs in plain bearings in the forward bearing housing. Outside the magazine, the spool shafts carry Knurled Film Tensioning Disks 21 (Fig. 2.2), and the take-up shaft also carries a pulley (the Belt Hub) which is coupled by a belt 76 to mechanism described below. A spring-mounted felt pad (the Friction Felt) bears on the tensioning disk of the feed spool shaft to control the unwinding of the spool. A ratchet spring is

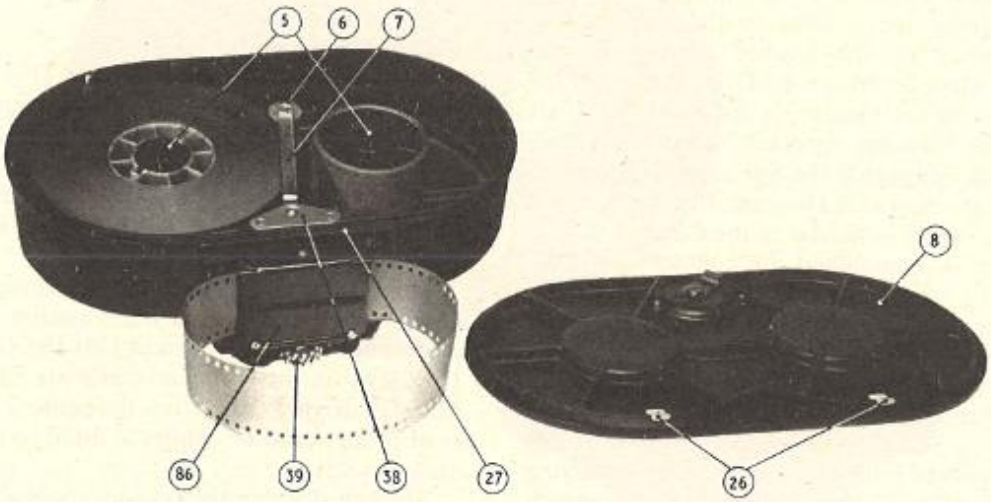



*Fig. 2.5. 200-ft Magazine for Arriflex 35-mm Camera*

As in the earlier sunshade and filter holder, a filter holder receptacle is provided at the smaller end of the sunshade; in the newer version, however, the receptacle contains a slide carrier which can be moved vertically by means of a rack-and-pinion mechanism operated by a knurled knob 65. By this means, mattes or graduated filters can be adjusted to fit the scene being photographed.

**10. 200-ft Magazine**

The 200-ft magazine is a cast light-alloy box, with a detachable light-tight door 8 (Figs. 2.1, 2.5). It is fitted with a simple mechanism, which couples to the camera mechanism when the magazine is fitted, to feed a loop of film of constant length to and from the camera.

fitted to the take-up spool shaft. This is a spiral spring, encircling and lightly gripping the shaft, with one end anchored to a screw tapped into the magazine casting. Its direction of wind is such that it tightens when an attempt is made to turn the shaft anticlockwise as viewed from the left-hand side of the magazine. The purpose of this arrangement is to ensure that the exposed film cannot become unwound inside the magazine.

The film leaves and re-enters the magazine through a machined Sprocket Housing 27 which is located by pins in an aperture in the bottom edge of the Magazine Casting, and secured by four screws. The housing contains two Sprockets, of which the forward one controls the film as it leaves the magazine, and the rear one as it re-enters. The

shafts carrying the sprockets are coupled to one another by a train of three gears 37, 39 and 41, so that the length of the loop of film threading the camera is maintained constant.

The Sprocket Housing has bevelled edges which are gripped between the rear edge of the magazine opening and the Magazine Clamp Plate of the camera housing to secure the magazine in place when it is fitted to the camera.

The shaft carrying the rear sprocket runs in ballraces, supported in corrugated insulation strips in a bearing housing, designated the Sprocket Bearing, mounted in the Sprocket Housing. In addition to the sprocket, this shaft carries the Gear 41, which is of fibre, and a pulley from which the belt drive is taken to the take-up spool shaft. The Gear 39 is of metal, and runs loose on a Bearing Screw tapped into the Sprocket Housing. When the magazine is fitted to the camera, this Gear is driven by the smaller member of the Compound Gear for Magazine Drive (assembly 13) and in turn drives Gears 37 and 41. The shaft carrying the forward sprocket runs in a plain bearing, also designated the Sprocket Bearing and mounted in the Sprocket Housing; this shaft carries the Gear 37, which is similar to the Gear 41.

The film is maintained in contact with the sprockets by the Intermediate Roller. This is grooved near each end to clear the sprocket teeth, and is loose on a shaft supported at its right-hand end in a bearing hole in the Sprocket Housing and at its left-hand end in a bearing swaged on to a brass Bearing Plate 38 (Fig. 2.5). Pinned to this shaft are a pair of Film Tensioning Arms 7 carrying a roller 6 (the Film Tension Indicator Roller) which rides on the feed spool; outside the magazine, the shaft carries a pointer 22 (Fig. 2.2), which serves, with a calibrated scale 79 designated the Footage Indicator, to show the length of unexposed film remaining on the feed spool. The bush by which the pointer is secured to the shaft is encircled by a Torsion Spring which thrusts the Film Tension Indicator Roller against the feed spool.

The Footage Indicator is supported away from the wall of the magazine by two spacers, one of which forms a pivot for an arm carrying a Belt Tension Pulley 77. The pulley is sprung against the take-up spool driving belt by a wire spring, the fixed end of which is anchored in one of a series of notches in the upturned edge of a Tension Adjusting Plate 78. The tension in the belt can be adjusted by moving the fixed end of the spring from one notch to another.

The mechanism on the right-hand side of the magazine is protected by a cast Magazine Mechanism Cover secured by two screws tapped into the magazine. The Sprocket Housing is rendered light-tight by a closely-fitting Cover Plate secured beneath it. Some of the later examples of the magazine are fitted with a metal plate 86 (Fig. 2.5), about half the width of the Cover Plate, secured by the two screws by which the right-hand side of the Cover Plate is attached to the Sprocket Housing. The plate forms a flap under which the loop of film can be stowed for protection.

### 11. 400-ft Magazine

The 400-ft magazine is similar in design to the 200-ft magazine (assembly 10), with which most of its parts are common. The remaining parts differ only in size and are listed in Appendix A.

### Colour Magazine

The 480-ft or colour magazine (Figs. 2.6, 2.7) accommodates up to 480 ft of normal panchromatic stock, or up to 400 ft of colour stock, and is more usually employed by the BBC than the 400-ft magazine (assembly 11). The design differs somewhat from that of assemblies 10 and 11, as described below.

The colour magazine Sprocket Housing and the components mounted on it are similar to those of assemblies 10 and 11, except that the Gears 37, 41 (Fig. 2.6) on the sprocket shafts are of nylon, the Gear 39 driving them from the camera mechanism is of bronze, and no pulley is fitted to the forward sprocket shaft.

The belt drive to the take-up spool shaft is from a pulley 34 mounted on a pivoted arm 33, to which spring tension is applied to maintain the necessary tension in the belt. A fibre gear 35, fastened to the pulley by three screws, is driven by a brass gear 36 running loose on a retaining pin which also forms the pivot for the arm 33. This pin is tapped into the Magazine Casting. The brass gear is driven by the Gear 37 on the forward sprocket shaft.

The spring tension is applied to the free end of the arm by a length of spring cord 31 which, for compactness, passes round a fibre pulley 32 loose on the feed spool shaft of the magazine, and is anchored to a small metal clip 30. This clip contains four holes, any of which can be engaged with either of two studs riveted into the wall of the Magazine Casting, to control the spring tension.

The spool centre on which the feed spool is wound is held on the feed spool holder of the

magazine by a cylindrical spring which is fitted in place of the usual driving key and tension spring. The take-up spool holder 90 is also of unusual design; it is of spring steel, and has the same diameter as a standard spool centre. When the magazine is being loaded, the end of the film is inserted into a slit in the spool holder, no spool centre being used; a small lever 89 is then moved to expand the holder, the same action clamping the end of the film. When the film is being removed from the magazine after exposure, the lever is moved to contract the holder and release the end of the film, so that the roll of film can be lifted away.

The large take-up spool holder covers the recess originally provided in the wall of the magazine casting as stowage for the Film Tensioning Arms; a small steel strip is therefore riveted over an indentation in the casting to engage with a stud riveted into the right-hand tensioning arm.

Polished steel bars are let into the strengthening ribs of the Magazine Casting to provide smooth and durable bearing surfaces for the right-hand edge of the film. The movement of the film on the feed spool is controlled by a pair of triangular steel plates, each floating under the pressure of compression springs on three shoulder screws tapped into the Magazine Door.

A small semicircular leaf spring is riveted into the cavity containing the Magazine Latch, and this spring must be depressed before the latch can be turned to release the door from the magazine. This arrangement prevents the magazine from being opened accidentally.

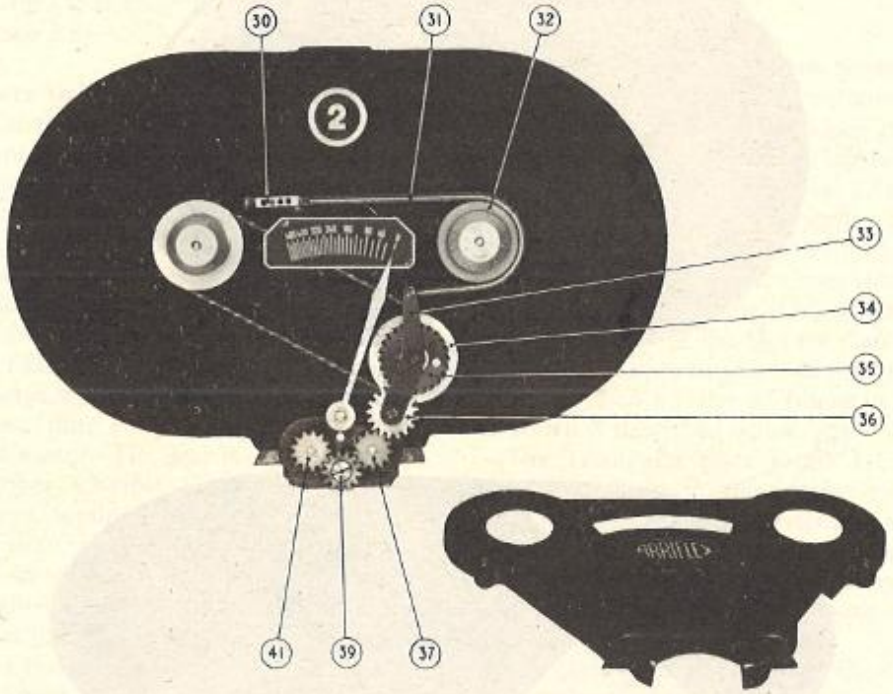



*Fig. 2.6. 480-ft or Colour Magazine for Arriflex 35-mm Camera: Magazine Mechanism Cover Removed*

**12. 180-degree Film Gate**

The aperture of the gate is cut in an Aperture Plate 18 (Fig. 2.1) of pressed steel, which has raised polished areas around the aperture and along the vertical edges to minimise the risk of damage by rubbing to the picture area of the film. A slot to the right of the aperture permits the film transport claw to pass through the sprocket holes of the film.

The film is held in contact with the Aperture Plate by a Pressure Plate 13 with raised polished areas corresponding to those on the Aperture Plate. The Pressure Plate is supported on the Film Gate

Back Plate 10. This is hinged to the Aperture Plate and supports the Pressure Plate on four shoulder screws passing through holes in the back plate and tapped into the Pressure Plate. The screws are encircled by four compression springs which thrust the Pressure Plate against the film.

An aperture in the Pressure Plate, corresponding to that in the Aperture Plate, is closed by a Cover Plate secured by two small screws and nuts.

slotted and drilled projections from two metal bars which form film guides secured to the right-hand edge of the Aperture Plate.

The right-hand edge of the film is located by the film guides already mentioned; the film is thrust against them by the Side Tension Rail 15. This is a strip of polished steel, floating on pins held between the left-hand edge of the Aperture Plate and Side Tension Lock Rail 17, which is a steel bar secured

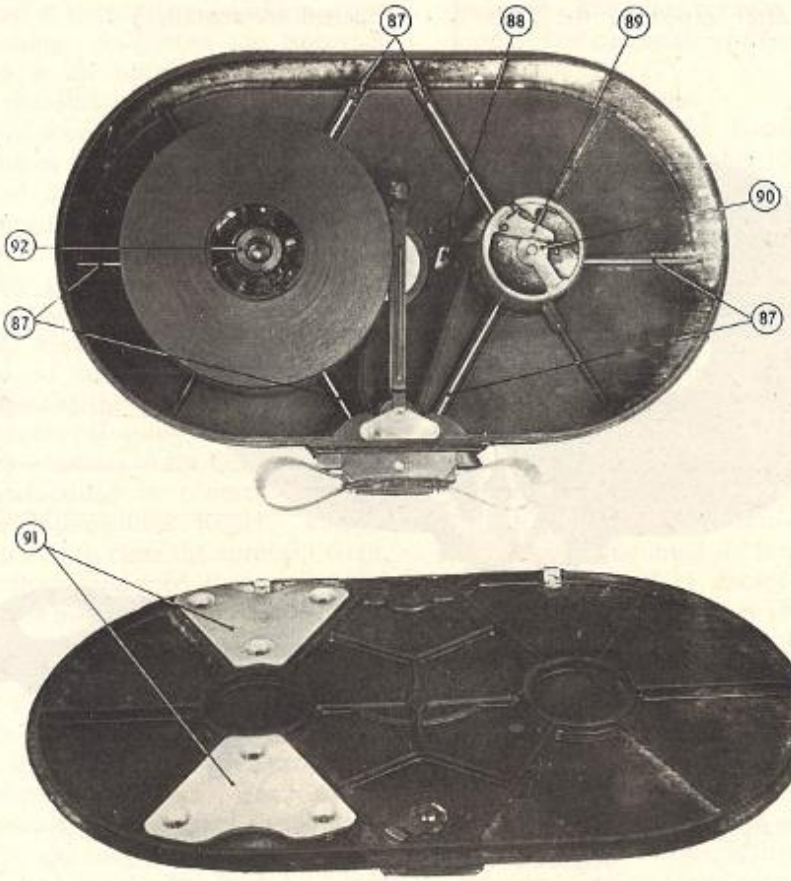



*Fig. 2.7. 480-ft or Colour Magazine for Arriflex 35-mm Camera*

The hinges on which the Film Gate Back Plate is mounted consist of three parts. A pair of bars, designated the Hinges, are secured to the back plate by screws tapped into it. (These bars are recessed to receive the heads of the screws supporting the Pressure Plate.) Transversely drilled slots in the ends of the bars accommodate flat metal links, designated the Hinge Arms, retained by Hinge Pins and small spring clips. The other ends of the Hinge Arms are similarly retained in suitably

to the edge of the Aperture Plate by four screws and nuts and recessed to accommodate the Side Tension Rail. The Side Tension Rail is drawn against the left-hand edge of the film by tension springs acting between each end of it and pins in the front surface of the Aperture Plate.

A three-limbed Locking Spring 9, mounted on the Side Tension Lock Rail, serves as a latch to hold the Film Gate Back Plate closed.

A casting, designated the Gate Cover, fills the

space between the front surface of the Aperture Plate and the mirror shutter. Its surfaces adjacent to the aperture have a stepped configuration so as to be approximately either normal or parallel to rays of light from the taking lens, thus avoiding the reflection of stray light on to the film. The Gate Cover is secured to the Aperture Plate by two screws which also secure the film guides.

The right-hand edge of the assembly is retained in the camera housing by a pair of Leaf Springs secured to the Gate Cover by screws. The ends of these springs engage with a rim on the camera housing. The left-hand edge of the assembly is retained by a Clip 74, already described as part of assembly 08 (page 2.8).

**13. New Camera Drive**

The pinion on the motor spindle drives a fibre gear, mounted on a ballrace, which is carried on a small plate pinned and screwed to the underside of the camera housing. The whole unit is designated the Drive Gear and Ball Race Assembly.

The fibre gear in turn drives a further gear 47 (Fig. 2.2) carried loosely on a flanged bush secured by two grubscrews to the lower end of a vertical shaft. The lower face of gear 47 has six inset rubber studs which engage with indentations in the flange of the bush and thus couple the vertical shaft resiliently to the motor. The gear is designated the Gear with Rubber Flexible Coupling, and the hinged bush, the Coupling for it.

The vertical shaft is accommodated in a cast Drive Housing 46 which is screwed to the outer surface of the right-hand wall of the camera housing. It is supported at its upper and lower ends in ballraces retained in the drive housing by circlips, the upper ballrace being protected against the entry of dust by a brass Ball Race Cover. The shaft has an integral worm gear near its upper end, by which the Shutter Drive Gear 45 (asembly 06) and the claw shaft gear (assembly 15) are driven. Below the worm gear, a step in the shaft locates a bevel gear which drives the tachometer. This bevel gear is secured to the shaft by a grubscrew, to which access is given by a hole in the Drive Housing. A further step in the shaft locates the inner member of the lower ballrace; here, a brass Thrust Washer is inserted, selected for thickness to give accurate fitting. Below the lower ballrace, a flanged spacer locates the upper face of the Gear with Rubber Flexible Coupling by which the shaft is driven.

The assembly also includes the Compound Gear for Magazine Drive, 60. This is a fibre gear clamped to a small brass one; the fibre gear is driven by the gear on the claw shaft (assembly 15), and the brass gear drives the magazine mechanism when a magazine is in position. The compound gear runs on a flanged retaining pin which is located on the camera housing by pins and secured by three screws tapped into the flange through the housing wall.

The lead 59 is fitted to certain cameras only. It connects a pair of sockets 12 (Fig. 2.1) at the rear of the camera housing to a film marking lamp accommodated in a cavity in the Gate Cover (assembly 12). This arrangement forms part of a sound and picture synchronising system which is not used by the BBC.

**14. Heart-shaped Cam Claw System**

The transport claw is actuated by a cam, mounted on the claw shaft which projects through the right-hand wall of the camera housing. The cam consists of a disk 98 (Fig. 2.8) designated the Double Cam, to the left-hand side of which is screwed a Triangular Plate 93 and a larger Cover of the same shape, the Cover forming a flange around the edge of the Triangular Plate. In the right-hand face of the Double Cam is machined a groove 99, the shape of which imparts a reciprocating motion to a roller 97 riding in it, the purpose of which is described below.

The Triangular Plate forms a Lumière cam, a device common in the motion-picture industry. It is, in fact, cardioid in shape, its sides being arcs each centred on the opposite corner of the plate. This shape always just fits between two parallel lines, whatever its angular disposition with respect to them.

The claw arm 94 is of fibre; the Claw Pin 100 is replaceable, and is retained by a transverse pin in a cast metal socket riveted to the claw arm. The arm contains cut-out areas, one having two parallel sides to fit the Triangular Plate. The flange formed by the Cover for the Triangular Plate retains the arm on the plate.

The Triangular Plate is secured to the Double Cam with one of its corners at the centre of the cam. Thus, this corner does not move as the cam rotates, and so long as the corner and a point on the opposite side of the Triangular Plate are the points of contact of the plate with the claw arm, the arm will not be moved by the plate. This is the condition at both the top and the bottom of the range of vertical movement of the arm while the Double Cam rotates through approximately 60 degrees. There are therefore periods of approximately

1/150 second before and after the pull-down of the film during which no vertical movement of the transport claw occurs, and it is during these periods that the claw is inserted into and withdrawn from sprocket holes in the film by a horizontal movement, imparted as described below. The phasing of the horizontal and vertical movements of the claw is arranged so that the film is brought to rest positively after being pulled down, before the claw is withdrawn; this arrangement obviates the need for a register claw.

The Double Cam, the Triangular Plate and its Cover are extensively pierced to reduce the rotating mass and to maintain the dynamic balance of the mechanism. One of the screws by which the Triangular Plate and its Cover are secured to the Double Cam is shorter than the other two in order not to project into the groove in the right-hand face of the cam.

A horizontal groove machined in the inner surface of the right-hand wall of the camera housing accommodates a pierced metal link 95 which slides

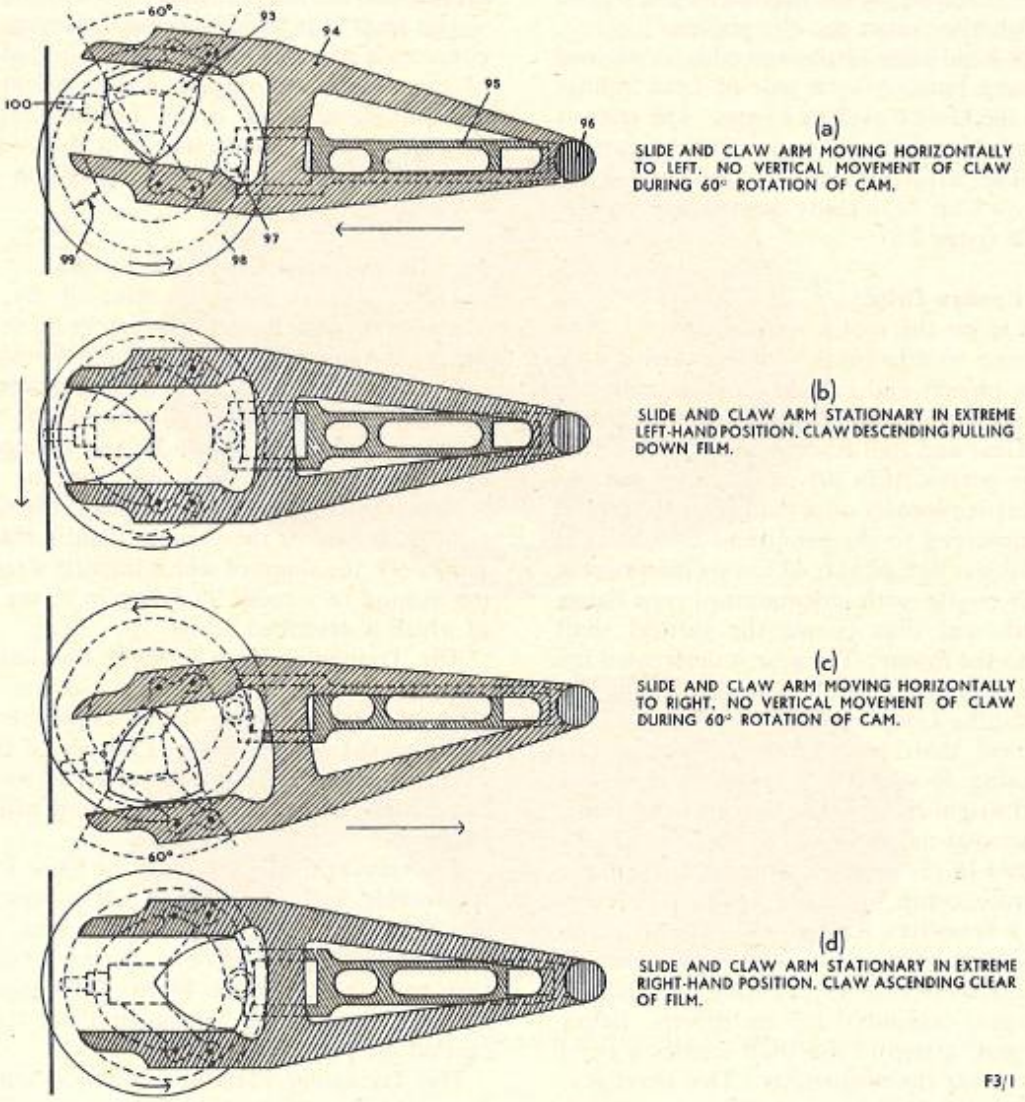



*Fig. 2.8. Heart-shaped Cam Claw System*

in it. The link carries at its forward end a Guiding Roller 97, which rides in the groove of the Double Cam and by which a reciprocating motion is imparted to it; at its rear end the link carries a tapped bush, on which the rear end of the claw arm is pivoted and retained by a screw 96. Thus, when the link is moved longitudinally, the claw arm is moved with it to insert the claw into a sprocket hole of the film, or to withdraw it.

The link is located and retained near its forward end by a brass guide block, which contains a felt insert for lubrication and is secured to the wall of the camera housing by two screws and a Retaining Clip. The guide block fits into a cut-out area of the link. A Guide Blade of hard steel is recessed into the groove carrying the link, in the region of its forward end, to provide a durable bearing surface. The link is located near its rear end by a Guiding Trunnion; this projects through the wall of the camera housing and has a square-sectioned end to fit a further cut-out area of the link, which is retained on it by a screw. The trunnion has a flange through which three screws are tapped into the outer surface of the wall of the camera housing; it is located by a pin.

The rear ends of the claw arm and link are protected by a pressed steel Gear Cover 14 (Fig. 2.1), retained by a screw 11 tapped into the Retaining Clip of the link guide block.

**15. Claw Bearing**

The claw shaft is carried in a Bearing Housing secured in a hole in the right-hand wall of the camera housing by three screws tapped into the wall through a flange on the housing. At its right-hand end, the shaft runs in a ballrace retained in the Bearing Housing, together with a dust cover, by a circlip. At the left-hand end of the shaft a machined groove forms the inner member of a roller race. The outer member is a flanged bush which fits into the bearing housing. Fifteen separate Rollers are used, and care must be taken in dismantling the assembly to ensure that none of these is lost.

The claw shaft has an integral gear which meshes with the worm gear of the vertical shaft and with the larger member of the Compound Gear for Magazine Drive (both assembly 13). The left-hand end of the claw shaft, which projects into the interior of the camera housing, is flanged to carry the Double Cam 98 (assembly 14). The right-hand end 58 (Fig. 2.2) of the shaft projects through the gear cover (assembly 01) and carries the inching knob. This is secured by a set-screw having a long unthreaded extension of its shank which passes through the spindle and the bush of the inching knob to form a pin.

The screws securing the assembly to the camera housing are dissimilar. One has a bevelled head to avoid fouling the bush of the bevel gear on the tachometer shaft; another is shorter than the other two, so as not to project into the groove carrying the link 95 (assembly 14) in the internal surface of the camera housing wall.

**Batteries**

The camera is normally powered by a 16-volt battery of eight Varley cells Type VPT7/7. These are supplied in a fibre box, with a leather strap carrying handle, fitted with two single sockets via which a connection to the battery is made. The sockets are colour-coded red and black. A battery lead is supplied having integrally-moulded connectors to couple the battery to the camera. At one end of the lead, a two-way female connector mates with the two-pin connector 51 on the motor–handgrip; at the other, a two-pin plug mates with the two sockets on the battery box.

The fibre battery box is being superseded by a more substantial metal box containing a battery of cells Type VPT7/9, which have a slightly greater capacity than the Type VPT7/7. This box is fitted with a Cannon connector Type EP-2-13, and the battery lead must therefore be fitted with a mating Cannon connector Type EP-2CG-12 in place of the two-pin plug mentioned above. Cameras are issued with a battery lead of each type, so that either type of battery box can be used.

The governor speed-controlled motor is fitted with a connector having pins of different sizes, to prevent the polarity of the connections from being reversed; additional battery leads must therefore be provided with this motor.

# SECTION 3

## LENS MOUNTS

### General

Lenses for use with the Arriflex camera Model IIA must be fitted in the Arriflex type of lens mount, which is illustrated in Fig. 3.1. Within the BBC, the camera is normally issued with a set of Taylor, Taylor & Hobson Series II lenses in this type of mount, of various focal lengths in the range between 18 mm (63 degrees horizontal angle of view) and 318 mm (4 degrees). In some instances, a Berthiot Pan-Cinor or Angenieux zoom lens is included to cover part of the range with greater flexibility.

Lenses issued with different cameras should not normally be interchanged unless means are to hand for checking the accuracy of focus.

The lens mounts are supported in sockets formed by tubular holes in the lens turret of the camera. The part of each lens mount in contact with the turret is the focus ring 103 which forms a bearing surface against the wall of the socket. The mount is retained in position by spring-loaded clips on the turret which ride in a groove 102 in the focus ring. The cell of the mount is prevented from rotating by a Lens Mount Key on the turret which engages with a keyway 101 in the cell.

The focus ring is fitted with a pair of metal ears 84 secured by screws tapped into the ring, to provide a convenient finger grip by which to manipulate it. It is calibrated with a scale of units of distance (feet or metres); this scale is read against a white paint-filled dot in the rim of the socket of the lens turret. The focus rings of some lens mounts have twin scales, in feet and metres; such mounts are provided with two keyways in the cell so that they can be inserted in the turret with alternative axial alignments, 180 degrees apart, to bring either of the two scales into use. An extra pair of tapped holes, filled by masking screws, is also provided to give corresponding alternative mounting positions for the focus-ring ears.

The lens mount contains an iris mechanism, coupled to a rotatable knurled ring 104 on the mount, forward of the focus ring. The iris ring is calibrated in *T* or *f* numbers, and the scale is read against a cursor line engraved on an adjacent part of the cell of the mount.

### Cleaning and Lubrication

Dust must be removed from the front and rear surfaces of the lenses by means of a camel hair

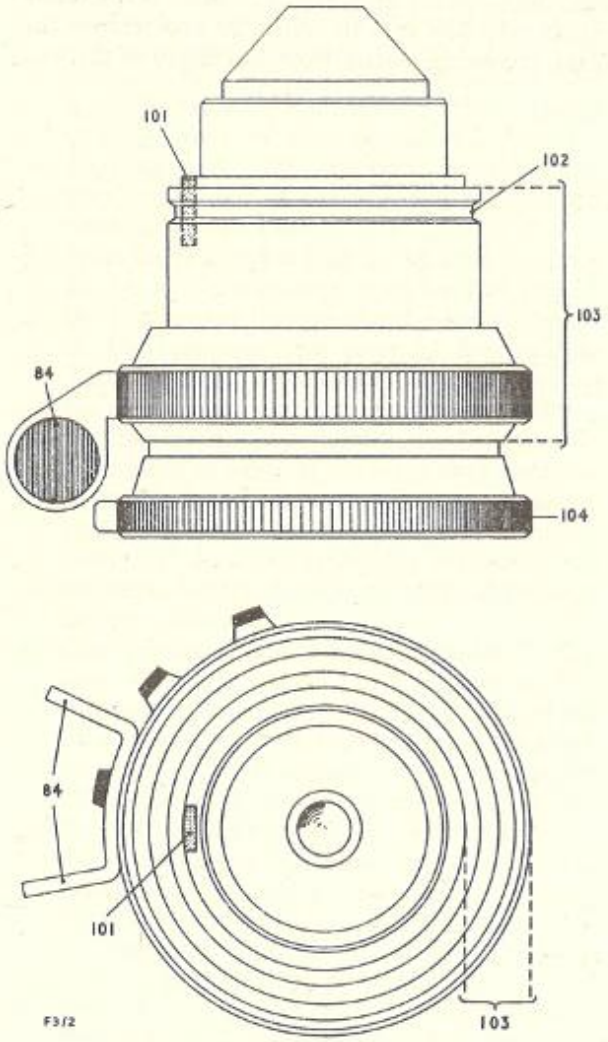



*Fig. 3.1. Arriflex Lens Mount*

brush; the brush should be cleaned, if it becomes greasy, by being washed in ether and allowed to dry at ambient temperature. When the lens surfaces

have been freed from dust they can be wiped clean with a Selvyt cloth, which itself must be clean. (If no Selvyt cloth is available, a cotton handkerchief or similar cloth can be used, provided that it is well washed and lint-free.) If grease is present the cloth should be moistened with ether or with a proprietary lens cleaner (e.g., May and Baker's Solution 10); industrial methylated spirit should not be used because it has a fairly high water content. If the greasy deposit is heavy it may be necessary to use benzine first and then to remove the residual smear with ether or lens cleaner. The minimum quantity of all solvents should be used, because any excess may flow into the cell bore and remove the black colouring matter from the edges of the lens elements; this would result in increased internal reflection and consequent loss of image contrast. The cleaning process should be completed by a final wipe with a clean dry cloth and the removal of lint particles by means of the camel hair brush.

Lens mounts must not be dismantled; if any repair is needed they should be returned to the manufacturers.

The focus ring should be lubricated with Ragosine Molydest 50 grease. Particular attention must be paid to the lubrication of the focus rings of mounts for use with a blimped camera; any friction in these may result in the camera being rocked on its floating base in the blimp when the follow-focus mechanism is operated.

# SECTION 4

## OPERATION

**General**

The camera is designed primarily for hand-held operation, the motor forming a grip for the operator's left hand, and giving the camera an irregular shape which prevents it from being mounted on a normal, flat-surfaced tripod head. However, the Arriflex tripod has a head consisting of a cradle into which the camera fits; an inserting screw is provided which engages with a hole tapped into the underside of the camera housing to the rear of the motor–handgrip, and a notch which receives a stud on the forward underside of the camera housing. To adapt the camera for use on other tripods or to enable it to be stood on a flat surface, a ' hi-hat ' is available. This device is so called because in its usual form it resembles a top hat. The Arriflex hi-hat, however, because of the unusual shape of the camera it accommodates, consists of a cast one-piece framework on which the camera is mounted in the same manner as on the tripod. The camera is shown mounted on the hi-hat in Figs. 2.1, 2.2 and 2.3. The handwheel 49 is attached to the inserting screw.

The camera can also be operated in a blimp (Section 6) in which case a special motor unit must be used.

**To Load the Magazine**

This must be done in darkness or with the aid of a changing bag; the operator is therefore advised to practice the operation in daylight, using dummy film. The procedure is as follows:

1. Turn the Magazine Latch 4 (Fig. 2.1) anti-clockwise, and lift off the door.
2. Swing the Film Tensioning Arms and roller towards the take-up spool shaft until the right-hand arm falls into the recess provided in the raised area of the magazine wall adjacent to the shaft.
3. Take a 200-ft roll of negative film, wound with the emulsion inwards on a standard spool centre, and cut the end of the film to shape with the aid of the template provided.
4. Insert the trimmed end of the film between the forward Sprocket and the Intermediate Roller in the Sprocket Housing, with the emulsion towards the Sprocket, and feed it through until the end emerges from the forward slit between the bottom of the Sprocket Housing and the Cover Plate. Grasp this and draw the film through the Sprocket Housing until the sprocket holes in the untrimmed part of the film engage with the teeth of the Sprocket.
5. Place the film on the feed (forward) shaft spool holder of the magazine, with the free end of the film leaving the spool in the central region of the magazine and pointing downwards. Turn the spool on the spool holder (preventing the spool shaft from turning by finger pressure on the knurled film-tensioning disk on the right-hand exterior of the magazine) until the spring-loaded driving key of the spool holder engages with the internal groove of the spool centre. If the spool centre fits too loosely on the spool holder, insert card or paper packing between them.
6. Draw sufficient film from the magazine for the first of the sprocket holes (ignoring the trimmed leader) to reach the mark 3 impressed on the upper wall when the film is wrapped around the front surface of the magazine. (This operation determines the length of the loop of film threading the camera.) Then insert the end of the leader into the rear slit between the Sprocket Housing and Cover Plate and feed it through into the interior of the magazine until the sprocket holes engage with the teeth of the rear Sprocket.
7. Ease the right-hand Film Tensioning Arm from the cast recess in the magazine wall and allow the arms to swing forward until the Film Tension Indicator Roller rides on the feed spool.
8. Place a spool centre on the take-up (rear) spool holder, ensuring that the spring-loaded

driving key of the spool holder engages with the internal groove of the spool centre. Turn the take-up spool shaft *clockwise* as viewed from the left-hand (open) side of the magazine, until the film is taut. (NOTE:- Damage may be caused if an attempt is made to turn the spool shaft anticlockwise.)

9. Ensure that the Magazine Door is the correct one for the particular magazine, by checking their numbers. Insert the two catches 26 (Fig. 2.5) riveted to the lower edge of the Magazine Door into the grooves in the Magazine Casting, close the door and turn the Magazine Latch clockwise. If difficulty is encountered in closing the door, do not use undue force, or damage may result.
10. Turn the knurled film-tensioning disks 21 (Fig. 2.2) on the spool shafts in the directions indicated by the arrows on the Magazine Mechanism Cover, to ensure that both spools are tightly wound.

NOTE:- When the magazine is loaded, the slits between Sprocket Housing and Cover Plate should be shielded against direct light from bright sources, to avoid the possibility of light entering the magazine.

**To Fit the Magazine to the Camera**

1. Disconnect the camera power supply.
2. Turn the camera door Latch 67 (Fig. 2.3) anticlockwise and remove the door.
3. Turn the inching knob of the camera until the film transport claw is fully withdrawn from the Aperture Plate.
4. Press the Locking Spring 9 (Fig. 2.1) and open the Film Gate Back Plate 10.
5. Check that the magazine release knob 23 (Fig. 2.2) is in the fully anticlockwise position as viewed from the front of the camera, and is thrust forward by its Torsion Spring.
6. Place the magazine in position, first engaging the rear edge of the Sprocket Housing with the edge of the magazine opening of the camera housing, then lowering the front of the magazine into place. Ensure that the film is not kinked during the process by being trapped between magazine and camera housing.
7. Press the magazine release knob until it turns clockwise.
8. Fit the film into the camera gate, ensuring that the length of film above the gate is such that there are fifteen sprocket holes between the film's points of emergence from the magazine and engagement by the transport claw (i.e., the highest position of the claw). Turn the inching knob to engage the claw with the film, taking care that the claw enters a sprocket hole and does not strike the film between holes. Close the Film Gate Back Plate.
9. Turn the inching knob to ensure that the film is being pulled through the camera satisfactorily.
10. Replace the camera door and turn the Latch clockwise.
11. Re-connect the camera power supply.

**To Remove the Magazine from the Camera**

1. Disconnect the camera power supply.
2. Turn the camera door Latch 67 (Fig. 2.3) anticlockwise and remove the door.
3. Turn the Inching Knob to withdraw the film transport claw from the film.
4. Press the Locking Spring 9 (Fig. 2.1) and open the Film Gate Back Plate 10. Remove the loop of film from the gate and close the back plate.
5. Supporting the magazine with one hand, turn the magazine release knob 23 (Fig. 2.2) anticlockwise as viewed from the front of the camera and allow it to spring forward. Lift the magazine clear of the camera, ensuring that the region of the Sprocket Housing is shielded against direct light from any bright source.

**To Remove and Fit Lenses**

1. Loosen the Knurled Clamp Screw and remove the sunshade.
2. Grasp the pair of Lens Release Latches 69 (Fig. 2.4) on either side of the relevant lens-mount receptacle between the forefinger and thumb of one hand, and while squeezing them towards one another, lift out the lens mount or protective cap already in position.
3. Inspect the interior of the lens-mount receptacle and the rear end of the lens mount to be fitted, and note the positions of the Lens Mount Key 82 in the turret and the keyway 101 (Fig. 3.1) in the cell of the lens mount.
4. Maintaining the pressure on the Lens Release Latches, drop the lens mount into place so that the Lens Mount Key enters the keyway.
5. Release the Lens Release Latches, and check that the lens mount is retained securely in place and that the focus ring is free to rotate.

6. Replace the sunshade and tighten the Knurled Locking Screw (subject to the remarks in the next paragraph).

The dimensions of a long focus lens mount preclude the use of the sunshade or of lenses in the other two receptacles of the turret. Receptacles containing no lens mount must always be filled by protective caps to prevent the entry of light and dust.

**Hand-held Operation**

1. Connect the camera power supply.
2. Turn the knurled film tensioning disks 21 (Fig. 2.2) on the magazine in the directions indicated by the arrows, to take up any slack film inside the magazine.
3. Press the button 53 at the top rear of the motor–handgrip to run a few frames of film through the camera, and observe the speed indicated by the tachometer; check that this is correct if a governor speed-controlled motor is in use, or adjust as necessary if a variable speed motor is fitted. If a governor speed-controlled motor runs too slowly, change the battery for a known good one before taking any other measures.
4. Rotate the lens turret to bring the required lens into the taking position; adjust the aperture of the lens to the appropriate setting, and the focus to infinity.
5. Grasp the motor–handgrip firmly in the left hand, and raise the camera to bring the Viewfinder eyepiece to the right eye.
6. If nothing can be seen through the Viewfinder, turn the inching knob with the right hand to bring the mirror shutter to one of its closed positions.
7. If a complete revolution of the inching knob fails to produce any picture in the Viewfinder, move the Slide on the forward underside of the Viewfinder receptacle to open the Viewfinder Flaps.
8. Repeat 6 if necessary.
9. Sight the camera on an object at infinity, and adjust the bright metal castellated ring 62 (Fig. 2.3) on the Viewfinder eyepiece to bring the object into sharp focus. Lock the ring in the position so found by means of the locking toggle 66.
10. Sight the camera on the scene to be photographed, steadying it with the right hand by means of the thumb grip provided, and adjust the focus of the taking lens with the fingers of the right hand to obtain a sharply focused Viewfinder image.
11. Run the camera motor by operating either the Toggle Switch 48 or the Press Button 53 (Fig. 2.2) with the thumb of the left hand.

Whenever possible during pauses in filming, check the tension of the film in the magazine by means of the knurled film-tensioning disks. Occasionally, check the speed of the motor as indicated by the tachometer, and the length of unexposed film as shown by the footage indicator of the magazine.

If a magazine of film is used until it is completely exhausted, so that the end of the film is passed through the camera, that end may remain gripped between the aperture and pressure plates of the gate after moving beyond the range of the transport claw. The gate assembly then receives an upward pull as the last few inches of film are drawn into the magazine, and may be displaced slightly from its proper position. If it is suspected that this has occurred, the assembly should be pressed downward slightly with the fingers when the camera is next re-loaded.

In some of the more recent specimens of the camera a trip lever fitted at the bottom of the camera housing is operated when the film loop tightens, and actuates a microswitch to stop the motor. It is, however, BBC practice to disconnect the microswitch, and in some instances the trip lever is removed and a blanking plate fitted to the wall of the camera housing in its place. The microswitch 55 and the right-hand end of a trip lever 54 can be seen in Fig. 2.2, and the left-hand end of a trip lever at 16 in Fig. 2.1.

Before stowing a loaded camera in its carrying case for transport, or during a long pause in filming, turn the inching knob to bring the dot engraved on it close to the corresponding dot marked on the Gear Cover of the camera housing. This ensures that the film transport claw is engaged with the film so that the latter cannot slip in the gate and later suffer damage by the claw when the camera is started.

**Tripod-mounted Operation**

Apart from points concerning the holding of the camera, the instructions given above for hand-held operation apply to tripod-mounted operation also.

Because of the unusual shape of the camera the Arriflex tripod must be used. The pan-and-tilt head of this is in the form of a framework which supports the camera forward and to the rear of the

motor–handgrip. An inserting screw is provided which engages with a tapped hole in the bottom of the camera housing, and a notch accepts a tripod-locating stud tapped into the front underside of the housing.

The Arriflex hi-hat can be used to adapt the camera to tripods other than the Arriflex tripod.

Continuous sighting of the subject through the Viewfinder may be less necessary during tripod-mounted operation than during hand-held operation; particular care should therefore be taken to close the Viewfinder Flaps, when the Viewfinder is not in use, by operating the Slide on the forward underside of the Viewfinder receptacle.

# SECTION 5

## MAINTENANCE

### Handling the Camera

The motor–handgrip prevents the camera from being stood firmly on a flat surface, and the hi-hat may be used while maintenance work is being carried out at the workshop bench, to overcome this difficulty. When the hi-hat is fitted, the camera is not only more stable and easier to manipulate, but exposed parts of its mechanism are less liable to damage by the weight of the camera being rested on them.

### Lubrication

The moving parts of the camera (other than the motor) should be lubricated with Esso clock oil 8119 after each 40,000 to 50,000 feet of filming. A felt lubrication insert is provided in the guide block carrying the link of the claw system; this is accessible when the Gear Cover 14 (Fig. 2.1) over the rear ends of the link and the claw arm is removed by loosening retaining screw 11. The Compound Gear for Magazine Drive 60 (Fig. 2.2) can be lubricated via the bore in its retaining pin, accessible from inside the camera housing. The film guides of the gate assembly should be smeared lightly with clear vaseline. Ballraces should be lubricated with Arriflex Spezialfett; this is a special non-vaporising grease, and so does not film the mirror shutter by recondensation. The motor bearings should be lubricated with the same grease, but this is necessary only after two years operation.

### Cleaning

The film transport system should be cleaned with a soft hair brush; any hard deposit of film emulsion which is not dislodged by the brush can be rubbed off with a piece of soft wood, such as an orange stick with its end cut to the shape of a wedge. A sharp tool should never be used, as it might roughen the polished metal surfaces so that they scratch the film. The gate assembly can easily be lifted out for cleaning and lubrication when the Clip 74 (Fig. 2.1) retaining its left-hand edge has been slid to the left after loosening the two screws which secure it to the camera housing, and the inching knob turned to withdraw the film transport claw completely from the film. The cleaning should be done with a chamois leather or soft cloth, the greatest care being taken that none of the polished surfaces is scratched in the process. When replacing the gate in the camera, check that no film debris or other foreign matter is trapped between it and the camera housing. When the Clip is moved back into place after re-fitting the assembly, the screws should not be tightened excessively, or the thread may be stripped from the holes in the soft light-alloy housing into which they are tapped.

The mirror shutter and the Ground Glass of the viewfinder optical system should be cleaned by wiping them with a Selvyt cloth. No attempt should be made to clean the mirrored surface of the shutter with oil or benzine, as this may damage it. The Ground Glass can be pushed out of its holder for cleaning by inserting a thin rod into a hole in the forward edge of the Ground Glass Holder; this hole is accessible through the taking lens receptacle of the lens turret when the lens mount is removed. The gate assembly must be removed to allow the Ground Glass to slide towards the rear of the camera. When the Ground Glass is replaced it must be inserted with its ground surface to the right, i.e., towards the shutter.

Instructions for cleaning and lubricating Arriflex type lens mounts are given in Section 3.

### Dismantling the Camera

The following miscellaneous points should be kept in mind when the camera is being dismantled:

(*a*) The viewfinder optical system should *not* be dismantled. It is essential that the optical distances from the taking lens to the film and from the taking lens to the Ground Glass should be the same, otherwise a focus setting giving a sharp Viewfinder image will give an inferior image on the film; dismantling the viewfinder optical system may upset this arrangement.

(*b*) The lens turret should not be removed unless absolutely necessary, because this could result in a slight change in the distance between the taking lens and the film. If the turret must be removed, the accuracy of focus should be checked by means of a camera focus autocollimator (see Instruction F.1, Appendix B), and care must be taken that the indexing wheels and plungers and their Compression Springs which are retained in holes in the edge of the Turret Casting only by the presence of the bearing insert are not ejected by the force of the Compression Springs and lost.

(*c*) The mirror shutter, which is of glass, fits into the forward right-hand projection 80 (Fig. 2.3) of the Gear Cover; the latter should therefore be removed with a motion forward at an angle of 45 degrees to the principal dimensions of the camera, to avoid risk of damage to the shutter.

(*d*) The method of dismantling the Sprocket Housing 27 (Fig. 2.5) of the magazine is as follows:

1. Remove the Bearing Screw carrying the Gear 39 (Fig. 2.2) coupling the two sprocket shafts.
2. Loosen the grubscrews securing the Sprockets to the sprocket shafts.
3. Withdraw the sprocket shafts, leaving the Sprockets inside the Sprocket Housing.
4. Withdraw the six countersunk, screws securing the Sprocket Bearings to the Sprocket Housing.
5. Lift out the Sprockets, with the Sprocket Bearings inside them.

When re-assembling the mechanism, note that the sprocket shaft having a length turned to a smaller diameter, and not carrying a pulley, runs in the plain Sprocket Bearing and is situated forward in the Sprocket Housing. The shaft with a pulley in addition to the Gear 41 runs in two ballraces in the other Sprocket Bearing, and is situated at the rear of the Sprocket Housing.

The pins securing the Gears 41, 37 to the sprocket shafts are in line with the grooves in the shafts which receive the grubscrews of the Sprockets. They thus indicate the correct alignment of the Sprockets on the shafts.

(*e*) The belt drive to the take-up spool shaft of the magazine is of the slipping friction type, and the belt tension should not be so great as to prevent slipping. If the drive is too definite, the mechanical load on the motor is increased.

**Performance Checks**

*Steady Tests*

Total image unsteadiness should not exceed 0·1 per cent of the picture width, as measured with the aid of the mechanical test object described in Planning and Installation Department Report No. PID/TV/1956/3. (This test object is a device which enables either of two patterns of apertures in a metal plate to be illuminated by the rotation of a second plate which acts as a set of shutters. The object is photographed *twice on the same film*, i.e., once with the movable plate in each position, and any movement between the two sets of elements of the resulting composite projected image is a measure of the total (horizontal and vertical) unsteadiness of the camera film transport mechanism.)

*Lens Scaling*

The accuracy of the lens scaling depends on the correctness of the distance of the lens from the plane of the camera gate; with the follow-focus mount adjusted to give a lens scaling indication of infinity, a distant object should be brought into sharp focus on the film. After any work involving disturbance of the lens mountings, the lens scaling should be checked at infinity by means of an auto-collimator (see Instruction F.1, Appendix B) and at measured distances by practical tests.

*Photographic Resolving Power*

The limiting resolution of each lens should be 50–55 lines/mm, assessed by microscopic examination of negative images shot under the following test conditions:

Test Object: 35-mm BBC Resolution Chart for use with transmitted light. (When the image of this is correctly framed in the camera gate, direct resolution readings in lines/mm are obtained.)

Stock: Ilford FP3.

Lens aperture: *f*/2.

Illumination: Transmitted light adjusted to give a Relative Brightness reading of 2 on a Weston Master II exposure meter.

Processing: Develop to gamma = 0·6.

Under these conditions a negative density of 0·7 should be obtained, but to allow for slight variations of stock processing, additional exposures should be made with the illumination slightly greater and slightly less than the theoretically optimum value prescribed above.

*Film Transport*

Routine checks should be made to ensure that the film is not scratched due to wear in the gate or excessive deposits of emulsion.

# SECTION 6

## SOUND SYSTEM AND BLIMP

**General**

The Arriflex camera Model IIA can be adapted to enable it to be used in conjunction with the BBC magnetic recorder Type RD4/501 for the simultaneous recording of pictures and sound. The system is similar to that described in Section 10 of Instruction F.2, and is therefore described only in outline in the present Instruction.

The slating unit of the sound system is mounted on the blimp in which the camera is used; this blimp (the Arriflex Blimp 120) thus forms part of the sound system, and therefore sound system and blimp are considered together in this single Section.

**Adaptation of Camera**

The following adaptations are necessary to enable the camera to be used with the sound system:

(a) The fitting of a synchronising tone generator.
(b) The mounting of the camera on a specially-designed motor unit.
(c) The replacement of the camera door by one of modified design.
(d) The drilling of holes in parts of the gate assembly to allow the passage of light from a film marking lamp.
(e) The removal of the Sunshade Guide Stud.
(f) The removal of the Protection Nose (pages 2.1, 2.2) to its stowed position.

Of these adaptations, only (a) and (d) are permanent modifications to the camera, and they do not affect its suitability for use unblimped if required.

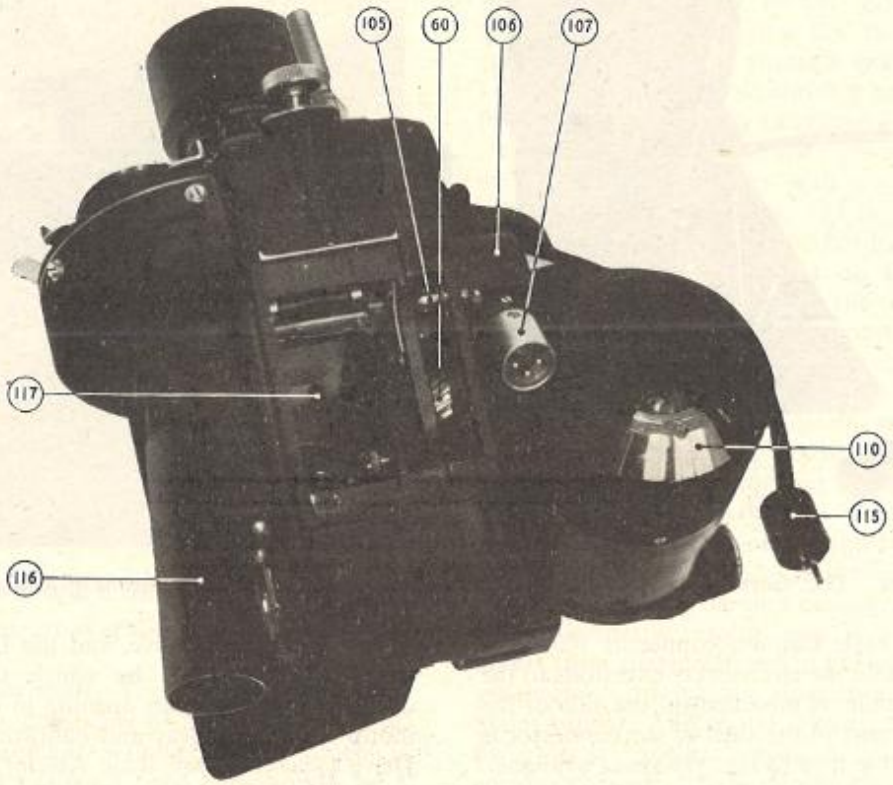



*Fig. 6.1. Camera, Mounted on D.C. Governed Motor Unit*

(*a*) *Synchronising Tone Generator*

Apart from its outer case, the synchronising tone generator is similar to that fitted to the 16-mm Arriflex camera and described in Section 10 of Instruction F.2. The generator 106 (Fig. 6.1) is mounted on the Gear Cover of the camera; its shaft carries a brass gearwheel 105 which meshes with the larger member of the Compound Gear for Magazine Drive 60 (Fig. 2.2) when the Gear Cover is in place.

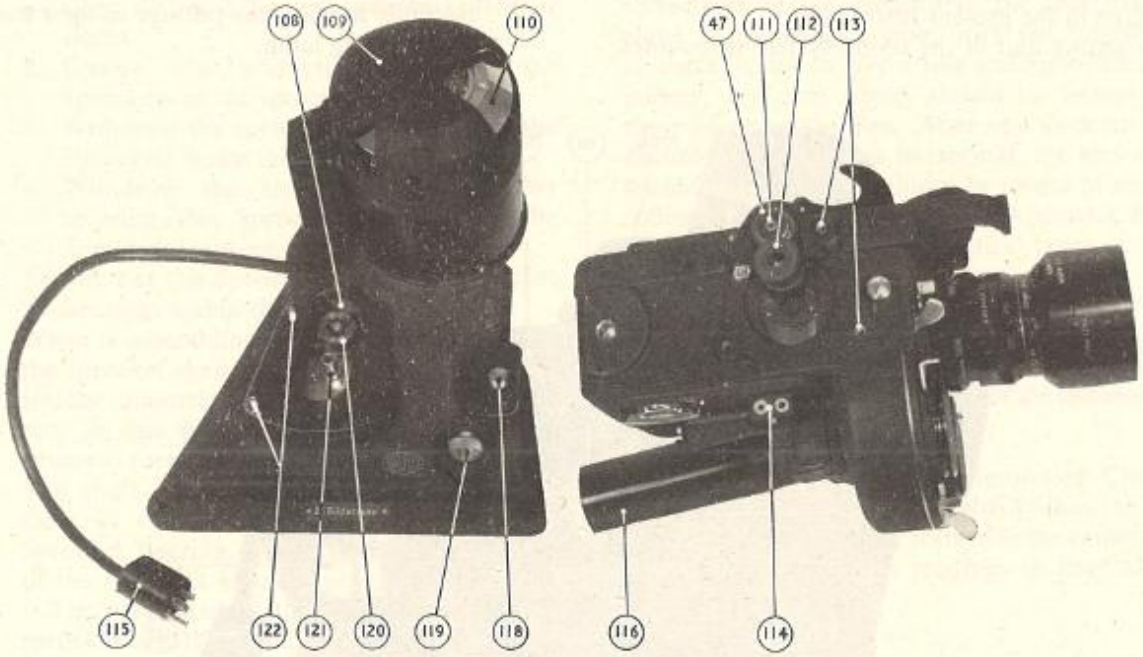



*Fig. 6.2. D.C. Governed Motor Unit and Underside of Camera, Showing Means of Attachment*

A three-way male Cannon connector 107 Type XL-3-12, via which the electrical connections to the generator are made, is mounted on the side of the generator case; part of the shell of the connector is cut away to enable it to fit into the space available.

The drilling of the Gear Cover so that the gear wheel on the generator shaft meshes accurately with the Compound Gear for Magazine Drive is an operation requiring a high degree of mechanical precision; cameras should therefore be handed over to the appropriate specialist department when they are required to be modified.

(*b*) *Motor Unit*

The d.c. governed motor unit (Fig. 6.2) for use with the camera in the Arriflex Blimp 120 consists of a hollow cast light-alloy base, on which the motor is mounted with its shaft projecting vertically downward into the cavity of the base. The base is fitted with an inserting screw near its rear edge to mate with the tapped hole in the underside of the camera housing, and screws 122 are provided which pass through the base and are tapped into two holes 113 of the four in the camera housing which normally receive the screws securing the Motor–Handgrip.

The gear 47 at the lower end of the vertical shaft 111 of the camera drive, and the Drive Gear and Ball Race Assembly by which the gear 47 is driven, project into an opening in the base of the motor unit. The gear and ballrace of the normal Drive Gear and Ball Race Assembly are replaced by a special gear and ballrace 112 supplied with the motor unit; the gear is twice the width of the normal one, and meshes with an idler pinion 120 in the base of the motor unit, as well as with the gear 47. The pinion 120 is driven via an intermediate gear 108 from a pinion on the motor shaft. The latter pinion is not fast on the shaft, but coupled to it by a sprung-ball clutch which is overridden in the event of the camera becoming jammed; thus no damage can occur if the rotor and flywheel of the motor are brought to rest suddenly.

The stub shaft of the Drive Gear and Ball Race

Assembly fits into the bore of a hollow stub shaft 121 which is mounted on a strengthening rib of the motor unit casting and projects upward into the opening accommodating the gear 117 and gear and ballrace 112; thus the gear of 112 is accurately located to mesh with the idler pinion 120.

When the camera is not mounted on the motor unit, the special gear and ballrace 112 is stowed in the opening, which is closed by a sheet-metal cover secured by two nuts on the screws 122.

The motor is designed to be powered by a 24-volt battery. It is fitted with a centrifugal governor contained in a recessed flywheel 110 on the upper

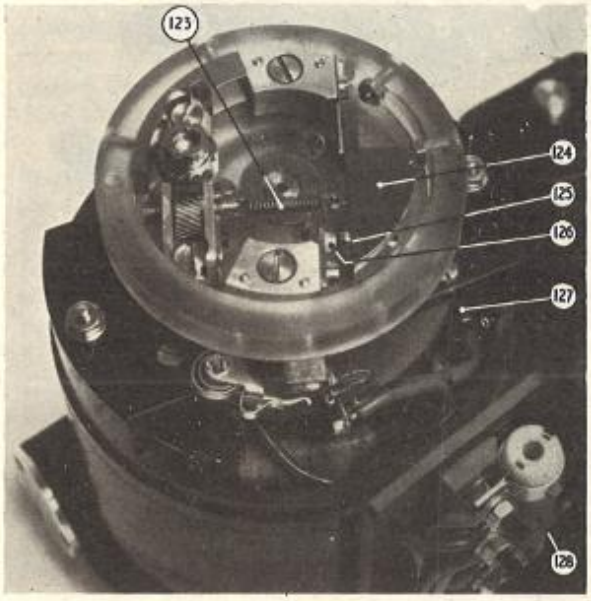



*Fig. 6.3. Motor of D.C. Governed Motor Unit, Showing Construction of Centrifugal Governor*

end of the motor shaft. The governor is of conventional design, consisting of a contact 125 (Fig. 6.3), on a compliant weighted arm, which is normally drawn against a fixed contact 126 by a tension spring 123, but breaks from it when centrifugal force on the weight 124 exceeds the tension in the spring. A worm-and-pinion device, operable by a screwdriver adjustment, enables the tension in the spring to be varied. The governor is protected from dust and damage by a plexiglass cover with a hole to permit the entry of a screwdriver blade.

A removable cover 109 (Fig. 6.2) over the upper end of the motor has a sector cut away to enable the flywheel to be driven by the rubber-edged wheel to which the inching wheel of the blimp is coupled. For BBC use, a further notch is made in the cover to accommodate part of the case of the synchronising tone generator.

The connections to the motor are made via terminals on a vertical strip beside the motor, shielded by a removable paxolin-lined sheet-metal cover; to these terminals is connected a short 3-way flexible lead, terminating in a German-type three-way male connector 115 which mates with a corresponding female connector on a lead in the blimp. The terminals can be seen in the lower right-hand corner of Fig. 6.3.

A frame counter is recessed into the rear edge of the motor unit base, and is driven via a train of gearing from the gear on the motor shaft. The re-setting shaft is on the left-hand side of the counter; it is coupled through gearing to a knob 119 (Fig. 6.2) accessible through the side door of the blimp when the unit and camera are in position.

A horizontal spigot on the right-hand side of the motor unit base engages with a socket 133 (Fig. 6.4) on a triangular frame 139 in the blimp, and cavities at the corners of the left-hand edge of the base engage with studs 134 on the frame. An inserting plate is provided on the underside of the motor unit, enabling it to be mounted on a tripod or other device and operated unblimped. (This is not normal practice, but can be done; synchronisation with a magnetic recorder is then still possible by direct connection to the synchronising tone generator, but the slating facility is lost.)

The underside of the motor unit base is closed by a sheet-metal cover plate, secured peripherally by screws tapped into the unit casting.

An alternative motor unit is available which differs from that described in having a three-phase synchronous motor for operation from the a.c. mains supply. This motor is easily recognisable by its external rotor, which is guarded against accidental contact by a curved sheet-metal shield. A set of special mains leads supplied with the synchronous motor unit enable it to be run from either single- or three-phase a.c. mains, in the blimp or apart from it. The leads for use without the blimp incorporate semicylindrical sheet-metal housings, each fitted with a motor switch and a female connector to receive the male connector on the motor unit lead. The housing on the single-phase lead also contains a phase-splitting capacitor. The flat sides of the housings are closed by paxolin panels retained by lugs. A pair of clips is provided

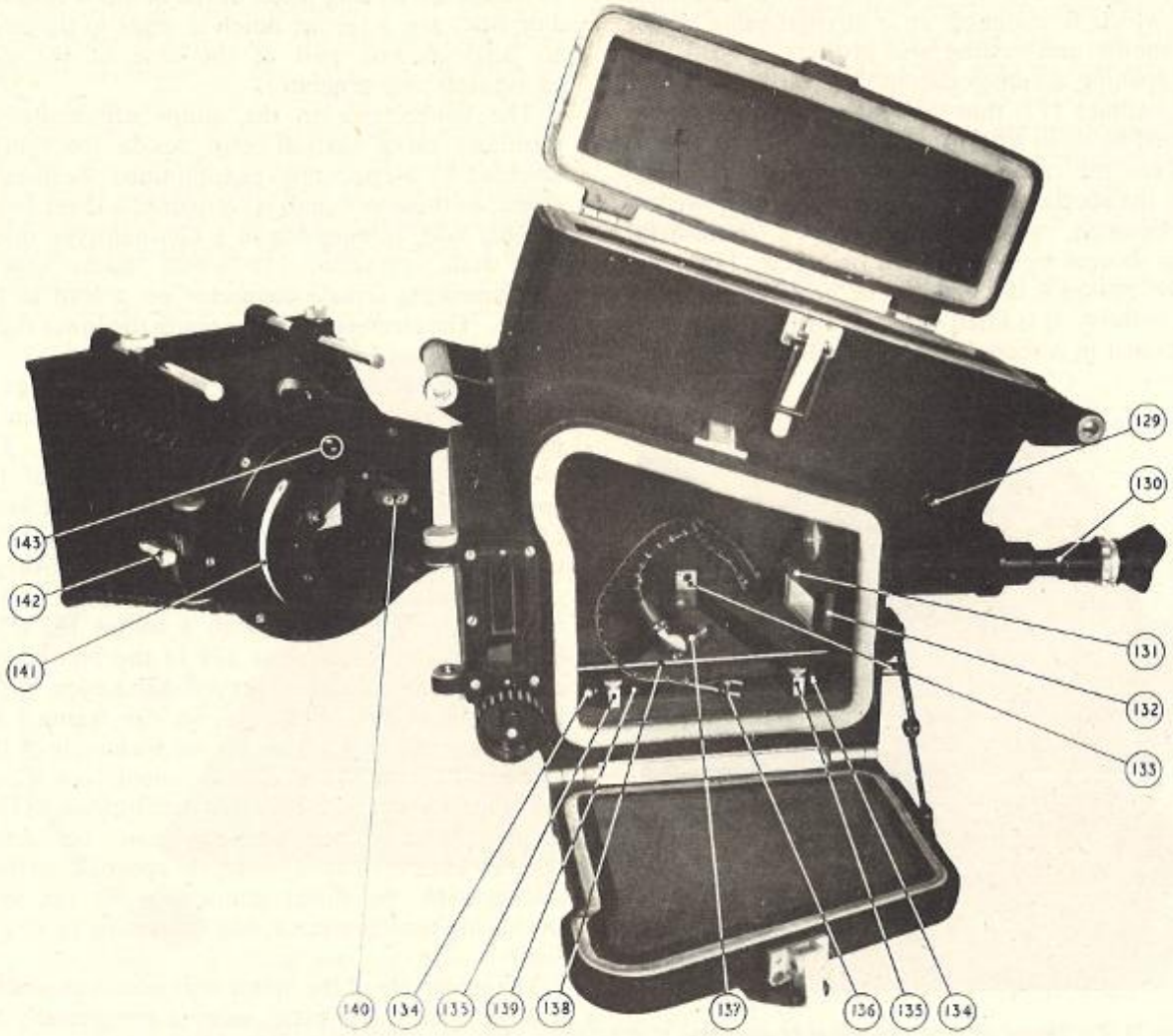



*Fig. 6.4. Blimp for 35-mm Arriflex Camera*

on the outer shield of the synchronous motor unit; the clips can be engaged with the lugs to mount the housings on the motor, for convenience of operation.

(*c*) *Modified Camera Door*

A modified camera door is supplied with the blimp. In place of the normal viewfinder optical system, this door is fitted with an adaptor 116 (Fig. 6.1) which is a simple tube linking the ground glass and mirror in the camera (page 2.4) with a viewfinder optical system fitted to the blimp. For BBC use, the door is fitted with a film marking lamp in a BBC-designed holder 117 supported on a bracket screwed to the inner surface of the door, so that light from the lamp passes through holes in parts of the gate assembly to mark the film as described under (*d*) below. The connections to the lamp are via a two-way female connector 114 (Fig. 6.2) mounted on the exterior of the door.

(*d*) *Drilling of Gate for Slating Facility*

Holes are drilled in the Cover Plate which is mounted in the Pressure Plate 13 (Fig. 2.1), and in the Film Gate Back Plate; these holes are in line with the opening at the forward end of the film marking lamp-holder 117 (Fig. 6.1) and allow light from the lamp to strike the film at a central point in the aperture of the gate. The distinctive mark

thus produced on the film when the lamp is flashed is used in conjunction with a simultaneous burst of oscillation from the slating unit, recorded on the magnetic tape, for the subsequent matching of the two recordings.

(*e*) *Removal of Sunshade Fixing Stud*
(*f*) *Removal of Protection Nose*

These require no clarification.

**Arriflex Blimp 120**

*Construction*

The construction closely resembles that of the blimp for the 16-mm Arriflex camera; this blimp is described in Section 7 of Instruction F.2. The present description therefore covers only those aspects of the Arriflex blimp 120 in which it differs from the other blimp.

When used in the blimp, the camera must be fitted to a special motor unit (described above under the heading *Adaptation of Camera*) which forms a base on which the camera is mounted. The camera on its motor unit is supported in the blimp on a triangular frame 139 (Fig. 6.4) which floats on rubber mountings. One corner of the frame, to the right-hand side of the interior of the blimp, carries a horizontal socket 133 to receive a spigot on the motor unit. Near the other two corners of the frame, to the left-hand side, are studs 134 which enter cavities in the underside of the motor unit to locate it in position, and holes to receive two removable clamps 135 fastened in place by knurled-headed screws; these clamps grip the left-hand edge of the motor unit to secure it in place.

The spring-loaded shaft on which the inching wheel 144 (Fig. 6.5) is mounted carries, inside the blimp, a wheel having a bevelled rubber edge to drive the flywheel of the motor unit when the inching wheel is pressed and rotated.

The shaft 138 (Fig. 6.4) by which the rear follow-focus handwheel 154 (Fig. 6.5) drives the follow-focus mechanism is removable to facilitate the insertion of the camera and motor unit into the blimp. Normally, the shaft is supported between stub shafts of the follow-focus mechanism and the handwheel; a pin formed by the shaped end of the screw 153 engages with an annular groove in the stub shaft of the handwheel and locates it longitudinally. When the screw is withdrawn, the stub shaft can be slid in its bearing about half an inch towards the rear of the blimp, by pulling the handwheel; this frees the shaft 138, which can be lifted out.

The blimp is fitted with a viewfinder optical system 130 which replaces that mounted on the normal camera door; the special door which must be fitted to the camera when it is used in the blimp is described above under the heading *Adaptation of Camera*.

Windows 152 and 151 at the rear of the blimp enable the tachometer of the camera and the frame counter of the motor unit to be observed. These instruments are illuminated by a pilot lamp 131 (Fig. 6.4) in a holder pinned to the fabric inner lining of the blimp.

The cast shape of the blimp includes a small rectangular compartment at the bottom rear right-hand corner (the switch compartment) containing the wiring connections and the motor switch. The BBC-designed slating unit 146 (Fig. 6.5) is mounted on the removable cover of this compartment, and a sheet-metal box 149 containing a small dry battery (Ever Ready Type PB3) is attached to the bottom edge of the cover so as to be closed by the underside of the switch compartment when the cover is in place. The battery supplies power for the slating unit; its connections are soldered. The slating unit is described in detail in Instruction F.2.

A red pilot-light 129 (Fig. 6.4) is mounted on the left-hand side of the blimp, and a spirit level 155 (Fig. 6.5) is provided to facilitate the levelling of the camera. The bottom of the blimp is faced with a flat aluminium plate having a central tapped hole to accept the inserting screw of a suitable tripod.

The power connection to the blimp is via the six-way male German-type connector 147 (Fig. 6.5) and the connection to the tape recorder is via the three-way male Cannon connector 145 Type XL-3-42. Inside the blimp, flexible leads are provided carrying (a) a three-way female German-type connector 132 to mate with a corresponding male connector 115 (Fig. 6.1) on the lead of the motor unit, (b) a three-way female Cannon connector 137 Type XLR-3-15 (Fig. 6.4) to mate with the connector 107 (Fig. 6.1) on the synchronising tone generator, and (c) a two-way male connector 136 (Fig. 6.4) to mate with the corresponding female connector 114 (Fig. 6.2) on the modified camera door.

*Electrical Connections*

The electrical connections of the system, when the governor-speed-controlled motor is fitted, are shown in Fig. 6.6. (This diagram corresponds to Fig. 7.2 in Instruction F.2.)

The output from the synchronising tone generator is connected to the tape recorder lead via pins 2 and 3 of the connectors PL2, SK3 and PL4; these connectors are 107 (Fig. 6.1), 137 (Fig. 6.4) and 145 (Fig. 6.5) respectively. A permanent internal connection is made from SK1 on the slating unit to pin 1 of PL4 to carry the output from the slating unit to the recorder, the circuit being completed via pins 3 of PL4, SK3 and PL2 and the frame of the equipment. Thus SK1 serves only as a wiring point, and the connection between pins 1 of SK3 and PL4 serves no purpose.

The supply to the motor is fed via SK8, PL7, the motor switch S2, SK10 and PL9; these connectors are that on the battery lead (not shown), 147 (Fig. 6.5), 132 (Fig. 6.4), and 115 (Fig. 6.1) respectively. S2 is 148 (Fig. 6.5). The resistor R7 in the motor unit is switched into and out of the field circuit of the motor by the centrifugal governor, to control the motor speed. R7 can be seen at 128 in Fig. 6.3. The capacitor C4 is inside the motor, at 127.

The red pilot-light and LP2 are connected in parallel to the double-throw switch S3, by which the lamps can be connected either to pins of PL7 and thence via straps in SK8 to the battery supply, or to the secondary winding of the transformer T1.

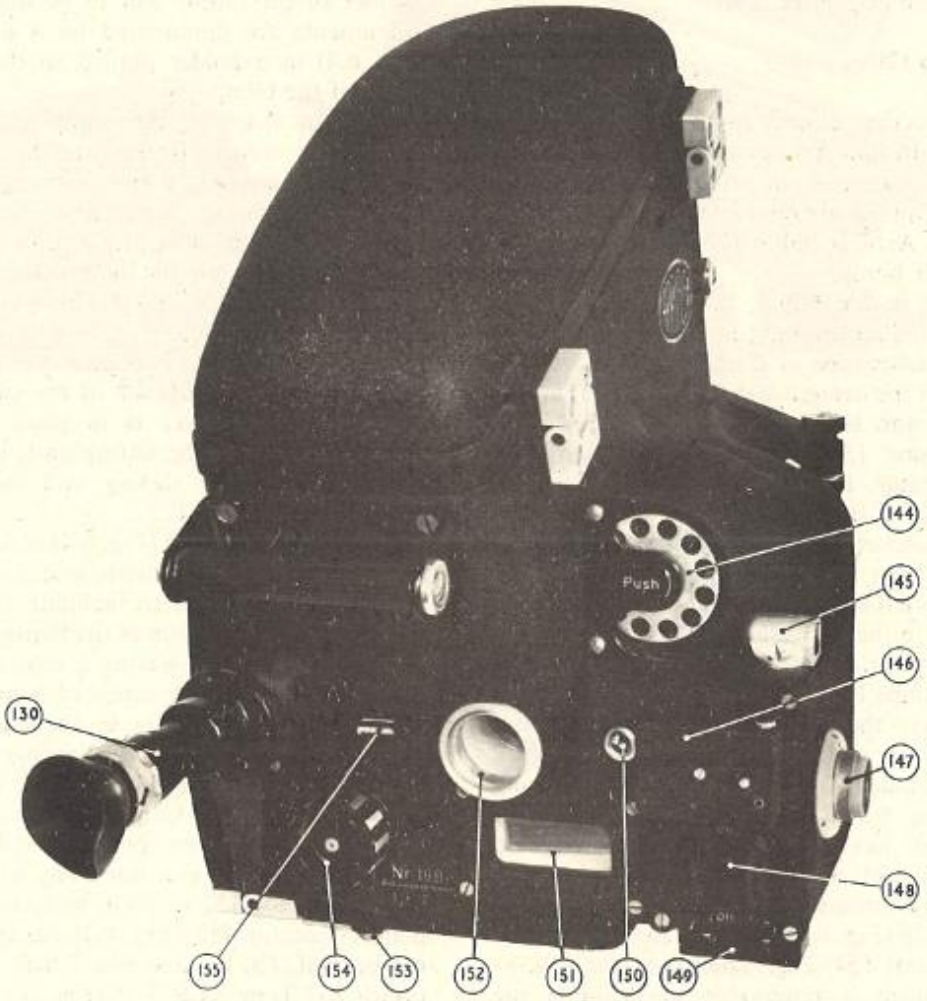



*Fig. 6.5. Blimp for 35-mm Arriflex Camera: Rear View*

When the battery-driven motor unit is employed, as shown in Fig. 6.6, the transformer is inoperative, as there is no a.c. source by which it could be energised, and the points in the circuit to which its primary winding is connected are commoned by straps in PL9 and SK8. Thus the setting of the switch connecting the pilot-lamps to T1 serves as an Off position. The active function of T1 is described below. The red pilot-light and LP2 are 129 and 131 respectively in Fig. 6.4. S3 is 150 in Fig. 6.5.

The film marking lamp is connected in series with the pilot-lamp LP1 in the slating unit via the two-way connectors PL5 and SK6, which are 136 (Fig. 6.4) and 114 (Fig. 6.2) respectively.

When the synchronous motor unit is employed, the circuit connections are as shown in Fig. 6.7, which is an amended version of the lower part of Fig. 6.6. The connectors SK8, PL9 in Fig. 6.7 are of similar types to those described above; SK8 terminates a special mains lead in which is suspended the phase-splitting unit, consisting of the capacitor C5 in a cylindrical container. This unit enables the three-phase motor to be run in the blimp from a single-phase mains supply. Tags 1 and 5 of SK8 are not connected, so that the setting of S3 connecting the pilot lamps to the battery supply in Fig. 6.6 is now the Off position of the switch. The primary winding of T1 is now connected across the capacitor C5 in the phase-splitting unit; when the motor is running, the potential difference across C5 provides a supply for the lamps. This supply is not available, however, when the motor is not running.

An alternative mains lead is provided to connect three-phase supply and earth leads to PL7.

The synchronous motor unit can be run from single-phase mains apart from the blimp, if desired, by means of the phase-splitting unit shown in Fig. 6.8. This unit consists of the capacitor C6 mounted in a housing as described on page 6.3, with a motor switch S4 and a three-way female German-type connector SK1 to accept PL9 of the motor unit. A flying lead X is provided so that an earth connection can be made to the motor unit, if it is considered neccessary.

A similar unit, containing only a three-pole motor switch and a connector similar to SK11, enables the motor to be run from a three-phase supply, without the blimp.

The pin numbering of the three- and six-way German-type connectors is indicated in Fig. 6.9 (see page 6.11) in which the connectors are represented as viewed from the rear or tagged end of the male connector.

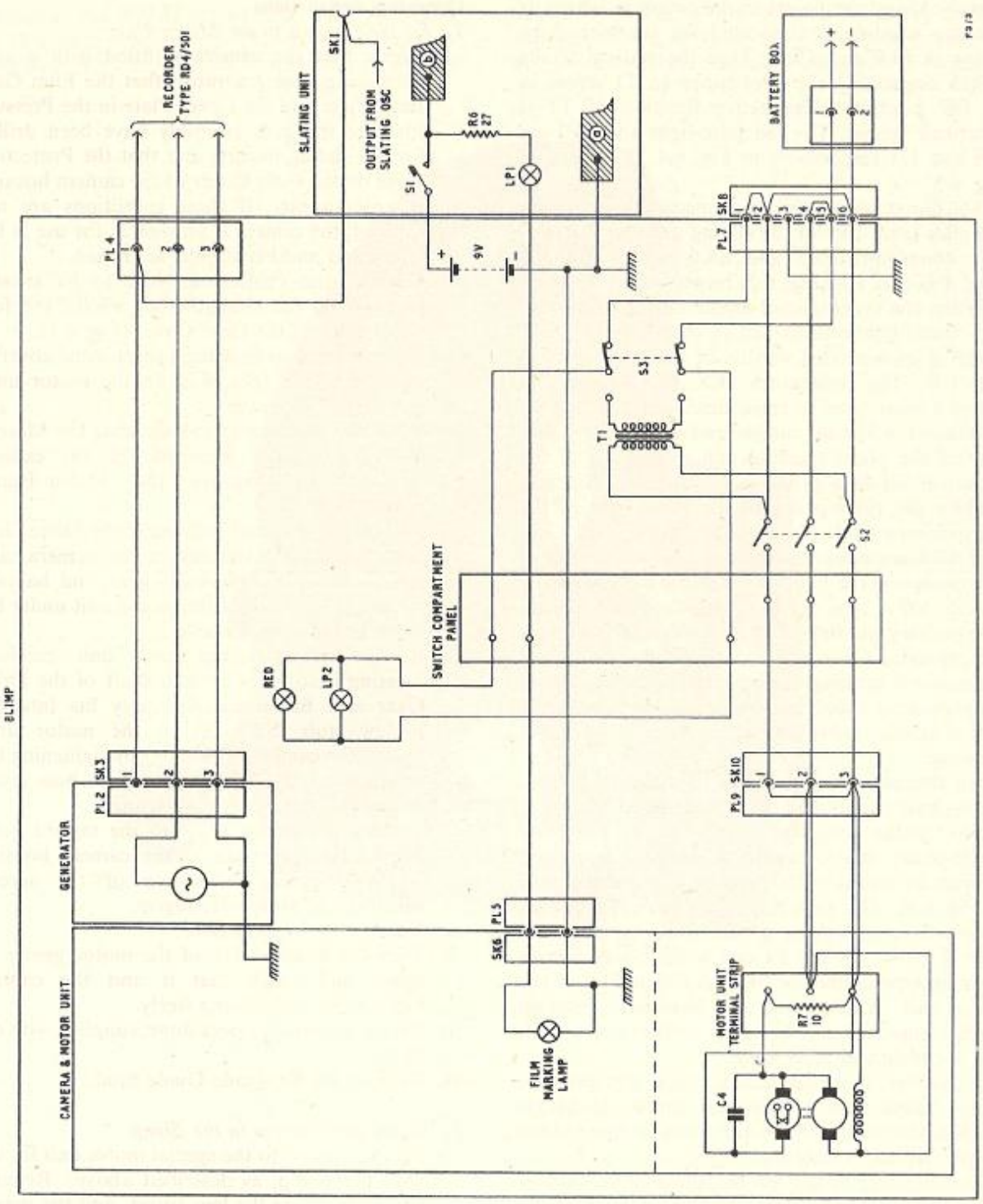
**Operating Instructions**

*To Fit the Camera to the Motor Unit*

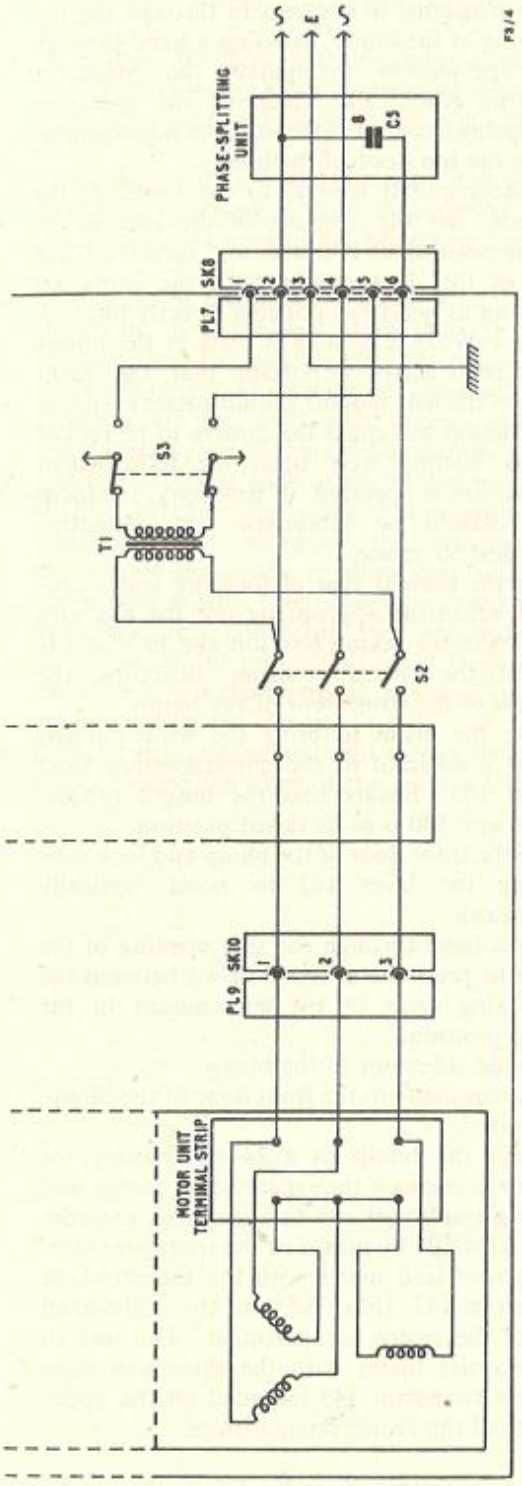
1. Check that the camera is fitted with a synchronising tone generator, that the Film Gate Back Plate and the Cover Plate in the Pressure Plate of the gate assembly have been drilled for the slating facility, and that the Protection Nose on the Gear Cover of the camera housing is unscrewable. If these conditions are not fulfilled, the camera is unsuitable for use in the blimp and another should be chosen.
2. Transfer the Protection Nose to its stowed position on the strengthening rib of the forward bulge of the Gear Cover (Fig. 6.1).
3. Remove the nuts securing a sheet-metal cover to the screws 122 (Fig. 6.2) on the motor unit, and lift off the cover.
4. Withdraw the four screws securing the Motor–Handgrip to the underside of the camera housing, and remove the Motor–Handgrip.
5. Pull off the gear and ballrace of the Drive Gear and Ball Race Assembly of the camera, and substitute the double-width gear and ballrace stowed in the base of the motor unit under the cover removed in 2 above.
6. Fit the camera to the motor unit, carefully locating it so that the stub shaft of the Drive Gear and Ball Race Assembly fits into the hollow stub shaft 121 in the motor unit. Secure the camera in position by tightening the inserting screw 118 into the tapped hole in the underside of the camera housing.
7. Tighten the screws 122 into the tapped holes 113 in the underside of the camera housing which originally held two of the screws securing the Motor–Handgrip.
8. Remove the camera door.
9. Turn the flywheel 110 of the motor gently by hand, and check that it and the camera mechanism are running freely.
10. Fit the modified camera door, supplied with the blimp.
11. Remove the Sunshade Guide Stud.

*To Mount the Camera in the Blimp*

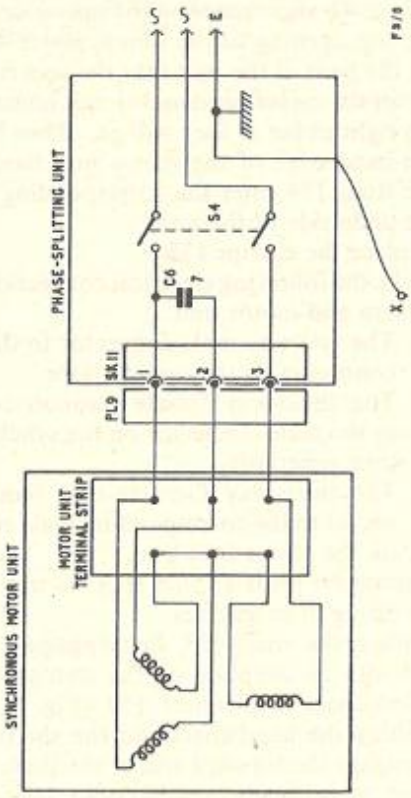
1. Fit the camera to the special motor unit for use with the blimp, as described above. Remove any lenses from the lens turret, and the magazine, if fitted.


RECORDER TYPE RD4/501
SLATING UNIT
SK1
OUTPUT FROM SLATING OSC
R6 27
S1
LP1
9V
BATTERY BOX
SK8
PL7
PL4
S3
T1
S2
SWITCH COMPARTMENT PANEL
RED
LP2
ELIMP
SK3
PL2
GENERATOR
PL3
SK6
FILM MARKING LAMP
PL9
SK10
MOTOR UNIT TERMINAL STRIP
R7 10
C4
CAMERA & MOTOR UNIT

6.8




Top: *Fig. 6.6. Electrical Circuits of Blimp and Sound System for 35-mm Arriflex Camera, using D.C. Governed Motor Unit*




Centre: *Fig. 6.7. Electrical Circuit of Blimp using Synchronous Motor Unit*

Bottom: *Fig. 6.8. Electrical Circuit of Phase-splitting Unit and Synchronous Motor Unit*

2. Open the front, top and side doors of the blimp. Remove the clamps 135 (Fig. 6.4) by unscrewing their knurled-headed screws.
3. Withdraw the screw 153 (Fig. 6.5) at the rear underside of the blimp. The slot in the head is sufficiently large to accept a small coin. Pull back the rear follow-focus handwheel 154 on its stub shaft (which has about half-an-inch freedom of longitudinal movement) to release the shaft 138 (Fig. 6.4), and lift out the shaft.
4. Dispose the three leads inside the blimp so that they do not obstruct the insertion of the camera.
5. Insert the camera and motor unit into the blimp through the side opening, at first keeping the camera well forward in order that the synchronising tone generator may clear the upper edge of the opening. Then lift the front of the camera slightly and press it towards the rear of the blimp, compressing the rubber edging of the opening to allow the Sunshade Fixing Stud 29 and the Support Arm 68 (Fig. 2.3) to pass through the widest part of the opening. Keeping the left-hand edge of the motor unit raised slightly to clear the studs 134 (Fig. 6.4), and observing the operation through the top opening of the blimp, insert the spigot on the base of the unit into the socket 133 and thrust the camera and motor unit home towards the right as far as they will go. Then lower the left-hand edge of the motor unit base so that the studs 134 enter the corresponding holes in the underside of the unit.
6. Replace the clamps 135.
7. Make the following electrical connections to the camera and motor unit:
   (a) The two-way male connector to the female connector on the camera door.
   (b) The three-way female Cannon connector to the male connector on the synchronising tone generator.
   (c) The three-way German-type female connector to the corresponding male connector on the motor unit lead.

   Dispose the leads so that they do not obstruct the fitting of magazines.
8. Replace the shaft 138, first engaging the rear end with its coupling on the stub shaft of the follow-focus handwheel 154 (Fig. 6.5), then pushing the handwheel and the shaft forward to engage the forward end of the shaft with the three screw-heads on the large gearwheel of the follow-focus mechanism.
9. Insert the screw 153 into its hole at the rear underside of the blimp, and tighten it.
10. Fit a magazine to the camera through the top opening of the blimp, inserting a hand through the opening to manipulate the Magazine Locking Knob, and observing the operation and lacing the camera through the side opening.
11. Close the top door of the blimp.
12. Fit the required lens(es) to the turret of the camera. Set the aperture of the lens in the taking position as required, and turn the focus ring of this lens mount until the grips are pointing as nearly as possible directly upward. NOTE:– When a camera is used in the blimp, it is particularly important that the focus rings of the lens mounts should rotate easily, as any friction will cause the camera to be rocked on its floating base when the follow-focus mechanism is operated. If necessary, the focus rings should be lubricated with Ragosine Molydest 50 grease.
13. From the tubular case of focusing scales provided, select the appropriate one for use with the lens in the taking position and fit it at 141 around the rotatable drum encircling the window of the front door of the blimp.
14. Rotate the drum to bring the white-painted dot on it adjacent to the corresponding fixed dot at 143. Ensure that the hinged rubber-tipped arm 140 is in its raised position.
15. Close the front door of the blimp and lock it by turning the lever 142 to point vertically downward.
16. Insert a hand through the side opening of the blimp to press the arm 140 down between the focus ring grips of the lens mount in the taking position.
17. Close the side door of the blimp.
18. Fit the sunshade to the front door of the blimp, if required.
19. Connect the blimp to a 24-volt battery (or to the a.c. mains if the synchronous motor unit is being employed) and to a magnetic recorder Type RD4/501 by means of the leads provided. The power lead mates with the German-type connector 147 (Fig. 6.5) in the right-hand wall of the switch compartment. The lead to the recorder mates with the three-way male Cannon connector 145 mounted on the upper surface of the switch compartment.

*To Remove the Camera from the Blimp*

1. Disconnect the power lead and that to the

magnetic recorder.

2. Open the front and side doors of the blimp.
3. Remove the lens(es) from the lens turret of the camera.
4. Withdraw the film marking-lamp connector from the camera door, remove the door and free the loop of film from the camera gate.
5. Open the top door of the blimp and remove the magazine, inserting a hand through the front aperture to manipulate the Magazine Locking Knob.
6. Withdraw the screw 153 (Fig. 6.5) from the rear underside of the blimp. Pull back the rear follow-focus handwheel 154 to release the shaft 138 (Fig. 6.4), and lift out the shaft.
7. Unscrew the knurled-headed screws securing the clamps 135, and remove the clamps.
8. Lift the left-hand edge of the motor unit base slightly to clear the studs 134 engaging its underside, and withdraw the camera and motor unit sufficiently to allow easy access to the synchronising tone generator connector. Withdraw this connector and uncouple the connectors in the motor unit lead. Dispose all the leads inside the blimp so as not to impede the removal of the camera.
9. Remove the camera and motor unit from the blimp, raising the front of the camera slightly, pressing it towards the rear of the blimp and compressing the rubber edging of the side opening to enable the Sunshade Fixing Stud and the Support Arm to pass through the widest part of the opening. When these projections are outside the blimp, move the camera forward slightly to permit the synchronising tone generator to clear the top of the opening.

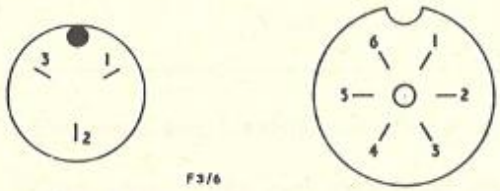



*Fig. 6.9. Pin Numbering of German-type Connectors*

10. Remove the focusing scale 141 from the rotatable drum on the front door of the blimp and stow it in the tubular case of scales provided.
11. Re-fit the shaft 138 in the blimp, and replace the screw 153. Refit the clamps 135. Close the doors of the blimp.

D.E.H. 4/60

# APPENDIX A

## PARTS LIST

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 01–1 | 1 | Camera housing | | Cast metal box, forming bulk of camera. |
| 01–2 | 1 | Gear cover | | Cast cover, fitting over right-hand side of 01–1, to form compartment containing camera drive mechanism. |
| 01–3 | 4 | Gear cover fixing screws | | Tapped into 01–1 through holes in 01–2. |
| 01–4 | 1 | Magazine fixing key plate | 24 | Mounted on upper front of 01–1, retains shaft for magazine release 01–6. |
| 01–5 | 2 | Countersunk screws for magazine key plate | | Tapped into 01–1 through holes in 01–4. |
| 01–6 | 1 | Shaft for magazine release | | Actuates magazine clamp plate 01–13. Works in bearing hole in 01–1, retained by 01–4. |
| 01–7 | 1 | Knurled knob for magazine release | 23 | Secured to 01–6 by fixing pin 01–8. |
| 01–8 | 1 | Fixing pin | | |
| 01–12 | 1 | Torsion spring | | Encircles 01–6, biases it to lock magazine in place. |
| 01–13 | 1 | Magazine clamp plate | 28 | Sliding latch in top of 01–1, actuated by 01–6 to lock magazine in place. |
| 01–14 | 1 | Countersunk screw for 0–13 | | Tapped into 01–13, engages with groove in 01–6. |
| 01–15 | 1 | Cover plate | | Partly covers 01–13. Secured to top of 01–1 by screws 01–16. |
| 01–16 | 2 | Countersunk screws for 01–15 | | Tapped into 01–1 through holes in 01–15. |
| 01–17 | 1 | Cover shield (outside) | 25 | Mounted on upper left-hand front of 01–1, covers gap between camera housing and sunshade. Secured by screws 01–18. |
| 01–18 | 2 | Cheese head screws for 01–17 | | Tapped into 01–1 through holes in 01–17. |

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 02–20 | 1 | Slide | | T-shaped component, working in recess on lower side of viewfinder receptacle on camera door, retained by cover plate 02–23. End of longitudinal limb bent to form actuating tab; transverse limb slotted to engage with wire clamps 02–21. |
| 02–21 | 2 | Wire clamps | | Wire shafts, supported in bearing holes in square-sectioned forward end of viewfinder receptacle on camera door. Carry viewfinder flaps 02–22 soldered to them. Ends bent to engage with slot in 02–20; rotatable through approximately 90° by movement of 02–20. |
| 02–22 | 2 | Viewfinder flaps | | Soldered to 02–21, form doors to close over forward end of viewfinder lens system when 02–20 is operated. |
| 02–23 | 1 | Cover plate | | Retains 02–20. Secured by screws 02–24. |
| 02–24 | 2 | Countersunk screws for 02–23 | | Tapped into 02–1 through holes in 02–23. |
| 03–1 | 1 | Turret casting, machined | | Lens turret |
| 03–3 | 1 | Turret centre stud | | Tapped into camera housing 01–1, forms stub shaft to carry 03–1. |
| 03–4 | 1 | Cheese head screw for 03–3 | | Tapped into forward end of 03–3, securing washer 03–5 which retains 03–1 in position on camera housing. |
| 03–5 | 1 | Washer for 03–3 | | |
| 03–6 | 1 | Turret bearing insert | | Brass ring, secured to camera housing by pins 03–7, providing bearing surface for edge of 03–1. |
| 03–7 | 2 | Fixing pins | | |
| 03–8 | 3 | Turret levers | 71 | Dovetailed into 03–1 and secured by screws 03–9. Form grips for rotation of turret. |
| 03–9 | 3 | Countersunk screws for 03–8 | | Tapped into 03–1 through holes in 03–8. |

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 03–10 | 3 | Lens mount keys | 82 | Angle brackets, secured to rear of 03–1 by screws 03–11, and projecting into lens mount receptacles to engage with keyways in cells of mounts. |
| 03–11 | 6 | Countersunk screws for 03–10 | | Tapped into 03–1 through holes in 03–10. |
| 03–12 | 3 pr. | Lens retaining latches | 70 | Pairs of arms, carried on rear ends of stub shafts of lens release latches 03–14, forming blades with bevelled edges engaging with grooves in focus rings of lens mounts. Drawn against mounts by tension springs 03–18. |
| 03–14 | 3 pr. | Lens release latches | 69 | Levers, on stub shafts working in bearing holes in 03–1. Rear ends of stub shafts shaped to fit barrel shaped holes in 03–12. |
| 03–16 | 6 | Hexagon nuts for 03–14 | | Secure 03–12 to 03–14. |
| 03–18 | 3 | Tension springs | 83 | Each acting between ends of a pair of 03–12 associated with one lens mount receptacle of 03–1, drawing them into engagement with the lens mount. |
| 03–19 | 3 | Turret indexing wheels | 81 | Carried on turret indexing plungers 03–20 in holes drilled radially in edge of 03–1. |
| 03–20 | 3 | Turret indexing plungers | | |
| 03–21 | 3 | Compression springs | | Acting between ends of 03–20 and bottoms of holes carrying them, thrusting 03–19 into notches in 03–6 to give three positive axial alignments of turret. |
| 04A–3 | 1 | Toggle switch | 48 | |
| 04A–13 | 1 | Press button | 53 | Working in hole in upper casting of motor housing, retained by and actuating press button switch 04A–14. |
| 04A–14 | 1 | Press button switch | | Pair of contacts, mounted on insulated block, actuated by 04A–13. Secured to casting of motor housing by screw 04A–15. |
| 04A–15 | 1 | Countersunk screw for 04A–14 | | |

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 04A–36 | 4 | Cheese head screws | | Tapped into bottom of camera housing through holes in motor housing. |
| 05–11 | 1 | Tachometer bevel gear | | Plexiglass bevel gear on shaft of tachometer 05–22. |
| 05–22 | 1 | Tachometer | 57 | Supported in tachometer clamp 05–23. |
| 05–23 | 1 | Tachometer clamp | 56 | Phosphor bronze strip, supporting 05–22. Secured to camera housing 01–1 by screws 05–24. |
| 05–24 | 2 | Cheese head screws for 05–23 | | Tapped into camera housing 01–1 through holes in 05–23. |
| 06–1 | 1 | Shutter bearing bracket with bearings and flanged shaft | 43 | Cast bracket, carrying shaft in ball races, with flanged bush to accommodate mirror shutter 06–18. |
| 06–2 | 4 | Cheese head screws for 06–1 | | Tapped into camera housing 01–1 through holes in bracket of 06–1. |
| 06–3 | 2 | Fixing pins | | Locate 06–1 on 01–1. |
| 06–12 | 1 | Brass spacing washer | | On shaft of 06–1, between shutter drive gear 06–13 and ball race. |
| 06–13 | 1 | Shutter drive gear | 45 | Fibre gear, secured to rear end of shaft of 06–1 by keyed washer 06–14 and screw 06–15. |
| 06–14 | 1 | Keyed washer | | Washer, with raised ridge engaging with grooves in face of 06–13 and in end of shaft of 06–1, giving positive drive. |
| 06–15 | 1 | Countersunk screw | | Tapped into end of shaft of 06–1, securing 06–12, 06–13 and 06–14 in position. |
| 06–16 | 1 | Plastic sleeve | | On screw 06–17, forms cushion between it and mirror shutter 06–18. |
| 06–17 | 1 | Shoulder screw | | Tapped into flange on shaft of 06–1, engages with hole in mirror shutter 06–18 to give positive drive. |
| 06–18 | 1 | Shutter glass only | 42 | Mirror shutter, of glass, surface silvered. |
| 06–19 | 1 | Shutter retaining screw | | Screw with large recessed head, tapped into end of shaft of 06–1, to retain 06–18. |

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 06–20 | 1 | Felt washer | | Between 06–18 and 06–19. |
| 08–27 | 1 | Clip | 74 | Retaining clip for assembly 12 (film gate). Secured to camera housing 01–1 by screws 08–28. |
| 08–28 | 2 | Cheese head screws | | Tapped into camera housing 01–1 through slotted holes in 08–27. |
| 08–29 | 1 | Upper film guide | | Loop-shaped skid of German silver, with strengthening wall at right-hand side, mounted forward and at top of camera housing interior. Secured at edge of magazine opening by two of screws 08–35, tapped into guide through holes in camera housing 01–1. Also retained by film loop indicator plate 08–33, which overlaps it. |
| 08–32 | 1 | Lower film guide | 19 | Skid of German silver, fitting around rear and bottom of camera housing interior. Secured at edges of magazine opening by two of screws 08–35, tapped into it through holes in camera housing 01–1, and at bottom of camera by a countersunk screw (not listed) tapped into 01–1 through a hole in the guide. |
| 08–33 | 1 | Film loop indicator plate | | Metal plate, printed with instructions for lacing camera, in interior of camera housing forward and high on right-hand wall. Secured by three rivets (not listed). |
| 08–35 | 4 | Countersunk screws | | Tapped into 08–29 and 08–32 through holes in camera housing 01–1 at edges of magazine opening. |
| 09–2 | 1 | Sunshade fixing stud | 29 | Tubular projection tapped into upper right-hand front region of camera housing 01–1, to accommodate sunshade and filter holder. |
| 09–3 | 1 | Sunshade guide stud | | Brass stud, tapped into support arm 09–22 to locate lower right-hand corner of sunshade and filter holder. |
| 09–4 | 1 | Sunshade and filter holder support casing | 72 | Circular casing, fitting over front of lens turret, with rectangular opening for sunshade. |

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 09–5 | 1 | Sunshade | | Rectangular funnel-shaped structure of sheet metal, riveted to cast frame at smaller end. Secured to 09–4 by screws 09–6. |
| 09–6 | 6 | Countersunk screws | | Tapped into cast frame of 09–5 through holes in 09–4. |
| 09–10 | 1 | Leaf spring | | Riveted inside slide receptacle of 09–5, on right-hand side. |
| 09–11 | 2 | Drive rivets | | Secure 09–10 in position. |
| 09–12 | 1 | Leaf spring with button | | Mounted on left-hand side of cast frame of 09–5. Shaped ends project over slot of slide receptacle to retain filter holders. |
| 09–13 | 2 | Cheese head screws | | Tapped into 09–5 through holes in 09–12. |
| 09–14 | 1 | Knurled clamp screw | | Tightens split tubular guide of 09–4 on to 09–2. |
| 09–19 | 3 | Drive rivets | | Secure hinge of slide receptacle top cover in slit in cast frame of 09–5. |
| 09–22 | 1 | Support arm | 68 | Bent metal strip, carrying 09–3, secured to front underside of gear cover 01–2 by screws 09–23. |
| 09–23 | 2 | Countersunk screws | | Tapped into gear cover 01–2 through holes in 09–22. |
| 09–24 | 2 | Hexagon nuts | | Inside gear cover 01–2, locknuts on screws 09–23. |
| 10–1 | 1 | Magazine casting, machined, for 200 ft film | | |
| 10–5 | 2 | Ball races | | One at each end of bearing housing (cast in 10–1) for take-up spool shaft. In some instances, supported in crimped metal foil insulation strips (not listed). |
| 10–5a | 2 | Plain bearings | | One at each end of bearing housing (cast in 10–1) for feed spool shaft. |
| 10–6 | 1 | Knurled film tensioning disk and shaft | 20<br>21 | Feed spool shaft; disk enables film tension to be checked manually, and acts as friction disk in conjunction with friction spring 10–82 and friction felt 10–83. |

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 10–7 | 2 | Spool holders, with driving key, tension spring and grub screw | 5 | Mounted on 10–6 and 10–12, inside magazine. Accommodate rolls of film on standard spool centres. |
| 10–12 | 1 | Knurled film tensioning disk with belt hub and shaft. | 20<br>21 | Take-up spool shaft; as 10–6, but with pulley for belt drive. |
| 10–16 | 1 | Ratchet spring for 10–12 | | Coil spring encircling and gripping shaft of 10–12, with one end anchored to 10–1 by screw 10–17. Permits rotation of shaft in one direction only. |
| 10–17 | 1 | Special screw M 3 × 3 | | Tapped into 10–1 to anchor one end of 10–16. |
| 10–19 | 1 | Belt tension pulley | 77 | Supplied as single unit. Tensioning arm 10–21 consists of two metal strips, one bent, secured together by rivet 10–23 and by pulley stud 10–20 which also carries loose pulley 10–19. Arm is pivoted on one of spacers 10–24. |
| 10–20 | 1 | Pulley stud | | |
| 10–21 | 1 | Tensioning arm | | |
| 10–23 | 1 | Rivet | | |
| 10–24 | 2 | Spacers | | Support footage indicator 10–27 on rivets 10–25. |
| 10–25 | 2 | Drive rivets | | Secure footage indicator 10–27 on spacers 10–24 to outer surface of 10–1. |
| 10–26 | 1 | Tension spring | | Wire spring, acting between bend in one member of 10–21 and notch in tension adjusting plate 10–28, to tension 10–19 against belt 10–48 driving take-up spool shaft. |
| 10–27 | 1 | Footage indicator | 79 | Metal plate, inscribed with footage calibration, secured to 10–1 on spacers 10–24 by rivets 10–25. |
| 10–28 | 1 | Tension adjusting plate | 78 | Metal strip, with upturned serrated edge, providing series of alternative anchoring points for one end of 10–26. Secured to 10–1 by one of rivets 10–25 securing footage indicator, and by rivet 10–29. |
| 10–29 | 1 | Drive rivet | | Secures one end of 10–28 to 10–1. |

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 10–33 | 1 | Bearing plate | 38 | Triangular plate, with brass bearing swaged on, for left-hand end of shaft 10–36. Secured to 10–1 by screws 10–35. |
| 10–35 | 2 | Countersunk screws | | Tapped into 10–1 through holes in 10–33. |
| 10–36 | 1 | Shaft | | Works in bearing plate 10–33 and corresponding bearing hole in 10–1. Carries indicator arm with bush 10–37, intermediate roller 10–41 and film tensioning arms 10–42. |
| 10–37 | 1 | Indicator arm with bush (10–38) | 22 | Supplied as single unit. 10–37 is pointer, with bush 10–38 swaged on. Secured to shaft 10–36 by pin 10–39, indicates footage on 10–27. |
| 10–39 | 1 | Fixing pin | | Secures 10–37 and 10–38 to 10–36. |
| 10–40 | 1 | Torsion spring | | Encircles 10–38, draws film tension indicator roller 10–45 against feed spool. Acts between hole in 10–38 and screw tapped into sprocket housing 10–64. |
| 10–41 | 1 | Intermediate roller | | Loose roller on shaft 10–36. |
| 10–42 | 2 | Film tensioning arms with bushes and nut | 7 | Arms carrying film tension indicator roller 10–45 on film tension roller shaft 10–46. Secured to shaft 10–36 by pins (not listed) through bushes and shaft. (*Note:* No nut employed but washer on 10–36 between right-hand bush of 10–42 and wall of 10–1.) |
| 10–45 | 1 | Film tension indicator roller | 6 | Carried on film tension roller shaft 10–46 by 10–42. Sprung against feed spool. |
| 10–46 | 1 | Film tension roller shaft with hexagon nut | | Bridges free ends of 10–42, carries 10–45. |
| 10–48 | 1 | Endless cotton belt | 76 | Conveys drive from pulley 10–72 to take-up spool shaft 10–12. |
| 10–49 | 1 | Magazine mechanism cover | | Cast metal cover, fitting over mechanism on right-hand side of magazine. Secured by screws 10–50. |
| 10–50 | 2 | Countersunk screws for 10–49 | | Tapped into 10–1 through holes in 10–49. |

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 10–51 | 1 | Magazine door, machined, with two catches | 8 | Casting forming removable left-hand side of magazine, with two catches 10–52. |
| 10–52 | 2 | Catches with rivet only | 26 | Lugs riveted close to lower edge of 10–51, engaging with grooves in 10–1. |
| 10–53 | 2 | Rivets | | Secure catches 10–52 to 10–51. |
| 10–55 | 1 | Magazine latch | 4 | Winged knob, with integral stub shaft, working in bearing hole in 10–51 to actuate latch clip 10–56. |
| 10–56 | 1 | Latch clip | | Clip secured to stub shaft of 10–55 by screw (not listed) tapped into 10–55. Has barrel-shaped hole fitting correspondingly shaped end of stub shaft. Rotatable to engage with groove in wall of 10–1. |
| 10–58 | 1 | Stop pin | | Pin projecting from inner surface of 10–51 close to bearing hole for 10–55. In conjunction with cut-out area in 10–56, limits rotation of 10–55. |
| 10–64 | 1 | Sprocket housing | 27 | Machined component forming joint between magazine and camera housing. Accommodates sprockets 10–70 on shafts 10–69, 10–69a, in bearings 10–66, 10–68, 10–74. Located on 10–1 by pins and secured by screws 10–65. |
| 10–65 | 4 | Cheese head screws | | Tapped into 10–1 through holes in 10–64. |
| 10–66 | 1 | Sprocket bearing | | Housing for ball races 10–68, with flange for securing to 10–64 by three of screws 10–67. |
| 10–67 | 6 | Countersunk screws | | Tapped into sprocket bearings 10–66 and 10–74 through holes in 10–64. |
| 10–68 | 2 | Ball races | | Supported in corrugated strips 10–87 in sprocket bearing 10–66. |
| 10–69 | 1 | Sprocket shaft, with notch | | Accommodated in 10–64, to rear of 10–41. Carries one of gears 10–71 and belt pulley 10–72 attached by one of pins 10–86 at bottom of groove of 10–72. Has notch to receive tip of grubscrew of one of sprockets 10–70. |

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 10–69a | 1 | Sprocket shaft, turned | | Accommodated in 10–64, forward of 10–41. Carries one of gears 10–71, attached by one of pins 10–86. Has short length turned to smaller diameter to minimise friction in plain bearing 10–74, and notch to receive grubscrew of one of sprockets 10–70. |
| 10–70 | 2 | Sprockets | | In 10–64, secured to 10–69 and 10–69a by grubscrews. |
| 10–71 | 2 | Gears | 37<br>41 | Fibre gears, pinned to 10–69 and 10–69a by two of pins 10–86. Both driven by gear 10–76. |
| 10–72 | 1 | Belt pulley | | Pinned to 10–69, with one of gears 10–71. |
| 10–74 | 1 | Sprocket bearing | | Plain bearing for 10–69a, with flange for securing to 10–64 by three of screws 10–67. |
| 10–75 | 1 | Collar | | Brass collar, on 10–69, spacing gear 10–71 (one of two) from right-hand end of ball-race in 10–66. |
| 10–75a | 1 | Collar for plain bearing | | Brass collar, on 10–69a, spacing gear 10–71 (one of two) from right-hand end of 10–74. |
| 10–76 | 1 | Gear | 39 | Metal gear, loose on screw 10–78. Meshes with both of gears 10–71 and with gear 13–2 of camera mechanism, to convey drive from camera mechanism to sprocket shafts 10–69 and 10–69a. |
| 10–78 | 1 | Bearing screw | | For 10–76. Has central bore, transverse hole and reduced-diameter section for lubrication. Tapped into 10–64. |
| 10–79 | 1 | Cover plate | | L-sectioned plate, fitting over bottom and left-hand side of 10–64. Secured by one countersunk screw (not listed) and two cheese head screws 10–81. |
| 10–80 | 1 | Angle plate | | Secured by screws 10–81, with 10–79. Forms ridge along right-hand side of 10–79. In some instances, integral with 10–79. |
| 10–81 | 2 | Cheese head screws | | Tapped into 10–64 through holes in 10–79 and 10–80. |

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 10–82 | 1 | Friction spring | | Leaf spring, carrying friction felt 10–83. Secured to 10–1 by screws 10–85. |
| 10–83 | 1 | Friction felt | | Felt pad, secured to end of 10–82 by rivet 10–84. Presses on left-hand side of knurled film tensioning disk 10–6. |
| 10–84 | 1 | Rivet | | Secures 10–83 to 10–82. |
| 10–85 | 2 | Cheese head screws | | Tapped into 10–1 through holes in 10–82. |
| 10–86 | 6 | Drive Pins | | Locate 10–64 on 10–1 (two); secure 10–42 to 10–36 (two); secure 10–71 to 10–69 and 10–69a (one each). |
| 10–87 | 2 | Corrugated strips (anti-freeze) | | Insulation strips, supporting 10–68 in 10–66. |
| 11–1 | 1 | Magazine casting, machined, for 400 ft film | | |
| 11–25 | 1 | Footage indicator plate | | Metal plate, inscribed with footage calibration, secured to 11–1 on spacers 10–24 by rivets 10–25. |
| 11–31 | 1 | Bearing plate with bush (11–32) and 4 countersunk screws | | Triangular plate, with brass bearing swaged on, for left-hand end of shaft 11–35. Secured to 11–1 by screws. |
| 11–35 | 1 | Indicator shaft | | Works in bearing plate 11–31 and corresponding bearing hole in 11–1. Carries indicator 11–36, intermediate roller 11–40 and film tension arms 11–41. |
| 11–36 | 1 | Indicator with bush (11–37) | | Supplied as single unit. 11–36 is pointer, with bush 11–37 swaged on. Secured to shaft 11–35 by pin 10–39, indicates footage on 11–25. |
| 11–40 | 1 | Intermediate roller | | Loose roller on shaft 11–35. |
| 11–41 | 2 | Film tension arms with bushes and pins | | Arms carrying film tension roller and shaft 11–44. Secured to shaft 11–35 by pins through bushes and shaft. |
| 11–44 | 1 | Film tension roller with shaft and hexagon nut | | Shaft bridges free ends of 11–41, carries roller. Sprung against feed spool. |

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 11–47 | 1 | Endless cotton belt | | Conveys drive from pulley 10–72 to take-up spool shaft 10–12. |
| 11–48 | 1 | Magazine mechanism cover | | Cast metal cover, fitting over mechanism on right-hand side of magazine. Secured by screws 10–50. |
| 11–50 | 1 | Magazine door, machined, with two catches | | Casting forming removable left-hand side of magazine, with two catches 11–51. |
| 11–51 | 2 | Catch with rivet only | | Lugs riveted close to lower edge of 11–50, engaging with grooves in 11–1. |
| 12–1 | 1 | Film gate back plate | 10 | Steel plate, supported on hinges made up of parts Nos. 12–2 to 12–7, to form door carrying pressure plate 12–10. |
| 12–2 | 2 | Hinges | | Bars secured to 12–1 by screws 12–21, slotted and drilled at right-hand ends to accommodate hinge arms 12–3 and two of hinge pins 12–4. Recessed to receive heads of screws 12–9, projecting through 12–1. |
| 12–3 | 2 | Hinge arms | | Steel links, drilled at each end for coupling by hinge pins 12–4 to 12–2 and film guides 12–6 and 12–7. |
| 12–4 | 4 | Hinge pins | | Grooved at tips to receive retaining pins 12–5. |
| 12–5 | 4 | Retaining pins | | Small spring clips held in grooves near the tips of 12–4. |
| 12–6 | 1 | Lower film guide | | Steel bar, forming guide for right-hand edge of film below level of aperture of gate. Secured to aperture plate 12–15 by one each of screws 12–17, 12–24. Has projection, slotted and drilled to accommodate one each of 12–3 and 12–4. |
| 12–7 | 1 | Upper film guide | | As 12–6, but shorter, above level of aperture of gate. |
| 12–8 | 4 | Pressure spring for gate side tension | | Compression springs, encircling screws 12–9, between 12–1 and pressure plate 12–10. *N.B.* Nomenclature is misleading. |

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 12–9 | 4 | Screws for pressure plate | | Shoulder screws, tapped into bushes swaged into 12–10, passing loosely through holes in 12–1. Encircled by springs 12–8. |
| 12–10 | 1 | Pressure plate | 13 | Pressed steel plate, with raised, polished areas to minimise scratching of film. Resiliently mounted on 12–1 by means of springs 12–8 and screws 12–9. |
| 12–11 | 1 | Cover plate | | Fills cut-out area of 12–10 corresponding to aperture of gate. Secured by screws 12–13 and nuts 12–12. |
| 12–12 | 2 | Nuts for 12–11 | | On screws 12–13. |
| 12–13 | 2 | Countersunk screws for 12–12 | | Through holes in 12–10 and 12–11, secured by nuts 12–12. |
| 12–14 | 8 | Countersunk screws and nuts for 12–20 | | 4 each nuts and screws. Secure side tension lock rail 12–20 to left-hand edge of aperture plate 12–15. |
| 12–15 | 1 | Aperture plate | 18 | Pressed steel plate, pierced with aperture of gate, and with raised, polished areas corresponding to those on 12–10. Carries all other parts of assembly 12 as single unit. |
| 12–16 | 1 | Gate cover | | Casting shaped to fill space between 12–15 and mirror shutter. Secured in position in front of 12–15 by screws 12–17. |
| 12–17 | 2 | Countersunk screws for 12–16 | | Tapped into 12–6 and 12–7 through holes in 12–16 and 12–15. |
| 12–18 | 2 | Leaf springs | | Retain right-hand side of assembly 12 in camera housing by engagement with rim cast in housing. Secured to 12–16 by screws 12–19. |
| 12–19 | 2 | Screws for 12–18 | | Tapped into 12–16 through holes in 12–18. |
| 12–20 | 1 | Side tension lock rail | 17 | Steel strip, with cut-out to fit around ground glass holder 02–13, recessed to accommodate locking spring 12–25 and ends of side tension rail 12–22. Secured to left-hand edge of 12–15 by screws and nuts 12–14. |
| 12–21 | 4 | Screws for hinges | | Tapped into 12–1 through holes in 12–2. |

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 12–22 | 1 | Side tension rail | 15 | Steel strip, floating on pins (not listed) between left-hand edge of 12–15 and 12–20, drawn against left-hand edge of film by springs 12–23. |
| 12–23 | 2 | Side tension springs | | Act between pins in front surface of 12–15 and ends of 12–22. |
| 12–24 | 2 | Screws for film guide | | One tapped into each of 12–6 and 12–7 through holes in 12–15. |
| 12–25 | 1 | Locking spring | 9 | Spring catch holding 12–1 closed against 12–15. Secured to 12–20 by screws 12–26. |
| 12–26 | 2 | Screws for 12–25 | | Tapped into 12–20 through holes in 12–25. |
| 13–1 | 1 | Vertical drive assembly, complete | | Comprising parts Nos. 13–4 to 13–15. |
| 13–2 | 1 | Compound gear for magazine drive, complete | 60 | Fibre gear, clamped between brass pinion and circular plate by three screws tapped into the pinion, with flanged retaining pin fitting into hole in upper right-hand region of camera housing 01–1, located by pins and secured by three screws (not listed) tapped into flange through holes in 01–1. Gear is driven by gear on claw shaft 15–3; pinion drives gear in magazine. |
| 13–3 | 1 | Drive gear and ball race assembly | | Fibre gear, on ballrace, mounted on stub shaft carried by small plate secured to underside of camera housing 01–1 by two screws (not listed) tapped into housing through holes in plate; located by pins. Meshes with motor pinion and with gear 13–14 to convey drive from motor to vertical shaft 13–5. |
| 13–4 | 1 | Drive housing | 46 | Housing for vertical shaft 13–5 and associated components. Secured to camera housing 01–1 by four screws (not listed) tapped into 01–1 through holes in 13–4. |
| 13–5 | 1 | Vertical shaft with gear | | Shaft, with integral worm gear. |
| 13–6 | 1 | Ball race | | Supports upper end of 13–5 in 13–4. |

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 13–7 | 1 | Circlip retainer | | Retains 13–6 and ballrace cover 13–8 in cavity at upper end of 13–4. |
| 13–8 | 1 | Ball race cover | | Circular brass cover on top of 13–6. |
| 13–9 | 1 | Bevel gear for tachometer | | On 13–5; located by step in cross-section of shaft. Secured by grubscrew, accessible through hole in 13–4. |
| 13–10 | 1 | Thrust washer | | Brass washer between step in cross-section of 13–5 and inner member of lower ballrace 13–11. Selected for thickness to give accurate fitting. |
| 13–11 | 1 | Ball race | | Supports lower end of 13–5 in 13–4. |
| 13–12 | 1 | Circlip retainer | | Retains 13–11 in cavity at lower end of 13–5. |
| 13–13 | 1 | Reinforcing clip | | Brass spacer, with raised central area to bear on inner member of 13–11. Locates gear 13–14. |
| 13–14 | 1 | Gear with rubber flexible coupling | 47 | Brass gear, loose on bush of coupling 13–15, with rubber studs set into lower face to engage with cavities in 13–15. Located by 13–13 and 13–15. |
| 13–15 | 1 | Coupling for 13–14 | | Bush, with flange containing cavities to receive rubber studs set in 13–14. Secured to 13–5 by two grubscrews. |
| 14–1 | 1 | Double cam | 98 | Perforated circular plate, mounted on left-hand end of claw shaft 15–3, with groove machined in right-hand face to actuate link with guiding trunnion 14–5. |
| 14–2 | 1 | Triangular plate | 93 | Mounted (with cover 14–3) on left-hand face of 14–1. Forms cam to actuate claw arm 14–18. Located by pins 14–8, secured by screws 14–9. |
| 14–3 | 1 | Cover for above | | Perforated triangular plate; slightly larger than 14–2, mounted with it on left-hand face of 14–1 to form flange retaining inner edges of claw arm 14–18 on 14–2. |
| 14–4 | 1 | Screw for 14–5 | 96 | Tapped into bush at rear end of link 14–5 to form pivot for claw arm 14–18. |

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 14–5 | 1 | Link with guiding trunnion | 95 | Pierced strip, with roller 14–6 mounted at forward end to ride in groove of 14–1, and tapped bush at rear end to receive 14–4. Works longitudinally in groove in wall of camera housing 01–1; wide section at forward end located by guide block 14–14, rear end located by guiding trunnion 14–10. Retained by guide block 14–14 and retaining clip 14–15. |
| 14–6 | 1 | Guiding roller for link 14–5 | 97 | On pin at forward end of 14–5. Retained by presence of 14–1. |
| 14–7 | 3 | Screws for 14–1 | | Tapped into flanged left-hand end of claw shaft 15–3 through holes in 14–1. |
| 14–8 | 2 | Pins for 14–2 | | Locate 14–2 on 14–1. |
| 14–9 | 3 | Screws for 14–3 | | Tapped into 14–1 through holes in 14–2 and 14–3. One shorter than others so as not to project into groove of 14–1. |
| 14–10 | 1 | Guiding trunnion | | Flanged bush, secured in hole through right-hand wall of camera housing 01–1, with flange outside housing and square-sectioned end of bush projecting through wall to carry 14–5. Located by pin 14–13, secured by screws 14–12. |
| 14–11 | 1 | Screw for 14–10 | | Large-headed screw, tapped into left-hand end of 14–10 to retain 14–5. |
| 14–12 | 3 | Screws for 14–10 | | Tapped into wall of camera housing 01–1 through holes in flange of 14–10. |
| 14–13 | 1 | Pin for 14–10 | | Locates 14–10 on wall of camera housing 01–1. |
| 14–14 | 1 | Guide block for link 14–5 | | Brass block, beneath retaining clip 14–15, with projection fitting into pierced aperture 14–5. Contains felt insert for lubrication. |
| 14–15 | 1 | Retaining clip | | Secured to wall of camera housing 01–1, together with guide block 14–5, by screws 14–16. Contains oiling holes and tapped hole to receive retaining screw (not listed) of gear cover 14–20. |

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 14–16 | 2 | Screws for 14–15 | | Countersunk screws, tapped into wall of camera housing 01–1 through holes in 14–14 and 14–15. |
| 14–17 | 1 | Guide blade | | Thin blade of steel, recessed into forward end of groove carrying 14–5. |
| 14–18 | 1 | Claw arm with claw pin holder | 94 | Fibre arm, pivoted at rear to bush on 14–5, with cast metal socket riveted on to accommodate claw pin 14–19. Forward end retained on 14–2 by 14–3. |
| 14–19 | 1 | Claw pin | 100 | Removable steel transport claw, secured in socket of 14–18 by transverse pin (not listed). |
| 14–20 | 1 | Gear cover | 14 | Pressed steel cover over rear end of 14–5 and 14–18, retained by screw (not listed) tapped into 14–15. |
| 15–1 | 1 | Claw bearing assembly, complete | | Comprising parts Nos. 15–3 to 15–11. |
| 15–2 | 3 | Screws for 15–1 | | Set of dissimilar screws, tapped into wall of camera housing 01–1 through flange of bearing housing 15–6. One with bevelled head to avoid fouling bush of tachometer bevel gear 05–11; one short to avoid projecting into groove carrying link 14–5. |
| 15–3 | 1 | Claw shaft with gear | 58 | Has integral gear (driven by worm gear on vertical shaft 13–5), groove for rollers 15–4 and flange to carry double cam, triangular plate and cover 14–1 to 14–3. |
| 15–4 | 15 | Rollers for 15–3 | | Form roller bearing for left-hand end of 15–3, in conjunction with groove in 15–3 and roller race 15–5. |
| 15–5 | 1 | Roller race | | Flanged bush, fitting into recess in left-hand end of bearing housing 15–6, to form outer member of roller bearing. |
| 15–6 | 1 | Bearing housing | | Tubular housing, with recesses at ends for 15–5 and ball race 15–7, flange for attachment to camera housing 01–1 and apertures to allow gear on 15–3 to mesh with that on vertical shaft 13–5 and with compound gear 13–2. |

| *Maker's Part No.* | *Quantity* | *Maker's Nomenclature* | *Ref. in Figs.* | *Notes* |
|---|---|---|---|---|
| 15–7 | 1 | Ball race 5 × 16 | | Supports right-hand end of 15–3. |
| 15–8 | 1 | Ball race dust cover | | Brass washer, covering right-hand side of 15–7. |
| 15–9 | 1 | Circlip retainer | | Secures 15–7 and 15–8 in position in 15–6. |
| 15–10 | 1 | Knurled knob | | Inching knob, mounted on right-hand end of 15–3 which projects through hole in gear cover 01–2. |
| 15–11 | 1 | Screw | | Grubscrew for 15–10. Has short, threaded length adjacent to head, and long, plain shank acting as pin through 15–3 and bush of 15–10. |

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