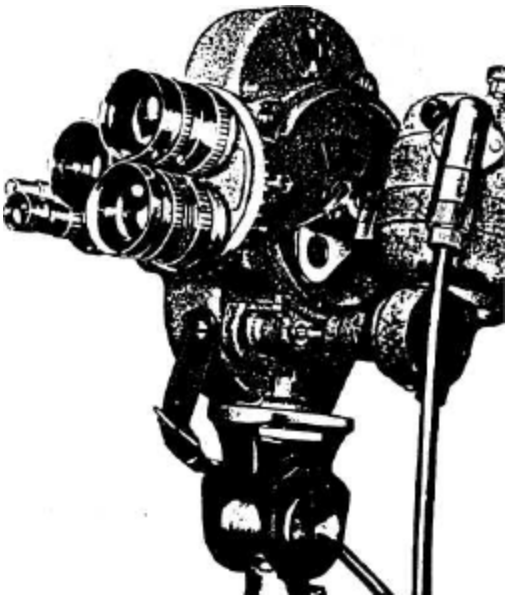
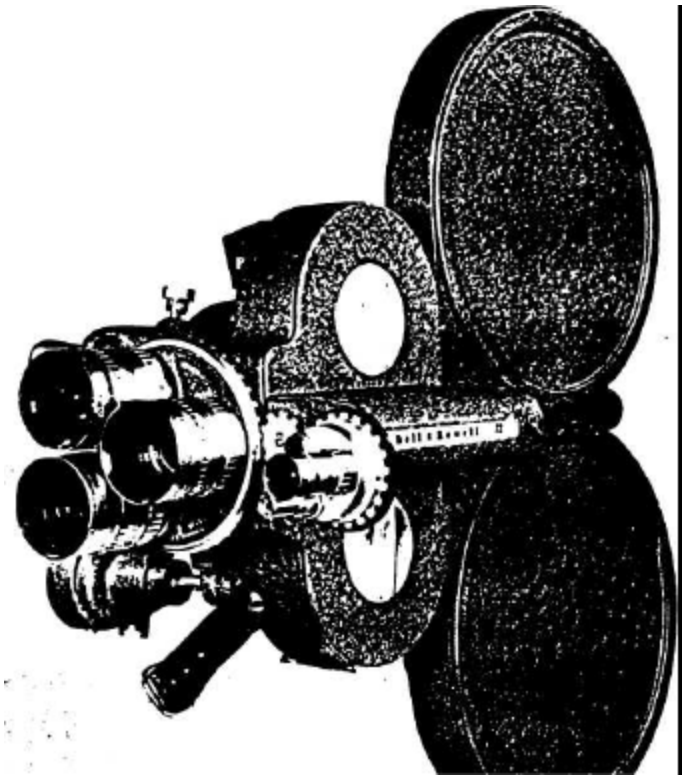
MSTRUCT IONS

MODEL 7ODR CAMERA



MODEL 7OTMR CAMERA



DESIGN 70

FACTORY SERVICE ADDRESSES

PRODUCT ONLY

CHICAGO

Kowell Photo Sales Co.
Service Department
sst Howard Street
m, niinois 60202
xie: 312-673-3300

NEW YORK

Bell & Howell Photo Sales Co.
General Service Department
200 Smith Street
E.Farmingdale, L.I., New York 11735
Area Code: 516-293-8910

GLENDALI

Bell & Howell Photo
General Service Dep
623 Rodier Drive
Glendale, California
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PARTS ORDERS AND SERVICE INFORMATION

Bell & Howell Photo Sales Co.
General Service Department 7100
McCormick Road Chicago, Illinois
60645 Area Code: 312-673-3300

CTIONS

:anual has been prepared to aid the \ repair and adjustment of Bell & Filmo" Motion Picture Cameras, -HR and 70-TMR. These instruc-it production models bearing serial nd higher. When repairing earlier refer to Service Manual Part No. :il 1959).

sra models covered in this Service r in appearance and design. All are eras with a 100-foot film capacity iven with a 19-foot film run on one three-lens turret is gear-coupled sitive-viewfinder turret and magni- ¦ lens focusing is provided. Major s are as follows:

and 70-TMR are adapted for addi- motor. The 70-DR must be facto ry- c motor drive is desired.

ameras have seven speeds. How- id 70-HR are calibrated in frames- ing from 8 fps to G4 fps, whereas brated in the decimal system, from s-per-minute, and is indexed to in- nd 24 fps speeds.

is adapted to accept a 400-foot film DR and 70-TMR are not.

Parts Catalog is included at the rear mal to identify replacement parts of parts in the exploded view illustra- in a suggested order of disassemble as an aid to the serviceman dur- 's.

CNANCE PRECAUTIONS.

5, the removal and installation of •ts can be accomplished with tools ie in all photo repair shops (re- >, assorted screwdrivers and socket weezers and so on). Special tools and test equipment required are listed in the Specia Tools List at the end of this section.

NOTE

BEFORE ATTEMPTING CAMERA REPAIRS

(1) Check camera operation by performing the pre-disassembly inspection procedures out lined in paragraph 1.

(2) Refer to Troubleshooting Chart for probable causes and recommended remedies involving customer complaints.

When repairing equipment, be sure that the wor table surface is clean. As parts are removed, groi them in an orderly fashion to avoid confusion durir reassembly. Clean dirt and old lubricant from par[1] (except electrical components and lenses) with a goc cleaning solvent. Hardened film emulsion can be r(moved from the aperture plate by using alcohol and sharpened orange stick. Do not use a knife, or oth(metal tool, to scrape away film emulsion.

During reassembly procedure, be sure to perfor lubrication procedures noted in the instructions. I not over-lubricate any part. Lubricant must be a] plied sparingly and special precautions must 1 taken to avoid getting oil and grease on optical el< ments (filters, lenses, etc.). Except where specif cally noted, be sure to use only Bell & Howell grea: (part no. 70468) and Bell & Howell oil (part no. 0896'

CAUTION: Follow the disassembly and reassemt instructions closely when removing and installing t main drive spring. Wear gloves to prevent cuts wh handling the spring during cleaning operations.

After the camera has been repaired and adjuste perform the inspections and test procedures outlin in the Final Test section to insure satisfacto operation.

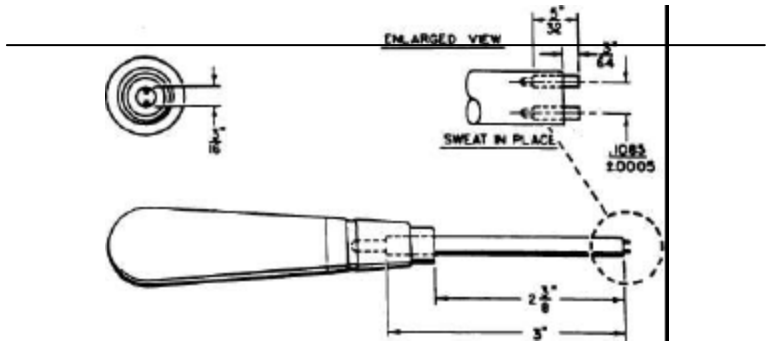


Figure A. S-8681-F1 Mechanism Pin Wrench

SPECIAL TOOLS LIST

3OLNO.	TOOL NAME	USE	FI
!43(F1-F11)	Spring winding fixture	Removing and installing drive spring	
72-Nl	Shuttle tooth gage	Checking shuttle teeth clearance	
63-N2	Front plate gage fixture	Aligning aperture opening	
18-F2	Hand crank	Used with spring winding fixture	
I94-F3	Spring gaging fixture	Adjusting the governor	
I94-F4	Spring gaging fixture	Adjusting the governor	
181-F1	Mechanism pin wrench	Adjusting feed spindle tension	

PECTION PRIOR TO DISASSEMBLY.

GENERAL INSPECTION. Load the camera tposed film. With the camera door removed, tie spring motor to capacity and lock the start-tton in place. Check the course of the film to certain that sprocket teeth are releasing the

b. CHECKING CAMERA RUNNING fore disassembling the camera, it is check the camera running speeds to detei or not the governor needs adjustment or In many cases, should it be found thatsp or fast, the replacement and remarkini dial may be all that is necessary. Wii

aid be recalibrated after the camera bled. (Refer to paragraph 22.)

of tions	No. of Seconds	Tolerances Fast	Slow
	75	6 sec	3 sec
	60	6 sec	3 sec
	45	5 sec	3 sec
	30	3 sec	2 sec
	26	3 sec	2 sec
	15	2 sec	2 sec
	13	2 sec	2 sec

NOTE

ite method for checking the run- to count the shutter revolutions scope, if such an instrument is e the following chart as a guide.

Shutter rom	Tolerances (~ or -)
480	10%
720	
960	
1440	10%
1920	10%
2880	10%
3480	

>T. Make a photo test with approxi- our feet of film. Examine this test s in order to check the camera lens nds of the film to make a loop and - ojector to check the steadiness and Df the image. Examine the film for

SEMBLY INSTRUCTIONS.

>embly of camera is not to include g mechanism from camera frame, vs: Allow camera to run down by button, until it stops at end of run.)ly instructions from paragraph 2

mechanism plate is to be removed *I* back mechanism plate or drive iare the camera as follows: Press utton and allow camera to run to end I idler grear in

(3) If camera is to be completely disassemble* first prepare the camera as follows: Wind sprir motor to capacity, remove camera cover and si camera at slowest speed. Press camera startir button, and allow camera to run until the first lor tooth of idler gear is completely visible in the ge£ opening. While holding idler gear in depressed pos: tion with screwdriver, allow camera to run until tl shallow space between drive gear teeth is visible the opening. Release the idler gear so that the fir: long tooth is engaged in this shallow space. Pres camera starting button to make certain that mecte nism is locked (does not run). Then proceed wi disassembly of camera.

2. WINDING KEY. (See Figure 1.)

a. Pry the winding key from its socket with screwdriver or simihar tool.

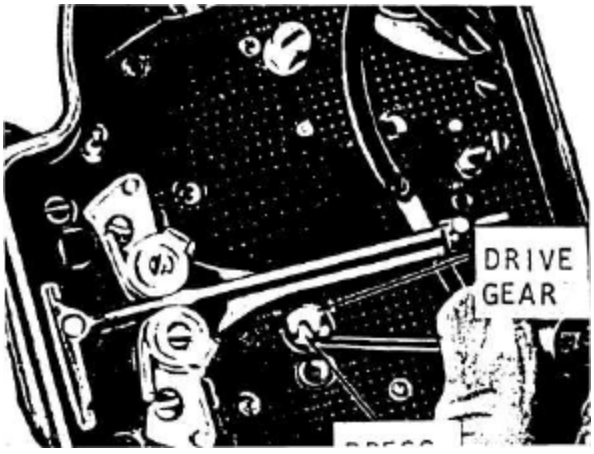
b. Drive out the pin (1) with a drift punch, and re move the ratchet (2) from the spring shaft.

c. Pry the retaining ring (3) from the groove the key body. Remove the retaining collar (4) ar slide off the friction clip (5), clamp spring (6) ai handle plate (7).

d. Pull on the end of the spring shaft to comprei the spring, and press out the uncoupling bar (8). Th< tap lightly on the end of the spring shaft (9) until tl plug (10), spring shaft and spring (11) come out of tl key body (12).

3. HAND CRANK. (See Figure 2.)

a. Remove the hand crank dial locking spring (and pull the dial (2) from the crank stem. Be caref not to lose the two steel balls (3) and the compre! sion spring (4).



ake out the fillister head screw (5) and remove lk handle (6) from the hand crank assembly (7).

[ERA COVER ASSEMBLY. (See Figure 3.)

emove the four screws (3) which secure the ler assembly (2) to the camera cover (34). Design 70-HR camera only, the viewfinder is rom the cover by means of a spacer (19), and : gear (19C) is required to couple the view - urret (8) to the lens turret.

inscrew the eyepiece mount (4) from the rear /iewfinder tube housing (18). Loosen the pilot (6) and (7) and withdraw the finder tube as- (5) from the housing. Remove the turret (9) and spring washer (10) and separate the 8) from the tube (13), being careful not to lose sxing spring (11) and roller (12). Remove the nternal retaining ring (15) and withdraw the *K* correction cam (14) from the housing, catch- steel ball (16) and spring (17) as they are d

"he prongs of the latch cam keys (20A) are over to secure the latch parts to the cover. stakings must be filed away in order to disas- the keys and the hubs (20B) and(20C) from the Then remove the latch cams (22) and (23) and :h cam link (24).

HI remaining cover parts are secured with and can be removed easily for replacement.

)NT PLATE ASSEMBLY. (See Figure 4.)

Phe unit of the camera known as the front plate >ly consists of the lens turret, front plate, and intermittent mechanism (cam and shuttle).

Pry out the oil retaining plug (2) with a screw- or knife blade. Remove the hex nut (3) and (4) from the shuttle cam spindle. Revolve the (5) with an outward motion while cuppiing one round the front plate to catch the three indexing studs (6), indexing rollers (7) and compression s (8) as the lens turret is removed.

CAUTION

fer to paragraph 1, step d, for proper pre- itionsto be taken before further disassembly attempted.

The bearing plate (9) now can be lifted from the plate. Remove the screw (10) that holds the r spring (11) in place, and lift out the spring mger (12).

e. Remove the two screws (14) that 1 guide rail (13) in place, and lift out the Remove the two screws (16) from the aj (15), and the aperture plate, film tension guide rail tension spring (18) can be lifte

f. Take out the two screws (19) that ho pins in place and lift out the shuttle (20). not to lose shuttle pins (21), bumper sj washer <23) during this operation. Lift pawl assembly (24).

g. C arefully lift the shutter and shuttle bly (25) from the shuttle cam spindle (29] careful not to lose the shims (26 and/< dowel pin (28) need not be removed fn plate. Do not remove the spindle as semi the front plate (32) unless it is loose in tl casting. If such is the case, the front \ replaced.

6. REMOVING DRIVING MECHANISM SEMBLING THE SPRING.

a. Before attempting to take out the c anism assembly, the hand crank housing or 50, Figure 10) first must be removei cameras, the belt housing parts (32 thrc ure 10) also must be removed. The pa: in the remainder of this disassembly p illustrated in Figure 5.

b. Remove the four screws (1) that fai plete driving mechanism to the camera remove the shoulder screw (2) and sp attach the governor link (8) to the speed the gate arm between thumb and forefing fully lift the driving mechanism out o frame.

CAUTION

Do not attempt to remove the maJ spring from the mechanism unless retaining clamp and a holding fixt No. ST-243) are available (Figure C Be careful not to drop the mechanisi may cause the spring to release.

c. Place the assembled mechanis: holding fixture (Tool ST-243-F1) wit! spring facing up (Figure C, Step 2), a spring clamp around the spring. If tl not fit easily around the spring, use t (Tool No. S-5218-F2) to wind the spring

d. Install the retaining bar (Tool Nc as shown in Figure C, Step 2, and loci the clamp knobs. Turn the fixture ovei

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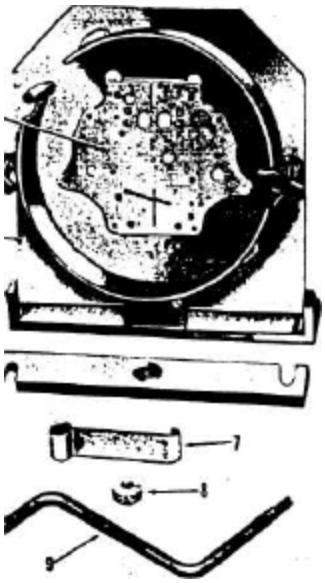


\dapter ST-243-F5
:ollar ST-243-F9
Spring Hub ST-243-F7
Bar ST-243-F2 Fixture
ST-243-F1 Plate ST-
243-F8 Book ST-243-
F11 Snob ST-243-F10
Hand Crank S-5218-F2

. Holding Fixture, ST-243 (Fl-Fll)

e. Remove the retaining bar from the holding fix ture and lift the spring and clamp carefully from th rear mechanism plate. It is always advisable t wear gloves when handling the spring since the edge are very sharp. When lifting the mechanism plat from the fixture, be careful not to lose the stud (i which held the outer end of the spring.

f. Place the fixture plate (Tool No. ST-243-FJ into the holding fixture as shown in Figure C, Step '. and install the collar (Tool No. ST-243-F9), sprir hook (Tool No. ST-243-F11) and nut (Tool No. SI 243-F10) on the spring hook stud of the fixture a shown in Figure C, Step 3. Place the fixture sprir hub (Tool No. ST-243-F7) over the collar in tl center of the fixture plate and lower the driving sprii down over the hub, engaging the inner end of tl spring with the slot in the hub.

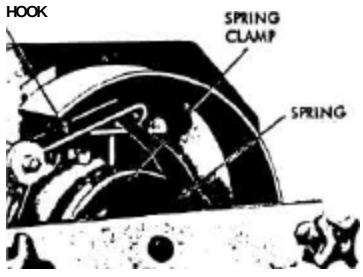
g. Install the adapter (Tool No. ST-243-F5) on tx of the hub and the retaining bar (Tool No. ST-243-F on the adapter, and tighten the clamp knobs securel; Engage the spring hook with the outer end of the drr ing spring.

h. Use the hand crank to wind the spring until tl spring clamp can be removed. Then slowly unwii the spring until it fills the drum of the holding fi: ture. The spring now can be pulled through the op< slot in the fixture for inspection and cleaning.

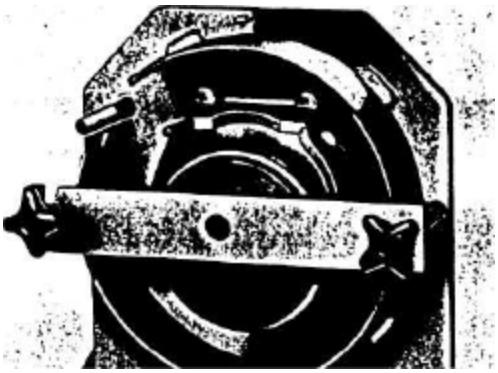
i. Remove the shoulder screw (9) that fastens tl governor connecting link (8) to the front plate.

7. FRONT MECHANISM PLATE ASSEMBLY.

a. Remove the fillister head screws (index 1, Fi; ure 6) that fasten the upper and lower mechanis plates together. Then remove the special head scr< (2) with the S-8681 driving mechanism pin wren



RETAINING BAR



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llder screw (12) and slide the two tvashers (13), the key washer (14), (15), and compression spring (16) and collar assembly (17).

ease retaining washer (18) from in- Lve shaft (21). Remove the split re- with a screwdriver and lift the main from the drive shaft. Press on the mtil it is forced out from the under- mechanism plate (24). The packing hellacked in place and should be re- leed of replacement. Lift the spring *re* shaft.

\ME ASSEMBLY (Design 70-DR and ee Figure 9.)

d focuser (1), critical focuser eye- .ser carrier (3) have been shown ex-)only for illustrating purposes. The e parts is very critical and requires 1 factory equipment. Do not remove the stop pawl push button (4) and

e retaining spring (6) from the stop lift out the plunger and the friction

he fillister head screw (9) from in- frame and remove the film meter *[* (11) and friction washer (12). Re- 3r head screw (14) that fastens the jtaining spring (13) to the inside of le and withdraw assembled governor der (17) and speed control knob (18). fastened to the holder (17) with two (16).

housing (19), which was taken off in te removal of the driving mechanism m be disassembled as follows: Lift 1) from the underside of the housing, sing cover (22) and press out the d pin assembly (23).

NOTE

within the housing are reamed ly and must not be removed.

nove the clamp (24) or clamp screws

10. CAMERA FRAME DISASSEMBLY (Design 70-1 only). (See Figure 10.)

a. The critical focuser (1), critical focuser ey piece (2) and focuser carrier (3) have been shown e ploded in Figure 9 only for illustrating purposes. T alignment of these parts is very critical and requir the use of special factory equipment. Do not remo them. Lift out the stop pawl push button (4) a spring (5).

b. Remove the retaining spring (6) from the st plunger (7), and lift out the plunger and the fricti spring (8).

c. Remove the cover screw (10) and cover (1 Remove two screws (12) and disassemble the era and support assembly (13), push pin (14) and spri (15) from the camera frame. Remove four sere (19), two side bars (20), the magazine attaching plate (21) and gasket (22).

d. Do not remove the clamp screws (24) or 1 critical focuser clamp (23). If the main drive sh bushing (25) is damaged or badly worn, press it fn the frame.

e. Remove the screw(26) and retaining spring (: and lift the assembled governor dial and holder fr< the camera frame. Remove two screws (29) and di assemble the dial (28) and holder (30) from the spe control knob (31).

f. Belt housing parts (32) through (28) and en housing parts (50) through (54) were removed in pai graph 6 to permit removal of the driving mechanis The bearing disc (40) can be removed by taking out five screws (39) that attach it to the frame.

g. Remove three screws (42) from inside the ca era frame and lift the complete Veeder counter ; sembly (41) from the frame. Drive out the dowel (43) to free the Veeder counter gear (44). Rem(four screws (45) and disassemble the mounting pi (46) from the Veeder counter (47).

11. CLEANING INSTRUCTIONS.

a. Wash all parts thoroughly with aromatic pet: leum naptha and dry carefully with a clean, wh: lint-free cloth. Old grease and oil must becomplet removed.

b. Remove the hardened shellac and old grapl from the main spring cover plate and the inside of camera frame.

3 a temporary measure. However, replace-
advisable if such damage is evident. Check
ttle cam spindle and shuttle cam bearing sur-
>r deep grooves or scratches and replace if
.ry.

ispect the aperture plate through a magnifying
[f available, for nicks and scratches. A light
with fine crocus cloth sometimes will remove
abrasions. Do not attempt to polish out deep
scratches because changes in the thickness of
rture plate affect the focal distance. If plate
id or scratched to any great extent, it must be
id with a new one.

nspect the teeth of the cranking gear and pin
>ly for damage and replace if necessary.

MV1ERA FRAME ASSEMBLY (Design 70-HR
ily). (See Figure 10.)

i During reassembly, lubricate all moving steel
and bearings with a light film of oil. Do not
ubricate.

If the stop plunger bushing (55) on the main
shaft bushing (25) was replaced, press the new
ig into the camera frame.

Assemble the cranking gear (54) into the crank
ig (50) and press the housing cover (53) in place,
the felt block (52) into the housing recess and
ese parts and the attaching screws (51) aside.
:rank housing must not be installed until the
g mechanism has been inserted into the camera

Attach the motor bracket (48) to the camera
i with four screws (49). Assemble the knurled
r (16) to the bracket.

Fasten the counter mounting plate (46) to the

d. Inspect governor worm carefully :
Make sure that shaft is not bent and spr
broken. The complete governor assem
replaced if damage is evident.

e. Examine all gears for broken te*
place damaged parts. All gear shafts mus
to make certain that they are not bent.

f. Examine the camera frame and co\
for cracks that might admit light, and i
items if such damage is found. Springs 1
come weakened through constant use si
placed with new ones.

g. Lay a scale across the surface of
plate. If there is a bow in the plate, it i
bent until straight. This must be done c
(32) through (38) must not be installed i
ing mechanism has been inserted int
frame.

f. Fasten the governor dial (28) to 1
(30) with two screws (29) and press the 1
speed control knob (31). Insert the di
through the camera frame and assemb
the retaining spring (27) around the groi
Secure the spring to the camera fran
(26).

g. Fasten the magazine attachmeni
its gasket (22) to the camera frame wi
bars (20) and four screws (19). Insts
(14) and its spring (15) and hold i
inserting the hub of the crank and suj
(13) through the frame and attachme
crank arm must engage the slot in the
cure the crank and support assembly v.
(12). Assemble the cover (11) to the ai
with the screw (10).

h. Assemble the friction spring *(I*
spring (6) to the stop plunger (7). MJ
both springs are fully compressed so tl

CTIONS

LME ASSEMBLY. (See Figure 9.)

ssembly, lubricate all moving steel film of oil. Do not over-lubricate.

)lunger bushing (27) was removed ress a new bushing into the camera L the main drive shaft bearing (26).

ranking gear assembly (23) into the , and press on the housing cover sit block (21) into the recess in the lk housing. Do not install this as- ;il after the driving mechanism has the camera frame.

MR only. Fasten the motor bracket frame with the four screws (30) and ¦ v (29) to the bracket.

>eed control dial holder (17) into the and fasten the governor dial (15) to > oval head screws (16). Insert the lder through the camera frame and ;he retaining spring (13) around the . Secure the retaining spring to the lera frame with the fillister head

i meter dial (11) and friction washer 5t the outside of the camera frame. er ratchet (10) on the fillister head 'ead the screw into the film meter he camera frame. The teeth of the re in a counterclockwise direction j E.

e friction spring (S) and retaining respective positions on the plunger plunger into the stop plunger bush-

NOTE THAT RATCHET TEETH PROJECT COUNTERCLOCKWISE

ing (33). Be sure that the springs are carefully com- pressed so that the bushing is not scored. Insert th< push button spring (5) and push button (4) into the pusl button opening. Tap the plunger (7) until the end of the plunger engages the keyway, or slot, at the end of th< push button.

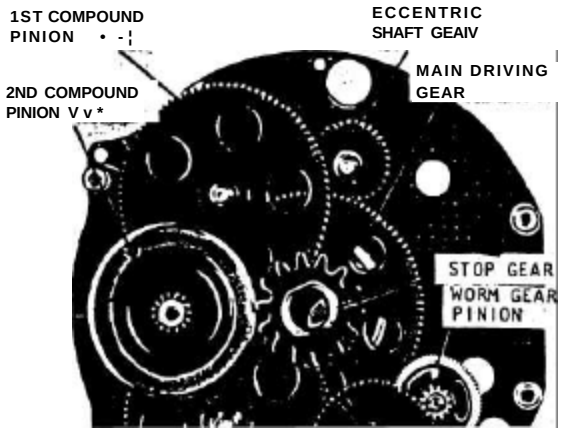
15. BACK MECHANISM PLATE ASSEMBLY. (Se< Figure 8.)

NOTE: During reassembly, lubricate all moving stee parts with a light film of oil. Do not over-lubricate

a. If the packing washer (22) was removed, appl; a thin coat of orange shellac before reinstalling. In sert the hub of the main driving gear (20) through th< opening in the back plate (24). Install the tensioi springs (23) on the gear hub. Grease the spring lightly. Insert the hub of the main drive shaft (21 through the hollow gear hub and press together unti the tension spring is completely enclosed by the driv shaft collar. Then install the split retaining ring (19 around the drive shaft to lock all the parts in place Saturate the felt washer (18) with B & H oil and pres it into the opening in the gear end of the drive shafi

b. Insert the spring (16), key washer (14) an friction washer (13) into the take-up drive shaft gea (15). Insert the screw (12) loosely, maintaining slight pressure on the screw head with the thumb whil turning the gear until the key washer matches with th slot in the gear. Then press the screw in place, an turn the spindle and collar assembly (17) down ont the screw. Place this group in a smooth-jaw vise and tighten the screw as tightly as possible. Test th operation of the assembly by holding the spindle an turning the gear. Then set this group aside for th time being.

c. In order that the installation of the gears to th back plate might be more easily understood, Figure



| and lift out the upper mechanism plate

a the gate arm. Remove the fillister head that attaches each sprocket guard (3) to the and lift off the guards. Then remove the :ket (5), take-up sprocket (6), spring cover orsion springs (8 and 9) and sprocket gear s (10) from the film sprocket studs. The ^uide shoes (11 and 13) can be removed by the film guide screws (12 and 14) that ch shoe to the front mechanism plate.

governor assembly (18), which regulates of the camera within the prescribed range) 64 frames per second, is critically alined ory and must not be disassembled except to ie governor assembly from the housing as- If either of these assemblies is damaged, ete governor must be replaced with a new remove the governor assembly, loosen the (15) located in the center of the stud at the r end of the governor shaft. Then back the 6) halfway out of the stud, and remove the shaft from the opposite bearing (16). The assembly now may be lifted free of the two Q plate studs that retain its bearings. Be it to lose the two steel balls (17) that are each bearing or the pressure spring (19) the recess of the governor housing.

NOTE

: disturb the bearing which carries the the shaft opposite from the worm, or difficulty will be experienced when at- ng to mesh the governor worm gear and ;jear during reassembly.

m the underside of the mechanism plate, he fillister head screw (index 2, Figure 7) the gate arm assembly (1) in place. The (3) can be removed from the arm by press- ; gate arm tension pin (through opening in gate plate) with a pointed instrument and ng the plate from the arm. Be very careful atch the gate plate.

i gate plate adjusting hex nuts (4) and set)) need not be removed from the gate plate, ie front retaining stud (7) and rear retaining rom the gate arm, being very careful not to ingle coil springs (8 and 10).

disassemble the feed spindle mechanism, it scessary to clamp the spindle in a smooth- Tighten the vice just enough to hold firmly.

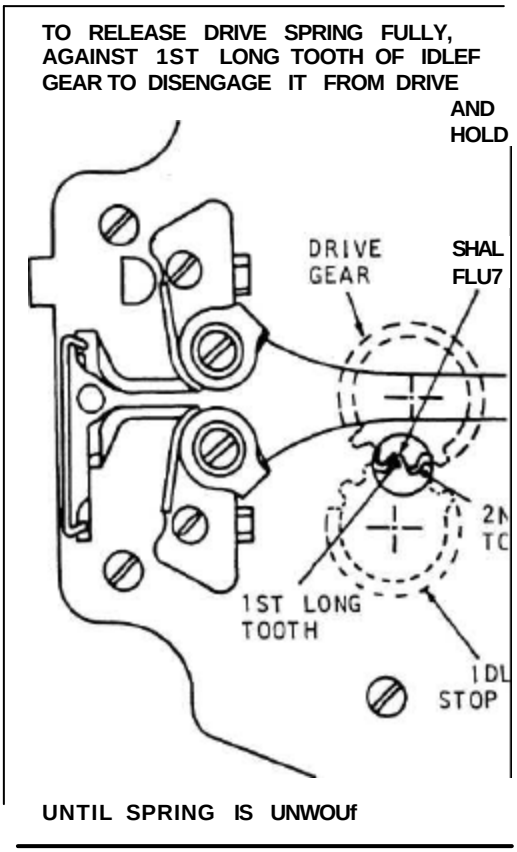


Figure D. Unlocking Idler and Drive <

h. Remove the fillister head screw (IS tens the stop gear spring (20) and idler sto] to the mechanism plate. Bearings (22 am not be removed from the plate (27) exce placement.

i. On 70-HR cameras only, remove fo (25), the retaining ring (24) and the idler j

8. BACK MECHANISM PLATE ASSEMB Figure 8.)

a. With the front mechanism plate remo be noted that the driving mechanism gears bearings pressed into the front and back p of these gears can be removed from the simply by lifting them out of the bearings, removed, make a note of its assembled po!

b. On 70-DR and 70-TMR cameras or pull pawl (1), locking pawl (2) and tensior from the shaft of the eccentric shaft gear (

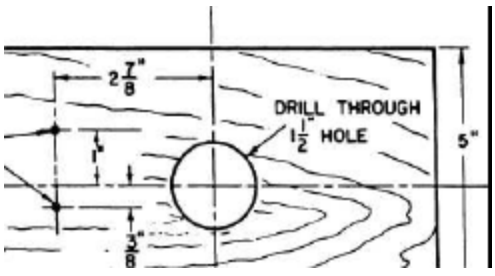
c. Remove the stop gear (5), intermedi

gears in place. The first compound pinion 2jes the main drive gear and the hand crank h in turn drives the second compound pinion ind the intermediate spindle and gear assem- econd compound pinion assembly drives the at mechanism and engages the geared ends ockets. The intermediate spindle and gear rotates both the film take-up spindle and the worm gear pinion assembly. The worm >n drives the governor worm shaft. The ubricating wheel is automatic in action. Its to assure a constant film of oil to the con- ces of the governor worm and worm gear, itric shaft gear assembly is driven directly in drive gear, and, through the action of an operates the footage indicator pawls. The :t stop gear meshes with the idler gear on mechanism plate. It is free to turn until the Dace between two of the teeth engages the of the idler gear. This action stops the

pare a back plate holding fixture from a vood two inches thick by five inches wide by es long. (See Figure G.) Place the back n plate in the fixture with the main driving lg up and the top of the plate near the two

ce a drop of B & H oil in the bearings of the s and on each gear shaft, and install the gears owing order: shaft and idler gear assembly : compound pinion and gear assembly (10), impound pinion assembly (9), and the inter- pindle and gear assembly (6). Lift the inter- pindle and gear assembly enough so that the pindle (assembled in step b, preceding) can ed. Install the governor worm gear pinion (7). Saturate the lubricator felt of the gov- ricating wheel (8) with B & H oil, and install back plate. Install the eccentric shaft gear (4), and press the drive shaft stop gear (5) he hub of the drive shaft.

[1] Design 70-DR and 70-TMR cameras only, 3 tension spring (3), locking pawl (2) and pull



pawl (1) on the shaft of the eccentric shaf sembly (4). Place the assembled back rr plate assembly in a clean spot until the fro nism plate assembly can be assembled.

16. FRONT MECHANISM PLATE ASSEMB]

NOTE: During reassembly, lubricate all m< parts with a light film of oil. Do not over-

a. If any of the bearings (22) or (23), were removed for replacement, press the into the front mechanism plate (27). In: stop gear (21) and spring (20) with the s<

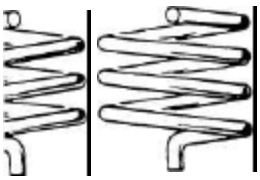
b. Place the stud carrier (18) into posi underside of the front mechanism plate, a forward until it is held by the two flanges of the plate.

c. Hold the gate arm (6) in place on the f] anism plate and press the rear retaining sti spring (10) installed, down through the openi of gate arm until the groove in the stud can 1 with the slot in the mechanism plate. Sir arm and stud carrier just a bit toward the : mechanism plate so that the rear reta holds. Then press the front retaining stu spring (8) installed, down through the fr gate arm until the groove in the stud engag slot in the stud carrier. Hold gate arm press stud carrier forward as far as it wil move the gate arm back until the hole in side of the gate arm is visible behind th< rier, and install the screw (2).

d Install the friction washer (17) over end of the spindle assembly (16) and insert end through the opening in the front mechai Slide the return spring (15), return spri (14), spring washer (13) and friction colla the spindle shaft, and secure all parts with der screw (11). Tighten the screw firmly,

e. Attach the lower guide shoe (13, Fi upper guide shoe (11) to the mechanism pi: film guide screws (12) and (14). Slide the s] tubes (7) down onto the sprocket gear asse: Install the torsion spring (8) and (9) so thati fits down into the spring cover tube and er fits into the recess in the gear. The wound spring (Figure H) goes with the take-u so be sure to note with which assembly was installed. Install each sprocket (5) ai respective sleeve assembly so that the t of the torsion spring fits into the recess ; end of each sprocket. Fasten the spro< (3) temporarily in place with the screws (4) must be synchronized after the camera m<

FRUCTIONS



JNTER- CKWISE FOR SPROCKET

CLOCKWISE FOR TAKE-UP SPROCKET

[. Sprocket Gear Torsion Springs

;s the latter bearing back down into the rt so that the long, key-like projection >r assembly (18) fits into the slot in the sm plate. Install the setscrew (15) to shaft bearing in place. Move the gov- back and forth to make certain that it *7.*

drop of B & H oil on each of the bear- :ain the governor worm shaft. Apply a } & H lubricating grease to spring (19) in the opening in the top of governor 5p the gate arm between thumb and place the assembled front mechanism *y* on the assembled back mechanism be necessary to shift the gears slightly d tool until the gear shafts enter the >penings in the upper mechanism plate, o mechanism plates together with the 2). It will be necessary to adjust screw ving mechanism pin wrench, S-8681-F1. Lgraph 30 for feed spindle adjustment.) the assembled mechanism from the

; hub of the main drive gear (on the back ate) and check the gears for freedom of Lso make certain that all gears are in they have the proper clearance in rela- ears.

:NG SPRING AND DRIVE MECHANISM.

; reassembly, lubricate all moving steel ight film of oil. Do not over-lubricate.

e driving spring loosely by hand until it in the drum of the holding fixture (Tool 1), engaging the inner end of the sprine looped outer end of the spring over the spring taining stud(5) in the mechanism plate. Handle s] carefully during installation.

c. Attach the lower end of the governor conne link (8) to the governor housing with the shoi screw (9). The tapped hole in the governor hoi can be seen through the long slot in the front me nism plate.

d. Place assembled mechanism in fixture (i graph 6, step c), and pre-set the camera foota follows: First, install the hand crank, S-521* and slowly and carefully wind the spring until tight. Remove the safety retaining ring from spring. Release the hand crank and count the nu of complete revolutions that the hand crank make fore the drive and idler gears lock. The hand < should make seven complete revolutions, whi equivalent to approximately 21 feet of film. If crank made only six revolutions, wind the sp disengage the gears (Figure D), and allow the s to unwind until one drive gear tooth has passed t idler gear. Then re-engage the gears. If hand i made eight revolutions, disengage the gears and the spring until one tooth of the drive gear has n back past the idler gear. Then re-engage the g

e. Now pre-set the speed as follows: Hoc loose end of the governor link over the pin o timing fixture speed indicating dial. Set the pointer between the two notches at the high-spee of the dial, and wind the spring slowly until it is Release the hand crank. Hand crank should seven complete revolutions in from 13 to 14 sec With dial pointer set between the two notches low-speed end of the dial, hand crank should one complete revolution in approximately 15 sec If unable to obtain these speed adjustments, re the governor and adjust it as instructed in para 18. If pre-setting speeds appear to be correct, the spring completely, lock the idler and drive by engaging first long tooth of idler gear with *s* space between drive gear teeth. Then install : retaining ring around the spring.

CAUTION

As a safety measure, it is advisable to lea[1] the safety retaining ring around the sprii until just before the driving mechanism is be installed in the camera frame.

f. Apply a thin film of orange shellac arou shoulder of the casting. This will act as a s prevent the graphite from reaching the driving of film chamber. Snrp.ad annrnyimntpiv nnpfpQ?

e thumb and forefinger, and insert the drivlism carefully into the camera frame.

[gp 70-DR and 70-TMR only. Spread the until they straddle the film meter ratchet, down firmly on the driving mechanism until \j seated. Check to make certain that lockoperates footage dial freely. Install the Bchanism attaching screws (index 1, Figturn them in until tight.

ch the upper end of the governor connect-) the speed control dial with the shoulder iex 2, Figure 5) and spacer (3). The speed al should turn freely and should move the lousing back and forth.

ill the assembled crank housing (19, Fig-0, Figure 10) to the camera frame with the :hing screws. During this operation, the =jear must be meshed with the second comon assembly of the driving mechanism.

m repairing Design 70-HR cameras, the ng parts (32 through 38, Figure 10) can now ed. Fasten the drive gear (37) to the drive i) with two screws (36) and assemble these the belt housing(35) with the gear stud(34). *i* end of the gear stud through the camera i secure it with the screw (32) and washer

[STING THE GOVERNOR.

i governor flexure control washer retainer) on the end of the governor housing assembe positioned very precisely so that it does "ere with the governor springs. Install the spring gaging fixtures, S-8094-F3 and 4, and loosen the retainer screws. Adjust ler so that it clears the S-8094-F3 gaging ind tighten the retainer screws.

not attempt to disassemble the governor in perform internal adjustments. If the speed set in accordance with the procedure out-Daragraph 17, step e, but does not satisfac-

S: GAGING, FIXTURE, ' - ^S:^ CONTROL., RETAINER:

torily meet the speed check requirements c paragraph 1, step b, it is recommended that plete governor assembly be replaced.

19. FRONT PLATE ASSEMBLY. (See 1

a. If the front plate and spindle were press the new spindle (29) carefully into the plate (32) so that the spindle washer fits do\ recess in the front plate casting. Put a dro lubricating oil on the shuttle cam spindle slip the shims (26 and 27) over the spindl the shutter and shuttle cam assembly (spindle, and spin the shutter around seven make certain that it spins freely and does the front plate casting.

b. Insert the shuttle pins (21) into the c the shuttle (20), and install the washer (2; the spring (22) on the lower pin. Position on the shuttle cam so that the dowel pins grooves in the front plate casting. Sprea far enough apart to allow a full shuttle s install special screws (19) to hold shuttle p

c. Rotate the shutter to make certain volves easily and that it drives the shutt should be very little play between shuttle either horizontally or vertically. Howe should not bind, and the shuttle and cam ; easily. If there is too much play between cam, shims should be added; if shuttle am remove a shim or shims.

d. Lay the aperture plate (15) temporar and check the height that the shuttle te through the two parallel slots in the apei The teeth must be high enough to engage tl tions in the film. This height can be ri changing the thickness of the shim, or sh the shuttle cam.

CAUTION

Do not attempt to adjust the shuttle t the grooves in which the shuttle do\ rest.

e. Place the aperture plate (15) in the r film tension rail (17), and lay both parts mate position on the front plate casting. I edge of the plate just enough so that the ter (18) can be slipped into the recess in the may be necessary to bend the ends of the from the front plate casting. Then hold 1 plate in position and install the two sere enough to hold the plate. Position the fill (13) along the opposite edge of the apertur

ICTIONS

he other leg is between the aperture :ing. Move the dowel pin back into :en the dowel pin retaining screw.

mera on the work bench with the g facing up. Remove the starting emporarily from the camera frame, plate assembly for cleanliness, and ing surfaces sparingly with a very H lubricating oil. Install the front that the stop pawl stud fits into the >n the upper mechanism plate. Be- j front plate completely down into B starting button and spring and en- ;1 assembly. Then press the front ice.

[our screws (1) that fasten the front -a casting. Install the plunger (12),) and screw (10).

NOTE

ing the turret head, check the e as instructed in paragraph 20, ecessary. Then mark the speed ted in paragraph 22.

earing plate (9) on top of the front s cut-out in the bearing plate is aperture opening. Carefully insert (8) into the slots around the edge of Place the indexing rollers (7) on the ads (6) and insert them partially into ly the lens turret (5) in place on the hile holding it firmly with one hand, ; rollers and studs into the slots one e lens turret is firmly seated. Re- to make certain that the indexing rollers properly position each lens opening at th aperture. Install the spacer (4) and special nut *(c* being careful not to turn the nut on too tightly. The press in the oil retaining plug (2).

NOTE

The turret must turn with some amount of resistance, but must not be so tight that the "snap" of the indexing rollers as they position the lens opening cannot be felt.

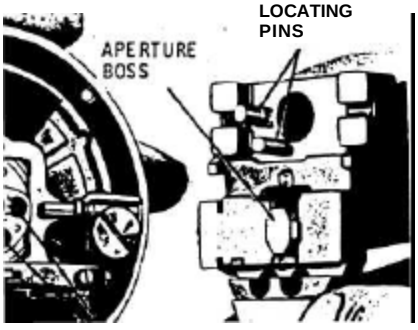
20. ADJUSTING THE APERTURE PLATE.

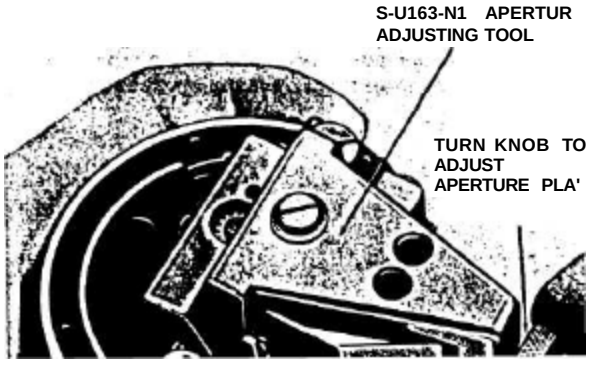
a. When correctly adjusted, the upper and lowe frame lines on the film are in the exact center of *t* film perforations and the outer frame lines ai equally distant from the edges of the film.

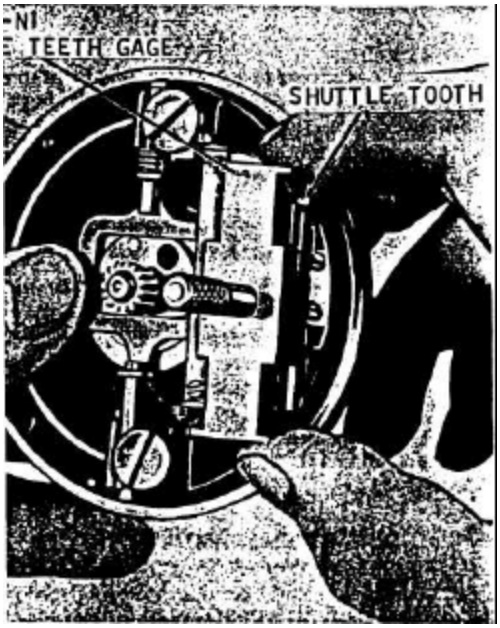
b. Rotate the shutter so that the two large holes : the cam are in the*position shown in FigureK. Notic that the shuttle teeth are at the beginning of the strok Lay the aperture adjusting tool, S-4163-N2, over tl aperture plate so that the two pins fit into the larc holes and the aperture stud fits into the apertui opening.

c. The four screws which attach the aperture pla were left slightly loose during reassembly. Turn tl knurled knob on the adjusting tool, as shown in Figu: L, until it is tight. This will pull the aperture pla to the correct position. Then tighten the apertu] plate attaching screws slightly, and remove the a< justing tool.

d. The gage, S-3972-N1, is used to check the pos tion of the aperture plate in relation to the shutt stroke. With the gage positioned on the aperture pla







M. Checking Clearance of Shuttle Teeth

in Figure M (boss on underside of gage in- .perture opening) and the NO GO end nearest i teeth, the shuttle teeth should just strike /hen the shutter is rotated. When the gage sd so that the GO end is nearest the shuttle teeth should just clear the gage as the rotated. It may be necessary to shift the Dlate slightly until this condition is met. at step c, preceding, and tighten down the late attaching screws securely.

3TING THE BUCK TOOTH GEARS.

idler and drive gears are visible through g in the front mechanism plate just below rm. The camera mechanism must be ad- run not less than 21 feet and not more than one full winding of the main drive spring, itment is made by setting the teeth of the in relation to the shallow space of the drive

i the spring to capacity and set the Veeder zero. Press the camera starting button, the camera to run until it stops. Then Veeder counter to see how many feet the s run.

an example, suppose the footage dial indi- camera run is 19 feet. Since each tooth of gear represents approximately three feet, of the ririvp *ppar* must be mnvpH fnrwarH momentarily to allow one tooth of the drr pass by. Then re-engage the gears.

d. If, for example, the footage dial shoul that the camera run is 30 feet on one compl ing, disengage the idler gear with a screwc wind the spring slowly until three drive g (representing nine feet) have passed the idl< a counterclockwise direction. Then re-e gears.

e. Test the adjustment by winding the capacity, setting the footage dial at zero, *i* ing the motor to run down.

22. MARKING THE SPEED DIAL.

a. Whenever the camera has been disa; it usually is necessary to remark the spee this is done, a new speed dial must be insta

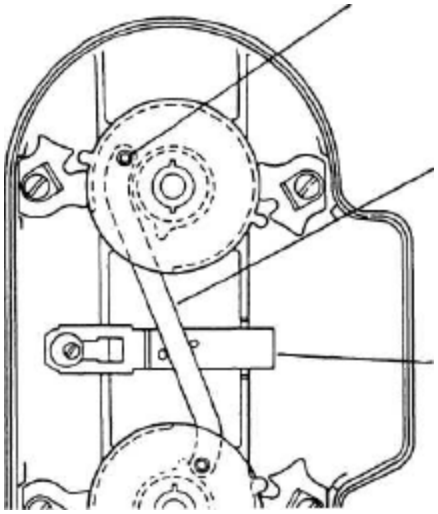
b. Determine the proper position of spe of the outer dial by checking the running ti structed in paragraph 1-a. As each speed is set, mark the dial with a sharp tool exactl; the mark on the speed control ring.

23. CAMERA COVER ASSEMBLY. (See I

a. Place the camera cover (34) flat with surface facing up. Position the push bar (cover and install the eccentric (31) and screw (32). The eccentric will be adjustet cover has been completely assembled (para

b. Assemble the latch cam link (24) to tl that it lies between the two guide pins of th< (33) and with the link pins facing up (see]

LINK Plr



UCTI O N S

er latch cam hub (20C) to the lower nd assemble these parts to the cover id of the link (24) as shown in Fig- dth the remaining inner hub and up- 22). Assemble the outer hubs (20B) ys (20A) to the cover, guiding the key :he slots in the inner hubs and latch » ends of the key prongs to hold all

i upper door latches (25) and lower) with the screws (26) and (29) and (27) and (30) as shown in Figure N.

the parallax correction cam (14), and steel ball (16) to the viewfinder id secure the inner end of the cam ng ring (15). Assemble the indexing roller (12) to the turret face of the 13) and hold these parts lightly in po- ce of shim stock while assembling the *i* viewfinder tube. Secure the turret (9) and washer (10). Insert the tube ie housing until fully seated; then se- y tightening the pilot screws (6) and

0-DR and 70-TMR. Assemble the nder assembly (2) to the camera cover tighten the four mounting screws (3). iece mount (4) into the rear end of the ing.

)-HR only. Assemble the viewfinder 1 complete viewfinder assembly (2) to ver and install and tighten the four ¦ s (3). Assemble the idler gear (19C) engaging its teeth with those of the secure the gear with the screw (19A)

j APERTURE GATE BACKLASH.

eccentric washer is located near the :amera cover on the inside of the door trpose is to lock the gate in the closed Lhe cover is in place so that it cannot camera is in use.

t the eccentric, open the gate approxi- ich. Install the camera cover and turn ,o the CLOSED position. Then remove press forward on the gate arm. If the 3e moved forward, the eccentric needs

CAUTION

If the eccentric is adjusted so that it forces the gate arm forward too tightly, it may cause the gate to pinch the film and result in binding or jamming of the camera.

25. HAND CRANK ASSEMBLY. (See Figure 2.)

a. Fasten the crank handle (6) to the spindle of hand crank (7) with the fillister head screw (5).

b. Insert the compression spring (4) and two st balls (3) into the opening in the crank stem, and h them with the thumb and forefinger while slipping hand crank dial (2) up into place. Install the c locking spring (1).

26. WINDING KEY ASSEMBLY. (See Figure 1.)

a. Place a small amount of vaseline on the ti] the spring shaft (9) and the teeth of the ratchet (2) key body (12). Insert the spring (11) and spring s! (9) down into the key body (12), and install the [(10).

b. Compress the spring by pulling the end of spring shaft until the uncoupling bar (8) can be serted through the opening in the key body.

c. Hold the handle plate (7) in position with prongs in the key body slots, and install the cl spring (6) and split retaining collar (4). Then s the friction clip (5) up over the key body, and ins the retaining ring (3).

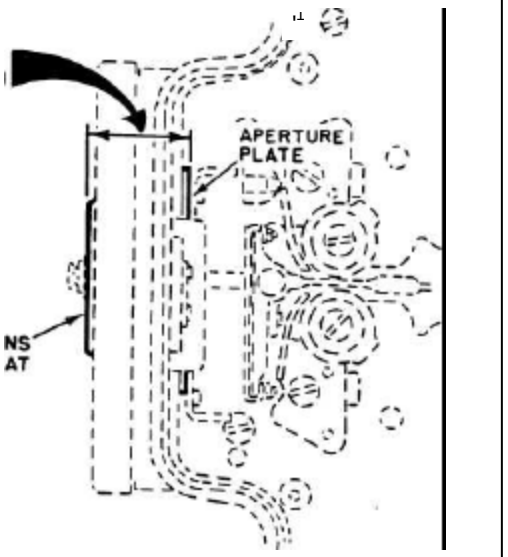
d. Slide the ratchet (2) onto the lower end o: spring shaft so that the ratchet teeth engage the t on the key body and the hole in the ratchet is al with the hole in the shaft. Install the pin (1) to the ratchet in place.

27. FOCAL LENGTH ADJUSTMENT. (See Figun

a. The focal length of the camera is meas from the film plane (surface of the aperture plat the lens seat. This measurement, which can be t with a standard one-inch micrometer, should . 690 inch plus or minus . 001 inch at all points o lens seat. The distance must be exact, because rors may cause pictures to be out of focus.

b. If the micrometer reading is less than.69(paper shims must be inserted under the aperture

Tf \\\a miprnmotor т



re P. Camera Focal Length Adjustment

NOTE

making the measurements, be sure that are no particles of lint or dust on the ure plate, lens seat or micrometer. Be to check each lens seat individually.

/[CLEARANCE ADJUSTMENT.

e film clearance is the distance between the plate and the gate plate when the film gate closed position. This clearance should be ;h. Allow the mechanism to run down so that Le teeth are retracted and behind the aperture

th a .0065-inch feeler gage, check the dis- tween the gate plate and aperture plate at the lers of the gate plate. The feeler gage should j into the space without forcing.

[just the film clearance by loosening the hex the three gate plate setscrews and turning crews in or out with an Allen head wrench clearance is correct. Then tighten the hex irely.

29. SYNCHRONIZING THE SPROCKETS.

a. Synchronization of the sprockets mui after the camera is completely assemble^ the mechanism at least partly wound so that anismis stopped with the shutter in the close

b. Remove the screw which holds the s\ guard in place. Lift the sprocket enough the gears, and revolve the sprocket unti farthest from the gate arm points away right angles to the center line of the gate Figure Q.)

c. When both sprockets are properl} there will be sufficient clearance between t\ teeth and the gate arm (with the gate open easy film threading.

30. FEED SPINDLE ADJUSTMENT.

a. Place the film spool on the feed s turn the spool three or four complete revo clockwise direction. When released, the s recoil about one and one-half turns.

b. The tension on the feed spindle is r turning the feed spindle tension regulai Turning the screw clockwise with theS-86£ mechanism pin wrench shown in Figure *J* the feed spindle tension; turning the sere clockwise decreases the tension of the fe

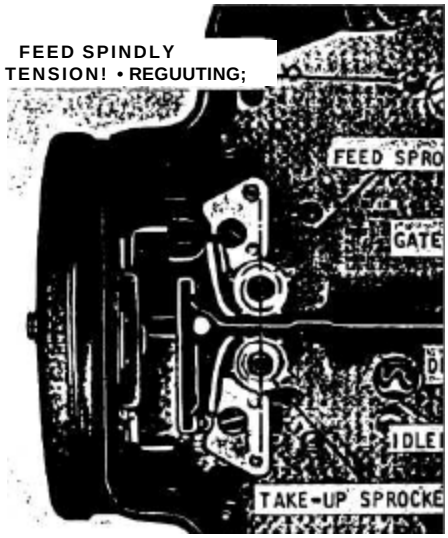


Figure Q. Feed Spindle and Sprocket *A*

UCTIONS

EST PROCEDURE.

spring motor to capacity. Press and ing button several times. The start- return to its original position each

footage dial while the camera is , move only one graduation at a time.

tension of the speed control dial. It ient tension to prevent its being dis- :mal handling of the camera.

i spring motor to full capacity and set at zero. Press the starting button, tmera to run down. Camera footage run of not less than 21 and not more ; necessary, adjust as instructed in

:amera is running, note carefully any i operation such as spring jump or vhich may be caused by a lack of oil.

amera with a 100-foot roll of positive lck film may be used repeatedly for

m the entire 100-feet of film to deter- Tiera functions properly when loaded, at the sprocket teeth release the film 2nly.

nning of the film, check the action of Che film must wind tight on the spool.

d. To check the tension of the feed spindle, pla a film spool on the feed spindle and turn the spc three or four complete revolutions in a clockwi direction. When released, the spool should rec< about one and one-half turns. Adjust, if necessai as instructed in paragraph 30.

33. PHOTO TEST.

a. Thread the camera with a short strip of pos tive or negative film. Set the camera as you woi normally do for taking pictures.

b. Make a short photo test, and check the test i sharpness, film scratches and proper framing of 1 pictures.

34. LIGHT-LEAK TEST.

a. Thread the camera in the usual manner wit short piece of Super XX Panchromatic film, us both the feed and take-up spools.

b. Close the camera door securely, and lay camera in the direct sunlight (door s ide up) for least 15 minutes. Move the camera frequently so t all edges of the door are exposed to the direct si light.

NOTE

If it is not possible to place the camera in the sunlight, use several photo flood bulbs and expose the camera in the same manner. Make certain that the lens cap, or caps, are in place during test.

c. Inspect the film to see whether or not it been affected in any way by the light.

pages illustrate and list, by part ^ription, all replacement parts for D" 16-mm Motion Picture Cameras, and TMR. Parts are indexed in a of removal and will serve as an aid Lring camera repair.

ng replacement parts, be sure to on Code olumn to be certain that the correct part for the particular ing serviced. If the Usable on Code column is blank, the part listed is applicable to ; camera models. Parts which apply to specific came models are letter-coded as follows: Design 70-1 camera parts are coded "A", Design 70-HR came parts are coded "B", and Design 70-TMR came parts are coded "C".

NOTE: This Parts Catalog reflects only those cai eras with serial number L-98020 and higher. Wh servicing earlier model cameras, refer to Servi Manual Part No. 70019 (revised April 1959).

NON-ILLUSTRATED PARTS AND ACCESSORIES

Carrying Case (70-DR)..... P/N 06974
Carrying Case (70-HR, 70-TMR).....P/N 040104
Film Magazine, 400 ft (70-HR only).....Design 132B
Spring Belt for 400 ft magazine..... P/N 10089
Film Spool ..... P/N 08272
?Electric Motors (70-HR and 70-TMR):
12VDC, 8 to 64 fps..... P/N 07035
24VDC, 8 to 64 fps.....P/N 031498
115V AC-DC, 8 to 64 fps .....P/N 031397
115VAC, 60 cycle, 24 fps.....P/N 085089

?Design 7 0-DR camera must be factory-adapted for use with external motors.

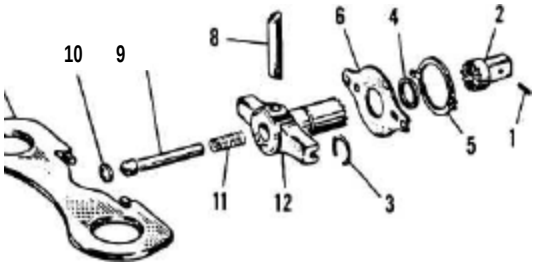


Figure 1. Winding Key Assembly

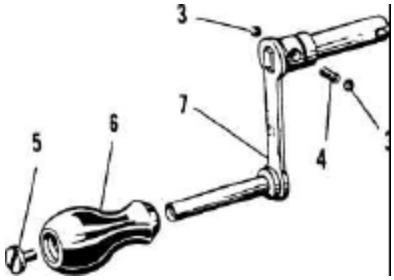


Figure 2. Hand Crank Assei

[G. & IDEX NO.	PART NO.	DESCRIPTION 12 3 4 5 6 7	UNITS PER ASSY
		WINDING KEY ASSEMBLY	
1 -	07388	KEY ASSY, Winding, non-rotating	1
-1	14479	. PIN	1
-2	14481	. RATCHET	1
-3	1662	. RING, Retaining	1
-4	1092	. COLLAR, Retaining, split	1
-5	1685	. CLIP, Friction	1
-6	14475	. SPRING, Clamp	1
-7	14474	. PLATE, Handle	1
-8	14476	. BAR, Uncoupling	1
-9	14478	. SHAFT, Spring	1
-10	14480	. PLUG	1
-11	14477	. SPRING, Compression	1
-12	14482	. BODY, Key	1
		HAND CRANK ASSEMBLY	
2-	0295	CRANK ASSY, Hand (complete)	1
-1	9419	. SPRING, Hand crank dial locking	1
-2	9421	. DIAL, Hand crank (20 frames)	1
-3	2569	. BALL	2
-4	10457	. SPRING, Compression	1
-5	21997	. SCREW, Fillister hd, No. 6-32 x 1/4 in	1
-6	15904	. HANDLE, Crank	1

DESIGN

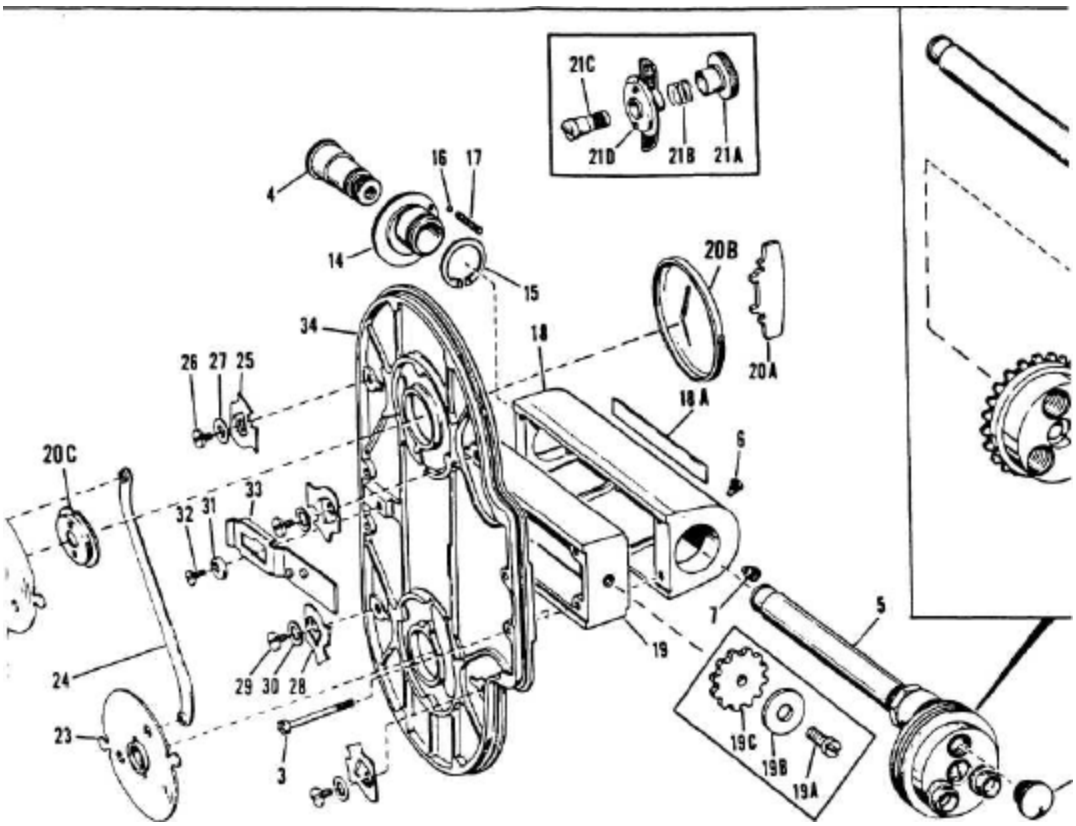


Figure 3. Camera Cover Asse

CAMERA COVER ASSEMBLY

PART NO.	DESCRIPTION	UNITS PER ASSY
11765	COVER, Lens mount	2
09020	VIEWFINDER ASSY (Includes items 4 thru 18)	1
09029	VIEWFINDER ASSY (Includes items 4 thru 18)	1
20549	SCREW, Viewfinder attaching	4
22305	SCREW, Viewfinder attaching	4
06680	. MOUNT, Eyepiece	1
09027	. TUBE ASSY,. Finder (includes items 8 thru 13)	1
20693	. SCREW, Pilot (upper)	1
20536	. SCREW, Pilot (lower)	1
09033	. . TURRET, Viewfinder	1
28069	. . SCREW, Turret	1
17891	. . WASHER, Spring	1
11775	. . SPRING, Turret indexing	1
11785	. . ROLLER, Turret indexing	1
No Number	. . TUBE, Viewfinder	1
22306	. CAM, Parallax correction	1
26915	. RING, Retaining	1
5238	. BALL, Steel	1
22500	. SPRING, Compression	1
27959	. HOUSING, Viewfinder	1
29268	NAMEPLATE (70-DR)	1
29270	NAMEPLATE (70-HR)	1
29273	NAMEPLATE (70-TMR)	1
27961	SPACER, Viewfinder	1
27968	SCREW, Pivot	1
27966	WASHER	1
27964	GEAR, Idler	1
09035	COVER ASSY (Includes items 20 thru 34)	1
09038	COVER ASSY (Includes items 20 thru 34)	1
27975	. KEY, Latch cam	2
27978	. HUB, Latch cam, outer	2
27981	. HUB, Latch cam, inner	2
16821	. KNOB, Clutch (see Note A)	1
6128	. SPRING, Compression (see Note A)	1
16822	. CLUTCH (see Note A)	1
09673	. HUB ASSY, Latch cam (see Note A)	1
04262	. CAM, Latch (upper)	1
04263	. CAM, Latch (lower)	1
6212 •	. LINK, Latch cam	1
14429	. LATCH, Door (upper)	2
14430	. SCREW, Door latch	2
6219	. WASHER, Spring	2
14428	. LATCH, Door (lower)	2
14430	. SCREW, Door latch	2
6219	. WASHER, Spring	2
11144	. ECCENTRIC	1
6458	. SCREW, Eccentric	1
02145	. BAR, Push	1
28009	. COVER, Camera	1
	r.nvrn r.nmom	l

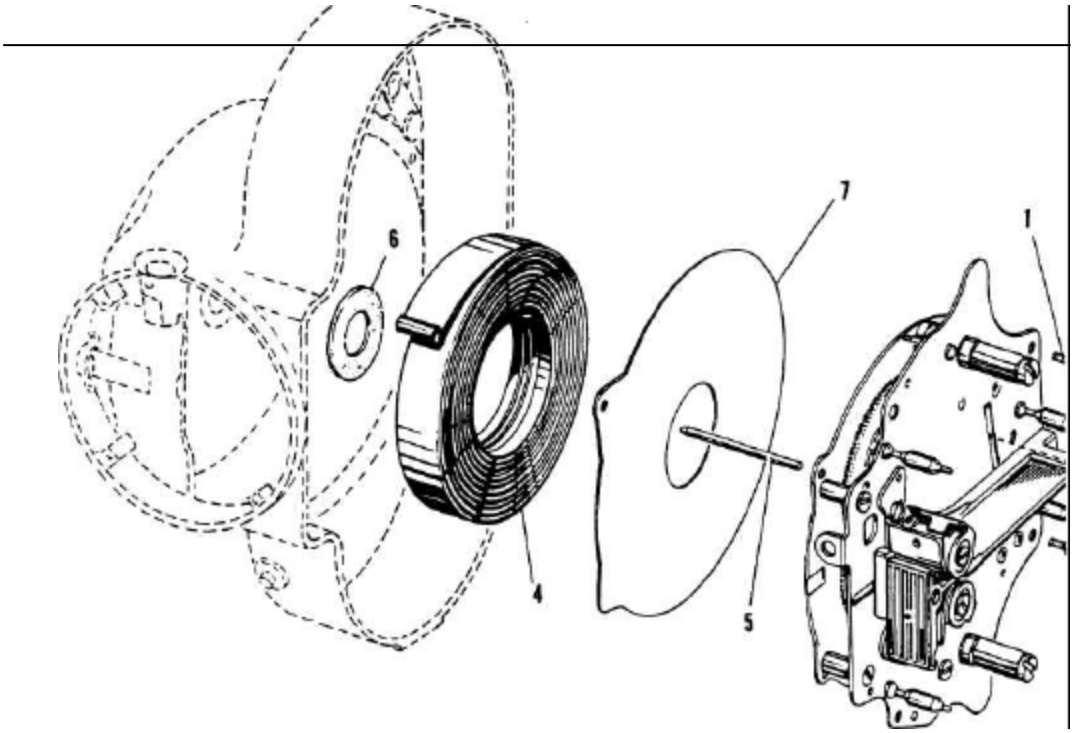
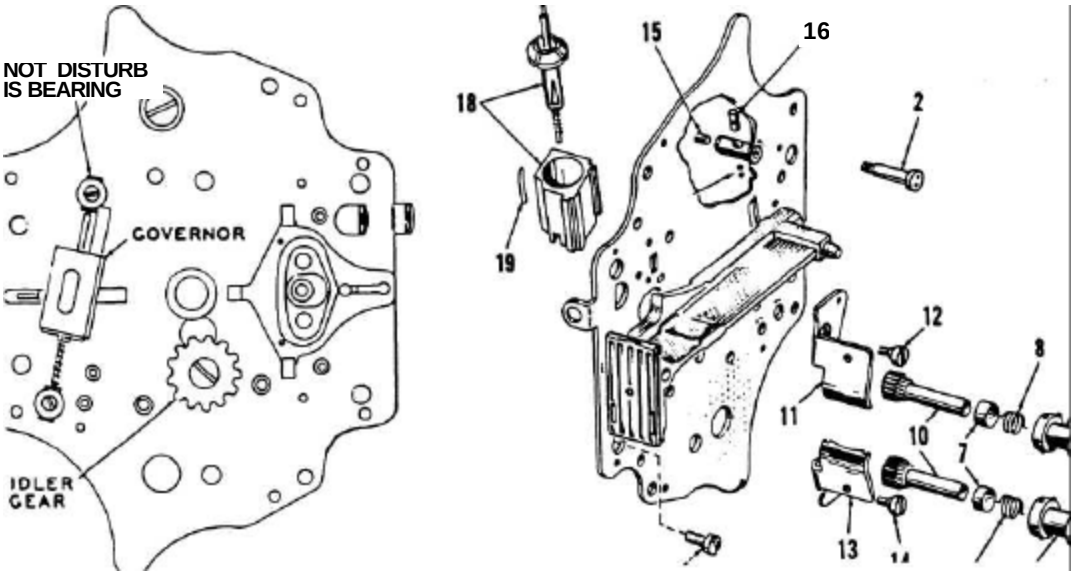


Figure 5. Main Drive Spring and Gc



DESIGN 7

1 29 27 XJ „

15 17 18

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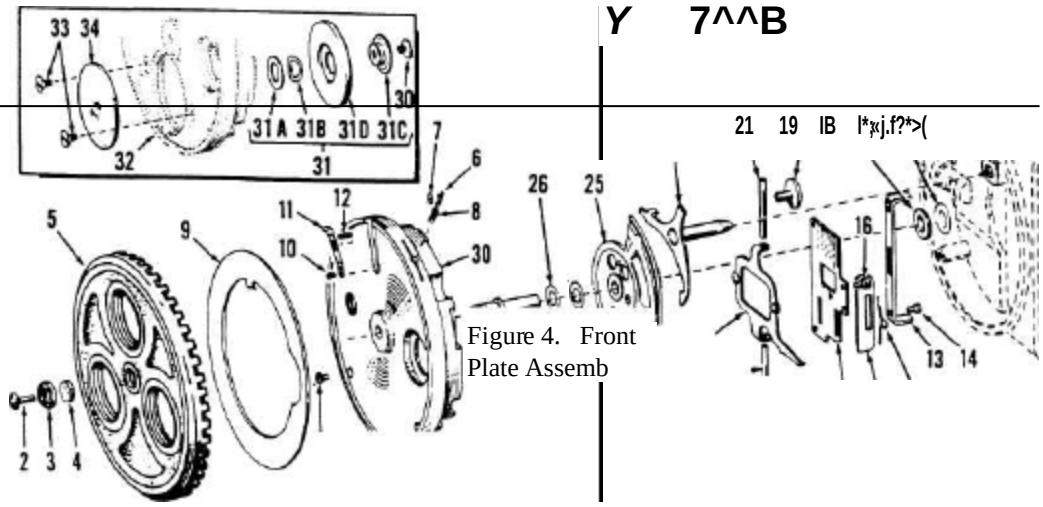


Figure 4. Front Plate Assemb

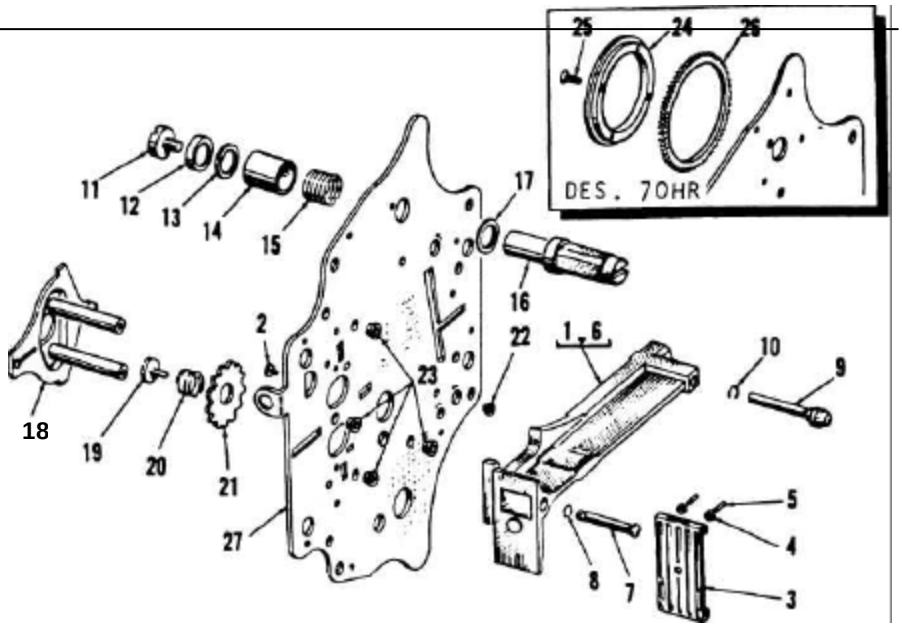
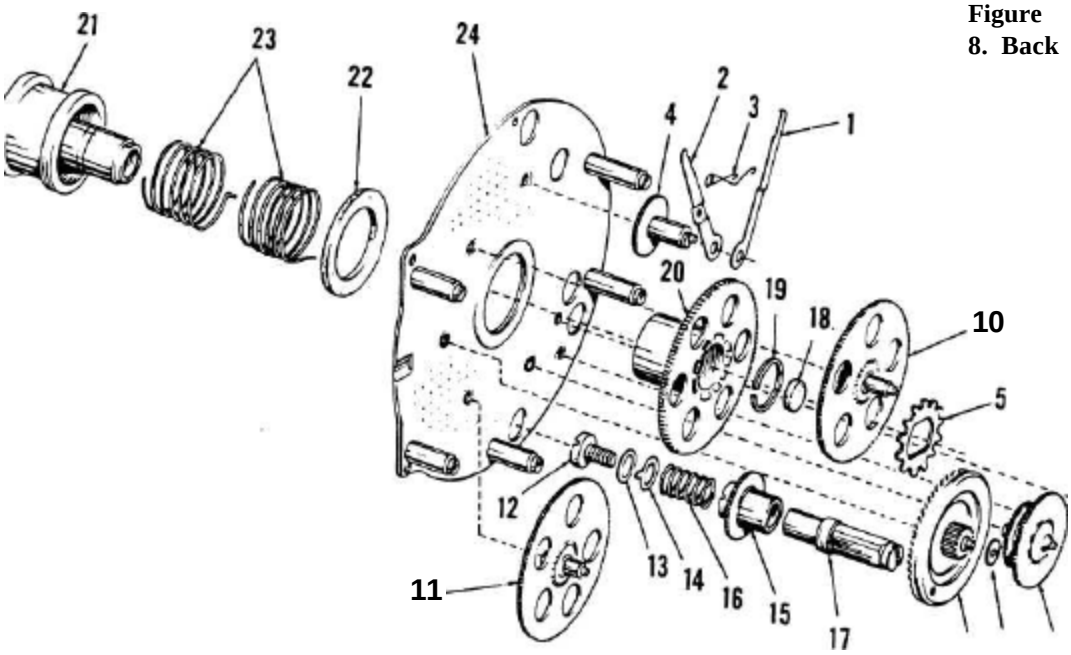


Figure 7. Front Mechanism Plate Assembly - Sheet

PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY
	FRONT MECHANISM PLATE ASSEMBLY	
06941	. ARM ASSY, Gate (includes items 3 thru 5)	1
7363 or4460	. SCREW, Gate arm	1
22355	. . PLATE, Film gate	1
15192	. . NUT, Hex	3
17934	. . SETSCREW, Headless	3
09672	. . ARM, PIN AND SPRING ASSY	1
6369	. STUD, Gate retaining (front)	1
28814	. SPRING, Single coil	1
11883	. STUD, Gate retaining (rear)	1
28814	. SPRING, Single coil	1
6296	. SCREW, Shoulder	1
6416	. COLLAR, Friction	1
24612	. WASHER, Spring	1
6417	. HOUSING, Return spring	1
6418	. SPRING, Feed spindle return	1
03045	. SPINDLE ASSY, Feed	1
6492	. WASHER, Friction	1
05867	. CARRIER ASSY, Sprocket stud	1
1523	. SCREW, Stop gear	1
6128	. SPRING, Stop gear	1
27630	. GEAR, Idler stop	1
fi373	. BEARING, Governor drive eear	1

Figure 8. Back Mechanism Plate



PART NO.	DESCRIPTION 12 3 4 5 6 7	UNITS ASSY	USA PER C(	(
	BACK MECHANISM PLATE ASSEMBLY			
6164	PAWL, Ratchet pull		1	J
6163	PAWL, Ratchet locking	1	1	
6165	SPRING, Ratchet pawl		1	i
9006	ECCENTRIC AND GEAR ASSY		1	i
9007	GEAR ASSY, Veeder counter		1	
27631	GEAR, Stop, main drive shaft		1	
09001	SPINDLE & GEAR ASSY		1	
09332	PINION ASSY, Governor		1	
0698	WHEEL ASSY, Governor lubricating		1	
09004	PINION ASSY, 2nd compound		1	
10601	WASHER, Shim		AR	
09003	PINION ASSY, 1st compound		1	
09002	GEAR ASSY, Idler		1	
09317	SPINDLE ASSY, Take-up (includes items 12 thru 17)		1	
09324	SPINDLE ASSY, Take-up (includes items 12 thru 17)		1	
6296	. SCREW, Shoulder		1	
6492	. WASHER, Friction		2	
6493	. WASHER, Friction (keyed)		1	
27626	. GEAR, Take-up drive (20° pressure angle)		1	
09323	. GEAR, Take-up drive (20° pressure angle)		1	
6124	. SPRING, Compression		1	
03045	. SPINDLE & COLLAR ASSY		1	
6147	WASHER, Grease retaining		1	
9343	PLATE ASSY, Back (includes items 19 thru 24)		1	
9344	PLATE ASSY, Back (includes items 19 thru 24)		1	
6146	. RING, Split retaining		1	
09005	. GEAR, Main driving		1	
6144	. SHAFT, Main drive		1	
22218	. WASHER, Packing		1	
12086	. SPRING, Tension		2	
05871	. PLATE & BEARING ASSY		1	
05873	. PLATE & BEARING ASSY		1	

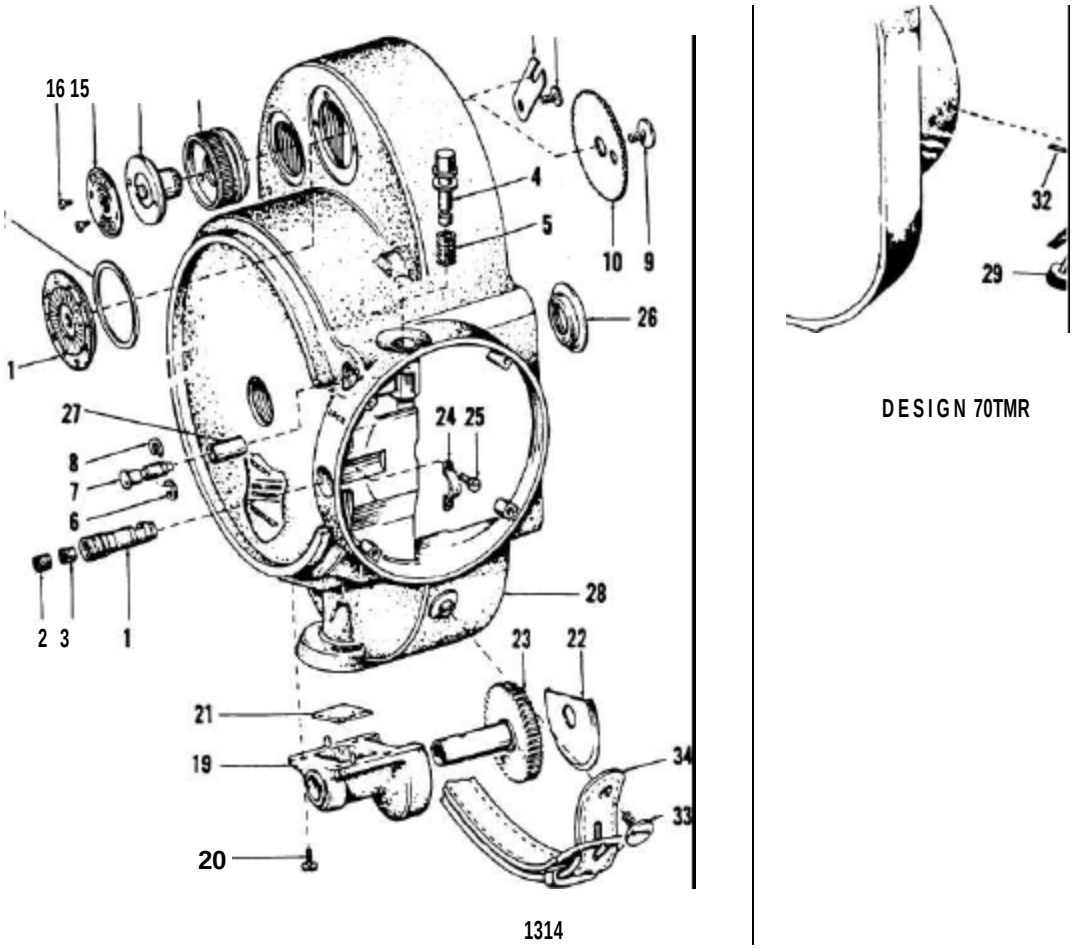
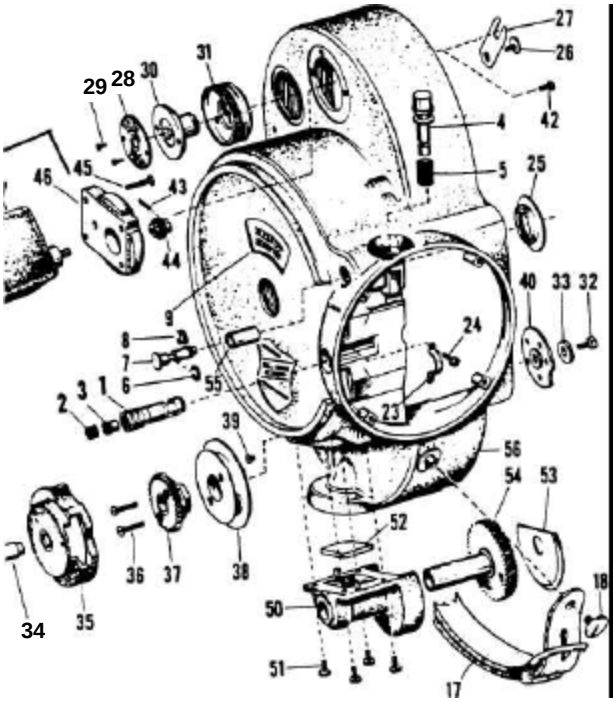


Figure 9. Camera Frame Assembly and 70TMR) (see Figure 10 for E Camera Frame)

PART NO.	12 3 4 5 6 7	DESCRIPTION	UNITS PER ASSY	
		CAMERA FRAME (DES. 70-DR AND 70-TMR)		
		FOCUSER, Critical	1	
		EYEPIECE, Critical focuser	1	
		CARRIER, Critical focuser	1	
		BUTTON, Stop pawl push	1	
		SPRING, Push button	1	
		SPRING, Stop plunger retaining	1	
		PLUNGER, Push button stop	1	
		SPRING, Stop plunger friction	1	
		FRAME ASSY (Includes items 11 thru 34)	1	
		FRAME ASSY (Includes items 11 thru 34)	1	
		. SCREW, Ratchet	1	
		. RATCHET, Film meter	1	
		. DIAL, Film meter	1	
		. WASHER, Friction	1	
		. SPRING, Speed control retaining	1	
		. SCREW, Retaining spring	1	
		. DIAL, Governor	1	
		. DIAL, Governor	1	
		. SCREW, Governor dial	2	
		. HOLDER, Speed control dial	1	
		. HOLDER, Speed control dial	1	
		. KNOB, Speed control	1	
		. HOUSING ASSY, Crank	1	
		. SCREW, Crank housing	4	
		. BLOCK, Felt	1	
		. COVER, Crank housing	1	
		. GEAR ASSY, Cranking (20° press, angle)	1	
		. CLAMP, Critical focuser	1	
		. SCREW, Clamp	2	
		. BEARING, Main drive shaft	1	
		. BUSHING, Stop plunger	1	
		. FRAME, Camera	1	
		SCREW, Locking, knurled	1	C
		SCREW	4	C C
		PIN, Aligning	2	C
		BRACKET, Camera motor	1	
		SCREW, Carrying strap	2	
		STRAP, Carrying	1	

DESIGN 7<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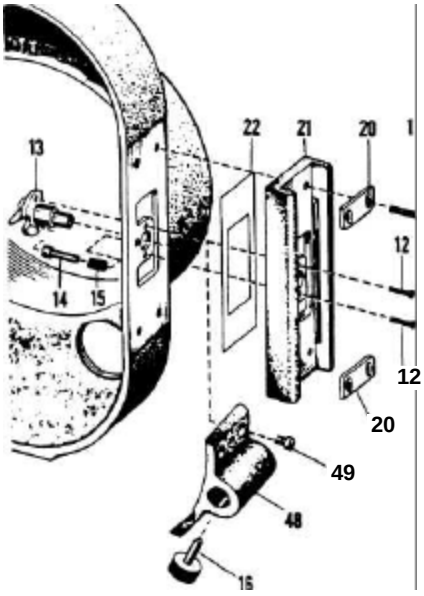
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