

***Nikon***

**MOTOR DRIVE MD-1**

**20FA97**

**REPAIR MANUAL**

**(REVISED)**



**NIPPON KOGAKU K.K.**

Tokyo, Japan

CONTENTS

	Page
Illustrations of Each Parts . . . (Fig.1 - 10) . . . . .	1 - 10
Relative Angles . . . . .	11
Wiring Diagram. . . . .	12
Circuit Diagram . . . . .	13
Lubricating and Cementing Table . . . . .	14
Operation Standards . . . . .	15
Adjustment. . . . .	16 - 17
Possibilities of Disorders. . . . .	18
Check Point, Cause, and Treatment . . . . .	19 - 25
Parts List . . . . .	26 - 55
Subassembly List. . . . .	56 - 57

## NOTE:

Marks in the "Term of Sale" column of the parts list are;

○ . . . . . Can be supplied individually

△ . . . . . Not supplied individually but only as subassembly

○△ . . . . . Supplied either as part or subassembly

Development

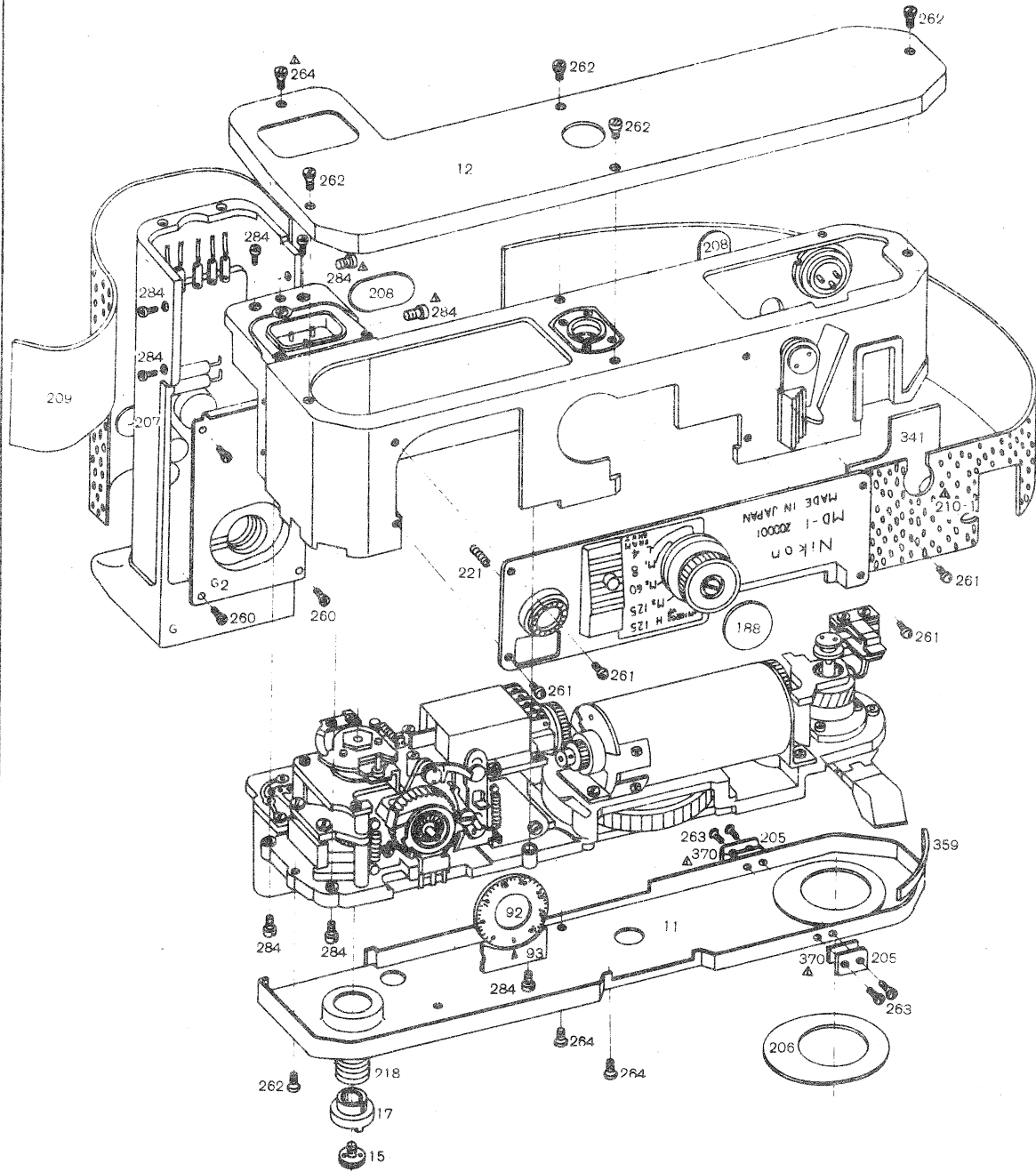


Fig. 1

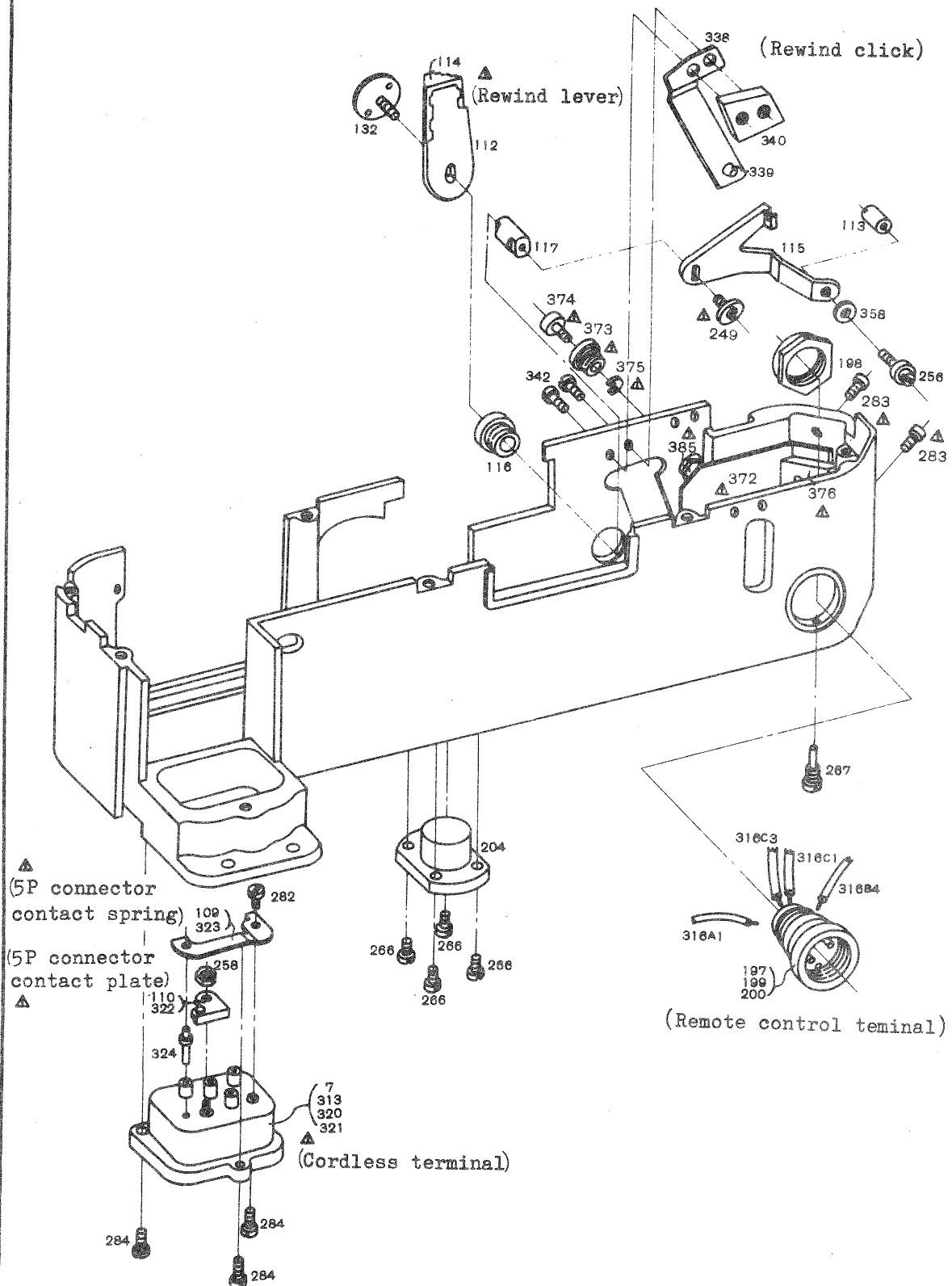


Fig. 2





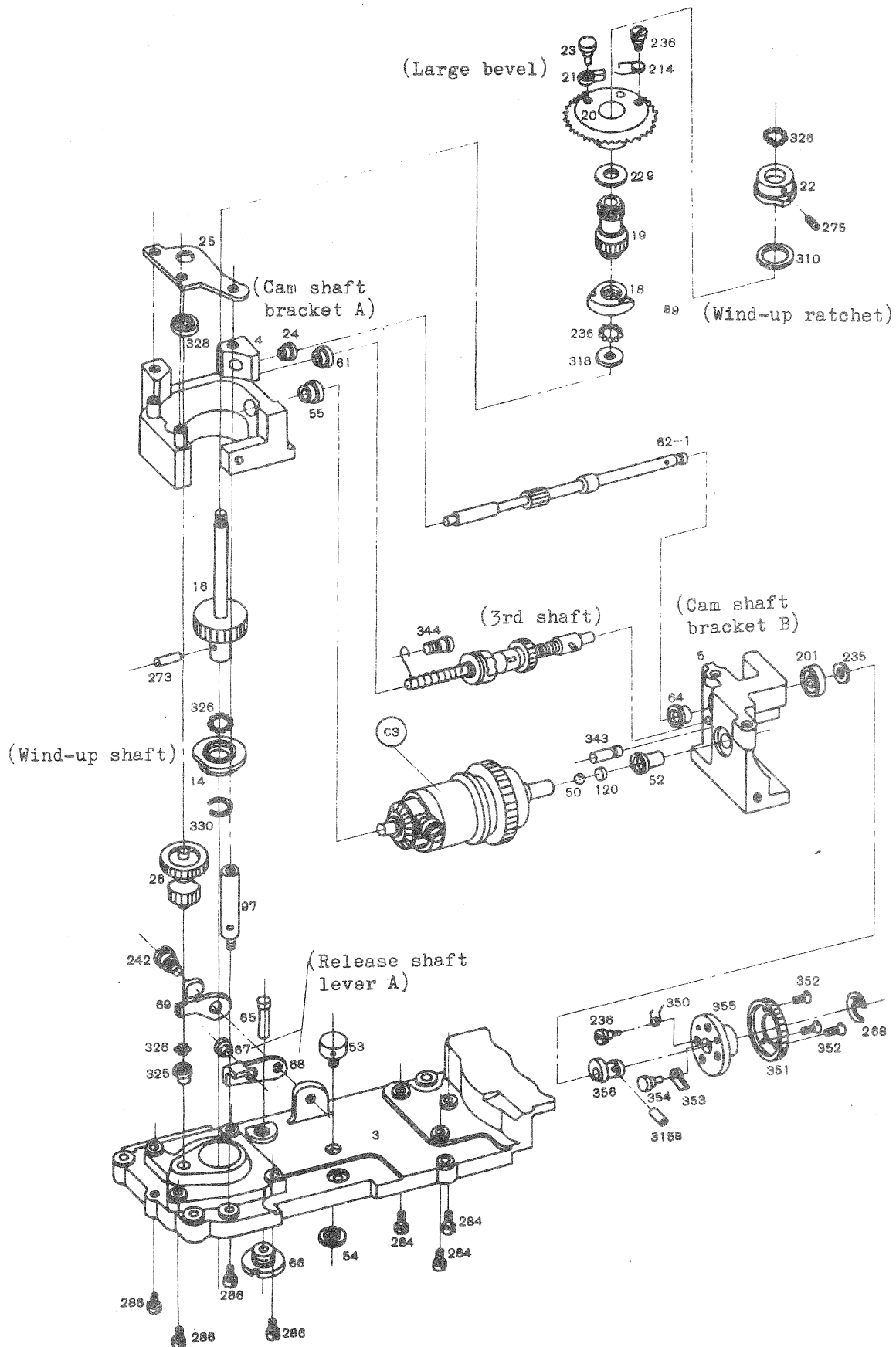


Fig. 4

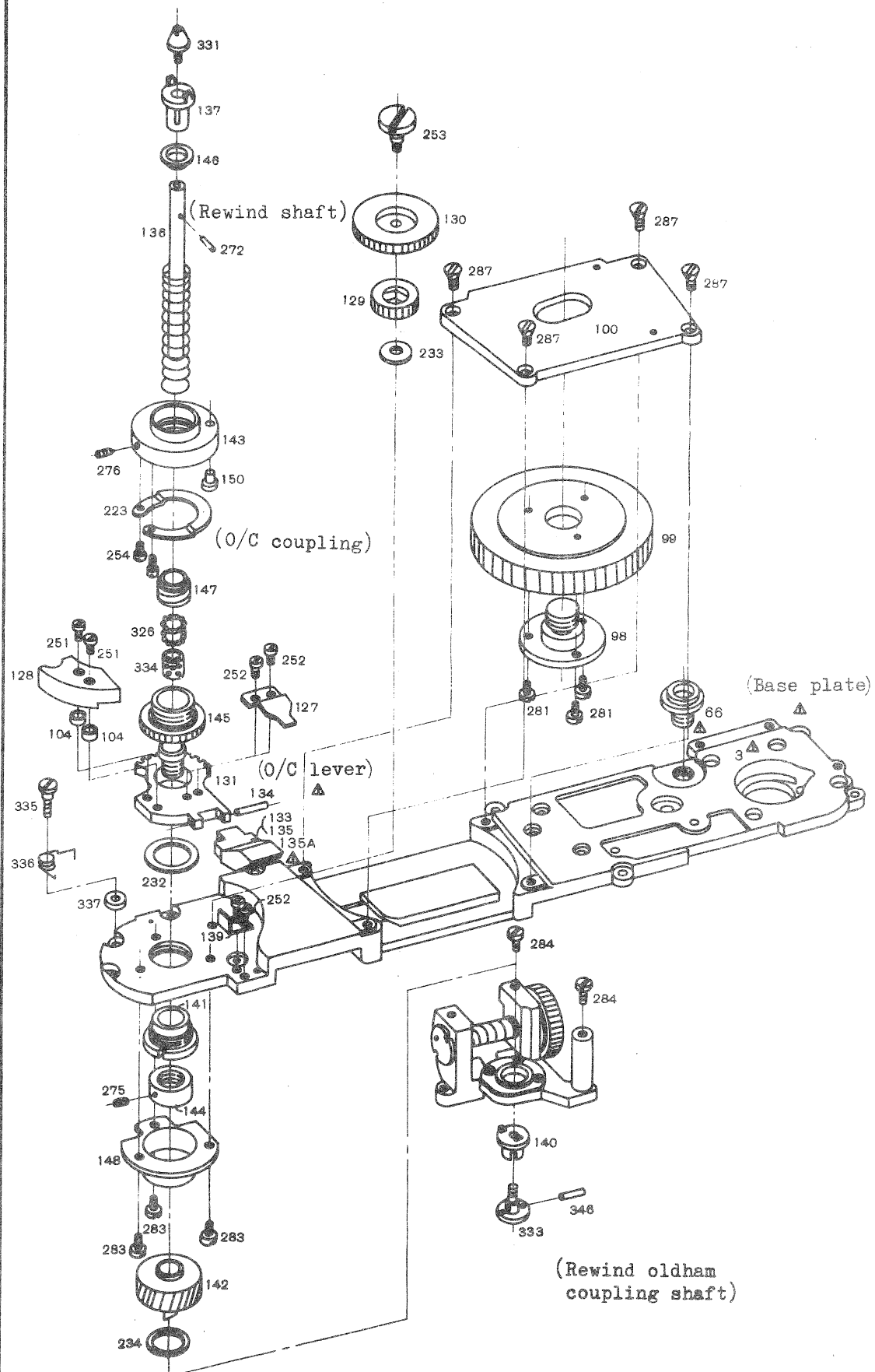


Fig. 5

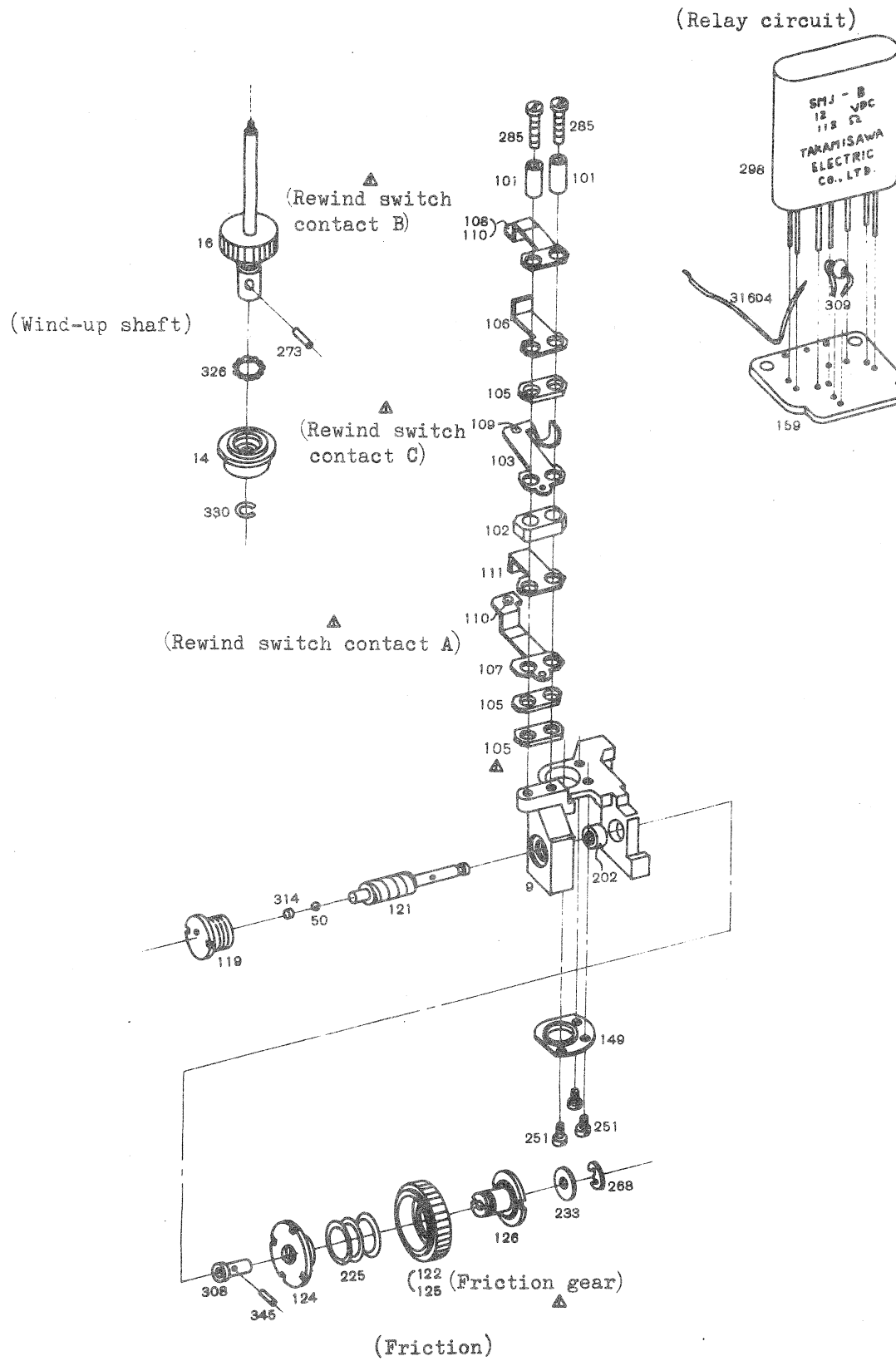


Fig. 6

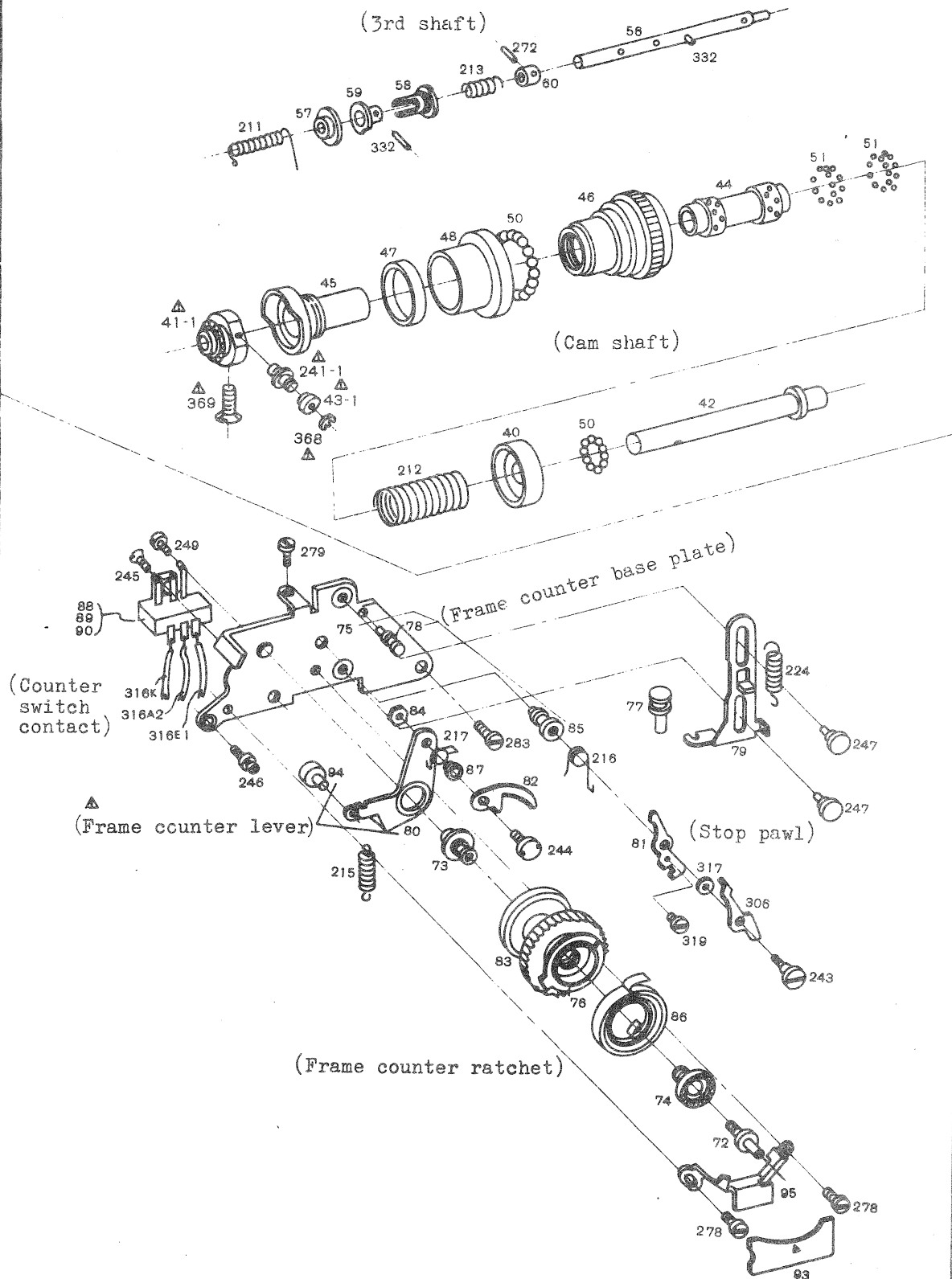


Fig. 7

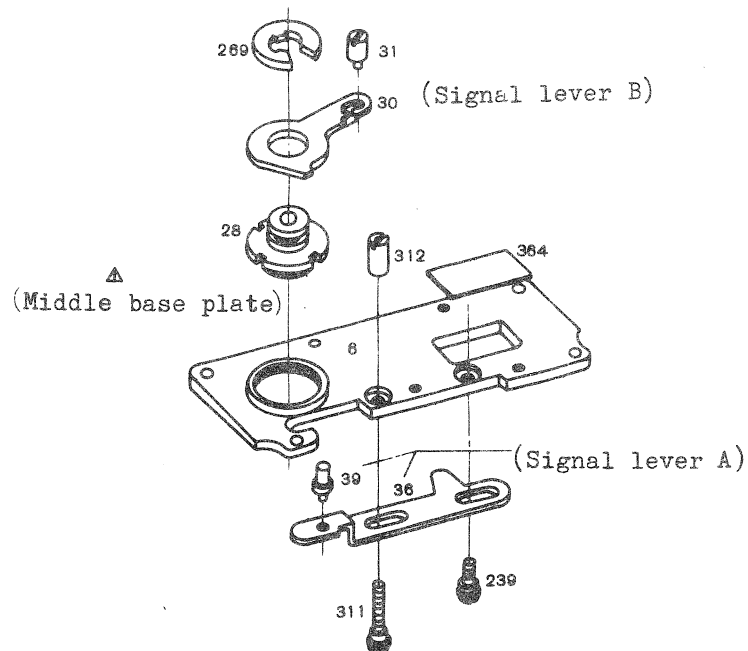
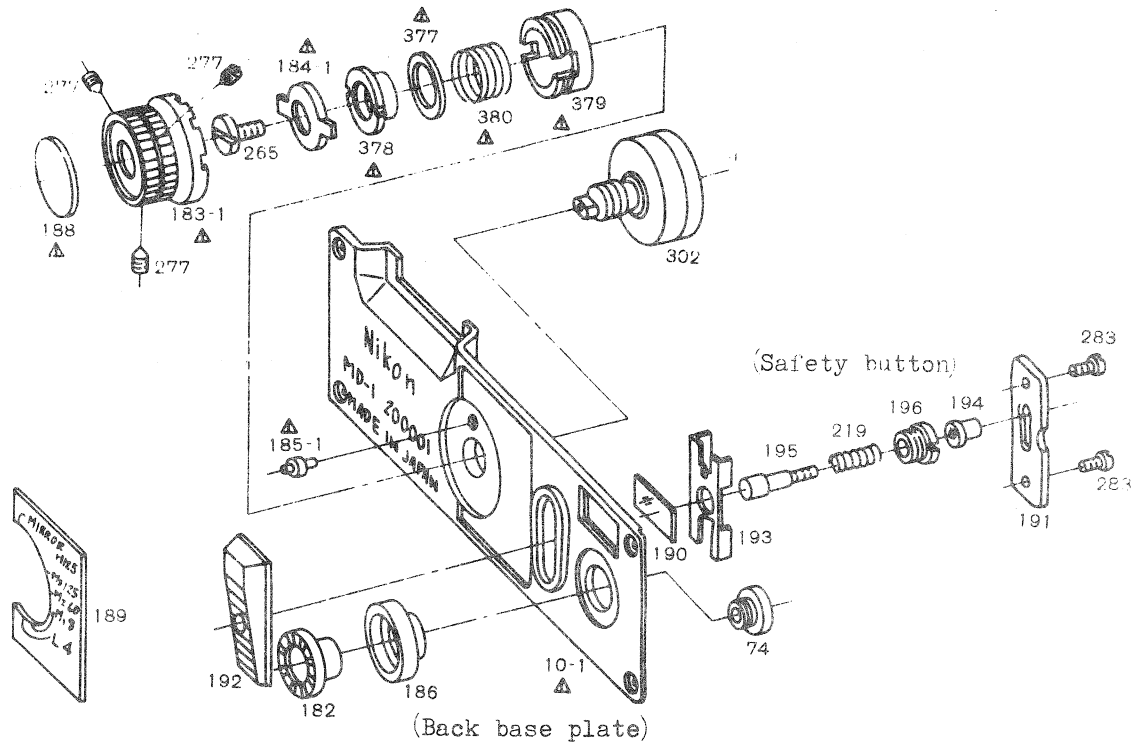


Fig. 8

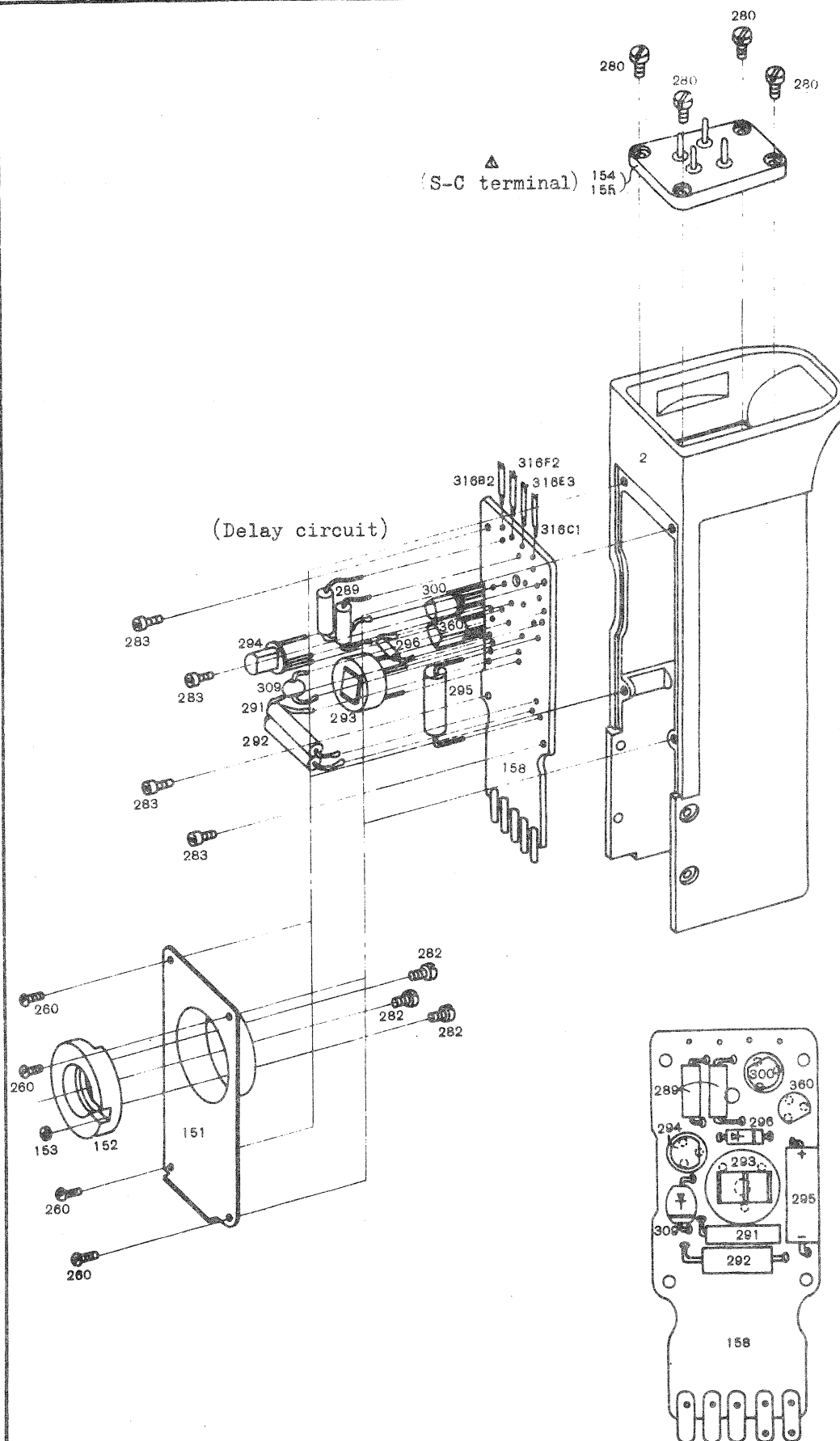


Fig. 9

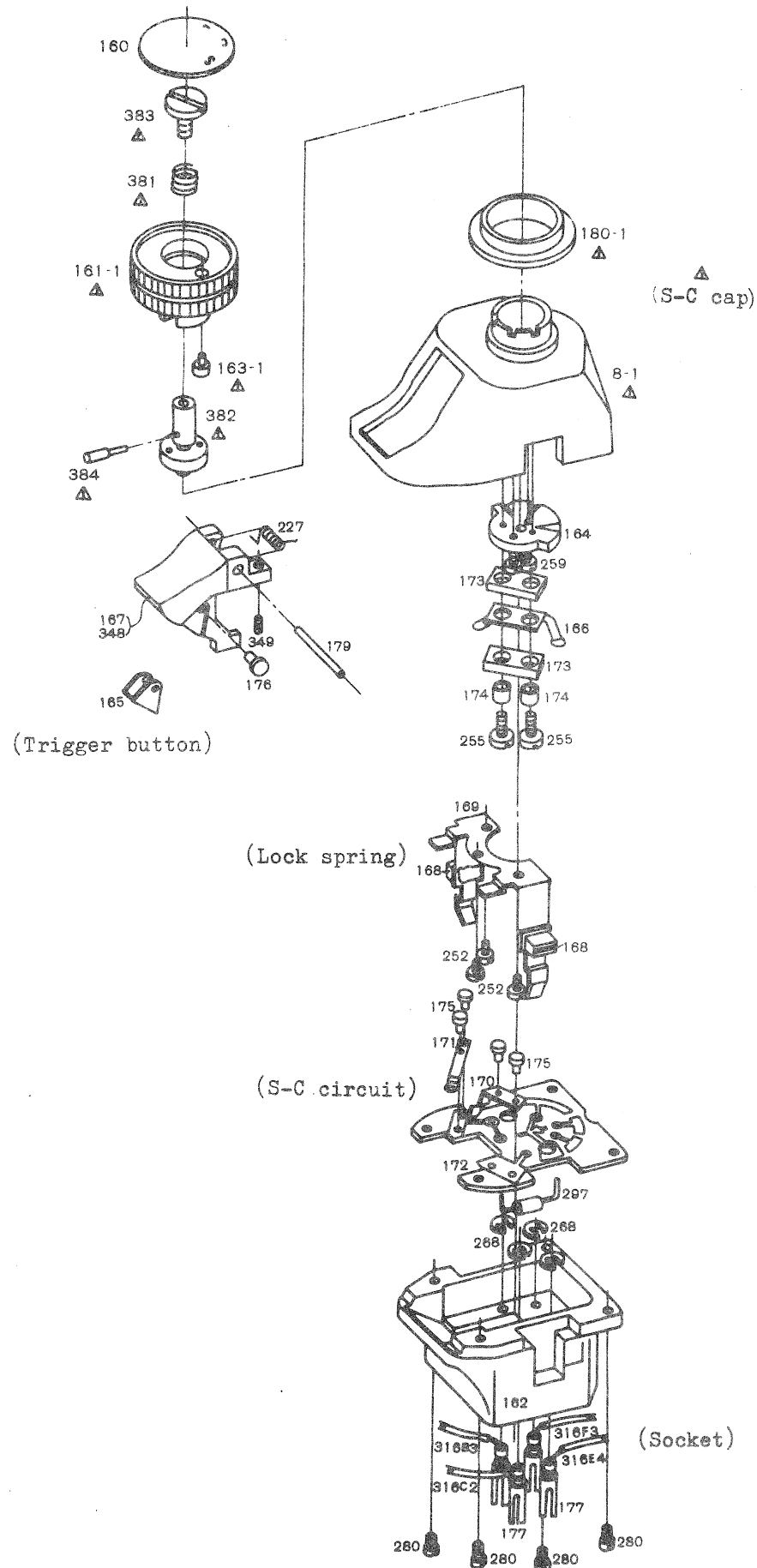
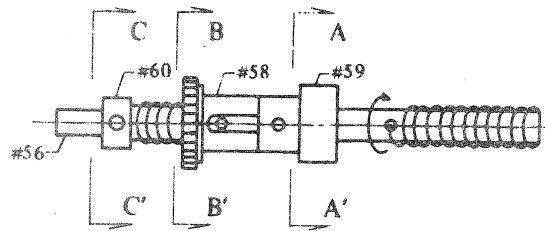


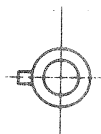
Fig. 10



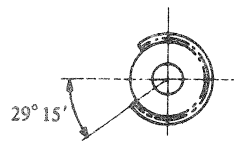
2. Relative angles to be given in assembling the parts to the third shaft are as follows:



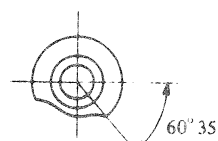
To assemble the third shaft, turn it two rotations in the direction indicated by the arrow.



C - C'



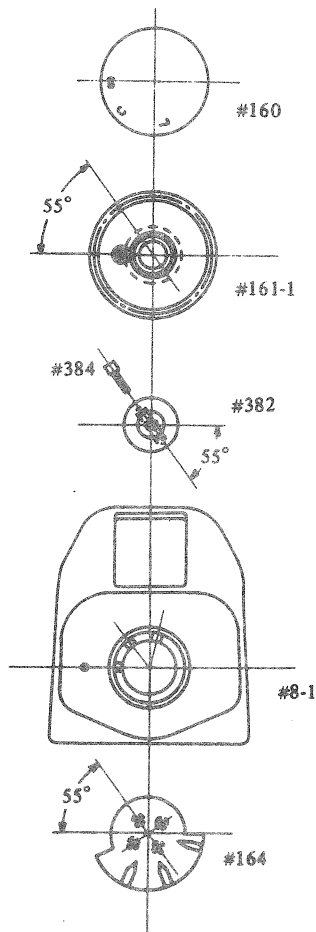
B - B'



A - A'

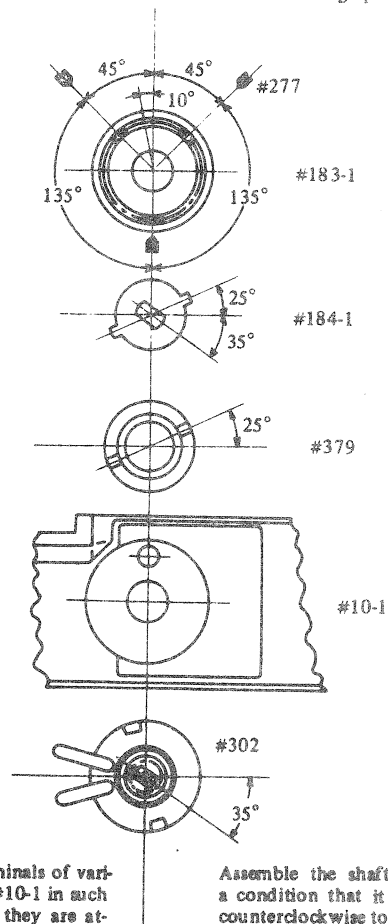
Relative angles to be given in assembling the parts to the S-C knob

When the S-C knob is set to S



Angular relations and assembling of the firing speed adjusting knob

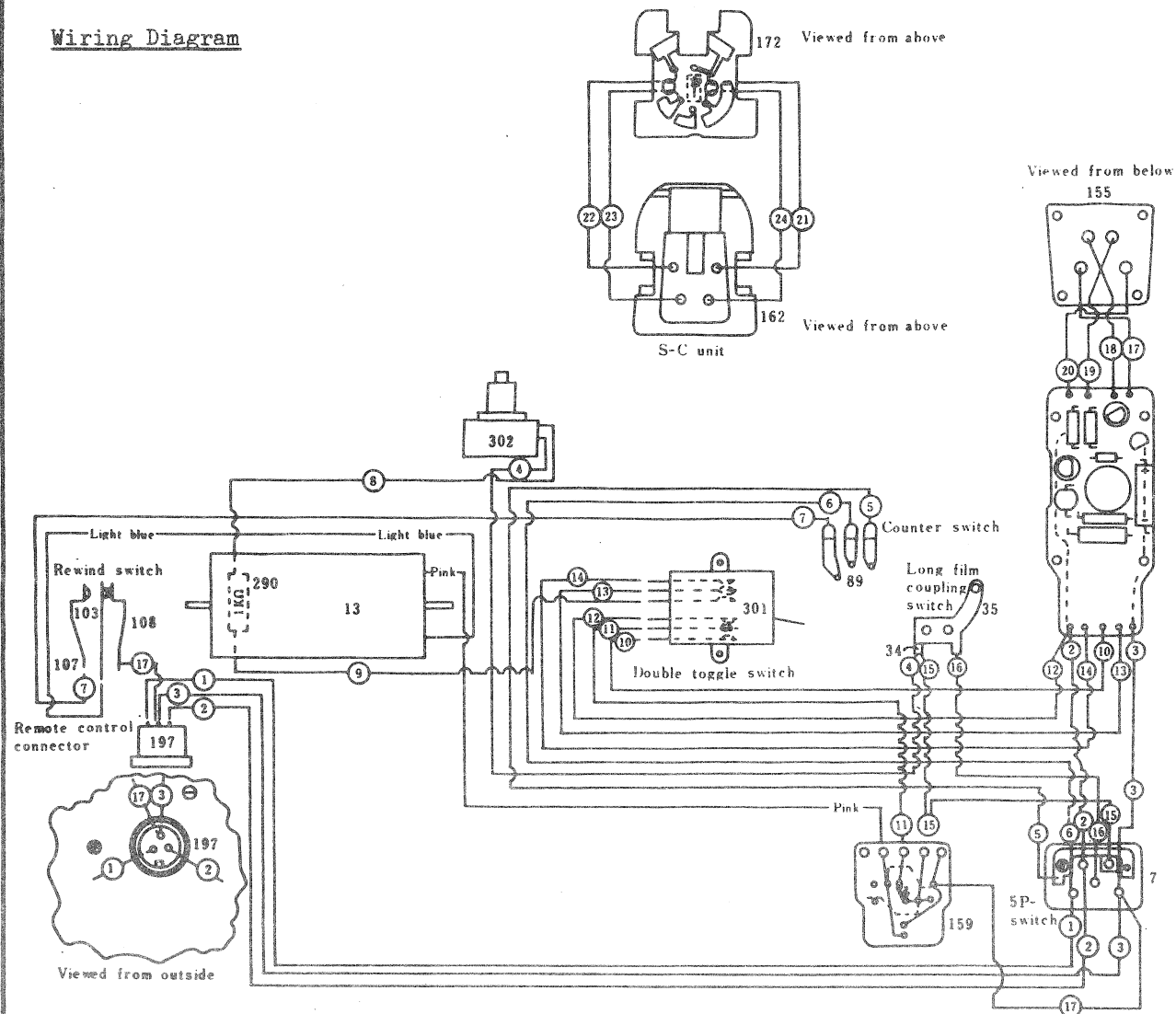
When the firing speed is set to H



Attach two terminals of variable resistor to #10-1 in such a position that they are attached symmetric above and below, as shown at right.

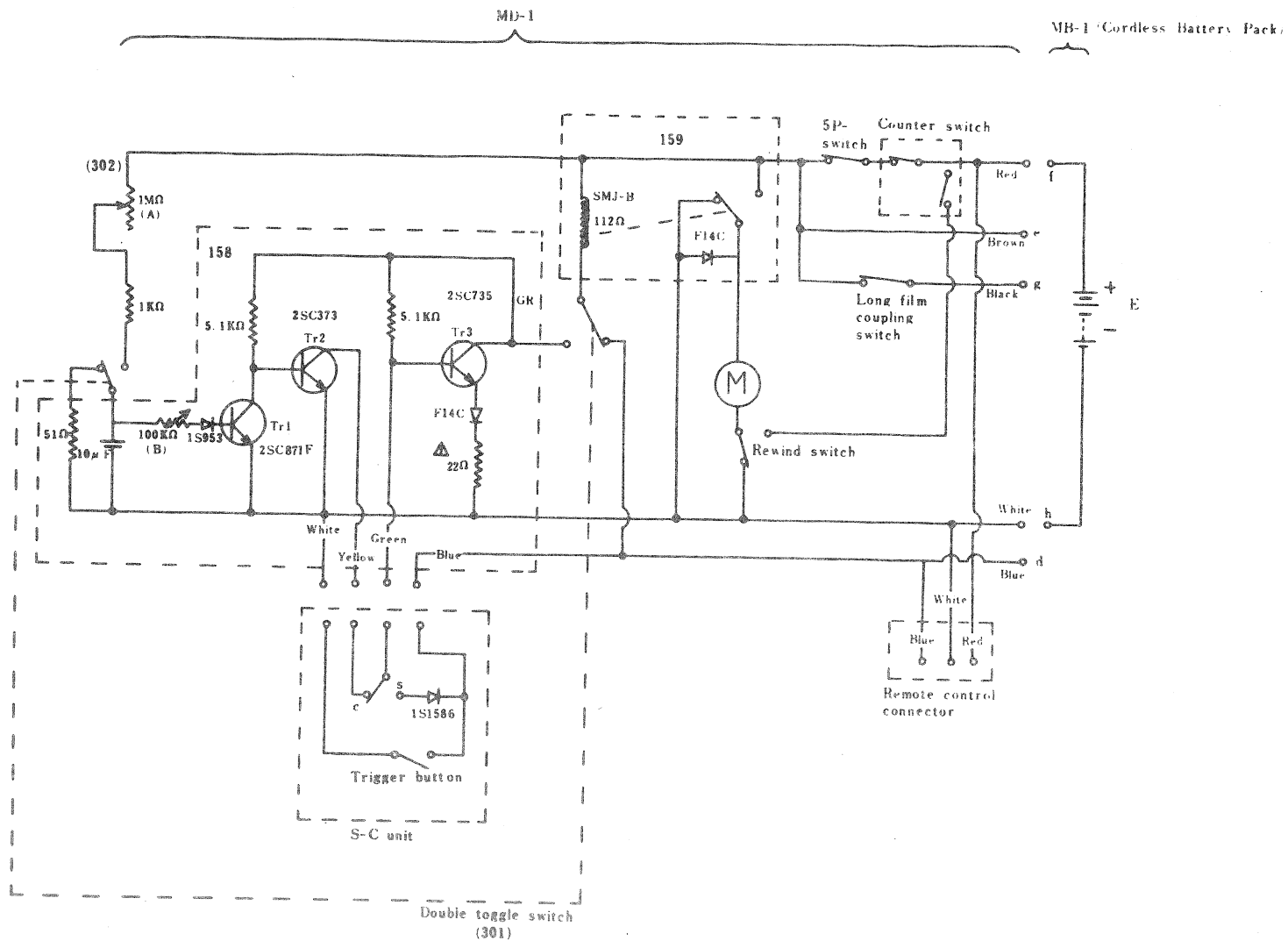
Assemble the shaft in such a condition that it is turned counterclockwise to the limit as shown at left, so that the firing speed is slower as the shaft is turned counterclockwise.

# Wiring Diagram



No.	Color	Part No.	Length (mm)
1	Red	316A1	140
2	Blue	316B4	200
		a=140, b=60	
3	White	316C3	200
		a=140, b=60	
4	Brown	316D3	130
5	Orange	316K	170
6	Red	316A2	170
7	Yellow	316F1	160
8	Brown	316D1	160
9	Brown	316D2	100
10	Green	316F1	120
11	Black	316G1	90
12	Blue	316H1	120
13	Yellow	316F2	120
14	Gray	316J	130
15	Brown	316D4	90
		a=60, b=30	
16	Black	316G2	60
17	White	316C1	50
18	Yellow	316F3	50
19	Green	316F2	50
20	Blue	316B2	50
21	Blue	316B3	22
22	White	316C2	22
23	Yellow	316F4	22
24	Green	316F3	22

# Circuit Diagram



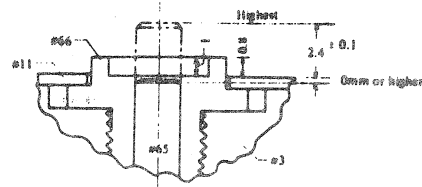
## 4. Lubricating and Cementing Table

	Type No. of the agent	Parts to be applied to
Lubricant	L2113	#86, #136, #137
	G7100	Tripod screw knob, #65, #334, #77, #17, Rewind lever #339(click), #127, #150, #73 - 74, #195 - 196 #73 - 80
	G8181	Wind-up idle gear, Cam shaft, 3rd shaft, #242 Wind-up shaft, Large bevel gear, Long film switch #131, Outer side of #145, O/C idle gear, #142 #140 - 333, 2nd shaft, #30 - 28, #36, Worm shaft Friction parts, Stop pawl, #79, Advance pawl, #161 S-C click, Frame counter dial, #191
Cementing agents	#501	#92, #93, #207, #208x2, #341, #188, #209, #210, #153 #160, #206, #189
	#616	#116 - 1, #145 - 143, #65 - 5, #24 - 4, #55 - 4, #61 - 4 #352 - 351 - 355, #249 - 75, #83 - 76, #180 - 8 #349 - 167, #196 - 192, #182 - 74, #343 - 5 #359{Cemented with #616 agent, after fixed temporarily with #921 (Aron-Alpha)}
	#646HB	#190 - 10
	#647HB	#95 - 75, #67 - 68
	#201 (#350)	#53 - 54, #284 - 5, #286 - 4, #283 - Motor, #284 - 4 #288 - 6, #284 - 6, #286 - 6, #237 - 6, #283 - 148, #284 - 9, #283 - 75, #279 - 75, #282 - 301, #284 - 3 #284 - 2, #342 - 1, #119 - 9, #278 - 95, #187 - 302 #283 - 10
	#410B/M	#287, #97, #275 - 144, #266 - 204, #276 - 143, #281 - 99 #362 - 357, #311 - 312, #251 - 149, #245 - 75

## 5. Operation Standards

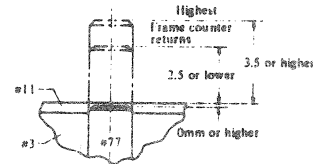
### 5-1. Stroke of shutter release shaft #65

Adjust the highest position of the shutter release shaft so as to reach a distance of  $2.4 \pm 0.1$  mm from the surface of #11, following the method described in 6-1. Although the stroke of the shaft is given on the drawing as 2.8mm, if the highest position comes to 2.5mm or higher, it sometimes happens that no shutter curtain slit opening is obtained at a shutter speed of  $1/2,000$  sec. The lowest position is to be lower than the surface of #11.



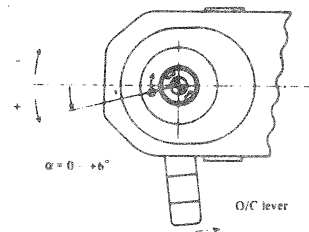
### 5-2. Stroke of rewind button pin #77

The highest position of the rewind button pin is to be 3.5mm or higher from the surface of #11. The position where the frame counter returns to S (start) is to be 2.5mm or lower. The lowest position should be lower than the surface of #11.



### 5-3. Angular position of O/C pin # 50

Push the O/C lever up to the limit in the C (close) position so that it has no slack in the direction of the arrow. In this position the O/C pin should be at an angle of  $0^\circ - 6^\circ$ .



### 5-4. Winding-up torque

The winding-up torque of the winding-up coupling (#17) is to be 6 - 7.5 kg.m.

### 5-5. Rewinding torque

The torque of the rewinding coupling (#137) should be 2 - 2.5 kg.m.

### 5-6. Highest operating voltage

Using a constant voltage power source (with a current capacity of 2A or more) and setting the S-C knob to the position S, the Motor Drive is to run normally at 15V. When the push button is released it should stop running, with the camera not loaded with film.

### 5-7. Lowest operating voltage

Using a constant voltage power source (with a current capacity of 2A or more), the Motor Drive is to run at 9V.

### 5-8. No load current

When the Motor Drive alone (with no camera attached) is wound up, the current capacity is to be as below: 0.25mA or less, while the roller (#43) is mount on the cam (#45) 0.22mA or less, while the roller is dismount from the cam.

### 5-9. Firing speed per sec.

When using a constant voltage power source (with a current capacity of 2A or more) at 15V and loading the camera with a patron of TRI-X or NEOPAN-SS film, the time required for running 36 picture frames is to be within the following ranges for each firing speed setting:

H	M <sub>3</sub>	M <sub>2</sub>	M <sub>1</sub>	L
6.5 - 8.0 sec.	7.7 - 9.2 sec.	9.0 - 10.5 sec.	13.5 - 17.0 sec.	26 - 31 sec.

### 5-10. Rewind current

Should not exceed 0.4A.

### 5-11. Rewind time

Time to be taken for rewinding 36 picture frames should not exceed 8.5 sec.

### 5-12. $1/2,000$ sec. speed shutter

Even setting the mirror to up-position and then to down-position, the correct widths of the shutter curtain slit should be obtained at the firing speeds: L, M<sub>1</sub>, M<sub>2</sub>, M<sub>3</sub>, and H (only here for up-position).

### 5-13. Time for conducting the current of the long film coupling switch

Should not exceed 120msec.

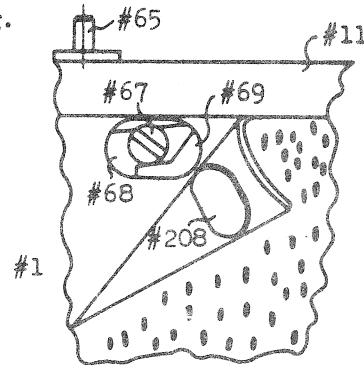
## 6. Adjustment

### 6-1. Adjusting the highest position of shutter release shaft

Peel off a small part of the leatherette from the front surface of the Motor Drive body to expose the oval adjusting opening. Let the cam in the Motor Drive advance (for which set the S-C ring to S and depressing the push button, switch off the power source.)

Keeping #65 protruded, rotate the adjusting pin #67 to adjust the height of #65.

After adjustment, fix #67 and #68 in position, using cementing agent #647HB.



### 6-2. Adjusting the picture frame speed per sec.

Adjustment of the following resistors is necessary:

1. Variable resistor #302
2. Semi-fixed resistor #293

The adjustment proceeds in the sequence as below:

1. Release three set screws #277 on the picture frame speed ring (#183).  
Unscrew screw #265.  
Turn the rotating shaft of the variable resistor counterclockwise to the limit. Bringing the index line on the speed ring to H position, refasten the set screws (#277) and screw (#265) tightly.
2. Turn the semi-fixed resistor counterclockwise to the limit.  
Using a constant voltage power source, slowly rotate the shaft of the semi-fixed resistor clockwise, until the following speeds are obtained at 12V with the camera loaded:

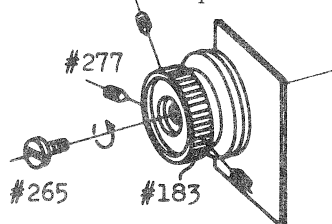
- 1 picture frame per sec. at L
- 2 picture frames per sec. at  $M_1$

3. Then, using a power source voltage of 15V, rotate the semi-fixed resistor shaft so that the following speeds are obtained:

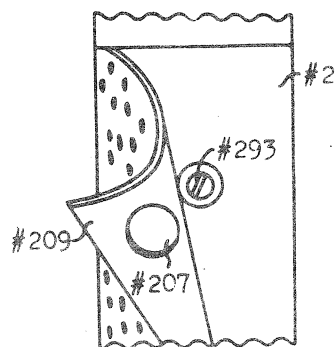
- 5 picture frames per sec. at H
- 4.3 picture frames per sec. at  $M_3$

(The counterclockwise turn will accelerate the speed.)

4. Error of the picture frame speed per sec. is allowed within  $\pm 10\%$ .

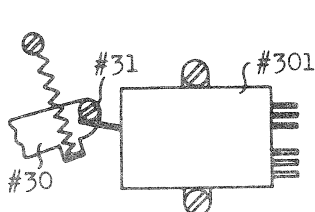


Counterclockwise turn of the variable resistor will accelerate the picture frame speed.

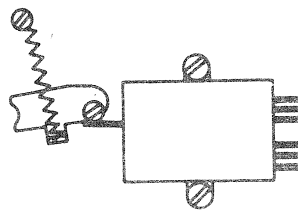


Peel off the leatherette from the front side of the grip.  
The semi-fixed resistor can be adjusted through the opening in #2.  
Counterclockwise turn will accelerate the speed.

### 6-3. Adjusting the highest operating voltage



(A)




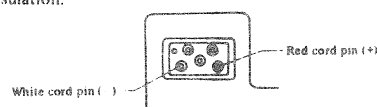
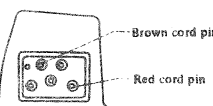
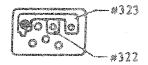
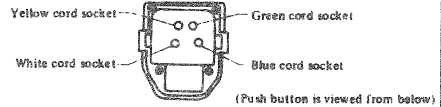

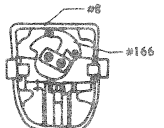
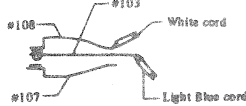
(B)

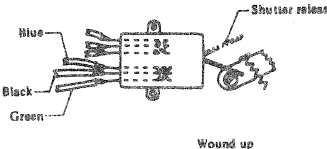
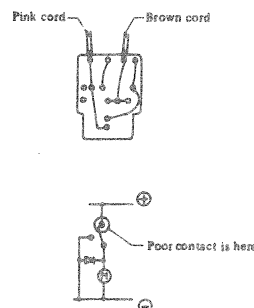
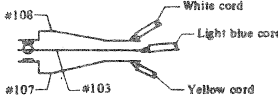
To reduce the highest operating voltage bring the eccentric pin (#31), which operates the lever of the snap switch (#301), to such a position as shown in A.  
To increase the voltage set the eccentric pin as shown in B.

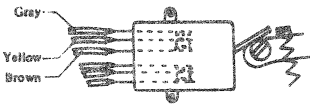
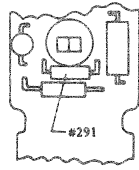
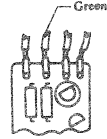
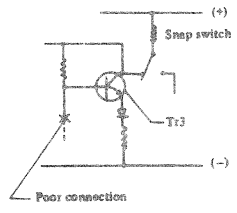
## A. Possibilities of Disorders

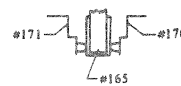
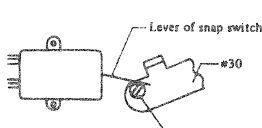

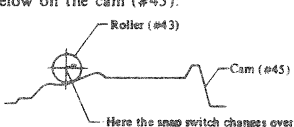
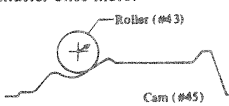
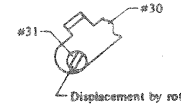

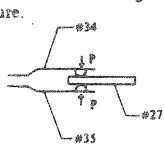
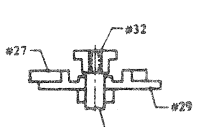
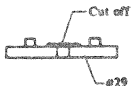
1. Even though the push button is depressed, the Motor Drive does not run, regardless of S or C setting of the S-C knob ..... 19~20
2. The S-C knob being set to S, the Motor Drive operates normally, but the winding-up does not work at the C position of S-C knob ..... 21
3. The S-C knob being set to S, the Motor Drive operates normally, but at the C position, the firing speed cannot be changed ..... 21
4. The S-C knob being set to S, when the push button is depressed, the Motor Drive stops operation, but, when the push button is released, with the S-C knob set to C, it runs normally. .... 21
5. The S-C knob being set to S, when the push buttons depressed, the Motor Drive runs continuously, but, at the C position, the firing speed cannot be changed ..... 21~22
6. When connected to power source, the Motor Drive continues its operation until the counter indicates zero (0), regardless of S or C setting of the S-C knob and of depressing or releasing of the push button ..... 22
7. The S-C knob being set to S, when the push buttons depressed, the shutter releases more than once ..... 22
8. Although the push button is depressed, the Motor Drive operates, but it does not stop, when the button is released, regardless of S or C setting of the S-C knob. This disorder takes place, even when the highest voltage limit does not exceed 15V ..... 22~23
9. The Motor Drive runs, but the wind-up coupling (# 17) does not rotate ..... 23
  - 9-1. Operating sound of the cam (# 45) is heard, which is produced by moving back and forth of the cam ..... 23
  - 9-2. Only the sound of the motor running (no sound of the cam) is heard. .... 23
  - 9-3. Running sound of the motor as well as an exordinary sound is heard. .... 23
10. When the Motor Drive is operated, with the S-C knob set to C, no uniform firing speed is obtained ..... 24
11. Although the push button is depressed, no wind-up operation is obtained, and the power source current makes shortcircuit. The wind-up coupling cannot be manually rotated clockwise (opposite to the winding-up direction), the power source being switched off ..... 24
12. Although the rewind lever is turned down, no rewinding operation is carried out ..... 24
13. Although the rewind lever is returned to its original position, the rewind coupling (# 137) does not come down ..... 25
14. While being rewound, the rewind lever returns of itself ..... 25
15. The picture frame counter does not advance ..... 25
16. Although the wind-up knob is lifted, the counter does not return to S ..... 25

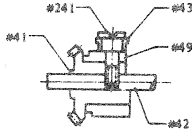
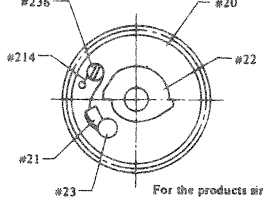


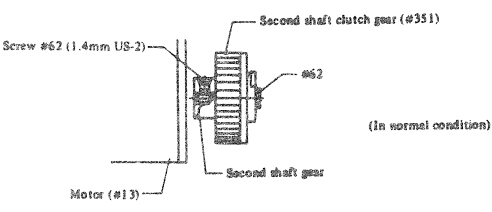
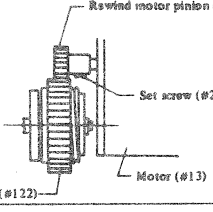
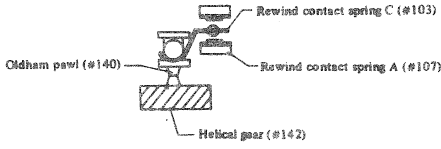
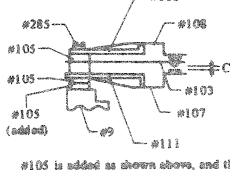
B. Check Point, Cause, and Treatment		
Part to be checked	Check point	Cause and treatment
1. Even though the push button is depressed, the Motor Drive does not run, regardless of S or C setting of the S-C knob.		
1) Power source	<p>i) When using cordless battery pack MB-1, the battery checker points the red region. When using AC-DC convertor MA-2 or other power sources, the voltage does not reach 9V (with the current capacity 0.4A).</p> <p>ii) Split in the connector of cordless battery pack MB-1 opens.</p>	<p>a) Too low voltage of the battery. b) Disorder of the power source. Repair or replace the power source.</p> <p>Poor contact between cordless battery MB-1 and connector of Motor Drive MD-1. Close the split, using a screw driver.</p>
2) Remote control terminal (in case where power is supplied through remote control terminal)	<p>Some plastic mold is attached around the red and/or white cord pin, causing insulation.</p> 	<p>Poor contact of remote control terminal. Scrape off the mold attached.</p>
3) Cordless terminal (when power is supplied through cordless terminal)	<p>Some plastic mold is attached around the red and/or white cord pin, causing insulation.</p> 	<p>Poor contact of directly connected terminals. Scrape off the mold attached.</p>
4) Five pin switches	<p>Even when red and brown cord pins are shortcircuited with another cord, Motor Drive runs.</p> 	<p>i) Remove bottom cover # 12 to take out cordless terminal unit from # 2. By bringing into contact #323 of five pin switches with #322 Motor Drive runs (without connecting the red with brown cord pin).</p> 
5) Counter switch	<p>ii) Even when #323 is brought into contact with #322, Motor Drive does not run (without connecting the red with brown cord pin).</p> <p>Connect power source with remote control terminal.</p>	<p>Poor contact of counter switch. Dust attached on the surface of contact point or insufficient spring pressure.</p>
6) Push button unit	<p>i) Even though the push button is depressed, no electricity is conducted between the blue and white cord socket. (check with a tester)</p>  <p>ii) Even though the push button is not depressed, green and white cord sockets conduct electricity (check with a tester), when S-C knob is set to C.</p>	<p>a) Split in the socket pin opens. b) Poor contact of #170, and #171 with #165.</p>  <p>(# 170 on the opposite side)</p> <p>#8 and #166 make shortcircuit.</p> 
7) Rewind switch	<p>Remove bottom cover #12. No current is conducted between the light blue and white cords.</p>	<p>Poor contact of contact point spring #108 with #103 or any dust or the like between the contact points.</p> 

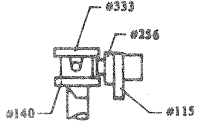


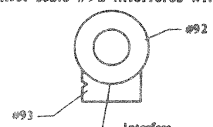
Part to be checked	Check point	Cause and treatment
8) Snap switch	i) No current is conducted between the blue and black cord terminals, when winding up operation has been finished. 	Poor contact between the blue and black cord contact points, or dust or the like on the contact point. Replace snap switch or improve the contact, using tweezers or by cleaning the contact surface.
	ii) No current is conducted between the black and green cord terminals, when shutter has been released.	Poor contact between the black and green contact points or dust or the like on the contact surface. Take the same measure as above.
9) Relay	i)-1 After winding up, depress the push button. Even though a current of about 130mA flows (use of a power source of constant voltage of 15V with an ammeter is convenient), Motor Drive does not run. i)-2 When shutter has been released, set the S-C knob to S. While the push button is not depressed, the power source current of about 100mA flows, but the Motor Drive does not run. i)-1 and i)-2 take place and furthermore, when brown and pink cord, each connected with the printed circuit of relay, are brought into contact with each other, the Motor Drive runs.	Poor contact of relay contact point. Replace the relay. 
	ii) When power source current flows in the case of i)	Disconnection in the relay coil. Replace the relay.
10) Delay circuit	S-C knob being set to S and C, when the push button is depressed, shutter is released, but no wind-up operation goes, even though the button is released. (At this time, power source current does not flow.)	Poor soldering of transistor Tr3(#294, 2SC735GR), diode (#309, F14C), resistor (#292, 22Ω) and resistor of 35.1KΩ (#289) connected with base of Tr3.
11) Shortcircuit inside the Motor Drive	i) Terminal of variable resistor, attached to back plate #10, makes short-circuit with a nearby body (e.g. earth metal).	Shortcircuit. Bend the terminal to avoid contact.
	ii) Brown cord connected with the variable resistor comes into contact with the motor gear. The covering of the cord being removed, it causes shortcircuit with a near body (e.g. earth metal).	Replace the cord.
	iii) When the counter is set to S, yellow cord on the rewind contact point makes shortcircuit with the earth. 	a) Make a clearance between #1 and #107. b) Avoid touching of #104 with #103.
	iv) Three terminals of red, orange and yellow cords at the picture frame counter contact makes shortcircuit with a nearby body (e.g. earth, top cover, #3).	Bend the terminals to avoid touching.
	v) In the Motor Drive provided with a resistor to raise the highest voltage limit (where a resistor of 2Ω ~ 3Ω is attached to the relay printed circuit), the resistor makes shortcircuit with the inside wall of grip.	Such a resistor, causing reduction of firing speed has been decided to be removed. Lowering of the highest voltage limit due to removal of the resistor will be avoided by taking the measures mentioned in 8-1) ~ 4).
12) Motor	The pink cord being disconnected from the motor, and the motor being directly charged, the motor does not run.	a) Disconnection in the motor. b) The motor brushes are on the dead point. Replace the motor.

Part to be checked	Check point	Cause and treatment
2. The S-C knob being set to S, the Motor Drive operates normally, but the winding-up does not work at the C position of S-C knob.		
1) Snap switch	Even when shutter is released, no current is conducted between the brown and yellow cord terminals. 	Poor contact between brown and yellow cord contact points or just or the like on the contact surface. Replace the snap switch or, using tweezers, improve the contact or clean the contact surface.
2) Brown cord (#316 D3 and #316 D1, connected with variable resistor)	Remove back plate #10 to see that two cords are disconnected from the terminal of variable resistor #302.	No conduction of current due to the disconnection. Improve the connection.
3. The S-C knob being set to S, the Motor Drive operates normally, but at the C position the firing speed cannot be changed.		
1) Discharge circuit of condenser	i) Poor conductivity between yellow and gray cord terminals on the snap switch. ii) Poor soldering of yellow and gray cords on the snap switch. iii) Poor soldering of 51Ω resistor #291 in the delay circuit.  iv) Poor soldering of gray cord on the delay circuit or poor conductivity of the eyelet.	Insufficient discharge of the condenser.  i) Improve the contact of contact point using tweezers or replace the snap switch. ii), iv) Improve the soldering.
2) Variable resistor	Even when rotating the shaft, resistance of variable resistor #302 and of semi-fixed resistor #293 remains zero.	Poor variable resist and/or semi-fixed resistor. Replace the variable and/or semi-fixed resistor.
4. The S-C knob being set to S, when the push button is depressed, the Motor Drive stops operation, but, when the push button is released, with the S-C knob set to C, it runs normally.		
Snap switch	Black and green cord terminals at the snap switch touch with each other.	Current flows at all times to the relay. Make a clearance between black and green cord terminals.
5. The S-C knob being set to S, when the push button is depressed, the Motor Drive runs continuously, but at the C position, the firing speed cannot be change.		
1) Snap switch	Black and blue cord terminals on the snap switch touch with each other.	Current flows at all times to the relay. Make a clearance between black and blue cord terminals.
2) Delay circuit	Poor soldering of green cord at the top of the delay circuit. 	When shutter is released, Tr3 (#294 2SC735GR) Keeps ON, allowing current to flow to the relay coil.  Improve soldering.

Part to be checked	Check point	Cause and treatment
3) S-C change-over switch on the push button unit	S-C knob being set to C, poor conductivity is found between yellow and green cord sockets on the push button unit, and S-C knob being set to S, poor conductivity between blue and green cord sockets on the push button unit (In this case, however, a diode being built in, check the conductivity by connecting green cord socket to ⊕ and blue to ⊖. Refer to Fig. in 1-6)-i).	Poor S-C change-over switch on the push button unit. Same as 2), when shutter is released, Tr3 keeps ON at all times. S-C contact spring #166 in the push button unit is disconnected from the conductor unit. Refer to Fig. in 1-6)-ii).
8. When connected to power source, the Motor Drive continues its operation until the counter indicates zero (0) (regardless of S or C setting of the S-C knob and of depressing or releasing of the push button).		
Relay	Relay switch keeps its ON position.	Replace the relay.
7. The S-C knob being set to S, when the push button is depressed, the shutter releases more than once.		
Push button switch		Poor contact of push button switch. Improve contact of #170, and #171 with #165. 
8. Although the push button is depressed, the Motor Drive operates, but it does not stop, when the button is released regardless of S or C setting of the S-C knob. This disorder takes place, even when the highest voltage limit does not exceed 15V.		
1) Snap switch	<p>i) Relative position of snap pin #31, which is in contact with the lever of snap switch, to snap lever #30 is not correct, as shown below:</p>  <p>#31 is displaced toward the lever of snap switch, respective to #30.</p> <p>ii) Lever of snap switch is bent as shown below:</p>  <p>As a result of i) and ii), changing over of the snap switch occurs in a position as shown below on the cam (#45):</p>  <p>Note: The voltage limit where the Motor Drive does not stop running, if referred to as "the highest voltage limit", which is to be 15V (using a constant voltage power source), when the camera is not loaded with film.</p>	<p>When roller #43 mounts on the cam (#45), as shown below, and the snap switch is change over, the breaking force, though exerted on the Motor, will be not overcome, causing releasing of shutter once more.</p>  <p>i) Correct the relative position of snap pin (#31) to snap lever #30 as below: (#31 is an eccentric pin)</p>  <p>Displacement by rotation.</p> <p>ii) Make straight the lever of snap switch or bent it, as shown below by two-dots-dashed line.</p> 
2) Long film coupling switch	<p>Contact springs #34 and #35 for the long film coupling switch provide too strong contact pressure.</p> 	Too strong contact pressure causes delay to revolution of snap lever #30, when the cam moves back, resulting the same way as 1), in delay of change over the snap switch. Weaken the contact pressure (suitable value: about 30 gr.).
3) Long film lever #29	<p>Wind-up friction nut #12, pressed on to the wind-up shaft #16, prevents smooth movement of long film lever #29.</p> 	<p>Incorrect rotation of #29 causes change over delay to the snap switch, same way as 2). Cut off the hatched portion of the long film cassette lever. The cutting off is carried out for the products since 1972 April.</p> 



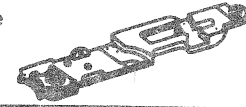






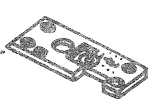
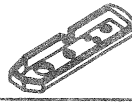
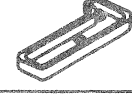



Part to be checked	Check point	Cause and treatment
4) Motor #13	A motor of too high speed running is assembled.	Too high speed motor causes delay of stopping to the motor, after change-over of snap switch. Replace the motor, if possible, after assuring the running speed of a new motor using a stroboscope. Suitable unloading rotation should not exceed 11,800 r.p.m.
9. The motor runs, but the wind-up coupling (#17) does not rotate.		
9-1. Operating sound of the cam (#45) is heard, which is produced by moving back and forth of the cam.		
1) Roller screw #241	Roller screw #241 is broken.  No fear of such breaking for the products since 1972, Feb.	Broken roller screw entering between the screw and the counter base plate (#75), prevents the rotation of small bevel gear #41. Replace the broken roller screw.
2) Third shaft #58	Gear of third shaft #58 is broken. (In this case, however, when the camera is not mounted, the wind-up coupling ring (#17) will rotate.)	The third shaft does not work correctly. Replace third shaft #58.
3) Third shaft stopper #343	Third shaft stopper #343 falls off. (In this case, however, when the camera is not mounted, wind-up coupling #17 will rotate.)	The third shaft does not work correctly. Replace the stopper (#343) in #5. Apply adhesive.
9-2. Only the sound of the motor running (no sound of the cam) is heard.		
1) Wind-up pawl #21	Wind-up pawl #21, opens, and cannot return.  For the products since 1972, Jan. two pawls #21 are used.	The rotation torque of the pawl is not transmitted to wind-up ratchet wheel #22. For the products before 1971 Dec. attach two pawls, if the pawl has opened.
2) Second shaft clutch pawl #353	The second shaft clutch pawl does not fit.	The torque is not transmitted to the second shaft. Improve the movement of the pawl, taking caution of the dead point of the spring.
3) Wind-up motor pinion #71	Set screw #275 for wind-up motor pinion #275 is loosened.	Wind-up motor pinion #71 rotates idle. Fasten the set screw (#275) and apply adhesive. Take caution not to let the adhesive enter the motor.
9-3. Running sound of the motor as well as an extraordinary sound is heard. No sound of the cam is heard except in the case of 2)-ii).		
1) Large #20 and small #41 bevel gears	Large and small bevel gears do not engage but slip, producing sound. In this case, when the camera is not mounted, wind-up coupling #17 will rotate.	a) Too thick counter cam washer #318. b) Too thin wind-up thrust washer #329. Replace the washer.
2) Gears of wind-up shaft #16, of large bevel gear shaft #19 and wind-up idle gear #28	i) Any gear is broken. When the camera is not mounted, the wind-up coupling #17 will rotate in most cases. ii) Broken gear enters between the gears. In this case, operating sound of the cam is heard.	Breaking of any gear prevents transmission of the torque. Replace the gear.

Part to be checked	Check point	Cause and treatment
10. When the Motor Drive is operated, with the S-C knob set to C, no uniform firing speed is obtained.		
1) Motor	When the Motor Drive is operated with its firing speed adjusting knob set to H (setting to other speeds will do, but finding out of the disorder is not so easy), the wind-up sound changes.	Poor motor. Replace the motor.
2) Discharge circuit for condenser	Malfunction of discharge circuit for the condenser takes place sometimes. For easier finding out of the disorder, use a firing speed other than H.	Defective discharge circuit for the condenser. Refer to 3.
11. Although the push button is depressed, no wind-up operation is obtained, and the power source current makes shortcircuit. The wind-up coupling cannot be manually rotated clockwise (opposite to the winding-up direction), the power source being switched off.		
1) Set-nut on the second shaft gear	Set-nut on the second shaft gear is loosened so that it touches the motor #13.   Note: In the products since 1972 April, E-shaped clip is used to prevent the falling off (Fig. 4)	Second shaft clutch gear #351 cannot rotate. Fasten up the set-nut firmly. Do not forget to apply adhesive and to drill a hole in the threaded part of second shaft (#62)
2) Rewind gear made of Delrin	Rewind gear #122 is detached from gear metal #125, interfering with the set screw #275 on the rewind motor pinion #123.   Rewind gear (#122)	Rewind motor pinion cannot rotate. Reattach the gear (#122) to the metal (#125) by cementing.
12. Although the rewind lever is turned down, no rewinding operation is carried out.		
1) If no winding-up operation also takes place refer to 1 (Even though the push button is depressed, the Motor Drive does not run) - 1), 2), 3), 4), 11), 12).		
2) Wind-up switch	Even when the Oldham coupling #140 comes into contact with the pawl on helical gear #142, contact spring C #103 does not touch rewind contact spring #107.   Helical gear (#142)	Poor contact of rewind contact spring C #103 with contact spring A #107. To improve the contact, the following construction has been adopted for the products since 1972, May.   #105 is added as shown above, and the bend length of #285 has been changed from 7.5 to 8.5mm. Therefore, adjust #107 and #111 so that C is 0.5mm in the above figure.
3) Counter switch	After removing bottom cover #12, turn down the rewind lever, and turn the wind-up switch to ON. Bring into contact the plus (+) of power source with rewind contact spring #103, and the Motor Drive start its operation.	Poor contact of counter switch. a) If counter ratchet wheel #76 is cemented in incorrect angular position to the frame counter #83, replace #76 and #83. b) If counter stopper #95 is displaced to the left, move it to the right. c) If dust is found on the contact point, clean it.
4) Relay	When removing grip #2, and bringing into contact the white with the pink cord, connected to printed circuit of relay #139, the relay operates.	Poor contact of the contact point of the relay. Replace the relay.

Part to be checked	Check point	Cause and treatment
<b>13. Although the rewind lever is returned to its original position, the rewind coupling (#137) does not come down.</b>		
Oldham coupling #140, rewind coupling screw #256 and Oldham coupling shaft #333	Rewind coupling screw #256 is disengaged, from between Oldham coupling #140 and the flange of Oldham shaft #333.  (In the normal assembled condition)	No coupling. Bring back rewind coupling screw #256 to between Oldham coupling #140 and Oldham shaft #333. If it is liable to falling off, bend #115 slightly. If it is bent too much, however, the motor will be charged too heavy, owing to large friction between #256 and #333 and #140.
<b>14. While being rewound, the rewind lever returns of itself.</b>		
Rewind click spring #338	i) Rewind click spring #338 is too weak.  ii) As shown below, rewind click spring #338 is so attached that rewind click pin #339 engages insufficiently with rewind coupling lever #115. 	To increase the spring action of #338, make larger the angle of #338 by bending.  #115 and #339 are liable to disengage. Displace #338 to prevent the possibility of coming off.
<b>15. The picture frame counter does not advance.</b>		
1) Spring #86	Spring #86 is displaced.	The spring extends outward, thus letting the stop pawl (#81) disengage.
2) Advance pawl spring #217	i) Advance pawl spring #217 is displaced. ii) Advance pawl spring #217 interferes with #1.	Advance pawl #82 does not engage with counter ratchet wheel #76. i) Change the form to avoid coming off. ii) Change the position of #1 and #3 or the form of the spring.
3) Advance pawl #82	Advance pawl #82 operates but counter ratchet wheel #76 is not advanced beyond one claw.	Incorrect position of back and forth movement of advance pawl #82. Bend counter lever #80, using a wrench, so that advance pawl #82 can advance the ratchet wheel one claw, but not two claws. 
4) Counter stopper #95	The counter does not advance only when it is set to S.	Incorrect position of counter stopper #95. Correct the position and fasten up the set screw, and, there-after, apply adhesive.
<b>16. Although the wind-up knob is lifted, the counter does not return to S.</b>		
1) Spring #86	Spring #86 is displaced.	The spring extends outward, thus letting the stop pawl (#81) disengage.
2) Picture frame counter scale #92 and index plate #93	Picture frame counter scale #92 interferes with index plate #93. 	The scale dial does not return. Detach the index plate #93 and, using adhesive reattach it.
3) Picture frame counter scale #92 and counter window #190	Picture frame counter scale #92 interferes with counter window #190.	The frame counter scale does not return. a) If counter center screw #72 is loosened and ratchet wheel #76 comes out, causing interference of #92 with #190, fasten up #72. b) If no clearance is between #92 and #190, use a proper washer between #10 and #1, when attaching the back plate (#10).
4) Switch contact spring #89	Too strong force of switch contact spring #89.	Counter ratchet wheel #76 does not return normally. Increase the contact pressure (20 ~ 30 gr will be suitable).

## Parts list


















20FA97 - R.1041.B

Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97-1	Body 	1			○	
▲ 1-1	Body (supplement a hole)	1			○	
2	Grip 	1		9	○	
3	Base plate 	1	B12	▲ 4, 5	△	
4	Cam shaft casting A 	1	C4	4	△	
5	Cam shaft casting B 	1	C6	4	△	
6	Bottom plate 	1	D8	8	△	
7	5-pin connector 	1	A7	2	△	
8	S-C cap 	1	H5	<del>10</del> ▲	△	
▲ 8-1	S-C cap (supplement a slot)	1	H5-1	10	△	
9	Rewind casting 	1		6	○	
10	Back plate 	1	R1	<del>8</del> ▲	△	
▲ 10-1	Back plate (moved a hole)	1	R1-1	8	△	
11	Top cover 	1	A10	1	△	
12	Bottom cover 	1		1	○	
13	Micro-motor 	1	B13	3	△	
14	Wind-up top bearing 	1	B1	4, 6	○△	
15	Coupling screw 	1		1	○	

















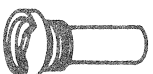
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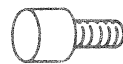




















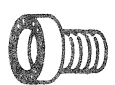

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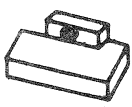



Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97- 16	Wind-up shaft 	1	B1	4, 6	△	
17	Wind-up coupling 	1		1	○	
18	Counter cam 	1		4	○	
19	Large bevel gear shaft 	1		4	○	
20	Large bevel gear 	1	B9	4	△	
21	Wind-up pawl 	<sup>△</sup> 2 	B9	4	△	
22	Wind-up ratchet 	1		4	○	
23	Pawl axle 	<sup>△</sup> 2 	B9	4	△	
24	2nd shaft bearing 	1	C4	4	○△	
25	Plate bearing 	1		4	○	
26	Wind-up idle gear 	1		4	○	
27	Long film switch plate 	1	D1	3	△	
28	Wind-up bottom bearing 	1	D8	8	△	
29	Long film lever 	1	D1	3	△	
30	Snap lever 	1	D4	8	△	

Revision △ × 2















Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97-						
31	Snap pin 	1	D4	8	△	
32	Wind-up friction nut 	1		3	○	
33	Long film switch collar 	2		3	○	
34	Switch spring contact A 	1	D6	3	△	
35	Switch spring contact B 	1	D7	3	△	
36	Switch slide lever 	1	D3	8	△	
37	Switch mount 	1		3	○	
38	Insulator plate 	3		3	○	
39	Wind-up signal pin 	1	D3	8	△	
40	Cam shaft thrust metal 	1	C3	7	△	
41	Small bevel gear 	1	C3	7 <sup>△</sup>	△	
△41-1	Small bevel gear 	1	C3	7	△	
42	Cam shaft 	1	C3	7	△	
43	Roller (long) 	1	C3	7 <sup>△</sup>	○△	Equivalent to 20FA94
△43-1	Roller (short) 	1	C3	7	○△	#105
44	Steel ball race 	1	C3	7	△	Equivalent to 20FA94 #108
45	Cam shaft 	1	C3	7	△	

Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97-46	Cam shaft gear 	1	C3	7	△	
47	Cam shaft collar 	1	C3	7	△	Equivalent to 20FA94 #111
48	Cam shaft flange 	1	C3	7	△	Equivalent to 20FA94 #112
<del>49</del>	<del>Small bevel gear collar </del>	<del>1</del>	<del>C3</del>	<del>7</del>	<del>△</del>	<del>Equivalent to 20FA94 #113</del>
50	Steel ball 1/16" 	<del>34</del> 34	C3	4, 6 7	○△	Equivalent to 20FA94 #101
51	Steel ball 1mm 	32	C3	7	△	Equivalent to 20FA94 #102
52	Cam shaft bearing B 	1		4	○	
53	Cam shaft stopper 	1		4	○	
54	Cam shaft stop nut 	1		4	○	
55	Cam shaft bearing A 	1	C4	4	○△	
56	3rd shaft 	1	C2	7	△	
57	3rd shaft cam thrust 	1	C2	7	○△	
58	3rd shaft gear 	1	C2	7	△	
59	3rd shaft cam 	1	C2	7	△	
60	3rd shaft collar 	1	C2	7	△	Equivalent to 20FA94 #123












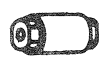


Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97- 61	3rd shaft bearing 	1	C4	4	○△	
62-1	2nd shaft 	1		4	○	
63						(Blank)
64	2nd shaft bearing 	1	C6	4	○△	
65	Shutter release shaft 	1		4	○	
66	Release shaft collar 	1	B12	4, 5 ▲	○△	
67	Release shaft eccentric pin 	1	B8	4	△	
68	Release shaft lever A 	1	B8	4	△	
69	Release shaft lever B 	1		4	○	
70						(Blank)
71	Motor pinion gear 	1	B13	3 ▲	○△	
72	Counter center screw 	1		7	○	
73	Frame counter shaft 	1		7	○	
74	Bevel ratchet 	2	F4	7, 8	○△	
75	Frame counter base plate 	1	F1	7	△	

















Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97-76	Frame counter ratchet 	1	F4	7	△	
77	R-pin 	1			○	
78	R-lever spring holder 	1	F1	7	△	
79	R-lever 	1	F1	7	△	
80	Frame counter lever 	1	F6	7	△	
81	Stop pawl 	1	F5	7	△	
82	Advance pawl 	1		7	○	
83	Frame counter 	1	F4	7	△	
84	Nut M1.4 	1		7	○	
85	Stopping pawl axle 	1	F1	7	△	
86	Spring 	1		7	○	
87	Feed pawl collar 	1		7	○	
88	Counter switch molded plate 	1	F2	7	△	
89	Switch contact spring 	1	F2	7	△	
90	Contact point 	▲ 3 →	▲  F2	3, 7	△	

20FA97 - R.1041.B

Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97-						(Blank)
91						
92	Frame counter scale 	1		1	○	
93	Frame counter index plate 	1		1	○	
94	Frame counter roller 	1	F6	7	△	
95	Frame counter stopper 	1		7	○	
96						(Blank)
97	Pillar A 	1		4	○	
98	Tripod screw 	1		5	○	
99	Tripod screw knob 	1		5	○	
100	Tripod screw plate 	1		5	○	
101	Rewind switch collar 	2		6	○	
102	Rewind switch insulator 	1		6	○	
103	Rewind switch contact C 	1	E4	6	△	
104	Dust cover collar 	2		5	○	
105	Rewind switch insulator 	△ 3 		6	○	















Revision △ x 1

Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97- 106	Switch contact support B 	1		6	○	
107	Switch contact A 	1	E5	6	△	
108	Switch contact B 	1	E6	6	△	
▲ 109	Contact point 	1 <del>7</del>	A9 <del>E4, E5</del>	2, 6	△	Equivalent to 20FA94 #53
▲ 110	Contact point (disk) 	3	A8 E5, E6	2, 6	△	Equivalent to 20FA94 #52
111	Switch contact support A 	1		6	○	
112	Rewind lever 	1	A5	2	△	
113	Insulating nut 	1		2	○	
114	Rewind lever knob 	1	A5	2	△	
115	Rewind coupling lever 	1	A6	2	△	
116	Rewind collar 	1		2	○	
117	Rewind lever shaft 	1	A6	2	△	
118						(Blank)
119	Worm shaft bearing 	1		6	○	
120	Cam adjusting disk 	1		4	○	Equivalent to 20FA94 #100A
















Part No. 部品番号	Name and Shape 名称および形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97-121	Worm 	1		6	○	
122	Rewind gear 	1	E1, E3	6	△	
123	Rewind motor pinion 	1	B13	3	○△	
124	Friction spring holder nut 	1	E1	6	○△	
125	Rewind gear bearing hub 	1	E1, E3	6	△	
126	Friction spring holder 	1	E1	6	○△	
127	O/C lever spring 	1		5	○	
128	Dust cover A 	1		5	○	
129	O/C idle gear, small 	1		5	○	
130	O/C idle gear, large 	1		5	○	
131	Segment gear 	1	B11	5	△	
132	Rewind lever screw 	1		2	○	Equivalent to 20FA30 #653
133	O/C lever knob 	1	B11	5	△	
134	O/C lever pin 	1	B11	5	○△	
135	O/C lever 	1	B11	5	△	
135A	O/C lever screw 	1	B11	5	△	

Revision ▲ × 2













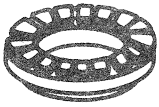






Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97-	Rewind shaft					
136		1	B5	5	△	
137	Rewind coupling 	1	B5	5	△	
138						(Blank)
139	Dust cover B 	1		5	○	
140	Oldham coupling 	1		5	○	
141	O/C bearing 	1	B12	5	○△	
142	Helical gear 	1		5	○	
143	O/C coupling 	1	B4	5	△	
144	O/C gear nut 	1		5	○	
145	O/C gear 	1	B4	5	△	
146	Spring seat, top 	1		5	○	
147	Spring seat, bottom 	1		5	○	
148	Helical gear bearing, top 	1		5	○	
149	Worm wheel bearing, bottom 	1		6	○	
150	O/C pin 	1	B4	5	△	





































20FA97 - R.1041.B						
Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97- 154	S-C pin 	4	J3	9	△	
155	S-C pin molded base 	1	J3	9	△	
156 157						(Blank)
158	Printed circuit 	1	J1	9	△	
159	Printed relay circuit 	1	B7	6	△	
160	S-C indicating plate 	1		10	○	
161	S-C knob 	1		10	○	
▲ 161-1	S-C knob 	1		10	○	
162	S-C socket molded 	1	H4	10	△	
163						(Blank)
▲ 163-1	S-C ring pin 	1		10	○	
164	S-C click plate 	1		10	○	
165	Trigger button switch plate 	1	H1	10	△	
166	S-C contact spring 	1		10	○	
167	Trigger button 	1	H1	10	△	
168	S-C side knob 	2	H2	10	△	
169	S-C lock spring 	1	H2	10	△	
















Revision ▲ × 2


















20FA97 - R.1041.B						
Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97-170	Trigger button contact spring A 	1	H3	10	△	
171	Trigger button contact spring B 	1	H3	10	△	
172	S-C printed circuit 	1	H3	10	△	
173	Insulating plate 	2		10	○	
174	S-C contact collar 	2		10	○	
175	Rivet 	7	D1×3 H3×4	3, 10	△	
176	Trigger button rivet 	1	H1	10	△	
177	S-C socket 	4	H4	10	○○△	
▲ 178	Steel ball 3/64" 	2		8, 10	○	Equivalent to 20FA94 #67
179	Trigger button shaft 	1		10	○	
180	S-C knob collar (short) 	1	H5	▲ 10	△	
▲ 180-1	S-C knob collar (long) 	1	H5-1	10	△	
181						(Blank)
182	Frame counter preset button 	1		8	○	
183	Speed selector knob (narrow slot) 	1		▲ 8	○	
▲ 183-1	Speed selector knob (wide slot) 	1		8	○	
184	VR adjusting ring 	1		▲ 8	○	
▲ 184-1	VR adjusting ring 	1		8	○	

Revision ▲ × 7













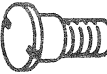



Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97-185	VR click 	1	R1	8	△	
△ 185-1	VR click 	1	R1-1	8	△	
186	Preset button ring 	1	R1	8	△	
△ 187	VR nut 	1		8	○	
188	Cover plate 	1		1, 8 △	○	
189	Shutter speed table 	1		8	○	
190	Frame counter window 	1		8	○	
191	R-guide plate 	1		8	○	
192	R-button 	1		8	○	
193	R-slider 	1		8	○	
194	R-safety nut 	1	R2	8	△	
195	R-safety button 	1	R2	8	△	
196	Safety button guide 	1	R2	8	△	
197	3-pin socket 	1	A2	2	△	
198	3-pin socket nut 	1		2	○	
199	3-pin 	3	A2	2	△	

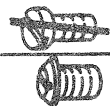




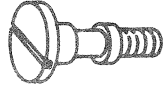










Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97- 200	3-pin molded ring 	1	A2	2	△	
201	Ball bearing SS2.5 - 6 	1		4	○	
202	Ball bearing SS2 - 5 	1		6	○	
203						(Blank)
204	Tripod screw socket 	1		2	○	
205	Guide plate 	2		1	○	
206	Light-tight seat 	1	A10	1	○△	
207	Dust cover 	▲ 1 		1	○	Equivalent to 20FD11 #99
208	Dust cover 	▲ 2 		1	○	Equivalent to 20FD11 #98
209	Leatherette A 	1		1	○	
210	Leatherette B 	1		1	○	
▲ 210-1	Leatherette B 	1		1	○	
211	3rd shaft torsion spring 	1	C2	7	○△	
212	Cam shaft spring 	1	C3	7	△	
213	3rd shaft thrust spring 	1	C2	7	△	Equivalent to 20FA94 #124
214	Wind-up pawl spring 	▲ 2 		4	○	





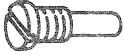










20FA97 - R.1041.B						
Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97-						
215	Frame counter spring 	1		3	○	
216	Stopping pawl spring 	1		7	○	
217	Advance pawl spring 	1		7	○	
218	Wind-up coupling spring 	1		1	○	
219	R-safety button spring 	1	R2	8	△	
220	Long film switch spring 	<sup>▲</sup> 1 		3	○	
221	Frame preset button spring 	1		1	○	
222	Wind-up shaft friction spring 	1		3	○	
223	O/C pin spring 	1	B4	5	△	
224	Rewind button lever spring 	1			○	
225	Rewind friction spring 	1	E1	6	○△	
226	Rewind coupling spring 	1			○	
227	Trigger button spring 	1		10	○	
<sup>▲</sup> 228	S-C click spring 	1		8, 10	○	Equivalent to 20FA94 #69



















Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97-229	Large bevel bottom washer 	1		4	○	
<del>△ 230</del>	<del>VR washer </del>	<del>1</del>		<del>8</del>	<del>○</del>	
<del>△ 231A</del>	<del>VR adjusting washer A </del>	<del>1</del>		<del>8</del>	<del>○</del>	<del>0.1t</del>
<del>△ 231B</del>	<del>VR adjusting washer B </del>	<del>1</del>		<del>8</del>	<del>○</del>	<del>0.2t</del>
<del>△ 231C</del>	<del>VR adjusting washer C </del>	<del>1</del>		<del>8</del>	<del>○</del>	<del>0.7t</del>
<del>△ 231D</del>	<del>VR adjusting washer D </del>	<del>1</del>		<del>8</del>	<del>○</del>	<del>1t</del>
<del>△ 231E</del>	<del>VR adjusting washer E </del>	<del>1</del>		<del>8</del>	<del>○</del>	<del>1.2t</del>
232	Segment gear washer A 	1		5	○	0.2t
232B	Segment gear washer B 	1		5	○	0.1t
232C	Segment gear washer C 	1		5	○	0.05t
233	O/C idle gear washer 	2		5, 6	○	Equivalent to 20FA30 #974
234A	Helical gear washer A 	1		5	○	0.3t
234B	Helical gear washer B 	1		5	○	0.4t
234C	Helical gear washer C 	1		5	○	0.5t
234D	Helical gear washer D 	1		5	○	0.05t
<del>△ 234E</del>	<del>Helical gear washer E </del>	<del>1</del>		<del>5</del>	<del>○</del>	<del>0.2t</del>
235A	2nd shaft washer A 	1		4	○	0.1t













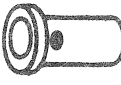
















Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97- 235B	2nd shaft washer B 	1		4	○	0.2t
235C	2nd shaft washer C 	1		4	○	0.4t
△ 236	Wind-up pawl screw 	3 		4	○	Equivalent to 20FA30 #819
237	Switch spring holder 	1		3	○	
238	Screw 1.7R - 3 special 	2		3	○	
239	Slide lever screw 	1		8	○	
240	Pillar B 	1			○	
241	Roller screw 	1	C3	7	○△	
△ 241-1	Roller screw 	1	C3	7	○△	
242	Release shaft lever screw 	1		4	○	
243	Stop pawl axle 	1		7	○	
244	Advance pawl screw 	1		7	○	
245	Screw 1.4Q - 2.7 ③ 	1		7	○	Equivalent to 20FA30 #810
246	Frame counter spring holder 	1		3	○	
247	Rewind button rivet 	2	F1	7	△	
248						(Blank)


















Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97- ▲ 249	Screw 1.7R - 2.5 special 	2 		2, 7	○	Equivalent to 20FA30 #853
250						(Blank)
251	Screw 1.7R - 3 special 	5		5, 6	○	
252	Screw 1.7R - 2 special 	▲ 7 		5, 10	○	
253	O/C idle gear screw 	1		5	○	
254	Screw 1.4R - 1.2 special 	2	B4	5	△	
255	Screw 1.4R - 3.5 special 	2		10	○	
256	Rewind coupling screw 	1		2	○	
257						(Blank)
258	Nut M1.7 	1		2	○	Equivalent to 20FA30 #433
259	Screw 1.4R - 2.7 special 	2		10	○	Equivalent to 20FA30 #790
260	Screw 1.7Q - 2.5 special 	4		1, 9	○	
261	Screw 1.7S - 3.5 special 	4		1	○	
262	Screw 1.7Q - 3 special 	▲ 5 		1	○	Equivalent to 20FA30 #818
263	Screw 1.7P - 3 	4		1	○	




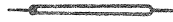











Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97-264	Screw 1.7Q - 2 special 	<sup>▲</sup> 3 		1	○	
265	Screw 1.4R - 3 special 	1		8	○	
266	Screw 2R - 2.8 special 	4		2	○	
267	3-pin locating pin 	1		2	○	
268	E-shaped clip E - 17 	6	H4x4	4, 6 10	○△	
269	E-shaped clip E - 42 	1		8	○	
270						(Blank)
271						(Blank)
272	Taper pin TP 1 - 8 	2	B5, C2	5, 7	○△	
273	Taper pin TP 1.6 - 8 	1	B1	4, 6	○△	
274						(Blank)
275	Set screw 1.4U - 1.2 	<sup>▲</sup> 5 	B13x4	<sup>▲</sup> 3 4, 5	○△	
276	Set screw 1.4US - 3 	1	B4	5	△	
277	Set screw 1.4US - 1.5 	<sup>▲</sup> 4 		8	○	
278	Screw 1.4R - 1.8 	2		7	○	

Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97-279	Screw 1.7R - 2.5 	<sup>▲</sup> 3 		3	○	
280	Screw 1.7R - 5 	8		9, 10	○	
281	Screw 1.7Q - 2.5 	3		5	○	
282	Screw 1.7R - 2 	<sup>▲</sup> 4 		2, 3 9	○	
283	Screw 1.7R - 3 	<sup>▲</sup> 20 		3, 5 8, 9 2 <sup>▲</sup>	○	
284	Screw 1.7R - 4 	23		1, 2, 3 4, 5	○	
285	<del>Screw</del> <del>1.7R - 7.5</del> 1.7R - 8.5 <sup>▲</sup> 	2		6	○	
286	Screw 1.7R - 6 	5		4	○	
287	Screw 2Q - 5 	4		5	○	
288	Screw 1.4R - 4 	1		3	○	
289	Resistor 5.1K $\Omega$ 	2	J1	9	△	
290	Resistor 1K $\Omega$ 	1	D5	3	○△	
291	Resistor 51 $\Omega$ 	1	J1	9	△	
292	<del>39<math>\Omega</math></del> 22 $\Omega$ <sup>▲</sup> 	1	J1	9	△	
293	Semi-fixed resistor 100K $\Omega$ 	1	J1	9	△	


















Part No. 部品番号	Name and Shape 名称および形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97- 294	Transistor 2SC735GR 	1	J1	9	△	
295	Condenser 10MF 	1	J1	9	△	
296	Diode IS 953 	1	J1	9	△	
297	Diode IS1586 	1	H3	10	△	
298	Relay 	1	B7	6	△	
299						(Blank)
300	Transistor 2SC373 	1	J1	9	△	
301	Toggle switch 	1	D5	3	△	
302	VR control 0 - 1MΩ 	1		8	○	
303	Cord clip 	▲ 5 			○	Equivalent to 20FD4 #15C, 6KB #425
304	Washer 	4			○	
305						(Blank)
306	Release lever 	1		7	○	
307						(Blank)
308	Worm collar 	1		6	○	
















Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97-309	Silicon diode F14C 	2	B7, J1	6, 9	△	
310A	Wind-up ratchet washer A 	1		4	○	0.2t
310B	Wind-up ratchet washer B 	1		4	○	0.1t
310C	Wind-up ratchet washer C 	1		4	○	0.05t
311	Slide lever long screw 	1		8	○	
312	Long film switch stopper 	1		8	○	
313	5P connector pin 	4	A7	2	△	
314	Worm shaft adjusting disk 	1		6	○	
315A						(Blank)
315B	Roll pin - 3.3 	1		4	○	
316A1	Lead wire (red) - 140 	1	A2	2	○△	
316A2	Lead wire (red) - 170 	1	F2	7	○△	
316B1	Lead wire (blue) - 120 	1	D5	3	○△	
316B2	Lead wire (blue) - 50 	1	J1	9	○△	
316B3	Lead wire (blue) - 22 	1	H4	10	○△	













Part No. 部品番号	Name and Shape 名称および形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97- 316B4	Lead wire (blue) - 200 	1	A2	2	○△	
316C1	Lead wire (white) - 50 	3	A2, <del>B7</del> J1 	2, 9	○△	
316C2	Lead wire (white) - 22 	1	H4	10	○△	
316C3	Lead wire (white) - 200 	1	A2	2	○△	
316D1	Lead wire (brown) - 160 	1	D5	3	○△	
316D2	Lead wire (brown) - 100 	1	D5	3	○△	
316D3	Lead wire (brown) - 130 	1		3	○	
316D4	Lead wire (brown) - 90 	1	 B7	3, 6	○	
316E1	Lead wire (yellow) - 160 	1	F2	7	○△	
316E2	Lead wire (yellow) - 130 	1	D5	3	○△	
316E3	Lead wire (yellow) - 50 	1	J1	9	○△	
316E4	Lead wire (yellow) - 22 	1	H4	10	○△	
316F1	Lead wire (green) - 120 	1	D5	3	○△	
316F2	Lead wire (green) - 50 	1	J1	9	○△	
316F3	Lead wire (green) - 22 	1	H4	10	○△	






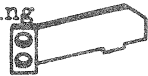









Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97-	Lead wire					
316G1	(black) - 90 	1	D5	3	○△	
316G2	(black) - 60 	1		3	○	
316J	Lead wire (grey) 	1	D5	3	○△	
316K	Lead wire (orange) 	1	F2	7	○△	
317	Stop pawl washer 	1		7	○	
318A	Frame counter cam washer A 	1		3, 4	○	0.05t
318B	Frame counter cam washer B 	1		3, 4	○	0.1t
318C	Frame counter cam washer C 	1		3, 4	○	0.2t
319	Stop pawl adjusting pin 	1	F5	7	△	
320	5P connector pin 	1	A7	2	△	
321	5P connector nut 	1	A7	2	△	
322	5P connector contact plate 	1	A8	2	△	
323	5P connector contact spring 	1	A9	2	△	
324	5P switch pin 	1		2	○	
325	Switch bearing 	1		4	○	



Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97-326	Steel ball 0.8 	60	B1	3, 4 5, 6	○△	
327	Wind-up shaft collar 	1		3	○	
328	Ball bearing 2 - 5 - 1.5 	2		3, 4	○	
329A	Wind-up thrust washer A 	1		3	○	0.05t
329B	Wind-up thrust washer B 	1		3	○	0.3t
329C	Wind-up thrust washer C 	1		3	○	0.4t
329D	Wind-up thrust washer D 	1		3	○	0.5t
330	C clip 	1	B1	4, 6	○△	
331	Rewind coupling screw 	1	B5	5	○△	
332	Taper pin TP 0.8 - 8 	2	C2	7	○△	
333	Qldham coupling shaft 	1	B10	<sup>▲</sup> 5	△	
334	Rewind retainer 	1		5	○	
335	O/C safety screw 	1		5	○	
336	O/C safety spring 	1		5	○	
337	O/C safety washer 	1		5	○	Equivalent to 20FA30 #986
338	Rewind click spring 	1	A4	<sup>▲</sup> 2, 	△	

Part No. 部品番号	Name and Shape 名称および形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97-339	Rewind click pin 	1	A4	2	△	
340	Rewind click spring retainer 	1		2	○	
341	Click spring cover 	1		1	○	
342	Screw 1.7R - 3 special 	2		2	○	Equivalent to 20FD11 #238
343	3rd shaft stopper 	1	C6	4	○△	
344	3rd shaft spring holder 	1		4	○	Equivalent to 20FA30 #787
345	Straight pin SP 0.8 - 3.6 	1		6	○	
346	Taper pin TP 1 - 8 	1	B10	5	○△	
347	Remote terminal cap 	1			○	
348	Trigger button cover 	1	H1	10	△	
349	Set screw 1.7U - 3 	1	H1	10, 2 <sup>△</sup>	○△	
350	2nd shaft clutch spring 	1		4	○	
351	2nd shaft clutch gear 	1		4	○	
352	Screw 1.4Q - 3 	3		4	○	
353	2nd shaft clutch pawl 	1	C7	4	△	

Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部組品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97- 354	2nd shaft clutch rivet 	1	C7	4	△	
355	2nd shaft clutch bearing 	1	C7	4	△	
356	2nd shaft clutch ratchet 	1		4	○	
357						(Blank)
358	Rewind coupling washer 	1		2	○	Equivalent to 20FD11 #282
359	O/C lever protector 	1	A10	1	○△	
360	Transistor 2SC871F 	1	J1	9	△	
361						(Blank)
362A	2nd shaft clutch washer A 	1			○	0.3t
362B	2nd shaft clutch washer B 	1			○	0.4t
362C	2nd shaft clutch washer C 	1			○	0.5t
363	Vinyl tube 3.6φ 	1	△ D5	3	○△ △	
364	Tape 	1	△ D8	8	○△ △	
365						(Blank)
△ 366	Palladium contact point 	1	E4		△	

Part No. 部品番号	Name and Shape 名称 および 形状	Pcs. per Unit 1台分個数	Reference Subassembly No. 参照部品番号	Reference Fig. No. 参照図番	Term of Sale 販売区分	Remarks 備考
20FA97- ▲ 367	#625 metal contact point 	2	D6, D7		△	
▲ 368	E-shaped clip E-13 	1	C3	7	△	
▲ 369	Screw 	1	C3	7	△	
▲ 370	Guide plate liner 	2		1	○	
▲ 371	Washer 	1			○	
▲ 372	Rewind lock spring 	1		2	○	
▲ 373	Rewind lock release socket 	1		2	○	
▲ 374	Rewind release button 	1		2	○	
▲ 375	E-shaped ring E-10 	1		2	○	
▲ 376	Plate nut 	1		2	○	
▲ 377	Washer 	1		8	○	
▲ 378	VR nut 	1		8	○	
▲ 379	Speed selector spring holder 	1		8	○	
▲ 380	Speed selector lock spring 	1		8	○	
▲ 381	S-C lock spring 	1		10	○	

## Subassembly list

20FA97 - R.1041.B

	No. of Sub-assembly	Name	Pcs. per Unit	No. of Constituent parts (*: Main parts)	Ref. Fig.	Remarks
Body	20FA97-A2	Remote control terminal	1	*197, 199x3, 200, 316A1 316B4, 316C1, 316C3	2	
	A4	Rewind click plate	1	*338, 339	2	
	A5	Rewind lever	1	112, 114	2	
	A6	Rewind coupling lever	1	*115, 117	2	
	A7	Cordless terminal	1	*7, 313x4, 320, 321	2	
	A8	5P connector contact plate	1	110, *322	2	
	A9	5P connector contact spring	1	109, *323	2	
	A10	Top cover	1	*11, 206, 359	1	
Base plate	B1	Wind-up shaft	1	14, *16, 273, 326x16, 330	4, 6	
	B4	O/C coupling	1	*143, 145, 150, 223, 254x2 276	5	
	B5	Rewind shaft	1	*136, 137, 272, 331	5	
	B7	Relay circuit	1	*159, 298, 309, <del>316D1</del> <sup>▲</sup> , 316D4 <sup>▲</sup>	6	
	B8	Release shaft lever A	1	67, *68	4	
	B9	Large bevel	1	*20, <del>21</del> <sup>▲</sup> , <del>22</del> <sup>▲</sup> , 21x2 <sup>▲</sup> , 23x2 <sup>▲</sup>	4	
	B10	Rewind oldham coupling shaft	1	*333, 346	5	
	B11	O/C lever	1	*131, 133, 134, 135, 135A	5	
	B12	Base plate	1	*3, 66, 141	4	
	B13	Micro-motor	1	*13, 71, 123, 275x4	3	
Cam	C2	3rd shaft	1	*56, 57, 58, 59, 60, 211 213, 272, 332x2	7	
	C3	Cam shaft	1	40, 41-1 <sup>▲</sup> (41), *42, 43-1 <sup>▲</sup> (43) 44, 45, 46, 47, 48, <del>49</del> <sup>▲</sup> , 50x33, 51x32, 212, 241-1 <sup>▲</sup> (241), 368, 369 <sup>▲</sup>	7	
	C4	Cam shaft bracket A	1	*4, 24, 55, 61	4	
	C6	Cam shaft bracket B	1	*5, 64, 343	4	
	C7	2nd shaft ratchet pawl	1	353, 354, *355	4	
Middle plate	D1	Long film contact plate	1	*27, 29, 175x3	3	
	D3	Signal lever A	1	*36, 39	8	
	D4	Signal lever B	1	*30, 31	8	
	D5	Toggle switch	1	290, *301, 316B1, 316D1 316D2, 316E2, 316F1, 316G1 316J, 363 <sup>▲</sup>	3	
	D6	Switch spring contact A	1	*34, <del>35</del> <sup>▲</sup> , 367 <sup>▲</sup>	3	
	D7	Switch spring contact B	1	*35, <del>36</del> <sup>▲</sup> , 367 <sup>▲</sup>	3	
	D8	Middle base plate	1	*6, 28, 364 <sup>▲</sup>	8	

Revision A x18

	No. of Sub- assembly	Name	Pcs. per Unit	No. of Constituent Parts (*: Main parts)	Ref. Fig. No.	Remarks
Rewind shaft bracket	20FA97- E1	Friction	1	E3, 124, *126, 225	6	
	E3	Friction gear	1	*122, 125	6	
	E4	Rewind switch contact C	1	*103, <del>*104</del> , <sup>Δ</sup> 366	6	
	E5	Rewind switch contact A	1	*107, 110	6	
	E6	Rewind switch contact B	1	*108, 110	6	
Counter	F1	Frame counter base plate	1	*75, 78, 79, 85, 247x2	7	
	F2	Counter switch contact	1	*88, 89, 90x3, 316A2, 316E1 316K	7	
	F4	Frame counter ratchet	1	74, *76, 83	7	
	F5	Stop pawl	1	*81, 319	7	
	F6	Frame counter lever	1	*80, 94	7	
Grip	J1	Delay circuit	1	*158, 289x2, 291, 292, 293 294, 295, 300, 309, 360, 296 316B2, 316C1, 316E3, 316F2	9	
	J3	S-C terminal	1	154x4, 155	9	
Trigger button unit	H1	Trigger button	1	165, *167, 176, 348, 349	10	
	H2	Lock spring	1	168x2, *169	10	
	H3	S-C circuit	1	170, 171, *172, 175x4, 297	10	
	H4	Socket	1	*162, 177x4, 268x4, 316B3 316C2, 316E4, 316F3	10	
	H5	S-C cap	1	*8, 180	<del>10</del> <sup>Δ</sup>	
	<sup>Δ</sup> H5-1	S-C cap	1	*8-1, 180-1	10	
Back plate	R1	Back base plate	1	*10, 185, 186	<del>8</del> <sup>Δ</sup>	
	<sup>Δ</sup> R1-1	Back base plate	1	*10-1, 185-1, 186	8	
	R2	Safety button	1	194, *195, 196, 219	8	