and piston arrangement 56 mounted on the machine frame. A coaster arrangement is associated with the pinion 54 (not shown but of conventional type) and assures that reciprocation of the piston of the cylinder and piston arrangement 56, and consequent advancement of the rack 55, effects rotation of the rotary plate 52 only in direction of the arrow 57 shown in FIGS. 3 and 4.

As most clearly evident from FIGS. 3 and 4, the rotary plate 52 carries three winding mandrels 58 which are equiangularly spaced from one another. FIG. 7 shows details of the construction of the winding mandrels 58. It will be seen that each of them is composed of a hollow tubular member 60 provided adjacent one end with an outer circumferentially extending shoulder 61 which is located immediately adjacent a bore through which the end portion of the respective tubular member 60 extends. It is clear from FIG. 7 that the tubular member is rotatable with respect to the rotary plate 52. FIGS. 5 and 6 show that the end portion 62 extending to the other side of the rotary plate 52 carries a friction wheel 66.

As shown in FIG. 7, the tubular member 60 is provided with a plurality of radial bores in which there are located spreading pins 63 which are secured to the inner surfaces of three elongated transversely arcuately curved contact members 59 (compare also FIG. 6). A cam rod 64 is located in the interior of the tubular member 60 and movable therein in opposite axial directions. In the region of the bores in which the spreading pins 63 are located, the cam rod 64 is provided with conically tapering cam faces 65 which are so constructed that, when the cam rod 64 is in the position shown in FIG. 7, they deflect the spreading pins 63 radially outwardly with the result that the contacts members 59 are also spread radially outwardly. Thus, if a reel or bobbin surrounds the respective winding mandrel 58, the contact members 59 will be spread into tight frictional engagement with the inner surface in the hub of the respective reel or bobbin, thus connecting the same tightly to the respective mandrel 58. If the cam rod 64 is moved towards the left in FIG. 7, the pins 63 can be moved inwardly and can be withdrawn into the bores, permitting the contact members 59 to move inwardly into contact with the outer surface of the tubular members 60, thereby enabling withdrawal of the reel or bobbin from the respective winding mandrel 58. It is advantageous to provide spring-biased arrangements (not shown) to deflect the contact members 59 inwardly into contact with the outer surface of the tubular member 60.

As also shown in FIG. 7, a further pin 81 is slidably received in a radial bore 80 which is provided in the shoulder 61. A substantially U-shaped bracket is secured on the rotary plate 52 proximal to each of the winding mandrels 58, and this bracket 75 receives and guides a pin 76 with reference radially of the respective winding mandrel 58. A helical spring 77 surrounds the pin 76 intermediate the arms of the U-shaped bracket 75, having one end abutting against one of the arms of the bracket and the other end abutting against a projection 78 or the like provided on the pin 76, whereby the latter is urged radially inwardly towards the winding mandrel 58. When the inner free end of the pin 76 registers with the bore 80 in the shoulder 61, this inner free end can enter into the bore 80, thereby arresting the winding mandrel 58 against rotation with respect to the rotary plate 52.

In a certain position of the rotary plate 52, still to be described, a rod 82 can enter through the hollow end portion 62 of the tubular member 60 and will, upon contact of its bevelled front end with the pin 81, urge the same radially outwardly in the bore 80. This, in turn, results in radially outward displacement of the pin 76 by the pin 81, so that the free end portion of the pin 76 is urged out of the bore 80 with the result that now the winding mandrel 58 can rotate relative to the rotary plate 52. It will be appreciated that a conventional counter for counting the number of rotations of the winding mandrel 58 can be operatively associated with the pin 76, so as to begin counting the same as the free end of the pin 76 is urged out of the bore 80 and rotation of the mandrel 58 can begin. In this manner the number of convolutions of tape placed onto the winding mandrel 58, or onto a bobbin or reel carried thereby, can be conveniently determined.

A cylinder and piston arrangement 68 is arranged on the frame 51, the piston rod being connected to the frame 51 and the cylinder to a member 69 which is vertically adjustably mounted in the frame 51 via guide rods 71. Coil springs surround the guide rods 71 and tend to urge the member 69 in upward direction as seen in FIG. 6. By activating the cylinder and piston arrangement 68 the member 69 can be moved downwardly against the biassing force of the springs 72, so that it is vertically movable in the direction of the double-headed arrow 67. A motor-transmission arrangement 70 is connected to the member 69 and has a laterally projecting output shaft 73 carrying a friction wheel 74.

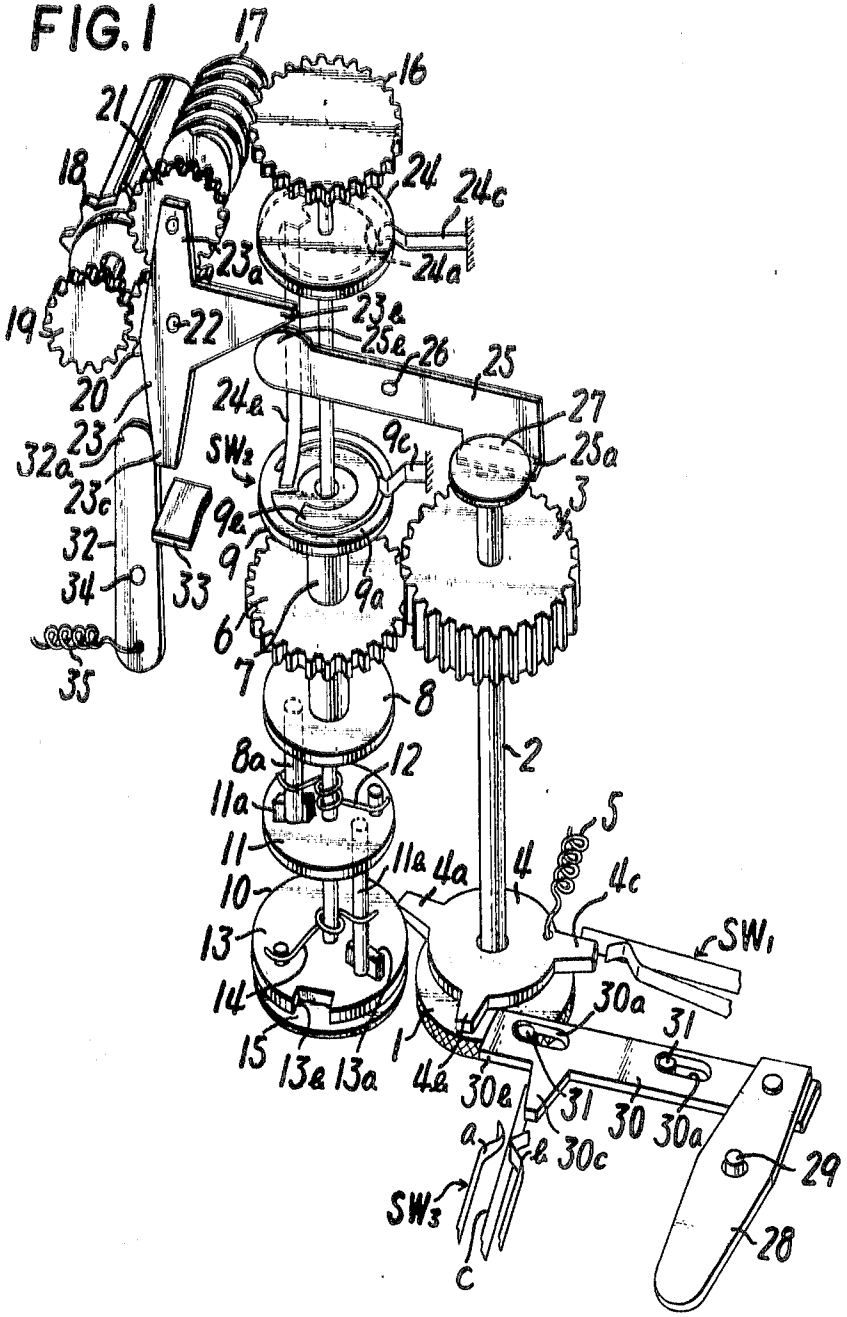
It is evident from FIGS. 3 and 4 that the rotary plate 52 is to turn in the direction of the arrow 57. Such turning movement takes place stepwise so that each of the winding mandrels 58 is serially advanced to a first operating station A, thereupon to a second operating station B and finally to a third operation station C. In a manner still to be described the winding mandrels 58 are provided, when located at the operating station A, with a device for securing the leading ends of the tape 40, whereupon they are advanced to the operating station B where the tape is severed as shown in FIG. 3 and the winding of the tape into a coil is then carried out. Finally, the next stepwise rotation of the rotary plate 52 carries the completed coil to the operating station C where it is removed from its winding mandrel 58 which, upon the next advancement of the rotary plate 52 in direction of the arrow 57, again moves to the operating station A.

As shown in FIGS. 5 and 6, the frame 51 with the member 69, the motor 70 and the friction wheel 74 are so arranged that the friction wheel 74 is in motion-transmitting contact with the friction wheel 66 with that winding mandrel 58 which is located at the station B. This takes place when the cylinder and piston arrangement 68 is actuated. The cylinder and piston arrangement 83, on the other hand, is so arranged that the rod 82 enters into the hollow end of the end portion 62 of the respective tubular member 60 of that winding mandrel 58 which is located at the station B, thereby moving the free end of the pin 76 out of the bore 80 and freeing the winding mandrel 58 for rotation with respect to the rotary plate 52. This means that the cylinder and piston arrangements 68 and 83 are jointly controlled.

An additional cylinder and piston arrangement 85 is mounted on the frame 51 at a location constituting an axial extension of the operating station C. A pin 84 is connected to the piston rod of this arrangement 85 and enters into the hollow end of the end portion 62 of that mandrel which is located at the operating station C, being moved towards the left in FIGS. 6 and 7 to such an extent that it shifts the cam rod 64 from the position shown in FIG. 7 towards the left, thereby permitting the contact members 59 to move into engagement with the outer surface of the associated tubular member 60. Thus, the coil, bobbin or the like which is carried by the respective winding mandrel 58, and onto which the completed coil 120 (compare FIG. 3) is wound, can be withdrawn from the winding mandrel 58. A further cylinder and piston arrangement 87 connected to a member 88 which is secured on a frame portion 71, and carries on its piston rod a pin 86 which, when the rotary plate 52 is standing still, is moved towards the right as seen in FIG. 6 and advances the cam rod 64 in FIGS. 6 and 7 towards the right, that is the cam rod of that winding mandrel 58 which is located at the operating station B. This spreads the members 59 into contact with a reel or bobbin placed onto the winding mandrel 58 and holds the reel or bobbin in position for rotation with the winding mandrel 58 which is located at the operating station B.

It is necessary to point out at this time that the device for securing the leading ends of the tape 40 to the respective winding mandrel 58, which has been mentioned earlier, consists in the illustrated embodiment of a channel-shaped rod 89

FIG. 1



Inventor

KAORU UMEDA

By Stanley Weder

Attorney

FIG. 2

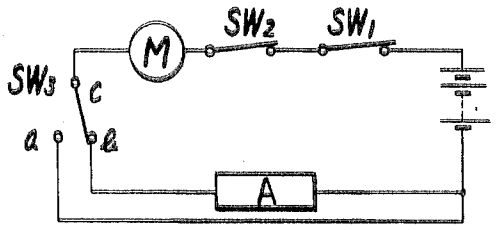


FIG. 3

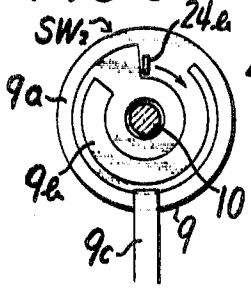


FIG. 4

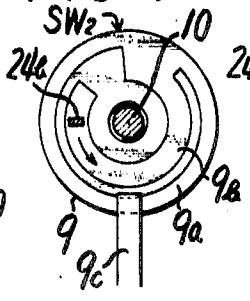
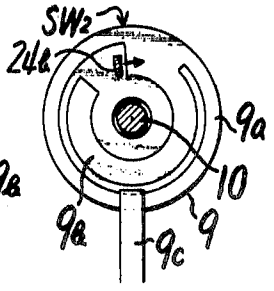


FIG. 5



Inventor
KAORU Umeda
By Stanley Weiser
Attorney

COUNTER MECHANISM IN MOTOR-DRIVEN CAMERA

The present invention relates to a counter mechanism for a motor-driven camera in which film winding or rewinding is effected by a motor and more particularly to a counter mechanism in a motor-driven camera which is so constructed that when a film counter is set to the frame number of the film to be exposed and loaded in the camera the electrical circuit of the motor is automatically opened so as not to advance the film in the winding direction upon the completion of winding the predetermined number of frames, the motor being set driving again by changing the circuit to another circuit by operating a rewinding lever while the direction of rotation of the counter transmission mechanism being changed simultaneously by a clutch to effect driving in the film rewinding direction, the electrical circuit of the motor being thereafter automatically opened to stop the film transport in winding and rewinding operations when the film has been rewound slightly beyond the windup initiating position, the switching mechanism for the motor being automatically set to the film windup initiating position when the back cover of the camera is opened.

With a motor-driven roll film camera, it is a common practice that, when a preset number of frames of film have been wound up, a switch is actuated to the THE electrical circuit of the motor and stop the winding operation. Proposals have also been made in which while the film is being rewound by the motor the electrical circuit of the motor is manually opened upon reading the length of the film yet to be rewound on the counter scale which is being reversely rotated by the rewinding action so as to stop the rewinding action immediately before the film is entirely rewound into the cartridge, or in which the electrical circuit of the motor is opened by the action of a detecting member such as a lever which is held in contact with surface of the film being rewound and adapted to be projected when the film passes by the detecting member. In case of these proposals, aside from the provision of an automatic switch for film winding operation, the manual procedure during rewinding operation is liable to result in such an error that the film may completely be wound in the cartridge unless a great care is taken, while the detecting member such as a lever, if provided in contact with the film surface, may give rise to undesirable friction on the surface when urged in the direction to project the lever, the detecting member further involving a great difficulty when it is to be built in a camera such as a single-lens reflex camera because of structural reasons of the camera. A further trouble encountered with a conventional camera is that the counter has to be set every time a new film is loaded.

An object of the present invention is to improve remarkably the operability of a camera having a motor-driven winding or rewinding device by providing, in addition to the function to automatically stop the film driving action during the above-mentioned winding and rewinding operation, a function to complete the preparation for the subsequent film winding operation by returning the counter to the previously set position for initiating film winding when the camera back cover is opened to take out the film, so as to eliminate the necessity to thereafter reset the counter again in case where films of the same frame number are used in succession, or so that when a film of a different frame number is used the counter may be set to the frame number.

Furthermore, the present invention contemplates fulfilling the above-mentioned object by a relatively simple structure, improving the reliability of performance and making the device easier to operate.

FIG. 1 is a perspective view showing the structure of the principal part of the present invention, the counter being shown as it is set the the number of film frames which can be exposed for taking photographs;

FIG. 2 is a simplified diagram showing the electrical circuit of the motor for driving the film winding or rewinding mechanism as the counter is in set position as in FIG. 1, A in the drawing showing a control circuit for winding operation; and

FIGS. 3, 4 and 5 are plan views showing an embodiment of a switch for halting winding action, FIG. 3 showing the state in which the counter is in set position, FIG. 4 showing the state in which rewinding operation is about to be effected after the completion of winding operation, FIG. 5 showing the state after rewinding has been completed.

Although the present invention will be hereinafter described in detail with reference to the drawings, it should be understood that the mode of embodying the present invention is not limited to the illustrated embodiment but the invention also includes various modifications which have the same functions as the embodiment below.

Referring to the drawings, designated at 1 is a knob for operating a counter exposed from the camera body (not shown) and fixed to an external end of a shaft 2 which is mounted rotatably on the body and adapted to be moved in the axial direction in a limited range. Designated at 3 is a thick gear secured to the shaft 2 at a suitable portion inside the body, the thickness of the gear being greater than the axial displacement of the shaft 2. Numeral 4 indicates an actuating plate having projections 4*a*, 4*b*, 4*c* at three portions on its periphery and urged by a pulling spring 5 in the counterclockwise direction in the drawing, with the shaft 2 extending therethrough loosely. The actuating plate 4 is therefore free to rotate with respect to the shaft 2 and independent of the axial movement of the shaft 2. Indicated at 6 is a gear driven by the thick gear 3 in meshing engagement therewith and fixed to a cylindrical shaft 7 supported on the camera body. The cylindrical shaft 7 carries a drive disc 8 fixed to the lower end and a switch disc 9 secured to the upper end. A follower pin 8*a* is mounted on the under face of the drive disc 8. The switch disc 9 is made of an electrically nonconductive material and carries a switch conductor which is fixed to its upper face and formed of an outer ring 9*a* and a partly cutout inner ring 9*b*, the outer and inner rings 9*a* and 9*b* being joined together at one portion so as to effect electrical connection. Designated at 10 is a counter shaft loosely extending through a cylindrical shaft 7 and adapted to be moved independently of the shaft 7. The countershaft rotatably carries an intermediate disc 11 below the drive disc 8. Being urged by a spring 12 in the counterclockwise direction in the drawing, the disc 11 causes a follower projection 11*a* fixedly mounted thereon to abut against the follower pin 8*a* on the drive disc 8. The intermediate disc 11 is further provided with an intermediate pin 11*b* extending from its under face. An operation plate 13 is secured to the lower end of the counter shaft 10 and urged by a spring 14 in the clockwise direction in the drawing, with the intermediate projection 13*a* on its upper face in engagement with the intermediate pin 11*b*. That is to say, the springs 12 and 14 act on the intermediate disc 11 in directions opposite to each other. The operation plate 13 is formed with a groove 13*b* at an appropriate portion in its periphery and provided with a counter dial 15 exposed from the camera body and fixed to the under face thereof so as to revolve integrally therewith. As already known the counterdial 15 is provided with a counterscale with stationary indications (not shown) disposed in facing relationship therewith.

In accordance with the above structure, when the operation plate 13 is rotated, (the rotating mechanism will be described later) the projection 4*a* of the actuating plate 4 under the action of the pulling spring 5 is engaged with or disengaged from the groove 13*b* in the operation plate 13 and the actuating plate 4 is turned to open or close a switch SW_1 for stopping winding operation.

Fixed to the upper end of the countershaft 10 is a worm gear 16 meshing with a worm 17. Through the train of gears 19, 20, 21 and a sprocket 18 which is operatively related with the film transport, the worm 17 is rotated to drive the worm gear 16. The worm 17 and the gear 21 on the end of the shaft thereof are supported at the end of an upper arm 23*a* of three-arm

lever 23 whose center portion is pivoted on the shaft 22 of the intermediate gear 20. By a spring (not shown) urging the three-arm lever 23 in clockwise direction in the drawing, the worm 17 is brought into meshing engagement with the worm gear 16, while when the lever 23 is turned counterclockwise by a mechanism to be described later, the worm is moved out of the engagement.

Designated at 24 is a switch-actuating disc fixed to the countershaft 10 in facing relationship with the switch disc 9. A switch SW_2 for stopping rewinding operation comprises an annular conductive plate 24*a* fixed to the disc of electrically nonconductive material and a tonguelike sliding member 24*b* extending therefrom and electrically connected to the annular conductive plate, the end of the sliding member 24*b* being in sliding contact with the partly cutout inner ring 9*b* of the switch disc 9. Respectively in sliding contact with the outer ring 9*a* of the switch disc 9 and the annular conductive plate 24*a* of the switch actuating disc 24 are contacting terminals 9*c* and 24*c* which are connected to a motor M and power source to form a power supply circuit.

Numeral 25 designates a lever pivotally mounted on a pin 26 on the camera body. A bent end 25*a* thereof is positioned under a disclike flange 27 mounted at the inner end of shaft 2 of the knob 1 and the tail end 25*b* engages with the under face of a follower arm 23*b* of the three-arm lever 23, the arrangement being such that when the shaft 2 is moved downward the three-arm lever 23 is turned counterclockwise about the shaft 22 by the tail end 25*b* to move the worm 17 out of engagement with the worm gear 16.

A rewinding lever 28 is pivotally mounted on a pin 29 at a suitable portion of the camera body with its forward end pivotally connected to the tail end of a slider 30 whose direction of movement is defined by a guide pin 31 engaged with a slot 30*a*. The forward end 30*b* of the slider is positioned close to a projection 4*b* of the actuating plate 4. When the rewinding lever 28 is pivotally moved in the counterclockwise direction in the drawing the slider 30 is moved leftward in the drawing to push the projection 4*b* and turn the actuating plate 4 in the clockwise direction against the pulling spring 5. The slider 30 is further provided with a switch changeover projection 30*c* for moving a contact member C of a circuit changing switch SW_3 off a contact *b* into contact with a contact *a*.

A lever 32 operatively related with the opening or closing of the back cover is moved in operative relationship with a back cover associated member 33 which is so adapted as to move rightward in the drawing when the cover is opened and to move leftward when it is closed. The lever 32 is pivotally mounted at its center on a pin 34 on the camera body and urged clockwise by a pulling spring 35 acting on its tail end, with the forward end 32*a* in engagement with a lower arm 23*c* of the three-arm lever 23. When the back cover is opened, the lever 32 is turned by the pulling spring 35 to rotate the lever 23 in the counterclockwise direction to disengage the worm 17 from the worm gear 16.

Schematically shown in FIG. 2 is a control circuit A of the motor M for driving a film winding or rewinding mechanism (not shown), the circuit comprising the switch SW_1 for stopping winding operation, switch SW_2 for stopping rewinding and circuit changing switch SW_3. When the switch SW_3 closes it contact *b*, a film winding circuit is formed to effect film winding operation, while the contact *a* when closed forms a rewinding circuit which, irrespective of the state of the control circuit A in the rewinding circuit, effects film rewinding until the tonguelike sliding member 24*b* fixed to the switch actuating disc 24 moves out of contact with the partly cutout inner ring 9*b* and turns off the switch SW_2 as the sprocket 18 is driven.

FIG. 1 shows the state in which the counter is set to the number of film frames to be exposed. In order to set the counter to the frame number after loading the film in the camera, the knob 1 is first pulled downward in the drawing and rotated, whereupon the disclike flange 27 at the upper end of the shaft 2 moves the lever 25 pivotally about the pin 26 in the clockwise direction and thereby turns the three-arm lever 23 about the shaft 22 in the counterclockwise direction to disengage the worm 17 from the worm gear 16. The thick gear 3 rotated integrally with the knob 1 drives the follower gear 6 which rotates the drive disc 8 and switch disc 9 together with the cylindrical shaft 7. By the follower pin 8*a* and follower projection 11*a*, the drive disc 8 rotates the intermediate disc 11 which further rotates the operation plate 13 by intermediate pin 11*b* and intermediate projection 13*a*. As a result, the counter shaft 10, counter dial 15 are rotated in the direction opposite to that of the rotation of the knob 1 by the rotation of the knob 1. Accordingly, when the counter scale is set to the unillustrated stationary indication and the knob 1 is pushed in, the shaft 2 is moved upward and the worm 17 is brought into engagement with the worm gear 16 as shown in FIG. 1 through the lever 25 and three-arm lever 23. In this state, the switch SW_1 for stopping winding action is in closed position and as shown in FIGS. 1 and 3 the switch SW_2 for stopping rewinding has the tonguelike sliding member 24*b* in contact with the cutoff end portion of partly cutout inner ring 9*b* of switch disc 9 to effect connection, while the circuit changing switch SW_3 has the contact *a* opened and the contact *b* closed. Although not shown in the drawing, the shaft 2 is locked against rotation when moved upward.

Every time exposure is completed upon shutter release in this state, a known control mechanism (not shown) operates to drive the motor M and wind up one frame of the film. When the film is wound up, the sprocket 18 is thereby rotated to drive, through the train of gears 19, 20, 21, the worm 17 which in turn rotates the countershaft 10 in the clockwise direction through the worm gear 16. Simultaneously, the switch-actuating disc 24, operation plate 13 and counterdial 15 are also rotated in clockwise direction. This rotation is effected every time a frame of film is wound up and the angle of rotation of course corresponds to one division of the scale on the counterdial 15. On the other hand, since the follower gear 6 is in meshing engagement with the thick gear 3 which is locked, along with the shaft 2, against rotation, the cylindrical shaft 7 can not be rotated and the drive disc 8 and switch disc 9 therefore remain at rest. Consequently, as the operation plate 13 is rotated in clockwise direction every time a frame of film is wound up, the intermediate disc 11 is also rotated in the same direction in accordance therewith, whereas the follower projection 11*a* on the intermediate disc 11 moves progressively away from the follower pin 8*a* to wind the spring 12. Furthermore, the tonguelike sliding member 24*b* on the switch actuating disc 24 slides in the clockwise direction on the partly cutout inner ring 9*b* on the switch disc 9 as indicated by an arrow in FIG. 3. However, both of the switches SW_1 and SW_2 close the circuit and the contact *b* of the circuit changing switch SW_3 is still in the closed position. When exposures of a preset number of frames have been made, the tonguelike sliding member 24*b* reaches the position (which changes depending upon the number of film frames to be exposed) shown in FIG. 4. The groove 13*b* of the operation plate 13 also reaches the position of the projection 4*a* of the actuating plate 4 whereupon the projection 4*a* is brought into engagement with the groove 13*b* by the pulling spring 5, with the result that the actuating plate 4 is turned in the counterclockwise direction by this amount to push the movable contacting member of the switch SW_1 by the projection 4*c* and open the switch. The circuit of the motor M is now opened to stop the winding operation.

To rewind the film after the completion of winding operation, the rewinding lever 28 is turned in the counterclockwise direction in the drawing, which urges the slider 30 leftward in the drawing and pushes the contact member C of the switch SW_3 off the contact *b* into contact with the contact *a*. Simultaneously with this, the forward end of the slider 30 pushes the projection 4*b* of the actuating plate 4 into clockwise rotation against the action of the spring 5, so that the projection 4*c* is retracted from the movable contacting member of the switch SW_1 and closes the switch SW_1. When the circuit-changing

switch SW_3 is closed at the contact *a*, a circuit independent of the winding operation control circuit A in FIG. 2 is formed and at the same time the rewinding operation drive system is actuated in place of the unillustrated winding operation drive system to rewind the film by the rotation of a rewinding shaft. When the film is rewound the sprocket 18 is thereby driven in the opposite direction, which further rotates the countershaft 10 fixed to the worm gear 16 in the counterclockwise direction through the worm 17, with the result that the countershaft 10 drives the switch actuating disc 24, operation plate 13 and counterdial 15 in the counterclockwise direction. The spring 12 wound up during the foregoing winding operation is now restored to the original condition and the tonguelike sliding member 24*b* is returned to the original position as shown by an arrow in FIG. 4. Even after the operation plate 13, counterdial 15, intermediate disc 11 and switch actuating disc 24 have thus been returned to the position shown in FIG. 1, the switches SW_1,SW_2 are in closed position and the circuit-changing switch SW_3 is kept closed at the contact *a*, so that the motor is driven further in the reverse direction until the position where the film is initiated into winding action is wound slightly into the cartridge. When the worm 17 and worm gear 16 are rotated counterclockwise slightly beyond the position where the winding operation was initiated, the tonguelike sliding member 24*b* on the switch actuating disc 24 operatively related therewith moves beyond the cutout end of the partly cutout inner ring 9*b* to reach the cutout portion made of the electrically nonconductive member. Consequently, the switch SW_2 is turned off to stop the motor M and complete the rewinding operation. Although the operation plate 13, counterdial 15 are brought to a halt at this time after having been rotated counterclockwise slightly beyond the position where the winding operation was initiated, the intermediate disc 11 will not be turned counterclockwise beyond the starting position, because the drive disc 8 is locked. Accordingly, the intermediate projection 13*a* on the operation plate 13 moves off the intermediate pin 11*b* and winds the spring 14 until it is stopped. When the rewinding lever is released, it is returned by an unillustrated spring and the actuating plate 4 is brought into the position shown in FIG. 1, with the contacting member C released from the contact *a* and brought into contact with the contact *b*.

The back cover of the camera when opened to take out the film after the completion of film winding operation, causes the back cover associated member 33 to move rightward, allowing the lever 32 to pivotally move clockwise under the action of the pulling spring 35 and push the lower arm 23*c* of the three-arm lever 23, whereby the lever 23 is turned counterclockwise and the worm 17 is released from the worm gear 16. The resilient force of the spring 14 on the operation plate 13 acting on the countershaft 10 now causes the shaft 10 to turn clockwise until the intermediate projection 13*a* on the operation plate 13 strikes on the pin 11*b* on the intermediate disc 11, with the result that the operation plate 13, counterdial 15, worm gear 16 and switch-actuating disc 24 are returned to the position where winding action was initiated. As indicated by an arrow in FIG. 5 the tonguelike sliding member 24*b* is also returned to the position in FIG. 3. The switch SW_2 is now returned to the position on the partly cutout inner ring, thereby forming the winding circuit in FIG. 2. Since the current supply is interrupted by the control circuit, the motor M is retained at rest unless release operation button of the camera is depressed.

When the back cover is closed after the used film is replaced with a new film, the back cover associated member 33 is moved leftward to return the lever 32 counterclockwise and turn the three-arm lever clockwise, thereby bringing the worm 17 into meshing engagement with the worm gear 16 as seen in FIG. 1.

As described above, upon the completion of film winding operation in accordance with the present invention, the switch SW_1 for stopping the winding operation is opened to stop the motor-driven winding operation, while during film rewinding operation the switch SW_2 for stopping rewinding action is opened after the relevant members have been driven slightly beyond the windup initiating position to bring the rewinding operation to a halt. Furthermore, when the back cover of the camera is opened, the switch SW_2 is returned to the windup initiating position and the operation plate 13 which serves to determine the time to open the switch SW_1 is also returned to the initiating position to which it was set first. Accordingly in case where the frame number of the film to be subsequently loaded for exposure is the same as the frame number of the used film, there is no need to operate the knob 1 for the subsequent operation but the camera is ready for winding up the required number of frames. Thus the trouble to set the counter is eliminated and improved operability of the camera is ensured. On the other hand, if a film of different frame number is to be used, the counter is set to the frame number.

I claim:

1. A motor control mechanism for a camera in which the film advancing and rewinding operations are effected by a drive motor to which an electric power-feeding circuit is connected comprising a rotatable member which rotates in both directions in response to movement of a film being advanced and rewound, a countershaft, a transmission means interposed between the rotatable member and the countershaft to transmit the movement of the rotatable member to the countershaft, a counterdisc adapted for rotation integrally with the countershaft and mounted for angular adjustment to a start position of said counterdisc, a first switch means actuatable to an open position when the counterdisc rotates to a predetermined angular position during film advancing operation and to a closed position on initiation of the film rewinding operation, a second switch means provided with a movable first contact member mounted on the countershaft so as to be rotated integrally therewith and with a disc concentric with the countershaft but independent of the rotation of the countershaft and having a second contact member, the second switch means being adapted to be opened only when the countershaft has been rotated during the film rewinding operation to a point wherein the counterdisc is rotated slightly beyond the start position thereof, and reset means for resetting the countershaft to bring the counterdisc to the start position in response to the opening of part of the camera body for loading or unloading the film, the first and second switch means being electrically connected in series with each other in the electric power feeding circuit for the driving motor.

2. A motor control mechanism as set forth in claim 1 wherein the counterdisc has a cam portion for closing the first switch means, the second contact member of the second switch means includes a partly cutout annular conducting portion, the movable first contact member of the second switch means includes a contact member slideably engaging the conducting portion and adapted to be disengaged from the conducting portion when the countershaft has been rotated beyond the start position during film rewinding operation, and the reset means includes a member for interrupting transmission of the transmission means for the countershaft in response to the opening of part of the camera body and a resilient means for returning the countershaft which has been rotated beyond the start position to the start position.

3. A motor control mechanism as set forth in claim 2 further comprising means for controlling the angular position of the counterdisc including a hollow shaft coaxially surrounding the countershaft for relative free rotation, a drive disc fixedly mounted on the cylindrical shaft, and an intermediate disc loaded with two springs acting thereon in opposite directions and rotatably mounted on the countershaft so as to deliver the movement of the drive disc to the counterdisc through two intermediate pins, the disc of the second switch means being mounted on the hollow shaft so as to be moved integrally with the counterdisc in changing the start position thereof.

4. A motor control mechanism as set forth in claim 3 wherein the reset means comprises a three-arm lever having a first arm in contact with a member to be moved by the part of

the camera body so as to be operated by the member, a second arm supporting one of gears included in the transmission means and a third arm associated with the vertical movement of the shaft of the countersetting knob, and the resilient means included in the reset means is one of the springs acting on the intermediate disc.

5. In a camera a motor driven film wind and rewind mechanism comprising a countershaft (**10**), first means (**16–21**) for rotating said shaft in opposite directions with the advance and rewind of said film, a switch-operating member (**13**) mounted on said countershaft and rotatable therewith, second means (**1–3, 6–8, 11, 23, 25, 27**) for selectively angularly adjusting said switch operating member independently of said first means, a normally closed first switch (SW_1) actuatable to an open position in response to a first predetermined angular position of said switch operating member, a normally closed second switch (SW_2) actuatable to an open condition in response to a second predetermined angular position of said countershaft different from said first predetermined position, and a motor (M) connected to a source of current through said first and second connected in series.

6. The mechanism of claim **5** wherein said second switch comprises a wiper arm contact element (**24***b*) slideably engaging a split annulus contact element (**9***b*), one of said contact elements being rotatable with said counter shaft and the other of said contact elements being relatively stationary and angularly adjustable by said second means.

7. The mechanism of claim **5** wherein said second means comprises a hollow shaft (**7**) rotatably engaging said countershaft, a knob (**1**), a first gear (**3**) rotatable with said knob, a second gear (**6**) secured to said hollow shaft and engaging said first gear, an eccentric first abutment element (**8***a*) rotatable with said hollow shaft, a freely rotatable intermediate member (**11**) coaxial with said shaft, a windup spring engaging said first abutment element and said intermediate member, a second eccentric abutment element (**11***a*) depending from said intermediate member and a second windup spring (**14**) engaging said second abutment element and said switch-operating member.

8. The mechanism of claim **5** including means (**23, 32**) for disabling said first means and permitting the rotation of said countershaft independently of the movement of said film.

9. The mechanism of claim **5** including means (**28, 30**) for closing said first switch independently of the position of said switch-operating member.