May 29, 1928. 1,671,588

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ELECTRICAL CONTROL MECHANISM FOR PHOTOGRAPHIC MACHINES

Filed April 28, 1925 3 Sheets-Sheet 1

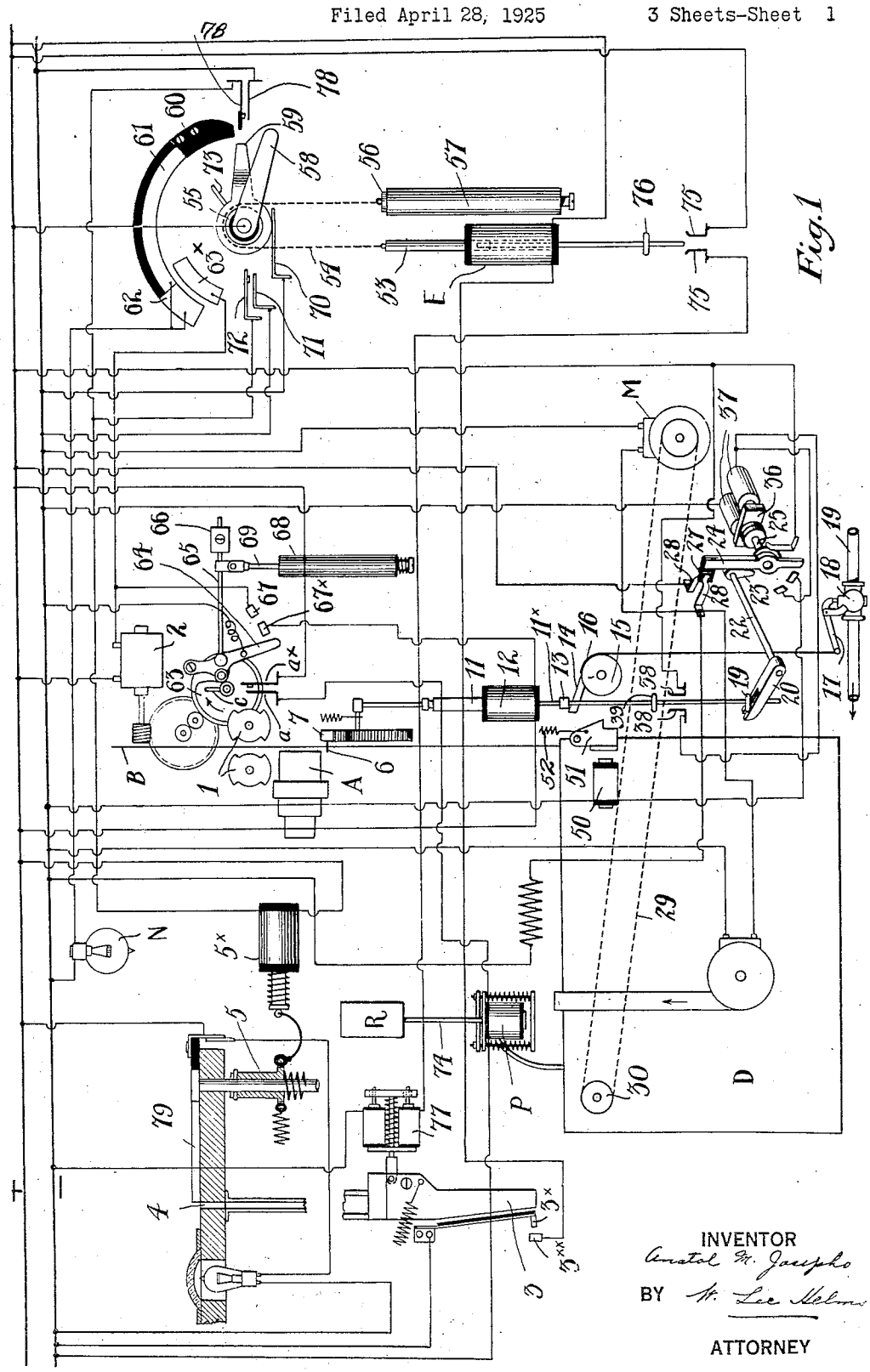


Fig. 1

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Filed April 28, 1925 3 Sheets-Sheet 2

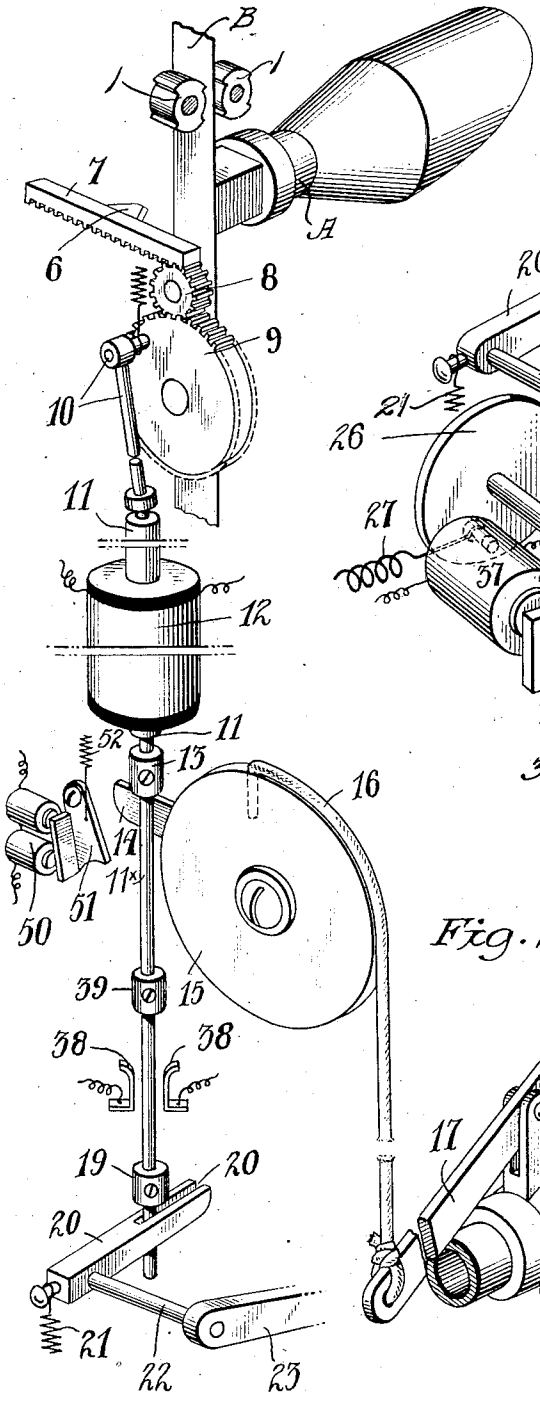


Fig. 2

Fig. 4

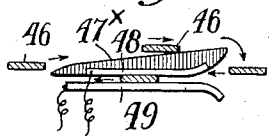
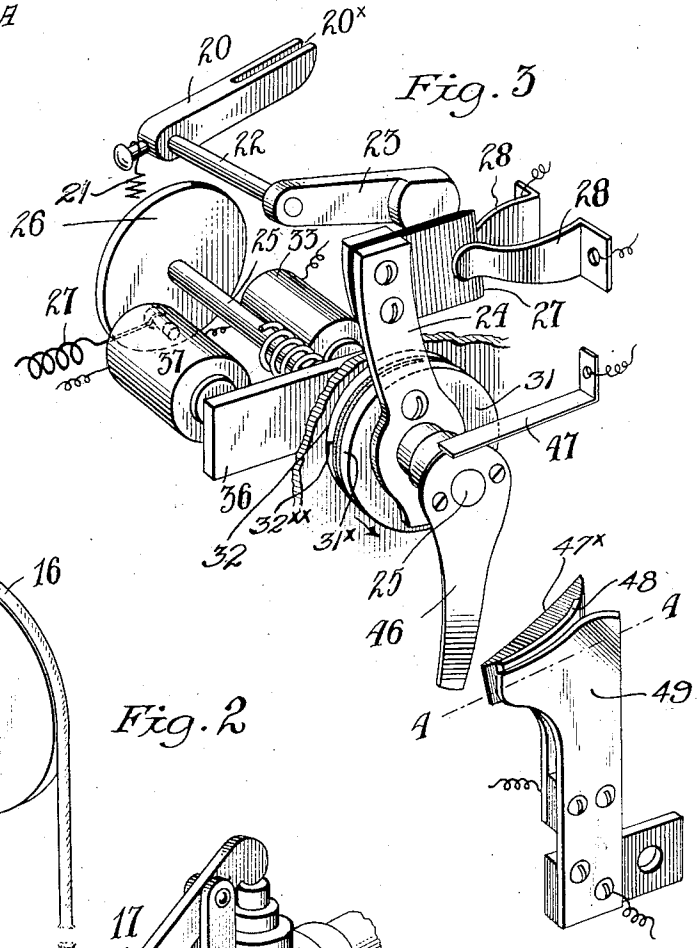


Fig. 3



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ELECTRICAL CONTROL MECHANISM FOR PHOTOGRAPHIC MACHINES

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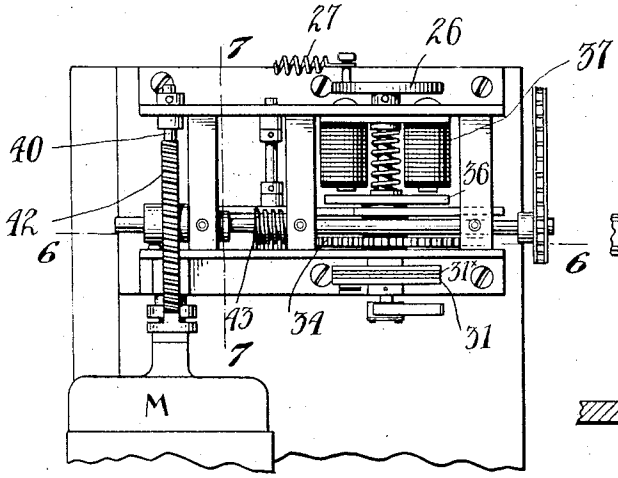


Fig. 5.

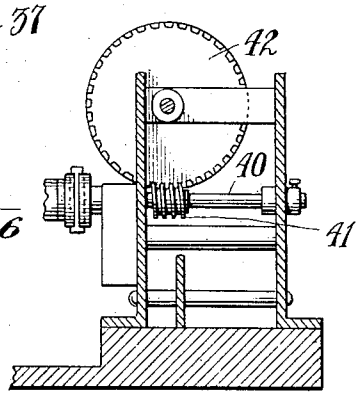


Fig. 7

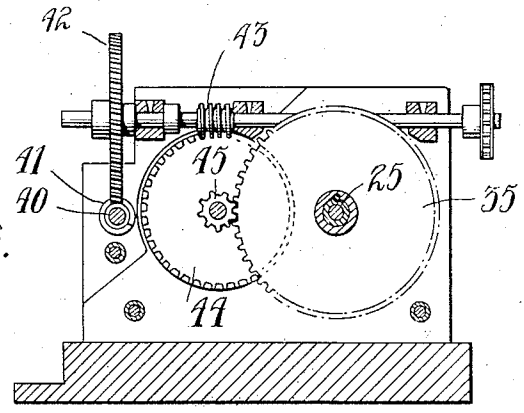


Fig. 6.

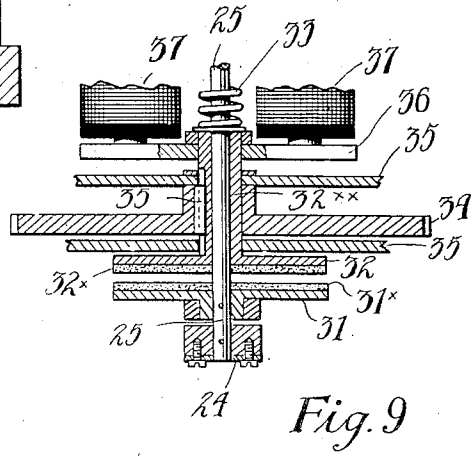


Fig. 9

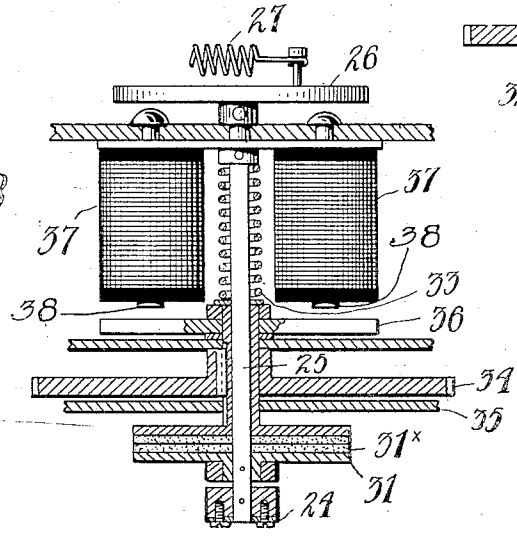


Fig. 8

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UNITED STATES PATENT OFFICE.

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ELECTRICAL CONTROL MECHANISM FOR PHOTOGRAPHIC MACHINES.

Application filed April 28, 1925. Serial No. 26,392.

The object of the present invention is to provide an electrical control for automatic photographic machines which will time the operation of an electrical motor drive in accordance with the operations to be performed.

The invention will be understood by reference to the accompanying drawings in which—

Figure 1 is a diagram of the units and electrical connections of an automatic photographic machine embodying the invention;

Figure 2 is a perspective view of certain mechanical and electrical elements which mechanically open a switch to throw the driving motor into initial operation;

Figure 3 is a perspective view, diagrammatic and fragmentary, of the primary control unit shown in detail, and in Figures 5 to 9 inclusive.

Figure 4 is a transverse section on the line 4—4, Figure 3;

Figure 5 is a plan view of the primary control member illustrating its connection with the motor;

Figure 6 is a transverse section on the line 6—6, Figure 5;

Figure 7 is a section on the line 7—7, Figure 5;

Figure 8 is an enlarged detail horizontal section of the magnet and members operated by it, the magnet being de-energized, and

Figure 9 illustrates the position of the parts with the magnet energized.

Referring to the diagram, Figure 1, A represents the lens housing of a camera, not shown, adapted to act upon a strip of sensitized film B, the film being fed step by step in front of the camera lens by means of the feed members 1 or any other suitable feeding mechanism, the specific feeding means forming no part of the present invention. The feeding means may be driven by suitable connections with a motor 2 thrown into action by a coin-controlled switch 3, the coin slot being indicated at 4 and being employed in conjunction with automatic coin slot closing means 5, 5× for closing the coin slot and keeping it closed a certain length of time after a coin is deposited.

After the feeding mechanism has fed a strip of film of a predetermined length in front of the lens of the camera so as to produce a succession of exposed pictures, the exposed strip of film is cut off by means of the knife 6, carried by a rack bar 7, the rack being operated by pinion 8, driven by gear 9 which is actuated through connections 10 with an armature 11 of the solenoid 12. At this point it is necessary to feed the exposed and severed strip of film through developing, washing, drying or other finishing members and it is in connection with the electrical control for the driving means for such members that the present invention relates.

As solenoid 12 is energized and draws downward the armature 11 with its connected rod 11×, a collar 13 on said rod engages an arm 14 fixed to a pulley 15 upon the periphery of which is secured a cable 16 attached at its lower end to a lever 17 which serves to operate a valve 18, controlling the flow of water through a pipe 19 which leads to the washing tanks for the film (not shown). Below collar 13 and rod 11× is a contact member 19 adapted to rock a lever arm 20. To receive rod 11× lever arm 20 is provided with a slot 20× at one end and collar 19 lies directly over the forked end of the lever. Lever arm 20 is normally maintained in neutral position by means of a spring 21. The lever arm is fixed to a shaft 22 which, at its end opposite the lever arm carries a pawl 23 which lies adjacent a switch arm 24.

Switch arm 24 is fixed upon one end of a shaft 25 which shaft, at its opposite end, is fixed to a disk 26. Disk 26 is connected by suitable means with a spring 27 which acts upon the disk to normally maintain the shaft 25 in such position that an insulating knife 27 is held between two spring contacts 28 thus separating the said contacts. Contacts 28 are in a circuit leading from the source of current supply to the motor M which motor, through suitable connections including drive belt 29 and pulley 30, operates the feeding mechanism for carrying the exposed film through the chamber D containing the developing, washing, toning or other chemicals for developing and finishing the strip of film.

When rod 11× is moved downward, collar 19 will rock lever 20 thus turning shaft 22 and causing pawl 23 to move switch arm 24 away from the spring contacts 28, thus per-

mitting those contacts to move together and to close the circuit through the motor.

Switch arm 24, as hereinbefore stated, is fixed to a shaft 25, and also fixed to said shaft is a disk 31 having on one face a friction surface 31^{x}. Slidably movable upon shaft 25 is a second disk 32 having a friction surface 32^{x}. Disk 32 is formed with a hub 32^{xx} against which presses one end of a coil spring 33 so as to normally maintain the two friction disks together. Surrounding hub 32^{xx} is a gear wheel 34 which by means of key 35 is adapted to rotate with friction disk 32 and at the same time permit endwise movement of the latter. Gear wheel 34 may be held against endwise movement by suitable stops, for example the parallel plates or disks 35. Fixed upon the rear of hub 32^{xx} is the field plate 36 of a magnet comprising parallel pole-members 37 mounted upon a supporting plate 38. Magnet 37, is in circuit with two contact members 38 which lie adjacent rod 11^{x} of solenoid 12 and under a contact collar 39 secured to the said rod.

As the rod 11^{x} moves down in the cutting operation, contact member 39 momentarily bridges the contacts 38 and acts upon the magnet 36, 37 to separate the friction disks 31, 32, simultaneously with the movement of switch arm 24 to the right from its position shown in Figure 3. At the instant arm 23 is released from switch arm 24 by the rise of rod 11^{x}, causing separation of the contact 39 from contacts 38, the magnet is de-energized and the disks are moved together by spring 33 thus holding switch arm 24 in its position away from contacts 28 and against the tension of spring 27. At this point the rotation of the motor M, through certain connections now to be described, acts upon shaft 25 and switch arm 24 to move the latter toward the left from its position shown in Figure 3 at a rate of speed depending upon the time required to carry the severed strip of film through the tank D or any further members driven by motor M.

To such end motor M is operatively connected by any suitable means as for example through the shaft 40, worm 41, reduction gear 42, worm 43, reduction gear 44, pinion 45 and gear 35, with shaft 25, the combined action of these elements being to slowly rotate shaft 25 in the direction of the arrow, Figure 3.

Fixed upon the end of shaft 25 opposite the disk 26 (Figure 3) is a spring contact arm 46 to which the current is led by feed plate 47. Adjacent spring contact arm 46 is an insulating plate 47^{x} carrying at one face a contact 48 which contact lies opposite a contact plate 49. As shaft 25 is slowly rotated in the direction of the arrow, Figure 3, arm 46 is carried over the inclined surface of insulation plate 47 and is sprung inwardly. This movement continues until the arm is carried beyond the end of the insulation plate and then it snaps, by spring action, into contact with contact plate 49. The connection of contact arm 46 with contact plate 49 completes the circuit through magnets 36, 37, thus separating the disks 31, 32, in the manner above described, and enabling spring 27 to quickly rotate shaft 25 and through arm 24 back to normal position so that insulation blade 27 will separate contact springs 28 and shut off the motor.

As arm 24 returns to initial position, arm 46 is moved to the left and engages contact plate 48. Contact plate 48 is connected in the circuit with a magnet 50 which operates a latch 51 in the path of arm 14 of the water valve pulley 15. In the previous operation of the elements when arm 14 was moved downward by collar 13, the arm momentarily pressed back latch 51 and then was engaged by the latch through the action of spring 52. The aforesaid contact of contact arm 46 with contact plate 48, energizing magnet 50, moves the latch away from arm 14 and enables the return of pulley 15 to normal position thus closing valve 18 and shutting off the flow of water to the washing tank for the film strip.

As hereinbefore stated, the present invention is more particularly applicable to automatic photographic machines of a type in which the train of elements is thrown into action by means of coin-control. After a coin is inserted in the coin slot a light is thrown on the object to be photographed and the feeding means for the film is thrown into action. During the exposure of the film the coin slot is closed by the mechanism 5, 5^{x} and the slot remains closed until after the exposed strip of film has been severed. The coin slot is then automatically opened by a second energizing of the magnet 5^{x}, and this takes place prior to or during the feeding of the film through the developing and finishing tank D.

If a coin is placed in the coin slot during the passage of a previously exposed strip of film through the tank D, the timing mechanism, previously set into motion, would shut off motor M at the end of the finishing operation for the first strip, and thus leave the second strip uncompleted in the machine, were it not for a special provision covering such contingency.

When a coin is inserted in slot 4 during the passage of an exposed strip through the tank D, the bringing together of contacts 3^{x}, 3^{xx} will close a circuit through solenoid E and will draw down armature 53 which is connected by chain 54 to a sprocket 55, the chain leading over a sprocket to a check weight 56 in a dash-pot 57. Sprocket 55 is rotatable with two switch arms 58 and 59.

When solenoid E is energized and chain 54 moved to turn sprocket 55, switch arm 58, which is a spring, rides up the forwardly inclined surface 60 of switch plate 61, and then, under spring tension, contacts with the surface 61, closing a circuit through the lamp N for illuminating the person or object to be photographed. The movement of arm 58 to the left from its position shown in Figure 1 is very rapid. At the end of its movement to the left it, being sprung, passes the end of the contact plate 61 and moves backward onto a second plate 62 on which plate it reverses its action and moves to the right due to the action of weight 56.

The movement of the arm 58 to the right is slow because of the action of the dash-pot 57 in retarding the downward movement of the weight. At the time arm 58 moves backward upon contact plate 62, contact arm 59 comes into contact with a contact plate 63^{x} and closes the circuit leading to motor 2. In the movement to the right of arm 58 of plate 62 the lamp N continues to remain illuminated and arm 59 remains on plate 63^{x} for sufficient time to enable such rotation of motor 2 as to rotate the cam 63 to such position that lever 64, arm 65 and weight 66 are lifted upwardly to cause the contact end of arm 64 to engage a contact plate 67 which serves to continue the circuit through the drive motor.

As the cam continues to rotate, arm 64 is permitted to fall. Dash-pot 68 acting upon check-weight 69 serves to check the downward movement of the arm so that the arm does not leave contact 67 until the last exposure of the film whereupon the arm does leave contact 67 and the motor 2 stops. A second contact 67^{x} is disposed in such position that its active face is not struck by arm 64 in its upward movement, but is struck by the arm in its downward movement. The contact of arm 64 with contact plate 67^{x} closes a circuit through the solenoid 12 for effecting the cutting operation during the rotation of the cam, a member C mounted thereon momentarily closes contacts A, A^{x}, and closes a circuit through magnet P, permitting the flow of liquid to the tank D through tubes from a supply tank R, one of the tubes being indicated at 74.

If, prior to the cutting operation upon an exposed strip of film, a previously exposed film passes through the machine in completed form, and the timing mechanism shuts off the driving motor M, this will not affect the proper treatment of said exposed strip of film because the feeding and controlling means up to and including the cutting operation is independent of the feeding and controlling mechanism for the film subsequent to the cutting operation, and the movement of the elements in the cutting operation is employed to throw into action the second named means. Thus the motor M being motionless, film is fed through the camera in accordance with the timing of cam 63 and its associated parts until arm 64 leaves the camera motor contact 67 and shuts off current to the feed motor 2, the arm 64 continuing its dropping movement until it closes the circuit through contact 67^{x} and the solenoid 12 for performing the cutting operation. In the cutting operation rod 11^{x} connected to the solenoid armature bridges contacts 38 and through the connections hereinbefore described starts the driving motor M and the timing control therefor.

If the second or succeeding exposed strips of film follow a previously exposed strip into the tank D and thus while the first strip is being developed and finished in said tank, the completion of the first strip and its discharge from the tank will not stop the tank feeding mechanism and the latter will remain in action until the last strip is fed through the tank for the reasons now to be described.

Assume an exposed strip of film to be half way through the tank D, so that in ordinary course the motor M has performed its function for half the time period between its starting and stopping by the control mechanism. As an example, take the time of feeding through the tank to be four minutes and the feeding to be half completed, leaving a period of two minutes for the reduction gearing and connections with shaft 25 to carry blade 46 up incline 46^{x} until it snaps over upon contact 49 to energize magnets 36, 37, and thus release arm 24 so that it will spring up to separate the contacts 28 in the circuit for motor M. Now assume that a coin is placed in the machine and the feeding mechanism of the film is started, this feeding mechanism continuing in action until the predetermined number of exposures have been made upon a strip and the strip is severed by knife 7. In the action of solenoid 12 to operate knife 7, rod 11^{x} will be moved downwardly to operate pawl 23. But arm 24 will be below the range of pawl 23 so that the downward movement of the pawl will be inactive. However, contact 39 will instantly bridge the contacts 38, and solenoid 36, 37 will be energized thus releasing the friction disks and permitting spring 27 to move switch arm 24 toward the contacts 28 in the circuit for motor M. However, these contacts will not be separated, because pawl 23 will lie in such position as to stop the complete movement of switch arm 24. In other words, switch arm 24 will move back to exactly the position where it is customarily moved by pawl 23 in separating the insulating knife 27, carried by the switch arm, from the contacts 28. Therefore, driving motor M will

not stop until the said second strip of film has been carried entirely through the machine.

In Figure 1 certain details are shown which have not heretofore been described, because they form no part of the present invention. It may be said, however, that in Figure 1 the member 70 is a contact for permitting the flow of current to switch arm 59; that the contact plates 71 and 72 are adapted to be closed by the lug 73 in the movement of switch arm 59 to the left, thereby causing a circuit through magnet 5× for closing the coin slot 4 through the actuation of parts 5 and 79. It is also to be noted that the contact plates 75 momentarily bridged by the contacts 76 on the depending rod of armature 53 are adapted to momentarily close a circuit through the coin release magnet 77, and that the contacts 78 are in circuit with the magnet 5× for opening the coin slot closing plate 79, said contacts 78 being moved together by contact arm 58 at the end of its movement to the right after passing between the contact plates 61. 62 at the end of the exposure of a strip of film and the extinguishing of the lamp ignited by contact of arm 58 with contact plate 62. It will be understood that movements of member 5 alternately close and open the coin slot, one movement closing the coin slot and the second movement opening the coin slot. the described mechanism enabling a dwell between such movements.

From the above it will be seen that the driving controls are in two units, one comprising means for handling the film prior to its passage to the tank D and a second means for handling the film after its passage into the tank. In the claims I have broadly denoted the first named means as "film exposing means", although the said means, in the embodiment herein shown, includes the cutting mechanism for severing the exposed strip. The second named means I have denoted by the broad term "film finishing means".

I claim:

1. In automatic photographic apparatus, means for passing a film in register with a camera including an electric motor and a timing device therefor, a finishing tank for the exposed film, means for carrying the film through said finishing tank including an electric motor, and means for timing the operation of the last named electric motor including means adapted to reset the timing means upon an operation of the film exposing means.

2. In automatic photographic apparatus, film exposing means including an electrical drive therefor, film finishing means including an electrical drive therefor, and an automatic timing control for the last named electrical drive including a switch, a movable switch actuating member, and connections with the film exposing means whereby operation of said film exposing means is adapted to reset said switch actuating member to initial position during the action of the film finishing means.

3. In automatic photographic apparatus, film exposing means including a camera, a film feeding device and an electric drive for said feeding device, film finishing means including a tank, a carrier for passing a film through the tank and an electric drive for said carrier, an electrical timing means for the last named drive including a switch, a switch operating member movable from an initial point to a point where it actuates said switch and connections with the film exposing means whereby an operation of the latter during the operation of the film finishing means will carry said arm back to its initial position.

4. In automatic photographic apparatus, film exposing means including a camera, film feeding means and an electric drive for said feeding means, film finishing means including a tank and means for feeding the exposed film through said tank, an electrical drive for said last named feeding means, an electrical timing device for said drive including a switch, a switch operating arm, means for moving said arm to operate the switch, means for automatically returning the arm to initial position after a predetermined time interval and means thrown into action by the film exposing means during operation of the film finishing means for retarding the return of said switch operating arm to initial position and thereby lengthening the said time interval.

5. Automatic photographic apparatus, in combination with film exposing means comprising feeding means for a strip of film, a camera, a drive device for said feeding means, a cutter for the film, and a coin operated control for said drive device, of film finishing means comprising a finishing tank for the exposed film, film carrying means in said tank and driving means for said film carrying means, an electrical timing control for the latter including a switch operating member moving from an initial point in a path of travel and means adapted to act upon said timing mechanism to return the switch operating member to its initial point upon operation of the film exposing means during operation of the film finishing means.

6. In automatic photographic machines, film exposing mechanism including feeding means for a film, a camera and a motor drive for said feeding means, film finishing means including a tank, means for carrying the exposed film through said tank and a motor drive for said film carrying means, a timing device for said motor drive, including a switch, a switch actuating arm, a shaft, driv-

ing means for said shaft, a magnet for clutching the arm to the shaft and a spring for moving the arm independently of the shaft.

7. In automatic photographic apparatus, a camera, film feeding means and a motor drive therefor, an electrical timing control for said motor drive comprising a switch actuating arm, means for moving said arm out of register with said switch and means acting automatically to return said arm to initial position at the end of a predetermined time interval.

8. In automatic photographic apparatus, a camera, film feeding means, a timing control for said film feeding means comprising a switch, a switch actuating arm, a driving member, a clutch adapted to connect the arm and driving member, means for rotating said driving member, magnetic means for operating said clutch, and a spring for actuating said arm independently of the driving member.

9. In automatic photographic apparatus, film exposing means including a camera, a film feeding device, a drive for said film feeding device, a cutter for the film, an actuating member for said cutter, film finishing means including a tank, a carrier for passing a film through the tank, an electric drive for said carrier, electric timing means for said carrier drive including a switch, a switch operating arm, an operative connection between the cutter operating member and said arm and means for automatically returning said arm to initial position at the end of a predetermined time interval.

10. In automatic photographic apparatus, feeding means for a strip of film, a camera, a cutter, a magnet for operating said cutter, a finishing tank, film carrying means in said tank and driving means for the film carrying means and an electrical timing control for the latter including a switch and a switch arm having an operative connection with said magnet.

11. Automatic photographic apparatus, a camera, feeding means for a strip of film including an electric motor, of a timing device for said motor including a switch, a switch actuating arm, a shaft, a driving element for said shaft, a magnetic clutch for connecting the driving element and shaft, means including the driving element for rotating the shaft for a predetermined time interval and means for actuating the arm independently of the driving element at the end of said time interval.

12. In automatic photographic apparatus, including a camera, means for feeding a film in register with the camera including a motor, of a timing device for said motor including a switch, a switch actuating arm, a shaft, a driving element, a magnetic clutch for operatively connecting the arm to the driving element, means acting positively upon the arm for moving it out of register with the switch, means including said shaft for carrying the arm in a path away from the switch and means for automatically releasing said arm at the end of said movement.

13. Automatic photographic apparatus including a camera and means for feeding a film, an electric motor and a timing device for said motor, said timing device comprising a switch, a switch actuating arm movable toward and away from the switch, a shaft carrying said arm, a driving element, a magnetic clutch for controlling the connection between the shaft and the driving element and a second switch automatically thrown into operation to release said arm from the driving element at the end of a predetermined movement of said arm away from the switch.

14. In automatic photographic apparatus including a camera, film feeding means and a motor drive, of timing means for said motor drive including a switch-actuating arm movable toward and from the switch, a shaft carrying said arm, a friction disk upon said shaft, a second friction disk rotatable upon the shaft and driving means therefor, a spring acting to normally hold the two disks in contact with each other, an electromagnet adapted to separate the disks, and a spring for actuating the arm.

15. In automatic photographic means including a camera, feeding means for a film and a motor for driving said feeding means, of a timing control for said motor comprising a shaft, reduction gears operated by said motor and rotating a clutch device in register with said shaft, a spring normally acting to engage said clutch device, a magnet adapted to release the clutch device, a motor switch, a motor switch operating arm on said shaft, a magnet switch, a second arm on said shaft and adapted to actuate the magnet switch, and means for actuating the shaft independently of the reduction gears and in a direction reverse to the direction of rotation by the latter.

16. In automatic photographic apparatus, a camera, film feeding means, a motor drive, and timing mechanism for said motor drive including a shaft, reduction gearing driven by said motor, a friction disk rotated by said reduction gearing, a second friction disk carried by the shaft, a spring acting to normally hold the two disks together, a magnet adapted to release the disks, a motor switch, a motor switch operating arm carried by the shaft, means tending to maintain the arm in position to hold the switch closed, a magnet switch, and a second arm on the shaft and adapted to actuate the magnet switch after a predetermined time of rotation of the shaft.

17. Automatic photographic apparatus, constructed in accordance with claim 16, in combination with means for mechanically actuating the motor switch arm for an initial starting of the motor.

18. In automatic photographic apparatus, a camera, means for feeding a film in register with the camera, a motor drive for said film feeding means, means for timing the operation of said motor drive, cutting means for the film, a finishing tank, means for carrying the exposed film through said tank including a motor drive, and a timing device for said last named motor drive adapted to be thrown into action by said cutting mechanism and including a motor switch, a shaft, a motor switch operating arm on said shaft, means including a magnet clutch for operatively connecting said shaft with the motor, a magnet switch, and a magnet switch operating arm on said shaft.

In testimony whereof, I have signed my name to this specification.

ANATOL M. JOSEPHO.