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TWO-WAY OPERATING MECHANISM FOR SHUTTERS

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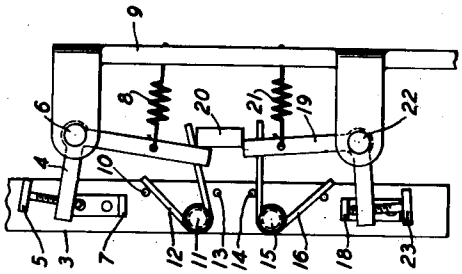

FIG. 1A

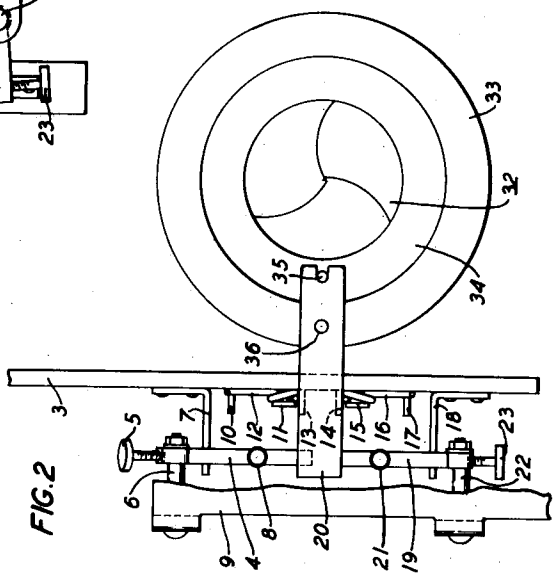

FIG. 2

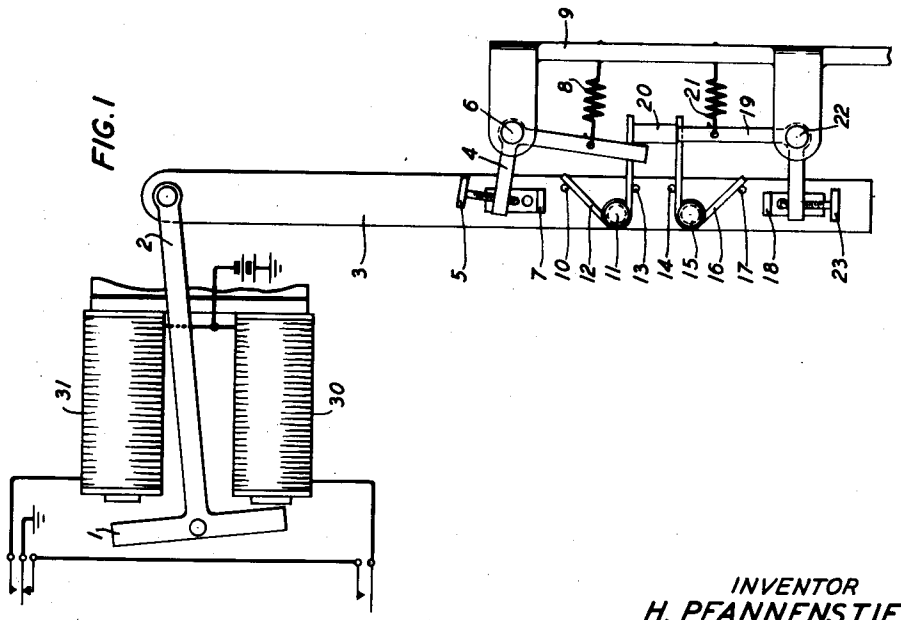

FIG. 1

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## TWO-WAY OPERATING MECHANISM FOR SHUTTERS

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3 Claims. (Cl. 88—19.3)

This invention relates to an electromagnetically operated two-way trigger device. A mechanism of this character finds utility whereever rapid or snap action is to be achieved under electromagnetic control. The relatively slow action of the magnet is offset by storing energy in a resilient agency during an initial stage of operation. As the operation proceeds into a later stage the mechanism is tripped and the stored energy is available to produce very rapid motion.

The invention will be described in combination with a shutter which may, for example, control the access of a recording light beam to a photographic film passing over a constant speed recording drum. In an arrangement of this kind, it is essential that the shutter open and close very rapidly so that the record may either start or finish on a sharp line without blur. It has been found that a direct electromagnetic control is not fast enough to accomplish this result.

It is an object of the invention to provide a mechanism capable of reciprocal movement in which stored-up energy may be sharply released on either forward or return movements.

A feature of the invention is a latching arrangement such that motion of the operating member is positively blocked in either direction until the operation of a control member has proceeded to a stage where the latch is tripped.

Although the invention has been shown in combination with mechanism for operating a shutter forming part of a sound film recording equipment, it is obvious that the invention is capable of a variety of uses and expressions, and is to be limited only by the specification and claims.

In the drawing, Fig. 1 is a plan view of the device in one of its operated positions, it being assumed that the shutter is closed in the position shown;

Fig. 1A is a similar view showing the operation of the device on its return stroke. The stage of operation illustrated shows the latch being moved out of engagement with the operating bar; and

Fig. 2 is a side elevation of the device showing the connection of the operating bar to a shutter of the iris diaphragm type.

Referring now to Fig. 1, a control bar 3 is mounted in suitable guides (not shown) for vertical reciprocatory motion. Motion may be imparted to the bar 3 by means of a lever 2 forming an extension of a T-shaped armature pivoted between two operating magnets 30 and 31 which may be alternately energized by means of suitable switch contacts. The bar 3 is arranged to transmit motion to a bar 20 which, as may be seen in Fig. 2, is arranged to control a light intercepting shutter which may be of the iris diaphragm type. Diaphragm members 32 are actuated by relative movement between control rings 33 and 34. Member 20 has a pivotal connection to ring 33 and a pin and slot connection 35 to ring 34. The positions of the member 20 and control bar 3 in Fig. 1 are those assumed when the shutter is closed.

To open the shutter, magnet 31 is energized attracting armature 1 and causing bar 3 to move downward. As bar 3 moves downward, pressure is exerted on operating member 20 by means of a spring 12 coiled about a stud 11 secured to bar 3. The short end of spring 12 is limited in motion and held under tension by a pin 10. The longer end is similarly restricted by a pin 13.

During the preliminary movement of the bar 3, member 20 is held firmly against motion, being blocked by one arm of a bell-crank lever 19 pivotally mounted on a stud 22 carried on a lug conveniently projecting from a frame 9. Accordingly, the first part of the motion of bar 3 accomplishes nothing more than the building up of tension in spring 12.

The lower portion of bar 3 has secured to it a tripping finger 18 projecting at right angles to its surface. It is the function of this tripping finger to engage the portion of the latch which projects into its path after sufficient energy has been stored in the spring 12. The extent of travel necessary before the latch is operated may be regulated by means of an adjusting screw 23 threaded through the operating finger of the latch. The latch is maintained in the position shown by means of a spiral spring 21. After finger 18 engages the latch, continued downward movement of bar 3 causes counter-clockwise rotation of the latch about pin 22. Fig. 1A shows the position of various parts of the device after this rotation has begun and slightly before the latch has been cleared away to permit spring 12 to snap the member 20 into its alternate position. Fig. 1A also demonstrates clearly that considerable tension has been placed on spring 12. As soon as the right-hand edge of latch 19 clears the left-hand edge of arm 20, arm 20 is moved into its alternate position where it will remain until magnet 30 is energized to cause a return movement of the control bar 3.

When the device is used in practice, suitable switching circuits are provided such that the

magnets are deenergized within a short time of their operation to avoid current drain.

Return movement of bar 3 brings about the closure of the shutter by means of like apparatus symmetrically disposed with respect to both control bar 3 and operating member 20. It should be noted that with the control bar 20 in its lower alternate position, a bell-crank latch 4 pivoted at 6 to a lug conveniently mounted on frame 9 is rotated in a counter-clockwise direction under the influence of a spiral spring 8, its extent of movement being limited by means of stops (not shown) to bring its longer or latching arm into axial continuation of bar 20. As a result of this blocking action of the latch 4, upward or return movement of bar 3 is ineffective to move member 20, although pressure is brought to bear upon it by means of a spring 16 tensioned between limiting pins 14 and 17 and rotatably mounted about a pin 15. Continued upward movement of bar 3 renders effective a tripping finger 7 corresponding to finger 8 and symmetrical therewith. Engagement of finger 7 with adjusting screw 5 produces sufficient clockwise rotation of latch 4 upon continued motion of bar 3 to ultimately free operating member 20 from the restraint of the latch and permit it to be snapped into its normal position under the influence of the tension built up in spring 16. In this position, latch 19 is restored to its normal position by spring 21 and is again ready to block operation of member 20 in a reverse direction. The apparatus has now been restored to the position shown in Fig. 1, having completed a cycle of operation.

What is claimed is:

1. In a trigger device, a reciprocating bar, operating fingers and energy storing means mounted on said bar, an operating member responsive to and capable of actuation by the stored energy, and a pair of pivoted latch members normally blocking motion of said operating member in the direction toward which said operating member is urged by said energy storing means, said tripping fingers cooperating with said latch members to permit effective motion of said operating member.

2. In a trigger device, a reciprocating bar, a pair of tripping fingers and energy storing means mounted thereon, an operating member responsive to and capable of actuation by the stored energy, a pair of bell crank levers cooperating with said tripping fingers respectively, each of said levers in its normal position blocking motion of said operating member from an alternate position, means to adjust the effective positions of said bell crank levers with respect to said operating fingers, and means to reciprocate said operating member under the control of said reciprocating bar by means of said stored energy.

3. In a trigger device, a frame, a pair of bell crank levers pivotally mounted thereon, an operating member alternately locked against motion from its extreme positions by one or the other of said levers, an electromagnetically operated reciprocating bar, a pair of tripping fingers and a pair of spring members carried by said bar, means to store energy for actuating said operating member during motion of said bar in either direction from an alternate position, means to adjust the effective positioning of said levers with respect to said operating fingers, and means to reciprocate said operating member under the control of said bar.

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