March 30, 1943. W. R. HUTTINGER 2,315,429

HIGH SPEED DRIVE

Filed May 16, 1941 4 Sheets-Sheet 1

Fig. 1.

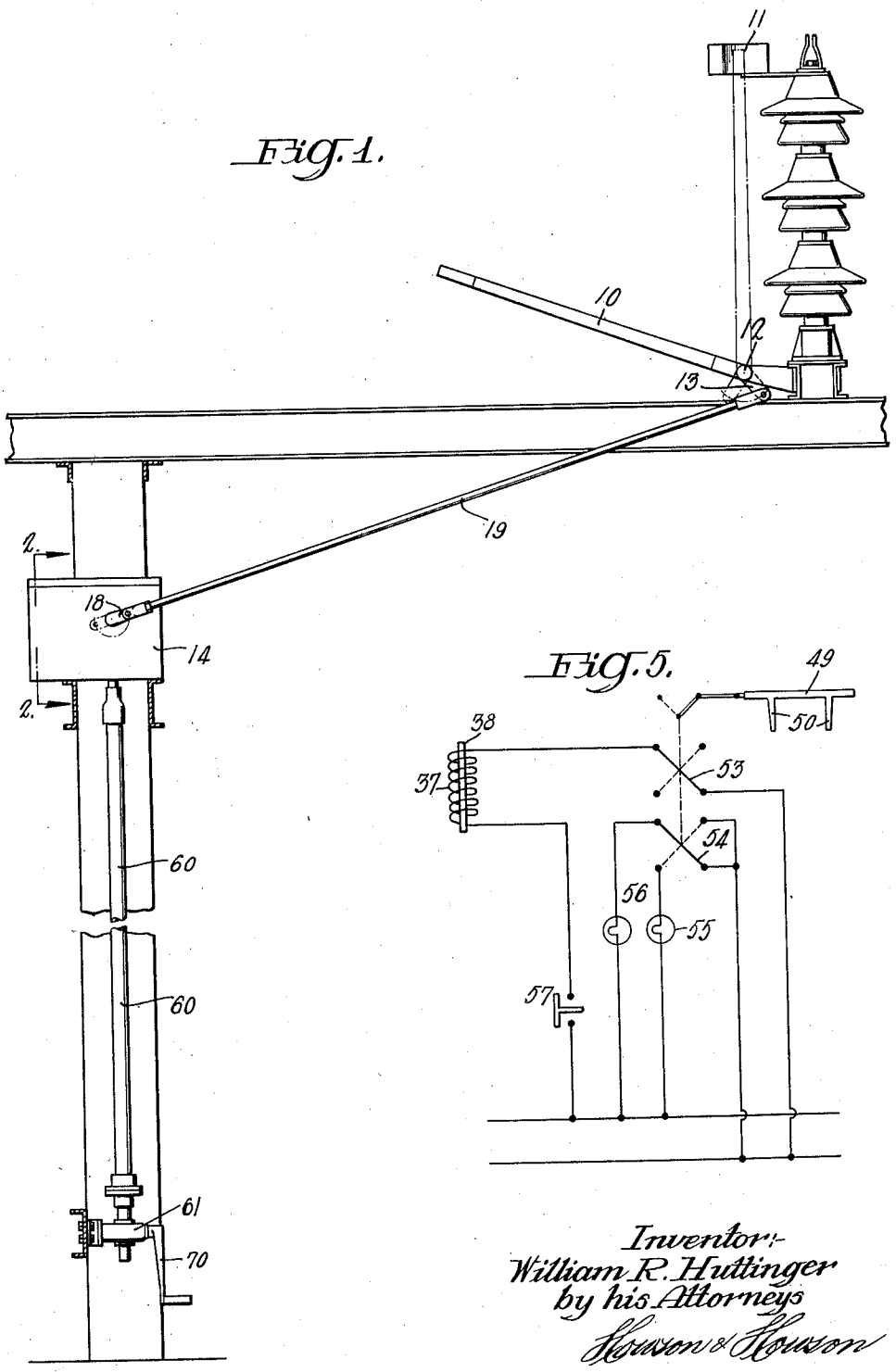

Fig. 5.

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Fig. 2.

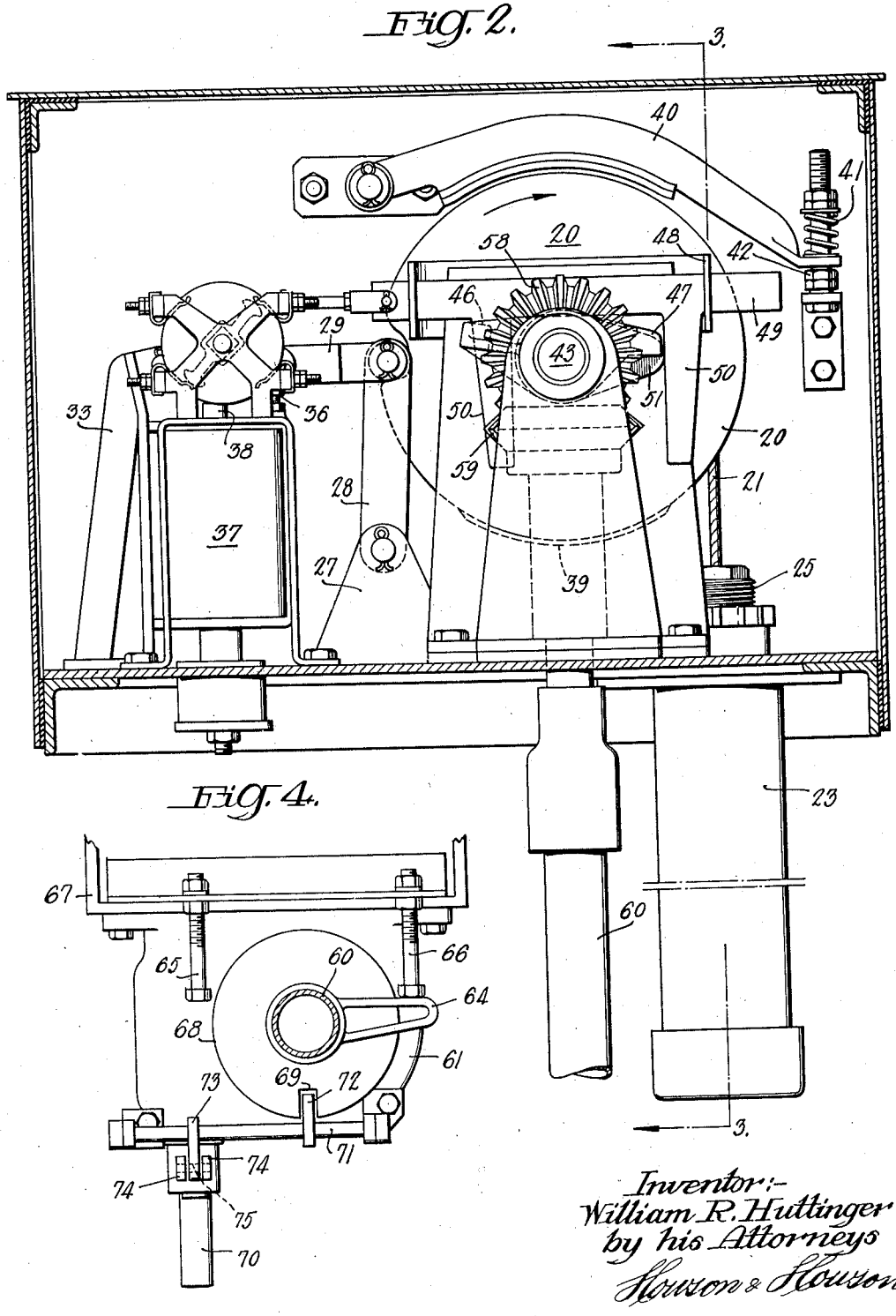

Fig. 4.

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Fig. 3.

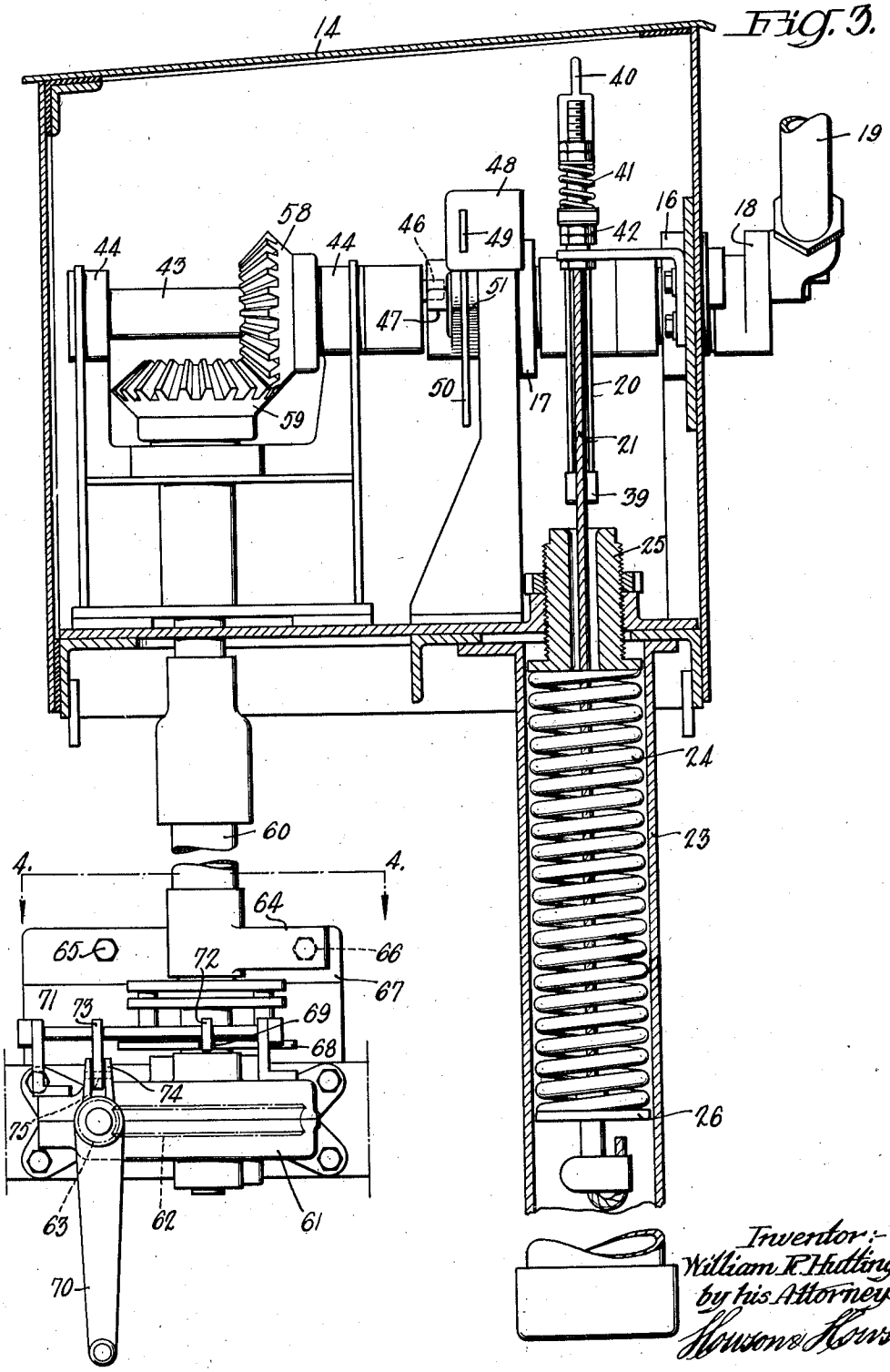

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Fig. 6.

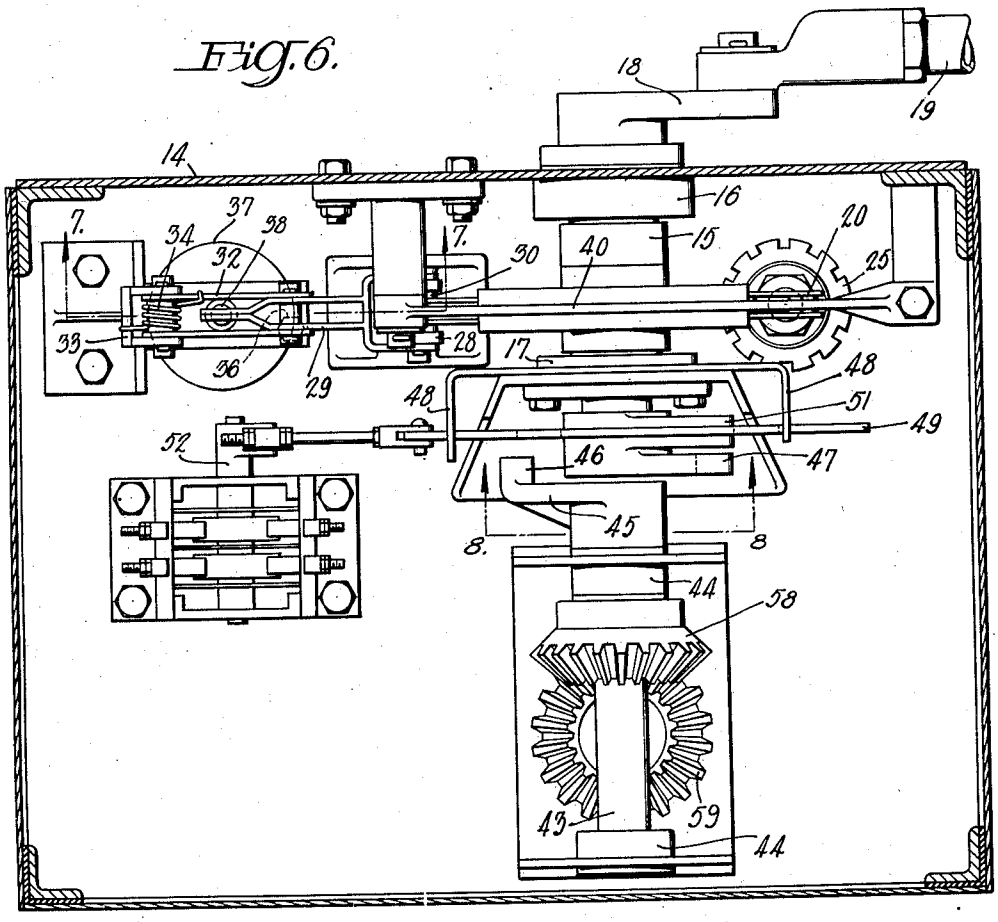


Fig. 7.

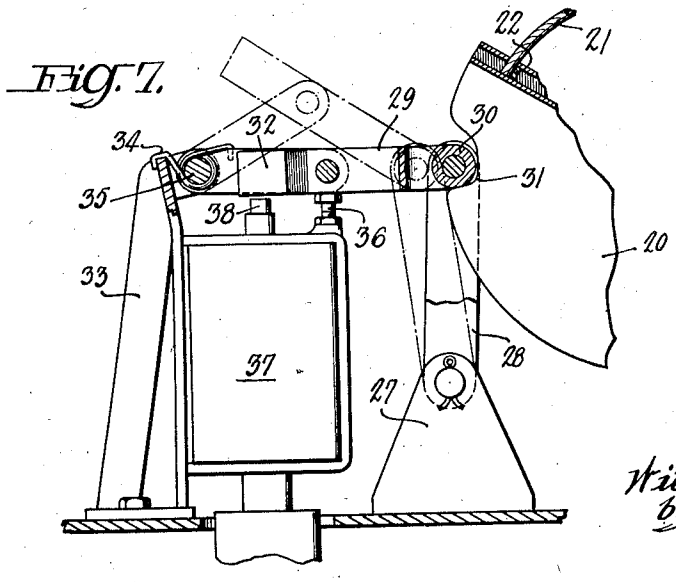
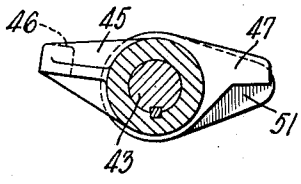


Fig. 8.



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UNITED STATES PATENT OFFICE

2,315,429

HIGH SPEED DRIVE

William R. Huttinger, Lansdowne, Pa.

Application May 16, 1941, Serial No. 393,835

11 Claims. (Cl. 200—106)

This invention relates to a high speed drive and, more particularly, to a high speed drive suitable for use in actuating switches such as those employed in grounding transformers and in situations having similar requirements.

An important object of the invention is the provision of a simple and durable mechanism which will provide for rapid actuation of an associated mechanism, and in which the shock of checking the final movements of the mechanism is reduced to a minimum.

A further and more specific object of the invention is to provide an apparatus for opening or closing high speed switches which is spring-operated and which includes a braking mechanism for insuring reduction of shock to a minimum.

Another object of the invention is the production of a drive of this type which may be very readily reset following its operation.

A further object of the invention is the provision of means insuring against accidental operation of the mechanism during a resetting operation.

These and other objects I attain by the construction shown in the accompanying drawings wherein, for the purpose of illustration, I have shown a preferred embodiment of my invention as applied to a switch-closing mechanism, and wherein:

Fig. 1 is an elevation of a switch mechanism constructed in accordance with my invention;

Fig. 2 is an enlarged vertical sectional view through the switch-operating mechanism, taken approximately on line 2—2 of Fig. 1;

Fig. 3 is a section on line 3—3 of Fig. 2;

Fig. 4 is a section on line 4—4 of Fig. 3;

Fig. 5 is a diagrammatic view of the latch-controlling mechanism;

Fig. 6 is a plan view of the actuating mechanism;

Fig. 7 is a section on line 7—7 of Fig. 6; and

Fig. 8 is a section on line 8—8 of Fig. 6.

Referring now more particularly to the drawings, the numeral 10 designates the pivoted blade of a switch the stationary contacts of which are indicated at 11. The blade is rotated about pivot 12 through a relatively short arm 13, with the result that a comparatively short throw will provide a rapid movement of the blade 10 through a considerable arc.

Arranged within a casing 14 is a shaft 15 mounted in bearings 16 and 17, this shaft extending through the casing wall and being provided with a crank arm 18 connected by the link 19 with the arm 13 of the switch blade. Secured to shaft 15 is a pulley 20 having a partially grooved periphery receiving a cable 21 which is secured to the pulley as at 22. Projecting downwardly from the bottom of the casing is a tubular housing 23 within which is arranged a spring 24. An adjusting nut 25 threaded through a bushing at the bottom wall of the casing extends into the upper end of the tube 23 and engages the upper end of spring 24 to provide for adjustable regulation of the tension thereof. This adjusting nut is tubular, and cable 21 extends therethrough and is secured to a spring seat 26 engaging the bottom of the spring.

Pivoted to a support 27 secured to the bottom wall of the casing is a link 28 the upper end of which is pivotally connected to one arm 29 of a toggle mechanism. This arm of the toggle mechanism bears a roller 30 adapted to engage in a notch 31 formed in the periphery of the pulley 20 when the toggle mechanism is in its latched position shown in solid lines in Figure 7. The second element 32 of the toggle mechanism is pivoted upon a bracket 33 and a spring 34 coiled about the pivotal connection 35 between the bracket and member 32 serves to constantly urge the toggle from the dotted-line position of Figure 7 to the solid-line position thereof. At this solid-line position its movement is positively checked by an adjustable stop 36 carried by bracket 33. Bracket 33 likewise supports a solenoid 37 the plunger 38 of which is aligned with and adapted to engage against and break the toggle to its dotted-line position when the solenoid is activated, thus releasing the pulley for rotation.

Secured to the periphery of the pulley 20 is a brake shoe 39, and arranged adjacent the pulley surface at a point circumferentially spaced from the normal position of this brake shoe is a spring-pressed brake element 40 the effective pressure of which may be varied through adjustment of spring 41 and the approach to the periphery of the pulley of which is adjustably limited as at 42.

Assuming the parts to be in the position shown in Figure 2, upon actuation of solenoid 37 the latch formed by the roller carried by the end of member 29 of the toggle mechanism is withdrawn from notch 31, and spring 24, which at this time is under tension, will cause a rapid rotation of pulley 20 in the direction of the arrow, with a corresponding rotation of shaft 15, thus producing a pull upon connecting rod 19 and closing switch blade 10 upon the stationary contact 11. Immediately prior to direct engagement of the blade in contact 11, brake 40 is engaged by the shoe 39 to check the movement of the pulley and

to reduce the shock of engagement of the switch contact.

Within the casing a second shaft 43 is supported by bearings 44 in axial alignment with shaft 15. The end of shaft 43 bears an arm 45 having a projecting lug 46 adapted to coact with the arm 47 secured to the shaft 15 so that by rotation of shaft 43 shaft 15 may be rotated to compress the spring 24 and align the notch 31 of the pulley for reception of the latch.

Supported by a guide 48 carried by the bearing 17 is a yoke 49 naving a pair of depending arms 50 alternately co-acting with a cam 51 secured to shaft 15. Through engagement of the cam with these arms, the yoke is caused to reciprocate upon each operation of shaft 15 whether this be under influence of spring 24 or actuation of shaft 15 through the shaft 43. This reciprocation is employed to oscillate the shaft 52 of a switch mechanism having two blades 53 and 54, blade 53 serving to open and close the circuit of solenoid 37, while blade 54 serves to alternately close the circuits of signal lamps 55 and 56. With the mechanism in the position shown in Figure 2, the switch blades are in their solid-line position of Figure 5, the signal element 56 being activated and the circuit of the solenoid 37 being prepared for closure at a remote point as, for example, by switch 57. With closure of the solenoid circuit, the switch elements move to their dotted-line positions of Figure 5, the solenoid circuit then being open at switch 53 and the circuit of signal 56 being open and that of signal 55 closed. This position will be maintained until the switch is manually "recocked" by operation of shaft 43.

The means for operating shaft 43 comprise co-acting pinions 58, 59 carried respectively by shaft 43 and a vertically extending shaft 60 extending through the bottom of the casing and having its lower end projecting into a gear case 61 where shaft 60 is equipped with a worm gear 62. This worm gear is actuated by a crank-rotated worm shaft 63. Secured to shaft 60 is an arm 64 operating between adjustably fixed stops 65, 66 carried by bracket 67 which, preferably, likewise supports gear case 61, these stops serving to adjustably regulate the limits through which shaft 60 may be rotated and, accordingly, the extent through which shaft 15 may rotate in either direction. The stop 66 is positioned at this time to limit rotation of the mechanism when the notch 31 of pulley 20 is positioned to receive the latch while stop 65 provides an adjustment insuring that the crank-to-connecting-rod connections between the switch blade and operating mechanism will not arrive at or pass dead center.

Likewise secured to shaft 60 for rotation therewith is a plate 68 which may be in the form of a disc having in its periphery a notch 69. Suitably supported in proper relation to the crank 70 and plate 68 is a shaft 71 bearing an arm 72 adapted for engagement in the notch of plate 68, and a second arm 73 for engagement between ears 74 carried by the hub of crank 70. Both arm 73 and ears 74 are perforated, as indicated at 75, for the reception of a suitable securing means preventing unauthorized manipulation such as a padlock (not shown).

Again assuming the parts of the switch-actuating mechanism to be in the position illustrated in Figures 1 and 2, closure of the solenoid circuit withdraws toggle control latch mechanism releasing pulley 20 and its shaft for rotation under influence of the spring 24. The switch blade is rapidly thrown into engagement with its contacts, being braked immediately prior to its engagement with such contacts by the braking mechanism 39, 40. The arm 47 of shaft 15 will be, by this operation, brought into contact with the lug 46 of arm 45 of shaft 43. At the same time, signal 56 will be actuated, indicating that the associated apparatus is grounded. In restoring the mechanism to its latched position the safety device employed for immovably connecting shaft 71 and crank 70 is removed and the shaft 71 rotated to release the crank for rotation and to simultaneously release shaft 60 for rotation. Crank 70 is then rotated to move the arm 64 out of contact with stop 66 and into contact with stop 65, at which time the latch mechanism will reengage with pulley 20. The movement of the crank 70 is then reversed and arm 64 is again brought into contact with stop 66. At this time the ears 74 of crank 70 and the notch 69 of plate 68 will properly align with the ears 72, 73 of shaft 71 and this shaft may, accordingly, be rotated to engage these arms in their respective sockets and the securing means preventing rotation of crank 70 may, accordingly, be replaced, thus "recocking" the mechanism for a further operation.

As will be noted from the illustration of Figure 1, the shaft is actuated through 180 degrees, with the result that the actuated mechanism is operated with a speed which increases and decreases rapidly, thus assisting in reducing shock at the close of the operative movement. This arrangement, coupled with the use of the brake 40, serves to reduce such shocks to a minimum.

While the drive has been above described and has been illustrated as a switch-actuating mechanism, it is obviously useable in any situation where an extremely rapid movement is to be effected with a minimum of shock. Furthermore, the mechanism herein disclosed may be utilized quite as well in opening as in closing switches. The specific recocking mechanism illustrated is, likewise, but one of many forms which might be utilized.

Since the construction illustrated is, obviously, capable of considerable modification without in any manner departing from the spirit of the invention, I do not wish to be understood as limiting myself thereto except as hereinafter claimed.

I claim:

1. In switch operating mechanism of the type described, the combination with a pivoted switch blade of an oscillatable shaft operatively connected to the blade to oscillate the same about its pivot, a spring to rotate the shaft in one direction, a latch preventing rotation of the shaft in said direction, electromagnetic means to release said latch, a circuit for controlling said electromagnetic means, and a member reversely movable to either of two positions, said member during its movement from one to another of said positions operatively engaging said shaft and rotating the same to energize said spring and to position said shaft for operative engagement by said latch, said member during its movement from said position to the other of said positions disengaging from the shaft and in the other of said positions constituting a stop limiting rotation of the shaft under the influence of the spring.

2. In switch operating mechanism of the type described, the combination with a pivoted switch blade of an oscillatable shaft operatively connected to the blade to oscillate the same about its pivot, a spring to rotate the shaft in one direc-

tion, a latch preventing rotation of the shaft in said direction, electromagnetic means to release said latch, a circuit for controlling said electromagnetic means, a member reversely movable to either of two positions, said member during its movement from one to another of said positions operatively engaging said shaft and rotating the same to energize said spring and to position said shaft for operative engagement by said latch, said member during its movement from said position to the other of said positions disengaging from the shaft and in the other of said positions constituting a stop limiting rotation of the shaft under the influence of the spring, and means to open the circuit of said electromagnetic means as the member arrives at the first of said positions and to close said circuit as the member arrives at the second of said positions.

3. In switch operating mechanism of the type described, the combination with a pivoted switch blade of an oscillatable shaft operatively connected to the blade to oscillate the same about its pivot, a spring to rotate the shaft in one direction, a latching element preventing rotation of the shaft in said direction, a spring-actuated toggle urging said latching element to latching position, electromagnetic means to break said toggle and release said latch, and a circuit for controlling said electromagnetic means.

4. In switch operating mechanism of the type described, the combination with a pivoted switch blade of an oscillatable shaft operatively connected to the blade to oscillate the same about its pivot, a spring to rotate the shaft in one direction, a latching element preventing rotation of the shaft in said direction, a spring-actuated toggle urging said latching element to latching position, electromagnetic means to break said toggle and release said latch, a circuit for controlling said electromagnetic means, and a member reversely movable to either of two positions, said member during its movement from one to another of said positions operatively engaging said shaft and rotating the same to energize said spring and to position said shaft for operative engagement by said latch, said member during its movement from said position to the other of said positions disengaging from the shaft and in the other of said positions constituting a stop limiting rotation of the shaft under the influence of the spring.

5. In switch operating mechanism of the type described, the combination with a pivoted switch blade of an oscillatable shaft operatively connected to the blade to oscillate the same about its pivot, a spring to rotate the shaft in one direction, a latching element preventing rotation of the shaft in said direction, a spring-actuated toggle urging said latching element to latching position, electromagnetic means to break said toggle and release said latch, a circuit for controlling said electromagnetic means, a member reversely movable to either of two positions, said member during its movement from one to another of said positions operatively engaging said shaft and rotating the same to energize said spring and to position said shaft for operative engagement by said latch, said member during its movement from said position to the other of said positions disengaging from the shaft and in the other of said positions constituting a stop limiting rotation of the shaft under the influence of the spring, and means to open the circuit of said electromagnetic means as the member arrives at the first of said positions and to close said circuit as the member arrives at the second of said positions.

6. In switch operating mechanism of the type described, the combination with a pivoted switch blade of an oscillatable shaft operatively connected to the blade to oscillate the same about its pivot, a spring to rotate the shaft in one direction, a latch preventing rotation of the shaft in said direction, electromagnetic means to release said latch, a circuit for controlling said electromagnetic means, and means operated by the oscillation of said shaft for opening and closing the circuit of said electromagnetic means.

7. In switch operating mechanism of the type described, the combination with a pivoted switch blade of an oscillatable shaft operatively connected to the blade to oscillate the same about its pivot, a spring to rotate the shaft in one direction, a latch preventing rotation of the shaft in said direction, electromagnetic means to release said latch, a circuit for controlling said electromagnetic means, means operated by the oscillation of said shaft for opening and closing the circuit of said electromagnetic means, and a member reversely movable to either of two positions, said member during its movement from one to another of said positions operatively engaging said shaft and rotating the same to energize said spring and to position said shaft for operative engagement by said latch, said member during its movement from said position to the other of said positions disengaging from the shaft and in the other of said positions constituting a stop limiting rotation of the shaft under the influence of the spring.

8. In switch operating mechanism of the type described, the combination with a pivoted switch blade of an oscillatable shaft operatively connected to the blade to oscillate the same about its pivot, a spring to rotate the shaft in one direction, a latch preventing rotation of the shaft in said direction, electromagnetic means to release said latch, a circuit for controlling said electromagnetic means, a member reversely movable to either of two positions, said member during its movement from one to another of said positions operatively engaging said shaft and rotating the same to energize said spring and to position said shaft for operative engagement by said latch, said member during its movement from said position to the other of said positions disengaging from the shaft and in the other of said positions constituting a stop limiting rotation of the shaft under the influence of the spring, and means coacting when the member is in the last-named position for the reception of a securing device to prevent unauthorized operation of said member.

9. In switch operating mechanism of the type described, the combination with a pivoted switch blade of an oscillatable shaft operatively connected to the blade to oscillate the same about its pivot, a spring to rotate the shaft in one direction, a latch preventing rotation of the shaft in said direction, electromagnetic means to release said latch, a circuit for controlling said electromagnetic means, a member reversely movable to either of two positions, said member during its movement from one to another of said positions operatively engaging said shaft and rotating the same to energize said spring and to position said shaft for operative engagement by said latch, said member during its movement from said position to the other of said positions disengaging from the shaft and in the other of

said positions constituting a stop limiting rotation of the shaft under the influence of the spring, means coacting when the member is in the last-named position for the reception of a securing device to prevent unauthorized operation of said member, and means preventing coaction of the securing device receiving means when the member is not in said position.

10. In switch operating mechanism of the type described, the combination with a pivoted switch blade of an oscillatable shaft operatively connected to the blade to oscillate the same about its pivot, an element secured to the shaft and having a notch in its periphery, a spring to rotate the shaft in one direction, a latch normally engaging in said notch and thereby preventing rotation of the shaft in said direction, electromagnetic means to release said latch, a circuit for controlling said electromagnetic means, a member reversely movable to either of two positions, said member during its movement from one to another of said positions operatively engaging said shaft and rotating the same to energize said spring and to position said shaft for operative engagement by said latch, said member during its movement from said position to the other of said positions disengaging from the shaft and in the other of said positions constituting a stop limiting rotation of the shaft under the influence of the spring, and means to open the circuit of said electromagnetic means as the member arrives at the first of said positions and to close said circuit as the member arrives at the second of said positions.

11. In switch operating mechanism of the type described, the combination with a pivoted switch blade of an oscillatable shaft operatively connected to the blade to oscillate the same about its pivot, a pulley secured to said shaft and having a notch in its periphery, a flexible element secured at one end to said pulley and trained about the periphery thereof, a spring to rotate the shaft in one direction and to which the opposite end of the flexible element is secured, a latching element to engage in the notch of the pulley and prevent rotation of the shaft in said direction, a spring-actuated toggle urging said latching element to latching position, electromagnetic means to break said toggle and release said latch, and a circuit for controlling said electromagnetic means.

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