March 10, 1942. J. W. SAMZELIUS 2,276,006

ELECTRIC SWITCH

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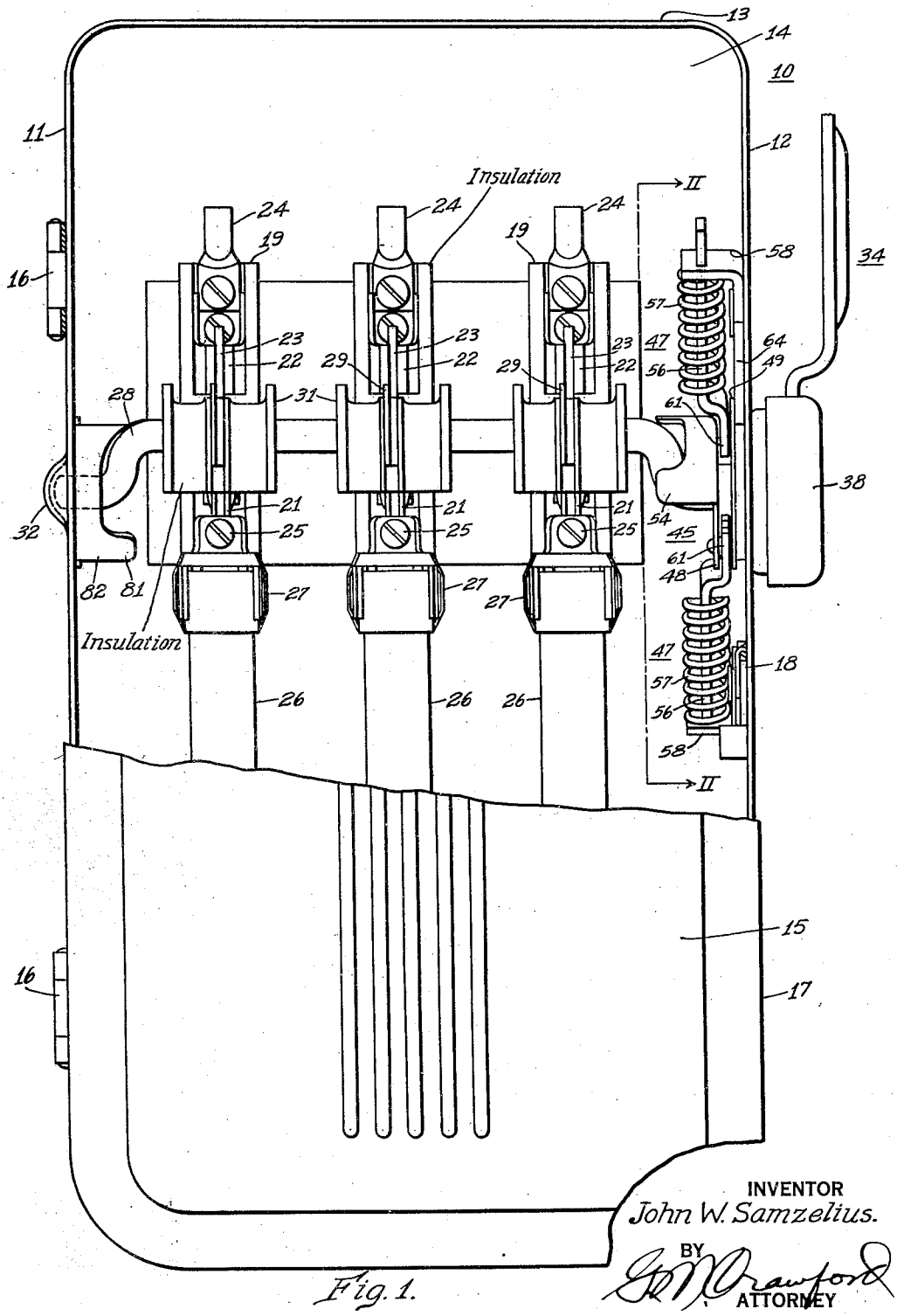


Fig. 1.

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ELECTRIC SWITCH

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Fig. 2.

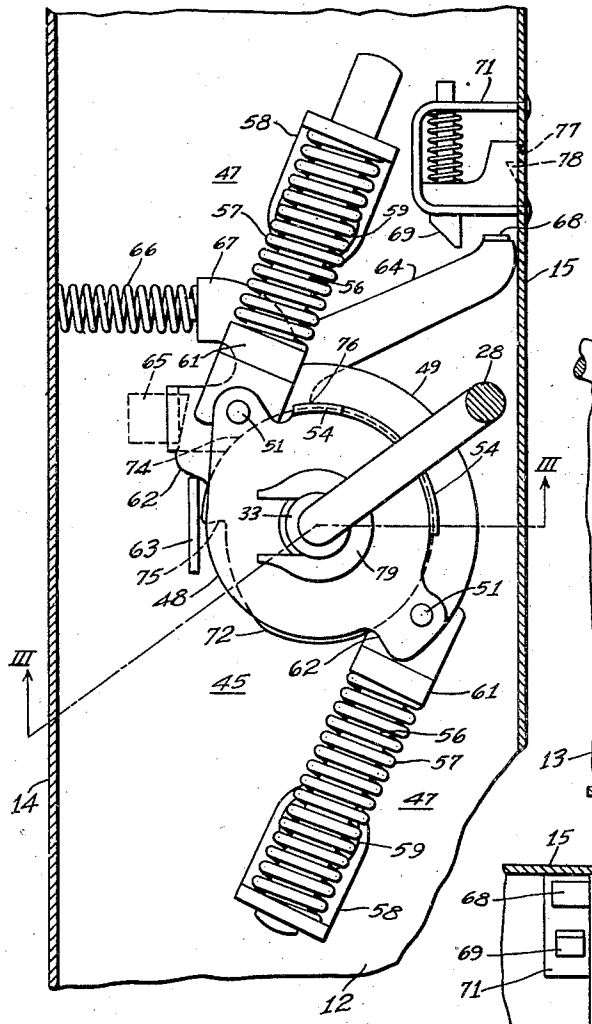


Fig. 3.

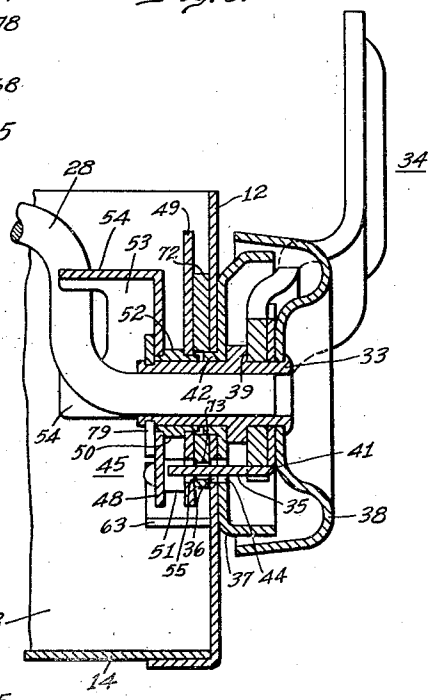
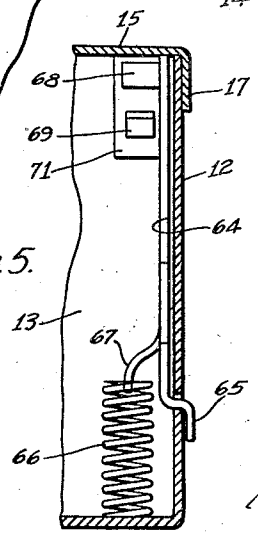


Fig. 5.



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ELECTRIC SWITCH

Filed July 20, 1940 3 Sheets-Sheet 3

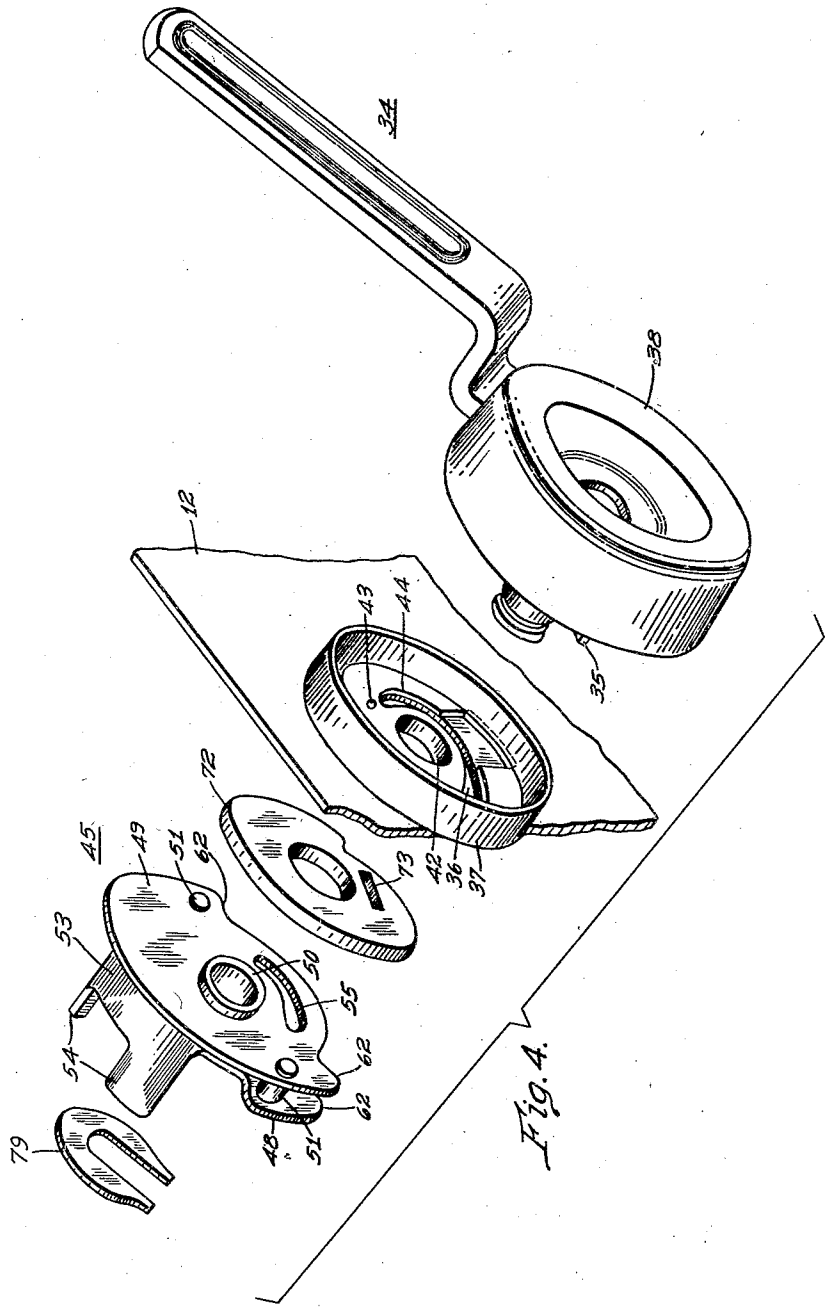


Fig. 4.

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UNITED STATES PATENT OFFICE

2,276,006

ELECTRIC SWITCH

John W. Samzelius, Wilkinsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application July 20, 1940, Serial No. 346,528

17 Claims. (Cl. 200—50)

My invention relates, generally, to electric switches and, more particularly, to electric switches of the enclosed type commonly known as safety switches.

In order to improve its efficiency and interrupting capacity, an electric switch may be provided with a quick-make-and-break mechanism for closing and opening the contact members of the switch. Also the safety features of an enclosed switch may be increased by providing a device for interlocking the switch cabinet cover with the switch operating mechanism. The prior operating mechanisms and interlocking devices with which I am familiar have been of a complicated structure and expensive to manufacture and assemble.

Accordingly, an object of my invention, generally stated, is to provide a combined snap-action operating and interlocking mechanism for an enclosed switch which shall be simple and efficient in structure and operation, and which may be economically manufactured and installed.

A more specific object of my invention is to reduce the friction and wear of the parts of a snap-action operating mechanism for an enclosed switch.

Another object of my invention is to provide a snap-action operating mechanism for an enclosed switch which may be readily assembled in the switch cabinet.

A further object of my invention is to provide a relatively tight cabinet for enclosing an electric switch.

Other objects of my invention will be explained fully hereinafter or will be apparent to those skilled in the art.

In accordance with the invention, the snap-action mechanism for an enclosed switch is provided with two compression springs which are connected between a pair of spaced actuating plates at diametrically opposite points, thereby dividing the load of the springs between the bearings for both actuating plates and balancing the entire mechanism. The interlock for the cabinet cover is actuated by a cam plate which is rotated by the handle that rotates the switch actuating plates.

For a fuller understanding of the nature and objects of the invention, reference may be had to the following detailed description, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a plan view of an enclosed switch embodying the features of the invention, part of the cover being broken away to show the switch mechanism;

Fig. 2 is a view in section, taken along the line II—II of Fig. 1, showing the snap-action and interlocking mechanism;

Fig. 3 is a view in section, taken along the line III—III of Fig. 2, showing a portion of the snap-action mechanism;

Fig. 4 is an exploded perspective view of the operating handle assembly; and

Fig. 5 is a detail view of a portion of the interlocking mechanism.

Referring to the drawings, the enclosure for the switch comprises a sheet metal casing 10 having side walls 11 and 12, end walls 13 and a bottom wall 14. An openable cover or door 15 is pivotally attached to the side wall 11 by a pair of hinges 16. The cover 15 is provided with a peripheral flange 17 which overlaps the edges of the side and end walls. A latching device 18 of the usual type is provided on the side wall 12 for latching the cover 14 closed.

A multi-pole switch mechanism is mounted in the casing, each pole of which comprises an insulating base 19 upon which is mounted a jaw 21 and contact jaw 22 for receiving a switch blade 23 that is pivoted to the hinge jaw 21. The contact jaws 22 are provided with terminals 24 and the hinge jaws with terminals 25 for making the desired electrical connections to the switch. If desired, each pole of the switch may be provided with a fuse 26 mounted in fuse clips 27 and electrically connected in series-circuit relation with the switch blades.

The switch blades 23 are of the knife-blade type and are simultaneously actuated by means of a bail 28 which constitutes a crank that is pivoted at its opposite ends to the side walls of the casing 10. Each switch blade is mechanically connected to the bail or crank 28 by hook-shaped members 29 and insulated from the bail by insulating members 31. One end of the crank 28 is rotatably mounted in a bearing 32 on the side wall 11 of the casing, and the opposite end of the crank is rotatably mounted in a tubular bushing 33 which is part of a handle 34.

As shown in Fig. 3, the operating handle 34 is secured to the bushing 33 exteriorly of the casing 10. The handle 34 is provided with a driving element 35 which extends through an arcuate slot 36 in the side wall 12 for operating the switch mechanism in a manner which will be described more fully hereinafter.

In order to prevent dirt and moisture from entering the operating mechanism and the in-

side of the switch casing, a pair of nested cup-shaped members 37 and 38 are provided for restricting access to the openings in the cabinet for the operating mechanism. As shown, the cup-shaped member 38 is inverted and its sides overlap the sides of the cup-shaped member 37. The handle 34, its driving element 35, and the cup-shaped member 38 are all secured to the bushing 33 by riveting the ends of the bushing against the sides of the cup-shaped member 38 to force the handle 34 against a shoulder 39 on the bushing 33. A notch 41 is provided in the lower end of the handle 34 for the driving element 35 to insure that the driving element will always move with the handle 34. Thus the torque is transmitted by the member 35 which engages the sides of the notch 41 and not through the riveted connection between the bushing and the handle.

The opening in the cup-shaped member 37 for the bushing 33 is provided with a flange 42 which constitutes a bearing for the bushing 33 where the bushing goes through the side wall 12 of the casing 10. The cup-shaped member 37 may be secured to the side wall 12 by rivets 43, as shown in Fig. 4, or by spot welding. An arcuate slot 44 similar to the slot 36 is provided in the cup-shaped member 37 for the driving element 35 of the handle. In this manner it will be seen that the bushing 33, the driving element 35, and the cup-shaped member 38 all rotate with the handle 34 when the handle is operated.

In order to provide a quick-make-and-break operation of the contact members of the switch, a snap-action mechanism is interposed between the operating handle 34 and the actuating crank 28, causing the switch blades to be actuated to open and closed circuit positions with a snap-action when the switch is operated. The snap-action mechanism comprises an actuating member 45 rotatably mounted on the bushing 33 and a pair of oppositely disposed overcenter spring units 47 which engage the rotatable actuator 45 at substantially diametrically opposite points.

As shown in Figs. 2, 3 and 4, the actuating member 45 comprises a pair of spaced actuating plates 48 and 49 rigidly secured together in slightly spaced relation by a bearing sleeve 50 and a pair of pins 51, the ends of which are riveted over against the plates. The bearing sleeve 50 is provided with a spacing shoulder 52 disposed between the plates 48 and 49. The plates 48 and 49 are provided with a central opening in which is mounted the bearing sleeve 50 by means of which the actuating member 45 is rotatably mounted on the bushing 33.

In order to provide a lost motion connection between the crank 28 and the actuator 45, the inner plate 48 is provided with an angular extension 53 having a pair of spaced arms 54 for engaging opposite sides of the bent portion of the crank 28. The actuating member 45 is manually oscillated by means of the operating handle 34. In order to provide a lost motion connection between the handle 34 and the actuator 45, an arcuate slot 55 is provided in the actuating plate 49 for the driving element 35 of the handle 34. The slot 55 is of a greater length than the width of the driving element 35, thereby permitting the handle to move relative to the actuator 45.

Each overcenter spring unit 47 comprises an actuating fork 56, and a coil spring 57 which is mounted on the arm of the fork 56 and disposed in compression between the head of the fork and an angle-shaped guide bracket 58. The guide bracket 58 is pivotally mounted on the wall 12 of the casing 10 by means of a pivot stud 59, and an angularly projecting end of the bracket 58 is provided with an opening through which the outer end of the fork arm extends. The heads 61 of the actuating forks 56 pivotally engage the pins 51 of the actuating member 45 between the plates 48 and 49.

When the actuating member 45 is rotated in either direction by the operating handle, the springs 57 are compressed during the first part of the movement and as soon as the connecting pins 51 cross the line adjoining the fixed pivots 59 of the springs, the line of action of the springs is shifted and the springs continue the movement of the actuating member with a snap-action. The arms 54 of the actuator 45 are preferably so spaced that they engage and being to move the crank 28 approximately at the time when the springs 57 pass overcenter. The actuating plates 48 and 49 are provided with shoulders 62 which engage a projection 63 of the cup-shaped member 37 which extends through the wall 12 of the casing, thereby limiting the rotational movement of the actuator 45 in either direction.

An interlock is provided for normally preventing opening of the cover 15 when the switch is in the "on" or closed position, and also for preventing closing of the switch when the cover is open. As shown in Figs. 2 and 5, the interlock lever 64 having an offset inner end 65 which is pivotally mounted in an opening provided in the side wall 12 of the casing 10. The interlocking lever 64 is biased in a clockwise direction by a compression spring 66 interposed between a projection 67 of the interlocking lever and the bottom wall 14 of the casing. A projection 68 on the outer end of the interlocking lever 64 cooperates with a spring-biased latch 69, slidably mounted in a bracket 71 on the inside of the cover 15, to normally prevent opening of the cover when the switch is in the closed position, as shown in the drawings.

The interlocking lever 64 is operated in accordance with the position of the operating handle of the switch by means of a cam plate 72 which is rotatably mounted on the bushing 33 between the actuating member 45 and the side wall 12 of the casing 11. The cam plate 72 is connected for movement with the operating handle 34 by means of a slot 73 in the plate 72 through which the driving element 35 of the handle extends. Since the slot 73 is practically the same size as the driving element, there is no lost motion between the cam plate 72 and the handle 34. The interlocking lever 64 is provided with an arcuate edge 74 which is biased against the periphery of the cam plate 72, and the cam plate is provided with a notch 75 which is positioned opposite a shoulder 76 on the interlocking lever when the operating handle 34 is in the "off" position, thereby permitting opening of the cover when the switch is in the open position.

As shown in Fig. 2, the cover 15 presses against the end of the interlocking lever 64 when the cover is fully closed to prevent the shoulder 76 from dropping into the notch 75 in the cam plate 72, thereby permitting the switch mechanism to operate freely. As the cover is opened, the interlocking lever 64 is biased in a clockwise direction by the spring 66. If the switch is in the "off" position, the notch 75 is so positioned with respect to the shoulder 76 that the interlocking lever rotates in a clockwise direction sufficiently to permit the latch 69 to clear the projection 68

on the interlocking lever, thereby permitting the cover to be entirely opened.

However, if the switch is not in the fully open position, the arcuate surface 74 of the interlocking lever 64 will ride against the cam plate 72 to prevent opening of the cover. Furthermore, it will be seen that when the shoulder 76 is in the notch 75 of the cam plate 72, the handle 34 cannot be rotated to close the switch. When the cover is closed it actuates the interlocking lever 64 in a counter-clockwise direction to a position in which the shoulder 76 clears the notch 75 thereby permitting closing of the switch mechanism.

In order to permit inspection of the switch by an authorized person an opening 77 is provided in the cover 15 through which a screw driver or similar tool may be inserted into a notch 78 in the sliding latch 69 to move the latch away from the interlocking lever 64 to permit the cover to be opened even though the switch is in the "on" position. The sliding latch 69 is so made that the opening 77 is always entirely closed on the inside of the cover, thereby excluding dirt and moisture from the interior of the casing.

In addition to functioning as an operating cam for the interlocking device, the plate 72 is also utilized to cover the openings 36 and 44 in the casing 10 and the cup-shaped member 37 provided for the driving element 35 of the switch handle, thereby making the casing more dirt and moisture proof. Also, the possibility of any arcs formed during the operation of the switch mechanism reaching the outside of the casing is precluded by covering all openings in the casing.

Referring particularly to Fig. 4, it will be seen that the handle and the snap-action mechanisms may be readily assembled by inserting the bushing 33, which has previously been secured to the handle and the cup-shaped member 38 in the manner hereinbefore described, through the bearing surface 42 of the cup-shaped member 37, which has previously been secured to the side wall 12 of the casing by the rivets 43 as hereinbefore described. The cam plate 72 is then inserted on the bushing inside of the casing, and the actuating device 45 comprising the plates 48 and 49, which are riveted together, as previously described, is inserted on the bushing 33 with the bearing sleeve 50 disposed between the plates and the bushing, as shown in Fig. 3. The U-shaped washer 79 is then inserted in an annular groove provided near the end of the bushing 33. The overcenter spring devices 47 may then be placed in position by compressing the springs 57 by means of a suitable tool to permit the forks 56 to be inserted between the pins 51 and the brackets 58. In this manner it will be seen that the entire operating mechanism may be quickly assembled or disassembled if desired.

The operation of the switch is briefly as follows: The switch mechanism and operating handle are shown in the "on" or closed circuit position in the drawings. To operate the switch to the "off" or open circuit position, the operating handle 34 is manually moved in a counter-clockwise direction. The driving element 35 and the cup-shaped member 38 move as a rigid unit with the operating handle 34, and as soon as the lost motion provided by the slot 55 is taken up the driving element 35 moves the snap-acting actuating member 45 in a counter-clockwise direction with the operating handle.

However, the crank 28 and the switch blades 23 remain in the "on" position during the first portion of the movement of the actuating member 45 until approximately the time that the overcenter spring units 47 pass overcenter. The contact members of the switch remain closed during the initial movement of the operating handle because of the lost motion provided between the handle 34 and the actuating device 45 by the slot 55 and the lost motion provided between the actuator 45 and the crank 28 by the spaced arms 54 on the actuating plate 48.

As soon as spring units 47 pass overcenter, the actuating member 45 is moved with a snap-action from this point on to the full "off" position where it is stopped by the shoulder 62 engaging the projection 63. Approximately at the time the spring units 47 begin to pass overcenter, the trailing arm 54 of the actuating member 45 engages the crank 28 to cause the crank and the switch blades to be moved with a snap-action to the full "off" position by the actuating member 45 and the spring units 47. By reason of the slot 55, it is impossible to check the snap acting movement of the switch mechanism once this movement is started, since the actuating member is moved ahead of the handle by the overcenter springs as soon as they pass overcenter.

The switch may be moved to the "on" position by substantially reversing the foregoing operation. The operating handle 34 is manually moved in a clockwise direction to the "on" position. As soon as the spring units 47 have been moved overcenter, the force of the springs act to move the actuating member 45 and the switch blades 23 to the "on" position with a snap-action, the force of the springs being sufficient to fully close the switch blades in the contact jaws 22. The movement of the crank 28 is limited by a pair of spaced arms 81 on a bracket 82 which is secured to the side wall 11 of the casing.

From the foregoing description, it is apparent that I have provided a combined snap-action operating and interlocking mechanism for an enclosed switch which is relatively simple in structure, and which may be readily assembled in the switch casing. Therefore, the structure herein described may be economically manufactured and installed. Furthermore, the operating mechanism is efficient in operation since the overcenter springs are equally balanced against each other, and the load of the springs on the bearing surfaces is divided between the pair of actuating plates, thereby reducing the friction and wear of the moving parts of the mechanism. Also, the cabinet is relatively tight, thereby excluding dirt and moisture from the switch mechanism and retaining arcs within the casing.

Since many modifications may be made in the apparatus and arrangement of parts without departing from the spirit of my invention, I do not wish to be limited other than by the scope of the appended claims.

I claim as my invention:

1. In an enclosed switch, in combination, an enclosing casing, a switch in said casing, a rotatable operating handle on the exterior of the casing for operating the switch to "on" and "off" positions, a snap-acting mechanism for actuating the switch, said mechanism comprising an actuating plate disposed inside the casing and rotatable about the same axis as said handle, said actuating plate having spaced portions thereon, said handle having a driving element which projects between said spaced portions to provide a lost motion connection between the plate and the handle, and overcenter spring means engag-

ing the actuating plate to impart a snap-acting movement thereto when the plate has been rotated a predetermined amount by the handle, and an additional plate having the same axis as the first plate and actuated thereby to operate said switch.

2. In an enclosed switch, in combination, an enclosing casing, a switch in said casing, a rotatable operating handle on the exterior of the casing for operating the switch to "on" and "off" positions, a snap-acting mechanism for actuating the switch, said mechanism comprising an actuating plate disposed inside the casing and rotatable about the same axis as said handle, said actuating plate having spaced portions therein, said handle having a driving element which projects between said spaced portions to provide a lost motion connection between the plate and the handle, an overcenter spring engaging the actuating plate to impart a snap-acting movement thereto when the plate has been rotated a predetermined amount by the handle, and an additional plate having the same axis as the first plate and actuated thereby, said additional plate having means thereon for operating said switch.

3. In an enclosed switch, in combination, an enclosing casing having a cover, a switch in said casing, a rotatable operating handle on the exterior of the casing for operating the switch to "on" and "off" positions, a snap-acting mechanism for actuating the switch, said mechanism comprising a pair of actuating plates disposed inside the casing and rotatable about the same axis as said handle, one of said plates having spaced portions thereon between which an element of said handle projects to provide a lost motion connection between the plate and the handle, and overcenter spring means engaging said plate to impart a snap-acting movement thereto when the plate has been rotated a predetermined amount by the handle, the other of said plates being actuated by the first plate to operate said switch.

4. In an enclosed switch, in combination, an enclosing casing having a cover, a switch in said casing, a rotatable operating handle on the exterior of the casing for operating the switch to "on" and "off" positions, a snap-acting mechanism for actuating the switch, said mechanism comprising a pair of actuating plates disposed inside the casing and rotatable about the same axis as said handle, means for securing said plates together in spaced relation, one of said plates having an arcuate slot therein in which an element of said handle projects to provide a lost motion connection between the plates and the handle, and a pair of overcenter springs engaging the actuating plates at substantially diametrically opposite points to impart a snap-acting movement thereto when the plates have been rotated a predetermined amount by the handle.

5. In an enclosed switch, in combination, an enclosing casing having an openable cover, a switch in said casing having relatively movable contact members, a member disposed interiorly of the casing for actuating the contact members of the switch, a rotatable operating handle disposed exteriorly of the casing, a snap-acting mechanism interposed between said actuating member and said operating handle, said mechanism comprising a pair of actuating plates disposed inside the casing and rotatable about the same axis as said handle, means for securing said plates together in spaced relation, one of said plates having an arcuate slot therein in which an element of said handle projects to provide a lost-motion connection between the plates and the handle, the other of said plates having spaced arms thereon for engaging said contact actuating member to provide a lost-motion connection between the plates and said member, and overcenter spring means engaging the actuating plates to impart a snap-acting movement thereto when the plates have been rotated a predetermined amount by the handle.

6. In an enclosed switch, in combination, an enclosing casing having an openable cover, a switch in said casing having relatively movable contact members, a member disposed interiorly of the casing for actuating the contact members of the switch, a rotatable operating handle disposed exteriorly of the casing, a snap-acting mechanism interposed between said actuating member and said operating handle, said mechanism comprising a pair of actuating plates disposed inside the casing and rotatable about the same axis as said handle, means for securing said plates together in spaced relation, one of said plates having an arcuate slot therein in which an element of said handle projects to provide a lost-motion connection between the plates and the handle, the other of said plates having spaced arms thereon for engaging said contact actuating member to provide a lost-motion connection between the plates and said member, and a pair of overcenter compression springs engaging the actuating plates at substantially diametrically opposite points to impart a snap-acting movement thereto when the plates have been rotated a predetermined amount by the handle.

7. In an enclosed switch, in combination, an enclosing casing having an openable cover, a switch in said casing having relatively movable contact members, a member disposed interiorly of the casing for actuating the contact members of the switch, a rotatable operating handle disposed exteriorly of the casing, a snap-acting mechanism interposed between said actuating member and said operating handle, said mechanism comprising a pair of actuating plates disposed inside the casing and rotatable about the same axis as said handle, means for securing said plates together in spaced relation, one of said plates having an arcuate slot therein in which an element of said handle projects to provide a lost-motion connection between the plates and the handle, the other of said plates having spaced arms thereon for engaging said contact actuating member to provide a lost-motion connection between the plates and said member, overcenter spring means engaging the actuating plates to impart a snap-acting movement thereto when the plates have been rotated a predetermined amount by the handle, and stop means in said casing for engaging said plates at predetermined points to limit their rotational movement.

8. In an enclosed switch, in combination, an enclosing casing having an openable cover, a switch in said casing having relatively movable contact members, a member disposed interiorly of the casing for actuating the contact members of the switch, a rotatable operating handle disposed exteriorly of the casing, a snap-acting mechanism interposed between said actuating member and said operating handle, said mechanism comprising a pair of actuating plates disposed inside the casing and rotatable about the same axis as said handle, means for securing said plates together in spaced relation, one of said plates having an arcuate slot therein in which an

element of said handle projects to provide a lost-motion connection between the plates and the handle, the other of said plates having spaced arms thereon for engaging said contact actuating member to provide a lost-motion connection between the plates and said member, overcenter spring means engaging the actuating plates to impart a snap-acting movement thereto when the plates have been rotated a predetermined amount by the handle, stop means in said casing for engaging said plates at predetermined points to limit their rotational movement, and additional stop means in said casing for limiting the movement of said contact actuating member.

9. In an enclosed switch, in combination, an enclosing casing having an openable cover, a switch in said casing having relatively movable contact members, a crank member pivotally mounted in the casing for actuating the contact members of the switch, an operating handle rotatably mounted on one end of said crank exteriorly of the casing, a snap-acting mechanism interposed between said crank and said handle, said mechanism comprising a pair of actuating plates disposed inside the casing and rotatable about said crank, means for securing said plates together in spaced relation, one of said plates having an arcuate slot therein in which an element of said handle projects to provide a lost-motion connection between the plates and the handle, the other of said plates having spaced arms thereon for engaging said crank to provide a lost-motion connection between the plates and the crank, and overcenter spring means engaging the actuating plates to impart a snap-acting movement thereto when the plates have been rotated a predetermined amount by the handle.

10. In an enclosed switch, in combination, an enclosing casing having an openable cover, a switch in said casing having relatively movable contact members, a crank member pivotally mounted in the casing for actuating the contact members of the switch, an operating handle rotatably mounted on one end of said crank exteriorly of the casing, a bushing disposed between said handle and said crank, a snap-acting mechanism interposed between said crank and said handle, said mechanism comprising a pair of actuating plates rotatably mounted on said bushing inside the casing, means for securing said plates together in spaced relation, one of said plates having an arcuate slot therein in which an element of said handle projects to provide a lost-motion connection between the plates and the handle, the other of said plates having spaced arms thereon for engaging said crank to provide a lost-motion connection between the plates and the crank and a pair of overcenter springs engaging the actuating plates at substantially diametrically opposite points to impart a snap-acting movement thereto when the plates have been rotated a predetermined amount by the handle.

11. In an enclosed switch, in combination, an enclosing casing having an openable cover, a switch in said casing, a rotatable operating handle on the exterior of the casing for operating the switch to "on" and "off" positions, a snap-acting mechanism for actuating the switch, said mechanism comprising an actuating plate disposed inside the casing and rotatable about the same axis as said handle, said actuating plate having an arcuate slot therein, said handle having a driving element which projects into said slot to provide a lost-motion connection between the plate and the handle, a cam plate disposed between said actuating plate and said casing, said cam plate having a slot therein through which the driving element of the handle extends to rotate the cam plate with the handle, an interlocking lever actuated by said cam plate to retain said cover closed when the switch is in the "on" position, and overcenter spring means engaging the actuating plate to impart a snap-acting movement thereto when the plate has been rotated a predetermined amount by the handle.

12. In an enclosed switch, in combination, an enclosing casing having an openable cover, a switch in said casing, a rotatable operating handle on the exterior of the casing for operating the switch to "on" and "off" positions, a snap-acting mechanism for actuating the switch, said mechanism comprising an actuating plate disposed inside the casing and rotatable about the same axis as said handle, said actuating plate having an arcuate slot therein, said handle having a driving element which projects into said slot to provide a lost-motion connection between the plate and the handle, a cam plate disposed between said actuating plate and said casing, said cam plate having a slot therein through which the driving element of the handle extends to rotate the cam plate with the handle, an interlocking lever actuating by said cam plate to retain said cover closed when the switch is in the "on" position, and overcenter spring means engaging the actuating plate to impart a snap-acting movement thereto when the plate has been rotated a predetermined amount by the handle, said interlocking lever being disposed to engage said cam plate when the cover is open to prevent actuating the switch to the "on" position.

13. In an enclosed switch, in combination, an enclosing casing having an openable cover, a switch in said casing, a rotatable operating handle on the exterior of the casing for operating the switch to "on" and "off" positions, a snap-acting mechanism for actuating the switch, said mechanism comprising an actuating plate disposed inside the casing and rotatable about the same axis as said handle, said actuating plate having an arcuate slot therein, said handle having a driving element which projects into said slot to provide a lost-motion connection between the plate and the handle, a cam plate disposed between said actuating plate and said casing, said cam plate having a slot therein through which the driving element of the handle extends to rotate the cam plate with the handle, an interlocking lever actuating by said cam plate to retain said cover closed when the switch is in the "on" position, overcenter spring means engaging the actuating plate to impart a snap-acting movement thereto when the plate has been rotated a predetermined amount by the handle, said interlocking lever being disposed to engage said cam plate when the cover is open to prevent actuating the switch to the "on" position, and spring means for biasing said interlocking lever against said cam plate.

14. In an enclosed switch, in combination, an enclosing casing having an openable cover, a switch in said casing, a rotatable operating handle on the exterior of the casing for operating the switch to "on" and "off" positions, a snap-acting mechanism for actuating the switch, said mechanism comprising an actuating plate disposed inside the casing and rotatable about the same axis as said handle, said actuating plate having an

arcuate slot therein, said handle having a driving element which projects into said slot to provide a lost-motion connection between the plate and the handle, a cam plate disposed between said actuating plate and said casing, said cam plate having a slot therein through which the driving element of the handle extends to rotate the cam plate with the handle, an interlocking lever actuated by said cam plate to retain said cover closed when the switch is in the "on" position, over-center spring means engaging the actuating plate to impart a snap-acting movement thereto when the plate has been rotated a predetermined amount by the handle, said interlocking lever being disposed to engage said cam plate when the cover is open to prevent actuating the switch to the "on" position, and spring means for biasing said interlocking lever against said cam plate, said cover being disposed to press said interlocking lever away from said cam plate when the cover is closed.

15. In an enclosed switch, in combination, an enclosing casing having an openable cover, a switch in said casing, a rotatable operating handle on the exterior of the casing for operating the switch to "on" and "off" positions, a snap-acting mechanism for actuating the switch, said mechanism comprising an actuating plate disposed inside the casing and rotatable about the same axis as said handle, said actuating plate having an arcuate slot therein, said handle having a driving element which projects into said slot to provide a lost-motion connection between the plate and the handle, a cam plate disposed between said actuating plate and said casing, said cam plate having a slot therein through which the driving element of the handle extends to rotate the cam plate with the handle, an interlocking lever actuated by said cam plate to retain said cover closed when the switch is in the "on" position, overcenter spring means engaging the actuating plate to impart a snap-acting movement thereto when the plate has been rotated a predetermined amount by the handle, and a spring-biased latch slidably mounted on said cover to engage said interlocking lever.

16. In an enclosed switch, in combination, an enclosing casing having an openable cover, a switch in said casing, a rotatable operating handle on the exterior of the casing for operating the switch to "on" and "off" positions, a snap-acting mechanism for actuating the switch, said mechanism comprising an actuating plate disposed inside the casing and rotatable about the same axis as said handle, said actuating plate having an arcuate slot therein, said handle having a driving element which projects into said slot to provide a lost-mention connection between the plate and the handle, a cam plate disposed between said actuating plate and said casing, said cam plate having a slot therein through which the driving element of the handle extends to rotate the cam plate with the handle, an interlocking lever actuated by said cam plate to retain said cover closed when the switch is in the "on" position, overcenter spring means engaging the actuating plate to impart a snap-acting movement thereto when the plate has been rotated a predetermined amount by the handle, and a spring-biased latch slidably mounted on said cover to engage said interlocking lever, said cover having an opening therein through which a tool may be inserted to disengage said latch from said interlocking lever.

17. In an enclosed switch, in combination, an enclosing casing having an openable cover, a switch in said casing, a rotatable operating handle on the exterior of the casing for operating the switch to "on" and "off" positions, a snap-acting mechanism for actuating the switch, said mechanism comprising an actuating plate disposed inside the casing and rotatable about the same axis as said handle, said actuating plate having an arcuate slot therein, said handle having a driving element which projects into said slot to provide a lost-motion connection between the plate and the handle, a cam plate disposed between said actuating plate and said casing, said cam plate having a slot therein through which the driving element of the handle extends to rotate the cam plate with the handle, an interlocking lever actuated by said cam plate to retain said cover closed when the switch is in the "on" position, overcenter spring means engaging the actuating plate to impart a snap-acting movement thereto when the plate has been rotated a predetermined amount by the handle, and a spring-biased latch slidably mounted on said cover to engage said interlocking lever, said cover having an opening therein through which a tool may be inserted to disengage said latch from said interlocking lever, said latch being disposed to close said opening on the inside of the cover.

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