

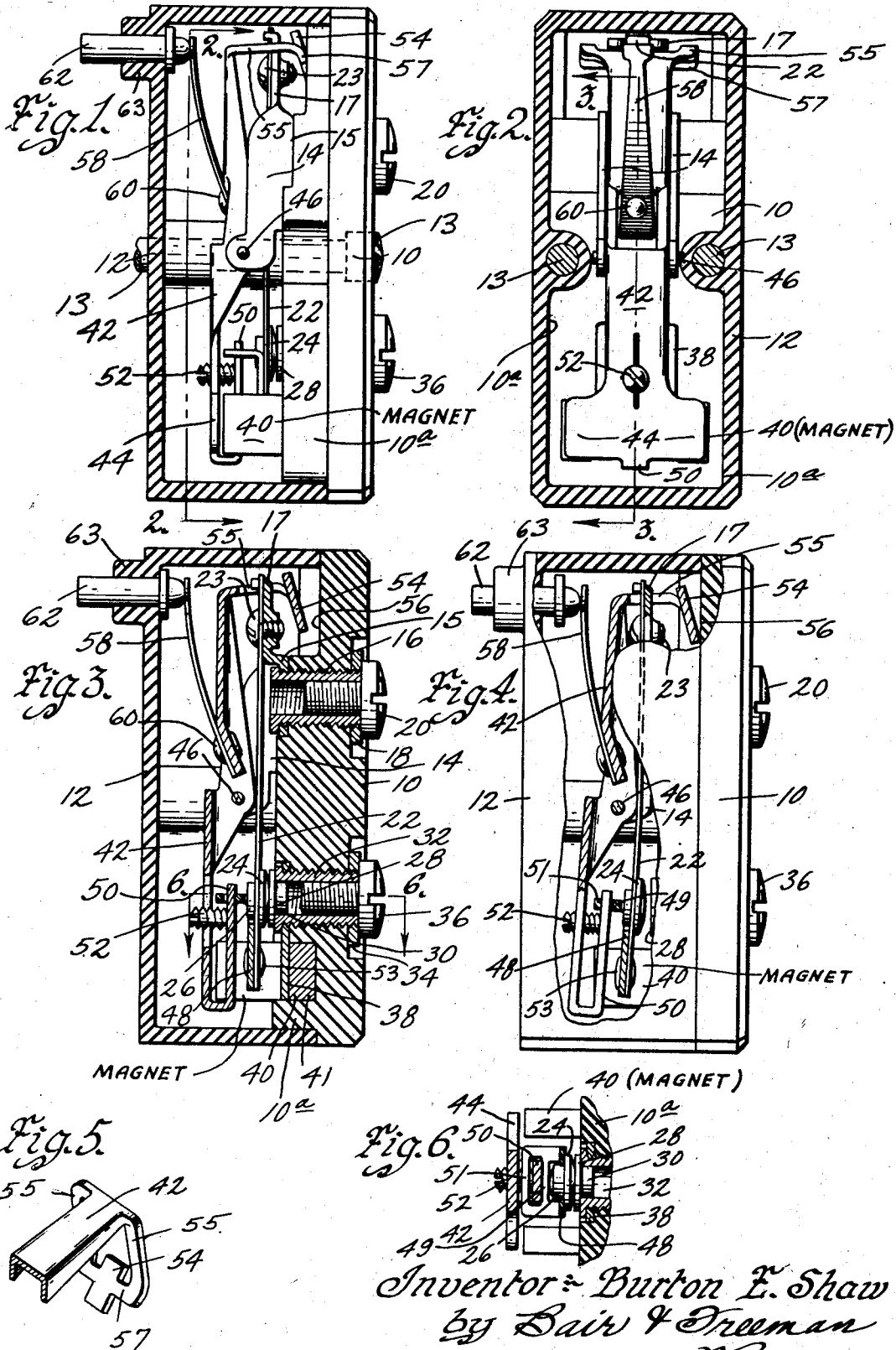
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SWITCH UNIT

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SWITCH UNIT

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8 Claims. (Cl. 200-67)

My present invention has to do with a switch unit of the general character shown in my issued patents, No. 2,111,816, dated March 22, 1938, No. 2,170,341, dated August 22, 1939, and No. 2,229,022, dated January 14, 1941.

One object of my present invention is to provide certain improvements over my prior patents, particularly with respect to certain constructional features which improve the contact action and secure other desirable results.

More particularly, it is my object to provide a switch unit wherein a magnet and armature means is used to secure snap action, and to also aid a leaf spring in holding a movable contact in engagement with a stationary contact, thereby providing the necessary pressure for pushing through a film of dirt or the like on the contacts, which, of course, is especially desirable in connection with the control of low voltage circuits.

Another object is to provide a positive two-way lost motion connection between an armature or switch arm and a movable contact to secure the advantage of the magnetic pull being imposed on the movable contact with respect to the stationary contact, and to also provide for some movement of the switch arm in a switch opening direction before the movable contact is separated from the stationary contact, thereby providing for a "hammer break" of the circuit.

Still another object is to provide an arrangement wherein the contacts constitute a stop for the armature in its position adjacent the magnet, and a novel and simple arrangement for adjusting the differential of operation of the switch through an adjustment of the connection between the switch arm and the movable contact.

Still a further object is to provide a leaf spring connection between the switch arm and an actuating element to eliminate the loose spiral spring shown in my former patents, and to provide a simple adjusting means for stopping the switch arm in its open circuit position by a bendable "butterfly" portion of the switch arm.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawing, in which:

Figure 1 is an enlarged side elevation of a switch unit embodying my invention, showing the housing in section;

Figure 2 is a sectional view on the line 2-2 of Figure 1;

Figure 3 is a sectional view on the line 3-3 of Figure 2;

5 Figure 4 is a side elevation with parts broken away to show the elements of the switch in a different position than Figure 3;

Figure 5 is a perspective view of one end of the switch arm in my switch unit; and

10 Figure 6 is a sectional view on the line 6-6 of Figure 3, showing a connection between the switch arm and the movable contact.

On the accompanying drawing I have used the reference numeral 10 to indicate a base. A housing 12 is mounted on the base 10. The housing and base may be retained in assembled position by screws 13 passing therethrough and into any suitable supporting surface on which the top of the housing (the left surface in Figure 1) may be mounted. The base 10 has a reduced portion 20 fitting into the housing 12 for positioning one relative to the other.

A pivot bracket 14 is mounted on the base 10, the bracket having a pair of ears, a cross-piece 15 and a bendable ear 17. The cross-piece 15 is mounted on the base 10 by means of a terminal sleeve 16 extending through the cross-piece and the base and provided with a retaining nut 18 on its outer end. A terminal screw 20 is screwed into the terminal sleeve 16 for connection with a circuit wire.

A leaf spring 22 is carried by the finger 17, a screw 23 being shown for connecting the spring to the finger. A movable contact 24 is carried by the leaf spring 22 and is adapted to coact with a stationary contact 28. The movable contact is mounted on the leaf spring 22 by having a shank portion 26 thereof riveted in position. The stationary contact 28 has a reduced portion 30 pressed into a second terminal sleeve 32 which, in turn, is retained in position through the base 10 by a retainer nut 34. A second terminal screw 36 is threaded into the terminal sleeve 32.

A finger-like bracket 38 is mounted on the terminal sleeve 32 for retaining a U-shaped magnet 40 in a socket 41 of the base 10. The magnet 40 is adapted to cooperate with armatures 44 formed on a switch or armature arm 42.

The switch arm 42 is pivoted by a pin 46 to the two ears of the bracket 14, the pivotal point being intermediate the ends of the switch arm and preferably at the center of mass thereof so that the switch arm is unaffected by the vibration of a support on which the switch unit is mounted.

55 The switch arm 42 has an extension 50 beyond

the armature portion 44 thereof which passes through an eye of a bracket 48. The bracket 48 is secured to the leaf spring 22 as by a rivet 53, and has cross-bars 49 and 51 for coaction with opposite faces of the extension 50, as will hereinafter be described. An adjusting screw 52 passes through the switch arm 42 and bears against the extension 50 for forcing it to various positions with respect to the switch arm 42. Referring to Figure 3, it will be noted that the contacts 24 and 28 are engaged, and that the extension 50 is engaged with the cross-piece 49 of the bracket 48. The armature portions 44 are adjacent the poles of the magnet 40, and the switch arm is being normally held in this position against a slight bias of a leaf spring 58. The contacts through engagement at 49-50 thereby act as a stop, and the distance of the armature from the magnet may now be increased by screwing the adjusting screw 52 inwardly, or decreased by screwing it outwardly. Thereby the differential of operation of the switch may be varied, as desired.

The switch arm 42 is provided with a pair of extensions 55 at its end opposite the armature 40, and these are connected by a cross-piece 57 having a stop "butterfly-like" blade 54 formed thereon. The blade 54 is adapted to engage a surface 56 of the base 10, as shown in Figure 4, when the switch arm is in open circuit position. The butterfly 54 may be twisted to change the position of its corner which engages the surface 56 with relation to the switch arm to thereby adjust the open circuit position of the switch arm and the separated position of the contacts 24 and 28, as desired.

The switch unit illustrated is adapted to be actuated manually or by a condition responsive device through an actuating pin 62 slidable in a boss 63 of the housing 12. The actuating pin 62 engages a leaf spring 58 riveted as at 60 to the switch arm 42.

Practical operation

In the operation of my switch structure, assuming, first, the closed circuit position of Figures 1, 3 and 6, the contacts 24 and 28 are engaged under the constraint of the leaf spring 22 (which has slight initial tension to insure such engagement). The magnet 40 is holding the armature 44 in a position adjacent thereto, which, through the direct connection 49-50, imposes the pull of the magnet on the movable contact 24 against the stationary contact 28. This effectively breaks down any insulating film on the contacts due to the pull of the magnet in addition to the slight pull of the spring 22.

When the actuating element 62 is pushed inwardly it will first tension the spring 58 until the tension thereof overcomes the pull of the magnet 40 on the arm 44. Thereupon, the armature will move away from the magnet, and, being immediately in a weaker magnetic field, the tension built up in the spring 58 will have an ever increasing effect on the switch arm to throw it toward open circuit position. After the switch arm moves a slight distance, the extension 50 will pick up the cross-piece 51 of the bracket 48, thereupon separating the contact 24 from the contact 28 with a hammer break. The parts will continue to move, due to the tension of the spring 58 and the force of momentum, until they assume the open circuit position of Figure 4. The blade 54 thereupon engages the surface 56 of the base 10 to stop the switch arm in its open circuit

position. From the foregoing description it is obvious that I have provided a switch unit wherein an effective holding of the contacts in tight engagement is insured, the magnet 40 being utilized for this purpose, in addition to the spring 22. The parts are so designed and arranged that a minimum number thereof enter into the construction of the switch, and the arrangement is such as to facilitate assembly without the loss of any loose parts.

Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure, or use of mechanical equivalents, which may be reasonably included within their scope.

I claim as my invention:

1. In a control switch unit, a switch arm having an armature, a magnet cooperating with said armature to constrain said switch arm toward movement in one direction, a pair of contacts, one of which is stationary, a leaf spring having the other contact mounted thereon, said contacts, when said leaf spring is in one position, being engaged and when said leaf spring is in another position being disengaged, said switch arm having means operably engaging said leaf spring to move it from one of its positions to the other one when said switch arm is moved to one of its positions, said means of engagement being arranged to stop the switch arm in a predetermined position when said contacts are engaged, whereupon said armature is thereby spaced a predetermined distance from said magnet, and the pull of the magnet on the armature assists the leaf spring in retaining the contacts engaged and means for adjusting the point of engagement of said switch arm with respect to said leaf spring whereby to vary the distance of the armature from the magnet.

2. In a control switch unit, a switch arm having an armature, a magnet cooperating with said armature to constrain said switch arm toward movement in one direction, a pair of contacts, one of which is stationary, a leaf spring having the other contact mounted thereon, said contacts, when said leaf spring is in one position, being engaged and when said leaf spring is in another position being disengaged, said switch arm being stopped in a predetermined position by said contacts when engaged, whereupon said armature is thereby spaced a predetermined distance from said magnet, means for adjusting the point of engagement of said switch arm with respect to said leaf spring whereby to vary the distance of the armature from the magnet, said armature in its switch contact closed position adding its pressure to said movable contact in its engagement with said stationary contact.

3. In a switch structure, a magnet, a switch arm pivoted with relation thereto, a leaf spring, a stationary contact, a movable contact mounted on said leaf spring for cooperation with said stationary contact, means on said switch arm to engage said leaf spring and thereby engage said contacts with each other when said switch arm is moved toward said magnet, said armature being stopped by such engagement of said contacts whereby the magnetic pull holds the contacts engaged said last means being adjustable relative to said switch arm for varying the position of said switch arm relative to said magnet when said contacts are engaged with each other.

4. In a control switch unit, a switch housing

including a base, a pivot bracket thereon, a switch arm pivoted to said pivot bracket, an armature on said switch arm, a magnet, an operating element extending from said switch housing for moving said switch arm in a direction for said armature to move away from said magnet, a leaf spring connection between said operating element and said switch arm, contacts controlled by said switch arm and located in said switch housing, said contacts comprising a stationary contact and a leaf spring mounted contact normally engaged with each other, said switch arm having, at a point between said switch arm pivot and said magnet, an operating connection with said leaf spring mounted contact to separate said contacts in one position of said switch arm and to engage them in the other position thereof, said contacts in said other position thereof constituting a stop for said switch arm in opposition to said magnet whereby the pull of the magnet is multiplied and imposed as a direct holding pressure on said contacts.

5. In a control switch unit, a switch housing including a base, a pivot bracket thereon, a switch arm pivoted to said pivot bracket, an armature on said switch arm, a magnet, a stop for said switch arm to normally position said armature spaced from said magnet, with the magnetic pressure imposed directly on the stop said stop comprising circuit controlling contacts controlled by said switch arm and enclosed in said switch housing, an operating element extending from said switch housing for moving said switch arm in a direction for said armature to move away from said magnet, and a leaf spring interposed between said operating element and said switch arm and carried by the switch arm.

6. In a control switch, a support, a pair of contacts mounted on said support and normally biased to closed position, a switch arm pivoted relative to said support and operative to engage said contacts with each other whereupon they constitute a stop for limiting movement of said switch arm in one direction, a magnet, an armature on said switch arm and cooperable with said switch magnet to secure snap action of the control switch, said switch arm having an extension including a cross-member and a blade formed thereon, said blade having an edge engageable with said support to constitute a stop

for said switch arm in the other direction, said cross member and blade being twistable for changing the position of said stop edge of said blade relative to said switch arm and thereby changing the position of the switch arm when stopped in said other direction.

7. In a switch unit, a base, a pair of terminals mounted thereon, a stationary contact carried by one of said terminals, a spring blade carried by the other terminal and having a movable contact carried thereby and normally constrained to circuit closing coaction with said stationary contact, means for disengaging said movable contact from said stationary contact comprising an armature arm pivoted on said base at substantially the center of mass of the armature arm, a magnet cooperating therewith to produce snap acting movement of said arm, an actuating element for transmitting movement from a condition responsive device to said arm, said arm having a lost motion connection with said spring blade effective to cause said contacts when engaged to serve as a positive stop for said armature arm in one direction with the magnetic pull imposed directly on the contacts to keep them engaged and for the armature arm to move slightly in the opposite direction before picking up the spring blade and thereupon separating the movable contact from the stationary contact.

8. In a switch unit, a base, switch contacts mounted thereon and normally biased to engage each other, means for separating said switch contacts from each other comprising a switch arm pivoted on said base, an armature carried by one end of said switch arm, the other end thereof being provided with a stop portion which provides additional weight to counterbalance said armature and which is adapted to engage said base to limit the position of the switch arm, a magnet mounted on said base and cooperating with said arm to provide snap-acting movement of said switch arm, an actuating element for transmitting movement from a condition responsive device to said switch arm, said stop portion of said switch arm being bendable to a different position relative to said switch arm whereby to vary the switch open position of the switch arm with relation to said base.

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