

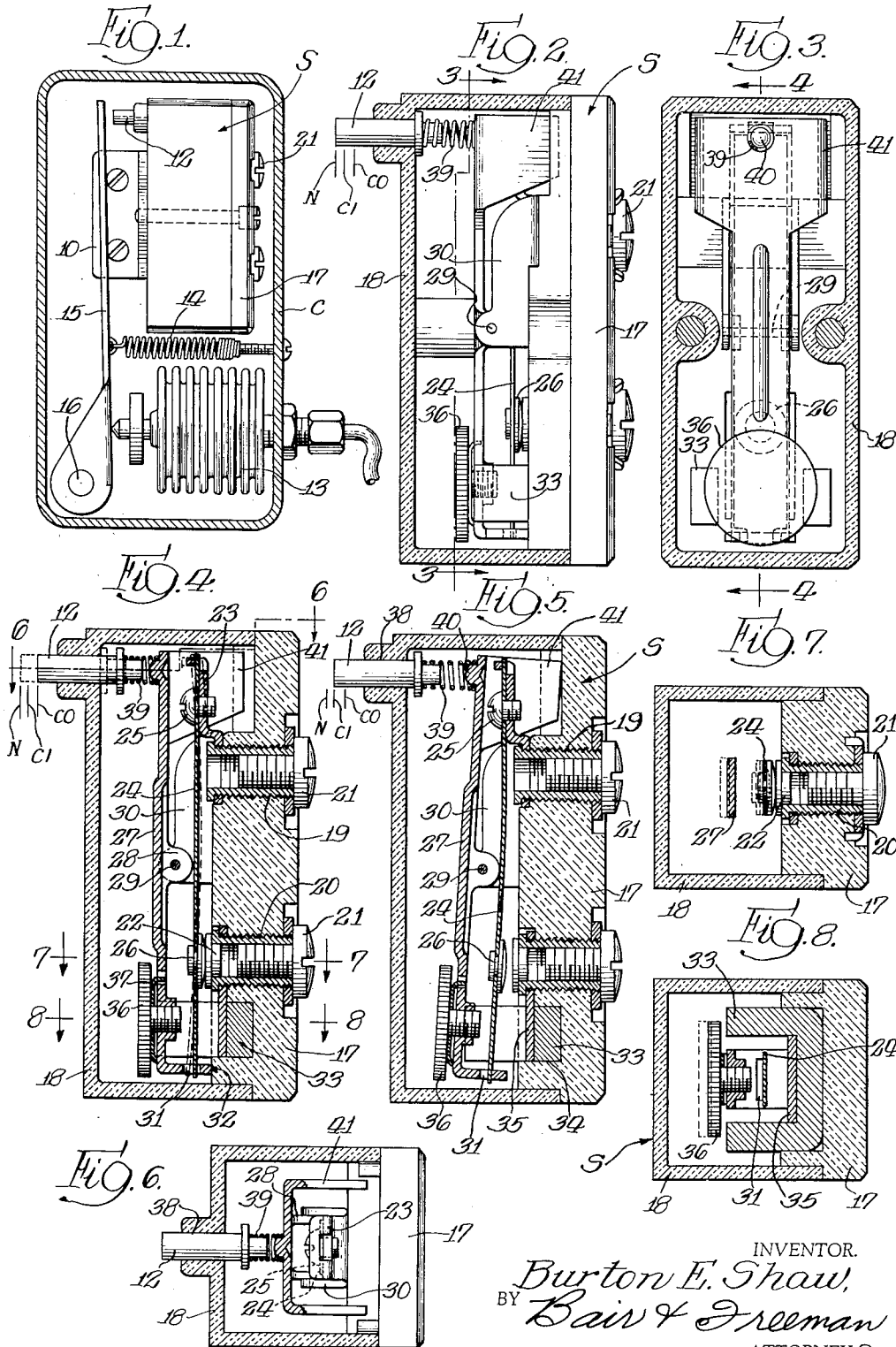
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SWITCH UNIT

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SWITCH UNIT

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An object of my present invention is to provide a switch unit of simple, durable and inexpensive construction having, for some types of installation, certain desirable features of improvement with respect to the switch unit shown in my Patent No. 2,111,816, issued March 22, 1938.

A further object is to provide a switch unit which can be used in certain installations or in combination with certain types or arrangements of condition-responsive devices and which is preferably used where the switch unit is subject to vibration, means being provided to counter-balance an armature in the switch structure so that a greater percentage of mass is not located on one side of a pivot than on the other, as in my issued patent, which sometimes results in the switch being operated from one position to another as a result of a slight jar of the switch when it is in position almost ready to snap from one of its limits to the other.

A further object is to provide a switch structure in which increased movement for an increased differential of operation is obtained by pivoting the switch arm at substantially its center and connecting it with the outer end of a switch blade having a movable contact carried thereby.

A further object is to connect the switch arm connected with the switch blade in such manner that even after the parts wear considerably, the switch will continue to operate properly, due to an arrangement wherein there is considerable movement of the switch arm and a lost-motion connection is provided between it and the movable contact, permitting considerable leeway in the dimensions.

Another object is to provide a switch unit in which the parts are so constructed and assembled as to make the switch unit inexpensive, readily assembled and readily adjusted after assembly, including a bracket to which a spring blade is secured, the spring blade carrying a contact the pressure of which can be changed by merely bending the bracket.

Another object is to provide a switch unit in which a magnet cooperating with an armature of the switch arm effects snap action and is retained assembled relative to the base by being mounted in a socket thereof, one of the terminals of the switch serving as a means for connecting a retainer element for the magnet with the base.

Still a further object is to provide a switch arm which is pivotally mounted and to provide a cover for the base and the switch mechanism

mounted thereon which when in position serves to retain the pivot pin for the switch arm in its position.

Further objects and advantages of the present invention will be apparent from the following description, wherein I have shown a preferred embodiment of the invention, and invention will be particularly pointed out in the appended claims.

On the drawing,

Figure 1 is a side elevation of a switch unit embodying my invention and showing it mounted in a housing and controlled by a bellows;

Figure 2 is a similar view of the switch unit per se showing it on an enlarged scale, and the casing being cut in longitudinal section showing the switch in normal position;

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

Figure 4 is a sectional view on the line 4—4 of Figure 3 showing the switch about ready to be moved to cut-out position;

Figure 5 is a similar sectional view showing the switch about ready to move to cut-in position;

Figure 6 is a sectional view on the line 6—6 of Figure 4;

Figure 7 is a sectional view on the line 7—7 of Figure 4, and

Figure 8 is a sectional view on the line 8—8 of Figure 4.

On the accompanying drawing I have used the reference character C to indicate generally a casing. Within the casing C a bracket 10 is mounted on which is secured my switch unit indicated generally as S. The switch unit S includes an actuating element or a slidable pin 12 adapted to be operated by any type of condition-responsive device. By way of illustration, I show a pressure or temperature bellows 13 opposed by a range-adjusting spring 14. The bellows and the spring are operatively connected with a pivoted arm 15. The arm 15 is pivoted on a pin 16.

My switch unit includes a base 17 and a cover 18. In the base 17 I mount terminal sleeves 19 and 20 into which are threaded terminal screws 21 for connection with the circuit wires of the circuit to be controlled by the switch unit. The terminal sleeve 20 carries a stationary contact 22. The terminal sleeve 19 carries a bracket 23 to which is secured a spring blade 24. I show a screw 25 for securing the blade to the bracket. The blade carries a movable contact

26 for circuit-controlling coaction with the stationary contact 22.

The blade 24 is adapted to be under tension to bias the movable contact 26 to engage the stationary contact 22. The degree of pressure can be varied by bending the bracket 23, for instance, to the dotted position shown in Figure 4 for increasing the tension. By this means it is a very simple matter at the factory to connect a spring scale with contact 26 and determine its pressure and then change the pressure to whatever is desired by bending the bracket 23 the proper amount in the proper direction.

An armature arm 27 is provided for moving the blade 24. The armature is made of sheet metal with a pair of ears 28 bent downwardly from the sides thereof and pivoted on a pin 29. The pin 29 is carried by ears 30 formed on the bracket 23.

An operative connection is provided between the switch arm 27 and the blade 24 consisting of an enlarged opening 31 in the end of the arm receiving the lower end of the blade (see Figure 4). This connection is of lost-motion type so as to permit positive engagement of the contacts 22 and 26 with each other when the lower end of the armature arm 27 is against a shoulder 32 of the base 17, the shoulder thereby acting as a stop.

Snap action is provided for the switch in the form of a magnet 33. It is imbedded in a socket 34 of the base 17 and retained in the socket by a retainer clip 35. The retainer clip is held in position by the terminal sleeve 20.

An armature 36 is carried by the armature arm 27. It is preferably a disc, screw-threadedly mounted relative to the armature arm so that its proximity to the poles of the magnet 33, when the switch is in the closed position of Figure 4, can be adjusted to thereby change the differential of operation of the switch unit. A leaf spring washer 37 serves as a friction means to retain the differential adjustment after it is once made.

The actuating means 12 is shown as a pin slidably mounted in a bore 38 of the cover 18. A spring 39 is interposed between a projection 40 of the armature arm 27 and the pin 12.

Practical operation

The outer end of the pin 12 has at least three distinct positions indicated as N, CI and CO, in Figures 2, 4 and 5. The N position is normal, as when the actuating arm 15 is free of the switch unit as shown in Figure 1. CI refers to the cut-in position of the switch, and CO the cut-out position. It will be noted that the CI and CO positions are somewhat spaced apart.

Referring to Figure 4, the pin 12 has been moved to cut-out position and as soon as this position is reached the tension of the spring 39 overcomes the magnetic pull of the magnet 33 on the armature 36 thus causing the switch to snap to the open position of Figure 5. The pin 12 may move still further inwardly due to continued contraction of the bellows 13 without accomplishing any result.

When it starts its return movement outwardly, however, it must move beyond the CO position to the CI position before cut-in of the switch will occur. The cut-in position of the pin 12 is shown in Figure 5 and as soon as this position is reached the switch arm 27 will snap from the position shown in Figure 5 to the position shown in Figure 4. It is therefore evident that after cut-

out has occurred there must be some movement of the arm 15 actuated by the condition-responsive element 13 in the reverse direction before cut-in can again occur. This constitutes the differential of operation of the switch unit. By pivoting the switch arm 27 at substantially the center, this movement is made considerable as compared with the movement required in my issued patent.

A further advantage of the substantially central pivoting of arm 27 resides in bringing the pivot to a point where the ends of the switch arm are more evenly balanced, thus preventing vibration from effecting movement of the switch unit from one position to another when it is about ready to swing over as in Figures 4 or 5. Due to the armature 36 making the lower end of the switch arm heavy, the upper end thereof can be formed to counterbalance the armature by increasing its mass. This is most readily done by providing side flanges 41 formed of the sheet metal of the switch arm 27 and located on the opposite side of the pivot from the armature 36.

For manufacturing economy it is obvious that a minimum number of parts have been used, all made possible by the particular arrangement of parts of the switch unit and their cooperation to perform their various functions. For instance, the terminal sleeve 19 serves also as a support for the blade 24 and the pin 29 and the sleeve 20 serves also to connect the retainer 35 and thereby the magnet 33 with the base, in addition to serving as terminals for the circuit wires.

The various features outlined all contribute to production of a switch unit which I have found can be easily and quickly assembled and very satisfactory for many installations. It is also usable with a great variety of condition-responsive elements.

While I have shown a particular embodiment of my invention, it will be understood of course that I do not wish to be limited thereto, since many modifications may be made without departing from the scope of the invention. I therefore contemplate by the appended claims to cover such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. 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 the armature arm, a magnet at one end of said base cooperating therewith to produce snap-acting movement of said armature arm, and an actuating element for transmitting movement from a condition-responsive device to said armature arm.

2. In a switch unit, a base, a stationary contact thereon, a spring blade carried by said base 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 gravity of the armature arm, a magnet cooperating therewith to produce snap-acting movement of

said armature arm, and means for transmitting movement from a condition-responsive device to said armature arm.

3. In a switch unit, a base, a stationary contact mounted thereon, a spring blade mounted on said base and having a movable contact carried thereby and normally constrained to circuit-closing coaction with said stationary contact due to the inherent resiliency of said blade, means for disengaging said movable contact from said stationary contact comprising a switch arm pivoted to said base at substantially the center of gravity of the switch arm, and an actuating element for transmitting movement from a condition-responsive device to said switch arm.

4. In a switch unit, a base, a pair of terminals mounted thereon, a stationary contact carried by one of said terminals, a bracket carried by the other terminal and having an arm and a pair of ears, said arm being bendable independent of said ears, a spring blade mounted on said arm, said spring blade coacting with said stationary contact to close an electric circuit, means for disengaging said movable contact from said stationary contact comprising an armature arm pivoted to said ears, a magnet cooperating therewith to produce snap-acting movement of said armature arm, and an actuating element for transmitting movement from a condition-responsive device to said armature arm.

5. 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 at substantially the center from end to end of the switch arm, said switch arm being formed of material having substantially the same thickness throughout, an armature carried by one end thereof, the other end thereof being widened to provide additional weight to counterbalance said armature, a magnet mounted on said base and cooperating with said armature to provide snap-acting movement of said switch arm, and an actuating element for transmitting movement from a condition-responsive device to said switch arm.

6. In a switch unit, a base, switch contacts mounted thereon, means for separating and engaging said switch contacts relative to each other comprising a pivoted switch arm, the pivot point being at substantially the longitudinal center thereof, said switch arm being formed of material having substantially the same thickness throughout, an armature carried by one end thereof, the other end thereof being widened to provide additional weight to counterbalance said armature across the switch arm pivot, a magnet cooperating with said armature to provide snap acting movement of said switch arm, and means for transmitting movement from a condition-responsive device to said switch arm.

7. In a switch unit, a base, a pair of terminals mounted thereon, a stationary contact carried by one of said terminals, a sheet metal bracket carried by the other of said terminals, a spring blade mounted thereon and carrying a movable contact for circuit-closing cooperation with said stationary contact, said bracket being bendable to change the contact pressure of the movable contact of said blade on said stationary contact, a switch arm for moving said blade and thereby said movable contact relative to said stationary contact, a pivot pin for said switch arm, said bracket having a pair of ears receiving said pin and a cover for said base and the switch mechanism

mounted thereon, said cover retaining said pivot pin in said ears.

8. In a switch unit, a base, a pair of terminals mounted thereon, a stationary contact carried by one of said terminals, a bracket carried by the other of said terminals, a spring blade mounted thereon for circuit-closing cooperation with said stationary contact, said bracket being bendable to change the contact pressure of said blade on said stationary contact and a switch arm for moving said blade and thereby said movable contact relative to said stationary contact.

9. 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 a switch arm pivoted on said base, a magnet to provide snap action for the switch mechanism, said base having a socket to receive said magnet, means carried by one of said terminals for retaining said magnet seated in said socket and an actuating element for transmitting movement from a condition-responsive device to said switch arm.

10. In a switch unit, a base, a stationary contact carried thereby, a spring blade carried by said base and having a movable contact carried thereby coacting with said stationary contact to control an electric circuit, means for engaging and disengaging said movable contact relative to said stationary contact comprising a switch arm pivoted on said base, a magnet to provide snap action for the switch mechanism, said base having a socket to receive said magnet and means for retaining said magnet seated in said socket.

11. In a switch unit, a base, a pair of terminals mounted thereon and spaced longitudinally of said base from each other, a stationary contact carried by one of said terminals, a contact blade extending from said bracket to a position beyond said stationary contact, a movable contact carried by said contact blade and coactable with said stationary contact, an armature arm having a lost-motion connection with the portion of said blade extending beyond said contacts, a stop for said arm in position with said contacts in engagement, a magnet tending to constrain said armature arm to its normal stopped position, said armature arm being pivoted to said base at a point spaced between said terminals, and an actuating element for movement by a condition-responsive element or the like and operatively coacting with said armature arm.

12. In a switch unit, a base, a pair of terminals mounted thereon and spaced longitudinally of said base from each other, a stationary contact carried by one of said terminals, a bracket carried by the other of said terminals and extending away from said stationary contact, a contact blade extending in the opposite direction from said bracket to a position beyond said stationary contact, a movable contact carried by said contact blade and coactable with said stationary contact, an armature arm connected with the portion of said blade extending beyond said contacts, a magnet tending to constrain one end of said armature arm to a position with said contacts engaged and an actuating element for movement by a condition-responsive element or the like and operatively associated with the opposite end of said armature arm.

13. In a switch unit, a pair of spaced terminals, a stationary contact carried by one of said terminals, a bracket carried by the other of said terminals, a contact blade extending from said bracket to a position beyond said stationary contact, a movable contact carried by said contact blade and coactable with said stationary contact, an armature arm having a lost-motion connection with the portion of said blade extending beyond said contacts, means for producing snap action of said armature arm and an actuating element for said armature arm.

14. In the switch unit, a base, a pair of terminals mounted thereon and spaced longitudinally of said base from each other, a stationary contact carried by one of said terminals, a contact blade extending from said bracket to a position beyond said stationary contact, a movable contact carried by said contact blade and coactable with said stationary contact, an armature arm having a lost-motion connection with the portion of said blade extending beyond said contacts, a stop for said arm in position with said contacts in engagement, a magnet tending to constrain said armature arm to its normal stopped position, said armature arm being pivoted intermediate its ends to said base whereby the ends thereof substantially counterbalance each other across the pivot axis, an actuating element for movement by the condition-responsive element or the like and a spring interposed between said armature arm and said actuating element and working in opposition to said magnet.

15. In a switch unit, a base, a pair of circuit-controlling contacts, a contact blade for said contacts, an armature arm having a lost-motion

connection with said blade, a stop for said arm in position with said contacts in engagement, a magnet tending to constrain said armature arm to its normal stopped position, said armature arm being pivoted to said base, an actuating element for movement by a condition-responsive device and a spring interposed between said armature arm and said actuating element and working in opposition to said magnet.

16. In a switch unit, a base, a pair of terminals mounted thereon, a stationary contact carried by one of said terminals, a bracket carried by the other terminal and having an arm and a pair of ears, said arm being bendable independent of said ears, a spring blade mounted on said arm, said spring blade coacting with said stationary contact to close an electric circuit, means for disengaging said movable contact from said stationary contact comprising a switch arm pivoted to said ears, a magnet to produce snap action of said switch contacts and an actuating element for transmitting movement from a condition responsive device to said switch arm.

17. In a switch unit, a base, a stationary contact thereon, a spring blade carried by said base 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 a switch arm pivoted on said base at substantially the center of gravity of the switch arm and means for transmitting movement from a condition responsive device to said switch arm.

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