Oct. 26, 1943. G. M. HAUSLER 2,332,911

SNAP ACTION DEVICE

Filed March 18, 1942

Fig. 1.

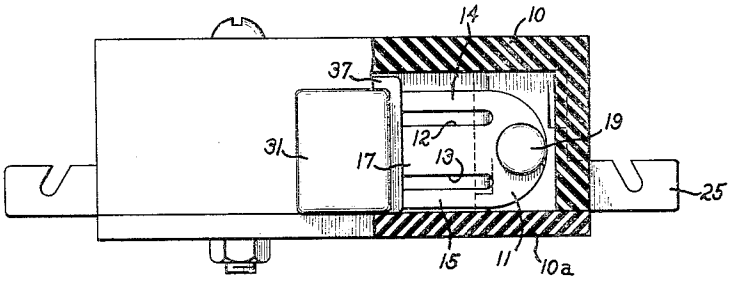


Fig. 2.

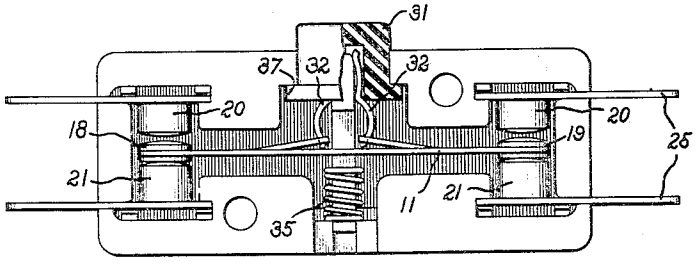


Fig. 3.

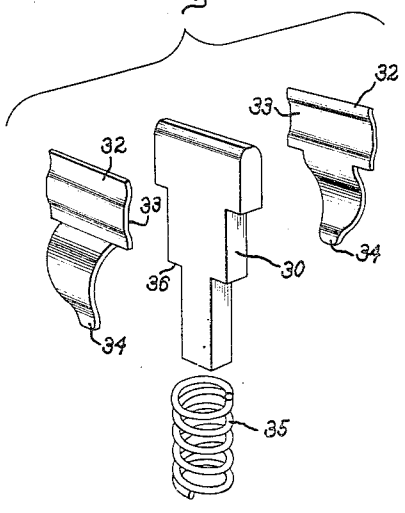


Fig. 4.

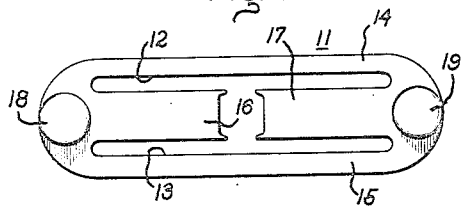
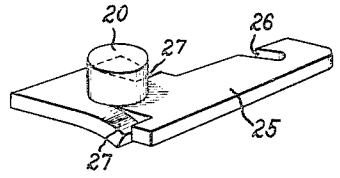


Fig. 5.



Inventor:
George M. Hausler,
by Harry E. Dunham
His Attorney.

Patented Oct. 26, 1943

2,332,911

UNITED STATES PATENT OFFICE

2,332,911

SNAP ACTION DEVICE

George M. Hausler, Ballston Lake, N. Y., assignor to General Electric Company, a corporation of New York

Application March 18, 1942, Serial No. 435,220

8 Claims. (Cl. 200—67)

My invention relates to snap action devices and more particularly to snap acting switches, and the like, and has for its object the provision of a simple, reliable device of this character which has a minimum number of parts and which is inexpensive to manufacture.

In carrying out my invention I utilize a switch member comprising a single unitary strip of spring material slotted to provide a pair of outer tension members and a central pair of spaced apart compression members in opposing relation. The juxtaposed ends of the compression members each engage a supporting and actuating member which is supported for movement in a direction normal to the plane of the strip to move the compression members overcenter with respect to that plane. The outer ends of the strip and the actuating member are provided with suitable stops to limit the movement of the various parts of the device.

Such a device may be built in very small sizes and, when used to actuate the contacts of an electric switch, the switch possesses remarkable interrupting capacity for both alternating and direct current in comparison to its physical dimensions. The switch is suitable for precision work, since movement of the actuating member required to effect circuit-making or circuit-breaking movement of the contacts is quite small and remains substantially constant. For example, in a typical switching device in which the switch member of spring material was approximately one inch in length, the actuating movement was approximately one thirty-second of an inch and was found to be substantially invariable after many thousands of operations. In the device the contact movement was of the order of only one hundredth of an inch, yet this switch successfully interrupted the current of a one-half horsepower stalled rotor capacitor motor thousands of times.

For a more complete understanding of my invention and a further appreciation of its objects and advantages, reference should now be had to the following detailed specification taken in conjunction with the accompanying drawing in which Fig. 1 is a plan view, partly in section, of a snap action electric switch embodying my invention; Fig. 2 is a side elevation, partly in section, of the device shown in Fig. 1 with the cover removed; Fig. 3 is an enlarged and exploded perspective view of various parts of the actuating member; Fig. 4 is a plan view of the resilient snap acting switch member; and Fig. 5 is an enlarged perspective view of one of the stationary contact members of the switch.

Referring now to the drawing, I have shown my invention in one form as applied to a push-button operated snap action switch. The switch is mounted in a casing 10 of suitable configuration which is preferably made of a molded insulating compound and provided with a cover 10a. The switch member itself is a unitary flat strip of spring material 11 slotted at 12 and 13 to provide a pair of outer tension arms 14 and 15 and a central pair of opposing compression arms 16 and 17 in spaced relation. The compression members 16 and 17 are deformable and are formed by dividing a single central arm transversely in the region of its center so that the inner ends of the arms 16 and 17 are in juxtaposed relation. At opposite outer ends of the strip 11 are mounted movable contact members 18 and 19.

In spaced relation adjacent each movable contact member 18, 19 are positioned a pair of fixed contact members 20 and 21. As shown at Fig. 4, each stationary contact, for example, one of the contacts 20, is mounted upon one leg of an L-shaped line terminal and lead-in conductor plate 25. One leg of the terminal conductor 25 is positioned to extend outside the casing 10 and is suitably slotted at 26 for connection of a current-conducting wire. The other leg of the L-shaped plate 25 is cut out at opposite sides thereof and bent to form a pair of resilient ears 27 for frictionally engaging suitable transverse grooves in the casing 10 thereby to position the stationary contacts and hold them firmly in place. Stationary contacts 20 and 21 serve also as stops for limiting the movement of the outer ends of the resilient switch member 11 in both directions normal to the plane of the switch member.

Slidably supported in the casing 10 for rectilinear movement along a line normal to the plane of the switch member 11, I provide an actuating and supporting member in the form of a push-button comprising a shank portion 30, a molded head portion 31, and a pair of bowed spring strips 32. The spring strips 32 are provided with slightly curved base sections 33 arranged for insertion in a suitable slot in the head portion 31 of the push-button along with one end of the shank portion 30. The portions 33 of the springs 32 serve frictionally to attach the head portion 31 to the shank portion 30 of the push-button and to attach the spring strips 32 to the push-button assembly. Each of the spring strips 32 is notched at its lower end, as shown at 34 at Fig. 3 to receive the opposite juxtaposed ends of

the inwardly extending deformable compression members 16 and 17. The spring strips 32 are biased outwardly to apply endwise forces to the members 16 and 17 and bend thereby to spread the members 16 and 17. The portion of the actuator between the juxtaposed ends of the members 16 and 17 is wider than the space between these ends in the plane of the strip. The notched ends of the spring strips 32 provide a pivotal supporting and actuating connection between the actuating member 30, 31, 32 and the resilient switch member 11. It will of course be understood that if desired the springs 32 may be made integral, as in the form of a resilient yoke bridging the gap between the abutting ends of the compression members 16 and 17. The push-button actuating member is preferably biased to the position shown in Fig. 1 by means of a small compression spring 35, one end of which engages a portion of the casing 10, the other end of which engages a shoulder 36 formed on the shank portion 30 of the push-button. The movement of the push-button in both directions is limited by suitable stops. As shown in the drawing, upward movement of the push-button is limited by engagement of a peripheral flange 37 on the head portion 31 of the push-button with the casing 10. Downward movement of the push-button is limited by the limit of compression of the spring 35 between the shoulder 36 and the casing 10.

With the foregoing understanding of the various elements of my invention and their interrelation in an actual operative device, the mode of operation of the device itself will be clear from the following brief description: Referring particularly to Fig. 2, the switch is shown in its normal position with the actuating member 30 biased upwardly and the contacts 18 and 19 in engagement with the lower stationary contacts 21. If now the actuating member 30 is depressed by pushing downwardly upon the head portion 31 of the push-button the compression arms 16 and 17 of the resilient switch member 11 will be forced overcenter with respect to the plane of the tension arms 14 and 15. Such overcenter movement will be accomplished partially by deformation of the spring strips 32 against their outward or spreading bias and partially by deformation of the resilient compression arms 16 and 17 themselves. As soon as the compression arms 16 and 17 are moved overcenter with respect to the plane of the spring strip 11 the outer ends of the spring strip carrying the contacts 18 and 19 will move upwardly with a snap action under the influence of the compression members 16 and 17 and the bowed springs which tend to spread the compression members and force them apart. Some further downward movement of the actuating member 30 may now be permitted to insure positive engagement of the contacts 18 and 19 with the stationary contacts 20. However, such additional downward movement of the actuating member 30 must be limited, as by engagement of the turns of the spring 35 with each other, in order to prevent the actuating member 30 from carrying the entire switch member 11 downwardly with it and reversing the movement of the contacts 18 and 19, thereby to reengage the contact 21.

From the foregoing description of the operation it will be evident that when the head portion of the push-button is released and the actuating member 30 is permitted to move upwardly under the influence of the compression spring 35 the overcenter action of the compression arms 16 and 17 will be similar to that previously described. It is to be noted, however, that the plane of the switch member 11 is now slightly displaced from its former position upon downward movement of the push-button because of the fact that the movable contacts 18 and 19 have moved into engagement with the upper stop 20. Therefore, the dead-center position of the actuating member 30 will be slightly different upon the upward movement than it was upon downward movement. It will of course be evident to those skilled in the art that the device will be fully operative even though the return spring 35 is omitted and that, if desired, manual return means may be provided.

While I have shown a particular embodiment of my invention by way of illustration, it will be understood, of course, that I do not wish to be limited thereto since many further modifications will occur to those skilled in the art. I therefore aim in the appended claims to cover all such changes and 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. A snap action device comprising an integral strip of spring material slotted longitudinally to form a plurality of substantially parallel resilient arms connected together at opposite outer ends of said strip, one of said arms being divided transversely intermediate its ends to provide a pair of spaced apart opposing compression members having their ends in juxtaposition, an actuating and supporting member disposed between the juxtaposed ends of said compression members, said actuating member being wider between said juxtaposed ends of said compression members than the space between said ends in the plane of said strip, means for supporting said actuating member for movement substantially normal to the plane of said strip, means operable in conjunction with the juxtaposed ends of said compression members for pivotally supporting said strip upon said actuating member, and stop means limiting the movement of both outer ends of said strip normal to the plane of said strip.

2. A snap action device comprising an integral strip of spring material slotted longitudinally to form a plurality of substantially parallel resilient arms connected together at opposite outer ends of said strip, at least one of said arms being divided transversely in the region of its center to provide a pair of spaced apart opposing compression members having their ends in juxtaposition, actuating and supporting means for said strip including resilient spreading means disposed between and pivotally engaging the juxtaposed ends of said compression members, means for supporting said actuating means for movement normal to the plane of said strip to move said compression members overcenter with respect to the other arms of said strip thereby to move the outer ends of said strip with a snap action, and stop means for limiting the movement of both outer ends of said strip in both directions normal to the plane of said strip.

3. A snap action device comprising an integral strip of spring material slotted longitudinally to form a plurality of substantially parallel resilient arms connected together at opposite outer ends of said strip, at least one of said arms being divided transversely in the region of its center to provide a pair of spaced apart opposing compression members having their ends in juxtaposition, an actuating and supporting member disposed

between the juxtaposed ends of said compression members, said actuating member being wider between the juxtaposed ends of said compression members than the space between said ends in the plane of said strip, means for supporting said actuating member for movement substantially normal to the plane of said strip, means operable in conjunction with said juxtaposed ends for pivotally supporting said strip upon said actuating member for movement of said compression members overcenter with respect to the other arms of said strip thereby to move the outer ends of said strip in an opposite direction with a snap action, stop means for limiting the movement of both outer ends of said strip in both directions normal to the plane of said strip, and stop means for limiting the movement of said actuating member in both directions to prevent reverse movement of the outer ends of said strip by continued movement of said actuating member.

4. A snap action device comprising an integral strip of spring material slotted longitudinally to form three substantially parallel resilient arms connected together at opposite outer ends of said strip, the central arm being divided transversely at substantially the center thereof to provide a pair of spaced apart opposing compression members having their ends in juxtaposition, actuating and supporting means for said strip including resilient spreading means disposed between and pivotally engaging the juxtaposed ends of said compression members, means for mounting said actuating means for substantially rectilinear movement substantially normal to the plane of said strip to move said compression members overcenter with respect to the other arms of said strip and thereby to cause the outer ends of said strip to move in a reverse direction with a snap action, spaced stop means for limiting the movement of both outer ends of said strip in both directions normal to the plane of said strip, and second spaced stop means for limiting movement of said actuating member in both directions after overcenter movement of said compression members.

5. A snap action device comprising an integral strip of spring material slotted longitudinally to form three substantially parallel resilient arms connected together at opposite outer ends of said strip, the central arm being divided transversely in the region of its center to provide a pair of spaced apart opposing compression members having their ends in juxtaposition, the outer of said arms serving as tension members for overcenter movement in said compression members, an actuating and supporting member disposed between the juxtaposed ends of said compression members, said actuating member including oppositely disposed spring means engaging the juxtaposed ends of said compression members, said spring means providing notches for pivotal engagement of said juxtaposed ends and being biased outwardly in opposite directions to tend to spread said juxtaposed ends, second spring means for biasing said actuating member to a predetermined position, means for mounting said actuating member for movement substantially normal to the plane of said strip and against the bias of said second spring means to move said compression members overcenter with respect to said tension members against the bias of said oppositely disposed spring means and thereby to cause the outer ends of said strip to move in a reverse direction with a snap action, spaced stop means for limiting movement of both outer ends of said strip in both directions, and second spaced stop means for limiting movement of said actuating member in both directions beyond the dead-center positions of said compression members.

6. A snap switch comprising a base, an elongated spring strip provided with at least one longitudinally extending slot and an intermediate transverse slot intersecting said first slot thereby to provide two deformable compression members in opposing relation each having an outer end integral with one end of said strip and having juxtaposed inner ends, an operating member interposed between said inner ends for applying a compressive force to bias said compression members to one side or the other of the plane of said strip, means for mounting said operating member on said base for movement laterally of said spring strip, first stop means for limiting lateral movement of said strip in one direction, second stop means for limiting lateral movement of said operating member in the opposite direction, and switching means actuated by said strip, whereby said operating member normally holds said strip against said first stop means and is movable toward said strip to move said compression members overcenter with respect to the plane of said strip thereby to actuate said switching means with a snap action.

7. A snap switch comprising a base, an elongated strip of spring material provided with two parallel longitudinally extending slots connected by an intermediate transverse slot thereby to provide two spaced apart compression members in opposing relation, said compression members each having an outer end integral with an end of said strip and having their inner ends in juxtaposition, spring means bearing on said inner ends and applying a compressive force to bias said members to one side or the other of the plane of said strip, a switch contact on each end of said strip, a pair of spaced apart stationary contacts mounted on said base for cooperation with said movable contacts, movable stop means limiting the lateral movement of said spring means on the side of said strip opposite said stationary contacts whereby said spring means holds said movable contacts against said stationary contacts, and means for mounting said movable stop means on said base for lateral movement toward said strip thereby to move said compression members overcenter with respect to said strip and to snap said strip away from said stationary contacts.

8. A snap action switch comprising a base, a switch member formed of an integral strip of spring material slotted longitudinally to form three substantially parallel resilient arms connected together at opposite outer ends of said strip, the central arm being divided transversely at substantially the center thereof to provide a pair of spaced apart opposing compression members having their ends in juxtaposition, a movable contact member mounted at each outer end of said switch member, actuating and supporting means for said switch member including resilient spreading means disposed between and pivotally engaging the juxtaposed ends of said compression members, means for mounting said actuating means upon said base for substantially rectilinear movement substantially normal to the plane of said switch member to move said compression members overcenter with respect to the other arms of said switch member thereby to cause said movable contact members to move in a reverse direction with a snap action, a pair

of fixed contacts positioned adjacent said movable contacts on one side of said switch member, said fixed contacts serving as stops to limit the movement of the outer ends of said switch member in one direction, a pair of fixed stops positioned in spaced relation to said fixed contacts on the other side of said switch member to limit the movement of the outer end of said switch member in the other direction, and spaced stop means for limiting movement of said actuating member in both directions after overcenter movement of said compression members.

GEORGE M. HAUSLER.

CERTIFICATE OF CORRECTION.

Patent No. 2,332,911. October 26, 1943.

GEORGE M. HAUSLER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 4, for "members 16 and 17 and bend thereby to spread" read --members 16 and 17 thereby to bend and spread--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 4th day of January, A. D. 1944.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.

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