

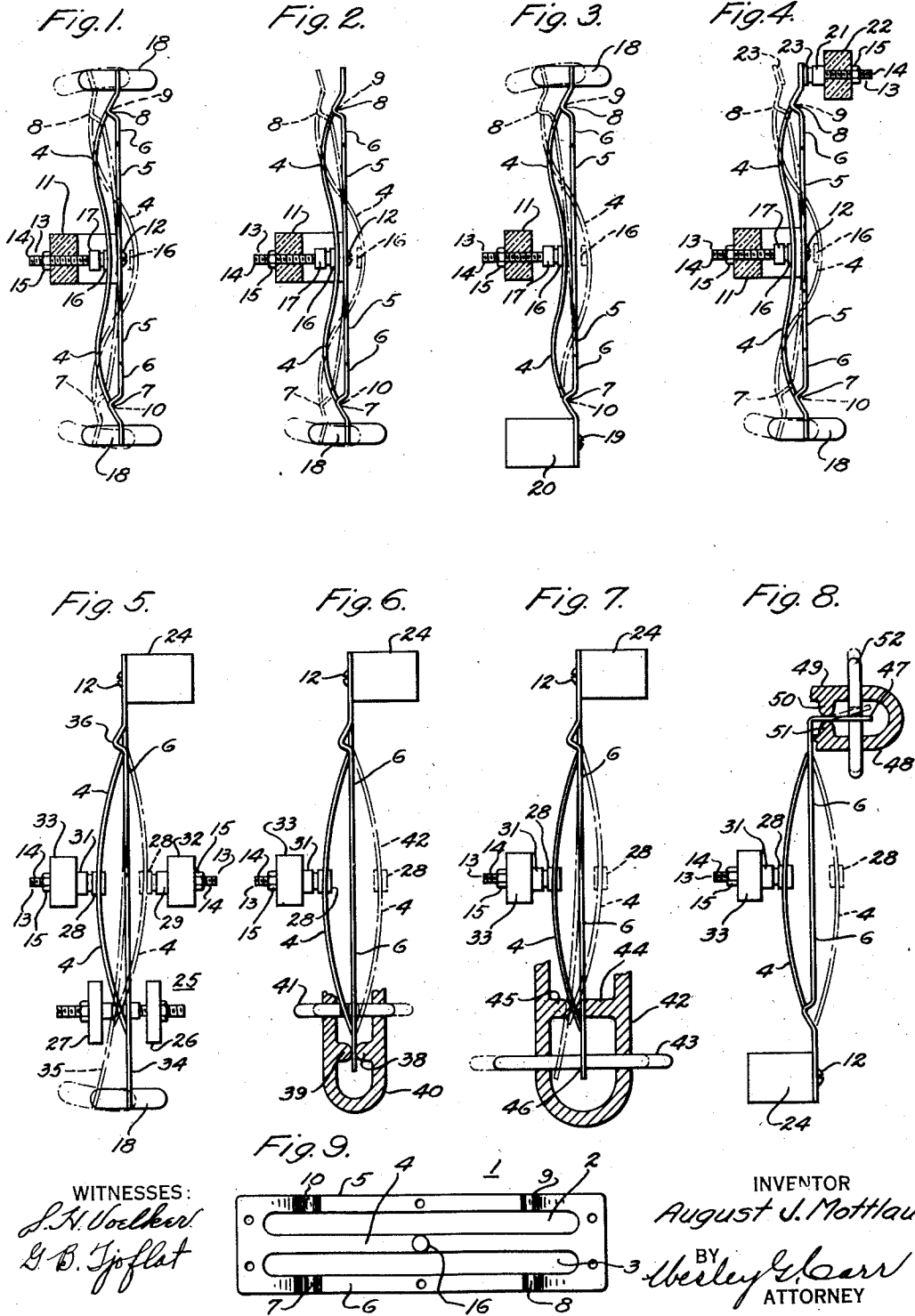
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SNAP SWITCH

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SNAP SWITCH.

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My invention relates to circuit controlling devices and particularly to resilient metallic switches that are adapted to engage or disengage contact members associated therewith with a snap motion.

An object of my invention is to provide an electric switch that may be manufactured from a single piece of material by a simple stamping operation.

Another object of my invention is to provide a switch that shall engage or disengage its contact members positively and quickly with a snap motion.

Another object of my invention is to provide a switch that shall increase the pressure of its contact members until the time of disengagement thereof.

Another object of my invention is to provide a switch that is manually operable to engage or disengage its contact members.

Another object of my invention is to provide a switch that may be operated manually to disengage its contact members and that operates automatically to re-engage the contact members.

In the single sheet of drawings.

Fig. 1 is a side view of a switch embodying my invention;

Fig. 2 is a side view of modification of the switch illustrated in Fig. 1;

Fig. 3 is a side view of a second modification;

Fig. 4 is a side view of another modification;

Fig. 5 is a still further modification in which the movable contact member is adapted to selectively engage a pair of contact members;

Fig. 6 is a side view of the switch illustrating a particular means for operating the switch illustrated in Figs. 1 to 5, inclusive;

Fig. 7 is a still further modification, illustrating modified means for operating the switch;

Fig. 8 illustrates a further modified means for operating the switch, and

Fig. 9 is a plan view of the operative portion of the switch embodying my invention.

My invention comprises, in general, a resilient metallic frame 1, having apertures

2 and 3 therein. The apertures 2 and 3 are separated by a bridging member 4 which is preferably integral with the frame portion 1. The frame 1, having the apertures 2 and 3 therein, may be made from a single rectangular sheet of metal, preferably spring steel, and the bridging member 4 therein may be made integral with the sheet by leaving a portion of the metal of said plate between the apertures 2 and 3. The frame 1 may have one or more apertures therein as desired.

In order that my device shall be operable, it is necessary that the bridging member 4 shall be longer than the apertures 2 and 3. In order to make the relative length of the bridging member 4 greater than the lengths of the apertures 2 and 3, side portions 5 and 6 may be deformed, as illustrated by the portions 7, 8, 9 and 10 of Figs. 1 to 4, inclusive and Fig. 9.

In Fig. 1, I have shown one form of mounting the switch member 1 in an operative position. The side portions 5 and 6 are suitably secured to an insulating member 11 as by screws 12, only one of which is shown in the drawing. A terminal member 13 is secured to the insulating member 11 and is adjustable by reason of the screw-threaded portion 14 and the nut 15. A contact member 16 is mounted on the bridging member 4 and is made to normally engage a contact member 17 mounted on the terminal member 13.

Suitable handle members 18 are attached to the ends of the switch member 1 and are effective to transmit a bending moment and an increased compressive force to the bridging member 4 through the agency of the side members 5 and 6 thereof by pressing on the handle members 18 in a direction normal to the plane of the member 1. By pressing the members 18 to the left, as viewed in Fig. 1, to the position illustrated by the dot-and-dash lines, the contact member 16 will be caused to disengage the contact member 17.

If the handle members 18 are pressed to the left to the position indicated by the dot-and-dash lines, the bridging member 4 is

subjected to stresses tending to change the curvature of the bridging member, and as the center line of the ends of the plate 1 approaches the contact member 16, the portion of the bridging member on which the contact member 16 is secured reaches a state of unstable equilibrium.

While in a state of unstable equilibrium, the bridging member 4 is subjected to a compressive force extending longitudinally thereof. But on moving the handle members 18 further toward the position illustrated by the dot-and-dash lines, a condition is reached when the increasing bending moment applied to the member 4 causes it to disengage the contact members 16 and 17 with a snap motion. The snap motion is produced by the stored energy of the compressive force and the bending moment to which the member 4 is subjected while in the state of unequal equilibrium. Accordingly the switch operates substantially as an over-center device except that the application of bending moments to the bridging member renders it unnecessary for the plate to be actuated across the center line of the bridging member, as would otherwise be necessary.

In Fig. 2, I have illustrated a modification of the device illustrated in Fig. 1 with the exception that only one handle member 18 is illustrated. The operation of the device illustrated in Fig. 2 is substantially similar to the operation of the device illustrated in Fig. 1.

In Fig. 3, I have shown a different method of mounting the switch structure 1, and in this particular case the switch member 1 is mounted at one end 19 thereof and is suitably secured to a fixed supporting member 20. The contact members 16 and 17 are made to assume an engaged or disengaged position by pressing on the handle member 18 to assume the one or the other of the positions respectively indicated by the dot-and-dash and the full lines.

In Fig. 4, I have illustrated the switch structure as being mounted on, and suitably secured to, the insulating member 11 at substantially the central portion of the switch structure 1. In this particular embodiment of my invention, I have provided two stationary contact members 17 and 21. The contact member 17 is adjustably secured to the insulating member 11 substantially in the same manner as the contact member 17 is secured to the member 11 of Fig. 1. The contact member 21 is suitably secured to an insulating member 22. A contact member 23 is mounted at one end of the switch structure 1 and an operating handle 18 is secured to the other end. By pressing on the operating handle 18 in a direction normal to the plane of the switch structure 1,

the contact members 16 and 23 will be caused to assume their disengaged position 5, because of the change in curvature of the member 4 as illustrated by the dot-and-dash lines.

In Fig. 5, I have illustrated the switch structure 1 as being supported by an insulating member 24, to which it is suitably secured at one end, and at the other end is provided with an operating mechanism 25, comprising a pair of adjustable stationary members 26 and 27 and a handle member 18. The bridging member 4 is provided with a double contact member 28 which is adapted to selectively engage a pair of stationary contact members 29 and 31 which are suitably secured to insulating members 32 and 33. The members 26 and 27 are located on each side of the bridging member 4 at the handle portion of the switch structure 1. By pressing the handle member 18 to the left in a direction normal to the plane of the switch structure 1, the end portion 34 of the switch structure 1 will assume the position 35, as illustrated by the dot-and-dash lines, and the resultant movement of the bridging member 4 causes the contact members 28 and 31 to become disengaged and the engagement of the contact members 28 and 29. Upon pressing the handle 18, to the right, the switch assumes its original position.

In the particular modification shown in Fig. 5, only one end of the switch structure 1 is deformed, as illustrated by a deformed portion 36. The portion of the bridging member 4 located between the members 26 and 27 does not move appreciably except to allow the member to move freely without binding and in this case, it is the combined bending moment and a compressive force which causes the bridging member 4 to change its curvature and to engage the contact members 28 and 29, as illustrated by the dot-and-dash lines.

In Fig. 6, a further modification of the means for operating the bridging member 4 of the switch structure 1 is illustrated. The switch structure 1 is supported by the member 24 and is suitably secured thereto as by a screw 12. The other end of the switch structure 1 is positioned between a pair of projections 38 and 39 of an operating structure 40. A pin member 41 projects through the member 40 and is operatively secured to the bridging member 4 in any suitable manner. By pressing the pin 41 to the right, as shown by the dot-and-dash lines, in a direction normal to the plane of the switch structure 1, the bridging member 4 is caused to assume the dot-and-dash position 42, thereby disengaging the contact members 28 and 31. Upon pressing the pin 41 to the left, the bridging member effects

the engagement of the contact members 28 and 31.

In Fig. 7 I have illustrated a further modification of the operating mechanism for the switch structure 1. A member 42 is provided with a pin member 43 and integral lug members 44 and 45. The lug members 44 and 45 are positioned on both sides of the bridging member 4 and the pin member 43 is operatively secured to the end of the switch structure 1 at 46. By moving the pin member 43 to the right or to the left in a direction normal to the plane of the switch structure 1, the contact members 31 and 28 may be made to engage or disengage each other, as desired.

In Fig. 8 a further modification of the operating mechanism for the switch structure 1 is illustrated. In this particular embodiment of my invention one end of the switch structure 1 is secured to a supporting member 24 by a screw member 12. At the other end of the switch structure 1 a portion 47 thereof is bent substantially at right angles to the plane of the switch structure 1.

A switch operating mechanism 48 is provided which comprises a portion 49 having a pair of lugs 50 and 51 located on both sides of the member 47 and a pin member 52. The pin member 52 is operatively secured to the portion 47 and is free to move through the portion 49. By pressing downwardly on the pin member 52, the bridging member 4 may be caused to move from its dot-and-dash line position to engage the contact members 28 and 31. By pressing upwardly on the pin member 52, the contact member 28 may be caused to assume its disengaged position.

The particular embodiments of the switch structures illustrated in Figs. 1 to 8, inclusive, may be used for interrupting an electric circuit. One terminal of the switch may be considered as the terminal member 14 and the other terminal of the switch may be considered as either of the portions 5 and 6 of the switch structure 1 or the other terminal may be considered as the portion of the switch structure 1 which is attached to a rigid support 24, as illustrated in Figs. 5 to 8, inclusive. In Fig. 4, I have illustrated a double contact mechanism wherein an electric circuit may be caused to be broken at two points, that is, between the contact members 15 and 16 and between the contact members 21 and 23.

The device embodying my invention, as illustrated in Figs. 1 to 9, inclusive, is similar to a switch mechanism that is operated by an over-center spring, a mechanism which is well known in the art. By punching out the pair of apertures 2 and 3, as illustrated in Fig. 1, a bridging member 4 remains which separates the two apertures from each

other and which is also integral with the plate. By bending certain portions at the sides of the apertures, as illustrated at the points 7, 8, 9 and 10 of Fig. 1, or at one end only at the points 8, 9 as illustrated in Figs. 5 to 8 the sides of the apertures 2 and 3 on the plane of the switch structure 1 are caused to shorten relatively to the length of the bridging member 4. Since the effective length of the sides of apertures have been shortened, the bridging member 4 is caused to assume a deflected position similar to the position of a beam that is supported at both ends and is uniformly loaded between the supports.

By providing a terminal member 12, which is secured to a support 11, as illustrated in Figs. 1 to 8, inclusive, the member 4 is prevented from deflecting further upon further bending of the sides of the apertures 2 and 3. By bending the sides of the switch structure 1 in a direction normal to the plane thereof, an end pressure is imposed on the bridging member 4. When the pressure has reached a certain point, the center line of the bridging member 4 extends substantially through the contact members 15 and 16, illustrated particularly in Fig. 1, and on further bending, the pressure on the bridging member 4 will be so distributed that it will be caused to bend in the opposite direction, as illustrated by the dot-and-dash lines of the figures.

While I have described the switch structure 1 as being manufactured from a single piece of sheet metal, it may be constructed satisfactorily from independent strips of sheet steel riveted together to form substantially the structure illustrated in Fig. 9.

I may also construct the switch structure 1 from a single piece of sheet metal by punching out only one aperture and by deforming only one side thereof. In this particular form, the undeformed or longer side serves as the bridging member 4.

Further modifications may be made without departing from the spirit and scope of my invention. I desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art.

I claim as my invention:

1. An electric switch comprising a resilient frame having an aperture therein and a resilient bridging member integral with said frame for bridging said aperture, said bridging member being substantially longer than the aperture.

2. An electric switch comprising a resilient frame having an aperture therein and a resilient bridging member integral with said frame for bridging said aperture, the length of said bridging member differing from the length of said aperture.

3. An electric switch comprising a resil-

ient frame having an aperture therein and a resilient bridging member secured to said frame for bridging said aperture, said bridging member being substantially longer than said aperture and adapted to pass there-
5 through with a snap motion upon the bending of said frame.

4. An electric switch comprising a resilient metal plate having an aperture therein and a bridging member extending across
10 said aperture, said bridging member being integral with said plate, and substantially longer than said aperture and adapted to pass therethrough with a snap motion upon
15 the bending of said frame.

5. An electric switch comprising a resilient plate having an aperture therein, and a resilient bridging member integral with said
20 plate extending across said aperture, portions of said plate at the sides of the aperture being deformed laterally from the plane of the plate for causing the relative lengths of said bridging member and said aperture
25 to be unequal.

6. An electric switch comprising a metal plate having an aperture therein and a bridging member, integral with said plate,
30 extending across said aperture, the sides of said aperture extending unidirectionally with said bridging member being deformed laterally from the plane of the plate for causing the relative lengths of said aperture and said bridging member to be unequal.

7. An electric switch comprising a resilient plate having a slot therein, a portion of said plate at one side of the aperture being deformed for causing the side opposite
35 to have an initial flexed position.

8. An electric switch comprising a resilient plate having a pair of apertures therein, said apertures being separated from each other by a portion of said plate, the portions of the plate at the sides of said apertures being deformed laterally from the
45 plane of the plates for causing the relative lengths of the portion separating said apertures and of the apertures to be unequal.

9. An electric switch comprising a metal plate having an aperture therein, the side portions of said plate being deformed laterally from the plane of the plate, and a bridging member extending across said
50 aperture and caused by the deforming of said plates to curve laterally from the plane of said plate, the amount of deformation in the side portion differing from the amount of departure of the bridging member.

10. An electric switch comprising a resilient plate having an aperture therein, a resilient bridging member having a contact member mounted thereon, said bridging member being integral with said plate and
65 extending across said aperture and being

substantially longer than said aperture, means for holding a portion of said plate fixed relatively to the bridging member, a stationary contact member mounted on said means normally in engagement with said other contact member, and means located at the ends of said plate for actuating the sides of said plate laterally of its plane in one direction to effect a deflection of the bridging member in the opposite direction thereby causing said bridging member to be disengaged from said stationary contact member.

11. An electric switch comprising a resilient plate having an aperture therein, a curved bridging member extending across
80 said aperture, said bridging member being integral with said plate, means for holding portions of said plate fixed relatively to other portions thereof and to the bridging member, and means for changing the curvature of said bridging member to cause a portion thereof to pass through said aperture with a snap motion.

12. An electric switch comprising a resilient plate having an aperture therein, a bridging member extending across said
90 aperture, said bridging member being integral with said plate, means for holding a portion of said plate fixed relatively to the bridging member and means for applying a bending force to said plate to deform said bridging member and for causing it to pass through said aperture with a snap motion.

13. An electric switch comprising a resilient metal plate having an aperture therein, a resilient bridging member integral with
100 said plate extending across said aperture, said bridging member being substantially longer than the aperture, means for holding portions of said plate fixed relatively to other portions thereof and to the bridging member, and means for deflecting one end of said plate laterally of the plane thereof to cause said bridging member to pass
110 through the aperture with a snap motion.

14. An electric switch comprising a resilient metal plate having an aperture therein, a resilient bridging member of greater length than said aperture extending there-
115 across, means for holding one end of said plate fixed, means for holding the bridging member fixed at the other end of said plate, and means for bending the end of said plate for causing said bridging member to pass through said aperture with a snap motion.

15. An electric switch comprising a resilient metal plate having an aperture therein, a resilient bridging member of greater length than said aperture extending there-
125 across, means for holding one end of said plate fixed, means for holding the other end of said plate fixed relatively to the end of the bridging member adjacent thereto and means for applying a force to said bridging

member to cause said member to pass through said aperture with a snap motion. portion of said plate to cause said bridging member to pass through said aperture with a snap motion. 1

16. An electric switch comprising a resilient plate having an aperture therein, a bridging member of greater length than said aperture extending thereacross, means for holding said plate and means for bending a

In testimony whereof, I have hereunto subscribed my name this 6th day of March, 1926.

AUGUST J. MOTT LAU.