

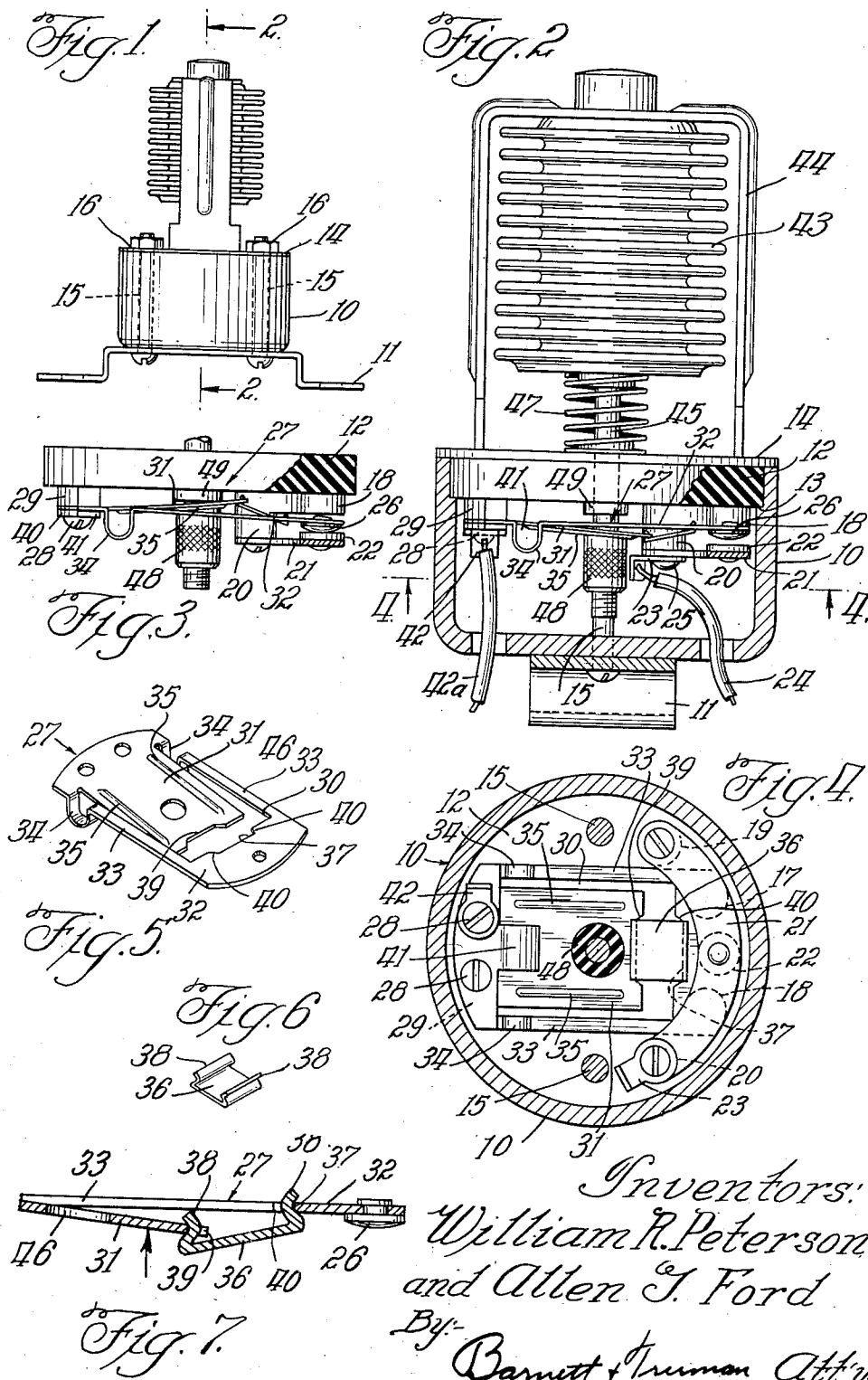
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SNAP ACTION SWITCH

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SNAP ACTION SWITCH

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This invention relates to certain new and useful improvements in a snap action switch.

A principal object is to simplify the structure of snap action switches, whereby the several parts thereof may be assembled in compact arrangement and whereby the operating parts may be made more durable from relatively thin metal strips and at the same time maintain the desired sensitivity in operation.

Another object is to provide a novel arrangement and construction whereby the switch may be normally operated in one direction by a slowly moving actuating means and will return to its initial position by the resilient reaction of the parts.

Another object of the invention is to provide a simplified structure which will be adapted to be actuated by a temperature responsive element and to provide in this connection means for adjustment whereby the movable members of the switch may be moved from one position to another at any desired temperature, the movable members being held by spring pressure in both their open and closed positions.

Other objects and advantages of the invention will be more apparent from the following detailed description of one preferred embodiment of the invention shown in the accompanying drawing.

In the drawing:

Fig. 1 is a view in elevation, drawn in full size scale, of one preferred form of switch, constructed in accordance with this invention.

Fig. 2 is an enlarged view, partly in section, along line 2-2 of Fig. 1 and illustrating the positions of the movable parts of the switch device when it is in its normally open position.

Fig. 3 is a fragmentary view of the lower portion of Fig. 2 illustrating the positions of the movable parts of the switch device when it is in its open position.

Fig. 4 is a bottom plan view of the structure shown in Fig. 2, the said view being taken on line 4-4 of Fig. 2.

Fig. 5 is a view in perspective of one of the elements of the switch structure.

Fig. 6 is a view in perspective of the rocker member which is adapted to be inserted between the inner and outer spring leaves of the member shown in Fig. 5; and

Fig. 7 is a further enlargement of a portion of the movable contact member shown in Fig. 2.

The invention as herein shown comprises a cylindrical cup shaped casing 10 adapted to be secured or mounted in any desired location. Such mounting of the casing is facilitated by the pro-

vision of an attaching bracket 11 secured to the bottom of the casing. A switch panel 12 of suitable insulating material is formed to fit the upper end of the casing. Preferably the panel 12 rests upon offset shoulders 13 formed in the inner surface of the casing near the upper edge thereof, the panel being of such thickness that its upper surface lies flush with the upper edge of the said casing. A top plate 14 fits over the said panel with its outer edges resting upon the upper edges of the casing 10. The casing 10, attaching bracket 11, switch panel 12 and top plate 14 are clamped together in assembled relation by means of suitable screw bolts 15-15 which extend through the several members above mentioned. The reference numeral 16 designates the nuts threaded on the upper ends of the bolts 15.

The under-face of panel 12 is formed with downwardly extending lugs 17-18. These lugs are preferably formed with further extensions 19-20 to which an arcuate shaped bridge member 21 is secured. A fixed contact 22 is centrally mounted on the bridge member. A terminal clip 23 for a line wire 24 is clamped to one end of said bridge member by means of an attaching screw 25.

Cooperating with the said fixed contact 22 is a movable contact 26 which is secured to one end of a flexible spring member, designated generally by the reference numeral 27. The other end of said spring member is clamped by screws 28 to a lug 29 depending from the said switch panel. The switch member 27 is preferably, though not necessarily, formed from a single strip of metal by punching therein a substantially U-shaped slot 30 to form, in effect, an inner spring leaf 31 and an outer spring leaf 32. The said outer leaf or contact carrying arm includes side members 33-33 which are relatively narrow so that they will be more flexible than the inner leaf or actuating arm 31. The side members 33-33 are bowed outwardly from the face of the strip, preferably downwardly, as shown at 34-34 so as to move the free end portions of the outer leaf 32 toward the free end of the inner leaf 31. The said bowed portions 34-34 provide resiliency whereby the outer leaf may be extended and retracted in the direction of its length for the purpose hereinafter described. The inner spring leaf 31 of member 27 is preferably formed with stiffening and reinforcing corrugations 35 so that it will maintain its proper shape during long periods of service and also prevent undue buckling during the operation of the switch. The inner leaf 31 is also preferably bent

downwardly at an angle to the plane of the outer leaf, as indicated in Figs. 2, 5 and 7 so that the inner and outer leaves will normally stand at an angle to each other, as indicated in Figs. 2, 5 and 7, when the contacts 22 and 26 are in the open positions shown in Fig. 2. A substantially rigid rocker member 36 is interposed between the free end of the inner spring leaf 31 and the inner edge 37 of the free end of the outer spring leaf 32. The rocker member may be formed from the metal removed from the wide portion of the U-shaped slot. The opposite ends of the rocker member are bent to form angular flanges 38—38 which engage over the adjacent edges of the inner and outer spring leaves 31—32. These edges of the spring leaves are notched, as shown at 39—40, to hold the rocker member in proper position.

The combined length of the inner spring leaf 31 and the rocker member 36 are greater than the length of the side members 33 of the outer spring 32. That is to say, they are greater than the distance from the fixed end portion of the outer leaf to the point of its connection with the rocker member. Consequently, when the rocker member is inserted in its operative position, the bowed portions 34—34 of the side members are expanded and therefore tensioned. The said bowed portions are always under some tension so that in one position of the movable switch the free end of the spring leaf 32 is held resiliently against the under surface of lugs 17—18 and when in closed position the contacts 22—26 are held together by sufficient resilient action to prevent rebound of the movable contact when it strikes the fixed contact and to prevent displacement or separation of the contacts by normal vibration. A stop member 41 is secured to the lug 29 of the switch panel so as to engage the under surface of the inner spring leaf 31 and thereby limit the downward movement of this leaf. A terminal clip 42 for line wire 42^a may be clamped in position by one of the screws 28.

It will be seen that by applying force upwardly against the lower surface of the actuating arm, when the switch is in the position indicated in Figs. 2 and 7, the force is transmitted through the rocker member 36 with a toggle like action while the free end of the spring 32 or contact carrying arm remains bearing against the bottom surface of the lugs 17—18. This pressure, therefore, spreads or expands the bowed portions 34—34 so as to elongate the spring-leaf 32 and provide the normal tension for resiliently holding the movable contact arm against the said stop lugs 17—18. The application of increased upward pressure to the inner leaf 31 imparts upward movement thereto. When this upward movement passes through a critical point or dead center, the tension in the bowed portions 34—34 will cause the contact carrying arm 32 to snap downwardly to the closing position indicated in Fig. 3. The said spring action of the portions 34—34 also impart a retracting or rearward movement to the said arm 32 and therefore cause the movable contact 26 to engage the fixed contact 22 with a wiping action. Preferably the tension in the reinforced inner leaf or actuating arm 31 is sufficient to return it to the normal position of Fig. 2 as the operating upward pressure thereon is relieved. During the relief of said operating pressure, the said inner leaf will gradually return toward its lower position. When it again passes the critical or dead center

position on its downward movement, the leaf spring 32 will snap upwardly to open the contacts of the switch.

It will be observed that the rocker member 36 engages the outer spring leaf in close relation to the contact 26 and stands at such angle as to transmit the desired contact pressure with a minimum linear tension on the operating parts. It will also be observed that with the arrangement of the rocker member 36 herein shown, the operating pressure is applied to the outer leaf 32 in close relation to the contact 26, whereby flexing of the leaf 32, due to internal impact or vibration, is induced to a minimum.

The pressure for operating the switch is applied to the inner leaf 31 by means of a temperature responsive element 43. This member, in the present embodiment, is supported on a yoke member 44, the ends of which are secured to the top plate 14 in any suitable manner. A rod 45 is secured to the lower portion of the bellows and extends through the top plate 14, the switch panel 12, and through an opening 46 in the inner spring leaf 31. A coil spring 47 surrounding the rod 45 is interposed between the bottom portion of the bellows and the said top plate 14 of the casing. A knurled adjusting nut 48 of insulating material is threaded on the lower end of the rod 45 to bear against the lower surface of the inner spring leaf 31 of the switch. A relatively slight contraction of the thermostatic bellows 43 from the position indicated in Fig. 2 will actuate the switch to close contacts 22—26. The return of the thermostatic bellows to the position indicated in Fig. 2 will permit the reflex movement of leaf 31 to operate the leaf 32 in a direction to open the contacts 22—26.

It will be observed that when the inner leaf 31 has been forced upwardly past the critical dead center position, its further upward movement is limited by reason of its contact with a boss 49 formed on the switch panel. Consequently, any further upward pressure exerted by the thermostatic bellows will not unduly flex the inner spring leaf 31. However, during the opening movement of the switch the thermostatic bellows 43 may expand beyond the position of Fig. 2, in which event, the adjusting nut 48 will merely move downwardly from the spring leaf 31.

While the invention is illustrated in one specific embodiment it will be understood that the invention is not to be limited to the specific construction shown and described except insofar as specific limitations appear in the appended claims.

We claim:

1. A snap action switch comprising a fixed contact, a movable contact for wiping engagement with said fixed contact and including a contact supporting arm one end of which is supported in fixed position and the free end of which is transversely flexible and resiliently extensible in the direction of its length, an actuating arm therefor having one end supported in fixed position and the other end movable from one side to the other of the plane of said contact supporting arm, and a relatively stiff rocker member hingedly engaging the free end portions of said contact supporting arm and said actuating arm: the combined lengths of the movable portion of said actuating arm and said rocker member being greater than the distance between the fixed end portion of said contact supporting arm and the point of its connection with said rocker member.

2. A snap action switch comprising a base panel, a fixed contact, a movable contact for wiping engagement with said fixed contact and including a leaf member one end of which is fixed to said panel and the free end of which is transversely flexible and resiliently extensible in the direction of its length, an actuating arm having an end secured to said panel with its free end adapted to move from one side to the other of the plane of said leaf, and a relatively rigid rocker member hingedly engaging the free end portions of said leaf and said actuating arm; the combined lengths of said arm and said rocker member being greater than the distance between the fixed end of said leaf and the point of its connection with said rocker member.

3. A snap action switch comprising a base panel, a fixed contact, a movable contact for wiping engagement with said fixed contact and including a leaf member, one end of which is fixed to the panel and the free end of which is provided with portions bowed outwardly from a face of the leaf to provide lengthwise resilience adapted to effect said snap action and said wiping engagement, a resilient actuating arm having greater resilient force than said leaf and fixed at one end to said panel, an actuating arm having one end secured to said panel with its free end adapted to move from one side to the other of the plane of said leaf, and a relatively rigid rocker member hingedly engaging the free end portions of said leaf and said actuating arm; the combined lengths of said arm and said rocker member being greater than the distance between the fixed end of said leaf and the point of its connection with said rocker member whereby said leaf is tensioned in the direction of its length by movement of the actuating arm toward the face plane of the leaf.

4. A snap action switch comprising a base panel, a fixed contact, a movable contact for wiping engagement with said fixed contact and including a leaf member, one end of which is fixed to the panel and the free end of which is provided with a U-shaped aperture therein defining flexible arm portions of the leaf at the side of said aperture, the said side portions being bowed outwardly from one face of the leaf to provide it with lengthwise resilience to effect said snap action and said wiping engagement, a resilient actuating arm having greater resilient force than said leaf secured to said panel adjacent the fixed end of said leaf with its free end adapted to move from one side to the other of the plane of said leaf, and a relatively rigid rocker member having an interlocked rocking engagement with the free end portions of said leaf and

said actuating arm; the combined length of said arm and said rocker member being greater than the distance between the fixed end of said leaf and the point of its connection with said rocker member.

5. A snap action switch comprising a fixed contact, a movable contact for wiping engagement with the fixed contact and including a metal strip having a U-shaped aperture therein defining outer and inner spring leaf portions, the latter of which is bent to extend at an angle to the plane of the outer leaf portion, formed with pressed stiffening corrugations and adapted to be flexed from one side to the other of the plane of said outer leaf and the side portions of the outer leaf defined by said aperture being formed with bowed portions to provide the outer leaf with lengthwise resilience adapted to effect said snap action and said wiping engagement, and a relatively stiff rocker member hingedly engaging the free ends of said inner and outer leaves; the length of said rocker member being such that the said inner and outer leaf members are held normally under tension.

6. A snap action switch comprising a base panel, a fixed contact supported in spaced relation to said panel, a movable contact carried on a flexible member and adapted to move into and out of engagement with the fixed contact with a wiping movement, said flexible member comprising a spring metal strip having a U-shaped aperture defining inner and outer spring leaves united at one end, the inner leaf being bent at an angle to the plane of the outer leaf and formed with reinforcing corrugations and adapted to be flexed from one side to the other of the plane of the outer leaf but is normally biased to a position at one side of the plane of the outer leaf, means for fixedly attaching the united ends of said leaves to said panel, stop means for limiting the movement of the inner leaf and for supporting it in its normal position, means on the panel providing stops for the movable ends of said leaves, and a relatively stiff rocker member connecting the free end portions of said leaves whereby the tension in the inner leaf is transmitted to the outer leaf, the side portions of the outer leaf defined by said aperture being provided with portions bowed outwardly from the plane of the leaf to provide it with lengthwise resilience, whereby the leaf is extended and contracted lengthwise during the movement of the inner leaf from one extreme position to its other.

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