July 25, 1939. G. H. BUGENHAGEN 2,167,543

ELECTRIC SWITCH

Filed Aug. 23, 1937

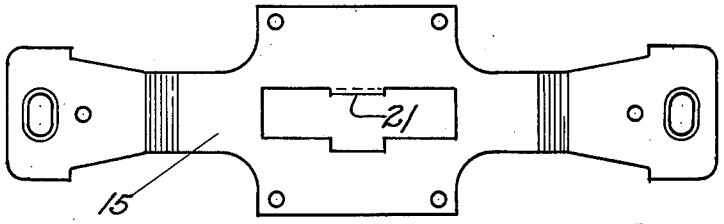


Fig. 3

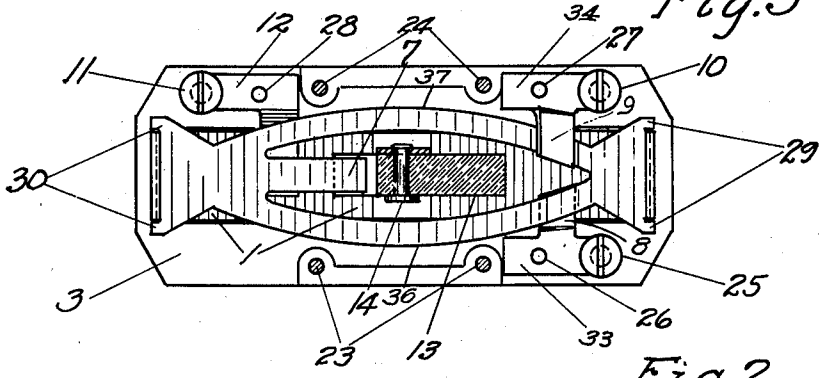


Fig. 2

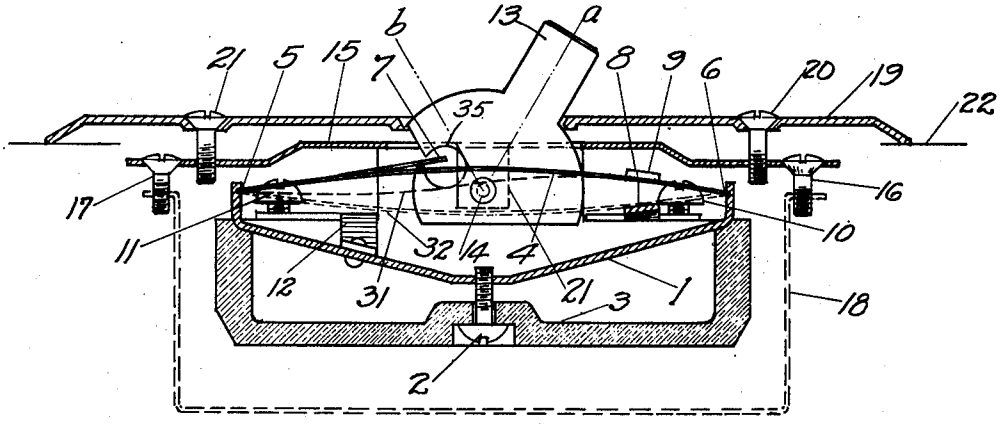


Fig. 1

INVENTOR.

G. H. Bugenhagen

Patented July 25, 1939 2,167,543

UNITED STATES PATENT OFFICE

2,167,543

ELECTRIC SWITCH

George H. Bugenhagen, Minot, N. Dak.

Application August 23, 1937, Serial No. 160,422

3 Claims. (Cl. 200—67)

The objects of my invention are: First, to provide a switch having a strutlike flexible spring member incorporating S-shaped or reverse flexure in the reversing operation of said flexible spring. Second, to provide a switch that is simple in operation and constructed of few parts. Third, to provide a switch that can be used for single or three-way circuits. Fourth, to provide a switch that has an adjustable spring tension member that is easily removed and replaced. Fifth, a switch that can be constructed to occupy small space and operated with less noise. I attain these objects in the device described in these specifications and as shown in the accompanying drawing, in which:

Fig. 1 is a longitudinal section, showing the flexible spring member in its raised position with the cantilever extension spring operatively engaging the operating lever, also means for adjustment of tension in the flexible member. Fig. 2 shows a plan view of the switch with the supporting plate and cover plate removed. Fig. 3 shows a top view of the supporting plate by which the switch assembly is fixed in an operative position.

Referring to the drawing, the supporting frame 1 is positioned in the cavity of a suitable insulator 3, said frame resting at the ends thereof on said insulator and held in an adjustable position by the adjusting screw 2. The flexible spring reversing member 4 pivotally supported in the grooves 5 and 6 of the supporting frame 1 is formed into separated bands 36 and 37 as shown in Fig. 2, the cantilever spring extension 7 fixed to the flexible member extends into the cavity 35 of the operating lever 13, for the purpose of operatively engaging the said spring-tension, the said lever is pivoted on the pin 14, the said pin provided with a swaged riveting end to provide operating clearance for the operating lever 13 is fixed by riveting aforesaid swaged end of the said pin to the lip 21 of the supporting plate 15, the said supporting plate being anchored to a suitable metal outlet box 18 by the screws 16 and 17, and serves as a support for the insulator block 3, which block is fixed thereto by the screws 23 and 24, see Fig. 2.

The supporting members 33 and 34 supporting the contact points 8 and 9 respectively are fixed to the contact supporting members 33 and 34 respectively and said supporting members fixed to the insulator 3 by the screws 26 and 27 respectively, see Fig. 2. Each contact is provided with a wiring terminal binding screw 10 and 25 respectively. The contact points 8 and 9 are positioned at opposite sides of the flexible member 4, separated so that the flexible member can contact only one point at a time. A live wire terminal lead 12 is fixed to the insulator block by the screw 28 and a lead extended to and fixed to the supporting frame member 1 as shown, the other end of the lead 12 is provided with a binding post wiring terminal 11, to which a live wire may be attached. Electric current supplied thru the lead 12 flows thru the supporting frame 1, the flexible member 4 and either of the contacts 8 or 9 that may close the circuit. The extension lips 29 and 30 keep the flexible member in its proper position in the supporting frame and in alignment with the operating lever 13, and maintain the required insulating clearance. The typical cover plate 19 is shown here only as its relations are adapted to the operating lever 13, it is held in its normal position by the screws 20 and 21.

The reversed position of the flexible spring member 4 is shown by the dotted lines 32, the corresponding position of the operating lever 13 is on line *b*, with the flexible spring member in its reversed position an electric circuit is closed with the contact 9. It will be noted that in the reversing operation, the flexible member takes the form of an S curve just before it flips over dead center as shown by dotted line 31, and into the final curve shown by dotted lines 32.

In operation, it will be observed that the energy in the flexible spring member is proportional to the compression applied to it, that any desired compression may be applied at the ends of the flexible member by the adjusting screw 2 in the bottom of the supporting frame, and that owing to the triangular form of this frame the end pressure on the flexible spring member may be adjusted very gradually, as the adjustment screw turns considerably more in this combination for a given adjustment, than if the screw is used as a direct tie rod from one end of the frame to the other. There is also a beneficial degree of elasticity in the supporting frame between the screw and the pivotal center.

Having described the method of changing the tension in the flexible spring member, I shall describe the essential features of the said flexible spring member. The said flexible spring member is divided into two bands 36 and 37. This combination facilitates the location of the operating lever and increases the contacting pressure of the contacts. It will be observed that when one band is in contact with a contact point, the other band is free and tends to bow con-

siderably more than the contacting band, thereby causing greater pressure on the closed contact. The two bands also provide greater transverse flexibility, thereby facilitating more perfect contacts. The cantilever spring extension connecting the operating lever is an important feature of my device; this extension permits building upon considerable reserve power when the operating lever is reversed and spends this stored up power the instant the switch reverses, causing it to break contact quickly and freely carry over to the opposite contact point. The cantilever spring extension also eliminates the possibility of the flexible spring member being held or retarded in the reversing cycle in a position that would prevent making a complete reversal and a proper contact whenever the flexible spring member has deflected over dead center, as the flexure in the said cantilever spring provides sufficient latitude to assure a perfect contact even tho the operating lever has not moved the full cycle of operation.

It will be observed that in my device the switch may be used as a single switch or for double throw operation and that the flexible spring member may be quickly and easily replaced after releasing the adjustment screw at the bottom of the supporting frame.

It will be noted also that the flow of electric current in my switch is thru the flexible member, that the current flows from both ends of the said flexible member, thereby increasing the capacity of the member. It will also be noted that the distance between contact points may be short, that this feature facilitates for easier operation and a more positive contact up until the instant the reversing cycle takes place. This feature also makes possible a more rugged switch construction within a given space.

Various contact points may be used, such as a knife switch, and high heat resisting points instead of the surface contacts shown, without changing the salient features described herein.

In moving the switch operating lever to the left, it will be observed from Fig. 1, that the cantilever spring **7** is pressed down and that when it has moved sufficiently the flexible spring member **4** is deflected into the shallow S curve shown by the dotted line **31**, and after being completely reversed takes the form shown by the dotted lines **32**. It will be noted that due to the predetermined S formation type of flexure, the flexible spring member at the contact end remains in contact until the other end of the flexible spring member has passed over dead center and suddenly reverses the entire flexible spring member. The S form of flexure of the flexible spring member is positively assured by locating the contacts near one end, and the attachment of the cantilever operating spring at the other end.

I am aware that flexible strut reversing members have been used, but not to my knowledge have the improved features shown in my device been incorporated and therefore claim as follows:

1. A combination in an electric switch having an insulator block supporting an adjustable supporting frame in which is operatively mounted a switch reversing member comprised of a flexible spring member, the major length between the ends thereof being composed of separated bands, a pair of insulated contacts mounted on said insulator block separately to alternately engage said separated respective bands of said flexible spring member and near one end of and independently of the said flexible spring member, the said flexible spring member normally engaging either one of said contacts to close an electrical circuit, a cantilever spring member, one end thereof being fixed to the said flexible spring member near the end opposite to the contacting point end of the aforesaid flexible spring member, the other end of said cantilever spring being positioned near the center of the said flexible spring member operatively engaging an operating lever pivotally mounted at a central point of the switch for reversing the said flexible spring member, means for adjusting the adjustable supporting frame to change the tension of the aforesaid flexible spring member.

2. A combination in an electric switch having an insulator block supporting an adjustable supporting frame in which is operatively mounted a switch reversing member comprised of a flat flexible spring member operatively positioned between a pair of contacts, the said flexible spring member normally engaging either one of said contacts to close an electrical circuit, a cantilever spring member, one end thereof being fixed to the said flexible spring member near the end opposite to the contacting point end of the aforesaid flexible spring member, the other end of said cantilever spring being positioned near the center of the said flexible spring member and operatively engaging an operating lever pivotally mounted at a central point of the switch for reversing the said flexible spring member, the ends of the said flexible spring member supported in bearings mounted in an adjustable supporting frame, the bearing ends of the said supporting frame supported on an insulation block, the portion of said frame between the aforesaid bearing ends deflected downwardly and free to be deflected for adjustment and at the center thereof connected to the aforesaid block with an adjusting screw, the said screw operative in adjusting the degree of pressure applied to the bearing ends of the aforesaid flexible spring member.

3. A combination in an electric switch having an insulator block supporting an adjustable supporting frame in which is operatively mounted a switch reversing member comprised of a flat flexible spring member operatively positioned between a pair of contacts, the said flexible spring member normally engaging either one of said contacts to close an electrical circuit, a cantilever spring member, one end thereof being fixed near the end opposite to the contacting point end of the aforesaid flexible spring member, the other end of the said cantilever spring being positioned near the center of the said flexible spring member and the said end operatively engaging an operating lever pivotally mounted at the center of the switch for reversing the switch.

GEORGE H. BUGENHAGEN.