Nov. 25, 1930. F. F. HAFEMEISTER 1,782,780

SAFETY SNAP SWITCH

Filed Nov. 19, 1924 2 Sheets-Sheet 1

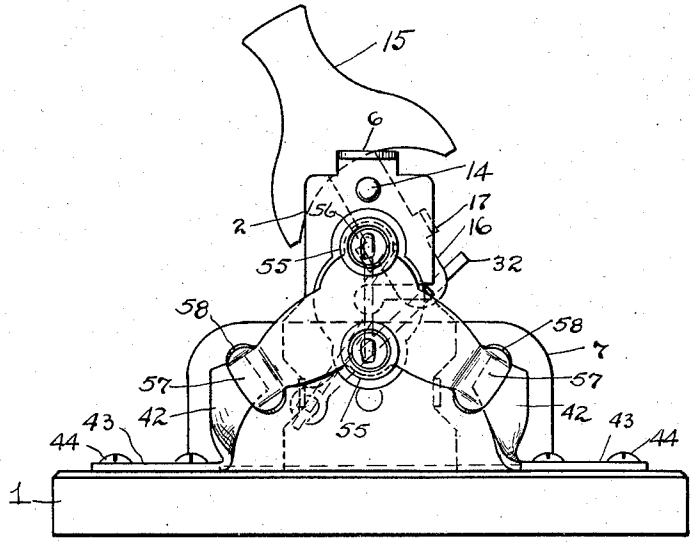


Fig. 1

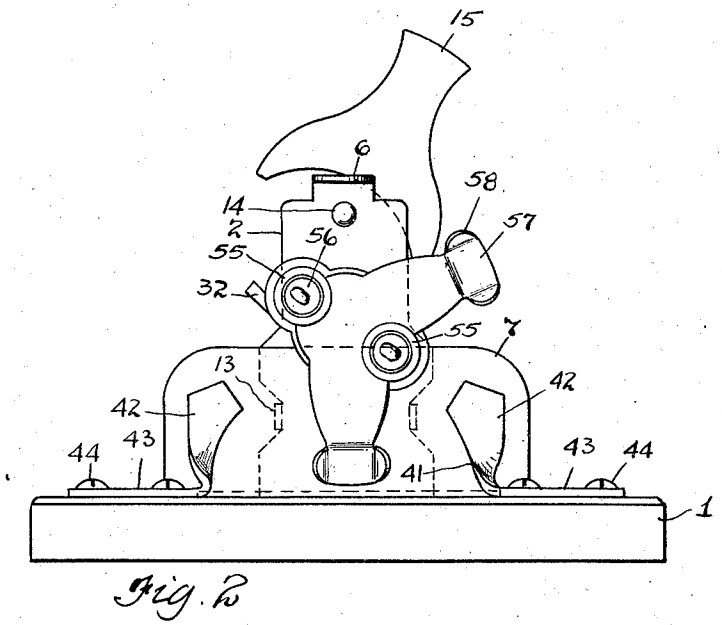


Fig. 2

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SAFETY SNAP SWITCH

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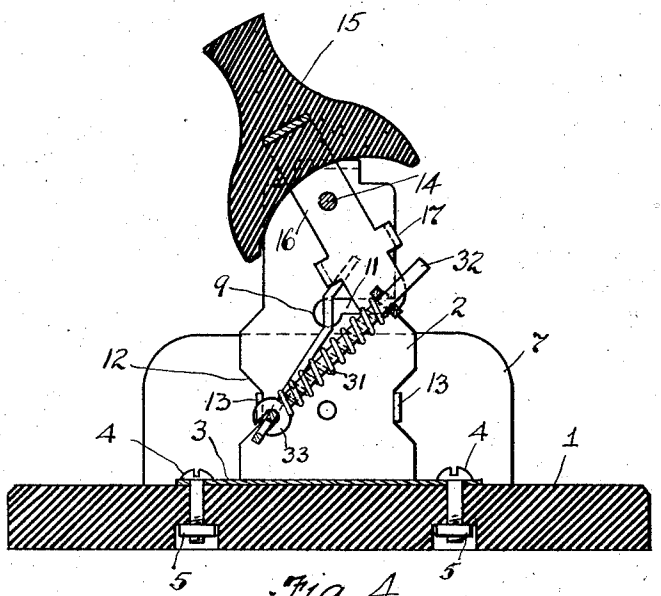


Fig. 4

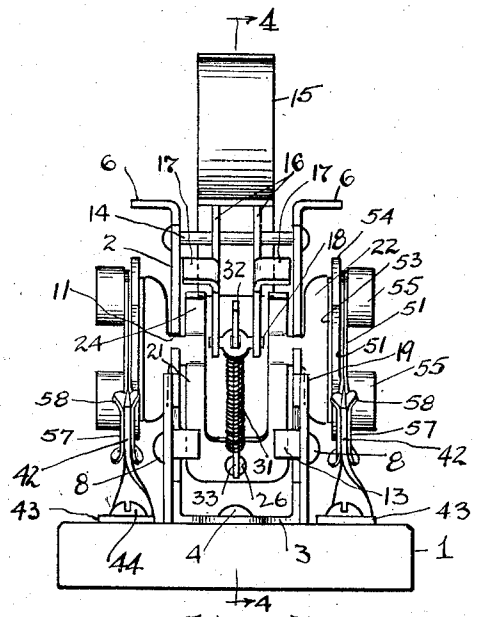


Fig. 3

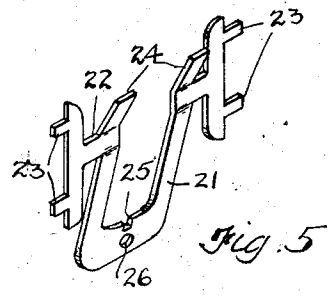


Fig. 5

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UNITED STATES PATENT OFFICE

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SAFETY SNAP SWITCH

Application filed November 19, 1924. Serial No. 750,928.

This invention, as has been indicated, relates to a safety snap switch. More particularly it comprises a switch which normally has snap action brought about by means of a spring but which, in the event of the failure of said spring, may still be operated to satisfactorily open or close the circuit.

The principal object of the invention is to improve the construction of snap switches. Another object of the invention is to include with the switch mechanism both spring and auxiliary contact moving means so that in the event of the failure of the spring said auxiliary means will serve to satisfactorily operate said switch. A further object of the invention is to provide a switch fully protected against arcing when used with high tension currents and at the same time one which is constructed of relatively few parts and which may be cheaply manufactured and readily assembled and disassembled. Other objects of the invention will appear in the course of the following description. To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings:—

Fig. 1 is a side elevation of a snap switch embodying the features of the invention, showing the contact member in circuit closing position; Fig. 2 is a view similar to Fig. 1 but showing the contact member in open position; Fig. 3 is an end elevation of the device shown in Fig. 1 as viewed from the right hand side of said figure; Fig. 4 is a vertical sectional view taken along the line 4—4 shown in Fig. 3, looking in the direction of the arrows; and Fig. 5 is a perspective view of the U-shaped toggle member which pivotally supports the movable switch contact member.

As is clearly shown in Figs. 1 to 4 of the drawings, the switch comprises a base 1 preferably of rectangular shape and formed of a block of insulating material such as slate, bakelite or similar composition. At a point centrally of said base a standard 2 is mounted, said standard being preferably formed of sheet metal bent to U-shape and having a pair of ears 3 projecting at either side through which openings are formed for suitable fastening means. As shown in Fig. 4 of the drawings said fastening means comprise small bolts having slotted heads with their shanks extending through registering openings through the base and being held firmly thereto by means of nuts 5 seated in countersunk recesses formed in the under side of said base. The U-shaped standard is provided at its upper edges with outwardly turned ears 6 suitably apertured to receive the fastening elements of a casing or wall plate (not shown) which may be used with said switch. At either side of said standard a sheet of insulating material 7, such as formica, is provided and is held firmly against the lower outside portions of said standard by means of screws 8, the threaded shanks of which are received in suitable apertures in the respective side walls of said standard. Centrally of each side wall of said standard a circular aperture 9 is provided, said aperture being connected by means of a narrow slot 11 with one side edge of each wall for a purpose hereinafter to be disclosed. The lower half of each side wall of said standard is preferably of somewhat greater width than the upper half thereof and centrally of said wider lower portion each side edge is provided with notches 12 centrally of which are positioned inwardly turned ears 13 preferably struck up from the body of the side wall. Said ears 13 are intended to act as limiting stops for the U-shaped toggle member hereinafter to be described. At a point in vertical alignment with the circular openings 9 through the side walls and adjacent the upper portion thereof a pivot pin 14 is provided. Said pivot pin is adapted to support the upper member of the toggle switch-operating device. This member, as is clearly shown in Fig. 4, comprises a finger piece 15 of insulating material such as bakelite or similar composition, having a flared lower end and having embedded

in the body portion thereof a strap 16 preferably formed of sheet metal. Said strap has its lower ends bent parallel to each other and each of the side edges thereof is provided at an intermediate position with outwardly turned integral ears 17. The free lower ends of said strap are provided with apertures within which lateral extensions 18 at either side of a collar 19 are received.

The lower portion of the toggle switch-operating mechanism is clearly shown in Fig. 5 of the drawings. Said member is preferably formed of a sheet metal stamping having a body portion 21 of U-shape. Spaced from the upper ends of said U-shaped portion a pair of extension members 22 of T-shape are formed, said arms each carrying integral pins 23 projecting outwardly to serve as securing means for the movable switch contact members. At the point where said T-shaped extensions merge with the U-shaped body portion the extensions and body lie in the same plane. The upper free ends 24 of the U-shaped body member are bent at an angle to the adjacent sections and the lower portion of the U-shaped body member immediately beneath the section connected with the extension arms is also bent at an angle thereto in the opposite direction and of a somewhat lesser degree of angularity. The lower portion of the U-shaped body portion is provided with a notch 25 upon its upper edge and immediately beneath said notch an opening 26 is formed through the same.

The lateral extensions of the U-shaped body portion of the toggle mechanism are adapted to have their shanks engaged within the circular openings 9 in the side walls of the standard heretofore described. The parts are thus assembled by moving the shank portions of the extensions of the U-shaped member through the horizontal slots 11 connected with the circular apertures 9 in said side walls.

When thus assembled the U-shaped lower portion of the toggle will co-act with the upper portion thereof, the free ends 24 of said U-shaped portion being received between the respective lateral ears 17 of said upper member. The parallel side members of the upper member will be freely movable through the central opening of the U-shaped member, the laterally extending ears serving to space said upper member centrally of the standard.

The snap action of the toggle is effected by means of a coiled compression spring 31 which is adapted to be supported upon a guide rod 32. The guide rod is provided with a slotted enlargement 33 at its lower end adapted to engage within the notch 25 at the lower portion of the U-shaped toggle member. The upper end of the guide rod is of a size to slidingly engage within the aperture of the collar 19 pivotally supported in the upper toggle member. The spring and its guide bar may be readily placed in position by fitting the spring over the guide bar with its lower end resting against the enlargement of the guide bar. The upper end of the guide bar is then inserted through the aperture of the collar and the spring forced under a sufficient degree of compression until the guide bar projects slightly above said collar. By means of a pair of pliers the projecting end of the guide bar may be grasped and manipulated until the slotted lower end is brought into alignment with the notch at the lower portion of the U-shaped toggle member when the release of the spring will hold the parts in permanent operative relation. The aperture 26 provided in the U-shaped toggle member immediately beneath the notch 25 provides clearance for the ends of the enlargement of the guide bar at either side of the slot, when the guide bar is moved to its extreme position in either direction.

The switch mechanism illustrated is adapted to open and close two distinct electric circuits although the mechanism is applicable to constructions involving but a single circuit or a single pair of contact members. In the form illustrated the block is shown as provided with four fixed contact members comprising a strip of conducting material, such as copper, having an upstanding portion 42 of slightly lesser width than the base portion 43 thereof and turned through an angle of 90 degrees after being thus bent upwardly so as to have the ends of said strips lie parallel to the sides of the standard and closely adjacent thereto. The base of each contact strip is held by suitable securing means to the block, the means illustrated comprising bolts 44 having slotted heads and passing through suitable apertures in said base similar to the bolts by means of which the standard is secured to said base, and having countersunk recesses to receive the securing nuts in like manner, as illustrated in Fig. 4, in connection with said securing bolts for the standard. The extensions formed at either side of the U-shaped toggle member are provided with integral pins 23, as heretofore described. These pins serve to support the movable contact members of the switch. These contact members preferably comprise a pair of V-shaped strips 51, 52, formed of copper alloy or other suitable conducting material, provided with a pair of apertures in vertical alignment with each other and spaced an adequate distance to fit over the pins 23. Before securing said contacting arms to the lateral extensions of the U-shaped toggle member a metal plate is positioned over said pins and a sheet of insulating material 54 of somewhat larger area than that of said metal plate is then seated upon said pins and against said plate. The movable contact arms are then seated over said pins, being spaced therefrom by means of insulating collars 55, which prevent elec-

trical contact of said movable contact arms with the metal of the toggle mechanism and the supporting standard. Said collars are of sufficient depth to fully cover the fastening means, such as washers 56 seated over said securing pins 23, the ends of which may be peined over or soldered. The movable contact members are thus securely held in close contact with each other upon said lateral extensions of said U-shaped toggle member. The ends of said movable contact arms are preferably provided with enlargements 57, the lateral edges 58 of which are bent outwardly.

It will be noted that the contact arms thus provide spring gripping members at either end which lie in the respective planes with the upstanding portions of the fixed contact members 41.

When the toggle mechanism is actuated to compress the coiled spring and move one end of the guide rod to the opposite side of the central pivot member, as soon as the same passes dead center the spring will suddenly expand and throw the contact arms in a direction opposite to that in which they were positioned at the start of said motion. When the finger piece 15 is moved to the position shown in Fig. 1 of the drawings, the movable contact arms will serve to bridge the space between the fixed contact members at either side of the standard and will complete the electrical circuit between said fixed contact members. When moved in the opposite direction to the position shown in Fig. 2, the movable contact arms will be shifted to a position spaced from said fixed contact members and the circuits will be interrupted.

Upon the failure of the spring it will be unnecessary to replace the same if it becomes necessary to close or open the several circuits controlled by said switch, inasmuch as the toggle mechanism will still be actuated by means of the lateral ears upon the upper toggle member contacting with the upper ends of the U-shaped lower toggle member. The snap action of the switch mechanism will not be as rapid as when the compression spring is in place but by shifting the finger piece rapidly the arcing of the switch contact members may be prevented. Also, when the circuit is broken the spring clamping action upon the fixed contact members by the parallel movable contact arms produces an accelerated motion as the same are moved to releasing position. When the switch is placed in vertical position it is preferably turned so that the action of gravity will assist in the disconnecting of the movable switch contacting arms, thus preventing the accidental shifting of the finger piece to switch closing position.

By means of the mechanism above described it will be obvious that the proper operation of the switch is provided for under all conditions. The failure of the spring will not result in the current being left on or off at a time when the inoperative condition of the switch would become a positive danger. In this manner every requirement of safety is provided for and at the same time a substantial switch mechanism is supplied and one which may be readily assembled and disassembled for purposes of installation or repair.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. An electric switch comprising a base, parallel switch supports extending upwardly from said base, a U-shaped member the upper ends providing lever arms, and having lateral extensions at intermediate positions on its side members, detachably engaged within journals formed centrally in the midportions of said parallel supports, a movable switch contact member supported on one of said extensions, stationary contact members adapted to be engaged by said movable member, a switch operating lever pivoted in said supports above said U-shaped member formed of parallel arms each having outwardly projecting spaced ears, a collar pivotally supported on the free end of said lever, a guide rod extending through said collar and adapted to seat upon the base of said U-shaped member, and a compression spring surrounding said guide member between said U-shaped member and said collar and adapted to move said U-shaped member and operating lever in opposite directions when the upper end of said spring is moved past dead center by said operating lever and when the upper end of the U-shaped member is also moved by the outwardly projecting ears on said operating lever.

2. An electric switch comprising a base, parallel switch supports extending upwardly from said base, a U-shaped member the upper ends providing lever arms, and having lateral extensions at intermediate positions on its side members, detachably engaged within journals formed centrally in the midportions of said parallel supports, a movable switch contact member supported on each of said extensions, stationary contact members adapted to be engaged by each of said movable members, a switch operating lever pivoted in said supports above said U-shaped member formed of parallel arms each having outwardly projecting spaced ears, a collar pivotally supported on the free end of said lever, a guide rod extending through said collar and adapted to seat upon the base of

said U-shaped member, and a compression spring surrounding said guide member between said U-shaped member and said collar and adapted to move said U-shaped member and operating lever in opposite directions when the upper end of said spring is moved past dead center by said operating lever and when the upper end of the U-shaped member is also moved by the outwardly projecting ears on said operating lever.

Signed by me, this 17th day of Nov., 1924.

FRED F. HAFEMEISTER.