Aug. 23, 1960 J. E. ASPINWALL 2,950,372

SINGLE-BUTTON-ACTUATED SWITCH

Filed Sept. 22, 1958

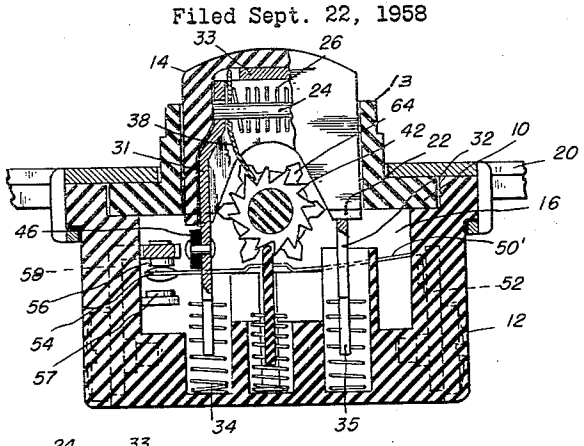


FIG. 1

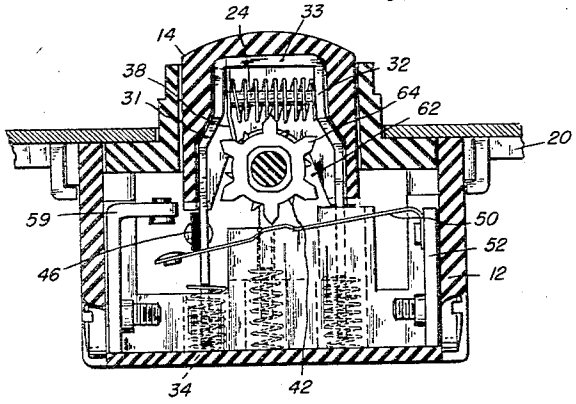


FIG. 2

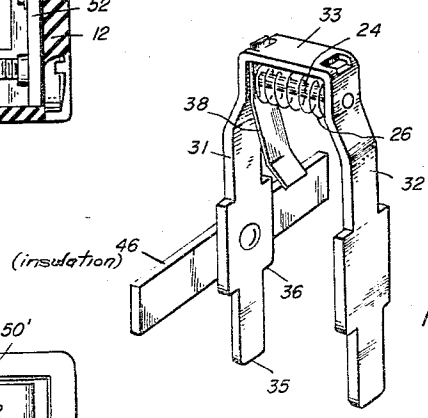


FIG. 4

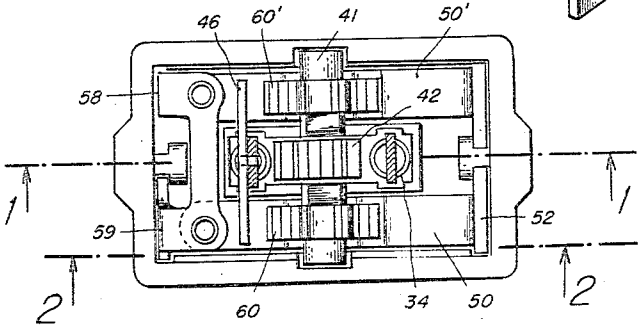


FIG. 3

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United States Patent Office 2,950,372 Patented Aug. 23, 1960

2,950,372

SINGLE-BUTTON-ACTUATED SWITCH

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Filed Sept. 22, 1958, Ser. No. 762,615

3 Claims. (Cl. 200—156)

This invention relates to electric switch mechanisms and more particularly to mechanisms for slow making and breaking engagement of switch contacts, preferably butt-type contacts, the switch mechanism being particularly adapted for operation by a single operating button whose actuation causes alternate making and breaking of the contacts as the button is successively depressed.

The invention is a further development of the invention of my copending application, Serial No. 620,658, filed November 6, 1956 and entitled "Single-Button Actuated Slow Make and Break Switch," now Patent 2,885,515.

One object of the invention is to provide a smoother actuating and quieter switch of the above-mentioned type.

Another object is to provide in such a switch for positive movement of the movable contact by depression of the button and utilization of mechanism, which heretofore was used to cam-operate the movable contact, for the new purpose of maintaining the movable contact in one position (either separated from or in contact with another) while depriving that mechanism of its previous contact-operating function.

Other objects and advantages will become apparent as the invention is described in connection with the accompanying drawing.

In the drawing:

Fig. 1 is a longitudinal section view of a switch embodying the invention, the section being taken along line 1—1 of Fig. 3.

Fig. 2 is a longitudinal section view of a switch embodying the invention taken along line 2—2 of Fig. 3.

Fig. 3 is a plan view of the switch of Figs. 1 and 2 with the cover and supporting bridge removed.

Fig. 4 is a perspective view of the guide member and the parts carried thereby.

Referring to the drawing, the parts are mounted within an insulating casing comprising cover and base portions 10, 12. The base is hollowed out to receive the various parts hereinafter described. The cover portion fits within the open top of the base and has a rectangular opening 16 in its center in which is mounted a depressible button 14. The cover and the base are conventionally secured together and to a metallic mounting strap or bridge 20 which lies upon the cover. A hole is formed in the center of the bridge through which extends a hollow neck 13 on the central portion of the cover. Through this neck the button 14 extends. Four shoulders 22 are formed at the inner corners of the button and project laterally outward from the sides thereof, so as to engage with the under or inner surface of the cover when the button is spring-pressed outwardly to the maximum of its travel. The shoulders limit the movement of the button in an outward direction.

The button is hollowed out to receive a U-shaped guide member stamped from sheet metal having legs 31, 32 extending inwardly into the casing. The transverse portion 33 of the guide member is lodged adjacent the ceiling of the button. Coiled compression springs 34 each have

one end seated on the bottom of parallel spaced bores running from front to back in the base 12. Their other ends are around fingers 35 extending from the lower or inner ends of the legs 31, 32 and engage shoulders 36 between the fingers and legs to push the guide member and push button up until stopped by the push button shoulders 22 engaging the cover 10.

Mounted upon a rod 24 within the button 14 and parallel to the transverse portion of the guide member is a coiled compression spring 26, one end of which presses against one of the legs of the guide member while the other end presses against a pawl member 38. In this fashion, the pawl is resiliently held upon the rod by the spring. The aperture through the top of the pawl through which the rod passes is large enough to permit the pawl to tilt on the rod 24 as the button is depressed.

The lower end of the pawl 38 is inclined inwardly and is adapted to engage a radial face on one or another of a series of peripheral extensions in the form of ratchet teeth 42 around the periphery of an insulating rotor or switch contact maintaining member, at the central portion thereof.

The rotor is preferably a molded insulation member. As viewed in Fig. 3, this member comprises a shaft having journal portions 41 at opposite ends adapted to fit in bearings in the opposite side walls of the base.

In the form illustrated, there are twelve ratchet teeth located at the center of the rotor and spaced 30° apart, each comprising a flat surface extending approximately radially and an arcuate surface curving from the outer edge of the radial surface toward the periphery of the rotor body. As the button 14 is depressed, the pawl 38 engages with the flat radial surface of the teeth, causing rotation of the rotor until the button is fully depressed. As the button reaches the lower end of its travel, the inner end of the pawl is required by the body of the rotor to move radially outward slightly. This outward movement or tilting of the pawl 38 is permitted by reason of the spring mounting of the upper end of the pawl upon the rod, as hereinbefore described.

The movable contact members, such as 50, each consist of an L-shaped flexible strip of thin sheet metal extending lengthwise of the casing, being anchored by its short leg or end by attachment to a terminal plate 52 conventionally held in slots running from front to back of the casing. The other or free end on the contact strip has contact button 54 on its top or bottom surface, or both, for engagement with fixed contact buttons 56, 57 on conventional terminal plates 58, 59 also fitted in slots in the casing.

When the invention is applied to a double-pole or a three-way switch or any switch requiring two movable contact strips, such contact strips 50, 50′ may be mounted on opposite sides of the casing.

For operating the flexible movable contact members, a transverse strip or bar 46 of thin sheet insulation is mounted on one leg 31 of the guide member in any suitable fashion. The transverse bar is in position to become engaged with the movable contact strips 50, 50′ near their free or button-carrying ends when the actuating button 14 is depressed. When the actuating button 14 is in normal outwardly-biased position, the bar preferably will not touch the movable contact strips in order to avoid the possibility of interference with engagement of the fixed and movable contact buttons. Also, by having a small amount of movement required before the transverse bar 46 engages the movable contact strips, the likelihood of anyone "toying" with the button and causing slight separation of fixed and movable contact buttons, or minimizing the pressure to such an extent to allow a temperature rise, is minimized if not avoided. When two contact strips are to be engaged and operated by

the transverse insulating bar, it is advantageous for the bar to be riveted upon the leg of the U-shaped guide member loosely so that it can pivot slightly in the event that the bar should engage one of the contact strips before the other rather than engaging them simultaneously. Moreover, such pivoting allows self-adjustment of the bar so that pressure upon the contact strips is equally exerted as the button is depressed, thus tending to cause simultaneous making or breaking of the movable and fixed contacts on each operation.

When only one movable contact strip is employed, as in single-pole switches and in one of the optional forms of three-way and two-circuit switches, it is desirable that the transverse bar **46** be affixed to the U-shaped guide member so as not to pivot but to transmit, without regression, all of the depressive force to the movable contact strip.

The invention is not limited to a separate insulating bar **46** attached to the guide member. It is within the scope of the invention to form a transverse arm integrally in any fashion with the leg of the guide member and to provide insulation between the contact strips and the guide member or transverse arm, it being the objective to prevent passage of current from one contact strip to another through the bar when two strips are used and, in certain cases, to prevent current being transmitted to the operating parts of the switch including the guide member, pawl and spring and their support although it is not essential in all cases that the guide member and associated parts be electrically dead.

For the purpose of maintaining the movable contact strip **50** in one switch position or allowing it to assume the other (for example, disengaged from the upper contact button **56** or in engagement therewith), rotary positioning members **60**, **60'** are non-rotatably mounted on the portions of the rotor between the ratchet teeth **42** and the journal portions **41**, parts of the rotor being flattened to slidably and axially receive the cam members non-rotatably on the rotor.

The teeth or lobes **64** on the members **60**, **60'** may be of any suitable number. For the purpose of illustration, six are shown of such size and position as to engage a movable contact strip **50** to cause the strip to be maintained in position with its button **54** disengaged from the fixed contact button **56** whenever a tooth is over the strip and the actuating button **14** has risen under its spring bias to normal position.

When a space **62** between the lobes is over the contact strip **50**, the strip can rise, allowing the contact button **54** to engage fixed contact button **56**.

From the foregoing, it will be observed that with the parts in the position of Fig. 1, as the actuating button **14** is depressed, the pawl **38** will engage one or another of the ratchet teeth **42** to cause rotation of the rotor and movement of the cam (or cams **60** in a double-pole or three-way switch) into a new position spaced 30° from the previous position. In such new position, the space (as seen in Fig. 2) between two adjacent teeth **64** of the positioning member will allow the movable contact strip to rise when finger pressure is removed from the actuating button **14** and the transverse contact operating bar **46** rises. This will allow the upper button **54** on the movable contact strip to re-engage the button **56** on the fixed contact member (and for the button on the lower side of movable contact strip to disengage the fixed button of the lower fixed contact button when such is used). Obviously, in some switches there need be no lower fixed contact while in others there may not be any upper fixed contact, it being within the skill of those familiar with the art to provide such fixed contacts and movable contact buttons as are required for a single-pole, a double-pole, a three-way or any other standard type of switch arrangement.

From the foregoing, it will be understood that the next depressive motion of the actuating button **14** causes eventual engagement of the transverse bar **46** with the movable contact strip or strips and disengagement of the upper fixed contact. At the same time, the pawl **38** engages the rigid teeth on the rotor and turns the latter into a new position in which the next tooth or lobe will be directed against movable contact strip **50** preventing the contact strip from returning to its original position and, thus, maintaining the condition of disengagement of the upper fixed contact. (If a lower fixed contact is present, it will remain engaged by the movable contact.) On the next depression of the actuating button **14**, the rotor is further rotated and the cam tooth is moved out of engagement with the movable contact strip and a space between the teeth is presented over the strip and the above-described action is repeated.

This arrangement provides a smooth and quiet action of the switch as well as providing a positive and direct movement of the movable contact by the depressive movement of the actuating button **14** itself.

Modifications within the scope of the invention will occur to those skilled in the art. Therefore, the invention is not limited to the specific form and configuration of the parts as illustrated.

What is claimed is:

1. In an electric switch, a depressible push button, means to restore said button to original position when manual pressure is released, a flexible contact member movable between two switching positions, a contact-operating member movable in direct response to movements of said button and engaging said contact member to move said contact member from one switching position to another, rotary means operable in response to said button movement to retain said contact member in the one or the other switching position after it has been moved there by said contact-operating member, and a fixed contact member engaged by said movable contact member in one of its positions.

2. In an electric switch, a depressible push button, a flexible contact member movable between two switching positions, a rotary device engaging said movable contact member and retaining the latter in one switching position or the other, means operable by the button and carrying a first member to move said contact member from one switching position to another and also carrying a second member to operate said rotary device, a fixed contact member engaged by said movable contact member in one of its positions, said first member controlling contact engagement and disengagement to the exclusion of said rotary device, and means to restore said button and said first member to original position when manual pressure is released.

3. In an electric switch, a depressible push button, a flexible contact member movable between two switching positions, a rotary device having cam surfaces and a ratchet, means operable by the button and carrying a member to move said contact from one switching position to another and also carrying a pawl cooperating with said ratchet to turn said rotary means, a fixed contact member engaged by said movable contact member in one of its positions, and means to restore said button and said contact-moving member to original position when manual pressure is released, said button-operated contact-moving member controlling contact engagement and disengagement to the exclusion of said rotary device.

References Cited in the file of this patent

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