July 1, 1947. D. W. JOHNSON 2,423,387

PUSH PULL SWITCH

Filed April 9, 1943

Fig. 1.

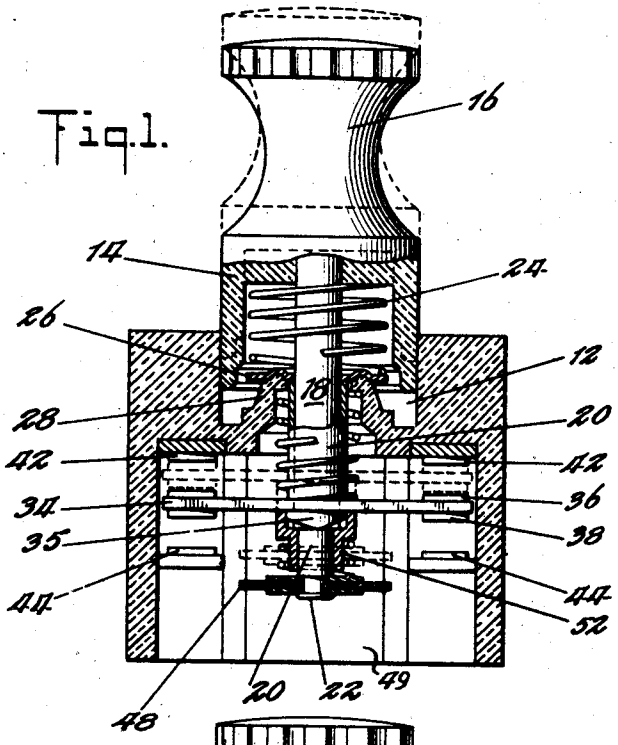
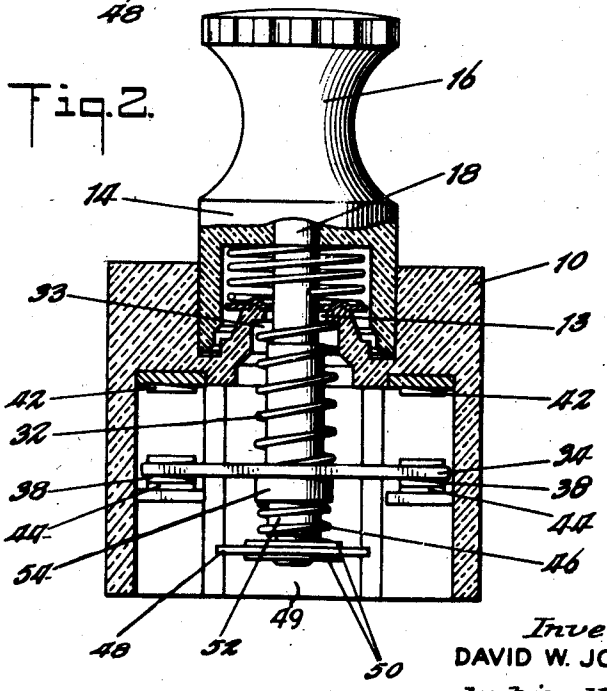


Fig. 2.



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PUSH-PULL SWITCH

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5 Claims. (Cl. 200—159)

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This invention relates to electric switches. More particularly it relates to manually operable switches wherein three positions of a reciprocative operating member are provided to close one or another of two circuits or to leave both circuits open.

It is an object of the invention to provide an improved construction of an electric switch of the type operated by a reciprocative handle wherein the parts normally occupy an intermediate contact-open position but are movable to other closed-contact positions by pushing or pulling the handle.

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

In the drawing—

Fig. 1 is a vertical section view of an electric switch embodying the principles of the invention, with the parts shown in full lines in normal position.

Fig. 2 is a view similar to Fig. 1 but showing the parts in closed circuit position after pushing the operating member.

Referring to the drawing, a base 10, conveniently made of molded insulating material, has a cylindrical cavity 12 formed in the top surface to receive a cylindrical plunger or operating member 14. Preferably the plunger will be provided with a contracted hand grip portion 16 which may be grasped by the fingers of the operator for pulling up. Alternately, the plunger may be depressed by the operator pressing on its top surface with his thumb or palm.

Within or on the opposite side of the base from the plunger 14 are spaced pairs of fixed contact buttons 42 and 44, which may be mounted on terminal members or the like, and secured to the base in any convenient or suitable way, in position to have contacts 42 bridged by a movable contact 34 when the plunger is pulled and to have contacts 44 bridged by contact 34 when the plunger is pushed. Normally the contacts will all be disengaged by the parts taking their position of equilibrium, as hereinafter described.

For mounting the bridging contact 34, a rod 18 extends coaxially from the inner end of the plunger 14 to which said rod is rigidly affixed, as by molding the rod in the plunger. The plunger rod 18 extends through an aperture 13 in the center of the base cavity 12 and has the bridging contact 34 slidably mounted on said inwardly-extending part.

The bridging contact may be in the form of a metal bar with the contact buttons 36 on its upper face and buttons 38 on its lower, for engagement with the fixed contact buttons 42 and 44. The bar 34 will be pierced for passage of the plunger rod 18.

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Normally pressing the plunger in an upward direction is a coiled spring 24 located within the lower hollowed-out end of the plunger and pressing downwardly upon a metallic washer 26 to urge that washer against a circular boss 28 formed in the bottom of the cavity 12 around the rod-receiving aperture 13. Upon the plunger rod 18 below the washer 26 is a tubular sleeve 20, around which is coiled a spring 32 whose upper end is received within a cylindrical recess 33 around and below the rod-receiving aperture 13. The lower end of the spring 32 presses upon the upper surface of the bridging contact 34, thus urging the contact 34 downwardly.

The force of the second spring 32 urging the bridging contact 34 downwardly is resisted by a third spring 46 on the lower or inner end of the plunger rod 18 below the contact 34. Spring 46 is held on the plunger rod by an insulating washer 48 and two reinforcing metallic washers 50 above and below the insulating washer, the three washers being permanently attached on the reduced end portion 22 of the rod by peening over of the end of said portion 22. The washer 48 is preferably the diameter of the passageway 49 in which it moves, so as to guide the movement of the plunger rod 18. The bottom of the spring 46 presses upon the upper of the washers 50, while the top of this spring is positioned around the sleeve member 52, having a hollow flange 54 on its upper end against the bottom surface of which the spring presses to urge the member against the bottom surface of the bridging contact 34. The hollow portion of the flange 54 receives an extruded edge 35 of metal pressed out in stamping the plunger-receiving aperture in the contact 34.

Normally, the contacts of the device will be in the full line position of Fig. 1. Upon pressing the plunger 14 downwardly or inwardly the plunger spring 24 is compressed and the rod 18, with its washers 48 and 50, will likewise move downwardly. This downward movement enables the contact-moving spring 32 to press the movable or bridging contact 34 down into the position of Fig. 2, wherein said spring holds the bridging contact in engagement with the lower fixed contacts.

Upon release of the plunger, the plunger spring 24 will return the parts to the position of Fig. 1. To accomplish this, the plunger spring 24 must

overcome the contact-moving spring 32. The parts will stop after moving from the position of Fig. 2 to Fig. 1 because the upper end of the sleeve 20 will then abut the washer 26, preventing the further expansion of the plunger spring under its own power.

Upon grasping the hand grip 16 and pulling the plunger 14 upwardly or outwardly, the rod 18 will be pulled up likewise, carrying with it the washers 48 and 50, the cushioning spring 46, the sleeve member 52, and the bridging contact 34. The force of the spring 32 is overcome by the manual pull the operator exerts. As the contact buttons of the bridging contact engage the upper fixed contacts 42, the cushioning spring 46 will be compressed by any further effort to pull up on the plunger, thus serving to indicate to the operator that the upward travel is complete and at the same time permitting the bridging contact to adjust itself to the location of the fixed contacts 42. Tilting of the bridging contact is permitted by inclining the bottom surface from a diametrical axis. The adjustability and spring pressure are particularly valuable in case means are provided to hold the plunger in pushed or pulled positions, as by means of a conventional bayonet slot and pin arrangement (not shown).

From the foregoing, it will be observed that the invention provides for normally holding the switch in an intermediate open circuit position but enables the switch operating plunger to be either pushed or pulled to close either of two circuits and the structure provides for automatic contact adjustment of the bridging to the fixed contacts in either direction and permits overtravel of the switch operating plunger in either direction. These provisions are all made with a minimum of compactly-arranged and sturdy switch parts, many of which may be of stamped sheet metal or molded insulating parts by reason of which a high quality device may be made at minimum expense compatible with such quality.

Many modifications within the scope of my invention will occur to those skilled in the art. Therefore I do not limit it to the specific form of the parts illustrated.

I claim:

1. In a push-pull electric switch, an insulating base, a manually operable plunger normally maintained stationary in an intermediate position between a pushed and a pulled position, a rod secured to said plunger and extending within said base, spring means urging said plunger outwardly of the base, a movable contact slidably mounted on said rod, upper and lower fixed contacts engaged by said movable contact when said plunger is pulled and pushed respectively, a second spring means urging said movable contact toward the inner end of said rod and operating to move said movable contact into resilient engagement with said lower contact when said plunger is manually depressed and also operating to return said movable contact to intermediate position upon release of said plunger from pulled position, and a third spring means forming a cushion when said movable and upper contacts engage and opposing the movement of said contact on said rod by said second spring means, said first spring means and said second spring means cooperating with said base and with the third spring to hold said movable contact in an intermediate position from which it may be pushed or pulled at will.

2. In a push-pull electric switch, an insulating base, a manually operable plunger normally maintained stationary in an intermediate position between a pushed and a pulled position, a rod secured to said plunger and extending within said base, spring means urging said plunger outwardly of said base, a movable contact slidably mounted on said rod, upper and lower fixed contacts engaged by said movable contact when said plunger is pulled and pushed respectively, second spring means urging said movable contact toward the inner end of said rod, said second spring means being compressible by said first spring means, and a sleeve member on said rod engageable with said movable contact and located between the movable contact and said first spring means and limiting the compression of said second spring means by said first spring means, and a third spring forming a cushion and permitting adjustment of said movable contact when it engages said upper fixed contact, said first spring means and said second spring means cooperating with said base and with said third spring to normally hold said movable contact in said intermediate position from which it may be pushed or pulled at will.

3. In a push-pull electric switch, an insulating base, a manually operable plunger normally maintained stationary in an intermediate position between a pushed and a pulled position, a rod secured to said plunger and extending within said base, spring means urging said plunger outwardly of said base, a washer forming a seat for said spring means, a movable contact slidably mounted on said rod, upper and lower fixed contacts engaged by said movable contact when said plunger is pulled and pushed respectively, a second spring means urging said movable contact toward the inner end of said rod, said second spring means being compressible by said first spring means, and a sleeve member on said rod between and engageable with said movable contact and said washer, said sleeve member limiting the compression of said second spring means by said first spring means, and a third spring means forming a cushion and permitting adjustment of said movable contact when it engages said upper fixed contact, said first spring means and said second spring means cooperating with said base and with the third spring means to normally hold said movable contact in said intermediate position from which it may be pushed or pulled at will.

4. In a push-pull electric switch, an insulating base, a manually operable plunger normally maintained stationary in intermediate position between a pushed and a pulled position, a rod secured to said plunger and extending within said base, spring means urging said plunger outwardly of said base, a movable contact slidably mounted on said rod, upper and lower fixed contacts engaged by said movable contact when said plunger is pulled and pushed respectively, second spring means urging said movable contact toward the inner end of said rod, said second spring means being compressible by said first spring means, and means on said rod to limit the amount of expansion of said first spring means and concomitantly to limit the compression of said second spring means by the first, and a third spring means forming a cushion and permitting adjustment of said movable contact when it engages said upper fixed contact, said first spring means and said second spring means cooperating with said base and with the third spring means to normally hold said movable contact in intermediate

position from which it may be pushed or pulled at will.

5. In a push-pull electric switch, an insulating base, a manually operable plunger, a rod secured to said plunger and extending within said base, a movable contact slidably mounted on said rod, upper and lower fixed contacts with which said movable contact may be engaged when said plunger is pulled or pushed, respectively, from an intermediate position, a spring engaged at one of its ends with said plunger, a spring seat member slidably mounted on said rod and engageable by the other end of said spring and pressed by said spring into engagement with said base in the pushed and intermediate positions of said plunger, means on said rod between said spring seat member and said movable contact limiting the expansive movement of said spring, a second spring engageable with said base and acting on said movable contact to urge said movable contact toward said lower fixed contact, said second spring being compressible by said first spring, and a third spring acting on said movable contact in opposition to and in cooperation with said

second spring and cushioning the engagement of said movable contact with said upper contact when said plunger and rod are pulled, said three springs co-acting with one another and said first and second springs mutually co-acting with said base, to normally hold said movable contact in said intermediate position from which it can be pushed or pulled at will.

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