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PUSH-PULL SWITCH

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Fig. 1.

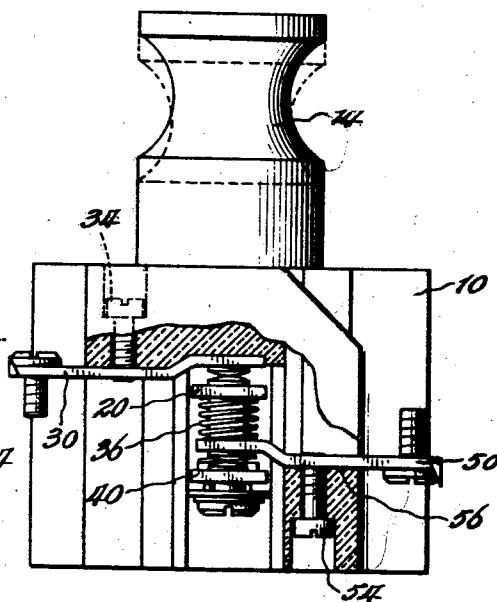
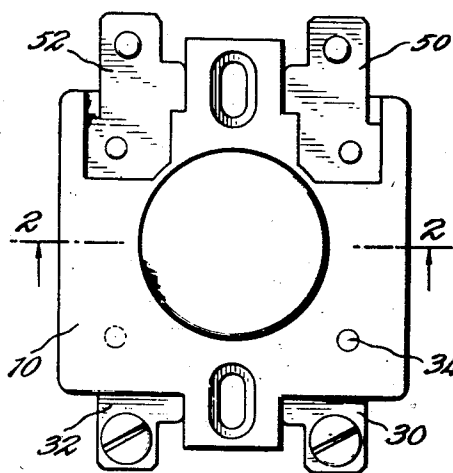


Fig. 3.

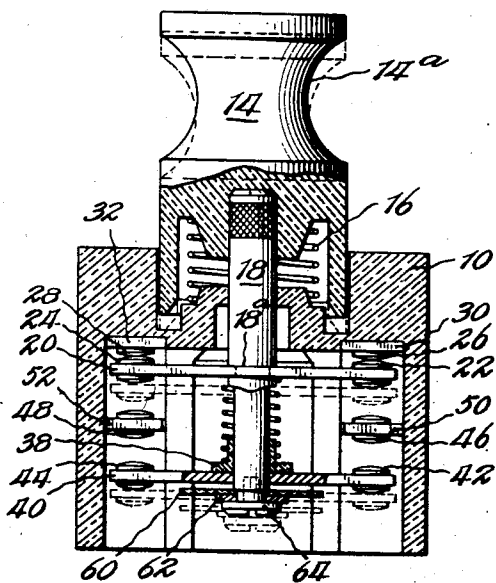


Fig. 2.

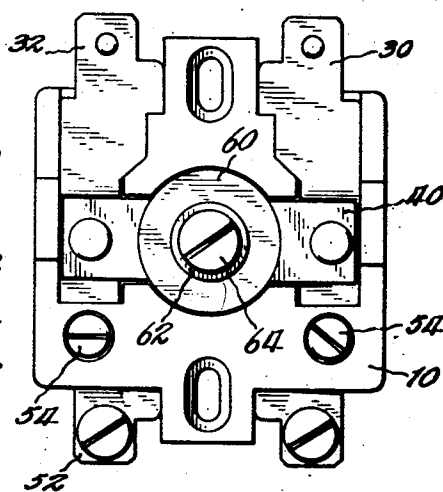


Fig. 4.

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PUSH-PULL SWITCH

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4 Claims. (Cl. 200—16)

This invention relates to electric switches. More particularly, it relates to an electric switch in which certain contacts can be momentarily engaged or disengaged by a push or pull applied to a reciprocating member.

In the control of electric motors by solenoid-operated switches, it is often necessary to employ in the control circuit switching means for completing and breaking the circuit to the solenoid. This has commonly been accomplished heretofore by the use of a device embodying two operating push buttons, one being for "starting" or, in other words, completing a holding circuit, and the other being for "stopping" or, in other words, breaking the holding circuit. One disadvantage of this type of control is that accidental pressure upon the starting button can cause closing of the main switch and possible starting of a motor or large piece of machinery. Another disadvantage of this type of control is that two spaced operating buttons are required, which sometimes occupy space on panel boards or other mountings wherein the amount of space is limited. Still another disadvantage of this type of control is that the operator of a machine must look up from his work to see which button he is pressing when he wants to stop the machine.

It is an object of my invention to provide a single switch which can accomplish the functions of "starting" and "stopping" and which will be free of the foregoing disadvantages of the prior type of control in the respect that the invention shall have only one operating member which the machine operator can actuate to "start" or "stop" by pulling or pushing.

Another object of my invention is to provide a switch which may momentarily open or close one circuit or more than one circuit by momentary contact engagement or disengagement through actuation of a single operating member.

Still another object of my invention is to reduce the space and number of devices and cost of installation of switching means which can be used for stopping and starting electric motors and the like.

Although the invention will be described as used in motor control circuits, it will be obvious that it may be applied generally to use in switching arrangements in a wide variety of applications.

Other objects and advantages of my invention, in addition to those above mentioned, will become apparent as the invention is described in connection with the accompanying drawing.

In the drawing—

Fig. 1 is a plan view of the invention;

Fig. 2 is a vertical mid-section view taken along line 2—2 of Fig. 1 of the invention, showing in full lines the parts in normal position, while in dotted lines the parts are in "stopping" or pushed-in position.

Fig. 3 is a side elevation view partly broken away of the invention.

Fig. 4 is a bottom view of the invention.

Referring to the drawing, the active parts of the device are mounted in a base or block 10 of molded insulating material which is provided in its top face with a cylindrical well or cavity 12 to receive a cylindrical plunger or hand grip 14. In order that the plunger 14 may be either pushed or pulled, its outer or upper end is recessed around its periphery as at 14a, to afford a grip for the fingers of a machine operator, and its top surface is made flat or slightly concave or convex, as preferred, to provide a surface for engagement by the thumb or palm of the hand of the operator. The inner or bottom end of the plunger is cylindrically recessed to provide a seat for a compression spring 16 between the plunger and the insulating body 10.

The base 10 beneath the plunger is provided with a circular aperture or passage communicating with a recessed bottom portion of the base and admitting the passage of a spindle 18 on whose upper end the plunger 14 may be molded. The mid portion of the spindle 18 is of reduced section providing a shoulder 18a against which normally is pressed a conductive bridging contact bar 20 which is slidably mounted upon the spindle. The bridging bar has contact buttons 22 and 24 mounted near its ends in position to engage with contact buttons 26 and 28 that are mounted upon the end portions of terminal bars 30 and 32. These terminals 30 and 32 extend outwardly of the base, which is conveniently recessed for that purpose, and they are held in position by bolts such as 34 extending through from the top of the base into threaded apertures in said terminals.

In order to hold the contact buttons of the

bridging bar 20 in engagement with the contact buttons of the terminals 30 and 32, a coiled compression spring 36 is placed around the reduced portion of the spindle 18 in position to have one end of the spring press against the under surface of the bridging bar 20. The other end of spring 36 seats upon the flange of a collar 38 which is slidably mounted upon the spindle 18 and rests upon the upper or inner surface of a second or lower bridging bar 40 located at the lower end of the spindle. The bridging bar 40 may be similar or identical in construction to the bar 20 and may have its contact buttons 42 and 44 in position to engage with the contact buttons 46 and 48 on terminal bars 50 and 52. The terminals 50 and 52 may be similar or identical to the terminals 30 and 32 but will preferably extend to the opposite side of the base 10 from the terminals 30 and 32. The base is conveniently recessed to provide ledges such as 56 upon which the mid-portions of the terminals 50 and 52 may be secured by bolts, such as 54, extending upwardly through the bottom of the base and threading into threaded apertures in the terminals 50 and 52.

In order to hold the bridging bar 40 on the spindle, an insulating disc 60 and a metallic washer 62 may be held against the end of the spindle by the head of a screw 64 threaded into the spindle end; or in lieu of the screw 64, the lower end of the spindle may be further reduced in section and peened over to form a permanent securing means for the disc 60 and washer 62.

In order that the parts of the device may normally be maintained in position of Figs. 2 and 3 wherein the contact buttons of upper bridging bar 20 are in engagement with the contact buttons on the terminals 30 and 32, the distance from the shoulder 18a to the insulating disc 60 is greater than the distance from the surface of the stationary contact buttons 26 and 28 to the surface of the contact buttons 46 and 48, and the spring 36 is made of as great or greater strength than the spring 16. Thus, the spring 36 will maintain the bridging bars 20 and 40 normally in engagement with the shoulder 18a and the insulating disc 60 respectively, i. e., their maximum distance apart, and the spring 16 will press the plunger 14 and spindle 18 integral therewith upwardly until the contact buttons on the bridging bar 20 are in engagement with the buttons on the terminals 30 and 32. The spring 36 will then prevent any further upward movement of the plunger by the spring 16. However, when the plunger 14 is grasped and pulled, the force of spring 36 may be overcome and the bridging bar 40 will be raised as the spring 36 is compressed until the contact buttons on the bridging bar 40 engage with the contact buttons on the lower terminals 50 and 52. On the other hand, when the plunger 14 is depressed, the spindle 18 will carry the bridging bar 20 downwardly to disengage its contact buttons from the contact buttons of the upper terminals 30 and 32.

The plunger 18 and flanged collar 38 may be made of insulating material, whether or not bridging bars 20 and 40 are to be included in the same or different circuits. However, if the bridging bars are to be included in the same circuit, the spindle and flanged collar could be made of metal without interfering with the satisfactory operation of the device.

From the foregoing, it may be observed that in the central or mid-position, as illustrated in Figs. 2 and 3, a circuit may be normally held

closed by the engagement of the contacts of the bridging bar 20 while the contacts of the upper terminals 30 and 32 and the circuit, including the lower terminals 50 and 52, will remain open. If the plunger 14 is pulled, this circuit may also be closed by reason of the contacts on the bridging bar 40 engaging the contacts on these terminals.

In many cases, it may be desirable to have all of the terminals in one circuit in series. In that case, the circuit will only be completed when the plunger is pulled. Now, if the device is used in connection with an electromagnetic switch, with the conventional holding contacts thereof in shunt with the terminals 50 and 52, then the electromagnetic switch will stay closed after the plunger has been pulled up and has been allowed to resume its central or normal position. The circuit through the coil of the electromagnetic switch will be broken as soon as the plunger is depressed.

Many variations within the scope of the invention will occur to those skilled in the art. Therefore, I do not limit myself to the specific details of the embodiment disclosed, or to the use of the device in a control circuit of an electromagnetic switch, said use being mentioned merely as an example and not as a limitation.

I claim:

1. In a momentary contact switch, a reciprocative operator adapted to normally occupy a central position and to be moved to positions on either side of said central position, a pair of fixed contacts, a bridging contact slidably mounted on said operator, spring means normally holding said bridging contact in a certain position on said operator, other spring means normally urging said operator to hold said bridging contact in engagement with said fixed contacts, a second pair of fixed contacts, a second bridging contact slidably mounted on said operator, said first spring means normally holding said second bridging contact in a certain position on said operator out of engagement with said second pair, the distance between the contact surfaces of said first and second bridging contacts being greater than the distance between said pairs of fixed contacts, a hand grip on said operator enabling pulling of said operator to engage said second bridging contact with the second pair while the first bridging contact remains engaged with the first pair, and enabling pushing of said operator to disengage the first bridging contact from the first pair.

2. In a momentary contact switch, a reciprocative operator adapted to normally occupy a central position and to be moved to alternate positions on either side of said central position, fixed contact means, movable contact means non-rigidly mounted upon said operator and normally engaged with said fixed contact means, means on said operator causing movement of said movable contact with said operator and disengagement of said fixed and movable contact means when said operator is moved in one direction, and resilient means acting upon said movable contact means to hold it in engagement with said fixed contact means but permitting movement of said operator in the other direction, in combination with second fixed contact means, and second movable contact means non-rigidly mounted on said operator the distance between said movable contact means being greater than the distance between said fixed contact means, said resilient means normally holding the sec-

ond movable contact means disengaged from the second fixed contact means, means on said operator causing movement with said operator of said second movable contact means into engagement with said second fixed contact means when said operator is moved in said other direction, a hand grip for actuating said operator in either direction, and means urging said operator to hold said first fixed and movable contact means engaged and said second fixed and movable contact means disengaged in said normal central position.

3. In a momentary contact switch, a reciprocative operator adapted to normally occupy a central position and to be moved to alternate positions on either side of said central position, fixed contact means, movable contact means non-rigidly mounted upon said operator and normally engaged with said fixed contact means, means on said operator causing movement of said movable contact with said operator and disengagement of said fixed and movable contact means when said operator is moved in one direction, and resilient means maintaining contact pressure between said fixed and movable contact means but permitting movement of said operator in the other direction, in combination with second fixed contact means, and second movable contact means non-rigidly mounted on said operator the distance between said movable contact means being greater than the distance between said fixed contact means, said resilient means normally holding the second movable contact means disengaged from the second fixed contact means, means on said operator causing movement with

said operator of said second movable contact means into engagement with said second fixed contact means when said operator is moved in said other direction, a hand grip for actuating said operator in either direction, and means urging said operator to hold said first fixed and movable contact means engaged and said second fixed and movable contact means disengaged in said normal central position.

4. In a momentary contact switch, a reciprocative operator adapted to normally occupy a central position and to be moved to alternate positions on either side of said central position, fixed contact means, movable contact means engageable and disengageable with said fixed contact means, second fixed contact means, second movable contact means engageable with and disengageable from the second fixed contact means, both said movable contact means being non-rigidly mounted upon and carried by said operator, coil spring means oppositely urging said first and second movable contact means into certain positions on said operator, means urging said operator in one direction and holding one of said movable contact means in engagement with its fixed contact means and the other of said movable contact means disengaged from its fixed contact means, a hand grip for moving the operator in opposition to or in cooperation with said means-urging-said-operator to cause simultaneous momentary engagement of each movable contact means with its fixed contact means or simultaneous disengagement.

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