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2,489,185

PUSH-PULL SWITCH

Filed Feb. 6, 1945

2 Sheets-Sheet 1

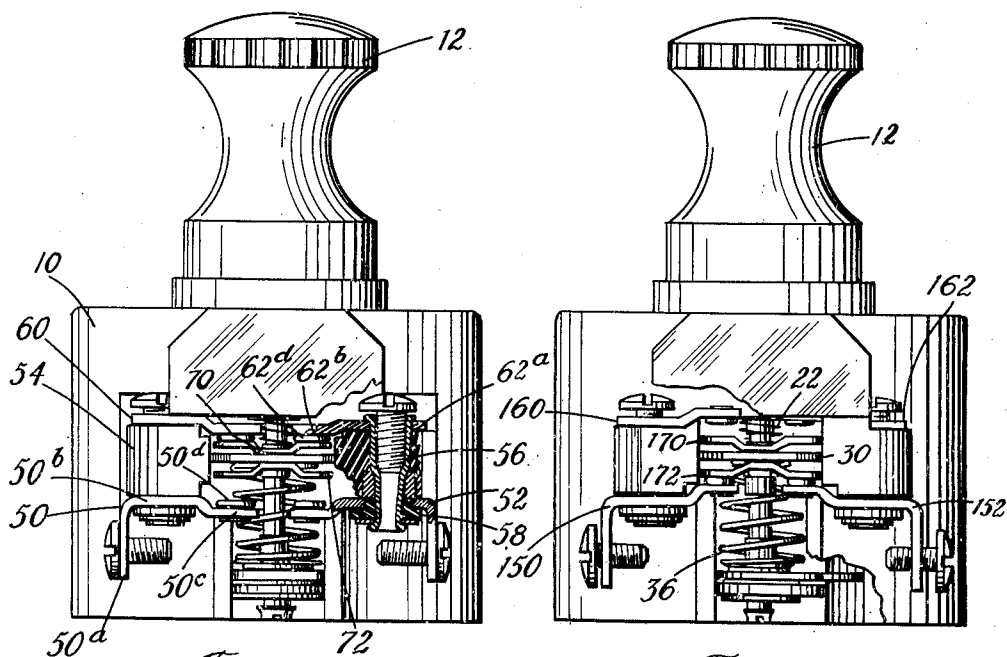


Fig. 1

Fig. 2

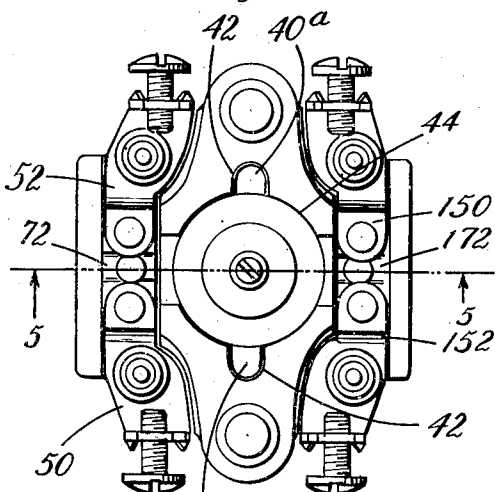
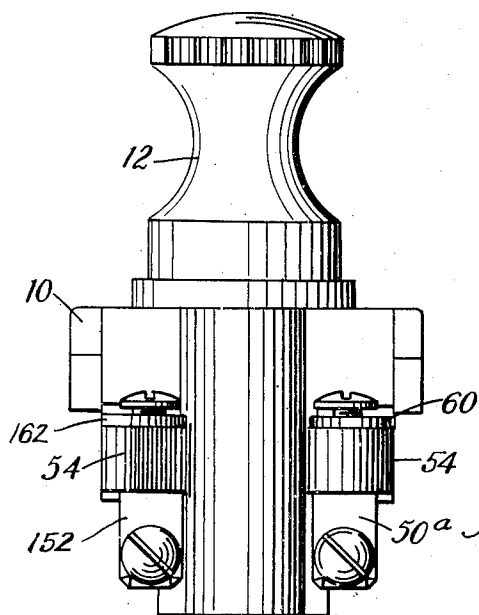


Fig. 3

Fig. 4

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2 Sheets-Sheet 2

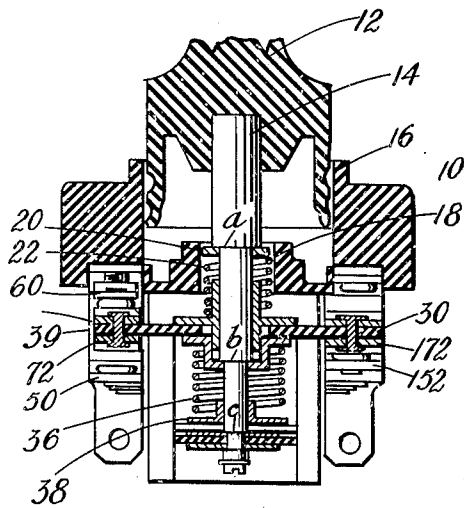


Fig. 5

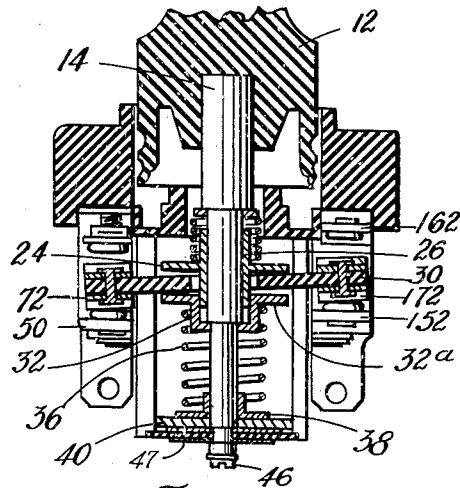


Fig. 6

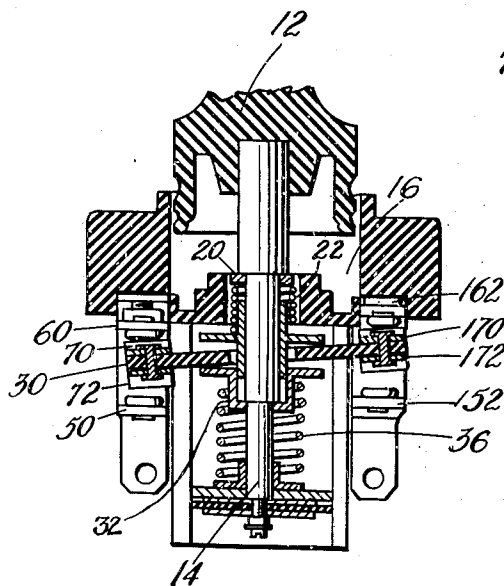


Fig. 7

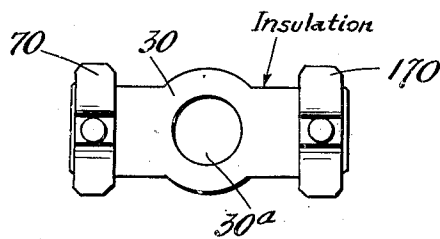


Fig. 8

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PUSH-PULL SWITCH

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8 Claims. (Cl. 200—16)

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This invention relates to push-pull electric switches wherein the switch parts normally occupy a central position, from which they can be moved by pulling a handle to establish certain circuits or by pushing the handle to establish other circuits.

It is an object of this invention to provide an improved electric push-pull switch mechanism of the foregoing type having rugged construction to stand continuous hard use, while at the same time possessing the characteristic of ease of operation.

Another object of the invention is to provide a push-pull switch structure which, when in its central position, will maintain one or more sets of contacts in engagement and which, when pushed or pulled, will maintain the engagement of one of said sets and will at the same time establish a new circuit or cause engagement of another set of contacts.

Another object of the invention is to provide a push-pull switch of the foregoing type utilizing a contact carrying member that is normally held in equilibrium in a central position by opposing spring actions, but which may be tilted upon pushing or pulling of the switch handle to accomplish a variation in contact engagements including the maintenance of one previously existing contact engagement.

Other objects and advantages will become apparent to those skilled in the art as the invention is described in connection with the accompanying drawings.

In the drawings—

Fig. 1 is a side elevation view partly broken away of a switch embodying the invention.

Fig. 2 is an elevational view, from the opposite side, of the switch illustrated in Fig. 1.

Fig. 3 is an end elevation view of the switch of Fig. 1.

Fig. 4 is a bottom view of the switch of Fig. 1.

Fig. 5 is a section view taken along line 5—5 of Fig. 4, illustrating the parts in central position.

Fig. 6 is a section view similar to Fig. 5 with the parts in "pushed" position.

Fig. 7 is a section view similar to Fig. 5 with the parts in "pulled" position, and

Fig. 8 is a detailed plan view of the contact carrier and the bridging contacts.

Referring to the drawings, the parts are

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mounted within a molded insulated base or body 10 which is provided, during the molding operation, with the necessary recesses, apertures and ledges for the reception of the fixed and movable switch parts (as will hereinafter be described).

A handle 12, preferably molded of insulating material into the form illustrated in Figs. 1-3, may be pushed or grasped and pulled to operate the movable switch parts. The handle is mounted upon a metallic spindle or shaft 14 preferably during the molding of said handle. The lower or inner portion of said handle is preferably cylindrical and received within a circular well or recess 16 formed in the top surface of the base 10 and the spindle extends through a smaller circular passage 18 in the bottom of the well 16. Three shoulders *a*, *b*, and *c* (Fig. 5) are formed on the shaft by providing the shaft with several portions of progressively reduced diameters.

Against the shoulder *a* of shaft 14 is pressed a circular washer 20 by a coiled compression spring 22 whose opposite end presses upon a flange 24 radially extending from a sleeve member 26 which is slidably mounted upon the central portion of the shaft 14. The sleeve member 26 extends through an aperture 30*a* in an insulating contact carrier 30 which may be stamped from sheet insulation in the form illustrated in Fig. 8. As the spring 22 tends to expand, it presses the flange 24 of the sleeve 26 against the innermost surface of the contact carrier 30. This urge is resisted by a cup-shaped member 32 located on the opposite side of the contact carrier 30 and slidably mounted upon the lower portion of the shaft 14. For passage of shaft 14, the bottom of the cup 32 is apertured, and its inner peripheral walls are of diameter to slidably receive the lower end of the sleeve member 26. A circular peripheral flange 32*a* is preferably provided on the top portion of the cup member to provide sufficient bearing area against the lower face of the contact carrier 30. The cup member 32 is urged against the face of the contact carrier 30 by the upper end of a compression spring 36 coiled around shaft 14. The lower end of the spring rests upon the flange of a small sleeve or spring retainer 38 which is slidably mounted upon the lower end

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of the shaft 14 and seats upon the stamped sheet metal guide member 40 having wings 40a extending in diametrically opposite directions and sliding within longitudinal recesses 42 molded in the walls of a central passage 44 in the bottom of base 10. The guide member 40 may be held upon the lower end of the shaft by any suitable means such as a screw 46 or by peening over the lower end of the shaft against a washer 47 on a neck at the shaft end.

Two pairs of upper and lower fixed contact and terminal members are mounted on each of two opposite sides of the switch base. Since the pairs of upper and lower terminal and contact members are alike on one side, description of one pair will suffice. The lower set on one side comprises contact and terminal members (designated generally by numerals 50 and 52) stamped from sheet metal into the form illustrated in Fig. 1. A terminal portion 50a is bent at right angles to an anchor portion 50b; and offset downwardly from the anchor portion is a contact portion 50c which has a contact button 50d riveted on its inner or upper surface. The anchor portion 50b is secured by means of a hollow rivet 56 against the bottom surface of a projection 54 molded integrally with the base 10. A flanged insulating washer 58 insulates the shank and head of the rivet from the terminal member. Such rivets also serve to secure the upper set or pair of contact members (designated generally by numerals 60 and 62) against the upper surface of the projections 54. These upper contact members are stamped from sheet metal with the terminal portion, 62a for example, resting upon the upper surface of the projection 54. Contact supporting portion 62b is offset downwardly and has contact button 62d on its lower surface. For bridging the contact buttons of the upper contact members 60 and 62 when the contact carrier 30 is in central position, a bridging contact 70 is provided; and for bridging the contact buttons of the lower contact members 50 and 52, when the handle 12 is pressed down, a bridging contact member 72 is provided. The bridging contacts 70 and 72 are located opposite each other on the upper and lower surfaces respectively at one end of the contact carrier 30 and are riveted thereon.

At the opposite end of the contact carrier are mounted upper and lower bridging contact members 170, 172 in similar manner and of similar structure to the bridging contacts 70 and 72. These bridging contacts 170 and 172 engage with upper and lower sets of fixed contacts 160, 162 and 150, 152 respectively, which are similar in structure to the contacts 50, 52 and 60, 62, except that the button carrying portions of these contacts are offset upwardly instead of downwardly so that in central position of the contact carrier 30, when the upper bridging contact 70 engages with the upper stationary contacts 60, 62, the lower bridging contact 172 will engage with the lower stationary contacts 150, 152.

By referring to Figures 5, 6, 7, it may be observed that upon pushing of the handle 12, the shaft 14 descends. This causes the shoulder a on the shaft to move the washer 20 downwardly and compresses the upper spring 22 causing the contact carrier 30 to tilt downwardly into the position of Figure 6. The contact carrier is caused to tilt from the position of Figure 5 to the position of Figure 6 because the bridging contact 172 was engaged and remains engaged with the lower fixed contacts 150, 152. The tilting of the contact carrier also causes the bridging contact 70

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to disengage the upper fixed contacts 60 and 62, and the bridging contact 72 to engage the lower fixed contacts 50 and 52. Upon release of the handle 12, the spring 22 returns the parts to the position in Figure 5. During the downward motion of the shaft 14, no substantial action of the lower spring 36 takes place for the reason that the intermediate shoulder b on the shaft 14 carries the spring 36 and its upper and lower retainers 32 and 38 downwardly with the shaft as a unit.

Continued pushing on the handle 12, after the contact carrier has assumed the position in Figure 6, results in no harmful effect because continued downward movement or over-travel is permitted before the upper spring 22 becomes fully compressed.

When the handle 12 is pulled, the shaft 14 ascends. This ascent causes the upward movement of the lower spring retainer 38 with the shaft to compress the lower spring 36. The pressure of the spring 36 is transmitted to the upper spring retainer 32 and by that member to the contact carrier 30 causing the carrier to tilt from the position in Figure 5 to the position in Figure 7. The contact carrier 30 is caused to tilt because the bridging contact 70 was engaged and remains engaged with the upper fixed contacts 60 and 62 during the pulling action. The tilting of the contact carrier also causes bridging member 172 to disengage the lower fixed contacts 150, 152 and bridging contact 170 to engage the upper fixed contacts 160 and 162. During this movement, the upper spring 22 can expand upwardly to some extent by reason of the raising of the washer 20 and shaft 14 and the accompanying smaller rise of the sleeve 23. Continued upward pull of the handle 12 after the contact carrier has assumed the position in Figure 7 results in no harmful effect, lost motion and over travel is permitted before the spring 36 becomes fully compressed.

From the foregoing it may readily be understood that the invention provides for maintaining the lower set of contacts engaged at one side of the switch when the handle is pushed to cause disengagement of the upper set at the opposite side of the switch and engagement of the lower set on that opposite side. In like manner, the invention provides for maintaining the upper set of contacts engaged on the opposite side when the handle is pulled to disengage the lower set on the first mentioned side and engage the upper set on that side. Furthermore, the means for accomplishing the aforementioned functions and actions is entirely novel; also the switch is of sturdy construction and its individual parts may be inexpensively manufactured from readily available materials by common manufacturing processes.

Many modifications within the scope of my invention will be apparent to those skilled in the art. Therefore, I do not limit my invention to the embodiment shown or described.

What I claim is:

1. An electric switch comprising a shaft movable back and forward from a central position, a pair of oppositely acting springs mounted on and movable with said shaft, a tiltable contact carrier movable by said shaft, contact means mounted on said carrier, a plurality of fixed contact means engageable by said contact means, said springs acting on said shaft and carrier to hold said shaft and carrier at rest in the central position and means causing said contact means to

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establish engagement of certain of said fixed contact means and disengagement of certain other of said fixed contact means as said carrier is tilted from central position while maintaining the pre-existing condition of other of said contact means.

2. An electric switch comprising a shaft movable back and forward from a central position, a tiltable contact carrier movable by said shaft, contact means mounted on said carrier, a plurality of fixed contact means engageable by said contact means, spring means mounted on said shaft acting oppositely on said carrier to hold said carrier and shaft at rest in a central position and also causing said contact means to establish engagement of certain of said fixed contact means and disengagement of certain other of said fixed contact means as said carrier is tilted in one direction from central position, while maintaining the pre-existing condition of other of said contact means.

3. In an electric switch, a movable contact carrier having contact surfaces at both ends and on opposite faces, springs mounted on said shaft acting oppositely on said carrier to hold it in a central position normally, fixed contact means engaged by the contact surface which is at one end and on one face of the carrier when the carrier is in central position, other fixed contact means engaged by the contact surface which is at the other end and on the opposite face of the carrier when the carrier is in central position, a third fixed contact means engageable by the contact surface on the opposite face of said one end of the carrier when the carrier is moved in one direction while the condition of contact engagement at the opposite end is maintained, and a fourth fixed contact means engageable by the contact surface which is on the reverse face of said other end when said carrier is moved in the other direction from central position while the condition of contact engagement at said one end is maintained.

4. In an electric switch, a shaft, a contact carrier mounted on said shaft and movable from a central position in opposite directions, springs mounted on said shaft acting oppositely on said carrier to maintain said carrier normally in central position, means on said shaft anchoring opposite ends of said springs, upper and lower contact surfaces at the ends of said carrier, fixed contact means engaged by said upper contact surface at one end of the carrier and other fixed contact means engaged by the lower contact surface at the other end of the carrier in the central position of the carrier, third fixed contact means engageable by the lower contact surface on said one end of the carrier when said carrier moves downwardly while contact conditions at the opposite end of the carrier are maintained, and a fourth fixed contact means engageable by the upper contact surface at said opposite end of the carrier when said carrier moves upwardly from central position while contact conditions at said one end of the carrier are maintained.

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5. In a push-pull switch, an axially movable shaft, a contact carrier movably mounted on said shaft, fixed members located on opposite sides of said shaft, plural spring means mounted on said shaft holding said carrier with a surface at one end normally in engagement with one of said fixed members and with an opposite surface at the other end in engagement with another of said fixed members, means on said shaft limiting expansion of one of said springs, means on said shaft limiting expansion of a second of said springs in one direction, expansion of said second spring in the opposite direction being opposed by the first spring whereby on movement of said shaft from normal position the carrier will tilt about one or the other of said fixed members and disengage the other.

6. In an electric switch, a shaft, contact carrying means mounted on said shaft, fixed members located adjacent opposite ends of said carrying means, means mounted on and moving with said shaft and resiliently holding said carrying means with a surface at one end normally in engagement with one of said fixed members and an oppositely facing surface at the other end in engagement with another of said fixed members, and means to move said carrying means from said normal position by causing tilting about one or the other of said fixed members and concomitant disengagement of the fixed member which is opposite the tilt point.

7. An electric switch, as set forth in claim 6, having contact surfaces at each end of said contact carrying means, said fixed members being switch contacts whereby tilting of said carrying means results in maintaining engagement of one set of contacts while another set becomes disengaged.

8. An electric switch, as set forth in claim 6, having contact surfaces at each end of said contact carrying means, fixed contacts including said fixed members above and below each end of the carrying means, whereby tilting of said carrying means results in maintaining engagement of contacts at one end of the carrying means and disengagement of one contact and engagement of another contact at the other end of the carrying means.

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