July 17, 1962 O. M. BUNDY 3,045,092

ELECTRIC SWITCH

Filed March 31, 1959

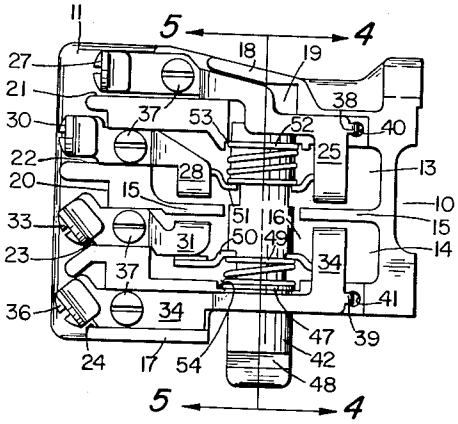


Fig. 1

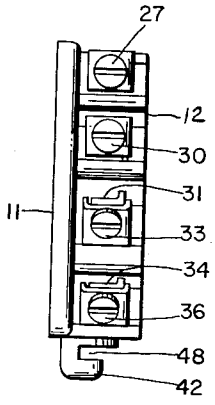


Fig. 2

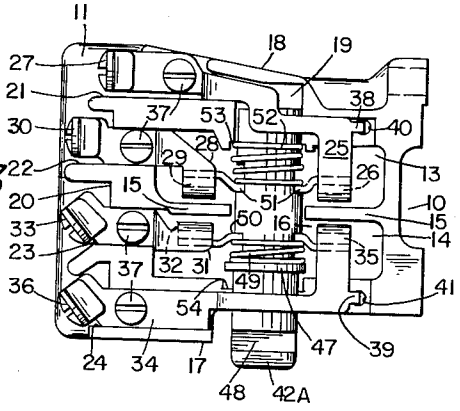


Fig. 3

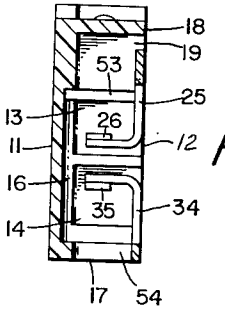


Fig. 4

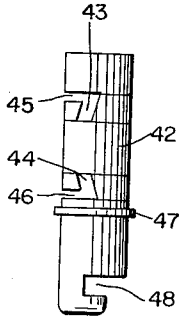


Fig. 6

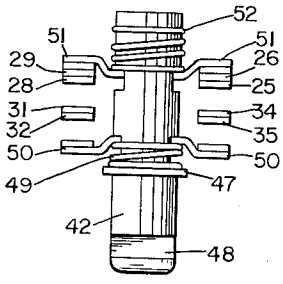


Fig. 7

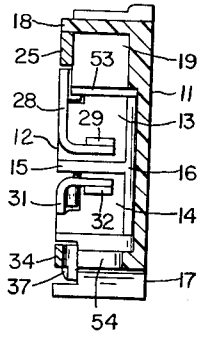


Fig. 5

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ELECTRIC SWITCH

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5 Claims. (Cl. 200—168)

My invention relates to an electric switching device and more particularly to improvements in the construction and operation of unitary electric switches.

In carrying out one form of my invention, I provide a housing having two recesses formed therein and opening out to one side. The recesses are separated by a mid-wall. Traversing through the two recesses, the mid-wall, the bottom wall, and into the top wall is a groove. A contact carrier fits into the groove and is guided thereby during its reciprocable movement. Two bridging contacts are separately attached to the contact carrier and spaced so one is positioned in each of the recesses. A pair of stationary contacts is also positioned in each recess to cooperate with the respective bridging contact. The stationary contacts are connected to terminals positioned at the front of the housing, and the connection means between one of the stationary contacts in each recess and its associated terminal serves to retain the contact carrier in the groove. Suitable spring means is disposed on the contact carrier to bias each bridging contact so the proper contact pressure is provided between it and its associated stationary contacts.

The terminals are arranged so an electrical circuit can be connected to the terminals for one pair of stationary contacts and a second electrical circuit can be connected to the terminals for the other pair of stationary contacts. The switch is constructed with sufficient electrical clearance so the electrical circuits can be of opposite polarity and electrically isolated from each other.

Normally, the contact carrier is in its down position. When in this position, the first bridging contact is engaged with the first pair of stationary contacts to complete the electrical circuit connected to associated terminals. The second bridging contact is disengaged from the second pair of stationary contacts, making the electrical circuit connected to its associated terminals open.

When the contact carrier is moved to its other position by means of an external operator, the first bridging contact is disengaged from the first pair of stationary contacts to open the electrical circuit connected to its associated terminals. The second bridging contact engages the second pair of stationary contacts to close the electrical circuit connected to its associated terminals.

Another embodiment of my invention is to make the switch so that its contacts "overlap." That is, the bridging contact of the open circuit will engage with its associated stationary contacts, when the contact carrier is moved, before the other bridging contact disengages from its associated stationary contacts. In my switch, this can be accomplished by changing the spacing between the bridging contacts on the contact carrier. In actual practice, this is accomplished most practically by providing a different contact carrier.

It is the primary object of my invention to provide an electric switch that can accomplish the above.

It is another object of my invention to provide an electric switch which has a minimum of parts, is easily assembled, and inexpensive to manufacture.

It is a further object of my invention to provide an electric switch which controls two separate electrically isolated circuits, and yet be of a compact and durable construction.

It is still another object of my invention to provide an

electric switch which has all of its terminals at one side, leaving the remaining sides free for other uses.

It is still a further object of my invention to provide an electric switch which is very flexible in its uses and which is readily convertible to the "overlap" type, with a minimum of changes.

The above and other objects of my invention will be made apparent to those skilled in the art, when taken in consideration with the following specifications and the accompanying drawings in which:

FIGURE 1 is a side elevational view of one embodiment of my electric switch showing the contacts, terminals, and their mounting arrangement.

FIGURE 2 is a front elevational view of my electric switch showing the location of the terminals.

FIGURE 3 is a side elevational view of another embodiment of my electric switch showing its contacts, terminals, and their mounting arrangement.

FIGURE 4 is a sectional view of the housing and stationary contacts taken in the direction of the arrows 4—4 in FIGURE 1, with the contact carrier removed.

FIGURE 5 is a sectional view of the housing and the stationary contacts taken in the direction of the arrows 5—5 in FIGURE 1 and with the contact carrier removed.

FIGURE 6 is a view of the contact carrier used in FIGURE 1.

FIGURE 7 is a view of the contact carrier used in FIGURE 1, having the springs and bridging contacts assembled thereon.

The electric switch of this application can be used to replace the switch units on the relay set forth in the pending application of William Few et al., Serial No. 560,655, filed January 23, 1956, now Patent No. 2,921,166, entitled "Electric Relays," and having the same assignee as the instant application. The use of these new electric switches on the relays set forth in the above mentioned application will provide an electric relay capable of controlling twice the number of electrical circuits without appreciably increasing the physical size or the mounting space required by the relay.

Referring to the assembled switch shown in FIGURE 1, it comprises a molded one-piece housing **10** having a closed side **11** and an open side **12**. A top recess **13** and a bottom recess **14** of general rectangular shape are formed in housing **10** opening toward side **12** and being separated by a horizontal mid-wall **15**. Housing **10** is also formed with a groove **16** perpendicular to mid-wall **15** therein and extending though recesses **13** and **14**, through mid-wall **15** for communication between recesses **13** and **14**, and through a bottom wall **17** for communication with recess **14** and the outside. Groove **16** also extends into a top wall **18** to form a recess **19** connected to recess **13**.

A front wall **20** of housing **10** has four horizontal grooves **21**, **22**, **23** and **24** therein, in vertical alignment respectively. Grooves **21** and **22** communicate with recess **13**, and grooves **23** and **24** communicate with recess **14**. Groove **21** runs through part of top wall **18** and over recess **19** before communicating with recess **13**. Groove **24** runs through part of bottom wall **17** and over groove **16** before communication with recess **14**.

A conducting strap **25** is fitted into groove **21** and extends over recess **19** to have one end, with a stationary contact **26** thereon, positioned in recess **13**; and the other end, with a terminal **27** thereon, positioned outside of front wall **20**.

A conducting strap **28** is fitted into groove **26**, having one end with a stationary contact **29** thereon, positioned in recess **13**; and the other end, with a terminal **30** thereon, positioned outside of front wall **20**.

A conducting strap **31** is fitted into groove **23**, having

one end with a stationary contact 32 thereon, positioned in recess 14; and the other end, with a terminal 33 thereon, positioned outside of front wall 20.

A conducting strap 34 is fitted into groove 24 and extends over groove 16 to have one end, with a stationary contact 35 thereon, positioned in recess 14; and the other end, with a terminal 36 thereon, positioned outside of front wall 20.

Conducting straps 25, 28, 31 and 34 are individually secured to housing 10 by means of screws 37—37 which are screwed into front wall 20. Conducting straps 25 and 34 are also secured in position by means of inturned ears 38 and 39 which fit into holes 40 and 41 located in the top wall 18 and bottom wall 17 respectively.

A contact carrier 42 (see FIGURE 6) is of a one-piece molding, preferably of nylon, and of a general cylindrical shape. It has two apertures 43 and 44 spaced along its length and which are quadrilateral in shape for receiving the bridging contacts 50 and 51. A slot 45 communicates with aperture 43 and the outside, and slot 46 communicates with aperture 44 and the outside. A ridge 47 circumscribes contact carrier 42 and is spaced below aperture 44 for a purpose to be described. Contact carrier 42 has a groove 48 near its bottom to form a connection with the operating means when used on an electric relay as described in the aforementioned application.

It is to be noted that aperture 43 and 44 are slanted away from the vertical centerline of contact carrier 42. This is to provide a wiping action between the bridging contacts and the stationary contacts when they engage or disengage. This feature is set forth in more detail and claimed in pending application of Arald B. Pearson, Serial No. 631,286, filed December 28, 1956, now Patent No. 2,879,359, and assigned to the same assignee as the instant application.

Contact carrier 42, with the bridging contacts assembled thereon, is shown in FIGURE 7. To assemble, a spring 49 is slipped over the top of contact carrier 42 and down until it seats on the top of ridge 47. Spring 49 is compressed against ridge 47 and bridging contact 50 is slid through slot 46 into aperture 44. Spring 49 is then released to securely retain bridging contact 50 against the top of aperture 44.

Bridging contact 51 is slid through slot 45 into aperture 43, and a spring 52 is slid over the top of contact carrier 42. Spring 52 is retained on contact carrier 42 when assembled in the housing by its seating against a ridge 53 located around groove 19 on top of wall 18.

In assembly of the entire switch, the assembled contact carrier of FIGURE 7 is placed in groove 16 of housing 10 so bridging contact 51 is in recess 13 and bridging contact 50 is in recess 14. Spring 52 is compressed and seated against ridge 53. Also, ridge 47 is positioned inside the ring 54, which is located on bottom wall 17, around groove 16. Ring 54 serves to limit the downward movement of contact carrier 42 in groove 16.

Next, conducting straps 25 and 28 are placed and secured in grooves 21 and 22 respectively by screws 37—37 which positions stationary contacts 26 and 29 immediately under bridging contact 51. The bias of spring 52 causes bridging contact 51 to engage stationary contacts 26 and 29 under pressure to insure positive continuity, and to prevent any undesired contact bounce or opening.

Conducting straps 31 and 34 are placed and secured in grooves 23 and 24 respectively by screws 37—37 which positions stationary contacts 32 and 35 in recess 14 above and spaced from bridging contact 50.

It is to be noted, that when conducting strap 25 is secured to housing 10 in groove 21, it extends over aperture 19 and the top portion of contact carrier 42 therein. Also, conducting strap 34 in groove 24 extends over groove 16 and contact carrier 42 therein at bottom wall 17. Therefore, these two conducting straps, 25 and 34, serve to retain contact carrier 42 in groove 16 and yet allow its required reciprocable movement.

When contact carrier 42 is in its down position, the electrical circuit connected to terminals 27 and 30 is completed because of bridging contact 51 engaging both stationary contacts 26 and 29. At the same time, the electrical circuit connected to terminals 33 and 36 is not completed because of bridging contact 50 being spaced below and away from stationary contacts 32 and 35.

To operate the switch, contact carrier 42 may be pushed upward by any suitable means; such as manually, electromagnetically, or mechanically.

While contact carrier 42 is moving upward, bridging contact 50 and spring 49 moves with it. Bridging contact 51 does not move until it is engaged by the bottom of aperture 43, after which it is carried upward by the movement of contact carrier 42. When bridging contact 51 is moved, it disengages from stationary contacts 26 and 29 to open the electrical circuit connected to terminals 27 and 30.

Further upward movement of contact carrier 42 causes bridging contact 50 to engage with stationary contacts 32 and 35 to complete the electrical circuit connected to terminals 33 and 36. After this occurs, contact carrier 42 is still moved upward to compress spring 49 and insure that bridging contact 50 is positively engaged with stationary contacts 32 and 35 under pressure. This again prevents the circuit from being accidentally opened due to vibration and the like.

When the upward force of the operator is removed from contact carrier 42, it drops to its down position. During the downward movement, the top of aperture 44 again engages with bridging contact 50 and moves it away from stationary contacts 32 and 35, opening the electrical circuit connected to terminals 33 and 36.

After this occurs, further downward movement of contact carrier 42 causes bridging contact 51 to engage with stationary contacts 26 and 29, and close the electrical circuit connected to terminals 27 and 30.

In many applications using electric switches of this general type, it is desirous to have the contacts in one circuit close before the contacts in another circuit opens. With my switch, this can be accomplished by merely changing the contact carrier used to carry the bridging contacts. The contact carrier required to accomplish this must have apertures of a closer spacing than those shown in FIGURE 6.

FIGURE 3 illustrates an electric switch having a modified contact carrier 42A. It is shown after having been moved upward by the external operator to a point where bridging contact 50 has engaged stationary contacts 32 and 35. At this same time, bridging contact 51 is still engaging stationary contacts 26 and 29. Therefore, both the circuit connected to terminals 27 and 30 and the circuit connected to terminals 33 and 36 are closed.

Continued upward movement of contactor carrier 42A causes bridging contact 50 to move relatively down in aperture 44 compressing spring 49. It also causes bridging contact 51 to become engaged by the bottom of aperture 43 to move it up so it becomes disengaged from stationary contacts 26 and 29. Spring 52 is compressed by the upward movement of bridging contact 51.

When the upward force is removed, contact carrier 42A is returned to its down position due to gravity and the force of spring 52.

Bridging contact 51 moves down with contact carrier 42A until it engages stationary contacts 26 and 29. Continued downward movement of contact carrier 42A causes the top of aperture 44 to engage bridging contact 50 and move it out of engagement with stationary contacts 32 and 35.

Thus, it is shown how the "overlap" action of the contacts takes place in both directions of the electric switch operation.

Another embodiment of my invention can readily be

accomplished by making modifications to the conducting straps such that both pairs of stationary contacts are disengaged from the bridging contacts when the contact carrier is in its down position and engaged by the bridging contacts when the contact carrier is in its up position.

Another embodiment is to have both of the pairs of stationary contacts engaged by the bridging contacts when the contact carrier is in its down position and disengaged from the bridging contacts when the contact carrier is in its up position.

Although I have described my invention with a certain degree of particularity, it is to be understood that the above disclosure has been made only by way of example as is required by law and that many changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and scope of my invention as hereinafter claimed.

I claim as my invention:

1. In an electric switch having an insulation housing, side walls and a mid-wall formed on said housing defining a first and second recess therein open towards one side of said housing; a groove in said housing extending through the bottom side wall, the mid-wall, the first and second recesses, and into the top side wall; an externally operated contact carrier disposed in and slidably guided by said groove, a first and second bridging contact spacedly mounted along the length of said contact carrier to be disposed in said first and second recess respectively; a first pair of grooves formed in said housing connecting the first recess with the front exterior of said housing, a conducting strap disposed in each of the first pair of grooves and each having a stationary contact at its inner end positioned in the first recess at either side of said contact carrier to cooperate with the first bridging contact while its outer terminal end extends external of said housing; one of said conducting straps in one of said first pair of grooves traverses over said contact carrier and then into the first recess; a second pair of grooves formed in said housing connecting the second recess with the front exterior of said housing, a conducting strap disposed in each of the second pair of grooves and each having a stationary contact at its inner end positioned in the second recess at either side of said contact carrier to cooperate with the second bridging contact while its outer terminal end extends external of said housing; one of said conducting straps in one of said second pair of grooves traverses over said contact carrier and then into the second recess; whereby said contact carrier is held in its groove by the two conducting straps traversing over it.

2. In an electric switch as described in claim 1 wherein the first bridging contact is disengaged from its associated stationary contacts before the second bridging contact engages with its associated contacts.

3. In an electric switch as described in claim 1 wherein the first bridging contact is disengaged from its associated stationary contacts after the second bridging contact has engaged with its associated contacts.

4. In an electric switch having an insulation housing, side walls and a mid-wall formed on said housing defining a first and second recess therein opening towards one side of said housing; a groove formed in said housing extending through the bottom side wall, the mid-wall, the first and second recess, and into the top side wall; an externally operated contact carrier disposed in and slidably guided by said groove, a first and second bridging contact spacedly mounted along the length of said contact carrier to be disposed in said first and second recess respectively; a first pair of grooves formed in said housing connecting the first recess with the front exterior of said housing, a conducting strap disposed in each of the first pair of grooves and each having a stationary contact at its inner end positioned in the first recess to cooperate with the first bridging contact while its outer terminal end extends external of said housing; one of said conducting straps in one of said first pair of grooves traverses over said contact carrier and then into the first recess; a first spring means normally biasing said first bridging contact into engagement with its associated contacts; a second pair of grooves formed in said housing connecting the second recess with the front exterior of said housing, a conducting strap disposed in each of the second pair of grooves and each having a stationary contact at its inner end positioned in the second recess to cooperate with the second bridging contact while its outer terminal end extends external of said housing; one of said conducting straps in one of said second pairs of grooves traverses over said contact carrier and then into the second recess; a second spring means for biasing the second bridging contact toward engagement with its associated stationary contacts, and external means for operating said contact carrier to cause the first bridging contact to disengage from its associated stationary contacts and the second bridging contact to engage with its associated contacts, and whereby said contact carrier is secured in its groove by the conducting straps traversing over it.

5. In an electric switch as described in claim 4 wherein the first bridging contact is disengaged from its associated stationary contacts after the second bridging contact has engaged with its associated contacts.

References Cited in the file of this patent

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