April 20, 1943. J. BIERENFELD 2,316,834

PUSH BUTTON

Filed Dec. 7, 1940

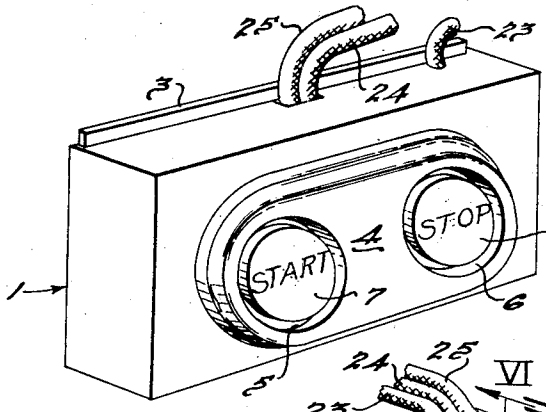


Fig. 1.

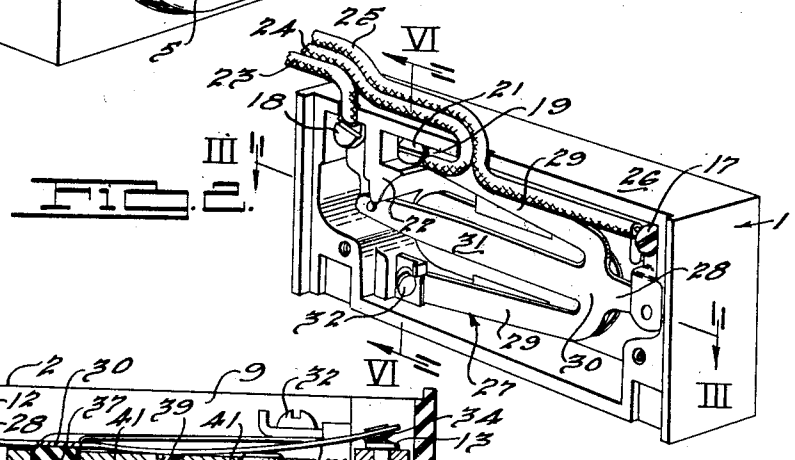


Fig. 2.

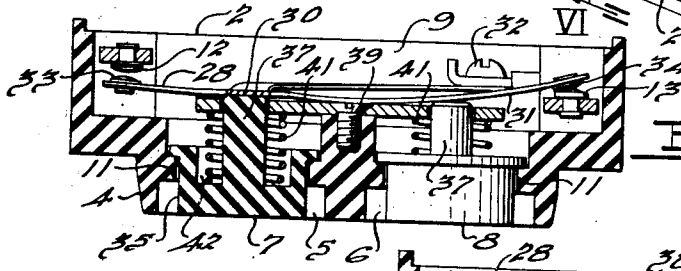


Fig. 3.

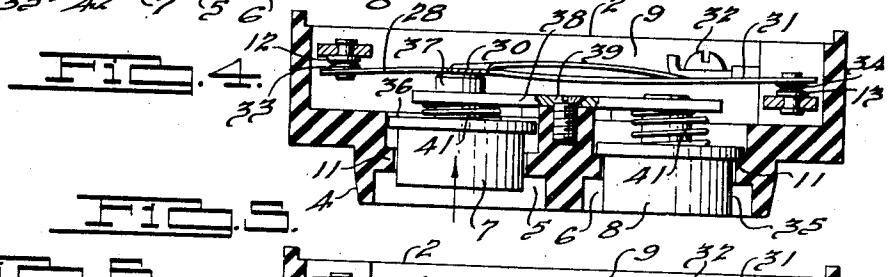


Fig. 4.

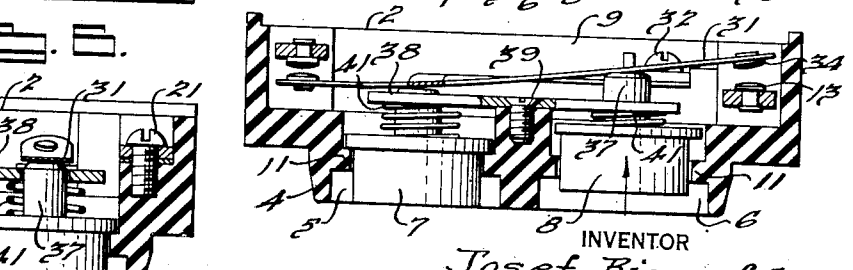


Fig. 5.

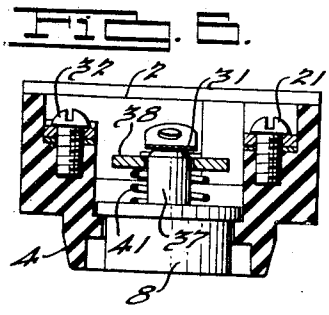


Fig. 6.

INVENTOR
Josef Bierenfeld.
BY
Myron J. Seibold
ATTORNEY

Patented Apr. 20, 1943 2,316,834

UNITED STATES PATENT OFFICE

2,316,834

PUSH BUTTON

Josef Bierenfeld, Shorewood, Wis., assignor to Square D Company, Detroit, Mich., a corporation of Michigan

Application December 7, 1940, Serial No. 369,015

7 Claims. (Cl. 200—5)

This invention relates to devices for making and breaking electrical circuits and more particularly to electric switches of the type known as push button stations.

The object of the present invention is to provide a push button station of an improved and simplified construction but which shall be reliable and positive in its operation.

Other objects and features of this invention will be readily apparent to those skilled in the art from the specification and appended drawing illustrating certain preferred embodiments in which:

Figure 1 is a front perspective view of an electric switch according to the present invention.

Figure 2 is a rear perspective view of the electric switch with the cover removed to show the interior thereof.

Figure 3 is a sectional view taken on the line III—III of Figure 2 showing the parts in normal position.

Figure 4 is a view similar to Figure 3 but with the Start button depressed.

Figure 5 is a view similar to Figure 3 but with the Stop button depressed.

Figure 6 is a sectional view taken on the line VI—VI of Figure 2.

Electric switches of the type commonly called push button stations are switches that are particularly adapted for use with starting equipment for electric motors. In normal use the momentary depression of the push button designated Start will throw in a circuit that initiates and maintains the operation desired. Momentary depression of the second or Stop push button will break this holding circuit and halt the operation of the controlled device.

The switch according to the present invention comprises a box-like body portion or base 1 of insulating material having an open bottom 2 closable by an insulated cover 3 and having a raised portion 4 of a generally elliptical contour on the front face thereof. A pair of spaced apertures 5 and 6 adapted to slidably receive push buttons 7 and 8 are provided at the front of the switch and extend through the raised portion 4 and into a chamber 9 provided within the body portion 1. Circular ledges 11 are provided in each of the apertures 5 and 6 for maintaining the push buttons within the apertures.

Stationary contacts 12 and 13 are mounted upon the body portion 1 at either end of chamber 9 and with the contact faces thereof oppositely directed. Studs 17 and 18 secure the stationary contacts to the body portion and also serve as means for connecting cable terminal ends to the switch. A terminal member 19 is disposed adjacent the stationary contact 13 and is secured in place by a stud 21. A barrier wall 22 separates the terminal member 19 from the stationary contact 13 preventing accidental shorting thereacross. Electric cables 23, 24 and 25 are led into the interior of the body portion 1 through openings in a side wall 26 thereof, and are secured respectively to stationary contact 13, terminal member 19 and stationary contact 12 by the studs 18, 21 and 17.

A resilient metallic conducting member 27 having a projecting portion 28, spaced armed portions 29 and an extended portion or tongue 31, their junction indicated at 30, is operable to effect the contact operation to perform the switching function. Studs 21 and 32 passing through the arm portions 29 secure the conducting member 27 in place upon the base. Contact faces 33 and 34 adapted to cooperate with the stationary contacts 12 and 13 for the making and breaking of an electric circuit there through are secured at the extremities of the projecting portion 28 and the tongue 31. The resilient element 27 and the stationary contacts 12 and 13 are so disposed within the chamber 9 that the movable contact 34 will normally be in engagement with stationary contact 13 and movable contact 33 will normally be biased to disengaged position.

The movable contacts 33 and 34 are manually actuated into and out of engagement with their cooperating stationary contacts by the push buttons 7 and 8. These push buttons comprise cylindrical portions 35 which are slidably disposed within the apertures 5 and 6. Circular flanges 36 carried at the extremities of the cylindrical portions 35 are adapted to engage the circular ledges 11 disposed in the apertures 5 and 6 to prevent outward removal of the push button. The cylindrical portions 35 are each integrally connected at the base thereof to a rectangular portion 37. A maintaining plate 38 secured to base 14 by a stud 39 and having spaced openings therethrough receives the rectangular portions 37 and thereby serves both to guide and to retain the push buttons within their respective openings. To normally maintain the circular flanges 36 in abutment with the circular ledges 11, springs 41 are disposed about the rectangular portions 37 with the upper extremities thereof received within recesses 42 provided in the bases of the cylindrical portions 35 and with the lower extremities biased against the face of the maintaining plate 38.

The planes of the outer faces of the push buttons bearing the indicia Start and Stop are disposed approximately in or a little below the plane of the face of the raised portion 4 to decrease the possibility of an accidental actuation of a push button.

The operation of the switch will be readily apparent from the above description of the parts. The normal position of the push button is shown particularly in Figure 3, with contact 33 biased open and contact 34 biased into engagement with contact 13. As the push button 7 is depressed, the rectangular portion 37 engages and positively moves the extended portion 28 to bring contact 33 into engagement with contact 12 as in Figure 4, thereby completing the circuit between contacts 12 and 13 and initiating the desired operation. The push button 7 may then be released as the holding circuit established when movable contact 33 engaged stationary contact 12 will maintain the desired operation. Upon release of push button 7, the parts will resume their original position under the bias of spring 41 which was compressed when the push button was depressed. To halt operation of the controlled device, it is necessary only to momentarily depress push button 8 to positively move tongue 31 through engagement therewith by portion 37 to carry contact 34 out of engagement with contact 13, as in Figure 5, thereby breaking the holding circuit and shutting off the flow of current to the controlled device. Push button 8 when released will also be returned to the position of Figure 3 under the bias of its compressed spring 41.

The resilient contact carrying member, according to the present invention, operates in two distinct manners under the actuation of the push buttons 7 and 8. As shown, the supporting arms 29 are joined to the projections 28 and 31 relatively closing the normally open contact 33 and with the movable contact 34 spaced a considerable distance from the junction 30 through the long projection 31. The projection 31 is then stressed to bias the contact 34 toward the stationary contact 13 and in normal operation the parts are in the position shown in Figure 3. When it is desired to close the contact 33, the push button 7 is actuated and this push button exerts its force substantially at the junction 30. This results in a movement of the resilient switching member with the arms 29 bending throughout their length to the point where they are connected to the base, thus the junction 30 and the stationary contact 33 are bodily moved into the position where the contact 33 engages the stationary contact 12, as in Figure 4. However, this movement does not effect opening of the contact 34 but instead increases the pressure exerted by this contact upon a stationary contact since the movement upwardly of the junction 30 tends to still further stress the arm 31 upon which contact 34 is mounted. When, on the other hand, it is desired to open contact 34, the push button 8 is actuated and this bears upon the arm 31. Due to the length of this extension and the distance of the point of application of the point of pressure from push button 8 from the junction 30, the resulting movement is substantially a bending of the extension 31 without substantial movement of the body portion of the resilient switching element as at its junction 30. This action is shown in Figure 5 in which the arm 31 has been bent upwardly to separate contact 34 but without substantial movement of the junction 30 and the contact 33.

While certain perferred embodiments of this invention have been specifically disclosed, it is understood that the invention is not limited thereto as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

What is claimed is:

1. In a device of the class described, a base, a stationary contact mounted thereon at either end thereof, movable contacts adapted to cooperate with said stationary contacts, a unitary resilient switching member comprising a pair of extended portions supporting movable contacts and normally biasing one of said movable contacts into engaged position and the other of said movable contacts into disengaged position, said switching member having at least one elongated portion thereon extending outwardly at an angle to said contact supporting portions for securing said switching member to said base, and a pair of push buttons slidably mounted on said base, one of said push buttons being actuable to positively move said normally engaged movable contact to disengaged position without engaging said normally disengaged contact and the other of said push button being actuable to positively move said normally disengaged contact into engaged position without disengaging said normally engaged contact.

2. In a device of the class described, a base, stationary contacts mounted thereon, a unitary resilient switching element comprising a plurality of extended portions, movable contacts carried by said extended portions adapted to cooperate with said stationary contacts for making and breaking electrical circuits therethrough, one of said movable contacts normally being biased to engaged position and a second of said movable contacts normally being biased to disengaged position, a plurality of elongated supporting members integral with said switching element and extending outwardly therefrom for securing said switching element to the base, a pair of reciprocably mounted push buttons operable to engage said extended portions upon manual actuation thereof, manual actuation of one of said push buttons effecting disengagement of the normally engaged movable contact and manual actuation of the other of said push buttons effecting engagement of the normally disengaged movable contact, and means for automatically returning said push buttons to their original position after actuation thereof.

3. In a device of the class described, a base, a stationary contact mounted thereon at either end thereof, movable contacts adapted to cooperate with said stationary contacts, a unitary resilient switching element comprising oppositely extending portions for mounting said movable contacts, one of said movable contacts being biased by said resilient switching element into normally engaged position, and the second of said movable contacts being biased into normally disengaged position, a pair of elongated supporting portions integral with said resilient switching element for securing said resilient switching element to the base, said elongated supporting portions extending outwardly from said switching element and at opposite sides thereof, a pair of push buttons slidably mounted in said base, one of said push buttons being actuable to positively move said normally engaged movable contact to disengaged position, and the second of said push buttons

being actuable to positively move said normally disengaged movable contact to engaged position without disengaging said normally engaged contact, and means for automatically returning said push buttons to their original positions after actuation.

4. In a device of the class described, a base, a stationary contact mounted upon said base, a second stationary contact oppositely faced to said first stationary contact also mounted upon said base, a pair of movable contacts cooperating with said stationary contacts for making and breaking electrical circuits therethrough, a unitary resilient switching element comprising oppositely extending portions for mounting said movable contacts, said switching element having arm portions integral therewith for securing the switching element to the base, said arm portions joining said resilient element at a point substantially adjacent to one movable contact and substantially removed from the other, the first of said movable contacts being biased by said resilient switching element into normally engaged position and the second of said movable contacts being biased by said resilient switching element to normally disengaged position, said base having a pair of spaced apertures extending therethrough, a pair of push buttons mounted for reciprocable movement within said apertures, said push buttons being actuable to positively engage and move said extending portions to thereby move the movable contacts mounted thereon, the first of said push buttons upon manual actuation thereof moving said normally engaged movable contact to disengaged position, the second of said push buttons upon manual actuation thereof moving said normally disengaged movable contact to engaged position, and spring means operable to return said push buttons to their original position after actuation thereof.

5. An electric switch of the push button type comprising a base, a pair of stationary contacts mounted thereon, a pair of movable contacts for cooperation with said stationary contacts, a unitary resilient element having oppositely directed extended portions upon which are mounted the movable contacts, said resilient element also having divergent supporting portions integral therewith and located thereon substantially closer to one movable contact than to the other, the first of said movable contacts being normally biased by said resilient element into engaged position and the second of said movable contacts being normally maintained by said resilient element in disengaged position, a raised portion on said base having spaced apertures therethrough, a pair of push buttons reciprocably movable within said spaced apertures, means for maintaining said push buttons within their respective apertures, the first of said push buttons being manually actuable to engage and positively move the extended portion mounting the normally engaged movable contact to move said contact to disengaged position, the second of said push buttons being manually actuable to positively move the portion mounting the normally disengaged contact to move said contact to engaged position, and spring means normally exerting their bias to return said push buttons to their original position after actuation.

6. An electric switch of the push button type comprising a base, a pair of spaced, oppositely directed, stationary contacts mounted thereon, a unitary resilient switching element having arm portions mounted on the base and carrying oppositely directed movable contacts adapted to cooperate with said stationary contacts, one of said contacts being mounted on said resilient element adjacent the connection of its supporting arms thereto, another of said movable contacts being mounted on an elongated projection at a substantial distance from said connection, a pair of push buttons for effecting operation of said movable contacts, one of said push buttons operating on said resilient element substantially at the point of connection of the arms thereto to effect movement thereof and of the stationary contact adjacent thereto without substantial movement of the movable contact mounted on said elongated projection and the other push button operating on said elongated projection to effect movement thereof and of the movable contact mounted thereon without effecting substantial movement of said arm connection and of the movable contact adjacent thereto.

7. An electric switch of the push button type comprising an insulating base, a pair of spaced, oppositely directed, stationary contacts mounted on said base, a unitary resilient switching element including a supporting arm integrally joined thereto and having one end thereof secured to the base, a normally open movable contact mounted adjacent to said arm connection and a normally closed movable contact mounted on an elongated extension from said arm connection, a pair of push buttons for operating said movable contacts, one of said push buttons engaging said resilient element adjacent said arm connection and effecting movement of said connection to move the movable contact mounted adjacent thereto into engaged position, said movement serving to increase the contact pressure between the normally closed movable contact and the stationary contact, the second push button operating on said elongated extension operating to move the normally closed movable contact to disengaged position but without effecting substantial movement of said normally open movable contact.

JOSEF BIERENFELD.