May 12, 1959 J. J. SPICER, JR 2,886,674

PUSH BUTTON SWITCH

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Fig. 1

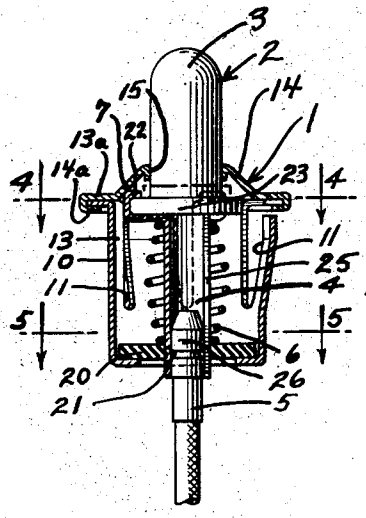


Fig. 2

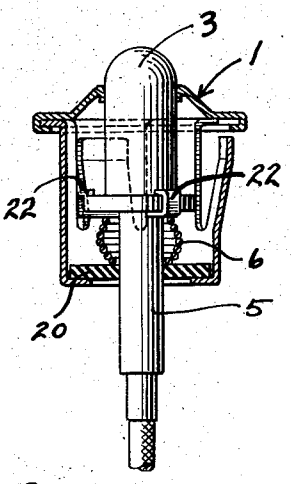


Fig. 3

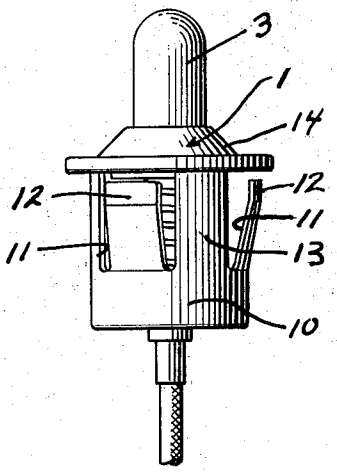


Fig. 4

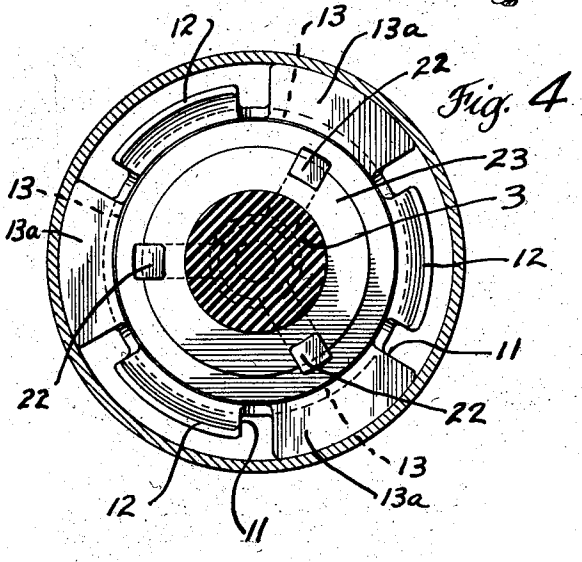
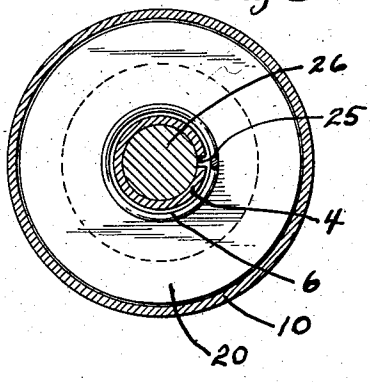


Fig. 5



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Fig. 6

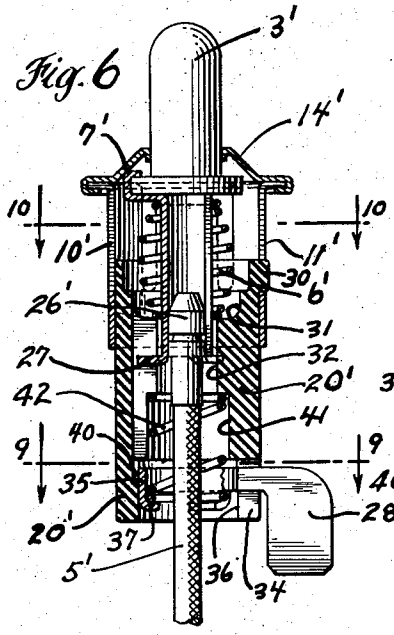


Fig. 7

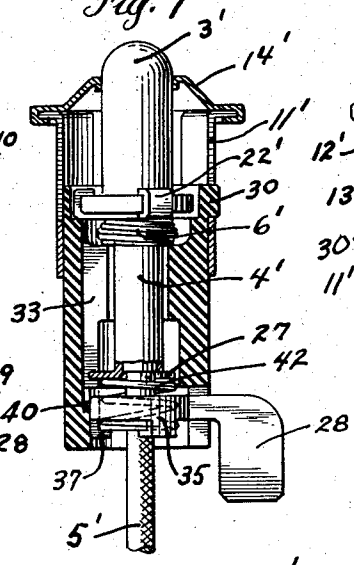


Fig. 8

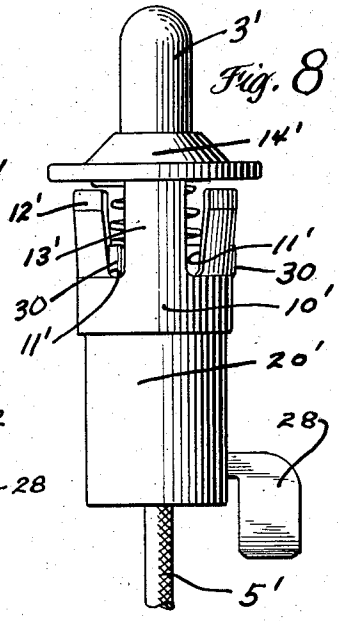


Fig. 9

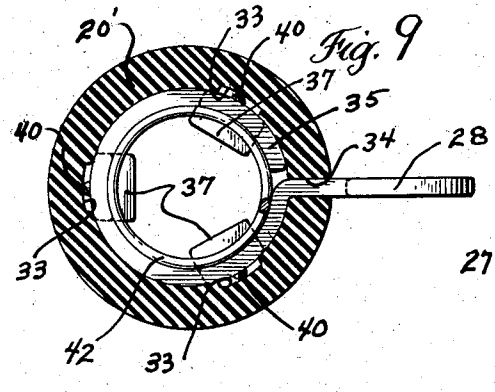


Fig. 10

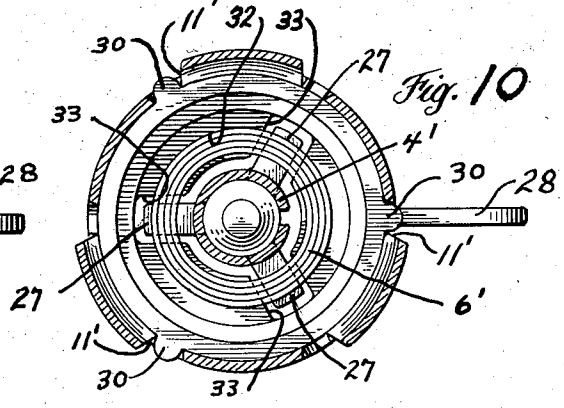
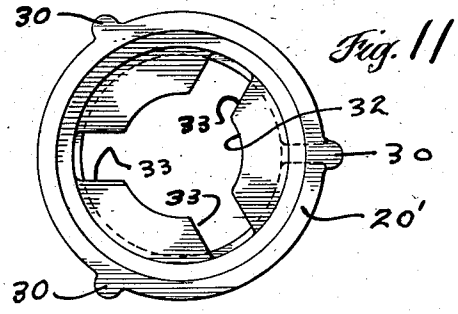


Fig. 11



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PUSH BUTTON SWITCH

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Application August 7, 1957, Serial No. 676,804

6 Claims. (Cl. 200—159)

This invention relates to switching devices and in particular relates to improvements in switching devices commonly known as the push button type.

While the switches of the invention herein disclosed are useful in a wide variety of applications, the switches are particularly suitable for use in automotive vehicles, for example, as a switch which is actuated by the opening and closing of a door, a glove compartment, a hood and the like.

Push button switches have been used for several years on passenger and truck type vehicles. In the usual instance such a switch is of the single-pole, single-throw type, that is to say, a circuit may be de-energized when a door is closed and energized when a door is open. The modern-day trend in the automotive field, however, is to have an increasing number of electrical devices and circuits which contribute to the usefulness of the vehicle and the convenience of the owner. For example, when all doors of a vehicle are closed, it may be desirable to energize some circuit for indicating that the doors are in fact closed or some circuit for preventing inadvertent opening of the doors and the like. For economy sake, such a circuit ordinarily requires a switch which will energize and deenergize two separate circuits when the switch is in one position and the converse when the switch is in another position, for example, a single-pole, double-throw switch. The use of such a switch on vehicles, however, does not eliminate the need for a switch of the type which merely makes and breaks a single circuit, i.e., a single-pole, single-throw switch.

Further in connection with the automotive field, manufacturers have been desirous of presenting cars having highly pleasing style and design. Thus it is desired to have visible push button type switches equipped to fit in with the decor of the car, for example, providing a door push button switch with a stainless steel type bezel. The manufacturing costs of switches of the kind in question are figured in terms of pennies and adding a component made of expensive material such as stainless steel imposes an additional cost factor which, until the advent of the present invention, limited the possibility of utilizing an attractive design.

With the above in mind then, it will be understood that among the objects of the present invention are:

To provide improvements in push button switches of a construction so that the tooling is usable in the manufacture of either a single-pole, single-throw switch or a single-pole, double-throw switch.

To provide improved push button switches having numerous interchangeable parts so as to keep tooling and inventory costs to a minimum.

To provide push button switches of improved design and having an arrangement of parts which are easily and quickly assembled.

To provide a push button switch either of the single-pole, double-throw type or of the single-pole, single-throw type which has a very low manufacturing cost,

which is highly reliable on operation and which has a long life.

To provide a push button switch the visible portion of which has a highly pleasing appearance without any sacrifice of efficiency, operation and longevity of use.

To provide a push button type switch equipped with a stainless steel bezel can be manufactured at a cost commensurate with push button switches not having a corresponding attractive design.

The manner in which the switch is constructed and certain other objects and features will be apparent from the following description and drawings wherein:

Figure 1 is a side elevational view partially in section illustrating the invention as embodied in a single-pole, single-throw push button switch with certain members in engagement to establish an electrical contact;

Figure 2 is a view similar to Figure 1 except that the members establishing the electrical contact have been moved out of engagement;

Figure 3 is a side elevational view illustrating in particular means provided on the switch for mounting the same;

Figure 4 is an enlarged view taken along the lines 4—4 of Figure 1;

Figure 5 is an enlarged view taken along the lines 5—5 of Figure 1;

Figure 6 is a side elevational view partially in section illustrating the invention as embodied in a single-pole, double-throw push button switch with certain members establishing an electrical circuit engaged with one another;

Figure 7 is a view similar to Figure 6 with the contact establishing members of Figure 6 out of engagement and with certain other members in engagement to establish another electrical contact;

Figure 8 is a side elevational view illustrating in particular means provided on the switch for mounting the same;

Figure 9 is an enlarged view taken along the lines 9—9 of Figure 6;

Figure 10 is an enlarged view taken along the lines 10—10 of Figure 6; and

Figure 11 is a view similar to Figure 10 with certain parts removed.

Referring to the drawings and particularly to Figure 1, it will be seen that the single-pole, single-throw embodiment of the invention comprises a housing generally indicated by the numeral 1 which supports an assembly 2 comprising a push button 3 and a terminal 4 mounted for reciprocating motion in the housing, a conductor member 5 in electrical engagement with the movable terminal 4 together with a spring 6 which urges the assembly upwardly or in the position as shown. In this position the movable terminal 4 and the housing 1 engage to establish an electrical contact as is generally indicated at 7.

The housing is made of metal and is adapted to be mounted (by means described later) in say the door frame of a car. When the door is opened, the assembly assumes the position shown such that there is an electrical circuit established between the conductor member 5, the terminal 4, the housing 1 to the metal door frame. When the push button is actuated as, for example by the closure of the door, the assembly is moved to the position shown in Figure 2 so that the electrical contact is broken.

Turning now to the details of construction, it will be seen that the housing 1 comprises a generally cylindrically shaped frame 10 which is provided with axially extending slots as indicated at 11 forming three equally spaced peripheral fastening members 12 and three equally spaced mounting members 13 each having radially extending shoulders as indicated at 13a. The fastening members

12 are formed to flare outwardly as shown in Figure 3 so that the frame can be pushed into a mounting recess which action tends to move the members 11 inwardly and thereby exerting an outward force which holds the switch in position.

Forming part of the housing is a metal bezel 14 having an upstanding conical portion with an aperture 15 which slidably supports the push button 3. The lower part of the bezel is provided with a bent over keeper portion 14*a* which is adapted to engage with the shoulders 13*a* on the frame whereby to hold the frame and bezel together. As stated heretofore, the bezel is preferably made from stainless steel and is polished so as to enhance its decorative effect.

On the bottom of the housing is a base 20 made of insulating material and provided with an aperture 21 which is in alignment with the aperture 15 and slidably supports the terminal 4.

The movable terminal 4 is hollow, elongated and provided at its upper end with three equally spaced arms 22 which surround and tightly grip the base portion 23 (see particularly Figures 2 and 4) of the push button. Interposed between the base 20 and the arms 22 or push button 3 is the spring 6 which, it will be seen, is generally barrel shaped in cross section, the upper and lower ends of which are tightly wound around the terminal. This prevents the spring from having excess radial movement whereby to eliminate the danger of the spring grounding the terminal to the housing.

With the parts in the position shown in Figure 1, it will be apparent that each of the arms 22 engages the conical portion of the bezel to establish an electrical contact. Since the contact is made by the motion of the terminal toward the apex of the conical portion and the fact that the conical portion of the bezel has some resiliency, there is a wiping action when the contact is made. This is an important feature since any good electrical contact should be established by a wiping action.

The movable terminal 4 is made of conducting material such as copper and is stamped to the proper shape and then wrapped into a cylinder with an axially extending slot as indicated at 25 in Figures 1 and 5. The conductor member 5 has a connector 26 which is pressed into the movable terminal 4 and, being oversized, tends to expand the same whereby to establish a firm electrical contact.

The single-pole, double-throw switch of Figures 6–11 will next be described. This switch uses several parts which are identical or similar to those used in the structure of the switch of Figure 1, and these will be identified by corresponding numerals having a prime mark and the details of construction can be eliminated. By comparing Figures 1 and 6, it will be observed that the push buttons 3 and 3', the bezels 14 and 14', the springs 6 and 6' are the same; that the frames 10 and 10' are similar, the only difference being that the bottom on the frame 10' is removed; that the movable terminals 4 and 4' are also similar, the only difference being that the terminal 4' has three radially extending feet 27; and that the conductor member 5' with its connector 26' are the same as the corresponding parts of Figure 1. The frame 10' has similar slots 11' which form the fastening members 12' and mounting members 13' so that the switch is adapted to be mounted in a manner similar as explained in connection with Figure 1. It will be observed that the base 20' in the switch of Figure 6 is considerably different from the base 20 in Figure 1, the different structure being for the purpose of providing for an additional pole or contact point.

One pole or contact point of the switch of Figure 6 is made by the engagement of the terminal 4' and the bezel 14' and the other pole or contact point is made by the interengagement of the terminal 4' and the fixed contact 28.

The base 20' is generally cylindrical in shape and formed with interior cavities supporting various of the components to be mentioned. The top of the base 20' has three equally spaced small projections 30 which are received by the slots 11' in the frame, the action of the spring 4' which is operatively interconnected between the push button 3' and a cavity 31 in the base pushes downwardly on the base so as to cause engagement of the projections in the bottom of the slots. The projections prevent the base from turning. As best seen in Figures 6 and 10, the base has an internal cavity 32 through which extends the terminal 4. About the cavity 32 are three slots 33 in which are respectively disposed the radially extending feet 27. The slots provide for freedom of back and forth movement of the terminal but prevent the same from rotating.

As best seen in Figure 9, the terminal 28 extends inwardly through a slot 34 in the base 20' where it is shaped in the form of a ring-like portion 35 which is disposed in the base cavity 36. This ring-like portion has three inwardly extending arms 37. On the outer periphery of the ring are three equally spaced projections 40 which respectively fit into the lowermost portions of the slots 33. The base 20' is provided with another cavity 41 which mounts a spring 42 which is compressed as between the uppermost portion of the cavity 41 and the arms 37 of the terminal 27. The force exerted by the spring pushes downwardly on the terminal to firmly press the abutments 40 on the bottom of the slots and thus firmly hold the terminal in position.

The spring is preferably made from a metal which will allow the same to conduct current yet maintian its spring-like action, for example, the spring is preferably formed from a copper alloy.

With the parts as viewed in Figure 6, the arms 22' of the terminal 4' engage the bezel 14' as indicated at 7' to establish an electrical contact and the feet 27 on the movable terminal 4' are separated from the spring 42. When the push button is moved and the parts assume the position shown in Figure 7, the electrical contact between the bezel and the terminal 4' is broken while the feet 27 engage and compress the spring 42 so that an electrical circuit is established between the conductor 5', the terminal 4', the spring 42 and the fixed terminal 28. When the push button is released, the parts move upwardly so that the contact is broken and the original contact established.

I claim:

1. In a switch: a housing; a movable terminal to engage and disengage the housing; means supporting the movable terminal in the housing for reciprocating motion comprising a movable insulator and a fixed insulator both connected with the housing and the movable insulator being in the form of a push button and being connected with said movable terminal; a spring operatively interconnected between the fixed insulator and the movable terminal and causing yielding engagement of the housing and the movable terminal, the engagement establishing an electrical contact; a fixed terminal; and a metal spring operatively interconnected between the fixed terminal and the fixed insulator, the metal spring being arranged to be engaged and compressed by said movable terminal to establish an electrical contact between the movable terminal, the metal spring and the fixed terminal when the push button is moved to effect breaking of first said electrical contact.

2. A switch comprising: an elongated hollow metal frame; a metal bezel mounted on one end of said frame and formed with a centrally disposed aperture; a base made of insulating material fixedly mounted on the opposite end of said frame and having a centrally disposed aperture in alignment with first said aperture; a push button made of insulating material extending outwardly through the bezel aperture; an elongated terminal connected with said push button and extending through said

base aperture, the assembly comprising the push button and terminal being mounted in said apertures for freedom of reciprocating motion; a spring urging said assembly in a direction out of said bezel aperture to effect engagement of the terminal and bezel whereby to establish an electrical contact which is broken by movement of the assembly in a direction opposite to first said direction.

3. A switch comprising: an elongated hollow metal frame; a metal bezel mounted on one end of said frame and formed with a centrally disposed aperture; a base made of insulating material fixedly mounted on the opposite end of said frame and having a centrally disposed aperture in alignment with first said aperture; a push button made of insulating material extending outwardly through the bezel aperture; an elongated terminal connected with said push button and extending through said base aperture, the assembly comprising the push button and terminal being mounted in said apertures for freedom of reciprocating motion; a spring urging said assembly in a direction out of said bezel aperture to effect engagement of the terminal and bezel whereby to establish an electrical contact which is broken by movement of the push button in a direction opposite to first said direction; a fixed terminal mounted in said base; and a metal spring operatively interconnected between the base and the second terminal, the second spring being arranged to be engaged and compressed by the movable terminal when the push button is moved in said opposite direction to establish an electrical contact between the movable terminal, the metal spring and the fixed terminal.

4. A switch comprising: a hollow metal housing; a movable electrical terminal in said housing; a push button made of insulating material mounted on and extending from said housing and connected with said terminal for imparting reciprocating motion thereto; a spring urging the push button in one direction whereby the terminal and housing engage to form an electrical contact which is broken by the movement of the push button in a direction opposite to first said direction; a fixed terminal

mounted on and insulated from said housing; and a second spring mounted on and insulated from siad housing and engaging said fixed terminal and arranged to be engaged and compressed by said movable terminal when the push button is moved in said opposite direction to establish an electrical contact between the movable terminal, the second spring and the fixed terminal.

5. A switch comprising: a metal housing; a fixed terminal including a compressible metal spring in said housing; a movable terminal adapted alternatively to contact the housing or the spring and establish an electrical contact with one or the other; a spring urging the movable terminal to establish one of said electrical contacts; and means to move said terminal to establish the other of said contacts, said means being engaged with said second spring.

6. A switch comprising: an elongated hollow metal housing; a metal bezel connected with the housing and formed with a centrally disposed aperture; a push button made of insulating material extending through said bezel aperture; an elongated terminal connected with said push button and having a portion on one end adapted to engage said bezel and establish an electrical contact and the terminal having a plurality of supporting feet on the other end; an elongated base on said housing formed with an aperture and a plurality of slots slidably mounting said feet; a spring to move the terminal and the push button to effect said engagement; a fixed terminal mounted on said base; and a spring operatively interconnected between the base and the fixed terminal, the spring being arranged to be engaged and compressed by said feet to establish an electrical contact between the movable terminal, the spring and the fixed terminal.

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