Jan. 26, 1954 L. GRIFFITHS 2,667,544

ELECTRIC SWITCH

Filed April 2, 1951

Fig. 1.

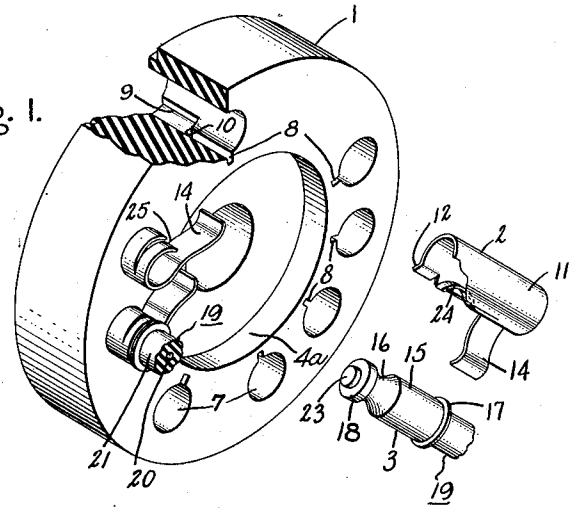


Fig. 3.

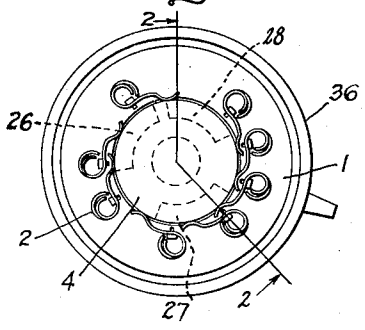
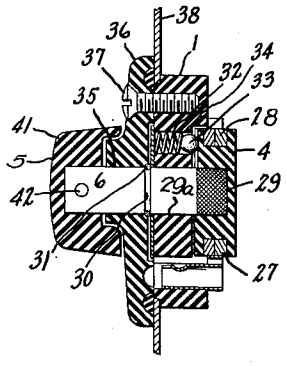


Fig. 2.



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ELECTRIC SWITCH

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3 Claims. (Cl. 200—8)

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This invention relates to electric switches and, in particular, to an improved, inexpensive electric switch of the type having a plurality of stationary flexible contacts and a rotor element for establishing an electrical circuit between the various flexible contacts.

This invention relates particularly to that type switch used for controlling a plurality of circuits. For example, it refers to that particular type switch that can be used in automobiles or turn on light and ignition circuits; or to radios for switching contacts simultaneously in a number of circuits depending upon the broadcast band to be used.

Switches of this sort must be inexpensive, yet sturdy, and certain of establishing good contact. In a radio circuit, for example, any dirt or faulty contact existing between the rotor and the contacting elements will produce unwanted noise or distortion.

Such switches are also subject to jarring if they are positioned in a moving vehicle. Consequently, consideration must be made of establishing positive contact in spite of any physical disturbance of the switch.

It is an object of this invention to provide a new and improved electrical switch.

It is a still further object of this invention to provide a new and improved electrical switch having a minimum number of parts.

It is a still further object of this invention to provide a new plug connector for a switch capable of engaging electric plugs.

It is a still further object of this invention to provide a new and improved plug connector which can be securely positioned within a switch and which is engageable with a mating electric plug.

It is a still further object of this invention to provide a new and improved combination electrical connector and switch contact element made in one piece.

Further objects and advantages of this invention will become apparent and the invention will be more clearly understood from the following description referring to the accompanying drawing and the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

Briefly, this invention comprises a molded plastic base having a plurality of sockets therein to receive plug connectors. Plug connectors are inserted into the sockets in the base and held there against longitudinal movement by an interlocking tongue and groove structure. The plug

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connectors are so designed as to provide an integral brush contact element and secure connection for a plug connector.

Referring to the drawing, Fig. 1 is a perspective view of the body portion of the switch (partially broken away) and the elements that fit into it; Fig. 2 is a sectional elevation of a complete switch taken along line 2—2 in Fig. 3, while Fig. 3 is an end elevation of the switch.

Referring to the drawing, this improved switch is shown as comprising a block or base 1, a plug connector 2, a mating electric plug 3, and a rotor 4 mounted with a spaced handle 5 on a shaft 6.

The block or base 1 is shown as comprising a disc of any insulating material, for example a phenolic resin plastic. A plurality of openings or sockets 7 are shown spaced apart along the circumference of an imaginary circle having the center of base 1 for its center. Each of the openings 7 in the body 1 has a particular configuration; specifically, the opening 7 is shown as being primarily cylindrical but including a groove 8 in the wall thereof. The groove 8 meets a second groove 9 having a greater width than that of groove 8 to provide a shoulder 10 at the abutting ends. These slots or grooves 8 and 9 are positioned to receive and interlock with an element of the plug connector 2 as will be described hereinafter.

Plug connectors 2, in a preferred embodiment, are stamped from phosphor bronze and shaped to provide a one piece plug connector comprising a generally cylindrical body 11 which is engageable with the socket 7 in base 1. Ideally, the free diameter of the body 11 is slightly larger than the diameter of the opening 7, but the body 11 may be compressed until it fits into socket 7, whereupon the natural resiliency of the phosphor bronze will expand the body 11 again to engage the side walls of the opening 7. A tongue 12, a portion of body 11 slides in the groove 8 thereby allowing the plug connector to be inserted into opening 7. After the tongue 12 has been inserted through the slot 8, it enters the larger slot 9 and then by twisting the plug connector 2, the tongue 12 engages shoulder 10 to hold the plug connector against longitudinal movement. Consequently, the combination of the resiliency of the phosphor bronze and interlocking of the tongue 12 with the shoulder 10 provides a tight secure fit between the plug connector and base 1.

The sockets 7 and grooves 8 and 9 are formed simultaneously with the molding of base 1. Consequently, problems are not encountered such as those experienced when metal inserts are cast

into the block or base portion as has been done heretofore in the art.

The plug connector 2 is further provided preferably with an integral leaf-spring like extension 14 which supplies a brush contact element for establishing an electrical circuit between the plug connector and the rotor 4. Note that the springs 14 are so positioned that the rotor 4 tends to urge the body portion 11 of plug connector 2 to be twisted counterclockwise thereby maintaining tongue 12 in groove 9 and in engagement with shoulder 10 to further secure the plug connectors within base 1.

The electric plug 3 is illustrated as an extruded cylinder having a central element 15, a groove 16, a shoulder 17, and an expanded end 18. An electrical conductor 19 of the usual sort having a wire 20 surrounded by insulation 21 is inserted into the plug 3 and secured as by solder at 23 to establish good electrical contact between the wire 20 and the plug 3.

Plug 3 is then axially insertable into the plug connector 2 until the shoulder 17 which has a larger diameter than the central portion 15 meets the end of the body 11 of the plug connector 2. The groove 16 in plug 3 registers with a finger 24 expressed from the body 11 of the plug connector 2 when the plug 3 is inserted into connector 2. Finger 24 is so shaped as to provide a resilient inwardly directed curve for establishing contact without providing catches which would resist the insertion of the plug 3.

The plug connector 2 has another finger 25 at the upper end of the body portion 11 which is crimped to have a smaller free diameter than the rest of the body portion, causing the finger 25 to be offset inwardly from the rest of the body portion as can be seen particularly in Fig. 1. When the plug 3 is inserted into the body portion 11, the finger 25 is pushed radially outwardly to accommodate the body portion 15 of the plug 3, but the finger 25, because of its resiliency, and tendency to achieve its free diameter, exerts a diametric force on the body portion 15 of the plug 3. This diametric force exerted by the finger 25 in combination with the force exerted by the finger 24 gives a secure contact to the plug 3 in its relationship with the plug connector 2, thus preventing plug 3 from being dislodged from the plug connector 2 due to vibration or the like.

Rotor 4 has a diameter which provides free rotation in a bore 4a positioned centrally of base 1. The depth of the rotor 4 is such that a portion of it will stick out from the base 1 to make contact with the leaf-springs 14 on the plug connectors 2. To provide this electrical contact, electrically conducting inserts 26, 27, and 28, etc. formed in the shape of arcs of circles are embedded in the rotor 4. They are circumferentially positioned to make contact with selected leaf-springs 14 at particular positions of rotation of the rotor 4. The natural resiliency of the leaf-contacts 14 in engagement with the smooth inserts 26, 27, 28, etc. provides a secure and intimate electrical contact having properties that will resist much vibration. Obviously, the positioning of the inserts within the rotor 4 in any particular position is not to be any limitation on this invention and the material from which the inserts 26, 27, and 28 are formed is not to be considered a limitation on this invention. For example, instead of inserts, strips of copper could be screwed or riveted to the rotor 4 and need not be molded in it.

The rotor 4 can be secured to the shaft 6 through any of the conventional means. For example, the rotor 4 can be molded directly on the shaft 6 whereupon the bottom of the shaft would be provided with serrations 29 to assure good contact between the shaft and the rotor 4. In another embodiment, the rotor 4 could have a set screw which would position it on the shaft 6. Shaft 6 is of a size which permits its free movement within a bore 29a centrally positioned in base 1 of the switch and it has a groove 30 which registers with the upper surface of the body 1. A clip ring 31 is inserted into this groove 30 after the shaft has been positioned through the body 1 to prevent the rotor 4 from being axially withdrawn from the base 1. Note too, that a spring 32 and ball 33 is maintained within the body 1 in a bore 34 to exert a pressure against the rotor 4 thereby keeping it from binding with the bottom of the base 1. This insures a free movement of the rotor 4 relative to the base 1 and simple and smooth contact between the inserts 26, 27, and 28 and the leaf-springs 14.

The shaft 6 is passed through a bore 35 in a cover plate 36 which in turn is secured by a plurality of screws 37 to the base 1. This structure permits the connection of the switch to a metal plate 38 for example which has an aperture large enough to receive the base 1. In one embodiment, the upper surface of the base 1 has a rabbet cut therefrom to provide a shoulder which will not go through the plate 38 while allowing a portion of the base 1 to pass through the plate 38. Then, by putting the cover plate 36 over the metal plate 38 and securing the cover plate 36 to the base 1 by means of the screws 37, the switch is prevented from movement relative to the plate and is securely held thereto.

The only other element added to this switch is the handle 41 which is secured to shaft 6 by any sort of a pin 42 to provide for the rotation of the shaft 6 and hence the rotor 4. Obviously, an indicator can be put on the handle 41 to align the handle with the desired electrical contacts that are intended to be made.

Modifications of this invention will occur to those skilled in the art and it is desired to be understood, therefore, that the invention is not intended to be limited to the particular embodiment disclosed, but rather is it intended to cover all modifications which are within the true spirit and scope of this invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electrical switch comprising a base of insulating material, a plurality of plug connectors each including a spring contact, electric plugs engageable with said plug connectors and a rotor including electrical conducting inserts for interconnecting the spring contacts of said plug connectors, said base defining a plurality of sockets spaced around the circumference of a circle, each of said sockets having a pair of interacting grooves in a wall thereof with one of said grooves having a larger width than the other to provide a shoulder, said plug connector including an integral body portion of resilient material having a tongue extending therefrom slideable within said grooves and engageable with said shoulder to prevent the axial withdrawal of said plug connector from said base, said spring contact portion of said plug connector when in engagement with said rotor acting to bias said tongue into en-

gagement with said shoulder thereby to prevent withdrawal of said plug connector from said base.

2. An electrical switch comprising a base of insulating material, a plurality of plug connectors each including a spring contact, electric plugs engageable with said plug connectors and a rotor including electrical conducting inserts for interconnecting the spring contacts of said plug connectors, said base defining a plurality of sockets spaced around the circumference of a circle, each of said sockets having a pair of interacting grooves in a wall thereof with one of said grooves having a larger width than the other to provide a shoulder, said plug connector including an integral body portion of resilient material having a tongue extending therefrom slideable within said grooves and engageable with said shoulder to prevent the axial withdrawal of said plug connector from said base, said spring contact portion of said plug connector when in engagement with said rotor acting to bias said tongue into engagement with said shoulder thereby to prevent withdrawal of said plug connector from said base,

said plug connector further comprising a resilient finger capable of interlocking with a circumferential groove on said electric plug to prevent said plug from vibrating out of said plug connector.

3. In an electrical switch, as is recited in claim 2, wherein an inwardly directed resilient finger is provided on the plug connector to frictionally engage the body of the said electric plug over a large area to assist in preventing said plug from vibrating out of said plug connector.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,219,878	Turck	Oct. 29, 1940
2,259,326	Schmid	Oct. 14, 1941
2,319,651	Penfold	May 11, 1943
2,449,765	Brattain	Sept. 21, 1948
2,472,131	Toth et al.	June 7, 1949