Sept. 1, 1959 K. C. ALLISON 2,902,550

SLIDE-TYPE ELECTRIC SWITCH

Filed March 1, 1956

Fig. 1.

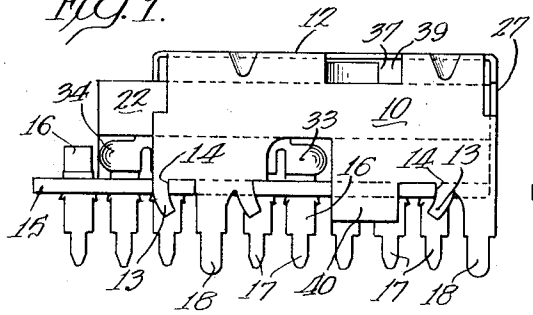


Fig. 4.

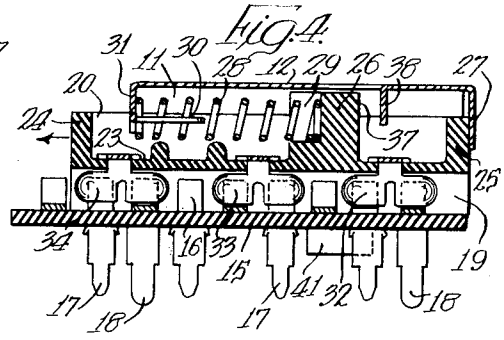


Fig. 2.

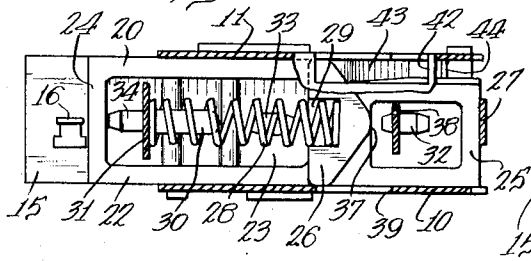


Fig. 5.

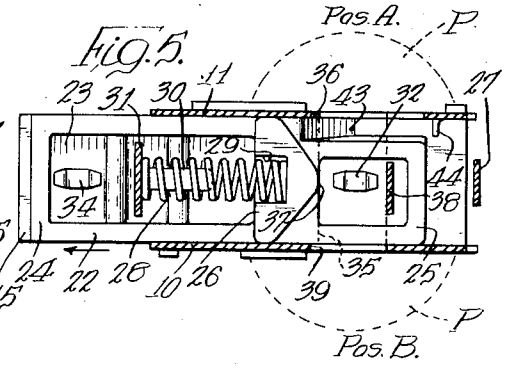


Fig. 3.

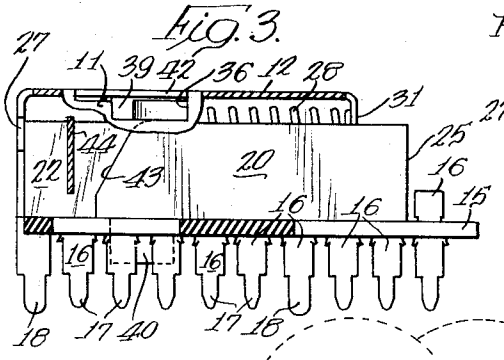
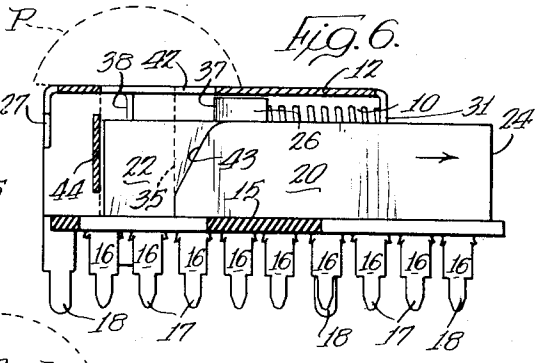


Fig. 6.



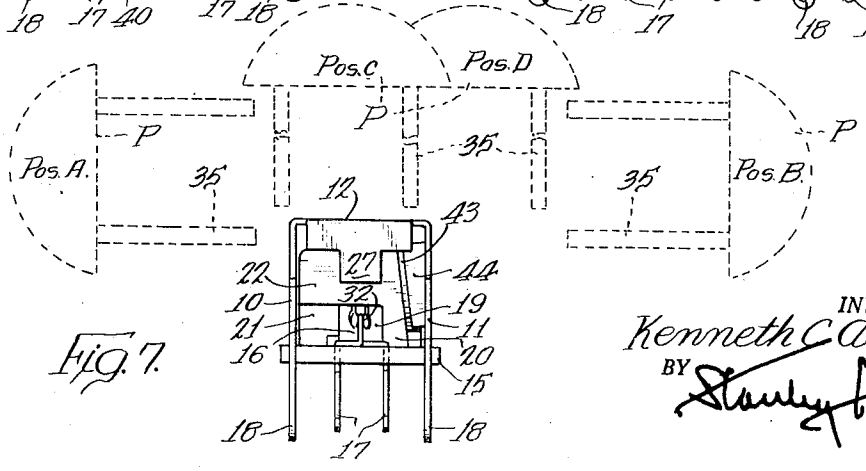


Fig. 7.

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SLIDE-TYPE ELECTRIC SWITCH

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1 Claim. (Cl. 200—16)

This invention relates to improvements in electric switches having a series of spaced stationary contacts extending lengthwise of the path of a slide member having bridging contacts and the slide member is biased into a first position wherein said contacts are operative to establish connection with electric current supplied by power service lines and the slide member is movable into a second position wherein said contacts are operative to complete connection with electric current supplied by battery through force applied by a wall plug prong being pushed into a prong receiving slot provided in the switch housing.

Switches of this character are commonly installed in portable radio receivers where only very limited space is available because of the relatively small size of the apparatus. The lack of variability in the mounting of such switches in that the mounting must coincide with a prong receiving slot in the switch housing readily accessible to the prong of the wall plug has made it desirable to provide a switch of the character indicated wherein the prong of the wall plug may have entrance to the switch housing along more than one path extending in selected rotated relation to an axis defined by the line of motion of the slide member between first and second positions of the latter.

With the foregoing in mind it is an important object of this invention to provide a switch of the type referred to which not only embodies improved features of construction and assembly but which incorporates means through which the prong of the wall plug may be selectively inserted in a number of prong receiving slots located at a variety of rotated positions relative to an axis defined by the line of motion of the slide member between said first and second positions of the latter.

While some of the more salient features, characteristics and advantages of the instant invention have been pointed out above, others will become apparent from the following disclosures, taken in conjunction with the accompanying drawing, in which:

Fig. 1 is a view in side elevation illustrating a switch embodying the features of the present invention.

Fig. 2 is a top plan view thereof with portions in section.

Fig. 3 is a side elevational view thereof with portions in section, showing the switch as it appears from the side opposite to that shown in Fig. 1.

Fig. 4 is a longitudinal section of the switch showing the parts in the position as they would appear in Fig. 1.

Fig. 5 is a similar view to that in Fig. 2, showing the prong of the wall plug in dotted line position effective to move and hold the slide member in its second or advanced position.

Fig. 6 is similar to Fig. 3 showing the prong of the wall plug in dotted line position effective to move and hold the slide member in the position as shown in Fig. 5.

Fig. 7 is an end elevational view taken from the right hand end of the switch as shown in Fig. 1 and having dotted line portions to illustrate the variety of positions

in which the wall plug plug is adapted to have entrance to the prong receiving slots in the switch housing.

Referring more particularly to the drawing, a switch frame or housing is shown in the general form of a channel having spaced parallel side walls **10** and **11** joined by a web or connecting wall **12**. The frame is preferably made of metal and the side walls **10** and **11** have integral lugs **13** which are bent to engage the edges of notches **14** formed in a stator or base member **15** of insulating material. The notches **14** and the lugs **13** thereby cooperate to hold the stator **15** in fixed relation to the frame and in spaced parallel relation to the connecting wall **12** of the frame. The stator **15**, as shown, is provided with suitable holes in which a series of contacts **16** are mounted in edgewise spaced apart relation lengthwise of the side walls **10** and **11** of the frame. The specific arrangement of these contacts **16**, is, of course, determined by the switching layout which is desired. In the switch shown in the drawings, nine contacts **16** are shown. Each contact includes a shank portion which is fixed in the mounting hole containing said shank portion by suitable staking and a soldering ear **17** which projects from the stator **15** in a direction away from the frame of the switch. As shown, these ears **17** are adapted for acceptance in holes in a printed circuit board. The frame also includes integral ears **18** which are also receivable in holes of a printed circuit board. Thus, through the soldered connection with the conductive areas surrounding the holes of the printed circuit board, the ears **17** of the contacts **16** and the ears **18** of the switch frame combine to provide a rigid assembly with the circuit board.

The area thus defined by the inwardly facing surfaces of the walls of the switch frame and the stator **15** is occupied by a contact block or slide member of such design and construction as to have guided sliding movement through its engagement with said inner surfaces of the frame and the stator. The block is preferably made of a molded insulating material and is shaped to provide a substantially continuous passageway **19** from end to end thereof lengthwise of the walls **10** and **11** of the siwtch frame and facing the area of the stator **15** occupied by the contacts **16**. The contacts **16** are thus straddled by the side wall portion **20** of the block which has sliding engagement with the stator **15** between said contacts **16** and the inner surface of the side wall **11** of the switch frame and an integral ear **21** forming an extension of the opposite side wall **22** of the block which has sliding engagement with the stator **15** between said contacts **16** and the inner surface of the side wall **10** of the switch frame.

The wall **23** of the block which is defined by the surface of the passageway **19** facing the stator **15** also defines an opposite surface in the form of the base of an elongated pocket facing the inner surface of the web or connecting wall **12** of the switch frame. The outer periphery of this pocket is defined by the walls **20** and **22** of the block and walls **24** and **25** which join opposite ends of said walls **20** and **22**. The pocket thus presented by the walls **20, 22, 24** and **25** is divided by a transverse partition **26** bridging the space between the walls **20** and **22**. The outer surface of the end wall **25** of the block is engageable with a stop comprising an angularly bent flange **27** formed integrally with the connecting wall **12** of the switch frame, as shown in Fig. 4, to limit sliding movement of the block relative to the switch frame in one direction of movement. The block is normally urged into this position by a coil spring **28** having one end thereof seated in a socket **29** formed in the partition wall **26** of the block facing in the direction of the end wall **24** of the block and its opposite end encircling a finger **30** forming an inwardly bent extension

of a flange 31 formed integrally with the connecting wall 12 of the switch frame and projecting from the edge thereof opposite to the flange 27. When the block is thus positioned by the spring 28 to engage the stop 27, the first, second and third pairs of contacts 16 made up of those contacts numbered one combined with two, four combined with five and seven combined with eight, respectively from the right hand end of Fig. 4 are engaged by flexible contact shoes 32, 33 and 34 respectively mounted on the wall 23 of the block. Mounting holes in the wall 23 in which the shank portion of the contact shoes 32, 33 and 34 are trapped provide such clearance as to accommodate slight relative movement of the contact shoes 32, 33 and 34 and this floating arrangement of the latter makes it possible for self-adjusting and self-aligning action of the contact shoes relative to the contacts 16. The relative position of the contacts 32, 33 and 34 and the cooperating contacts 16, as shown in Fig. 4, illustrate the condition of the switch for controlling the operation of an apparatus, such as a receiver, operated by electric current supplied by power service lines via a power service line cord having its terminal plug P plugged into the usual wall socket (not shown). The plug P thereby functions as a circuit connector and the receiver is supplied with electric current, either A.C. or D.C., as the case may be, from the power service lines through the cord on which the plug P is attached. If the receiver is to be operated by electric current supplied by a battery, the block or slide member is moved to the left as indicated by the arrow in Fig. 4, whereupon the contact shoes 32, 33 and 34 are engaged with first, second and third pairs, respectively of contacts numbered two combined with three, five combined with six, and eight combined with nine, as viewed from right to left in Fig. 4. To thus move the block to the left into the position as indicated in Figs. 5 and 6, the plug P is used as a key for mechanically shifting the block. This action takes place by inserting the prong 35 of the plug P through guide openings provided in the switch frame so as to occupy a position within the area containing the block corresponding to position A or position B, as designated in Fig. 5, or corresponding to the position C as shown in Fig. 6. The side wall 11 of the switch frame is accordingly formed with an elongated rectangular opening 36 of such contour as to match the transverse cross-sectional contour of the contact prong 35 of the plug P with one of the opposite long edges of the opening defined by the surface of the connecting wall of the switch frame facing the sliding block. The surface of the sliding block facing the connecting wall 12 which extends from the partition 26 in the direction of the stop 25 is approximately coplanar with the opposite long edge of the opening 36. The partition 26 is adapted to have sliding engagement with the connecting wall 12 of the switch frame facing the sliding block while the side wall of the partition 26 facing the area to which the opening 36 leads is shaped to provide a pair of cam surfaces which converge uniformly in the direction of the area opposite the opening 36 to form a rounded tip 37 midway of the side walls 20 and 22 of the sliding block. As shown in Figs. 2 and 3, the tip 37 occupies a position in obstructing relation to said opening 36. A tongue sheared and bent from the connecting wall 12 of the switch frame provides a stationary guide 38 directly opposite the tip 37 with the surface thereof facing the tip coplanar with the edge of the opening 36 which forms the limits of the latter in the direction of the stop 27. The surface of the guide 38 facing the tip 37 is accordingly engaged by one edge of the prong 35 of the plug P as the prong enters the opening 36 while the opposite edge of the prong 35 engages the cam surface of the tip 37 and thus exerts a camming action which forces the sliding block in a direction to clear the path of the prong 35 and thereby effect operation of the switch for closing the circuit to the battery through the contact shoes 32, 33 and 34 and the cooperating contacts 16 of the stator 15. An opening 39 provided in the opposite side wall 10 of the switch frame arranged to present edge portions in transverse coplanar alignment with the edge portions of the opening 36 provides an entrance through which the prong 35 may be inserted from a position in 180 degree rotated relation to position of the prong 35 when entering opening 36. When thus inserted through the opening 39, the prong 35 through engagement with the stationary guide 38 and the camming surface of the tip 37 facing the opening 39 effects actuation of the switch for battery operation in the same manner as the prong functions when inserted through the opening 36.

Thus either side wall 10 or 11 of the switch frame presents an opening for accepting the prong 35 of a receptacle plug P to thereby operate the switch from the first or normally biased position shown in Figs. 1, 2, 3 and 4 to the position shown in Fig. 5. When one of the prongs 35 is accordingly presented to either the opening 36 or opening 39, the companion prong of the plug P is blocked from engagement with the contacts 16 and the contact shoes on the sliding block by stops 40 and 41 forming extension of the switch frame side walls 10 and 11, respectively, at a distance from the opening in the corresponding wall 10 or 11 coextensive with the distance between the prongs 35 of the plug P. As a result, accidental impact with and consequent damage to the contacts by the prongs 35 of the plug P when the latter enters the openings 36 or 39, is effectively avoided by the stops 40 and 41.

In order to accommodate switching action through the prongs 35 of the plug P when the latter is presented to the switch housing along a path in intersecting relation to the connecting wall 12 of the switch frame rather than in parallel relation to the conecting wall 12 via the openings 36 or 39, the prong has entrance to the area containing the sliding block via an opening or slot 42 in the connecting wall 12. One of the opposed long edges of the slot or opening 42 is defined by the surface of the frame switch side wall 11 facing the sliding block and an inwardly offset surface portion of the side wall 24 of the block facing the inner surface of the side wall 11 of the switch frame is in alignment with the opposite long edge of the opening 42. The inwardly offset portion of the side wall 24 extends from the partition 26 to the end of the sliding block in the direction of the stop 27 and a shoulder developed by said offset portion where it joins the side wall 24 presents a cam surface 43. The latter surface slants toward the stator 15 in the direction of the stop 27. The inwardly offset portion of the side wall 24 also slants toward the stator 15 in the direction of the side wall 11 of the switch frame. A flange bent inwardly from the side wall 11 of the switch frame provides a stationary guide 44 directly opposite the cam surface 43 with the surface thereof facing the cam 43 being coplanar with the edge of the opening or slot 42 nearest the top 27. As shown in Fig. 3, the cam surface 43 obstructs the opening 42 in the same manner that the openings 36 and 39 are obstructed by the cam surfaces of the tip 37. Accordingly, the guide 44 is engageable by one edge of the prong 35 of the plug P as the prong is advanced through the opening 44 while the opposite edge of the prong 35 engages the cam surface 43 to shift the sliding block in a direction to clear the path of the prong 35 into the position shown in Fig. 6 whereupon the switch is likewise actuated for battery operation of the apparatus controlled by the switch.

The switch specifically illustrated and described herein as one embodiment of the present invention accordingly accepts the prong of a wall plug for actuation of the switch by such prong when the location of the switch in its fixed relation to the apparatus is in either of three rotated positions, a quarter turn apart, about an axis defined by the line of motion of the block or slide mem-

ber between its first and second switching stations. Because of this variety of available positions, the present invention provides a switch as indicated which meets many different extremely limited space requirements.

What is claimed is:

An electric switch including a housing having a pair of spaced parallel side walls joined by a web, a stator of insulating material joined to said side walls in spaced opposed relation to said web, a slide of insulating material having sliding engagement with inwardly facing surfaces of said housing and said stator, said slide having spaced side walls extending lengthwise of its path of sliding movement, said latter side walls being joined by a connecting wall to define a first channel facing said stator and a second channel facing said web of the housing, said second channel being closed at opposite ends thereof by a first end wall and a second end wall, a transverse partition wall dividing said second channel, a stop forming an extension of the web of the housing with which the second end wall of said second channel of the slide is engageable to limit movement of the block in a first direction, a flange forming an extension of the web of the housing, a spring acting between said flange and said partition wall of the slide normally urging said slide toward said limit of movement in said first direction, cooperating contacts on said stator and said slide, said contacts cooperating to complete an electric circuit when said slide is in its limit of movement in said first direction, and cooperating to complete a different electric circuit when said slide is in a second position away from said latter limit of movement in said first direction,

openings in said housing through which the prong of a receptacle plug is adapted to be selectively inserted including a first opening in one side wall of the housing, a second opening in the second side wall of the housing, and a third opening in the web of said housing, said surface of the slide opposite each of said openings being slanted inwardly from said opening in the direction of movement of the slide toward the position in which it is normally urged by said spring, and a stationary guide forming an extension of the web of the housing cooperating with the surface of the slide opposite said first and second openings in the housing to shift said slide to said second position when said receptacle prong is inserted in either said first opening or said second opening in the housing, and a second stationary guide forming an extension of one of the side walls of the housing cooperating with the surface of the slide opposite said third opening in the housing to shift said slide to said second position when said receptacle prong is inserted in said third opening.

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