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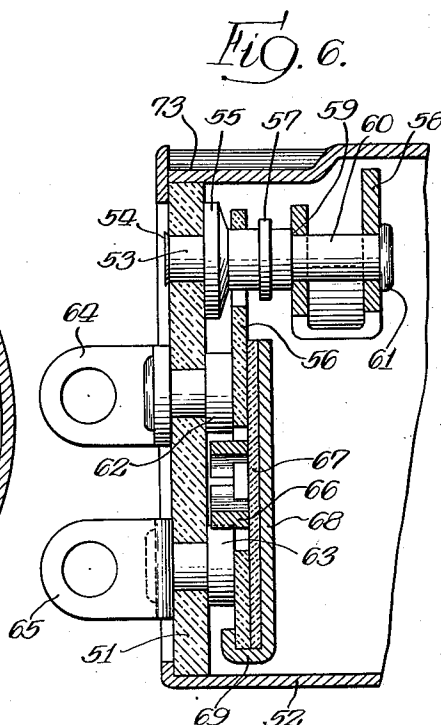
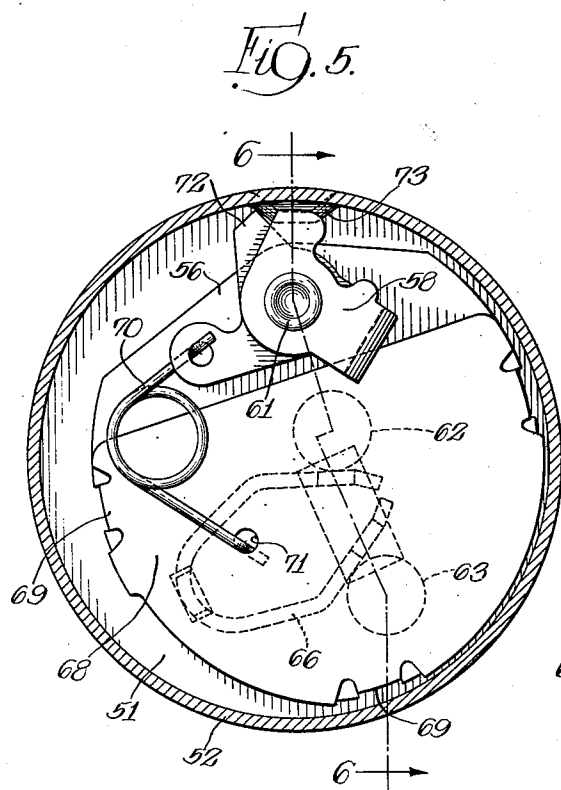
W. E. HASELWOOD

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SWITCH CONSTRUCTION

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INVENTOR.
Willis E. Hazelwood,
BY *Wilkinson, Hurley, Byron & Knight*
ATTORNEYS.

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SWITCH CONSTRUCTION

Willis E. Haselwood, Elkhart, Ind., assignor to Chicago Telephone Supply Company, Elkhart, Ind., a corporation of Indiana

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8 Claims. (Cl. 200—67)

This invention relates to a new and improved switch construction and more particularly to a shielded switch of the snap or toggle type.

Switches of this character are especially adapted for use with radio apparatus, such as radio receivers, or test equipment, and in public address systems or the like. In many such circuits it is desired to locate switches closely adjacent other control units, which control units are connected into the circuit at points where any hum or other disturbance picked up from the switch will be highly amplified. It is customary to use such switches directly connected to variable resistances which are connected into and control earlier stages of high gain circuits. If the switch is used to control alternating current there may be picked up from the switch an audible hum which will thereafter be so amplified as to be highly objectionable. The same effects are present where the switches are used in controlling battery circuits in which vibrators are used for stepping up the voltage.

In prior constructions the switch has been shielded from the adjacent control unit in various manners. A fixed shield has been provided between the adjacent units, with an eccentric opening through which the switch operating mechanism extends. Any opening through the shield permits some transfer of electrical disturbances to pass. Also the construction requires a separate shield or a multiplicity of housings, one for the switch and one for the other control unit, which adds to the expense.

An alternate form of construction has been the provision of a rotating shield carried by and rotated by the shaft controlling the units. This rotating shield has the undesirable effect of adding to the expense and also constitutes a grounded member closely adjacent the parts of the second control unit which may result in undesirable capacity coupling between that unit and ground.

According to the present construction, I have placed the shield directly upon the switch, which is the unit carrying the current having the disturbing characteristics. There are no undesirable effects from placing the grounded element closely adjacent the current carrying switch elements, if the parts are properly insulated. This construction also makes it possible to eliminate separate shield partitions and to carry the switch directly upon a wall of the housing used to enclose the second control unit. The construction, therefore, results in close shielding of the switch itself and in the reduction of cost of parts and saving in space.

It is an object of the present invention to provide a new and improved switch having a self contained shield.

It is a further object to provide a switch having a shield as a portion of the switch arm assembly and movable with the movable contact.

It is also an object to provide a switch in which the movable shield is electrically connected to the switch actuating means.

It is an additional object to provide a switch of this character associated with a metallic housing to which the switch actuating means is grounded at its limits of movement.

It is a further object to provide a shielded switch and housing assembly adapted for use with other control units and in which the switch will be adequately shielded from other units within the housing.

Other and further objects will appear as the description proceeds.

I have shown certain preferred embodiments of my invention in the accompanying drawings, in which—

Figure 1 is a face view of the switch, with the parts in the off position;

Figure 2 is a view of the construction of Figure 1 as seen from the left, with the housing broken away;

Figure 3 is a view similar to Figure 1 but showing the switch in the closed position;

Figure 4 is a section taken on line 4—4 of Figure 3;

Figure 5 is a view similar to Figure 3, but showing a modified form of construction; and

Figure 6 is a section taken on line 6—6 of Figure 5.

Referring first to Figures 1 to 4, the non-conducting base member 11 is supported in one end of the housing 12, which latter is formed of metal and functions as a shield surrounding the periphery of the switch. The housing 12 is shown as provided with lugs 13 by means of which it can be secured to a base or to another circuit control device. It will be understood that the housings may be formed of different shapes and proportions and may be deeper than the housings shown, so that the single housing can enclose a plurality of units. The pivot member 14 is secured to the base 11 and carries the metallic operating cam 15. This cam engages a shoulder 16 on the pivot and is held in place by the deformed end 17 of the pivot which engages the washer 18.

The switch arm assembly comprises the metallic member 19, which is provided with the enlarged opening fitting around the portion 20 of

the pivot member 14 below the ridge 46. This metal member 19 has the downturned and reversely bent lugs 21 which secure the two non-conducting members 22 and 23 against the under face of the metal member 19. The member 22 is imperforate and serves to insulate the movable contact 24 from the metal member 19. The movable contact 24 is generally U-shaped in construction as shown in Figures 1 and 3, and is provided with the upwardly extending intermediate lug 25, which fits into a recess 26 in the insulating member 23. The legs of the member 24 are also each provided with the upstanding lugs 27, these two lugs 27 fitting into an enlarged recess 28 in the member 23. The movable contact member 24 is held between the base plate 11 and the switch arm assembly, and the interfitting lugs 25 and 27 cause it to be moved with the switch arm assembly, although allowing a limited play whereby this movable or bridging contact may properly adjust itself to interfit between the two fixed contacts 29 and 30 which are carried by the base plate 11. These fixed terminals 29 and 30 are provided with the solder lugs 31 and 32 upon the upper face of the base plate 11.

The housing 12 is provided with an inwardly pressed portion 33 which serves as a limiting stop for movement of the operating cam 15. This cam 15 is generally U-shaped in construction and its lower leg is provided with the stop extension 34 adapted to engage this portion 33 of the housing with the switch in the closed position, as shown in Figure 3. The opposite end 35 of the operating cam engages the other side of the housing portion 33 when the parts are in open position, as shown in Figure 1. The upper leg of the operating cam 15 is provided with the rounded portions 36 and 37 adapted to be engaged by a driving member for operation of the switch. The lower leg of the operating cam is provided with the inward extension 38 having a perforation 39 into which is fitted one end 40 of the coil spring 41. The opposite end 42 of this spring extends through a perforation 43 formed in the metal plate 19. This construction forms a toggle action by means of which the switch arm assembly is snapped into and out of closed position as the operating cam and spring 41 are moved past the dead center position in the two directions of movement.

As shown in Figure 3, with the switch in the closed position, the bridging contact member 24 effectively closes the circuit between the two fixed contacts 29 and 30. The spring 41, in addition to serving as a resilient driving connection for the toggle operation, also is so biased as to urge the switch arm assembly downwardly toward the base plate 11, thus maintaining the bridging contact 24 held down against the base plate 11 for proper operation. It will be noted that in Figure 3 the switch assembly does not engage the housing 12. The entire stopping action when the switch is moved to a closed position is afforded by the resilience of the bridging contact 24 as it engages and wedges between the switch contacts 29 and 30.

It will be apparent that the metal plate 19 fully covers both the fixed contacts 29 and 30 and the bridging contact 24 so that it effectively shields them and prevents passage of any disturbing electrical effect therefrom in the direction covered by the shield. This metal plate 19 is electrically connected to the pivot 17 by its pivoting contact therewith. It is also electrically connected to the pivot through the drive spring

41 and the operating cam 15 which is formed of metal and mounted directly on the metallic pivot. Due to the engagement of the stop portions of the cam 15 with the inwardly extending portion 33 of the housing, the switch plate 19 is always electrically connected to the housing 12 when the switch is in closed position. It will be understood that when the switch and housing are assembled upon any supporting structures, such, for example, as the housing of another unit or a base carrying another unit, the housing will be grounded through this support.

Referring now to the form of construction shown in Figures 5 and 6, the parts are generally similar with the exception that the shield plate does not serve to connect the switch arm assembly to the pivot. The insulating base 51 is supported in a metal housing 52, which is shown as broken away in Figure 6. It will be understood that this housing may be of any suitable depth or dimension to enclose other control units adapted to be operated jointly with the switch. The pivot member 53 is fastened into the base 51 by riveting over its head 54. The enlarged portion 55 of the pivot 53 bears against the inner face of the base 51 and its opposite face serves to limit movement along the pivot by the switch arm 56, which is formed of insulating material. The circumferential ridge 57 on the pivot 53 serves to limit movement of the switch arm in the opposite axial direction.

The operating cam 58 engages the shoulder 59 formed on the pivot 53. This cam 58 is rotatable about the reduced portion 60 of the pivot and is held in place by the head 61 of the pivot riveted over against the outer face of the cam 58. The fixed contacts 62 and 63 are supported in the base 51 and are connected to the solder lugs 64 and 65.

The movable contact member 66 is similar in construction to that shown at 24 in Figures 1 to 4 and described in connection therewith, having portions fitting in recesses formed in the insulating switch arm 56. The insulating plate 67 is placed against the upper face of the switch arm 56 and serves to insulate the movable contact 66 from the shield plate 68. This shield plate 68 is secured in position upon the switch arm 56 by the downturned and inturned lugs 69. The coil spring 70 is connected to the operating cam 58 and has its opposite end fitting in an opening 71 in the shield plate 68. It will be apparent that this spring, therefore, serves to electrically connect the operating cam 58 and the shield plate 68. The operating cam, as shown in Figure 5, has the portion 72 engaging the indented portion 73 of the housing 52 when the switch is in closed position. This serves to connect the cam 58 to the grounded housing 52 and, through the medium of the spring 70, the shield plate 68 is also grounded.

The form shown in Figures 5 and 6 operates in the same manner as the form shown in Figures 1 to 4. The only substantial difference between the two is that the metal shield 68 of the form of Figures 5 and 6 does not constitute the switch arm and does not engage the pivot.

While I have shown certain preferred embodiments of my invention by way of example, it will be understood that these are illustrative only, as the switch and its housing are capable of modification and change to meet varying conditions and requirements and I contemplate such variations as come within the spirit and scope of the appended claims.

I claim:

1. In a switch of the character described: a housing having a metal side wall and a non-conducting end wall providing a base; a stationary contact carried by the base and exposed on the inner face thereof; a movable contact; an insulated carrier member for the movable contact; a metal shielding member connected with the carrier member and overlying the same on its side remote from the base, said metal shielding member being large enough to cover the contacts in any position of the connected carrier and shielding members; means pivotally mounting said connected members for swinging movement inside the housing to carry the movable contact to and from engagement with the stationary contact; a metal actuating cam pivotally mounted inside the housing; means electrically grounded to the housing side wall engageable with the cam for limiting movement thereof between two defined positions and for electrically grounding the cam to said housing side wall; and a snap spring connected between the metal actuating cam and the metal shielding member for snapping said connected members from one position to the other as the actuating cam is operated and for electrically grounding the shielding member through the cam to the housing side wall.

2. In a switch of the character described: a housing having a metal side wall and a non-conducting end wall providing a base; a stationary contact on said base exposed on the inner face thereof; a movable contact; a metal shielding member overlying the base in substantially parallel spaced relation thereto, with the contacts between it and the base; means pivotally mounting said metal shielding member for oscillation across the inner face of the base; an insulated connection between the movable contact and said metal shielding member whereby the movable contact moves with the shielding member for coaction with the stationary contact; a metal actuating cam mounted within the housing for oscillation about a fixed axis between predetermined limits; means for defining said limits of oscillation of the cam and for electrically grounding the cam to the metal side wall of the housing; and a snap spring connected between the metal actuating cam and said metal shielding member for snapping the shielding member and consequently the movable contact from one position to the other as the cam is actuated and for electrically grounding the shielding member through the cam to said side wall of the housing.

3. In a switch of the character described: a flat insulating base; a stationary contact on the base; a pivot post projecting from the base; a movable contact; a carrier for the movable contact pivoted on said post for planar movement across the base, said carrier including a metal shielding plate in substantially parallel spaced relation to the base, with the contacts between it and the base; and a toggle snap mechanism for actuating the movable contact carrier comprising a metal actuating cam pivotally mounted on said post, and a snap spring connected between said cam and the metal shielding plate whereby said shielding plate, spring and metal actuating cam are electrically connected so that grounding of any one grounds all of said elements.

4. In a snap switch of the type adapted for use in radio circuits; stationary and movable contacts; a carrier for the movable contact, said carrier including a metal shielding plate overlying the contacts and large enough to cover them in

all positions of the carrier; means mounting the carrier for switch closing and opening movement; snap actuating means for snapping the carrier from one position to the other; and a housing for the switch including a metal side wall electrically connected with the metal shielding plate so that grounding of said side wall also grounds the shielding plate to prevent the transmission of electrostatic or electromagnetic effects from the switch to other electrical instrumentalities adjacent to the front of the switch.

5. In a snap switch: stationary and movable contacts; a carrier for the movable contact including a metal shielding plate overlying the contacts and large enough to cover them in all positions of the carrier; means mounting the carrier for switch closing and opening movement; snap actuating means for snapping the carrier from one position to the other comprising a metal actuating cam, and a lost motion driving connection between the cam and the carrier, said lost motion driving connection serving to electrically connect the metal shielding plate with said actuating cam; and means for electrically grounding the actuating cam.

6. In a snap switch of the character described: a non-conducting base; a metal pivot post; an actuating cam mounted on said post; a stationary contact carried by the base; a movable contact; a carrier for the movable contact including a metal shielding plate overlying the base in substantially parallel spaced relation thereto, with the contacts between it and the base, said shielding plate being large enough to cover the contacts in all positions of the carrier and said metal shielding plate being pivotally mounted on said pivot post so as to be electrically connected with the post; a snap driving connection between the carrier and the actuating cam whereby actuation of the cam snaps the carrier from switch open to switch closed position and vice versa; and means for electrically grounding the pivot post.

7. In a snap switch of the character described: a non-conducting base; a metal pivot post; a metal actuating cam mounted on said post; a stationary contact carried by the base; a movable contact; a carrier for the movable contact including a metal shielding plate overlying the base in substantially parallel spaced relation thereto, with the contacts between it and the base, said shielding plate being large enough to cover the contacts in all positions of the carrier and said metal shielding plate being pivotally mounted on said pivot post so as to be electrically connected with the post; a snap driving connection between the carrier and the actuating cam whereby actuation of the cam snaps the carrier from switch open to switch closed position and vice versa; and a metal stop capable of being electrically grounded and engageable with the metal actuating cam to define its limits of movement and electrically ground the cam, post, and shielding plate.

8. A snap switch of the type described comprising: a non-conducting base; a metal wall encircling the base and cooperating therewith to form a substantially cup-shaped housing; a pivot post projecting from the inner face of the base near the metal side wall but spaced therefrom; a pair of stationary contacts carried by the base and exposed on its inner face; a movable bridging contact for electrically bridging the stationary contacts in switch closed position; a carrier for the movable bridging contact pivoted on the

post and including a metal shielding plate over-
lying the base in substantially parallel spaced
relation thereto, with the contacts between it
and the base, said plate being smaller than the
5 base but large enough to cover the contacts in
both positions of the switch; a metal actuating
cam pivoted on the post; a resilient electrically
conductive driving connection between the cam
and the shielding plate of the contact carrier
10 for snapping the carrier from one position to the
other as the cam is actuated and for electrically

connecting the shielding plate with the metal
cam; and means for limiting motion of the metal
actuating cam, said means being electrically
conductive and electrically connecting the metal
cam with the metal side wall of the housing when
the cam is at either of its limits of movement so
that grounding of said side wall electrically
grounds the cam and consequently the shielding
plate.

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