Sept. 10, 1940. T. W. HECKING ET AL 2,213,960

ELECTRIC SWITCH

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FIG. 1.

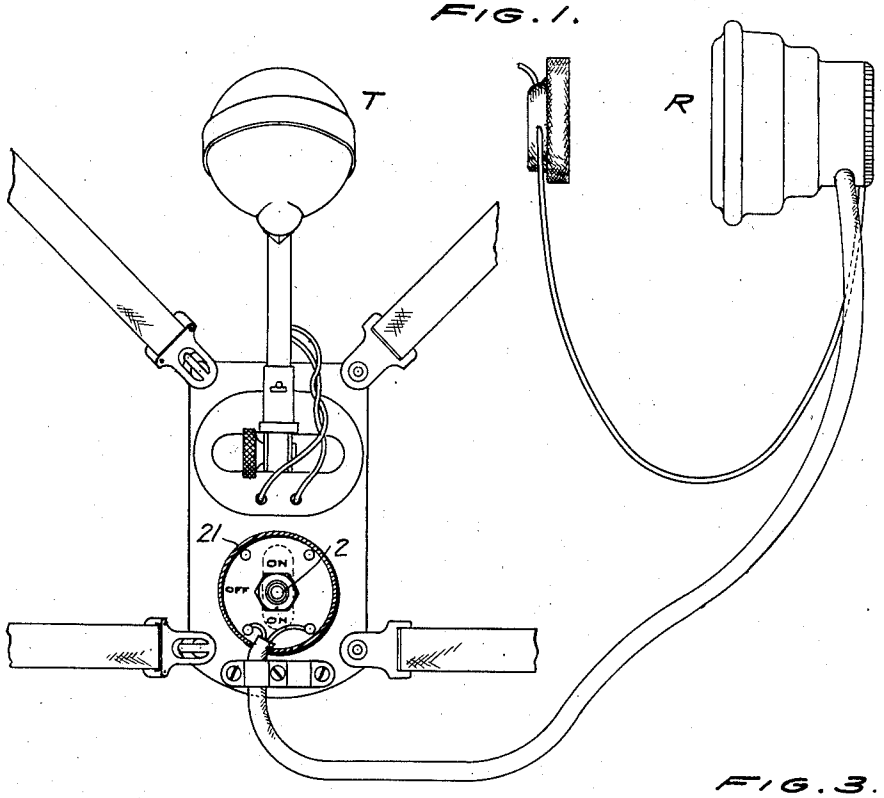

FIG. 2.

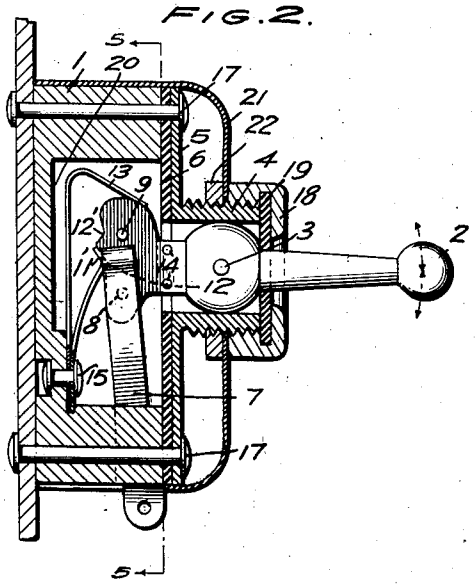

FIG. 3.

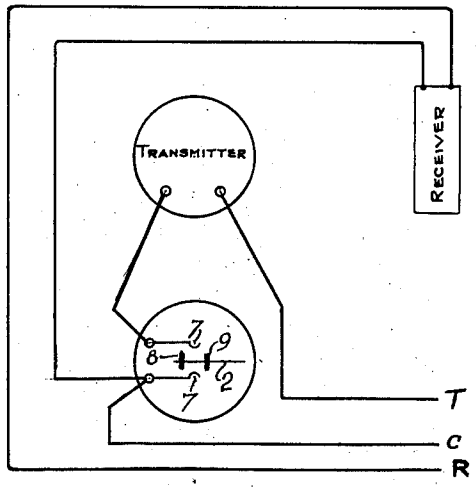

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FIG. 4.

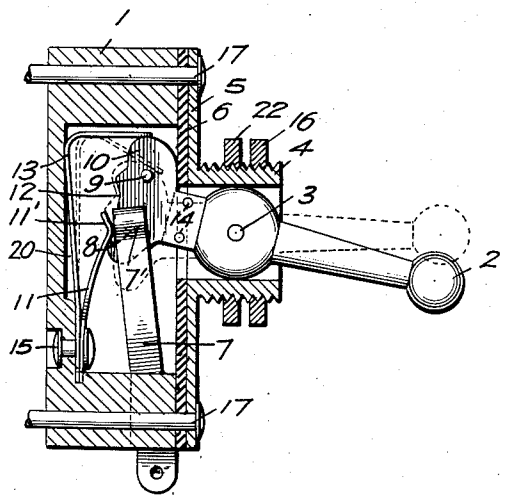


FIG. 5.

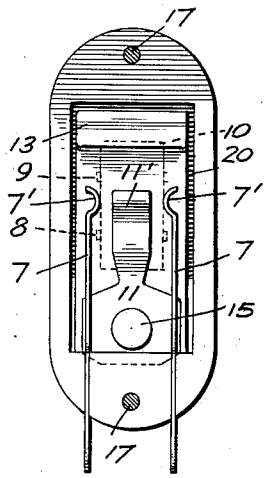


FIG. 6.

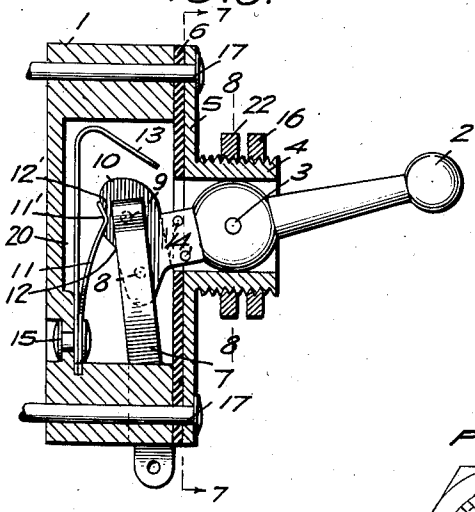


FIG. 7.

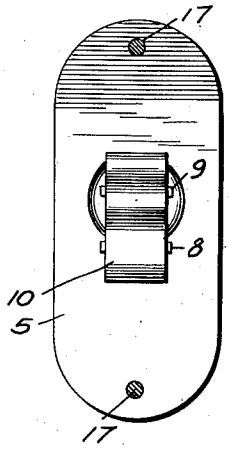
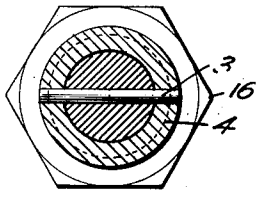


FIG. 8.



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Patented Sept. 10, 1940 2,213,960

UNITED STATES PATENT OFFICE

2,213,960

ELECTRIC SWITCH

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Application June 16, 1938, Serial No. 213,987

10 Claims. (Cl. 179—176)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to us of any royalty thereon.

This invention relates to electric switches and proposes a switch assembly which may be mounted as a unit on various types of electrical appliances.

An object of the invention is to provide a switch with the following three positions: first, a locking closed-circuit position; second, a locking open-circuit position; third, a nonlocking closed-circuit position.

Another object is to operate the switch mechanism by means of one lever in all three positions and in a single plane.

A further object is to inclose the switch mechanism in a dust and splash-proof housing.

Another object is to provide wiping contacts so that the switch may be used on low-voltage circuits such as local-battery telephone circuits.

Another object is to provide means for restoring the switch to the open-circuit position when the lever is released from the non-locking closed-circuit position.

Another object is to produce a switch of small size and few parts for use with portable telephone equipment. Other objects and advantages will appear as the description proceeds. The invention will now be described in detail with reference to the accompanying drawings, in which:

Fig. 1 is a perspective showing the switch applied to a portable type of telephone set comprising both receiver and transmitter components;

Fig. 2 is a side view in longitudinal section of the switch and its cover cap in which the switch is shown in open circuit position;

Fig. 3 is a schematic circuit diagram showing the conduit controlling action of the switch in a transmitter circuit;

Fig. 4 is another side view in longitudinal section in which the switch is shown in non-locking closed circuit position;

Fig. 5 is a section taken on the line 5—5 of Fig. 2;

Fig. 6 is a side view in longitudinal section showing the switch in locked circuit closing position;

Fig. 7 shows a section on the line 7—7 of Fig. 6; and

Fig. 8 shows a sectional view on the line 8—8 of Fig. 6.

Referring to the drawings, the numeral 1 designates a housing or casing, here shown as formed of non-metallic or insulating material. In said casing a pair of spring contact members 7—7 are mounted in spaced relationship and insulated from one another. Contact points or elements as at 7'—7' are formed on said members in the manner of a boss to provide a clean electrical contact when in wiping engagement with switching conductors as hereinafter described. A face plate 5 is attached to the housing and is separated therefrom by insulating plate 6. Threaded tubular sleeve 4 is securely attached to said plate 5 and switch lever 2 is mounted for pivotal operation about pivot pin 3 secured diametrically in said sleeve. Plate 5, insulating plate 6 and housing 1 are held together by rivets or bolts as at 17—17. Attached to switch lever 2 is an insulator block 10, fastened in any suitable way as by means of rivets 14.

Mounted in the insulator block 10 are conductors or bridge pins 8 and 9. These conductors project beyond the side faces of block 10, which is of proper thickness for free switching operation between the spring contact members 7—7. The conductors function to bridge the contacts 7'—7' in circuit making or switching operations. A resilient strip or spring 13 and a spring dog 11 coact with the block 10 in various switching or circuit controlling operations of the said block and conductors 8 and 9 when manipulated by operating lever 2. Strip 13 and dog 11 are secured to the housing 1 by any suitable means such as rivet 15, and it will be noted that both are fixed to work from a common fulcrum point. The spring dog 11 has a pawl element 11' which coacts with the block 10 as the latter is moved during switching operations. The dog is adapted to lock the block 10 when one of the conductors as at 9 is brought into circuit closing position, the pawl element 11' engaging in a notch as at 12' in block 10 when in said position. When the block is manipulated by lever 2 to unlock the same from said position and thus break contact, the block 10 is centered or locked by the combined action of strip 13 pressing against 10 and pawl 11' of dog 11 engaging against shoulder 12 of block 10 whereby both conductors are out of circuit closing position and in open circuit position, at which time the contact elements 7'—7' occupy an intermediate position in relation to the projecting points of conductors 8 and 9. When the block 10 is again moved in the opposite direction, resilient strip 13 exerts spring tension against the block (see Fig. 4) and is so designed as to establish a limit of movement for the block when the end portions of conductor 8 come into circuit closing relation with the contact elements

7'—7' of spring contact members 7—7. Thus, at the time of such manipulation, a non-locking circuit closing position is established for the switch. At the time of this manipulation, the pawl 11' of dog 11 has a cam action with the block 10 and coacts with the strip 13 to restore the block to neutral when released and thereupon returns to the point where pawl 11' engages in notch 12 to lock the block at intermediate or open circuit position of the bridge conductors in relation to the contacts. It will be noted that a recess as at 20 is provided in the base of the housing 1 in which the strip 13 is seated and supported when reacting under tension, and in particular at the moment of maximum stress. This permits the strip 13 to flex substantially along its entire length. Several advantages result among which may be mentioned that a shorter spring may be used and breakage is avoided. As shown in Fig. 2, a gasket 19 of rubber or other suitable material is provided and held in place by cap nut 18. The flexible gasket is held in place in such manner as to exclude foreign matter from entering around toggle lever 2, while at the same time permitting free manipulation of the said lever. A protective cap or shield may be used to cover the junction box of portable telephone field sets, as shown in Fig. 1, and also to cover the switch. In such cases, said cover 21 is clamped in place on the tubular sleeve 4 between cap nut 18 and inner nut 22. As shown in other figures of the drawings, a slightly different form of nut as 16 may be substituted for 18, and used with nut 22 for purposes of mounting the switch as a unit.

The operation may be explained as follows: As shown in Fig. 2, the switch is in neutral or open circuit condition. As shown in Fig. 6, lever 2 is manipulated in an upward direction causing block 10 to move downwardly until pawl 11' of spring dog 11 engages in notch 12' to lock the block so that conductor 9 bridges the contact members 7—7 at contact points 7'—7', thus establishing a locked circuit closing position for the switch. This would establish a circuit through conductor 9 and spring contact members 7—7, and as may be seen by reference to schematic diagram (Fig. 3) will place the transmitter circuit in operative condition. The lever 2 and block 10 will remain in this position until again moved, since the spring dog and pawl are in locked circuit closing position as above described.

When lever 2 is operated to release the block from locking engagement as above described, the block will return to neutral or open circuit condition as shown in Fig. 2. The lever 2 is then moved further in the same plane and in an opposite direction, or downwardly as shown in Fig. 4, and against the resistance of strip 13 the conductor 8 will be brought into position to bridge the contact members 7—7 at contact points 7'—7' thus establishing a circuit closing position, but this position will be a non-locking position since there is no notch in block 10 to lock the same at this stage. On releasing the lever 2, the block 10 will return to normal due to the self-restoring action of strip 13. It will be noted that strip 13 also functions to limit the movement of arc of block 10 to determine the correct position of conductor 8 in relation to contact points 7'—7' at the moment of non-locking circuit closing position. It will be further noted that spring dog 11 has a cam action with block 10 to aid in returning the same to neutral whereupon pawl 11' of said dog is in neutral, i. e. the contacts 7'—7' take up an intermediate position between the projecting ends of conductors 8 and 9.

It will be understood that changes, modifications and equivalent arrangements are contemplated within the scope of the invention as defined by the appended claims.

We claim:

1. An electric switch comprising a pair of contacts; conductors for bridging said contacts in different circuit closing positions; an insulator element in which said conductors are mounted for switching control in at least three positions; means for locking said element when one conductor is in circuit closing position, said means including a spring dog which cooperates with said element to maintain the other conductor in open circuit position; and a resilient strip coacting under tension with said element to determine the limit of its movement when said last named conductor is in non-locking circuit closing position and also functioning together with said dog to return the said element when released to normal whereby both of said conductors are placed in open circuit position.

2. In a three position electric switch, a pair of spring contacts; an insulator block having conductors projecting beyond the side faces of the block for bridging said contacts in different circuit closing positions, said conductors having a clean wiping action with said contacts when assuming said positions; a lever for operating said block; means for locking said block when one of said conductors is in one circuit closing position; and means to determine the limit of movement of said block when another of said conductors is in non-locking circuit closing position, said means including a resilient strip coacting with said block under tension at said limit and functioning to return the block to open circuit position when said lever is operated to release the block from said last named position.

3. A three position electric switch comprising a pair of spaced spring contacts; an insulator block having conductors whose ends project beyond the side faces of the block for bridging said contacts in two circuit-closing positions, said block normally clearing said spring contacts whereby the contact points have a clean wiping action with the conductors when assuming said positions; a pivoted operating lever fixed to said block; means to lock said block when one of said conductors is in circuit-closing position; and means to limit the movement of said block when the other of said conductors is in non-locking circuit-closing position, said means including a resilient strip coacting with said block to maintain the same under tension at said limit and acting to return the block to open circuit position when said lever is operated to release the block from said non-locking circuit closing position.

4. A multiple position electric switch comprising spaced spring contact elements provided with raised contact points; conductors for bridging said contacts in different circuit closing positions; an insulator block in which said conductors are mounted for switching movement and said conductors having their ends projecting beyond the side faces of the block to make clean wiping engagement with the contact points in assuming said circuit closing positions; an operating lever fixed to the block; means for locking said block when one conductor is in one circuit

closing position; and a resilient strip coacting with the block to determine the limit of its movement when another of said conductors is in non-locking circuit closing position, said strip also functioning to place the block under tension at this stage of operation and acting to return the block to place the conductors in open circuit position when the same is released from said tension.

5. An electric switch comprising a pair of spaced spring contacts; conductors for bridging said contacts in different circuit closing positions; an insulator block in which said conductors are mounted for switching control in a plurality of positions, said conductors having their ends projecting from the block to provide clean wiping contact when engaging said spring contacts in circuit closing positions; means for locking said block when moved in one direction to bring a conductor in circuit closing position, said means including a spring dog which aids in the intermediate stage of returning the block to normal and for locking said block to maintain both conductors in open circuit position; and a resilient strip coacting under tension with said block when moved in an opposite direction to determine the limit of its movement in order to bring another of said conductors in non-locking circuit closing position, said strip also functioning together with said dog to return the block to normal when released whereby the conductors are placed in open circuit position.

6. In an electric switch assembly, a hollow casing formed of insulating material and a pair of spaced contacts mounted interiorly of said casing; conductors for bridging said contacts in different circuit closing positions; an insulator block in which said conductors are mounted for switching operation in at least three positions; a lever for manipulating the said block; means for locking the block when one of said conductors is in circuit closing position, said means including a spring dog which cooperates with said block to maintain the conductors in open circuit position; a resilient strip fixed in said casing and coacting under tension with said block to determine the limit of its movement when another of said conductors is in non-locking circuit closing position, and also functioning together with said dog to return said block to open circuit position when the block is released; and a recess formed in said casing wherein said strip is retracted when reacting under its tensional operation with the block.

7. In an electric switch, a casing having a chamber therein and a pair of spaced spring contact members mounted in said chamber, said members being provided with raised contact elements; conductors for bridging said contact elements in different circuit closing positions; an insulator block in which the conductors are mounted for switching action and said conductors having a wiping action when engaging said elements; a pivoted lever for manipulating the block; means for locking the block when one of said conductors is in circuit closing position, said means including a spring dog attached at one point in said casing and having a cam action with said block to maintain the conductors in open circuit position; a resilient strip fixed in said casing at a common point of attachment with said dog and coacting under tension with said block to determine the limit of its switching movement when another of said conductors is in a non-locking circuit closing position, and also functioning together with said dog to return the block to open circuit position when the block is released; and a recess formed in the casing wherein said strip is seated when reacting under tensional stress.

8. In a portable telephone instrument which comprises a chest transmitter component and a head receiver component; an electric switch assembly for use with said transmitter component including a housing of insulating material, and a pair of spaced contacts mounted interiorly of said housing; conductors for bridging said contacts in different circuit closing positions; an insulator block in which said conductors are mounted for circuit control in at least three positions; a lever for manipulating the block; means for locking the block when one of said conductors is in circuit closing position, said means including a spring dog which also cooperates with said block to maintain the conductors in open circuit position; a resilient strip fixed in said casing and coacting under tension with said block to determine the limit of the block's movement when another of said conductors is brought into non-locking circuit closing position, said strip also functioning with said dog to return the block to open circuit position when released; and a recess formed in said housing wherein said strip is seated and supported when flexing in tensional operation with the block.

9. In a portable telephone instrument which comprises a transmitter component and a receiver component; an electric switch for use with said transmitter component including a housing of insulating material, and a pair of spaced contacts mounted in said housing; conductors for bridging said contacts in different circuit closing positions; a movable insulator block which carries said conductors to effect circuit control in at least three positions; means for manipulating said block; means for locking the block when one of said conductors is in circuit closing position, said means including a spring dog which also cooperates with said block to maintain the conductors out of circuit closing positions; a resilient strip fixed in said casing and having a common fulcrum point of attachment with said dog, said strip coacting under tension with said block to determine the limit of its movement when another of said conductors is brought into non-locking circuit closing position, and said strip functioning together with said dog to return the block when released to break both contacts; and a recess formed in the housing wherein the strip is seated when reacting under its tensional operation with the block.

10. In an electric switch, a housing having a chamber therein and a pair of spaced spring contact members mounted in said chamber, said members being provided with contact elements; conductors for bridging said contact elements in different circuit closing positions; an insulator block in which the conductors are mounted for switching action, and said conductors having their ends projecting from the block to produce a clean wiping action when electrically contacting said elements; a pivoted lever for manipulating the block in one plane; means for locking the block when moved in one direction to bring one of the conductors in circuit closing position, said means including a spring dog which tends to return the block to normal and which also functions to lock the same in order to maintain the conductors in open circuit position; a resilient strip fixed in said housing at a common point

of attachment with said dog and coacting under tension with said block to determine the limit of its switching movement when another of said conductors is in non-locking circuit closing position, said strip also cooperating with said dog to return the block to normal when released; and a recess formed in the housing wherein said strip is seated and supported while reacting under maximum tensional stress.

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