June 13, 1939. W. R. CURTISS 2,162,528

SWITCH MECHANISM

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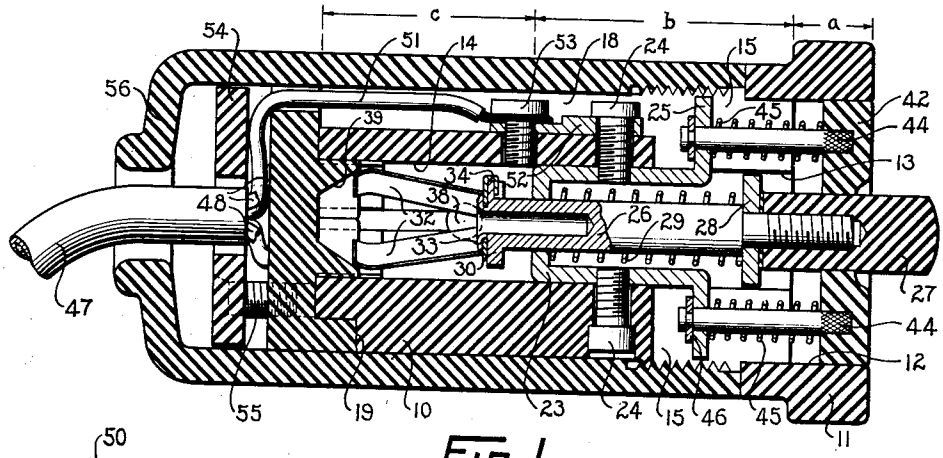


Fig 1

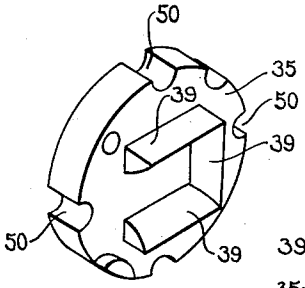


Fig 4

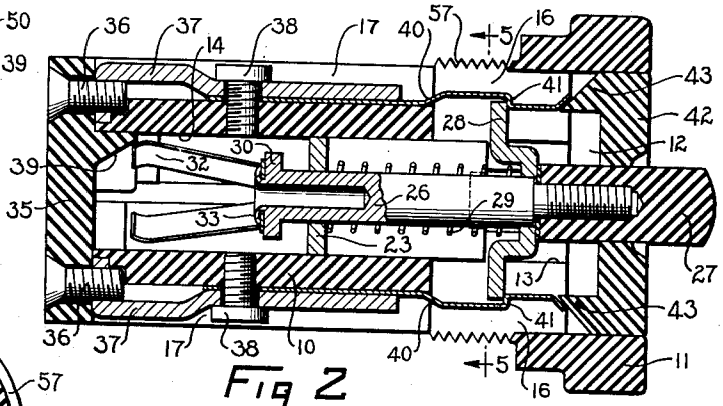


Fig 2

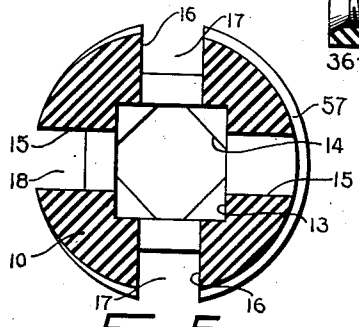
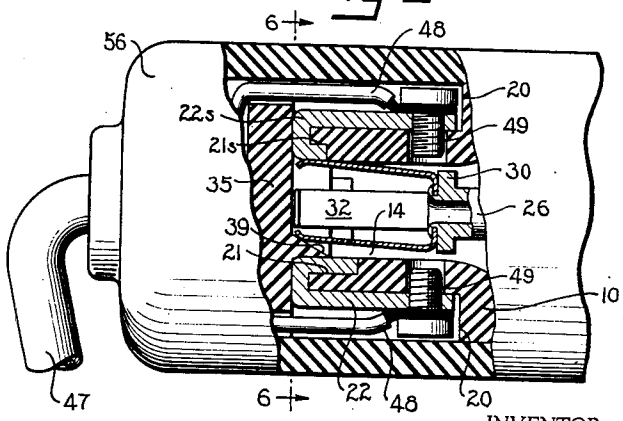


Fig 5

Fig 3



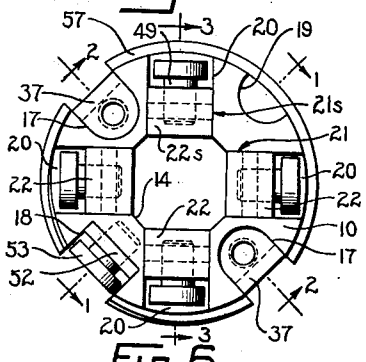


Fig 6

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SWITCH MECHANISM

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12 Claims. (Cl. 200—16)

This invention relates to electrical apparatus and more particularly to switch means for controlling the flow of current in electrical circuits.

One of the objects of the present invention is to provide novel switch mechanism adapted for use in hospital call systems and the like.

Another object of the invention is to provide novel switch mechanism embodying means for releasably and automatically locking the same in operative position whereby release thereof will not be effected by sudden shocks, jarring, or the like.

Still another object is to provide a novel switch for controlling a plurality of circuits which is more simple in construction, less expensive, and more readily constructed than similar devices heretofore employed.

A further object is to provide a novel switch mechanism which is so constructed that the same is more reliable and easier to assemble and disassemble for inspection, cleaning and repair than are similar devices heretofore provided.

The above and further objects and novel features of the invention will more fully appear from the following detailed description when the same is read in connection with the accompanying drawing. It is to be expressly understood, however, that the drawing is for the purpose of illustration only and is not intended as a definition of the limits of the invention.

In the drawing, wherein like reference characters refer to like parts throughout the several views,

Fig. 1 is a sectional view with parts broken away of one form of switch mechanism embodying the present invention, the section being taken in the plane of line 1—1 of Fig. 6;

Fig. 2 is a similar view with the cover piece removed, the section being taken in the plane of line 2—2 of Fig. 6;

Fig. 3 is a view similar to Fig. 1, the section being taken in the plane of line 3—3 of Fig. 6;

Fig. 4 is a detail isometric view of one form of cam element which may be employed in carrying out the invention;

Fig. 5 is a detail sectional view of the main body of said switch mechanism, the section being taken on line 5—5 of Fig. 2; and,

Fig. 6 is an end view of said mechanism with the cover, cam element and wiring removed, the view being taken on line 6—6 of Fig. 3.

The single embodiment of the invention illustrated in the drawing, by way of example, is shown in the form of a novel self-locking switch mechanism adapted for use in hospital call systems or the like to enable a patient or other operative to give both visual and audible signals either or both of which may be intermittently or constantly energized. In the form illustrated, said mechanism comprises a housing or body 10 of suitable insulating material such as Bakelite, said body being generally cylindrical with an enlarged portion 11 at one end thereof. A central or axial bore is provided in body 10 for the reception of the movable parts of the switch mechanism and parts adapted to cooperate therewith, said bore comprising a cylindrical portion 12 at the enlarged end of the body, a square portion 13 intermediate the ends of the body and a substantially square portion 14 with filleted corners, the walls of said square portions making angles of 45° with each other, as best seen in Fig. 5. The axial lengths of portions 12, 13 and 14 of the bore through body 10 are represented by the distances *a*, *b* and *c*, respectively, (Fig. 1).

For a purpose to appear hereinafter, that portion of body 10 containing bore 13 is milled or cut away at the center of each side of said bore to form two pairs of diametrically disposed slots or internal grooves 15, 15 and 16, 16, the outer surfaces of said grooves being flush with the periphery of bore 12 (Figs. 1 and 2) which is preferably of the same or slightly greater diameter than the small portion of body 10. A plurality of grooves or recesses are also milled in the outer surface of that portion of body 10 in which bore 13, 14 is located, two of said grooves 17, 17 (Fig. 2) being in alignment with slots 16, 16 and connecting therewith. A third groove 18 (Fig. 1) is provided in alignment with one of the slots 15 and diametrically disposed with respect to groove 18 is a short semi-circular groove or recess 19. Spaced about the periphery of body 10 and interposed between the grooves 17 to 19 are four equally spaced external grooves 20 which extend a short distance from the left end of body 10, as viewed in the drawing (Fig. 3). Radially inward from grooves 20 are four internal grooves 21, 21*s* cut in the inner wall of bore 14, each of said latter grooves being centrally disposed in a side wall of said bore and one of said internal grooves 21*s* being axially shorter than the other three (Fig. 3). Grooves 20 and 21, 21*s* are joined by slots in the end of body 10 for the reception of U-shaped or hook-like conductors 22, 22*s*, to be more fully described hereinafter.

A U-shaped guide member 23 which also functions as an electrical conductor, in a manner to hereinafter appear, extends into bore 13 and is held in position by one or more stud bolts 24

which freely extend through the wall of body 10 (Fig. 1) and threadedly engage said guide member. Said member 23 is provided at one end thereof with diametrically disposed ears 25, 25 extending therefrom at right angles and into slots or grooves 15, 15.

Slidably extending through an opening in the inner end or cross bar of guide member 23 and having electrical contact therewith is a reciprocable spindle 26 of conducting material, the outer reduced end of which is threaded for receiving a push button 27 of suitable insulating material, such as Bakelite. Interposed between button 27 and a shoulder on spindle 26 is an element 28 which has radially projecting portions which slidably extend into slots 16, 16 (Fig. 2). Element 28 is preferably fixed against rotation on spindle 26 by providing an elongated slot in said element for receiving a correspondingly cut portion of said spindle. Suitable resilient means, such as a coil spring 29, interposed between the cross bar of member 23 and element 28 are provided for normally urging spindle 26, 27 to the right, as viewed in the drawing, the movement of spindle 26 by the spring being limited by a collar 30 on the spindle which is adapted to engage the inner end of member 23.

Mounted on the inner end of spindle 26 is a contact member provided with a plurality of resilient contact fingers 32, each of said fingers being adapted to engage one of the hook-like conductors 22, 22*s* which fill internal grooves 21, 21*s*, and are flush with the flat inner surfaces of bore 14 (Fig. 3). Fingers 32 are formed from a single blank of thin resilient material which, in the form shown, is secured to spindle 26 by providing a central opening in said blank and peening over a hollow tube-like portion 33 provided on the end of spindle 26. To hold fingers 32 against rotation relative to spindle 26, a laterally extending portion or tongue 34 of the contact member is bent into a slot formed in collar 30 (Fig. 1).

The lengths of fingers 32 and the lengths of the internal portions of conductors 22 are such that, when spindle 26, 27 is in its extreme right-hand position with collar 30 engaging member 23, there will be no engagement of said fingers and conductors with each other. When button 27 is pushed inwardly, however, to the intermediate position illustrated in Figs. 1 and 2, three of the fingers 32 move into electrical engagement with the three conductors 22, while the finger corresponding to conductors 22*s* remains in contact with the walls of insulating body 10. Upon further depression of button 27, the short conductor 22*s* is engaged by one of the fingers 32, while the other three of said fingers are bent inwardly and out of electrical contact with conductors 22 by novel cam means to be next described (Fig. 3).

Said novel cam means, in the form illustrated, are constituted by an insulating disc-like member 35 (Fig. 4). The member 35 may be provided with a positioning-lug to extend into groove 19 of the body. Preferably, the said member is adapted to be secured to the end of body 10 by one or more screws 36 which threadedly engage radially and inwardly extending portions of a pair of metallic strips 37, 37 which are, in turn, fixedly secured in grooves 17, 17 by stud bolts 38, 38 that threadedly engage the walls of body 10 (Fig. 2). Formed integrally with or rigidly secured to the inner face of disc 35 are three cams 39 each having a flat surface adapted to engage one of the flat walls of bore 14 and partially cover an internal portion of a conductor 22 and each having a curved or bevelled surface adapted to cooperate with one of the fingers 32 to guide or press the same inwardly and out of electrical contact with said conductor 22 when button 27 is pressed inwardly to its extreme position, as illustrated in Fig. 3.

Means are provided for automatically and releasably holding spindle 26, 27 in an intermediate position, such as illustrated in Fig. 1, whereby three of the contact fingers 32 will engage conductors 22 and establish circuits which will remain closed until the spindle is released by the operator through the operation of suitable means to be hereinafter described. The novel construction of the switch mechanism heretofore described permits the provision of holding means which obviate the danger that spindle 26, 27 will be released when said mechanism is dropped or subjected to some other shock or jarring of some nature. In the form shown, said holding means comprise a pair of diametrically disposed leaf springs 40, 40 secured in grooves 17, 17 by strips 37 and studs 38 (Fig. 2) and so shaped as to provide a shoulder 41 adapted to engage the upper surfaces of the ends of element 28 when spindle 26, 27 is in an intermediate position. It will be seen that, by employing two diametrically opposed springs 40, any tendency to jar one of said springs to such position as to release spindle 26, 27 will tend to urge the other toward its holding position.

Novel means are also provided for releasing spindle 26, 27 when the same is being held in intermediate position by springs 40, said means, as shown, comprising an annular button 42 of insulating material which has a sliding fit in bore 12 and surrounds button 27. A pair of bevelled lugs 43, 43 (Fig. 2) are mounted on or formed integrally with the inner face of button 42 in alignment with grooves 16 and springs 40. When button 42 is pressed inwardly, the bevelled outer faces of lugs 43 are adapted to engage the outwardly turned ends of springs 40 and thereby move the latter in diverging directions to move shoulders 41 beyond the ends of member 28 and release spindle 26, 27 for movement to inoperative position by spring 29. Button 42 may be guided and held against rotation by a pair of inwardly extending pins 44 which slidably extend through openings in the laterally extending ears 25 of guide member 23 (Fig. 1). Any suitable resilient means, such as coil springs 45, 45 interposed between ears 25 and button 42, may be provided for normally holding the latter out of contact with springs 40, the movement of said button by springs 45 being limited by any suitable means, such as snap rings 46 which form collars on pins 44 and engage ears 25.

The electrical connections to the above-described embodiment of the novel switch mechanism hereby provided comprise a five-wire cable 47, four of which wires 48 are connected to suitable signal means (not shown) and to conductors 22, 22*s* by any suitable means such as terminal bolts 49 which are threaded into said conductors and freely extend into openings drilled in the wall of body 10. Grooves 20, into which conductors 22 fit, are preferably sufficiently deep so that the heads of studs 49 will not project beyond the periphery of body 10 and wires 48 pass through notches 50 cut in the periphery of disc 35. It may be here noted that either bolts 49 or disc 35 is effective to maintain contacts 22, 22*s* in position and against removal. The fifth wire 51 of cable 47 is connected to a source of elec-

trical energy (not shown) and to a conductor plate 52 by a stud bolt 53 that is threaded into said plate, the latter being held in position in groove 18 and electrically connected to guide member 23 and, hence, to spindle 26 by bolt 24 (Fig. 1). The other terminals of the signals and source of energy above referred to may be connected together by any suitable means, such as through suitable ground connections.

In order to obviate any tension on the individual wires 48 and 51 and on the terminals to which said wires are connected, a disc 54 having a central opening therein may be provided on cable 47 and secured to disc-like member 35 by means of screws 55 (Fig. 1). Wires 48, 51 are thus firmly clamped between members 35 and 54.

To protect the switch mechanism against dirt, moisture, and the like, a cover 56 is provided therefor. Said cover, in the form shown, is cylindrical, the inner diameter thereof being slightly greater than the outside diameter of body 10. Said cover is provided at one end with a small opening through which cable 47 slidably extends and is internally threaded at the other end for threaded cooperation with threads 57 cut on the periphery of body 10 adjacent the enlarged portion thereof. Cover 56 is shown in installed position in Fig. 1.

In operation, when button 27 is pressed inwardly a sufficient distance to cause fingers 32 to contact conductors 22, circuits will be closed from the source of energy through wire 51, plate 52, bolt 24, guide member 23, spindle 26 and three each of contact fingers 32, conductors 22 and wires 48 to three suitable signals (not shown) which may be either visual or audible or both and located at the same or different stations. With button 27 in this position, springs 40 snap inwardly so that shoulder 41 engages the ends of element 28 thereby automatically and releasably locking spindle 26, 27 and contacts 32 in an intermediate and operative position, i. e., the position illustrated in Figs. 1 and 2. In the usual hospital call system, the three conductors 22 are connected in circuit with visual signals and conductor 22s is connected in circuit with an audible signal. When it is desired to energize said audible signal with the above-described switch mechanism, button 27 is pressed inwardly beyond said intermediate position until one of the fingers 32 engages conductor 22s and the other of said fingers are lifted out of contact with conductors 22 by cooperation with cams 39. The visual signals connected to the latter conductors are thus deenergized until spindle 26, 27 is permitted to return to intermediate position, i. e., by removing the pressure from button 27. Thus, by repeatedly pressing and releasing button 27, intermittent visual and audible signals may be given. It will also be seen that by eliminating one or more of the cams 39, a signal may also be constantly energized even when button 27 is reciprocated. Additionally, it will be noted that, once button 27 has been pressed to energize a signal, the same will be held in operative position by springs 40 until released by depression of button 42 while spindle 26, 27 is free to be moved outwardly by spring 29. Upon depression of button 42, the bevelled lugs 43 thereon engage the upper ends of springs 40, thereby spreading the same and releasing spindle 26, 27 for movement to inoperative position. This latter operation is ordinarily performed by the nurse after the signal given by the patient has been answered.

There is thus provided a novel switch mechanism for controlling a plurality of signal circuits whereby intermittent or constant audible or visual signals may be given in a variety of combinations. The mechanism is extremely simple in construction, the same embodying only a small number of rugged, compactly assembled parts which may be inexpensively manufactured and which are readily assembled and disassembled for inspection, cleaning, and repair. The mechanism provided is so constructed that it is only necessary to thread two set screws into the Bakelite body, thereby materially increasing the life of the device, said two screws being ones which need not be removed in the usual disassembly for cleaning or repair.

Although only a single embodiment of this invention is illustrated and described, it is to be expressly understood that the same is not limited thereto but that various changes may be made therein, particularly in the design and arrangement of parts illustrated, without departing from the spirit and scope of the invention, as will now be understood by those skilled in the art. For a definition of the limits of the invention, reference is had primarily to the appended claims.

What is claimed is:

1. In apparatus of the class described, a tubular insulating housing, a hook-like conductor engaging the inner and outer walls of said housing at one end thereof, reciprocable means in said housing including a resilient contact member adapted to engage the portion of said conductor which extends into the bore of said housing, resilient means coacting with said reciprocable means for normally holding said contact member in a limiting position out of engagement with said conductor, means for releasably holding said reciprocable means against movement by said resilient means after movement of said reciprocable means to intermediate position with said contact member in engagement with said conductor, and means mounted at the end of said housing and having a portion projecting into the bore thereof for lifting said contact member out of engagement with said conductor when said reciprocable means is moved beyond said intermediate position.

2. In apparatus of the class described, a tubular housing, a pair of reciprocable concentric buttons in one end of said housing, a guide member rigidly secured in said housing, resilient means interposed between each of said buttons and said guide member, means carried by each of said buttons adapted to slidably extend through said guide member and to engage the latter for limiting the movement of said buttons by said resilient means, a pair of diametrically disposed springs mounted on said housing, means carried by one of said buttons adapted to be engaged by said springs to hold said button in depressed position, and means on the other of said buttons for moving said springs to inoperative position.

3. In apparatus of the class described, an insulating housing having a bore therein, a conductor slidably extending into a recess at one end of said housing, conductor-securing means including a terminal-member threaded into said conductor and freely extending into an opening in the wall of said housing for holding said conductor in position, and a reciprocable contact member in said housing adapted to be moved axially of the latter into and out of yielding engagement with said conductor.

4. In apparatus of the class described, an insulating housing having a bore therein, a con-

ductor, slidably extending into a recess at one end of said housing, conductor-securing means including a terminal-member threaded into said conductor and freely extending into an opening in the wall of said housing for holding said conductor in position, a reciprocable contact member in said housing adapted to be moved axially of the latter into and out of yielding engagement with said conductor, resilient means for locking said recprocable contact in position to engage said conductor, and means for releasing said resilient locking means.

5. In apparatus of the class described, a housing having a bore therein, a plurality of fixed conductors in said bore and extending to the end thereof, reciprocable means in said housing including a plurality of resilient contact fingers adapted to yieldingly engage the wall of said bore and said conductors, and insulating means mounted on and closing the end of said housing and having a portion extending into said bore for moving said contact fingers out of engagement with certain of said conductors in response to movement of said fingers axially of said bore.

6. In apparatus of the class described, an insulating housing having a bore therein, a plurality of peripherally spaced, U-shaped conductors slidably engaging the inner and outer walls of said housing, conductor-securing means including a disc-like member across the end of said housing, the said disc-like member engaging portions of the said plurality of conductors to hold said conductors in mounted position, and a reciprocable contact member in said housing adapted to be moved axially of the latter into and out of yielding engagement with said conductors.

7. In apparatus of the class described, a housing of insulating material having a bore therethrough, said housing having an external groove and an internal groove adjacent one end thereof, said grooves being radially disposed with respect to each other, a hook-like conductor with portions thereof slidably fitting into said grooves, removable means for normally holding said conductor in said grooves, and means slidably mounted in said bore including a resilient contact adapted to alternately engage the portion of the said conductor extending in the said internal groove and to also engage the wall of said bore upon reciprocation of said last named means axially of said bore.

8. In apparatus of the class described, an insulating housing having a bore therethrough, said housing having a plurality of peripherally spaced external grooves at one end thereof and a plurality of internal grooves in the surface of said bore, each of said internal grooves being radially disposed with respect to one of said external grooves, a plurality of hook-like conductors each having a portion thereof slidably extending into one of said external grooves and a portion slidably extending into a corresponding one of said internal grooves, common means for holding all of the said conductors in position in said grooves, and means slidably mounted in said bore including a plurality of resilient contacts adapted to yieldingly and successively engage the wall of said bore and the portions of said conductor extending into said internal grooves when said slidably mounted means are reciprocated axially of said bore.

9. In apparatus of the class described, a housing of insulating material having a bore therethrough, said housing having an external groove and an internal groove at one end thereof, said grooves being radially disposed with respect to each other, a hook-like conductor with portions thereof slidably fitting into said grooves, an insulating member for holding said conductor in position in said grooves, said member having a portion extending into said bore and partially covering the portion of said conductor in said internal groove, an element slidably mounted in said bore, and a resilient contact mounted on said element and adapted to successively engage the wall of said bore, said conductor and said extending portion of said insulating member.

10. In apparatus of the class described, an insulating housing having a bore therein, said housing having an external groove and internal groove at one end thereof, said grooves being radially disposed with respect to each other, a hook-like conductor with portions thereof slidably fitting into said grooves, and conductor-securing means including a terminal-member threaded into the portion of said conductor in said external groove, said means extending through said conductor and into a recess in said housing for holding said conductor in position on the latter.

11. In apparatus of the class described, an insulating housing having a bore therethrough, said housing having axially extending internal and external grooves connected by a radially extending groove at the inner end of said housing, a hook-like conductor slidably fitting into said grooves, and conductor-securing means including a disc-like member engaging said end of the housing and the portion of the conductor in the radially-extending groove for holding said conductor in position in said groove, and the said disc-like member also closing the said bore at the inner end of the housing.

12. In apparatus of the class described, an insulating housing having a bore therethrough, said housing having an axially extending internal groove in the end of said housing, a hook-like conductor slidably fitting into said groove, and means engaging said end of the housing for holding said conductor in position in said groove, said holding means having an insulating portion extending into said bore and partially covering the part of said conductor in said internal groove.

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