Oct. 31, 1950 C. MILLER 2,527,564

HOSPITAL SIGNALING SWITCH

Filed April 9, 1947 2 Sheets-Sheet 1

Fig. 1

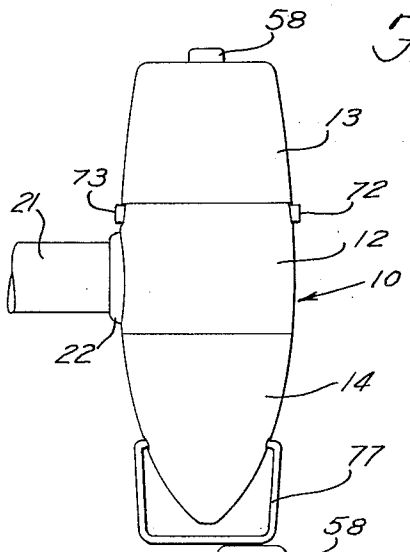

Fig. 2

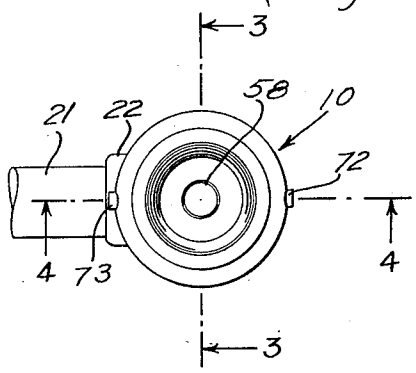

Fig. 3

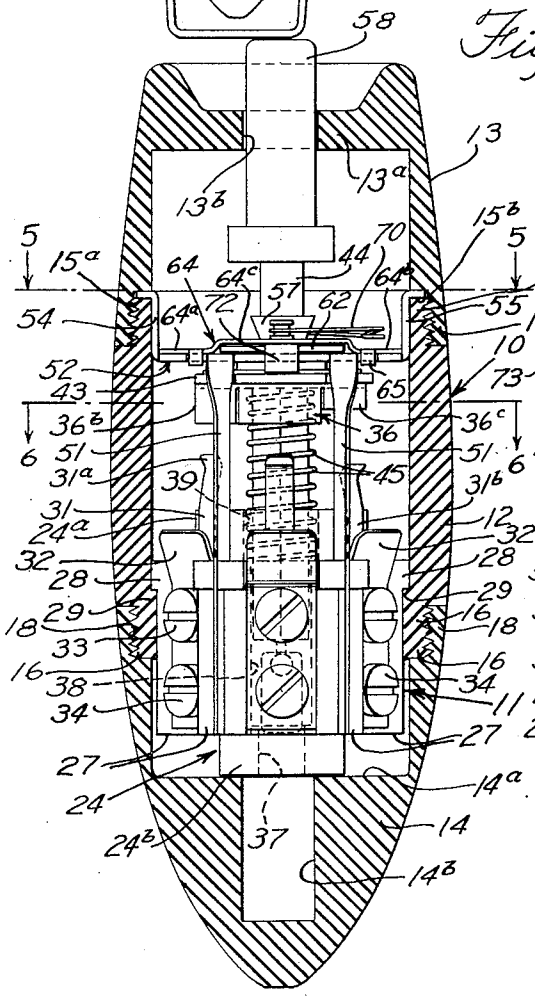

Fig. 4

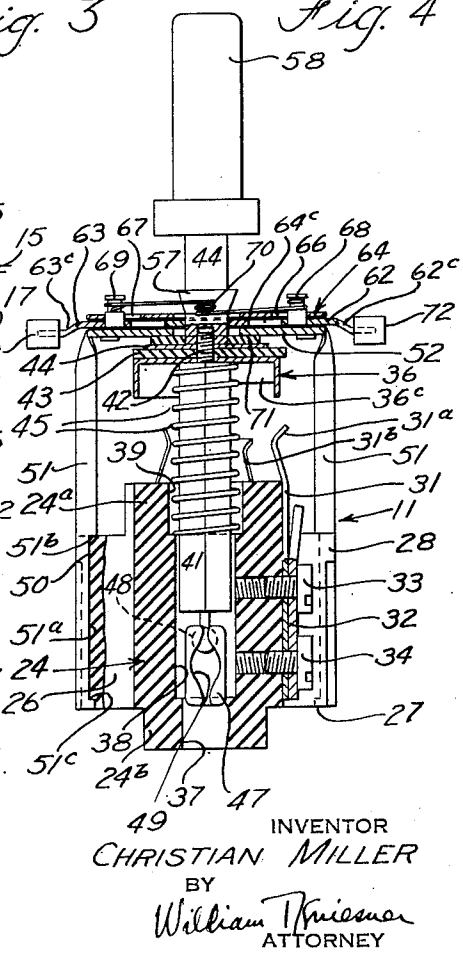

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Fig. 5.

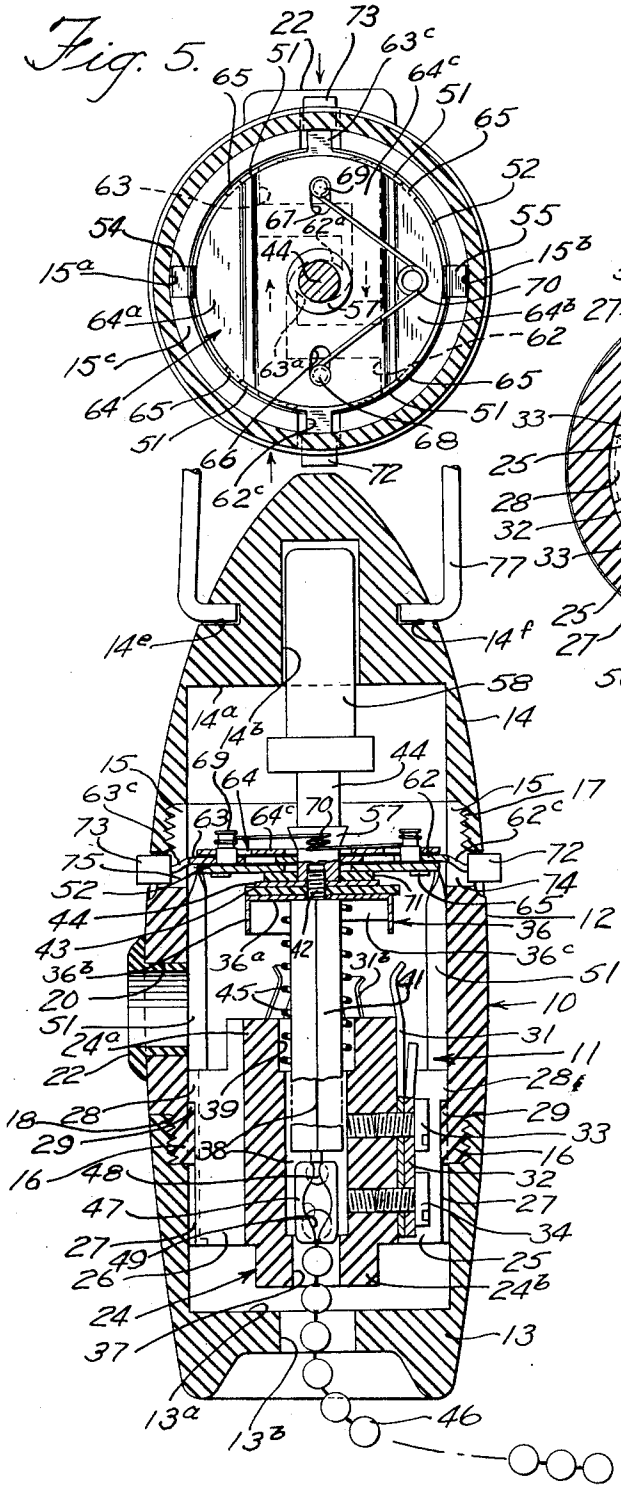

Fig. 6

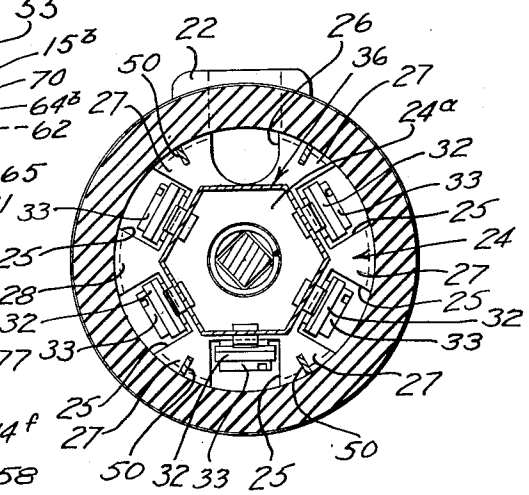

Fig. 7.

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HOSPITAL SIGNALING SWITCH

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Application April 9, 1947, Serial No. 740,288

7 Claims. (Cl. 200—169)

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This invention relates to hospital signalling switch construction, more particularly to a switch construction intended to be operated by a bed patient for signalling or calling an attendant.

One of the objects of this invention is to provide a compact and strong switch construction that will be convenient for actuation by a patient for setting it to effect the calling signals and that will be simple and dependable for release from its set or actuated condition by the answering attendant. Another object is to provide a switch construction of the above mentioned kind that will embody features of construction whereby it can be quickly and easily adapted for various kinds of control or actuation by the patient. For example, there are circumstances where it is appropriate and convenient for the patient to set the switch by a simple exertion of pressure as by actuating a push button and there can be circumstances where the patient is incapable of exerting a manual pressure, being, for example, physically incapacitated so to do, but can exert a pull as on a string, chain or the like, and hence this invention aims also to provide a signalling switch construction of such flexibility of rearrangement of its parts that it can be easily and quickly suited to meet such varying conditions or requirements of practical use. More particularly another object is to provide a switch construction operable either by a push or tension member and so constructed that its parts can be readily rearranged by the attendant to suit a particular requirement and at the same time avoid any elements of confusion as to how the patient is to operate the device.

Another object is to provide an improved self-locking switch construction with improved means for releasing it from set or locked condition. Another object is to provide a switch of the above-mentioned kind with locking and release mechanism that will be simple and inexpensive to manufacture and assemble, of reliable action, and constructed and arranged, with respect to the main actuating element, that the operator, such as a patient, has minimum or no material opportunity or risk of confusing the release mechanism with the main actuating element. Another object is in general to provide an improved signalling switch construction capable of handling a number of signalling circuits, and other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts as will be exemplified in the structure to be hereinafter described and the scope of the application of which will be indicated in the following claims.

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In the accompanying drawings in which is shown a preferred embodiment of this invention,

Figure 1 is a small scale side elevation of the switch with a multi-conductor cable associated therewith showing the switch arranged for push-button operation;

Figure 2 is a plan view as seen from the top in Figure 1;

Figure 3 is a central vertical sectional view on an enlarged scale as seen along line 3—3 of Figure 2, certain parts being shown in elevation;

Figure 4 is a central vertical sectional view as seen along the line 4—4 of Figure 2, with the casing construction omitted, the view depicting the operating mechanism sectionally with the cross-section taken at right angles to the cross-section of Figure 3;

Figure 5 is a horizontal sectional view as seen along the line 5—5 of Figure 3;

Figure 6 is a transverse sectional view as seen along the line 6—6 of Figure 3, and

Figure 7 is a central vertical sectional view on an enlarged scale showing the switch arranged for pull chain operation, being otherwise a section as seen along the line 4—4 of Figure 2.

Similar reference characters refer to similar parts throughout the several views of the drawings.

The construction preferably comprises a casing generally indicated by the reference character 10 and a sub-assembly, better shown in Figure 4 and indicated generally by the reference character 11 and comprising the mechanism accommodated within the casing 10. The casing 10 may be of any desired cross-section and illustratively and preferably is of circular cross-section, providing internally a cylindrical space in which the mechanism 11, as a single sub-assembly or entity, is snugly received and therein housed. The casing 10, in the illustrative embodiment, comprises three casing sections, namely, a middle or central casing part 12 and two end casing parts 13 and 14 provided with any suitable means for relatively quickly and detachably securing them together. Such means preferably comprises threaded connections and thus the casing part 12 is shaped at its respective ends to provide lesser-diametered flanges which are externally threaded, these threaded flanges being indicated at 15 and 16, and each end casing section 13 and 14 is counter-bored

and internally threaded to provide female threaded parts 17 and 18 into which the male threaded parts 15 and 16 are respectively engaged. These threaded parts terminate in and have adjacent to them flat annular shoulders which mate upon threaded assembly of the parts and provide coacting annular faces for effecting good frictional holding of the several parts in effect to lock the parts against too great ease of turning in unthreaded direction and thus maintain the three casing parts dependably assembled. The diameters and pitch of the various threaded parts are the same so that the end casing parts 13 and 14 are interchangeable and either may be threaded onto either end of the central casing part 12. Preferably these casing parts are made of any suitable molded and cured material such as Bakelite. As is clear from Figures 3 and 7 the internal diameters of the three casing parts are the same so that, regardless of which end casing part is assembled to which end of central casing part 12, the cylindrical space of each end casing part forms an extension of the cylindrical interior of the central casing part.

At a suitable point in the side of the central casing part 12 is provided a hole 20 (Figure 7) into which leads the multi-conductor cable 21 (Figures 1 and 2) and preferably that hole is provided with a protective bushing 22 (Figure 7) suitably secured therein. The bushing may be of any suitable material, rigid such as metal, or cushioning or resilient, such as suitably vulcanized rubber. The various individual conductors of the cable 21 are, upon the inside of the casing, connected to suitable connecting devices embodied in the switch unit or sub-assembly 11 which, for purposes of illustration, is shown as constructed to handle at least five conductors, thus to illustrate application of my invention to a typical hospital signalling circuit in which the switch is to control four circuits of five conductors of which one is the "common" conductor to all of the circuits. The cable 21 may thus be a 5-conductor cable.

The sub-unit 11 comprises a part 24 preferably of molded and cured resin or other plastic which may be said to be generally cylindrical (see Figure 6), excepting that it is shaped to provide laterally exposed vertically extending slots 25 which are five in number as shown in Figure 6, being right-angled in cross-section, and a sixth slot 26 which is preferably of curved cross-section, the six slots extending vertically and being equi-distantly spaced in the external and otherwise cylindrical face or side of the insulating member 24, thus leaving six vertically extending external ribs 27 whose curved external faces fall in a geometric cylinder or surface of revolution whose diameter is somewhat less than the internal diameter of the casing 10, excepting at the upper ends thereof where the diameter substantially matches the internal diameter of the casing 10, thus providing in each vertical rib 27 a shoulder 28 (see Figures 3, 4, 6 and 7) at the upper end of the insulating member 24. At the lower end of the central casing part 12 the latter has an internal shoulder 29 (Figures 3 and 7) so that the insulating member 24, when inserted, with the parts assembled to it as later described, into the central casing part 12 and from the upper end of the latter as viewed in Figures 3 and 7, is brought to rest by the engagement of the shoulders 28 of the ribs 27 against the annular internal shoulder 29 of the casing part 12, giving the part 24 and the parts carried by it good mechanical support and also

bringing it and them into co-axial relationship to the casing itself.

In each of the vertical external slots 25 is seated a contact spring 31 which extends upwardly beyond the upward cylindrical extension 24a of the part 24, being shaped and bent substantially as shown in Figures 3, 4 and 7, and overlying the contact spring is an elongated relatively stiff and heavy piece of sheet metal 32, and two spaced screws 33 and 34, extending through suitable holes in the two metal members 31 and 32, are threaded into suitable holes in the material of the insulating part 24 at the base of the slot, thus to secure these metal parts in the slot, one of the screws such as the lower one 34, being available for having a conductor from the cable 21 secured under its head and thus to extend the circuit of that conductor to the contact spring 31. As is better shown in Figures 4 and 7 the contact springs 31, five in number, are normally biased inwardly against the extension part 24a beyond which they project upwardly, being suitably bent inwardly toward the central axis, and at their ends being bent outwardly as at 31a for better coaction with a bridging or circuit-closing member 36 constructed and mounted and actuated as is later described. The upper ends of the metal plates 32 are bent away from the contact springs 31 to give them more ease of flexing radially outwardly when they are engaged and pressed outwardly by the contact member 36, upon depression of the latter.

The contact springs and their mountings and connector devices occupy the five slots 25; the sixth slot 26 (Figures 6 and 7) is of substantial depth and is provided with curved walls so that the cable can be accommodated therein, the vertical slot 26 being closed by the casing walls. As is better understood from Figure 7 the cable, entering through the hole 20 or bushing 22, makes a downward bend as it is accommodated in the slot 26 and at the bottom end of the latter, the cable sheathing can terminate so that the five individual insulated conductors may, from that point on, be fanned out and led to the five binding screws 34 (Figure 7) for electrical connection. At its lower end, the part 24 has a downward cylindrical extension 24b (Figure 7) of reduced diameter, and it is about that extension that the five insulated conductors may be fanned or led to their respective binding screws 34.

In molding or shaping the part 24 it is provided with a central passage or hole along its axis, preferably shaped to have different dimensions or cross-sectional shapes. Thus at the lower end of part 24 this coaxial channel or hole comprises a round or cylindrical portion 37 at the upper end of which it communicates with a square-cross-sectioned channel 38 that is of substantial axial extent and which communicates at the upper end with a larger and circular recess or channel 39. Slidably fitted into the square channel 38 is a stem 41 of square cross-section which terminates at its upper end in a threaded stud 42. The bridging contactor 36 is preferably in the form of a cup-shaped sheet metal stamping, having a flat base 36a and depending side walls 36b which are preferably arranged to form a hexagon (see Figure 6), so that each presents a flat face for engagement with a contact spring 31. The flat base portion 36a thereof has a hole in it (Figures 4 and 7) so that it is received over the threaded stud 42 to rest against the end face of the flat stem 41, and superimposed upon the part 36a is a hexagonal plate 43 of fiber or other insulating

material, with its sides paralleling the flat sides 36b and projecting beyond them as shown. Above the insulating plate 43 is a metal washer 44, parts 43 and 44 having central holes through which projects the threaded stem 42 which thus centers and coaxially aligns them with the stem and with the part 36.

These three parts are clamped tightly against the end face of the square stem 41 by the lower end of a metal stem 44 that is preferably of round cross-section and has a threaded coaxial hole at its lower end for threaded engagement with the threaded stud 42. Surrounding the stem 41 and with one end abutting against the flat part 36a is a helical spring 45 whose lower end extends into the round portion 39 of the central hole or channel in part 24, abutting against the shoulder formed at the junction with the smaller square hole 38. Spring 45 normally biases the stem 41 and the parts carried by it in upward direction. The lower end of stem 41 is provided with suitable means for mechanically securing thereto, preferably detachably, a suitable pull or tension member which preferably takes the form of a chain 46 comprising hollow balls connected together by dumb-bell links, being a known form of pull chain, and in such case the connecting means comprises a sheet metal tubular or sleeve member 47 (Figures 4 and 7) of known form, having end walls or flanges each providing a central hole and with a radial slit that joins a longitudinal side slit 48 which is narrow at its ends and enlarged centrally to permit the end ball link of the chain to be laterally snapped or pressed through the widened side slit and the dumb-bell link then passed through the narrower portion and through the radial slit in the end wall. The connecting element 47 may in turn be mechanically secured to the lower end of the square stem 41 in any suitable manner as by providing the lower end of stem 41 with a half dumb-bell or ball terminus so that the member 47 can itself be readily and detachably secured to the stem.

The diameter of the round hole portion 37 at the lower end of the part 24 is larger than that of the tubular connecting element 47 and its axial extent is such that upon depression of the stem 41 against the spring 45 the tubular connector 47 loosely and freely slides through the hole portion 37 and is projected sufficiently beyond the lower end of the extension 24b so that the chain 46 may be easily attached to or detached from the projecting connecting device 47. The downward projection of the part 47 however is insufficient to permit disconnecting it from the ball stud 48 at the end of the stem 41 and hence, as will later be seen, there is no risk of the part 47 being inadvertently detached from the mechanism when it is desired to detach the chain 46 itself. As is now apparent the connecting element 47 is attached to the stem 41 during assembly of the latter to the part 24.

As is better shown in Figure 6, four of the external vertically extending ribs 27 are provided with longitudinal extending slots 50 located generally at the corners of a rectangle for the reception of elongated sheet metal posts 51 which are at their lower inner edges cut away as at 51a (see Figure 4) to provide an upper shoulder 51b and a lower shoulder 51c of which the former overlies the upper face of the part 24 and the latter is seated against a radially inward extension of the slot 50, and thereby each post 51 is held against longitudinal movement relative to the insulating part 24. The radial dimensions of the slot 50 are such that the outer edges of the posts 51 fall in a geometric cylinder of the same radius as the radius of the internal walls of the casing part 12 whose internal shoulder 29 is vertically slotted to accommodate the posts 51 which thus become keys which hold the insulating part 24 as well as the parts carried by the posts 51 against rotary movement relative to the casing.

The posts 51 may be stamped integrally with, or suitably secured to, at their upper ends, a frame plate 52 (Figures 4 and 7), the plate 52 being generally circular to be accommodated within the casing and being, by the posts 51, held in a plane at right angles to the axis of the insulating part 24 and coaxial with the axis of the latter and the stem structure 41—44, and at two diametrically opposed points in its periphery it is provided with upwardly extending arms or lugs 54, 55 (Figures 3 and 5) which may be integrally formed as by stamping with the plate 52 or may be secured thereto in any suitable way, and bent at their upper ends into a horizontal plane as is better shown in Figure 3 so as to be received against the bottoms of recesses 15a and 15b in the flat upper annular end face of the male threaded part 15 of the central casing section 12. In thus seating in these recesses 15a and 15b, the arms 54 and 55 also virtually key the upper end of the sub-assembly or built-up frame structure against rotary movement relative to the casing and when either end casing part 13 or 14 is then screwed on to the threaded male part 15, the shoulder therein closes over the recesses 15a and 15b, thus blocking upward movement of the sub-assembly relative to the casing and holding the shoulders 28 of the insulating part 24 downwardly against the internal annular shoulder 29 of the central casing part 12. If desired the parts can be so dimensioned that the horizontal portions of the arms 54 and 55 are somewhat clamped between the annular shoulder of the end casing part and the bottoms of their respective recesses.

The stem 44 is preferably of round cross-section and an intermediate portion is shaped, as by turning, to have a frusto-conical portion 57, and at its upper end it has secured to it in any suitable way an elongated push-button 58 made preferably of any suitable non-conductive material, for example, a molded and cured resin type of plastic, and in such case it may be molded onto a suitably configured upper end of the stem 44. The push member or button 58 thus becomes related to the square stem 41 at that end of the latter opposite to which the connecting device 47 for the chain 46 is provided. Accordingly a depression of the button 58 effects a downward movement of the stem 41 and the parts carried thereby just as does a pull of the chain 46.

Such downward movement brings the bridging member 36 into coaction with spring contacts 31 in a manner later described and suitable means are provided to lock or hold the bridging member 36 in such downward or actuated position. Such means preferably comprises two sliding plates 62 and 63 which rest flatwise on top of the frame plate 52 relative to which they are held and slidably guided by a disc-like cover or guide-plate 64 which is stamped to give it the shape of a widened inverted U, as is better shown in the Figure 3, thus providing it with two opposed segment-shaped parts 64a and 64b (Figures 3 and 5) which rest against the frame plate 52 to which it is secured by bent-over ears 65 which are ac-

commodated in suitable peripheral recesses in the frame-plate 52, and thus providing a central parallel-sided plate portion 64c spaced upwardly from the frame plate 52 by somewhat more than the thickness of the two locking plates 62 and 63. In the plate part 64c are two aligned elongated slots 66 and 67 through which project pins 68 and 69 respectively, being secured respectively to the sliding locking plates 62 and 63 to limit their movements toward or away from each other along the vertical diameter as viewed in Figure 5. A helical spring 70 has elongated arms whose ends are looped around the upper grooved ends of the pins 68 and 69, and through the arms the force of the spring biases the locking plates 62, 63 in directions away from each other.

The locking plates 62 and 63 are identically shaped as shown in broken lines in Figure 5, having suitable parallel side edges to coact with the guideway provided by the cover plate 64 and their adjacent ends are shaped to provide curved hook-like edges 62a and 63a that are of a radius of curvature equal to or greater than that of the maximum radius of the frusto-conical part 57 of the stem 44. The frame plate 52 and the cover plate 64 are provided with central round holes large enough to accommodate the maximum diameter of the frusto-conical stem part 57 and in the position shown in the drawings, the cylindrical portion of the stem 44 below the cam portion 57 extends through these aligned holes, being engaged on opposite sides as shown in Figure 5 by the hook-shaped ends 62a and 63a of the locking plates. A felt washer 71 surrounds that portion of the stem 44 underneath the frame plate 52 and serves to cushion the upwardly moving parts, in effect snapped upwardly by the action of spring 45, when they are released for such upward movement as is later described.

As is better seen in Figures 4 and 7 the locking plates 62 and 63 have extensions 62c and 63c respectively which, in the assembly, extend beyond the frame plate 52 and at their outer ends have secured to them, as by molding them thereon, finger-pieces 72 and 73 respectively of Bakelite or the like, being preferably quite smaller in relation to the push button 58 that is carried by the stem 44. In relation to the sub-assembly or sub-unit 11 of Figure 4 these parts 72 and 73 are preferably at opposite ends of a diameter and as the sub-assembly is inserted into the central casing section 12 by downward movement of the former into the latter as above described, these finger pieces 72 and 73 ride downwardly into diametrically opposed vertical slots 74 and 75 respectively (Figure 7) which are formed in diametrically opposed portions of the upper end of the casing section 12, extending through the male threaded part 15 thereof and extending also into the main side wall of the section 12 below the threaded male part 15, as is better shown in Figure 7, so that when an end casing part is screwed onto the threaded part 15 to its fullest extent, the finger piece parts 72 and 73 lie below the plane of the end edge of the finger pieces and are not interfered with by the end casing section. The finger pieces 72 and 73 being carried by the sliding locking plates 62, 63 which are biased outwardly away from each other by the spring 70, are limited in the extent of their projection beyond the casing 10 by the action of the plate studs 68 and 69 coacting with the slots 66 and 67 respectively, or by the extent to which the hook edge portions 62a and 63a of the plates are permitted to approach each other

by the cylindrical stem 44 toward which they are pressed by the spring 70. Preferably the studs and slots are so proportioned as to allow this latter action to take place during the use of the device, the studs and slots coacting to limit the plate movements during various steps of assembly of the switch unit 11 of Figure 4.

If the device is to be employed for push button control by the patient or operator, the interchangeably mountable end casing sections 13 and 14 are assembled to the central casing section 12 in the relation shown in Figures 1 and 3, casing part 13 being threaded onto the male threaded flange 15 of the central casing 12 and the other end casing part 14 being threaded onto the male threaded flange 16. Casing part 13 has an upper transverse end wall 13a spaced suitably from its lower end for purposes later described and in that end wall 13a is a hole 13b aligned with the axis of the casing section so that when the latter is assembled as above described, the hole 13b, which is slightly larger than the cross-section of the elongated push button 58, the latter freely passes therethrough to be exposed on the outer side of the end wall 13b by a sufficient extent for manual depression thereof. The other end casing part 14 which in outer configuration may be tapered or curved off as shown in the drawings, has an internal end face 14a spaced from the upper end of the casing part 14 by a sufficient distance to just accommodate those portions of the sub-unit 11 of Figure 4 which, when assembled to the central casing part 12 project downwardly below its lower end. Opening into the face 14a is a coaxial cylindrical recess 14b of a diameter equal to that of the hole 13b in the other end casing part 13.

So assembled, the switch structure may be placed at the disposal of a patient as by suitably securing it or its cable to the bed clothes so as to be within reach of the patient, whence the patient can at any time depress the plunger or button 58 to activate the signalling circuits as is later described, the locking plates 62 and 63, after being cammed away from each other by the frusto-conical face of the part 57 of the stem 44, snapping toward each other above the part 57, thus locking the stem structure 41—44 in a downward position. Thereby also the small finger pieces 72—73 assume positions projecting from the casing 10, substantially as in Figures 1, 2 and 7 so that the answering attendant can press them toward each other to separate the curved hooked edge portions 62a and 63a (Figure 5) and thereby permit the detent or ratchet-like part 57 to pass upwardly therethrough, under the urge of spring 45, the felt washer 71 cushioning the stopping action of the frame plate 52 in limiting this upward movement of the parts, whereby the switch is restored to normal or open-circuit condition and the large plunger 58 is again projected out of the casing part 13 and is ready for subsequent actuation. It is to be noted that both finger pieces 72, 73 have to be actuated to effect this release from locked condition and thus there is obtained better assurance that the patient does not accidentally or unknowingly unlock the switch from signalling condition. The patient, knowing that the depression of a single button suffices to signal an attendant might inadvertently, after having initially set the switch by pressing the button 58, press one of the smaller buttons but that would not effect restoration of the switch and its circuits. In normal condition, that is

with the large plunger or button 58 projected, depression of either one or both of the release buttons 72 and 73 results in no action taking place, the depression being simply against the biasing of the spring 70, and hence the release buttons operate as a tell-tale to indicate to the patient that, because neither button is locked in depressed position, he is actuating the wrong actuator, for it is only the button 58 that remains locked in depressed position after actuation.

In cases where the patient is incapacitated to operate the button 58, or for other reasons, it is desired to provide the patient with a cord, string, chain or other pull member, the end casing parts 13 and 14, instead of being assembled to the central casing part 12 as in Figures 1 and 3, are assembled thereto as shown in Figure 7 in that the casing part 14 is assembled to the upper end of the central casing part 12, by threading it onto the male threaded part 15, and end casing part 13 is threaded onto the male threaded part 16 at the lower end of the central casing part 12. The internal recess 14b of the casing part 14 thus receives therein the plunger or large button 58, being of sufficient axial extent to fully accommodate it when it is in normal or upwardly projected position. Button 58 is thus completely covered over and is inaccessible for actuation. The end casing part 14 may be provided with any suitable means to facilitate tieing or anchoring the switch structure to a suitable rigid or stationary part. For example, it may be provided with diametrically opposed recesses or holes 14e and 14f (Figure 7) to receive therein and thereby hingedly support the ends of a heavy wire bail 77 (Figures 1 and 7) whereby the switch structure may be hung on a hook on the wall or tied to the head or foot of the bed, by way of illustration.

Before assembling the end casing part 13 to the lower end of the central casing part 12 in Figure 7, there is first secured to the lower end of the central sliding stem 41 the desired tension or pull member such as the chain 46, and that is done in the manner above described, namely, by effecting downward movement of the stem 41 to project the connecting sleeve or tube member 47 out of the hole 37 in the lower end of the insulating part 24 to facilitate connection thereto of the end ball link of the chain. The chain is then passed through the hole 13b which in the arrangement of Figure 3 serves to slidably guide and support the plunger 58, whence the casing part 13 may be screwed home onto the lower end of the central casing part 12. The chain 46 may be of a length to reach to the patient or a suitable cord or string may be tied to it and led to the point from which it is desired to actuate the switch. A single pull on the chain suffices to depress the stem structure 41—44 sufficiently to pass the cam detent part 57 downwardly below the plane of the locking plates 62 and 63 which thereafter serve to lock the switch in actuated position, subsequent depression of all of the manual actuators 72 and 73 by the attendant thereafter serve to restore the switch to normal condition, retracting some of the chain 46 through the hole 13b as the same structure moves upwardly under the action of the spring 45.

Preferably the switch structure is so arranged that the stem structure 41—44 is not locked in its lowermost possible position, whether it is moved downwardly by the button 58 in Figure 3 or by the chain 46 in Figure 7. Rather the locking action takes place at a point intermediate of the complete range of movement of the stem structure, preferably a bit short of its maximum downward movement. In coaction with this relationship it is possible to achieve a number of signal actuations subsequent to those achieved by the position of the switch when locked against retrograde movement. For example, and as shown in Figures 3, 4 and 7, I may make one or more of the contact springs 31, illustratively the one indicated at 31b, shorter than the rest or I may make one of the sides 36b (Figure 6) of the hexagonally side-walled contactor 36 shorter than the rest, or I may employ both in the same circuit other than the contact spring that is connected to the common; for example, contact spring 31b can be made shorter as indicated and contact wall 36c with which the contact spring 31b coacts may be made shorter than the rest, as shown. In such case, when the structure is locked in downward position, all of the contact springs 31 are engaged by the contactor 36 and their circuits held closed, excepting contact spring 31b whose circuit thus remains open. But a subsequent additional downward movement of the stem structure 41—44, either by further depressing the button 58 in Figure 3 or by giving the chain 46 a slight additional pull, suffices to bring the parts 36c and 31b into engagement to close that circuit which illustratively could be a lamp signal or a buzzer signal so that by repeated additional pushes or pulls by the patient the light may be repeatedly flashed or the buzzer repeatedly buzzed.

At the same time it might be desirable during such subsequent or repeated additional pushes or pulls to deactivate one or more of the circuits initially closed when the switch is in locked position. One of the signals might comprise an electric lamp or buzzer or other audible signal at a different location and such signals though initially activated, can be repeatedly inactivated, thus reemphasizing the signals as by repeatedly interrupting their circuits in response to such additional pulls or pushes. In such case the hexagonal insulating member 43 that overlies the contactor 36 (Figures 3, 4 and 7) can be made to project laterally beyond such of the contact side walls 36b as is desired and corresponding to the circuit or circuits which it is so desired to repeatedly deactivate by subsequent actuations beyond the locked condition of the switch. In Figures 3, 4 and 7 the insulating plate 43 is shown projecting to the right beyond the right-hand contact wall of the part 36 so that upon such additional downward actuation this projecting portion engages the upper outwardly bent end of the corresponding contact spring and cams it radially outward out of engagement with the contactor 36, thus breaking the circuit of that contact spring which of course should not be the contact to which the "common" is connected if the switch structure is also to embody a shortened contact spring 31b or a shortened contact wall plate 36c. On the other hand, in the absence of such a shortened contact arrangement, camming of the "common" contact spring out of engagement with the contactor 36, by the action of a projecting portion of the insulating plate 43, can, if desired, be employed to accentuate the already set signals by repeatedly deactivating them.

However, with the preferred arrangement shown in the drawings and above described,

greater reliability of signalling is achieved in that the subsequent additional actuation, even if it opens one signalling circuit, effects closure of another so that there is no risk of complete failure of signalling if the button **58** of Figure 3 or the chain **46** of Figure 7 be inadvertently held so that the switch and stem structure is held in its lowermost possible position. Maximum downward movement is preferably limited by the engagement of the lower edges of the side walls of the contactor **36** with the upper end face of the extension **24a** of the insulating part **24** and when so engaged the lower end of the button or plunger **56** is at rest just above the guide plate **64**.

It will thus be seen that there has been provided in this invention a signalling switch construction in which the various objects above set forth together with many thoroughly practical advantages are successfully achieved. The construction is substantially fool-proof and is readily adaptable, by simple, speedy and convenient rearrangement of its parts, to suit it to meet widely differing requirements of use met with in practice.

As many possible embodiments may be made of the above invention and as many changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. An electrical switch comprising a casing and a switch structure therein, said switch structure comprising a reciprocating shaft adapted to be actuated by a push button at one end and by a pull chain at the other end, spring means adapted to constantly urge said shaft out of circuit closing position, and locking means lateral to said shaft adapted to prevent said spring from returning said shaft to open circuit position comprising a pair of plates each having a portion relatively adjacent said shaft disposed to engage an enlarged portion thereof to hold it in circuit closing position and manual releasing means for said locking means comprising a projection on each of said plates extending laterally and opposite each other outside said casing whereby said portions adjacent said shaft may be disengaged from said enlarged portion thereof and said shaft released.

2. An electrical switch comprising a casing and a switch structure therein, said switch structure comprising a reciprocating shaft adapted to be actuated by a push button at one end and by a pull chain at the other end, a plurality of electric contacts surrounding said shaft and adapted to be operated simultaneously thereby, spring means adapted to constantly urge said shaft out of circuit closing position, and locking means lateral to said shaft adapted to prevent said spring from returning said shaft to open circuit position comprising a pair of plates each having a portion relatively adjacent said shaft disposed to engage an enlarged portion thereof to hold it in circuit closing position and manual releasing means for said locking means comprising a projection on each of said plates extending laterally and opposite each other outside said casing whereby said portions adjacent said shaft may be disengaged from said enlarged portion thereof and said shaft released.

3. An electrical switch comprising a casing and a switch structure therein, said switch structure comprising a shaft adapted to be actuated by a push button at one end and by a pull chain at the other end, and spring means adapted to constantly urge said shaft out of circuit closing position, and said casing comprising a central casing part and two end casing parts, said casing parts having means for interchangeably connecting said end casing parts to either end of said central casing part, one of said end casing parts having an aperture therein adapted to permit actuation of the push button and the pull chain depending upon the end of the central casing part to which it is attached and said other end casing part adapted to cover said push button and said pull chain depending upon the end of the central casing part to which it is attached and locking means for said shaft lateral to said shaft comprising a pair of plates each having a portion relatively adjacent said shaft disposed to engage an enlarged portion thereof to hold it in circuit closing position and manual releasing means comprising a projection on each of said plates extending laterally and opposite each other beyond said central casing part whereby said portions adjacent said shaft may be disengaged from said enlarged portion thereof and said shaft released.

4. An electrical switch comprising a casing and a switch structure therein, said switch structure comprising a shaft adapted to be actuated by a push button at one end and by a pull chain at the other end, spring means adapted to constantly urge said shaft out of circuit closing position, latch means coacting with said shaft for holding it in circuit opening position, and manual releasing means comprising a pair of oppositely disposed members projecting laterally from said switch structure for actuating said latch means to release said shaft, and said casing comprising a central casing part and two end casing parts, said casing parts having means for interchangeably connecting said end casing parts to either end of said central casing part, said central casing part having opposed open-ended slots at one end thereof for accommodating said two opposed laterally projecting release members upon assembly of said switch structure to said central casing part, one of said end casing parts having an aperture therein adapted to permit actuation of the push button and the pull chain therethrough depending upon the end of the central casing part to which it is attached and said other end casing part adapted to cover said push button and said pull chain depending upon the end of the central casing part to which it is attached, said slots that accommodate said opposed release members being closed by that end casing part which is attached to that end of the central casing part.

5. An electrical switch comprising a casing and a switch structure therein, said casing comprising a tube-like central casing part and two end casing parts for closing off the latter, said central casing part having an internal ledge-like means facing toward one end of said tube-like casing part, said switch structure comprising an elongated frame received into said central casing part through said one end thereof and having therein a longitudinally extending reciprocating shaft adapted to be actuated in one direction by a push button at one end and by a pull chain at the other end and in opposite direction by a spring means and having coacting electrical contact means for closing a circuit on one stroke of reciprocation of said shaft and for

opening said circuit on the reverse stroke, said frame having a projecting frame part that seats against said ledge-like means to limit entry of said switch structure lengthwise into said tube-like central casing part, said casing parts having means for interchangeably connecting said end casing parts to either end of said tubular central casing part, one of said end casing parts having an aperture therein adapted to permit actuation of the push button and the pull chain therethrough depending upon the end of said tube-like casing part to which it is attached and said other end casing part adapted to cover said push button and said pull chain depending upon the end of the tube-like casing part to which it is attached, said switch structure being held against lengthwise movement away from said ledge-like means by whichever one of said end casing parts its attached to that end of said tube-like central casing part toward which said ledge-like means faces.

6. An electrical switch comprising a casing and a switch structure therein, said casing comprising a tube-like central casing part and two end casing parts for closing off the latter, said switch structure comprising an elongated frame received lengthwise into said central tube-like casing part and having therein a longitudinally extending reciprocating shaft adapted to be actuated in one direction by a push button at one end and by a pull chain at the other end and in opposite direction by a spring and having coacting electric contact means for closing a circuit on one stroke of reciprocation of said shaft and for opening said circuit on the reverse stroke, said casing parts having means for interchangeably connecting said end casing parts to either end of said tube-like central casing part, one of said end casing parts having an aperture therein adapted to permit actuation of the push button and the pull chain therethrough depending upon the end of said tube-like casing part to which it is attached and said other end casing part adapted to cover said push button and said pull chain depending upon the end of the tube-like casing part to which it is attached.

7. An electrical switch comprising a casing

and a switch structure therein, said casing comprising a tube-like central casing part and two end casing parts for closing off the latter, said tube-like casing part having an aperture in its wall for the passage therethrough of a conductor-carrying cable, said switch structure comprising an elongated frame received longitudinally into said central casing part and having therein a longitudinally extending reciprocating shaft adapted to be actuated in one direction by a push button at one end and by a pull chain at the other end and in opposite direction by a spring and having coacting electric contact means for closing a circuit on one stroke of reciprocation of said shaft and for opening said circuit on the reverse stroke, said frame having a longitudinally extending recess in a side thereof and underlying said casing aperture for accommodating said cable with the conductors thereof connected to said contact means, said casing parts having means for interchangeably connecting said end casing parts to either end of said tube-like central casing part, one of said end casing parts having an aperture therein adapted to permit actuation of the push button and the pull chain therethrough depending upon the end of said tube-like casing to which it is attached and said other end casing part adapted to cover said push button and said pull chain depending upon the end of the tube-like casing part to which it is attached.

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