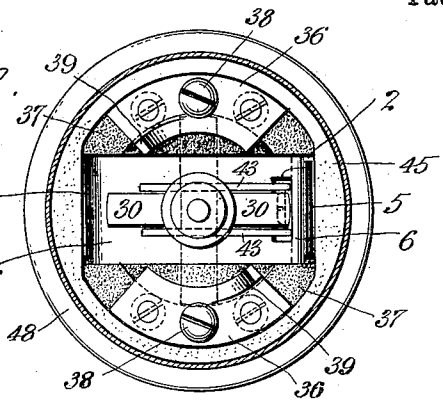
C. D. GERVIN.

PENDANT SWITCH.

APPLICATION FILED MAR. 26, 1908.

977,446. Patented Dec. 6, 1910.

FIG. 2.



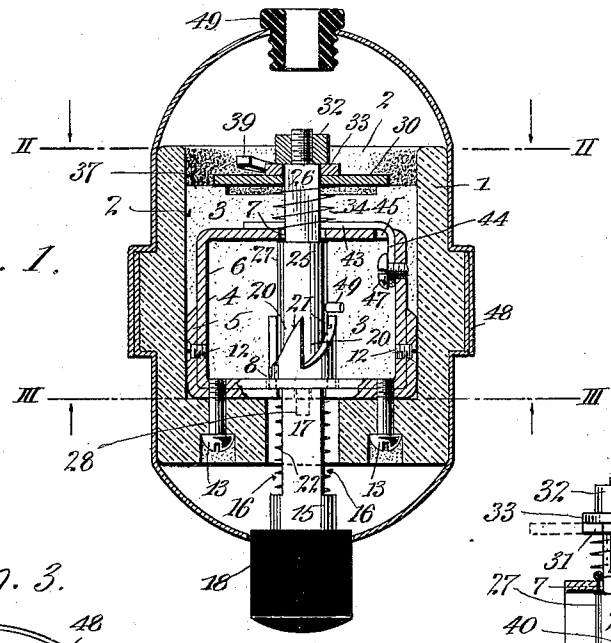
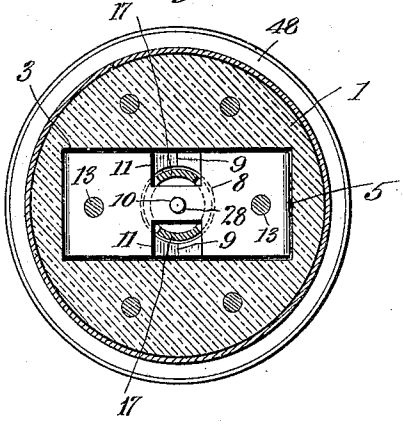


FIG. 1.

FIG. 3.



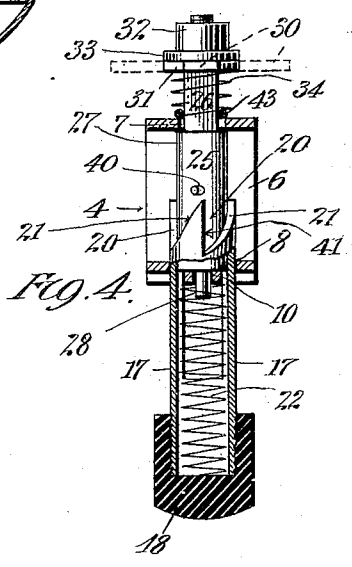


FIG. 4.

Witnesses:

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PENDANT-SWITCH.

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Application filed March 26, 1908. Serial No. 423,311.

To all whom it may concern:

Be it known that I, CHARLES D. GERVIN, a citizen of the United States, residing at New York, in the borough of Manhattan and State of New York, have invented certain new and useful Improvements in Pendant-Switches, of which the following is a full, clear, and exact description.

My invention relates to a construction of pendant or other switch of the type having a depressible button which is actuated to complete the circuit to be controlled. Switches of this character have in some cases been made with a separate release button which is manipulated to interrupt the circuit after the said circuit closing button has been depressed.

It is the purpose of my present invention to provide means whereby the successive actuation of the main controlling button will first act to complete the circuit and subsequently to open it. In this way, the device is made more symmetrical and ornamental in appearance, and is more simply controlled or operated. I make use of a switch blade or element which is repeatedly displaced rotatably in a given direction by the successive movements of the operating button, which causes the action of cam faces to positively move the switch element through a predetermined angle.

The invention includes various matters of construction by which the switch is very simply and economically manufactured, and is very strong and durable in use.

With these and other objects in view, the invention consists in the features of construction and combination hereinafter pointed out in the appended claims, reference being made to the accompanying drawings and description in which a preferred embodiment of the invention is set forth.

In the drawings, Figure 1 is a vertical sectional view of a pendant switch embodying the principles of my invention. Fig. 2 is a section of the same on the line II—II of Fig. 1, looking in the direction of the arrows. Fig. 3 is a section on the line III—III looking in the direction of the arrows. Fig. 4 is a detail view partly in vertical section showing the operating parts in a plane at right angles to that of Fig. 1.

Referring to the drawings in which like parts are designated by the same reference sign, 1 indicates a porcelain block or body which is preferably generally cylindrical on its exterior surface, and has an interior cavity 2, the main portion 3 of which is of rectangular transverse section, as shown in Fig. 3. Within this cavity there is received a frame 4, which I prefer to make of box-like form, comprising a U-shaped sheet metal strip or stamping 5 and a rectangular sheet metal strip or stamping 6. The frame part 6 has a circular perforation 7 on its upper face and a similar somewhat larger perforation 8 on its lower face at the point where its meeting ends 9 come together. (See Fig. 3). The frame part 5 is made with a small perforation 10 and is assembled over the bottom face of the part 6 so as to embrace the sides thereof, with the hole 10 coaxial with the openings 7 and 8 of the said part 6. At points adjacent to the hole 10, the part 5 is deeply cut away or notched at 11, the notches being deep enough to expose portions of the adjacent opening 8 in the part 6. (See Fig. 3). In this relation, the parts 5 and 6 may be permanently assembled together by screws 12 and fastened within the block or body 1 by screws 13.

15 designates a tubular plunger which I make with diametrically opposite elongated notches or cut-away portions 16, so that along the length of the plunger corresponding to these notches, there only remains a pair of diametrically opposite arcuate strips 17, constituting a skeleton framework to hold the end portions of the tubular plunger together. At its outer end, the plunger has a button 18 by which it is depressed. At its inner end, the plunger may have certain parts which act to secure a cam-impelled movement of the switch element, as later described. In the drawings, I have shown the inner end of the plunger 15 formed with notches 20 having inclined edges 21 constituting cam faces. The U-shaped part 5 is passed through the cut-away portions 16 of the plunger before it is assembled on the part 6, so that, when all these devices are assembled, the plunger is guided within the frame 4 to have a depressible, but non-rotatable relation therein. As illustrated in Fig. 3, the arcuate strip portions 17 of the plunger are received in the notches 11 of the frame part 5, and are inclosed by the surrounding edges of the opening 8 in the frame part 6.

22 designates a spring received within the hollow plunger 15 and bearing against the U-shaped frame part 5, for impelling said

plunger normally outward from said frame. The outward movement of the plunger is, of course, limited by the length of the notches or cut-away portions 16 thereof.

25 designates the spindle of the switch element, which has a square, rectangular, or otherwise non-cylindrical portion 26 at its upper end, a cylindrical portion 27 at its middle adapted to be slidably received within the hollow plunger 15, and a lower terminal stud 28 received within the hole 10 of the U-shaped frame part 5. The square portion 26 of this spindle is rotatably received in the opening 7 of the frame 4, and the spindle is held against longitudinal movement in either direction through openings 7 and 8 by its central enlarged part 27. The plunger 15 telescopes over the spindle 25 in its movement of depression.

30 designates the switch element formed of a narrow sheet metal strip or blade centrally enlarged at 31 and perforated with a square hole corresponding to the square portion 26 of the spindle. The switch element 30 is loose on its spindle, so as to be capable of longitudinal displacement, but is always rotated with the spindle on account of the square shape of the engaging parts.

32 designates a nut on the upper end of the spindle and 33 is a washer which cooperates with the nut to limit the upward movement of the switch element.

34 denotes a spring surrounding the spindle between the switch element and the upper face of the frame 4. This spring keeps the switch element pressed upwardly to its limit of movement determined by the nut 32. The circuit terminals are established by plates 36 secured to ledges 37 at the upper portion of the cavity 2 in the block 1.

38 designates the terminal screws by which the circuit wires are attached. Each of these contact plates 36 has an upwardly deflected tongue 39 in the path of the extremities of the switch element 30, so that the latter is guided beneath the tongues and into engagement with the contact plates during its movement of rotation. When the switch element is in the position shown in full lines in Fig. 2, electrical connection between the terminal plates 36 is broken or interrupted at two separate points. If the switch element is displaced through 90° from this position to the relation shown in dotted lines in Fig. 2, it is evident that the electrical circuit is completed between the terminal plates directly through the switch element. In this engagement the switch element is kept pressed constantly upward by its spring 34, but yields downwardly as far as necessary to accommodate the irregularities of the contact plates. The spring pressure maintains a good electrical connection under all circumstances, when the switch element is displaced into its circuit closing relation.

I provide means making use of a cam for displacing the switch element in its angular movement. In the preferred embodiment shown in the drawing, I provide the notches 20 with cam faces 21 on the depressible plunger 15, which coöperate with a pin 40 on the spindle 25. There are four cam faces 21 each extending in a spiral direction for about a quarter of the circumference around the tubular plunger 15, being joined together by the straight or vertical edges 41. The relation between the pin 40 and the faces 21 is such that, when the switch element 30 is in any of its positions of rest, said pin 40 is in a location to be engaged and displaced by an inclined face 21 of the plunger. (See Fig. 4). The movement of the plunger is adapted to displace the switch element through nearly 90° or until the pin 40 comes in contact with the vertical edge 41. In this relation, means constituting an important feature of my invention, causes the completion of movement of the switch element through its complete throw of 90°.

The fact has been referred to that the upper portion 26 of the spindle 25 is square or non-circular in transverse section. By this means, two of the sides of the square are always presented in a certain or fixed direction whenever the switch element is in its properly thrown position to open or close the circuit. I take advantage of this fact to secure a completion of the movement of the switch element to either circuit opening or circuit closing relation.

43 designates blade springs conveniently made integral with one another out of a single piece of springy wire which is bent into a U-shape with its middle portion downwardly deflected at 44. This portion 44 passes through an opening 45 in the frame part 6, and is secured to said frame part by a screw 47. The tension of the leaf or blade springs 43 is toward one another and they extend in parallel directions adapted to embrace opposite flat side faces of the square portion of the spindle. The springs tend to embrace the square portion of the plunger with a resilient pressure at all times, so that a cam action is exerted to displace the spindle to a position where its flat faces are in alinement with said blade springs 43. If the switch element is displaced through anything less than a complete throw of 90°, its movement is therefore completed by the action of the springs 43. The switch is inclosed in the usual sheet metal casing 48 which I conveniently make of two parts telescoping together to inclose the block or body 1.

49 designates an insulating bushing at the

upper end of the casing 48 through which the circuit wires may enter for their connection with the terminal screws 38.

The use and operation of the device will be clear from the foregoing description. Assuming that the parts are in the open circuiting relation shown in the drawings, it is evident that, if the botton 18 is depressed, the pin 40 will be engaged by one of the cam faces 21 and displaced through an angle of nearly 90°, or until it brings up against the straight edge 41. This movement causes new faces of the square portion 26 of the spindle to be presented in nearly but not exactly parallel relation to the blade springs 43. Accordingly, said blade springs exert a pressure to force the spindle to complete its 90° movement, and this movement is completed as soon as the button 18 returns downwardly so that the pin 40 is freed from the edge 41. The switch element has now been moved beneath the contact plates 36, which position it takes without constraint or excessive friction, by virtue of its downwardly yielding character. Adequate pressure for the purposes of establishing an electrical connection between the contact plate is, however, insured by the pressure of the spring 34 which maintains a firm contact of the switch element with the contact plates under all circumstances. The switch element having been thrown through a 90° movement from its original position, it is evident that the pin 40 is now adapted to coöperate with another cam face 21 in exactly the same manner as already described. In this way, the switch element is stepped around rotatably through 90° angles by successive depressions of the push button 18, and it is evident that it is positioned to open and close the circuit of the switch at each successive actuation respectively.

It is understood that when the switch element 30 is given a quarter turn for closing the switch, its terminals first come in contact with the tongues or cams 39, which cause an inward sliding of the switch element 30 on the polygonal spindle portion 26 against the tension of the spring 34, so that when the terminals of the switch element 30 have finally moved under the contact plates 36, then the pressure of the spring 34 causes a firm contact of the terminals of the switch element 30 with the contact plates 36. When the switch element is given the next quarter turn for opening the switch, the spring 34 immediately causes an outward sliding of the switch element 30, as soon as the terminals of the switch element 30 leave the under side of the contact plates, thus insuring a prompt breaking of the electrical connection to avoid arcing. It is further understood that the plate spring 43 completes the turning of the spindle 25 as soon as the vertical edge 41 of a notch 20 releases the pin 40, so that the said pin 40 is moved a short distance beyond the vertical edge 41, to be in position for engagement by the cam face 21 of the next following notch 20 at the next depression of the plunger 15. Thus by the arrangement described the plate spring 43 moves the spindle 25 to a final position of rest, and the pin 40 and cam faces 21 move into operative position on releasing the plunger 15.

What I claim is:

1. An electrical switch comprising a cup-shaped housing, a spindle having a non-circular portion angularly movable therein, a switch element carried by said spindle, a frame within said housing for supporting the switch element, a tubular plunger depressible through said housing and frame and having cam faces for rotating said spindle through successive angular movements in the same direction, and a spring engaging the non-circular portion of said spindle for supplementing the action of said cam faces.

2. An electrical switch, comprising a rotatable spindle, a switch element mounted to turn with the said spindle and to slide thereon in the direction of the length of the spindle, a spring pressing the said switch element, fixed contact plates having cams for engagement by the said switch element to direct the latter into firm contact with the said contact plates, and mechanical means connected with the said spindle for intermittently rotating the spindle on alternately pushing and releasing the said means.

3. An electrical switch comprising a rotatable spindle having a switch element, a frame in which said spindle is rotatable, a plunger telescoping over the spindle and guided by said frame to have a limited longitudinal but no angular movement, and means acting, when said plunger is released, for abruptly rotating the spindle.

4. An electrical switch, comprising a rotatable spindle, a switch element mounted on the said spindle to turn with the same and to yield in the direction of the length of the spindle, fixed contact plates having cams for engagement by the said switch element to direct the latter into firm contact with the said contact plates, a pin on the said spindle, and a spring-pressed plunger mounted to slide and having a cam provided with a plurality of cam faces for engagement with the said pin to intermittently rotate the said spindle on successively depressing and releasing the said plunger.

5. An electrical switch, comprising a rotatable spindle, a switch element mounted on the said spindle to turn with the same and to yield in the direction of the length

of the spindle, fixed contact plates having cams for engagement by the said switch element to direct the latter into firm contact with the said contact plates, a pin on the said spindle, a spring-pressed plunger mounted to slide and having a cam provided with a plurality of cam faces for engagement with the said pin to intermittently rotate the said spindle on successively pressing and releasing the said plunger, and a spring engaging the said spindle for turning the spindle to final position of rest on releasing the plunger.

6. An electrical switch, comprising a frame, a hollow plunger having cut out portions through which extends a portion of the frame to hold the plunger against turning and to guide the plunger in its axial movement, a spring pressing the said plunger to hold the latter in a normal or release position, a cam secured on the said plunger and provided with a plurality of cam faces, a spindle mounted to turn in the said frame, a pin on the said spindle and adapted to be engaged and disengaged by the said cam faces on alternately depressing and releasing the plunger to intermittently rotate the said spindle, a switch element on the said spindle to turn with the latter, fixed contact plates adapted to be alternately engaged and disengaged by the said switch element, and means for moving the said pin and cam faces into operative position on disengaging the cam from the said pin on the release of the plunger.

7. An electrical switch, comprising a frame, a hollow plunger having cut out portions through which extends a portion of the frame to hold the plunger against turning and to guide the plunger in its axial alinement, a spring pressing the said plunger to hold the latter in a normal or release position, a cam secured on the said plunger and provided with a plurality of cam faces, a spindle mounted to turn in the said frame and having a non-circular portion, a pin on the said spindle and adapted to be engaged and disengaged by the said cam faces on alternately depressing and releasing the plunger to intermittently rotate the said spindle, a switch element on the said spindle to turn with the latter, fixed contact plates adapted to be alternately engaged and disengaged by the said switch element, and a spring pressing the said non-circular portion of the spindle for moving the said spindle into final position of rest on disengaging the cam from the said pin on the release of the plunger.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

CHARLES D. GERVIN.

Witnesses:
FRANK S. OBER,
WALDO M. CHAPIN.