

April 16, 1963

R. G. BARKER

3,086,093

SENSITIVE ELECTRIC SWITCH

Filed June 6, 1961

2 Sheets-Sheet 1

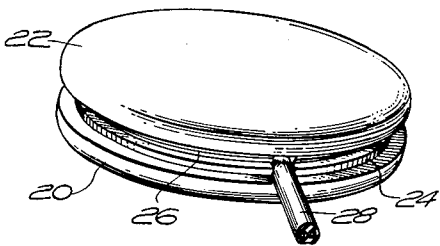


FIG. 1

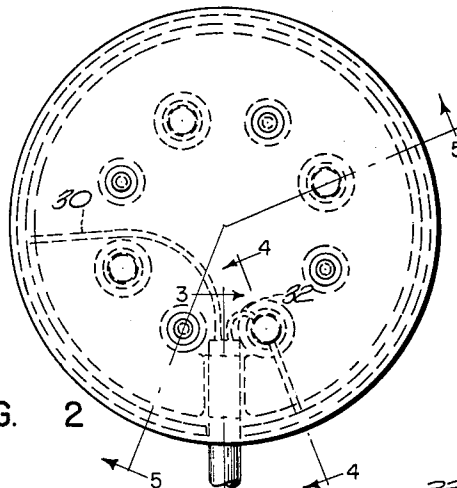


FIG. 2

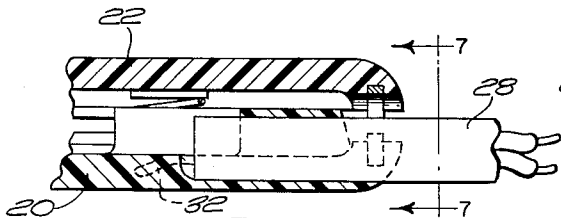


FIG. 3

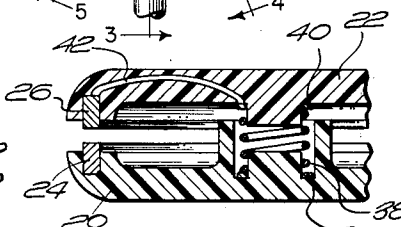


FIG. 4

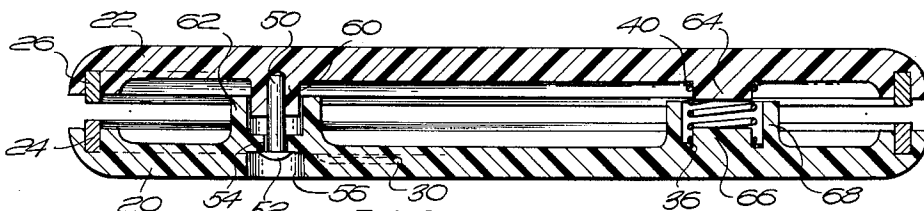


FIG. 5

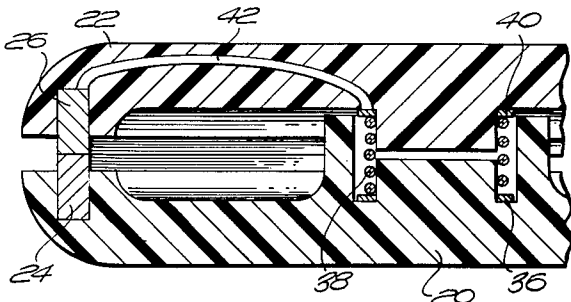


FIG. 6

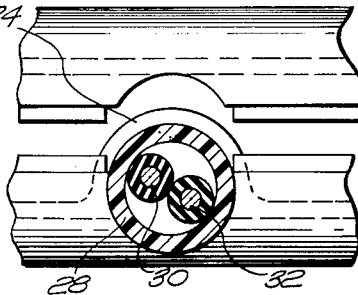


FIG. 7

INVENTOR.
RANDOLPH G. BARKER
BY *Morse Altman*

ATTORNEYS

April 16, 1963

R. G. BARKER

3,086,093

SENSITIVE ELECTRIC SWITCH

Filed June 6, 1961

2 Sheets-Sheet 2

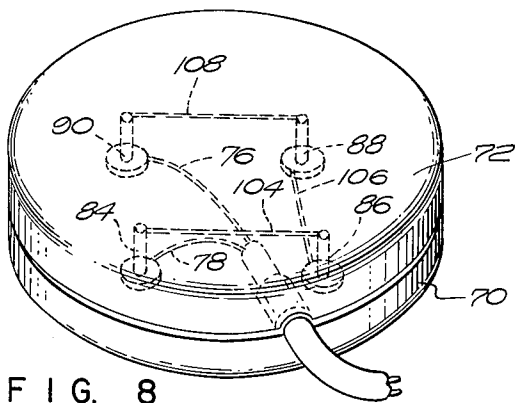


FIG. 8

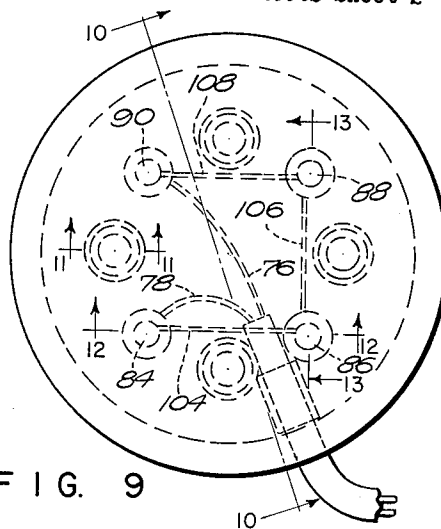


FIG. 9

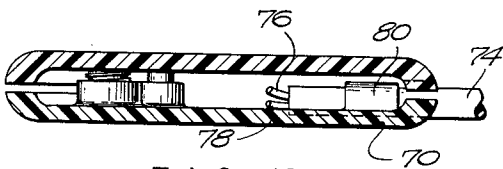


FIG. 10

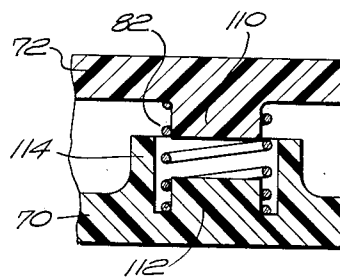


FIG. 11

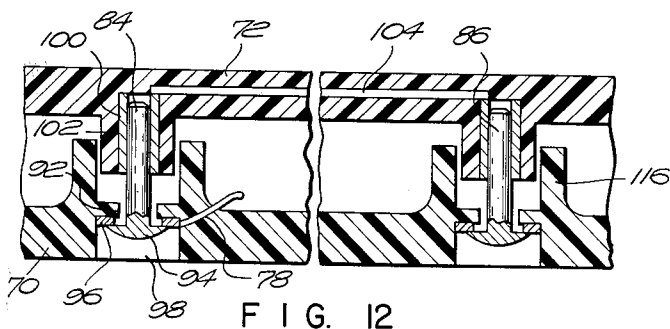


FIG. 12

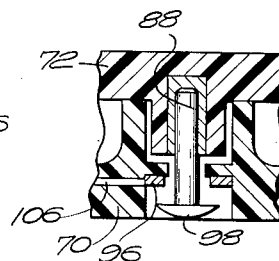


FIG. 14

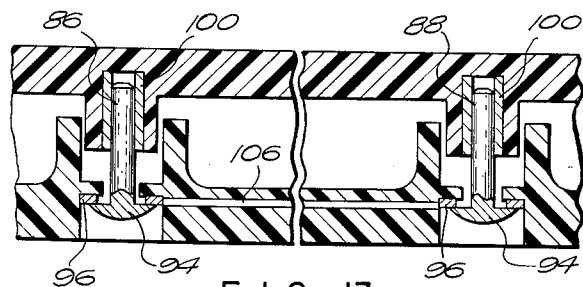


FIG. 13

INVENTOR.
RANDOLPH G. BARKER
BY *More Altman*

ATTORNEYS

1

3,086,093

SENSITIVE ELECTRIC SWITCH

Randolph G. Barker, West Bridgewater, Mass.

Filed June 6, 1961, Ser. No. 115,220

2 Claims. (Cl. 200—85)

This invention relates to electric switches of the push-button variety to be pressed manually to make or break a circuit in which the switch is connected. It is an object of the invention to provide a switch which can be easily operated by a relatively slight effort and is thus adapted for operation by elderly people or hospital patients. As hereinafter described, the switch may conveniently be in the form of two parallel disks which are resiliently held in mutual proximity and which contain conductors and contact elements arranged to make or break a circuit in which the switch is connected.

For a more complete understanding of the invention reference may be had to the following description thereof, and to the drawings, of which

FIGURE 1 is a perspective view of a normally open switch embodying the invention;

FIGURE 2 is a plan view of the same on a slightly larger scale;

FIGURES 3, 4 and 5 are sectional views taken on the lines 3—3, 4—4 and 5—5, respectively of FIGURE 2, but on a larger scale;

FIGURE 6 is a fragmentary sectional view similar to FIGURE 4, but on a larger scale and showing the parts in a different relative position;

FIGURE 7 is a fragmentary sectional view, on an enlarged scale, on the line 7—7 of FIGURE 3;

FIGURE 8 is a perspective view of a normally closed switch;

FIGURE 9 is a plan view of the same;

FIGURE 10 is a section on the line 10—10 of FIGURE 9;

FIGURES 11, 12 and 13 are enlarged sectional views on the lines 11—11, 12—12 and 13—13, respectively, of FIGURE 9; and

FIGURE 14 is similar to a part of FIGURE 13 but with the parts shown in a different position.

The normally open switch shown in FIGURES 1—7 of the drawing comprises two saucer shaped disks 20, 22 which are of insulating material, preferably a molded synthetic resin. As shown, these disks are of the same diameter and are held in face-to-face relationship with the concave faces opposed. The contact elements of the switch consist of two rings, a lower ring 24 embedded in the lower disk 20, and an upper ring 26 embedded in the upper disk 22. These rings are near the circumferences of the respective disks and extend substantially all the way around except for a slight gap shown in FIGURE 7, where a lead-in wire cable 28 enters. This cable comprises a sheath within which are two separately insulated lead-in wires 30 and 32.

The lower disk 20 may be molded with the ring 24 therein, a portion of the ring projecting slightly from the rim of the concave face of the disk. Also molded integral with the lower disk 20 is a short arched protective cover 34 over the portion of the cable 28 immediately within the switch. The wire 30 extends to the ring 24 and is preferably soldered thereto, this wire being embedded in the lower disk 20. The wire 32 is also embedded in the lower disk 20 and is electrically connected, preferably by a soldered joint, to a metal washer 36 which is in or on the lower disk 20, as indicated in FIGURE 6. Seated on the washer 36 is one end of a helical compressed spring 38, the other end of this spring bearing against a metal washer 40 which is connected by a wire 42 embedded in the upper disk 22 to the ring 26.

2

The spring 38 is one of a series of such springs which are preferably arranged in a circular series symmetrical with respect to the axis of the disks 20 and 22, as indicated in FIGURE 2. These springs hold the disks apart but permit them to come together if pressed by a light touch, the degree of pressure being determined by the strength of the springs 38 which are employed to keep the disks yieldingly separated. In the switch shown in FIGURES 1—7, four such springs 38 are indicated, but a greater or lesser number may be employed as desired, these being equally spaced around the center of the disks so that pressure on the upper disk at any point of its periphery will tilt the disk down so as to bring two points of the rings 24 and 26 into contact so as to close the circuit through the lead-in wires, the current flowing in through the wire 30 going to the ring 24, the ring 26, the conductor 42, one of the upper washers 40, the spring 38 touching this washer, the washer 36 at the bottom of this spring and the lead-in wire 32.

If preferred, the end of the lead-in wire 32 can be soldered or otherwise directly connected to the ring 26 before the disks are brought together.

Means are provided for limiting the separating movement of the disks from each other. As shown, such means may consist of a series of pins 50 which extend loosely through holes in the lower disk 20 and are secured by a drive fit or otherwise in the upper disk 22. As indicated in FIGURE 5, each pin 50 has a head 52 which is larger than the hole 54 through which the pin extends. The disk 20 is preferably countersunk as at 56 so that the head 52 is well within the surface contour of the disk. To provide a firmer grip of the pin by the upper disk, a cylindrical boss 60 is preferably provided for each pin 50 to project from the concave face of the disk 22. This boss 60 is loosely fitted in a short tubular extension 62 which projects from the inner face of the lower disk 20. The number of pins 50 employed is preferably, but not necessarily, equal to the number of springs 38 contained within the switch. As indicated in FIGURE 2, the pins 50 are arranged in alternation with the springs 38 and are equally spaced around the axis of the disks, four such pins being indicated. To keep the springs 38 in place, a cylindrical boss 64 is provided to project from the inner face of the upper disk 22 for each of the springs 38. The upper washers 40 fit around these bosses. Opposite these bosses are similar bosses 66 projecting from the inner face of the lower disk 20. Surrounding each boss 66 and spaced therefrom sufficiently to accommodate a lower washer 36 is a tubular projection 68 which extends from the inner face of the lower disk 20. These projections from the inner faces of the two disks maintain the disks in proper relation to each other and prevent sticking when the disks are pressed to close the switch.

In many cases a normally closed switch is desirable, such switch to be opened by manual pressure. The switch illustrated in FIGURES 8—14 is of this type. The switch comprises a lower disk 70 and an upper disk 72 which are saucer shaped, that is, they are plane disks with turned up rims as indicated in FIGURE 10. These disks are held in normally spaced relation by means hereinafter described. A lead-in cable 74 containing two separately insulated wires 76 and 78 enters between the disks at one point of the circumference. Within the switch the lower disk 70 has a semi-cylindrical arch 80 molded over a portion of the cable 74 within the switch to hold the cable against retraction. A number of compressed springs 82 are arranged in circular array around the axis of the disks to press the disks apart. The distance of separation of the disks is limited by a series of four pins 84, 86, 88 and 90, but a greater or lesser number can be employed if desired. These pins pass through holes in the lower disk 70, such as the hole 92 shown in FIGURE 12. Each pin has a

3

head 94 which bears against a washer 96, the disk 70 being countersunk as at 98 so that the head of the pin is well within the surface contour of the disk. The other end of each pin is driven into a tight sleeve 100 which is molded into the upper disk 72, a cylindrical boss 102 being made to project from the inner face of this disk so as to give a longer length of mutual contact between the end of the pin and the sleeve 100. The sleeves 100 are connected in series by conductors 104, 106 and 108, as indicated in FIGURE 9. The lead-in wire 78 is electrically connected, preferably by a soldered joint, to the washer 96 engaged by the head of the pin 84. The lead-in wire 76 is similarly connected to the washer engaged by the head of the pin 90. Hence, when the switch is in its normally closed position, the current enters through the wire 78 and goes from one pin to another until it leaves through the wire 76. If the upper disk 72 is pressed at any point so that one or more of the heads of the pins moves away from contact with the corresponding washers 96, the circuit is thus broken.

To prevent skew movements of the disks and consequent sticking, bosses 110 are provided on the inner face of the disks 72 and 112 on the inner face of the disk 70. The end portions of the springs 82 fit around these bosses. Also projecting from the inner face of the lower disk 70 are tubular bosses 114 which surround and are sufficiently spaced from corresponding bosses 112 to accommodate the springs 82. In like manner tubular bosses 116 project from the inner face of the lower disk 70 to receive the ends of the bosses 102 which project from the inner face of the upper disk 72.

4

The assembled switch is preferably enclosed in a thin waterproof plastic bag or envelope (not shown) to protect it from dust, moisture, and the like.

I claim:

1. A normally closed electric switch comprising two saucer-like disks of insulating material facing each other with concave faces opposed, one of said disks having a circular series of holes therethrough, a pin extending through each said hole, each said pin having a shank loosely fitting in the corresponding hole and a head of larger diameter than that of the hole, the end of each pin remote from the head thereof being secured to the other said disk, contact elements in said one disk mounted in position to be pressed against the heads of respective pins by movement of said disks away from each other, spring means pressing said disks apart to hold the heads of said pins yieldingly in contact with respective contact elements, two lead-in wires entering between said disks, and conductors connecting said pins and contact elements in series with said lead-in wires, whereby relative movement of any portion of one disk toward the other separates one of said contact elements from the corresponding pin head, thereby opening the switch.

2. An electric switch as described in claim 1, each said pin being surrounded by two tubular bosses integral with respective disks and telescoping one within the other.

References Cited in the file of this patent

UNITED STATES PATENTS

2,339,495	McMann	Jan. 8, 1944
3,005,055	Mattke	Oct. 17, 1961