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Naples et al.

[11] **3,882,293**

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[54] **QUICK BREAK TYPE SWITCH WITH SNAP ACTION DEACTUATION STRUCTURE**

[75] Inventors: **Richard J. Naples,** New Britain; **Norman H. Newhall,** Suffield, both of Conn.

[73] Assignee: **General Signal Corporation,** New York, N.Y.

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[51] **Int. Cl.** **H01h 5/16**

[58] **Field of Search** .... 200/11 R, 11 C, 11 G, 11 E, 200/11 EA, 11 K, 63 R, 63 A, 65, 154, 155 R, 157, 291, 335, 336, 339, 11, 63, 70, 252–261, 264, 275, 282, 318

[56] **References Cited**

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2,023,219	12/1935	De Reamer	200/65 X
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2,707,741	5/1955	Collura	200/65 X
2,708,227	5/1955	Collura	200/65 X
2,987,636	6/1961	Jepson	200/157 X
3,140,364	7/1964	Swanke et al.	200/11 K
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Primary Examiner—James R. Scott

Attorney, Agent, or Firm—John F. Ohlandt

[57] **ABSTRACT**

A rotary type electric switch adapted selectively to bridge a common contact and one of a plurality of contacts for closing a selected circuit, the unique feature thereof residing in the provision of a momentary or "power pulse" actuation mode incorporated as an integral part of such rotary switch.

6 Claims, 5 Drawing Figures

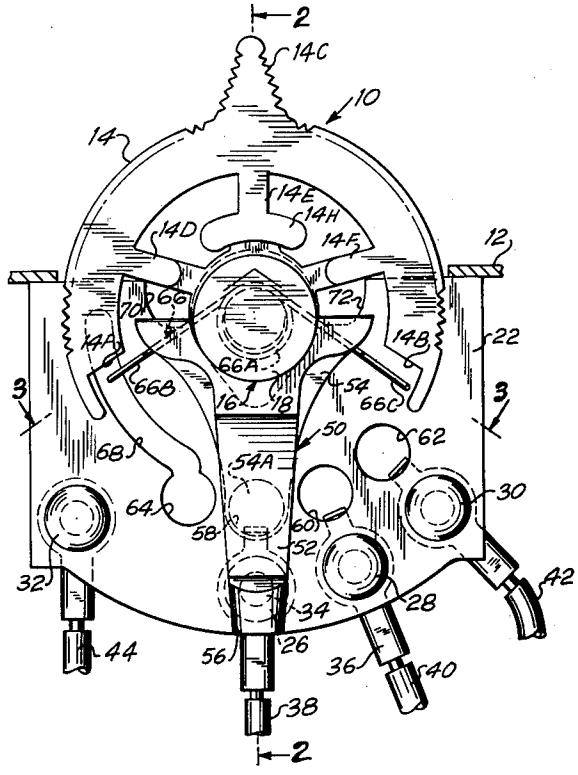


FIG. 1

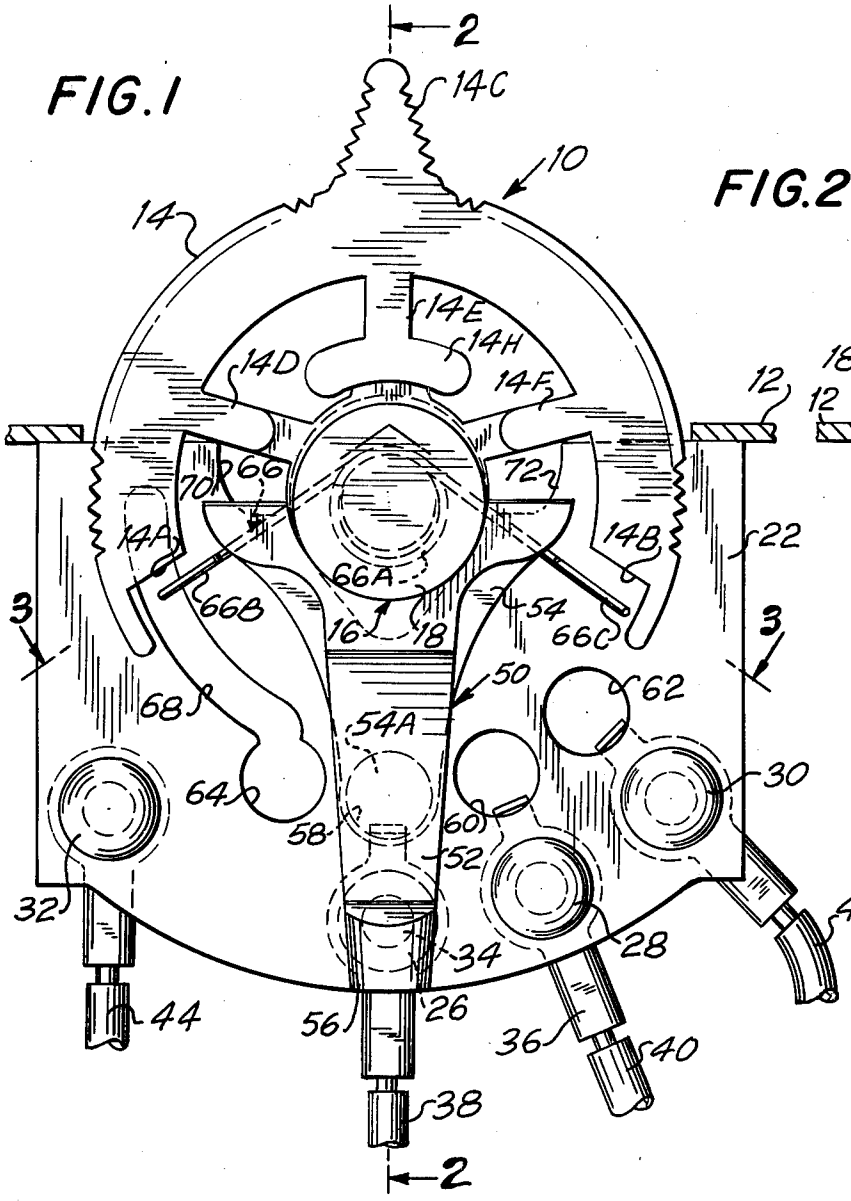


FIG. 2

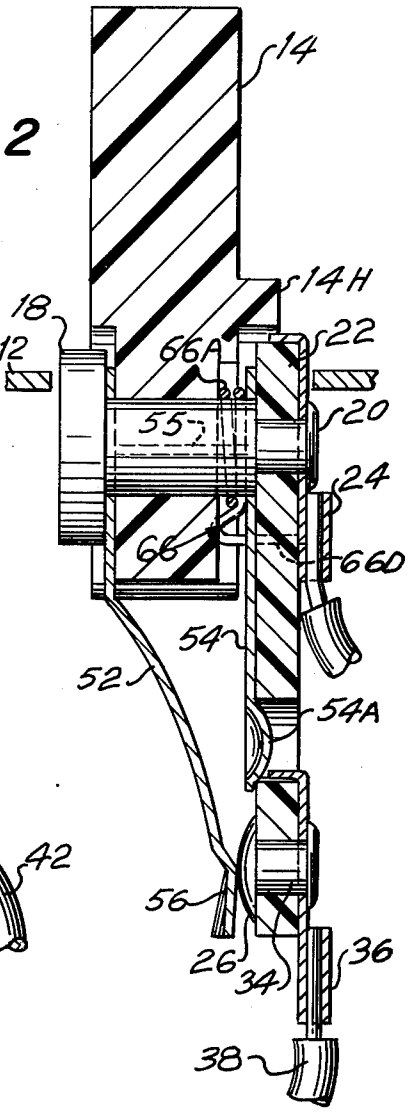


FIG. 3

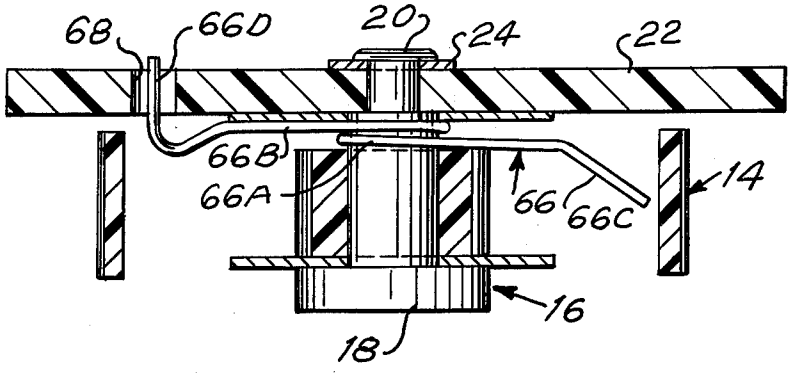


FIG.4

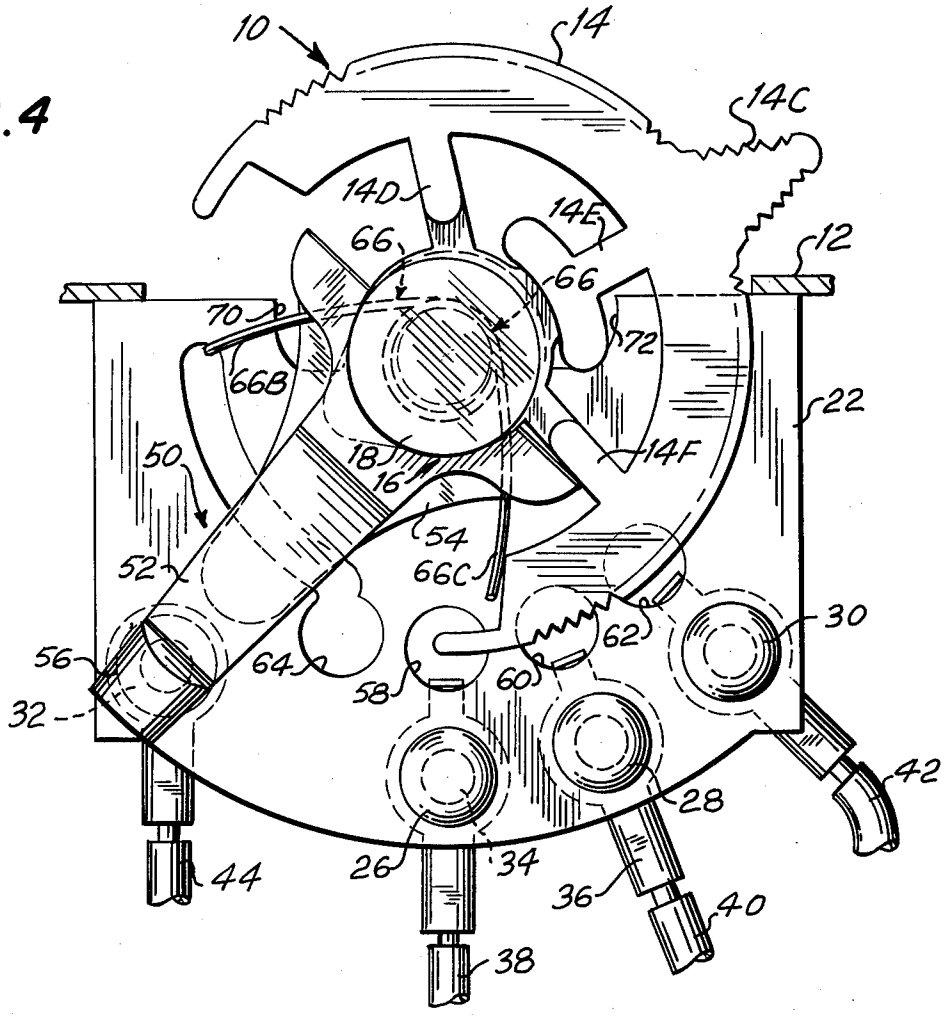
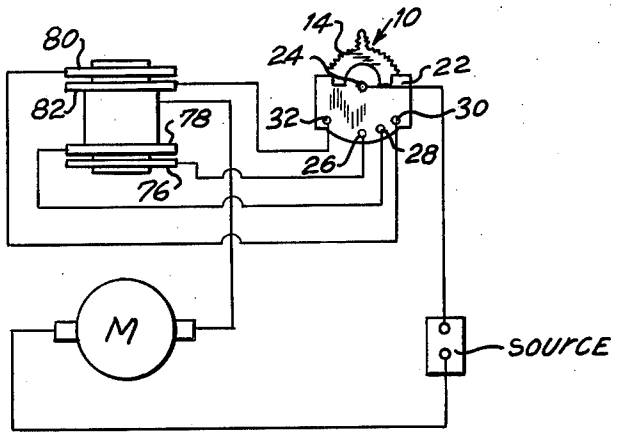

10
14
14C
14D
14E
12
66
66
70
72
66B
22
50
18
16
14F
54
52
66C
30
62
56
64
58
60
32
42
28
44
26
34
36
40
38

FIG.5


80
14
10
24
22
82
78
32
30
26
28
76
M
SOURCE

QUICK BREAK TYPE SWITCH WITH SNAP ACTION DEACTUATION STRUCTURE

BACKGROUND, OBJECTS AND SUMMARY OF THE INVENTION:

This invention relates to an electric switch assembly and more particularly to an improvement in a rotary type switch by which a momentary or power pulse mode is achieved through the medium of a unitary assembly.

Switches of the rotary type are adaptable for a variety of purposes and are particularly useful in connection with multispeed electric motors for household appliances, such as food mixers and the like. In such an environment only a minimum of space is permitted for housing the switch and it is required that the switch be able to make and break contacts of an electric circuit while avoiding arcing between the contacts.

Examples of the type of switch with which the present invention is concerned may be appreciated by reference to the following U.S. Pat. Nos. 2,707,741; 2,708,227 and 2,987,636.

For many applications, especially those involving electric food mixers, it is frequently desirable to be able to produce an abrupt increase of power, that is, to propell the beater elements of the mixer at a predetermined selected speed for a limited time period and then to release, or desist from, the predetermined speed of operation almost instantaneously. Such mode of operating the mixer is particularly useful, for example, when a small amount of an ingredient is to be mixed into an already formed mass and rapid incorporation of such ingredient is called for in order to achieve the best possible result, but rapid termination of the step is likewise required. In other words, it becomes necessary to shut off power completely upon finishing the required step and to do so without having to think about further switch actuators. As a result, it is highly desirable to produce the power pulse in such a way that release of the user's finger will instantaneously stop the burst of power.

Accordingly, it is a principal object of the present invention to provide an electric switch assembly which by its unitary construction provides the desired stable state switch positioning, but also permits momentary application of desired power to effect a given speed for the motor of the device and quick release or shut off of such power.

Another object is to produce a unitary switch assembly which is relatively simple and inexpensive to manufacture and assemble.

The above and other objects are fulfilled in accordance with a feature of the present invention, according to which further unique selectability is provided for a rotary type electric switch. One example of such a switch that has been known comprises a movable contact arm, preferably arranged to quickly and abruptly shift in a positive stepping action from one contact position to another in either direction as a control knob is operated. The unique provision of selectability results from the arrangement of an additional contact position to accomplish the momentary or power pulse operation. The added position is judiciously located on the same arcuate or circumferential line defined by the other contact positions. Accordingly, the same basic elements, that is, the aforesaid

knob and movable switch arm, and, in addition, a control spring, which preferably also functions to permit stable state positioning of contacts to bring about selected speeds of operation, can be utilized for achieving the desired power pulse mode of operation.

Other and further objects, advantages and features of the invention will be apparent from the accompanying drawing in which a preferred embodiment of the invention is depicted.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a front elevational view of an electric switch assembly in accordance with a preferred embodiment of the present invention.

FIG. 2 is a sectional view taken on the line 2—2 of FIG. 1.

FIG. 3 is another sectional view taken on the line 3—3 of FIG. 1.

FIG. 4 is another front elevational view as in FIG. 1, but illustrating the switch parts in the power pulse operating mode.

FIG. 5 is a schematic diagram illustrating the connections for the switch of the present invention to several windings of an appliance motor.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring more particularly to the drawing in which like numerals refer to like parts, the electric switch assembly, generally designated **10**, is adapted for mounting in a recess, for example, within a handle of an electric mixer. To this end, the upper wall **12** of such a handle is provided with an opening through which a peripheral portion of a control knob **14** projects. Switch control knob **14** is rotatably supported on a stub shaft **16** which has an enlarged retaining end **18** and a reduced opposing end **20** and which projects through a switch base plate **22**, the shaft **16** being suitably secured to the plate by roll-over of the end **20**.

A central or common terminal **24** is anchored to the base plate **22** by the rolled or turned end of shaft **16**. At the lower end of the base plate **22**, as will be seen, are a plurality of fixed contacts **26, 28, 30** and **32**, each of which is formed by a pin **34** to which is secured, at the other side of the base plate, a connecting lug **36** for connection to individual conductors **38, 40, 42** and **44** respectively.

It will be apparent as the description proceeds that the contacts **26, 28, 30** are, in this particular embodiment, "snap-action" contacts and that the positions for the switch may be considered as "stable state" positions, i.e. positions which are assumed by the switch upon application of suitable finger pressure and in which the switch remains after such pressure has been removed. Accordingly, one of three possible speeds is stable state selected by connection of the common terminal to one of the contacts **26, 28** or **30**. As shown, the speed selected would be in direct relationship to the order of reference numberals applied to the contacts. Thus, contact **26** would select the lowest speed available for the snap-action positions.

For bridging the common terminal **24** with any one of the fixed contacts there is provided a movable, that is, a rotatable switch member **50** which comprises a contact arm **52** and an integrally formed detent arm **54**, including a pair of axially extending ears **55**. The contact arm **52** is suitably apertured at one end for securing to the shaft **16**, and likewise, the detent arm **54**

is suitably apertured for the same purpose. The opposite end of the contact arm **52** terminates in a wiping contact surface **56** which is capable of making selected physical contact with the fixed contacts **26, 28** and **30.**

The contact arm **52** is struck downwardly so as to impose pressure of the wiping contact surface **56** on the various contacts **26, 28, 30** and **32.** This surface **56** is provided with flared side edges to facilitate movement across the contacts.

The detent arm **54** is provided with a detent **54A** which is generally concavo-convex in configuration. Suitable openings or recesses **58, 60, 62** and **64** are arranged in the base plate **22** for receiving the detent **54A** and for holding same when the switch has been actuated and has moved by the inherent snap action into a given position. The first three recesses, starting with the positioning of the switch in FIG. **1** and going to the right, are so placed in an arcuate spaced manner as to correspond with the positions of the contacts **26, 28** and **30**; that is to say, to be in respective radial alignment therewith so that, when the contact arm **52** is touching any one of the contacts **26, 28, 30,** the detent **54A** will be disposed in the appropriate recess. It will be noted that the fourth recess, that is recess **64,** corresponds with the OFF position for the switch. Accordingly, no conductor or wire is connector to a contact at this position, therefore, the contact arm **52** has its wiping surface **56** resting on the base plate in the OFF position.

It will be appreciated from the drawing that the switch member **50** responds to movement of the control knob **14** through the medium of the spring member **66.** As best shown in FIGS. **2** and **3,** the looped portion **66A** of the spring member is adapted to fit around the shaft **16** and the arms **66B** and **66C** thereof extend outwardly from the shaft to engage with end surfaces **14A** and **14B** on the control knob **14.** One end of the spring **66** has a hooked portion **66D**; that is, there is a hook at the end of the arm **66B** so that while there is engagement of this end with the end surface **14A** of the control knob, the very end of this hooked portion **66D** extends transversely within an arcuate slot **68** formed in the switch base plate **22.** The slot **68** extends a sufficient distance so that the hooked portion **66D** of the spring is permitted free movement over the full required distance as the knob **14** is being moved in effecting selective contact between the contact arm **52** and the fixed contacts **26, 28** and **30.**

It will be noted that the control knob **14** includes a pointed peripheral portion **14C,** which is engageable by the user's finger, and also a series of spokes **14D, 14E, 14F** extending radially outwardly from a hub **14G** at spaced locations. The spoke **14E** includes a circumferentially extending lug **14H** which also extends axially to such an extent that it is selectively engageable with the slots **70** and **72** at the upper edge of base plate **22.** Thus, this lug **14H** serves as a means to limit the rotational movement of the control knob **14,** because when the lug moves sufficiently in either the clockwise or counterclockwise direction it will engage one or the other of these slots **70** and **72** and hence prevent further rotational movement of the control knob **14.** The spokes **14D** and **14F** serve to initiate movement of the switch member **50** in either the clockwise or counterclockwise direction respectively.

It will be apparent that as the control knob **14** is rotated, for example, in a clockwise direction, as seen in FIG. **1,** the spring arm **66C** engageable with the end surface **14B** will move therewith while the opposed arm **66B** lags behind this movement and hence applies tension, that is, stored energy in the spring **66.** However, when the spoke **14F** begins to make contact with the switch member **50,** as a consequence of further clockwise movement, the energy stored in the spring **66** is abruptly released, thereby causing the switch member **50** to shift to the next succeeding contact position. This so called snap-action will, of course, also occur upon movement of the knob **14** in a counterclockwise direction.

It will also be apparent to those skilled in the art that the detent arm plays a significant part in the preceding operation; that is to say, the detent arm is so designed that the detent **54A** will not be easily moved out of a given recess into which it has been placed by the snap-action of the switch, and that it will also serve to restrain movement of the switch member **50** in going to the next succeeding position.

In considering the operation of the switch of the present invention so as to achieve the so called power pulse mode of operation, it should first be understood that when the switch member **50** has been placed in the off position, by reason of the control knob having been rotated such that the switch member **50** has its wiping surface **56** in contact with the base plate **22,** there is no circuit established to the mixer motor. This will be especially appreciated by reference to the schematic diagram of FIG. **5** in which connection of the fixed contacts **26, 28, 30** and **32** to individual windings **76,** 78, 80 and **82** of appropriate value will be seen. As previously explained, bridging of contact arm **52** with any one of the contacts **26, 28** and **30** is selectively achieved by snap-action involving spring **66.**

However, referring now to FIG. **4,** further rotation of knob **14** in the clockwise direction does not result in further snap-action positioning. Instead, by application of sufficient force against the bias of spring **66,** which is somewhat greater than required for the snap-action positions, the control knob **14** is so rotated that the switch member **50** has its wiping surface **56** come into engagement with the contact **32.** Preferably this contact **32** is formed by another pin **34** connected to conductor **44,** which, in turn, is connected to a different winding of the motor for the mixer such that a somewhat higher speed for the motor is preferably achievable by this power pulse mode of operation.

It will be seen in FIG. **4** that when the control knob has been so turned in the aforedescribed manner in the clockwise direction the limit on such movement will have been reached because lug **14H** is then up against the bottom of slot **72** in plate **22.** Moreover, energy continues to be stored in the spring **66** so long as this position for the switch member **50** is maintained by pressure on the knob, the spring being unable to release such energy inasmuch as it has its hooked portion **66D** held within the slot **68.** As soon as the finger of the user is released from the knob, the knob will immediately return, because of the energy stored in the spring **66,** to the OFF position and the burst of power applied to the motor will cease.

While there has been shown and described what is considered at present to be the preferred embodiment of the present invention, it will be appreciated by those skilled in the art that modifications of such embodiment may be made. It is therefore desired that the in-

vention not be limited to this embodiment, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. An electric switch assembly comprising:
a base plate;
a common electrical terminal on said base plate;
a plurality of spaced, fixed electrical contacts arranged in an arcuate line on said base plate;
a shaft secured to said base plate;
a switch member rotatably supported on said shaft, said switch member including a contact arm for selectively bridging said common terminal with any one of said fixed contacts;
a control knob disposed on said shaft, said control knob being adapted to be actuated by finger pressure and engageable with said shaft so as to control said switch member for selecting contact positions;
means for retaining the switch member in certain of said contact positions after removal of the finger pressure used in selecting such positions;
spring means formed around said shaft and engageable by said control knob such that the spring means is able to shift the contact arm abruptly from certain ones of said fixed contacts to other ones thereof;
means on said base plate for restraining said spring means only when said switch member is being moved to a predetermined one of said contact positions from an adjacent position by application of sufficient pressure to said control knob, such that said switch member will remain in such predetermined position so as to engage the particular fixed contact thereat only so long as said sufficient pressure is being applied, and will return to said adjacent position upon release of the pressure.

2. A device as defined in claim 1, in which a slot is formed through said base plate and in which said spring means has a hook extending into said slot.

3. A device as defined in claim 1, further comprising a centrally located aperture in said control knob, said shaft secured to said base plate projecting through said aperture;
said switch member further including a detent arm integrally formed with said switch contact arm, said integral formation also including a pair of ears which extend axially;
said contact arm and detent arm being suitably apertured and mounted thereby in spaced relationship on said shaft;
a plurality of recesses for receiving the detent formed on said detent arm, said recesses being spaced from and radially aligned respectively with said fixed contacts on said base plate.

4. A device as defined in claim 3, in which
said control knob has a wheel shape, including ends;
said spring means being looped around said shaft and engageable by said ends of the control knob such that the ends of said spring means are engaged by the respective trailing ends of said control knob when the control knob is moved in either the clockwise or counter-clockwise direction.

5. A device as defined in claim 3, further comprising a hub and an annular peripheral portion for said control knob, and a plurality of spokes extending from the hub to the peripheral annular portion; two of said spokes being adapted to engage with the aforesaid ears on the switch member so as to actuate said switch member in a clockwise or counter-clockwise direction respectively.

6. A device as defined in claim 5, in which an axially extending lug on another of said spokes is effective to limit movement of said control knob.

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