

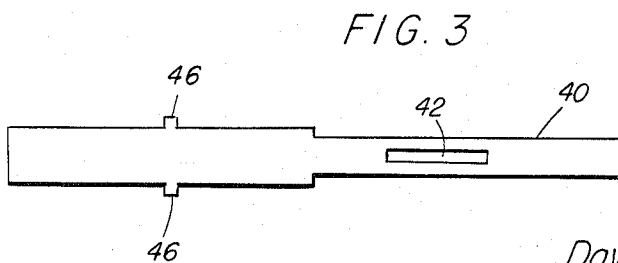
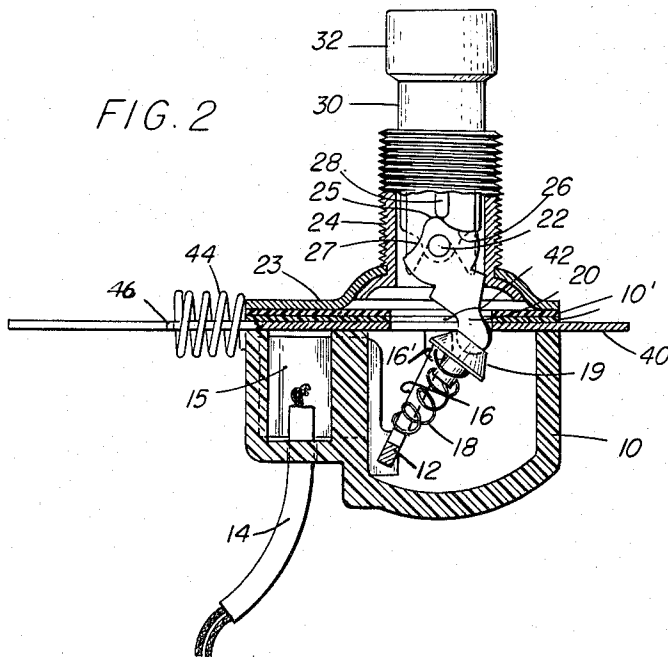
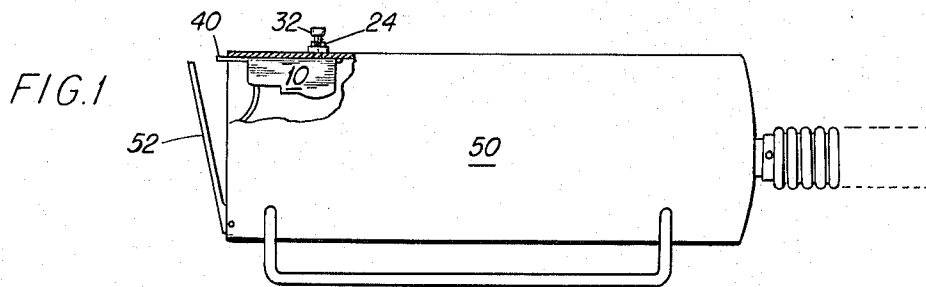
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LOCKING MEANS FOR ELECTRIC SWITCHES

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LOCKING MEANS FOR ELECTRIC SWITCHES

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This invention relates to electric switches and more particularly to an electric switch with a locking arrangement adapted for use in connection with a door or other control element whose position determines whether the switch shall be locked or free for operation.

Switches to which this invention relates are particularly useful in connection with tank-type vacuum cleaners in which the door is caused to open when the vacuum cleaner bag becomes full, but in which the door may be opened when desired to remove the dust bag or for any other reason. Under such conditions, it is desirable that the switch be inoperable so that the vacuum cleaner cannot be started while the door is open.

It is an object of the invention to provide an improved combination of locking means with an electric switch and control element, such as the door, wherein conventional switch mechanism may be employed and wherein the locking element may be interposed with minimum of change in the conventional switch parts.

Another object is to provide a combination as aforesaid which is reliable in operation and sturdy and is less complicated than previous combinations for similar purpose.

Other objects and advantages of the invention will appear as it is described in connection with the accompanying drawing.

In the drawing:

FIG. 1 is a side elevation view, partly in section, of a vacuum cleaner tank in connection with which the invention is particularly useful, the switch being open.

FIG. 2 is a transverse section view of a switch as used in FIG. 1 and embodying the invention, the switch being closed.

FIG. 3 is a detail view of the locking bar used in the embodiment of FIGS. 1 and 2.

Referring to the drawing, a casing 10 of generally rectangular shape may be molded from insulation with a large cavity recessed into its top for the reception of the switch contacts, terminals and operating parts. The top of the casing is open and may be covered by a stamped sheet insulation plate or plates 10' which may be held on top of the casing by a stamped rectangular sheet metal mounting plate 23 having an externally threaded cylindrical nipple or neck 24 affixed thereto and extending upwardly for mounting the switch in an aperture in a plate, vacuum cleaner tank or other support.

Mounted conventionally in vertical slots (not shown) formed adjacent the opposite side walls of the casing at one end is a pair of laterally spaced stationary contacts 12 which may have terminals 15 to which pigtail leads 15 may be soldered, if desired.

For bridging the contacts, a swinging yoke 16 stamped from sheet metal has trunnions 16' seated in bearing recesses formed in opposite side walls of the casing 10 at the top edges of said walls. The yoke is adapted to be swung back and forth within the casing by a coiled compression overcenter spring 18, the lower end of which is seated upon a nub or circular protuberance formed centrally in the transverse portion of the yoke 16 while the upper end of the spring has a circular cap 19 thereon which is pressed by the spring against the lower end of a pivoted operating lever 20. Preferably the operating lever is stamped from sheet metal in the form illustrated in FIG. 2 and is pivoted upon a pin 22 extending diametrically across and mounted in the neck or nipple 24.

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The overcenter lever 20 preferably has at its top end within the neck 24 a peak 25 on the opposite sides of which are curved concave recesses or depressions 26, 27. For causing the overcenter lever 20 to swing back and forth between the two opposite similar positions (in one of which it is shown in FIG. 2), an actuating finger 28 is carried by and moved up and down within the neck 24 by a cylindrical plunger 30 which is slidable within the neck 24 and has an operating button 32 or closure cap on its top end. The plunger and button are upwardly biased by a spring (not shown).

The structure of the switch and the operating mechanism as thus far described are conventional and similar to that illustrated and described in the R. H. Bentley Patent 2,576,771 issued November 27, 1951. Therefore, the details of construction of the switch and its overcenter action from "On" to "Off" position as the operating button is depressed need not be further described herein. It will be understood from the illustration herein and by reference to said Bentley patent that as the operating button is depressed when the switch is in the position shown in FIG. 2, the actuating finger 28 engaging in the recess 26 will cause the overcenter lever 20 to pivot clockwise causing the overcenter spring 18 to be compressed until the line of action of the spring passes through the plane of the yoke 16. At that time, the line of force of the spring will be exerted in an opposite direction, causing the yoke to swing toward the opposite end of the switch casing.

As the button 32 is released, the finger 28 is drawn upwardly and moves to the opposite side of the peak 25, the overcenter lever 20 having swung clockwise in the course of operating the switch. On the next depression of the operating button, the actuating finger 28 will engage in the recess 27 causing the switch to be operated in the opposite direction.

In order to cause operation of the switch from "On" to "Off" position under certain conditions and to prevent operation of the switch from "Off" to "On" position under those conditions (such for example as when the door of a vacuum cleaner opens or is opened), a locking bar 40 preferably stamped from sheet metal as a long narrow strip, as illustrated in FIG. 3, is slidably mounted along the center line of the switch casing 10 at its top between the plates 10' and the casing edges. The bar has its ends slidably seated in rectangular guide notches formed in the opposite longitudinal ends of the casing.

In the central portion of the locking bar 40 along its center line, a longitudinally extending narrow rectangular slot 42 is formed. Through the slot 42, the lower end of the overcenter lever 20 extends, to engage the cap 19 on the upper end of the overcenter spring as hereinbefore described.

The locking bar 40 is biased by a coiled compression spring 44 which is coiled around the locking bar and presses at one end against the casing 10 and at the other end against lateral lugs 46 oppositely projecting from opposite sides of the locking bar at a point approximately midway between the casing 10 and the end of the locking bar. Thus, the locking bar is normally biased to the left, as the switch as viewed in FIG. 2. The biasing spring 44 is of such strength and the slot 42 is of such length that when the biasing spring 44 exerts its force upon and the locking bar is free to move, the right end of the slot 42 will engage the overcenter lever 20 and cause it to pivot clockwise about its pivot pin 22, thus operating the switch from the "On" position illustrated in FIG. 2 to its opposite or "Off" position.

The slot 42 is so located and of such length that when the locking bar is pressed in opposition to the bias of the spring 44, the slot will be centered beneath the pivot pin 22 of the overcenter lever 20 and the switch

may be operated freely between "On" and "Off" positions by successive depressions and releases of the operating button 32. However, when pressure opposing the bias of the spring 44 is removed from the locking bar 40, the switch may not be operated from "Off" to "On" position because the force normally available by manual pressure on the button 32 and the leverage exerted by finger 28 on overcenter lever 20 will be insufficient to cause the overcenter lever to swing from "Off" to "On" position against the biasing action of the spring 44. This is due to the short lever arm between point of engagement of finger 28 with depression 25 and the pivot 22 as compared with the relatively much longer lever arm between the pivot 22 and the point of engagement of lever 20 with the right edges of the slot 42 of the locking bar 40, when the switch and bar 40 are in the opposite positions from that which they occupy in FIG. 2.

However, when pressure opposing the biasing spring 44 is removed and that spring is free to exert its force on the locking lever 40, the entire action of that force will be exerted and used in moving the switch operating mechanism overcenter since, due to the construction of the switch, the overcenter lever 20 can be moved back and forth without any noticeable opposition by the actuating finger 28 which swings with the overcenter lever 20.

Referring to FIG. 1, the switch is applied to a vacuum cleaner tank 50 having a door 52 pivoted at its bottom edge to one end of the tank 50. When the door 52 is opened as shown in FIG. 1, no pressure is exerted against the locking bar 40 and the switch is locked in open position and is prevented from moving to closed position, for the reasons above given.

When the door is closed, its upper edge presses against the locking bar and compresses the spring 44 and moves the aperture 42 of the locking bar to center it below the pivot 22 of the overcenter lever 20. The switch may now be operated between open and closed position freely with the overcenter lever moving back and forth within the slot 42 as the switch mechanism is operated.

Should the switch be in closed position, upon movement of the door to open it, opposition to the biasing action of the spring 44 will be removed and the switch will be operated to open position where it will remain and be locked until the door is again closed.

From the foregoing, it will be noted that the invention provides means for very simple adaptation of conventional switch mechanism to a locking arrangement for use with a vacuum cleaner tank door or equivalent usage and requires only the addition of two simple inexpensively fabricated parts in order to make operation of the switch completely responsive to the position of the vacuum cleaner tank door. The invention is, thus a great improvement over previous devices for a similar purpose which involve the use of many more parts which are not only more numerous, but are more complex and more expensive to manufacture and assemble. Each additional part increases the possibility of the mechanism malfunctioning or getting out of order or being damaged. Moreover, this invention permits the use of a push button type switch which may be operated manually or by foot pressure with utmost convenience to the user.

It will be noted that the locking bar operates directly upon the switch mechanism and is completely independent of the push button when the biasing spring acts to move the switch from closed to open position, thus providing maximum simplicity and minimum operating parts.

While the switch has been described as used in connection with a vacuum cleaner door, it will be obvious that the invention is adaptable to other usages wherein

any other control element which is normally in a given position may be released or moved to another position wherein conditions would require the switch to be maintained inoperable in its open condition or in any other condition.

Modifications within the scope of the invention will occur to those skilled in the art. Therefore, the invention is not limited to the specific form illustrated and described.

What is claimed is:

1. An electric switch mechanism comprising a casing, a yoke pivotally mounted in said casing for swinging motion between two switch positions, overcenter spring means operable to swing said yoke from one switch position to the other, an operating lever movable between two positions and actuating said spring to cause said yoke to snap between its two positions when said lever is moved from one position to another, a manual operating member for said mechanism in combination with a locking bar mounted for sliding movement across the top of said casing between two positions to lock said operating lever against movement in one position of said locking bar and to release said operating lever for operation in the other of the positions of the locking bar, a spring biasing said locking bar toward said one position, a control member holding said lock bar against its spring bias in a holding position but movable into releasing position to free the lock bar for movement under force of its spring bias, said biasing spring causing said lock bar to engage said operating lever and move it and said yoke into one position when said control member is moved into its releasing position, said manual operating member remaining stationary during movement of said operating lever by said lock bar.

2. An electric snap switch comprising a casing, overcenter snap-action mechanism in said casing, switch contact means in said casing operated between two positions by said mechanism, a manual operating member for said mechanism, a slidable locking bar mounted for slidable movement across the top of said casing and engageable with said mechanism to move it from one position to another independent of and without moving said manual operating member, said locking bar in one position engaging said mechanism and locking it against movement between its two positions.

3. A switch as claimed in claim 2 having a slot in said locking bar which when said bar is in non-locking position permits operation of said mechanism between its two positions.

4. A switch as claimed in claim 3 having a spring biasing said bar into locking position and acting to move it and said switch mechanism into said one position from another position.

5. A switch as claimed in claim 2 having a spring biasing said bar into locking position and acting to move it and said switch mechanism into said one position from another position.

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