

[54] **ELECTRIC SWITCH FOR PORTABLE ELECTRIC APPLIANCES**

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[58] Field of Search **200/157, 169 PB, 169 R, 200/166 J, 6 BB, 60**

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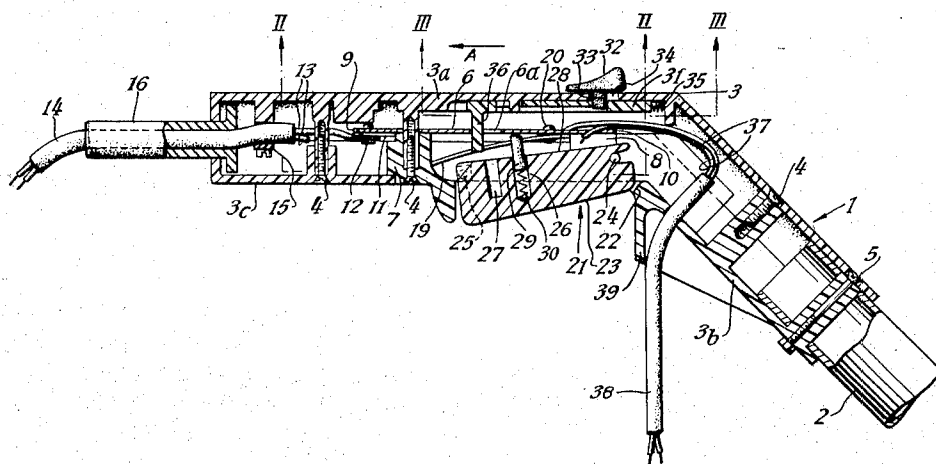
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[57]

ABSTRACT

An electric switch, which is particularly suitable for controlling the operation of a portable electric appliance, for example a lawn mower, comprises a support, a first contact fixed relative to said support, a second contact movable into and out of engagement with the first contact, a contact-actuating member movable relative to the support for effecting electrical contact between the first and second contacts, a locking means movable relative to said support between a first position in which it prevents engagement of said first and second contacts and a second position in which it allows engagement of the first and second contacts, and means urging the locking means towards said first position. The locking means may comprise a push button slidably mounted on the support, this push button preferably being positioned relative to the contact-actuating member so that both the push button and the contact-actuating member can be operated by the fingers of one hand of a person operating the appliance on which the switch is mounted.

6 Claims, 5 Drawing Figures



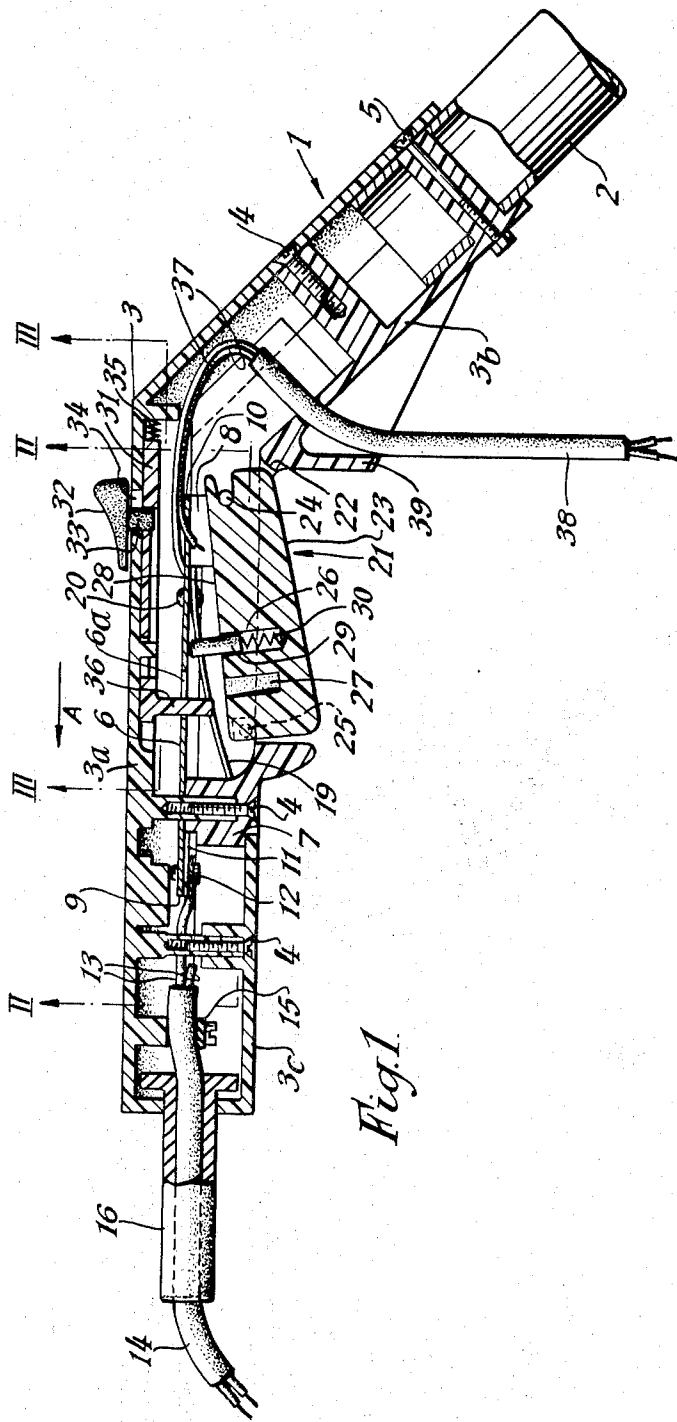


Fig. 1.

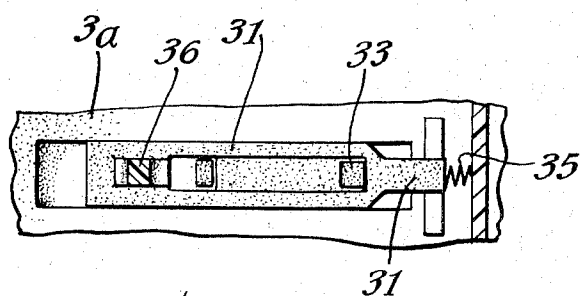
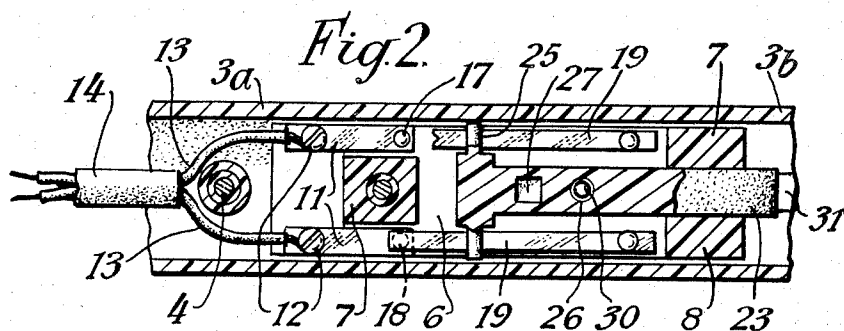
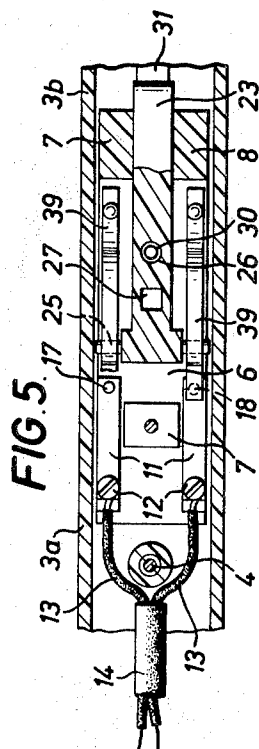
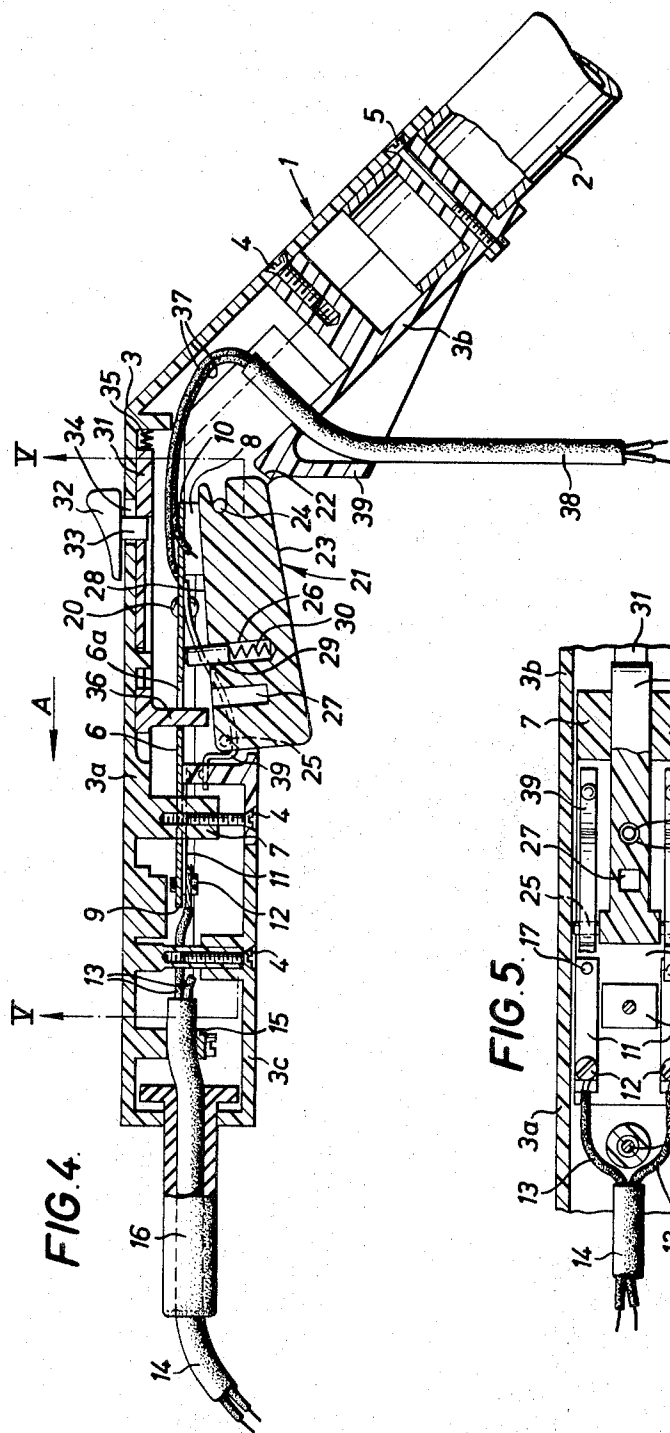


Fig. 3



ELECTRIC SWITCH FOR PORTABLE ELECTRIC APPLIANCES

This invention relates to an electric switch which is particularly suitable for controlling the operation of a portable electric appliance. Although the switch is suitable for use with portable appliances such as vacuum cleaners, food mixers and portable hand tools, for example drilling machines and sanding machines, which are used mainly indoors, it is particularly suitable for portable electric appliances which are used mainly outdoors, for example lawn mowers, lawn edge trimmers, hedge trimmers and sawing machines.

Many portable electric appliances constitute a considerable hazard to the safety of the persons using them, owing to the fact that the appliance can be operated whilst the operator is in a position where he can be injured by the appliance. Thus, for example, in the case of an electric lawn mower, it is possible to set the cutters in motion whilst someone is making adjustments to the mower.

In an endeavour to prevent such accidents occurring with portable electric appliances, it has been proposed to provide the "on"/"off" switch which controls the supply of electricity to the appliance with a mechanical locking device which can be moved into a safety position which prevents the switch being actuated to the "on" position. The operator can then move this locking device to the safety position and so render the appliance harmless while any minor adjustment or repair work is performed on the appliance. This arrangement, however, has the disadvantage that the operator has to move the locking device to said safety position before the appliance is rendered harmless and he may forget or fail to do this.

The present invention aims to provide an electric switch which is suitable for controlling a portable electric appliance and which does not have the disadvantage referred to above.

According to the invention, an electric switch comprises a support, a first contact fixed relative to said support, a second contact movable into and out of engagement with the first contact, a contact-actuating member movable relative to the support for effecting contact between the first and second contacts, a locking means movable relative to said support between a first position in which it prevents engagement of said first and second contacts and a second position in which it allows engagement of the first and second contacts, and means urging the locking means towards said first position.

Preferably, the support is made of electrically insulating material and has the first contact mounted directly thereon.

The switch may comprise means biasing the second contact out of engagement with the first contact. In this case the contact-actuating member is employed to move the second contact into engagement with the first contact in opposition to the biasing means. The second contact may be mounted at one end of a leaf spring which has its other end secured to the support, the leaf spring serving as the biasing means for urging the second contact out of engagement with the first contact.

The contact-actuating member may be a lever or trigger pivotally or slidably mounted on said support. The biasing means associated with the second contact may

serve to move the contact-actuating member to a limit position in which the first and second contacts are not in engagement with one another. If desired, a further biasing means may be associated with the contact-actuating member for the purpose of urging it towards said limit position.

In an alternative embodiment, the switch may comprise means biasing the second contact into engagement with the first contact. In this case the contact-actuating member normally occupies a first position in which it holds the second contact out of engagement with the first contact, and movement of the contact-actuating member to a second position allows the second contact to engage with the first contact under the influence of the biasing means. In this embodiment the second contact may again be mounted at one end of a leaf spring which has its other end secured to the support, the leaf spring serving as the biasing means for urging the second contact into engagement with the first contact. As in the case of the first embodiment, the contact-actuating member may be a lever or trigger pivotally or slidably mounted on said support. In this case, however, the contact-actuating member is provided with a further biasing means which normally overcomes the biasing means urging the first and second contacts together and holds the contact-actuating member in a limit position in which said first and second contacts are out of engagement with one another.

In each of the above-described embodiments, the locking means may comprise a push button slidably mounted on said support, this push button preferably being positioned relative to the contact-actuating member so that both the push button and the contact-actuating member can be operated by the fingers of one hand of a person operating the appliance on which the switch is mounted.

Preferably, the switch is of the double-pole type, there being two fixed contacts cooperable with two movable contacts.

In the case of a switch intended for use with an appliance, having a handle, for example a lawn mower or lawn edge trimmer, said support may form at least a part of the handle of the appliance. In this case, it is convenient to make the support in the form of a tubular casing which houses internally the first and second contacts and which has the contact-actuating member and the locking means projecting externally of the tubular casing.

Embodiments of switches in accordance with the invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIG. 1 is a cross-sectional view of part of the handle of a lawn mower incorporating the switch,

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

FIG. 3 is a sectional view taken on the line III—III of FIG. 1, and

FIGS. 4 and 5 are views similar to FIGS. 1 and 2, respectively, of a modified embodiment of the lawn-mower handle of FIGS. 1 to 3, FIG. 5 being a sectional view taken on the line V—V of FIG. 4.

In FIGS. 1 to 3, the reference numeral 1 generally designates part of a handle of a lawn mower. This handle comprises a metal tube 2 having a handgrip 3 secured to an end thereof. This handgrip is made of electrically insulating material and consists of three parts

3a, 3b and 3c, of generally U-cross-section which are held together by screws 4 to define a tubular casing. A bolt 5 passes through the casing parts 3a and 3b and through the tube 2 for the purpose of clamping the handgrip 3 to the tube 2.

A plate 6 of electrically insulating material is secured in the casing part 3b on pillars 7, 8 forming integral parts of the casing part 3b. In the assembled condition of the three casing parts, the end 9 of the plate 6 is located in the portion of the handgrip formed by the parts 3a and 3c and the end 10 of the plate 6 is located in the portion of the handgrip formed by the parts 3a and 3b.

Two contact strips 11 are secured to the underside of the plate 6 at its end 9. These contact strips receive screws 12 by means of which the conductors 13 of a supply lead 14 may be connected to the strips. This connection may be made by removing the casing part 3c from the casing part 3a and a conventional cord grip device 15 is provided in the casing part 3a for gripping the lead 14. A rubber sleeve 16 surrounds the lead 14 where it emerges from the casing parts 3a, 3c.

At its end remote from the screw 12, each of the contact strips 11 has a fixed contact button 17 secured thereto, one of these contact buttons being shown in FIG. 2. These fixed contact buttons cooperate with movable contact buttons 18, each of which is secured to one end of its own spring contact strip 19. The ends of the contact strips 19 remote from the contact buttons 18 are secured to the underside of the plate 6 adjacent the end 10 of the latter by rivets 20. The spring contact strips 19 serve as biasing means to separate the contact buttons 18 from the fixed contact buttons 17.

A contact-actuating member, generally designated by the numeral 21, is mounted in an aperture 22 in the casing part 3b. The member 21 consists essentially of a block 23 of electrically insulating material which is mounted on a pivot 24 secured at its two ends in the pillars 8, the axis of the pivot 24 being parallel to the plane of the plate 6. At its end remote from its pivotal mounting in the casing part 3b, the block 23 is provided on each side with a projecting finger 25, these fingers being disposed substantially parallel to the axis of the pivot 24. Two blind holes 26, 27 are formed in the edge 28 of the block 23 which confronts the plate 6. The axes of these two bores are substantially parallel and disposed substantially at right angles to the axis of the pivot 24. A short rod 29 of electrically insulating material is slidably mounted in the bore 26 and is urged by a helical spring 30 in a direction towards the plate 6. This spring 30 urges the block 23 to turn in an anticlockwise direction about the pivot 24 to a limit position (shown in FIG. 1) in which the fingers 25 are out of engagement with the contact strips 19 and bear against the wall of the casing part 3b on each side of the aperture 22. If the contact-actuating member 21 is turned in a clockwise direction about the pivot 24, for example by fingers of the hand of an operator holding the handgrip 3, the fingers 25 engage the contact strips 19 and the latter are deflected, in opposition to their inherent resilience, to bring the contact buttons 18 into engagement with the fixed contact buttons 17.

A plate 31 of electrically insulating material is slidably mounted inside the casing part 3a. This plate can be slid, in a direction at right angles to the pivot 24, in a plane spaced from and parallel to the plate 6, by a

push button 32 arranged on the outside of the casing part 3a and having a stem 33 projecting through an elongated hole 34 in the wall of the casing part 3a and connected to the plate 31. A spring means in the form of a helical spring 35 urges the plate 31 in the direction of the arrow A to a limit position in which the stem 33 bears against one end of the hole 34.

A finger 36 projects from the plate 31 through an elongated slot 6a in the plate 6 into the casing part 3b. In the position of the various parts shown in FIG. 1, the finger 36 acts as a stop to prevent any substantial clockwise pivotal movement of the contact-actuating member 21. If, however, the push button 32 is moved in the direction opposite to the arrow A against the action of the spring 35, the plate 31 can be slid to a position in which the finger 36 comes opposite the hole 27 in the block 23. The contact-actuating member 21 can then be pivoted in the clockwise direction to cause engagement of the contact buttons 17 and 18. The push button 32 is arranged to be positioned so that it can be conveniently actuated by the thumb of the hand of an operator holding the handgrip 3.

The conductors 37 of a lead 38 are connected to those ends of the contact strips 19 which are riveted to the plate 6. This lead 38 supplies electric current to the driving motor (not shown) of the mower.

From the above description it will be appreciated that the contact buttons 17, 18 can only be brought into engagement with one another (by actuation of the contact-actuating member 21) when the push button 32 is moved in the direction opposite to the arrow A. Furthermore, as soon as the contact-actuating member 21 is released, it is moved in an anticlockwise direction by the spring 30 and the resilience of the strips 19. This disengages the block 23 from the finger 36 and the spring 35 immediately returns the push button 32 to the position shown in FIG. 1, so that re-engagement of the contact buttons 17 and 18 cannot occur until the push button 32 is again moved in the direction opposite to the arrow A.

Preferably, the casing part 3b is shaped to provide a finger stop 39 to prevent the fingers of the hand of the operator from slipping along the handgrip past the contact-actuating member 21.

FIGS. 4 and 5 show a modified embodiment of the lawn-mower handle of FIGS. 1 to 3, the same reference numerals being used in FIGS. 4 and 5 as in FIGS. 1 to 3 to designate the same or substantially the same items.

The difference between the switch of the handle shown in FIGS. 4 and 5 compared with that of the handle shown in FIGS. 1 to 3 is that the two spring contact strips 19 of the latter are replaced by two spring contact strips 39, each of which is shaped to pass partly around a different one of the two projecting fingers 25 of the actuating member 21. The spring contact strips 39 serve as biasing means to urge the contact buttons 18 into engagement with the fixed contact buttons 17. However, in the position of the switch parts shown in FIG. 4, the projecting fingers 25 of the contact-actuating member prevent engagement of the contact buttons 18 with the contact buttons 17, due to the biasing action of the spring 30.

In all other respects the switch of the handle shown in FIGS. 4 and 5 is the same as that of the handle shown in FIGS. 1 to 3. It will therefore be appreciated that the contact buttons 18 can only move into engagement

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with the contact buttons 17, under the influence of the spring bias of the strips 39, when the block 23 of the contact-actuating member is turned in a clockwise direction (as viewed in FIG. 4) about the pivot 24. As in the case of the embodiment of FIGS. 1 to 3, such movement of the block 23 cannot take place unless the push button 32 is moved in the direction opposite to the arrow A. Furthermore, as soon as the contact-actuating member 21 is released, it is moved in an anticlockwise direction by the spring 30 in opposition to the resilience of the strips 39. This disengages the block 23 from the finger 36 and the spring 35 immediately returns the push button 32 to the position shown in FIG. 4, so that re-engagement of the contact buttons 17 and 18 cannot occur until the push button 32 is again moved in the direction opposite to the arrow A.

What is claimed is:

1. In combination with a hollow-elongated handle of a portable electric appliance, said handle being adapted for gripping by the hand of a person using the appliance, said handle having a first side and a second side, a switch within the said handle having contact means to open and close the electrical circuit of the appliance, and manually operable switch operating lever pivoted at one end and means mounted on the first side of the handle for engagement by the fingers of a person using the appliance and capable of movement between switch-open and switch-closed positions; means slidably mounted on the second side of the handle for engagement by a finger of a person using the appliance, means biasing the said slidable means to a first position, means on said slidable means engageable by said oper-

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ating means when said slidable means is in said first position but not when in a second position, to prevent movement of said operating means into switch-closing position in said first position but not in said second position, whereby switch cannot be closed unless both said slidable means and said operating means are simultaneously operated.

2. The combination as claimed in claim 1 in which said slidable means is a member having an extension inward of said handle, and said operating member is recessed to receive said extension in said second position of said member.

3. The combination as claimed in claim 2 having a plate member extending lengthwise in said handle, fixed contact means mounted on said plate member, and movable contact means including a leaf spring having a contacting surface on one end engageable with and disengageable from said first contact means by movement of said operating member.

4. The combination as claimed in claim 1 having a plate member extending lengthwise in said handle, fixed contact means mounted on said plate member, and movable contact means including a leaf spring having a contacting surface on one end engageable with and disengageable from said first contact means by movement of said operating member.

5. The combination as claimed in claim 4 in which said leaf spring biases said movable contacting surface to switch-open position.

6. The combination as claimed in claim 4 in which said leaf spring biases said movable contacting surface to switch-closed position.

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