

[54] LOCK-OFF SWITCH

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[56] References Cited

UNITED STATES PATENTS

3,662,136 5/1972 Bienwald et al. 200/157

FOREIGN PATENTS OR APPLICATIONS

1,263,901 3/1968 Germany 200/169 PB

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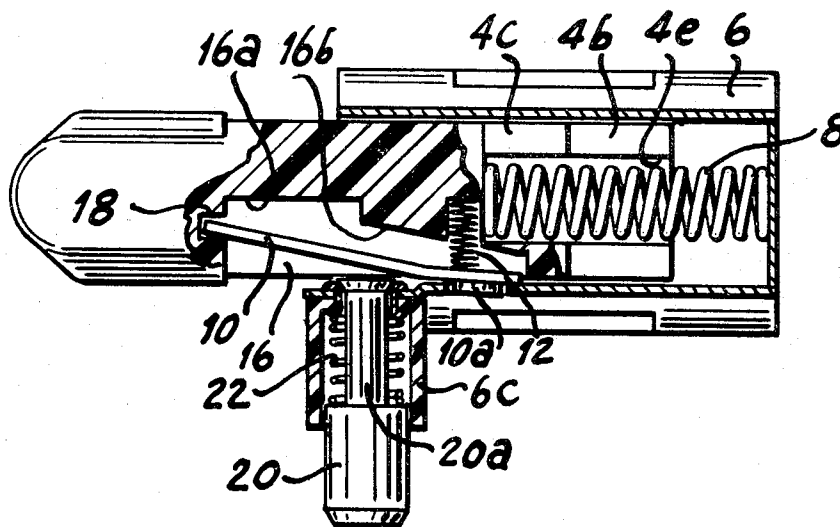
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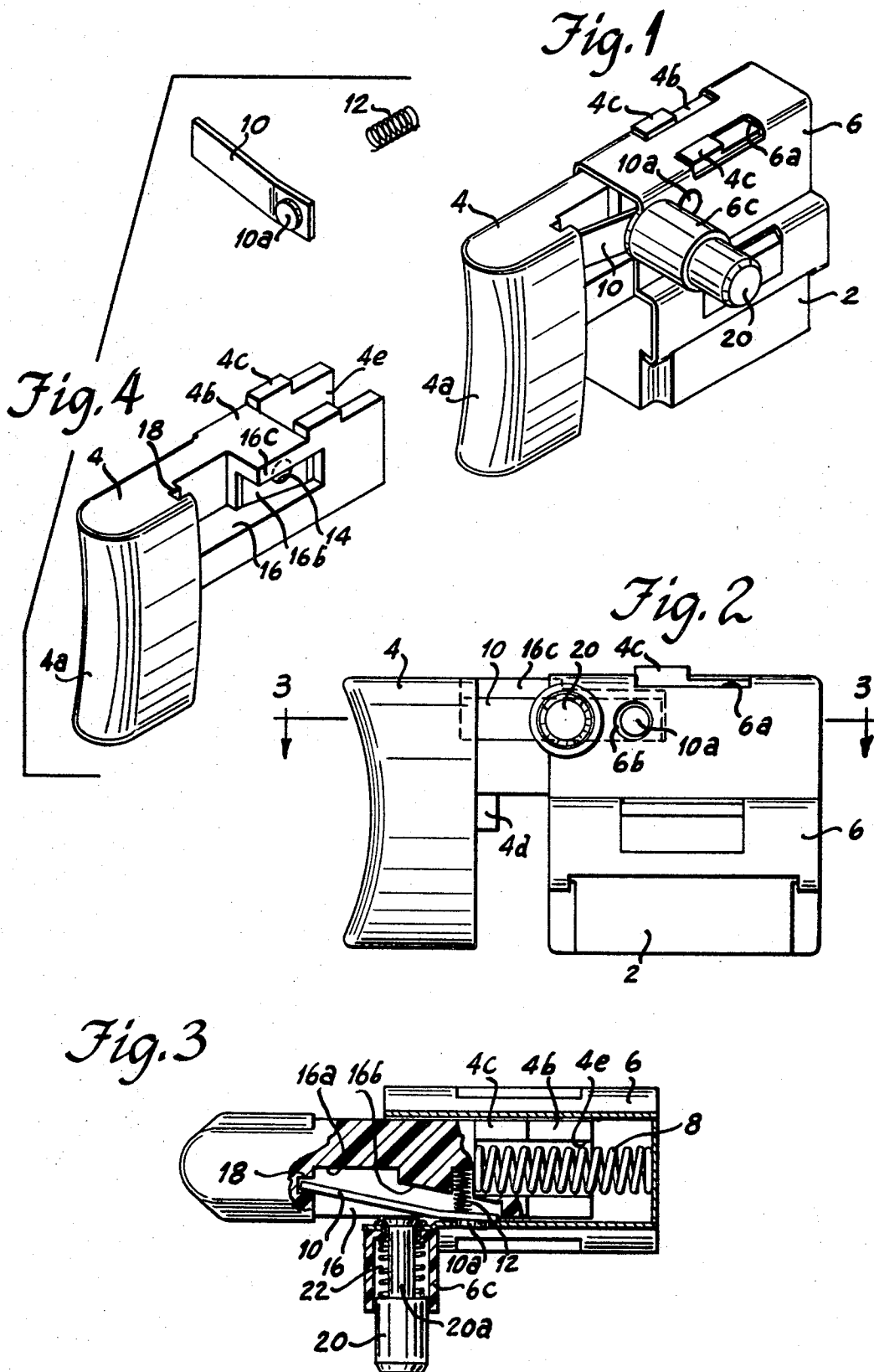
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[57] ABSTRACT

A manual switch that has a built-in rigid lock lever having one end seated in the switch actuator, biased by a helical compression spring, and having a detent at the other end that snaps into a hole in the frame when the switch is released to return to its off position to lock the switch off. A thumb-operated release button when depressed pivots the lock lever to separate the detent from the hole thereby to allow reoperation of the switch actuator. The rigid lock lever is angularly disposed so that attempted forcing of the switch actuator without depressing the release button tightens the locking engagement to absolutely prevent operation.

10 Claims, 4 Drawing Figures





LOCK-OFF SWITCH

BACKGROUND OF THE INVENTION

Lock-off switches have been known heretofore. One form of such prior switch is characterized primarily by a laterally sliding pin or rotary knob which in one position engages an abutment to prevent switch actuator movement and in another position clears such abutment to allow actuator movement. Manual setting is required for either position. Another form of such prior switch is characterized by a resilient L-shaped locking member having a detent thereon that snaps into a hole in the switch frame whenever the switch is released to return to its off position. This L-shaped member is mounted at its foot into the switch trigger and its shank portion that has the detent is biased by its own resilience against the switch frame as shown in Merlin R. Dummer copending application Ser. No. 195,167, filed Nov. 3, 1971.

This invention relates to improvements thereover.

SUMMARY OF THE INVENTION

This invention relates to a lock-off switch and more particularly to a switch incorporating an automatically engaging off lock that allows the user to pick up a circular saw or the like without inadvertently turning it on.

An object of the invention is to provide an improved lock-off switch of the self-enclosed type.

A more specific object of the invention is to provide an off-lock for a trigger switch that not only prevents forcing but also enhances locking engagement on attempted forcing.

Another specific object of the invention is to provide a trigger switch with a compression spring biased, rigid lever off-lock.

Another specific object of the invention is to provide a rigid lever off-lock of the aforementioned type with an angular orientation to enhance locking engagement on attempted forcing.

Another specific object of the invention is to provide a rigid lever off-lock of the aforementioned type with an offset seat within the trigger to enhance locking engagement on attempted forcing.

Another specific object of the invention is to provide a trigger switch with a compression spring biased, angularly disposed, rigid lever off-lock that is readily releasable by the conventional thumb-operated plunger button.

Other objects and advantages of the invention will hereinafter appear.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an enlarged isometric view of a lock-off switch of the trigger type constructed in accordance with the invention;

FIG. 2 is a left side elevational view of the switch of FIG. 1;

FIG. 3 is a sectional view taken approximately along line 3-3 of FIG. 2; and

FIG. 4 is an exploded isometric view of the trigger, lock lever and bias spring of the switch of FIGS. 1-3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, there is shown a lock-off switch of the in-line trigger actuated type constructed in ac-

cordance with the invention. This switch comprises an insulating base 2 housing the switch contacts, or speed control circuit and switch contacts, as desired. This base normally has holes in the bottom through which conductors extend or through which conductors may be inserted for connecting the trigger switch to an external circuit. The base has an open top through which the trigger is coupled to the switch and switch actuation takes place in response to depression of the trigger as shown, for example, in R. G. Miller U.S. Pat. No. 3,242,298, dated Mar. 22, 1966. As will be apparent, this switch is adapted for mounting in the handle of a portable tool such as an electric saw or the like.

A trigger 4 of the in-line movement type has a finger-engaging portion 4a and a slidable portion 4b, the latter portion overlying the base and being held on the base by a frame 6 that may be made of metal or molded insulating material. A helical compression spring 8 shown in FIG. 3 biases the trigger into its forwardly extended "off" (contact open) position and the trigger may be depressed by the forefinger of the user against the force of this return spring 8 into its "on" (contact closed) position.

As shown in FIGS. 1 and 2, frame 6 is provided at its top with a pair of rectangular apertures 6a to limit the trigger movement in the forward direction. Extending up through these apertures are respective projections 4c integrally molded on the upper surface of slidable portion 4b of the trigger. As will be apparent, these projections stop against the forward end of these apertures when the trigger is in its "off" position. Abutment 4d shown in FIG. 2 stops against the base when the trigger is depressed into its fully "on" position.

As shown in FIGS. 3 and 4, the slidable portion of the trigger is provided with a groove 4e for accommodating return spring 8. One end of this return spring abuts the forward end wall of this groove and the other end abuts the rear, interior end wall of the frame.

The lock-off mechanism comprises a rigid lever 10, most clearly shown in FIG. 4, a bias spring 12 for this lever including a well 14 for this spring, a slot 16 and notch 18 for retaining the lock lever, and a locking hole 6b or catch in the left side of the frame for receiving the detent 10a or stop rigidly secured to or integrally formed on lock lever 10.

The lock lever 10 is mounted on the trigger. For this purpose, the trigger is provided at its left side with the aforementioned slot 16 having its greatest depth portion 16a at its forward end as shown in FIG. 3, and a shallower, inclined-toward-shallower portion 16b extending therefrom to the rear end of this slot, with an overhanging ledge 16c above this inclined portion 16b to confine the lock lever therebelow. Round well 14 extends toward the right from this inclined portion 16b as shown in FIGS. 3 and 4. Notch 18 is in the forward end of slot 16 and is offset toward the right as shown in FIG. 3 so as to dispose the lock lever at an angle toward the left rear with respect to the forward center line of the trigger.

The lock-off lever is stiff enough to resist bending or flexing if the trigger is attempted to be forced, and is provided with a small angle bend just forwardly of detent 10a to dispose its rear end portion toward parallelism with the aforementioned center line of the trigger so as to bring detent 10a closely toward a parallel plane with respect to the frame adjacent hole 6b.

Referring to FIG. 3, it will be seen how lock lever 10 fits into slot 16. The forward end of this lock lever is seated in notch 18 and the rear end of the lock lever extends into close spaced relation with the lateral rear end wall of shallower portion 16b of the slot. Thus, the inclined wall of slot 16b is substantially complementary to the angularly disposed lock lever. Therefore, when the trigger is depressed, force is applied at notch 18 to the lock lever. When the trigger is released to return "off" following depression thereof to "on", the rear end wall of slot 16b moves the lock lever forwardly until detent 10a snaps into hole 6b in the frame to automatically lock the trigger off.

The manual release means comprises a release button 20 similar to the conventional "on" lock button used in trigger switches. This release button is mounted within a sleeve 6c, the latter being rigidly secured over a hole in the left side of the frame at the vertical level of the intermediate portion of lock-off lever 10. This release button is attached to a shaft 20a that extends through the mounting sleeve and hold in the frame, and a helical compression spring 22 shown in FIG. 3 surrounds this shaft to bias the release button outwardly, toward the left. The right, or inner, end of this shaft is spun larger than its hole in the frame to secure the release button to the frame.

As will be apparent, when the user presses the release button, it moves inwardly plunger-like against the force of spring 22, and the inner end of the shaft pivots the lock lever counter clockwise as seen in FIG. 3 in notch 18 against the force of bias spring 12 until detent 10a clears hole 6b in the frame. While the release button is so held, the trigger may be depressed to close the switch. After the trigger is slightly depressed, the release button may be released since detent 10a has moved back of hole 6b and can no longer fall therein. Subsequently, release of the trigger allows spring 8 to return the trigger to its off position, and upon arriving thereat, detent 10a snaps (under the action of bias spring 12) into hole 6b to automatically lock the trigger "off." This prevents accidental starting of the portable tool as a safety measure, particularly in the case of circular saws, chain saws, and the like.

It will be seen in FIG. 3 that attempted forcing of the trigger (without depressing the release button) only causes tighter locking in view of the angular disposition of the lock lever with respect to the trigger and frame.

While the invention has been shown as applied to a trigger switch, it will be apparent that it has wider application not only to switches but as an off-lock for a movable actuator lever generally.

While the apparatus hereinbefore described is effectively adapted to fulfill the objects stated, it is to be understood that the invention is not intended to be confined to the particular preferred embodiment of lock-off switch disclosed, inasmuch as it is susceptible of various modifications without departing from the scope of the appended claims.

I claim:

1. A self-enclosed trigger switch for a portable electric tool affording operation of the tool but preventing accidental operation thereof comprising:

- an insulating base housing the switch mechanism;
- a movable spring-biased trigger having a normal off position in which the tool is not in operation and having an alternate on position in which the tool is in operation;

a frame secured to said base and mounting said trigger for movement relative to said base and frame; means coupling said trigger to the switch mechanism to afford operation thereof;

and an automatically-engaging off lock for said trigger comprising:

a rigid locking member having a detent at one end portion;

a slot in one side of said trigger for accommodating said locking member and including a notch seating the other end of said locking member;

said notch being in the forward end of said slot and seating the forward end of said rigid locking member for limited pivotal movement within said slot, and said rigid locking member being confined in said slot by the abutting rear end wall of the latter;

a compression spring within said trigger biasing said one end of said locking member against the adjacent inner wall of said frame;

a hole in said adjacent wall of said frame disposed to receive said detent in the off position of said trigger;

and a spring-biased release button mounted on said frame and disposed to release said detent from said hole.

2. The invention defined in claim 1 wherein said rigid locking member comprises:

an elongated strip of steel thick enough and stiff enough to resist bending or flexing on attempted forcing of the trigger.

3. The invention defined in claim 2, wherein:

said notch is offset toward the center line of said trigger from the plane of said adjacent wall of the frame to dispose said locking member at an angle causing tightening of the locking engagement on attempted forcing of the trigger.

4. A self-enclosed trigger switch for a portable electric tool affording operation of the tool but preventing accidental operation thereof comprising:

an insulating base housing the switch mechanism;

a movable spring-biased trigger having a normal off position in which the tool is not in operation and having an alternate on position in which the tool is in operation;

a frame secured to said base and mounting said trigger for movement relative to said base and frame; means coupling said trigger to the switch mechanism to afford operation thereof;

and an automatically-engaging off lock for said trigger comprising:

a rigid locking member having a detent at one end;

a slot in one side of said trigger for accommodating said locking member and including a notch seating the other end of said locking member;

a compression spring within said trigger biasing said one end of said locking member against the adjacent inner wall of said frame;

a hole in said adjacent wall of said frame disposed to receive said detent in the off position of said trigger;

and a spring-biased release button mounted on said frame and disposed to release said detent from said hole;

said rigid locking member comprising an elongated strip of steel thick enough and stiff enough to resist bending or flexing on attempted forcing of the trigger;

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said detent comprising a steel disc rigidly secured to one surface of said steel strip adjacent the rear end thereof;

and said notch is in the forward end of said slot and seats the forward end of said steel strip for limited pivotal movement within said slot. 5

5. The invention defined in claim 4, wherein:

said notch is offset toward the center line of said trigger from the plane of said adjacent wall of the frame to dispose said locking member at an angle causing tightening of the locking engagement on attempted forcing of the trigger. 10

6. The invention defined in claim 1, wherein:

said trigger comprises an overhanging ledge over said slot for confining said locking member therebelow. 15

7. The invention defined in claim 1, wherein:

said compression spring is a helical spring having one end against the opposite surface of said locking member adjacent said detent;

and said trigger comprises a well in said slot for retaining the other end of said spring. 20

8. In combination with a portable tool having a handle to be grasped by the hand of the user, an aperture in the front of the handle for a trigger and a hole in one side of the handle for an off lock release member: 25

a self-enclosed trigger switch mounted within said handle comprising:

a housing for the switch mechanism;

a trigger mounted on said housing for limited sliding movement between an on position wherein the switch is in operation and an off position wherein the switch is not in operation; 30

said trigger extending out of said aperture for depression by the forefinger of the user;

a return spring normally biasing said trigger into its off position; 35

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and an automatically engaging off lock for said trigger including:

space within said trigger defined by a pivot at the forward end of said space and an abutment at the rear end thereof;

an elongated rigid locking lever within said space seated at its forward end in said pivot and its rear end being confined by said abutment and having a detent at its rear end portion;

a catch in said housing for receiving said detent to lock the trigger in its off position;

a compression spring between said trigger and said locking lever biasing said detent into said catch;

and a spring-biased release member mounted on said housing and disposed to be depressed by the thumb of the user to pivot said locking lever and move said detent clear of said catch to allow depression of said trigger to its on position;

and said abutment causing said locking lever to return with the trigger upon release of the latter to enable said compression spring to snap said detent back into said catch to lock said trigger in its off position.

9. The invention defined in claim 8, wherein:

said pivot for the forward end of said locking lever is offset toward the center line of said trigger from the plane of said catch to provide an angular line of force insuring engagement of said detent in said catch in the event of attempted forcing of said trigger. 40

10. The invention defined in claim 8, wherein said locking lever is disposed in a vertical plane and said detent is a coin-shaped projection on the flat surface thereof. 45

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