TRIGGER LOCKING MEANS FOR PORTABLE ELECTRIC DEVICE

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The present invention relates to trigger locking means for a hand-portable power-operated device, and more particularly, to means whereby the trigger may be locked either in its "on" position or in its "off" position.

It is an object of the present invention to provide a trigger locking means for a hand-portable power-operated device, such as a portable electric drill, wherein a movable trigger member may be locked either in its "on" position or in its "off" position by means of a locking member movable transversely to the plane of movement of the trigger.

It is another object of the present invention to provide a trigger locking means that may be manipulated easily and conveniently.

It is yet another object of the present invention to provide a combination of a movable trigger member and a trigger locking means which is inherently rugged and reliable for extended usage, and which is compact and may be manufactured easily and economically.

In accordance with the general teachings of the present invention, there is herein illustrated and described a trigger locking means for a hand-portable power-operated device of the type having a housing and further having a pendant handle secured to the housing. A movable trigger is disposed within the housing to actuate the device, and the trigger normally has an "off" position in which the device is de-energized and alternately has an "on" position in which the device is energized. The trigger has a portion projecting below the housing and forwardly of the pendant handle for manual manipulation by the user. Resilient means, preferably disposed in the housing, biases the trigger to its "off" position; and means, including a locking member movable transversely to the plane of movement of the trigger are provided to selectively lock the trigger in either of its positions.

In accordance with the more specific teachings of the present invention, there is herein illustrated and described a hand-portable power-operated device, such as a portable electric drill, having a main motor housing and further having a movable trigger within the housing. The trigger normally has an "off" position in which the drill is de-energized and alternately has an "on" position in which the drill is energized. A locking pin is journaled in the housing for sliding movement transversely to the plane of movement of the trigger, and the locking pin has manually-manipulable end portions which project externally from respective sides of the housing. Two-position spring-loaded detent means are provided between the locking pin and the housing, so that the pin normally has an "unlocked" position and alternately has a "locked" position with respect to the trigger. A locking element is carried by the locking pin; and when the locking member is moved into its "locked" position, the locking element cooperates with a recess formed within the trigger member to thereby prevent movement of the trigger and to lock the trigger in its "off" position. Moreover, when the trigger is first moved into its "on" position and the locking pin is subsequently moved into its "locked" position, the locking pin bears against an end face of the trigger to thereafter prevent return movement of the trigger and to thereby lock the trigger in its "on" position.

These and other objects of the present invention will become apparent from a reading of the following specification, taken in conjunction with the enclosed drawings, in which:

FIGURE 1 is a side elevation of a typical hand-portable power-operated device with which the teachings of the present invention may find most particular utility;

FIGURE 2 is an enlarged fragmentary portion of FIGURE 1 with part of the housing being broken away to illustrate the movable trigger in elevation and the locking pin in section;

FIGURE 3 is a section view taken along the lines 3—3 of FIGURE 2 (and turned 90° for convenience of illustration) showing the locking pin in its "unlocked" position, and further showing the respective manually-manipulable end portions of the sliding locking pin;

FIGURE 4 is a section view corresponding substantially to that of FIGURE 3, but illustrating the locking pin in its alternate or "locked" position;

FIGURE 5 is a sequence view (partially schematic) and showing the means for locking the trigger switch either in its "on" position or in its "off" position.

With reference to FIGURE 1, there is illustrated a cordless electric drill 10 with which the teachings of the present invention may find most particular utility. The cordless electric drill 10 is energized by means of one or more self-contained removable battery packs, each of which comprises a series of interconnected rechargeable energy cells. The drill 10 is the subject of the pending Riley et al. application S.N. 177,316, filed March 5, 1962, entitled “Heavy-Duty Industrial-Type Cordless Electric Drill,” and assigned to the assignee of the present invention. However, it will be understood and appreciated by those skilled in the art that the essence and teachings of the present invention are equally applicable to a wide variety of power-operated tools, devices, and appliances, and that the specific illustration herein of the cordless drill 10 is merely for convenience and clarity of understanding. With this in mind, the drill 10 comprises a motor housing 11 in which a suitable motor (not shown) is housed, a gear case 12 secured forwardly of the motor housing 11, a chuck member 13, an end handle 14, and a pair of substantially-aligned side handles 15 and 16 within which suitable slide-out battery packs (not shown) may be housed.

With reference to FIGURE 2, the motor housing 11 carries a stationary pivot pin 17, and a trigger member 18 is pivotally mounted upwardly therefrom. The trigger member 18 is adapted to close a pair of electrical contacts forming a switch means for the drill 10; but for convenience of illustration, and because the details of the switch means may be considered as conventional for purposes of the present invention, the electrical contacts as well as the structural details of the switch means are herein deleted. The trigger 18 has a manually-manipulable projecting portion 19, which is disposed below the motor housing 11 and forwardly of the pendant (lower) side handle 16. The trigger 18 normally has an "off" position in which the drill 10 is de-energized and further has an alternate "on" position in which the drill is energized. Moreover, the trigger 18 is normally biased to its "off" position by means of a spring 20 housed in a recess 21 in the motor housing 11.

With reference again to FIGURE 2, and with further reference to FIGURE 1 and 3, a locking member (preferably in the form of a locking pin) is journaled within substantially-aligned apertures 23 and 24 within the motor housing 11 for a sliding movement substantially transverse to the plane of movement of the trigger 18. The locking pin 22 has manually-manipulable end portions 25 and 26 which project beyond the respective sides of the housing 11, and preferably, at least one of the sliding
portions has a knurled knob as at 25a. Two-position spring-loaded detent means are provided between the sliding locking pin 22 and the housing 11, so that the locking pin 22 normally has an "unlocked" position and alternately has a "locked" position with respect to the trigger member 18. This detent means comprises a ball detent 27 seated within a recess 28 in the housing 11 and urged by a spring 29 to engage one or the other of a pair of external annular grooves 30 and 31 formed on the locking pin 22. The annular grooves 30 and 31 are substantially parallel to each other and are spaced apart a distance equal to the degree of sliding movement of the locking pin 22. The locking pin 22 carries a locking element 32, preferably in the form of an L-shaped pin, which has a portion 33 extending substantially parallel to the locking pin 22. This extending portion 33 is normally confined within a recess 34 formed in the housing 11 for the purpose of suitably guiding the sliding movement of the locking pin 22 and simultaneously preventing a substantial rotation of the pin 22 about its own axis and with respect to the housing 11. When the trigger 18 is to be locked in its "off" position, see FIGURE 4, the extending portion 33 of the pin 22 is received within a recess 35 formed in the trigger 18.

Operation

With reference to FIGURE 5, the complete operation and inherent utility of the present invention may be more easily understood. Initially, and as shown in the left-hand illustration of FIGURE 5, the lock is in its "off" position, and the trigger switch is also in its "off" position. In the succeeding illustration of FIGURE 5, the switch has been moved into its "on" position for actuating the drill 10 in the normal manner, the lock remaining in its "off" position. Under certain circumstances, however, it may be desirable to lock the switch in its "off" position; and this is shown in the succeeding illustration, wherein the locking pin 22 has been moved so that the extending portion 33 of the L-shaped locking element 32 has been received within the recess 35 formed within the trigger 18, thereby preventing the normal movement of the trigger 18, and thereby locking the trigger switch in its "off" position. This feature may be particularly useful when the drill 10 is of the cordless type; for example, when changing bits, especially a 2%4" diameter wood auger, maintaining the cordless drill 10 in its "off" position is a decided safety feature. Besides, when the cordless drill is not in use, it is desirable to prevent an inadvertent closing of the trigger switch which would otherwise deplete the self-contained battery. In the last illustration of FIGURE 5, the trigger switch has first been moved into its "on" position, and then the sliding locking pin 22 has subsequently been moved into its "locked" or "on" position; in such a manner, the extending portion 33 of the L-shaped locking element 32 abuts against or bears against the end face 36 of the trigger 18, thereby preventing the trigger from returning to its normal "off" position, and thereby locking the trigger in its "on" position. This may be particularly useful when the operator desires to use the drill 10 for extended periods of time, during which it would otherwise be necessary for him to manually depress the trigger. Consequently, the drill 10 may be locked either in its "on" position or in its "off" position in a quick and convenient manner.

Obviously, many modifications may be made without departing from the basic spirit of the present invention; and accordingly, within the scope of the appended claims, the invention may be practiced other than has been specifically described.

I claim:

1. In a hand-portable electrical device, the combination of:
   (a) a housing;
   (b) a pendant handle secured to said housing;
   (c) a trigger movable in a plane in said housing;
   (d) said trigger having a portion disposed below said housing and forwardly of said handle, and said trigger normally having an "off" position in which the device is de-energized and alternately having an "on" position in which the device is energized;
   (e) resilient means biasing said trigger to its "off" position; and
   (f) means including a positive locking member movable independently of said trigger, and transversely to the plane of movement of said trigger, to selectively lock said trigger either in its "on" position or in its "off" position;
   (g) said locking member requiring a deliberate manual effort for movement from its unlocking position to its locking position, and vice versa.

2. In a hand-portable electrical device, the combination of:
   (a) a housing;
   (b) a pendant handle secured to said housing;
   (c) a pivot pin mounted in said housing;
   (d) a pivot trigger carried by said pin;
   (e) said trigger pivoting in a plane longitudinally of said housing and having a portion disposed below said housing and forwardly of said pendant handle, and said trigger normally having an "off" position in which the device is de-energized and alternately having an "on" position in which the device is energized;
   (f) resilient means biasing said trigger to its "off" position; and
   (g) means including a locking member movable independently of said trigger, and transversely to the plane of movement of said trigger, to selectively lock said trigger in either of its positions;
   (h) said locking member requiring a deliberate manual effort for movement from its unlocking position to its locking position, and vice versa.

3. In a hand-portable electrical device, the combination of:
   (a) a housing;
   (b) a trigger movable in a plane in said housing;
   (c) said trigger having a portion disposed below said housing and forwardly of said handle, and said trigger normally having an "off" position in which the device is de-energized and alternately having an "on" position in which the device is energized;
   (d) resilient means biasing said trigger to its "off" position; and
   (e) means including a locking pin journaled in said housing for sliding movement transversely to the plane of movement of said trigger and independently of the movement of said trigger to selectively lock said trigger in either of its positions;
   (f) said locking pin having manually-manipulatable end portions projecting externally from respective sides of said housing; and
   (g) said locking pin requiring deliberate manual effort for movement from its unlocking position to its locking position, and vice versa.

4. In a hand-portable electrical device, the combination of:
   (a) housing;
   (b) a trigger movable in a plane in said housing;
   (c) said trigger having a portion projecting externally of said housing, and said trigger normally having an "off" position in which the device is de-energized and alternately having an "on" position in which the device is energized;
   (d) means including a locking pin slideably transversely to the plane of movement of said trigger to selectively lock said trigger in either of its positions; and
   (e) said locking pin having manually-manipulatable
end portions projecting externally from respective sides of said housing;
(f) spring-loaded two-position detent means between said locking pin and said housing; and
(g) said locking pin requiring a deliberate manual effort for movement from its unlocking position to its locking position, and vice versa.
5. In an electrical device, the combination of:
(a) a movable trigger member normally having an "off" position in which the device is de-energized and alternately having an "on" position in which the device is energized;
(b) a locking member normally having an "unlocked" position and being movable transversely of and independently of said trigger member into an alternate "locked" position;
(c) said locking member requiring a deliberate manual effort for movement from its unlocking position to its locking position, and vice versa;
(d) a locking element carried by one of said members cooperating with a recess formed in the other of said members, when said locking member is moved into its "locked" position, to thereafter preclude movement of said trigger member and to thereby lock said trigger in its "off" position;
(e) said locking element bearing against the other of said members, when said trigger is first moved into its "on" position and said locking member is subsequently moved into its "locking" position, to thereafter lock said trigger in its "on" position.
10. In a hand-portable electrical device, the combination of:
(a) a housing;
(b) a movable trigger member in said housing;
(c) said trigger normally having an "off" position in which the device is de-energized and alternately having an "on" position in which the device is energized;
(d) a locking member slidably transversely to the plane of movement of said trigger member and independently of said trigger member and having manually-manipulatable end portions projecting externally from respective sides of said housing;
(e) two-position spring-loaded detent means between said locking member and said housing, whereby said locking member normally has an "unlocked" position and alternately has a "locked" position with respect to said trigger;
(f) said locking member requiring a deliberate manual effort for movement from its unlocking position to its locking position, and vice versa; and
(g) a locking element carried by one of said members cooperating with a recess formed in the other of said members, when said locking member is moved into its "locked" position, to thereafter preclude movement of said trigger member and to lock said trigger in its "off" position;
(h) said locking element bearing against the other of said members, when said trigger is first moved into its "on" position and said locking member is subsequently moved into its "locking" position, to thereafter lock said trigger in its "on" position.
15. The combination according to claim 6, wherein:
(a) said locking element comprises an L-shaped pin carried by said locking member;
(b) said L-shaped pin having a portion extending parallel to said locking member and cooperating with a hole formed in said trigger member to lock said trigger in its "off" position.
20. The combination according to claim 7, wherein:
(a) said extending portion of said L-shaped pin is constantly received within a recess formed in said housing, thereby preventing a rotation of said locking member about its axis, and thereby keying said trigger member to said housing to lock said trigger in its "off" position.
9. In a hand-portable electrical device, the combination of:
(a) a housing;
(b) a pendant handle secured to said housing;
(c) a movable trigger in said housing;
(d) said trigger having a portion disposed below said housing and forwardly of said handle, and said trigger normally having an "off" position in which the device is de-energized and alternately having an "on" position in which the device is energized;
(e) resilient means biasing said trigger to its "off" position;
(f) means including a locking pin journaled in said housing for sliding movement independently of said trigger and transversely of said trigger to selectively lock said trigger in either of its positions;
(g) said locking pin requiring a deliberate manual effort for movement from its unlocking position to its locking position, and vice versa; and
(h) two-position spring-loaded detent means between said locking pin and said housing, thereby providing a "snap action" to the manual movement of said locking pin.
25. In a power-operated device having a housing provided with a manually-manipulatable resiliently-biased switch having a normal or "off" position in which the device is de-energized and a retracted or "on" position in which the device is energized, the switch automatically being returned to its "off" position upon the release of manual pressure, the improvement which comprises means to lock the switch selectively in its "on" position or in its "off" position, said means comprising:
(a) a positive locking member carried by the housing for movement transversely of the switch and independently of the switch from an unlocked position to a locked position;
(b) said locking member requiring a deliberate manual effort for movement from its unlocking position to its locking position, and vice versa;
(c) means carried by said locking member and operative in the locked position of the locking member to cooperate with a first portion of the switch to prevent the normal retraction of said switch, thereby locking the switch in its "off" position; and
(d) means carried by said locking member and operative in the locked position of the locking member to cooperate with a second portion of the switch, in the retracted position of the switch, to prevent the automatic return of said switch, thereby locking the switch in its "on" position;
(e) said switch automatically being returned from its "on" position to its "off" position upon the movement of said locking member to its unlocked position.

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