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

It is an object of the present invention to provide a locking means for a slidable trigger used in a hand-portable power-operated device, such as a cordless electric drill, wherein the slidable trigger may be either locked in its "on" position or in its "off" position, and wherein the locking means comprises a locking pin passing through an aperture formed within the trigger member, with the locking pin being movable transversely to the plane of movement of the trigger.

It is another object of the present invention to provide a trigger, slidable on respective guideways formed in the housing, in combination with means for locking the trigger in either of its positions.

It is yet another object of the present invention to provide a combination of a slidable trigger and a trigger locking means; wherein the overall combination may be manufactured easily and economically, manipulated conveniently, and used repeatedly without breakdown or failure.

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 trigger slidable in the housing to actuate the device. The trigger normally has an "off" position in which the device is de-energized; and the trigger further has an "on" position, retracted with respect to the housing, in which the device is energized. A slotted aperture is formed in the trigger, and a stop is formed intermediate the extremities of the aperture. A locking pin is journaled in the housing for sliding movement transversely of the trigger, and the locking pin normally has an "unlocked" position and alternately has a "locked" position with respect to the trigger. The locking pin passes through the aperture in the trigger, and the locking pin is formed with an intermediate portion of reduced diameter which is normally received within the rear portion of the slotted aperture in the trigger; consequently, and whenever the trigger is moved into its "on" position, the stop in the aperture passes freely and is not impeded by the intermediate portion of the locking pin.

The locking pin is further formed with a portion that is adjacent to its intermediate portion, and which has a diameter larger than the reduced diameter of the intermediate portion of the pin. Whenever the locking pin is moved to its "locked" position, this adjacent portion of the locking pin abuts against the stop formed within the aperture of the trigger. Consequently, the locking pin thereafter prevents further movement of the trigger, either inwardly or outwardly of the housing, so as to lock the trigger in either its "on" position or its "off" 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 more particular utility.

FIGURE 2 is an enlarged fragmentary portion of FIGURE 1, with parts broken away and sectioned, showing the spring-biased sliding trigger and the slotted aperture formed therein, and further showing the transverse locking pin in section.

FIGURE 3 is a section view taken along the lines 3--3 of FIGURE 2, showing the ribs formed integrally on the sliding trigger, and further showing the cooperating respective guideways formed in the housing.

FIGURE 4 is a view taken along the lines 4--4 of FIGURE 2, showing the contact bar carried by the sliding trigger switch for engaging the cantilevered leaf-spring contacts.

FIGURE 5 is a stepped section view taken along the lines 5--5 of FIGURE 2, showing the sliding locking pin in its "unlocked" position with respect to the trigger.

FIGURE 6 is a section view taken along the lines 6--6 of FIGURE 2, showing more particularly the slotted aperture formed within the trigger member.

FIGURE 7a is an enlarged view of a portion of FIGURE 2, with the sliding trigger in elevation and the locking pin in section, and showing the switch in its "off" position and the lock also in its "off" position;

FIGURE 7b is a view corresponding substantially to that of FIGURE 7a, but showing the switch in its "on" position and the lock in its "off" position;

FIGURE 7c is a corresponding view, showing the switch locked in its "on" position; and

FIGURE 7d is a corresponding view, showing the switch locked in its "off" position.

With reference to FIGURE 1, there is illustrated a portable cordless electric drill 10 with which the teachings of the present invention may find more particular utility; however, it will be understood and appreciated by one skilled in the art that the essence of the present invention is not necessarily confined thereto, but rather comprises a wide variety of power tools, appliances, and devices. With this in mind, the drill 10 comprises a motor housing 11, a gear case 12 secured forwardly of the motor housing 11, a conventional chuck 13, a handle housing 14 secured rearwardly of the motor housing 11, an auxiliary battery case 15 depending from the handle housing 14, with the removable battery pack (not shown) being housed mutually between the handle housing 14 and its associated battery case 15, and a sliding trigger 16 mounted within the handle housing 14 and adapted to be locked either in its "on" position or in its "off" position by means of a locking pin 17 slidable transversely of the trigger.

With reference to FIGURES 2 and 3, the sliding trigger 16 may be molded from a suitable insulating material, and the trigger 16 has a pair of integrally-formed longitudinal ribs 18 adapted to be received within respective longitudinal slotted guideways 19 formed in the handle housing 14, thereby guiding the sliding trigger 16. The trigger 16 normally has a forward position with respect to the housing, see FIGURE 2, wherein the switch is in its "off" position and the drill 10 is thus deenergized; and the trigger 16 further has a retracted position with respect to the housing, wherein the switch is in its alternate or "on" position when the drill is energized. The trigger 16 is normally biased to its "off" position by means of a spring 20 seated within a recess 21 formed within the rear portion of the trigger 16. A contact bar 22 is mounted upon the trigger 16 by means of a screw 23, and a pair of cantilevered leaf-spring contacts 24 are mounted within the housing and carry respective electrical contact buttons 25. Thus, whenever the trigger 16 is retracted within the housing, the
contact bar 22 bridges the contacts 25; and the switch is closed for energizing the drill 10.

With reference to FIGURES 5, 6, and 6, the trigger 16 is formed with a slotted aperture 26, and the aperture is provided with a narrowed-down stop portion 27 intermediate its forward and rearward portions. A sliding locking pin 28 is journaled within the handle housing 14 and passes through the slotted aperture 26 for movement transverse with respect to the trigger 16. Two-position detent means are provided between the sliding locking pin 28 and the handle housing 14. This detent means comprises a resilient O-ring 29 retained within a counterbore 30 of the handle housing 14 by means of a press-fitted bushing 31. A pair of spaced-apart parallel external annular grooves 32 and 33 are formed on the locking pin 28, and the combination of the grooves 32 and 33 and the O-ring 29 provides a spring-loaded "snap" action for the sliding movement of the locking pin 28. The opposite end of the locking pin 28 carries a lock washer 34 and an internally-threaded locking cap 35, and the pin 28 is thus provided with end portions which project beyond the respective sides of the housing 14 for convenient manipulation by the user. The locking pin 28 has an intermediate portion 36 of substantially-reduced diameter which is normally received within the rear portion of the slotted aperture 26; and the pin 28 further has an adjacent portion 37 having a normal diameter larger than that of the intermediate portion 36.

Operation

The operation and inherent utility of the present invention may be more clearly understood from an examination of FIGURE 7a through FIGURE 7d, which are in sequential form. In FIGURE 7a, the trigger 16 is in its normal position with respect to the housing 14, such that the switch is "off" and the drill is deenergized; and the locking pin 28 is also in its "off" position, with the reduced intermediate portion 36 of the pin being received within the rear portion of the slotted aperture 26 formed in the trigger 16. In FIGURE 7b, the trigger 16 has been slidably retracted within the handle housing 14, against the tension of spring 29, such that the intermediate narrowed-down stop portion 27 of the aperture 26 has easily cleared the reduced portion 36 of the locking pin 28, and such that the reduced portion 36 is now received within the forward portion of the aperture 26. The switch is in its "on" position, with the drill being energized, while the lock remains in its "off" position. If it is then desired to maintain the switch in its "on" position, as shown in FIGURE 7c, the sliding locking pin 28 is moved (transversely of the trigger 16) into its "locked" position, such that its portion 37 is received into the reduced intermediate portion 36) is received within the forward portion of the slotted aperture 26. In such a position, the portion 37 of the locking pin 28 will abut against one side of the stop 27 in the aperture 26 to prevent the return of the trigger 16 to its normal position; and hence the switch is locked in its "on" position. This may be particularly useful when the drill is being used for extended periods of time, such that the operator will no longer be required to manually and continually depress the trigger 16. The trigger cannot return to its "off" position until the locking pin 28 has first been moved back to its "unlocked" position. Finally, in FIGURE 7d, the trigger 16 is initially in its normal position with respect to the housing, and the switch is "off"; and if it is desired to maintain the switch in this position, then the sliding locking pin 28 is moved to its "locked" position, such that its portion 37 is received within the rear portion of the slotted aperture 26. In such a position, the portion 37 of the locking pin 28 will abut against the stop 27 in the aperture 26 to prevent the retraction of the sliding trigger 16 to its "on" position, and thus the switch is locked in its "off" position. When the drill 10 is of the cordless type, this feature may be used either as a safety factor or as a means for preventing the inadvertent closing of the switch and the consequent depletion of its battery when the drill is not being used.

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 power-operated device, the combination of:
   (a) a housing;
   (b) a trigger slideable in said housing;
   (c) said trigger normally having an "off" position in which the device is de-energized and further having an alternate "on" position, retracted with respect to said housing, and in which the device is energized;
   (d) a slotted aperture formed in said trigger;
   (e) a stop formed intermediate the extremities of said aperture, and said aperture having forward and rearward portions on respective sides of said stop;
   (f) a locking member slideable in said housing and passing transversely through said aperture in said trigger, said locking member normally having an "unlocked" position and alternately having a "locked" position with respect to said trigger, and said locking member requiring a deliberate manual effort for movement from its "unlocked" position to its "locked" position, and vice-versa;
   (g) said locking member having an intermediate portion of reduced cross-section normally received within said rearward portion of said slotted aperture in said trigger in the "unlocked" position of said locking member, whereby said stop in said aperture moves freely past said intermediate portion when said trigger is moved into its "on" position, and whereby said intermediate portion of said locking pin is received within said forward portion of said aperture in the "on" position of said trigger; and
   (h) said locking member further having a second portion adjacent said intermediate portion, said second portion having an increased cross-section over said intermediate portion and being adapted to abut against a respective end of said stop, when said pin is moved into its "locked" position, to thereafter prevent further movement of said trigger, and to thereby lock said trigger in either of its positions.

2. The combinations according to claim 2, wherein said locking member comprises:
   (a) a locking pin journaled for sliding movement in said housing; and wherein
   (b) said intermediate portion of said pin comprises a portion of reduced diameter.

References Cited by the Examiner

UNITED STATES PATENTS

2,200,322 5/40 Arnesen 200—157
2,487,011 11/49 Wilhide 200—157
2,503,226 4/50 Turner et al. 200—157
2,815,016 12/57 Kellogg 124—40 X
2,922,012 1/60 O'Mara 200—157
3,295,724 8/61 Lockin 200—157
3,061,334 10/62 Everett et al. 292—150
3,132,227 5/64 Butler 200—157

BROUGHTON G. DURHAM, Primary Examiner.
BERNARD A. GILHEANY, Examiner.