

May 5, 1964

T. C. BUTLER

3,132,227

TRIGGER SWITCH WITH LOCK FOR TOOL OR APPLIANCE

Filed Aug. 28, 1961

2 Sheets-Sheet 1

FIG. 1

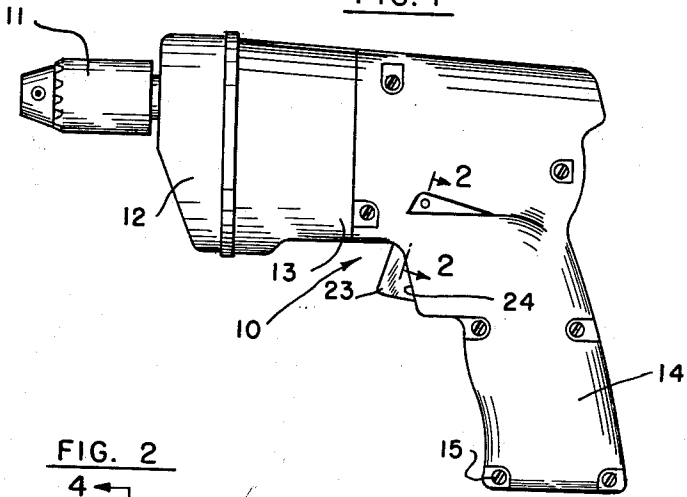


FIG. 2

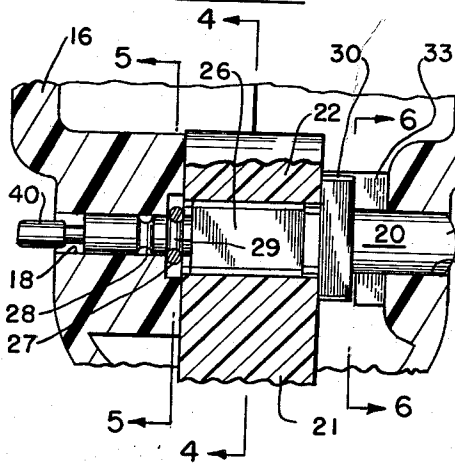


FIG. 3

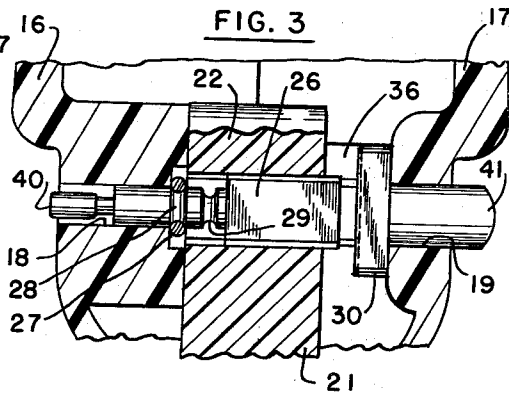


FIG. 4

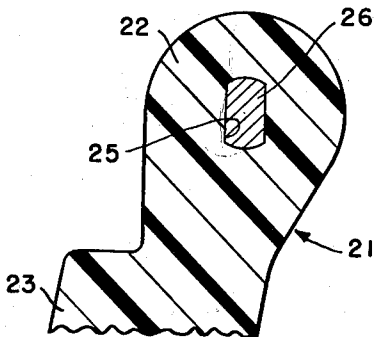


FIG. 5

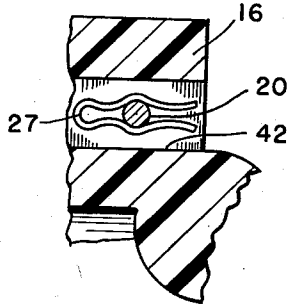
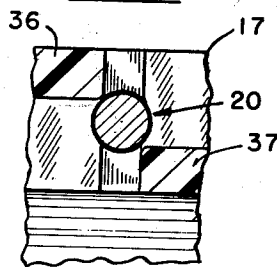


FIG. 6



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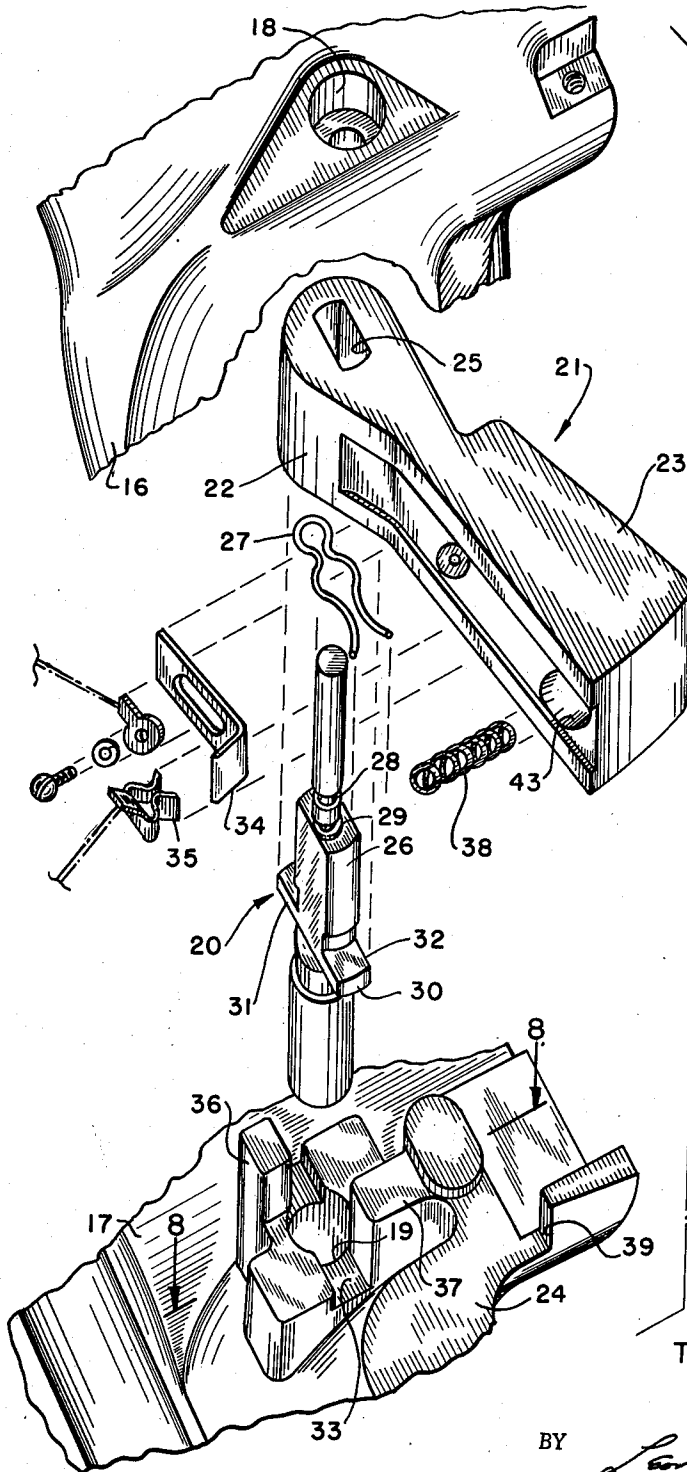


FIG. 7

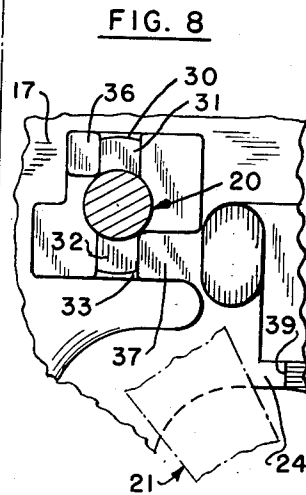


FIG. 8

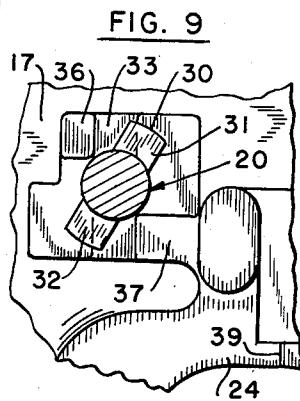


FIG. 9

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**TRIGGER SWITCH WITH LOCK FOR TOOL
 OR APPLIANCE**

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Filed Aug. 28, 1961, Ser. No. 134,301

11 Claims. (Cl. 200-157)

The present invention relates to a trigger locking means for an electrical tool or appliance, and more particularly, to such a trigger locking means that will lock the trigger switch in the "off" position.

In the prior art relating to electrical devices, such as portable electric tools, various types of trigger switches have been employed, wherein the switch includes a sliding or pivoted trigger block. The trigger block has an "on" position and an "off" position; and means are usually provided to lock the switch, and the trigger block thereof, in the "on" position, thus relieving the strain and fatigue on the operator. However, in certain types of electrical devices, such as a cordless electric tool or appliance, a problem arises of locking the switch, not necessarily in the "on" position, but rather in the "off" position, thus insuring against an inadvertent operation of the tool. In such a cordless electric tool, the energy is supplied by means of a group of self-contained rechargeable energy cells; and if the tool were placed in a crowded tool box or storage area, it may become possible for the trigger block to be actuated sufficiently so as to close the electrical contacts and operate the tool. In a noisy environment, especially, the tool may thus operate—unknown to the user—for a considerable period, during which time the energy cells are being continuously depleted; hence, the tool may become completely "run down" at just the instant that it is desired to use it.

Accordingly, it is an object of the present invention to alleviate the aforementioned difficulties by providing in conjunction with an electrical device having a trigger switch, means to lock the switch in the "off" position, thus insuring against an inadvertent and undesirable operation of the device.

It is another object of the present invention to provide a trigger locking means for a tool or appliance, wherein the locking means may be actuated so as to preclude a pair of electrical contacts from being closed.

It is yet another object of the present invention to provide, in conjunction with a tool having a split-housing pendant handle including a pair of complementary mating halves detachably secured together, means to trap a pivoted trigger block between the mating halves, as well as means to trap the pivot pin between the housing and the trigger block.

It is a further object of the present invention to provide a trigger locking means that may be actuated easily and conveniently by the operator.

It is a still further object of the present invention to provide, for use with an electrical tool or appliance, a trigger locking means that may be manufactured easily and economically.

In accordance with the teachings of the present invention, one preferred embodiment thereof is herein described and illustrated; and accordingly, there is provided in an electrical device, a pivoted trigger switch having an "on" position and an "off" position in combination with means to lock the switch at least in the "off" position. The trigger locking means comprises a housing having a pivot pin included therein, and a pivoted trigger block is carried by the pivot pin. The trigger block has a limited pivoted movement with respect to the housing, and the pivot pin in turn has a limited pivoted movement about its own axis in response to the movement of the

trigger block. A pair of electrical contacts are provided in the housing, and the contacts are closed by the movement of the trigger block. Two-position detent means are further provided, thereby allowing the pivot pin to have at least two axial positions with respect to the housing; and trigger locking means are also provided. This locking means cooperates between the pivot pin and the housing in one of the axial positions of the pivot pin to preclude a pivoted movement of the pivot pin, thus locking the trigger block against a substantial pivoted movement, and thus precluding the electrical contacts from being closed.

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 elevational view of a complete cordless electric drill in conjunction with which the teachings of the present invention may find more particular utility;

FIGURE 2 is a view taken along the lines 2-2 of FIGURE 1, showing the pivot pin in elevation, and further showing the trigger block (carried thereby) and the mating halves of the split housing handle in section;

FIGURE 3 is a view corresponding to that of FIGURE 2, but showing the pivot pin in its alternate or locking position;

FIGURE 4 is a view taken along the lines 4-4 of FIGURE 2, showing the trigger block being carried by the pivot pin, there being a close sliding fit therebetween;

FIGURE 5 is a view taken along the lines 5-5 of FIGURE 2, showing a portion of the detent means for the pivot pin;

FIGURE 6 is a view taken along the lines 6-6 of FIGURE 2, showing a portion of the locking means for the pivot pin;

FIGURE 7 is an exploded perspective view showing the relationship between the mating halves of the split housing, the pivot pin, the pivoted trigger block, the outside cotter pin for the detent means, and the electrical switch contacts, the latter being illustrated partially in schematic form for ease of illustration;

FIGURE 8 is a plan view taken along the lines 8-8 of FIGURE 2, showing the means including a pair of internal bosses for limiting the pivoted movement of the pivot pin (and hence the trigger block) outwardly of the housing; and

FIGURE 9 is a plan view corresponding to that of FIGURE 8, but showing the pivoted movement of the pivot pin with respect to the housing and unobstructed by the internal bosses formed in the housing.

With reference to FIGURE 1, there is illustrated a cordless portable electric drill 10 of the type described more particularly in the co-pending Butler et al. application Ser. No. 102,819, filed April 13, 1961, entitled "High-Efficiency Cordless Electric Drill," and assigned to the same assignee as that of the present invention. The drill 10 comprises a chuck 11, gear case 12, field housing 13, and a split-housing handle 14 held together by means of a plurality of screws, one of which is indicated as at 15. It will be appreciated, however, that the drill 10 is only illustrative of one type of electrical device with which the present invention may find particular utility, and that the scope of the invention is not necessarily confined thereto.

With reference to FIGURES 2, 3, 4, 5, 6, and 7, the handle 14 is of the split-housing type and includes a pair of relatively thin-walled substantially-hollow complementary mating portions or halves 16 and 17, each of which may be molded (preferably) from a suitable plastic material. Respective holes 18 and 19 are formed in the mating halves 16 and 17, and the holes 18 and

19 are aligned with each other when the mating halves 16 and 17 are secured together. A pivot pin 20 (which itself comprises the locking member) is disposed within the handle 14 in sliding engagement with respect to the holes 18 and 19, and a trigger block 21 is carried by the pivot pin 20. Preferably, the trigger block 21 is molded from a suitable plastic material; and the trigger block 21 has an internal portion 22 and an external portion 23, the latter portion 23 protruding through a trigger block opening 24 in the handle 14 so as to facilitate a manual actuation of the trigger block 21 by the user. The internal portion 22 of the trigger block 21 has an opening 25 formed therein, and the opening 25 has a cross-section corresponding substantially to the intermediate portion 26 of the pivot pin 20. Thus the trigger block 21 is carried by the intermediate portion 26 of the pivot pin 20; and the trigger block 21 and the pivot pin 20 will pivot substantially in unison about the axis of pin 20, with the pivot pin 20 (preferably being made of metal) having a close sliding fit with respect to the trigger block 21. In such a manner, the trigger 21 is constantly keyed to the pin 20 for a conjoint movement. Two-position detent means are provided to allow the pivot pin 20 to have at least two axial positions with respect to the handle 14; the detent means comprises an outside cotter pin 27 and a pair of parallel external annular grooves 28 and 29 formed on the pivot pin 20. The outside cotter pin 27 is positioned within one of the grooves 28 and 29 and is trapped (in a recess 42 formed in mating half 16) between the trigger block 21 and the mating half 16. Locking means are provided for the trigger block 21; the locking means comprises a wing 30 formed on a portion of the pivot pin 20, the wing having a pair of parallel flats 31 and 32 formed thereon (see FIGURE 7), and the mating half 17 being provided with a complementary slotted recess 33 formed therein.

With reference, again, to FIGURE 3, when the pivot pin 20 is moved into its alternate or locking position, the wing 30 of the pivot pin 20 is received within the slotted recess 33. Consequently, the pivot pin 20 is locked against pivoting movement about its axis; and inasmuch as the trigger block 21 is mechanically coupled to the pivot pin 20, the trigger block 21 is also locked against any substantial pivoting movement within the trigger block opening 24 and inwardly of the handle 14. Consequently, the drill 10 is locked in its "off" position.

With reference, again, to FIGURE 7, a pair of electrical contacts 34 and 35 are provided to energize the drill 10, and suitable electrical connections (illustrated schematically by the broken lines) are made between the contacts 34 and 35 and the electrical components (not shown) of the drill 10. One of the contacts, 34, is carried by the pivoted trigger block 21, and it will be understood that the trigger locking means hereinbefore described will operate (in the locking position) to preclude the contacts 34 and 35 from being closed.

With reference to FIGURES 7, 8, and 9, mating half 17 is provided with a pair of inwardly-projecting bosses 36 and 37 formed one on each side of the slotted recess 33 and diametrically opposite from one another. Thus, in the other axial position of the pivot pin 20, that is, the position of the pivot pin 20 which will allow the trigger block 21 to be actuated and the contacts 34 and 35 to be closed, the wing 30 of the pivot pin 20 is disposed above the slotted recess 33 and in the plane of the bosses 36 and 37 and intermediate of the diametrically-opposite bosses 36 and 37; and consequently, the pivoted movement of the trigger block 21 outwardly of the handle 14 will be limited by the bosses 36 and 37, as shown in FIGURE 8. The trigger block 21 is under the influence of a suitable spring 38, which is received with a hole 43 in the trigger block 21, and which urges the trigger block 21 outwardly of the trigger block opening 24 in the handle 14; and the function of the bosses 36 and 37 is to provide a stop or abutment for the wing 30 so as to limit

the outward movement of the trigger block 21 and preclude an abutment of the trigger block 21 with a ledge 39 formed adjacent to the trigger block opening 24. Consequently, there is no necessity for holding the dimensions from the ledge 39 to the axis of the aligned holes 18 and 19 to close tolerances.

In the assembly of the drill 10, and in particular the pivoted trigger switch, the trigger block 21 is trapped between the mating halves 16 and 17 of the split-housing handle 14, the trigger block 21 being carried by the pivot pin 20, while the pivot pin 20 (with the wing 30 formed therein) is itself trapped between the trigger block 21 and the mating half 17 of the split-housing handle 14. Moreover, as illustrated more clearly in FIGURES 2 and 3, the pivot pin 20 is of such a length so that in either of its two axial sliding positions, at least one of the ends 40 or 41 of the pivot pin 20 will protrude partially beyond the respective mating halves 16 and 17, thus allowing the pivot pin 20 to be easily actuated by one of the fingers of the operator. However, as shown in FIGURES 2 and 3, neither of the ends 40 or 41 of the pivot pin 20 will ever protrude beyond the outermost side surfaces of the drill 10; and thus the pivot pin 20 cannot be shifted inadvertently whenever the drill 10 is placed or laid down on its side, even though the step of placing the drill 10 on its side may be an abrupt one.

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

I claim:

1. In an electrical device, a pivoted trigger switch having an "on" position and an "off" position in combination with means to lock the switch in the "off" position, comprising a housing, a pivot pin in said housing, a trigger block carried by said pivot pin, said trigger block having a limited pivoted movement with respect to said housing, and said pivot pin having a limited pivoted movement in response to the movement of said trigger block, a pair of electrical contacts in said housing, said contacts being closed by the movement of said trigger block, two-position detent means operative between said pivot pin and said housing, whereby said pivot pin has at least two positions axially thereof, and locking means cooperating between said pivot pin and said housing in one of said axial positions of said pivot pin to preclude a pivoted movement of said pivot pin, whereby said trigger block is locked against substantial pivoted movement, and whereby said electrical contacts are precluded from being closed.

2. The combination according to claim 1, wherein said housing comprises a split-housing pendant handle including a pair of relatively thin-walled substantially-hollow complementary mating halves detachably secured together.

3. The combination according to claim 2, wherein each of said mating halves has a hole formed therein, said holes being aligned with respect to each other when said mating halves are secured together, said pivot pin being disposed in said holes in said housing, and wherein said pivot pin has a sufficient length so that at least one of the two ends of the pivot pin will protrude partially beyond said respective hole in either of the two axial positions of said pivot pin.

4. The combination according to claim 3, wherein in either of the two axial positions of said pivot pin, said pin extends sufficiently beyond said respective hole to allow the user to push said pin into the other axial position, but wherein each of said mating halves have respective side surfaces which extend beyond the farthestmost respective axial position of said pivot pin, thereby precluding an inadvertent shifting of said pivot pin should the user place the drill on its side in an abrupt manner.

5. The combination according to claim 1, wherein said

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two-position detent means comprises an outside cotter pin, said housing including a recess, said pivot pin having a pair of parallel external annular grooves formed thereon, and said outside cotter pin being positioned within one of said grooves and being trapped in said recess between said housing and said trigger block.

6. The combination according to claim 1, wherein said pivot pin includes an intermediate portion having a pair of parallel flats formed thereon, and wherein said trigger block comprises a single molded plastic piece having an internal portion trapped within said housing, said internal portion having an opening formed therein, said opening having a cross-section corresponding substantially to said intermediate portion of said pivot pin, whereby said trigger block is carried by said intermediate portion of said pivot pin, and whereby said pivot pin has a close sliding fit with respect to said trigger block.

7. The combination according to claim 1, wherein said locking means comprises a wing formed on a portion of said pivot pin, said wing having a pair of parallel flats formed thereon, said housing having a complementary slotted recess, whereby in the one axial position of said pivot pin, said pair of parallel flats of said wing are received within said slotted recess in said housing, thereby precluding substantial pivoted movement of said pivot pin and said trigger block, and thereby precluding said electrical contacts from being closed.

8. The combination according to claim 7, wherein said housing has a pair of inwardly-projecting bosses, one on each side of said slotted recess and diametrically opposite from one another, whereby in the other axial position of said trigger block, said wing of said pivot pin is disposed above said slotted recess and in the plane of said bosses and intermediate said diametrically-opposite bosses, thereby to limit the pivoting movement of said trigger block outwardly of said housing.

9. In an electrical device, the combination of a split-housing comprising a pair of complementary mating halves, means to detachably secure said halves together, a pivoted trigger block trapped between said halves, said trigger block having a portion protruding externally of said housing, said trigger block having a limited pivoted movement inwardly and outwardly with respect to said housing, a pivot pin carrying said trigger block for conjoint movement, said pivot pin being trapped between said trigger and one of said mating halves of said housing and having a limited axial movement in said housing trans-

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verse with respect to said trigger, a pair of electrical switch contacts, one of said contacts being carried by said trigger block, resilient means urging said trigger block outwardly of said housing, whereby said contacts are normally out of engagement, and locking means between said pivot pin and said housing and operable upon the axial movement of said pin to preclude substantial movement of said trigger block inwardly of said housing, whereby said contacts are precluded from being closed.

10. In an electrical device, the combination of a trigger switch having an "on" position and an "off" position and means to lock the switch in its "off" position, comprising a housing, a trigger mounted in said housing and movable with respect to said housing, resilient means biasing said trigger to its normal position, electrical contact means closed upon the movement of said trigger to energize the device, a locking member keyed to said trigger and movable transversely of said trigger, whereby said trigger and said locking member have a conjoint movement, and means to key said locking member to said housing, in a selected position of said locking member, to prevent the conjoint movement of said locking member and said trigger and to thereby prevent the closing of said electrical contact means.

11. In an electrical device, the combination of a split-housing comprising a pair of complementary mating portions, means to detachably secure said mating portions together, a trigger trapped between said mating portions and movable with respect to said housing, resilient means biasing said trigger to its normal position, electrical contact means closed upon the movement of said trigger to energize the device, a locking member movable transversely to the plane of movement of said trigger, means to trap said locking member between said trigger and one of said mating portions of said housing, detent means between said locking member and said housing, whereby said locking member has at least two positions transverse with respect to said trigger, and means in one of said positions of said locking member to preclude the movement of said trigger, thereby locking said trigger in its "off" position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,200,322 Arnesen ----- May 14, 1940