

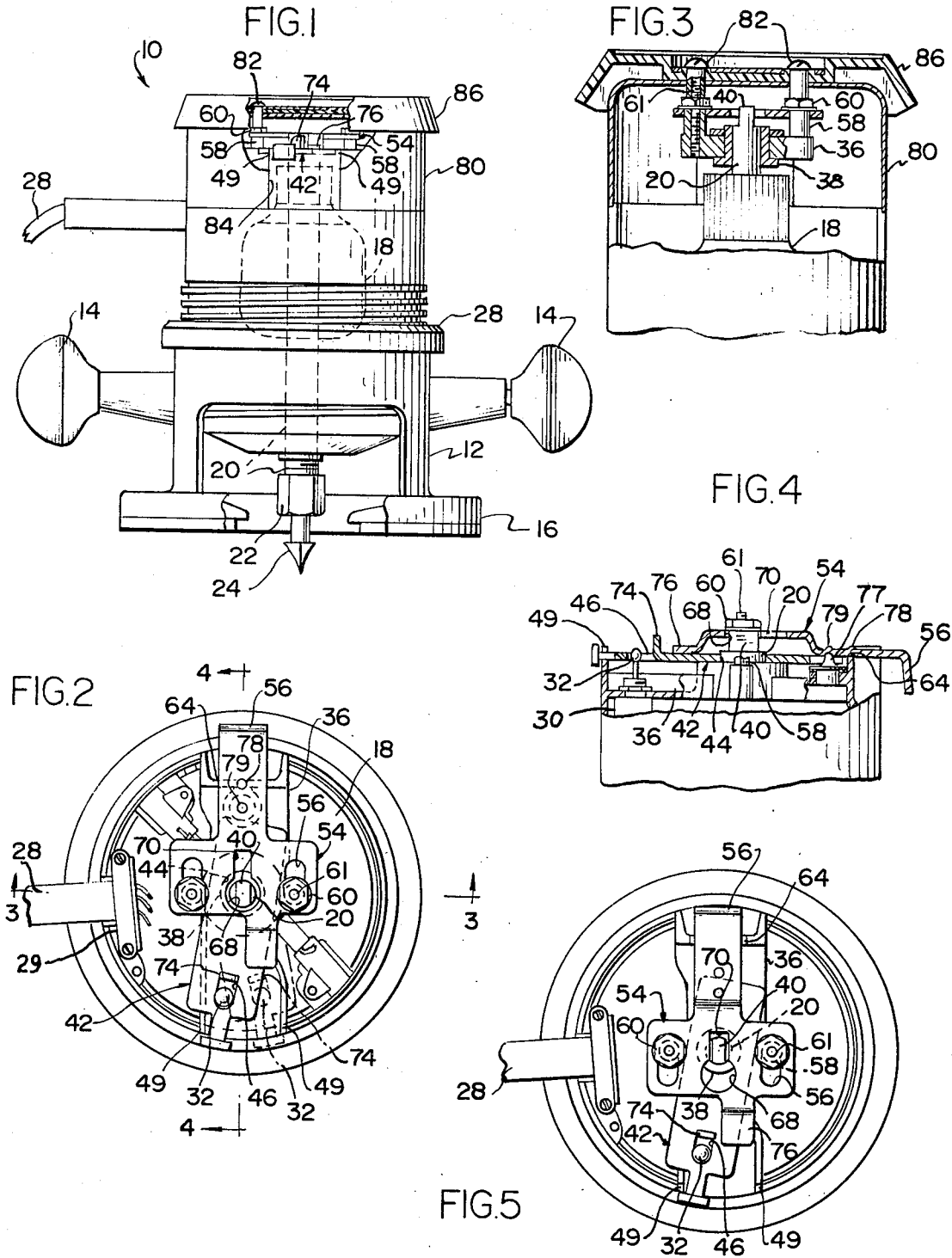
May 12, 1970

J. G. EIKERMANN ET AL

3,511,947

COMBINATION SAFETY LOCK-SWITCH MECHANISM FOR POWER TOOL

Filed Jan. 3, 1968



INVENTORS.

JERRY G. EIKERMANN

PAUL A. HAWLEY

BY *Charles F. Lind*

ATTORNEY.

1

3,511,947

COMBINATION SAFETY LOCK-SWITCH MECHANISM FOR POWER TOOL

Jerry G. Eikermann and Paul A. Hawley, Jefferson City,
Mo., assignors to McGraw-Edison Company, Elgin, Ill.,
a corporation of Delaware

Filed Jan. 3, 1968, Ser. No. 695,492

Int. Cl. H10h 9/20

U.S. Cl. 200—42

7 Claims

ABSTRACT OF THE DISCLOSURE

A safety lock-switch mechanism for a power tool having a switch actuating element and a shaft locking element which are movable between various interfering and non-interfering positions with one another which in a first instance precludes movement of the switch actuating member from its switch OFF position to its switch ON position when the shaft locking element is in its shaft locking position, and conversely in a second instance precludes movement of the shaft locking element from its shaft non-locking position to its shaft locking position when the switch actuating element is in the switch ON position.

This invention relates to a combination safety lock-switch mechanism for a power tool, and more particularly, to a mechanism which when set in a safety condition locks the tool shaft against rotation and precludes the shifting of ON-OFF switch to the ON position, and conversely when set in the normal tool operating condition precludes the locking of the tool shaft until the ON-OFF switch is in the OFF position.

Power tools commonly have an electric motor including a shaft which is connected by appropriate drive means to a tool holding device. It is common in many tools, for example, routers, saws, drills or the like to provide that one tool element is readily removed from the tool holding device and replaced by a different tool element. Under normal conditions when a tool element is being replaced, the user seldom disconnects power from the tool by removing the plug from the socket but merely relies on the electric ON-OFF switch being in the OFF position. This situation can be quite dangerous since for some tools such as a router, appreciable force must be applied to the holding device to loosen the tool element, and with this tool manipulation, it is possible to accidentally turn the tool on.

Accordingly, an object of this invention is to provide a safety lock-switch mechanism for a power tool having a rotating shaft and switch, and particularly, a mechanism having a switch actuating element and a shaft locking element which by appropriate interference with one another preclude accidental shifting of the switch actuating element to the switch ON position when the shaft locking element is locking the shaft, or the accidental shifting of the shaft locking element to the shaft locking position when the switch actuating element is in the switch ON position.

Another object of this invention is to provide a safety lock-switch mechanism which is useful for locking the rotating shaft of a power tool and thereby permits the ready replacement of the tool element, and moreover, during this shaft locking, is useful for holding the ON-OFF switch in the OFF position.

2

These and other objects will be more fully understood and appreciated after referring to the following specification and the accompanying drawing forming a part thereof, wherein:

FIG. 1 is a side elevational view of a router in which a preferred embodiment of the invention is incorporated, the router being shown with part of the outer shell broken away to more clearly show the invention;

FIG. 2 is a plan view, showing the safety lock-switch mechanism forming this invention, of the tool shown in FIG. 1;

FIGS. 3 and 4 sectional views of the mechanism, as seen generally from lines 3—3 and 4—4, respectively, in FIG. 2; and

FIG. 5 is a plan view similar to FIG. 2, except showing the mechanism in an alternate position.

Referring to FIG. 1, a router tool 10 shown includes a casing 12 having opposed handles 14 for holding the tool and a base plate 16 adapted to set on the surface to be worked. A motor 18 is supported rotatably within the casing 12 and includes a shaft 20 connected to a tool holding device 22 suitable to releasably hold a tool element or bit 24. Conventional mechanism 28 is incorporated for adjusting the height of the tool element 24 relative to the base plate 16 to provide for various depths of cut. See Patent 2,988,119 for example. Electric cord 28 (FIG. 2) is secured to the casing and has its wires connected to terminal block 29, and thus provides power for the motor 18. Switch 30 (FIG. 4) is secured to the casing and is connected in a typical electric circuit between the terminal block 29 and the motor, and is shifted between its ON and OFF positions for control of the tool by means of switch lever 32.

Referring now to FIGS. 2, 3, 4 and 5, it will be noted that casing 12 includes a cross member 36 having a journal 38 supported therein which in turn rotatably supports one end of shaft 20. The shaft projects beyond the journal 38, and includes an exposed key configuration 40 of rectangular shape. A switch actuating element 42 is rotatably mounted to the casing, with an opening being received on a projected end of journal 38, and an opening 46 in the switch actuating element receives and thereby laterally confines the switch lever 32. Thus, by oscillating the switch actuating element 42 as allowed in a slotted opening in the casing defined by opposing stops 49, the switch lever 32 is shifted to its positions corresponding, respectively, to the ON or OFF condition of the tool.

Also connected in adjacent relationship to the switch actuating element 42 is a shaft locking element 54 which is mounted to slide in a direction generally transverse to the shaft 20, toward and away from switch 30. To accommodate this movement, slots 56 are formed in the locking element, and posts 58 extending from the cross member 38 are received within these slots. The locking element is held in place by nuts 60 threaded onto the threaded ends 61 of the posts. One end of the locking element 54 projects through a channeled area 64 on casing 12 and further is downwardly turned to form as at 56 a gripping section for moving the locking element laterally in the manner desired. The locking element 54 has an opening 68, which in the furthest removed position of the locking element 54 from the switch 30, is in concentric relationship to the shaft and is sufficiently large to receive and accommodate free rotation of the shaft therein (see FIG. 2). A keyway 70 extends from

3

the opening in the direction of movement of the lock element 54 and is sized to receive in locking engagement, when the same are properly aligned, the key configuration 40 of the shaft. The keyway opening 70 is located in such a manner that it fully cooperates with the key to hold the shaft against rotation, when the locking element is shifted to its other position closest to the switch (see FIG. 5).

The switch actuating element 42 has an upwardly projecting tab 74 located between the shaft and the switch lever receiving opening 46 which is formed from that material punched out to form the opening. The free end 76 of the locking element 54 adjacent the switch overlies the switch actuating element 42 and is located immediately adjacent the tab 74. Moreover, the free end 76 is laterally displaced relative to its line of movement from the tab.

When the switch and thus the switch actuating element 42 is in the OFF position (FIG. 2), the locking element can be shifted so that the free end 76 moves past the tab 74 on the switch member 42 (FIG. 4). In this position, the shaft locking element 54 holds the shaft against rotation by means of the cooperating key 40 and keyway 70, and the free end 76 extends past and interferes with the tab 74 to prevent the switch actuating element 42 from being moved from its OFF position to its ON position. Conversely, when the locking element 54 is moved to its shaft nonlocking position (FIG. 2) end 76 is clear of the tab 74 on the switch actuating element 42 so that element 42 can be moved to the switch ON position (in phantom in FIG. 2) for operating the tool, and whereat the tab 74 prevents the shifting of the locking element 54 to its shaft locking position (FIG. 4). A detent 77, such as a plastic element biased by a rubber washer, is secured within an opening on the cross member 36 and releasably engages dimples 78 and 79 on the locking element 56 to maintain the locking element in its shaft locking or shaft nonlocking position, as desired.

To provide access to the safety lock-switch mechanism, a cap 80 is secured to the remainder of the casing and removably held in place by nuts 82 being threaded onto the threaded ends 61 of posts 58. The cap has recesses 84 formed therein to receive the cross member 36 of the casing, and the cap at the end of each recess confines and retains in place the respective switch actuating element 42 and locking element 54. A decorative plastic end piece 86 is also held in place against the cap by nuts 82.

It is thus readily seen that the subject safety lock-switch mechanism is fool proof and precludes the accidental, untimely shifting of the tool from its OFF condition to its ON condition when the shaft is being locked for the safe exchange of the tool elements 24, and further precludes locking the shaft when the tool is operating.

While only a single embodiment of the subject invention has been disclosed, it will be understood that various modifications can be made without departing from the invention concept, so that it is desired that the invention be limited only by the scope of the claims hereinafter following.

What is claimed is:

1. A combination safety lock-switch mechanism for a power tool having a holder for removably securing a replaceable tool, comprising in combination a powered rotatable shaft, and means connecting the shaft in driving relation to the holder; a locking element; means to support the locking element to move between alternate shaft locking and shaft nonlocking positions; means including cooperating components between the shaft and locking element operable when said locking element is in the shaft locking position to interlock to hold the shaft against rotation; a switch actuating element; means to support the switch actuating element to move between operating and nonoperating positions corresponding, respectively, to the operating and nonoperating conditions of the tool; a tab portion formed on the switch actuating element and defining an opening in said element, the power tool includ-

4

ing a switch actuated between the operating and nonoperating conditions of the tool by a switch lever, the switch lever being received and confined within the switch actuating element opening to be actuated in turn by movement of the switch actuating element, and means including the tab portion and an interfering part of the locking element operable in a first instance when the switch actuating element is in its operating position and the locking element is in its shaft nonlocking position to interfere with one another to preclude the shifting of the locking element to its shaft locking position, and operable in a second instance when the switch actuating element is in its nonoperating position and the locking element is in its shaft locking position to interfere with one another to preclude the shifting of the switch actuating element to its operating position.

2. A combination safety lock-switch mechanism according to claim 1, wherein the locking element includes an end portion, the switch actuating element includes a tab portion, and these portions are disposed to engage and interfere with one another according to the first and second instances previously recited.

3. A combination safety lock-switch mechanism according to claim 1, wherein posts extend in generally parallel spaced relationship to the shaft, and wherein the locking element includes elongated slots which receive the posts and secure thereby the locking element to move laterally of the shaft to its respective shaft locking and shaft nonlocking position.

4. A combination safety lock-switch mechanism according to claim 1, wherein detent means engage the locking element to releasably hold it in its respective shaft locking and shaft nonlocking positions.

5. A combination safety lock-switch mechanism for a power tool having a holder for removably securing a replaceable tool, comprising in combination a powered rotatable shaft, and means connecting the shaft in driving relation to the holder; a locking element; means to support the locking element for reciprocation in a direction transversely of the shaft between alternate shaft locking and shaft unlocking positions; means including cooperating key and keyway components between the shaft and locking element operable when properly aligned and said locking element is in the shaft locking position to interlock to hold the shaft against rotation; a switch actuating element; means to pivot the switch actuating element in adjacent relation to the locking element for rotation about the shaft between alternate operating and nonoperating positions corresponding, respectively, to the operating and nonoperating conditions of the tool; and cooperating means on the elements including a tab formed from one and extended transversely past a cooperating edge on the other operable in a first instance when the switch actuating element is in its operating position and the locking element is in its shaft nonlocking position to interfere with one another to preclude the shifting of the locking element to its shaft locking position, operable in a second instance when the switch actuating element is in its nonoperating position and the locking element is in its shaft locking position to interfere with one another to preclude the shifting of the switch actuating element to its operation position, and operable in a third instance when the locking element is in its nonlocking position to clear one another to permit the shifting of the switch actuating element between its operating and nonoperating positions.

6. A combination safety lock-switch mechanism according to claim 5, wherein detent means engage the locking element to releasably hold it in its respective shaft locking and shaft nonlocking positions.

7. A combination safety lock-switch mechanism according to claim 5, wherein the switch actuating element includes opposed surfaces thereon at a location spaced from the shaft, and wherein the power tool includes a switch having a switch lever for actuation thereof, which switch

5

lever is abutted by said surfaces for shifting the switch to ON and OFF positions upon movement of said switch actuating element to its respective operating and non-operating positions.

6

2,807,732 9/1957 Kurtovich.
2,897,302 7/1959 Godfrey et al. ----- 200—42
3,422,296 1/1969 Frank ----- 200—157 X

References Cited

5

ROBERT K. SCHAEFER, Primary Examiner
R. A. VANDERHYE, Assistant Examiner

UNITED STATES PATENTS

1,635,080 7/1927 Gilpin et al. ----- 70—185 X
1,805,164 5/1931 Carter ----- 310—77

U.S. Cl. X.R.

70—186; 310—68; 77—6; 200—50; 310—50