May 21, 1968 E. T. PIBER 3,383,943

ALL-SPEED LEVER LOCK

Filed July 8, 1966 2 Sheets-Sheet 1

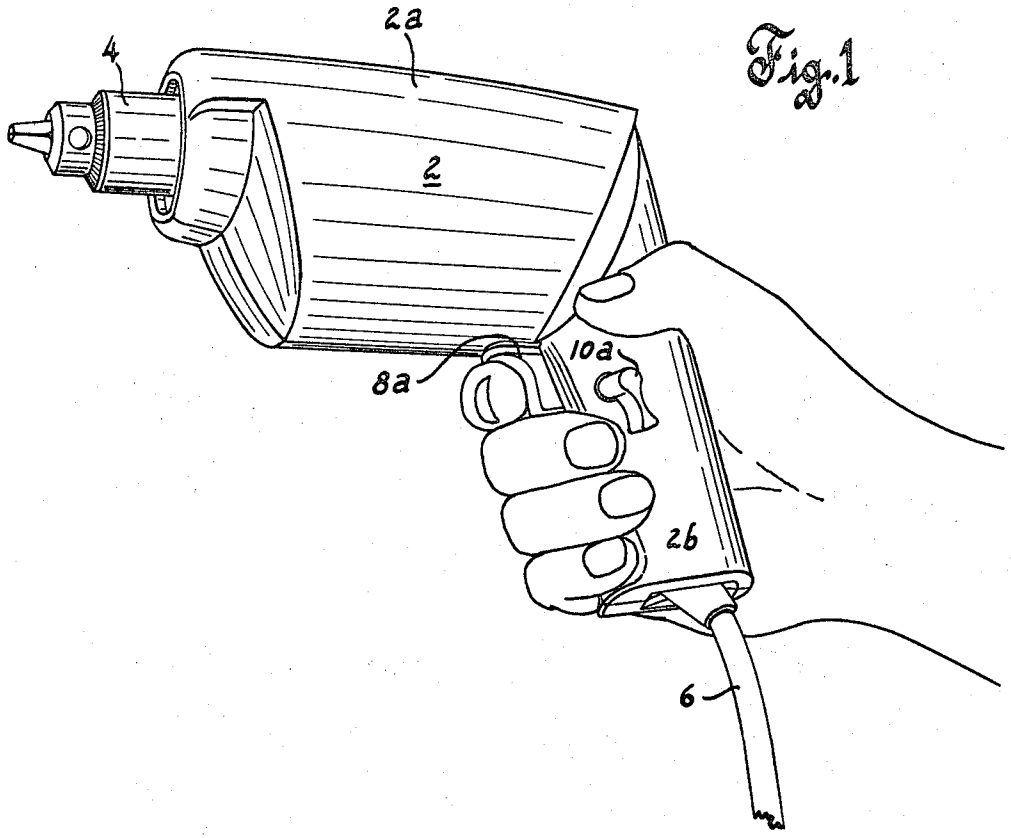



Fig. 1

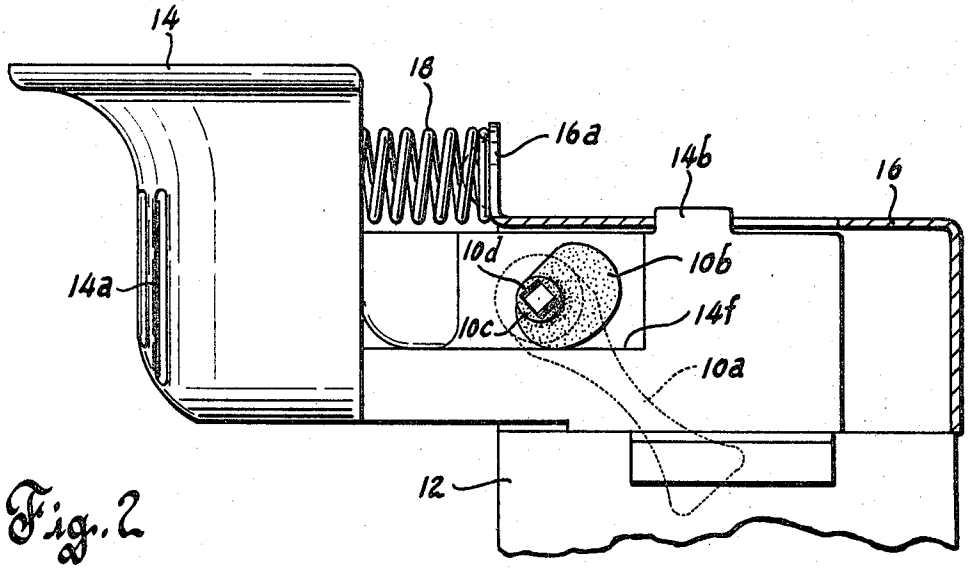



Fig. 2

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Fig. 3

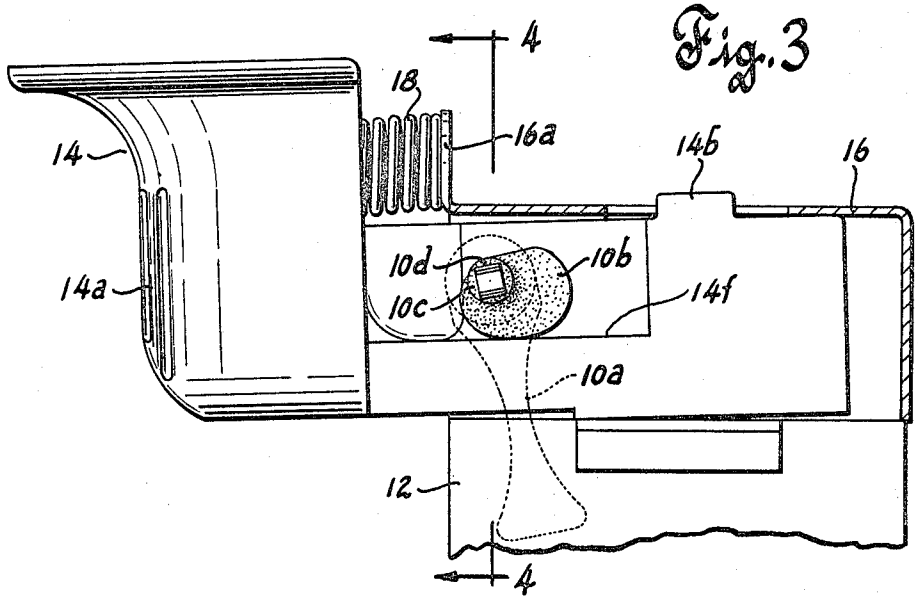



Fig. 4

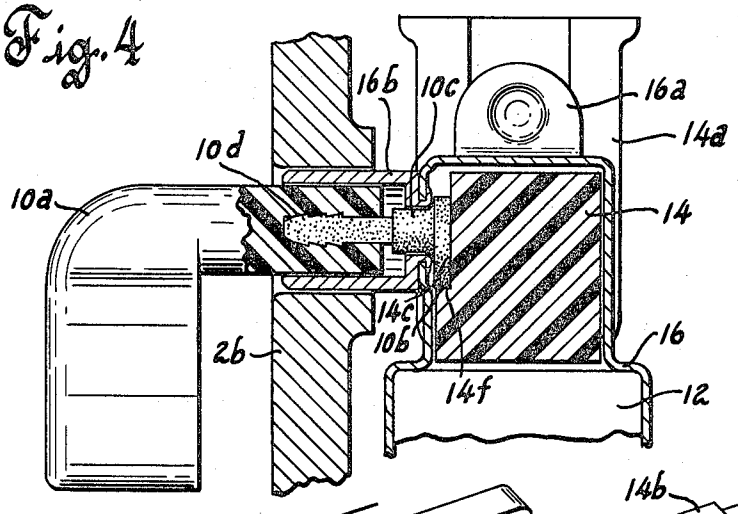
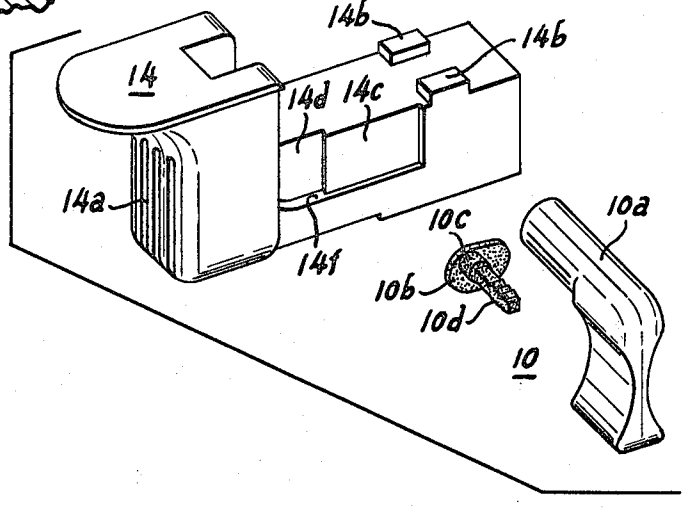



Fig. 5



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3,383,943

# ALL-SPEED LEVER LOCK

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7 Claims. (Cl. 74—529)

## ABSTRACT OF THE DISCLOSURE

An all-speed lever lock for the index finger operated trigger of a speed control switch for a portable tool. A swingable handle operable by the thumb of the user rotates a cam which frictionally grips a surface on the trigger to lock the trigger in any depressed position. The cam is automatically released by further depression of the trigger.

This invention relates to an all-speed lever lock for an electrical control device and more generally to a locking device for locking an actuator lever steplessly in any desired position.

While not limited thereto, the invention is especially applicable to an electric speed control device of a portable tool for locking the adjustable speed control lever in any desired, steplessly adjustable position from zero speed to full speed.

A general object of the invention is to provide an improved all speed lever lock, all speed lever lock being defined as means capable of locking a continuously adjustable speed control lever in any adjusted position thereof.

A more general object of the invention is to provide improved means for locking an actuator in any desired, continuously adjustable position of its total range of movement.

A more specific object of the invention is to provide a lever lock of the aforementioned type which is adapted for use with a conventional trigger operated speed control switch.

Another specific object of the invention is to provide improved means for locking a return spring biased actuator in any desired, steplessly adjustable position and incorporating locking means having increased gripping action in response to return spring force.

Another specific object of the invention is to provide improved locking means of the aforementioned increased gripping action type adapted for automatic release of the actuator in response to further depression of the actuator.

Another specific object of the invention is to provide improved means for locking a return spring biased control actuator of a hand-held portable tool in any desired, steplessly adjustable position which is adapted to be mounted on the tool handle in a position accessible for operation by the thumb of the user.

Other objects and advantages of the invention will hereinafter appear.

These and other objects and advantages of the invention and the mannor of obtaining them will best be understood by reference to the following description of an exemplary embodiment of an all speed lever lock taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a perspective view of a hand-held portable tool such as a power drill including an all speed lever lock constructed in accordance with the invention;

FIG. 2 is an enlarged front elevational view of an electric speed control device such as a speed control trigger switch and showing in non-locking association therewith the all speed lever lock partly in solid lines and partly in dotted lines;



FIG. 3 is an enlarged view like FIG. 2 but showing the all speed lever lock as being in locking association with the trigger switch;

FIG. 4 is a cross-sectional view taken along line 4—4 of FIG. 3; and

FIG. 5 is an exploded, isometric view of the trigger and all speed lever lock of FIGS. 2–4 in reduced scale.

Referring to FIG. 1, there is shown a portable electric tool such as a power drill. This power drill is of the conventional type having a housing **2** including a motor and drive gear assembly enclosing portion **2***a* and a handle portion **2***b* in which is mounted a speed control switch hereinafter described. A chuck **4** extends from the forward end of housing portion **2***a* and is adapted for receiving and securely holding a drill bit, screw-driver or the like. An insulated electric conductor **6** extends from the lower end of handle portion **2***b* and is adapted with a plug as is well known for plugging the drill into an electric power outlet.

A power control or speed control switch actuator such as a trigger **8***a* of a speed control switch hereinafter described extends from the forward side of the handle portion immediately below motor housing portion **2***a* so that it can be manipulated by the index finger of the user as shown in FIG. 1.

An actuator **10***a* of an all speed lever lock hereinafter described extends from the left face of handle portion **2***b* near the trigger so that it can be manipulated by the thumb of the user as will readily be apparent from FIG. 1.

Referring now to FIGS. 2–4, there is shown in enlarged views the all speed lever lock of the invention and the trigger operated speed control switch with which it is adapted to be used. Only so much of the trigger operated speed control switch as is needed for an understanding of the all speed lever lock is illustrated and described herein. Reference may be had to Harry W. Brown copending application Ser. No. 545,808, filed May 11, 1965, now Patent No. 3,329,842, dated July 4, 1964, for a more detailed disclosure of the trigger operated speed control switch.

As shown in FIGS. 2–4, the trigger operated speed control switch is provided with a base **12** which houses the elements and circuit of a solid state speed control system. A trigger **14** is arranged for linear sliding movement along the top of the base. The trigger and base are molded of insulating material and the trigger is clamped to the top of the base by a metal frame **16**. To bias the trigger normally into its off or open circuit position, an helical compression spring **18** is mounted between a groove in the trigger and an upstanding tab **16***a* on the frame.

As shown in FIG. 4, the switch frame is provided at a suitable location on its front wall with a round hole into which is riveted the reduced end portion of a bushing **16***b*, the enlarged portion of such bushing extending outwardly. In this manner, the hole in the enlarged portion of the bushing communicates with the interior of the switch frame through the hole in the reduced portion of the bushing. As will be apparent, this bushing may be like or the same as the bushing which accommodates the trigger lock pushbutton as shown in the aforementioned copending application. This bushing extends through a round hole in handle portion **2***b* of the drill and supports the all speed lever lock as shown in FIGS. 1 and 4.

As shown in FIGS. 2–5, a lever or trigger **14** of conventional configuration may be used and needs no modification for cooperation with the all speed lever lock of the invention. This trigger **14** has a grooved forward portion **14***a* shaped to fit and to be engaged by the index finger of the user. On top of the trigger, there are provided a pair of raised rectangular projections **14***b* which run in rectangular apertures in the top of the frame to

guide the trigger movement and to serve as stops at each end of the trigger movement. The face of the trigger adjacent bushing **16***b* is provided with a stepped, shallow, flat-bottomed depression having a shallow, relatively longer depression **14***c* at the right end and a deeper, relatively shorter depression **14***d* at the left end. These depressions are like or the same as the corresponding depressions shown in the aforementioned copending application and have an angular, under-cut shoulder therebetween. As will be apparent in the aforesaid copending application, depression **14***d* was originally provided to receive the locking end of a conventional locking push-button having a slightly flanged end which would engage the under-cut shoulder in its locking position to hold the trigger fully depressed. Depression **14***c* was originally provided to afford clearance for the flanged end of such locking button in its unlocked position. This stepped depression may be used without modification for cooperation with the all speed lever lock hereinafter described.

As shown in FIG. 5, the all speed lever lock **10** consists of two parts including a molded handle portion **10***a* and a cast cam portion **10***b*. The handle portion has a cylindrical shank for receipt in bushing **16***b* and for rotation therein and a radial handle portion forming a crank whereby the shank can be turned. As shown in FIG. 4, this shank portion is provided with a square hole extending axially partway thereinto for receiving the shaft of cam portion **10***b*. Cam portion **10***b* consists of an eccentric cam having a shaft extending therefrom for rigidly securing the same to the handle portion when the all speed lever lock is assembled onto the portable tool. As shown in FIGS. 4 and 5, the shaft is provided with a short cylindrical portion **10***c* immediately adjacent the cam which forms a journal for rotation within the reduced portion of bushing **16***b*. The remainder of this shaft has a relatively longer substantially square portion friction fitting into the square hole in the shank of the handle portion. This square portion of the shaft may be provided on opposite surfaces thereof, as shown in FIG. 4, with serrations **10***e* directed so as to permit insertion of the shaft in the hole but which bite into the shank if attempt is made to pull the shaft from the hole.

As shown in FIGS. 4 and 5, depressions **14***c* and **14***d* extend from the upper surface of the trigger down the wall a predetermined distance ending in a narrow, flat, horizontal shoulder **14***f*. It is this flat, horizontal shoulder which cooperates with cam portion **10***b* to provide locking of the lever or trigger **14** in any desired position.

FIG. 2 shows the trigger in its off position. In this position, spring **18** has restored trigger **14** all the way to the left wherein projections **14***b* have stopped against the left ends of the apertures in the frame. As shown in dotted lines in FIG. 2, handle portion **10***a* of the all speed lever lock has been swung from a downwardly depending position counterclockwise about 45 degrees toward the right. In this position, the lower left-hand portion of cam **10***b* rests lightly on shoulder **14***f* so that the trigger is not restrained thereby from moving. In this position, it will be noted that the largest contour of the cam extends toward the right and upwardly. Now when the trigger is pulled back by the index finger to any speed position desired such as that shown in FIG. 3 for example, the operator can use his thumb to push on handle portion **10***a* so as to lock the trigger in such desired position.

The locking occurs as follows. Pushing on the handle portion of the all speed lever lock causes cam **10***b* to be rotated clockwise. In view of the contour with which the cam is provided as shown in FIG. 3, this rotation brings an increasingly larger portion of the cam down against shoulder **14***f* of the trigger. Shoulder **14***f* has a smooth surface whereas cam **10***b* is a casting of metal such as zinc. Since the cam is a casting, the contoured edge thereof that frictionally engages shoulder **14***f* is not very smooth but instead has a natural roughness such as results from casting. In other words, the operative edge of the cam is not machined smooth but is left with a slight roughness afforded in casting it. This slight roughness is enough to provide a good frictional grip on the smooth surface of the trigger to lock the trigger in any position, the trigger being molded of "nylon" or the like.

As will be apparent, when the trigger is disengaged by the user's index finger, spring **18** biases the trigger in the left-hand direction in FIG. 3. The friction between cam **10***b* and shoulder **14***f* tends to cause further clockwise rotation of the cam to grip the trigger more tightly to positively lock the same. This is due to the fact that the tendency to clockwise rotation tends to cause a larger portion of the cam to be forced against the trigger thereby to grip the trigger between the cam and the top of the switch base.

The all speed lever lock may be released in either of two ways to allow spring **18** to return the trigger to its off position. The user may grasp handle **10***a* of the lever lock with his other hand and rotate it counterclockwise to disengage the trigger. Alternatively, the user may depress the trigger a small amount with his index finger and then relax the pressure on the trigger. Such small amount of depression automatically releases the lever lock by rotating cam **10***b* counterclockwise so that its frictional grip on shoulder **14***f* of the trigger is released. When finger pressure on the trigger is then relaxed, spring **18** restores the trigger to its off position. During such restoration, shoulder **14***f* slides under the cam freely since no locking force is being applied.

While the apparatus hereinbefore described is effectively adapted to fulfill the objects stated, it is to be understood that I do not intend to confine my invention to the particular preferred embodiment of all speed lever lock disclosed, inasmuch as it is susceptible of various modifications without departing from the scope of the appended claims. For example, it is apparent that the invention hereinbefore disclosed is not limited to use with a linearly movable lever such as trigger **14** and its linear locking shoulder **14***f*. It may also be used to lock or latch a lever having rotary or other type of motion provided that the surface or shoulder equivalent to shoulder **14***f* remains at a substantially constant distance from the rotary axis of the cam when such lever is actuated.

I claim:

**1.** In an electrical device having a handle portion and a control device mounted in the handle portion and including an actuating lever extending from the handle portion for manipulation by a finger of the user, the improvement comprising:

means for locking said actuating lever in any adjusted position thereof comprising:

a frictional gripping member mounted on the control device for gripping a surface of the actuating lever;

and a handle rigidly secured to said frictional gripping member and extending from the handle portion for manipulation by the thumb of the user.

**2.** The invention defined in claim **1**, wherein said frictional gripping member comprises:

an eccentric cam mounted on the control device for rotary motion so that a gradually larger portion thereof bears against the surface of the actuating lever when its handle is rotated.

**3.** The invention defined in claim **1**, wherein said handle comprises:

a rotary portion journaled on the control device;

and a crank extending from said rotary portion which can be pushed by the thumb of the user to rotate said rotary portion.

**4.** In a portable electric tool having a handle portion and a continuously adjustable speed control device mounted therein including a spring-biased movable operating lever having a smooth shoulder surface formed in one side thereof and adapted to be actuated by the index finger of the user to control the speed of the tool;

an all speed lever lock comprising:

an eccentric cam journaled for rotary motion adjacent the shoulder surface of the operating lever and being rotatable to grip said shoulder surface and lock the operating lever in any adjusted position;

said eccentric cam having a shaft extending outwardly from the control device;

a mounting sleeve secured to the control device and having a reduced end portion in which said cam shaft is journaled;

and a handle journaled in the larger portion of said sleeve and rigidly secured to said cam shaft for rotating the latter.

5. The invention defined in claim 4, wherein said cam shaft comprises:

a cylindrical portion immediately adjacent said cam for rotation in the reduced end portion of said sleeve;

and a flat sided portion extending into a complementary hole in said handle to prevent relative rotation therebetween.

6. The invention defined in claim 5, wherein said cam shaft further comprises:



serrations on said flat sided portion arranged in a direction permitting insertion thereof into the hole in the handle but which bite into the handle to prevent subsequent separation thereof.

7. The invention defined in claim 4, wherein said mounting sleeve comprises:

a metal tube with its reduced end portion extending through a hole in the control device and flared to secure it to the control device and to provide a bearing in which said cam shaft is rotatably supported.

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