

[54] **TRIGGER SWITCH WITH LATCH AND
VERNIER SPEED ADJUSTING SHAFT**

[75] Inventor: **Earl T. Piber**, Oconomowoc, Wis.

[73] Assignee: **Cutler Hammer, Inc.**, Milwaukee,
Wis.

[22] Filed: **July 31, 1973**

[21] Appl. No.: **384,258**

[52] U.S. Cl. **200/321, 317/102, 200/157,
200/328**

[51] Int. Cl. **H01h 9/06, H01h 21/10**

[58] Field of Search.. 200/156, 157, 169 PB, 172 R,
200/172 A, 321, 322, 328; 310/50; 338/198,
200; 317/102

[56] **References Cited**

UNITED STATES PATENTS

3,143,606	8/1964	Brown.....	200/157
3,194,898	7/1965	Thomas	200/157
3,383,943	5/1968	Piber.....	200/157
3,456,230	7/1969	Matthews.....	338/200
3,641,471	2/1972	Labude	338/200

3,711,666	1/1973	Sahrbacker	200/157
3,775,576	11/1973	Brown.....	200/157

Primary Examiner—Robert K. Schaefer

Assistant Examiner—Gerald P. Tolin

Attorney, Agent, or Firm—H. R. Rather; Wm. A.
Autio

[57] **ABSTRACT**

A self-enclosed variable speed trigger switch adapted for mounting in the handle of a portable electric tool. The speed adjusting mechanism comprises a catch block movable by a stop shaft threaded therethrough with the rear end of the stop shaft abutting a wall in the trigger. Thus, the rear end of this stop shaft is placed in compression to positively take up the trigger return spring force when the lock pin is engaged on the side shoulder of the catch block. This relieves the rotary speed adjusting wheel that is coupled to the front end of the stop shaft of any tensile force and thus enables this wheel to be located in a transverse slot in the trigger so as not to interfere with the finger-engaging surface.

5 Claims, 4 Drawing Figures

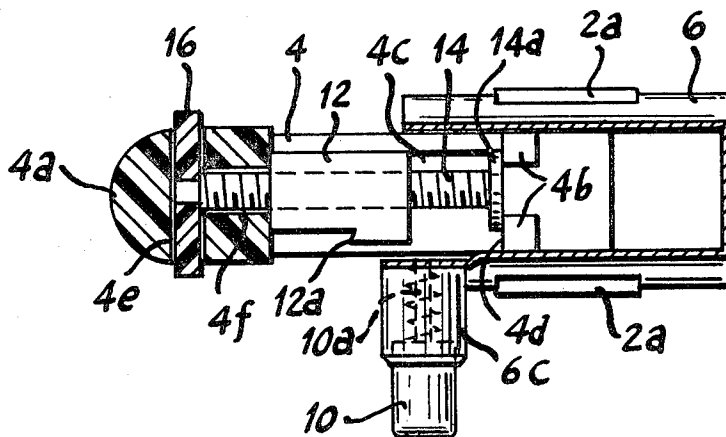


Fig. 1

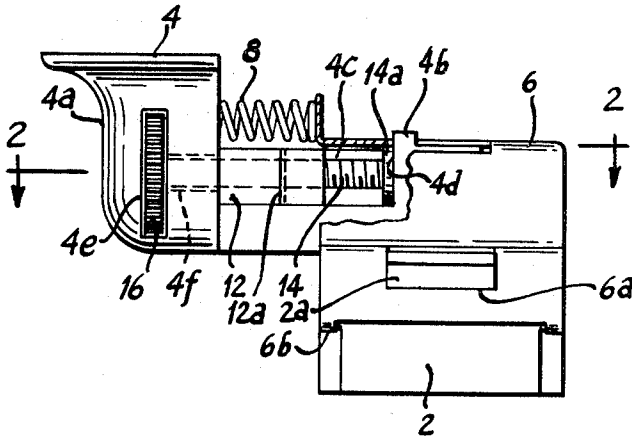


Fig. 2

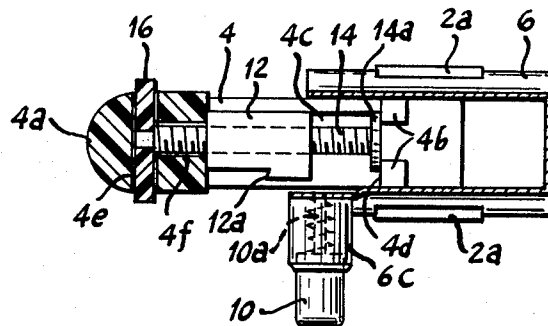


Fig. 3

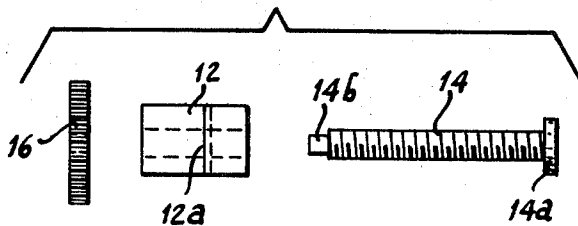
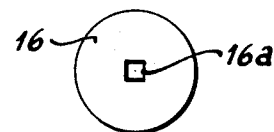


Fig. 4



TRIGGER SWITCH WITH LATCH AND VERNIER SPEED ADJUSTING SHAFT

BACKGROUND OF THE INVENTION

Rotary knob adjusted trigger locks have been known heretofore. However, these prior devices have had certain disadvantages. Because the rotary shaft was placed in tension by the knob abutting the trigger face in order to take up the force of the trigger return spring, the knob and shaft were made integral to prevent the knob from being pulled loose from the shaft. The only way to assemble this integral member was to insert the shaft through the front face of the trigger. Consequently, the knob interfered with the finger-engaging surface of the trigger into which it was recessed.

While these prior devices have been useful for their intended purposes, this invention relates to improvements thereon.

SUMMARY OF THE INVENTION

This invention relates to dial-a-speed trigger switches and more particularly to speed adjusting mechanisms built thereinto.

An object of the invention is to provide an improved self-enclosed variable speed trigger switch.

A more specific object of the invention is to provide a variable speed trigger switch with an improved speed adjusting mechanism.

Another specific object of the invention is to provide a self-enclosed variable speed trigger switch with an improved vernier speed adjusting mechanism that does not impair the fingerengaging surface of the trigger.

Another specific object of the invention is to provide a variable speed trigger switch with an improved speed adjusting mechanism affording a positive trigger stop against the return spring force.

Another object of the invention is to provide a speed adjusting mechanism that is simple in construction and assembly and efficient in operation.

Other objects and advantages of the invention will hereinafter appear.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an enlarged left side elevational view of a dial-a-speed trigger switch constructed in accordance with the invention;

FIG. 2 is a cross-sectional view taken substantially along line 2—2 of FIG. 1;

FIG. 3 is a left side elevational view of the three parts of the speed adjusting mechanism prior to assembly into the trigger switch of FIGS. 1 and 2; and

FIG. 4 is a front elevational view of the rotary speed adjusting wheel used in the trigger switch of FIGS. 1 and 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, there is shown a self-enclosed variable speed trigger switch constructed in accordance with the invention. As shown therein, it comprises a molded base 2 of insulating material that houses the solid state speed control circuit such as that shown in H. W. Brown copending application Ser. No. 233,621, filed Mar. 10, 1972, now Pat. No. 3,775,576, and assigned to the assignee of this invention.

A slidable trigger 4 is mounted on top of the base and is held thereon by a frame 6, being biased in the forward

direction by a helical compression spring 8. The frame is held on the base by suitable projections 2a on each side of the base that enter corresponding apertures 6a in the skirts of the frame and tabs 6b bent into notches in the base. For the purpose of connecting this speed control circuit to an external power supply and load, conductors (not shown) may extend out through holes in the bottom of the base or connector clips may be provided within the base onto which bare conductors may be pushed in through the bottom holes as shown in the aforementioned H. W. Brown copending application.

The bottom of the part of the trigger that slides over the base is provided with a suitable configuration for operating the switch contacts and the variable resistor such as shown in the aforementioned H. W. Brown copending application. Thus, upon initial depression of the trigger, the on-off switch contacts close the circuit from the A.C. power supply through the SCR variable speed circuit to the load which may be a portable drill motor. Upon further depression of the trigger, the slider moves along the variable resistor to decrease the resistance value in circuit as shown in FIG. 9 of the aforementioned H. W. Brown patent. This reduction in resistance in the firing circuit advances the firing angle of the SCR to increase the power applied to the drill motor thereby to increase the motor speed. At the end of the trigger depression, the shunting contact closes to by-pass the SCR variable speed circuit for full-speed operation of the drill.

The forward part of the trigger is provided with a rounded surface 4a as shown in FIG. 2 that is engaged by the forefinger of the user to pull the trigger against the bias of spring 8 in operation.

The top of the trigger is provided with a pair of integrally molded upward projections 4b that extend up through rectangular apertures in the frame to function as stops against the ends of these apertures in known manner.

The frame is provided with the usual mounting bushing 6c for a lock button 10 having a lock pin 10a attached thereto that engages a shoulder 12a in the left side of a catch block 12 to lock the trigger in its depressed position, this lock button being spring biased as shown in dotted lines in FIG. 2 to cause it to snap out for automatic release upon slight further depression of the trigger.

The speed adjusting mechanism comprises the aforementioned catch block 12, a rotary stop shaft 14 threaded through the catch block, and a knurled rotary wheel 16 secured to the forward end of the stop shaft.

The trigger is provided with a recess 4c as shown in FIGS. 1 and 2 for accommodating the catch block for limited forward-rearward movement. This recess is provided with a rear wall 4d against which enlarged rear end 14a of the stop shaft abuts, as shown in FIGS. 1 and 2, as a positive stop to take up the force of return spring 8 when the trigger has been depressed and lock button 10 has been engaged in shoulder 12a.

The trigger is also provided with a transverse slot 4e located rearwardly of finger-engaging surface 4a for freely accommodating rotary wheel 16. A hole 4f extends from recess 4c to this transverse slot for accommodating a section of shaft 14.

As will be apparent from FIG. 3, shaft 14 is first threaded through catch block 12. Wheel 16 is then inserted into slot 4e and held therein while the forward

end of the shaft is inserted from recess 4c through hole 4f into slot 4e. The wheel or the shaft or both are then rotated until square forward end 14b of the shaft registers with square hole 16a of the wheel shown in FIG. 4 and the shaft is pressed in to securely lock the two together. It will be apparent that there will be no tensile force tending to pull the wheel from the shaft because the return spring restraining force will be applied from the trigger through rear wall 4d of the recess, rear end 14a and stop shaft 14, and catch block 12 to lock pin 10a.

For ease of assembly, hole 4f in the trigger may be slightly larger than the shaft or may flare upwardly at its rear end or the shaft may have sufficient resiliency to afford bending the same to get the forward end of it through the hole before its enlarged rear end drops down into the recess.

When so assembled, the trigger may be depressed sufficiently to allow lock pin 10a to be hooked on shoulder 12a of the catch block and retained therein upon release of the trigger. Wheel 16 may be then rotated for vernier adjustment of the extent of trigger depression, and, consequently, the speed of the motor is controlled by this trigger switch. The peripheral portions of the wheel extend out beyond the left and right sides of the trigger as shown in FIG. 2 to facilitate rotation thereof. When this speed setting wheel is adjusted, the stop shaft rotates with it and the enlarged rear end of the stop shaft spins on the rear wall of the recess. The shaft being threaded in the catch block, rotation of this shaft causes the shaft to move steplessly either rearwardly or forwardly, depending on the direction of rotation, and the trigger to move with the shaft under the force of spring 8, the pitch of the thread affording vernier adjustment of the position of the trigger relative to the base. Thus, pullback of the forefinger constitutes course adjustment of the trigger whereupon the lock button may be engaged and rotation of the wheel thereafter with the lock button engaged constitutes vernier adjustment of the trigger and the motor speed.

When it is desired to turn the switch off, the trigger is depressed slightly to allow the spring-biased lock button to snap out of the catch block shoulder whereupon release of the trigger allows it to be returned to off position by its return spring action.

While the apparatus hereinbefore described is effectively adapted to fulfill the objects stated, it is to be understood that the invention is not intended to be confined to the particular preferred embodiment of dial-a-speed trigger switch disclosed, inasmuch as it is susceptible of various modifications without departing from the scope of the appended claims.

I claim:

1. In a trigger switch the combination comprising a housing; a spring-biased trigger slidable mounted for a slidable movement on the housing and having a recessed wall portion a lock pin mounted on the housing; the improvement comprising:

vernier adjusting means and means mounting it in the

trigger comprising:

an adjustable block having a catch in removable engagement with the lock pin;
a shaft threaded through said block, carried by said trigger and having a rear end abutting and rotatable on said recessed wall portion to take up the force of the trigger return spring when the lock is engaged in said catch;
and an adjusting wheel on the forward end of said shaft for rotating said shaft to adjust the position of the trigger relative to said block.

2. The invention defined in claim 1, wherein said means mounting said vernier adjusting means in the trigger comprises:

a recess in the trigger providing space for forward-rearward movement of said block;
a transverse slot spaced forwardly of said recess for accommodating said adjusting wheel;
and a hole between said recess and said slot through which said shaft extends.

3. The invention defined in claim 2 wherein:

said adjusting wheel is provided with a mounting hole at its center and said shaft is provided with a complementary forward end received snugly and non-rotatably in said mounting hole to afford rotation of said shaft by said adjusting wheel.

4. The invention defined in claim 3, wherein:

peripheral portions of said adjusting wheel stick out from opposite sides of said trigger for rotation by the user.

5. A self-enclosed variable speed trigger switch adapted for mounting in the handle of a portable electric tool comprising:

an insulating housing for enclosing the speed control circuit;
a trigger;
a frame mounting said trigger for sliding movement along said housing to operate the speed control circuit therein;
a spring biasing said trigger into its extended "off" position from which it is depressed by the forefinger of the user into its "on" position;
a spring-biased lock pin mounted on said frame accessible to the thumb of the user;
and speed adjusting means comprising:
a recess in said trigger having a rear wall;
a catch block within said recess and having a catch in movable engagement with said lock pin;
a stop shaft threaded through said catch block and having a rear end abutting said rear wall and rotatable thereon;
a transverse slot in said trigger;
a rotary wheel in said slot with its opposite sides extending outside thereof for rotation by the user;
and a hole between said recess and said slot through which said shaft extends into non-rotary engagement with said wheel.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,869,591
DATED : March 4, 1975
INVENTOR(S) : Earl T. Piber

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 65, reads:

"233,621, filed Mar. 10, 1972, now Patent No. 3,775,576",
and should read:

-- 233,621, filed Mar. 10, 1972, now Patent No.
3,775,576 dated November 27, 1973 --;

Column 3, line 55, reads:

"trigger slidable mounted"
and should read:

-- trigger slidably mounted --;

Column 3, line 56, "slidable" should be deleted;

Column 3, line 58, "the improvement comprising" should be
deleted;

Claim 5, line 49, reads:

"in movable engagement"
and should read:

-- in removable engagement --.

Signed and Sealed this

twenty-fifth Day of November 1975

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks