May 10, 1960 D. W. JOHNSON 2,936,349

INTERLOCKED TRIGGER AND REVERSING SWITCHES

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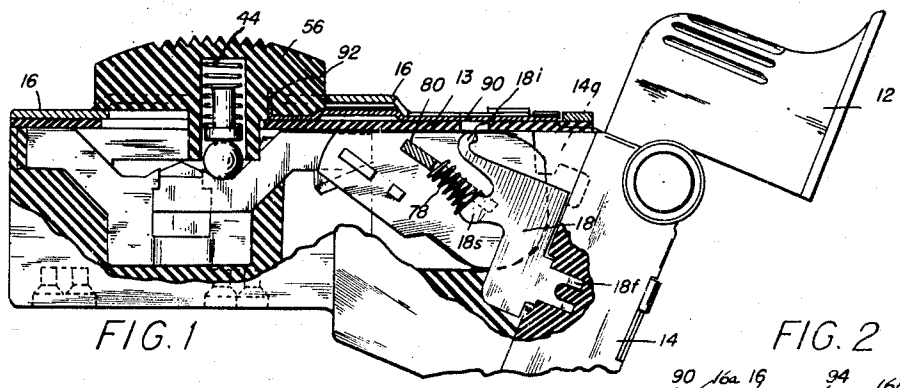
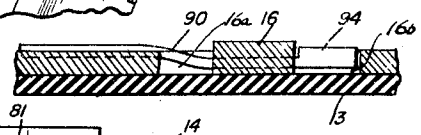


FIG. 1

FIG. 2



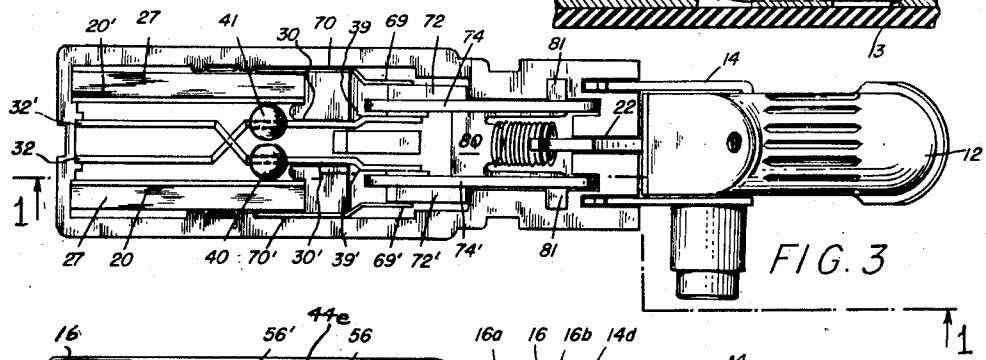


FIG. 3

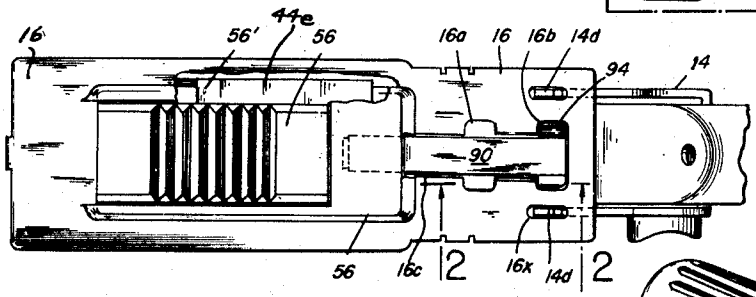


FIG. 4

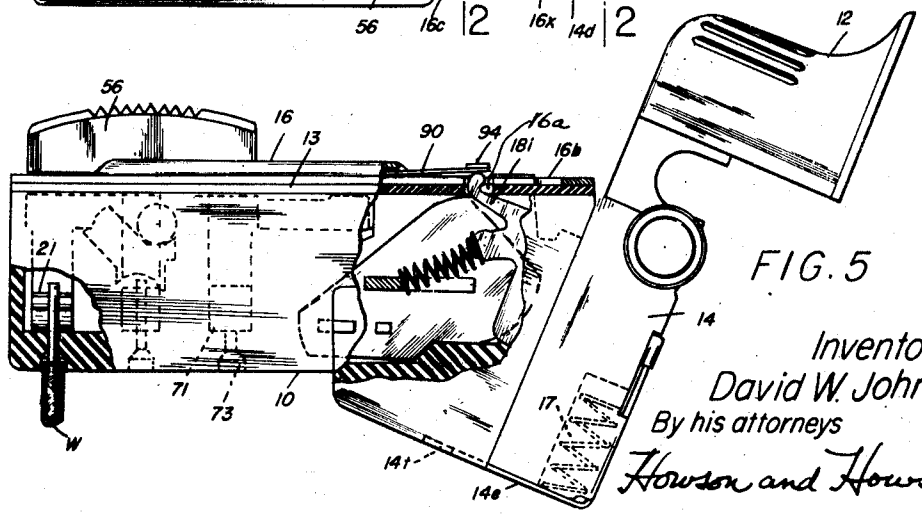


FIG. 5

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INTERLOCKED TRIGGER AND REVERSING SWITCHES

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9 Claims. (Cl. 200—50)

This invention relates to electric switches and more particularly to electric switch devices of the type commonly mounted on a portable tool, preferably in or near the handle in position to be actuated by the finger of the tool operator.

In devices of this type, it is often necessary to provide a current reversing switch in connection with another switch to turn the current on and off (and which for convenience will be referred to as the control switch). These switches need to have their mechanisms interlocked so that the reversing switch can only be operated when the current is not flowing.

One object of the invention is to provide an improved interlocking mechanism between the control switch and the reversing switch to prevent operation of the reversing switch while the control switch is in position to conduct current which can be constructed and fabricated with minimum cost for labor and materials, but which will be durable and satisfactory in operation.

Other objects and advantages of the invention will appear as the invention is described in connection with the accompanying drawing.

In the drawing:

Fig. 1 is a side elevation view, partly broken away, of a switch device embodying the invention with the control switch operated.

Fig. 2 is a fragmentary detail view showing in section a portion of the interlocking mechanism.

Fig. 3 is a plan view with the operating member of the reversing switch and the cover removed from the base.

Fig. 4 is a plan view of the trigger, partly broken away, of the switch illustrated in Figs. 1 and 3.

Fig. 5 is a side elevation view, partly broken away, similar to Fig. 1, but with the control switch in open circuit position.

Referring to the drawing, the operating mechanism is housed in an insulating base **10** which is hollowed out to receive the various current-carrying and operating parts. The switch for controlling the flow or cutting off the flow of current is operated by a trigger member **12**, preferably made of molded insulating material and slidably mounted at one end of the base. The body of the trigger is held against the end of the base **10** by a sheet metal bracket **14** bent into U-shape with its transverse portion against the outside surface of the trigger and a T-shaped extension **14***t* at one end **14***e* (the lower end in Fig. 5), which end is bent perpendicularly to the transverse portion of the bracket. The head of the T lies in a T-shaped recess formed in the bottom of the base to hold the bracket and trigger in place.

To hold the bracket and trigger at the upper end (still referring to Fig. 5), lugs **14***d* extend up from forwardly extendings legs **14***a* at each side of the bracket into small rectangular apertures **16***x* in a sheet metal cover plate **16** which lies on top of the base **10**.

To maintain the trigger in the position of Fig. 5 which is the open-circuit position of the control switch, a coiled compression spring **17** is mounted in a recess molded into the lower end of the trigger with one end of the spring pressing against the lower end **14***e* of the bracket and the other pressing against the upper end of the recess urging the trigger upwardly, all referring to Fig. 5.

Carried by and moving rectilinearly with the trigger for the purpose of actuating the control switch mechanism is a stamped sheet metal member **18** having the form best illustrated in Fig. 1. To guide the motion of this actuating member, a slot slightly wider than the actuating member is formed centrally in the base at the trigger end thereof. A lug or foot **18***f* is fitted securely into a slot formed in the inner face of the trigger. Also formed on the actuating member are an interlocking finger **18***i* (hereinafter more fully described) and an overcenter spring operated finger **18***s*.

For controlling the flow of current through the control switch, moving bridging-contact elements **72**, **72'** are mounted upon parallel spaced insulating plates **74**, **74'** adapted to be moved by the control switch mechanism. The contact carrying plates are carried by an operating yoke **80** which is adapted to be moved overcenter between "on" and "off" positions by a coiled compression spring **78**. The yoke is preferably stamped in U-shape from sheet metal with trunnions **81** laterally extending outwardly from the ends of the arms into recesses formed in the inside surfaces of the side walls of the base on opposite sides of the cavity that is provided for the control mechanism. The trunnions preferably extend through long narrow apertures provided in the insulating contact carrying plates **74**. The side edges of the yoke also lie in these apertures so that the yoke and plates move as a unit.

A nub **84** on the inside edge of the transverse part of the yoke forms a seat for one end of the switch operating spring **78**. The opposite end of that spring is seated on the finger **18***s* of the actuating member **18** so that as the trigger and actuating member move from the position of Fig. 5 to the position of Fig. 2 when the trigger is depressed, the spring will move overcenter and the contact carrying plates and bridging contact elements will move likewise from the position of Fig. 5 to the position of Fig. 1.

Movement of the bridging contacts **72**, **72'** causes them to engage and disengage contact surfaces **39**, **69** and **39'**, **69'** of the contacts of the control and reversing switches, respectively, which are constructed and located as follows.

For the control switch, a pair of sheet metal contact strips **70**, **70'** is inserted edgewise in slots running lengthwise of the base **10** near the outside walls of the base. At one end of each of the contact strips **70**, **70'** are the contact faces **69**, **69'**. These are opposite contact faces **39**, **39'** of dual contact members of the reversing switch as will presently be described. The other ends of the contact members **70**, **70'** may be provided with terminal plate portions and screwless terminals (shown in dotted lines in Fig. 5) accessible through holes in the bottom of the base.

The reversing switch is in general similar to that in my prior Patent 2,789,170 of April 16, 1957. In general, it consists of a pair of sheet metal outer contact strips **20**, **20'** placed edgewise in the base and a pair of inner reversing contacts, designated generally by **30**, **30'**. The contacts **20'** and **70** (and likewise contacts **20** and **70'**) may be spaced apart and positioned by insulating bars or blocks **27** inserted edgewise between them in the base.

The outer contacts **20**, **20'** have terminal portions extending toward the bottom of the base and reversely bent to provide screwless terminals such as **21** (see Fig. 5) for connector wires *w*.

The reversing contacts **30**, **30'** are located between the contact and terminal members **20** and **20'**. The reversing contact members are dual purpose members, the portions toward one end serving as contacts for the reversing switch and the other portions at the opposite ends thereof serving as fixed contacts for the control switch. The dual contacts are of irregular shape, prefer-

ably being stamped from sheet metal and lying edgewise in slots formed in the switch base inwardly of and in the area between the contact and terminal members 20, 20'. In general, the dual contact members are parallel to each other and to members 20, 20'; but the right ends thereof (as viewed in Fig. 2) are formed to provide the contact surfaces 39, 39' for the control switch and are offset together with the midportions toward the opposite side walls of the base.

The opposite ends 32, 32' of the contact members 30, 30' (the left ends as viewed in Fig. 2) are thus crossed-over with respect to the surfaces 39, 39' so as to exchange positions, placing end 32 in substantial alignment with the midportion of the contact 30' and placing the end 32' in substantial alignment with the midportion of the contact 30.

The left ends 32, 32' of the contacts 30, 30' are recessed in their upper edges to provide seats for bridging contact balls 40, 41 which are movable lengthwise of the base. In the positions of Figs. 1 and 3, the bottom or inner surface of the ball 41 engages the edge of the midportion of the contact 30 while the outer surface of that ball engages the inside surface of the contact 20'. Likewise, the ball 40 engages the midportion of the contact 30' and the inside surface of the contact 20.

The balls are resiliently supported in spaced relation by springs 44 in pockets in a thumb piece 56. The thumb piece is slidable to cause the balls to ride over a hump of insulation 46 seated over the cross-over point of the contacts 30 and 30' and to move them into the position of Fig. 5. In that position, the ball 41 engages the side of contact 20' and the edge of the contact portion 32', while the ball 40 engages the side of contact 20 and the edge of contact portion 32.

The thumb piece is held in slidable relation with the cover 16 by ears 44*e* which extend laterally from its opposite side surfaces between the cover and a liner plate 13 of sheet insulation.

Interlocking of the control switch and the reversing switch is accomplished by providing a thin flexible sheet metal strip 90 movable with and connected to the thumb piece 56 by an end 92 bent up normal to the plane of the strip and lodged in the body of the thumb piece. The interlocking strip 90 extends beyond the thumb piece toward the trigger in a longitudinal opening punched out of the cover 16. The interlocking strip thus lies in the plane of the cover and is adapted to be moved along the longitudinal opening 16*c* when not interlocked, as will presently appear.

Two transverse spaced recesses 16*a* and 16*b* intersect the longitudinal opening 16*c*. Each recess is adapted to receive oppositely and laterally extending slightly bent ears 94 extending from the end of the strip 90. As the interlocking strip moves, it slides over the liner plate 13.

An aperture is provided in the liner plate directly above the finger 18*i* through which aperture that finger may extend when the trigger is in its normally upwardly pressed position as shown in Fig. 5. In such position, this interlocking finger 18*i* presses against the under surface of the interlocking strip 90 and bends that strip upwardly sufficiently to move the ears 94 above the recesses 16*a* or 16*b* as the case may be. In other words, these ears are elevated above the upper surface of the cover and, hence, when pressure is exerted on the thumb piece to move it either from the position of Fig. 5 to the position of Fig. 1, or vice versa, such sliding action can take place due to the movement of the ears 94 being above the surface of the cover.

On the contrary, when the trigger is depressed as indicated in Fig. 1, the interlocking finger 18*i* is withdrawn from the recess in the liner 13 and is disengaged from the interlocking plate 90 so that the interlocking plate will flex downwardly, seating the ears 94 in either the recesses 16*a* or 16*b*, depending upon which position the thumb piece and reversing switch then occupy.

The slight bend or curvature of the ears 94 provides additional surface width for engagement of the edges of the ears with the margins of the recesses 16*a* and 16*b* to more effectively prevent movement of the thumb piece and reversing switch while the control switch trigger is depressed and the control switch is in current-conducting position.

From the foregoing, it will be observed that the invention provides a very simple and inexpensive construction for interlocking the control switch and the reversing switch in an effective and positive manner so that the reversing switch cannot be operated while the control switch is in current-conducting position.

Modifications within the scope of the invention will occur to those skilled in the art. Therefore, the invention is not limited to the precise configuration and arrangement of parts illustrated and described.

What is claimed is:

1. A control switch having contacts, means to cause engagement and separation of said contacts including a manually operable member, in combination with a reversing switch having contacts and means to operate said reversing switch contacts, means interlocking said control switch and said reversing switch so that the latter may not be operated unless the former is in a given position, comprising an interlocking member movable with the operating means of said reversing switch, a fixed plate member engaged by said interlocking member in both of two positions of said reversing switch when said control switch is not in said given position, and a member movable with said manually operable control switch member causing disengagement of said interlocking member and said plate member when said control switch is in said given position.

2. The combination claimed in claim 1 in which said plate member has a plurality of recesses and the interlocking member has portions engageable in and movable from said recesses for locking and unlocking said reversing switch.

3. The combination claimed in claim 2 wherein the disengagement member when in said given position bends said interlocking member to disengage the latter from said plate recesses.

4. The combination as claimed in claim 1 in which the interlocking member is slidable in the plane of said plate member and has portions engageable in and movable out of recesses in said plate member for locking and unlocking said reversing switch.

5. The combination as claimed in claim 4 in which the interlocking member is flexible and said disengagement member when in said given position bends said interlocking member to disengage the latter from said plate recesses.

6. The combination claimed in claim 1 in which said interlocking member is flexible and said disengagement member when in said given position bends said interlocking member out of interlocking relation with said plate member.

7. The combination claimed in claim 6 having a base in which said switches are housed, said plate member being a cover for said base.

8. The combination claimed in claim 1 in which said interlocking member is slidable in the plane of said plate member and is flexible, and said disengagement member when in said given position bends said interlocking member out of interlocking relation with said plate member.

9. The combination claimed in claim 8 having a base in which said switches are housed, said plate member being a cover for said base.

References Cited in the file of this patent

UNITED STATES PATENTS

2,789,170 Johnson ---------- Apr. 16, 1957