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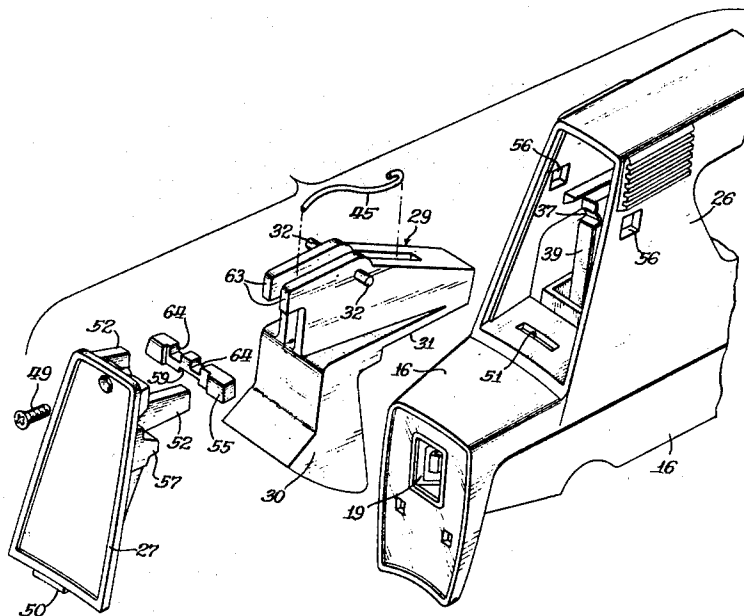
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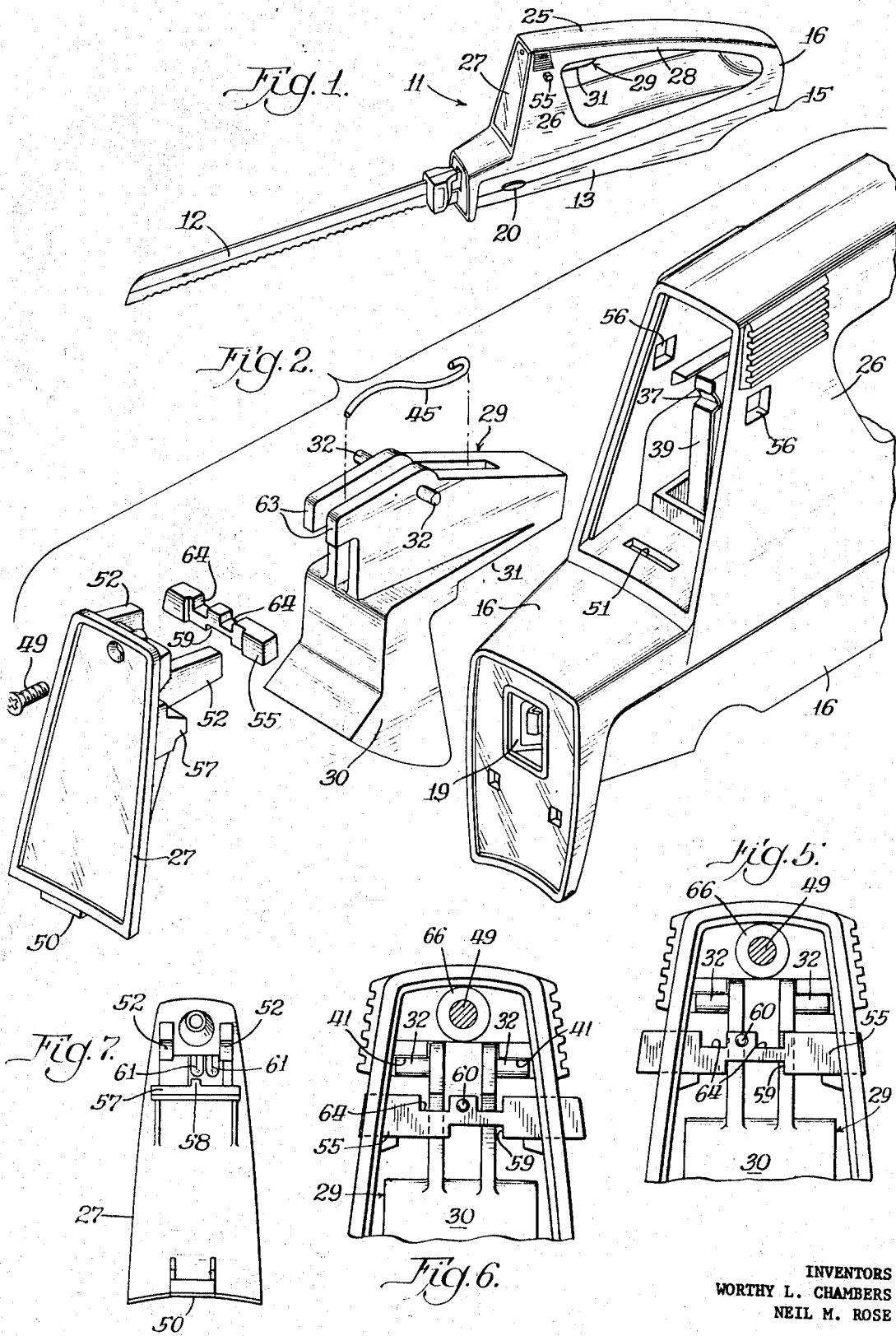
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[54] **TRIGGER SWITCH FOR ELECTRIC APPLIANCE**
7 Claims, 8 Drawing Figs.
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 [51] Int. Cl..... H01h 21/04

ABSTRACT: A trigger switch for an electric appliance having a simple lock or safety supported by the appliance housing and being movable between a trigger locking and trigger movement positions.





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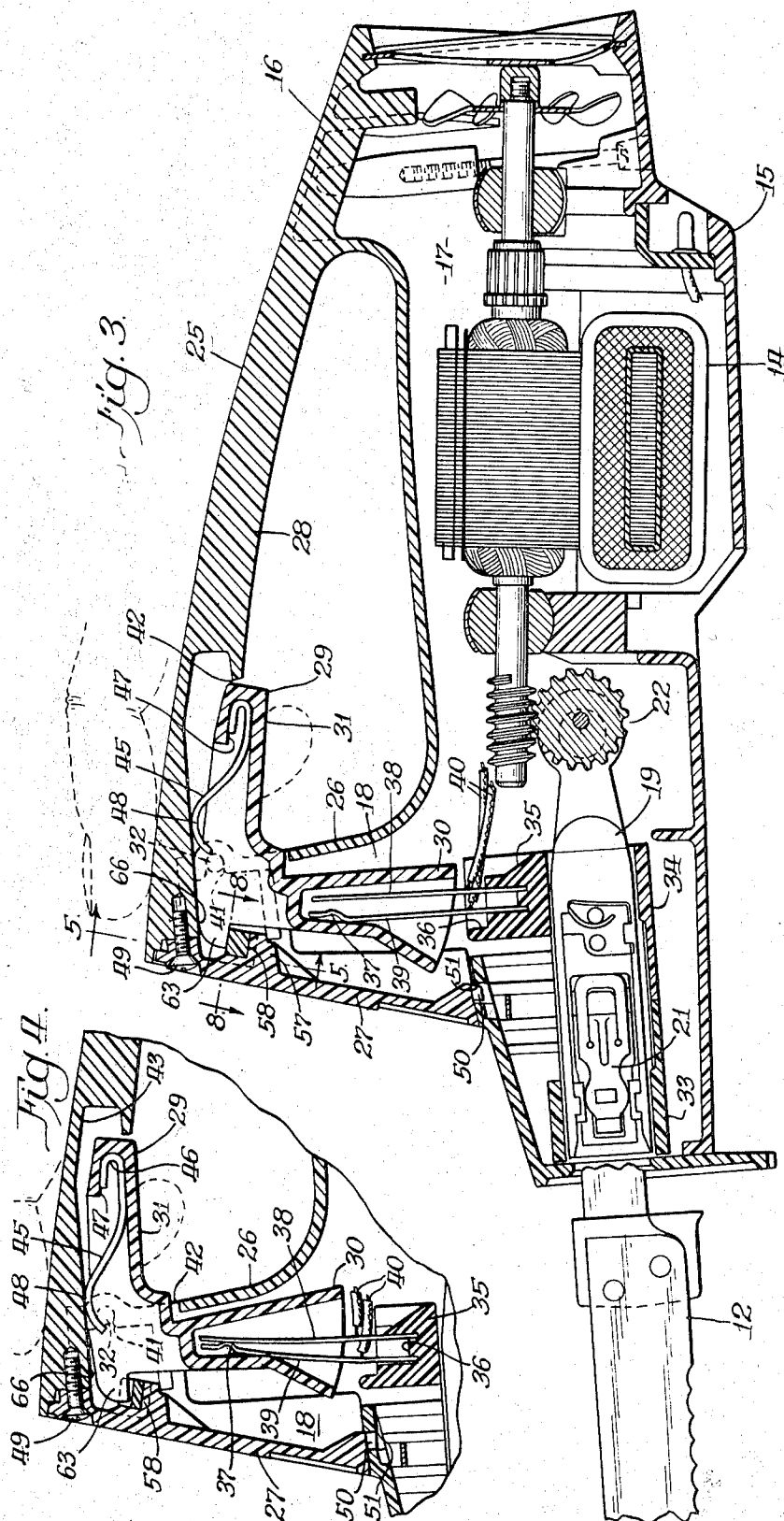
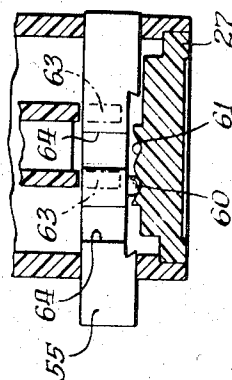


Fig. 8.



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TRIGGER SWITCH FOR ELECTRIC APPLIANCE

BACKGROUND OF THE INVENTION

This application is a division of copending application Ser. No. 652,322, filed July 10, 1967 now Pat. No. 3,461,556.

The electric carving knife has become an increasingly popular household appliance during the last several years. In its present form, the carving knife characteristically has a motor positioned within the handle, a pair of counterreciprocating blades extending from one end of the handle, and drivemeans interconnecting the motor and the support means for the blades. The blades are provided with serrated edges and are reciprocated at relatively high speeds, on the order of 2,500 strokes per minute. As a consequence of the serrated edge and the high-speed reciprocation, care must be exercised in order to avoid injury to the user of the knife.

In order to facilitate cleaning of the reciprocating blades, an arrangement is normally provided wherein the blades may be detached from the handle and motor housing so that the blades may be immersed in water. To accomplish the removal of the blades, a latch means is normally utilized wherein the blades are gripped with the fingers of one hand while the latch means is actuated with the other hand. The presence of an easily accessible control means, such as a trigger or button, presents the possibility of the user inadvertently actuating the control means during the insertion or removal of the blades. Such inadvertent actuation of the switch while the fingers are on the blades, may easily result in severe injury to the user. Accordingly, it has been conventional to provide the actuating switches on electric knives with a so-called safety or lock of the type used on firearms. The safety consists of a secondary switch which mechanically restrains the control switch from being operated. Because of the marginal need for a safety switch in a household appliance of this type, it is necessary that the switch be simple and easy to assemble to the appliance. It is also important that the safety switch be foolproof and effective in its operation.

SUMMARY OF THE INVENTION

The invention relates to a trigger-type control for a hand-held electric appliance and more specifically for an electric knife. A safety switch is provided which includes only a single part mounted in the appliance housing for lengthwise movement between a first position in which it locks the trigger against pivotal movement and a second position in which the trigger is released for movement to an actuated position. The cooperating portions of the housing serve to mount the trigger for pivotal movement and support the safety with a detent action for movement between the trigger restraining and trigger released positions. In addition, the trigger consists of a one-piece member having a manually actuable portion, a contact engaging portion, and a cuplike cover which encloses the switch contacts.

It is an object of the present invention to provide an improved control switch for a hand-held electric appliance.

It is a further object of the present invention to provide a trigger switch for an electric knife having a safety button reciprocally mounted in the appliance housing for locking the trigger against movement in one of the positions of the safety.

It is still another object of the present invention to provide an improved trigger switch for an electric appliance having a one-piece plastic member with a manually actuable portion on one end and a switch contact enclosing portion on the other end.

It is a further object of the present invention to provide a manually actuable trigger switch which is mounted for pivotal movement between interfitting portions of the housing.

Further objects and advantages of the invention will become apparent as the following description proceeds, and the features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, reference may be had to the accompanying drawings wherein:

FIG. 1 is a perspective view of an electric knife embodying my invention;

FIG. 2 is an enlarged exploded perspective view of the handle portion of the knife of FIG. 1;

FIG. 3 is a vertical sectional view of the electric knife shown in FIG. 1 taken substantially along the plane of the blades;

FIG. 4 is a fragmentary section view taken on the same plane as FIG. 3 but showing the trigger switch in its actuated position;

FIG. 5 is a sectional view taken on line 5-5 of FIG. 3 with the front cover of the housing removed showing the safety in the "safety lock" or restraining position;

FIG. 6 is a fragmentary sectional view identical to FIG. 5 but showing the safety in the "operate" or released position;

FIG. 7 is a rear elevational view of the front cover of the housing; and

FIG. 8 is an enlarged fragmentary sectional view taken on line 8-8 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, there is shown in FIG. 1 an electrically operated carving knife designated generally by reference numeral 11. The knife includes a pair of counter-reciprocating blades 12 and a housing 13 within which is enclosed an electric motor 14. The housing 13 is made up of a lower housing member 15 and an upper housing member 16 which interfit to form a motor chamber 17 and a switch chamber 18.

The armature bearings and field of the motor 14 are supported directly on the lower housing member 15. A pair of blade carriers 19 are provided which detachably support the blades 12 therein. Actuating buttons 20 (FIG. 1) in exposed position on the exterior of the housing 13 are interconnected to spring latches 21, which detachably secure the blades 12 to the blade carriers 19. To drivingly interconnect the motor 14 and the blade carriers 19, there is provided a transmission means 22 which consists of a worm, worm gear, eccentrics, and connecting rods. The structure of the motor, transmission, blade carriers, and blades is completely disclosed in Cousins et al. U.S. Pat. No. 3,417,469, granted Dec. 24, 1968, and assigned to the same assignee as the instant application. The instant invention relates to the actuating means for controlling the motor 14 and the disclosure of the instant application differs from the above cited Cousins et al. patent only insofar as the housing 13 is concerned and the manner in which the motor control switch is mounted in the housing.

The upper housing member 16 is formed with a loop handle 25 which extends above and parallel to the motor enclosing portion of the housing 13. The forward portion of the loop handle is defined by an upwardly extending column portion 26, which, along with a front cover 27, defines the switch chamber 18 within which a switch 24 is enclosed. Mounted within the column portion 26 and extending rearwardly along a handgrip portion 28 of the handle is a trigger 29.

The trigger 29 is generally L-shaped member having a downwardly extending switch cover 30 and a rearwardly extending manually actuable portion 31. A pair of trunnions 32 extend outwardly from the middle of the trigger 29 and provide for pivotally mounting trigger 29 with respect to the housing 13, as will be explained more completely below.

The blade carriers 19 are supported for reciprocating movement with respect to housing 13 by means of a front guide 33 and a rear guide 34, as shown in FIG. 3. The guides 33 and 34 are tubular members in which the blade carriers are slidably received. The blade carriers 19 and the guides 33 and 34 are collectively referred to as supporting and reciprocating means which supports the blades 12 and by means of motor 14 and transmission means 22 causes the blades to reciprocate. The

rear guide 34 for the blade carriers 19 is formed at its upper side with an integral switch support 35. An upwardly facing recess 36 in support 35 is formed with aligned grooves which receive and support a fixed switch contact 38 and a movable switch contact 39. Suitable leads 40 are provided which connect the switch contacts 38 and 39 in series with the motor 14. The contacts 38 and 39 are made of a resilient electrically conducting material, such as phosphor bronze, and the end of the movable contact 39 is formed with a bend 37 which is movable into engagement with the fixed contact 38 to complete the electrical circuit to the motor 14.

In providing a simple switch including a pair of exposed contacts, such as 38 and 39, problems arise in connection with the materials to be used in housing for the appliance. A so-called ABS material is generally used in an appliance housing such as an electric knife. The ABS material is flammable, however, and it is often required that exposed electrical parts, such as switch contacts 38, 39, be enclosed by nonflammable materials. For the purpose of satisfying these safety requirements, the trigger 29 is formed with a switch cover 30, which includes an upwardly extending recess 30a into which the contacts 38 and 39 protrude. By fabricating the trigger 29 of nylon, it is possible to fabricate the upper housing member 16 of a flammable material and still meet the most stringent safety requirements.

In order to mount the trigger 29 for pivotal movement, there are provided in the upper housing member 16 a pair of forwardly facing notches or grooves 41 which receive the trunnions 32. With the trigger 29 received in the column portion 26 of the handle with the trunnions 32 in the notches 41, the manually actuable portion 31 of the trigger extends rearwardly through an opening 42 in handle column 26 into hand grip portion 28 of the handle. The opening 42 extends into or connects with a recess 43, which is adopted to receive the trigger 29 in its actuated or depressed position, as is best shown in FIGS. 3 and 4.

In order to bias the trigger 29 in a clockwise position as shown in FIG. 3 to a position in which the portion 31 is available for manual actuation, a spring 45 is provided. To simplify assembly of the spring 45 and the trigger 29 to the upper housing member 16, one end of the spring 45 is formed with a bend 46 which inserts into a recess 47 thereby retaining the spring 45 assembled to the trigger 29. The other end of the spring 45 is formed with a curved portion 48, which extends into biasing engagement with the bottom of the recess 43 as is shown in FIGS. 3 and 4.

For the purpose of completing the switch housing 18 and to retain the trigger 29 in its position for pivotal movement, the front cover 27 is secured to the upper housing member 16 by means of a single assembly screw 49. The lower end of the cover 27 is provided with a projection 50, which is insertable into an opening 51 in the upper housing member 16 to retain the lower end of the cover 27 in position. The arrangement of the projection 50 and the opening 51 is best shown in the exploded perspective view, FIG. 2, and in the section views, FIGS. 3 and 4. Extending rearwardly from the upper portion of the cover 27 are bearing retainers 52, which engage the interior of the upper housing member 16 and close the notches 41 thereby trapping the trunnions 32 and completing the bearings for the trunnions 32 which pivotally mount trigger 29.

As is evident from the foregoing description, the trigger 29 is mounted in the loop handle 25 by means of trunnions 32 which extend into supporting engagement with the notches 41. The spring 45 biases the trigger 29 clockwise to the position shown in FIG. 3 in which the upper ends of the contacts 38 and 39 are spaced apart. When finger pressure is applied upwardly against the exposed portion 31 of the trigger 29, the trigger 29 rotates counterclockwise from the position shown in FIG. 3 to the position shown in FIG. 4. As a consequence of this rotary movement of the trigger 29, the interior of the switch cover 30 engages the movable contact 39 and biases it into engagement with the fixed contact 38 thereby completing

the electrical circuit to the motor 14 and energizing the knife 11. FIG. 4 shows the trigger 29 in its actuated position in which the manually actuable portion 31 has been urged upwardly into the handle recess 43 against the force of the spring 45 thereby causing the switch cover 30 to cause engagement of the contacts 38 and 39.

As was discussed above, it is considered desirable to provide a safety to prevent accidental energization of the motor 14 during the insertion or removal of the knife blades 12. Applicant has conceived a simple safety which consists only of a reciprocating plunger 55 which is received in spaced-apart openings 56 in opposite sides of the column portion 26 of the handle. In assembled position in the handle 25 extending through the openings 56, the opposite ends of the plunger 55 are exposed as shown in FIGS. 5 and 6. The front cover 27 cooperates with the plunger 55 to both limit its range of movement and to provide a detent action whereby the plunger 55 will be retained in either one of two positions.

For the purpose of limiting or establishing the range of movement of the plunger 55, the front cover 27 is formed with a horizontal wall 57 having an upwardly extending stop 58, as may be seen best in FIG. 7. When the front cover 27 and the plunger 55 are assembled to the handle 25, the stop 58 extends into an elongated cutout or notch 59 positioned along the bottom edge of the plunger 55, as is best shown in FIG. 2. The width of the notch 59 is such that about an eighth of an inch of movement is possible between the positions in which the stop 58 engages either end of the notch 59.

In order to retain the plunger 55 in the extreme positions of movement in either direction, the plunger 55 is formed with a small hemispherical projection 60, shown in FIGS. 5, 6, and 8. Cooperating with the projection 60 are two V-grooves 61 which extend vertically on the interior face of the front cover 27. Although the projection 60 is seated alternatively in one of the V-grooves 61 as shown in FIG. 8, the resilience of the plunger 55 permits the plunger to be moved lengthwise between positions in which the projection 60 engages either one of the V-grooves 61.

The purpose of the plunger 55 is to provide a safety by means of which the trigger 29 will be restrained from rotation even though the manually actuable portion 31 is engaged by the user. To accomplish this function, there are a pair of fingers 63 extending forwardly from the trigger 29. These fingers 63 are positioned to overlie the plunger 55, as shown in FIG. 5, where the plunger 55 is in the "safety lock" or restraining position. The upper surface of the plunger 55 is formed with a pair of spaced cutouts or notches 64, which serve as clearance spaces when aligned with the fingers 63 to permit rotation of the trigger 29 to the switch closing position. FIG. 6 shows the plunger 55 in the "operate" or released position in which the trigger 29 may be rotated to close the switch contacts 38, 39 and energize the motor. FIG. 4 shows clearly the manner in which each finger 63 moves downwardly into a notch 64 when the trigger 29 is rotated counterclockwise to actuate the switch.

In the light of the above discussion, it should be obvious that when the safety switch or plunger 55 is pushed to the left, as shown in FIG. 5, the fingers 63 will engage the plunger 55 adjacent the notches 64 thereby restraining the trigger 29 from rotating to the switch closing position. When the plunger 55 is displaced to the right, as shown in FIG. 6, the projection 60 will snap into the right V-groove as viewed in FIG. 8 and the fingers 63 will be aligned with the notches 64 thereby permitting limited movement of the trigger 29. It should be noted that the upper surface of the trigger 29 adjacent the fingers 63 abuts a boss 66 within which the assembly screw 49 is received in the upper housing member 16 thus limiting the clockwise rotation of the trigger 29 as viewed in FIG. 3.

It should be appreciated that the trigger 29 and the plunger 55 provide a simple and convenient means for controlling the operation of the electric carving knife 11. The manually actuable portion 31 of the trigger 29 is conveniently located on the underside of the handle grip portion 28 so that it may be easily

actuated by the finger of a user as shown in dotted lines in FIGS. 3 and 4. By supporting the switch contacts 38 and 39 on the guide for the blade carriers with the contacts extending upwardly into the column portion 26 of the handle, it is unnecessary to provide any actuating linkage between the trigger and the switch itself. In addition, the downwardly extending cup-shaped portion 30 of the trigger 29 covers the switch contacts 38 and 39 and provides a substantial safety factor permitting the upper housing member 16 to be made by a flammable ABS material while necessitating the use of nylon only for the trigger 29.

The plunger or safety switch 55 is supported simply by means of the openings 56 in the column portion 26, while the front cover 27 provides the detent action for the plunger 55 and limits the extent of possible movement. The cover 27 also holds the trunnions 32 for the trigger 29 in their pivotally supported position with respect to the upper cover member 16. By suitable adaptation of the housing parts 16 and 27, it has been possible to obtain a convenient and smooth operating trigger switch with a safety latch utilizing essentially only two molded plastic parts.

While there has been shown and described a particular embodiment of the invention, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention, and therefore, it is intended by the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

I claim:

1. A power operated electric knife comprising a housing enclosing an electric motor, means in said housing drivingly connecting said motor to a reciprocating blade carrier, a switch comprising a pair of spaced contacts connected in series circuit with said motor, a trigger pivotally mounted in said housing and having a portion extending outside of said housing, a switch cover formed integrally with said trigger and movable into switch closing position with respect to said contacts.

2. The power operated electric knife of claim 1 wherein said trigger comprises a lever pivoted intermediate its ends, said switch cover being formed by an inwardly extending recess at one end thereof, said switch contacts extending into said

recess and having engaging portions at the inner end of said recess and said trigger being formed of a nonflammable electrically insulating plastic.

3. The power operated electric knife of claim 1 wherein said housing defines a motor chamber and a switch chamber, means supporting said contacts in said motor chamber, said contacts having unsupported ends extending into said switch chamber, said switch chamber being formed by a handle positioned laterally of and having a gripping portion spaced from the housing portion defining said motor chamber, said trigger being pivoted to said handle with said cover positioned in said switch chamber.

4. The power operated knife of claim 3 wherein said trigger comprises an L-shaped lever having a finger engageable portion extending parallel to said gripping portion of said handle, said handle being recessed to receive said finger engageable portion when said trigger is pivoted to the switch closing position.

5. The power operated knife of claim 4 wherein spring means is provided to bias said trigger about its pivotal mounting to a position in which said switch contacts are open, said spring means comprising a leaf spring secured at one end to said finger engageable portion of said trigger and having its other end in biasing engagement with said handle within said recess.

6. In a motor operated electrical appliance having switch means for controlling energization of the motor, the combination comprising a housing, means supporting an electric motor within the housing, a pair of switch contacts within said housing connected in series with said motor to control energization thereof, a switch lever pivotally supported on said housing and extending through the wall of said housing, an actuator portion on said lever accessible for manual actuation exteriorly of said housing, said lever being formed with a switch cover on the end thereof positioned with said housing, said cover having a recess within which said switch contacts extend, said cover engaging one of said contacts to close the switch.

7. The combination of claim 6 wherein said switch lever is made of a nonflammable electrical insulating plastic and said housing is made of a flammable plastic material.

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