A. H. TRUMBULL.

KNIFE BLADE SWITCH.

APPLICATION FILED JUNE 11, 1919.

1,424,266. Patented Aug. 1, 1922.

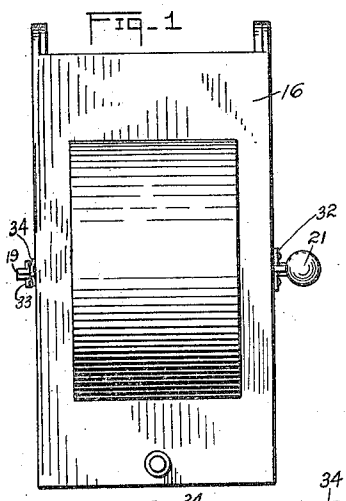


FIG. 1

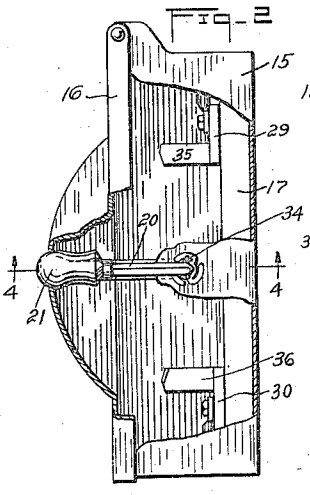


FIG. 2

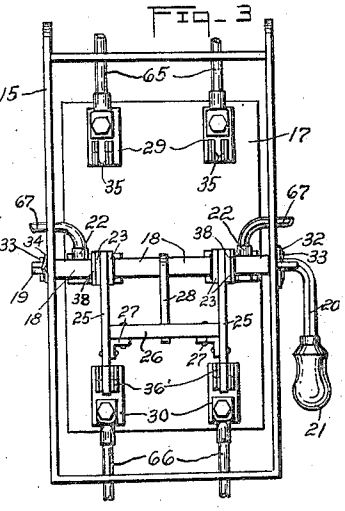


FIG. 3

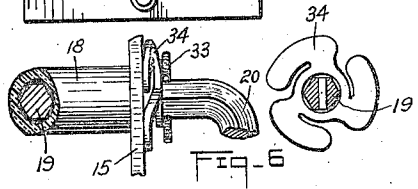


FIG. 6

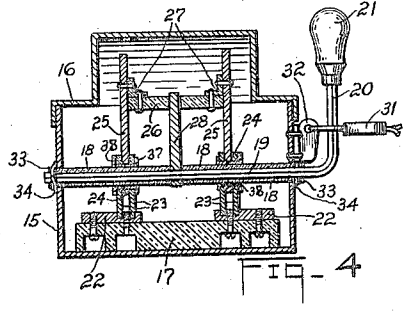


FIG. 4

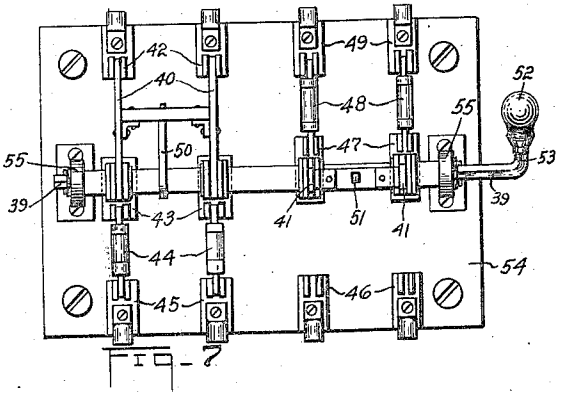


FIG. 7

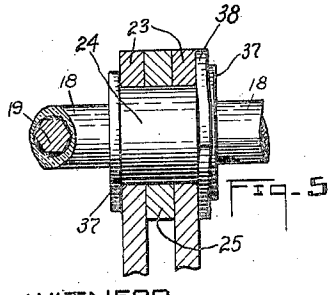


FIG. 5

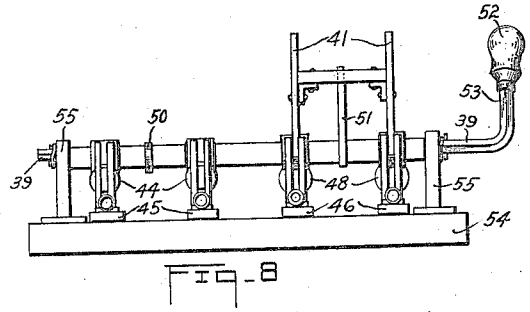


FIG. 8

WITNESS

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KNIFE-BLADE SWITCH.

1,424,266. Specification of Letters Patent. Patented Aug. 1, 1922.

Application filed June 11, 1919. Serial No. 303,367.

To all whom it may concern:

Be it known that I, ALEXANDER H. TRUMBULL, a citizen of the United States, residing at Stratford, county of Fairfield, State of Connecticut, have invented an Improvement in Knife-Blade Switches, of which the following is a specification.

This invention relates to electric circuit closers or switches and has for its objects to provide a knife blade switch which may be operated from its hinge end by a handle member located at a distance from the switch terminals, said switch having provision for completely insulating the operating means from the current carrying portions of the switch, requiring but a single contact member for cooperation with each switch blade to open or close the circuit, and being of a generally improved construction affording a smooth and easy action and permitting the ready assembling and disassembling of the parts; and also to provide an improved multiple unit switch device in which the successive throwing of a plurality of switches in order to open and close a plurality of circuits is facilitated.

The foregoing and other objects of the invention, together with means whereby the same may be carried into effect, will best be understood from the following description of certain forms or embodiments thereof illustrated in the accompanying drawings, in which:

Figure 1 is a plan view of the casing of an enclosed switch constructed in accordance with the invention.

Figure 2 is a side elevation with the casing partly broken away, the switch being shown in circuit breaking position.

Figure 3 is a plan view with the casing cover removed and the switch in one of its circuit closing positions.

Figure 4 is a transverse section taken substantially on the line 4—4, Figure 2.

Figure 5 is a detail view of one of the switch hinges.

Figure 6 is a detail view of the construction at the point where the operating shaft enters the casing.

Figure 7 is a plan view of a multiple switch embodying the invention.

Figure 8 is an elevation of the parts shown in Figure 7.

Referring first to Figures 1 to 4, the invention is therein illustrated as embodied in an enclosed switch particularly adapted for use in connection with a junction box. As shown in said figures, said junction box comprises a body 15 having a hinged cover 16 and enclosing a block or plate 17 of insulating material constituting the base of the switch. Seated at their outer ends in alined openings in the opposite walls of the body 15 are a pair of alined insulating sleeves 18, spaced apart at their inner ends for a purpose presently to be described. Rotatably mounted in the sleeves 18 is a shaft 19 of hexagonal or other non-circular cross section having, outside the casing, an end portion 20 which is bent at right angles to the rest of the shaft to constitute an operating lever, and which is provided with a handle 21. Mounted on the plate 17 immediately beneath the sleeves 18 is a pair of terminals 22 to which circuit or line wires 67 may be connected, each of said terminals having a pair of spaced parallel arms 23 formed with alined openings to receive and support a bushing 24 on the corresponding sleeve 18. Mounted on each of the bushings 24 between the corresponding arms 23 is a switch blade 25, said switch blades being connected intermediate their ends by a block 26 of insulating material, the ends of said block being secured to the switch blades by angular brackets 27 riveted to said block and blades respectively. The block 26 is provided with an opening which loosely receives the end of an arm 28 mounted on the shaft 19 between the spaced inner ends of the sleeves 18, said arm having an opening shaped to fit the shaft 19, whereby said arm is secured to said shaft for rotation therewith while permitting longitudinal movement of said shaft with respect to said arm. The outer ends of the switch blades 25 are, in the construction shown, adapted to cooperate alternatively with a pair of contacts 35 or with a pair of contacts 36 when said switch blades are turned in opposite directions from the neutral or circuit breaking position shown in Figures 2 and 4. The contacts

35 and 36 are carried respectively by terminals 29 and 30 having suitable means for connection with circuit or line wires 65 and 66 respectively. The switch may, if desired, be retained against unauthorized operation, in the position to open the circuit by means of a suitable seal or lock 31 (see Figure 4) passed around the operating portion 20 of the shaft and engaged with an apertured bracket 32 riveted or otherwise secured to the exterior of the casing body 15.

As will now be seen, the switch blades 25 are supported, independently of the shaft 19, by the hinge arms 23, and are completely insulated from said shaft and from the arm 28 by the sleeves 18 and insulating block 26, so that no current can pass from said blades to said shaft. Said switch blades are, however, operatively connected with said shaft, for operation thereby to open and close the circuit, by means of the arm 28 and block 26, said blades turning about an axis coincident with the axis of said shaft but being separated from said shaft by the interposed sleeves 18, which are independently supported by the arms 23 and the walls of the casing 15.

The shaft 19 is held in place in the sleeves 18 by cotter pins 33 between which and the adjacent sides of the casing body 15 are interposed spring washers 34 each comprising a central portion to engage the cotter pin 33, and having an opening to receive the shaft, and a plurality of arms offset from the plane of the central portion to engage the casing. These springs serve to hold the shaft properly centered and to give a smooth action thereto and also serve to ground said shaft upon the casing in order to carry away any current which may accidentally reach the same notwithstanding the insulating provisions above described.

It will be seen that, by removing the cotter pins 33, the shaft 19 may readily be withdrawn longitudinally from the sleeves 18 and arm 28, and the latter, due to its loose engagement with the opening in the block 26, be thereafter removed from between the sleeves 18, thereby easily disassembling the parts which may be as readily assembled in proper position by reversing these operations, no careful positioning of said parts, other than that naturally accompanying the assembling thereof, being required.

As above stated, the blades 25 are, in the construction shown, adapted to close the circuit either between the terminals 22 and terminals 29 or between the terminals 22 and the terminals 30, although, for some purposes, one of the terminals 29 or 30 may be omitted. In any case, however, it will be seen that said blades are obliged to engage and disengage but one pair of contacts 35 or 36 in order to make or break the circuit, said blades being permanently electrically connected through their hinges with the terminals 22, this permanent connection being permitted by the complete insulation of said blades from the operating shaft and other parts of the device. Extended contact surfaces are provided for the passage of current from the arms 23 to the blades 25, and, in order to maintain these surfaces in close engagement, each of the bushings 24 is preferably formed with end flanges 37 between one of which and the adjacent arm 23 is interposed a spring washer 38 (see Figure 5) similar to the spring washer 34.

In Figures 7 and 8 is shown a multiple unit switch device constructed on the general principle of the single unit switch above described and comprising a shaft 39 on which are mounted two pairs of switch blades 40 and 41, each pair being substantially similar in construction and mounting to the switch blades 25 and therefore not requiring description in detail. The blades 40 cooperate with terminal contacts 42, and the hinge terminals 43 thereof are shown as connected by fuses 44 with terminals 45; while the switch blades 41 cooperate with terminal contacts 46 and the hinge terminals 47 thereof are connected by fuses 48 with terminals 49. The terminal contacts 42 and 46 are disposed at opposite sides of the shaft 39, and the operating arms 50 and 51 for the switches 40 and 41 respectively are disposed in different angular positions on said shaft, said arms being herein shown as disposed at an angle of 90° from one another. It will therefore be seen that a movement of the shaft 39 through an angle of 90° will serve to open the switch 40 and close the switch 41 or vice versa. This arrangement is particularly advantageous for use under circumstances in which it is desired to close one switch and thereafter open said switch and immediately close another, as, for example, in starting a polyphase motor, since, by suddenly throwing the handle 52 from one extreme position to the other, one of the switches may be opened and the other immediately closed without an appreciable interval. In order to facilitate this operation, as well as to serve as a convenient indication of the position of the switches, the operating portion 53 of the shaft 39 preferably occupies an angular position half way between the arms 50 and 51, being disposed at an angle of 45° from each, so that an inclination of the handle in one direction from a vertical position will indicate the closure of the switch 40, while a similar inclination in the opposite direction will indicate a closure of the switch 41, said handle being in a vertical position when both switches are open.

The apparatus shown in Figures 7 and 8 is illustrated as in the form of an unen-

closed switch mechanism comprising a suitable switch board or insulating base 54, upon which the several terminals above referred to are mounted, and provided with a pair of brackets 55 constituting bearings for the shaft 39.

Having thus described my invention, I claim:

1. In a knife blade switch, an insulating sleeve, a shaft mounted to turn therein, a switch blade mounted to turn about said sleeve, and means for operatively connecting said shaft and blade.

2. In a knife blade switch, an insulating sleeve, means for supporting the same, a removable shaft mounted to turn in said sleeve, a switch blade mounted to turn about said sleeve, and means for operatively connecting said shaft and blade.

3. In a knife blade switch, a pair of alined insulating sleeves, means for supporting the same, a shaft mounted to turn in said sleeves but longitudinally removable therefrom, a pair of switch blades mounted to turn about said sleeves respectively, an arm between said sleeves and connected with said shaft to turn therewith but disengageable therefrom when said shaft is withdrawn from said sleeves, and means for connecting said arm with said blades.

4. In a knife blade switch, an insulating sleeve, a shaft mounted to turn therein, a bushing on said sleeve, a switch blade mounted on said bushing to turn about the axis of said shaft, and means for operatively connecting said shaft and blade.

5. In a knife blade switch, an insulating sleeve, a shaft mounted to turn therein, a switch blade mounted to turn about said sleeve, and means for operatively connecting said shaft with and insulating the same from said blade.

6. In a knife blade switch, a pair of alined insulating sleeves, a shaft mounted to turn in said sleeves, a pair of switch blades mounted to turn about said sleeves respectively, an arm between said sleeves and connected with said shaft to turn therewith, and means for connecting said arm with and insulating the same from said blades.

7. In a knife blade switch, a shaft, a switch blade, means independent of said shaft for supporting said blade through which the shaft extends so that the blade will turn about said shaft, and means for operatively connecting said shaft with and insulating the same from said blade.

8. In a knife blade switch, a shaft, an arm thereon, a switch blade, a mounting on which the blade is pivotally supported and through which the shaft extends so that the blade will turn about said shaft, and a block carried by said blade and having an opening engaged by said arm.

9. In a knife blade switch, a pair of alined insulating sleeves, a shaft mounted to turn in said sleeves, a pair of switch blades mounted to turn about said sleeves respectively, a block connecting said blades, and an arm between said sleeves and connected with said shaft, said arm engaging said block to operate said blades.

10. In a knife blade switch, a pair of alined insulating sleeves, a shaft mounted to turn therein but longitudinally removable therefrom, a pair of switch blades mounted to turn about said sleeves respectively, an arm mounted on said shaft between said sleeves, said arm having a non-circular opening and said shaft having a non-circular portion removably engaging said opening, and a block connecting said blades and having an opening engaged by said arm.

11. In a knife blade switch, a shaft, a switch blade mounted to turn about the axis of said shaft, an insulating sleeve interposed between said shaft and blade, an arm on said shaft, and an insulating block carried by said blade, said block having an opening engaged by said arm.

12. In a knife blade switch, a switch blade, means for pivotally supporting the same, means for conducting electric current to said supporting means, said supporting means and switch blade being electrically connected, a shaft disposed with its axis coincident with the axis of movement of said blade, insulating means between said shaft and blade, and means for operatively connecting said shaft and blade.

13. In a knife blade switch, a support, a shaft journalled therein, a switch blade operated by said shaft and insulated therefrom, and a spring washer carried by and contacting with said shaft and engaging said support.

14. In a knife blade switch, a support, a shaft journaled therein, insulating material between the shaft and the support, a switch blade mounted to turn about said shaft and operated thereby, means for insulating said shaft from said blade, and means for grounding said shaft on said support.

15. In a knife blade switch, a terminal having a pair of supporting arms, a bushing carried by said arms, an insulating sleeve in said bushing, a switch blade carried by said bushing between said arms, a contact cooperating with said blade, a shaft mounted to turn in said sleeve, and means for operatively connecting said shaft and blade.

16. In a knife blade switch, a pair of terminals each having a pair of supporting arms, alined bushings carried respectively by the arms of the several pairs, insulating sleeves in said bushings, a pair of switch blades each carried by one of said bushings between the arms of the corresponding pair, a pair of contacts cooperating respectively with said blades, a shaft mounted to turn in

said sleeves, an insulating block connecting said blades and provided with an opening, and an arm on said shaft between said sleeves, the outer end of said arm engaging the opening in said insulating block.

17. A multiple unit switch comprising a shaft, contacts disposed at opposite sides of said shaft, switch blades cooperating with said contacts respectively, and operating members for said switch blades carried by said shaft and disposed in different angular positions about the axis thereof, said switch blades rotatably carried by supports independent of said shaft.

18. A multiple unit switch comprising a shaft, contacts disposed at opposite sides of said shaft, switch blades cooperating with said contacts respectively, means for pivotally supporting said switch blades, means for conducting electric current to said supporting means, said supporting means and switch blades being electrically connected, operating members for said switch blades carried by said shaft and disposed in different angular positions about the axis thereof, and means for insulating said shaft from said switch blades.

19. A multiple unit switch comprising a shaft, contacts disposed at opposite sides of said shaft, switch blades cooperating with said contacts respectively and independently supported to turn about the axis of said shaft, and operating members for said switch blades carried by said shaft and disposed in different angular positions about the axis thereof.

20. A multiple unit switch comprising a shaft, contacts disposed about the axis of said shaft, switch blades co-operating with said contacts respectively and independently supported to turn about the axis of said shaft, and operating members for the switches carried and rotated by said shaft.

21. A multiple unit switch comprising a shaft, unitary switches disposed about the axis of said shaft and mounted independently thereof, operating members for the unitary switches carried and rotated by said shaft and means for insulating said shaft and operating members from the current carrying portions.

22. A multiple unit switch comprising a shaft, contacts disposed about the axis of said shaft, switch blades co-operating with said contacts respectively and independently supported to turn about the axis of said shaft, means for insulating said shaft and operating members from the current carrying portions, and operating members for the switches carried and rotated by said shaft.

In testimony whereof I affix my signature.

ALEXANDER H. TRUMBULL.