The present invention relates to an electric switch and particularly to a rotary switch of the slow make, slow break type adapted to control alternating current circuits for such applications as the speed control of fan motors.

This switch is characterized by the fact that it includes a hollow housing comprising a recessed base and a cover member with a rotatable contactor centered in the base and controlled by a switch handle. A series of resilient contacts are positioned edgewise in the base around the rotatable contactor for making and breaking the several circuits through the switch. Each contact has a locking tongue at its terminal end to provide the switch with quick-connect terminals. Hence, a bare wire is connected in the switch by merely forcing it through an opening in the housing which is partially covered by the free end of the locking tongue of the contact. The wire will displace the tongue until the tongue engages the side of the wire. Then, when a pulling force is exerted on the wire, it will tend to carry the tongue with it so that the tongue wedges the wire against an inner wall of the housing, and this force will increase in proportion to the pulling force exerted on the wire.

Each resilient contact is generally in the shape of the letter Z where the ends of the Z represent a locking tongue and a spring contact finger which are joined by an intermediate arm. The two bends in the resilient contact are supported in opposite pockets in the base so that the intermediate arm will flex slightly to distribute the bending stresses exerted on both the locking tongue and the spring finger.

In addition, the rotatable contactor has a series of detent notches formed in its periphery between the contacting surfaces therein so that the spring fingers of the contacts which are not connected as part of the circuit through the switch will mate in these notches and form an indexing means for the switch.

The primary object of this invention is to provide a rotary electric switch of compact size with a minimum number of parts by using the spring fingers of the resilient contacts of the switch as both electrical contact elements and as an indexing means.

A further object of this invention is to provide a rotary electric switch with quick-connect terminals having novel locking tongues, each with a V-shaped groove to increase the effective holding force against larger size conductors, to reinforce the tongue against distortion and, finally, to serve as a guide means for a wire as it enters the switch housing.

A still further object of this invention is to provide a rotary switch with resilient contacts having both spring fingers and quick-connect terminals which are held in the base between opposite pockets so that the intermediate arm may flex when either the locking tongue or the spring finger is stressed to give long life and reliability to the resilient contacts.

My invention will be better understood from the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.
extend upwardly therethrough and be bent over as shown in Fig. 5 to attach the spring to the cam. Turning now to a consideration of the identical resilient contacts 45 as best shown in Fig. 4 of the drawing, each comprises a strip of thin strip metal or other metallic material having conducting properties such as Phosphorous bronze and in its unstressed condition it is generally in the shape of the letter Z. The inner end of the contact has a spring finger 46 with a rounded tip 47 for engagement with the contact surfaces 24 of the rotating contactor 19. The cam members of the rotatable contactor 19 furnishes a series of detent notches 48 located between some of the contact surfaces 24 in such a manner that in the several positions of the switch, the spring fingers which are not connected as part of the circuit through the switch serve the secondary function of indexing the rotatable contactor 19, as distinguished from having a separate member or members for providing the indexing feature. The rotatable contactor 19 must be forced between all of the spring fingers as it is being assembled in the switch so that the fingers engage the contact surfaces 24 in the detent notches 48 with a spring force. That illustrates the wiring diagrams for the four positions of the switch. Starting with the upper left hand figure which is similar to that of Fig. 4, the switch is in its Off, Low (1), Medium (2), and High (3) positions. This switch is unique in that the contact fingers 46 are located 90° apart and the rotatable contactor 19 is formed with four contacting surfaces 24 that are so related that in any position of the switch two of the contact fingers 46 are engaged in the detent notches 48 to serve as an indexing means for the contactor.

The opposite end of each resilient contact 45 is provided with a movable locking tongue 49 that is arranged to extend along one side wall 28 of the housing to overlie a counterbore receiving opening 50 located in the base 10. The edge of the opening 50 remote from the tongue 49 is generally in alignment with the inner surface of an adjacent wall 51 of the base. Thus, a bare stranded wire that has been twisted and tinned or a bare solid wire may be forced through the opening 50 to deflect the locking tongue 49 to the side until the tongue engages the side of the wire at which time any pulling force exerted on the wire will tend to pivot the tongue in a reverse direction to wedge the wire between the tongue and the adjacent wall 51.

The basic concept of quick-connect terminals of the type disclosed herein is taught in the Benander Patent No. 2,746,799 which is assigned to the present invention. However, I have developed an improved construction with the addition of a V-shaped groove or fold 52 in the locking tongue facing outwardly against the related wall 28 of the base 10. The locking tongue serves the dual function of a spring member when a lead wire is being forced into the housing and of a rigid lever fulcrumed against a wall of the base when tension is applied to the wire thereby creating a wedging action against the wire in direct proportion to the pulling force. However, this wedging action is greatest for small size conductors where the angle between the locking tongue and conductors reaches 90° and at a minimum for the largest conductors which is most needed. The V-shaped groove has the effect of a notch in the end of the tongue when it is inclined at an acute angle as would be the case for larger size wires, but this effect becomes smaller and disappears altogether as the angle approaches 90° as for smaller size wires. Another advantage of the V-shaped groove is to reinforce the end of the tongue against distortion so that smaller spring stock may be used for the contact. A third advantage of the V-shaped groove is that it serves as a guide means tending to hold the lead wire on the center line of the locking tongue during insertion, and it prevents the larger sizes of the same from damaging insertion. Also, in the case of the larger sizes of stranded wire, the V form helps to keep the strands bunched.

In the illustrated embodiment of my invention, there is a resilient contact 45 positioned in each of the four corners of the base 10. The locking tongue is fulcrumed against a partition 53 extending inwardly from the wall 28 of the base while the spring finger 46 is fulcrumed in a pivot hole being received by the base, and a partition 54 extending at right angles thereto. Thus, the intermediate arm 55 of the contact connecting the spring finger 46 with the locking tongue 49 is in effect pivotedly connected in opposite pockets 56 and 57 formed by the partitions 53 and 54, respectively. To permit the removal of a wire strand from a base wall 28, and to provide a stop for the intermediate arm, a provision in the wall 28 of the base an opening 58 through which the end of a suitably tool, such as a small screwdriver 60 shown in Fig. 4, may be passed to engage the tongue and by an inward push move it away from locking engagement with the wire end.

Accordingly, having described my invention of a novel rotary switch, it should be readily appreciated that the switch handle is provided with a superior indexing means to give positive positioning of the rotating contactor. Also, the design of the resilient contacts is an important feature of this switch for the contact is merely dropped into the base between the opposite pockets and serves as a springing member whenever the spring finger or the locking tongue is stressed. The V-shaped groove in the locking tongue also adds to the improvements of this invention for the three reasons given previously. Other modifications would include the elimination of the quick-connect terminals and the substitution of phaser lug or lead wires soldered directly to the terminal ends of the contact. Also, different means may be provided for holding the shaft of the handle in the housing and different means could be provided for making the handle separable from the shaft so that a user may provide his own handles to conform with the design and color motif of his appliances.

Modifications of this invention will occur to those skilled in this art and it is to be understood, therefore, that this invention is not limited to the particular embodiments disclosed but that it is intended to cover all modifications which are within the true spirit and scope of this invention. What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric switch comprising a hollow housing with a recessed base and a cover member held therewith, at least three resilient contacts positioned in the base, each contact being of generally Z-shape and comprising a locking tongue at its inner end, an intermediate arm, and a spring finger, a rotatable contactor mounted in the base between the spring fingers of the contacts, and shaft means for moving the contactor, the said contactor having detent notches in its periphery so that the spring fingers which are not connected in a complete circuit through the switch serve as an indexing means in cooperation with the said detent notches, the locking tongue of each contact being positioned adjacent an outer wall of the base with its free end overlying a conductor wire-receiving opening in the wall, one edge of said opening being aligned with an adjacent wall of the switch base, and a partition extending from the said outer wall substantially parallel with the adjacent wall to form a corner, one bend in the Z-shaped contact being positioned in said corner while the other bend in the contact is seated in an opposite corner in the base formed by said adjacent wall and a cooperating partition, wherein the lead wire may be inserted through the base to move the locking tongue aside until the tongue engages the side of the wire, any pulling force exerted on the wire tending to drag the locking tongue into a tighter wedging engagement with the wire to increase its holding power.

2. An electric switch as recited in claim 1, wherein the free end of the locking tongue of each contact is formed with a longitudinal V-shaped groove that opens toward the said outer wall of the base so as to increase the effective wedging force against the larger sizes of con-
ductors as well as to reinforce the tongue against distortion and to hold the conductor centered with relation to the locking tongue.

As an article of manufacture, an electrical contact for a wiring device, said contact being of thin blade construction and having a movable locking tongue at its terminal end with a squared-off tip for wedging engagement with a bare conductor, said locking tongue having a longitudinal V-shaped fold in its outer side at the outer end of the tongue so as to increase the effective wedging force against larger sizes of conductors as well as to reinforce the tongue against distortion and to hold the conductor centered with relation to the locking tongue.

4. An electric switch comprising a hollow housing with a recessed base and a cover member held therewith, a plurality of resilient contacts positioned in the base, each contact having a spring portion with a rounded contacting section, a rotatable contactor mounted in the base and having a plurality of upstanding contact surfaces, a cam member of insulating material with peripheral notches receiving the lips of said contacting surfaces and being supported in a spaced relation thereby, and a series of detent notches for cooperation with the said rounded sections of the resilient contacts, a shaft supported in the housing in driving engagement with the said cam member for sweeping the contactor over the spring portions of the contacts, so that at any one position of the switch the spring portions which are not joined in the circuit through the switch serve as an indexing means for the rotatable contactor.

5. An electric switch comprising a hollow housing with a recessed base and a cover member held therewith, a plurality of resilient contacts positioned in the base, each contact being of generally Z-shape and comprising a locking tongue at its terminal end, an intermediate arm, and a spring finger, a rotatable contactor mounted in the base between the spring fingers of the contacts, and a shaft supported in the housing for moving the contactor into several switch positions, the locking tongue of each contact being positioned adjacent an outer wall of the base with its free end overlying a conductor wire-receiving opening in the wall, one edge of said opening being aligned with an adjacent wall of the switch base, and a partition extending from the outer wall substantially parallel with the said adjacent wall to form a corner, one bend in the Z-shaped contact being positioned in said corner while the other bend in the contact is seated in an opposite corner in the base formed by said adjacent wall and a cooperating partition, whereby a bare wire may be inserted through the openings in the base to displace the locking tongue until the tongue engages the side of the wire, any pulling force exerted on the wire tending to increase the wedging force provided by the locking tongue in a direct proportion.

6. An electric switch as recited in claim 5 wherein the free end of the locking tongue of each contact is formed with a longitudinally extending V-shaped groove that opens toward the said outer wall of the base so as to increase the effective wedging force exerted against the larger sizes of conductors as well as to reinforce the tongue against distortion and to hold the conductor centered with relation to the locking tongue.

7. An electric switch comprising a hollow housing, at least three resilient contacts of strip material positioned edgewise in the housing in a circular arrangement, a rotatable cam member of insulating material centered from the said contacts, the peripheral edge of the cam having a series of detent notches and a plurality of metal contactor elements joined together as the movable contacting portion of the switch, a switch handle connected to the cam and extending outwardly of the housing, each resilient contact having a spring locking tongue and a spring biased contacting portion, the contacting portion having wiping engagement with the peripheral edge of the said cam, so that at any one position of the switch the contacting portions of the contacts which are not joined in the circuit through the switch serve as an indexing means for the cam member, each resilient contact having a pair of elbows which are supported in opposing pockets in the housing and held in place by a removable cover member which forms one wall of the housing, the portion of each contact between the pair of elbows being movably mounted in the base to deflect both when the switch handle is burned and when the locking tongue is made to connect or disconnect a wire conductor.

8. An electric switch comprising a hollow housing with a recessed base and a removable cover member held therewith, at least three resilient contacts of thin strip material positioned edgewise in the housing each adjacent one corner thereof, a movable contactor having an insulated cam member with a peripheral edge containing a series of detent notches combined with a grouping of current-carrying elements joined together as the movable contacts of the switch, a switch handle connected to the movable contactor and extending outwardly through an opening in the cover of the housing, each resilient contact having a spring locking tongue and a spring biased contacting portion making wiping engagement with the peripheral edge of the said movable contact so that when the contacting portions are not making engagement with the movable contacts, they serve to mate in the detent notches as the indexing means of the switch, each resilient contact having a spring portion with a pair of elbows that are confined in a pair of opposed corner recesses, this spring portion being deflected whenever the movable contacts shift or the locking tongue is made to move.

9. An electric switch comprising a hollow housing with a recessed base and a cover member, a plurality of resilient contacts positioned in the base, each contact being arranged edgewise in the base and having a spring locking tongue at its terminal end, the tongue having a reentrant end that is seated in a pocket formed by interior wall portions of the base, the reentrant end of the tongue emerging into a springing portion that likewise has a reentrant end seated in an opposing pocket in the base, the said springing portion of the contact serving to extend the springing characteristics of the locking tongue so that the bending stresses are not concentrated at the reentrant end of the tongue, the free end of the tongue has a longitudinal V-shaped groove for so as to increase the effective wedging force against larger sizes of conductors as well as to reinforce the tongue against distortion and to hold the conductor centered with relation to the locking tongue.

References Cited in the file of this patent

UNITED STATES PATENTS

1,554,090 Hewitt ------------------ Sept. 15, 1925
2,068,079 Schwartz ------------------ Jan. 19, 1937
2,166,607 Popp et a. -------------- July 18, 1939
2,235,275 Winning ------------------ Mar. 18, 1941
2,522,423 Youhouse ------------- Sept. 12, 1950
2,705,785 Benharder -------------- Apr. 5, 1955
2,723,327 Gilbert ------------------ Nov. 8, 1955
2,725,544 Strange ------------- Nov. 29, 1955
2,729,799 Pintey -------------- Jan. 3, 1956

FOREIGN PATENTS

38,708 France ------------------ Apr. 4, 1931
643,721 France ------------------ May 21, 1928
380,416 Great Britain ----------- Sept. 15, 1932
711,202 Germany ---------------- Sept. 27, 1941