Dec. 1, 1925.

1,564,016

B. C. PERKINS

ELECTRIC SWITCH

Filed Nov. 4, 1922

Fig. 1.

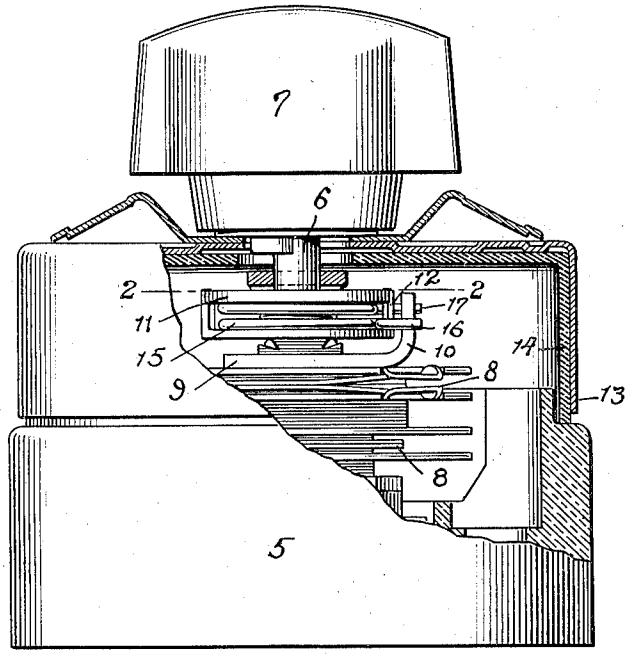


Fig. 2.

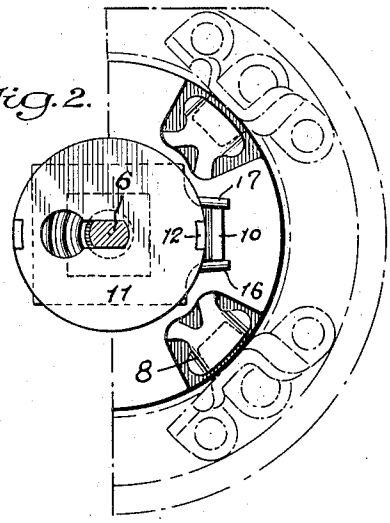


Fig. 3.

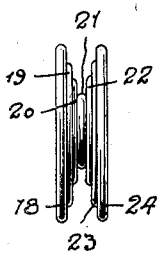
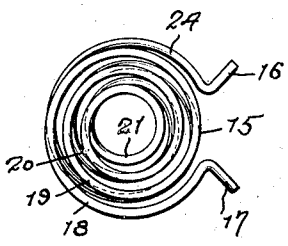


Fig. 4.



INVENTOR

BENJAMIN C. PERKINS

BY

Strauss and Strauss

ATTORNEYS

Patented Dec. 1, 1925. 1,564,016

UNITED STATES PATENT OFFICE.

BENJAMIN C. PERKINS, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE ARROW ELECTRIC COMPANY, OF HARTFORD, CONNECTICUT, A CORPORATION OF CONNECTICUT.

ELECTRIC SWITCH.

Application filed November 4, 1922. Serial No. 599,015.

To all whom it may concern:

Be it known that I, BENJAMIN C. PERKINS, a citizen of the United States of America, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Electric Switches, of which the following is a specification.

My invention relates to electric switches, and particularly to switches of the rotary snap type. The object of my invention is to provide an improved operating spring for the switch mechanism.

In the accompanying drawings—

Fig. 1 is a broken side elevation of a switch in which my invention is illustrated in one form;

Fig. 2 is a broken plan thereof;

Fig. 3 is a side elevation of the spring detached; and

Fig. 4 is a plan view of the spring.

In switches of the rotary snap type, the standard mechanism includes a coil spring of uniform diameter throughout its length, surrounding the switch spindle and having one end of the spring secured to the spindle or to some abutment element rotating therewith, while the other end of the spring engages the rotary switch blade or an associated member. An escapement device is generally provided which retains the switch blade during a partial rotation of the spindle, accompanied by a corresponding increase in the torsional stress of the spring. Upon release of the escapement, the switch blade moves to its succeeding position with a snap action. In order to obtain sufficient strength and ease of action in the spring, it has been necessary to make it of considerable length. In switches for controlling relatively heavy currents, such as are employed in heater installations, the necessary length of the spring has often proved a serious handicap by reason of the necessarily increased length of the spindle to accommodate the spring, thus rendering the switch as a whole much larger than is desirable, both from the standpoint of appearance and from the standpoint of efficiency, since the lengthened spindle imposes additional strains upon its bearing in the base, and consequently renders the construction more subject to injury by blows upon the handle end of the spindle. The present invention provides an operating spring which is not only extremely compact, but of such construction that it is possible to provide in a greatly restricted space, a considerably greater length of spring wire, with consequent increased strength and durability, and freedom from the danger of over-stressing on operation of the switch.

In the accompanying drawings, I have illustrated a rotary snap switch of the heater type, comprising an insulating base 5, upon which the switch mechanism is mounted. The mechanism includes a rotary switch spindle 6 adapted to be rotated by the thumb piece 7, either in one direction alone or in opposite directions, depending upon the nature of the escapement mechanism, not shown. Freely mounted on the spindle are switch blades 8, of which two are here shown, although either more or less may be used, depending upon the service which the switch is to perform. Rigidly associated with the switch blades is a spring abutment plate 9 having an offset lug 10. Rigidly secured upon the spindle is a spring abutment plate 11, also having an offset lug 12. As shown, the lug 12 is spaced a less radial distance from the spindle 6 than the lug 10. The moving parts of the mechanism, with the exception of the thumb piece 7, are housed within the usual cover 13 provided with an insulating lining 14 in a manner well understood in the art.

Arranged upon the spindle 6 is the coil spring 15, to which my invention particularly relates. As will be noted, the spires of this spring instead of being of equal diameter throughout, are of unequal diameter, and are spaced from each other radially instead of longitudinally, as has heretofore been common practice. The spires at the opposite ends of the spring are provided with offset ends 16 and 17, and in the adjusted position of the spring, overlap each other circumferentially, so that the offset ends 16 and 17 engage on opposite sides of the lugs 10 and 12 of the spring abutment plates. The spring is normally under slight torsional stress, so that the lugs 10 and 12 are maintained in radial alinement due to the opposed stresses placed

thereon by their engagement between the spring ends.

In the particular form of the spring shown, the spire 18 from which the offset end 17 extends, is of greater diameter than the next adjacent spire 19, which again is of greater diameter than the succeeding spire 20, which finally merges in an inner spire 21, which is continued by a spire 22 of increased diameter, substantially corresponding to that of the spire 20, while the spire 22 in turn merges into the spire 23 of greater diameter, and the latter finally into the spire 24, which is of a diameter substantially corresponding to that of the spire 18. While the spires are to a certain extent nested, they lie in slightly spaced planes, so that in effect they present in side elevation the appearance of a double cone spool, the apex angle of the cones of which is obtuse. I prefer a spring in which the inclines of the cone meet at an angle greater than 90 degrees, since this provides a spring of extremely short axial length, and thus enables me to materially shorten the length of the spindle 6, while at the same time obtaining a spring length fully as long as, if not longer than, that of the usually one-diameter switch spring.

The operation of the spring is substantially identical with that of the usual coil spring. Thus, when the spindle 6 is rotated by the thumb piece 7, the lug 12, which forms the movable abutment rigid with the spindle 6, engages one or the other of the ends 16 or 17 of the spring and shifts it circumferentially with respect to the other spring end, which is detained by its engagement with the abutment lug 10 rigid with the rotary switch blade. The spring is thus placed under increased torsional stress and effects the rotation of the switch blades in the usual fashion upon the release of the escapement which detains the blades.

I have found that the winding-up action of the spring incident to the rotation of the switch spindle does not materially decrease the diameter of the innermost spire 21 of the spring, such reduction of diameter as is occasioned by the winding action being confined almost entirely to the spires of larger diameter. There is thus no danger that the spring will bind upon the switch spindle. Moreover, due to the enlarged diameter of the end spires of the coil, and the easier curve thereof, a spring wire of greater cross section may be used than has heretofore been possible. A spring of greater strength may thus be used. This is important in connection with multi-blade switches, or switches of large size, in which the load imposed upon the spring is often considerable, while it is particularly necessary to obtain a rapid snap action in breaking the currents which such large switches are intended to handle.

It will of course be realized that the particular construction of the abutments 10 and 12 may be widely varied. Similarly it is not necessary that the spring be in the shape of a double cone, since it may suffice in some instances to use but a single cone. In such case the end of the spring associated with the spire of least diameter may be secured directly to the spindle 6. I prefer, however, the double cone shape illustrated. The number of spires may of course be varied to meet the requirements of the particular switch in which the spring is installed.

With the understanding that the drawing and foregoing description present but a single illustrative embodiment of my invention, I claim—

1. A coil spring for an electric switch or the like, comprising a double cone torsion spring the terminal spires of which are of greater diameter than the intermediate spires, the spire of least diameter having an internal diameter sufficient to freely accommodate the switch spindle, the terminal spires of the spring having offset ends adapted under torsional stress to straddle and engage between them a pair of abutments relatively pivoted coaxial with the spindle, and angularly displaceable with respect to each other to place the spring under increased torsional stress.

2. The combination with a rotary spindle, of a double cone torsion spring threaded thereon and having its opposite ends offset outwardly away from the spindle, a member rigid with the spindle and having an abutment member engaged under stress between the offset ends of the spring, together with a member pivoted on the spindle and having an abutment element engaged between said offset ends of the spring and held thereby under normal conditions in substantially radial alignment with the abutment member rigid with the spindle.

3. A torsion spring for an electric switch comprising a spring wire coiled to form a double cone spring with nested spires, the coil of least diameter forming the common apex of the cones and spacing longitudinally apart the next adjacent spires of greater diameter of the opposed cones the end spires of said spring terminating in offset outwardly extending ends adapted to embrace between them, when the spring is under slight torsional stress, relatively movable abutments pivoted substantially coaxially with the spring.

In testimony whereof I have signed my name to this specification.

BENJ. C. PERKINS.