

UNITED STATES PATENT OFFICE

FREDERICK A. VOOS, OF NEWARK, NEW JERSEY, ASSIGNOR TO BELL TELEPHONE LABORATORIES, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

RETRACTILE DEVICE

Application filed May 21, 1930. Serial No. 454,477.

This invention relates to retractile spring assemblies and particularly to those used for the release of switches employed in telephone and other systems.

5 The objects of the invention are to reduce the number of failures in operation, to render these devices more positive and reliable, to facilitate adjustment, to reduce the cost of manufacture, and to otherwise effect improvements therein.

10 It has been the custom in the past to use coil springs, such as those employed in clocks, for the restoration of the shafts of automatic switches. These springs have not been found entirely satisfactory due to the friction offered by contact between adjacent convolutions, since they are liable to lock in their tensioned condition preventing restoration of the shaft, since they are 15 subject to breaking, and on account of the fact that they are costly to manufacture and maintain in adjustment.

20 The present invention is an improvement over the devices of the prior art in that it enables the use of a helical type spring which is better suited for the release of switch shafts and can be attached to present standard switches without necessitating any changes. These results are secured by 25 means of a spring assembly which includes an extension tube that fits on over the end of the standard switch shaft and is firmly secured thereto by means of a set screw. The retractile spring, which may take the 30 shape of an inverted cone, is secured at one end to a collar on the extension tube. The free end of the spring is secured to an adjusting cap which carries a small bushing that fits into the upper end of the extension tube and provides a bearing for rotation of 35 the cap with respect to the tube. The adjusting cap has slots around its periphery into which a locking spring member fits to hold the cap against rotation when the 40 spring is tensioned. The locking spring element is secured to the hub member of the stop bracket which engages the stationary post on the switch frame. To adjust the tension of the spring, it is only necessary to disengage the locking spring from the

slot in the adjusting cap, rotate the cap until the spring has received its proper tension, and reengage the locking spring with one of the notches in said cap.

A feature of the invention is an assembly 55 of the type above described in which the retractile spring and its associated elements may readily be attached to the standard switch shaft in replacement of the spring devices now used without disturbing the 60 stop finger that limits the restoring movement of the switch.

Although it has been proposed heretofore to use helical springs for the restoration of switches, applicant's invention is an improvement over these prior devices in that 65 it materially facilitates replacement and makes it possible to secure a correct adjustment with the least amount of difficulty.

The invention is illustrated in the accompanying drawings in which Fig. 1 shows 70 a portion of a two-movement step-by-step selector switch including the retractile device for restoring the brush shaft to its normal position. Fig. 2 is an enlarged view 75 of the retractile assembly showing the various elements partly disassembled. Fig. 3 is a detail of the assembly showing the manner in which the stop finger is attached to the shaft. Fig. 4 is an assembly view partly 80 in cross section showing an alternative form of retractile spring.

Inasmuch as the construction and operation of selector switches of the type to which this invention is applicable are well-known 85 to those skilled in the art, it is not considered necessary to show the full details of such a switch. Reference, however, may be made to the patent to Keith et al. No. 815,176, granted March 13, 1906.

Referring first to Fig. 1 of the drawings, the brush shaft 1 of a switch of this kind carries a plurality of brushes 42, 43 and 44 which cooperate with rows of contacts in a terminal bank, not shown. A set of vertical 90 operating magnets 23 mounted on the switch frame operate an armature 29, which in turn actuates the stepping pawl 30. Pawl 30 engages the vertical ratchet 34 to step the brush shaft vertically in a step-by-step 100

manner. The shaft 1 is held in its vertical position by the holding dog 38. After the switch has been positioned in its vertical direction, the rotary magnets 31 are energized to operate the armature 32, which in turn actuates the rotary stepping pawl 33. The pawl 33 engages the rotary ratchet 35 to rotate the shaft 1, which advances the associated brushes into engagement with the sets of terminals in the terminal bank. The shaft 1 is held in its rotary position by the holding dog 39 engaging the rotary ratchet 35.

During the vertical movement of the brush shaft, the retractile spring assembly, connected to the top of the shaft, moves bodily therewith. During the rotary movement of the shaft 1, the retractile spring 25 is tensioned so as to restore the shaft in its rotary direction when the shaft is released. The release of the shaft is effected by energizing the release magnet 36 to disengage the holding dogs 38 and 39. The shaft releases first in its rotary direction and then in its vertical direction. To accomplish this, the shaft is prevented from restoring in its vertical direction until it has completely restored in its rotary direction by means of a further holding dog, not illustrated in the drawing. It will be seen from the drawing that a vertical slot 47 is cut in the teeth of the ratchet 34. A stationary dog lies within this slot when the shaft is in its normal rotary position. As soon, however, as a rotary step is taken, the dog passes under the corresponding rotary tooth in the ratchet 34. This holds the shaft against release vertically until it has restored to its normal rotary position, regardless of the fact that the holding dog 38 may have been withdrawn.

The spring assembly comprises an extension tube 2 (shown in Figs. 2 and 4) which fits easily on over the brush shaft 1. The tube 2 has an integral hub portion 3 tapped to receive a set screw 4. The spring assembly also includes a locking spring 6, a bushing 5, and a stop bracket 8. The lower portion 12 of the bushing 5 is of reduced diameter to receive the locking spring 6 and the stop bracket 8 when assembled. These elements after being assembled are securely held together as a unit by turning over a portion of the bushing, or in any other suitable manner. When these elements have been assembled, a projecting portion 7 of the spring 6 enters the notch 9 on the bracket 8. This is a safeguard against any relative rotary movement between the assembled parts.

The brush shaft 1 is provided with a slot 16, into which the stop finger 15 snugly fits. With the stop finger 15 properly adjusted in the slot 16 and with the clevis 14 in place as illustrated, a set screw 17 is tightened

to firmly secure the clevis and stop finger to the shaft 1. After the stop finger and clevis have been fastened to the shaft, the unit including the stop bracket 8, bushing 5 and locking spring 6 is passed on over the shaft until it rests upon the upper surface of the clevis 14. With the elements thus assembled, the extension tube 2 is passed over the shaft until the lower reduced portion thereof enters the bushing 5 and the hub 3 comes to rest in contact with the upper surface of said bushing. The set screw 4 is now tightened to securely attach the extension 2 to the shaft 1. In tightening the set screw 4, sufficient clearance is allowed to permit the shaft 1 and tube 2 to rotate with respect to the bushing 5.

The assembly also includes a retractile spring comprising a bushing or bearing piece 18, an adjusting cap 19, and a helical spring 25. The cap 19 may be formed in any suitable manner from sheet metal and is provided with a depressed central portion having a concentric aperture therein which receives the upper reduced portion of the bushing 18. The upper end of the bushing is turned over, as best seen in Fig. 4, to securely hold the bushing and cap together as a unit. The lower portion of the bushing 18 enters the upper end of the extension tube 2 to permit free rotation of the extension tube with respect to the cap 19 and also to serve as a bearing area to hold the parts in proper relative position during actuation of the switch shaft. The retractile spring 25 at its lower end enters the aperture 13 in the hub 3 to secure the lower end of the spring to the shaft 1. The upper end of the spring has a loop 27 which engages an aperture 24 in the side wall of the depressed portion of the adjusting cap 19. The cap 19 is provided with a plurality of notches 20, 21, 22 and 23 equally spaced about the periphery thereof. The purpose of these notches is to receive the upper or free end of the locking spring 6 to hold the adjusting cap 19 against rotation due to the tension of the spring 25.

With all parts fully assembled, as illustrated in Fig. 1, the stop bracket 8 is held against rotation by means of the normal post 41, which is secured to the frame 40 of the switch and which freely enters an aperture 10 in the stop bracket. During vertical movement of the switch, the stop bracket slides up and down the post 41, but is not permitted to participate in the rotary motion of the shaft. In this manner the locking spring 6 is held against rotation since it is secured to the stop bracket, and thus the adjusting cap 19 is prevented from rotating due to the engagement of the locking spring 6 in one of the notches 20, 21, 22 or 23. The upper end of the spring 6 is shaped so as to lock the

adjusting cap 19 in a vertical direction thus preventing the bushing 18 from working loose due to the tension on the spring 25.

In order to adjust the spring 25 to the proper degree of tension, the locking spring 6 is disengaged from the adjusting cap 19, the cap seized and given the requisite number of turns against the tension of the spring 25, and the locking spring 6 reengaged with the proper notch in said cap. With the spring 25 under tension the shaft 1 is urged toward its normal position, the limit of which is determined by engagement between the stop finger 15 and the depending portion 11 on the stop bracket 8. Since the stop finger 15 presses against the bracket 8, the forces of the spring are confined within the assembly so that the stop bracket 8 offers no friction as it slides along the normal post 41 during the vertical movement of the switch.

The retractile spring 25 illustrated in Figs. 1 and 2 is conical in shape. In Fig. 4 a modified form of spring 46 is illustrated which is cylindrical in shape.

What is claimed is:

1. In combination, a rotatable shaft, an extension piece having one end securely attached to said shaft, an adjusting cap attached to the other end of said extension piece for rotation relative thereto, a spring surrounding said extension piece and having one end secured thereto, the other end of said spring being attached to said adjusting cap, and a locking spring element having a detachable engagement with said cap to hold the same against rotation.

2. In combination, a rotatable shaft, an extension piece, having one end secured to said shaft, a retractile spring surrounding said extension piece and having one end secured thereto, an adjusting member attached to the other end of said extension piece and arranged for rotary movement relative thereto, the other end of said retractile spring being secured to said adjusting member, and a locking spring element arranged to engage any one of a series of notches in said adjusting member to hold said adjusting member against rotation with said shaft.

3. In combination, a rotatable shaft, a hollow extension piece one end of which receives the end of said shaft, means for securing the extension piece to said shaft, an adjusting member associated with the other end of said extension piece and arranged for rotary movement relative thereto, a helical spring surrounding the extension piece, one end of said spring secured to said extension piece and the other end attached to said adjusting member, and a locking element for adjustably engaging and holding said adjusting member against rotation.

4. In combination, a rotatable switch

shaft, an extension tube, one end of which receives said shaft, means for securing said tube to the shaft, an adjusting cap having a bearing piece which enters the other end of said tube to permit rotary movement of said cap with respect to the tube, a helical spring having one end secured to the extension tube and the other end attached to said adjusting cap, a locking spring for detachably engaging said adjusting cap to hold the same from rotating, and means secured to said adjusting spring to prevent the same from participating in the rotary movement of said shaft.

5. In combination, a rotatable shaft, a hollow extension piece, one end of which receives the end of said shaft and is securely attached thereto, an adjusting cap having a bearing element which enters the free end of said extension piece to permit rotation of the cap with respect to said extension piece, said cap having a series of notches in the periphery thereof, a retractile spring surrounding said extension piece having one end secured thereto and the other end attached to said adjusting cap, and a spring element having one end fixed and the other end arranged to detachably engage said notches to hold said adjusting cap from rotation under the tension of said retractile spring.

6. In combination, a shaft, an extension piece, one end of which receives the shaft and is secured thereto, an adjusting member, having a bearing and cap element, which engages the other end of said extension piece to permit rotary movement of the adjusting member relative to said extension piece, a helical retractile spring for restoring said shaft to its normal position, one end of said spring secured to said extension piece and the other end attached to said adjusting member, and a locking spring for adjustably engaging said adjusting member to hold the same against movement under the tension of said retractile spring.

7. In combination, a rotatable shaft, an extension tube, one end of which receives said shaft and is secured thereto, a stop bracket associated with said shaft and serving to limit the rotary movement thereof, a helical spring surrounding said tube and having one end secured thereto, an adjustable cap attached to the free end of said spring and having a bearing and guide element which loosely fits in the other end of said extension tube, and a locking element having one end secured to said stop bracket and the other end adjustably engaging said adjusting cap to hold the same against rotation under the tension of said helical spring.

8. In combination, a rotatable shaft, a hollow member, one end of which receives

the end of said shaft and is securely attached thereto, a stop bracket encircling said shaft and serving to limit the rotary movement thereof, a stop finger secured to the shaft and engaging said stop bracket in the normal position of the shaft, a cylindrical retractile spring surrounding said hollow member and having one end secured thereto, an adjusting member attached to the other end of said spring and attached to said hollow member for rotary movement relative thereto, and a locking spring having one end encircling said shaft and securely attached to said stop bracket and the other end flexibly engaging said adjusting member to hold the same against relative movement with respect to said stop bracket.

9. In combination, a stationary frame, a rotatable shaft supported by said frame, an extension piece, one end of which is securely attached to the end of said shaft, a spring for restoring said shaft, a cap member engaging the other end of said extension piece in such a manner as to permit free rotation of the extension piece with respect to said cap member, and a locking spring for detachably engaging said cap member to hold the same firmly in engagement with said extension piece and also to prevent said cap member from participating in the rotary movement of said extension piece.

10. In combination, a rotatable shaft, a tube, one end of which receives the end of said shaft and is securely attached thereto, a circular cap having a bearing element which loosely fits in the other end of said tube to permit rotary movement of the tube with respect to the cap, said cap having a series of notches in the periphery thereof, a helical spring surrounding said tube having one end secured thereto and the other end attached to said cap, and a locking member for engaging any one of said notches to hold said cap against displacement with respect to said extension tube and also to hold said cap member from participating in the rotary movement of said extension tube.

In witness whereof, I hereunto subscribe my name this 16th day of May, 1930.

FREDERICK A. VOOS.

55

60

65