

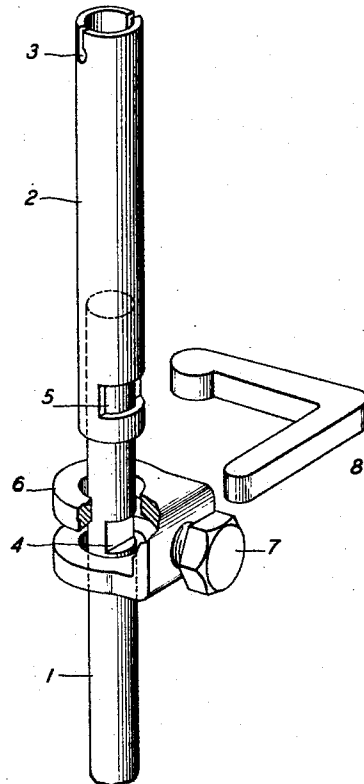
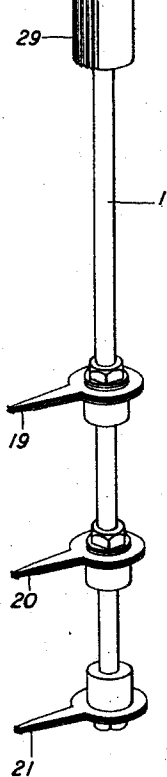
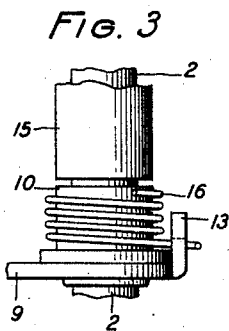
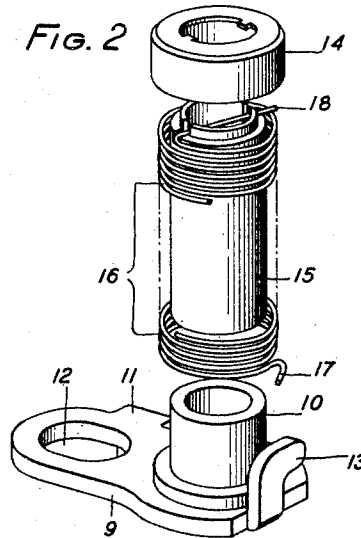
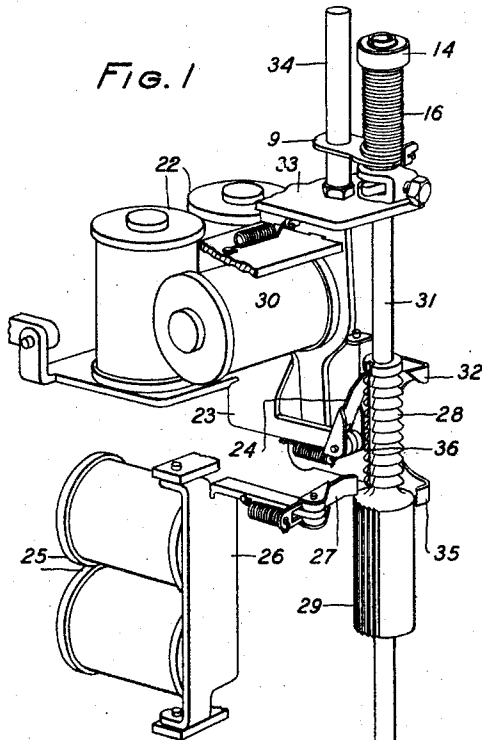
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B. FREILE ET AL

1,913,440

RETRACTILE DEVICE

Original Filed May 21, 1930



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RETRACTILE DEVICE

Application filed May 21, 1930, Serial No. 454,368. Renewed August 10, 1932.

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

5 The objects are to reduce the number of failures which have been encountered with devices of this character, to render them more positive and reliable, to facilitate adjustment, to increase their efficiency, and to reduce the cost of manufacture.

10 It has been the custom in the past to restore the shafts of automatic switches by means of coiled springs such as those used in clocks. Springs of this type have been found to have certain disadvantages. The friction offered by the convolutions of the spring as it is wound is an added load on the switch operating magnets. They are liable to lock in their tensioned condition, thus failing to restore the shaft; they are subject to breaking; and, moreover, the assemblies of which they are a part are costly to manufacture and maintain in adjustment.

15 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 to fulfill the requirements and can be attached to the present standard switch shafts without necessitating any changes. These results are secured by means of a spring assembly which includes an extension tube that fits over the end of the standard switch shaft and is secured there-
20 by means of the fastening device that attaches the stop finger. The hub member, to which the stop bracket is secured, fits loosely on over the extension tube. In the upper end of the extension tube a locking slot of the bayonet-joint type is provided. The helical spring fits on over the extension tube and hub member and has a loop in its lower end which attaches to a projection on the bracket. The upper end of the helical spring is securely attached to a cap and a sleeve which slides on over the extension tube. The end of the wire, which forms the helical spring, is so disposed as to pass diametrically across the sleeve such that it engages said locking slot to secure the spring to the extension tube.
25 To adjust the tension of the spring, it is only

necessary to seize the cap member, disengage the spring from the locking slot, give it the necessary number of turns, and then reengage it in said slot.

A feature of the invention is an assembly 55 of the kind above described in which the various parts are held in their positions relative to one another by means of opposing shoulders, one on the shank of the hub member and the other on a sleeve secured to said cap and disposed within the helix of the spring and around the shaft. There is a normal clearance between these shoulders to permit proper freedom of movement of the parts but not sufficient to allow any part to work out of place.

Although helical springs have been proposed for restoring switches, the assembly which applicants have invented is an improvement over these prior devices in that it greatly facilitates replacement and makes it possible to secure the correct adjustment with the least amount of difficulty and permits more efficient use of the motive power of the spring.

The invention is illustrated in the accompanying drawing, in which Fig. 1 shows 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 of the retractile spring assembly showing the various elements partly disassembled. Fig. 3 is a detail of the assembly.

Inasmuch as the construction and operation of selector switches of the type to which this invention is applicable are well known 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 accompanying drawing, the brush shaft 1 of a switch of this kind carries a plurality of brushes 19, 20, and 21, which cooperate with rows of contacts in a terminal bank (not shown). A set of vertical operating magnets 22, mounted on the switch frame, operate an armature 23, which in turn actuates the step-

ping pawl 24. Pawl 24 engages the vertical ratchet 28 to step the brush shaft vertically in a step-by-step manner. The shaft 1 is held in its vertical position by the holding dog 32. After the switch has been positioned in its vertical movement, the rotary magnets 25 are energized to operate the armature 26, which in turn actuates the rotary stepping pawl 27. The pawl 27 engages the rotary ratchet 29 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 35, which engages the rotary ratchet 29.

During the vertical movement of the brush shaft, the retractile spring assembly, which is connected to the top of the shaft, moves bodily therewith. During the rotary movement of the shaft 1, the retractile spring 16 is tensioned so as to restore the shaft 1 in its rotary direction when the shaft is released. The release of the shaft is effected by energizing the release magnet 30 to disengage the holding dogs 32 and 35. The shaft releases first in its rotary direction and then in its vertical direction.

The spring assembly comprises an extension tube 2 (shown in Fig. 2) which fits easily on over the end of the brush shaft 1. The tube 2 has a notch 5 cut in the lower end thereof which registers with a notch 4 in the shaft when the tube is adjusted to its correct position on the shaft. The tube is held to the shaft 1 by means of a clevis 6 and a combined locking key and stop finger 8. With the tube in place on the shaft, the locking key 8 is passed through an opening in the clevis and into the slots 4 and 5. With the parts in this position, the set screw 7 is tightened, thus fastening the tube 2 and the stop finger 8 securely to the shaft 1.

The stop bracket 9 is equipped with a hub portion 10, which is securely attached thereto and has an opening of sufficient diameter to receive the extension tube 2. The stop bracket 9 also has an opening 12, which loosely receives the post 34 secured to the frame 33 of the switch. To assemble the stop bracket 9, it is passed on over the tube 2 until it encounters the upper surface of the clevis 6.

The assembly also includes a spring unit comprising a sleeve 15 of sufficient diameter to admit the extension tube 2. The sleeve 15 is notched at its upper end to receive the end of the wire 18 that forms the helical retractile spring 16. With the wire 18 passing diametrically across the sleeve 15 and resting in the notches thereof, a cap member 14 is fitted on to the end of the sleeve and, while in this position, secured thereto by turning over the upper edges of the sleeve. This process firmly secures the cap, sleeve, and spring together as a unit. To finally assem-

ble the complete device, the cap and spring unit is passed on over the end of the extension tube 2 until the end of the wire 18 enters the bayonet joint slot 3 in the upper end of the tube 2. The free end of the spring 16 is fashioned to provide a hook 17, which engages a projecting piece 13 on stop finger 9. With the lower end of the retractile spring thus secured to the stop bracket 9, the cap 14 may be given a number of turns to tension the retractile spring before dropping into the locking slot 3.

When the retractile elements are thus assembled, the shaft 1 is urged by the tension in the spring 16 until the stop finger 8 engages a depending portion 11 of the stop bracket, thus defining the fully released position of the shaft. With the stop finger 8 pressing against the stop bracket 11, the forces of the spring are confined within the assembly so that the stop bracket 9 offers no friction as it slides along the vertical post 34 when the shaft 1 is moved vertically. When, however, the shaft is rotated, the post 34 prevents the stop finger from participating in the rotary movement of the shaft, and thus the spring 16 is further tensioned. As soon as the holding dogs are removed as above noted, the tension in the spring rotates the shaft back to its normal rotary position where the stop finger 8 engages the depending portion 11 of the bracket 9. Thereupon, the shaft 1 restores to its normal vertical position. Shaft 1 is prevented from restoring in its vertical direction until it has completely restored in the 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 36 is cut in the teeth of the ratchet 28. A stationary dog normally lies within this slot when the shaft is in its normal rotary position. As soon as a rotary step is taken, however, the dog passes under the corresponding vertical tooth in the ratchet 28. This holds the shaft against release until it has restored to its normal rotary position regardless of the fact that the holding dog 32 may have been withdrawn.

With the elements of the spring assembly in their proper relative positions, there is a slight clearance between the lower edge of the sleeve 15 and the upper edge of the hub member 10. This is clearly seen in Fig. 3. The purpose of this clearance is to permit a certain amount of freedom of the relatively movable parts. The opposing edges, however, prevent these parts from becoming unduly displaced due to forces set up by the tension of the retractile spring 16.

What is claimed is:

1. In combination, a rotatable member having a locking slot in the end thereof, a non-rotatable member, a spring having a plurality of turns surrounding said rotat-

able member and having one end secured to said non-rotatable member and the other end secured to said rotatable member by engagement in said locking slot, and means secured to said spring to enable its disengagement from said slot for adjustment.

2. In combination, a shaft, a member secured to said shaft having a slot in the end thereof, a bracket associated with said shaft, a helical spring surrounding said shaft and having one end secured to said bracket and the other end secured to said first member by engagement in said slot, and means associated with said spring for rotating it relative to said shaft to enable its disengagement from said slot.

3. In combination, a rotatable shaft, a member secured to said shaft having a recess in the end thereof, a non-rotatable member associated with said shaft, a wire of suitable material fashioned to give a spring in the form of a helix, one end of said wire being secured to said non-rotatable member, and a cap securely attached to the said wire spring at the other end thereof, said cap having a concentric opening, the latter end of said wire spring being so disposed as to pass diametrically across the opening in said cap and to engage said recess to lock said spring to the shaft.

4. In combination, a movable switch shaft having an extension piece with a locking recess in the end thereof, a hub member loosely surrounding said extension piece, a bracket to which said hub is securely fixed, a sleeve surrounding the end of said extension piece, a cap securely attached to said sleeve, and a helical spring surrounding said hub member and said sleeve and having one end secured to the hub and the other end secured to said cap and sleeve and also secured to said extension piece by engagement in said recess, said hub member and sleeve presenting opposing shoulders to prevent undue displacement of the above-mentioned elements.

5. In combination, a switch shaft having an extension piece with a locking slot in the end thereof, a bracket having an opening through which said extension piece freely passes, a stationary member to which said bracket is attached, a stop finger securely attached to said switch shaft and engaging a portion of said bracket to limit the restoring movement of the switch shaft, a helical spring surrounding said shaft and having one end secured to said bracket and the other end engaging said locking slot, and means attached to the latter end of said spring to facilitate its disengagement from and reengagement with said slot for the purpose of adjusting the tension.

6. In combination, a rotatable shaft, a hollow extension member, one end of which receives the end of said shaft, the other end

of said extension member having a recess therein, means for securely fastening said extension member to said shaft, a non-rotatable member, a sleeve member surrounding said extension member, and a cylindrical spring surrounding said sleeve member and having one end secured to said non-rotatable member and the other end secured to said sleeve member and to said extension member by a locking engagement with said recess.

7. In combination, a shaft, an extension tube, one end of which receives the end of said shaft, the other end of said tube having a locking slot therein, means for securely fastening the tube to said shaft for movement therewith, a stop member associated with said shaft, and a helical spring surrounding said tube and having one end secured to said stop member and the other end secured to said extension tube by detachable engagement with said locking slot.

8. In combination, a shaft, a hollow extension member, one end of which receives the end of said shaft, a stop finger for limiting the movement of said shaft, means for securely fastening both said stop finger and said extension member to said shaft, said extension member having a recess formed in the end thereof, a stop member associated with said shaft and arranged to permit movement of the shaft with respect thereto, and a helical spring surrounding said extension member and having one end secured to said stop member and the other end detachably engaged in said recess.

9. In combination, a movable shaft having a notch formed therein, an extension tube, one end of which receives the end of said shaft, the other end of said tube having a locking slot therein, said extension tube also having a notch therein, a stop finger for limiting the movement of said shaft, means for fastening said stop finger in said notches to rigidly secure said extension tube and stop finger to said shaft, a stop bracket coaxing with said stop finger, and a spring surrounding said extension tube and having one end attached to said stop bracket and the other end to said tube by engagement with said locking slot.

10. In combination, a rotatable shaft, an extension tube, one end of which receives the end of said shaft, the other end of said tube having a locking recess therein, means for fastening said tube to said shaft, a non-rotatable stop bracket including a hub portion surrounding said tube and permitting movement of the tube therein, and a cylindrical retractile spring disposed about said tube and having one end secured to said stop bracket and the other end adjustably secured to said extension tube by engagement in said locking recess.

11. In combination, a rotatable shaft, an extension tube, one end of which receives

the end of said shaft, the other end of said tube having a locking slot therein, means for securely attaching the tube to the shaft for rotation therein, a non-rotatable stop bracket having an opening through which said tube passes, a helical spring surrounding said tube and having one end secured to said bracket and the other end secured to said tube by engagement with said locking slot, and a cap attached to the latter end of said spring to enable its disengagement from said slot for adjustment.

12. The combination in an automatic switch of a rotatable shaft, an extension tube, one end of which receives the end of said shaft, the other end of said tube having a locking recess therein, means for clamping said tube to said shaft for rotation therewith, a stop bracket having an opening at one end thereof within which said tube and shaft rotate, a stationary rod, said stop bracket having an opening in the other end thereof for slidable engagement with said rod, and a retractile spring surrounding said extension tube and having one end secured to said stop bracket and the other end adjustably secured to said extension tube by engagement with said locking slot.

13. In combination, a rotatable member having a locking recess therein, a second member, and a spring having a plurality of turns disposed about said rotatable member and having one end in engagement with said second member and the other end secured to said rotatable member by engagement in said locking recess, said spring being readily disengaged from said recess to enable adjustment.

14. In combination, a rotatable member having a receptacle in one end thereof, a second member, and a helical retractile spring having one end connected to said second member and the other end attached to said rotatable member by engagement in said receptacle, said spring being readily detached from said rotatable member to enable an adjustment of its tension.

15. In combination, a non-rotatable member, a helical retractile spring having one end attached to said member, and a rotatable member disposed within said spring and having its end fashioned to provide a detachable connection with the other end of said spring such that a slight rotary movement of said spring enables its detachment from the rotatable member.

16. In combination, two members, one of which is rotatable relative to the other, and a helical retractile spring disposed about one of said members and having one end secured to one of said members and the other end engaged in a locking recess in the end of the other one of said members, said spring being detachable from said recess to enable ad-

justment of its tension by a slight rotary movement.

17. In combination, a sleeve having a slot cut in one end thereof, a coiled retractile spring disposed about said sleeve and having one of its ends arranged in said slot, a cap fitting over the end of said sleeve and into said slot, said parts when thus assembled being secured as a unitary structure by overturning the slotted end of said sleeve, a non-rotatable member to which the free end of said spring is attached, and a rotatable member disposed within said sleeve and having a locking slot in the end thereof, said unitary structure being detachably connected to the rotatable member by engagement of the first-mentioned end of said spring in said locking slot.

18. In combination, a cylindrical sleeve having slots cut in one end thereof, a retractile spring coiled about said sleeve with one of its ends arranged in said slots and passing across the open end of the sleeve, a cap fitting over the end of the sleeve end and into said slots, said sleeve, spring, and cap when thus assembled being clamped together as an integral spring structure by overturning the slotted end of said sleeve, a rotatable member disposed within said sleeve and having a locking recess in the end thereof for detachable engagement by the clamped end of said spring, said recess being so shaped that a slight rotary movement of said cap permits the disengagement of said spring structure from said rotatable member, and a relatively non-rotatable member to which the free end of said spring is connected.

In witness whereof, we hereunto subscribe our names this 19th day of May, 1930.

BRUCE FREILE.
ARTHUR C. MAGRATH.