Feb. 4, 1964 J. H. NICHOLAS ETAL 3,120,291

HELICAL SPRING OPERATOR

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Fig. 1

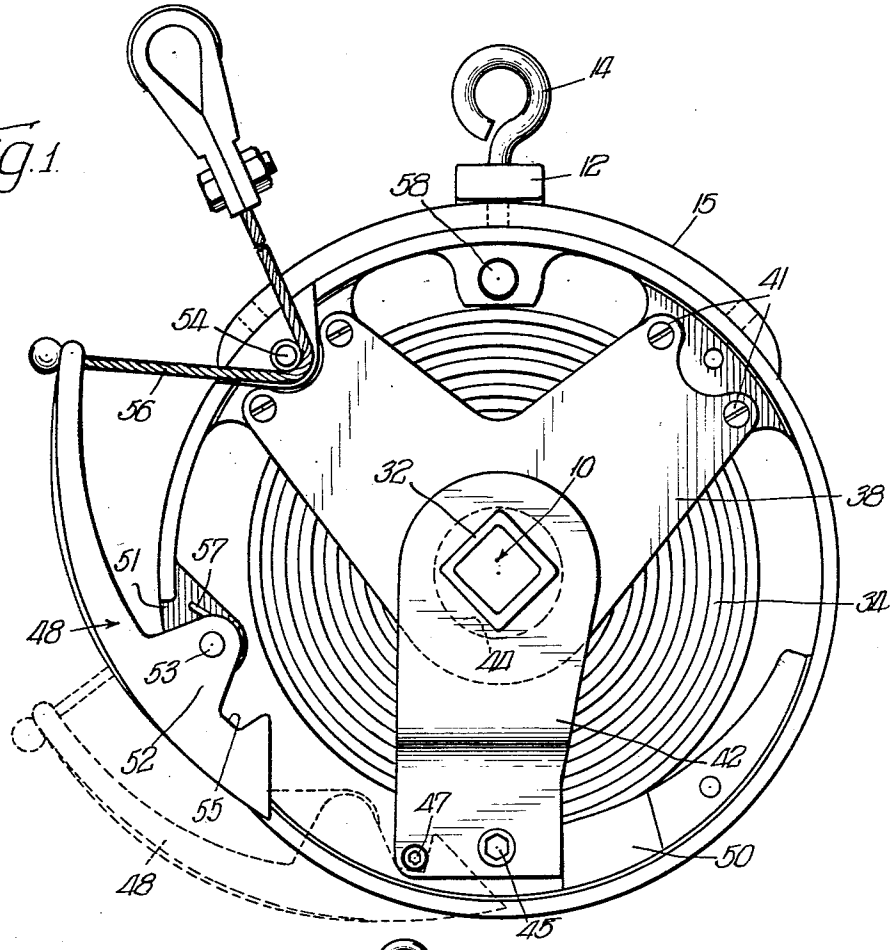

Fig. 4

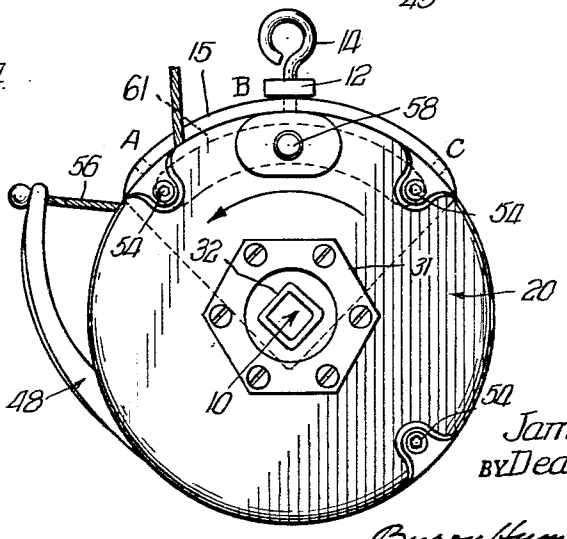

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Fig. 2

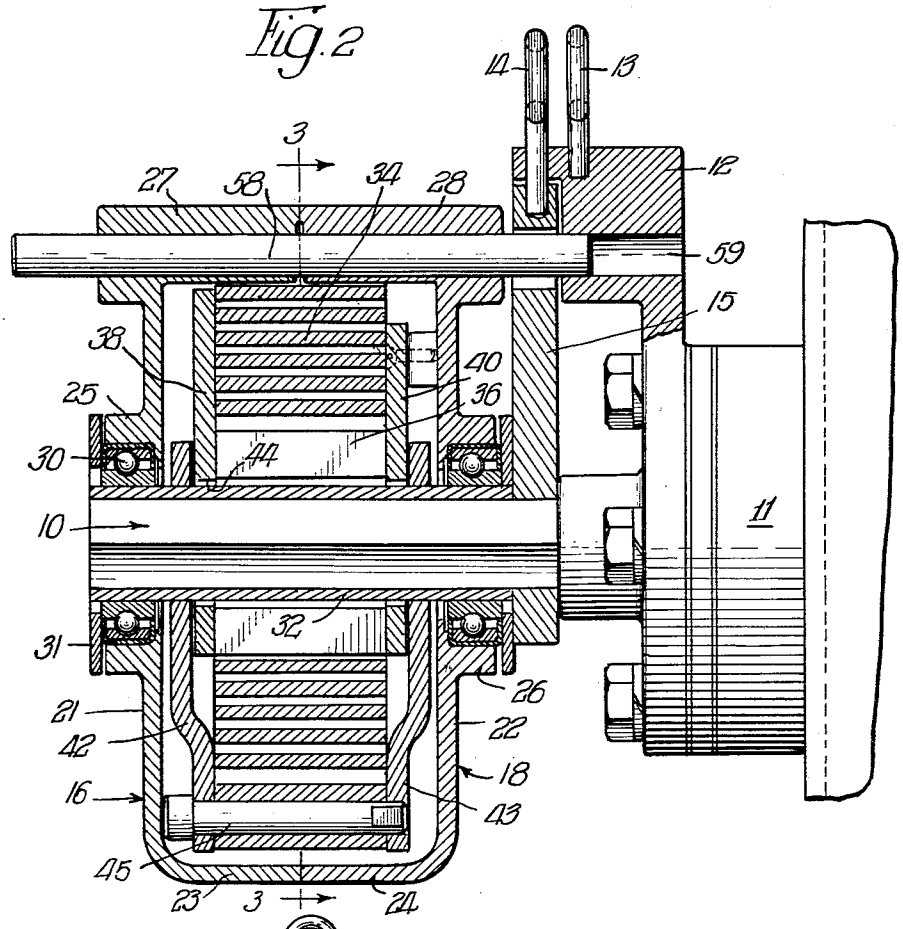

Fig. 5.

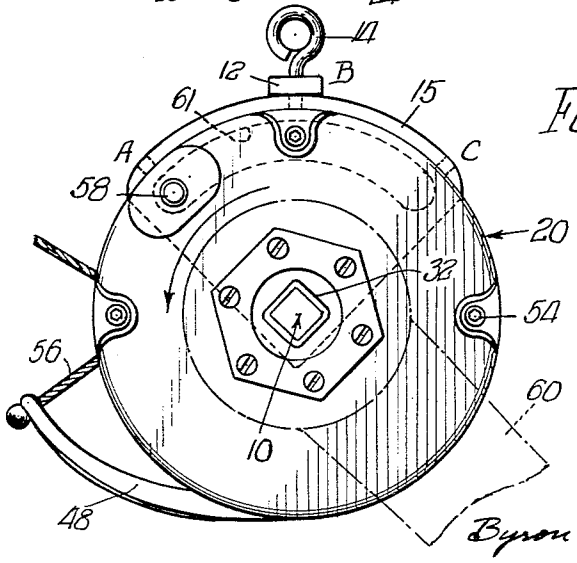

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Fig. 3

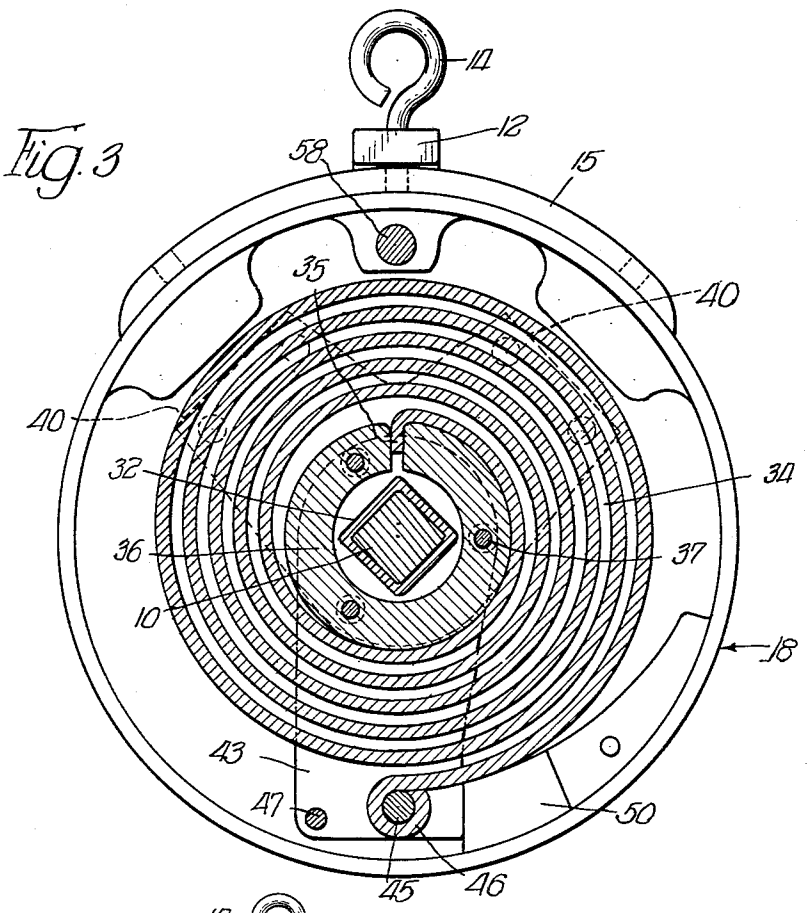
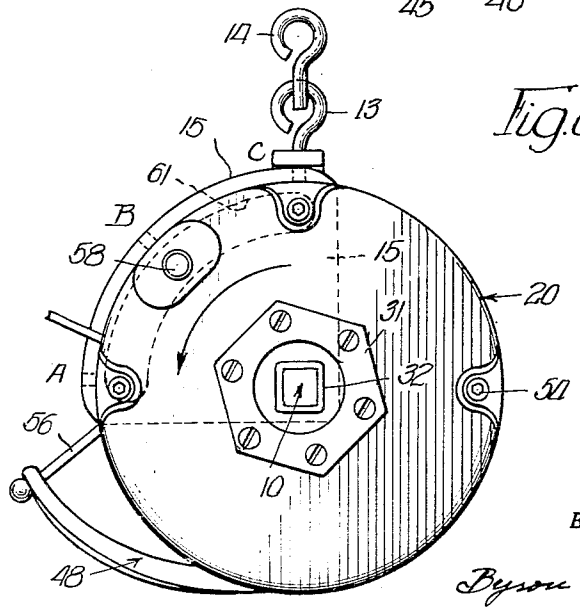


Fig. 6.



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HELICAL SPRING OPERATOR

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4 Claims. (Cl. 185—39)

The invention relates to a spring energized mechanism and has reference in particular to a helical spring operator for actuating high voltage electrical switches.

The helical spring operator of the invention is mechanically trip-free since it is necessary to cock or load the spring assembly in advance of a desired operation. Also it is necessary for the personnel to locate the helical spring operator on the switch shaft in a manner to produce the desired direction of throw of the switch contact arm. Finally a trigger must be actuated to release the cocked or loaded helical spring thereby completing the throw of the switch contact arm in the pre-selected direction for either opening or closing the electrical circuit controlled by the said switch.

Accordingly an object of the invention resides in the provision of a spring energized switch operator which will be portable so that it can be carried from switch to switch by the operating personnel, which will be mechanically trip-free in operation and which can be tripped by a lanyard or by a solenoid, thus facilitating remote actuation thereof.

Another object is to provide a helical spring switch operator wherein right and left hand housings of similar size and shape will house the helical spring, wherein the said spring has one end fixed to the housing and its other end fixed to a sleeve journalled by the housing and which is adapted to receive the squared end of the switch actuating shaft. Thus the switch operator does not have any exposed moving parts and the housing in addition affords protection to the operating personnel and also protects the working parts of the spring assembly from mechanical damage.

Another object is to provide a mechanism for snap action, trip-free operation in either direction of a multiple position switch having two or more positions.

Another object is to provide a helical spring mechanism having utility for the purposes described which will be rugged and compact in construction, which will embody relatively few parts and which will be highly efficient in operation.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out in the specification, drawings and claims appended thereto.

In the drawings which illustrate an embodiment of the device and wherein like reference characters are used to designate like parts—

FIGURE 1 is an elevational view of the spring energized mechanism of the invention, one of the housing sections being removed to show details of the operating parts;

FIGURE 2 is a transverse sectional view taken substantially through the center of the mechanism as shown in FIGURE 1 and further illustrating its association with the actuating shaft of a switch;

FIGURE 3 is a sectional view taken substantially along line 3—3 of FIGURE 2;

FIGURE 4 is an elevational view of the switch operator showing the same in position on a switch shaft and ready for an operation;

FIGURE 5 is a view similar to FIGURE 4 but illustrating the manner of cocking or loading the helical spring assembly of the operator; and

FIGURE 6 is a view also similar to FIGURE 4 but illustrating the position of the switch shaft following actuation thereof by the operator.

The embodiment selected for illustrating the invention is shown in FIGURES 1 and 2 as mounted on the actuating shaft 10 of a high voltage industrial type switch generally designated by numeral 11. The shaft 10 is square in cross section being made so in order to accommodate the present operator. However, a splined or keyed connection can be employed or the shaft 10 can be otherwise suitably shaped. The portion 11 of the switch structure is provided with a position plate 12 which anchors a stationary locking pin 13 and a removable locking pin 14. It is also necessary for the invention that a segment such as 15 be anchored on the shaft 10 so as to rotate with the shaft. Except during operation, the shaft and segment are locked against rotation by the removable pin 14 having location in the position plate 12 of the switch structure 11.

The operator of the invention is associated with the switch actuating shaft 10 in a manner designed to produce the desired direction of throw. Accordingly, both sections 16 and 18 of the housing 20 for the spring assembly are substantially similar in size and shape, although not exactly identical. As shown in FIGURES 1, 2 and 3 each half section is circular, the same including an end wall 21 and 22, respectively, peripheral flanges 23 and 24, center hub portions 25 and 26 and a heavy flange section 27 and 28. The center hub portions each mount a ball bearing structure 30 and the same are retained in place by the plates 31. The ball bearing structures journal the elongated sleeve 32 which is square in cross section or otherwise suitably shaped and of a size to accommodate the shaft 10. Thus the sleeve is rotatable with respect to the housing 20 but more important is the fact that when the sleeve is located on the shaft 10 the two part housing may be rotated with respect to the sleeve.

The numeral 34 indicates the helical spring comprising the power element of the present device. The inner end 35 of the helical spring, see FIGURE 3, is anchored in the hub 36 which is securely fastened by the screws 37 to the hub supports 38 and 40 located on respective sides of the hub 36. Each hub support is substantially in the shape of a V and the terminal end of each arm of the support is secured by screws 41 to the inner periphery of the housing element 18.

The hub supports 38 and 40 have a journalling relationship with the spring retainer arms 42 and 43, respectively. The said arms each have a square opening formed in the same for receiving the square sleeve 32 and in this manner the retainer arms are fixedly mounted on the sleeve. However, the hub supports are formed with an opening 44 through which the sleeve 32 is located. Thus the hub supports and the retainer arms are associated in a manner permitting independent movement. However, the hub supports are fixed to the housing, whereas the retainer arms are fixed to the square sleeve. In accordance with the invention the arms at their depending ends are tied together by the retainer pin 45 and the said retainer pin provides an anchor for the outer terminal end 46 of the helical spring 34, which end is thus fixed to the retainer arms all as shown in FIGURE 3. The housing element 18 is provided with a stop member 50, the same being located on the inside periphery of its flange such as at 24. The said member 50 provides a stop for the retainer arms 42 and 43 limiting movement of the said arms in a counterclockwise direction (FIGURE 3). The said arms are additionally connected by the latch pin 47 and which is adapted to coact with the latching handle 48 for cocking or loading the helical spring 34 all in a manner as will now be described.

The latching handle 48 is located in an opening 51 provided in part by each of the housing sections 16 and

18. Thus the latching handle is centrally located in the peripheral flange of the complete housing 20. The hub section 52 of the latch handle receives the pivot pin 53 which pivotally mounts the latch handle on the housing, since the pin 53 is anchored at its respective ends in the said housing sections. The connecting bolts 54 as best shown in FIGURES 4, 5 and 6, connect the two half sections of the housing. The operative end of the latching handle is recessed at 55 and the said recess is adapted to have latching engagement with the latch pin 47 carried by the retainer arms 42 and 43. The handle portion of the latch has connection with the lanyard or cable 56 which passes under the connecting bolt 54 and then extends to the exterior of the housing. A pull on the cable will pivot the latch 48 in a clockwise direction, FIGURE 1, to release the latch pin 47 when the same is engaged thereby. The tension spring 57 is associated with latching handle 48 and with its pivot pin 53 in a manner to yieldingly bias the handle in a counter-clockwise direction to maintain the handle portion projecting outwardly and the latching portion projecting inwardly of the housing 20.

Before the operator is placed on the actuating shaft 10 of the switch structure, it will be understood that the shaft and segment have been locked by the pin 14. The operator is then positioned on the switch structure by telescoping the sleeve 32 on the shaft 10. The direction of throw is determined by the placement of the operator on the shaft. When the half section 16 of the housing is located outwardly, then the throw of the switch actuating shaft will be in a counter-clockwise direction, as indicated by the arrow on the housing. When the half section 18 is located outwardly, then the throw of the switch actuating shaft will be in a clockwise direction.

The operator should be initially positioned on shaft 10 so that securing pin 58 is aligned with but does not enter opening 59 in the position plate 12. Thus the securing pin 58 remains withdrawn from its opening 59 in the position plate so as to free the housing. With the shaft 10 locked and the housing 20 of the operator free for rotation, the spring assembly can now be cocked and latched for storing energy in the helical spring 34. For this purpose the tool 60, FIGURE 5, is engaged with plate 31 and with the hub portion 25 and the housing 20 is rotated counterclockwise until the latching handle 48 engages with the latch pin 47. The housing will accordingly be moved from the position as shown in FIGURE 4 to the position of FIGURE 5. The stop 50 will be indexed to the right, FIGURE 1, a distance equal to the movement of the latching handle, and likewise the securing pin 58 will be moved from position B to position A. This is possible since the segment 15 is provided with a slot 61 so that the securing pin does not interfere with the movement of the segment, nor with movement of the shaft when the operator is tripped. Following rotation of the housing for cocking the helical spring 34, it will be understood that the operator is then axially moved into position on shaft 10 so that the securing pin is thereupon inserted in an opening in the positioning plate 12, similar to opening 59 but located at position A.

The operator should not be tripped until the locking pin 14 is withdrawn from segment 15. This is, of course, necessary in order to free the segment and shaft for rotation. With removal of the pin 14, tripping of the operator is accomplished by depressing the handle portion of the latch 48. This releases the retainer arms 42 and 43 which were previously tensioned by the cocking of the helical spring. The released arms, due to the tension exerted thereon by the helical spring, will move in a counter-clockwise direction until they contact the stop 50, and in so doing, movement is imparted to shaft 10, thereby throwing the contact arms of the switch structure into either a closed or an open position. At the end of the operation, the parts assume the position as shown in FIGURE 6. The shaft and segment are again locked by the pin 14 and the operator can now be removed from the shaft.

In assembling the operator it will be understood that the helical spring 34 is pre-stressed, that is, the spring is wound to place the parts under tension so that a torque exists even at the end of the throw.

The invention is not to be limited to or by details of construction of the particular embodiment thereof illustrated by the drawings, as various other forms of the device will, of course, be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

What is claimed is:

1. In a spring energized mechanism of the character described, in combination, a housing for said mechanism including a pair of spaced side walls and a connecting annular flange, a sleeve of non-circular shape in cross section extending from wall to wall and being journalled for rotation by said walls respectively, a helical spring within the housing and encircling the sleeve, a hub support on each side of the helical spring, each hub support having a radial position with respect to the sleeve and being fixed at its outer end to the housing, a retainer arm on each side of the helical spring, each retainer arm at one end being fixed to the sleeve so as to have oscillating movement when the sleeve rotates, a retainer pin connecting the arms at their opposite end, the said helical spring having its inner terminal end fixed to the hub supports and having its outer terminal end fixed to the retainer pin, a latch pin carried by the retainer arms adjacent the retainer pin, a latching lever pivotally mounted on the housing and located so as to have latching engagement with the latch pin, and a stop element located on the inside periphery of the annular flange of the housing and disposed on the side of the retainer arms opposite the latching lever.

2. In a spring energized mechanism of the character described, in combination, a two-part housing of circular shape, each part including a side wall and an annular flange, means connecting the housing parts to form a unitary structure, a sleeve extending from side wall to side wall and having a shape in cross-section which is substantially non-circular, a bearing structure mounted in each side wall and said structures journalling the sleeve, a hub support fixed at its outer end to the housing and extending radially with respect to the sleeve, a retainer arm fixed to the sleeve and also extending radially with respect thereto, a retainer pin fixed to the outer end of the arm, a helical spring having encircling relation with the sleeve and being confined within the housing, the inner end of the spring being fixed to the hub support, the outer end of the spring fixed to the retainer pin, a latch pin carried by the retainer arm adjacent the retainer pin, a latching lever pivotally carried by the housing and positioned to have latching engagement with the latch pin, a stop element located on the inside periphery of the annular flange of the unitary housing and disposed on that side of the retainer arm opposite the latching lever, and a securing pin carried by the housing adjacent the annular flange and adapted to lock the housing against rotation when the pin operatively positioned.

3. In a spring energized operator adapted for use with the actuating shaft of electric switch mechanism, the combination including a unitary housing having side walls and an annular connecting flange, a sleeve journalled by the housing and extending centrally from side wall to side wall, said sleeve having a shape in cross section similar to the actuating shaft of the switch mechanism for telescoping, non-rotative relation therewith, a helical spring within the housing and having encircling relation with the sleeve, means having a fixed connection with the inner end of the spring and with the housing adjacent the annular flange, other means fixed to the sleeve and extending radially thereof, a retainer pin fixed to the outer end of the said other means and anchoring the outer ter-

minal end of the helical spring, a latch pin also fixed to said other means, and a latching lever pivotally mounted on the annular flange of the housing and positioned within the same for latching engagement with the pin.

4. A spring energized operator adapted for use with the actuating shaft of electric switch mechanism as defined by claim 3, additionally including a securing pin carried by the housing at a location adjacent the annular flange.

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