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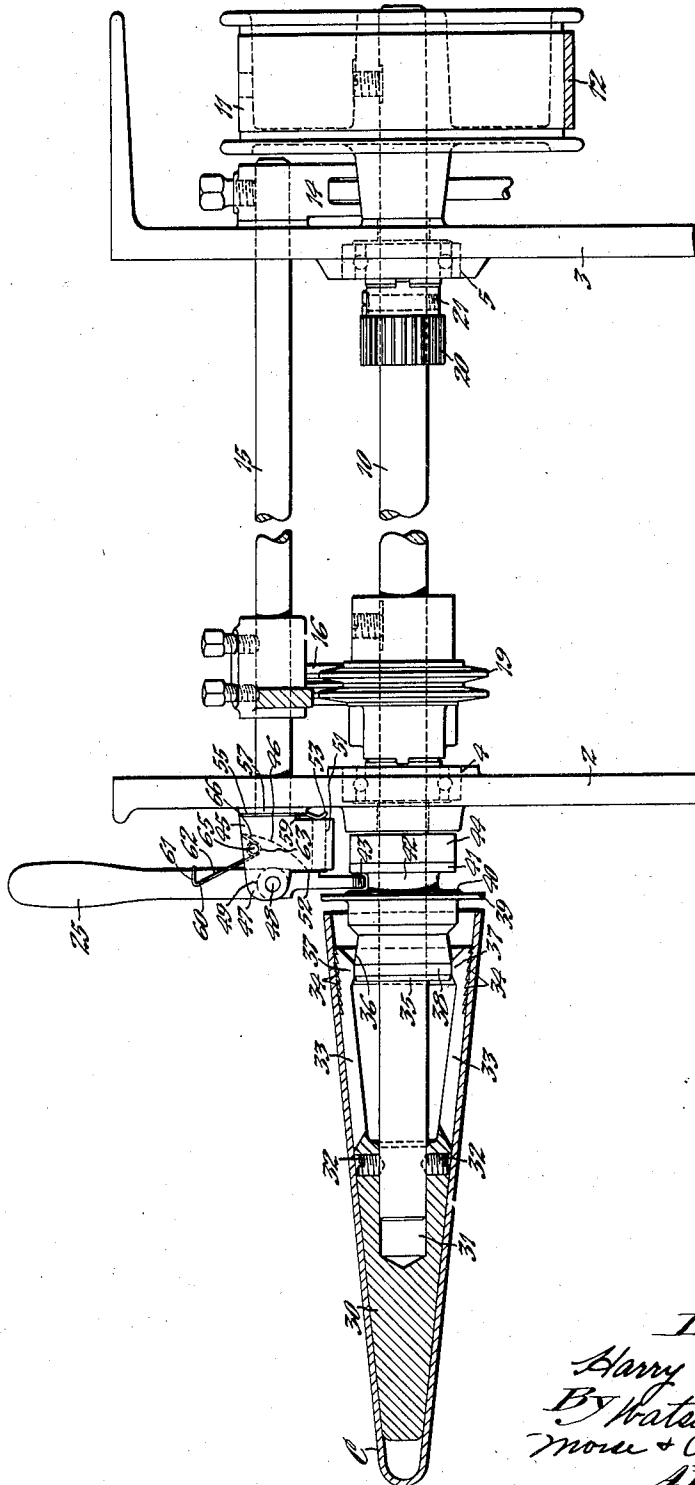
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SHIFTING MEANS FOR ROTATABLE ELEMENTS

Filed March 17, 1933

2 Sheets-Sheet 1



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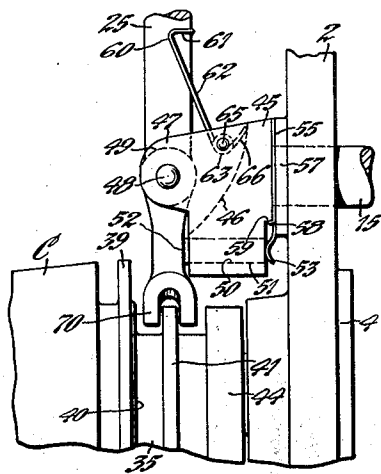


Fig. 5.

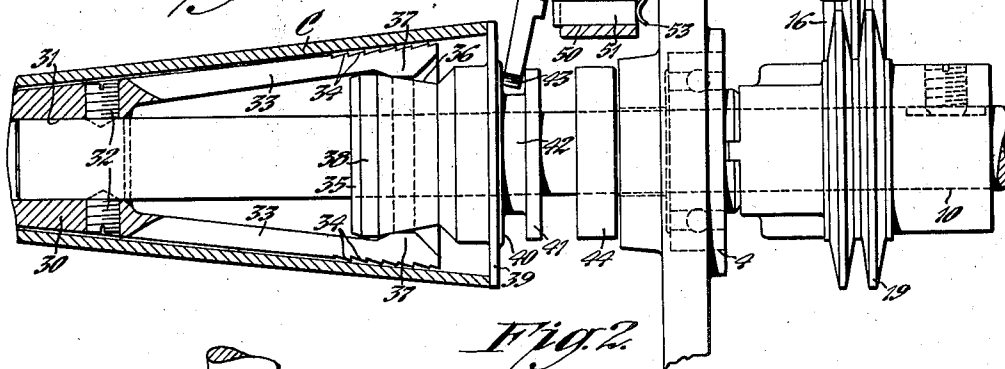


Fig. 2.

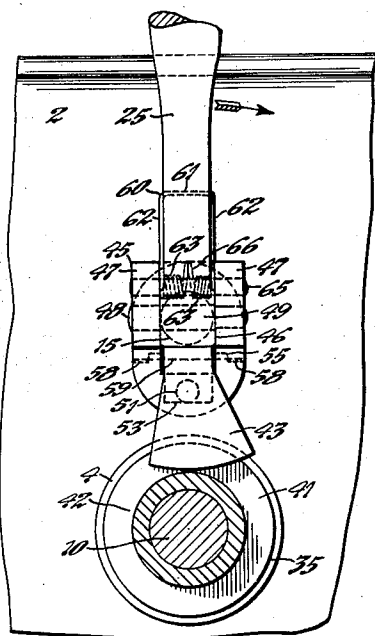


Fig. 3.

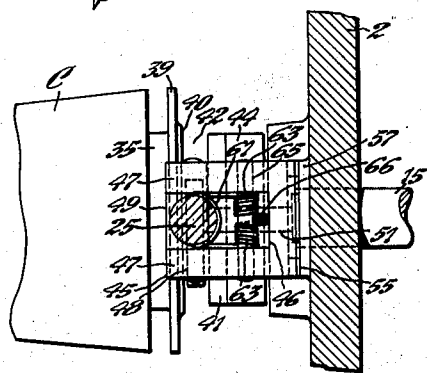


Fig. 4.

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UNITED STATES PATENT OFFICE

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SHIFTING MEANS FOR ROTATABLE ELEMENTS

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12 Claims. (Cl. 192—99)

This invention relates to improvements in shifting means for rotatable elements such, for example, as clutch-members, gear-wheels or expanders for mandrels and the like. The invention is herein shown as applied to use with a shiftable lever or handle arranged to control the operation of a winding machine and to slide a rotatable element which acts to expand the mandrel or cop-holder to grip the interior of the paper tube on which the cop or package is wound. In its broadest aspect, however, the invention is applicable to various and sundry machines and mechanisms wherein the operation of the apparatus is controlled by manually or mechanically actuated means engaged with a rotating part to effect the shifting of the latter to perform its appropriate function.

One object of the present invention is to provide a device of the type specified wherein the lever or other shifting means which slides the rotating element is normally held out of frictional contact therewith to prevent wear on the parts.

Another object of the invention is to provide a yielding control for the shift-lever which permits its movement in opposite directions for sliding the rotating element while acting to return it to neutral position when released.

Another object of the invention is to provide a device of the type specified which is particularly adapted for use with the expanding means for cop-holders of winding machines and so constructed and arranged that the shift-lever will be free from frictional engagement with the rotating element to prevent wear and abrasion which results in the throwing off of iron or steel particles liable to soil the delicate material being wound.

Another object of the invention is to provide a device of the type specified which is simple in construction, economical to manufacture and efficient in use for the purposes stated.

Further objects of the improvement are set forth in the following specification which describes the invention, by way of example, as applied to use on a winding machine with two different embodiments illustrated by the accompanying drawings. In the drawings:

Fig. 1 is a part sectional view showing the rotary spindle of a winding machine and illustrating the present invention as applied to use with the expander-means for the cop-holder mounted on the spindle;

Fig. 2 is an enlarged view of the forward end

of the winding-spindle showing the cop-holder in section;

Fig. 3 is an end view of the spindle showing the mounting for the control-handle or shift-lever for the cop-holder expander;

Fig. 4 is a plan view of the same; and

Fig. 5 shows a modified form of construction of the control-handle or shift-lever.

It is a common practice in various types of machines to employ a rotating element slidable on its shaft to control some part of the mechanism of the machine. For example, the machine may be operated through a clutch-mechanism in which one of the clutch-elements is loose on the shaft and the other element fast therewith and arranged to be engaged with or disengaged from the loose element by sliding it longitudinally of the shaft. In its present embodiment the invention is applied for use with a rotating element which is slidable on a shaft or winding-spindle to effect the expansion and contraction of a mandrel for mounting a paper cop-tube to rotate with the spindle. In this construction the means for shifting the expander-element consists in a handle or lever which is pivoted to rock on an axis at right-angles to the axis of the winding-spindle.

Referring to the drawings, Fig. 1 represents a portion of a winding machine having a frame constituted by side members or uprights 2 and 3 carrying bearings 4 and 5, in which is journaled a horizontal shaft 10 constituted as a winding-spindle. The shaft or spindle 10 may be driven from a pulley 11 secured fast at one end thereof and adapted to be rotated from a belt 12 passing across the underside of its periphery. The rotation of the spindle 10 may be controlled by engaging the belt with and releasing it from the pulley 11 through suitable means not herein shown in detail. In one form of construction as used on winding machines, an idler pulley, not shown, presses against the belt 12 to maintain the latter in contact with the periphery of the driving pulley 11, the idler pulley being moved to release the belt from the driving pulley through connection with a lever 14 secured fast to a rocker-shaft 15. As illustrated in Fig. 1, the rocker-shaft 15 is mounted to turn in bearings in the uprights 2 and 3 of the frame of the machine and carries a manually-operable control-lever 25 at its forward end which is also employed for shifting the cop-holder expanded. The lever 25 forms an essential part of the present invention and its arrangement will hereinafter be described in detail.

The rocker-shaft 15 carries a brake-lever 16 arranged to engage with a grooved brake-disk 19 which is secured rotatively with the spindle 10. The spindle 10 also carries a spur-gear 20 keyed thereto by a screw 21 and these two elements, the brake-disk 19 and gear 20, have hubs abutting the ends of the bearings 4 and 5 in the frame members 2 and 3 to take the longitudinal thrust of the spindle.

As herein illustrated the cop-holder or mandrel 30 is embodied in a conical shell-like structure carried at the forward end of the winding-spindle 10. The tapered part of the mandrel 30 is of solid construction provided with an axial bore 31 fitted to the end of the spindle 10. A pair of set-screws 32 disposed radially with their ends engaging depressions in the periphery of the spindle 10 secure the mandrel 30 fast thereon. Rearwardly of its solid portion the mandrel 30 is of hollow construction with its periphery conforming to the conical shape of its forward part. The hollow portion of the mandrel 30 has its walls split longitudinally to form a plurality of segments or spring-fingers 33 adapted to be expanded to engage the inner walls of the cop-tube C which is usually constructed of paper or fiber. At their free ends the segments 33 are scored with a plurality of annular serrations forming sharp teeth 34 adapted to bite into the inner wall of the cop-tube C when the segments are expanded whereby to hold the tube securely in place on the mandrel 30. The segments 33 are adapted to be expanded to engage their teeth 34 with the inner wall of the cop-tube C by means of a slidable expander-element or sleeve 35.

The expander-element 35 is mounted free to rotate on the shaft or spindle 10 and is slidable axially thereof under the actuation of the control-handle or shift-lever 25, previously referred to. The expander 35 has a beveled face 36 on its periphery adapted to engage inwardly projecting portions 37 of the segments 33 to force the latter radially outward. At one side of the beveled face 36 is a cylindrical surface 38 which is eventually carried into engagement with the projections 37 to retain the segments 33 in their expanded relationship while tending to prevent the expander 35 from sliding back to release them, see Fig. 1 of the drawings.

The expander 35 is formed with an annular flange 39 adapted to engage against the end of the cop-tube C to force the latter off from the mandrel 30 after the segments 33 have been allowed to contract by sliding the expander axially of the spindle 10 to the position illustrated in Fig. 2 of the drawings. On one side of the flange 39 is a boss 40 arranged in opposite spaced relation with respect to a flange 41 surrounding the end of the expander. The boss 40 and flange 41 form an annular groove or opening 42, the sides of which are adapted to be engaged by a toe-portion 43 on the lever 25 which projects into the groove. An annular flange or collar 44 fast on the spindle or shaft 10 adjacent the outer portion of its bearing 4 is employed as a stop for limiting the sliding movement of the expander-sleeve 35 to the right as viewed in Figs. 1 and 2 of the drawings.

The control-handle or shift-lever 25 is pivotally supported on a head or mounting 45 fast on the end of the rocker-shaft or rod 15. Preferably, the mounting or head 45 is constructed integrally with the rod 15, for example, as a forging. Referring particularly to Figs. 2, 3 and 4, the head or mounting 45 is slotted vertically at 46 and

formed with forwardly projecting ears 47 apertured to receive a cross-pin 43 on which the lever 25 is pivoted by means of its hub or bearing 48. The lever 25 is received in the slotted opening of the head or mounting 45 and pivoted on the pin 48 to adapt it to be rocked to cause its lower toe-portion 43 to slide the expander-element or sleeve 35 on the shaft or spindle 10. As shown in Fig. 3 of the drawings, the toe-portion 43 of the lever 25 is preferably of substantially segmental shape having an arcuate lower edge so that when the lever is rocked in the direction indicated by the arrow in this view to oscillate the rocker-shaft 15 the toe will remain in engagement with the groove 42 in the expander-element 35; it being understood however that the movement of the lever in this direction has no function in connection with the expanding of the cop-holder or mandrel 30. Normally, when the machine is in operation with the cop-tube C gripped on the mandrel 30 by the expansion of its segments 33, the expander-element 35 is slid to the right with the side of the flange 41 abutting the outer face of the fixed collar 44. With the expander 35 in this position the lever 25 stands erect with its toe 43 extending vertically within the groove 42 between the boss 40 and flange 41.

The shift-lever 25 is held in this neutral position with a clearance between the sides of its toe 43 and the faces of the boss 40 and flange 41 by an arrangement of self-adjusting resilient means as next explained. Slidable in a horizontal bore 50 at the bottom of the head or mounting 45 is a plunger-pin 51, the end of which projects slightly beyond the forward side of the mounting to bear against a finished face 52 on the side of the toe 43 of the lever 25. The opposite end of the pin 51 engages against a curved finger 53 projecting downwardly from a spring-plate or washer 55.

The spring-plate 55 is located between the inner face of the head or mounting 45 and the face of a boss 57 projecting from the side of the frame member 2, being provided with an axial aperture for receiving the rocker-shaft or rod 15. The spring-plate 55 is arranged to turn with the head or mounting 45 when the lever 25 is rocked in the direction indicated by the arrow in Fig. 3 to perform its function of oscillating the rocker-shaft or rod 15 to control the drive through the belt pulley 11. Conveniently, the spring-plate 55 may have fingers 58 bent across the lower squared edge 59 of the body of the head or mounting 45, see Figs. 2 and 3. The projecting finger 53 on the spring-plate 55 is of relatively narrow width as shown by the dotted lines in Fig. 3 and its convex face bears against the end of the pin 51 to retain it in the position illustrated in Fig. 2. The sides of the spring-finger 53 also bear against the rearward face of the head 45 to prevent it from projecting the pin 51 forwardly beyond the position illustrated in Fig. 2. The pin 51 thus serves as a cushioned stop to limit the rocking motion of the lever 25 in the direction indicated by the arrow in Fig. 2 to locate the toe 43 of the lever in exact position centrally of the groove 42 on the end of the expander 35 with a clearance between its sides and the lateral faces of the boss 40 and flange 41.

The lever 25 is resiliently held in neutral position as last described by means of a bifurcated wire-spring 60 bearing against its side above its pivotal axis. The spring 60, shown most clearly in Figs. 2, 3 and 4, is of generally hairpin-shape having an arcuate portion 61 shaped to enclose the rounded side of the lever 25 with opposite legs 62 extended downwardly therefrom and termi-

nating in helical coils 63. The helical coils 63 of the spring 60 are received within the slot 46 between the ears 47 of the head or mounting 45, being supported on a cross-pin 65 driven through holes in the sides of the head. The ends of the wire from the spring-coils 63 are extended at an angle to the main legs 62 in portions 66 which bear against the rearward side of the slot 46, the slot being herein shown as of arcuate contour formed by a milling cutter.

The spring 60 is held in position with its coils 63 maintained under tension by the terminal portions 66 of the wire bearing against the curved edge of the slot 46 whereby to cause its longer legs 62 to exert a force tending to rock the lever 25 in the direction indicated by the arrow in Fig. 2. Through this arrangement the lever 25 is resiliently held in neutral position with the finished face 52 of its toe 43 bearing against the end of the plunger-pin 51; it being understood that the spring-finger 53 has greater tension than the spring 60 so that the latter has no effect to rock the lever 25 to such an extent as to slide the plunger-pin 51 in its bore 50. On the other hand, the spring-finger 53 is yieldable to allow the plunger-pin 51 to be slid axially in its bore when the lever 25 is manually rocked in the direction indicated by the arrow in Fig. 2 to slide the expander 35 to the position shown in Fig. 1 where its flange 41 brings up against the fixed collar 44.

The method of operation of the device is as next explained. When the machine is inactive the lever 25 is rocked to the position shown in Fig. 2 with the expander 35 slid to the left on the shaft 10; it being understood that the shaft or spindle 10 is at rest so that the expander 35 does not rotate and therefore there will be no frictional rubbing action between the toe 43 of the lever and the sides of the groove 42 in the end of the expander. The parts are held in this position by the pressure of the segments 33 of the mandrel 30 on the beveled face 36 of the expander 35, the spring tendency of the segments being considerably greater than that of the spring 60 acting on the lever 25.

In preparing the machine for operation the paper or fiber cop-tube C is slid over the periphery of the mandrel or holder 30 until its rearward or larger end brings up against the side of the flange 39 of the expander 35, as shown in Fig. 2, to force the latter back on the spindle 10 until the tube seats firmly on the solid part of the mandrel. The operator then grasps the handle or lever 25 and pulls it forward, rocking it in the direction indicated by the arrow in Fig. 2, to cause its toe 43 to slide the expander 35 axially of the shaft 10 in a direction to the right as viewed in Fig. 2. As the expander 35 is forcibly shifted in this direction its annular beveled face 36 rides under the projections 37 on the inner sides of the segments 33 to expand the latter outwardly whereby to cause their teeth 34 to bite into the inner wall of the tube C. In this manner the segments 33 are expanded to grip the tube C firmly to the mandrel 30 as the projections 37 on the segments ride up onto the cylindrical face 38 of the expander.

As before indicated, the upper or handle portion of the lever 25 is rocked outwardly from the frame of the machine to a sufficient extent to carry the expander 35 back into position with its flange 41 abutting the side of the fixed collar 44, the pin 51 in the head or mounting 45 sliding axially to a slight extent under this movement of the lever as the spring-finger 53 yields.

As soon as the expander has been shifted into operative position, as shown in Fig. 1 of the drawings, the handle 25 may be released, whereupon the tension of the spring-finger 53 will force the plunger-pin 51 back in its bore 50 to return the lever to neutral position against the tension of the upper spring 60. As the lever returns to neutral position the upper spring 60 holds it with the finished face 52 of the toe 43 bearing against the end of the pin 51, the parts being so proportioned and located that at this juncture the toe 43 will be positioned centrally of the groove 42 in the expander 35 with its sides clear of the sides thereof.

The winding operation of the machine may now be started by rocking the lever 25 in the direction indicated by the arrow in Fig. 3 to cause the belt 12 to be engaged with the pulley 11 whereby to rotate the shaft or spindle 10. As the shaft 10 is rotated the mandrel or cop-holder 30 turns therewith to wind the yarn onto the cop-tube C as it is traversed longitudinally thereof by suitable means, not herein illustrated. It will be evident that the expander 35, being frictionally engaged with the segments 33 of the mandrel 30, will rotate with the latter, but during this rotation it is entirely free from contact with the toe 43 of the lever 25 due to the maintenance of the lever in neutral position as described under the control of the spring 60 and plunger-pin 51. Frictional contact between the toe 43 of the lever 25 and the sides of the groove 42 in the expander 35 is thus entirely eliminated to save the parts from excessive wear and deterioration. Furthermore, the elimination of the abrasive or rubbing action between the expander and its shift-lever prevents the grinding off of carbon particles which are liable to fly off from the rotating surfaces to lodge on the material being wound. In winding rayon and other synthetic materials the yarn is subjected to treatment with liquid such as an emulsion of oil. Under rapid manipulation a portion of the oil may be thrown off from the yarn and when mixed with the carbon particles caused by friction between the machine elements it may lodge on the yarn to soil the delicate material. With the present invention such a deleterious action of the oil and carbon particles is avoided so that the material is saved from damage or injury from this cause. It will thus be seen that the present invention, besides relieving the engaging parts from wear and deterioration, also insures against the danger of soiling the yarn packaged on the winding machine.

Fig. 5 illustrates an alternative form of construction of the device wherein the lever 25 is provided with a forked lower extremity 70 in place of the toe previously described. The sides of the fork 70 straddle the sides of the flange 41 on the expander 35 to effect the shifting of the latter in the same manner as first described, while the spring 60 and plunger-pin 51 act to maintain the lever 25 in neutral position with a clearance between the sides of the flange and the sides of the fork.

While the invention is herein illustrated and described as employed in connection with the shift-lever and slidable expander of a cop-tube holder or mandrel, it is to be understood that it is capable of wider use in various applications to machines and mechanisms of other types. Further modifications may also be made in the structure and arrangement of the parts of the device without departing from the spirit or scope of the inven-

tion. Therefore, without limiting myself in this respect, I claim:

1. In a device of the type specified, the combination of a rotatable and axially shiftable element, a manually operable lever for shifting said element, said lever and element having opposed faces for engagement to shift the element, and resilient means acting in opposite directions on the lever to move it in one direction or the other after its manual operation whereby to maintain it in neutral position with the engaging faces out of contact.

2. In a device of the type specified, the combination of a rotatable and axially shiftable element, means for shifting said element, said element and shifting means having opposing faces for engagement to shift the element, and yieldable means acting to move said shifting means in opposite directions whereby to return it to neutral position after it has been moved in either direction against the yielding action of said means.

3. In a device of the type specified, the combination of a rotatable and axially shiftable element having an annular flange, a lever adapted to engage the sides of the flange to shift said element, and resilient means acting in opposite directions on the lever to maintain it in neutral position free from engagement with the flange on said element during the rotation of the latter while permitting manual movement of said lever in two directions to shift said shiftable element.

4. In a device of the type specified, the combination of a rotatable and axially shiftable element, a member for shifting said element in opposite directions, yieldable means acting against said member to maintain it in neutral position while permitting it to be moved in one direction under the yielding action of said means, and a second resilient means acting against the member to maintain it bearing against the yieldable means while permitting it to be moved in the opposite direction away from said yieldable means.

5. In a device of the type specified, the combination of a rotatable and axially shiftable element, a lever adapted to engage the rotatable element to shift it in opposite directions, yieldable means having a limited range of movement with respect to the lever to act thereon to hold the lever in neutral position without engagement with the shiftable element, and resilient means acting against the lever to maintain it against the yieldable means to define its neutral position.

6. In a device of the type specified, the combination of a rotatable and axially shiftable element having opposite annular faces, a pivoted lever having a portion engageable with the faces of the rotatable element to shift the latter, yieldable means engageable by the lever when it is moved to shift the rotatable element to one extreme of its travel, said yieldable means acting to return the lever to neutral position free from engagement with the opposite faces of the rotatable element, and auxiliary resilient means acting on the lever in the opposite direction from the first yieldable means to maintain said lever in its neutral position.

7. In a device of the type specified, the combination of a rotatable and axially shiftable element having opposite annular faces, a lever adapted to engage the faces on said element to shift it in opposite directions, a plunger engageable by the lever when it is moved in one direction

to shift the rotatable element, a spring acting to slide the plunger to move the lever into neutral position out of engagement with the faces of the rotatable element, and resilient means for maintaining the lever in contact with the plunger.

8. In a device of the type specified, the combination of a rotatable and axially shiftable element having opposite annular faces, a pivoted lever adapted to engage the faces of the rotatable element to shift the latter in opposite directions, a slidable plunger adapted to be engaged by the lever when the latter is rocked in one direction, a spring acting against said plunger to allow it to yield with the movement of the lever and to react to return the lever to neutral position free from engagement with the opposite faces of the rotatable element, and a second spring acting on the lever to maintain it in contact with the plunger without sliding the latter.

9. In a device of the type specified, the combination of a rotatable and axially slidable element having opposite annular faces, a lever engageable with said faces to shift said element in opposite directions, a relatively fixed member, means for pivoting the lever to said member, a plunger slidable in said fixed member with its end projecting into position to be engaged by the lever when the latter is rocked in one direction, a spring acting against the opposite end of the plunger to maintain it in predetermined position, and a second spring acting against the lever to hold it against the plunger to locate it in neutral position free from engagement with the opposite faces of the rotatable member.

10. In a device of the type specified, the combination of a rotatable shaft, an element slidable on said shaft, said element having opposite annular faces, a mounting, a lever pivoted to said mounting and having means engageable with the opposite faces of the slidable member to shift the latter, a plunger-pin slidable in a bore in the mounting with its end projecting therefrom for engagement with the lever, a spring-plate held against the mounting and formed with a portion engaging the end of the pin to slide the latter to a limited extent, and a second spring carried on the mounting and acting against the lever to hold it in engagement with the end of the slidable pin to maintain the lever in neutral position free from engagement with the opposite faces of the slidable element.

11. In combination, a rotatable and axially shiftable element, a manually operable lever for shifting said element, a spring acting on said lever to maintain it in neutral position free from engagement with said element while adapting it to be moved in opposite directions to shift said element, and a second spring opposed to the first spring to act on the member to return it to neutral position to be held by the first spring.

12. In combination, a rotatable and axially shiftable element, a lever, said lever and element having overlapping portions for engagement to shift the element in opposite directions, a spring acting to move the lever in one direction while permitting its movement in the opposite direction, and a second spring opposed to the first spring and acting on the lever to return it to neutral position where it is restrained from further movement by the first spring.

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