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RETRACTABLE KNOB DEVICE

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This invention relates to control devices and in particular to retractable knobs for use in controlling devices such as line-operable switches.

In certain apparatus, such as electric range apparatus, it is desirable to provide a manually operable control means which is selectively disposible in an extended operative position and in a retracted inoperative position.

In the retracted position, the control knob is preferably arranged to be flush with the forward surface of a wall member. In such structure, it is desirable to provide means for facilitated selective disposition of the control knob in the retracted and extended arrangements and to assure the arrangement of the control knob in a preselected rotational position, such as corresponding to the off condition of the associated switch, when the control knob is in the retracted position. The present invention comprehends a new and improved structure providing these desiderata in a simple and economical manner.

Thus, a principal feature of the present invention is the provision of a new and improved retractable device for selectively operating a rotatable member.

Another feature of the invention is the provision of such a device having new and improved means for selectively retaining a manually operable knob thereof in operative and inoperative positions.

A further feature of the invention is the provision of such a device providing facilitated adjustment of the knob to the selected position.

A further feature of the invention is the provision of such a device having new and improved means for assuring the arrangement of the associated control in a preselected condition when the knob is in the retracted position.

Other features and advantages of the invention will be apparent from the following description taken in conjunction with the accompanying drawings wherein:

FIG. 1 is a side elevation of a retractable control device embodying the invention, illustrated as mounted in a portion of apparatus as a range apparatus and connected to a control switch thereof;

FIG. 2 is a plan view thereof;

FIG. 3 is a fragmentary plan view illustrating the arrangement of the catch and spring clip means of the retractable device in the retracted position thereof;

FIG. 4 is a fragmentary plan view similar to that of FIG. 3 but illustrating the arrangement of the catch and spring clip as during a release of the device to the extended position;

FIG. 5 is a front elevation thereof with portions broken away to illustrate more clearly the means for assuring the disposition of the switch in a preselected arrangement when the device is in the retracted position;

FIG. 6 is a side elevation, partially in section, of another form of retractable device embodying the invention;

FIG. 7 is a horizontal section taken substantially along the line 7—7' of FIG. 6;

FIG. 8 is a fragmentary plan view illustrating the arrangement of the catch and spring clip means thereof in the retracted position;

FIG. 9 is a fragmentary plan view generally similar to that of FIG. 8 but illustrating the arrangement of the catch and spring clip as during a release of the device to the extended position; and

FIG. 10 is a vertical section taken substantially along the line 10—10 of FIG. 6.

In the exemplary embodiment of the invention as disclosed in FIGS. 1–5 of the drawing, a retractable control device generally designated 10 is shown to comprise a connector shaft 11 fixedly secured as by a suitable set screw 13, to the operating shaft 12 of a rotatable element, herein a rotatably operable control switch 14. In illustrating the invention, the switch 14 is shown to comprise a portion of a range apparatus (not shown) have a front wall 15 and an associated rearwardly spaced wall 16 through which the switch shaft 12 forwardly extends. The front wall 15 is provided with a circular opening 17 and control device 10 is coaxially aligned therewith to extend forwardly from rear wall 16 and through the opening in its extended arrangement, as shown in FIGS. 1 and 2.

The control device 10 further includes a control knob 18 having a hexagonally sectioned rearwardly opening bore 19 slidably receiving a complementary hexagonally sectioned forward portion 20 of the shaft 11 for non-rotative axially movable connection of the knob to the shaft. The hexagonally sectioned forward portion 20 includes rounded portions 20a to allow an air break between the hexagonally sectioned rearwardly opening bore 19 and the forward portion 20 of the shaft 11. Opening coaxially forwardly in shaft portion 20 is a cylindrical bore 21 in which is seated the rear end 22 of a helical compression spring 23 having its outer end 24 seated in the bore 19 of knob 18 whereby the knob is biased forwardly at all times. The forward movement of the knob 18 is limited by the engagement of a slide ring 25 secured to the control knob to have slidable facial engagement with the annular rearwardly facing surface portion 26 of the wall 15 defining the opening 17. An annular index bezel 27 is secured to the forwardly facing surface portion 28 of wall 15 surrounding opening 17 for cooperation with suitable indicating means (not shown) on the knob to indicate to the operator the rotational position of the knob.

Thus, as shown in FIGS. 1 and 2, in the extended arrangement of control device 10, the knob 18 extends substantially forwardly through the wall opening 17 permitting facilitated manipulation thereof to rotate the control switch shaft 12 selectively as desired. Control device 10 further includes means 30 for retaining the knob 18 in a retracted position wherein the forward surface 29 of the knob 18 is substantially flush with the wall 15. As best seen in FIGS. 1–4, the retaining means 30 includes a catch 31 carried by the knob 18 and a co-operating spring clip 32 secured to the rear wall 16 by suitable means such as screw and nut means 33. Catch 31 comprises a pest having a Shank 34 fixedly secured to knob 18 to extend rearwardly therefrom parallel to the axis of shaft 11 and terminating rearwardly in an enlarged end 35 defining a forwardly facing annular radial shoulder 36. Spring clip 32 comprises a bifurcated clip having a pair of forwardly extending legs 37 each formed at the inner end 38 thereof to define a rearwardly facing shoulder 39 and a forwardly angled guides portion 40. As best seen in FIG. 3, the spacing between leg ends 38 is normally less than the diameter of the catch end 35. Thus, when the knob 18 is moved rearwardly from the position to the position of FIG. 3 the catch end 35 bears against the guides 40 to spread the legs 37 sufficiently apart to permit the catch end 35 to pass rearwardly between the leg ends 38, whereupon the legs 37 spring together and dispose the shoulders 39 in the path of outward movement of catch end 35 whereby positively latching the knob in the retracted position.

To permit release of the knob 18 from the retracted
position when desired, a release member 41 is provided. The release member comprises an annular member concentrically mounted on the shank 34 of catch 31 for axial movement therein. A conical spring 42 is concentrically mounted on the shank 34 to extend between the catch end 31 and the release member 41 in a rearwardly opening recess 42 of the release member, thereby urging the release member forwardly toward the knob 18 at all times. Thus, when the catch 31 moves rearwardly to the retracted position of FIG. 5, the clip ends 38 may move readily together between the catch shoulder 36 and the rearward end 43 of the release member to effect the latching of the knob. However, as shown in FIG. 4, when the knob 18 is depressed further rearwardly to remove the release member 41 further rearwardly, the action of the release member end 43 against the guides 40 causes the clip legs 37 to spread sufficiently apart to permit the rearward end of the release member to pass therebetween and be gripped thereby as shown in FIG. 4. Thereafter, when the control knob 18 is released, permitting the spring 23 to urge the control knob forwardly and carry with it the catch 31, the catch moves forwardly independently of the release member until the shoulder 36 of the catch abuts the rearward end 43 of the release member whereinupon further forward movement of the knob 18 and catch 31 causes the release member to move rearwardly between the clip ends 38. As no space remains between the catch shoulder 36 and the release member end 43, the clip ends 38 are prevented from re-engaging the catch shoulder 36 whereby the knob 18 may move freely to the extended position of FIG. 1.

As discussed briefly above, if it is desirable to assure an arrangement of control switch 14 in an off position whenever the control knob is disposed in the retracted position. For this purpose, an elongated stop 44 is secured to the front wall 35 to extend rearwardly therefrom parallel to the axis of shaft 11 subjacent the path of movement of knob 18. The slide ring 25 is provided with a radially outwardly opening notch 45 which is aligned with the stop 44 when the knob 18 is rotated to a position, as shown in FIG. 5, wherein the control switch 14 is in a preselected position, herein the off position. The notch is made slightly larger than the guide so that the knob 18 may be moved freely rearwardly at this time by virtue of the clearance between the stop and the slide ring in the notch. However, for all other rotational positions of the knob in the extended position of FIG. 1, the peripheral edge of the slide ring prevents rearward movement of the knob by virtue of the interference of the stop 44 therewith.

Thus, in utilizing the control device 10, the operator may rotate the knob 18, and therefore the switch 14, as desired with the knob in the extended position of FIG. 1. When it is desired to dispose the knob in a retracted position, the operator must first turn the knob 18 to the position wherein the switch 14 is in the preselected, or off, position, thereby aligning the notch 45 with the stop 44. The operator then merely presses the knob rearwardly until the catch end 35 moves past the clip ends 38. The operator then releases the knob whereby the knob is retained in this retracted position with the forward face 29 of the knob substantially flush with the forward wall 15. To return the knob to the extended position of FIG. 1, the operator merely urges the knob further rearwardly until the release member 41 is disposed between the clip ends 40. Release of the knob now permits the catch end 35 to move into abutment with the rearward surface of the release member whereinupon further forward movement of the knob permits the catch to move forwardly of the clip as the ends 38 of the clip are precluded from engaging the catch shoulder 36 by the rearward portion of the release member.

Referring now to FIGS. 6–10, another form of retractable control device generally designated 110 is shown to comprise a control device generally similar to control device 10 but having modified means for retaining the knob 115 thereof in the retracted position. More specifically, control device 110 includes a connector shaft 111 fixedly secured to a split-ended operating shaft 112 of control device 110. The clip 132 has a clip end 135 that extends between the wall 1115 and 116, superimposed on the shaft 111. The slide ring 125 secured to knob 118 is provided with a suitable notch 145 for co-operation with the stop 144.

In control device 110, the clip 132 is secured to the knob 118 by screw means 133 to have the legs 137 thereof extend rearwardly for co-operation with the catch 131 carried by the rear wall 116 to extend forwardly therefrom. The release member 141 is coaxially movable on the catch shank 134 between the rear wall 116 and the enlarged forward end 131 of the catch. No conical spring is required for biasing the release member 141, as is required in control device 10 for biasing the release member 41. Rather, as shown in FIGS. 8 and 9, the spring clip 132 in moving to the rearward position assumed when the knob 118 in the retracted position pushes the release member 141 rearwardly into abutment with the rear wall 116. When the knob 118 is further depressed, as shown in FIG. 9, the clip ends 138 climb onto the release member 141 which is then being held by the rear wall 116, whereinupon release of the knob 118 allows the release member to move with the clip ends forwardly until it abuts the catch end 131. Further forward movement of the knob 118 then causes the clip ends to move forwardly away from the catch. For improved positive clearance of the clip ends with the catch end 131 during this forward movement of the clip, the release member 141 may be provided with a forwardly opening annular recess 151 receiving a substantial portion of the catch end 131 when the release member is in its forwardmost position as shown in FIG. 1.

Thus, the control device 110 functions generally similarly to the control device 10, the release means 130 thereof comprising of the catch 131, clip 132 and release member 141 functioning reversely similarly to the release means 30 of the control device 10. All other structures of the control device 10 are generally similar and function generally similarly to control device 10.

Having described our invention as related to the embodiments shown in the accompanying drawings, it is our intention that the invention be not limited by any of the details of description, unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

We claim:

1. A retractable device for selectively rotating a rotatable member comprising: a connector shaft; means for securing said shaft to said rotatable member; a knob; means connecting said shaft and knob for non-rotative, axial movement therebetween; means urging said knob axially to an extended position; means for releasably securing said knob in an axially retracted position; and means effecting covering said securing means as a result of movement of said knob to a release position beyond said retracted position and permitting movement of said knob by said urging means from said release position to said extended position.

2. A retractable device for selectively rotating a rotatable member, comprising: a connector shaft; means for securing said shaft to said rotatable member; a knob; means connecting said shaft and knob for non-rotative, axial movement therebetween; means urging said knob axially to an extended position; a first device having an inner shank and an inwardly facing radial shoulder; a second device having a shoulder; means securing one of said devices to said knob for movement
therewith; means fixedly holding the other of said devices with the shoulder thereof in the path of movement of the shoulder of said one device; cam means associated with said second device for guiding the shoulder thereof to laterally of said first device shoulder as said knob is moved to an axially rearward retracted position, and arranged to permit the shoulder of said second device to move into facial engagement with said first device shoulder in said retracted position and thereby hold the knob against forward movement; and a release member engageable with said cam means arranged to move said second device shoulder laterally to clear said first device shoulder as a result of movement of said knob axially rearwardly beyond said retracted position and to retain said second device shoulder laterally displaced until said knob is disposed forwardly of said retracted position.

3. A retractable device for selectively rotating a rotatable member, comprising: a connector shaft; means for fixedly securing said shaft to said rotatable member; a knob means connecting said shaft and knob for non-rotative, axial movement therebetween; means urge said knob axially forwardly to an extended position; a catch device having an inner shank and an inwardly facing radial shoulder; a spring clip device having a shoulder; means securing one of said devices to said knob for movement therewith; means fixedly holding the other of said devices with the shoulder thereof in the path of movement of the shoulder of said one device; cam means associated with said spring clip device for guiding the shoulder thereof to laterally of the catch device shoulder as said knob is moved to an axially rearward, retracted position, and arranged to permit the shoulder of said second device to move into facial engagement with said catch device shoulder in said retracted position and thereby hold the knob against forward movement; and a release member engageable with said cam means to move the spring clip shoulder laterally to clear said catch device shoulder as a result of movement of said knob axially rearwardly beyond said retracted position and movable forwardly with said cam means to retain said spring clip shoulder laterally displaced until said knob is disposed forwardly of said retracted position.

5. A retractable device for selectively rotating a rotatable member, comprising: a connector shaft; means for fixedly securing said shaft to the rotatable member; a knob; means connecting said shaft and knob for non-rotative, axial movement therebetween; means urging the knob axially forwardly to an extended position; a catch having a shank portion extending rearwardly from the knob for movement therewith, and a rear portion defining a forwardly facing shoulder; a spring clip having a rearwardly facing shoulder disposed in the path of movement of the catch shoulder for facial engagement therebetween when the knob is in the retracted position, said clip further having a camming portion extending forwardly of the catch shoulder engageable by the rear portion of the catch to translate said clip shoulder transversely and permit movement of said catch shoulder to rearwardly of the clip shoulder; and a release member longitudinally movable on said shank and having a forward portion selectively abutting said knob and a rear portion selectively movable against said camming portion to space said camming portion out of the path of movement of said catch shoulder; and means biasing the release member forwardly away from said catch shoulder, said spring clip including a portion slidably engaging the release member to retain the release member in a rearward position against the action of said biasing means and permitting said knob urging means to cause movement of the catch rear portion in abutment with said release member rear portion forwardly past said clip shoulder.

6. A retractable device for selectively rotating a rotatable member, comprising: a connector shaft; means for fixedly securing said shaft to the rotatable member, a knob; means connecting said shaft and knob for non-rotative, axial movement therebetween; means urging the knob axially forwardly to an extended position; a catch having a shank portion extending rearwardly and a forward portion defining a rearwardly facing shoulder; a spring clip extending rearwardly from the knob for movement therewith and having a rearwardly facing shoulder moveable into facial engagement with the catch shoulder when the knob is in the retracted position, said clip further having a camming portion extending rearwardly of said catch shoulder engageable by the forward portion of said catch to translate the clip shoulder transversely and permit movement of said catch shoulder to rearwardly of said catch shoulder; and a release member longitudinally movable on said shank selectively guiding said camming portion to space said camming portion laterally of said catch shoulder said spring clip including a portion engaging said release member to move said release member in a forward direction with said knob and holding said spring clip shoulder in the translated position to clear said catch shoulder.

7. The device of claim 1 wherein said securing means includes a support having a catch shoulder and said covering means comprises an element movably carried on said support for selectively covering said shoulder.

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