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D. G. HEBERT

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LATCHING DEVICES

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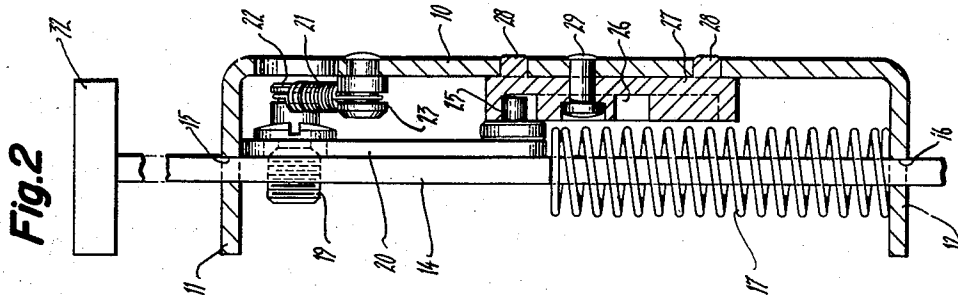


Fig. 2

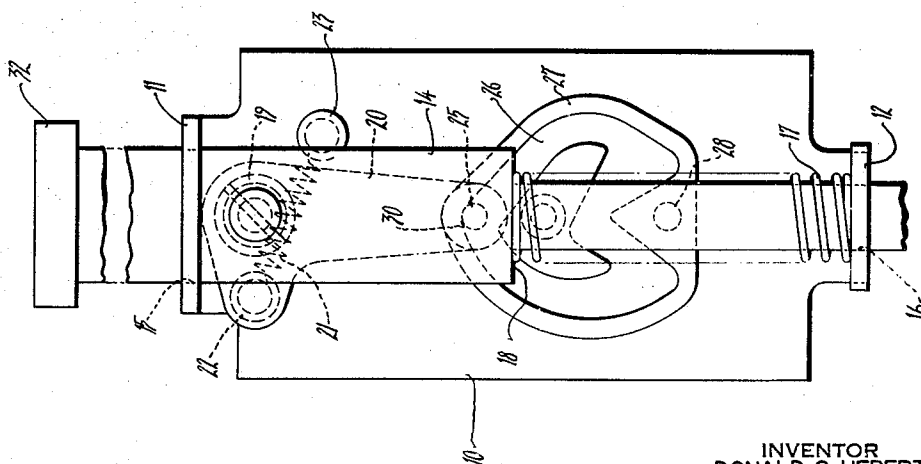


Fig. 1

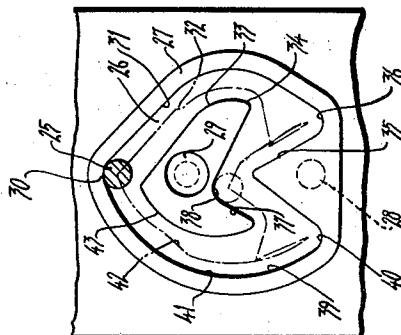


Fig. 3

INVENTOR
DONALD G. HEBERT
BY *Thomas S. Rose*
Robert W. Scribner
ATTORNEYS

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LATCHING DEVICES

Donald G. Hebert, South Windsor, Conn., assignor to Royal McBee Corporation, Port Chester, N.Y., a corporation of New York

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This invention relates to a latching device and more particularly relates to a bi-stable latch which is operated by successively depressing a single plunger.

There are many structural environments in which a bi-stable latching device is needed. A prime example of such an environment is in electrical switching apparatus where the contacts of one or more switches are alternately moved to and retained in an "open" and a "closed" condition. Here, it is very convenient to operate the switch by utilizing a "push button" type of latch having a single manually operated plunger which is successively axially movable between a depressed and a released position. Several such "push button" type of latches have been proposed, however these have not been entirely satisfactory either because their production costs are apt to be too high or because the speed, efficiency, and/or reliability of operation is not up to that desired.

The instant invention contemplates the provision of a latching device having a longitudinally reciprocable switch actuating plunger to which is pivotally secured a spring biased cam follower arm that cooperates with a stationary cam mounted on the latch housing.

The primary object of the instant invention is to provide a simple, inexpensive and reliable latching device which may be used to control the operative condition of an electric switch or the like.

Another object of the invention is to provide an improved latching device having a novel camming arrangement which is used to retain a spring biased latch plunger in either of its two operative positions.

Another object of the invention is to provide a novel latching device having a cam and a cooperating cam follower that is rotatably biased first in a counterclockwise direction and then in a clockwise direction.

Other objects of the invention will become apparent as the disclosure progresses.

In the drawing:

Fig. 1 is a front elevational view of a latching device constructed according to the present invention.

Fig. 2 is a right side view taken in partial section, and

Fig. 3 is a diagrammatic sketch illustrating the progressive sequence of operation of the camming elements of the instant latching device.

Referring to Figs. 1 and 2 there is shown a latch housing frame 10 having upper and lower bent over ears 11 and 12. A reciprocable switch actuating plunger 14 is slidably mounted in two axially aligned apertures 15 and 16 respectively formed in said ears 11 and 12. Plunger 14 is axially biased upwardly by means of the main compression spring 17 which surrounds the lower portion of said plunger and which is operatively disposed between the lower ear 12 and the shoulder 18, Fig. 1, formed near the center of plunger 14. Pivotally mounted by means of a stud 19 on the upper portion of plunger 14 is a bell crank lever 20 which is yieldably biased in a counterclockwise direction, Fig. 1 by means of a tension spring 21. Said spring is operatively secured between the stud 22, fixedly mounted on the hori-

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zontal arm of the lever 20 and the stud 23 secured to the frame 10.

It will be noted that the lever 20, when in its Fig. 1 or released position, will be rotatably biased in a counterclockwise direction; however, as soon as the plunger 14 is depressed downwardly a short distance against the action of spring 17 the lever pivot stud 19 will move to a position below the "over-center" spring 21 and hence the latter will then rotatably bias the lever 20 in a clockwise direction. When the plunger 14 is restored to its released position by action of the compression spring 17 the lever 20 will again be biased in said counterclockwise direction.

A cam follower roll 25 is rotatably mounted at the lower end of the downwardly extending arm of bell crank lever 20, said follower being operatively disposed in a heart-shaped closed loop camming groove 26 formed in the inner face of cam 27. Cam 27 is fixedly secured to the housing frame 10 by any suitable means such as by the locating studs 28 and the rivet 29. The top of the plunger 14 may be provided with any type of button or key 32 which facilitates the manual operation of the plunger.

The operational nature of the instant bistable latching device and a detailed consideration of the contour of the cam groove 26 will be made with reference to the diagrammatic sketch shown in Fig. 3 wherein the dot-dashed lines denote the trajectory of the center line or axis of the cam follower roll 25 during two successive cyclic operations of the plunger 14.

When the push-button type plunger 14 is in its upper or released position shown in Fig. 1 the cam follower roll 25 will be yieldably held against the upper portion 30 of the radially outer surface of the cam groove 26 by the main compression spring 17. As the plunger 14 is displaced downwardly the counterclockwise biased lever 20 will cause roll 25 to follow the outer portion 31 of the cam groove until the axis of the said lever stud 19 moves below the spring 21, whereupon roll 25 will swing, as at 32, into engagement with the inner portion 33 of said cam groove. When the roll 25 is displaced below the lower edge 34 of said cam portion 33, it will swing into engagement with the outer portion 35 of the cam groove. Continued downward movement of the plunger 14 will cause roll 25 to move to the lowest part 36 of this portion of the cam groove wherein further downward movement of said plunger is impossible. Upon release of the downward pressure on the plunger, the main spring 17 will cause said plunger to move upwardly whereby roll 25 will move upwardly along and over the groove portion 35 and will swing to the inner portion 37 of the cam groove and thence upwardly into the notched portion 38 of said groove. Here further upward movement of the plunger 14 is impossible, and hence the latter will be yieldably retained in this depressed position by spring 17.

When it is desired to return plunger 14 to its said released position, said plunger is again moved downwardly against the action of spring 17 so that roll 25 will move along and over the lower edge of cam portion 37 and thereafter will swing into engagement with and downwardly follow the outer portion 39 of the cam groove. This downward movement of the plunger is stopped when roll 25 reaches the lowest part 40 of this portion of the cam groove. The downward pressure against the plunger is then released and the spring 17 will then move plunger 14 upwardly so that roll 25 follows along the outer portions 39 and 41 of the cam groove. When the axis of the pivot stud 19 moves above the "over-center" spring 21 the lever will again become biased in a counter-clockwise direction and the roll 25 will be swung, as at 42, into engagement with

the inner portion 43 of the cam groove. Spring 17 will cause plunger 14 to continue its upward movement until said roll 25 again reaches the upper portion 30 of the cam groove whereby said plunger again assumes and is yieldably held in the released position of Fig. 1.

The instant latching device has been found to be unusually reliable and efficient in operation, and is easily and inexpensively adapted to control the operation of various electrical switching mechanisms.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration only and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

The invention claimed is:

1. A latching device; comprising, a frame, a plunger slidably mounted in said frame, a spring means longitudinally biasing said plunger, a lever pivotally mounted on said plunger; means for rotatably biasing said lever, a cam mounted on said frame, and means on said lever and cooperating with said cam for retaining said plunger in one of two alternate longitudinal positions against the action of said spring means.

2. A latching device; comprising, a frame, a plunger reciprocally mounted in said frame, means for longitudinally biasing said plunger, a lever pivotally mounted on said plunger, an over-center biasing spring operatively mounted between said lever and frame, and cam means cooperating with said lever and supported by said frame; said cam means being contoured such that said cam means and lever retain said plunger in two alternate longitudinal positions against the action of said biasing means.

3. A latching device; comprising, a frame, a plunger reciprocally mounted in said frame, a spring operatively mounted between said frame and plunger so as to bias said plunger in one longitudinal direction, a lever pivotally mounted on said plunger; means for alternately

biasing said lever in a clockwise and a counterclockwise direction, a cam fixedly secured to said frame and having a cam groove formed therein, and a cam follower roll mounted on said lever for cooperation with said cam groove whereby said cam and roll may retain said plunger in two alternate longitudinal positions against the action of said spring.

4. Apparatus as defined by claim 3 wherein the lever biasing means comprises an over-center spring operatively secured between the said lever and frame.

5. A latching device; comprising a frame, a plunger reciprocally mounted in said frame, a spring operatively mounted between said frame and plunger so as to bias said plunger in one longitudinal direction, a lever pivotally mounted on said plunger, an over-center spring operatively connected between said frame and lever so as to alternately bias said lever in opposite rotative directions for different longitudinal positions of said plunger; a cam mounted on said frame, said cam having a heart-shaped closed loop groove formed in the face thereof, and means on said lever movably disposed in said groove; said groove being shaped so as to alternately retain said plunger in two different longitudinal positions; respectively, against the action of said plunger biasing spring and wherein said over-center spring respectively biases said lever in opposite rotative directions.

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