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SPRING RETURN FOR SELECTOR VALVES

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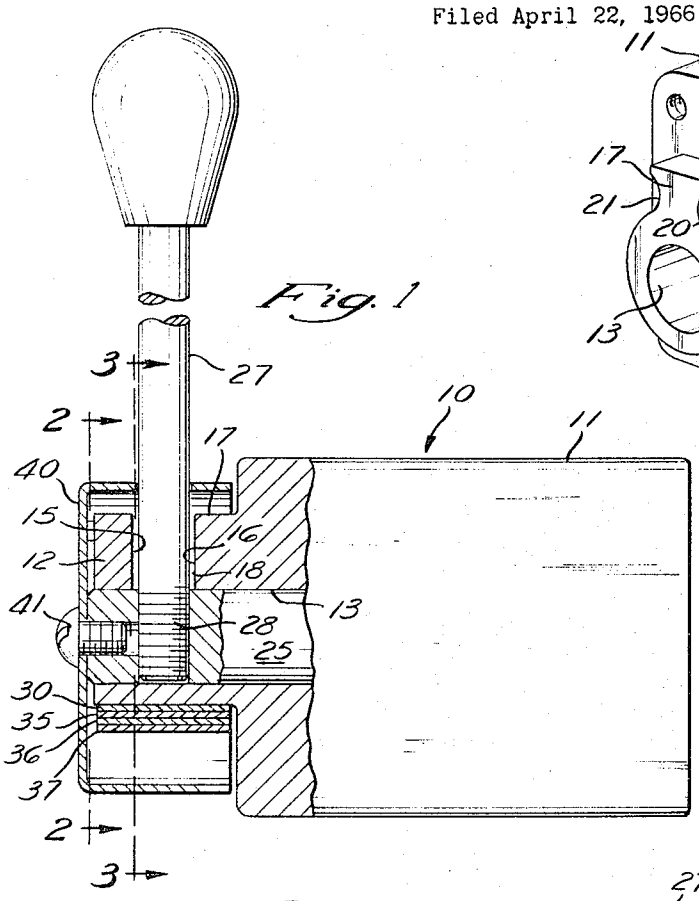


Fig. 1

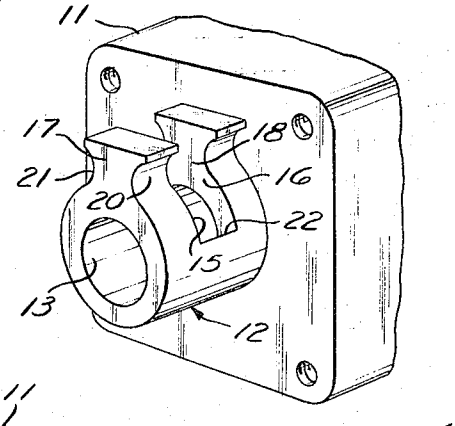


Fig. 4

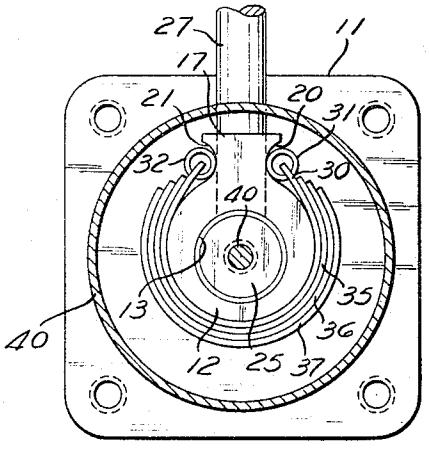


Fig. 2

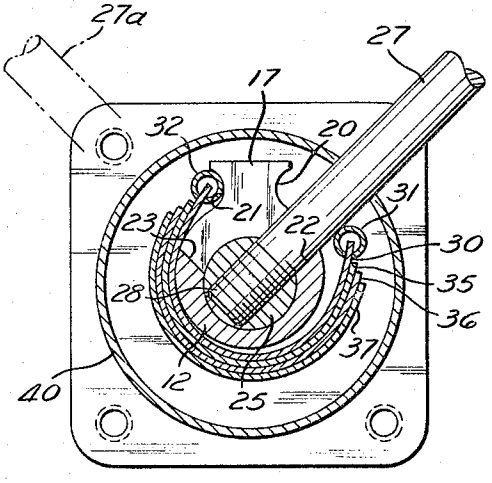


Fig. 3

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SPRING RETURN FOR SELECTOR VALVES

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ABSTRACT OF THE DISCLOSURE

A valve has a rotating shaft for actuating the valve extending outward from the valve housing and surrounded by a projecting boss. The boss has an arcuate slot to allow movement of the shaft by a handle connected to the shaft and extending radially outward through the slot. In one position of the handle, it is in alignment with a pair of projections on the boss axially on each side of the handle with respect to the shaft. A C-shaped spring surrounds the boss and abuts the projections to hold the handle in the centered position, so that movement of the handle to rotate the shaft in either direction engages an end of the spring which provides a restoring force for the handle.

The present invention relates generally to return spring arrangements for intermittently actuated control mechanisms and more particularly to return spring arrangements for rotary selector valves.

Many intermittently actuated control mechanisms are provided with some form of a selector element or actuating means which is moved from a centered or neutral first position to a second position to actuate the control mechanism. Particularly when the operation of the control mechanism is intermittent, the selector element need remain in the second position for a short period of time only, and it should automatically return to the first position by a spring return arrangement upon the release of the selector element or other actuating means.

In many uses, it is important that the return spring arrangement hold the zero position accurately so as to prevent play in the selector element, and there must be a minimum of binding or other interference with the operation of the control mechanism. Also, the arrangement should permit bi-directional movement of the selector element from the centered or neutral position so as to provide a plurality of operating settings. Furthermore, the arrangement should be easily replaceable and interchangeable with other units and of such a design that the spring tension may be varied easily, while being compact and durable with a long service life.

The present invention provides a novel arangement having a slotted yoke fixed relative to the selector or actuating means of the control mechanism and an element within the yoke slot which is movable in response to the movement of the actuating means. The return biasing force is provided by an arcuate spring having an end engaging the yoke body across the width of the yoke slot so as to be engaged by the movable element upon movement of the actuating means. The width of the movable element and the length of the yoke slot allow the end of the arcuate spring to rest against the yoke when the movable element is in the centered or neutral position so that this position is accurately maintained by the fixed yoke rather than by the spring.

Since the spring does not engage the actuating means directly, it does not bind or interfere with its movement except by the desired force tending to return it to its centered or neutral position. The arcuate spring may be arranged about the other elements of the control mechanism and may be relatively wide as compared to its thickness to be both compact and durable. Bi-directional

movement of the actuating means can be provided by the use of a substantially C-shaped spring having its ends engaging opposite sides of the yoke body to be engageable by the movable element when moved in either direction from the centered or neutral position.

The spring is easily removable from the control mechanism for replacement, and the spring tension can be varied easily either by substituting a heavier or lighter spring or by adding or substracting spring leaves from the arrangement.

Further features and advantages of the invention will readily appear to those skilled in the art upon a more complete understanding of the preferred embodiment of the invention as applied to a rotary hydraulic selector valve as shown and described in the following description and drawings, wherein:

FIGURE 1 is an elevational view of a rotary hydraulic selector valve partially cross sectioned through the return spring arrangement;

FIGURE 2 is a cross sectional view taken on line 2—2 of FIGURE 1 showing the return spring arrangement in the centered or neutral position;

FIGURE 3 is a cross sectional view taken on line 3—3 of FIGURE 1 but with the selector member moved to one side of the centered or neutral position; and,

FIGURE 4 is a perspective view of the valve body and yoke arrangement.

While the present invention is shown and described as applied to a rotary hydraulic selector valve, this is done for purposes of illustration only and it is also applicable to any intermittently actuated control mechanism. Referring to FIGURE 1, the control mechanism comprises a rotary hydraulic selector valve indicated generally by the numeral **10**. The internal operating mechanism of the selector valve forms no part of the present invention and, therefore, has not been shown in further detail. The selector valve **10** comprises a valve body **11** having an integral boss generally indicated by the numeral **12** formed upon one end thereof. A bore **13** leading to the internal operating mechanism of the selector valve **10** extends through the valve body **11** and the boss **12**.

The boss **12** includes a radially outwardly extending neck-like yoke portion **17** having a slot **18** extending transversely of and opening into the bore **13**. The slot is defined by parallel sides **15** and **16** and end surfaces **22** and **23** extending generally radially of the boss **12**. Spaced stop surfaces **20** and **21** defining curved recesses are formed on opposite sides of the exterior of the yoke portion **17** and extend axially on both sides of the yoke slot **18**.

Rotatably mounted within the bore **13** is an axially extending actuating means or control shaft **25** adapted to be connected at its inner end to the rotary selector valve mechanism (not shown). A handle **27** threaded in the outer end of the control shaft **25** at **28** projects radially outwardly from the shaft **25** through the yoke slot **18** and beyond the stop surfaces **20** and **21**. The handle **27** forms a selector element movable relative to the yoke portion **17** and is adapted to be hand manipulated by an operator from the exterior of the selector valve. The diameter or width of the handle **27** is substantially equal to the width of the yoke portion **17** between the stop surfaces **20** and **21** so that the handle may be centered within the yoke slot.

As seen in FIGURES 2 and 3, the preferred form of return spring comprises an arcuate C-shaped leaf spring **30** which surrounds the boss **12**. Generally, the return spring **30** may be any configuration of an open curve, the ends of which are arcuately displaced from one another by at least 180°, and which is mounted so that one end is fixed relatively to the yoke when the other is

displaced by flexing of the spring. Bearing caps **31** and **32** which may be in the form of a slotted tube of sufficient axial length to extend across the yoke slot **18** are secured to the opposite ends of the return spring **30** and bear against the stop surfaces **20** and **21** respectively. Since the diameter or width of the handle **27** is substantially equal to the width of the yoke portion **17**, the bearing caps **31** and **32** rest against the machined stop surfaces **20** and **21** on the yoke **17** rather than directly against the handle **27** to accurately position the handle **27** in a centered or neutral position within the yoke slot **18**.

The use of the substantially C-shaped return spring permits bi-directional movement of the handle **27** from the neutral or zero position with only a single return spring. With the handle centered within the yoke slot **18** as shown in FIGURE 2, movement of the handle **27** to the right rotates the control shaft **25** and causes the side of the handle to engage the bearing cap **31** and flex the return spring **30** by increasing its radius of curvature as shown in FIGURE 3. Although this causes the one end of the spring to move outwardly relative to the stop surface **20**, the other end of the spring bears firmly against the other stop surface **21** and resists rotation of the spring around the boss **12**. Thus the other end of the spring **30** is effectively fixed relative to the yoke **17** and the spring exerts an inward force upon the handle **27** tending to return it to a centered position within the yoke slot **18**. The dotted line **27***a* in FIGURE 3 represents the position of the handle **27** when it is rotated to the left against the other bearing cap **32**.

The spring tension may be increased either by adding additional and similarly shaped leaves **35**, **36** and **37** to overlie the same return spring **30** or by replacing the original return spring **30** with a heavier spring if it is so desired.

To protect the return spring arrangement from environmental abuse, a cup-shaped housing **40** is secured to the end of the control shaft **25** by a screw **41** in such a manner that the housing **40** will rotate along with the control shaft **25** and the handle **27**. The housing **40** also serves as a safety feature to contain the return spring in case of breakage under tension.

Although the preferred embodiment of the invention has been shown and described in detail, it is recognized that various modifications and other arrangements will occur to those skilled in the art and will be within the scope of the invention as disclosed in the claims.

What is claimed is:

1. A mechanism comprising a body member, boss means on said body member, said body member and said boss means defining a bore coaxial with said boss means, shaft means rotatably journalled within said bore, said boss means including a yoke portion extending radially therefrom with respect to said bore, said boss means defining a slot through said yoke portion extending generally transversely of and opening into said bore, external stop surfaces on opposite radial sides of said yoke portion defining curved recesses extending axially on both sides of said slot, handle means secured to said shaft means and extending radially therefrom through said slot, C-shaped leaf spring means having an arcuate extent of more than 180°, bearing caps secured to the ends of said spring means, said spring means extending substantially around said boss means with said bearing caps being adapted to engage said stop surfaces, the spacing between said stop surfaces and the corresponding width of said handle means being substantially equal so that said bearing caps rest adjacent said stop surfaces and said handle means when said control shaft is centered within said yoke slot, whereby movement of said handle means away from said yoke portion engages the adjacent bearing cap to flex said spring means and provide a biasing force tending to restore said handle means to its position within said yoke portion.

2. A mechanism as set forth in claim **1** wherein a housing means is provided surrounding said spring means, and boss means, said housing means being secured to said shaft means so as to rotate therewith and having an opening therethrough through which said handle means projects.

3. A return spring arrangement comprising slotted yoke means, a shaft rotatable relative to said yoke means, a handle projecting into the slot of said yoke means and connected to said shaft so as to cause rotation thereof, and arcuate spring means having one end adapted to engage said yoke means and being engageable by said handle upon its movement from a neutral position within said slot, said spring means being arranged so that a portion of said spring is fixed relative to said yoke means when an end is engaged and flexed by said handle.

4. In a rotary selector valve, a valve body, a projecting boss on said valve body, a bore extending axially through said boss into said valve body, a rotatable actuating shaft in said bore, said boss having an arcuate slot thereon axially intermediate the ends thereof opening into said bore, a handle secured to said shaft and extending radially outward through said arcuate slot, said boss having a pair of radial projections, one on each side of said slot in axial alignment therealong and projecting outward beyond the remainder of said boss, said projections defining a neck of reduced width and having a portion of greater width radially outward of said neck, a C-shaped spring member extending around said boss and having free ends adjacent said projections, a bearing member secured to each end of said spring and having a portion engageable with the necks on both projections and arranged to engage said handle when said handle is moved out of a center position in alignment with said projections to provide a biasing force tending to return said handle and said shaft to a neutral position.

5. A device as set forth in claim **4** including at least one additional C-shaped spring overlying said spring member, said additional spring extending over less than the full circumferential extent of said spring member.

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