

Jan. 6, 1942.

J. C. COTNER

2,268,699

FLUID CONTROL VALVE

Filed Jan. 26, 1940

2 Sheets-Sheet 1

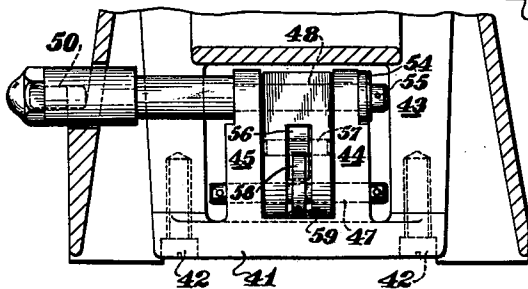
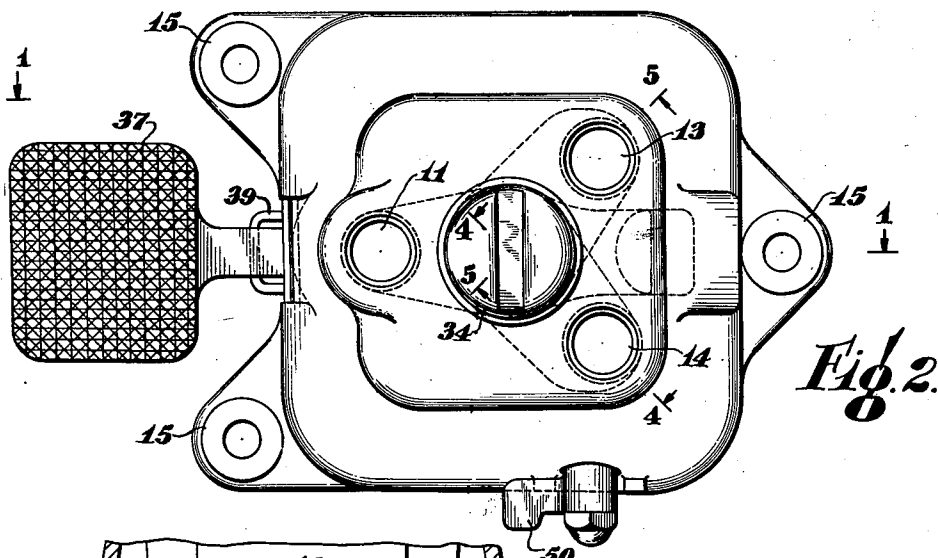
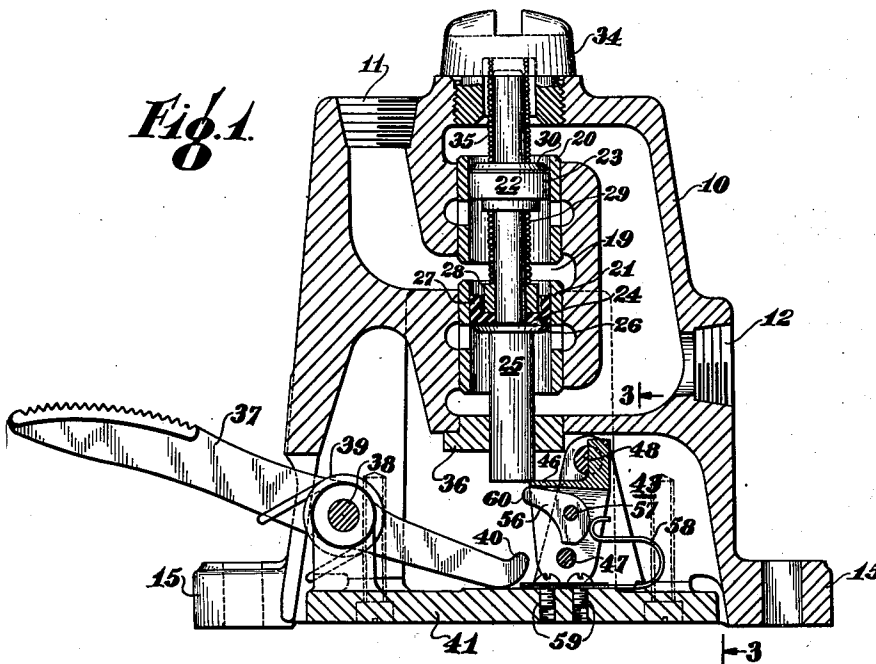


Fig. 3.

INVENTOR.

John C. Cotner.

BY

Shoodling and Krost
ATTORNEY.

Jan. 6, 1942.

J. C. COTNER

2,268,699

FLUID CONTROL VALVE

Filed Jan. 26, 1940

2 Sheets-Sheet 2

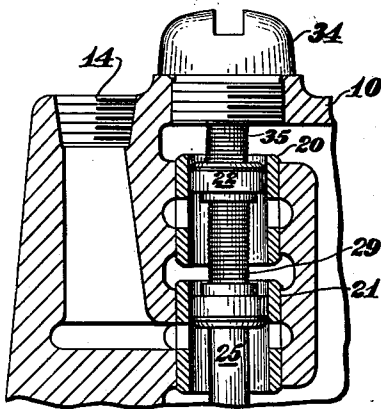


Fig. 4.

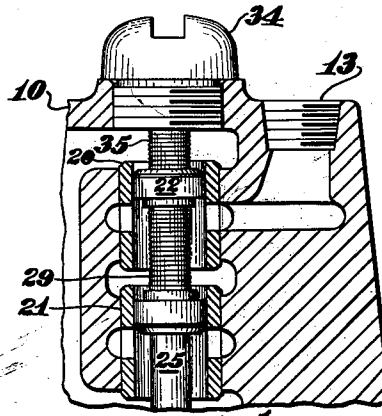


Fig. 5.

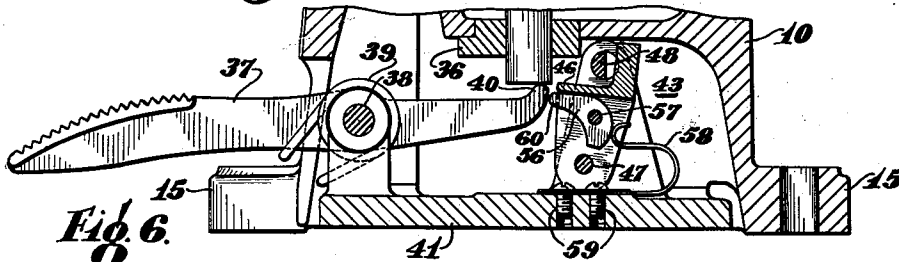


Fig. 6.

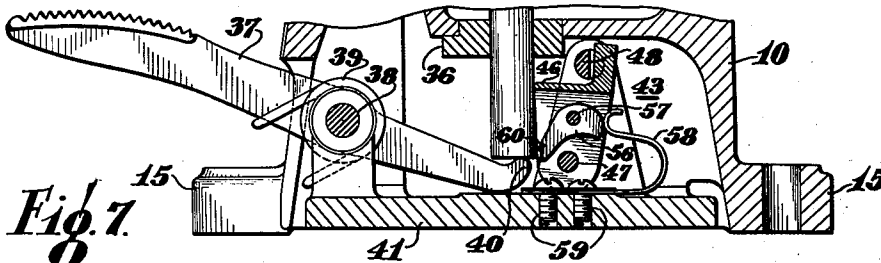


Fig. 7.

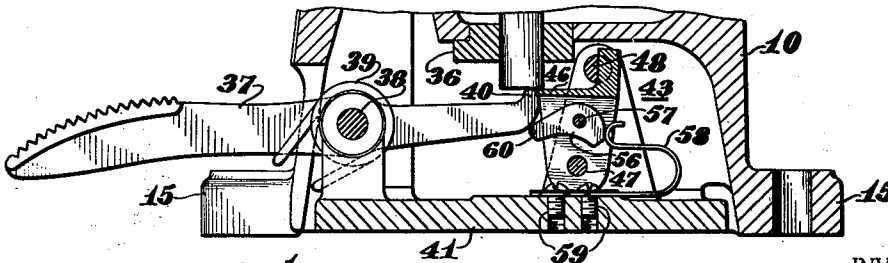


Fig. 8.

INVENTOR.

John C. Cotner.

BY

Hoodling and Krost
ATTORNEY.

UNITED STATES PATENT OFFICE

2,268,699

FLUID CONTROL VALVE

John C. Cotner, Logansport, Ind., assignor to
Logansport Machine, Inc.

Application January 26, 1940, Serial No. 315,785

8 Claims. (Cl. 74—526)

My invention relates in general to control valves and more particularly to fluid control valves for controlling the fluid in fluid systems.

In the operation of fluid actuated devices such, for example, as the actuation of a fluid actuated chuck for holding work pieces, it is desirable that the chuck be governed by the operation of the control valve in either one of two methods. First, the control valve which controls the fluid chuck may be operated such that a complete cyclic movement of the lever which actuates the valve gives a complete cyclic movement of the fluid chuck. That is to say a movement of the lever of the control valve in one direction causes the fluid to actuate the fluid chuck and clamp the work piece and the movement of the lever of the control valve in the reverse direction causes the fluid to actuate the fluid chuck and release the work piece. This method of operation might be characterized as "direct cycling" control of the fluid to and from the fluid chuck. The second method of operation may be characterized as a "locked cycling" control and this latter method of operation may be described as follows: The work piece is clamped in the fluid chuck by the movement of the lever of the control valve in one direction. As the lever of the control valve is returned in the opposite direction to its starting position, completing one cyclic movement of the lever, the work piece is not released but continues to be clamped by the fluid chuck and remains in the clamped position until the operator finishes the processing of the work piece. Upon the finishing of the processing, the work piece is released by the operator actuating the lever of the control valve through another complete cyclic movement. That is to say, in operating the control valve under the "locked cycling" condition, the lever for the control valve must be operated twice to make one complete cycling operation of the fluid chuck, whereas under the "direct cycling" condition, the lever for the control valve is operated only once for a complete cycling operation of the fluid chuck.

An object of my invention is the provision of a control valve which may be selectively operated to give a direct cycling operation or a locked cycling operation.

Another object of my invention is the provision of a control valve operated by a single actuating lever which will give either a direct cycling operation or a locked cycling operation, depending upon the selection made by the operator.

Another object of my invention is the provision of a control valve operated by a single lever, in

combination with a locking or latch arrangement selectively controlled by the operator to give either a direct cycling operation or a locked cycling operation.

5 Another object of my invention is the provision of a control valve operated by a single actuating lever such that under a direct cycling operation only one complete movement of the control lever is necessary to complete the cycling operation, and whereas under a locked cycling operation 10 two complete movements of the control lever are necessary to make a complete cycling operation of the fluid system.

15 Another object of my invention is the provision of a control valve wherein the valve parts may be readily and quickly removed from the valve housing.

Other objects and a fuller understanding of my invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings, in which:

20 Figure 1 is an elevational and cross-sectional view of my fluid control valve, taken along the line 1—1 of Figure 2 and shows my control valve set for giving a locked cyclic operation.

25 Figure 2 is a plan view of my fluid control valve.

Figure 3 is a fragmentary and cross-sectional view of my control valve, taken along the line 3—3 of Figure 1.

30 Figure 4 is a fragmentary and cross-sectional view of my control valve, taken along the line 4—4 of Figure 2.

35 Figure 5 is a fragmentary and cross-sectional view of my control valve taken along the line 5—5 of Figure 2.

40 Figure 6 is a fragmentary and cross-sectional view similar to Figure 1, but shows the position of the parts when the foot lever is depressed for disengaging the locking or latching mechanism from the stem of the valve.

45 Figure 7 is a view similar to Figure 6 but shows the position of the parts when the foot lever is undepressed; and

Figure 8 is a view similar to Figures 6 and 7 but shows the foot lever in its second depressed position.

With reference to the drawings, my device 50 comprises, generally, a housing 10, a slide valve indicated generally by the reference character 22 and reciprocally mounted in the housing, a foot pedal 37 for operating the valve, and a selectively operated latch mechanism indicated generally by the reference character 43 to selectively set the

control valve for direct cycling operation or for locked cycling operation.

With reference to Figures 1, 2, 4 and 5, the housing has four threaded fluid ports adapted to receive fluid pipes for connecting the control valve in a fluid system. In the drawings, the supply port is indicated by the reference character 11, the exhaust port by the reference character 12, and the feed or distribution ports which admit the fluid to and from the fluid device operated are indicated by the reference characters 13 and 14. The housing is provided with supporting flanges 15 through which a bolt or other threaded element may pass to anchor the control valve to a suitable support. The upper portion of the housing is provided with a central valve opening 19 into which are pressed two snugly fitting valve sleeves 20 and 21 having openings which communicate with the ports within the valve housing. Mounted within the sleeves 20 and 21 is the slide valve indicated generally by the reference character 22 comprising two spaced valve sealing head 23 and 24 mounted upon a valve stem 25. Each of the valve sealing heads 23 and 24 has substantially the same construction and a description of the valve sealing head 24 which is shown in cross-section applies equally well to the valve sealing head 23. The valve sealing head 24 comprises an end retaining washer 26 which abuts against a shoulder upon the valve stem 25 formed by a reduction in the diameter of the valve stem. Resting upon the top of the retaining washer 26 is a packing material 27 held in position by an internal sleeve 28. As illustrated, a spring 29 surrounding the smaller diameter of the stem 25 is used to separate the two internal sleeves 28 of the valve sealing heads. The upper retaining washer 30 for the valve sealing head 23 is constrained downwardly against the packing material. The valve is biased downwardly by a spring 35 which fits within a central recess in a relatively large threaded cap 34 of the housing. In addition to forming a receptacle for the spring 35 the cap 34 also constitutes a stop or upper limit to the movement of the valve stem 25. The lower end of the valve stem 25 extends through an opening in a bushing 36, leaving the lower end of the valve stem 25 exposed for actuation. The entire valve assembly may be readily withdrawn from the housing by removing the cap 34 and pulling the entire assembly upwardly through the threaded opening into which the cap fits. The threaded opening is also larger than the sleeves 20 and 21 so that they may pass there-through. Therefore, the slidable valve may be readily interchangeable with other valves for exchange, replacement or repair without disconnecting the housing from the fluid pipes of the system in which the housing is connected.

In the uppermost position of the valve shown in Figure 1, fluid may enter the supply port 11, flow through the radial port of the sleeve 20 immediately under the valve sealing head 23 into the feed or distribution port 13 which is connected to the fluid device to be operated such, for example, as a fluid operated chuck. The fluid which is exhausted from the chuck being operated flows back to the other feed or distribution port and enters the housing at the port 14 from which the fluid flows through the radial opening of the sleeve 21 underneath the valve sealing head 24 and out through the exhaust port 12. When the valve is actuated to the lowermost position, fluid flows from the supply port 11 through the radial opening of the sleeve 21 above

the valve sealing head 24 and then out through the feed or distribution pipe 14 to the chuck or fluid device to be operated. In this position, the fluid which is exhausted from the fluid chuck or device to be operated flows back to the feed port 13, then through the radial opening in the sleeve 20 above the valve sealing head 23 and out through the exhaust port 12.

The valve stem 25 may be actuated to its uppermost position by means of the foot pedal 37 and to its lowermost position by the spring 35. The pedal 37 may be pivoted about a pivot pin 38 carried by two spaced brackets extending upwardly from the base 41 of the housing. A spring 39 surrounding the pivot pin 38 may be employed to normally constrain the foot pedal 37 in a clockwise position so that when the foot pedal is undepressed it occupies the position as shown in Figure 1. The base upon which the foot pedal 37 is carried may be secured to the inside and bottom of the housing by any suitable means and as illustrated in Figures 2 and 3 it may be fastened thereto by means of cap screws 42.

Mounted upon the base 41 and slightly to the right of the nose 40 at the end of the foot pedal 37, is the latching mechanism 43 arranged to give the locked cyclic operation. The latching mechanism comprises a pivotally mounted latch member 46 having an upper left-hand portion which engages the lower end of the valve stem 25. The latching member 46 is positioned between two spaced upright bracket members 44 and 45 carried by the base 41 and the lower end of the latch member 46 is pivotally mounted about a pin 47 which is anchored at each end to the two bracket members 44 and 45. The latching member 46 has a vertical open space in which is pivotally mounted a dog 56 about a pivot pin 57 that extends through opposite sides of the latch member 46. The dog 56 having a nose 60 is constrained in a clockwise direction by means of a spring 58 having its free end engaging the lower portion of the dog 56 and having its anchored end connected to the base 41 by means of the illustrated screws 59. The spring 58 also serves a second function in that it urges the latch member 46 in a counter-clockwise direction about the pivot pin 47 and causes its upper left-hand portion to engage the end of the valve stem 25.

The latch mechanism 43 is adapted to be selectively governed by means of a selective knob 50 positioned externally of the housing 10, see Figure 3. Connected to the selective knob 50 is a shaft having a cam 48 provided by cutting one-half of the shaft away. The innermost end portion of the shaft extends through openings in the two spaced brackets 44 and 45 and is secured therein by means of a washer 54 and a pin 55, see Figure 3. In the position shown in Figure 1 the selective knob 50 is turned such that the upper left-hand portion of the latch member 46 is constrained by the spring 58 to engage the underneath edge of the valve stem 25. In this position the valve stem or valve is locked in its uppermost position. Upon the rotation of the selective knob 50 through a 90 degree angle or more the latch member 46 is moved in a clockwise direction about the pivot pin 47 until the left-hand edge thereof clears the valve stem 25 in which case the latch mechanism is prevented from engaging the stem 25.

The position in which the selective knob 50 is operated to constrain the latching mechanism 46 in a clockwise direction and out of engagement

with the valve stem 25 may be characterized as the direct cycling position, in that the valve directly follows the movements of the foot pedal 37 as the latter is moved up-and-down.

The position to which the selective knob 50 is turned in Figures 1, 6, 7 and 8, causing the spring 58 to urge the latch member 46 in a counter-clockwise direction until its left-hand portion engages the valve stem 25, may be characterized as the locked cycling position of the valve. In this locked cycling position the foot pedal 37 must be depressed twice in order to complete one cycling operation of the valve. The operation of the foot pedal 37 and the latching mechanism 43 for the locked cyclic position may be described as follows: With the position of the parts shown in Figure 1, the depression of the foot lever 37 causes the nose 40 thereof to be moved upwardly through an arc and first engage the nose 60 of the dog 56. The engagement of the nose 40 of the foot pedal 37 with the nose 60 of the dog 56 pushes the latch member 46 in a clockwise direction about the pivot point 47 until the upper left-hand edge of the latch member 46 is pushed out of engagement from underneath the valve stem 25. This position is shown in Figure 6 and shows the foot pedal 37 completely depressed. Upon the operator taking his foot off the foot pedal 37 the valve stem 25 is urged downwardly by means of the spring 35. The completed downward travel of the valve stem 25 is shown in Figure 7 with the lowermost end of the valve stem 25 resting upon the nose 40 of the foot pedal 37. As the valve stem 25 moves downwardly the dog 56 is constrained to move in a counter-clockwise direction about the pivot pin 57 and assumes the position shown in Figure 7. Upon the second operation of the foot pedal 37, the nose 40 moves the valve stem 25 upwardly as shown in Figure 8. As the valve stem 25 moves upwardly, the nose 60 of the dog 56 slides underneath the nose 40 of the foot pedal 37 such as shown in Figure 8. When the valve stem 25 is moved to a point higher than the upper left-hand edge of the latching member 46 the spring 58 urges the latching member 46 to move under the valve stem 25 and lock the valve in its uppermost position. As the foot lever 37 is undepressed the second time, the nose 40 swings downwardly, turning the nose 60 of the dog 56 therewith until a point is reached where the two ends separate, at which time the dog 56 swings back in a clockwise direction about the pivot pin 57 and assumes the position as shown in Figure 1, which completes the cycle of operation when the control valve is set in the locked cycling position. Thus, in the locked cycling position it takes two complete up-and-down operations of the foot pedal 37 to make one complete cycle of operation to the valve. In operating the control valve with a fluid chuck, for example, the operator, after inserting the work piece in the chuck, would step on the foot pedal 37 to lock the valve in its uppermost position as shown in Figures 1 and 8 and hold the work piece for processing. The operator then could remove his foot from the foot pedal 37 and perform the work upon the work piece. When the work piece was finished, the operator would again depress the foot pedal 37 and release the work piece from the chuck.

When the selective knob 50 is positioned in the direct cycling position where the cam 48 pushes the upper left-hand portion of the latch member 46 from underneath the valve stem 25, the control valve follows the movement of the

foot pedal 37 and direct fluid control is applied to the chuck or other device being controlled. The use of the word fluid herein includes air and fluids of all kinds.

Although I have described by invention with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

I claim as my invention:

1. A mechanism for moving an element between two limiting positions designated as a first and a second position comprising, in combination, resilient means for urging the movable element in said first position, actuating means for moving the movable element in said second position, pivotally mounted latch means for securing the movable element in said second position, spring means for urging the latch means into engagement with the movable element, means carried by the latch means and engageable by the actuating means for causing the actuating means to oppose the spring means and disengage the latch means from the movable element and permit the resilient means to urge the movable element to said first position, and selective means for independently opposing the spring means and holding the latch means out of engagement with the movable element.

2. A mechanism for moving an element between two limiting positions designated as a first and a second position comprising, in combination, resilient means for urging the movable element in said first position, actuating means for moving the movable element in said second position, pivotally mounted latch means for securing the movable element in said second position, spring means for urging the latch means into engagement with the movable element, pivotally mounted dog means carried by the latch means and engageable by the actuating means for causing the actuating means to oppose the spring means and disengage the latch means from the movable element and permit the resilient means to urge the movable element to said first position, and selective means for independently opposing the spring means and holding the latch means out of engagement with the movable element.

3. A mechanism for moving an element between two limiting positions designated as a first and a second position comprising, in combination, resilient means for urging the movable element in said first position, actuating means for moving the movable element in said second position, pivotally mounted latch means for securing the movable element in said second position, pivotally mounted dog means carried by the latch means and engageable by the actuating means for causing the actuating means to disengage the latch means from the movable element and permit the resilient means to urge the movable element to said first position, spring means engaging the dog means for urging the latch means into engagement with the movable element and for urging the dog means in a position of engagement with the actuating means, and selective means for independently opposing the spring means and holding the latch means out of engagement with the movable element.

4. A mechanism for moving an element between two limiting positions designated as a first and a second position comprising, in combina-

tion, resilient means for urging the movable element in said first position, said movable element having an end arranged for actuation, a pivotally mounted lever having a nose for engaging the said end of the movable element and actuating the movable element to said second position, pivotally mounted latch means for engaging the said end of the movable element and securing the movable element in said second position, pivotally mounted dog means carried by the latch means and engageable by the nose of the pivotally mounted lever for causing the lever to disengage the latch means from the said end of the movable element and permit the resilient means to urge the movable element to said first position, spring means for urging the latch means into engagement with the said end of the movable element, and selective means for independently opposing the spring means and holding the latch means out of engagement with the said end of the movable element.

5. A mechanism for moving an element between two limiting positions designated as a first and a second position comprising, in combination, resilient means for urging the movable element in said first position, actuating means for moving the movable element in said second position, latch means adapted to be moved in either one of two positions, selective means for governing the selective positions of the latch means, said latch means in one selective position clearing the movable element whereby the movable element directly follows the movements of the actuating means, said latch means in the other selective position engaging the movable element and arresting the movements of the movable element, said latch means having movable means engageable by the actuating means to alternatively move the latch means from disengagement with the movable element, whereby two complete cyclic movements of the actuating means makes one complete cyclic movement of the movable element.

6. A mechanism for moving an element between two limiting positions designated as a first and a second position comprising, in combination, means for moving the movable element in said first position, actuating means for moving the movable element in said second position, latch means adapted to be moved in either one of two positions, said latch means in one position clearing the movable element whereby the movable element directly follows the movements of the actuating means, said latch means in the

other position engaging the movable element and holding the movable element in said second position, said latch means having movable means engageable by the actuating means to alternatively move the latch means from disengagement with the movable element, whereby two complete cyclic movements of the actuating means makes one complete cyclic movement of the movable element.

7. A mechanism for moving an element between two limiting positions designated as a first and a second position comprising, in combination, resilient means for urging the movable element in said first position, actuating means for moving the movable element in said second position, latch means adapted to be moved in either one of two positions, selective means for governing the selective positions of the latch means, said latch means in one selective position clearing the movable element whereby the movable element directly follows the movements of the actuating means, said latch means in the other selective position engaging the movable element and arresting the movements of the movable element, said latch means having pivotally mounted dog means engageable by the actuating means to alternatively move the latch means from disengagement with the movable element, whereby two complete cyclic movements of the actuating means makes one complete cyclic movement of the movable element.

8. A mechanism for moving an element between two limiting positions designated as a first and a second position comprising, in combination, means for moving the movable element in said first position, actuating means for moving the movable element in said second position, latch means adapted to be moved in either one of two positions, said latch means in one position clearing the movable element whereby the movable element directly follows the movements of the actuating means, said latch means in the other position engaging the movable element and holding the movable element in said second position, said latch means having movable means engageable by the actuating means to alternatively move the latch means from disengagement with the movable element, whereby two complete cyclic movements of the actuating means makes one complete cyclic movement of the movable element, and selective means for holding the latch means in said one position for clearing the movable element.

JOHN C. COTNER.