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M. E. PAPANOLI ET AL

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AUTOMATIC CONTROL FOR HYDRAULIC PAPER CUTTERS

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3 Sheets-Sheet 1

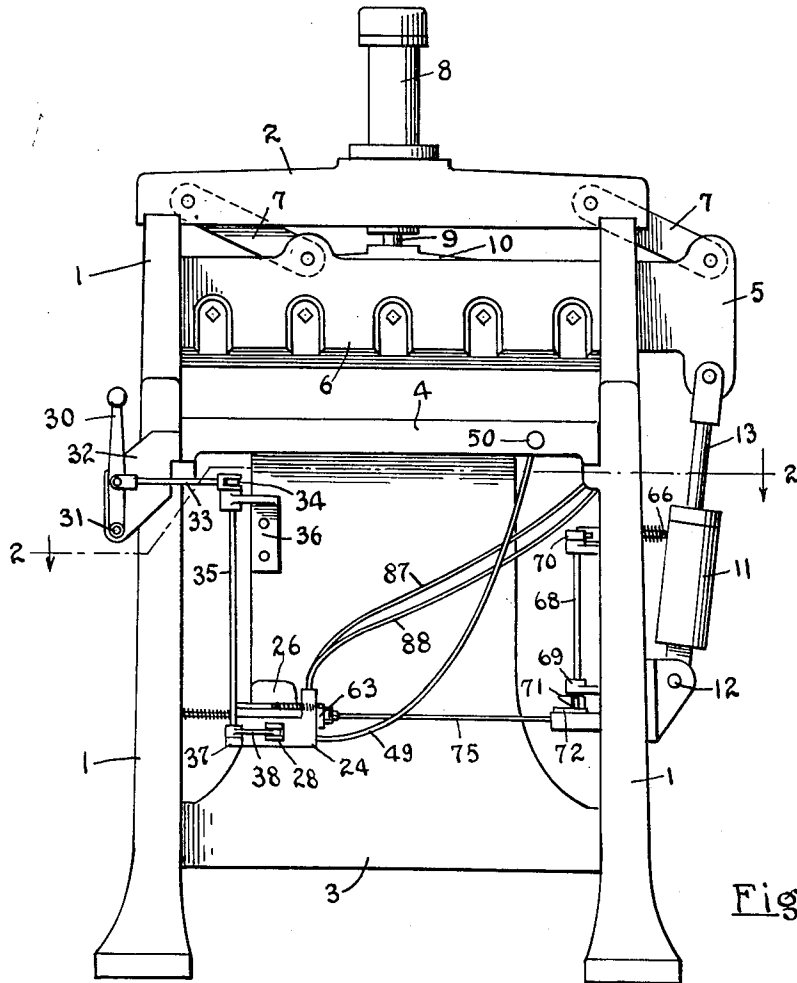


Fig. 1.

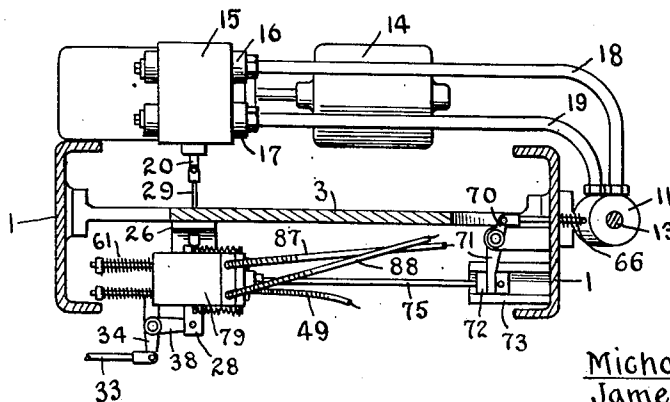


Fig. 2.

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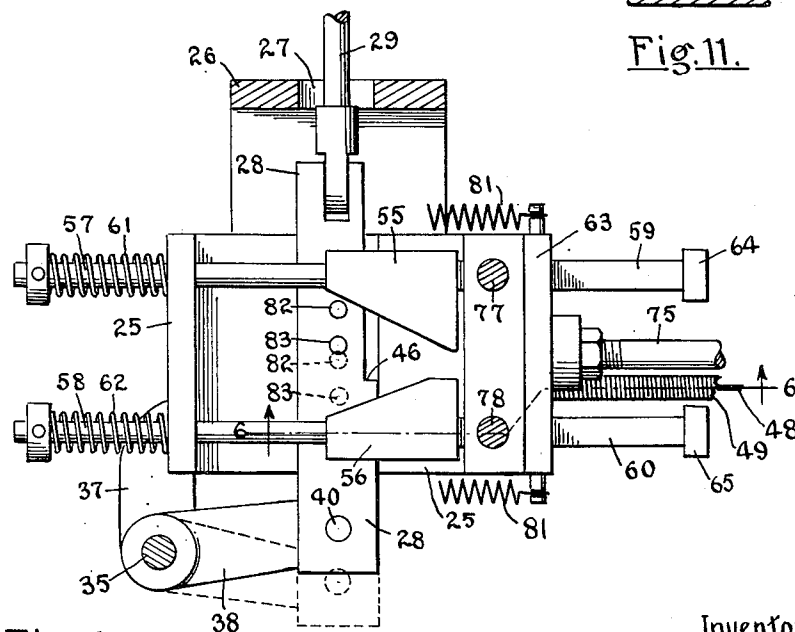
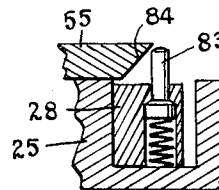
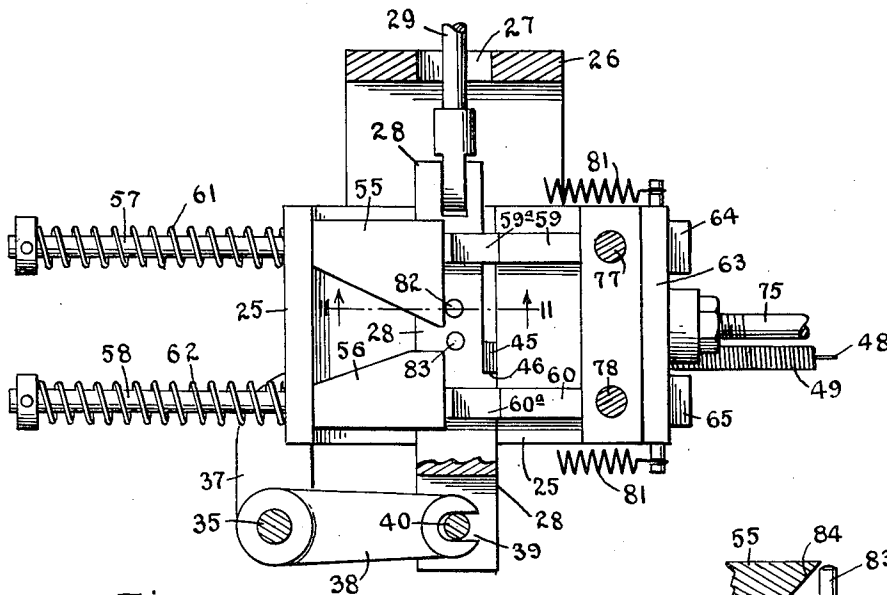
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

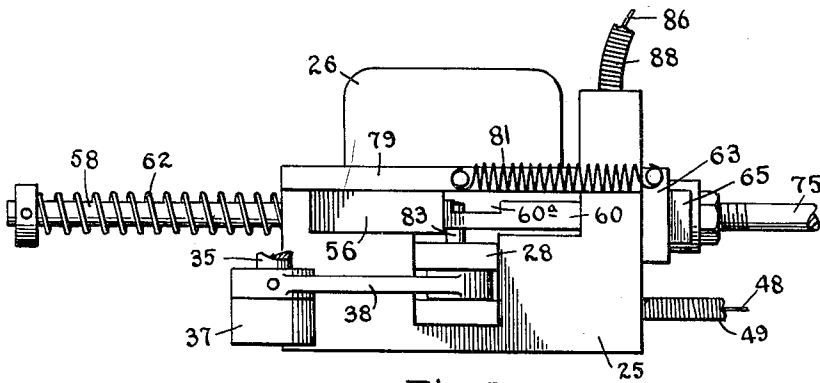


Fig. 5.

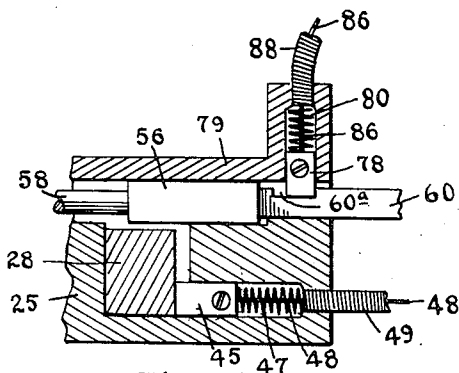


Fig. 6.

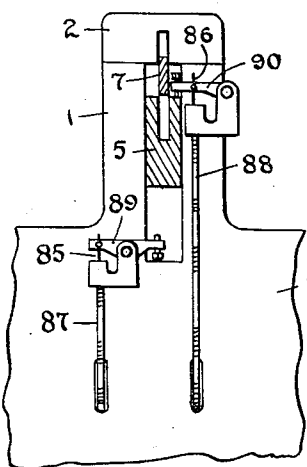


Fig. 7.

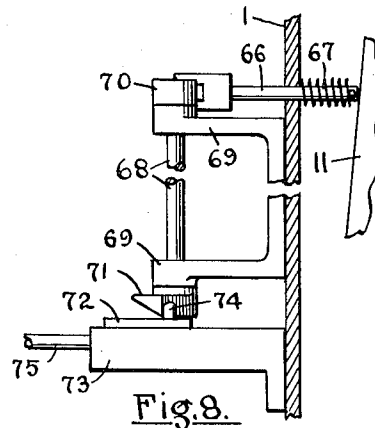


Fig. 8.

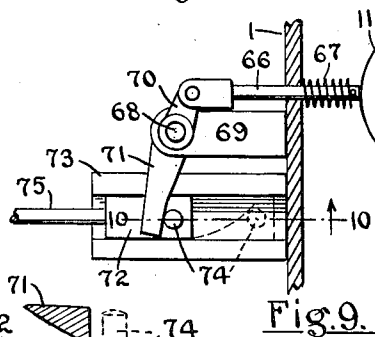


Fig. 9.

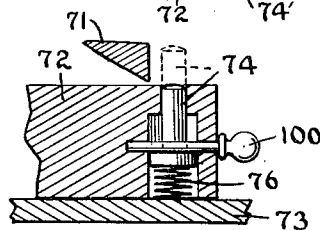


Fig. 10.

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AUTOMATIC CONTROL FOR HYDRAULIC PAPER CUTTERS

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3 Claims. (Cl. 121—38)

This invention relates to the control for hydraulic paper cutters which are used in printing shops to cut stacks of paper to the desired size. Paper cutters of this nature have a table on which the stack of paper is laid and above it is a horizontal knife bar on which is mounted a knife having a sharp lower edge. The knife bar is mounted for swinging downward and upward movements and, for the purpose of this invention, it is operated hydraulically by means of a hydraulic pressure mechanism connected to the respective ends of a cylinder connected to the frame of the machine and having a piston and a piston rod which is connected to the knife bar.

The hydraulic mechanism includes a valve which has a neutral position and can be moved either way from the neutral position to direct the hydraulic fluid to either the top or the bottom of the cylinder to cause movement of the knife either downward for the cutting movement or upward for the return movement. The knife is in its uppermost position when at rest.

This invention deals with the means for operating the valve which is always manually movable, but includes means for automatically moving the valve to cause return stroke of the knife, and for moving the valve to neutral position at the completion of the return stroke. The invention also incorporates a safety device which makes necessary the use of both hands of the operator remote from the knife to start the knife on its downward movement.

The invention is hereafter more fully described, reference being had to the accompanying drawings in which:

Fig. 1 is a front elevation of a paper cutter embodying the invention,

Fig. 2 is a sectional plan view of the same on the line 2—2 of Fig. 1,

Fig. 3 is a plan view of the valve control mechanism at rest with some of the upper parts removed,

Fig. 4 shows the same parts as Fig. 3 with the operating cams in cocked position,

Fig. 5 is a front elevation of the valve operating mechanism,

Fig. 6 is a vertical partial section on the line 6—6 of Fig. 4,

Fig. 7 is a partial elevation of one end of the machine,

Fig. 8 is a fragmentary elevation of the cam retracting mechanism,

Fig. 9 is a plan view of the parts of Fig. 8,

Fig. 10 is an enlarged fragmentary section on the line 10—10 of Fig. 9, and

Fig. 11 is a fragmentary section on the line 11—11 of Fig. 3.

Like reference numerals refer to like parts in all of the figures.

The paper cutter has vertical side frame members 1, a top cross member 2, and a web 3. There is a table 4 extending between the side members 1, and the knife bar 5, carrying the knife 6, is located above the table and guided at its ends in the side members 1. The knife bar is hung on links 7 pivoted at their respective ends to the

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top member 2 and the knife bar, which causes the knife to follow a swinging path in its up and down movements.

A hydraulic cylinder 8 is mounted on the top of the member 2 and has a piston rod 9 connected to a paper clamp 10, this being no part of the present invention.

A hydraulic cylinder 11 is pivotally anchored at its lower end at 12 to a side frame member 1, and its piston rod 13 is connected to one end of the knife bar 5 outside the frame.

Hydraulic pressure mechanism is provided, including a pump not shown, driven by a motor 14 and having a control valve located in a valve housing 15 which has two outlets 16 and 17 which are connected by flexible conduits 18 and 19 to the top and bottom respectively of the cylinder 11. The valve in the housing 15 is of the sliding balanced type and has a valve stem 20 extending outside the housing 15.

The afordescribed parts are conventional and well known in the art and form no part per se of the present invention excepting as they cooperate therewith to produce the desired novel result.

The control mechanism of this invention comprises a body 25 fixed to the web 3 of the frame by a flange 26 through which is an opening 27 in alignment with the valve stem 20. An operating bar 28 is mounted in the body 25 to slide in and out, also in alignment with the valve stem 20, and a connecting rod 29 connects the valve stem 20 with the operating bar 28 so that they move in unison.

A hand lever 30, located in convenient reach at the left hand side of the table 4, is pivoted at 31 to a bracket 32 and is connected by a link 33 to a lever 34 which is fastened to the upper end of a vertical 35 which is journaled in brackets 36 and 37, and a lever 38 is fastened to the shaft 35 near its lower end and has its swinging end slotted at 39 to receive a pin 40 on the outer end of the operating bar 28. By this construction manipulation of the lever 30 causes inward or outward movement of the operating bar 28 and like movement of the hydraulic control valve in the housing 15. No other mechanism would be required if the hydraulic valve were to have full manual control.

A safety latch 45, shown in Figs. 3 and 6, is mounted to slide in the body 25 laterally of the operating bar 28 which is shouldered at 46, its inward portion being narrower than its outer portion, and a spring 47 normally thrusts the latch 45 toward the operating bar so that its inner end will be engaged by the shoulder 46 when the parts are in neutral position as shown in Fig. 3. In this position the latch 45 prevents inward movement of the operating bar 28 which would move the hydraulic valve to a position to direct the hydraulic fluid to move the knife bar downward.

A release wire 48 is connected to the latch 45 and extends through a flexible casing 49 to a position near the right hand side of the table 4 where it is provided with a pull button 50. Thus by pulling with the right hand on the button 50 the safety latch 45 is retracted away from the shoulder 46 so that the left hand may manipulate the lever 30 to move the operating bar 28 and the hydraulic valve inwardly to knife-lowering position as shown in Fig. 4, and with both hands of the operator being necessarily occupied remote from the knife, they cannot be cut during the lowering movement.

From neutral position of Fig. 3 the operating bar may be moved either inwardly or outwardly, but since the knife bar is always raised in rest position, outward movement of the bar would accomplish nothing and therefore the above described inward movement is the only effective movement that can first be made.

Two cams, 55 and 56, are mounted to slide above and transversely of the operating bar 28. These cams have

guide rods 57, 58, 59 and 60 mounted to slide in the body 25, the rods 59 and 60 preferably being square to prevent rotating. The rods 57 and 58 have springs 61 and 62 which normally thrust the cams to the left into rest position shown in Fig. 3. The rods 59 and 60 pass through a cross head 63 which is freely slidable on them, and the rods are provided with heads 64 and 65 outside the cross head.

The cams are pulled to the right, where they are latched in cocked position of Fig. 4, by the cam-actuating mechanism shown in Figs. 8, 9 and 10. This mechanism comprises a push rod 66 passing through an end frame member 1 and thrust outwardly into engagement with the cylinder 11 near its upper end by a spring 67. A vertical shaft 68 is journaled in a bracket 69 on the inner side of the frame and a lever 70 fastened to the upper end of the shaft is connected to the push rod 66.

A lever 71 is fastened to the lower end of the shaft 68 and swings over a slide 72 mounted in a guide 73. The swinging end of the lever 71 engages a pin 74 which projects upward from the slide 72 and the slide is connected by a rod 75 to the cross head 63.

As the knife bar 5 is moved downward in its swinging movement the upper end of the cylinder 11 swings toward the frame and pushes the push rod 66 inward. This action, through the lever 70 and shaft 68, causes the end of the lever 71 to swing to the right and by engagement with the pin 74 it carries the slide 72 with it. The end of the lever 71 moves in an arc while the slide and pin move in a straight line and shortly before the end of its swinging movement, the lever leaves the pin permitting the slide to be moved back to rest position as hereafter described.

The pin 74 is mounted to be depressed in the slide 72 and is thrust upward by a spring 76. The following edge of the lever 71 is beveled at 77 and when the lever moves back to rest position, on upward movement of the knife bar 5 and outward swinging of the cylinder 11, this beveled under side of the lever cams the pin downward so that the lever passes over the pin and gets behind it for the next operating stroke.

As the slide moves to the right on the down stroke of the knife, as above described, the rod 75 pulls the cross head 63 in the same direction and moves the cams 55 and 56 to the right, the heads 64 and 65 on the rods 59 and 60 engaging the cross head for this purpose, and in so doing the springs 61 and 62 are compressed storing energy to return the cams to the left.

The guide rods 59 and 60 are provided in their upper faces with notches 59^a and 60^a, and when the cams reach their right hand positions the latches 77 and 78 mounted in the cover 79 spring downward into the notches and hold the cams in cocked position, Figs. 4 and 6. The latches 77 and 78 are vertically slidable in the cover 79 and are thrust downward by springs 80.

With the cams thus latched in cocked position they will remain there until released as hereafter explained. When the pin 74 is released from the lever 71 as it swings away from the pin in its arcuate movement, the springs 81, attached to respective ends of the cross head 63 and to the cover 79, return the cross head to rest position of Fig. 4 and the cams are then free to move to the left when they are released from the latches 77 and 78.

The operating bar 28 is provided with two cam pins 82 and 83 which project upward therefrom and are spring-thrust for depression as shown in Fig. 11. These pins are engaged respectively by the cam faces of the cams 55 and 56 to move the bar 28 in opposite directions. The leading or right hand edges of the cams 55 and 56 are beveled at 84 so that they will depress the pins 82 and 83 and ride over them when the cams are moved from rest to cocked positions. This movement of the cams does not move the bar 28.

The cams 55 and 56 are released so that they may move from cocked positions by action of the springs 61 and

62 by the following mechanism. Each latch 77 and 78 has connected to it respectively pull wires 85 and 86 which run through flexible casings 87 and 88 and extend to positions adjacent the knife bar 5 on the outside of a frame member 1, Fig. 7. The pull wire 85 is connected to a pivoted lever 89 which is engaged by the knife bar 5 at the bottom of its stroke, and the pull wire 86 is attached to a pivoted lever 90 which is engaged by the knife bar at the top of its stroke.

The cam 55 moves the operating bar 28 outwardly to cause upward motion of the knife, and its latch 77 has the pull wire 85 connected to it, and when the knife bar 5 reaches the bottom of its stroke it will engage and move the lever 89 to release the cam 55 which moves to the left, engaging the pin 82 and pushing the bar outwardly causing upward movement of the knife. This position of the operating bar and cam pins 82 and 83 is shown in dotted lines in Fig. 4.

The latch 78 for the cam 56 has the pull wire 86 connected to it, and when the knife bar reaches the top of its stroke it will engage and move the lever 90 to release the cam 56, which moves to engage the cam pin 83 and move the operating bar back to neutral position of Fig. 4.

Operation

With the parts in neutral position and the knife bar raised, a stack of paper is placed under the knife and then the operator, using both hands, pulls on the button 50 releasing the latch 45 from the operating bar 28, and then by manipulation of the lever 30 the operating bar is moved inwardly to cause downward movement of the knife.

The operator may then release both the lever 30 and the button 50 and the cutter will automatically perform its cycle of operations and come to rest. On the downward movement of the knife the swinging movement of the piston 11 pushes in on the push rod 66 and through the lever 71 moves the slide 72 to retract the cams 55 and 56 and move them to cocked position, where they are held by the latches 77 and 78. Following this the end of the lever 71 swings past the pin 74 permitting the springs 81 to pull the cross head 63 and slide 72 back to rest positions.

As the knife bar 5 reaches the bottom of its stroke it will engage the lever 89 to release the cam 55, which is moved by its spring 61 to cam the pin 82 and operating bar to outward position, which will move the control valve to cause upward movement of the knife. When the knife bar reaches the top of its stroke it will engage the lever 90 to release the cam 56, which is moved by its spring 62 to cam the pin 83 and the operating bar back to neutral position where all parts are at rest ready for another operation.

It has been found that this automatic operation of the knife bar interferes with its proper placing when setting and adjusting a new knife on it. For that purpose the automatic mechanism can be temporarily made inoperative, which is done by depressing the pin 74 on the slide 72 and holding it depressed as by inserting a pin 100 through a hole in the slide in a position to engage the head of the pin. With the pin 74 so depressed it will not be engaged by the lever 71 and the cams 55 and 56 will not be moved by movement of the knife. The movement of the knife bar is then controlled entirely by the lever 30, and after the knife has been properly adjusted and set the pin 100 is removed making the mechanism again automatic. It is conceived that the lever and slide mechanism for pulling the cross head 63 and cocking the cams above described, may be replaced by an electric solenoid magnet having its case connected to the cross head 63 and its electric circuit energized and de-energized in synchronism with the movements of the knife bar 5. To make such an actuator inoperative for the purpose of adjusting and setting the knife could be done by using a circuit-breaking switch in the solenoid circuit.

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The invention is defined by the appended claims, which are to be considered comprehensive of all forms coming within their scope.

We claim:

1. The combination with a machine having a movable element and pressure means for moving the element in working and return directions, including a source of pressure for said pressure means and a valve to control said pressure, of means for actuating said valve comprising a body, an operating member movably mounted on the body and connected to the valve, manual means for moving the operating member, two cams movable on said body, each having a cam face engageable with a part of said operating member to move it to different positions, a spring for each cam acting to move it with its face against said part of the operating member, automatic means acting to move said cams against tension of their springs and without engaging their cam faces with said part of the operating member during movement of the element before completion of its working stroke, individual latch means acting to hold said cams cocked with their springs under tension and separate means acting to release said cams to permit their springs to move them with their faces against the said parts of the operating member, the first cam acting to move the operating member and valve to element return position and the second cam acting to move the operating member and valve to neutral position, the latch for the first cam being released at the end of the element working stroke and the latch for the second cam being released at the end of the return stroke.

2. The elements of claim 1 combined with quick-acting manual means for making said cams inoperative.

3. The combination with a machine having a movable element and pressure means for moving the element in working and return directions, including a source of pres-

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sure for said pressure means and a valve to control said pressure, of manual means for actuating said valve combined with automatic means for actuating the valve comprising, a body, an operating member connected to said valve and movably mounted on said body, a cam for moving said operating member and valve to element return position at the end of the working stroke and a cam for moving the operating member and valve to neutral position at the end of the return stroke, said manual means being free to move said operating member and valve at all times, each of said cams being spring urged and each being respectively engageable with said operating member to move it to different positions, automatic means for moving both cams against tension of their springs during movement of the element before completion of the working stroke, means for latching said cams out of engagement with the operating member, means for releasing said first named cam for action by its spring at the end of the working stroke and means for releasing said second named cam for action by its spring at the end of the return stroke.

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