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CONTROL DEVICE

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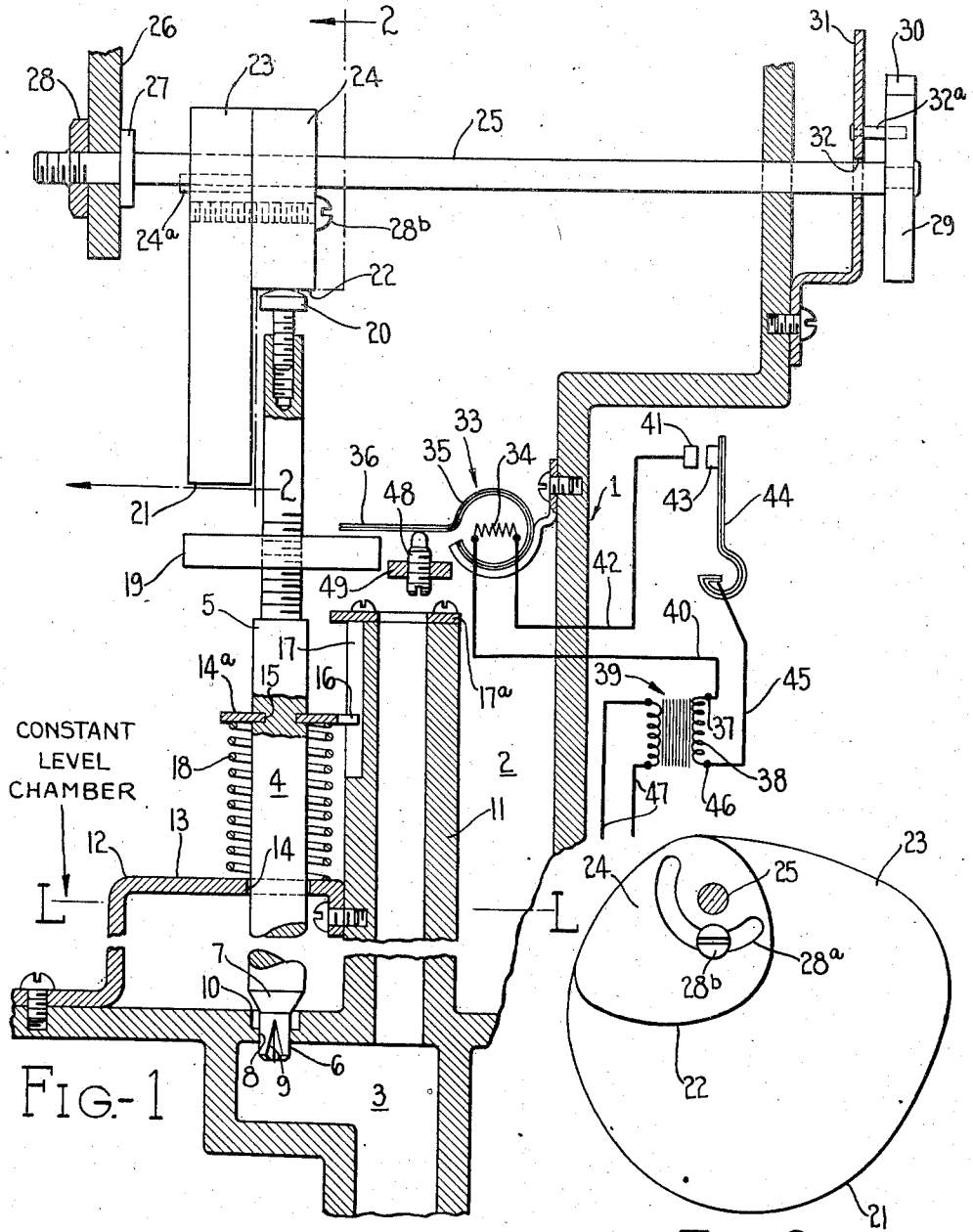


FIG.-1

FIG.-2

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CONTROL DEVICE

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15 Claims. (Cl. 137—21)

This invention relates generally to means for operating a control member such as a reciprocal plunger which may be the stem of a valve.

An object of this invention is to provide means for adjusting the position of a reciprocating member in accordance with the position of an operating means.

An object of this invention is to provide means for regulating the output of an oil burning device by adjusting the flow of fuel thereto.

A further object is to provide means whereby with one operating means the flow of fuel may be controlled for either pilot or full fire operation.

A further object is to provide means for independently adjusting the range of control through which the single operating means will act to control the operation.

The invention consists in the improved construction and combination of parts, to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawing, to be taken as a part of this specification, there is fully and clearly illustrated a preferred embodiment of this invention, in which drawing:

Figure 1 is a partial view in vertical central section of a fluid flow controlling device embodying the invention, and

Fig. 2 is a view taken along the line 2—2 of Fig. 1.

Referring to the drawing by characters of reference, the numeral 1 designates generally a casing having a chamber 2 in which liquid fuel is maintained at a substantially constant level, substantially at the line L—L. Integral with the bottom wall of the casing 1 there is an outlet passageway 3 adapted to be communicatively connected to a gravity or hydroxilation type oil burner (not shown). Liquid flow from the chamber 2 to the outlet passageway 3 is controlled by means of a reciprocally movable valve member 4 having a stem portion 5 extending vertically upwards and above the liquid level L—L. The member 4 has a reduced diameter downwardly extending portion 6 connected to the normal diameter portion by a tapered conic section 7. The reduced diameter portion 6 has a sliding substantially fluid-tight fit within an aperture or passageway 8 leading from the chamber 2 into passageway 3. Flow controlling means which may be a V-shaped slot 9 having its apex adjacent the conic section 7 opens downwardly and cooperates with the wall of the passageway 8 to control the quantity of liquid which flows from the chamber 2 into passageway 3. As the valve member 4 is moved downward, less area of the slot 9 is open to liquid within the chamber 2 and consequently the flow therefrom into the passageway 3 is reduced. Upon upward movement of the valve member 4, a greater area of the slot 9 is progressively exposed to the liquid within chamber 2 and a greater flow therefrom into outlet passageway 3 results. The upper end of the passageway 8 is of enlarged diameter and at its intersection with the bottom wall of chamber 2 forms a valve seat 10 against which the conic section 7 seats upon movement of the valve member 4 to its lowermost position thereby to completely stop flow of liquid from the chamber 2.

Leading upward into the chamber 2 from the bottom wall of the casing 1 and extending above the liquid level line L—L is a hollow boss or conduit 11 which opens at its lower end into the passageway 3. The function of the boss 11 is to provide atmospheric pressure within the passageway 3 at all times so that the only force tending to cause liquid flow into passageway 3 is the substantially constant head exerted by liquid in chamber 2.

An angular bracket 12 has one end portion secured to the boss 11 in some manner, such as a screw, and has a portion 13 which extends therefrom substantially parallel to the casing bottom wall and overlying the passageway 3 and the bracket 12 has its other end portion extending downwardly through the liquid and secured in a suitable manner, such as by a screw, to the bottom wall of the chamber 2. The valve member 4 is guided within and extends through an aperture 14 in the bracket portion 13 concentric with the passageway 3. An annular ring 14a is rigidly secured to the valve member stem portion 5 in a suitable manner, such as by being held in an aperture 15. The ring 14a has at one peripheral portion a protruding finger or guide portion 16 which fits and is guided for reciprocal movement in a slot 17 in the adjacent side wall of the boss 11. The finger 16 allows the valve member 4 to be freely movable in a vertical direction but prevents rotation thereof about its longitudinal axis.

A plate-like member 17a having an aperture therethrough which aligns with the hollow interior of boss 11 is secured to the top wall of the boss 11 overlying the slot 17 and acts as a stop member, due to the engagement therewith of finger 16, to limit upward or valve opening move-

ment of the valve member 4. A helical coil spring 18 is located concentric with the stem portion 5 and is under compression between the horizontal bracket portion 13 and the ring 14a and acts to urge the valve member 4 upwardly in a valve opening direction. The valve opening movement of the spring 18 is limited by engagement of abutment members 19 or 20 with cam surfaces 21 or 22, respectively. The abutment member 19 may be a nut-like or collar member having an internal thread which is cooperable with an externally threaded portion of a reduced diameter portion of the stem portion 5. The threads of member 19 may be such that they will not easily allow member 19 to turn on the portion 23 or unwanted rotation of the member 19 may be prevented by means of the usual setscrew or any other known locking means. The member 20 may be a screw which threads into a tapped hole in the end wall of the stem portion 5 and unwanted rotation thereof may be prevented in any known manner, such as a high friction fit of the threads or a split screw. The cam surfaces 21 and 22 are respectively part of cams 23 and 24 which are clearly shown in Fig. 2. Cam 23 is held, as by a key 24a, rigid with a shaft 25. The shaft is journaled at one end in a side wall of the casing 1 and at the other end in a guide member 26 held rigid with the casing 1. Longitudinal movement of the shaft 25 is prevented by a pair of abutments 27, 28 which are secured to and rigid with the shaft 25. The abutment 27 may be integral with the shaft 25 while the abutment 28 may be screw-threaded thereon and locked as by staking the threads. The cam 24 has an arcuate slot 28a concentric with the shaft 25. An adjustment screw 28b extends through the slot 28a and is threaded into the cam 23 to lock the cams 23 and 24 together in any desired position.

Rotation of the shaft 25 is accomplished by manually gripping a wheel portion or knob 29 which is suitably secured to an end portion of the shaft extending externally of the casing 1. The knob 29 may have a protruding or indicating portion 30 which cooperates with indicia on a plate 31. The plate 31 may be held in any convenient manner to the casing 1 or in any manner which prevents rotation thereof. The shaft 25 may extend, as shown, through an aperture 32 of the plate 31 and the indicia and knob 29 may be on the outward side of the plate 31 so as to render the manual adjustment thereof less difficult. If desired, the plate 31 may carry one or more pins or projections 32a which may be engaged by the portion 30 to limit rotation of the knob 29 to any desired angle less than 360° to limit the maximum flow for which the valve member 4 may be adjusted.

In case automatic operation of the device is desired, a bimetallic heat actuated element 33 may be utilized to allow the valve member 4 to move toward open position until one of the abutment members 19 or 20 engage its respective cam surface 21 or 22. The element 33 comprises an electric resistance heater 34 in heat exchange relation with a bimetallic strip 35 which strip acts upon heating to move an arm portion 36 thereof upwardly out of engagement with the abutment member 19. The heater 34 may have one terminal thereof connected to one terminal 37 of a secondary coil 38 of a transformer 39 by a lead wire 40 and may have its other terminal connected to a stationary contact member 41 of a thermostat (diagrammatically shown) by a lead wire 42. The thermostat has a movable contact member 43 carried by a temperature sensitive arm 44 and is cooperable with the contact member 41 to control an electric circuit upon movement of the arm 44 due to temperature change and in the manner well known to the prior art. The arm 44 may be of current conducting material and the member 43 connected to a lead wire 45 therethrough, or the member 43 may be directly connected to the lead wire 45 by a pig-tail connection. The other end of lead wire 45 is connected to a terminal 46 of the coil 38, opposite to terminal 37, to complete the electric circuit. The primary coil of the transformer 39 may be connected by means of lead wires 47 to a source of electrical energy. Downward movement of the portion 36, due to cooling of the strip 35, is limited by engagement thereof with a stop member 48 which may be a screw, threaded within a member 49 rigid with the casing 1.

The operation of the apparatus without the element 33 is as follows: Oil from a suitable source of supply is admitted to the chamber 2 to maintain a constant level therein at the line "L—L" by a suitable manner (not shown) but well known to the prior art. The knob 29 is rotated in a clockwise direction and the spring 18 moves the valve upwards to maintain the abutment member 20 in engagement with the cam surface 22 of cam 24 which is being rotated by the knob 29. Oil for a pilot or low fire then flows from the chamber 2, through the V-shaped slot 9, into the outlet passageway 3 to the burner (not shown). If the high fire operation is desired, the knob 29 is further rotated in a clockwise direction until the abutment member 20 reaches the end of the active portion of cam surface 22 and the abutment member 19 is urged into engagement with the cam surface 21 at which time the valve member slot 9 is admitting high fire oil to the burner (not shown). Continued rotation of the knob 29 rotates the cam 24 and the surface 21 so that high fire oil flow may be modulated to suit the desires of the operator. Reverse or counter-clockwise rotation of the knob 29 causes the cam surface 22 to engage the abutment member 20 thereby moving the abutment member 19 from the surface 21 and causing the valve member 4 to allow pilot fire oil to flow to the burner (not shown). Continued counter-clockwise rotation will move the valve member 4 so that the conic section 7 engages the seat 10 to stop flow of oil completely.

It is to be understood that the valve operation may be somewhat modified by adjusting the abutment members 19 and 20 and/or cams 23 and 24 and that by suitably adjusting the members the valve member 4 may never reach a position in which the conic section 7 closes flow of oil completely. In such an event the burner will never go out due to lack of oil but will continue to operate with a small pilot flame. If desired, the abutment member 19 may be so positioned relative to abutment member 20 that there is no large change in oil flow as the abutment member 20 leaves or engages the cam surface 22.

If the element 33 is utilized, the knob 29 may be set for any desired maximum oil flow. When the temperature sensitive arm 44 causes the contact members 41, 43 to make an electrical circuit through the heater 34, the heater 34 will be energized and heat the strip 35. Heating of the strip 35 causes the arm portion 36 to move upward so that the valve member can move up-

ward due to the force exerted by the spring 18 for increased fuel flow. Upward movement of the valve member 4 is limited when one of the abutment members 19 or 20 engages its respective cam surfaces. The particular engagement, of course, depends upon the setting of the cams 23, 24. Upon breaking of the electrical circuit, the element 33 cools and the arm portion 36 moves downward and by engagement with the abutment member 19 moves the valve member 4 toward closed position until the portion 36 engages the stop member 48 at which time the oil flow has been lowered to minimum flow.

It may now be seen that by means of this invention it is possible to operate an oil burner at a modulated pilot or low fire flame and at a modulated high fire flame, the range of each being independently adjustable. It is also possible to set the device for a high fire oil flow and a minimum oil flow and to automatically vary the oil flow between the two limits. If desired, it is also possible to so adjust the device that the oil may be completely shut-off at the minimum setting and also to adjust the abutment members so that the range of the modulation of the two cam surfaces overlap.

What is claimed and desired to be secured by Letters Patent of the United States is:

1. In an apparatus of the character described, a supporting means, a reciprocal member movable relative to said means, a pair of abutment members carried by said reciprocal member, a movable member carried by said means, and an actuating means carried by said movable member and having two actuating portions, one of said portions being engageable with one of said abutment members upon predetermined movement of said movable member, another of said portions being engageable with another of said abutment members upon continued movement of said movable member, said other portion acting upon engagement with said other member to move said one member from a position in the path of movement of said one portion.

2. In an apparatus of the character described, a supporting means, a reciprocal member movable relative to said means, a pair of abutment members carried by said reciprocal member, an actuating means carried by said means and having two actuating portions, one of said portions being engageable with one of said abutment members, another of said portions being engageable with another of said abutment members, said one portion engaging said one member, said other portion acting upon engagement with said other member to move said one member out of engaging relation with said one portion, and automatic means engageable with one of said abutment members and operable to move said abutment members out of engagement with their respective actuating portions.

3. In an apparatus of the character described, a casing having a chamber with an outlet, a valve member movable relative to said outlet to control flow of fluid therethrough, a pair of independently mounted members carried by said valve member, a movable member carried by said casing, and actuating means carried by said movable member and having two actuating portions, one of said portions being engageable with one of said pair of carried members upon predetermined movement of said movable member, another of said portions being engageable with another of said pair of carried members upon further movement of said movable member, said one portion engaging said one member, said other portion acting upon said further movement of said movable member to engage said other member to move said one member out of engaging relation with said one portion.

4. In an apparatus of the character described, a casing having a chamber with an outlet, a metering valve member movable relative to said outlet to control flow of fluid therethrough, a pair of independently mounted members carried by said valve member, a rotatable cam means journaled in said casing and having two cam surface portions, one of said portions being engageable with one of said pair of carried members, another of said portions being enageable with another of said pair of carried members, said one portion engaging said one member prior to engagement of said other portion with said other member, said other portion acting upon engagement with said other member to move said one member out of engaging relation with said one portion, and means for moving said cam means.

5. In an apparatus of the character described, a casing having a chamber with an outlet, a valve member movable relative to said outlet to control flow of fluid therethrough and having a stem, a first abutment member carried by said valve member stem, a second abutment member carried by and extending longitudinally from the end of said stem, and a rotatable cam means carried by said casing and overlying said stem, said cam means having two surface portions, one of said portions being engageable with said first abutment member, another of said portions being enageable with said second abutment member, said one portion engaging said first abutment member prior to engagement of said other portion with said second abutment member, said other portion acting upon engagement with said second abutment member to move said first abutment member out of engaging relation with said one portion.

6. In an apparatus of the character described, a casing having a chamber with an outlet, a valve member movable relative to said outlet to control flow of fluid therethrough and having a stem, a pair of independently adjustable members carried by said valve member, a shaft journaled in said casing and extending across said stem and out of said casing, a cam means carried by said shaft and having two surface portions, one of said portions being engageable with one of said pair of carried members, another of said portions being engageable with another of said pair of carried members, said one portion engaging said one member prior to engagement of said other portion with said other member, said other portion acting upon engagement with said other member to move said one member out of engaging relation with said one portion, and means carried by said shaft external of said casing for rotating said shaft.

7. In an apparatus of the character described, a supporting means, a reciprocal member movable relative to said means and having an extending portion, a guide means secured to said means and having an aperture receiving and guiding said reciprocal member, means urging said reciprocal member in one direction, a collar member threaded to said extending portion, an adjustable screw projecting axially from the end of said extending portion, a rotatable cam means carried by said supporting means and having two surface portions for limiting movement of said

reciprocal member in said one direction, one of said portions being engageable with said collar member, another of said portions being engageable with said screw, said one portion engaging said collar member prior to engagement of said other portion with said screw, said other portion acting upon engagement with said screw to move said collar member in a second direction out of engaging relation with said one portion, and means carried by said supporting means to rotate said cam means.

8. In an apparatus of the character described, a supporting means, a reciprocal member movable relative to said means and having an extending portion, a guide means secured to said means and having an aperture receiving and guiding said reciprocal member, means urging said reciprocal member in one direction, a collar member threaded to said extending portion, an adjustable screw projecting axially from the end of said extending portion, a rotatable cam means carried by said supporting means and having two surface portions for limiting movement of said reciprocal member in said one direction, one of said portions being engageable with said collar member, another of said portions being engageable with said screw, said one portion engaging said collar member prior to engagement of said other portion with said screw, said other portion acting upon engagement with said screw to move said collar member in a second direction out of engaging relation with said one portion, means carried by said supporting means to rotate said cam means, and condition responsive means cooperable with said collar member and operable to move said stem against the force of said urging means and relative to said cam means.

9. In an apparatus of the character described, a supporting means, a reciprocal member movable relative to said means and having an extending portion, a guide means secured to said means and having an aperture receiving and guiding said reciprocal member, a ring member secured to said reciprocal member, a spring member concentric with said reciprocal member and positioned intermediate said ring member and said guide means, said spring member acting to urge said reciprocal member in one direction, a collar member threaded to said extending portion, an adjustable screw projecting axially from the end of said extending portion, a rotatable cam means carried by said supporting means and having two surface portions for limiting movement of said reciprocal member in said one direction, one of said portions being engageable with said collar member, another of said portions being engageable with said screw, said one portion engaging said collar member prior to engagement of said other portion with said screw, said other portion acting upon engagement with said screw to move said collar member in a second direction out of engaging relation with said one portion, indicia carried by said supporting means, a stop member carried by said supporting means, and means carried by said supporting means to rotate said cam means and having a protruding portion, said protruding portion being cooperable with said indicia to indicate the position of said reciprocal member and being engageable with said stop member to limit rotation of said last-named means.

10. In a liquid controlling apparatus, a casing having an inlet and an outlet port, a metering valve member controlling flow through said port and having a stem, a guide member secured to said casing and having an aperture receiving and guiding said stem, a ring member rigid with said stem, a spring surrounding said stem and held under compression intermediate said guide member and said ring member, an annular collar adjustably screw-threaded on said stem, an adjustment screw projecting axially from the end of said stem, a shaft extending across said stem, and external of said casing, a first cam wheel secured to said shaft and engageable with said collar, a second cam wheel adjustable on said shaft and having a cam surface portion engageable with said screw, a clamping screw holding said second cam wheel in adjusted position on said shaft and to said first cam wheel, and a hand grip member on said shaft external of said casing.

11. In a liquid controlling apparatus, a casing having an inlet and an outlet port, a metering valve member controlling flow through said port and having a stem, a guide member secured to said casing and having an aperture receiving and guiding said stem, a ring member rigid with said stem, a spring surrounding said stem and held under compression intermediate said guide member and said ring member, an annular collar adjustably screw-threaded on said stem, an adjustment screw projecting axially from the end of said stem, a shaft extending across said stem and external of said casing, a first cam wheel secured to said shaft and engageable with said collar, a second cam wheel adjustable on said shaft and having a cam surface portion engageable with said screw, a clamping screw holding said second cam wheel in adjusted position on said shaft and to said first cam wheel, a hand grip member on said shaft external of said casing, means limiting rotation of said shaft by said grip member, and a condition responsive means cooperable with said collar and operable to move said stem against the force of said spring and relative to said cam wheels.

12. In a liquid controlling apparatus, a casing having an inlet and an outlet port, a metering valve member controlling flow through said port and having a stem, a guide member secured to said casing and having an aperture receiving and guiding said stem, a ring member rigid with said stem, a spring surrounding said stem and held under compression intermediate said guide member and said ring member, an annular collar adjustably screw-threaded on said stem, an adjustment screw projecting axially from the end of said stem, a shaft extending across said stem and external of said casing, a first cam wheel secured to said shaft and engageable with said collar, a second cam wheel adjustable on said shaft and having a cam surface portion engageable with said screw, a clamping screw holding said second cam wheel in adjusted position on said shaft and to said first cam wheel, a hand grip member on said shaft external of said casing, a bracket extending from said casing, and a bimetal actuator secured to said bracket and having its free end overlying said collar, said actuator cooperating with said collar and operable to move said stem against the force of said spring and relative to said cam wheels.

13. In an apparatus of the character described, a supporting means, a controlling member carried by said means for reciprocal movement, means urging said member in one direction, a pair of independently adjustable abutment members carried by said controlling member, a rotatable shaft carried by said supporting means and extending in a plane substantially normal to

and overlying the path of movement of said controlling member, a first cam wheel fixed to said shaft and having a cam surface engageable with one of said abutment members, a second cam wheel carried by and rotatable relative to said shaft and having a surface portion engageable with a surface portion of said first cam wheel, said second cam wheel having a cam surface engageable with the other of said abutment members, means for holding said surface portions in tight frictional engagement for unison movement of said wheels by said shaft, said second wheel cam surface acting upon predetermined rotational movement to move said controlling member in a second direction against the force of said urging means, said first wheel cam surface acting upon continued rotational movement of said shaft to move said controlling member in said second direction and said other abutment member out of engagement with said second wheel cam surface, and means for imparting said rotational movement to said shaft.

14. In an apparatus of the character described, a supporting means, a controlling member carried by said means for reciprocal movement, means urging said member in one direction, a pair of independently adjustable abutment members carried by said controlling member, a rotatable shaft carried by said supporting means and extending in a plane substantially normal to and overlying the path of movement of said controlling member, a first cam wheel fixed to said shaft and having a cam surface engageable with one of said abutment members, a second cam wheel carried by and rotatable relative to said shaft and having a surface portion engageable with a surface portion of said first cam wheel, said second cam wheel having a cam surface engageable with the other of said abutment members, said second wheel having an arcuate slot opening through said second wheel surface portion and concentric with said shaft, said first wheel having a screw-threaded aperture opening through said first wheel surface portion and registering with said arcuate slot, a screw extending through said arcuate slot and screw-threaded into said screw-threaded aperture and having a shoulder engageable with said second wheel, said screw acting to clamp said wheel surface portions in tight frictional engagement for unison movement of said wheels by said shaft, said second wheel cam surface acting upon predetermined rotational movement to move said controlling member in a second direction against the force of said urging means, said first wheel cam surface acting upon continued rotational movement of said shaft to move said controlling member in said second direction and said other abutment member out of engagement with said second wheel cam surface, and means for imparting said rotational movement to said shaft.

15. In an apparatus of the character described, a supporting means, a reciprocal member movable relative to said means and having an extending portion, a guide means secured to said means and having an aperture receiving and guiding said reciprocal member, a ring member secured to said reciprocal member and spaced from said guide means, a helical coil spring positioned concentric with said reciprocal member under stress between said ring member and said guide means and acting to urge said reciprocal member in one direction, an abutment member carried by said supporting means, said abutment member being co-operable with said ring member to limit movement of said reciprocal member in said one direction, a collar member threaded to said extending portion, an adjustable screw projecting axially from the end of said extending portion, a rotatable cam means carried by said supporting means and having two surface portions for limiting movement of said reciprocal member in said one direction, one of said portions being engageable with said collar member, another of said portions being engageable with said screw, said one portion engaging said collar member prior to engagement of said other portion with said screw, said other portion acting upon engagement with said screw to move said collar member in a second direction out of engaging relation with said one portion, and means carried by said supporting means to rotate said cam means.

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