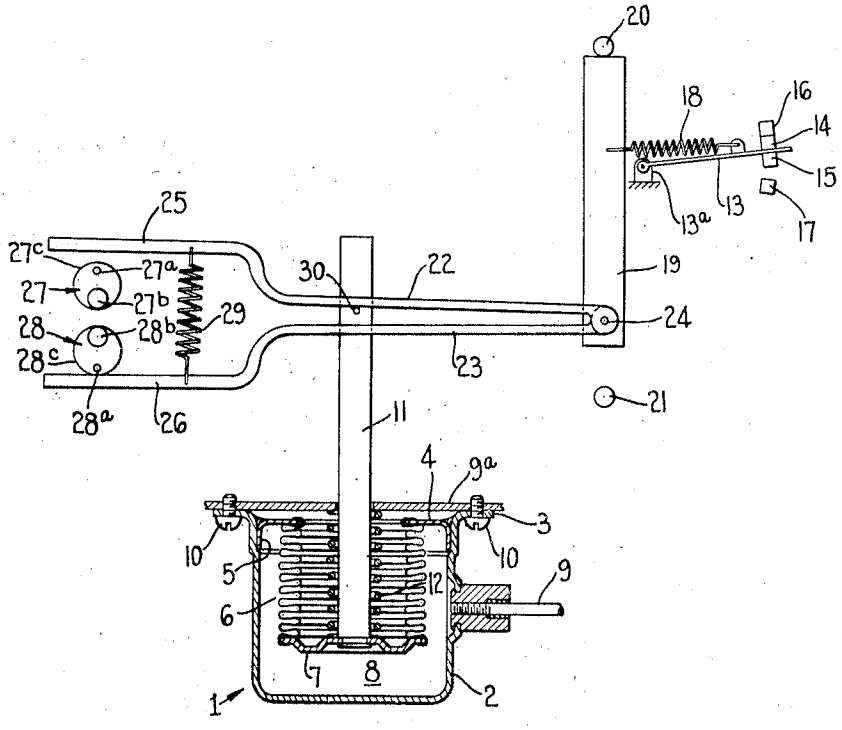
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CONTROL DEVICE

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CONTROL DEVICE

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This invention relates generally to control devices and more particularly to an operating mechanism for such devices and which among other uses, is particularly adapted for operating a switch or the like by a power element.

One object of this invention is to provide a novel means for transmitting movement to a controlling means for an actuating means.

Another object is to provide means for adjusting the operation of the controlling means relative to the operation of the actuating means.

Another object is to provide means for adjusting the position in one of the strokes of a reciprocal actuating means at which the actuating means operates a controlling means.

Another object is to provide means for adjusting relative to each other the positions in the respective strokes of a reciprocal actuating means at which the actuating means operates a controlling means.

Other objects will be apparent from a reading of the specification and appended claims.

The invention consists in the improved construction of 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 the invention, in which drawing the figure of the drawing is a schematic view of a control device embodying the invention.

Referring to the drawing by characters of reference, numeral 1 designates generally a power element or actuating means having a cup-shaped casing 2 with an outwardly projecting flange 3 at its open end portion. An annular member 4 has a perpendicularly extending circumferential flange 5 at its outer periphery which is sealed in fluid tight relationship to the inner wall of the casing 2 adjacent its open end portion. A bellows member 6 has one end portion sealed in fluid tight relationship to the member 4 adjacent its inner periphery and the bellows member 6 extends toward the bottom end wall of the casing 2. The other end of the bellows member 6 is sealed to the periphery of a disk 7 which preferably is substantially parallel to the bottom end wall of the casing 2. The casing 2, annular member 4, bellows member 6 and disk 7 cooperate to form a pressure sensitive expansible-contractible chamber 8. Pressure from a suitable source such as a temperature responsive bulb (not shown) is transmitted to the chamber 8 by means of a conduit 9 suitably secured to the side wall of the casing 2 and in open communication with the chamber 8. The power element 1 is secured to a suitable supporting member 9^a as by screws 10 extending through apertures in the flange 3 and having screw-threaded connection with the member 9^a. A thrust rod or shaft 11 extends substantially along the longitudinal axis of the bellows and has one end portion secured to the disk 7 and has its other end portion extending through an aperture in the supporting member 9^a. A helical coil spring 12 is positioned concentric with the shaft 11 and is held under compression between the member 9^a and the disk 7 and acts to oppose movement of the shaft 11 in an upward direction.

A switch blade 13 is pivoted at one end to a supporting member 13^a rigid with the supporting member 9^a and carries at its other end a pair of oppositely facing contact members 14 and 15 for cooperation respectively with a pair of oppositely positioned fixed contact members 16 and 17. The blade 13 in one position maintains the contact members 14 and 16 in engagement and in a second position maintains the contact members 15 and 17 in engagement. Movement of the blade 13 to each of its positions is accomplished by a spring 18 having one end secured to the blade 13 adjacent its contact carrying end and the other end of the spring 18 is secured to a reciprocally movable member 19. Movement of the member 19 in one direction is limited by engagement thereof with a stop member 20 and movement thereof in a second or opposite direction is limited by engagement thereof with a stop member 21. As the member 19 is moved from the stop member 20 toward the stop member 21, the spring 18 passes through an imaginary line drawn through the point at which the spring 18 is secured to the blade 13 and the pivot point of the blade 13 so that the spring 18 will cause a quick movement of the blade 13 thereby breaking the connection between the contact members 14 and 16 and making a connection between the contact members 15 and 17.

The transmitting means comprises a pair of elongated levers 22 and 23 which have one end portion pivotally secured by a pin 24 to the movable member 19. The levers 22 and 23 overlie each other and have oppositely disposed off-set portions 25 and 26 at their free end portions. A first cam member 27 is pivotally supported on a fixed shaft or axle 27^a intermediate the portions 25 and 26 and may be rotated about the axle 27^a by a suitable grip member 27^b. The

cam member 27 subsequent to movement of the grip member 27b is held in the set position by any suitable means such as a lock screw or the friction of member 27 on the shaft 27a. A second cam member 28 is pivotally supported on a fixed shaft or axle 28a intermediate the portions 25 and 26 and may be rotated about the axle 28a by a suitable grip member 28b. The cam member 28 subsequent to movement of the grip member 28b is held in its set position by any suitable means such as a lock screw or the friction of the member 28 on the shaft 28a. A helical coil tension spring 29 has one end portion secured to the lever portion 25 and its other end portion secured to the lever portion 26 and acts to urge the lever portions 25 and 26 respectively, into engagement with cam surfaces 27c and 28c of the members 27 and 28 respectively. The force of spring 29 tending to hold levers 22 and 23 in engagement with cam surfaces 27c and 28c, respectively, is greater than the component of the force of spring 18 acting in opposition to movement of member 19. The shaft 11 has a radially extending pin 30 positioned intermediate and engageable with the levers 22 and 23 for movement thereof upon movement of the shaft 11 by the power element 1.

The operation of the control device is as follows: The parts as shown in the drawing are in a position in which there is an excess of pressure in the chamber 8 and the lever portion 25 has been moved away from the cam member 27. As the pressure within the chamber 8 decreases, the spring 12 will move the shaft 11 downward and the spring 29 will cause the lever portion 25 to engage the cam surface 27c. Subsequent decrease in pressure in the chamber 8 will cause the pin 30 to move out of engagement with the lever 22 and engage the lever 23 and rotate the lever 23 clockwise about the cam member 28 as a fulcrum until the movable member 19 is moved into engagement with the stop member 21. Because of the fact that the movable member 19 has straight line movement and the lever 23 has rotatational movement there is a sliding of the lever portion 26 along the cam surface 28c. The spring 29 must exert a sufficient force to maintain the lever portion 26 in engagement with the cam surface 28c during such movement. This movement of the movable member 19 out of engagement with the stop member 20 and into engagement with the stop member 21 causes the end portion of spring 18, which is connected to the member 19, to be moved past an imaginary line drawn through the point of connection of the spring 18 to the blade 13 and the pivot point of the blade 13 so that the spring 18 will cause the blade 13 to move clockwise parting the contact members 14 and 16 and engaging the contact members 15 and 17 with a quick action. It is to be understood that either of the contact members 16 or 17 may be merely a stop member limiting the movement of the blade 13 and in such an event the switch becomes a single pole single throw switch. Other types of switches may be used or some other controlling means might be substituted for the switch, such as a valve.

Should the pressure in the chamber 8 be further lowered after the movable member 19 has engaged the stop member 21, the spring 29 which is preferably sufficiently strong to maintain the lever portion 26 in engagement with the cam surface 28c only so long as the movement of the member 19 is not limited, will allow the lever 23 to fulcrum about the pin 24 and the lever portion 26 to move away from the cam surface 28c. The provision for the continued movement of lever 23 subsequent to movement of the member 19 into engagement with the stop member 21, among other functions, acts to prevent undue strains in the apparatus due to overtravel of the element 1.

Upon increase in pressure within the chamber 8, the shaft 11 will be moved upwardly toward the position shown, allowing the lever portion 26 to engage the cam surface 28c and the pin 30 to move out of engagement with the lever 23 and into engagement with the lever 22 which at this time will have the portion 25 in engagement with the cam surface 27c. Continued increase in pressure in chamber 8 will cause the lever 22 to be moved counterclockwise about the cam member 27 as a fulcrum with a rotational and sliding movement as described hereinbefore in connection with the lever 23. This movement causes the movable member 19 to be moved out of engagement with the stop member 21 and moved into engagement with the stop member 20, the spring 29 acting to hold the portion 25 against the cam surface 27c. Upon movement of the member 19 from engagement with the stop member 21 and into engagement with the stop member 20, the end portion of the spring 18 secured to the member 19 is moved past the imaginary line drawn through the point at which the spring 18 is secured to the blade 13 and the pivot point of the blade 13 so that the blade 13 will move with a quick movement to part the contact members 15 and 17 and engage the contact members 14 and 16. As was stated hereinbefore, the force exerted by the spring 29 is only sufficient to maintain the lever portion 25 in engagement with the cam surface 27c until the movable member 19 engages the stop member 20. Subsequent increase in pressure in the chamber 8 after the member 19 has been limited in its upward movement will cause the lever 22 to pivot clockwise about the pin 24 and the lever portion 25 will be moved against the force of the spring 29 as shown.

The cam members 27 and 28 are shown in the figure of the drawing as being set for the lowest pressure setting at which the contact members 14 and 16 will be closed and for the highest pressure setting at which the contact members 15 and 17 will be closed. Should it be desired to increase the pressure at which the contact members 14 and 16 are caused to engage, it is necessary merely to rotate the cam member 27 about the shaft 27a by the grip member 27b. This causes the surface 27c of the cam member 27 to move the lever portion 25 away from the shaft 27a so that it is necessary for the shaft 11 to be moved further in an upward direction before the pin 30 will engage the lever 22 to pivot it in a counterclockwise direction about the cam member 27 as a fulcrum. It will be noted that irrespective of the setting of the cam member 27, the spring 29 will maintain the proper cooperation of the lever portion 25 to the cam member 27 so that the parts will function as hereinbefore set forth. It will be further noted that the positioning of the lever 22 by the cam member 27 will not affect the movement of the member 19 by the lever 23. The cam member 28 may be adjusted similarly to the cam member 27 for determinating the pressure within the chamber 8 necessary to cause movement of the movable member 19 downwardly under the force of spring 12 and into engagement with the stop member 21 and which adjustment will not affect the pres-

sure in chamber 8 required to move the member 19 against the stop member 20.

It may now be understood that this invention provides means whereby the actuation of the controlling means to its two controlling positions may be independently adjusted and the parts are prevented from undue strain upon movement of the actuating means subsequent to actuation of the controlling means.

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

1. A control device comprising a lever, a controlling means movable by said lever, a fulcrum support pivotally supporting said lever for movement of said controlling means, means tending solely to hold said lever against said support, a power element acting through said lever to move said controlling means and being unopposed by the force of said holding means, said lever being movable away from said support against the force of said holding means upon initiation of movement of said controlling means.

2. A control device comprising a pair of laterally positioned levers, a controlling means, means operatively connecting one end of each of said levers to said controlling means, fulcrum means for the other end of each of said levers, a power element operable on movement in one direction to move one of said levers to actuate said controlling means and operable on movement in the other direction to move the other of said levers to actuate said controlling means, and a spring having its opposite ends secured to said levers and acting solely to hold said levers against said fulcrum means during actuation of said controlling means.

3. A control device comprising a pair of laterally positioned levers, a controlling means, means operatively connecting one end of each of said levers to said controlling means, fulcrum means having slidable engagement with the other end of each of said levers, a power element operable on movement in one direction to move one of said levers to actuate said controlling means and operable on movement in the other direction to move the other of said levers to actuate said controlling means, and a single means acting on said levers and tending to hold said levers in engagement with said fulcrum means.

4. In an apparatus of the character described, a first abutment, a second abutment, a first lever, a second lever, means urging said first lever into engagement with said first abutment and said second lever into engagement with said second abutment, a movable controlling member, means pivotally securing said levers to said controlling member, and an actuating member engageable with said first lever and operable to pivot said first lever about said first abutment thereby to move said controlling member in one direction, said actuating member being engageable with said second lever to pivot said second lever about said second abutment thereby to move said controlling means in a second direction.

5. In an apparatus of the character described, a first abutment, a second abutment, a first lever, a second lever, means urging said first lever into engagement with said first abutment and said second lever into engagement with said second abutment, a movable controlling member, means pivotally securing said levers to said controlling member, and an actuating member engageable with said first lever and operable to pivot said first lever about said first abutment thereby to move said controlling member in one direction, said actuating member being engageable with said second lever to pivot said second lever about said second abutment thereby to move said controlling means in a second direction, means for moving said abutments thereby to determine the position of said actuating member at which said movable member is moved thereby.

6. In an apparatus of the character described, a first lever, a second lever overlying said first lever, a controlling means movable between two positions, means securing one end portion of each of said levers to said controlling means, a first abutment, a second abutment, means urging a second end portion of said first lever into engagement with said first abutment, said urging means acting to urge a second end portion of said second lever into engagement with said second abutment, an actuating means having an abutting portion positioned intermediate said levers and intermediate said one end portions and said second end portions, said actuating means being operable to move said abutting portion in one direction thereby to pivot said one lever about said one abutment and said controlling means to one of said two positions, said actuating means being operable to move said abutting portion in a second direction thereby to pivot said second lever about said second abutment and said controlling means to the second of said two positions.

7. In an apparatus of the character described, a first lever, a second lever overlying said first lever, a controlling means movable between two positions, means securing one end portion of each of said levers to said controlling means, a first abutment, a second abutment, means urging a second end portion of said first lever into engagement with said first abutment, said urging means acting to urge a second end portion of said second lever into engagement with said second abutment, an actuating means having an abutting portion positioned intermediate said levers and intermediate said one end portions and said second end portions, said actuating means being operable to move said abutting portion in one direction thereby to pivot said one lever about said one abutment and said controlling means to one of said two positions, said actuating means being operable to move said abutting portion in a second direction thereby to pivot said second lever about said second abutment and said controlling means to the second of said two positions, and means for independently positioning said abutments thereby to provide for independent adjustment of the position of the actuating means at which said controlling means is moved to either of its said two positions.

8. In an apparatus of the character described, a first lever, a second lever overlying said first lever, a movable controlling means, a first stop means limiting movement of said controlling means in one direction, a second stop means limiting movement of said controlling means in another direction, means pivotally securing one end portion of each of said levers to said controlling means, a first abutment, a second abutment, a second end portion of said first lever being operable to engage said first abutment, a second end portion of said second lever being operable to engage said second abutment, an actuating means having an abutting portion positioned intermediate said levers and intermediate said one end portions and said second end por-

tions, said actuating means upon movement in one direction acting to move said one lever and upon movement in a second direction acting to move said second lever, means releasably holding said second end portions of said levers against their respective abutments so that movement of said actuating means in a first direction will pivot said first lever about said first abutment thereby to cause said controlling means to move toward said first stop means and so that movement of said actuating means in a second direction will pivot said first lever about said second abutment thereby to cause said controlling means to move toward said second stop means, said releasable holding means acting upon continued movement of said actuating means in said first direction subsequent to engagement of said controlling means with said first stop means to allow said first lever second end portion to be pivoted about said controlling means and be moved away from said first abutment and acting upon continued movement of said actuating means in said second direction subsequent to engagement of said controlling means with said second stop means to allow said second lever second end portion to be pivoted about said controlling means and be moved away from said second abutment, and means for independently positioning said abutments thereby to provide for independent adjustment of the position of the actuating means at which said controlling means is moved to either of its said two positions.

9. In a device of the character described, a first movable member, means for moving said member, a second movable member, means limiting movement of said second member in each of two directions, a pair of members pivotally secured to said second movable member, a first stop member limiting movement of the free end of one of said pair of members in one direction, a second stop member limiting movement of the free end of the other of said pair of members in a second direction, means urging said pair of members into engagement with their respective stop members, said first movable member being operably connected to each of said pair of members and operable upon movement in one direction to pivot said one pivotal member about said first stop member thereby to move said second movable member in one of said second member two directions, said first movable member being operable upon movement in a second direction to pivot said other pivotal member about said second stop member thereby to move said second movable member in another of said second member two directions, said urging means acting to permit movement of each of said pair of members out of engagement with said stop members upon movement thereof by said first movable member subsequent to limitation of movement of said second movable member.

10. In a device of the character described, a first fulcrum member, a second fulcrum member, a first lever member fulcrumed on said first fulcrum member, a second lever member fulcrumed on said second fulcrum member, a movable controlling member, means connecting said lever members to said controlling member, means urging said lever members against their respective fulcrum members, an actuating member operatively engageable with said lever members, said actuating member being operable upon movement in one direction to pivot said first lever member about said first fulcrum member thereby to move said movable member in one direction, means limiting movement of said movable member in said movable member one direction, said urging means being operable upon movement of said actuating member in said actuating member one direction subsequent to limitation of movement of said movable member to allow said first lever member to move away from said first fulcrum member, said actuating member being operable upon movement in a second direction to pivot said second lever member about said second fulcrum member thereby to move said movable member in a second direction, means limiting movement of said movable member in said movable member second direction, said urging means being operable upon movement of said actuating member in said actuating member second direction subsequent to limitation of movement of said movable member by said last-named means to allow said second lever member to move away from said second fulcrum member.

11. In an apparatus of the character described, a first abutment, a second abutment, a first lever, a second lever, means urging said first lever into engagement with said first abutment and said second lever into engagement with said second abutment, a movable controlling member, means pivotally securing said levers to said controlling member, and an actuating member engageable with said first lever and operable to pivot said first lever about said first abutment thereby to move said controlling member in one direction, said actuating member being engageable with said second lever to pivot said second lever about said second abutment thereby to move said controlling means in a second direction, said first abutment being adjustable to regulate the operation of said first lever by said actuating member.

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