

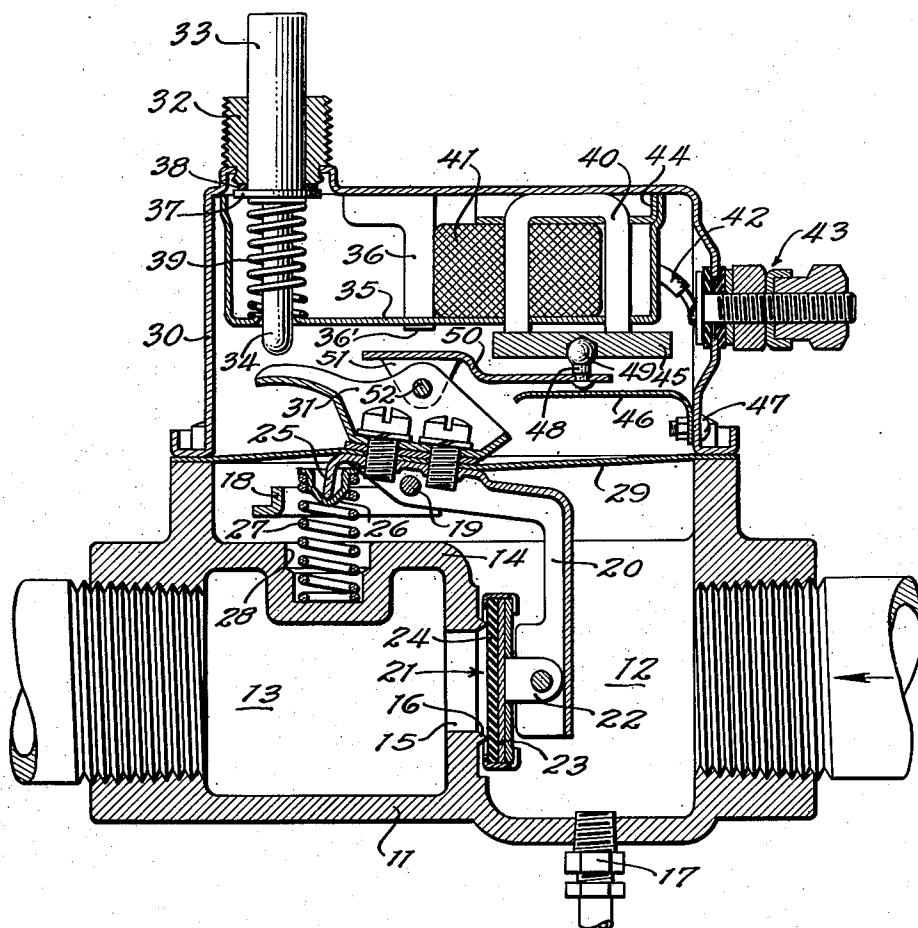
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W. A. RAY

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MANUAL-RESET CONTROL DEVICE

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Inventor,
WILLIAM A. RAY

John H. Rouse,
Attorney

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MANUAL-RESET CONTROL DEVICE

William A. Ray, North Hollywood, Calif., assignor
to General Controls Co., Glendale, Calif., a corporation of California

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My present invention relates to control devices of the manual-reset type wherein a control member, such as a valve closure or switch contact, is normally retained in its reset position by electromagnetic means responsive to a controlling condition and is released upon establishment of an abnormal or unsafe degree of said condition to effect, for example, closing of the valve or opening of the switch; it then being necessary to manually-reset the device after the source of trouble has been corrected.

An example of a device of this character is disclosed in my Patent No. 2,354,704 and comprises an armature connected to the control member and movable manually, in the resetting operation, into engagement with the pole faces of an electromagnet where it is magnetically held only while the electromagnet is energized; the electromagnet being incapable of attracting the armature through space.

In most applications of this device, the amount of energy available for the electromagnet is very small, as, for example, that produced by a thermoelectric generating device or thermocouple heated by the gas flame of a pilot burner. The amount of magnetic force holding the armature in contact with the pole faces (against the force of a bias) is accordingly very weak so that intimate interengagement of the armature surface and the pole faces is essential for effective holding of the armature.

The intimacy of interengagement of the surfaces may be greatly reduced by particles of dust or other matter deposited on them when the armature is away from the pole faces, or the surfaces may for other reasons fail to interengage properly when the armature is reset, so that proper holding of the armature is not always achieved.

It is therefore an object of this invention to overcome the aforementioned deficiency, and I accomplish this object by so arranging the armature that (instead of being movable toward and away from the pole faces) it is continuously in engagement with the pole faces and slides thereon in the movements of the control member; the force of the electromagnet being sufficient to prevent sliding of the armature under the force of the bias so that the control member is retained in its manually-moved position while the electromagnet is energized.

For full understanding of the invention, and further appreciation of its features and advantages, reference is to be had to the following de-

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tailed description and accompanying drawing, and to the appended claims.

The single figure of the drawing is a sectional view of a valve structure embodying the invention.

In the drawing, the numeral 11 indicates a valve casing having inlet and outlet chambers 12 and 13, respectively, separated by a partition 14 the vertical portion of which is provided with a valve port 15 having around its inner end an annular valve seat 16. In the bottom wall of the inlet portion of the casing is a fitting 17 whereby, for example, gas can be supplied to a pilot burner for igniting a main burner connected to the valve. Above the top wall of partition 14, and joined integrally to the front and back walls of the casing, is a U-shaped bracket 18 between the side arms of which is pivoted, on a pin 19, a channelled right-angled lever 20 to the dependent vertical portion of which is connected a closure member 21 cooperable with the seat 16; the closure member being rockably mounted on the lever by means of an ear 22 turned-up from a metal plate 23 which forms a backing for a resilient seat-engaging disk 24. The left-hand extremity of the horizontal portion of lever 20 is formed to provide a dependent finger 25 which bears in a cup 26 provided in the upper end of a compression spring 27 which serves to bias the lever in clockwise direction; the lower end of the spring being received in a recess formed in a thickened portion of the top wall of partition 14.

Covering the open top of casing 11 is a diaphragm 29, of flexible material such as leather or thin metal, which is clamped at its margin between the casing and the flanged mouth of a cup-shaped housing 30 secured to the casing. Forming within housing 30 an extension of lever 20 is a channelled arm 31 which is secured by screws to the horizontal portion of the lever with diaphragm 29 therebetween; the connection between these parts being fluid-tight. Reciprocable in a bushing 32, sealingly secured in an opening through the top wall of housing 30, is a push-button 33 having a stem 34 engageable with the left-hand end of the arm 31. The bushing 32 is externally threaded for the connection of means for remotely operating the push-button, or for the attachment of a protective cap. The stem 34 extends freely through an opening in the bottom wall of a relatively-narrow rectangular receptacle 35 which is secured in position by a sheet-metal member 36 spot-welded to the top

wall of housing 30 and having ears bent-up under the bottom of the receptacle, as indicated at 36'. When the push-button 33 is in its retracted position, as shown, the clearance-opening around it is sealed by cooperation of its enlargement 37 and soft washer 38 with the underside of bushing 32; the push-button being biased to this position by a compression spring 39 encircling the stem 34.

Within the right-hand end of receptacle 35 is an electromagnet comprising a U-shaped core 40 around one side arm of which is an energizing coil 41 having leads 42 which are connected, as by solder, to the inner ends of terminal-posts 43 sealingly and insulatingly mounted in openings through an end wall of housing 30. The electromagnet is held in place by the receptacle 35 and by a cooperating cupped member 44 which fits within the expanded mouth of the receptacle; the side arms of the core 40 extending freely through openings in member 44 and corresponding openings in the bottom wall of the receptacle.

The ends of the side arms of the core 40 are accurately ground to provide pole faces in a common plane. Cooperable with these pole faces is a disk-shaped armature 45 whose top surface is ground flat to conform intimately with the pole faces. The armature is held continuously in engagement with the pole faces by the force of a leaf spring 46 secured, as by screws 47, to the end wall of housing 30; the spring acting on the armature through the medium of a member 48 having a spherical upper portion 49 freely received in a recess bored centrally in the underside of the armature. The ball member 48 is connected to the closure-rocking arm 31 and lever 20 by an arm 50, to one end of which member 48 is riveted. The arm 50 has at its other end dependent ears 51 overlapping the sides of arm 31; a pin 52 inserted in openings through these parts providing a pivotal connection for arm 50.

As shown in the drawing the device is in unoperated condition. To reset the device, the push-button 33 is manually depressed so that the tip of its stem 34 engages the lever-arm 31 and by continued downward movement effects counterclockwise rocking of the same and lever 20 about pin 19 against the force of spring 27; the closure member 21 thereby being moved away from its seated position to open port 15. Inasmuch as the armature 45 is connected to lever-arm 31 at a point thereon away from its pivot by means of the link formed by arm 50 and member 48, in the resetting movement of the parts the armature is slid to the left on the pole faces of the electromagnet; the size of the armature and the range of movement of the parts being such that the pole faces are always fully engaged by the armature.

If the electromagnet is energized when the parts are in their reset positions, when the push-button is released the other parts remain in those positions due to the attractive force acting between the armature and the electromagnet which prevents sliding of the armature against the force of bias-spring 27. If and when the electromagnet is subsequently deenergized and the attractive force on the armature ceases, the parts return to their biased positions as shown in the drawing. If the electromagnet happens to be in energized condition before and during the resetting operation, manual pressure on the push-button, somewhat greater than when the electromagnet is unenergized, is required to effect

sliding of the armature against the magnetic force.

A typical application of the device is in the safety-control of supply of gaseous fuel to a main burner, for the igniting of which a pilot burner (supplied as by way of fitting 17) is provided. Energization of the electromagnet is then usually effected by a thermoelectric generating device or thermocouple subjected to the flame of the pilot burner. After the pilot burner is lighted sufficient time is permitted to elapse before the device is reset as described above (the armature being slid on the pole faces against the force of the electromagnet) to supply gas to the main burner. While the pilot burner is alight, and the electromagnet consequently energized, the valve is maintained in open condition, but in the event of failure of the pilot-burner flame and resultant cessation of generation of energy by the thermocouple the armature then slides to the left on the pole faces under the force of the bias, permitting the closure to seat.

In a manual-reset burner-control valve of the "100% shut-off" type, such as that disclosed in my Patent No. 2,472,384, the pilot burner is lighted only after the parts have been moved to, and are being held in, reset position so that there is then no magnetic resistance to manual movement of the armature if, in accordance with the present invention, it is arranged to slide on the pole faces instead of move into and out of engagement with them as in the valve structure of that patent.

Inasmuch as the cooperating surfaces of the armature and electromagnet-core are continuously interengaged, there is little possibility of entrance of dirt or other matter therebetween, so that intimacy of engagement of the surfaces is preserved in a degree such that the reluctance of the magnetic circuit is low and the amount of magnetic energy necessary for proper attraction or holding of the armature is correspondingly small.

The specific embodiment of my invention herein shown and described by way of illustration is obviously susceptible of modification without departing from the spirit of the invention, and I intend therefore to be limited only by the scope of the appended claims.

I claim as my invention:

1. In a manual-reset control device: a control member movable between alternate controlling positions and biased to one of said positions, manually operable means for moving said member to the other of said positions, an electromagnet comprising a core having a flat pole face, an armature having a flat surface slidable on said pole face, resilient means acting on said armature and maintaining said armature-surface continuously in intimate engagement with said pole face, and means so interconnecting said control member and said armature that movement of the control member effects sliding movement of said armature-surface on said pole face, the extent of said armature-surface in relation to that of said pole face being such that in the movements of the armature its surface is continuously in engagement with the pole face, the attractive force of the electromagnet being such as to prevent sliding of the armature under the force of said bias so that the control member is retained in its manually-moved position while the electromagnet is energized.

2. In a manual-reset control device: a control member movable between alternate controlling

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positions and biased to one of said positions, manually operable means for moving said member to the other of said positions, an electromagnet comprising a U-shaped core providing at the ends of its side arms a pair of pole faces in a common plane, an armature having a flat surface slidable on said pole faces, resilient means acting on the armature at a point intermediate the side arms of the core and maintaining said armature-surface continuously in intimate engagement with said pole faces, and means so interconnecting said control member and said armature that movement of the control member effects sliding movement of said armature-surface on said pole faces, the extent of said armature-surface in relation to that of said pole faces being such that in the movements of the armature its surface is continuously in engagement with the pole faces, the attractive force of the electromagnet being such as to prevent sliding of the armature under the force of said control-member bias so that the control member is retained in its manually-moved position while the electromagnet is energized, the force of said bias being such as to effect sliding of the armature and return of the control member from its manually-moved position when the electromagnet is subsequently deenergized.

3. In a manual-reset control device: a rockable lever, a control member carried by said lever, manually operable means for rocking said lever to move said member to one of its controlling positions, means biasing said lever to a position

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wherein said member is in an alternate controlling position, an electromagnet comprising a core having a flat pole face, an armature having a flat surface slidable on said pole face, resilient means acting on said armature and maintaining said armature-surface continuously in intimate engagement with said pole face, and means so interconnecting said lever and said armature that rocking of the lever effects sliding movement of said armature-surface on said pole face, the extent of said armature-surface in relation to that of said pole face being such that in the movements of the armature its surface is continuously in engagement with the pole face, the attractive force of the electromagnet being such as to prevent sliding of the armature under the force of said lever-bias so that the lever and the control member are retained in their manually-moved positions while the electromagnet is energized, the force of said bias being such to effect sliding of the armature and return of the lever from its manually-moved position when the electromagnet is unenergized.

WILLIAM A. RAY.

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