

Feb. 18, 1936.

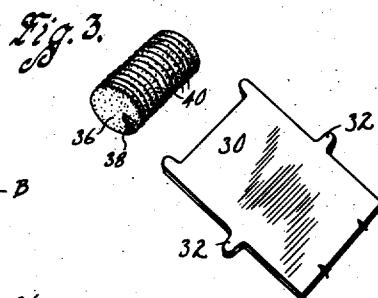
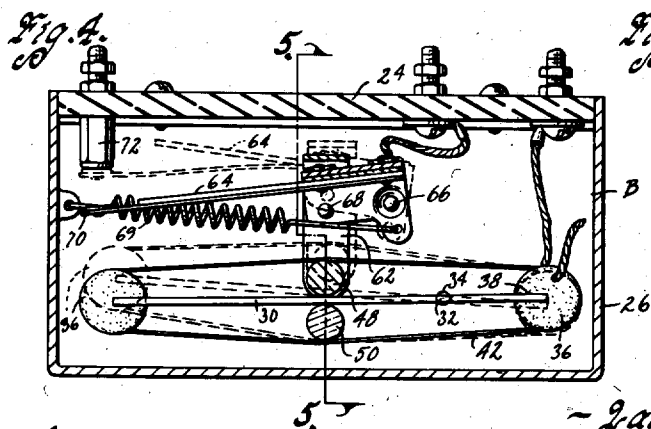
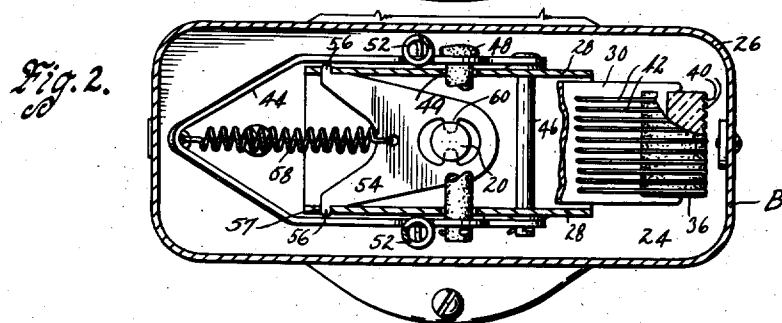
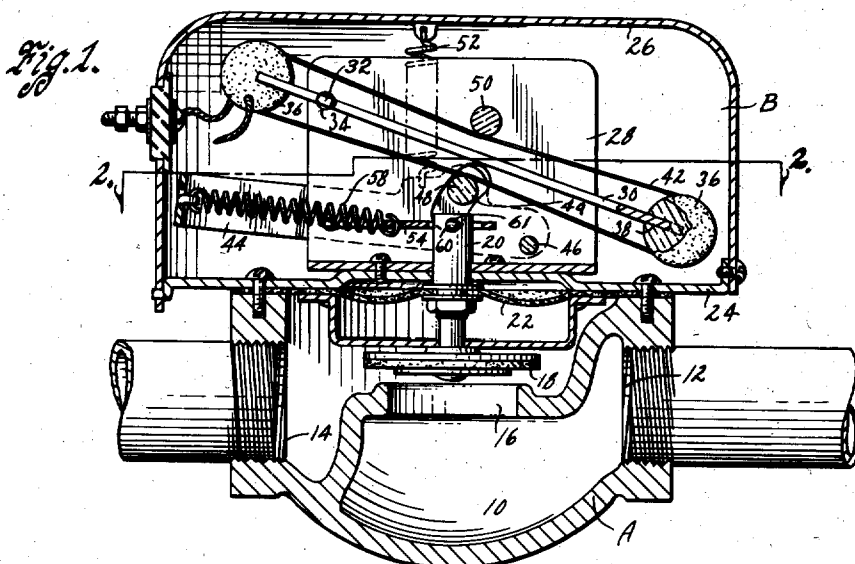
L. M. PERSONS

2,030,932

CONTROL DEVICE

Filed Oct. 17, 1932

2 Sheets-Sheet 1



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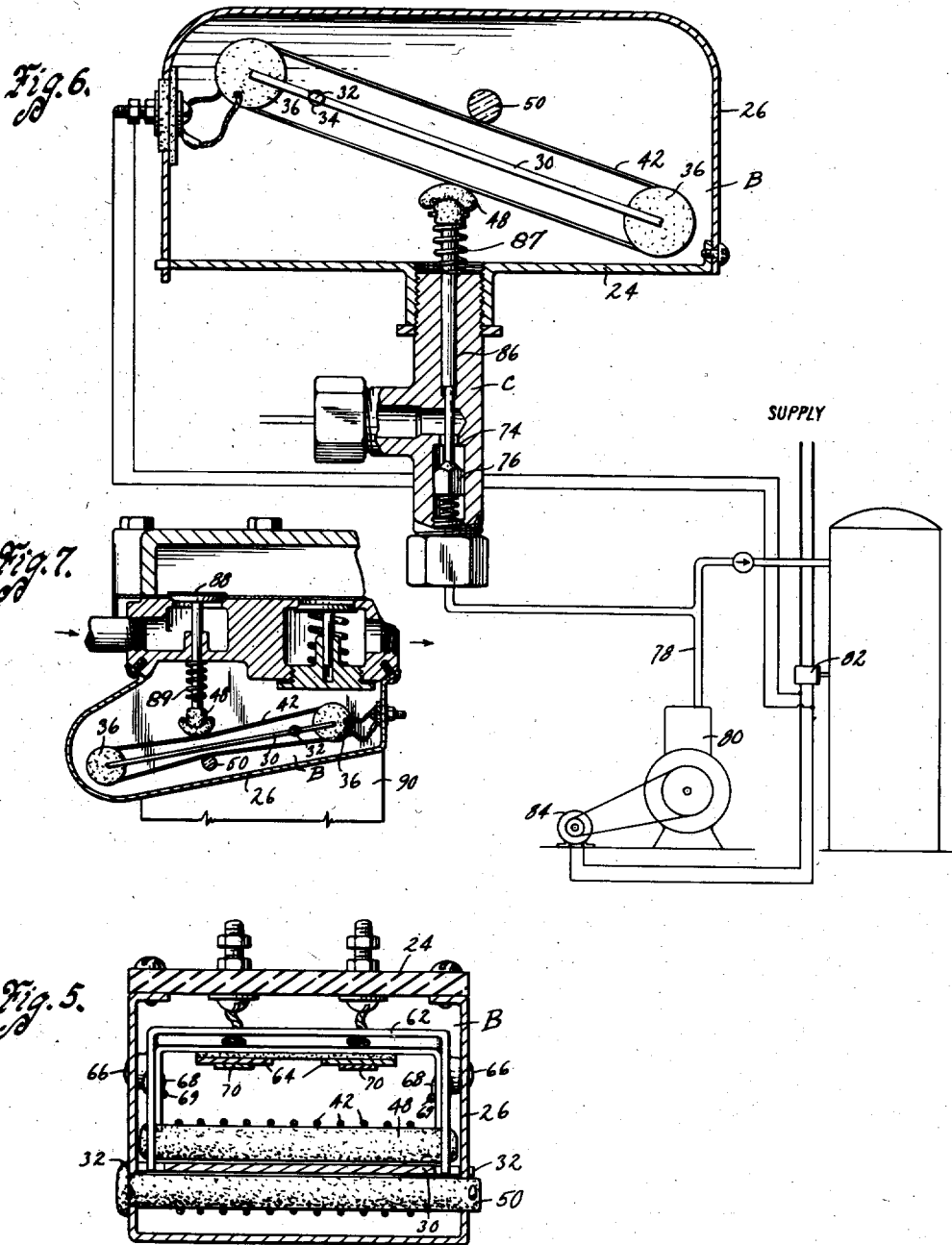
L. M. PERSONS

2,030,932

CONTROL DEVICE

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,030,932

CONTROL DEVICE

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Application October 17, 1932, Serial No. 638,114

3 Claims. (Cl. 60—23)

An object of my invention is to provide a control device which is electroheat responsive and which is simple in construction and readily adapted for a number of different uses or installations.

A further object is to provide a control device for an actuating or control member of movable character, the control device including an electric resistance wire so supported that expansion thereof caused by a current of electricity passing through the wire and consequently heating and expanding it will operate the control member, thus making it electroresponsive.

Still a further object is to provide an electric resistance wire associated with a spring urged control member so that upon energization of the wire, it will heat and expand and permit the spring to urge the control member toward movement in one direction and will, when de-energized, contract so as to move the control member against the action of the spring thereon.

Still a further object is to provide a control device or heat motor which is electroresponsive and which develops considerable power as well as considerable movement in proportion to the actual longitudinal expansion of the resistance wire.

A further object is to provide an actuating device which is electroheat responsive and which can be readily applied to a variety of different devices for controlling them such as gas, air compressor unloader and air compressor intake valves as well as relay switches and the like.

Still a further object is to provide a novel arrangement and construction of parts for my control device.

With these and other objects in view my invention consists in the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

Figure 1 is a vertical sectional view through a gas valve showing my control device associated therewith and including snap acting mechanism interposed between the electroheat responsive actuator and the movable gas valve parts.

Figure 2 is a horizontal sectional view on the line 2—2 of Figure 1.

Figure 3 is a perspective view of two parts of my invention showing them separated from each other to illustrate their manner of assembly.

Figure 4 is a sectional view through a relay switch with my control device connected thereto.

Figure 5 is a sectional view on the line 5—5 of Figure 4.

Figure 6 is a sectional view through my control device showing it designed for an air compressor unloader valve; and

Figure 7 shows it applied to the intake valve of an air compressor and operative to unload the air compressor at the beginning of its operation.

In Figure 1, I have shown a gas valve A and my electroheat responsive control device B associated therewith for automatically operating it, depending on the supply of current to the control device. The valve A comprises a body 10, an intake 12, an outlet 14 and a valve seat 16. A valve member 18 is adapted to seat against the seat 16 and is carried by a control member 20 which is slidably mounted and sealed relative to the valve body 10 by a diaphragm 22.

On the valve body 10, a base plate 24 is supported and a housing 26 is mounted on the base plate for housing my electroheat responsive mechanism.

The mechanism itself includes a support 28 and a supporting bar 30 pivoted thereto by trunnions 32 extending into openings 34 of the support 28.

The ends of the supporting bar 30 are notched, as indicated in Figure 3 and resistance wire supports 36 of cylindrical formation are associated with the ends of the bar 30. The supports 36 are slotted, as indicated at 38, to receive the ends of the bar 30. Since the ends of the bar are notched, lateral movement of the resistance wire supports 36 relative to the bar 30 is obviously prevented.

The resistance wire supports 36 are grooved as indicated at 40 and a resistance wire 42 is coiled around the supports 36, thus having stretches lying on opposite sides of the bar 30 but spaced therefrom. The supports 36 are preferably of heat resisting insulation, to prevent short circuiting the successive turns of the resistance wire 42.

The trunnion mountings at 32—34 allow for the bar 30 and the resistance wire 42 to be floatingly mounted. An actuating arm 44 of yoke-like construction is pivoted at 46. It carries an insulating rod 48 adapted to engage one stretch of the coiled resistance wire 42. The other stretch of the wire is engaged by a stationary insulating rod 50 and the yoke 44 is spring urged in one direction by springs 52. This causes the stretches of the wire 42 to be slightly bowed toward each other, depending on the tightness of the winding and the tension of the springs 52.

A slot 49 is provided in each of the two side plates of the support 28 for the rod 48 to extend through. The slots 49 are curved on a radius from the pin 46.

- 5 If the normal position of the wire 42 is less bowed than shown in Figure 1, it will be obvious that when it is energized by a current of electricity, it will expand and the springs 52 will bow the stretches thereof to the position of Figure 1. Thus energization and de-energization 10 of the wire is transformed into motion of the actuating arm 44.

- The arm 44 may be directly connected with some device which it is desired to control or 15 it may be connected therewith through snap acting mechanism as shown in Figure 1. The snap acting mechanism includes an arm 54 having pivot trunnions 56, oscillatably mounted in perforations 57 of the support 28. The pivot connection is similar to the one at 32-34. A 20 spring 58 is provided for moving the lever 54 to opposite positions. The lever 54 is pivoted by trunnions 60 to the stem 20 of the valve 18 so as to snap it to open or closed position, depending on whether the wire 42 is energized or de-energized.

- The stem 20 is provided with perforations 61 receiving the trunnions 60. The snap action is accomplished by the arm 44 moving the outer 30 end of the spring to a point past a center line through the trunnions 60 and 56 and the connection of the spring to the arm, whereupon the spring acts to complete the movement.

- The particular arrangement of the wire 42 35 whereby it is supported at spaced points—that is, by the members 36 and spans the distance between them, provides for considerable actuating movement when the stretch of the wire is placed under tension by a member which is 40 adapted to move at right angles to the length of the stretch. Even the slightest expansive or contractive movement of the wire will be greatly multiplied for moving the rod 48 and by providing a plurality of coils for the wire 42, considerable power may be exerted.

- As shown in Figure 4, the heat motor can be used for other purposes, a relay switch being shown. Some of the parts in this figure bear the same reference numerals as the parts in Figures 1, 2, and 3. Additional parts are shown as 50 will now be described.

- The movable rod 48 is carried by a yoke 62 and a switch arm 64 is pivoted at 66. A pivot connection 68 is provided between the yoke 62 55 and the switch arm 64 for moving the switch arm in proportion to the movement of the rod 48. The switch arm is constrained to move in one direction by a spring 69 and carries a contact 70 for engagement with a stationary contact 72.

- A construction as shown in Figure 4 is adapted for relay work, the resistance wire 42 when energized and thereby expanded, permitting the relay switch arm 64 and its contact 70 65 to be moved to the dotted line position by the spring 69. When the wire is deenergized, it contracts and opens the contacts against the tension of the spring. Figure 4 illustrates how expansion of the wire 42 can permit the movable bar 48 to recede from the stationary bar 50 instead of advance toward it.

- I find that a heat motor of the character disclosed is quite efficient as an operating device for an air compressor unloader valve. In Figure 6, 75 an unloader valve C is shown having a valve

seat 74 and a valve member 76 for coaction therewith. The valve is connected in an outlet pipe 78 of an air compressor 80 and is normally held open, as shown in Figure 6, when the compressor is at rest. When the compressor commences to 5 operate, however, current is supplied to the resistance wire 42, this current being controlled by a switch 82 which also controls a motor 84 for the air compressor 80.

Thus whenever the compressor starts, the wire 10 42 is energized.

Energization of the wire 42 causes it to expand and a valve stem 86 will travel upwardly urged by a spring 87 as the expanding wire permits it. The upwardly traveling stem 86 will 15 permit the valve member 76 to move to closed position against the seat 74, the valve member being spring loaded to accomplish this.

With an air compressor valve operated by an electroheat responsive device, as disclosed in 20 Figure 6, an air compressor unloader tank can be eliminated inasmuch as the valve 76 closes slowly so that the air compressor can get up to speed before the valve is completely closed. The valve C thus unloads the compressor during the 25 initial period while it is getting up to speed, and is thereafter closed so that air pumped by the compressor 80 goes into the storage tank instead of to atmosphere through the valve C.

In Figure 7, I have shown how my heat motor 30 can be applied to the intake valve 88 of an air compressor 90. The intake valve is normally closed by a spring 89. The resistance wire 42, when energized from the switch which controls the air compressor, will permit normal action of 35 the intake valve 88. When the air compressor stops, however, because of de-energizing its motor, the resistance wire 42 will also be de-energized, causing it to contract and force the valve 88 away from its seat.

The valve 88 will then be in open position when 40 the air compressor starts and due to slow heating up of the wire 42, it will not be permitted to close until after the air compressor has worked up to full speed or at least nearly so. This permits 45 pulsation of the air through the intake valve, without pumping action, while speed is being attained, as the pumping action can occur only after the valve 88 is permitted by the wire 42 to close so that it can function.

It will be seen that my electroheat responsive device can be used in a number of ways. Although I have shown one form in which it may be constructed, considerable change can be made 55 in the details of construction without departing from the real spirit and purpose of my invention and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents, which may be reasonably included within their scope.

I claim as my invention:

1. In an actuating device of the class described, a support, a control member movable relative thereto, means constraining said control member toward movement in one direction, a supporting bar pivoted to said support and having 65 ends of insulating material, an electric resistance wire coiled around said ends and spanning the distance therebetween on each side of said supporting bar, said control member engaging the 70 stretches of said wire on one side of said supporting bar and being retained in engagement therewith by said means constraining it toward movement in a direction toward the supporting bar and a stationary abutment engaging the out- 75

side of the stretches of said wire on the other side of said supporting bar.

2. An actuating device comprising an abutment, a movable control member, means constraining said movable control member to move with respect to said abutment and electroresponsive means comprising a supporting bar pivotally mounted, insulating elements having slots receiving the ends thereof and a resistance wire wound around said insulating elements and the stretches of said resistance wire intermediate said insulating elements engaging said abutment and said control member respectively.

3. An actuating device comprising an abut-

ment, a movable control member, means constraining said movable control member to move in one direction with respect to said abutment and electro-responsive means comprising a supporting bar, insulating elements carried by the ends of said supporting bar, a resistance wire wound around said insulating elements, the stretches of said resistance wire intermediate said insulating elements engaging said abutment and said control member respectively, said supporting bar being pivotally mounted intermediate said abutment and one of said insulating elements.

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