

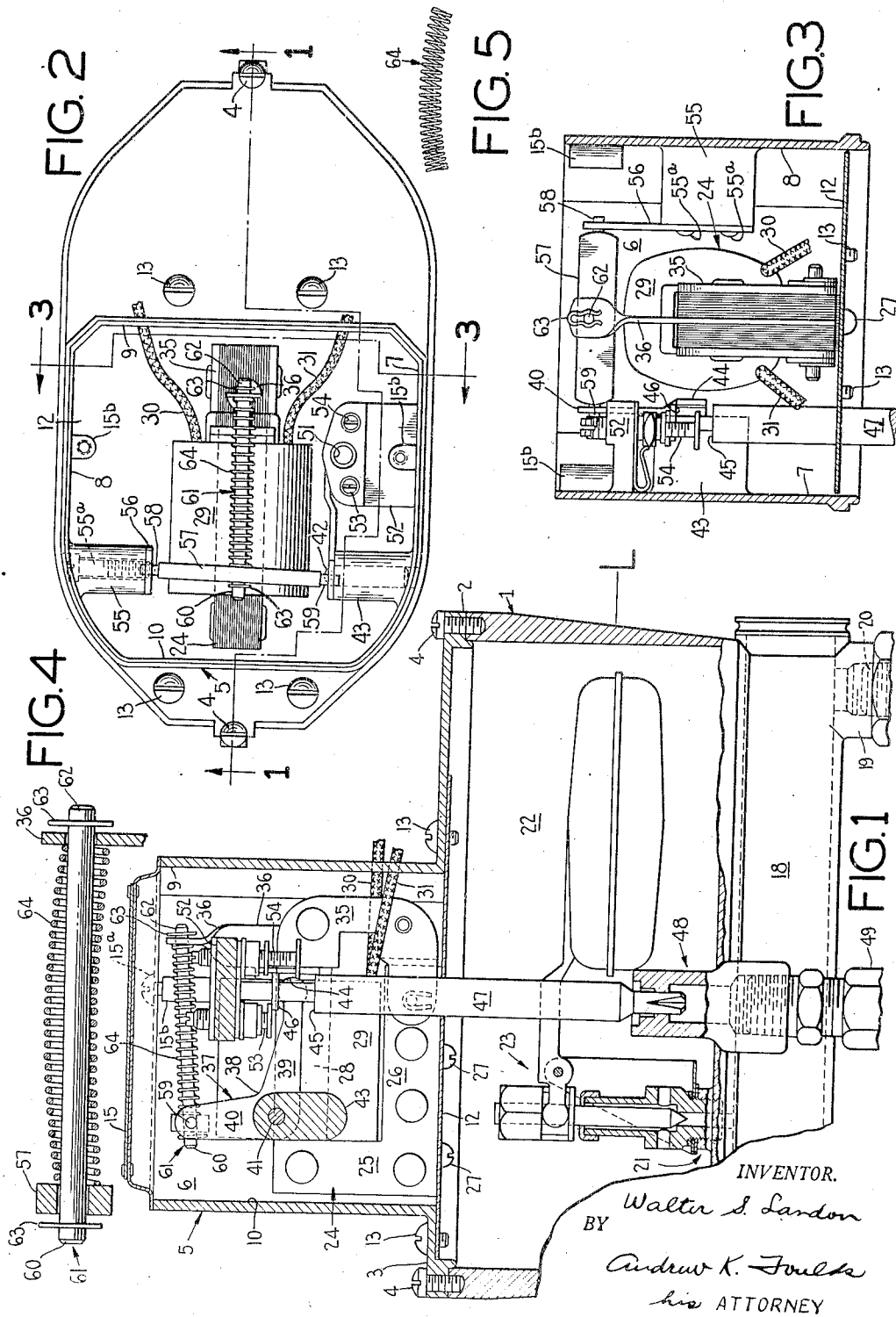
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CONTROL MEANS

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CONTROL MEANS

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7 Claims. (Cl. 74-470)

My invention relates generally to means for controlling the operation of a valve or other actuated device.

One object of the invention is to provide means for transmitting motion between interrelated members.

Another object is to provide means for reducing vibration.

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, I have fully and clearly illustrated my invention, in which drawing—

Figure 1 is a view in vertical section on the line 1—1 of Fig. 2 and showing a control device embodying my invention;

Fig. 2 is a top plan view of the control device with the top cover removed;

Fig. 3 is a view along the line 3—3 of Fig. 2, looking in the direction of the arrows;

Fig. 4 is an enlarged detail view in section of a thrust spring and its cooperating parts, and

Fig. 5 is a side view of the bowed thrust spring in an inert position apart from the rest of the device.

Referring to the drawing by characters of reference the numeral 1 represents a chambered casing having an open top wall 2 over which a cover member 3 is secured, as by means of screws 4. The cover member 3 has a tubular, upwardly extending portion 5 which forms a chamber 6 having side walls 7, 8 and end walls 9, 10. The bottom wall of the chamber 6 is formed by a plate 12 held, as with screws 13, to the member 3. The upper wall of the chamber 6 is formed by a cover member 15 secured by screws 15^a threaded into a pair of bosses 15^b projecting inwardly into chamber 6 from the walls 7, 8. Secured to the bottom wall of casing 1 is a strainer chamber 18 having an inlet means 19 connected by means of a conduit member 20 to a suitable source of liquid fuel supply (not shown). The chamber 18 has an outlet 21 leading to a constant level chamber 22 within the casing 1, and the flow of fluid through the outlet 21 into chamber 22 is controlled by means of a float valve 23 which maintains a predetermined constant liquid level within chamber 22, along the line L—L.

A U-shaped electric magnetic means 24 is located within chamber 6 and comprises a laminated core 25 having one leg 26 secured by means

of screws 27 to the plate 12. The other leg 28 of the core 25 is spaced above leg 26 and carries an electrical coil 29 which surrounds and is concentric therewith. Lead wires 30, 31 connect the coil 29 to a current controlling switch, not shown. The coil 29 is operable to induce a magnetic flux in the core 25 so that a laminated armature 35 having one end hinged at the open end of the leg 26 is operable upon energization of the coil 29 to pivot so that the other end of the armature 35 will be urged into engagement with the open end of the leg 28 to close the magnetic circuit between the open ends of the legs 26, 28. The armature 35 has a portion 36 which extends upwardly toward the top wall portion of the cover member 15.

A bell crank lever 37 is pivoted at the intersection 38 of its horizontal arm 39 and its vertical arm 40 by a pin 41 which is received within an aperture through and secured to the lever 37, as by peening 42. The pin 41 is journaled in a boss 43 projecting inwardly into the chamber 6 from the side wall 7, intermediate the end wall 10 and armature 35. The leg or arm 39 of the bell crank lever 37 has its end portion rounded, as at 44, and received between shoulders 45, 46 of a valve member 47. The valve member 47 is located intermediate the boss 43 and end wall 9 and extends vertically downward through an aperture in the plate 12 into the chamber 22. The lower end of the valve member 47 cooperates with an outlet means 48 of the chamber 22 to control flow of fluid from the chamber 22 by reason of its vertical spacing relative to the outlet means 48. The outlet means 48 is connected by a conduit means 49 to supply oil or liquid to a liquid fuel burner, not shown. The upper end of the valve member 47 is guided for reciprocal movement within an aperture 51 in an internal boss 52 projecting inwardly into chamber 6 from the side wall 7. A pair of stop members 53, 54 are adjustably held in the boss 52 and cooperate with the valve member 47 to limit upward and downward movement respectively thereof relative to the outlet means 48 and thereby limit the maximum and minimum flow respectively of fluid from the chamber 22.

Projecting from the wall 8 and extending inwardly therefrom into chamber 6 is a boss 55 having rigidly secured thereto, as by screws 55^a, an upwardly extending carrying member 56 which extends substantially parallel to the arm 40 of the bell crank lever 37. A horizontally extending lever member 57 has one end 58 fulcrumed within an aperture in the carrying mem-

ber 56 and has the other end 59 loosely received within an aperture in the arm 40. The lever member 57 has an aperture midway between its ends 53, 59 which receives one end 60 of a rod member 61. The other end 62 of the rod member 61 is received within an aperture in the upwardly extending portion 36 of the armature 35. Clips 63 which are secured in spaced positions by a convenient method on the rod member 61, such as being in grooves, limit separating movement between the lever member 57 and extended portion 36, which are urged in a separating direction by a helical coil, thrust spring 64 surrounding and longitudinal of the member 62 and having its opposite ends abutting the member 57 and portion 36. The spring 64 transmits the thrust of the armature extended portion 36 to the lever member 57 and exerts sufficient opposing or separating force between the lever member 57 and portion 36 so that upon movement of the armature 35 by the coil 29, toward the lever member 57, the bell crank lever 37 will be pivoted upon its pin 41 and the valve member 47 will be moved into engagement with its stop member 53. The force opposing movement of the bell crank lever 37, upon engagement of valve member 47 with its stop member 53, is now greater than the force exerted by the spring 64, and further movement of the armature 35 into abutting relation with leg 28 is accomplished by compressing the spring 64 which provides lost-motion between the magnetic means 24 and the valve 47 so that the armature 35 will abut the magnet leg 28. The spring 64 is given a permanent set, see Fig. 5, so that when off the rod 61 and inert, it is bowed or curved longitudinally, preferably having its longitudinal axis in the form of an arc. The lateral deflection or bowing of the spring is sufficient so that when placed on or sleeved over the rod 61, as in Fig. 4, the spring is tensioned laterally of the rod axis engaging the rod on one side at spaced points and engaging the rod on the other side at an intermediate point. The spring is therefore held in frictional engagement with the rod and opposes movement of the rod through its bore so that when placed in position on the rod member 61, the spring acts as an anti-rattling means. The rod member 61, when the valve is in open position, would, if not for the spring 64, merely lie loosely in the aperture through the member 57 and portion 36 and any vibration which might be caused by the magnetic means 24 would rattle the rod member 61 to cause an objectional noise. The spring 64 due to its tendency to assume the shape of an arc, frictionally engages the rod member 61 and as the spring 64 itself is held between the member 57 and portion 36, effectively holds the rod member 61 against vibration. Another feature of this construction is the increased tendency of the spring 64 to prevent vibration, because of the increase in the frictional force due to the compression of spring 64, at the time that the tendency of the rod member 61 to vibrate is greatest, or when the magnetic means 24 is urging the valve 47 in a valve opening direction. The end 58 of the lever member 57 is held in fixed position by the carrying member 56, and the end 59 moves the bell crank lever 37 with a force equal to one-half that exerted by the magnetic means 24 but through a distance equal to twice that of the movement of the point of intersection of the rod member 61 and the lever member 57.

In operation my device works as follows: The

magnetic coil 29 is shown as energized and holding the armature 35 against the leg 28. The valve member 47 will accordingly be against its stop member 53 in maximum open position and the oil will be flowing through the conduit 49 from the chamber 22. When the circuit through lead wires 30, 31 is broken, the armature 35 will rotate counterclockwise, as seen in Fig. 1, allowing the bell crank lever 37 to rotate clockwise and the valve member 47 to move vertically downward to engage its minimum stop 54. The valve member 47 when against its stop member 54 is preferably set to deliver a minimum flow of fuel to the burner so that proper combustion therein with air being supplied by natural convection will occur and the burner will stay ignited. When it is desired to increase the flow from chamber 22 and the heat output of the burner, the circuit through lead wires 30, 31 is closed to energize the coil 29. Accordingly, the armature 35 will be drawn toward the leg 28 and the valve member 47 will be lifted by the bell crank lever 37 against its upper stop member 53 to increase the flow of fuel to the burner. The valve member 47 preferably engages its stop member 53 before the armature 35 engages the leg 28 and thereby is prevented from further movement in an open direction. The bell crank lever member 37 is prevented from further counterclockwise rotation and the spring 64 compresses under the closing force of the magnetic means 24 and operates as a lost-motion means to allow the armature 35 to engage the magnet leg 28. Engagement of the armature 35 and leg 28 is necessary to prevent the armature from vibrating under the influence of the coil 29 and causing a humming noise.

This application is a division of my copending application Serial No. 218,720, filed July 11, 1938, for Heating systems and control means therefor, and which matured into Patent No. 2,259,645 dated October 21, 1941.

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

1. In a device of the character described, operated means movable between predetermined limits, stop means limiting movement of said operated means in one direction prior to movement to one of said predetermined limits, a bell crank lever engaging said operated means for movement thereof, a lever member fulcrumed at one end and received by said bell crank lever at the opposite end, said lever member having an aperture therethrough, an operating member having an aperture therethrough in substantial alignment with said lever member aperture, a rod member having one end portion loosely received in one of said apertures and the other end portion in the other of said apertures, means limiting relative movement of said lever member and said operating member in a separating direction, and resilient means urging said lever member and said operating member in said separating direction and providing lost-motion so that said operating member can continue movement toward said lever member after said operated means has engaged said stop means.

2. In a device of the character described, an operated means having an aperture therethrough, an operating means having an aperture therethrough aligned with said first-named aperture, rod means having its opposite ends carried within said apertures, and a helical coil spring having the longitudinal axis thereof bowed when in a free position, said spring surrounding said rod

means and having one end in engagement with said operated means and the other end in engagement with said operating means, said spring being operable to hold said rod means against vibration in said apertures.

3. In a device of the character described, an operated means having an aperture, an operating means having an aperture aligned with said first-named aperture, rod means having portions carried within said apertures, and means carried by said rod means and operable to hold said rod means against vibration within said apertures with increasing force upon operation of said operated means by said operating means.

4. In an actuating means, an operating member, an actuated means, a rod member movable by said operating member and having lost-motion connection with said actuated means on movement in one direction, means to transmit movement of said rod member to said actuated means on movement of said rod member in the opposite direction, and resilient means carried by said rod member and operable to transmit the movement of said operating member to said actuated means upon movement of said rod member in said one direction, said resilient means being laterally tensioned against said rod member to oppose vibration of said rod member by said operating member.

5. In a device of the character described, a member having an aperture, a second member, a rod operable to transmit movement from one to the other of and extending between said members and having a portion loosely carried in said

aperture, and a motion-transmitting helical coil spring having spaced coil turns surrounding said rod and having its ends abutting and urging said members apart, said spring being operable to transmit movement from one to the other of said members and having a portion intermediate its ends laterally engageable with said rod, said spring portion being stressed laterally against said rod by compression between said members thereby to reduce vibration of said rod.

6. In a device of the character described, a member having an aperture, a second member, a rod extending between said members and having a portion loosely carried in said aperture, and a helical coil spring having its longitudinal axis bowed when in a free position, said spring surrounding and having a portion intermediate its ends laterally engageable with said rod, said spring portion being stressed laterally against said rod by compression between said members thereby to reduce vibration of said rod.

7. In a device of the character described, a member having an aperture, a second member having an aperture, a rod having portions loosely carried in said apertures, means cooperable with said rod to limit separation of said members, and a helical coil spring having its longitudinal axis bowed when in a free position, said spring surrounding and having a portion intermediate its ends laterally engageable with said rod, said spring portion being stressed laterally against said rod by compression between said members thereby to reduce vibration of said rod.

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