

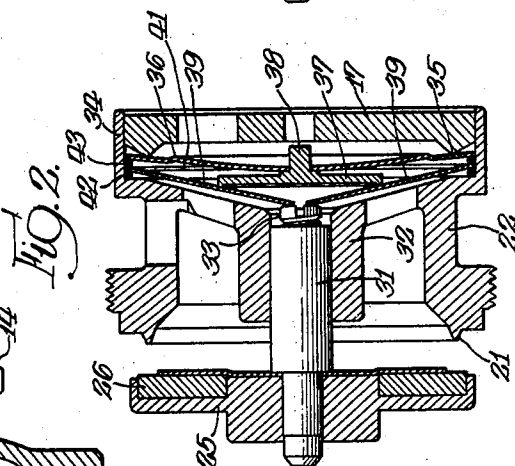
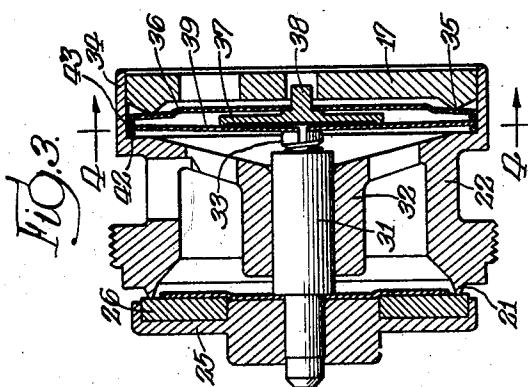
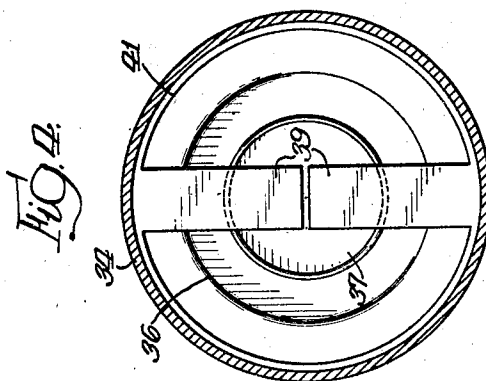
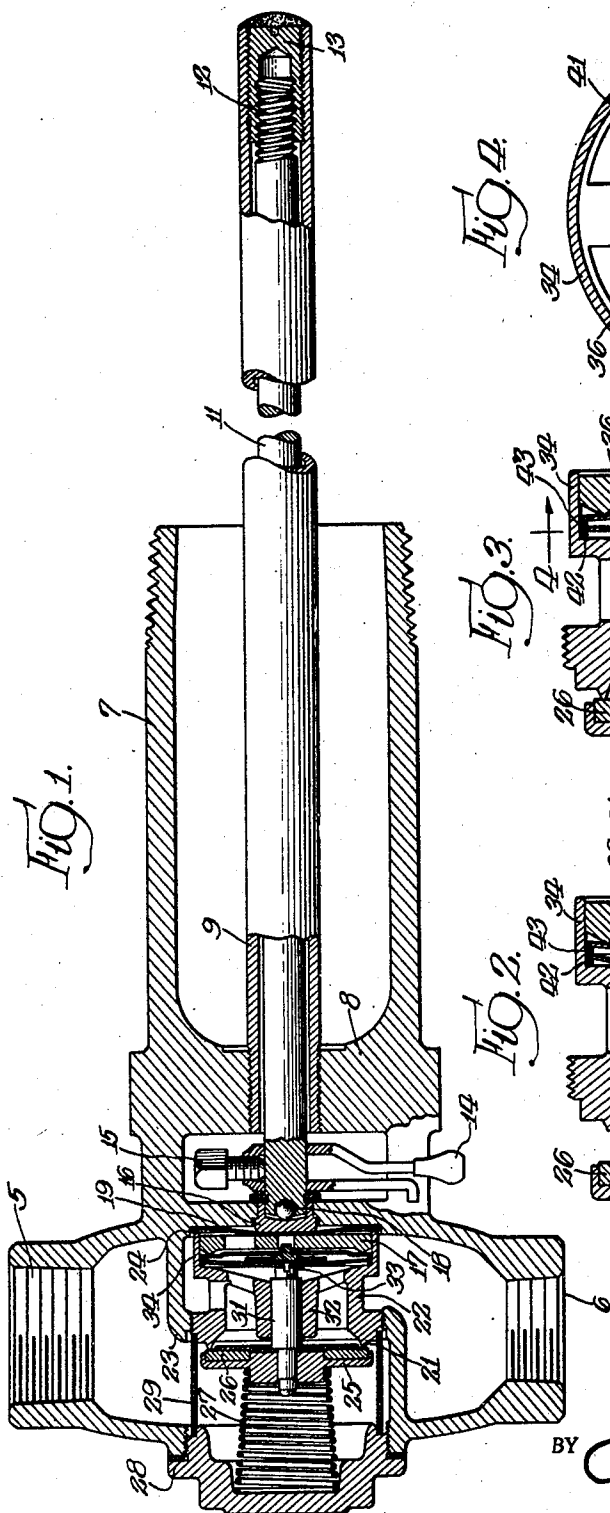
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2,236,908

MOVEMENT AMPLIFYING SNAP ACTION THERMOSTAT

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MOVEMENT AMPLIFYING SNAP ACTION
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6 Claims. (Cl. 236—48)

This invention relates to thermostats of the snap action type, and while the principles thereof may be utilized in thermostats adapted for various uses, the invention is here shown for illustrative purposes as embodied in a water heater control thermostat designed to shut off and turn on the fuel to the heater burners in response to variations in the temperature of the heated water in the storage tank.

In snap action thermostats of this general type, such as exemplified in Grayson Patent No. 1,744,465, for instance, a motion amplifying lever device has been employed between the thermostatic element and the clicker disk to expedite the snap over action of the disk. The extent of movement imparted to the control valve or other operated element, however, was equal only to the extent of movement of the center of the clicker disk when it reversed from one position to the other. A greater range of movement of the valve is very desirable in devices of this character.

One of the primary purposes of my present invention is to amplify the actual movement of the clicker disk in the transmission of such movement from the disk to the valve or other operable member so that the movement of the valve will be greater than the movement of the disk, thereby lifting the valve a greater distance away from its seat so as to permit an increased volume of fuel to pass the valve.

Another object of the invention is to insure a quick opening and a quick closing of the valve and to enable accurate operation of the valve against higher fuel pressures than have heretofore been considered good practice.

Another feature of the invention resides in the construction which increases the sensitivity of the thermostat so that the valve will open and close within a shorter range of temperature variations than has heretofore been possible of attainment.

Another advantage of the invention resides in the fact that the inevitable lost motion in devices of this character is materially reduced even though the individual parts be made with less detailed accuracy than heretofore required.

Another advantage is that with my present construction, graduation or creeping of the valve at the point or time of closure is largely eliminated so that the dangers of flashbacks, resulting from partial closure of the valve, are obviated.

Other purposes and advantages of my invention should be readily appreciated as the same becomes better understood by reference to the following description when considered in connection with the accompanying drawing.

Referring to the drawing:

Fig. 1 is a longitudinal sectional view through a thermostat embodying my invention;

Fig. 2 is an enlarged fragmentary view showing the position of the parts when the valve is in open position;

Fig. 3 is a similar view showing the valve in closed position; and

Fig. 4 is a sectional view on the line 4—4 of Fig. 3.

Referring to the drawing more in detail, it will be observed that the valve casing or body is formed in one piece to provide the fuel inlet 5, the fuel outlet 6, and the cylindrical extension 7 adapted to be threaded into a tapped opening in the wall of a heater tank or the like. The bridge 8 of the cylindrical extension is tapped to receive the expansible tube 9 of the thermostatic element, the other member of which is formed by a rod 11 of Invar or other materials having a low coefficient of expansion which is adjustably threaded at 12 into the plug 13 closing the end of the tube. This thermostatic element consisting of the expansible and the non-expansible members is of a well-known type. For adjustment purposes the rod 11 is equipped with an adjusting lever 14 secured to the rod by a set screw 15 so that swinging movement of the lever will thread the outer end 12 into or retract it from the closure plug 13. The thrust of the rod 11 is exerted through a cap 16 against a pusher 17. A ball 18 interposed between the rod and the cap permits self-centering of the cap and reduces friction. A diaphragm 19 interposed between the cap and the pusher seals the casing against escape of the gaseous fuel around the cap.

The fuel valve seat 21 is formed on the end of a cage 22 which when threaded into a tapped opening in the partition wall 23 seats at its inner end against a seal ring 24.

A valve 25 equipped with a seating face 26 of suitable material is urged into closed position against the seat 21 by an expansion spring 27 interposed between the valve and a closure cap 28. A cylindrical screen 29 may be positioned between the cap and the cage. The stem 31 of the valve disk extends through a guide 32 centrally of the cage, and its inner end is equipped with an adjustable screw 33 by which the effective length of the stem may be regulated.

The pusher 17 is guided in the cylindrical skirt 34 of the cage 22, and the annular shoulder 35 spaced marginally inward from the perimeter of the pusher is adapted to engage and actuate the clicker disk 36 from the normal position shown in Fig. 3 to the reverse position illustrated in Fig. 2.

The parts thus far described may be of usual construction, and in commercial thermostats heretofore employed, the outer or left hand face,

viewing Figs. 2 and 3 of the drawing, of the clicker disk has directly contacted the valve stem, and, consequently, travel of the stem would be equal to the distance traveled by the center of the clicker disk in its movement from one extreme position to the other. The initial movement, however, of the clicker disk from the normal position of Fig. 3 toward the reverse position of Fig. 2 before the snap action of the disk occurred would cause a slight lift of the fuel valve from its seat prior to the full opening by the snap action. This slight lift permitted the passage past the valve of a small amount of fuel which would produce a lean mixture conducive to undesirable flashbacks.

As previously stated, my present invention aims to obviate such flashbacks by amplifying the movement of the clicker disk center in the transmission of said movement to the valve disk, thereby insuring a quick opening action of the valve without initial creeping. With this end in view, I have interposed between the clicker disk and the adjustable valve stem head 33 motion amplifying mechanism comprising an annular disk 37 constituting a thrust member having a central stud 38 seated in an opening located at the center of the clicker disk and a pair of levers 39 disposed between the disk 37 and the head 33. The levers 39 of resilient sheet metal are formed integrally with a ring 41 adapted to loosely fit within the skirt 34 of the cage 22. A substantial fulcrum is afforded for the outer ends of the levers 39 by a fulcrum ring 42, preferably of wire of suitable size interposed between the levers and the base of the skirt 34, and a similar fulcrum for the peripheral margin of the clicker disk 36 is afforded by a wire fulcrum ring 43 interposed between the clicker disk and the lever ring 41.

Pressure exerted to the left viewing the drawing upon the pusher 17 as the result of contraction of the thermostatic tubular element 9 will cause the clicker disk to reverse its convexity from that shown in Fig. 3 to that shown in Fig. 2 carrying with it the thrust member 37. The annular rib at the perimeter of this disk engaging the levers 39 intermediate their ends will move these levers into the position shown in Fig. 2, thereby quickly and fully lifting the valve 25 from its seat. It will be manifest that by reason of the leverage afforded by the levers 39 and the disk 37, the free or inner ends of levers 39 will move a distance considerably in excess of the movement of the center of the clicker disk. The clicker disk movement is accordingly amplified, the movement of the fuel valve is increased, and the sensitivity of the thermostat is improved without the necessity of increased accuracy in the production of the parts.

The fulcrum rings 42 and 43 provide non-yielding and substantial fulcrums for the amplifying levers and for the clicker disk, and being of cylindrical shape permit a rolling action of the levers and of the clicker disk in their flexing movements which is conducive to smoothness of operation and to a minimization of friction between the parts.

While I have shown and described that preferred embodiment of my invention whereby amplification of valve movement induced by a clicker disk is obtained, it should be manifest that the structural details exemplified are capable of considerable modification and variation

within the scope of the invention as defined in the appended claims.

I claim:

1. In a thermostatic device, the combination of a pair of annular fulcrum rings, a plurality of levers fulcrumed between said rings, a clicker disk fulcrumed at its peripheral margin against one of said rings, a thrust member engaging the central portion of the disk and the levers intermediate their ends, means for actuating the disk, and a member operable by said levers.

2. In a thermostatic device, the combination of a cage having an annular skirt provided with an internal annular shoulder, a fulcrum ring engaging said shoulder, a plurality of radially disposed levers fulcrumed at their outer ends against said fulcrum ring, a second fulcrum ring engaging the outer ends of said levers, a clicker disk fulcrumed at its peripheral margin against said second fulcrum ring, a thrust member interposed between said levers and said clicker disk, means for actuating the clicker disk, and a member positioned to be operated by said levers.

3. In a thermostatic device, the combination of a clicker disk, thermostatic means for actuating said disk, a thrust member carried centrally of the disk and movable therewith, lever mechanism fulcrumed near the perimeter of the disk with the movement delivery portion thereof disposed centrally of the disk, said thrust member being engageable at its perimeter with said mechanism to cause the same to amplify the movement transmitted by the disk, and a valve or the like positioned coaxially with said disk and operable by said lever mechanism.

4. In a thermostatic device, the combination of a clicker disk, means for actuating said disk, a plurality of levers fulcrumed in proximity to the periphery of the clicker disk and extending toward the center thereof, a valve member or the like positioned to be actuated by said levers, and a thrust member positioned centrally of the disk between the disk and said levers for transmitting the movement of the center of the disk directly to the levers intermediate their ends whereby said movement is amplified and transmitted to said valve member.

5. In a thermostatic device, the combination of a clicker disk, means for actuating the same, a disk-shaped thrust member, a lever mechanism, and an element to be operated, all concentrically arranged in cooperative relation, said thrust member being interposed between said disk and said lever mechanism and movable bodily and equally with the center of the clicker disk, said lever mechanism being operable by said thrust member to amplify and transmit to the element to be operated the movement imparted to the thrust member by said clicker disk.

6. A mechanism for transmitting movement from a thermostat to a member to be operated, comprising, a clicker disk, means for actuating the clicker disk from the thermostat, a plurality of levers in proximity to and substantially parallel with said disk when in normal position, and a thrust member of smaller radial dimensions than the disk interposed between said disk and said levers centrally of the disk and movable therewith, said member engaging said levers at an intermediate point on the levers and radially spaced from the center of said disk, whereby said levers are caused to amplify and transmit to the member to be operated the movement received through said thrust member from said disk.

WILBUR JACKSON.