Jan. 26, 1937. R. H. BEMAN 2,069,002

THERMOSTATIC CONTROL MECHANISM

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Fig. 1.

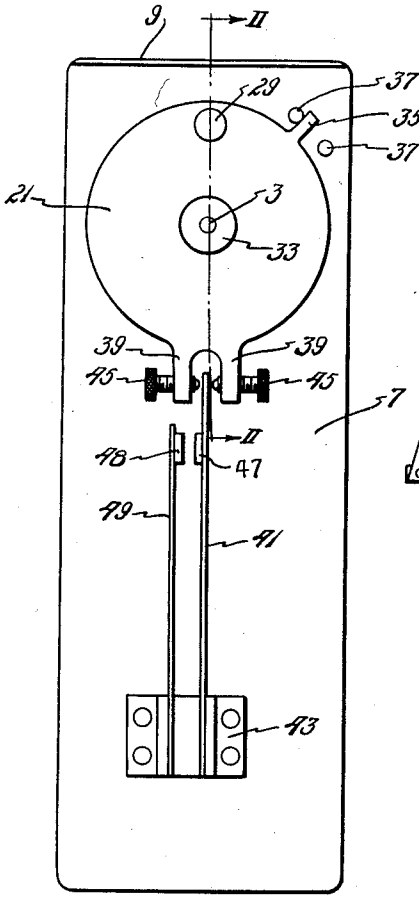
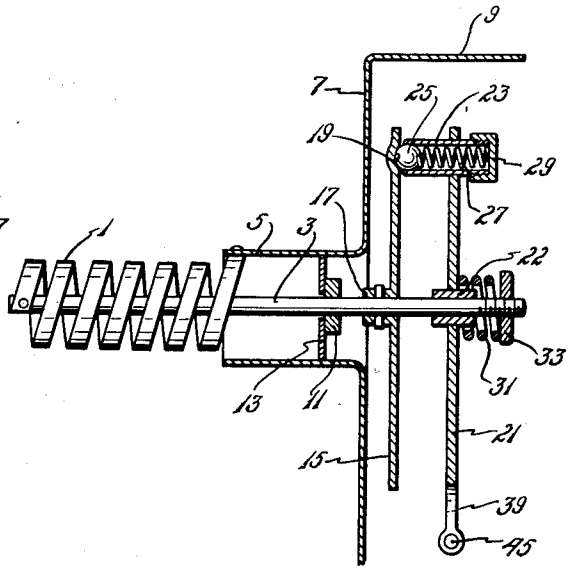



Fig. 2.




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## THERMOSTATIC CONTROL MECHANISM

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5 Claims. (Cl. 200—138)

My invention pertains to thermostatic control mechanisms and more particularly to driving mechanisms for actuating controllers or regulators by thermostatic devices.

It is an object of my invention to provide a thermostatic device for driving a two position controller or regulator to either one of two extreme positions in response to the initial actuation of a thermostat in either direction comprising a rotatable shaft having an indented disc rigidly secured thereon, a second disc journalled freely thereon, a spring for urging the second disc toward the first disc, a ballway in the second disc, a spring for biasing the ball to resiliently engage the indentations in the first disc and means for operatively associating the freely journalled disc with the controller to be actuated.

It is a further object of my invention to provide a thermostatic control driving mechanism for yieldingly actuating a two position control or a regulating element comprising an indented plate or disc rigidly secured upon a thermal responsive member and disposed in parallel spaced relation to a plate carrying a resilient member for operatively engaging the indentations in the first plate.

The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment, when read in conjunction with the accompanying drawing, in which:—

Fig. 1 is an elevational view of my thermostatic control mechanism; and

Fig. 2 is a sectional view on lines II—II thereof.

Referring more particularly to the drawing my thermostatic control device comprises a bimetallic temperature responsive element 1 of elongated spiral formation having one end secured to the end of a shaft 3 extending axially therethrough. The other end of the bimetallic spiral 1 is rigidly secured to and supported from a tubular housing 5 through which the shaft extends. The opposite end of the tubular housing 5 is secured, as by welding, in an aperture provided in a suitable instrument supporting panel 7 which may be of sheet metal having an upturned flange 9 for receiving a suitable cover (not shown).

The shaft 3 which is rotated by the thermal element 1, is rotatably supported in suitable bearing means 11 supported in the tubular housing 5 on a disc like partition 13 and has an extended portion passing entirely through the tubular housing beyond the instrument panel 7 for actuating the controlling or regulating elements which are to be operated thereby. Upon the extended end of the shaft a plate like member or disc 15 is mounted having a hollow hub 17 rigidly secured for rotation therewith, and is provided with depressions or indentations 19, as shown in Fig. 2. Adjacent the free end of the shaft a second disc like member 21 is journalled for free rotation thereon in parallel spaced relation to the indented disc 15. The disc 21 is preferably supported on a tubular hub 22 slidably disposed on the shaft 3 whereby the disc 21 is supported in parallel relation to the disc 15.

For driving the freely journalled disc 21 in accordance with the rotation of the indented disc 15 the free disc 21 is provided with a biased element which resiliently engages the indentations 19 in the other disc. As shown the resilient engaging means comprises a ballway 23 extending through the free disc 21 having a ball 25 slidably disposed therein and a spiral spring 27 in the ballway for biasing the ball toward the indented disc. The spiral spring 27 in the ballway 23 reacts between the ball 25 at one end of the tubular guide 23 and an adjustable stop 29 threadably provided on the opposite end of the guide whereby the biasing pressure of the spring may be adjusted as desired.

A spiral compression spring 31 is concentrically disposed on the end of the rotatable shaft 3 to react between the freely journalled disc 21 and an adjustable stop member 33 threadably supported on the extreme end of the shaft for continuously urging the free disc 21 toward the indented driving disc 15. The free disc 21 is provided with a laterally projecting arm 35 which extends between a pair of spaced stop pins 37 projecting from the panel board 7 whereby its rotatable movement in either direction is limited to either one of the two extreme positions.

To utilize the initial movement of the driven shaft 3 in either direction for accomplishing a desired control or regulation a pair of spaced arms 39 are provided projecting radially from the periphery of the free disc 21 for engaging a control member to be actuated thereby. If the control is to be accomplished electrically the control or regulating means 41 may comprise a flexible contact supporting arm having one end rigidly secured by a bracket 43 projecting from the panel 7, and its other end extending between the spaced arms 39 projecting from the disc 21, as shown. The threadably adjustable stop screws 45 are preferably provided for engaging opposite sides of the adjacent end of the control means 41. By turning the adjustable stop screws 45 the degree

of predetermined slack movement permitted between the disc 21 and the control means 41 may be adjusted as desired.

An electrical contact member 47 is mounted on the flexible control arm 41 to engage a cooperatively disposed electrical contact 48 supported on one end of a flexible spring 49 which at its opposite end is rigidly supported on the bracket 43 on the panel. Although for clearness the panel 7 is shown in open exposed condition, it will be understood that in actual practice a suitable cover (not shown) will be provided thereon, for protecting the electrical contacts and associated actuating elements from interference and foreign matter which might render them inoperative.

The device is of a formation suitable for conveniently mounting and inserting the spiral thermal element 1 into a stack carrying hot combustion gases, for example, and it is thus readily adapted to safety control in conjunction with oil burner systems and the like, where it may be utilized to open the blower circuit and cut off the fuel in case of flame failure.

In operation changing temperature conditions cause the spiral bimetallic element 1 to turn in one direction or the other thus rotating the shaft 3 accordingly. The indented disc 15 which is rigidly secured to the shaft 3 is directly rotated thereby. This rotation is imparted to the driven disc 21, which is loosely journalled on the shaft through the ball 25 which is resiliently biased upon the indentations 19. The rotation of the shaft 3 caused by either increasing or decreasing temperature variation causes the rotation of the free disc 21 which is rotated until its lateral arm 35 engages with one of the stationary stop pins 37. When the free disc 21 is rotated to either one of its extreme positions as limited between stationary stop pins 37, the control means 41 is correspondingly actuated to either one of its extreme positions thus accomplishing the control or regulation desired. The ball 25 is free to move in and out of the indentations 19 in the disc 15, but the torque required to move the ball out of its socket 17 is considerably in excess of that required to simply rotate the two discs together. Thus as the torque increases with the continuation of the temperature variation which initiated the movement it will continue to rotate the shaft 3, until the temperature levels off to normal.

During this operation the driven, or freely journalled disc 21, is held stationary against one of the stop pins 39, and the resiliently biased ball 25 operates in and out of the indentations in the indented disc. When the temperature varies in the opposite direction, the driving disc 15 is rotated in the opposite direction by the shaft 3. This causes the free or driven disc 21 to rotate in the opposite direction until the other stop pin 37 is engaged and the control means 41 is moved in the opposite direction to accomplish the predetermined control or regulation.

When the rotation of the driven disc 21 is stopped in this direction the driving disc 15 will continue to rotate until the temperature levels off, while the ball 25 yieldingly slides over the indentations maintaining a predetermined driving torque thereon.

The device is thus responsive to a relatively constant temperature differential in either direction for applying a substantially constant torque to actuate any desired regulating element in response to its initial movement.

It will thus be seen that I have provided an improved thermal control mechanism which is especially suitable for driving a two position control member to either one of its extreme positions in response to the initial actuation of a thermostat in either direction while thereafter sufficiently releasing the thermostat to permit movement thereof in accordance with the temperature to which it is subjected.

Aside from the specific embodiment of the invention herein shown and described, it will be understood that numerous details of the construction may be altered or omitted without departing from the spirit and scope of the invention as disclosed and claimed, and that I do not desire to limit the invention to the exact constructions herein set forth.

I claim as my invention:

1. In combination a thermal responsive element actuated in accordance with varying temperature conditions, control means having two extreme positions, driving means for yieldingly actuating said control means to its corresponding extreme position in response to the initial movement of said element in either direction by increasing or decreasing temperature variations, said driving means comprising a plurality of members movable relative to one another, one of said members being resilient, one of said members having a plurality of indentations resiliently engageable with the other member for causing one of said members to be driven by the other, said resilient engagement being such that said members are slidable relative to one another, one of said members being associated with said thermal responsive element to be driven thereby and the other of said members being associated with the control means for actuating the latter.

2. In combination a thermal responsive element actuated in accordance with varying temperature conditions, control means having two extreme positions, driving means for yieldingly actuating said control means to its corresponding extreme position in response to the initial movement of said element in either direction by increasing or decreasing temperature variations, said driving means comprising a plate member having indentations therein, a second member disposed in parallel spaced relation thereto, a spring pressed ball associated with said second member for operatively engaging said indentations to move one of said members with the other, means securing one of said members to said thermally actuated element, and means operatively connecting the other member to said control means.

3. In combination a thermal responsive element, a shaft rotated by said element in accordance with varying temperature conditions, control means having two extreme positions, driving means for yieldingly actuating said control means to its corresponding extreme position in response to the initial rotation of said shaft in either direction by increasing or decreasing temperature variations, said driving means comprising an indented disc rigidly secured on said shaft for rotation therewith, a freely journalled member mounted upon said shaft in spaced parallel relation adjacent said indented disc, a resilient member on said freely journalled member for operatively engaging said indented disc, and means on said freely journalled member for operatively engaging said control means.

4. In combination a thermal responsive element, a shaft rotated by said element in accordance with varying temperature conditions, control means having two extreme positions, driving

means for yieldingly actuating said control means to its corresponding extreme position in response to the initial rotation of said shaft in either direction by increasing or decreasing temperature variations, said driving means comprising an indented disc rigidly secured on said shaft for rotation therewith, a freely journalled member mounted upon said shaft, a ball way on said freely journalled member, a ball in said way, a spring in said way for biasing said ball to resiliently engage the indentations in the disc, and means on said freely journalled member for operatively engaging said control means.

5. In combination a thermal responsive element actuated in accordance with varying temperature conditions, control means having two extreme positions, driving means for yieldingly actuating said control means to its corresponding extreme position in response to the initial movement of said element in either direction by increasing or decreasing temperature variations, said driving means comprising a plurality of members movable relative to one another, one of said members being resilient, one of said members having a plurality of indentations and the other including a ball-like element engageable with any one of said indentations for causing one of said members to be driven by the other and frictionally slidable out of the indentations for relative slidable relation between said members, one of said members being associated with the said thermal responsive element to be driven thereby and the other of said members being associated with the control means for actuating the latter.

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