

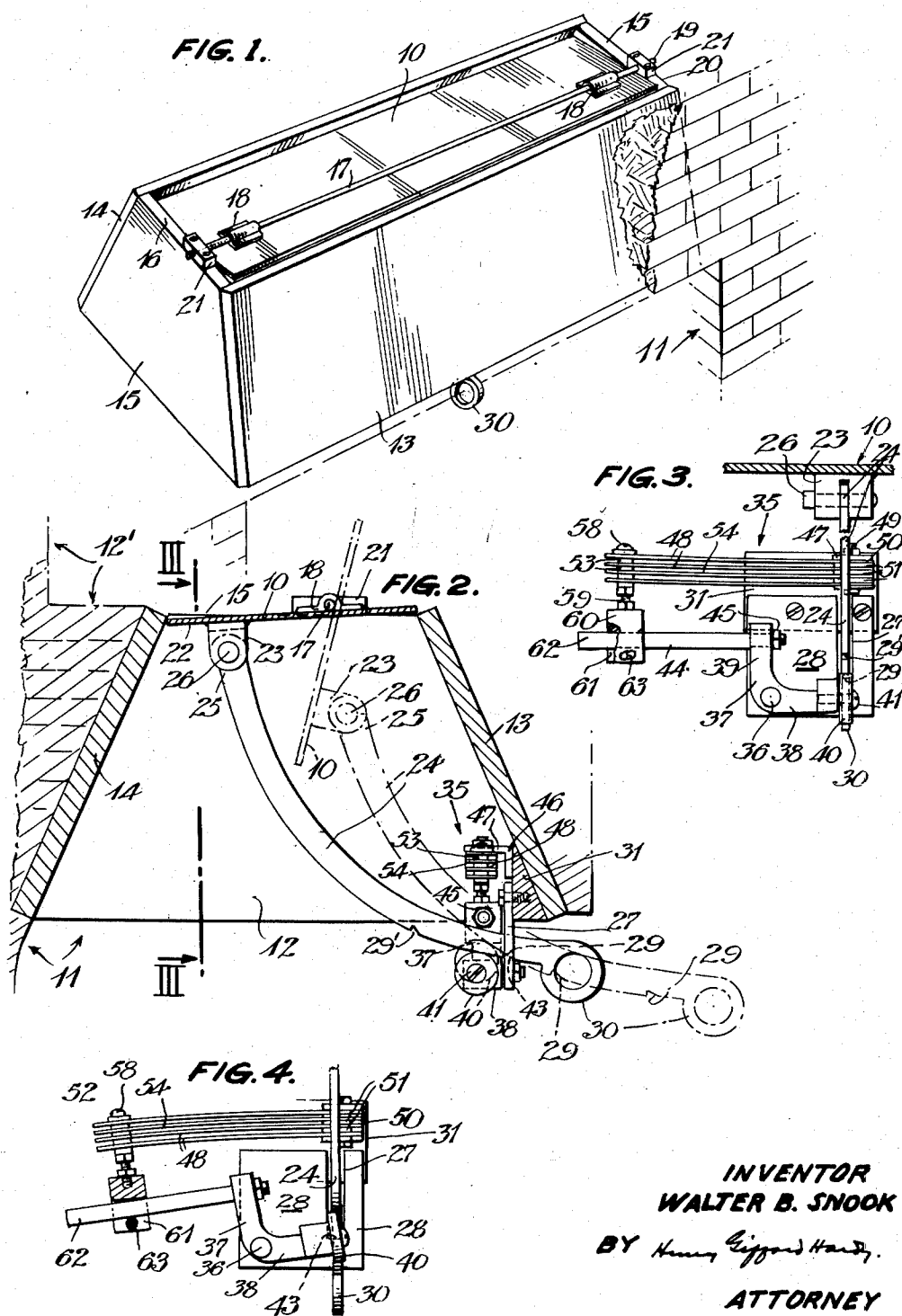
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THERMALLY CONTROLLED FIREPLACE DAMPER

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THERMALLY CONTROLLED FIREPLACE
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This invention relates to thermo-responsive control devices possessing high sensitivity and high torque characteristics, and more particularly to such thermo-responsive control devices as are capable of releasing fireplace dampers and the like directly and without the use of auxiliary servo mechanism or external sources of power.

Efforts have heretofore been made to minimize fire hazards and prevent excessive smoking in fireplaces and other types of conventional heating systems by the use of automatic dampers and similar regulating devices. Most of the thermostatic control devices heretofore used either do not possess the power or sensitivity required for such applications, or employ complex control mechanisms which are relatively expensive to produce and which must be frequently inspected and adjusted in service. Moreover, such conventional thermostatic control devices usually are dependent upon a continuous source of electric power or other external power source for their operation, with the result that such control mechanisms cannot always be relied upon, particularly in instances in which suitable sources of external power are temporarily or permanently unavailable.

It is therefore an important object of this invention to provide a thermostatic control means for a fireplace damper or the like which is not dependent for its operation upon a continuous source of electrical power or other external source of energy.

It is another object of the instant invention to produce a highly sensitive thermostatic control device which is capable of developing sufficient power to directly release a fireplace damper or similar draft regulating device without the necessity of providing auxiliary servo units or relays.

It is also an object of the present invention to provide a thermostatic control means having high torque characteristics and which is quickly responsive to relatively small thermal changes.

A still further object of the instant invention is to provide a thermostatically responsive control device possessing high sensitivity and relatively large power output, which at the same time is light in weight, easily inspected, and readily adjusted without the employment of more than ordinary mechanical skill.

It is another object of this invention to produce a highly sensitive thermostatic control of relatively simple design, for use in heating systems and the like, which is not adversely affected in its operation by prolonged exposure to heated

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combustion products, and which at the same time can be readily constructed in quantity at a low price.

Further objects are to provide a construction of maximum simplicity, economy, and ease of assembly and disassembly, and such further objects, advantages, and capabilities as will fully appear and as are inherently possessed by the device and the invention described herein.

The invention further resides in the combination construction and arrangement of parts illustrated in the accompanying drawings, and while there is shown therein a preferred embodiment thereof, it is to be understood that the invention is capable of modification and change and comprehends other details of construction without departing from the spirit thereof or the scope of the appended claims.

Referring to the drawings:

Figure 1 is a perspective view of the complete damper assembly, showing the damper in the fully closed position.

Figure 2 is a cross sectional view showing, by means of the dotted and solid lines appearing thereon, the damper of Figure 1 in the open and closed positions, respectively.

Figure 3 is a rear elevational view to an enlarged scale showing the thermostatic control means in the normally closed position.

Figure 4 is a rear elevational view of the thermostatic control means in the fully released or open position.

Referring now more particularly to the drawing, in which like reference numerals indicate like parts in the several views, there is shown an unbalanced damper plate 10 disposed above a fireplace 11, the damper 10 being adapted upon release to move under the influence of gravity to an open position, thereby communicating with the chimney 12' the enclosure 12 formed by the two spaced apart end members 15 and the front and rear members 13 and 14, respectively.

The damper plate 10 has disposed along its upper edge 16, in a position parallel to but spaced apart a predetermined distance from the geometric axis thereof, a rod 17 of slightly greater length than the long edge of the damper plate. The rod 17 is permanently affixed to the upper surface 16 of the damper 10 by conventional means, such as the welded strap 18, the end portions 19 of the rod 17 projecting transversely across the upper edges 20 of the end members 15. The ends 19 of the rod 17 are journaled in bearing blocks 21 secured to the upper edges 20 of the members 15; thus the blocks 21 piv-

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totally support the unbalanced damper 10 for free turning movement about the rod 17 as an axis.

Secured to the lower surface 22 of the unbalanced damper 10 in a position adjacent to the rear member 14 is a bracket 23 pivotally attached by the pin 26 to the upper end 25 of a control arm 24. The control arm 24 extends through a flap or aperture 27 formed in a vertical plate 28 supported on the front member 13 by the wedge 31. The notches 29 and 29' formed in the lower edge of the arm 24 are adapted to coast with the edge 43 of the aperture 27 to retain the unbalanced damper 10 in the fully closed or open positions respectively. A handle 30 is formed on the free extremity of the control arm 24, and the weight of the arm assists the unbalanced damper 10 in moving from the closed to the open position under the influence of gravity whenever the notch 29 becomes disengaged with the coating edge 43 of the aperture 27.

The thermostatic control means for releasing the unbalanced damper 10, indicated generally at 35, is shown in the closed and open positions in Figures 3 and 4, respectively. Pivotally supported along the lower extremity of the plate 23 by the pin 36 is a lever 37 having a horizontally disposed lower arm 38 and an upwardly directed vertical arm 39. The lower arm 38 carries a roller 40 attached by the screw 41 to the free end thereof. The upper surface 42 of the roller 40 is disposed adjacent to the lower edge 43 of the aperture 27, and the roller 40 is adapted to be normally retained in rolling engagement with the lower edge 32 of the control arm 24, by the action of the lever 37. A relatively long rod 44 is attached by the bolt 45 to the vertical arm 39, and extends horizontally outwardly therefrom.

A right angle bracket 46 is secured to the upper portion of the plate 23 in a position diagonally opposite the pin 36. Horizontally supported by the upper leg 47 of the bracket 46 are a plurality of thin and relatively long but spaced apart bimetallic strips 48. The strips 48 are retained in a predetermined parallel and spaced apart relationship at one end 50 thereof by the spacer plates 51 alternately placed between the strips 48, the opposite ends 52 of which are similarly retained in a predetermined parallel and spaced apart relationship by the washers 53. The multiple layer assembly 54 formed by the plurality of equidistantly spaced apart bimetallic strips 48, and the spacer elements 51 interspersed therebetween are secured at one end by the bolt 49 to the horizontal leg 47 of the bracket 46. The strips 48 are also retained in predetermined spaced apart relationship at the opposite end 52 thereof by the washers 53 interspersed therebetween and by the relatively long bolt 58 which carries at the free end 59 thereof a cylindrical member 60. A slot 61 formed in the member 60 is of sufficient width and depth to slidably accept and engage with the free end 62 of the rod 44, the latter being retained within the slot 61 by a small pin or cotter key 63.

Preferably, the thin bimetallic strip 48 which comprise the layer assembly 54 each consists of bonded pairs of dissimilar metals having different coefficients of linear expansion, and are so selected that high sensitivity to moderate changes in normal heating temperatures is obtained. Although such dissimilar metals as iron and brass may be used in some applications, when considerable power must be developed while preserv-

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ing high thermostatic sensitivity the strips 48 preferably are formed of bonded layers of dissimilar steels, such as Invar steel and heat resistant stainless steel, the total thickness of each individual strip 48 being approximately .030 of an inch. A multiple layer assembly 54 constructed and arranged in accordance with this disclosure develops considerable operating torque without producing the time lag or delay which is an inherent operating characteristic of conventional thermostatic controls, particularly when comparatively large thermostatic power must be directly developed by the control device. Moreover the thermo-responsive action of such a multiple layer assembly 54 is not adversely affected by prolonged exposure to heat, smoke, or the combustion products normally present in fireplaces and other types of heating systems.

Operation

The operation of the unbalanced damper 10 and the thermostatic control means 35 directly associated therewith will now be described in conjunction with a conventional fireplace wherein the damper 10 is interposed between a chimney 12' and the fireplace interior 11. It is the usual practice to maintain such a damper 10 in the fully closed position whenever no fire is burning in the fireplace, thereby preventing objectionable drafts from being created in the room and also preventing soot and moisture from becoming deposited in the bed of the fireplace 11. Whenever the fire is completely out the damper 10 is normally moved manually to the fully closed position indicated by the solid lines in Figure 2, and is retained in that position by engagement of the slot 29 with the lower edge 43 of the aperture 27. It is highly desirable that such a damper be automatically opened soon after the next combustion cycle is initiated. If the damper 10 is not opened by a reliable means at this time the fire which is being started in the fireplace 11 will soon disburse objectionable quantities of smoke into the room and may even burn the mantle of the fireplace or otherwise create a dangerous fire hazard, particularly in instances wherein the kindling of the new fire is not carefully watched. These highly objectionable conditions are automatically eliminated in a fireplace embodying the instant invention. The heat generated during the early stages of the combustion process produces a thermal rise approximating 50° F. in the ambient temperature of the enclosure 12 which surrounds the thermostatic control 35. Because of the manner in which the multiple layer assembly 54 is constructed and arranged a comparatively small rise in temperature within the enclosure 12 above the ambient room temperature is sufficient to quickly actuate the control 35 and the damper 10 directly associated therewith without the use of complex servo units or other relatively expensive auxiliary devices which require a continuous source of electricity or external source of power. Thus, power is developed directly by the thermostatic action of the multiple layer assembly of sufficient magnitude to depress the rod 44 to the position illustrated in Figure 4, thereby angularly displacing the lever 34 above the pin 36 and moving the contact surface 42 of the roller 40 against the coating lower edge 32 of the control arm 24. This action of the multiple layer assembly 54 occurs with sufficient force to raise the notch 29 out of engagement with the lower edge 43 of the aperture 27, and as soon as the lower edge of

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the arm 24 has been raised sufficiently above the aperture 27, the unbalanced damper 10 is free to turn under the influence of gravity about the rod 17 as an axis, thereby moving the damper 10 to the open position in a sufficiently short time to eliminate any potentially dangerous fire hazard and prevent objectionable quantities of smoke produced by the combustion process from entering the room.

The multi-layer construction and arrangement of the thermostatic control 35 enables the inherent sensitivity of a thin section of thermostatically responsive material 48 to be preserved while enabling the power or torque normally developed by a bar of thermostatically responsive material of substantial size, through the plurality of individual layers 48 comprising the assembly 54, to be utilized to directly actuate the relatively heavy control arm 24. Because of the rapid thermal response or high thermostatic sensitivity of the multiple layer assembly 54, the air which is drawn into the fireplace 11 as soon as the unbalanced damper 10 has been opened has a sufficient cooling action to quickly lower the ambient temperature around the thermostatic control 35, so that the notch 29 placed at a predetermined position along the lower edge 32 of the arm 24 will engage with the lower edge 43 of the aperture 27 and retain the unbalanced damper 10 in a predetermined open position. After the combustion process has ceased and the fire in the bed of the fireplace 11 has completely died out, the unbalanced damper 10 may readily be closed manually by merely depressing the handle 30 at any convenient time so as to reengage the notch 29 with the lower edge 43 of the aperture 27.

From the above description it will be apparent that there has been produced an automatic means of opening a fireplace damper in such a manner as to avoid the objectionable distribution of smoke into the room and to eliminate any potential fire hazard which would exist if the fireplace damper were inadvertently left closed after a new fire had been started in the fireplace. There has also been produced a thermostatic control device of multiple layer construction which retains the high sensitivity characteristic of a thin section of thermostatically responsive metal, while at the same time permitting the total power developed by a bar of thermostatically responsive material of considerable size to be utilized for directly actuating the device to be controlled thereby. It will also be apparent that there has been produced a control device which develops relatively large amounts of thermostatic power response to relatively small temperature increases above normal room temperatures, and which is not adversely affected in its operation by continued exposure to the heat and combustion products normally present in the chimneys or flues of fireplaces and other types of conventional heating systems.

I claim:

1. A fireplace structure of the character described comprising a fire box, a flue therefor, a damper in said flue directly above said fire box, means mounting the damper in the flue for swinging between an open position and a closed position and being biased so as normally to swing to open position, a lever secured to said damper for swinging said damper to either position, non-fusible type of thermo-responsive means operable by a relatively slight increase in temperature caused by igniting a fire in said fire box, and

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latch means for latching said lever when the damper is in closed position operatively connected to said thermo-responsive means for immediately unlatching said lever and opening said damper when a fire has been started in said fire box.

2. A fireplace structure of the character described comprising a fire box, a flue therefor, a damper in said flue directly above said fire box, means mounting the damper in the flue for swinging between open position and closed position and so as normally to swing by gravity to open position, a lever for operating said damper and secured thereto, non-fusible type of thermo-responsive means operable by a relatively slight increase in temperature above room temperature from starting a fire in the fire box, said thermo-responsive means being in the form of a plurality of superimposed, spaced bimetallic elements, and latch means for latching said lever when the damper is in closed position operatively connected with said thermo-responsive means to immediately unlatch said lever and open said damper when a fire has been started in the fire box giving a temperature rise above room temperature.

3. A structure of the character described comprising a fire box, a flue communicating with the fire box, an unbalanced damper supported for pivotal movement between a closed position closing the flue and an open position opening the flue, said damper being urged by gravity to open position unless otherwise restrained, a lever for pivoting the damper and mounted on the heavy side thereof, said lever being of relatively massive construction to resist the heat to which it is normally subjected, latch means for said lever operable to support and latch the lever to maintain the damper in closed position, and non-fusing thermo-responsive means operatively connected with said latch means to lift and unlatch said lever when subjected to a rise in temperature of approximately 50° F. above room temperature within the fire box, said thermo-responsive means comprising multileaf bimetallic members capable of developing sufficient power to lift said massive lever free of said latch means.

4. A structure of the character described comprising a fire box, a flue communicating with the fire box, an unbalanced damper supported for pivotal movement between a closed position closing the flue and an open position opening the flue, said damper being urged by gravity to open position unless otherwise restrained, a lever for pivoting the damper and mounted on the heavy side thereof, said lever being of relatively massive construction to resist the heat to which it is normally subjected, latch means for said lever operable to support and latch the lever to maintain the damper in closed position, and non-fusing thermo-responsive means operatively connected with said latch means to lift and unlatch said lever when subjected to a slight rise in temperature, said thermo-responsive means comprising multileaf bimetallic members capable of developing sufficient power to lift said massive lever free of said latch means in responsive to approximately a 50° F. rise in temperature above room temperature within the firebox.

5. A fireplace damper adapted to be automatically released by thermostatic power when a fire is lighted in the fireplace, comprising a flue for the passage of combustion products, an unbalanced damper plate mounted in said flue operable

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upon release to move under the influence of gravity from a position closing said flue passage to open the same, a lever arm attached to said damper operable to latch the same in closed position and operable to release the said unbalanced damper plate to open position, latching means for said lever, and a multiple layer non-fusing type of thermo-responsive device operatively connected to said latch and so constructed and arranged as to move the said latch to the release position for said lever by the direct application of thermostatic power thereto in response to the heat of a fire lighted in said fireplace.

6. A fireplace damper adapted to be automatically released when a fire is lighted in the fireplace to minimize fire hazards and prevent smoke damage, comprising a flue for the passage of combustion products, an unbalanced damper plate mounted in said flue operable to move upon release the influence of gravity from a position closing said flue passage to open the same, a control arm attached to said damper plate operable to latch the same in closed position and operable to release the said damper plate to open position, latching means for said control arm, and a highly sensitive multiple layer non-fusing type of the thermostatic actuator opera-

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tively connected to said latching means and operable to develop sufficient thermostatic power for directly moving the said latching means to the release position for said control arm in response to a predetermined increase in temperature of relatively small magnitude above normal room temperature caused by igniting a fire in the fireplace.

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