July 1, 1952 W. D. HALL 2,601,892

BURNER CONTROL SYSTEM

Original Filed Dec. 4, 1945

FIG. 1.

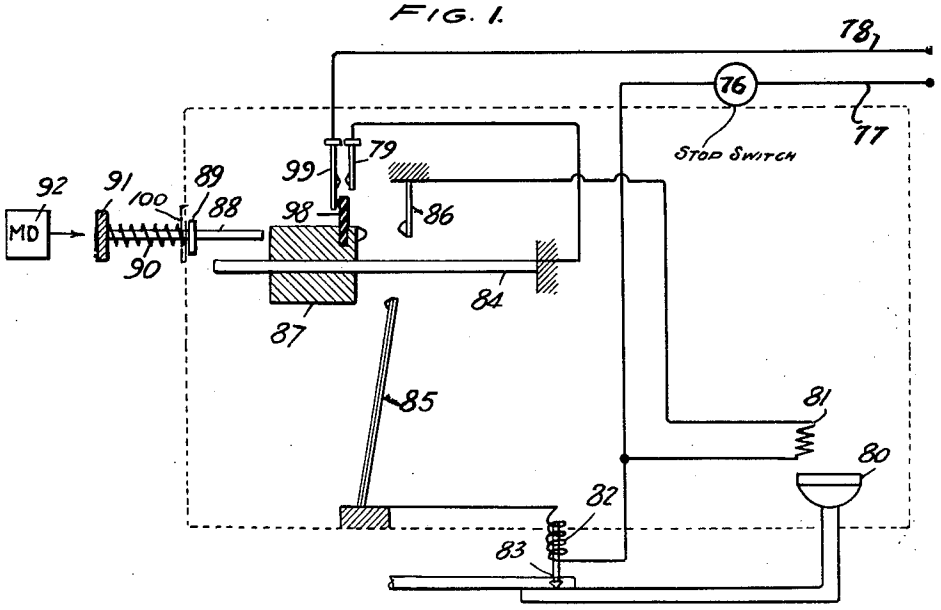
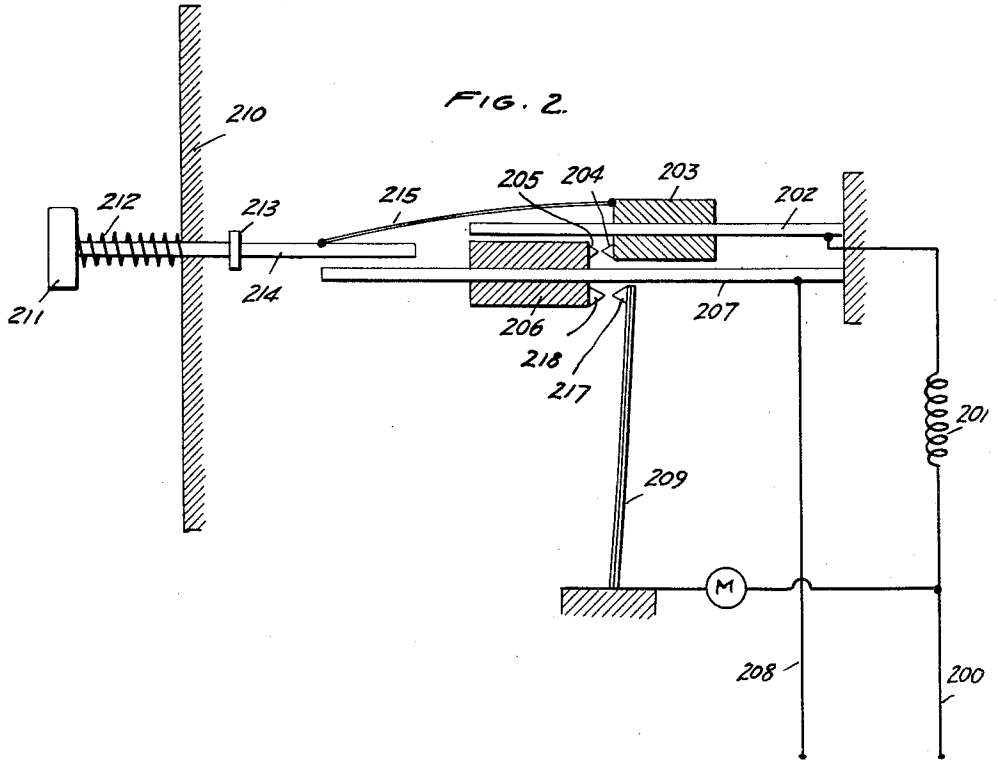


FIG. 2.



INVENTOR:
William D. Hall

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BURNER CONTROL SYSTEM

William D. Hall, Washington, D. C.

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5 Claims. (Cl. 158—28)

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This invention relates to control systems and more particularly to means for controlling a burner. The primary object of this invention is to provide a simple and inexpensive control system that is safe in operation. Other objects of the invention include the provision of means whereby the control operations are performed rapidly when rapid operation is desired for safety reasons.

Briefly speaking the detailed character of the invention is that a massive slidable member is moved by a bimetallic strip, which strip is responsive to the heat from the burner, and the position of this member controls the energization of the igniter. The fuel flow to the burner is controlled in accord with the "lost-motion" action of the slidable member and the bimetallic strip. The circuit to the fuel controller of the burner is closed for a limited time period by mechanically bringing together contacts which may be respectively located on the bimetallic strip and the slidable member. Further details of the invention will hereinafter appear as will further objects and advantages.

In the drawings, Figure 1 is a diagrammatic view of one form of the invention and Figure 2 is a diagrammatic view of another form of the invention. Both views show their respective systems in the "off" positions thereof.

This application is a division of my prior copending application Serial No. 632,673, filed December 4, 1945, entitled Burner Control System, now U. S. Patent No. 2,503,260, granted April 11, 1950. The subject matter of the present patent was originally disclosed in said earlier application S. N. 632,673 as filed on December 4, 1945, but was cancelled therefrom after the application on which the present patent issued was filed.

I will now describe the construction and mode of operation of Figure 1. A burner 80 has a hot-wire igniter 81 and a solenoid 82 controlling the valve 83. A rigid supporting member 84 supports the sliding massive member 87. The latter is arranged to slide unbiased on the supporting member 84. A bimetallic strip 85 rigidly supported at its lower end is arranged to be engaged by sliding member 87 when the latter is moved to the right sufficiently, and the resilient strip 86 (which is fixed at its upper end) is likewise arranged to engage member 87 when the latter is moved to the right. Strips 79 and 99 are supported at their upper ends, and strip 99 is resilient so that it may be moved to the left by arm 98 when block 87 is sufficiently moved to the left. For the purpose of moving member 87 to the

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right there is provided a push button 91 attached to rod 88. Rod 88 is held in a normal off position by a nut 89 which engages the inside of fixed heater wall section 100. On the outside of the wall section 100 is a spring 90 which is compressed between the push button 91 and wall section 100. Spring 90 retains the push button 91 in the normal "off" position as shown. As an alternative to manually depressing push button 91, a mechanical device 92 (designated "MD") of any character, for example a time clock, may be employed.

The operation of Figure 1 is as follows: By depressing push button 91, the slidable member 87 is forced into contact with strips 85 and 86. This closes circuits to the igniter and valve through supply lines 77 and 78 as follows: 78—99—79—84—87—86—81—76—77; and 78—99—79—84—87—85—82—76—77. Hence the igniter is energized and valve 83 opens causing fuel to flow to the burner 80. Now assume that the burner temperature goes too high; the bimetallic strip 85 will move block 87 to the left and the insulation arm 98 will engage resilient arm 99 and break the circuit to solenoid 82. If the flame ignites and the burner thereafter operates in the normal and expected way, the bimetallic strip 85 will move block 87 sufficiently to the left to break the circuit between contact 86 and block 87 thereby deenergizing the igniter 81; however block 87 will not move far enough to deenergize the circuit through contacts 79 and 99. If the burner satisfactorily ignites and continues to heat, but not excessively, and the flame should accidentally go out, the bimetallic strip 85 moves block 87 to the left until the flame goes out and then strip 85 will reverse its direction and disengage slidable member 87 thus opening the circuit to the valve. An ordinary switch 76 may be employed to shut down the system.

Referring to Figure 2 there is shown a source of electrical supply 200, 208, a hot-wire igniter 201 and two rigidly mounted bars 202 and 207 which respectively carry the slidable members 203 and 206. Complementary contacts 204 and 205 are respectively mounted on said members. A bimetallic strip 209 is rigidly mounted at its lower end and carries contact point 217 at its upper end which may engage contact point 218 upon motion of the parts. A handle 211 may be used for starting the apparatus, which handle is held by spring 212 in separated position from the wall 210. The handle 211 carries rod 214 which rod carries stop 213. A flexible wire 215, which has no electrical function, but purely mechanical

functions, is connected between rod **214** and slidable member **203**. Motor M serves to supply fuel to the system.

To place the system of Figure 2 into operation, knob **211** is pulled to the left, which action pulls wire **215** taut and then pulls slidable member **203** to the left. The movement of member **203** to the left causes contacts **204** and **205** to engage, and if the knob **211** is pulled still further to the left (which is not necessary) the member **203** will move member **206** to the left. The engagement of contacts **204** and **205** closes the circuit to the igniter **201**. After the knob **211** has been pulled out it is then quickly pushed in until member **206** closes contacts **218** and **217** starting the fuel motor (or valve) M. Fuel therefore starts to flow and assuming it is ignited, the heat therefrom will cause bimetallic member **209** to move to the left. Since the knob **211** has been released, the member **206** is moved away from member **203**, thus deenergizing igniter **201**. Fuel contacts **217**, **218**, however, remain close as long as the burner gives off heat. Should the flame accidentally go out, strip **209** will cool and thereby separate contacts **217**, **218**, thereby stopping fuel flow. The device may be restarted at any future time by again pulling knob **211** and then pushing it clear in. It is desirable that rod **214** be composed of insulating material and that insulating beads (not shown) be placed around wire **215**.

I claim to have invented:

1. In a heating system, a burner, an igniter for the burner, a slidable member, a thermal element responsive to the heat of combustion of said burner which deflects when heated, means supporting the first end of the thermal element to locate the second end adjacent said sliding member, said second end and said sliding member being normally spaced from each other and the thermal element being so positioned that when heated the second end moves toward the sliding member, means mounting the slidable member for sliding movement and including means permitting the slidable member to be moved to a position where it is in contact with said second end when the thermal member is in its cool condition as attained when the burner has been off for such an extended period that the thermal element has attained ambient temperature, fuel flow control means for the burner operable to admit fuel flow when said second end contacts said slidable member and stops fuel flow when said second end is separated from said slidable member, contact means which closes a circuit therethrough when said slidable member is moved to said position and which opens the circuit therethrough when said thermal member moves the slidable member away from said position, and a circuit connected in series with said contact means for controlling said igniter.

2. In a heating system, a burner, an igniter for the burner, a slidable member, a thermal element for driving the slidable member and fixed at a first end and movable toward and away from the slidable member at its second end, said thermal element being subject to the heat of combustion at the burner, means mounting the slidable member for such extensive sliding motion that the same may be moved into a predetermined relative position with respect to said second end when the thermal element is at ambient temperature, fuel control means including a circuit controller which effects fuel flow when the slidable member and said second end are in said predetermined relative position, and a circuit controller for said igniter controlled by said slidable member.

3. The system defined by claim 2 including in addition a manually movable element for moving the slidable member into said predetermined position.

4. In a burner control system, a circuit for controlling fuel feed, an igniter for the burner, a slidable member, circuit controlling means for closing the igniter circuit only when the slidable member is in a predetermined position, means mounting the slidable member for such extensive motion as to be movable to said predetermined position, a thermal element responsive to the heat of combustion of said burner having one end thereof fixed and the other end thereof arranged to move the slidable member away from said predetermined position in response to heat, said other end being so positioned when cool that it is engaged by said slidable member when the latter is moved to said predetermined position, circuit control means for controlling the fuel circuit according to the relative position of said other end and said slidable member, and manual means including biasing means for normally biasing the manual means so it does not affect the operations of the foregoing parts, said manual means including mounting means enabling the manual means to move said slidable member to said predetermined position.

5. In a burner control system, an igniter for the burner, a fuel circuit including fuel control means for the burner, a pair of slidable members, means mounting said members for motions toward and away from each other, a thermal element responsive to combustion fixed at one end and having a free end normally spaced from the first of said slidable members and movable toward and away therefrom, manually operable means for moving said slidable members together and thereafter moving the said first slidable member into contact with said free end, circuit control means for the igniter controlled by the relative position of the slidable members, and additional circuit control means for the fuel circuit controlled by the relative position of said free end and said first slidable member.

WILLIAM D. HALL.

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