Feb. 2, 1954 J. W. SMITH 2,667,920

GAS FUELED PILOT BURNER AND ION SENSING FLAME PROBE

Filed Dec. 22, 1949

FIG. 2

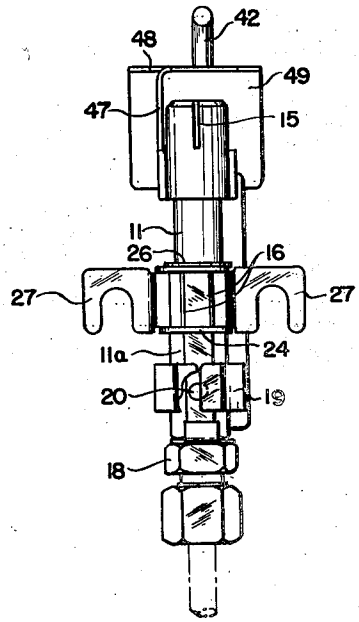


FIG. 1

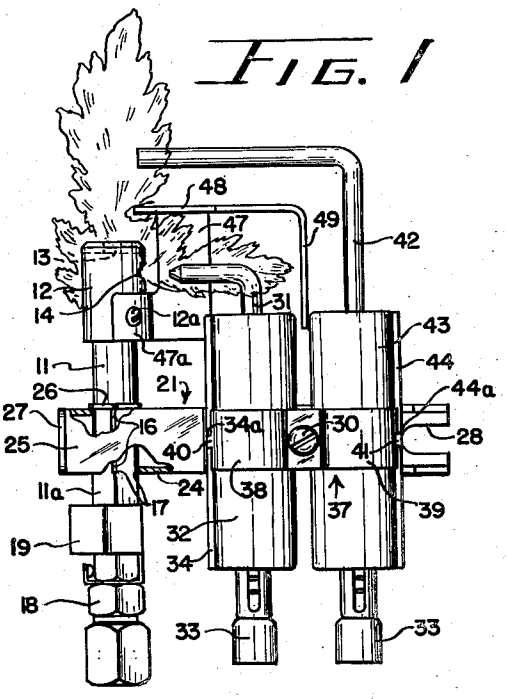
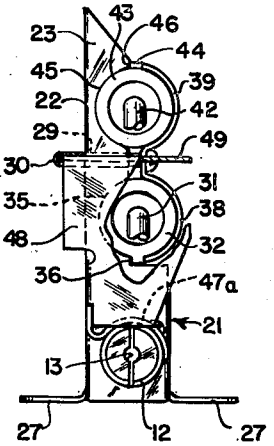


FIG. 3



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GAS FUELED PILOT BURNER AND ION SENSING FLAME PROBE

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7 Claims. (Cl. 158—123)

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This invention relates to igniting devices of the type which comprises a pilot burner, for igniting a much larger main burner, along with electrical means for igniting the pilot burner and for detecting the presence or absence of a flame at the pilot burner.

Igniting devices of the above mentioned type are well known in the heating art and, particularly, in heating systems which use gas as fuel. In these systems suitable control means, such as a room thermostat, causes the flow of gas to the pilot burner and the flow of electrical energy to an igniter for said pilot burner, whenever there is a demand for heat. In order to prevent the main burner from starting up immediately, regardless of whether or not there is a flame at the pilot burner for igniting the main burner, a flame sensing means usually has been supplied which will cause the valve controlling the gas flow to the main burner to open only if a flame is present at the pilot burner. Otherwise, the main burner remains closed, or, if the main burner has come on and the pilot burner subsequently becomes extinguished, the main burner will be shut off.

One of the objects of this invention is to provide an igniting device of the above mentioned type which is compact and inexpensive, yet sturdy in construction and reliable in operation.

Another object of the invention is to provide an igniting device of the type described wherein the orifice construction of the burner provides a divided flame, one for self ignition and the other for igniting a main burner and for cooperating with the flame sensing element of the igniter device.

Still another object of the invention is to provide an igniting device having a divided flame burner construction, wherein a shield is provided for preventing the flame for igniting the pilot burner from contacting the flame sensing element exposed to the other flame for igniting a main burner.

A still further object of the invention is to provide an igniting device having a divided flame burner, a spark igniter, a flame sensing electrode, and a shield for grounding ions generated by said spark igniter and thus preventing them from reaching the flame sensing electrode.

Another object of the invention is to provide an igniting device having a simple and compact arrangement whereby an electrical igniting means for the pilot burner may be on the same side of and closely spaced from another electrical means for sensing the presence of a flame off the pilot burner.

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Other objects of the invention will become apparent upon reading the following detailed description of the invention in conjunction with the accompanying drawing wherein:

Figure 1 is a side elevational view of the igniting device;

Figure 2 is an elevational end view of the device; and

Figure 3 is a plan view of the igniting device with portions thereof broken away.

In the drawing, the reference numeral 11 designates a pilot burner body. Secured to the upper end of the body 11, is a cup-shaped burner tip 12 having a coaxial orifice 13 in the end thereof, a radially extending orifice 14 in the side thereof, and a runner slot 15 extending between said orifices and diametrically through the said end. A lower portion 11*a* of the body 11 is of slightly greater thickness than the upper portion, and is of hexagonal shape. An upper part of the portion 11*a* has the corners of the adjoining sides beveled off at 16 to form shoulders 17 at the lower end of the beveled portion. The lower end of the body portion 11*a* is internally threaded (not shown) to receive a conventional burner spud 18. The spud clamps a shield 19 in position around the lower end portion of the burner to protect a primary air opening 20 of the burner from an enveloping flame, should one occur. The details of this primary air shield form no part of this invention but are fully disclosed in a copending application of George M. Jenkins, Serial No. 135,623, filed December 29, 1949 and owned by the assignee of this application.

A bracket 21, formed of sheet metal, has a long side wall 22, an upper wall 23 and a lower wall 24 of equal length to the side wall 22 and a side wall 25 of shorter length than wall 22. Apertured ears 27 for mounting the bracket member to a suitable support extend laterally from the ends of walls 22 and 25. The side wall 22 is also apertured or slotted at its outer end, as shown at 28, to provide alternate mounting means. Said side wall is also provided with a threaded opening 29 to receive a screw 30, the purpose of which will be described hereinafter. Holes in the walls 23 and 24 have the same shape as a cross section of the burner body portion 11*a* to permit the bracket to fit around said portion 11*a* and rest on shoulders 17. The bracket is held thereon by staking or rolling over the upper end of the portion 11*a* onto wall 23, as shown at 26.

An L-shaped igniter electrode 31 has a long leg thereof surrounded by an insulating sleeve 32 of any suitable material, preferably a ceramic ma-

terial, and the free end thereof engaged by a conventional lead wire connector 33. The sleeve 32 has a longitudinally extending rib 34 substantially in alignment with the short leg of the electrode 31. The sleeve 32 bears against an arcuate-shaped recess 35 formed in the upper wall 23 and lower wall 24 of the bracket, with the rib 34 bearing against shoulders 36 formed on said walls. It is thus seen that when the sleeve member 32 is held in this position, the short leg of the electrode 31 will be held in alignment with the orifice 14. To hold the sleeve 32 and the short leg of electrode 31 in position longitudinally of the burner, a clamping plate 37 is provided, having two arcuate portions 38 and 39 and two ears 40 and 41 extending from the ends of the arcuate portions 38 and 39 respectively. The clamping plate is secured to the bracket 21 by means of the screw 30, described above, with the arcuate portion 38 clamping the sleeve 32 and the ear 40 engaging in a notch 34*a* in the rib 34. As the electrode 31 is rigidly secured to the sleeve 32, it is apparent that the electrode 31 will be held in a position which will permit a flame of the orifice 14 to impinge on at least the outer end of the short leg. The distance of the end of the short leg from the orifice 14 should be $\frac{3}{16}$ of an inch for the best operation of the igniting device.

An L-shaped, flame-sensing electrode 42 is likewise surrounded by and rigidly secured to an insulation sleeve 43, substantially the same as sleeve 32. This sleeve 43 has a longitudinally extending rib 44 on the opposite side of the sleeve from the short leg of electrode 42 but in the same plane thereof. The sleeve 43 is clamped to the bracket 21, in recesses 45 in the upper wall 23 and lower wall 24 by the arcuate portion 39 of clamping plate 37. As in the mounting of the electrode 31, the ear 41 engages in a notch 44*a* in the rib 44 to hold the electrode 42 in longitudinal adjustment. The rib 44 bears against abutment shoulders 46 in said walls to prevent rotation of the sleeve 43 and thus hold the outer end of the short leg of the electrode 42 in position to be contacted by a flame issuing from the orifice 13.

Mounted on the burner tip 12 by means of screw 12*a*, the same screw that holds the tip 12 on burner 11, is an electrode shield 47. The shield has a flat wall portion 48 which lies in a plane at right angles to the plane of the short legs of the electrodes 31 and 42 with substantially the central portion thereof positioned in the plane of said electrodes and with one end thereof substantially on a line extending from orifice 13 to the outer end of the short leg of electrode 42. The other end of the wall 48 is integral with or connected to a wall 49 which extends downwardly between the electrodes 31 and 42 in a plane at right angles to the plane of electrodes 31 and 42. The lower end of this wall 49 terminates at a point slightly inwardly of the upper ends of the sleeves 32 and 43, as viewed in Figure 1 of the drawing. An arcuate portion 47*a* of the shield member 47, being tightly held against an arcuate surface of the burner tip 12, by the screw 12*a*, prevents pivoting of the shield member 47 around the screw 12*a* and thus holds the shield rigidly in position.

Operation

The above described igniting device is intended to be mounted in any suitable manner so that the portion of the flame issuing from the orifice 13, at the end of the flame sensing electrode 42, is in the path of a portion of the gas flowing from a main burner (not shown) of the furnace of a heating system. The electrode 31 should be connected to a source of high voltage electrical current. Electrode 42 may be connected to an amplifying system, which in turn is connected to a suitable control for the control of gas flow to the main burner with the amplifier serving to control the energization of the control in accordance with the current flow between electrode 42 and the burner.

With the apparatus of the heating system in the above described igniting device thus installed, the closing of a circuit between the high voltage electrical source and the electrode 31 and the opening of the valve to the pilot burner (which may be done either simultaneously or one shortly after the other) will cause gas to issue from the two orifices 13 and 14 and slot 15 at approximately the same time that an arc exists between the end of electrode 31 and the edge of orifice 14. This will cause ignition of the gas issuing from orifice 14 and the carrying around of the flame thus started through the slot 15 to orifice 13. As soon as the flame from orifice 13 strikes the electrode 42, a closed circuit will be formed from the electrode 42 through the flame at orifice 13, plate 48, shield 47, the grounded burner 11, the above mentioned amplifier (not shown) and through the source of electrical energy back to the electrode 42.

While the arc existing between the electrode 31 and the burner may be permitted to continue, it is the general practice in heating systems to provide a switch controlled by an amplifier to break the circuit to the ignition electrode 31 upon the electrode 42 sensing a flame at orifice 13. With the igniting device thus in operation, it is obvious that the main burner may be supplied fuel periodically under the control of a room thermostat, or other control of the system, and be assured of becoming ignited.

If for some reason the orifice 13 becomes clogged up, as by the falling of soot onto the top of the burner, or for any other reason that the flame at orifice 13 should become extinguished, the circuit to the amplifier will become broken and thus cause the shutting down of the main burner.

On an inspection of the drawing it is readily seen that the shields 48 and 49 prevent any portion of the flame issuing from orifice 14 or from slot 15 from contacting the electrode 42, and tends to prevent ions generated by an arc between electrode 31 and orifice 14 from reaching electrode 42 by grounding said ions. Therefore, even though a flame may exist at orifice 14 when no flame exists at 13, or an arc at electrode 31 may exist, the circuit from the electrode 42 to the grounded burner 11 through a conducting flame or stream of ions remains broken.

As it is apparent to those skilled in the art that modifications may be made in the above described igniting device without departing from the spirit of the invention therein, it is to be understood that the scope of the invention is to be determined solely from the appended claims.

1. An igniting device comprising a burner having a first orifice for directing a flame in one direction and a second orifice for directing a second flame in another direction at substantially a right angle to said one direction, a runner flame slot extending between said orifices, a bracket

extending laterally from and grounded to said burner, an ignition electrode supported by and insulated from said bracket and terminating a short distance from and substantially in alignment with said first orifice, a flame sensing electrode supported by and insulated from said bracket and terminating substantially in alignment with and spaced from said second orifice, and a shield supported by said bracket and having a surface portion positioned transversely between said first orifice and said flame sensing electrode so as to prevent a flame at said first orifice from contacting said sensing electrode but to permit a flame from said second orifice to contact both said sensing electrode and said shield.

2. In combination, a burner having angularly disposed first and second orifices with a runner slot extending therebetween, an L-shaped ignition electrode positioned with one end thereof in the path of gas flow from said first orifice, an L-shaped flame sensing electrode positioned with one end thereof in the path of gas flow from said second orifice, and an L-shaped shield of flat material positioned between said electrodes and between said first orifice and said flame sensing electrode with the flat surfaces thereof substantially at right angles to the plane of said electrodes to prevent a flame at said first orifice from impinging on said flame sensing electrode.

3. In combination, a burner having angularly disposed first and second orifices, an ignition electrode having an end thereof positioned in the path of gas flow from said first orifice, an L-shaped flame sensing electrode positioned on the opposite side of said ignition electrode from said burner and having an end thereof in the path of gas flow from said second orifice, and a shield of flat material positioned between said electrodes and between said first orifice and said flame sensing electrode with the flat sides thereof extending transversely of the plane of said electrodes to prevent a flame at said first orifice from impinging on said flame sensing electrode.

4. In combination, a burner having angularly disposed first and second orifices, an ignition electrode having an end thereof positioned in the path of gas flow from said first orifice, a flame sensing electrode positioned on the opposite side of said ignition electrode from said burner and having an end thereof in the path of gas flow from said second orifice, and a shield of flat material positioned between said electrodes and between said first orifice and said flame sensing electrode with the flat surfaces thereof extending transversely of the plane of said electrodes to prevent a flame at said first orifice from impinging on said flame sensing electrode.

5. An igniting device comprising a burner having a first orifice and a second orifice and a runner flame slot extending between said orifices, an ignition electrode terminating a short distance from and substantially in alignment with said first orifice, a flame sensing electrode terminating substantially in alignment with and spaced from said second orifice, and a shield grounded to said burner and positioned between said first orifice and said flame sensing electrode so as to have a larger surface thereof contacted by flame than contacts said sensing electrode and so as to prevent that portion of the flame supported by said first orifice and runner flame slot from contacting said sensing electrode.

6. In combination, a burner having first and second orifices, an ignition electrode having an end portion thereof positioned in the path of gas flow from said first orifice, a flame sensing electrode having an end portion thereof positioned in the path of gas flow from said second orifice, and a shield of substantially flat material positioned between said electrodes and between said first orifice and said flame sensing electrode with the flat surfaces of an end portion thereof extending transversely between said end portions of said electrodes to prevent a flame at said first orifice and ions from said ignition electrode and first orifice from impinging on said flame sensing electrode.

7. In combination, a burner having first and second orifices with a runner slot extending therebetween, an ignition electrode having an end portion positioned in the path of gas flow from said first orifice, a flame sensing electrode having an end portion positioned in the path of gas flow from said second orifice, and a shield of substantially flat material positioned transversely between said end portions of said electrodes and between said first orifice and said flame sensing electrode to prevent a flame at said first orifice from impinging on said flame sensing electrode but to permit a portion of a flame from said second orifice to impinge on said shield.

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