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PILOT BURNER AND FLAME DETECTOR ASSEMBLY

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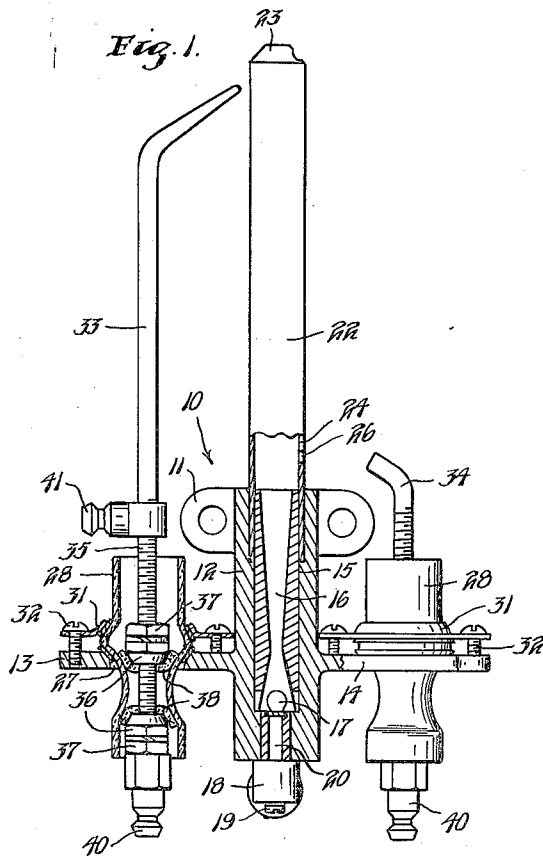
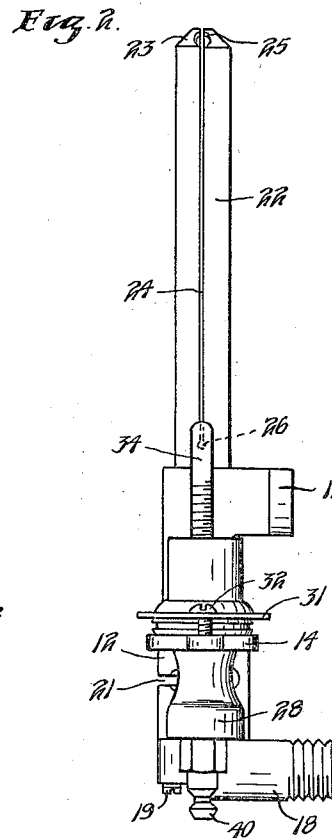
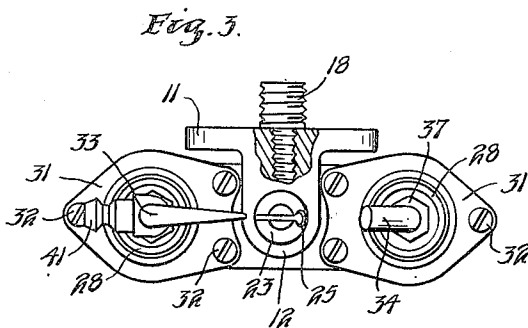
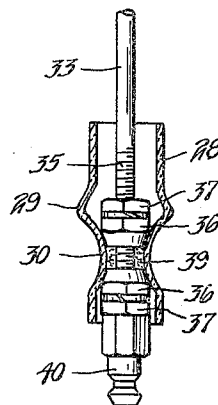


Fig. 4.



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PILOT BURNER AND FLAME DETECTOR
ASSEMBLY

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5 Claims. (Cl. 158—117.1)

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My invention is related to an improved construction of a pilot burner assembly for use in an electrically controlled furnace using intermittent ignition.

While there are certain industrial applications in which the device forming the present invention could be applied, its principal use is intended to be for domestic heating systems which utilize gaseous fuel as a heating means. In fluid fuel furnaces intended for this purpose, the ignition of the main burner is generally affected in one of several ways, either by the use of a constant burning pilot flame, an electrically heated filament, or a spark ignited pilot burner. Considering the latter group, for safety control purposes there is generally associated with the furnace structure a flame rod upon which a portion of the pilot burner flame impinges for the completion of an electronic circuit to provide a source of power for the operation of valves or other control means used in conjunction with the furnace to insure safe operation thereof.

In the intended application of the device under present consideration, a safety pilot assembly including a pilot burner, an ignition electrode and a flame rod are provided in a unitary device which is adapted to be mounted in a fixed relation to the main burner. The grouping of such an assembly in close proximity to the main burner presents certain problems, among which are the construction and spacing of the various elements with relation to each other and to the main burner so that their correct operation can be uniformly insured. Another problem is to properly insulate the current conducting members from the supporting member with means which will not deteriorate under the effect of moisture condensation which occurs when the device is not in use, and from the high temperatures emanating from the main burner when that device is operating at its full capacity. I believe that I have solved this problem by the construction and arrangement of the various elements in proper relation to each other so as to provide for uniform operation, and furthermore I have provided a novel form of sealed insulation construction which will remain unaffected by moisture condensation or high temperatures.

The principal object of my invention is to provide a unitary pilot burner assembly for mounting in close proximity to the main burner of an electrically controlled fluid fuel burning furnace.

Another object is to provide a pilot burner assembly in which the current conducting elements are insulatingly mounted in fixed relation to the

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pilot burner and in which the insulating members are capable of resisting both moisture condensation and the high temperature emanating from the main burner.

Another object is to provide in a pilot burner assembly an adjustable air intake so that the character of the fuel and of the ignited flame will be such as to provide easy and proper functioning of the electrical means which are associated with said pilot burner.

Other and further objects will become apparent from the following description and in the appended drawings in which:

Figure 1 is a front elevation of the pilot burner assembly showing certain portions in cross section;

Figure 2 is a side elevation of the device shown in Figure 1 as seen from the right side thereof;

Figure 3 is a plan view of the device shown in Figure 1, and

Figure 4 is a cross sectional view of a modified form of insulation of one of the current conducting members.

Referring now to the drawing and particularly to Figure 1, the general reference numeral 10 indicates a casting which forms the body of the main supporting member, having a mounting bracket 11 and a body portion 12 with arm portions 13 and 14 extending laterally therefrom. The body portion 12 has a hollow center portion 15 in which is turnably mounted a throated Venturi tube 16 which has a series of air inlet apertures 17 located at the base of said tube and whose purpose will be discussed hereinafter. An exteriorly threaded nipple 18 is secured to the bottom of the body portion 12 by means of a screw 19. An aperture 20 in the body portion 12 connects the interior of the nipple 18 to the Venturi member 16 for the purpose of conducting gaseous fuel to the burner. A small slot or aperture 21 seen in Figure 2 permits the insertion of a small tool into one of the apertures 17 of the Venturi member 16 for the purpose of rotating said member within the body portion 12 to increase or decrease the amount of air which may be admitted or drawn in by the Venturi member 16 for admixture with the gaseous fuel. At the opposite end of body member 12 a pilot burner tube 22 is suitably inserted within the hollow center portion 15 and extends from the Venturi tube 16 to a flattened tapered end 23. The burner tube 22 has a long slot 24 within its longitudinal periphery which extends across the top of the tube to the opposite side as shown in Fig. 3. An enlarged circular aperture 25 is located in said slot at the closed end

of the tube for igniting the main burner and a smaller circular aperture 26 is located in said slot near the base of the tube for impinging a flame on a flame detecting rod 34.

The lateral arm portions 13 and 14 have a pair of similarly shaped apertures 27 for supporting a pair of similarly shaped insulating members 28. These insulating members must be capable of resisting high temperatures and they must also have the characteristics of being electrically nonconductive. For these purposes I have found that glass having a high silicon content such as "Pyrex" is best suited. The insulating members 28 have a portion of enlarged diameter 29 to provide for support on the periphery of apertures 27, and a portion of narrow diameter for engagement with insulation material as will be explained later. The insulators 28 are secured to arms 13 and 14 with brackets 31 and screws 32. Located within insulating member 28 of arm 13 is an ignition electrode 33, while on the opposite side of the burner and suitably secured in the same manner within a similar insulator 28 supported on arm 14, is a flame rod 34.

The manner of mounting and insulating each of these electrical conductors is identical but two modifications of insulation are shown in Figures 1 and 4. Each of the members 33 and 34 have a threaded portion 35 upon which is located a pair of conical shaped nuts 36. In Figure 1 the nuts 36 are shown in contact with insulating washers 38 while in Figure 4 is shown an alternative insulation material such as cement 39, which may be in the form of any non-porous, low expanding, non-conductive ceramic-like substance, which may be introduced in a paste-like consistency and which after drying will adhere to both the metal and glass surfaces. The purpose of the insulation in each instance is merely to form a cushion between the nuts 36 and the glass members 28, and will thus prevent breakage resulting from excessive tightening of the nuts, or expansion resulting from heat conduction through the electrodes of the supporting arms. Locking nuts 37 are placed behind the nuts 36.

Affixed to the bottom of each of the current conducting members is a terminal member 40 and affixed to the upper portion of electrode 33 is an alternative and preferred form of terminal 41.

The device is adapted to be suitably mounted in a fixed relation with regard to the main burner of a gaseous fuel furnace, and unless there is need for heat within the space being controlled, the device is normally at rest. When the device becomes operative, gaseous fuel enters nipple 18 and passes up through aperture 20 to the Venturi tube 16. Passage of the fluid fuel through the throat of the venturi creates a condition of low pressure and air is drawn in through the aperture 17 to admix with the fuel and form a readily combustible mixture. A source of high potential current enters the ignition electrode 33 through terminal 40 or 41 and forms a spark as it jumps from the end of the electrode to the burner tube 22 causing ignition of the inflammable mixture which is being emitted from slot 24, adjacent the electrode.

When the fuel is ignited the flame quickly travels along slot 24 to aperture 25 and there ignites a larger quantity of fuel issuing from aperture 25 which acts as a pilot means of igniting the main burner. Thenceforth the flame

continues along slot 24 until it ignites the fuel issuing from aperture 26 to impinge upon flame rod 34. This sequence is necessary for it is important that a flame should issue from aperture 25 to ignite the main burner before the second flame issuing from aperture 26 impinges upon the flame rod 34; otherwise a flame impinging on the flame rod will complete a circuit to cause the opening of the main fuel valve without providing proper means for igniting the fuel issuing from the main burner. Under the latter conditions the accumulation of gas would be likely to form an explosive mixture within the furnace. Although the other portions of an electronic burner control with which the present device would be utilized are not a part of this invention and therefore are not described herein, it will be evident that the flame rod serves to control other elements so that upon failure of the flame emitting from aperture 26, a break in the circuit will result and thereby bring into operation the closing of the main valve or other safety devices.

The device described above has the advantage of combining the pilot burner with the ignition rod and the flame detecting rod, in a small compact and rigid arrangement with each of the elements mounted in proper relation to one another so as to obtain the best possible results, and to assure that the various operations take place in their proper sequence. The insulators 28 have the natural non-conductive property of glass, and by reason of their being composed of high silicon content material, are capable of being exposed to high temperatures without breakage. The arrangement for securing the electrodes within the insulators permits rigid fastening without breaking the glass and aids further in insulating the high potential current carried by the electrode.

No doubt those skilled in the art may find alternative ways of arranging and mounting the various elements of this device and, therefore, I do not wish to be restricted to the specific arrangement shown and described herein, but by the terms of the appended claims.

I claim as my invention:

1. A pilot burner assembly comprising a body member having four arms, a pilot burner mounted on a first of said arms, said burner having a slotted end and side wall, a second of said arms extending in line with said first arm but in the opposite direction and having fuel and air receiving openings therein, said first and second arms having a passage therethrough connecting said air and fuel receiving openings with the interior of said pilot burner, the remaining pair of arms extending laterally in opposite directions from the junction of said first two arms whereby the four arms form the general shape of a cross, an igniting electrode supported on one of said last pair of arms and terminating adjacent said slotted end wall, and a flame detecting electrode supported on the other of said last pair of arms and terminating adjacent the end of the slot in said side wall nearest the junction of said arms.

2. A pilot burner assembly, comprising, a body member having four arms, a pilot burner having an elongated diametrically and axially extending fuel mixture discharge opening therein and being mounted on a first of said arms, a second of said arms extending in line from said first arm but in the opposite direction and having fuel and air receiving openings therein, said first and second arms having a passage therethrough connecting

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said air and fuel receiving openings with the interior of said pilot burner, the remaining pair of arms extending laterally in opposite directions from the junction of said first two arms whereby the four arms form the general shape of a cross, an igniting electrode supported on one of said last pair of arms and terminating adjacent one end of said elongated discharge opening, and a flame detecting electrode supported on the other of said last pair of arms and terminating adjacent the other end of said elongated discharge opening, said electrodes having tips disposed on opposite sides of said burner and spaced from each other along the path of said elongated fuel mixture discharge opening so that when said fuel mixture is ignited the flame must travel transversely and longitudinally of the burner from the ignition point of said elongated opening to the flame detection point of said opening.

3. A pilot burner assembly comprising a burner having a transverse slot in a generally closed outer end thereof and a communicating slot extending from said end to a point near the inner end of said burner, a flame sensing element attached to said burner to sense the presence of a flame at the inner end of said longitudinal slot, and an igniting electrode secured to said burner with its outer end positioned adjacent the end of the transverse slot on the opposite side of the burner from said flame sensing element.

4. A pilot burner assembly comprising a burner having a transversely extending opening in a generally closed outer end thereof and an opening extending from said transversely extending opening to a point intermediate the ends of said burner, a flame sensing element attached to said burner to sense the presence of a flame at said

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intermediate point, and an igniting electrode secured to said burner with an end thereof positioned adjacent said transverse opening at the opposite side of said burner from said sensing element.

5. A pilot burner assembly comprising a vertically extending burner having a transverse slot terminating at opposite sides of a generally closed upper end thereof, an opening in said burner intermediate its ends, and a slot extending from said opening to said transverse slot, a flame sensing element attached to said burner to sense the presence of a flame at said opening, and an igniting electrode adjustably secured to said burner with its outer end positioned adjacent said transverse slot at the opposite side of said burner from said sensing element.

SIDNEY K. MALEK.

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