

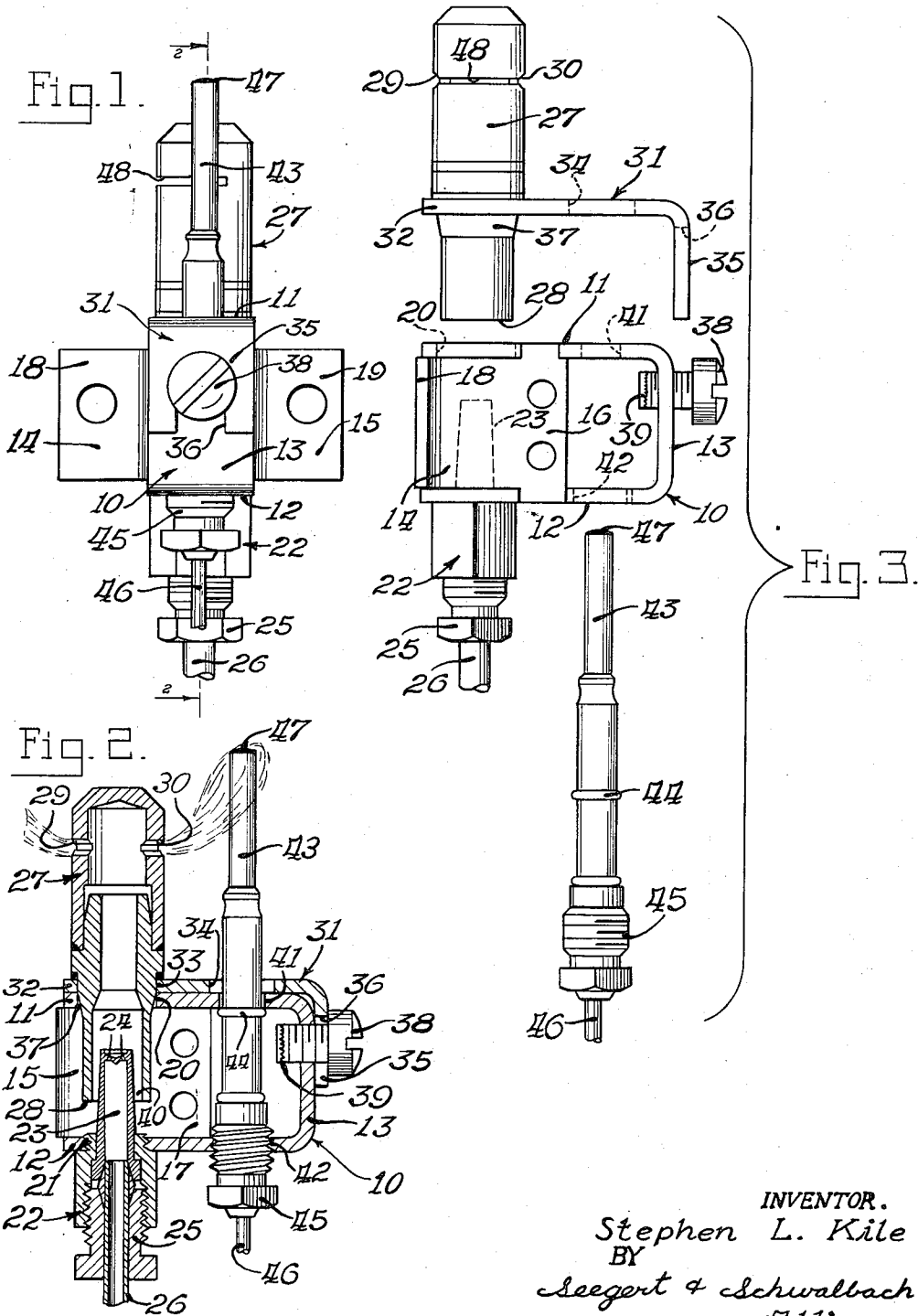
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PILOT BURNER-THERMOELECTRIC GENERATOR ASSEMBLIES

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PILOT BURNER-THERMOELECTRIC GENERATOR ASSEMBLIES

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This invention relates to improvements in pilot burner-thermoelectric generator assemblies and more particularly to pilot burner-thermocouple assemblies wherein the flame of the pilot burner may be utilized both to ignite gas issuing from a main burner and to heat a thermocouple providing electrical energy for safety shut-off devices in the fuel supply line.

One of the major causes of pilot burner failure is clogging of the burner body by dust, lint or other foreign matter which is carried into the burner while entrained in the air entering the burner. Advances in pilot burner design have substantially reduced the incidence of burner clogging, but the burners heretofore developed have not been entirely satisfactory because in some instances the entire burner assembly must be removed and disassembled in order to permit cleaning of the burner body.

It has been standard practice to provide the pilot burner body with an integral bracket for supporting the entire burner assembly, and it has also been standard practice to provide means on the burner body for removably supporting a thermoelectric generator in coacting relationship with the burner. Prior burner structures, while permitting individual removal of the thermoelectric generator and of the spud from the burner assembly, did not permit the removal of the burner body from the assembly without disturbing the burner spud and the thermoelectric generator.

There are certain installations, such as in fowl brooders, where a pilot burner must operate under extremely adverse conditions as respects clogging, because of the high concentration of suspended matter in the surrounding atmosphere. In fowl brooders this suspended matter may take the form of feathers, dust and chaff particles, down, or the like. Under such extreme conditions even burners having the least tendency to clog must be periodically cleaned for proper operation.

With the above in mind, it is a general object of the present invention to provide an improved pilot burner which is so constructed that the burner body can be readily cleaned, as for the correction of a clogging condition.

A further object of the invention is to provide an improved assembly, including a pilot burner having a spud and a thermoelectric generator, wherein the burner body can be readily removed from the assembly without displacement of either the spud or the thermoelectric generator.

More specifically, it is an object of the invention to provide an improved pilot burner of the type wherein the open end of the burner body is spaced from and concentrically surrounds the tip of the spud to provide an annular primary air intake passage surrounding said spud tip, there being a supporting frame on which said burner body and said spud are individually readily removably mounted.

Another object of the invention is to provide an improved assembly of the aforeindicated character in which

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the supporting frame is provided with means for removably mounting a thermoelectric generator in coacting relationship with the pilot burner, the structure of the improved assembly being such that it inherently affords proper placement of the burner body with respect to the spud and to the thermoelectric generator.

Another specific object of the invention is to provide an improved assembly of the character described in which the removability of the burner body from the supporting frame is not deleteriously effected by the heat of the burner, said burner body having novel centering means providing minimum frictional contact with the margins of the frame aperture in which it is positioned, said body also being provided with an integral bracket which is secured to the frame at a point remote from the burner body.

Another object of the invention is to provide an improved pilot burner assembly of the character described having a novel burner body mounting, whereby said burner body can be quickly removed from the frame by simply loosening a readily accessible securing member carried by the frame, there being means provided for preventing removal of the securing member from the frame, so that upon replacement of the burner body, the latter can be locked in operative position by simply tightening the securing member.

Another object of the invention is to provide an improved pilot burner assembly of the character described which is simple in construction, efficient in operation and otherwise well adapted for the purposes described.

Other and further objects will become apparent as the description proceeds, reference being had to the accompanying drawing illustrating one complete embodiment of the preferred form of the invention, and in which:

Figure 1 is an end elevational view of the improved pilot burner assembly;

Figure 2 is a vertical sectional view taken approximately along the line 2—2 of Figure 1; and

Figure 3 is an exploded side elevational view of the improved pilot burner assembly illustrating the removability therefrom of the burner body and of the thermoelectric generator.

Referring now to Figures 2 and 3 of the drawing, the numeral 10 indicates a frame, which in the illustrated embodiment takes the form of a U-shaped member made of flat stock. The frame 10 comprises a pair of spaced parallel arms 11 and 12 which are connected at one end by an integral transverse member 13. The frame 10 may have a pair of L-shaped brackets 14 and 15 fixed, as by brazing, to opposite edge portions of the free end portions of the bar members 11 and 12. The brackets 14 and 15 preferably have apertured parallel arms 16 and 17, respectively, which are positioned between and are contiguous with the edges of the bars 11 and 12, said brackets also having aligned supporting arms or lugs 18 and 19, respectively, which project outwardly in opposite directions as shown.

The arm 11 is formed with a circular aperture 20 therein adjacent its free end, and the arm 12 is formed with a threaded aperture 21 preferably coaxial with the aperture 20. A spud 22 having an elongated tip 23 is removably threaded into the aperture 21. The tip 23 is provided with angularly disposed fuel orifices 24 the axes of which intersect at a focus spaced beyond said tip. The spud 22 is internally threaded to removably receive the connecting nut 25 of a fuel supply line 26.

A tubular pilot burner body 27 has an open lower end 28 and is provided with radial burner ports 29 and 30 at its opposite end, said ports being connected by a slit 48. The combined cross-sectional area of the ports 29 and 30 and slit 48 is substantially smaller than that of the

open lower end 28 of the burner body. An L-shaped bracket 31, which may also be made of flat stock, has an extent 32 formed with an aperture 33 in which the burner body 27 may be press fitted and fixed, as by brazing, said arm preferably projecting normal to the axis of the burner body. The arm 32 is also formed with a second aperture 34 for a purpose which will become apparent hereinafter. The bracket 31 has an extent 35 which is normal to the extent 32 and is formed with a central slot 36 which extends inwardly from the free end of said extent.

The burner body 27 and its bracket 31 are normally positioned as shown in Figures 1 and 2, the burner body being positioned coaxially within the aperture 20 of the frame arm 11, with the extent 32 of the bracket 31 overlying said arm, and with the extent 35 of said bracket positioned flat against the transverse member 13 of the frame 10. It will be noted that the burner body 27 has a frusto-conical external surface portion 37 within the aperture 20 to provide accurate centering of the burner body. The larger end of the frusto-conical portion 37 has a diameter substantially equal to the diameter of the aperture 20 and preferably contacts the margins of said aperture at the upper end of said aperture only. Accurate centering is thus provided with a minimum of surface contact between the burner body and the wall surface of the aperture 20, thereby preventing binding of the burner body in said aperture.

A securing member, which may take the form of a screw 38, is threaded through a suitable aperture in the transverse wall or bar 13 of the frame 10. The screw 38 normally extends within the slot 36 of the bracket 31 as shown in Figures 1 and 2, with its head engaging the portions of the bracket at the margins of said slot to securely clamp the bracket to the frame 10. The screw 38 projects inwardly from the inner surface of the wall 13, and the threads of said screw are preferably burred, as at 39, to prevent inadvertent removal of the screw from the wall 13, while permitting loosening of said screw sufficient to release the bracket 31. It is apparent that loosening of the screw 38 permits the burner body 27 to be lifted axially out of the aperture 20, and as the bracket 31 is lifted therewith, the slotted extent 35 of the bracket is withdrawn from around the screw 38.

As shown in Figure 2, the inner diameter of the burner body 27 is substantially larger than the diameter of the tip 23 of the spud, and said tip projects coaxially a substantial distance within the open lower end of the burner body to provide an annular air inlet passage 40 within the burner body and surrounding the spud tip. The passage 40 freely communicates with the surrounding atmosphere, since the end 23 of the burner body is spaced a substantial distance from the arm 12 as well as from the main body portion of the spud 22, as shown.

As will be understood, injection of fuel through the spud 22, and more particularly the angularly disposed fuel orifices 24 thereof, causes the streams of fuel injected to converge at a focal point within the burner body 27 thereby reducing the velocity of the fuel for transformation to a static pressure head. This effect is further aided by the fact that the combined cross-sectional area of the outlet ports 29 and 30 together with their connecting slit 48 is less than that of the open lower end 28 of the burner body thereby tending to create a back pressure within the burner body 27. Simultaneously the amount of primary air entrained through the annular opening 40 is automatically controlled independently of the size of such air opening. The result is a discharge of a proper mixture of air and fuel from the outlet ports affording stable, steady flame for heating of the thermocouple 43 under a wide range of variation in fuel pressure and ambient operating temperature.

The arm 11 of the frame 10 is also provided with an aperture 41, and the arm 12 has a threaded aperture 42, said apertures being in alignment and providing means for removably mounting a thermoelectric generator, such

as the thermocouple 43, in coaxial relationship with the burner body 27. The thermocouple 43 projects through the apertures 34, 41 and 42, having an annular shoulder 44 abutting the underside of the bar 11 to accurately position said couple axially with respect to the burner body 27, said couple also being provided with a connector nut 45 threaded into the aperture 42 to removably anchor the couple in operative position. The thermocouple has a lead 46 projecting from the connector nut 45, said lead being preferably of the concentric type having a grounded tubular outer conductor and a concentric inner conductor in insulated relation within the outer conductor. The thermocouple 43 is readily removable from the frame 10 by simply unscrewing the connector nut 45 and withdrawing the thermocouple axially through the aperture 42.

As shown in Figure 2, the flame port 30 of the burner body 27 is positioned to direct a flame at the upper end portion 47 of the thermocouple, this being the location of the hot junction of the thermocouple. The flame port 29 is positioned to direct an ignition flame toward the main burner (not shown) with which the improved pilot burner is associated. The slit 48 provides for immediate reignition upon extinguishment of the flame at one of said ports as long as there is a flame at the other port.

The coaction of the portion 37 of the burner body 27 with the aperture 20 provides accurate centering of the burner body with respect to the spud tip 23, and the superimposed relationship of the bracket arm 32 on the bar 11 accurately positions said burner body coaxially with respect to said aperture, and the tip 23, while at the same time insuring that the proper longitudinal relationship between said burner body and the spud tip 23 is maintained at all times. Maintenance of these relationships automatically provides the proper annular air inlet passage 40. The disposition of the bracket 31, with the screw 38 in the slot 36, accurately positions the burner body in the proper position of axial rotation so that the ports 29 and 30 are properly directed toward the main burner and the thermocouple, respectively.

It is apparent that the spud 22, the burner body 27, and the thermocouple 43 can be readily removed from the frame 10 individually, and without disturbing either of the other of said elements. When it is desired to clean the burner body, it is only necessary to loosen the screw 38 and lift the burner body and its bracket 31 from the frame 10. Replacement of the burner body and its bracket is equally simple, being the reverse of the removal operation.

The coaction of the portion 37 of the burner body with the frame aperture 20 not only provides accurate centering of the burner body, but it also provides for minimum frictional contact between the burner body and the margins of the aperture 20. This prevents binding of the burner body in said aperture and therefore permits easy removal of said body. Another feature contributing to ease of removal of the burner body is the fact that the securing screw 38 is remote from the burner body and is not subjected to high concentrations of heat. Thus, the screw 38 does not tend to become frozen in operative position.

While the illustrated form of the invention is embodied in a pilot burner assembly of the type having an annular air intake passage, it is obvious that the invention has utility when embodied in other specific types of burner assemblies. The illustrated form of the invention is for the purpose of disclosure only, and it is not to be construed as imposing any unnecessary limitations on the claims. Various changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated as may come within the scope of the appended claims.

What is claimed as the invention is:

1. A pilot burner assembly comprising: A frame having a first portion formed with an opening and having a second portion spaced from said first portion; a spud carried by said second frame portion; a tubular burner body

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removably positioned in said frame opening substantially coaxial with said spud; a bracket on said burner body engaging said frame to position said burner body longitudinally with respect to said spud; and a connecting member releasably securing said bracket and hence said burner body to said frame.

2. A pilot burner assembly comprising: A frame having a first portion formed with an opening and having a second portion spaced from said first portion; a spud carried by said second frame portion in alignment with said opening; a tubular burner body having a removable centering fit within said frame opening; a bracket on said burner body engaging said frame to position said burner body longitudinally with respect to said spud and to also position said burner body coaxially with respect to said spud; means releasably securing said bracket and hence said burner body to said frame; and means on said first and second frame portions for receiving and positioning a thermoelectric generator adjacent and in coacting relationship with said burner body.

3. A pilot burner assembly comprising: A frame having a first portion formed with an aperture and having a second portion spaced from said first portion; a spud mounted on said other frame portion in alignment with said aperture; a tubular burner body removably positioned in said aperture, said burner body having a frusto-conical external surface portion within said aperture, the larger end of said frusto-conical surface portion having a diameter substantially equal to that of said aperture; a bracket on said burner body positioned in engagement with said frame in a manner to position said burner body longitudinally within said aperture so that said frusto-conical surface portion is positioned within said aperture with the larger end of said surface portion having a snug centering fit within one end of said aperture, the engagement of said bracket with said frame and the fit of the burner body within said aperture assuring coaxial alignment of said burner body with said spud in the proper longitudinal relationship; and connecting means releasably securing said bracket and hence said burner body to said frame.

4. A pilot burner assembly comprising: A U-shaped frame having a pair of spaced parallel arms and a transverse connecting member, one of said arms being formed with an aperture; a spud mounted on the other arm in alignment with said aperture; a tubular burner body removably positioned in said aperture; an L-shaped supporting bracket integral with and projecting normal to said burner body positioned on said first-mentioned arm and having a slotted angled end portion engaging said transverse frame member; and a securing screw threaded into said transverse frame member and positioned in the slot of said bracket end portion, the head of said screw releasably engaging said bracket end portion, whereby loosening of said screw permits axial withdrawal of said burner body from said frame aperture and simultaneous withdrawal of the slotted bracket end portion from said screw.

5. A pilot burner assembly comprising: A U-shaped frame having a pair of spaced parallel arms and a transverse connecting member, one of said arms being formed with an aperture; a spud mounted on the other arm in alignment with said aperture; a tubular burner body removably positioned in said aperture; an L-shaped supporting bracket integral with and projecting normal to said burner body positioned on said first-mentioned arm and having a slotted angled end portion engaging said transverse frame member; a securing screw threaded into said transverse frame member and positioned in the slot of said bracket end portion, the head of said screw releasably engaging said bracket end portion, whereby loosening of said screw permits axial withdrawal of said burner body from said frame aperture and simultaneous withdrawal of the slotted bracket end portion from said screw; and means on said screw preventing removal of said screw from said frame.

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6. The combination with an assembly comprising, a supporting frame, a thermoelectric generator supported by said frame, a spud formed with at least one orifice and supported by said frame, and a burner body having an open end portion for positioning in operative relation with respect to said spud and affording a primary air opening, said burner having a flame port for heating of said thermoelectric generator; of bracket means on said burner body for cooperation with said frame to position said burner body in said operative relation with respect to said spud and with respect to said thermoelectric generator for heating of said thermoelectric generator by a flame at said flame port, said bracket means and burner body being readily removable from said operative position without disturbance of either of said spud and thermoelectric generator.

7. The combination with an assembly comprising, a supporting frame, a thermoelectric generator supported by said frame, a spud formed with at least one orifice and supported by said frame, and a burner body having an open end portion for longitudinal and transverse positioning in operative relation with respect to said spud and affording a primary air opening, said burner body having a flame port radially disposed with respect to the longitudinal axis of said body for heating of said thermoelectric generator, of bracket means on said burner body for cooperation with said frame to position said body longitudinally and transversely in said operative relation with respect to said spud and rotationally with respect to said thermoelectric generator for heating of the latter by a flame at said radially disposed flame port, said bracket means and burner body being readily removable from said operative position with respect to said spud and generator.

8. The combination with an assembly comprising, a supporting frame, a thermoelectric generator supported by said frame, a spud formed with at least one orifice and supported by said frame, and a burner body having an open end portion for positioning in operative relation with respect to said spud and affording a primary air opening, said burner having a flame port for heating of said thermoelectric generator, of bracket means on said burner body for cooperation with said frame to position said burner body in said operative relation with respect to said spud and with respect to said thermoelectric generator for heating of said thermoelectric generator by a flame at said flame port, said bracket means and burner body being readily removable from said operative position and connections between said thermoelectric generator and said frame permitting ready removability of said generator from said frame without disturbance of either said burner body and said spud.

9. A pilot burner assembly comprising, a frame member having first and second portions angularly disposed to each other, said first portion being formed with an aperture having an axis generally parallel to said second portion, a burner body removably positioned within and substantially coaxial with respect to said aperture, a supporting bracket on said burner body and having a first portion positioned on said frame first portion and a slotted second portion engaging said frame second portion, and adjustable securing means on said frame having a portion disposed within the slot of said bracket and having a portion releasably engaging said second bracket portion whereby release of said securing means permits axial withdrawal of said burner body from said frame aperture and simultaneous withdrawal of said bracket from said frame and from said securing means.

10. A pilot burner assembly comprising, a frame member having first and second portions disposed at substantially right angles to each other, said first portion being formed with an aperture having an axis generally parallel to said second portion, a burner body removably positioned within and substantially coaxial with respect to said aperture, a supporting bracket on said burner body and having a first portion positioned on said frame first

portion and a slotted second portion engaging said frame second portion, and adjustable securing means on said frame having a portion disposed within the slot of said bracket and having a portion releasably engaging said second bracket portion whereby release of said securing means permits axial withdrawal of said burner body from said frame aperture and simultaneous withdrawal of said bracket from said frame and from said securing means.

11. A pilot burner assembly comprising, a frame member having first and second portions angularly disposed to each other, said first portion being formed with an aperture having an axis generally parallel to said second portion, a burner body removably positioned within and substantially coaxial with respect to said aperture, a supporting bracket on said burner body and having a first portion positioned on said frame first portion and a slotted second portion engaging said frame second portion, and a securing screw threaded into said frame second portion and positioned within the slot of said bracket second portion, the head of said screw releasably engaging said second bracket portion whereby release of said screw permits axial withdrawal of said burner body from said frame aperture and simultaneous withdrawal of said bracket from said frame and from said screw.

12. A pilot burner assembly comprising, a frame member having first and second portions disposed at substantially right angles to each other, said first portion being formed with an aperture having an axis generally parallel to said second portion, a tubular burner body removably positioned within and substantially coaxial with respect to said aperture, an L-shaped supporting bracket integral with said burner body and having a first portion projecting normal to said burner body axis positioned on said frame first portion and a second portion disposed at substantially right angles to said bracket first portion and formed with a slotted end portion engaging said frame

second portion, and a securing screw threaded into said frame second portion within the slot of said bracket end portion, the head of said screw releasably engaging said bracket end portion whereby loosening of said screw permits axial withdrawal of said burner body from said frame aperture and simultaneous withdrawal of the slotted bracket end portion from said screw.

13. A pilot burner assembly comprising, a frame member having first and second portions disposed at substantially right angles to each other, said first portion being formed with an aperture having an axis substantially parallel to said second portion, a tubular burner body removably positioned in said aperture and having an axis coincidental with that of said aperture, an L-shaped supporting bracket integral with said burner body and having a first portion projecting normal to said burner body axis positioned on said frame first portion and a second portion disposed at substantially right angles to said bracket first portion and formed with a slotted end portion engaging said frame second portion, a securing screw threaded into said frame second portion within the slot of said bracket end portion, the head of said screw releasably engaging said bracket end portion whereby loosening of said screw permits axial withdrawal of said burner body from said frame aperture and simultaneous withdrawal of the slotted bracket end portion from said screw, and means on said screw preventing removal of said screw from said frame.

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