July 16, 1957 C. E. HAJNY 2,799,331

PILOT BURNER

Original Filed July 18, 1948

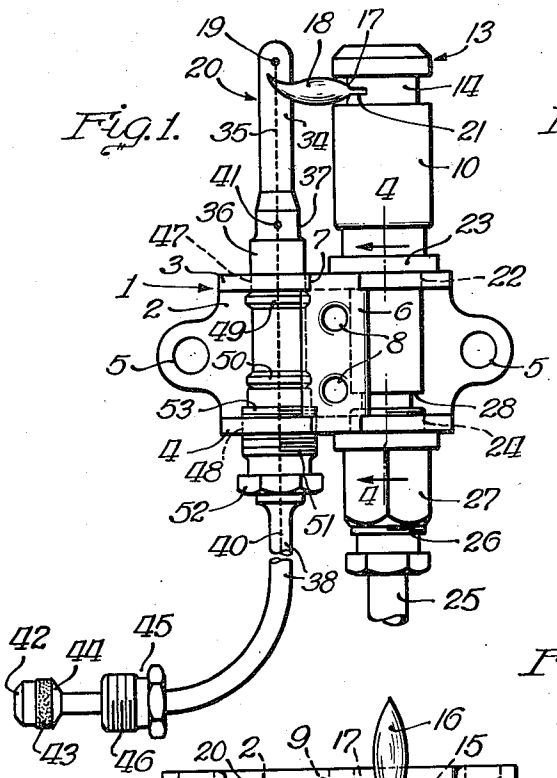


Fig. 1.

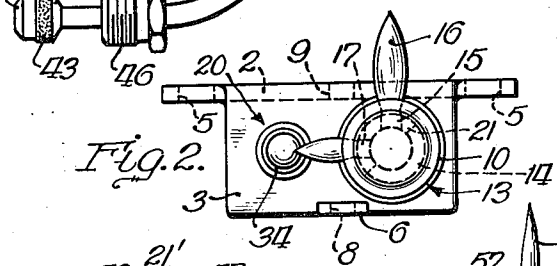


Fig. 2.

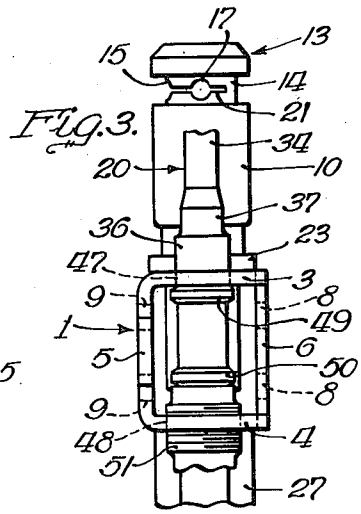


Fig. 3.

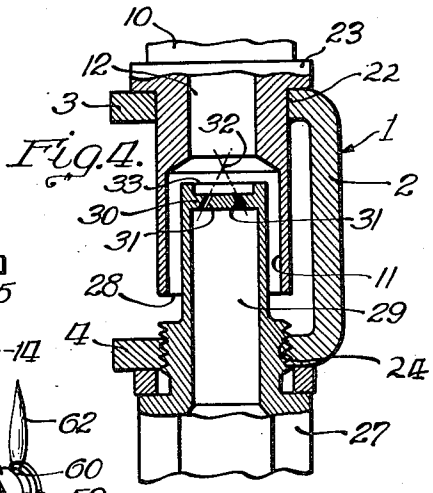


Fig. 4.

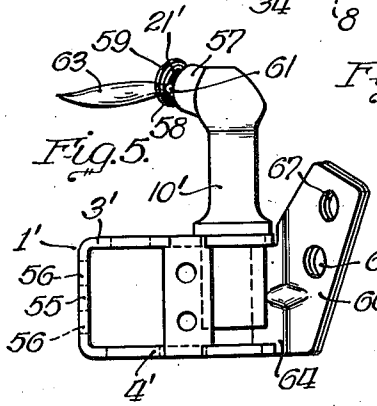


Fig. 5.

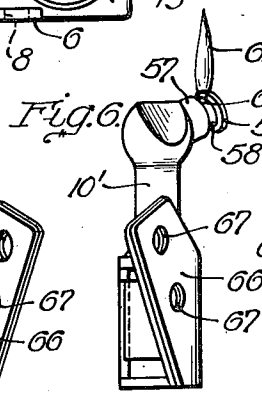


Fig. 6.

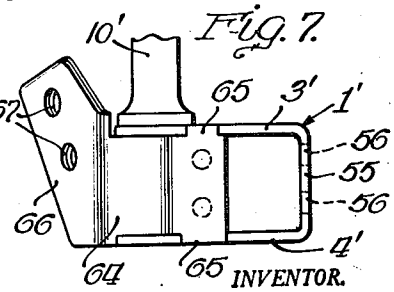


Fig. 7.

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PILOT BURNER

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5 Claims. (Cl. 158—123)

This invention is a continuation of my application Serial No. 39,339, now abandoned, filed July 18, 1948, and relates, in general, to gas burners, and has particular relation to an improved pilot burner for use with various types of gas appliances.

One of the main objects of the invention is to provide an improved form of pilot burner having an improved form of air inlet; more particularly, a primary air inlet which extends peripherally about the spud of the burner and is formed by supporting the spud in position within the adjacent end of the pilot burner body and with a clear or unobstructed channel type peripheral air inlet space therebetween.

Another object of the invention is to provide an improved form of pilot burner for use with a thermoelectric generator and an improved form of bracket or mounting means for the pilot burner and thermoelectric generator with which constant flame characteristics of predetermined character and in appropriate position to assure ignition of the main burner and proper heating of the hot junction means of the thermoelectric generator are at all times effectively maintained.

Another object of the invention is to provide an improved form of mounting for the pilot burner, and an improved form of mounting for the thermoelectric generator which adapts itself to the pilot burner mounting, and which mountings maintain the thermoelectric generator effectively at all times in the desired relation with respect to the thermoelectric generator heating flame of the pilot burner and the main burner igniting flame of the pilot burner in the desired relation with respect to the main burner.

Another object of the invention is to provide an improved pilot burner of the character described wherein a turbulent flow is maintained at all times, although each individual gas stream might be in a streamline condition; also a pilot burner wherein, in operation, the intersection of the two or more streams of fluid fuel causes the fluid fuel to fan out to provide a large, turbulent mass within which the air admitted through the annular air inlet opening is intimately intermixed, and wherein a turbulent condition is established in proximity to the position where the air is entrained and the resulting fuel mixture then passes to flame position remote from the intersection of the fuel streams.

Another object of the invention is to provide an improved pilot burner of the character described wherein constant flame characteristics of predetermined character are maintained over the complete range of operating pressures and any operating temperature which assures lighting of the main burner and proper heating of the hot junction of the thermoelectric generator under all operating conditions and against false or erroneous shut-off of the fuel by the thermoelectric safety means, such as occurred heretofore in the art where proper heating of the thermoelectric generator was not maintained notwithstanding the fact that the system was not in condition requiring shut off of the fuel supply by the thermoelectric safety control means.

Another object of the invention is to provide an improved form of pilot burner of the character described having the novelty and advantages set forth and characterized by its simplicity in construction, its economy in manufacture, its adaptability for use with different appliances, and its effectiveness for accomplishing the results set forth.

Further objects and advantages of the invention will appear from the following detailed description, taken in connection with the accompanying drawing in which:

Figure 1 is a front elevational view of one form of pilot burner embodying the present invention;

Figure 2 is a top plan view of the pilot burner shown in Figure 1;

Figure 3 is an end view of the pilot burner shown in Figure 1;

Figure 4 is a fragmentary axial sectional view, partially in elevation, taken on the line 4—4 of Figure 1;

Figure 5 is a front elevational view of another form of pilot burner embodying the present invention;

Figure 6 is an end view of the pilot burner shown in Figure 5; and

Figure 7 is a fragmentary back view of the pilot burner shown in Figure 5.

Referring now to the drawings, the device shown in Figures 1 to 4, inclusive, comprises a bracket or mounting 1 of generally channel or U-shaped section and having a back wall 2, an outstanding upper arm 3 and an outstanding lower arm 4 in parallel spaced relation with respect to the arm 3. The arms 3 and 4 constitute spaced pilot burner mounting parts, it being understood that the bracket may have only one arm provided with such parts or a plurality of arms as shown in the illustrated embodiment of the invention. The bracket 1 may be made of cold rolled steel, or other suitable material, and may be cold rolled or of other suitable form.

The ends of the back wall 2 are shown with apertured mounting lugs 5 for mounting the bracket in the desired position on a suitable support. The lugs 5 have apertures as shown in the drawing, through which screws or other suitable attachment means may be passed and screwed into or otherwise engaged with various forms of supports (not shown) to attach the bracket in any desired one of various positions.

A strip 6 has scarfed ends 7 secured by pressed fit or by brazing, soldering or otherwise in notches in the outer edges of the arms 3 and 4. The shoulders formed by scarfing the ends of the strip 6 engage inner surfaces of the arms 3 and 4, and constitute spacing means between the outer ends of these arms. The strip 6 may have apertures at 8, and the back wall 2 may have similar apertures 9 in register with the apertures 8. The apertures 8 and 9 may, if desired, be used for attaching the brackets in various positions to suitable supports by screws or other attachment means.

The pilot burner body 10 is of generally tubular form, having at its lower end a passage 11 of enlarged diameter with a reduced diameter passage 12 extending upwardly from the passage 11. The fundamental mixing and injecting power of the plurality of angular fluid fuel streams according to the present invention as will hereinafter appear, eliminates the need of a venturi in the burner throat and provides for air intake of increased proportions. Therefore the passage 11 is shown devoid of venturi form, although this passage may be of venturi form within the scope of the present invention.

It is to be understood that the present invention is not limited to use with a multiple orifice spud. For example, a single orifice spud may be used with a venturi, a restricted air passage, and/or smaller port sizes. A single

orifice may be used with no constructional change for use with L. P. G. gases.

The particular tip 13 of the burner body selected for illustration has an annular groove 14 through which a port 15 opens radially outwardly from the outer end of the passage 12 for maintaining an ignition flame 16 for a main burner. A second port 17 opens outwardly from the passage 12 through the grooved part 14 of the burner tip for maintaining a pilot flame 18 for heating the hot junction 19 of the thermoelectric generator 20. In the illustrated embodiment of the invention, the port 17 is spaced approximately 90° from the port 15, although this may, of course, vary according to the position of the main burner relative to the hot junction of the thermoelectric generator. The ports 15 and 17 are connected by a slit 21 which extends circumferentially within the groove 14 whereby the ignition and thermoelectric generator heating flames 16 and 18 are joined together, making it impossible for either flame to burn without the other.

The lower end of the pilot burner body 10 is of externally reduced diameter, and extends through an opening 22 in bracket arm 3 and may have fixed pressed fit therein. An external flange or shoulder 23 of annular form on the pilot burner body 10 abuts the adjacent surface of the arm.

The lower bracket arm 4 has an internally threaded opening 24 coaxial with the opening 22. Fluid fuel, such, for example, as gas, for the pilot burner is supplied through a tube or pipe 25 joined by a suitable coupling member 26 to the burner inlet fitting 27. The coupling member 26 is screwed into the adjacent end of the inlet fitting 27, and the inlet fitting is screwed into the opening 24 with the spud or inner end thereof supported in position within the adjacent end of the burner body 10 and a peripheral or annular primary air inlet space 28 extending annularly between the exterior of the spud and the interior of the adjacent end of the pilot burned body.

The inlet fitting or spud 27 has an external nut-like portion of hexagonal or polygonal form for receiving a wrench or other suitable tool for applying and removing the spud. The coupling member 26 also has an external nut-like portion of polygonal form for receiving a wrench or other suitable tool for connecting the fuel supply tube to the inlet fitting and detaching the same therefrom. The fitting 27 has an internal passage 29 for receiving gas from the tube or pipe 25. The inner or jet end of the spud 27 has a transverse wall 30 provided with a plurality (two being shown) of orifices 31 which are directed at an angle to the axis of the fitting so that the two gas streams will intersect each other at 32.

With the gas streams intersecting at 32, a turbulent flow is maintained at all times, although each individual gas stream might be in a streamline flow condition. In operation, the intersection of the two or more streams of fluid fuel causes the fluid fuel to fan out to provide a large, turbulent mass within which the air admitted through the annular air inlet opening is intimately intermixed. A turbulent condition is established in proximity to the position where the air is entrained, and the resulting fuel mixture then passes to flame position remote from the intersection of the fuel streams.

As a result, constant flame characteristics of predetermined character are maintained over the complete range of operating pressures and any operating temperature. This assures lighting of the main burner and proper heating of the hot junction of the thermoelectric generator under all operating conditions and against false or erroneous shut-off of the fuel by the thermoelectric safety control means, such as occurred heretofore in the art where proper heating of the thermoelectric generator is not maintained notwithstanding the fact that the system is not in condition requiring shut-off of the fuel supply by the thermoelectric safety control means.

It is also believed that the angular streams of fuel striking together where they intersect at 32 removes energy and eliminates or reduces variations in pressure in the fuel mixture passing to flame position.

In the illustrated embodiment of the invention, the ends of the orifices 31 are shown countersunk at 33 into the end of the fitting 27 to avoid distortion of the ends of the orifices 31 by contact with the end of the fitting.

While the thermoelectric generator 20 may be of any other suitable form (thermocouple or thermopile), the one shown in the drawing is of the type shown and described in Oscar J. Leins Patent No. 2,126,564, August 9, 1938. It comprises an outer metallic tubular thermocouple member 34 and an inner metallic thermocouple member 35 disposed within the tubular thermocouple member and joined to the end thereof to form the hot junction 19.

A metallic tubular member or sleeve 36 is connected to the end of the tubular thermocouple member 34 to form a cold junction at 37, and a tubular lead conductor 38 is connected to the opposite end of the sleeve 36. An internally disposed lead conductor 40 extends through tubular lead conductor 38 and sleeve 36, and is connected to the inner thermocouple member 35 to form an inner enclosed cold junction 41. The opposite end of the conductor 40 has a terminal tip 42 insulated at 43 from an annular terminal 44 on the adjacent end of tubular conductor 38. A coupling sleeve or connector nut 45 freely surrounds the tubular conductor 38 and is threaded at 46 to be screwed into a cooperating part of a thermoelectric control device (not shown) to connect the conductors 38 and 40 in circuit with the electromagnet thereof, as well known in the art.

The bracket arm 3 has an opening 47 spaced laterally from the pilot burner mounting, and the bracket arm 4 has an internally threaded opening 48 in alignment or axial registration with the opening 47. The opening 48 is of larger diameter than the opening 47, and the sleeve 36 of the thermoelectric generator 20 has a pair of longitudinally spaced integral annular ribs or shoulders 49 and 50 on the external surface thereof. The shoulders 49 and 50 are of outside diameter that will pass freely through the opening 48 for insertion of the thermocouple into place in the bracket arms 3 and 4, as shown.

The outside diameter of at least the shoulder 49 is larger than the diameter of the opening 47 so as to abut the inner side of arm 3 in securing the thermocouple in place. A coupling member or compression nut and sleeve 51 loosely surrounds the conductor 38 and is adapted loosely to surround the adjacent end of the sleeve 36. The nut 51 has a polygonal portion 52 for engagement by a wrench or other suitable tool, and is threaded at 53 to be screwed into the opening 48. By screwing the nut 51 into the opening 48, its inner end abuts the shoulder 50 and forces the shoulder 49 against the inner side of arm 3, thus securing the thermocouple in place in the bracket. The thermocouple mounting adapts itself to the pilot burner mounting and positions the hot junction of the thermocouple where it will at all times be properly heated by the flame 18.

The advantages of the properly dimensioned, unobstructed peripheral air channel are:

(1) The chances of clogging a circumferential channel by dust and lint is much less than would be the case with air holes or slots.

(2) It is almost impossible to ignite the pilot gas as it issues from the spud, even when a flame is played around the air intake.

(3) Where two or more orifices are used, the clear channel peripheral air inlet permits the location of these orifices in any position circularly or azimuthally around the main axis of the air channel or of the orifice spud axis with any such rotation in position having no effect on the amount of primary air inspiration, because of said circular and unobstructed structure. Azimuthal variations in multiple orifice position occur for such reasons as varying degree of tightness of the orifice spud

in the main pilot body or in mechanical variations during production.

The embodiment of the invention shown in Figures 5, 6, and 7, is, in general, similar to the embodiment shown in Figures 1 to 4 inclusive. In this case, the U-shaped bracket 1', instead of having a back wall, has an end wall 55 provided with apertures 56. The upper end of the pilot burner body 10' has a tip part 57 secured thereto and extending obliquely therefrom. The outer end of the tip part 57 is of reduced diameter at 58 and has a tip shield 59 secured on its outer end as by pressed fit forming an annular groove between the shield 59 and the outer end of the inner enlarged portion of the tip part.

Ports 60 and 61 open radially outwardly within the groove thus formed; the port 60 maintaining an ignition flame 62 for a main burner, and the port 61 maintaining a pilot flame 63 for heating the hot junction of the thermoelectric generator. As before, the ports 60 and 61 are connected by a slit 21' which extends circumferentially within the groove whereby the ignition and thermoelectric generator heating flames 62 and 63 are joined together, making it impossible for either flame to burn without the other. Instead of a slit, the ports may be connected by intervening smaller holes to act as carrier ports.

A bracket member 64 is fixed by pressed fit, brazing, soldering or otherwise edgewise between the arms 3' and 4' at one side of the bracket 1', and has integral lugs 65 secured in notches in the adjacent edges of the arms 3' and 4'. The bracket member 64 has an obliquely turned lug 66 provided with apertures 67 for mounting the bracket in the desired position upon a suitable support. The remaining parts of the device shown in Figures 5, 6, and 7 are similar to the parts of the preceding embodiment of the invention, and are designated by primed reference characters corresponding with the reference characters used in Figures 1 to 4, inclusive.

The embodiments of the invention shown in the drawings are for illustrative purposes only, and it is to be expressly understood that such drawings and the accompanying specification are not to be construed as a definition of the limits or scope of the invention, reference being had to the appended claims for that purpose.

I claim:

1. In a device of the class described, in combination, a supporting bracket of generally U-shaped section having integral parallel first and second arms, a pilot burner body having a tubular inlet end supported in a first opening in said first arm, a fuel inlet fitting supported in a first opening in said second arm and projecting into the tubular inlet end of said pilot burner body in annularly spaced relation thereto, said first arm having a second opening, said second arm having a second opening of larger diameter than the second opening in said first arm, a thermoelectric generator having first and second spaced annular shoulders of sizes which will pass through the second opening in said second arm but with the first shoulder of a size incapable of passing through the second opening in said first arm so that it will seat against said first arm adjacent to said second opening, and a compression nut screwed through the second opening in said second arm for endwise abutment with the second shoulder on said thermoelectric generator to secure the thermoelectric generator in place in relation to the pilot burner body.

2. In a device of the class described, in combination, a supporting bracket of generally U-shaped section having a first arm provided with a pair of spaced openings and having a second arm parallel with and spaced from said first arm, a pilot burner head having a tubular part inserted through one of the openings in the first arm from the outer side of said arm and having at least one flame port, an abutment rigidly joined to said pilot burner head and engageable with the outer side of said first arm by insertion of the tubular part through one of said openings to limit the movement of the tubular part through said opening and to position the flame port in predetermined relation to said arm, a thermoelectric generator inserted through the other opening of said first arm from the inner side of said arm, said thermoelectric generator having at least one hot junction, an abutment rigidly joined to said thermoelectric generator and engageable with the inner side of said first arm by insertion of the thermoelectric generator through the other opening of said arm to limit the movement of the thermoelectric generator through said other opening and to position the hot junction in predetermined relation to said flame port, said openings being spaced an amount to provide a predetermined spacing of said thermoelectric generator from said burner head, and a fuel inlet fitting supported in an opening in said second arm and projecting coaxially into the tubular part of the pilot burner head with an annular air inlet passage therebetween, said fuel inlet fitting having a plurality of fuel orifices arranged with their axes angularly disposed relative to each other for directing fuel into the pilot burner head in a plurality of converging streams which intersect at a focus within the pilot burner head and beyond the adjacent end of the fuel inlet fitting.

3. In a device of the class described, in combination, a supporting bracket of generally U-shaped session having a first arm provided with a pair of spaced openings and having a second arm parallel with and spaced from said first arm, a pilot burner head having a tubular part inserted through one of the openings in the first arm from the outer side of said arm and having at least one flame port, an abutment rigidly joined to said pilot burner head and engageable with the outer side of said first bracket arm by insertion of the tubular part through one of said openings to limit the movement of the tubular part through said opening and to position the flame port in predetermined relation to said arm, a thermoelectric generator inserted through the other opening of said first arm from the inner side of said arm, said thermoelectric generator having at least one hot junction, an abutment rigidly joined to said thermoelectric generator and engageable with the inner side of said first arm by insertion of the thermoelectric generator through the other opening of said arm to limit the movement of the thermoelectric generator through said other opening and to position the hot junction in predetermined relation to said flame port, said openings being spaced an amount to provide a predetermined spacing of said thermoelectric generator from said burner head, and a fuel inlet fitting supported on said second arm and projecting coaxially into the tubular part of the pilot burner head with an annular air inlet passage therebetween.

4. In a device of the class described, in combination, a supporting bracket of generally U-shaped section having a first arm provided with a pair of spaced openings and having a second arm parallel with and spaced from said first arm, said second arm having a pair of openings one in axial alignment with each of the openings in the first arm, a pilot burner head having a tubular part inserted through one of the openings in the first arm from the outer side of said arm and having at least one flame port, an abutment rigidly joined to said pilot burner head and an engageable with the outer side of said first arm by insertion of the tubular part through one of said openings to limit the movement of the tubular part through said opening and to position the flame port in predetermined relation to said arm, a thermoelectric generator inserted through the other opening of said first arm from the inner side of said arm, said thermoelectric generator having at least one hot junction, an abutment rigidly joined to said thermoelectric generator and engageable with the inner side of said first bracket arm by insertion of the thermoelectric generator through the other opening of said arm to limit the movement of the thermoelectric generator

through said other opening and to position the hot junction in predetermined relation to said flame port, said openings being spaced an amount to provide a predetermined spacing of said thermoelectric generator from said burner head, a fuel inlet fitting supported in one of the openings in said second arm and projecting coaxially into the tubular part of the pilot burner head with an annular air inlet passage therebetween, and a nut screwed into the other opening in said second arm into engagement with a second abutment on the thermoelectric generator to clamp the first-mentioned abutment on the thermoelectric generator in engagement with the inner side of the first-mentioned arm of the bracket.

5. In a device of the class described, in combination, a supporting bracket having first and second spaced arms each formed with an opening, a pilot burner body carried by said first arm and having a tubuler inlet end, a fuel inlet fitting supported in the opening in said second arm and projecting into the tubular inlet end of said pilot burner body in annularly spaced relation thereto, a thermoelectric generator extending into the opening in said first arm and having a first shoulder means in abutment with said first arm adjacent the opening therein, said generator also having a second shoulder means, and clamping means in threaded engagement with said second arm and engaging said second shoulder means to secure said thermoelectric generator in operative position with respect to said pilot burner body.

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