Aug. 7, 1962 S. L. KILE ETAL 3,048,216

GAS BURNER

Original Filed April 8, 1955

FIG. 2.

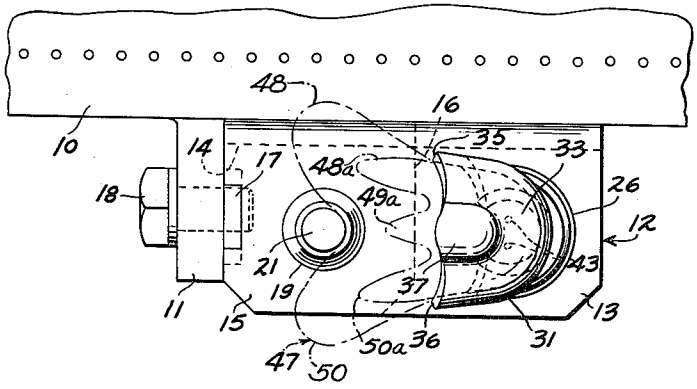


FIG. 3.

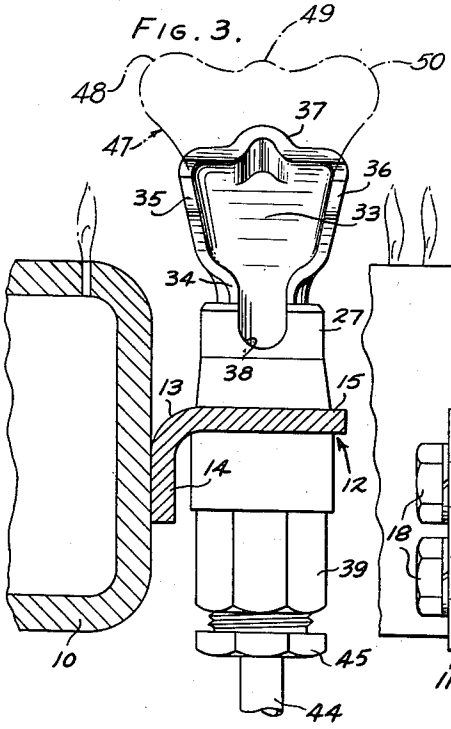
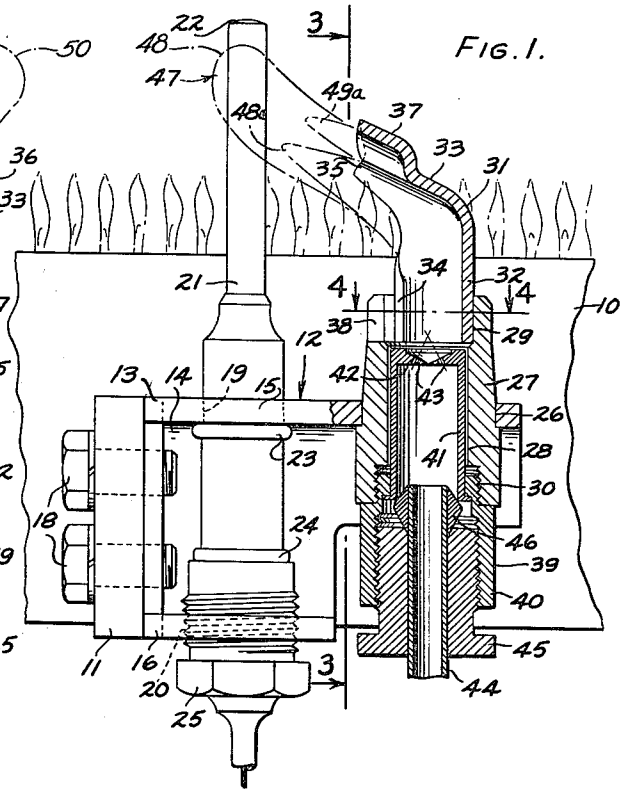


FIG. 1.



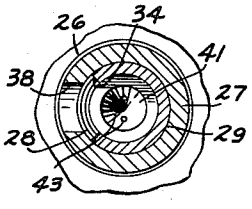


FIG. 4.

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United States Patent Office 3,048,216 Patented Aug. 7, 1962

3,048,216

GAS BURNER

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Continuation of application Ser. No. 500,210, Apr. 8, 1955. This application July 20, 1959, Ser. No. 828,412
5 Claims. (Cl. 158—113)

This invention relates to improvements in fuel burners and more particularly to gaseous fuel burning pilot burners. This application is a continuation of our application Serial No. 500,210, filed April 8, 1955, now abandoned.

In fluid fuel burning apparatus, it is standard practice to provide a pilot burner which is mounted in igniting relationship with one or more main burners as well as in heating relationship with a thermoelectric generator powering a safety shut-off device. Pilot burners necessarily are of small capacity and are therefore relatively small in size, and operation of prior pilot burners has been beset by a number of difficulties. For example, entrainment of lint or other foreign matter in the primary air supplied to certain burners has tended to clog the restricted passages thereof and render said burners inoperative. Other prior burners are unsatisfactory from the standpoint that normal changes in the pressure of the fuel supplied thereto tend to cause extinguishment thereof, while still other burners are unstable in that they are susceptible to extinguishment by even small drafts and therefore have limited application.

With the above in mind it is a general object of the present invention to provide an improved gaseous fuel burner, for example, a pilot burner which is non-clogging in character, said burner being devoid of any restricted air inlets, flame ports, or other passages in which lint or other foreign matter can collect.

Another object of the invention is to provide an improved burner of the class described which affords a stable flame over the entire range of normal variations in the pressure of the fuel supplied thereto.

Still another object of the invention is to provide an improved burner of the aforementioned character which is substantially immune to drafts, said burner being so constructed as to afford a shield for at least a portion of the base of the flame thereof.

A further object of the invention is to provide an improved burner of the class described having an open discharge end provided with a deflector portion positioned for impingement thereagainst of a burning fuel-air mixture, said deflector being formed in a manner to channel said burning mixture into a plurality of streams affording a fan-shaped flame having a corresponding plurality of divergent flame tips for respective igniting coaction with one or more main burners and heating coaction with a thermoelectric generator.

Other objects and advantages of the invention will become apparent as the description proceeds, reference being had to the accompanying drawing illustrating one embodiment of the invention. In the drawing:

FIGURE 1 is a fragmentary elevational view showing a pilot burner constructed in accordance with the teachings of the present invention and incorporated into a pilot burner-thermoelectric generator assembly operatively related to a main burner, said pilot burner being shown in vertical section;

FIGURE 2 is a fragmentary plan view of the parts shown in FIGURE 1;

FIGURE 3 is a fragmentary vertical sectional view taken along the line 3—3 of FIGURE 1; and

FIGURE 4 is a fragmentary sectional plan view of the improved burner taken along the line 4—4 of FIGURE 1.

Referring more particularly to FIGURES 1 and 2 of the drawing, the numeral 10 indicates a main burner formed with a laterally projecting lug 11 on which is mounted a pilot burner-thermoelectric generator assembly 12. The assembly 12 comprises a channel shaped frame 13 having a side plate 14 and a pair of spaced parallel flanges 15 and 16 normal to said side plate. The flanges 15 and 16 are notched at one end to fixedly receive, as by staking, opposite end portions of an end plate 17 which is apertured to threadedly receive a pair of mounting screws 18 extending through the lug 11.

The flange 15 is formed with an aperture 19, and the flange 16 is formed with a threaded aperture 20 aligned with the aperture 19, said apertures being adapted to removably receive a thermoelectric generator, for example a thermocouple 21 having a hot junction 22. The thermocouple 21 is formed with a pair of spaced annular ribs 23 and 24, the rib 23 being adapted to engage the flange 15, and the rib 24 being engageable by a connector nut 25 surrounding the thermocouple 22 and threaded into the aperture 20 to secure said thermocouple in the operative position shown.

The flange 15 is formed with a second aperture 26 in which a supporting sleeve or bushing 27 is fixed, as by brazing. The bushing 27 is provided with an axial bore 28 having a counterbore 29 at one end and a threaded counterbore 30 at the opposite end. A tubular burner body 31 has one end telescopically seated within the counterbore 29 and fixed therein, as by brazing. The burner body 31 has a substantially cylindrical portion defining a tubular throat 32 having an open outer end affording a flame port, said burner body being formed at its outer end with a substantially flat deflector portion 33 extending obliquely from one side of said burner body across the outer end of the throat 32 and projecting laterally of said throat at least substantially to, and preferably beyond, the opposite side of said burner body toward the thermocouple 21. The burner body 31 is formed with a longitudinal opening or slot 34 therethrough extending the full length of the side thereof opposite that from which said deflector portion extends. The slot 34 may have, within the throat portion 32, a width equal to approximately one fourth of the circumference of said throat as shown most clearly in FIGURE 4. Adjacent the deflector portion 33, the opening 34 is enlarged and is defined by a pair of off-set flanges 35 and 36 depending from the side edges of the deflector portion 33. In the portion thereof projecting laterally from the throat 32, the deflector 33 is preferably formed with an upwardly offset portion 37. The bushing 27 is formed with a longitudinal slot 38 which may have a generally U-shaped conformation as shown in FIGURE 3 and which extends the length of the counterbore 29 as shown most clearly in FIGURE 1, said slot registering with the opening 34 in the adjacent portion of the throat 32.

Means is provided for supplying gaseous fuel to the end portion of the burner body 31 disposed within the counterbore 29, said means comprising a spud fitting 39 threaded into the counterbore 30 as shown in FIGURE 1. The spud 39 may include a screw machine part 40 and a tubular tip 41 having an end wall 42 adjacent the inner end of the burner body 31, said end wall having a countersunk outer surface and being formed with a pair of fuel inlet orifices 43. The orifices 43 are preferably diametrically aligned and are angularly disposed with respect to each other and are equiangularly disposed with respect to the axis of the throat 32. In FIGURE 1 the tip member 41 is rotated 90° to more clearly show the orifices 43, the preferred position of said orifices being shown in FIGURES 2 and 4. The size and the angularity of the orifices 43 preferably vary in accordance with the

B.t.u. content of the fuel to be burned. Fuel is supplied to the spud **39** through a fuel supply conduit **44** extending into the fitting **40** and sealingly secured therein by means of a nut **45** and a compression ring **46** in a manner well known in the art.

In the operation of the improved burner, fuel from the inlet orifices **43** is injected into the inner end of the burner **31** in a pair of fuel streams which converge as indicated by the dot and dash lines in FIGURE 1. The slot **38** and the longitudinal opening **34** expose the interior of the burner body **31** to the ambient atmosphere throughout the length thereof, and as a result, the fuel streams emitted from the orifices **43** begin entrainment of air immediately adjacent said orifices. The intersection of the converging fuel streams, reduces the velocity of said fuel streams and produces turbulence which results in substantial mixing of said fuel and air. As this fuel-air mixture moves axially within the throat **32**, additional air is entrained therein by virtue of the continual exposure of said mixture to the ambient atmosphere provided by the longitudinal opening **34**.

On ignition of the fuel-air mixture, a portion of the base of the flame **47** produced thereby extends into the upper portion of the throat **32**. The burning mixture impinges against the deflector portion **33** and is deflected laterally along the inner surface of the deflector, the velocity thereof being thus further reduced. The burning fuel-air mixture fans out within the deflector, entraining still further amounts of air, and by virtue of the shape of the outer end of the burner body **31**, including the off-set side flanges **35** and **36** and the central offset portion **37**, said burning mixture is channelled into a plurality of streams to impart to the flame **47** a fan-shape including a plurality of separated divergent flame tips **48**, **49** and **50** indicated in dot and dash lines in FIGURE 3, there being a conical flame base portion for each of said tips indicated in dot and dash lines by the numerals **48***a*, **49***a* and **50***a* in FIGURES 1 and 2. In the embodiment of the invention shown, the flame tip **48** projects laterally over a portion of the main burner **10** into igniting proximity thereto. The flame tip **49** is directed toward and wipes the outer surface of the thermocouple **21** adjacent the hot junction **22** thereof for heating coaction therewith. If desired, the flame tip **50** may also be utilized for ignition of a second main burner which may be disposed on the opposite side of the assembly **12** from the main burner **10**.

As aforementioned, a portion of the base of the flame **47** is located within the upper portion of the throat **32** and is therefore protected from drafts tending to extinguish said flame, particularly drafts from the side opposite the thermocouple **21** or from the sides protected by the flanges **35** and **36**. The combination of the dual orifice fuel inlet means with the novel burner body structure provides the flame **47** with marked stability characteristics over the entire range of pressures which normally occur in the fuel supplied by the conduit **44**. Equally important, however, is the fact that the improved burner has no restricted ports or passages to present clogging problems. Any lint or foreign matter drawn into the burner body **31** through the opening **34** is entrained with the fuel-air mixture and is burned and ejected from the open outer end of the burner body.

The specific illustrations and corresponding description herein set forth are used for the purpose of disclosure only and are not intended to impose unnecessary limitations on the claims, or to confine the invention to a particular use. 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 burner comprising, a burner body formed with a tubular wall portion having a substantially cylindrical inner surface defining a throat portion having a fuel inlet portion at its inner end and having an open outer end terminating in a flame port, fuel inlet means closing said fuel inlet end of said throat portion and having fuel metering orifice means having a cross-sectional area substantially less than one-sixth the cross-sectional area of said throat portion for directing a stream of fuel into said burner body from said inlet toward said flame port, said tubular wall being formed at one side with a longitudinal slot therethrough extending outwardly from an inner end adjacent said fuel inlet to an open outer end at said flame port, said slot having a width at its inner end which is less than the inside diameter of said throat portion and affording with said flame port the only means of a substantial access of said fuel stream to the ambient atmosphere, said slot permitting entrainment of air substantially throughout the travel of said fuel stream from adjacent the inner end of said slot to said flame port to provide a fuel-air mixture for burning at said flame port, said burner body terminating adjacent said flame port in a laterally extending deflector portion formed on said tubular wall and extending from the portion of said wall opposite said slot at least substantially to the side of said wall having the longitudinal slot formed therein, said deflector having a deflecting surface portion extending obliquely across the outer end of said throat portion and positioned for impingement thereagainst of the burning mixture for direction of the flame laterally from the side of the burner body in which the slot is formed.

2. A burner according to claim 1 in which the deflector portion is formed at opposite sides thereof with depending flanged edge portions.

3. A burner according to claim 1 in which said deflector portion is formed with offset portions channeling the burning mixture into a plurality of streams affording the burner flame corresponding separated flame tips.

4. A burner according to claim 1 in which the fuel metering orifice means comprises at least two fuel metering orifices angularly disposed with respect to each other for emission of converging streams of fuel.

5. A burner according to claim 1 in which the longitudinal slot extends radially through said tubular wall and the fuel metering orifice means comprises at least two substantially coplanar fuel metering orifices angularly disposed with respect to each other for emission of converging streams of fuel, the plane of said orifices being transverse to the radial direction in which said slot extends through said wall.

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