United States Patent [19]

Hapgood

[11] **3,915,625**

[45] **Oct. 28, 1975**

[54] **HEAT INJECTOR GAS BURNER**

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[22] Filed: **May 2, 1974**

[21] Appl. No.: **466,096**

[52] **U.S. Cl.** **431/353;** 431/264

[51] **Int. Cl.²** **F23D 15/02**

[58] **Field of Search** 431/353, 158, 263, 264, 431/265; 432/222

[56] **References Cited**

UNITED STATES PATENTS

2,701,608	2/1955	Johnson	431/353 X
3,182,711	5/1965	Robb	431/263 X
3,275,057	9/1966	Ward	431/353 X

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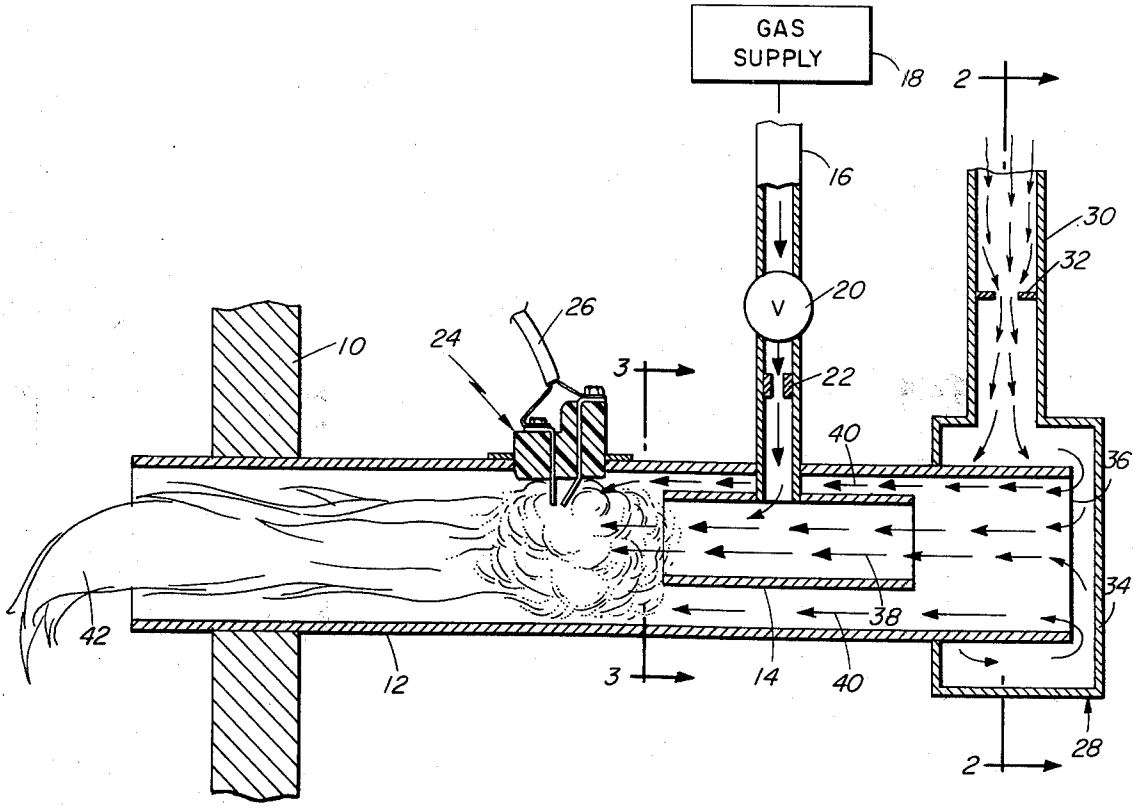
[57] **ABSTRACT**

A heat injector gas burner for producing an extended flame for heating a remote area, comprising an elongated tubular casing having therein a short tubular flame holder into which gas is introduced, means at one end of the casing for metering the flow of air into the casing and simultaneously into the adjacent end of the flame holder, and ignition means within the casing external to and adjacent the opposite end of the flame holder, which metering means produces substantially uniform velocity of air flow within the casing both inside and outside the flame holder.

3 Claims, 3 Drawing Figures



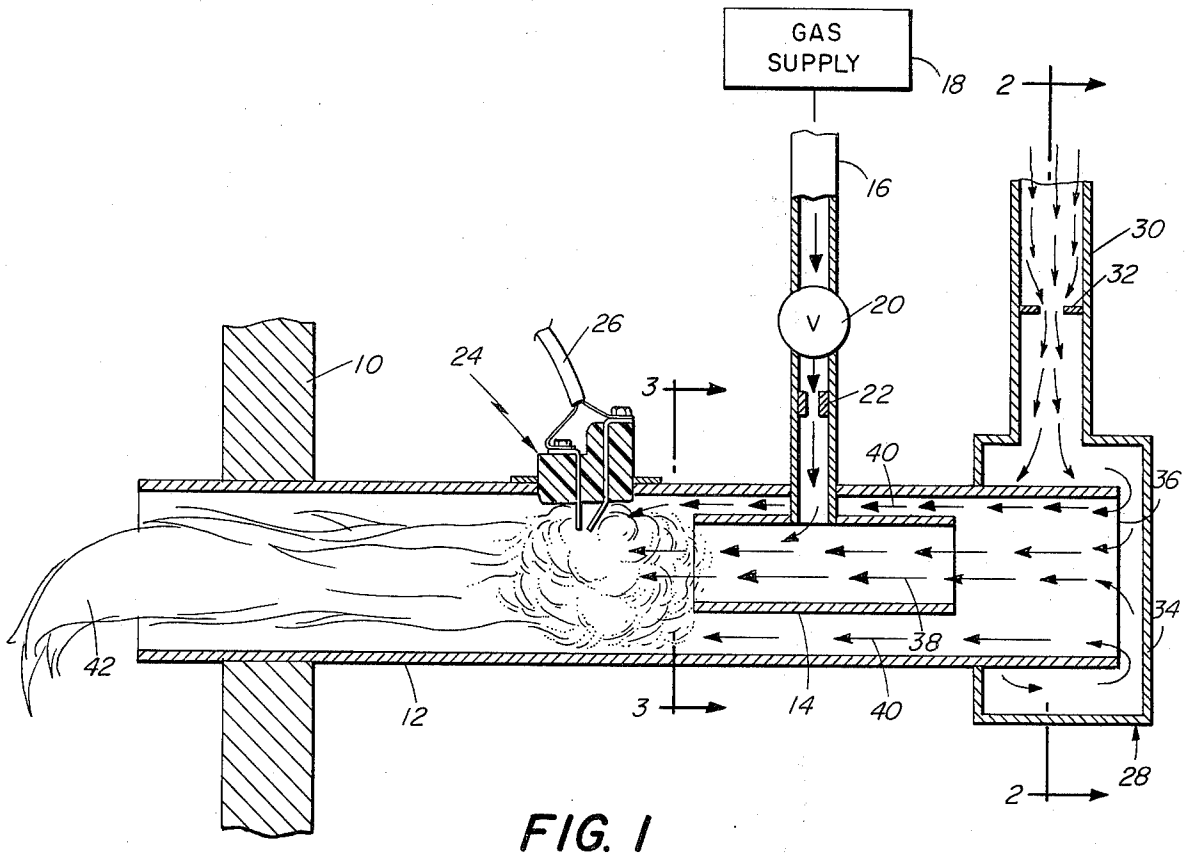


FIG. 1

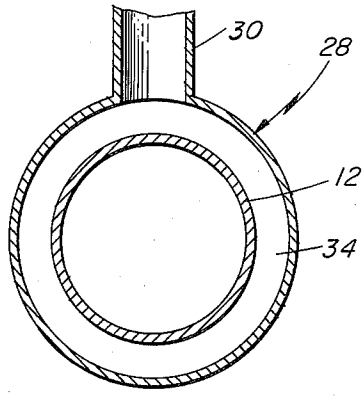


FIG. 2

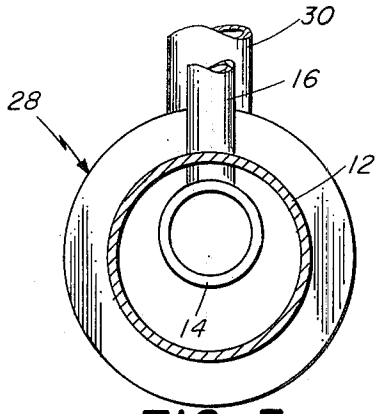


FIG. 3

HEAT INJECTOR GAS BURNER

BACKGROUND OF THE INVENTION

In the manufacture of gas-fueled devices such as incinerators, for example, it is often highly desirable that the burner thereof be located in a chamber remote from the chamber in which combustion takes place. This thus requires that the burner be designed so as to efficiently produce an exceptionally long flame which will extend into the remote combustion area.

Burner structures have been made which employ an outer tubular casing which encloses a parallel short tubular flame holder, with air being introduced simultaneously into adjacent ends of the casing and flame holder. Gas is introduced into the flame holder for mixing with the air therein for primary combustion when ignited adjacent the exit end of the flame holder. Secondary combustion is sustained by the air flowing between the flame holder and casing. U.S. Pat. No. 3,486,835 is an example of such a known burner structure.

However, in known burners of this character it has been found difficult to regulate or adjust the quantity and velocity of primary air within the flame holder for most efficient ignition. One attempt to solve this problem is made by providing an apertured closure in the entrance end of the flame holder, as shown in U.S. Pat. No. 2,072,731. Such a device, however, is not entirely satisfactory for many reasons.

SUMMARY OF THE INVENTION

In accordance with the present invention the foregoing and other problems are improved upon or overcome by the provision of a burner structure employing a short tubular flame holder within an elongated tubular casing wherein air flow into the adjacent entrance ends of the casing and flame holder is controlled or metered by a reversing fitting which achieves uniform air velocities within both the casing and flame holder and provides efficient quantity of primary air for efficient ignition. Gas is introduced into the flame holder and such air is necessary for ignition of gas-air mixtures emanating from the exit end of the flame holder.

The reversing fitting comprises a box which is mounted in spaced relation with and over the end portion of the casing. Air is metered through a duct into the space surrounding the wall of the casing so that a substantial portion of the incoming air contacts the wall. One end of the box is spaced slightly from the end of the casing so that a substantial portion of the incoming air first contacts the casing wall and then flows substantially uniformly around the periphery of the casing end and into the interior of the casing.

Such air throughout the diameter of the casing is substantially uniform in velocity and density. Thus, primary combustion air which continues on through the flame holder and secondary combustion air which flows longitudinally along the outside of the flame holder and within the casing are substantially uniform in density and velocity so that ignition is efficiently achieved and maintained.

BRIEF DESCRIPTION OF THE DRAWING

The above and other objectives of this invention will become apparent from the following description taken in connection with the accompanying drawings, wherein;

FIG. 1 is a vertical sectional view of a burner structure embodying the invention;

FIG. 2 is a sectional view taken on line 2—2 of FIG. 1 looking in the direction of the arrows; and

FIG. 3 is a sectional view taken on line 3—3 of FIG. 1 looking in the direction of the arrows.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings wherein like characters of reference designate like parts throughout the views, the burner **10** shown in FIG. **1** is adapted to be mounted, for example, in a chamber which is located on one side of a wall or partition **10** and to produce a flame which extends well into the chamber on the opposite side of the partition.

The burner comprises a casing **12** which has one end protruding through an opening in the partition. Casing **10** is tubular in shape and has within it spaced substantially inwardly from the opposite end thereof, a flame holder **14** which is in the form of a short tubular member of substantially smaller diameter than casing **12.** Flame holder **14** extends parallel with casing **12** and is located somewhat closer to the top than to the bottom of the casing as shown clearly in FIGS. **1** and **3.**

A gas supply pipe **16** is connected at one end to a manifold or other source of gas **18,** with its other end projecting through an opening in casing **12** and connected directly into the flame holder **14** whereby gaseous fuel may flow from the supply **18** into the flame holder **14.** The pipe **16** may contain a conventional valve **20** and orifice **22** if desired for controlling the flow of the fuel.

An ignitor **24** of any selected type, such as the Fenwal spark ignitor shown, is mounted in the casing adjacent the inner end of the flame holder, and is adapted to be connected to a suitable source of electrical energy in any conventional manner through cable **26.**

The inner end of the casing **12** is enclosed within a reversing box **28,** to be described, to a side wall of which is connected one end of a duct **30** which is connected at its other end to a plenum or other source (not shown) of forced air flow. Air passes through the duct in quantity and velocity controlled by a suitable orifice **32** therewithin and flows into the reversing box **28** and thence into the adjacent end of the casing **12.**

The reversing box **28** meters the flow of air into the casing so that the density and velocity of the air is substantially uniform throughout the diameter of the casing. This is achieved by disposing the end wall **34** of the box in controlled closely removed spaced relation with the end surface **36** of the casing, and by locating the adjacent end of duct **30** forwardly with respect to the extreme end of the casing **12** so that substantially all of the air from duct **30** will fall upon a side wall of the casing. Such air entering the box **28** will be distributed around the circumference of the casing and from there will find its way into the end of the casing through the space between the end surface **36** of the casing and the wall **34** of the box.

It has been found that by the use of a reversing box **28** as shown and described the density and velocity of the air flow into the casing **12** will be substantially uniform throughout the diameter of the casing. Thus, air will flow uniformly down the casing interior and into and through the interior of the flame holder **14** as well as along the outside of the flame holder as shown. Air

flowing through the flame holder, as indicated by arrow **38,** will function as primary combustion air, as will be described, while air flowing outside the flame holder **14,** as indicated by arrows **40,** will function as secondary combustion air.

Primary air within the flame holder **14** will mix with the gas therein, which entered from pipe **16,** and this gas-air mixture upon emerging from the flame holder **14** will become ignited by ignitor **16.** Thereafter, combustion will be sustained by the secondary air, whereupon a flame **42** of substantial length will be produced.

From the foregoing it will be apparent that all of the objectives of this invention have been achieved in the burner structure shown and described. It is to be understood, however, that various modifications and changes may be made by those skilled in the art without departing from the spirit of the invention as expressed in the accompanying claims. Therefore, all matter shown and described is to be interpreted as illustrative and not in a limiting sense.

We claim:

1. A gaseous fuel burner comprising an elongate tubular casing open at both ends, an ignitor supported within said casing at a point intermediate its ends, a short open-ended tubular flame holder disposed within the casing between the ignitor and one end of the casing, means for injecting gaseous fuel into the flame holder, and means for directing a stream of air into said one end of the casing and including control means mounted over said one end of the casing for controlling the velocity and distribution of said air stream within the casing, said ignitor being supported by a wall of the casing adjacent the end of the flame holder remote from said control means, said flame holder extending substantially parallel with the casing, and said air stream flowing through the casing both exteriorly of and within the flame holder, the interior of said flame holder being unobstructed wherein velocity of the air flow within and without the flame holder is substantially equal.

2. A gaseous fuel burner comprising an elongate tubular casing open at both ends, an ignitor supported within said casing at a point intermediate its ends, a short open-ended tubular flame holder disposed within the casing between the ignitor and one end of the casing, means for injecting gaseous fuel into the flame holder, and means for directing a stream of air into said one end of the casing and including control means mounted over said one end of the casing for controlling the velocity and distribution of said air stream within the casing, said control means comprising a boxlike member disposed upon the adjacent end portion of the casing and having an end wall spaced a predetermined distance from said one end of the casing, and a duct connected to a side of said member for directing air into said member, the adjacent end of said duct being located opposite the outer surface of the casing whereby a substantial amount of the air from the duct will contact the outside of the casing before proceeding into the interior thereof.

3. A gaseous fuel burner comprising an elongate tubular casing open at both ends, a flame holder disposed within the casing, means for injecting gaseous fuel into the flame holder, means for igniting said fuel, and means at one end of the casing for directing a stream of air into one end of said casing and simultaneously into said flame holder from a direction perpendicular to the axis of the casing, said means comprising a boxlike member disposed upon said end of the casing and having an end wall spaced a predetermined distance from said end of the casing, and a duct connected to a side of said boxlike member for directing air into the member, the end of the duct being located opposite the outer surface of the casing whereby a sutstantial amount of the air from the duct will contact the outside of the casing before proceeding into the interior thereof.

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