

[54] **GAS BURNER HEAD ASSEMBLY FOR TORCHES**

[75] Inventor: **Cadet E. Bowman**, Sycamore, Ill.
[73] Assignee: **Olin Corporation**, Stamford, Conn.
[22] Filed: **May 29, 1969**
[21] Appl. No.: **828,957**

[52] U.S. Cl.**431/349, 431/353, 239/468**
[51] Int. Cl.**F23d 13/36**
[58] Field of Search.....**431/9, 158, 173, 284, 349, 431/353; 239/468, 469, 470, 472**

[56] **References Cited**
UNITED STATES PATENTS

1,231,726 7/1917 Gault.....431/353
1,600,712 9/1926 Buttner431/349

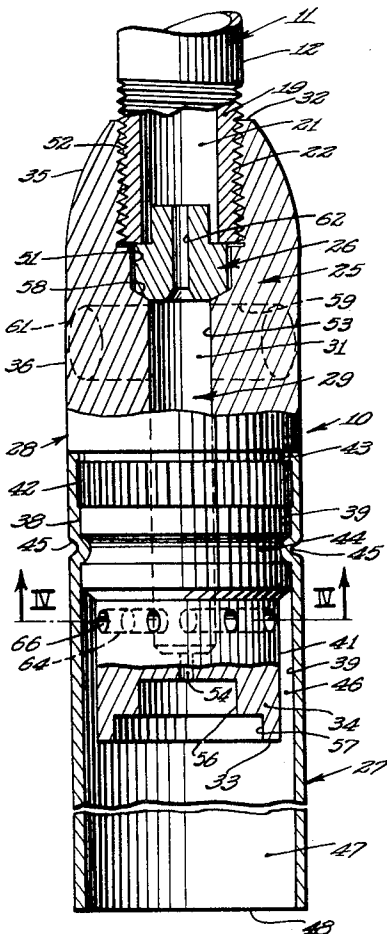
2,005,801 6/1935 Olsen431/349
3,002,553 10/1961 Reed431/349
3,198,239 8/1965 Webster431/349

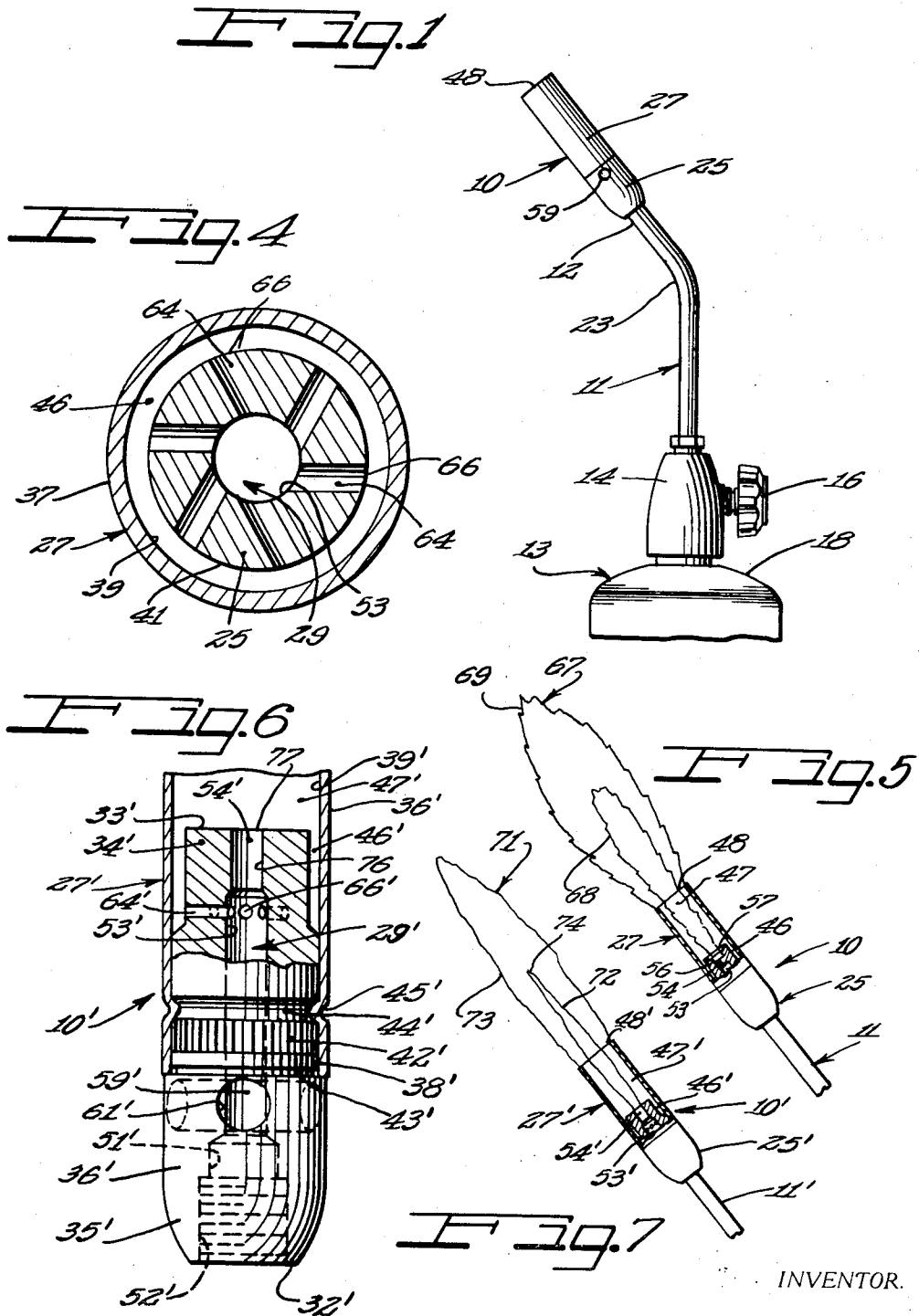
Primary Examiner—Carroll B. Dority, Jr.
Attorney—Hill, Sherman, Meroni, Gross & Simpson

[57] **ABSTRACT**

A gas burner head assembly generally comprises an elongated body member having an axially disposed main gas flow passage, a tubularly shaped flame holder at an outlet end, transverse air admitting passageways intersecting the main gas flow passage, and a circumferential array of passages formed in the body and arranged to deliver air-gas mixture in a swirling path forming an air-gas vortex within the flame holder.

2 Claims, 7 Drawing Figures

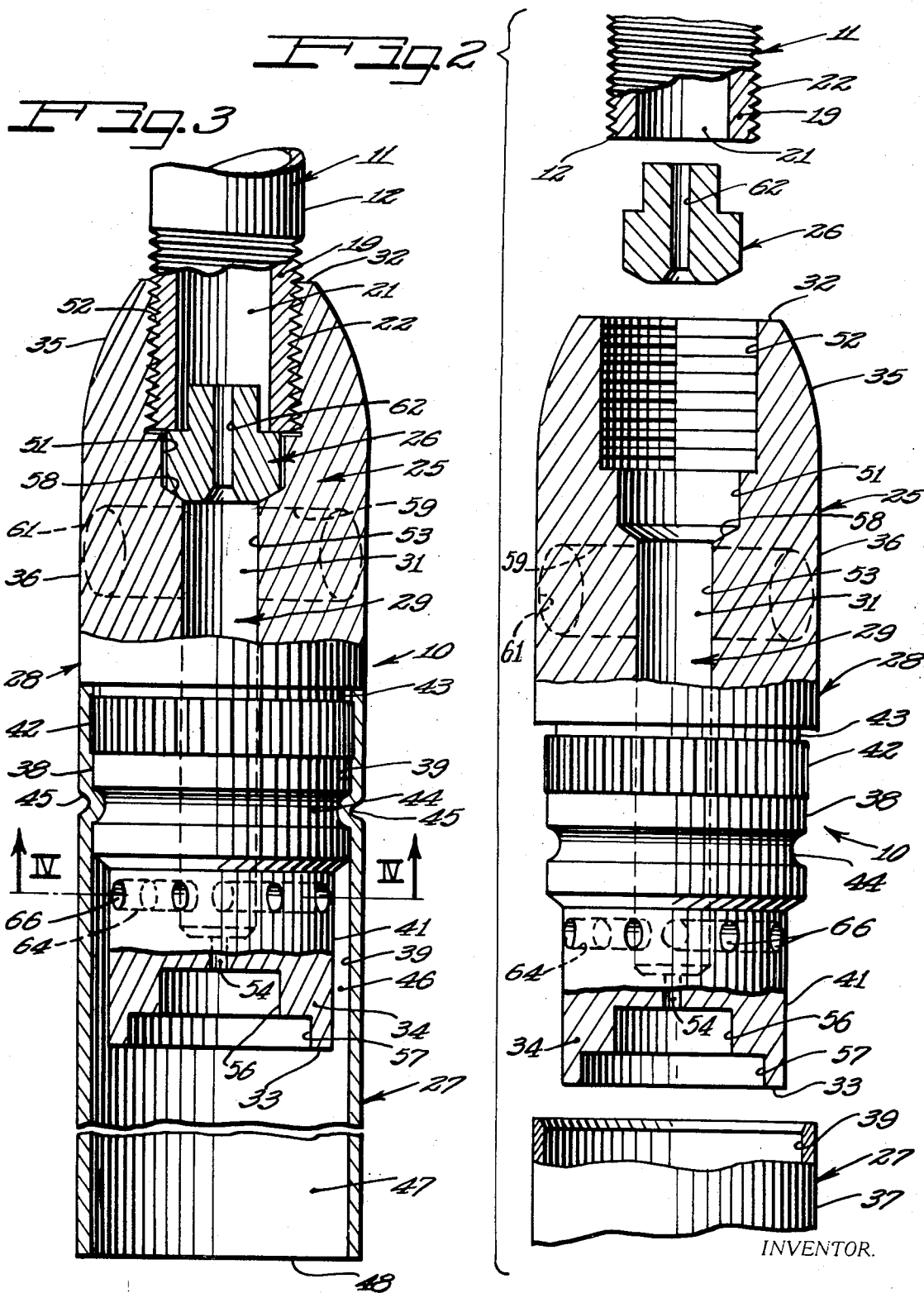




INVENTOR.

Cadet E. Bowman

BY *Hill, Sherman, Morris, Shad & Simpson* ATTORNEYS



INVENTOR.

Cadet E. Boumar

BY *Hill, Stegma, Morris, & Co.* ATTORNEYS

GAS BURNER HEAD ASSEMBLY FOR TORCHES

BACKGROUND OF THE INVENTION

Field of the Invention

This invention generally relates to torches and more particularly refers to a gas burner head assembly having means delivering air-gas mixture to a flame holding means in both a swirling path forming a vortex and a straight line path axially of the vortex.

SUMMARY OF THE INVENTION

A gas burner head assembly constructed in accordance with the principles of the present invention comprises a centrally apertured body member forming a main gas supply passage characterized by a reduced outlet end portion and having gas feed passageways intersecting the main gas supply passageway adjacent to, and upstream from, the reduced outlet end and laterally extending primary air passageways, and a flame tube affixed to the body member at an outlet end thereof and having a portion in spaced relation thereto for forming therebetween an annular channel connecting the gas feed passageways with a flame holding chamber within the flame tube.

The gas feed passageways extending from the main gas supply passage to the annular channel are arranged to deliver air-gas mixture in a swirling path into the flame holder, thereby producing a swirling vortex of air-gas mixture inside the flame tube. Swirling a portion of the air-gas mixture within the flame tube increases the path of travel therewithin, thereby providing sufficient time for combustion of the mixture to occur within the flame holding chamber rather than immediately outwardly of an exit opening thereof, as is common in prior art devices. Furthermore, swirling the air-gas mixture promotes complete admixture of the air with the gas and enhances proportionate control of the air-gas mixture.

Characteristics of the flame produced by the burner head assembly of the present invention depend upon the fractional amount of air-gas mixture diverted through the vortex-forming passageways, which amount in turn is controlled by back pressure produced by the reduced outlet end portion of the main gas supply passage. A pencil point flame, i.e. a thin flame suitable for spot or localized heating of an area, is produced by diverting a small amount of the air-gas mixture through the vortex-forming passageways. In that manner the swirling vortex within the flame holding chamber forms a mantle of gases moving at a lower velocity than a main jet stream exiting axially of the vortex from the main gas supply passage outlet. The slower moving mantle ignites within the flame tube to sustain and stabilize the pencil point flame.

If desired, a heavy duty hard flame of the blow torch type may be produced by diverting substantially all of the fuel mixture through the vortex-forming passageways and only permitting a small quantity of air-gas mixture to exit axially of the vortex from the reduced outlet end portion in the main gas supply passageway. The axially directed stream of gas directionalizes the mass of flame at an open outlet end of the flame tube and expands to fill a central area of the vortex for eliminating any center dead spot which might otherwise be present.

It is, therefore, an object of the present invention to provide a gas burner head assembly having air-gas feed passageways forming a swirling vortex of fuel within a flame tube and also having air-gas supply passageways directing fuel axially of the swirling vortex.

It is another object of the present invention to provide a burner head assembly comprising a burner body member having air-gas feed passageways supplying fuel to a flame holding chamber both in a swirling vortex and a stream directed axially of the vortex wherein flame characteristics produced by the burner head assembly depend upon the fractional quantity of fuel directed through the vortex-forming passageways.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of the present invention will be readily apparent from the following description of certain preferred embodiments thereof, taken in conjunction with the accompanying drawings, although variations and modifications may be effected without departing from the spirit and scope of the novel concepts of the disclosure and my contribution to the art, and in which:

FIG. 1 is a partial side elevational view of a torch including a burner head assembly incorporating the principles of the present invention;

FIG. 2 is an enlarged, exploded view, partially in section, of the burner head assembly of FIG. 1;

FIG. 3 is a longitudinal sectional view of the burner head assembly of FIG. 1 with portions thereof shown in elevation for clarity;

FIG. 4 is a sectional view taken substantially along lines IV—IV of FIG. 3 and illustrating vortex-forming passageways embodying the features of the present invention;

FIG. 5 is a side elevational view, partly in section, of the burner head assembly of FIGS. 1-4 and arranged to produce a heavy duty hard flame;

FIG. 6 is a longitudinal sectional view of another embodiment of a burner head assembly incorporating the principles of the present invention and arranged to produce a pencil point flame with portions shown in elevation for clarity; and

FIG. 7 is an elevational view, partly in section, of the burner head assembly of FIG. 6 and arranged to produce a thin, pencil point type flame.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, a burner head assembly 10 constructed in accordance with the principles of the present invention is connected to a gas supply tube 11 at an upper terminal end thereof as at 12. The gas supply tube 11 delivers gaseous fuel received at increased pressures from a fuel or gas source, such as a cylinder 13 containing liquefied propane, via a main control valve 14 having an actuating knob 16 and threadingly engaging an outlet coupling 17 carried in an upper domed wall 18 of the cylinder.

The main supply tube 11 comprises an elongated cylindrical tube having sidewalls 19 defining an axial passageway 21 and threaded as at 22 at the upper terminal end 12. As illustrated, the tube 11 is bent to form an angle portion 23 to facilitate use of the burner head assembly 10 with the cylinder 13, but it is apparent that

a straight run of tube or a tube formed in other configurations may be effectively utilized depending upon the particular application of the torch assembly.

The burner head assembly 10 comprises a burner body member 25, an orifice block 26 and a tubularly shaped flame holder or tube 27.

In accordance with the principles of the present invention, the burner head body member 25 is particularly characterized as comprising an elongated, substantially cylindrically shaped article having an outer peripheral wall 28 axially aligned with respect to the upper terminal end of the tube 11 and centrally apertured as at 29 to form a main gas supply passageway 31 extending therethrough from an inner or inlet end wall 32 to an outer end wall 33 at an outlet end of the body member as at 34.

The outer peripheral wall 28 comprises a smoothly tapered portion 35 tapering outwardly from the inlet end wall 32 to a smooth cylindrical portion 36 characterized by a diameter equal to that of an outer peripheral wall 37 of the tubular flame holder 27, a reduced diameter attachment wall portion 38 sized to closely fit within an inner bore wall 39 of the flame holder, and a still further reduced portion 41 at the outlet end 34 of the body member 25. The attachment wall portion 38 has an outwardly bulged, knurled section 42 separated from the smooth cylindrical portion 36 by an undercut, circumferential groove 43 and sized for interference fit with the inner bore wall 39 of the flame holder 27. If desired, a circumferential groove as at 44 may be turned in the attachment wall portion 38 to permit staking portions as at 45 of the flame holder tube 27 thereinto, thereby to securely affix the flame holder to the burner body 25.

Also, in accordance with the principles of the present invention, the reduced outlet end portion wall 41 is radially spaced inwardly of the inner bore wall 39 of the flame holder 27, thereby forming an annular channel or zone 46 opening outwardly into a flame holding chamber 47 formed within the flame tube or holder 27 outwardly of the outlet end portion 34 of the burner body 25. A flame directing outlet for the burner head assembly 10 includes an exit mouth as at 48 defined by the cylindrical inner bore 39 of the flame holder 27 and opening outwardly of the burner head assembly.

It is contemplated by the present invention that the passageway 31 particularly comprise a counter bored passage 51 including a portion 52 extending from the inlet wall 32 and threaded to receive the complementarily threaded portion 22 of the tube 11, a somewhat reduced central passage 53 and a further reduced orifice portion 54 opening into successively wider counter bored outlet openings or ports 56 and 57. Situated within the inlet end passage 51 and seated against an annular shoulder 58 is the orifice block 26 dimensioned to impart a predetermined pressure drop of the gas thereacross and thereby to provide a measure of control of the rate of gas flow into the central passage 53.

Extending transversely or radially through the body member 25 and intersecting the central passage 53 of the aperture 29 are plural angularly or circumferentially spaced air supply passageways as at 59. The air supply passageways 59 open through ports 61 in the side wall 28 of the body member 25 and supply air for admixture with gaseous fuel, such as propane, entering through a central bore 62 of the orifice block 26.

It is contemplated by the present invention that at least a portion of the air-gas mixture passing through the central passageway 53 downstream of the air inlets 59 be directed into the flame holding chamber 47 in a swirling path to provide a swirling vortex of air-gas mixture within the flame holding chamber. Thus, upstream of the orifice or reduced portion 54 in the aperture 21 are situated vortex-forming passageways as at 64 intersecting the central passage and opening into the annular channel 46 through ports as at 66 formed in the reduced outlet end wall 41 of the burner body 25.

As best illustrated in FIG. 4, the vortex-forming passageways 64 are particularly characterized as comprising a spoke-like array of passages disposed in circumferentially spaced relation each intersecting the central passage 53 and arranged parallel to circumferentially or angularly spaced radial axes of the central passage so as to be generally tangential thereto and transversely offset in similar directions from the radial axes. Thus, as air-gas mixture exiting from the vortex-forming passageways 64 impinge against a portion of the inner bore wall 39 defining the annular channel 46, the mixture is circumferentially directed around the annular channel to form a swirling mass of air-gas mixture within the annular channel and advancing outwardly therefrom into the flame holding chamber 47, thereby forming a swirling vortex of air-gas mixture within the flame holding chamber.

The outlet orifice 54 formed in the central aperture 29 creates a back pressure within the central passage 53 to divert a fractional portion of the air-gas mixture through the vortex-forming passageways 64, and by varying the size of the orifice 54, and thus varying the back pressure created thereby, the fractional portion or quantity of the air-gas mixture diverted through the vortex-forming passageways may be changed. As illustrated in FIGS. 1 through 5, inclusive, the outlet orifice 54 is substantially reduced with respect to the central passage 53 and in one example has a cross sectional area approximately one-sixth that of the central passage. With that arrangement, a substantial back pressure is created to divert a major portion of the air-gas mixture outwardly through the vortex-forming passageways 64 thereby providing a heavy duty hard flame 67 characterized by a large, somewhat indistinct blue cone 68 surrounded by a hard flame of the blow torch type as at 69. The heavy duty flame 67 is usually employed by users desiring to rapidly heat large areas where heating precision is not required. In that type of flame, the swirling vortex of air-gas mixture forms the major portion of the flame and an axially directed stream of air-gas mixture exiting from the substantially reduced orifice 54 expands in the successively larger openings 56 and 57 to fill a central area of the vortex and to provide an outwardly directed impetus thereto, thereby eliminating center dead spots and directionalizing the swirling vortex.

If desired, the burner head assembly of the present invention may be adapted to produce a pencil point type of flame for directing concentrated heat at a precise point of utilization.

Thus, in the embodiment illustrated in FIGS. 6 and 7 wherein parts similar to those of FIGS. 1 through 5, inclusive, are given the same reference numerals to which a prime has been added, a burner head assembly 10' for producing a pencil point type of flame has an

orifice or reduced portion 54' sized only to create a sufficient back pressure for diverting a small amount of the air-gas fuel mixture through vortex-forming passageways 64'. With that arrangement, the swirling vortex of air-gas mixture within the flame holding chamber 47' forms a mantle of gases moving at a lower velocity than a main jet stream directed axially of the vortex and exiting from the orifice 54'. The slower moving mantle burns within the flame holding chamber 47' to ignite the axially directed jet stream, thereby sustaining and stabilizing the pencil point flame 71.

The pencil point flame 71, as illustrated in FIG. 7, comprises a thin sharply pointed center portion 72 enveloped by a soft blue flame 73. A forward tip 74 of the center portion 72 is a point of concentration of the heat in the flame 53 and permits precise concentration of heat at a small point of utilization.

As illustrated in FIGS. 6 and 7, the orifice 54' is particularly characterized as comprising a straight through, cylindrical bore 76 extending from the central passageway 53' and terminating at the outlet end wall 33' to define an outlet opening 77 disposed axially of the flame holder inner bore 39'. In this embodiment, the orifice 54' has a cross sectional area only somewhat reduced with respect to the cross sectional area of the central passageway 53', and in one example the orifice 54' was sized to have a cross sectional area approximately one-half that of the central passageway 53'.

It will be appreciated that the orifice 54 or 54' creating back pressure for diverting a fractional portion of the air-gas mixture through the vortex-forming passageways 64 or 64' may be sized relative to the central passageway 53 or 53' to produce various flame configurations depending upon desired flame characteristics required by the user.

Although various minor modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. In a gas burning torch, a gas burner head assembly comprising:
 - a. means forming a body having a main gas flow passage extending therethrough for receiving a

gaseous fuel at an inlet end of said passage and for discharging the gaseous fuel at an outlet end thereof downstream of said inlet end;

- b. means forming a flame holder affixed to said body and extending downstream of said body outlet end, said flame holder having a first end portion upstream of said body outlet end and closed by said body, an intermediate portion providing, with said body, an annular space, and a second end portion open to form an outlet downstream of said body outlet end;
 - c. first passageway means formed in said body and extending transversely of said main passage for communication with ambient air outside of said body, said first passageway means being upstream of said body outlet end;
 - d. means positioned in said body inlet end to impart a predetermined pressure drop of gaseous fuel at the downstream side of said body inlet in the area of said first passageway means to draw ambient air through said first passageway means and into said main passage for mixture with the gaseous fuel;
 - e. second passageway means formed in said body and interposed between said first passageway means and said body outlet end, said second passageway means opening from said main passage into said annular space, and said second passageway means being arranged to deliver an air-gas mixture to said flame holder means to form a swirling air-gas vortex therein; and
 - f. said main passage body outlet end having a reduced portion downstream of said second passageway means, sized to create back pressure in the air-gas mixture in the area of said second passageway means to divert a major fraction of the air-gas mixture through said second passage means to produce a flame of the type used for rapidly heating large areas.
2. The gas burner head assembly of claim 1, wherein said main passage includes at least one portion downstream of said reduced portion and enlarged relative thereto to form means for imparting a radially outwardly directed impetus to the axially discharged air-gas mixture to eliminate any dead center spots and directionalize the swirling vortex.

* * * * *

50

55

60

65