United States Patent [19]

Hein

[11] **3,799,452**

[45] **Mar. 26, 1974**

[54] **PREMIXING GAS BURNER**

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[73] Assignee: **Joh Vaillant K.G.,** Remscheid, Germany

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[52] **U.S. Cl.** **239/553.3,** 239/557, 239/566, 431/354

[51] **Int. Cl.** **B05b 1/14**

[58] **Field of Search** 431/180, 354, 355; 239/553.3, 557, 565, 566, 568

[56] **References Cited**

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1,942,397 1/1934 Cuyler 239/565

FOREIGN PATENTS OR APPLICATIONS

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Primary Examiner—Carroll B. Dority, Jr.

Attorney, Agent, or Firm—Toren, McGeady and Stangler

[57] **ABSTRACT**

Two interconnected shell members of sheet metal are formed with impressions which combine to form a plurality of mixing tubes disposed one beside the other and having upper ends. The shell members have chamber portions defining between them a distributing chamber, which extends over said mixing tubes and with which said mixing tubes communicate at their upper ends. A plurality of parallel burner tubes extend transversely to and communicate with said distributing chamber and are formed with burner ports.

11 Claims, 6 Drawing Figures

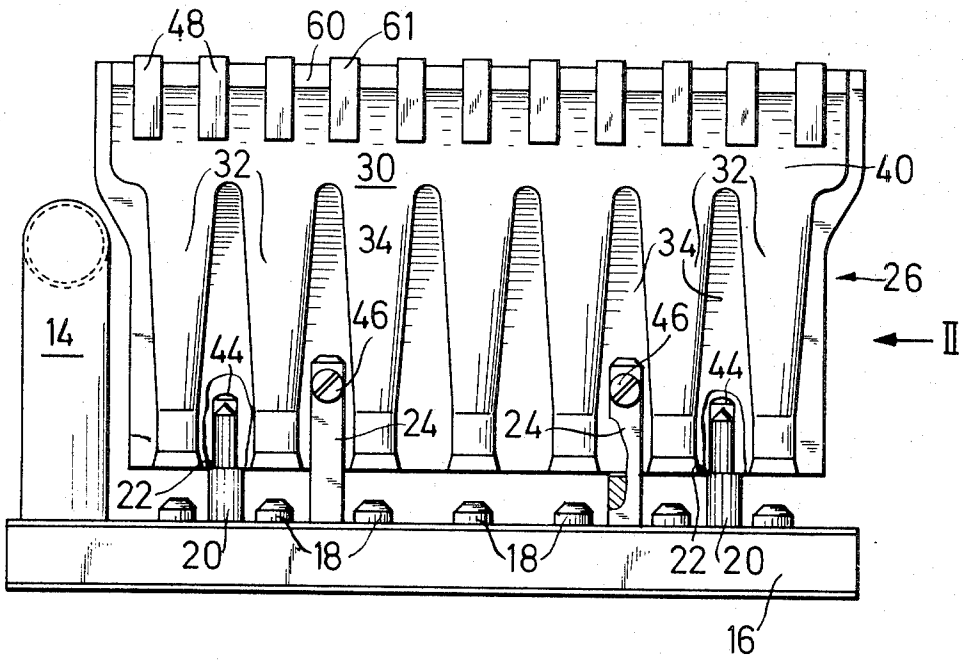


Fig. 1

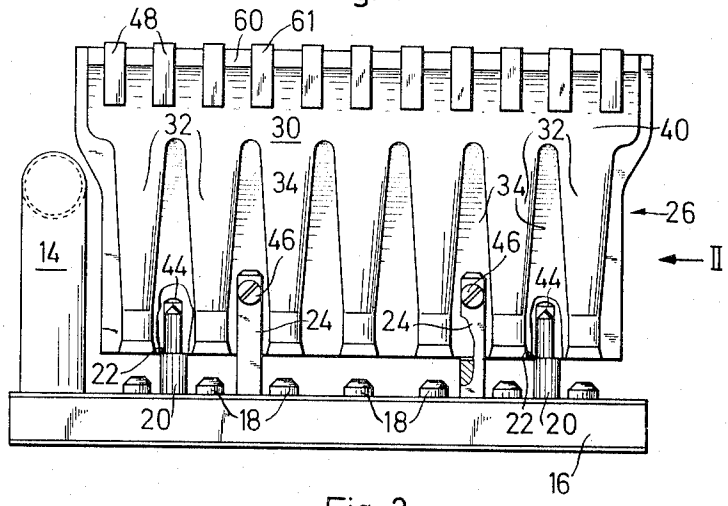


Fig. 2

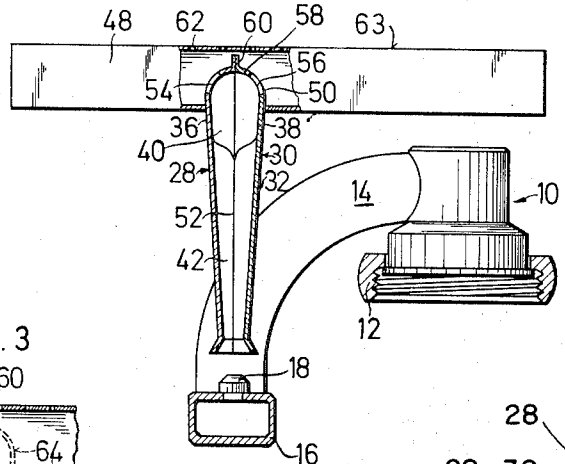
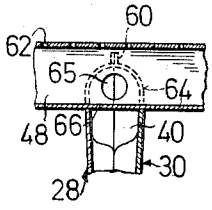


Fig. 3



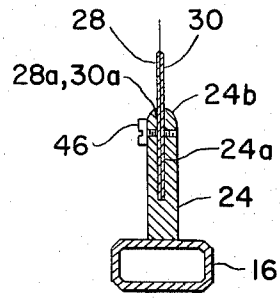


Fig. 1a

Fig. 4

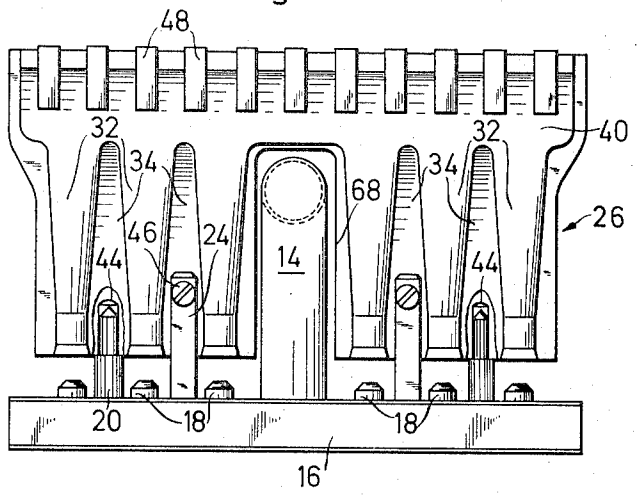
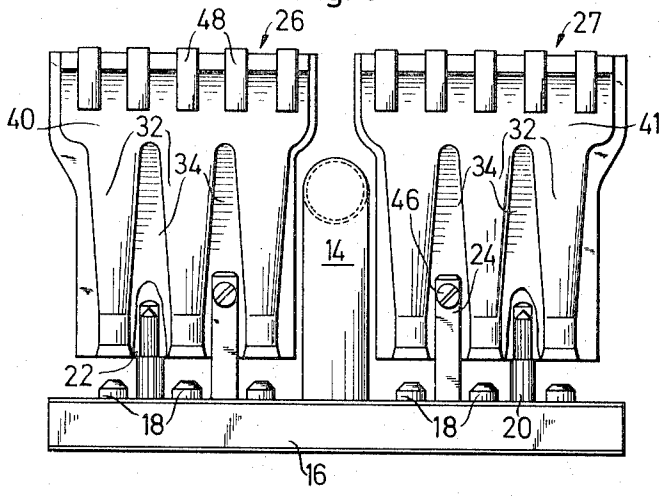

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Fig. 5


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PREMIXING GAS BURNER

This invention relates to a premixing burner for gas-fired appliances, which comprises a plurality of mixing tubes which are disposed one beside the other and are formed by impressions in interconnected sheet metal shell members.

In a burner of this type which is known from the Printed German Application 1,232,692, the mixing tubes terminate directly in the burner ports. To provide a grate burner having a substantially rectangular burner area, a plurality of such pairs of half-shells of sheet metal are connected to a plurality of gas manifold tubes, which are disposed under the half-shells and extend transversely thereto from a central gas supply pipe. Hence, each pair of half-shells of sheet metal form a plurality of mixing tubes and each of these mixing tubes communicates with a different gas manifold. Each mixing tube terminates in a burner port.

Such burner produces relatively large individual flames. The large burner ports involve a danger of backfire. Where gases having a high burning velocity are burned, the large burner ports involve a risk of backfire. Besides, the heat output is not uniformly distributed over the cross-section of the burner so that problems arise regarding the generation of noise and the supply of secondary air. Burners are desired which produce a multiplicity of small flames which are distributed as uniformly as possible throughout the cross-section of the burner and which may have relatively narrow burner ports so that the risk of backfire is minimized.

It is an object of the invention to provide for gas-fired appliances a premixing burner which has a high heat output and produces burner flames which are uniformly distributed over the cross-section of the burner.

In a premixing burner of the kind defined first hereinbefore, this is accomplished in that the sheet metal shells define at the upper ends of the mixing tubes a distributing chamber, which extends over the mixing tubes and into which the mixing tubes open, and that a plurality of parallel burner tubes are provided, which extend transversely to the distributing chamber and have burner ports communicating with the distributing chamber.

In the burner designed according to the invention, a plurality of parallel, vertical mixing tubes are formed by simple means consisting of two interconnected half-shells of sheet metal. All these mixing tubes communicate with a common horizontal distributing chamber, from which the burner tubes extend, which may have relatively small burner ports and ensure a uniform distribution of the flame over the cross-section of the burner. The risk of backfire is eliminated because the burner tubes may have a multiplicity of small burner openings.

The burner tubes may have a vertically elongated, rectangular shape in cross-section.

To secure the burner tubes to the pair of half-shells of sheet metal, the burner tubes may be formed on the underside with apertures and may be secured on top of the distributing chamber in a straddling relation. In that case the half-shells of sheet metal may be interconnected by folded seams in their vertical plane of contact. Laterally of their plane of contact, the half-shells of sheet metal may be formed with apertures

through which the distributing chamber communicates with the burner tubes. The distributing chamber is thus closed at its top, and its top wall acts as a baffle and ensures that the gas stream rising vertically in the mixing tubes will not produce an increased pressure and an irregular flame pattern at the burner ports disposed over the mixing tubes.

Alternatively, the half-shells of sheet metal may be provided at the top of the distributing chamber with apertures in which the burner tubes are inserted. In this case, the burner tubes are desirably provided in the distributing chamber with lateral openings through which the distributing chamber communicates with the burner tubes. In that case the underside of the burner tubes serves as a baffle for the gas which rises in the mixing tubes.

The invention enables the use of the burner tubes in a number which exceeds that of the mixing tubes. The number of mixing tubes may then be selected in view of the desired output of the burner. The number of burner tubes is selected in view of the desired distribution of the flames over the surface of the burner.

In a particularly desirable design, a nozzle tube is provided which carries gas outlet nozzles disposed below the mixing tubes, vertical plug pins for centering the mixing tubes are secured to said nozzle tube, and the half-shells of sheet metal are provided between adjacent mixing tubes with hemicylindrical impressions, which combine to form cylindrical guides with which the interconnected half-shells of sheet metal are fitted on the plug pins. Besides, vertical holders may be mounted on the nozzle tube between adjacent nozzles, which holders are provided each with a slot extending in the longitudinal direction of the nozzle tube and at their upper end with a transverse bore, the interconnected half-shells of sheet metal may have surface portions which are disposed between adjacent mixing tubes and inserted into the slots in the holders, and the half-shells of sheet metal may be secured by threaded fasteners, which extend through the transverse bores and through apertures formed in the half-shells of sheet metal and aligned with said transverse bores. This arrangement ensures a simple centering of the mixing tubes with the nozzles on the nozzle tube. The mixing tubes may be secured by means of two screws so that the mixing tubes can easily be detached and removed, e.g., for cleaning.

In a development of the invention, the half-shells of sheet metal are provided between two mixing tubes with a central aperture, through which a curved gas supply pipe extends to the nozzle tube. The curved gas supply pipe supplies the gas from above into the nozzle tube so that the nozzle tube may be disposed on a lower level and the burner with its burner tubes does not undesirably protrude upwardly so as to add to the overall height of the appliance. In a preferred design, this supply of gas through a curved gas supply pipe need not involve an interruption of the distributing chamber, which extends throughout the length of the burner.

Additional features of the invention will become apparent from the appended claims and the following illustrative embodiments with reference to the accompanying drawings, in which

FIG. 1 is a fragmentary front elevational view showing part of a premixing burner according to one embodiment of the invention,

FIG. 1*a* is a cross-sectional view taken along line 1*a*—1*a* in FIG. 1;

FIG. 2 is a side elevational view, partly in section, looking generally in the direction of arrow II in FIG. 1,

FIG. 3 is a partial sectional view of a modified embodiment,

FIG. 4 is a front elevational view showing a preferred premixing burner according to a further modified embodiment of the invention, and

FIG. 5 shows an embodiment of a burner according to the invention which is similar to that of FIG. 1.

A burner unit is shown in FIG. 2 and comprises a gas inlet connecting pipe **10**, which by means of a cap nut **12** is connected to a gas valve, not shown, of a gas-fired water heater. Gas is conducted from the gas inlet connecting pipe **10** through a downwardly curved gas supply pipe **14** to a nozzle tube **16**. Regularly spaced gas outlet nozzles **18** are mounted on the nozzle tube **16**. Above the nozzle tube is a mixing tube unit **26**.

Two plug pins **20** are secured to the nozzle tube **16** between adjacent nozzles **18** (see FIG. 1). Each of the plug pins **20** forms a shoulder **22**. Holders **24** are secured to and extend upwardly from the nozzle tube **16** for attachment to the mixing tube unit **26**. In the range of the mixing tube unit **26**, the holder has an upwardly extending slot **24***a*, note FIG. 1*a*. The holders each have a transverse bore **24***b* adjacent the upper end.

A mixing tube unit **26** consists of two embossed half-shells **28, 30** of sheet metal. The half-shells have impressions **32**, which combine to form parallel, vertical mixing tubes. Surface portions **34** are disposed between these mixing tubes. Above the mixing tubes, the half-shells **28, 30** are provided with transversely extending impressions **36, 38**, which form a distributing chamber **40**, which extends transversely over the mixing tubes. The mixing tubes **42** formed by the impressions **32** open into this distributing chamber **40**.

Between adjacent mixing tube impressions **32**, each of the half-shells of sheet metal is formed with two hemicylindrical impressions **44**, which are combined to form a cylindrical guide. To assemble the burner, the mixing tube unit **26** is fitted on the plug pins so that the guides formed by the impressions **44** of the mixing tube unit **26** are fitted on the plug pins **20** until the lower edge of the unit **26** engages the shoulder **22**. Each mixing tube **42** is then exactly centered over one nozzle **18** and is spaced from this nozzle **18** by a distance which is defined by the shoulder **22**.

Two surface portions **34** of the half shells **28, 30**, disposed between adjacent mixing tubes **42**, are inserted into the slots **24***a* of the holders **24**. The mixing tube unit **26** is secured by two threaded fasteners **46**, each of which extends through one of the transverse bores **24***b* in the holders **24** and through registering apertures **28***a*, **30***a* in the sheet metal half shells **28, 30**.

A series of burner tubes **48** which are rectangular in cross-section are secured to the mixing tube unit **26** above the distributing chamber **40**. For this purpose, each of the burner tubes is provided on the underside with a U-shaped aperture **50** with which it straddles the distributing chamber **40**. A communication between the distributing chamber **40** and the interior of the burner tube **48** is established by two apertures **54, 56**, which are formed in the half-shells of sheet metal within the burner tubes **48** and are disposed laterally of the plane of contact **52** of the half-shells **28, 30** of sheet metal. As a result, a wall portion **58** is left which is disposed on the axis of the mixing tube **42** and serves as a baffle and ensures a uniform distribution of the gas pressure in the burner tube **48**.

In the plane of contact **52**, the half-shells **28** and **30** of sheet metal are interconnected by a folded seam **60**. As is apparent from FIG. 1, the folded seam **60** is interrupted at the top of the distributing chamber **40** by apertures **61** in which the burner tubes **48** are held.

The gas flows through the gas supply pipe **14** into the nozzle tube **16** and is discharged through the gas outlet nozzles **18**. Primary air is thus entrained by injector action and is mixed with the gas in the mixing tube **42**. The gas-air mixture from the several mixing tubes **42** enters the distributing chamber **40** and from the latter flows into the burner tubes **48** through the apertures **54, 56**. From the burner tubes **48**, the gas is discharged through a large number of small gas discharge ports **62**. The number of burner tubes **48** exceeds the number of mixing tubes **42**. The arrangement according to the invention results in a uniform distribution of the individual flames throughout the surface **63** of the burner.

FIG. 3 shows a modified embodiment, in which the half-shells **28, 30** of sheet metal are formed in their top portions with U-shaped apertures **64**, in which the burner tubes **48** are inserted. A communication between the distributing chamber **40** and the burner tubes **48** is established by lateral openings **65** in the burner tubes. In this design, the underside **66** of the burner tubes serves as a baffle for the rising gas stream.

In the embodiment shown in FIG. 1 the gas supply pipe **14** is disposed between two burner units.

FIG. 4 shows a preferred embodiment, which in the other details corresponds to the embodiment shown in FIG. 1 but in which the half-shells **28, 30** of sheet metal have a central aperture **68**, through which the arcuate gas supply pipe **14** extends to the nozzle tube **16**. The distributing chamber **40** extends throughout the width of the burner. In FIGS. 4 and 5, corresponding parts are designated with the same reference characters as in FIGS. 1 and 2.

FIG. 5 shows the complete burner of FIG. 1 and two mixing tube units **26** and **27**, between which the curved gas supply pipe **14** extends centrally to the nozzle tube **16**. In the embodiment shown in FIG. 5, the distributing chamber is divided into two distributing chamber sections **40** and **41**.

Instead of two separate half-shells of sheet metal, half-shells of sheet metal may be used which form an integral sheet metal element which is reversely bent through 180° adjacent to the surface **58** in FIG. 2.

What is claimed is:

1. A premixing gas burner comprising two interconnected sheet metal shell members, each of said shell members having impressions which cooperate therebetween to form a plurality of generally parallel disposed mixing tubes, each of said mixing tubes having an upper end, each of said shell members having chamber portions which cooperate therebetween to form a distributing chamber which extends across said mixing tubes, said upper ends of said mixing tubes being in communication with said distributing chamber, and a plurality of burner tubes extending transversely of said distributing chamber, said burner tubes being in communication with said distribution chamber and having means thereon defining burner ports.

2. A premixing gas burner as set forth in claim 1, in which said burner tubes are vertically elongated and have a rectangular shape in cross-section.

3. A premixing gas burner as set forth in claim 1, in which said burner tubes are secured to said chamber portions in a straddling relation and are formed on the underside with apertures through which said burner tubes communicate with said distributing chamber.

4. A premixing gas burner as set forth in claim 3, in which

said shell members consist of half-shells contacting each other in a vertical plane of contact and interconnected by folded seams disposed in said plane of contact,

one of said folded seams extends at the top of said distributing chamber, and

said chamber portions comprise seat portions which are disposed on top of said distributing chamber and in which said burner tubes are seated and which are formed with apertures which interrupt said one folded seam.

5. A premixing gas burner as set forth in claim 3, in which

said half-shells are formed adjacent to said distributing chamber and burner tubes with apertures which are disposed laterally of said plane of contact and through which said distributing chamber communicates with said burner tubes.

6. A premixing gas burner as set forth in claim 1, in which

said chamber portions comprise apertured seat portions disposed on top of said distributing chamber and

said burner tubes are inserted in said apertured seat portions.

7. A premixing gas burner as set forth in claim 6, in which said burner tubes are formed with lateral apertures which are disposed within said distributing chamber and through which said distributing chamber communicates with said burner tubes.

8. A premixing gas burner as set forth in claim 1, in which the number of said burner tubes exceeds the number of said mixing tubes.

9. A premixing gas burner as set forth in claim 1, in

which each of said mixing tubes has an open lower end, said shell members consist of half-shells, each of which is formed with at least two hemicylindrical impressions, each of which is formed between two adjacent ones of said mixing tubes, and said hemicylindrical impressions in said half-shells combine to form at least two transversely spaced cylindrical guides, and a nozzle tube is provided and carries upwardly directed gas outlet nozzles axially aligned with said lower ends of respective ones of said mixing tubes, and two upwardly directed plug pins mounted on said nozzle tube, which are fitted into respective ones of said cylindrical guides.

10. A premixing gas burner as set forth in claim 9, in which

at least two vertical holders which are spaced in the longitudinal direction of said nozzle tube are mounted on the latter between adjacent ones of said nozzles,

each of said holders is formed with a slot extending in the longitudinal direction of said nozzle tube,

each of said holders has an upper end portion formed with a transverse bore,

said half-shells comprise portions disposed between adjacent ones of said mixing tubes and extending through said slots in said holders,

said half-shells are formed with apertures aligned with said transverse bores, and

said half-shells are secured to said holders by threaded fasteners extending through said transverse bores and said apertures aligned therewith.

11. A premixing gas burner as set forth in claim 1, in which

each of said mixing tubes has an open lower end,

a nozzle tube is provided and carries upwardly directed gas outlet nozzles axially aligned with said lower ends of respective ones of said mixing tubes,

said shell members are formed at the center of their length with an aperture, which is disposed between two adjacent ones of said mixing tubes, and

a curved gas supply pipe extends through said aperture and communicates with said nozzle tube.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,799,452 Dated March 26, 1974

Inventor(s) Georg Hein

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading of the patent, insert

--[30] Foreign Application Priority Data

February 19, 1972 Germany.....P 22 07 888.2--

Signed and sealed this 30th day of July 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
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