# United States Patent [19]

**Ghelfi**

[11] **3,822,654**

[45] **July 9, 1974**


[54] **BURNER FOR BURNING VARIOUS LIQUID AND GASEOUS COMBUSTIBLES OR FUELS**


[76] Inventor: **Salvatore Ghelfi,** 8610 Uster Bordackerstrasse 18, Uster, Switzerland



[22] Filed: **Jan. 8, 1973**

[21] Appl. No.: **321,987**

[52] **U.S. Cl.** ..... **110/7 S,** 431/284

[51] **Int. Cl.** ..... **F23g 7/00**

[58] **Field of Search** ..... 110/7 R, 7 S, 8 R, 8 C; 431/284



[56] **References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 1,976,528 | 10/1934 | Vandeveer | 110/7 X |
| 2,335,188 | 11/1943 | Kennedy | 431/284 |
| 3,489,108 | 1/1970 | Garver et al. | 110/7 |
| 3,611,954 | 12/1971 | Monroe, Jr. | 110/7 |
| 3,729,285 | 4/1973 | Schwedersky | 431/284 |



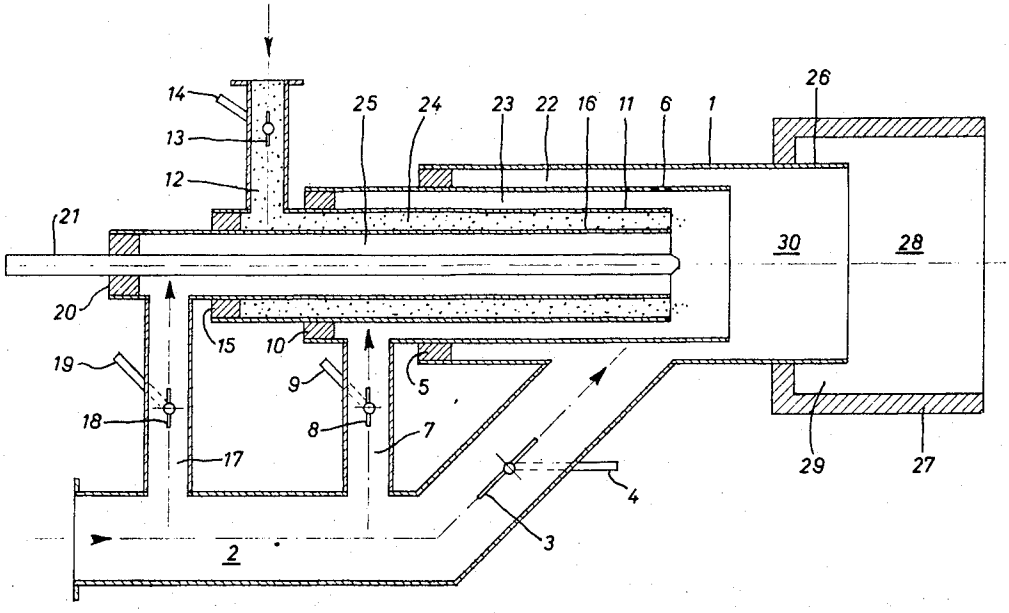
*Primary Examiner*—Kenneth W. Sprague



[57] **ABSTRACT**

The present invention relates to a burner for burning various liquid and gaseous combustibles or fuels simultaneously, i.e., a burner which can operate and work simultaneously with gaseous and liquid combustibles and with liquids and or gas containing materials to be incinerated. The burner of the invention comprises a first tubular outer shell and a plurality of concentrically arranged tubular inner shells forming a number of ring shaped chambers opening into a common mixing chamber provided at the front end of said first shell each of said chambers communicating with a source of combustion air or a source of fuels, the burner further comprising means for the controlled feeding of combustion air or fuel into said chambers.


**4 Claims, 2 Drawing Figures**



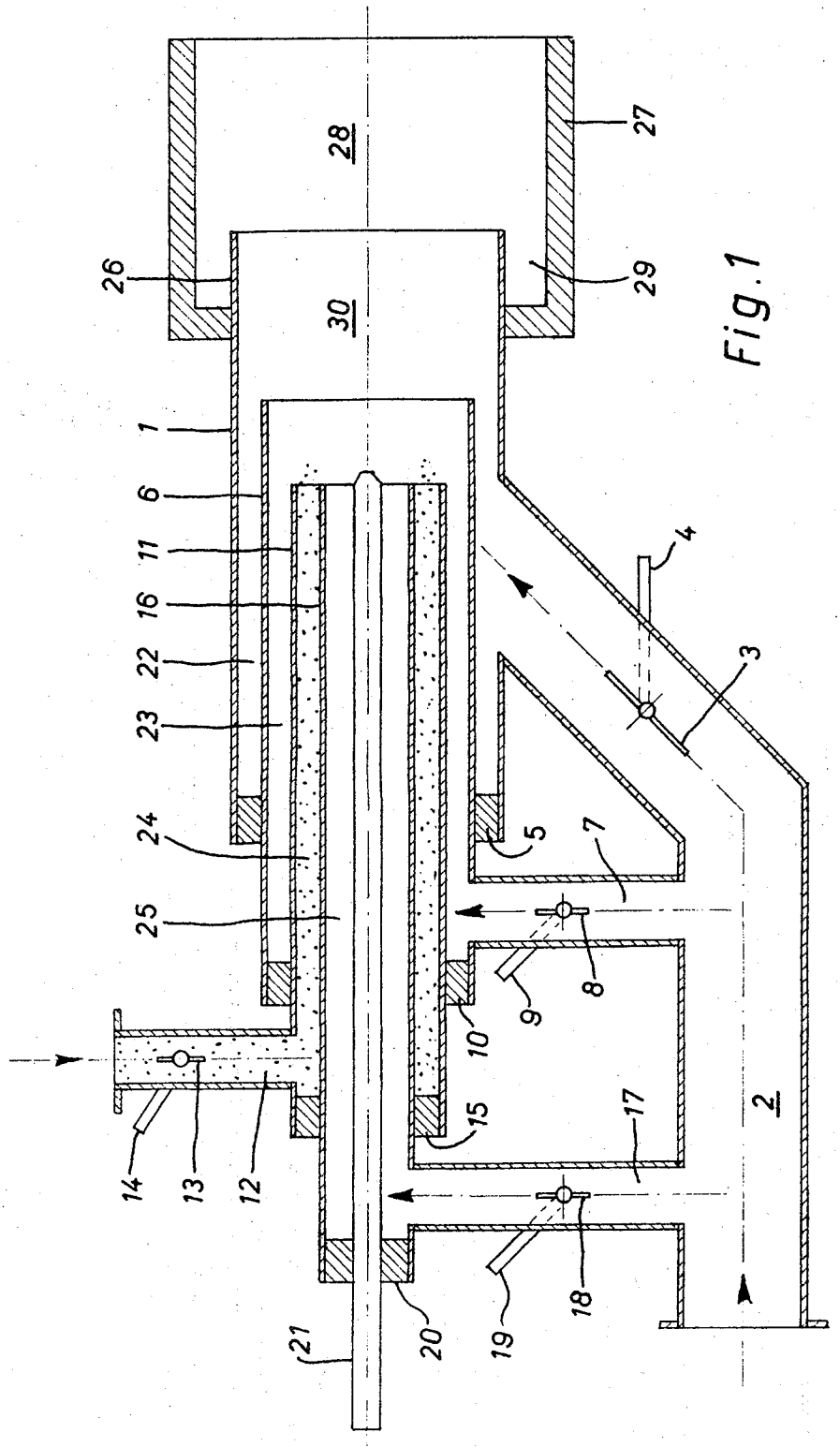

28
27
26
30
29
1
6
11
16
22
23
24
25
4
3
5
7
8
9
10
15
17
2
14
13
12
21
20
19
18

Fig. 1

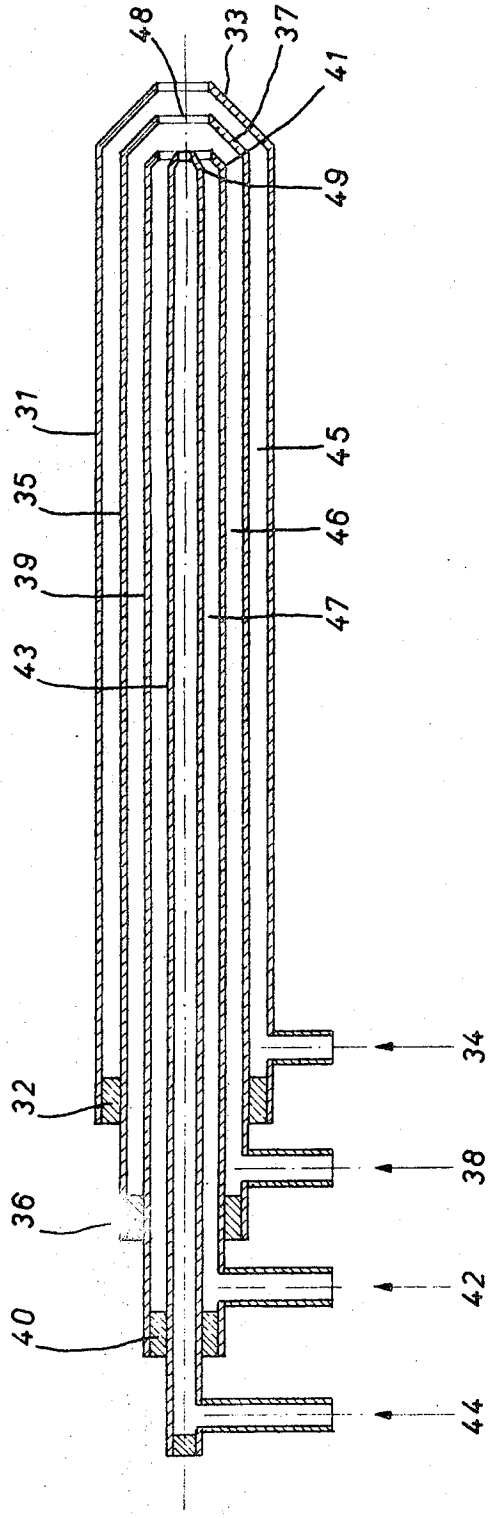



Fig. 2

# BURNER FOR BURNING VARIOUS LIQUID AND GASEOUS COMBUSTIBLES OR FUELS

## BACKGROUND OF THE INVENTION

The present invention relates to a burner useful for burning various liquid and gaseous combustibles or fuels simultaneously if desired. Sludged liquids, i.e., liquids containing solid materials to be incinerated, should also be considered as combustibles in the present invention.

Known burners are usually constructed for burning fuel or for incinerating a single material or a mixture of materials by feeding to a combustion chamber an atomized mixture of fuel, material to be incinerated and combustion air.

## SUMMARY OF THE INVENTION

It is an object of the present invention to provide a new type of burner permitting to feed to a combustion chamber a mixture of fuel and of various combustibles or materials to be incinerated.

It is a further object of the invention to provide a new and useful burner of the type permitting to feed the combustibles into the center of the flame or into outer regions thereof.

The burner for various liquid and gaseous combustibles or fuels in accordance with the invention comprises a first tubular outer shell and a plurality of concentrically arranged tubular inner shells forming a number of ring shaped chambers opening into a common mixing chamber provided at the front end of said first shell, each of said chambers communicating with a source of combustion air or a source of fuels, the burner further comprising means for the controlled feeding of combustion air or fuel into said chambers.

In a preferred embodiment of the invention the said outer shell projects into a combustion chamber thereby forming a ring shaped zone or chamber between the part of said outer shell projecting into the combustion chamber and the end and side walls of said combustion chamber.

A still further object of the invention is a burner for various liquid and gaseous combustibles or fuels, comprising a plurality of longitudinal tubular concentrically arranged shells forming a number of ring shaped chamber closed at their rear ends and opening at their front ends into a common mixing or combustion chamber, and further comprising fuel or combustion air feeding ducts for each of said chambers and means for the controlled feeding of combustion air or fuel into said chambers.

A further object of the invention is a burner for various liquid and gaseous combustibles or fuels, comprising a tubular central nozzle for injecting liquid fuel, a plurality of concentric shells mounted on said nozzle and forming a number of chambers between them, each of said chambers being connected to a source of combustion air or material to be burned.

## BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the present invention will hereinafter be described with reference to the drawings in which:

FIG. 1 shows a longitudinal section through a burner in accordance with the invention, and



FIG. 2 a longitudinal section through a further embodiment, particularly through a nozzle for injecting liquid fuel.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 of the drawing shows a burner comprising a cylindrical outer shell **1**. A feeding duct **2** for combustion air is connected to shell **1**. A flap valve **3**, operable by means of a lever **4**, is mounted in said duct **2**.

A mounting element **5** on the rear end of shell **1** holds a second cylindrical shell **6** concentrically within shell **1**.

A combustion air duct **7** interconnects the main duct **2** and the tubular shell **6**. A further flap valve **8**, operable by means of a lever **9**, is mounted within said duct **7**.

A mounting part **10** at the rear end of shell **6** holds a further tubular shell **11** concentrically within shell **6**. A duct **12**, provided with a flap valve **13** operable by means of a lever **14**, is fixed on shell **11** for feeding a combustible or a mixture of fuel and material to be incinerated.

A further mounting part **15** at the rear end of shell **11** holds a tubular shell **16** concentrically within shell **11**. A combustion air duct **17** interconnects the main duct **2** and the tubular shell **16**. A flap valve **18**, operable by means of a lever **19**, is mounted within duct **17**.

A nozzle **21** is fixed, by means of a mounting part **20** at the end of shell **16**, concentrically within shell **16**. The nozzle **21** serves for feeding the liquid fuel or a mixture of fuel and materials to be incinerated.

As can be seen from the drawing, ring shaped longitudinal chambers are formed between the different adjacent shells, such as chambers **22,23,24** and chamber **25** between shell **16** and the central nozzle **21**. All these chambers open at their front ends into a mixing chamber **30** provided within the front end portion of shell **1**.

The front end portion **26** of shell **1** projects within a further shell **27** forming a combustion chamber **28**. The inner walls of chamber **28** are lined with ceramic materials. Ignition means of any known type are provided, i.e., mounted in chamber **28**.

A ring shaped chamber or zone **29** is formed between the outer wall of the front end portion **26** of shell **1** and the end and side walls of chamber **28**.

FIG. 2 shows a section through a nozzle of a burner, such as e.g. a nozzle as shown by **21** in FIG. **1**.

The nozzle is formed by concentrically arranged tubes **31, 35, 49** and **43** each mounted on the adjacent one by means of the closure and mounting parts **32,36** and **40** respectively. Each tube **31,35,39** and **43** has at its front end a conical head **33,37, 41** and **49** respectively.

The tube **43** may be slidably mounted within tube **39**. Ring shaped chambers **45,46** and **47** are formed between the tubes **31, 35** and **35,39** and **39, 43** respectively. A feed duct **34,38** and **42** leads into said chambers **45,46** and **47** respectively at the rear ends thereof. A feed duct **44** leads into the tube **43**.

As already mentioned, this nozzle could be used in the burner described in FIG. **1** as the fuel injection nozzle **21**.

In operation of the burner the combustion air is introduced through duct **2** and it penetrates through chamber **22** into the combustion chamber **28**. A desired por-

tion of combustion air will flow through ducts **7** and **17**, chambers **23** and **25** and finally also enter chamber **28.**

The whole mass of combustion air coming from chambers **22,23** and **25** with great velocity and laminar flow will therefore produce a depression in the ring zone **29.** This will produce a turbulent flow in said zone and in the combustion chamber **28.**

The gaseous fuel is fed into the burner through duct **12,** traverses chamber **24** and will be mixed with the combustion air in the mixing chamber **30.** Ignition of the mixture can take place within chamber **30** and propagate to the combustion chamber **28.**

Simultaneously with the operation by gaseous fuel the burner may also operate with liquid fuel or combustibles. The liquid fuel will be introduced through nozzle **21,** i.e., through duct **44** and tube **43** of the nozzle shown in FIG. **2.**

For atomizing the liquid fuel a pressurized gas (vapor, air or any gas) may be introduced through duct **42** and the chamber **47** into the passage **48** at the front end **49** of tube **43.** This will provide for an effective atomization of the fuel. The atomization can still be ameliorated by introducing a further fluid through duct **38** and chamber **46** opening into passage **48.**

A still further amelioration is possible by introducing a gaseous fluid, at high temperature for example, through duct **34** and chamber **45,** thereby increasing the inflammability of the mixture.

It would also be possible to introduce a liquid, combustible or not, through duct **38,** e.g. a sludged liquid, the solid parts thereof having to be incinerated, this particularly if the nozzle or burner is used in an incinerating furnace. The same mixture could also be introduced through duct **12** of the burner of FIG. **1.**

The flap valves **3, 8** and **18** serve to control the volume and thereby the pressure of the combustion air introduced into the mixing chamber **30** and to thereby stabilize the mixture and the oxidation in the different zones of the flame produced.

The turbulent flow and the turbulence in the zone **29** of the combustion chamber **28** permit an enlargement of the flame against the walls lined with ceramic materials of the shell **27** forming the combustion chamber **28.** The flame fills completely the combustion chamber **28** and avoids that air not mixed with fuel can enter into the furnace where the burner is mounted.

The burner of the present invention can operate and work simultaneously with gaseous and liquid combustibles and liquids or gas containing materials to be incinerated.

The flap valves may be operated manually or automatically, individually or simultaneously.

As already mentioned, the central tube **43** of the nozzle, e.g. of nozzle **21** may be movable with respect to the other tubes of the nozzle. It would also be possible to mount and arrange other tubes of the nozzle or of the burner movable with respect to others, thereby varying e.g. the velocity of the fluid in the passage **48.**

What is claimed is:

**1.** A burner for various liquid and gaseous combustibles or fuels, comprising a first tubular outer shell and a plurality of concentrically arranged tubular inner shells forming a number of ring shaped chambers opening into a common mixing chamber provided at the front end of said first shell, each of said chambers communicating with a source of combustion air or a source of fuels, and means for the controlled feeding of combustion air or fuel into said chambers, said outer shell projecting into a combustion chamber thereby forming a ring shaped zone or chamber between the part of said outer shell projecting into the combustion chamber and the end and side walls of said combustion chamber.

**2.** A burner according to claim **1** wherein said ring shaped chambers are closed at their rear ends and open at their front ends into said common mixing chamber, and there is further provided fuel or combustion air feeding ducts for each of said chambers.

**3.** A burner as claimed in claim **2,** wherein the innermost of said concentric tubular shells is mounted axially slidable with respect to the other shells.

**4.** A burner as claimed in claim **1,** wherein the innermost shell is a nozzle for injecting a liquid fuel.

* * * * *