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[54] **APPARATUS AND METHOD FOR INCREASING THE TEMPERATURE OF AN EFFLUENT BURNER**

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[52] **U.S. Cl.** ..... **431/5,** 110/8 A

[51] **Int. Cl.** **F23d 13/20**

[58] **Field of Search** ..... 431/5, 116, 11; 110/8 A; 23/277 C; 432/72

[56] **References Cited**

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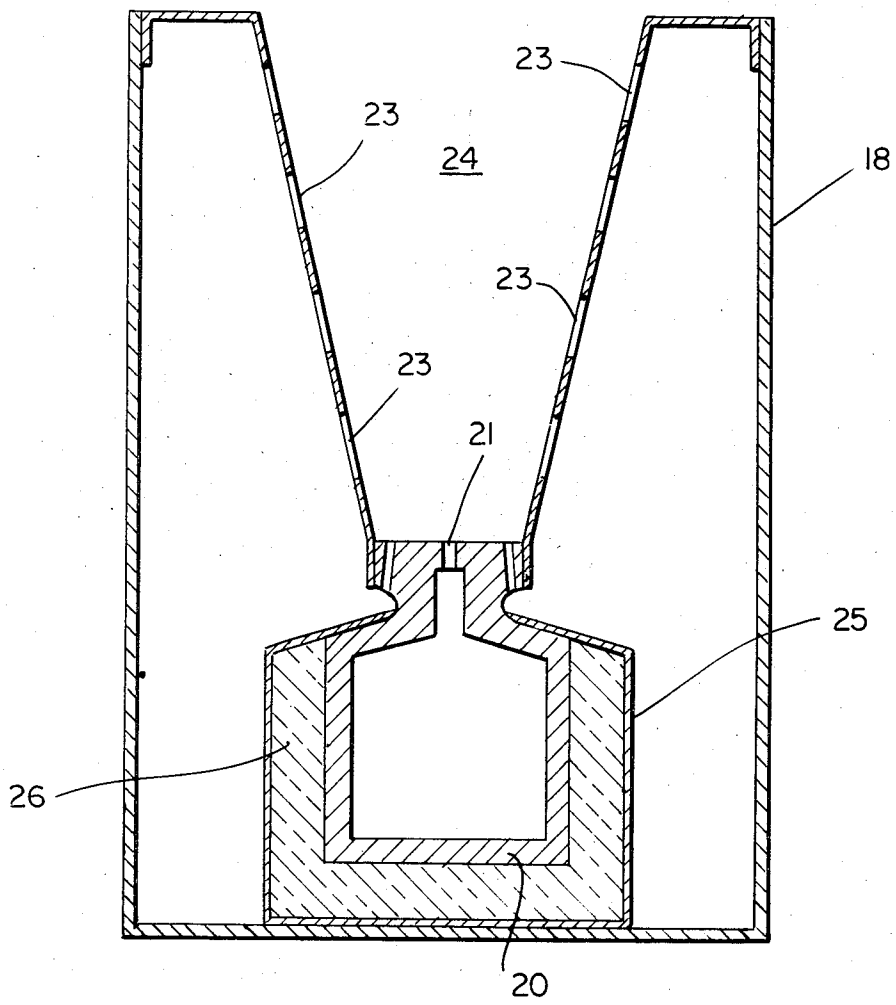
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[57] **ABSTRACT**

The fuel chamber of the effluent burner is insulated from the surrounding effluent to maintain the temperature of the fuel below its "cracking point." The effluent is heated beyond the cracking point of the natural gas or other fuels prior to burning.

4 Claims, 2 Drawing Figures



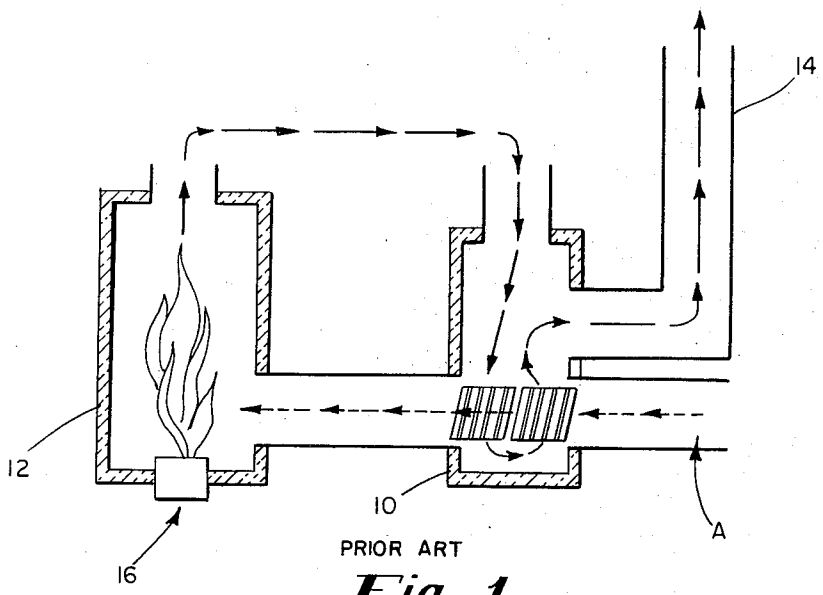


Fig. 1

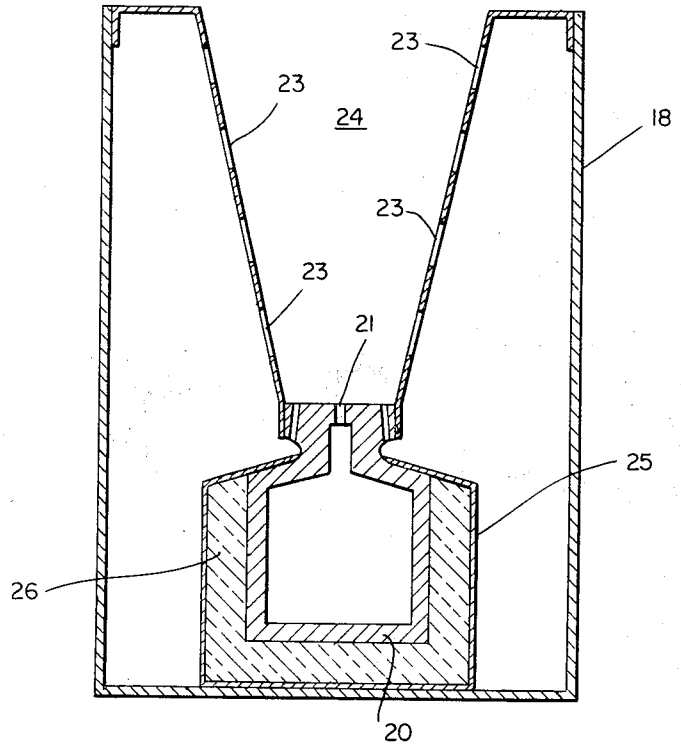


Fig. 2

APPARATUS AND METHOD FOR INCREASING THE TEMPERATURE OF AN EFFLUENT BURNER

BACKGROUND OF THE INVENTION

This invention relates to apparatus and methods of burning waste products, and more particularly, to a new and novel apparatus and method for increasing the temperature of effluent to be burned so that it can be burnt at increased thermal efficiency.

In the prior art, as shown in FIG. **1,** it was known to pre-heat fumes from chemical processes and the like in a heat exchanger **10** and then pass the pre-heated fumes, or effluent as it is known, into an afterburner **12** where they were burnt. The process fumes entered at A, passed through the heat exchanger in the direction of the arrows shown, were burnt and then passed back through the heat exchanger before exiting through the stack **14,** as shown by the arrows. The thermal efficiency of such a system is usually about 60 percent.

There are limits on such a system caused in part by the use of natural gas fuel to burn the effluent. The natural gas enters the burner through the chamber designated generally **16** in FIG. **1.** Natural gas or methane thermally cracks at temperatures above about 1,200°F, so that it is important in the prior art process to keep the fuel gas below that temperature prior to burning. Accordingly, in prior systems, since the gas chamber **16** is surrounded by the effluent, the effluent was maintained at a pre-heated temperature less than the cracking temperature of the gas. This was normally about 900°F.

In air pollution clean-up, the cracking of fuel prior to incineration results in breakdown of the fuel, resulting in products of precombustion which are pollutants and are not destroyed by the flame, and can combine with other undesirable elements.

It is desirable, therefore, to find ways of increasing the pre-heated temperature of the effluent so as to reduce the necessary heat input of the natural gas in burning and increase the efficiency of the unit.

SUMMARY OF THE INVENTION

We have discovered and disclose in this application a new and novel apparatus and method for increasing the thermal efficiency of an effluent burner of the type described, and in particular, have provided a jacket surrounding the natural gas chamber which in the preferred embodiment is insulated in order to maintain the temperature of the natural gas at below its cracking point prior to combustion. This allows us to increase the pre-heated temperature of the effluent, and in turn allows us to recover a higher percentage of heat from the stack gases.

Accordingly, it is an object of this invention to provide a new apparatus and method for increasing the thermal efficiency of an effluent burner.

This and other objects of the invention will become apparent from the following description with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic of an effluent burning system using a heat exchanger and afterburner; and

FIG. **2** is an enlarged sectional view of a burner in accordance with the preferred embodiment of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Although specific forms of the invention have been selected for illustration in the drawings, and the following description is drawn in specific terms for the purpose of describing these forms of the invention, this description is not intended to limit the scope of the invention which is defined in the appended claims.

Referring now to FIG. **2,** a transverse vertical section of a typical burner for use in a system such as shown in the prior art in FIG. **1,** is shown in a form modified in accordance with our invention. It comprises an effluent receiving chamber **18** mounted about a natural gas fuel receiving chamber **20.** The gas exits from the opening **21** and is burned with the effluent exiting through the holes **23** in the space **24.** In accordance with our invention, a steel jacket **25** is provided mounted about the gas chamber **20,** and suitably attached thereto by welding or other similar means, so as to completely surround the thin walled portion of the chamber. In the preferred embodiment an insulating means is provided in the space between the steel jacket **25** and the chamber **20.** As shown, it is filled with an insulating material **26** capable of withstanding high temperatures on the order of 2,000°F. Such materials are well known and shall not be described further herein.

Sufficient material must be provided to maintain the temperature of the fuel gas below cracking. As previously stated, the cracking temperature is about 1,200°F and therefore it is desirable to maintain it at between say 900° to 1,100°F.

By providing such insulation, it is possible to raise the temperature of the effluent in the pre-heated condition; and depending on the system, and the type of effluent used, this temperature can rise to from 1,200° to 1,400°F prior to burning. This greatly increases the efficiency of the system, as well as the amount of heat recovered. To achieve this rise in temperature the prior art system shown in FIG. **1** and known heat exchangers can be used, and therefore they will not be described further herein.

While we have described a solid insulating material, it will be apparent that a fluid insulator could be used within the scope of this invention.

Accordingly, we have described, in addition to the new apparatus, a new process comprising the steps of pre-heating effluent to a temperature above the cracking temperature of the fuel with which the effluent will be burned, introducing the preheated effluent into a chamber surrounding the chamber in which the fuel is contained prior to burning, and maintaining the temperature of the fuel gas at below its cracking point in said chamber prior to burning.

It will be understood that various changes in the details, materials and arrangement of parts which have been herein described and illustrated in order to explain the nature of this invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the following claims.

It will further be understood that the "Abstract of the Disclosure" set forth above is intended to provide a non-legal technical statement of the contents of the disclosure in compliance with the Rules of Practice of the U.S. Pat. Office, and is not intended to limit the scope of the invention described and claimed herein.

What is claimed is:

1. An apparatus for burning effluent comprising: a body forming a chamber for gaseous fuel; a second body forming a chamber for effluent to be burned with said gaseous fuel mounted about said first body; a third body forming a third chamber disposed about said first body within said second body; and insulating means within said third chamber coacting therewith to provide insulation about said first chamber to maintain the temperature of the gaseous fuel in the first chamber lower than the temperature of the effluent in the second chamber.

2. A method of burning effluent comprising: the steps of providing a gaseous fuel from a source to a burner; heating the effluent to a temperature above the cracking temperature of the gaseous fuel; and exposing the gaseous fuel to the heat of the effluent while maintaining the gaseous fuel at a temperature below its cracking temperature prior to combustion.

3. A method, for increased thermal efficiency, of burning effluent above the cracking temperature of a gaseous fuel without resulting in pollutant products of pre-combustion, comprising the steps of:

providing heated effluent at a temperature above the cracking temperature of the gaseous fuel,

maintaining a source of the gaseous fuel below the cracking temperature of the gaseous fuel by insulating it from the heated effluent, and then

supplying the gaseous fuel from the insulated source to a burner exposed to the heated effluent.

4. An apparatus, of increased thermal efficiency, for burning effluent above the cracking temperature of a gaseous fuel without resulting in pollutant products of pre-combustion, comprising:

a first body forming a first chamber for the gaseous fuel;

a second body forming a second chamber for effluent heated above the cracking temperature of the gaseous fuel, mounted about said first body;

a third body forming a third chamber disposed about said first body within said second body; and

insulating means within said third chamber co-acting therewith to provide insulation about said first chamber from the heat of the effluent so as to maintain the temperature of the gaseous fuel within said first chamber at a temperature lower than the cracking temperature of the gaseous fuel.

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