Nov. 18, 1969 A. B. CARSON 3,478,706

TRANSPIRATION-COOLED INCINERATOR

Filed Feb. 12, 1968

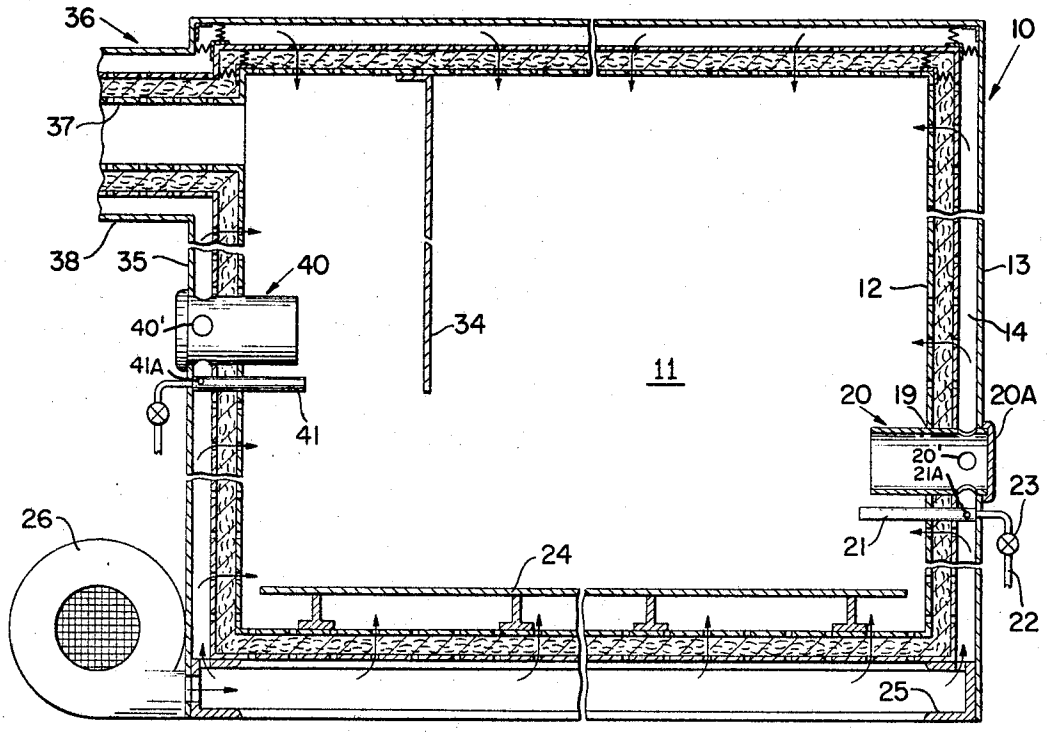


Fig. 1

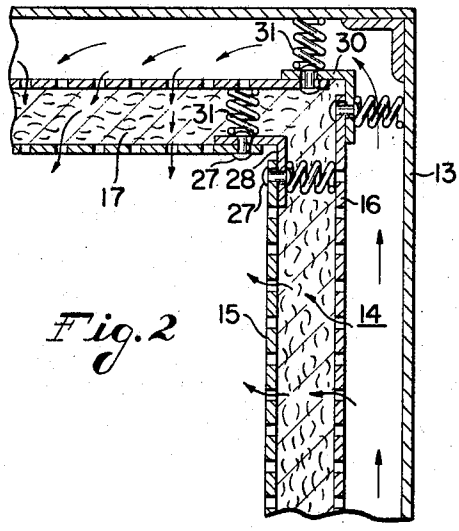


Fig. 2

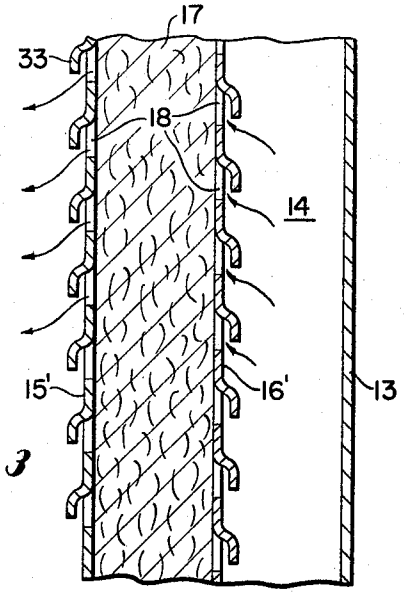


Fig. 3

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3,478,706
Patented Nov. 18, 1969

3,478,706

TRANSPIRATION-COOLED INCINERATOR

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Filed Feb. 12, 1968, Ser. No. 704,932
Int. Cl. F23g 3/00; F23l 9/00, 1/00
U.S. Cl. 110—8 10 Claims

ABSTRACT OF THE DISCLOSURE

This incinerator has composite walls consisting of an imperforate outer casing enclosing an inner casing formed with perforated walls spaced by a layer of air-pervious fireproof insulating means, such as glass, metallic or mineral fibers. The outer casing is spaced from the inner casing to form a manifold for receiving air under pressure which flows through the walls and insulation of the inner casing to support combustion and prevent outward flow of heat. The fibrous material functions first to reduce radiative heat flux, and second to permit inward air flow from the manifold to reduce heat flux by conduction through the fibers and convection through the wall. Elongated heat dissipating elements yieldably space the inner and outer casings and the walls of the former are relatively movable so that the inner casing may expand and contract in response to thermal variations. Suitable shielding may be provided on or around the inner casing to dissipate the heat and prevent direct heat radiation from the inner casing to the walls of the outer casing. Ignition and smoke burners and an exhaust stack also receive air from the air manifold.

Summary

This invention relates generally to waste disposal; more particularly it is concerned with the incineration of the type of waste generated in military or other kitchens designed to prepare food rapidly for consumption by large crowds of individuals. Still more particularly, the invention is directed to a portable, substantially self-contained incinerator, which is so constructed that it will be light in weight compared to conventional structures, will have relatively cool exterior walls, will substantially completely consume the waste introduced to it, will have an extended useful life, and will require a minimum of care and attention.

An object of this invention is to provide an incinerator having an inner casing forming a combustion chamber enclosed in an outer casing with an air space therebetween to receive air under pressure, such air serving the dual purpose of preventing heat transfer to the outer from the inner casing by conducting the radiative and convective heat back into the interior of the inner casing and supporting combustion of fuel supplied to ignition and smoke burners as well as the waste matter introduced into the combustion chamber.

Another object of the invention is to provide an incinerator utilizing transpiration cooling principles to maintain cool exterior walls and exhaust stack.

Still another object of the invention is to provide an

incinerator having an inner casing with relatively movable walls to permit expansion and contraction due to varying temperatures, the inner casing being enclosed within an outer casing and yieldably held in spaced relation from the walls thereof by attenuated heat radiating means to prevent heat conduction from the inner to the outer casing, the space between the casings receiving air under pressure for flow through air-pervious material forming the inner casing walls to remove heat from such material and conduct the heat back into the interior of the inner casing, the air also serving to support combustion of refuse within the inner casing.

Another object of the invention is to provide the incinerator mentioned in the previous paragraphs with means, such as shields or deflectors, over the perforations in the inner casing walls to prevent line-of-sight heat radiation toward the outer casing and to cause air flow paths from the space between the casings to and through the openings in the inner casing walls, which paths will make the air most effective in extracting the heat from the walls and shields and conducting such heat back into the inner casing.

Other objects and advantages of the invention will be apparent from the following description of the embodiment of the invention selected for illustration in the accompanying drawings.

The drawings

FIG. 1 is a vertical sectional view taken through an incinerator formed in accordance with the invention;

FIG. 2 is a detail sectional view on an enlarged scale taken through a corner of the incinerator to show yieldable support means employed therein; and

FIG. 3 is also a detail sectional view on an enlarged scale showing a modified form of perforation and shield construction which may be used in the wall of the incinerator.

Description

To carry out the objects outlined previously, an incinerator **10** of the type shown in the drawings may be provided. This incinerator, as shown in FIG. 1, includes a wall structure forming a chamber **11** into which waste materials to be burned are introduced. In the form of the invention illustrated, the wall structure forms a rectangular enclosure. It is obvious that any desired shape may be provided. One of the features of this invention is to utilize a transpiration method of cooling the wall structure. To secure this result, each wall of the enclosure is composed of an inner section **12** and an outer section **13**. The sections **12** form an inner casing for the incinerator and the sections **13** form an outer casing.

The sections or walls **13** are spaced from the inner section **12** to provide an air chamber **14** completely enclosing the inner casing. The walls **13** are imperforate and may be formed of metal or other suitable material. The sections **12** of the inner casing have perforated inner and outer walls **15** and **16** which are spaced from one another for the reception of a filler layer **17** former of fireproof insulating material which may be of any suitable type such as glass, metal or mineral fibers so arranged as to provide tortuous passages therethrough and thus be air-pervious.

As shown in FIG. 3, modified walls 15' and 16' may be provided with openings or slots 18 which may be stamped or otherwise formed. The openings in these walls permit air to flow from the air chamber into and through the insulating layer 17 to the interior of the incinerator. This air will support the combustion of the waste materials in the chamber 11. One of the walls is formed with an opening 19, having a liner 20 through which the waste materials may be introduced to the chamber 11. This opening is closed by a dor 20A. If found necessary, a burner 21 may be located adjacent the opening for the initial ignition of materials introduced through the opening. Suitable fuel may be supplied to the burner through a passage 22. Valve 23 is arranged in the passage to control flow of fuel to the burner. As illustrated, burner 21 may receive air for combustion of the fuel through openings 21A communicating with air chamber 14. Additional combustion air, if required, may be supplied to the burner from chamber 14 through openings 20' in liner 20.

In the form of the invention illustrated, all of the walls have similar construction and a platform 24 is arranged over the bottom wall to prevent ashes or other accumulation of noncombustible materials from clogging the openings in the bottom wall. This bottom wall is elevated above the ground or the other supporting surface by a base 25 which may form a manifold for the reception of air supplied to the incinerator by a suitable fan 26. In the form of the invention shown, this fan is located at the back of the incinerator to be accessible for servicing. It is obvious that it could be disposed within the manifold formed by the base 25, if desired.

During the use of the incinerator, relatively high temperatures may be generated by the burning waste material. These temperatures may tend to cause the expansion of the walls, particularly those of the inner casing. To permit this action, the walls are joined to one another, as illustrated in FIG. 2, through movable connections provided by passing fastening elements 27 through slots or other suitable openings in the walls 15 and 16 and angle iron elements 28 and 30 arranged at the inner and outer corners of the inner casing. Lost motion connections thus formed will permit the expansion and contraction of the walls.

The spacing of the walls of the inner casing from one another and from the walls of the outer casing is maintained by coiled elements 31 which serve the dual purpose of yieldably maintaining the spacing of the wall elements and as heat dissipation means. Due to the elongated construction, the conduction of the heat from within the inner casing to the outer casing through the elements 31 will be prevented since any heat transmitted to the elements will be dissipated into the air around the elements. The outer wall surfaces will thus be kept cool.

Radiation of heat from the inner to the outer casing is also reduced by forming the walls of the inner casing with shields 33 over the openings 18 is such walls. These shields prevent direct line-of-sight radiation of heat through the inner casing wals. They also cause the air to flow over paths designed to remove heat from the adjacent portions of the walls. While FIG. 3 shows the shields stamped from the wall material, such shields could also be separately formed and suitably secured to such walls.

The inner casing is provided, as shown in FIG. 1, with a partition 34 depending from the top wall. This partition is located adjacent to, but spaced from, the back wall 35 of the incinerator. The partition terminates in spaced relation from the bottom wall and is provided to cause smoke and gases resulting from combustion to flow generally downwardly within the chamber 11 and upwardly along the back wall to an outlet stack 36 leading from the incinerator adjacent the upper end of the back wall 35. The stack may have a suitable cross sectional configuration, i.e., either round or square, the walls being similar in construction to the walls of the incinerator. The inner wall 37 of the stack has a double-wall construction with insulation between the walls and an outer wall 38 spaced from the inner walls to provide a continuation of the air chamber 14. The outer wall of the stack will thus be maintained at a relatively low temperature.

To insure the complete combustion of the smoke and gases flowing to the stack, the back wall is provided with a smoke burner 40. This element, like element 20, is provided with openings 40' to admit air from the air chamber 14 to assist the combustion of the gases. Here again, a fixture 41 for gas or other fuel may be employed. The burners 21 and 41 are constructed with openings 21A and 41A, respectively, to receive air from the air chamber 14 to support the combustion of the fuel supplied thereto.

From the foregoing description, it will be apparent that an incinerator has been provided in which an inner casing for the combustion of waste materials is completely enclosed in an outer casing with an air space therebetween. Means have also been provided to supply such air space with air under suitable pressure to cause a flow of air through the air space and through the wall structure of the inner casing to remove heat from the materials of the walls and transmit it to the chamber 11 within such inner casing. This transfer of heat will assist in the complete consumption by fire of the waste materials introduced into the incinerator. The air thus serves a dual purpose of cooling the walls of the incinerator and supporting the combustion of waste materials within the incinerator. By reason of this transpiration cooling, the wall structure may be maintained at a minimum thickness, conserving materials and reducing the final weight of the incinerator to make it more suitable for mobility purposes.

I claim:

1. Incinerator apparatus, comprising:
   (a) an imperforate outer casing;
   (b) an inner casing spaced from the walls of the outer casing, said inner casing having wall means with fireproof fibrous insulating material assembled to provide tortuous air passages therethrough; and
   (c) means for introducing air under pressure into the space between the inner and outer casing, such air flowing through said tortuous air passages of said inner casing to reduce heat flux by radiation, convection and conduction therethrough.

2. Incinerator apparatus of claim 1 in which the inner casing has spaced inner and outer perforated walls and a layer of air-pervious fireproof insulating material therebetween.

3. Incinerator apparatus of claim 1 in which the inner casing is maintained in spaced relation from the outer casing by attenuated heat dissipation means.

4. Incinerator apparatus of claim 1 in which the inner casing is maintained in spaced relation from the outer casing by coiled elongated metallic elements.

5. Incinerator apparatus of claim 1 in which means are provided to make the walls of the inner casing movable relative to one another to provide for thermal expansion and contraction.

6. Incinerator apparatus of claim 2 in which the openings in the exterior walls of the inner casing are slots and shields are provided over the slots to resist heat flow from the slots toward the outer casing.

7. Incinerator apparatus of claim 1 in which the inner casing has at least one ignition burner therein, a part of the air supplied to the space between the casings being admitted to said burner to support combustion at said burner.

8. Incinerator apparatus of claim 1 in which an exhaust stack leads from the inner casing adjacent the upper

portion of one side thereof, the walls of said stack having the same type of construction as the incinerator per se.

9. Incinerator apparatus of claim **8** in which a baffle depends from the top wall of the inner casing in spaced relation to the entrance to said exhaust stack and a smoke burner is disposed below the entrance to said exhaust stack adjacent the lower end of said baffle, air from the space between said inner and outer casings flowing to said smoke burner to support combustion at the same.

10. Incinerator apparatus of claim **2** in which the perforations in the walls of the inner casing are slots and shields extending substantially parallel to the respective walls and over the slots are provided to cause air supplied

to the space between the casings to flow parallel to the walls when entering and leaving said slots to remove heat from said walls.

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U.S. Cl. X.R.

110—56, 72