April 26, 1966 R. S. BRATKO 3,248,099

INFRA-RED INDUSTRIAL OVEN

Filed Nov. 20, 1963 2 Sheets-Sheet 1

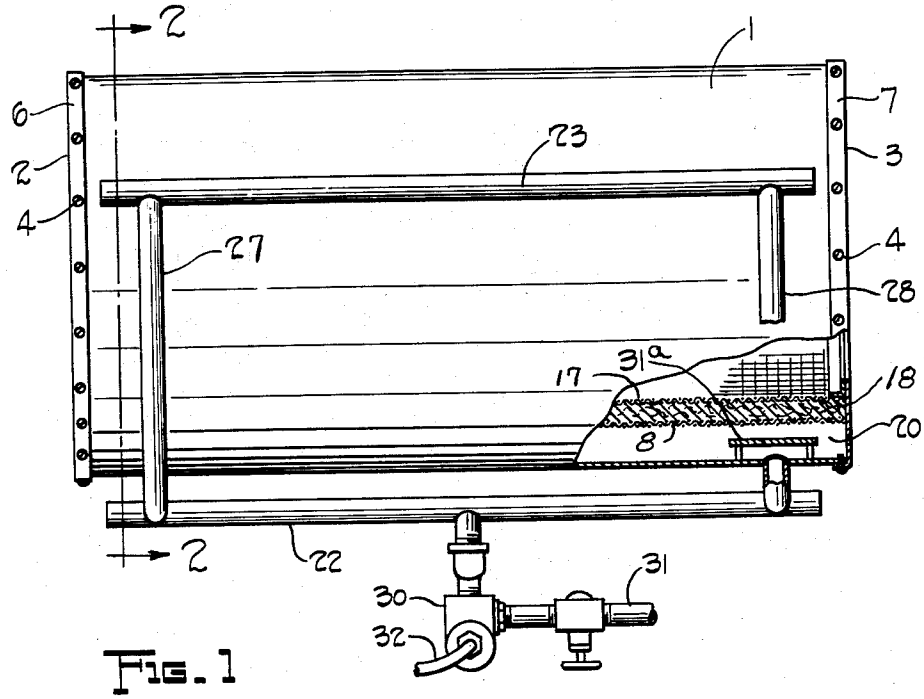


Fig. 1

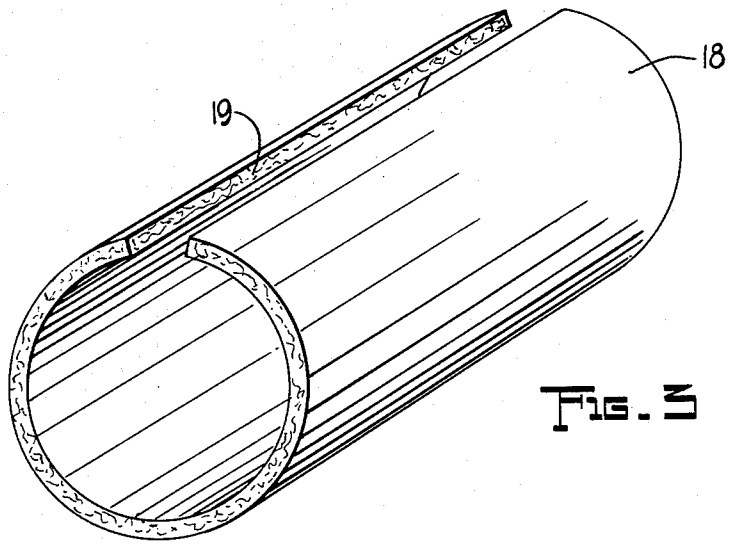


Fig. 3

INVENTOR.
RUDOLPH S. BRATKO

BY Robb & Robb attorneys

April 26, 1966 R. S. BRATKO 3,248,099

INFRA-RED INDUSTRIAL OVEN

Filed Nov. 20, 1963 2 Sheets-Sheet 2

FIG. 2

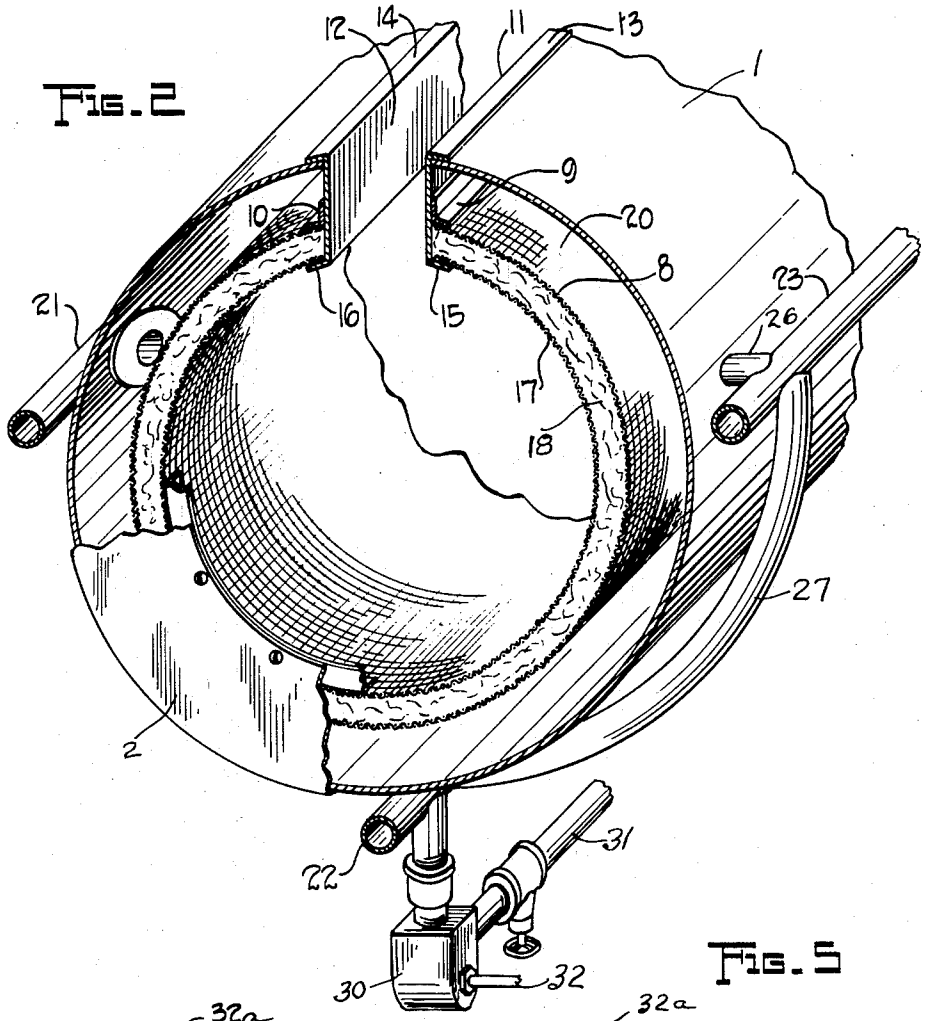
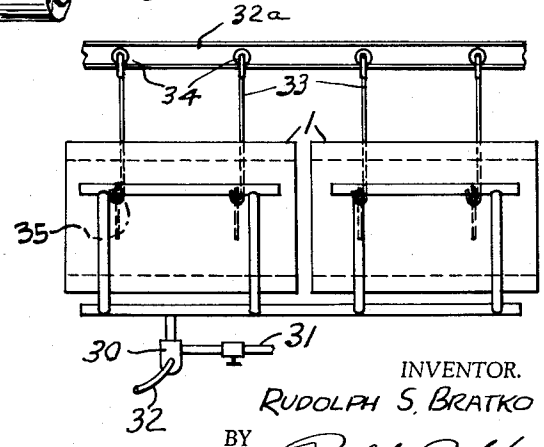


FIG. 5



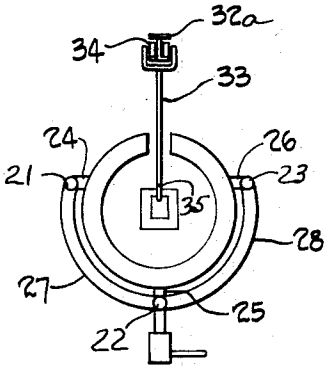


FIG. 4

INVENTOR.
RUDOLPH S. BRATKO
BY Robb & Robb
attorneys

United States Patent Office 3,248,099 Patented Apr. 26, 1966

3,248,099

INFRA-RED INDUSTRIAL OVEN

Rudolph S. Bratko, 10706 Harvard Ave., Cleveland, Ohio

Filed Nov. 20, 1963, Ser. No. 325,102
5 Claims. (Cl. 263—6)

This application is a continuation in part of application Serial No. 130,835, filed August 11, 1961, now abandoned.

This invention relates to industrial ovens and primarily to an oven of this class which is capable of generating infra-red radiation for the treatment of various parts manufactured in certain industrial processes primarily.

While infra-red radiation producing industrial ovens are known, the desirability of providing a relatively inexpensive type which is suitable for use in small units, gas fired preferably, and thus flexible in nature, such units likewise being desirably arranged in series under certain conditions, is readily understood.

The advantages of infra-red radiation producing ovens are well known since they are usually more economical of fuel and more flexible as well as accurate in control for the treatment of parts which require heating or drying as the case may be under certain conditions.

With the foregoing in mind, the present invention contemplates the provision of an oven of this general class which is gas fired, avails of a material upon whose surface the combustible mixture will burn and which surface will become incandescent thereafter producing infra-red radiation, all of the foregoing combined in an oven of small size with the combustible mixture supplied under pressure.

With the foregoing outline of the general type of oven and construction thereof in mind, it is a principal object of this invention to provide an oven of the general class described which may take the form of a substantially cylindrical unit thereby increasing the efficiency in some aspects, said unit availing of a material of unique qualities as the supporting material upon which the combustion will take place at the surface thereof, all being supplied by an air gas mixture under pressure.

It is a further object of this invention to provide an oven as previously described which avails of certain peculiar qualities of a new material to produce infra-red radiation when the surface becomes incandescent under burning conditions produced by a combustible mixture passing through the said material.

Yet another object of this invention is to provide novel oven units which may be combined so as to form an oven of any desired length to thereby make possible the controlled treating of parts passing therethrough, the oven itself being susceptible of having the individual units controlled as to temperature and infra-red radiation production.

Other and further objects of the invention will be understood from a consideration of the specification appended hereto and disclosed in the drawings wherein:

FIGURE 1 is a side view of an oven unit constructed in accordance with this invention.

FIGURE 2 is a sectional view in perspective showing the end of an oven constructed in accordance with this invention and the relationship of various elements thereof.

FIGURE 3 is a perspective view of the infra-red radiation producing member formed for use in the oven disclosed.

FIGURE 4 is an end view somewhat diagrammatic in nature illustrating one manner of use of the oven.

FIGURE 5 is a side view diagrammatic generally in nature to indicate another possible use to which the oven may be placed as combined with like units.

Referring now to FIGURE 1, the oven of this invention is generally cylindrical in nature as suggested by the FIGURE 2 disclosure including an outer shell of non-permeable material such as metal or the like denoted **1** formed into a generally cylindrical shape and of any desired length, with end caps **2** and **3** provided which are fastened to the shell **1** as by means of suitable machine screws **4** used in any desired quantity, the end caps **2** and **3** being substantially circular segments so as to fit over the ends of the shell **1** with the flange portions of the caps **2** and **3** denoted **6** and **7** respectively.

Spaced inwardly from the outer shell **1** is a stainless steel mesh cylindrical unit indicated at **8** in FIGURE 2 which may be fastened at its ends to the longitudinally extending angle parts **9** and **10**, the latter in turn being fastened to vertical end closure members **11** and **12** respectively.

The end closure members **11** and **12** are attached to the slotted shell **1** by means of the flange portions **13** and **14** respectively, the lower sections of these members **11** and **12** being similarly formed with flange portions **15** and **16** respectively.

The stainless steel mesh **8** may be fastened in any preferred manner to the angle members **9** and **10** as will be readily understood and spaced from the angle members **9** and **10** the flange portions **15** and **16** support a further stainless steel mesh member **17** of similar form to the member **8** previously mentioned and likewise fastened to the flanges **15** and **16** in any preferred manner.

Intermediate the stainless steel mesh members **8** and **17**, is a novel pervious member formed as indicated in FIGURE 3 of generally cylindrical configuration and denoted **18** with a slot indicated at **19** extending along the same, said member **18** being supported as suggested by the stainless steel meshes **8** and **17**.

This pervious member may be preferably made predominately of alumina and silica, commercially available under the trademark Cerafelt and produced by Johns-Manville, in a form which for the purposes hereof, is of a density equal to about 10 pounds per cubic foot. Other examples of commercially available materials predominantly composed of alumina and silica are shown in the patents to Harter et al. 2,674,539 and 2,467,889.

The material is available in various densities but this particular density has been found to be satisfactory for the purposes hereof and is therefor used as a preferred example although other densities may under some circumstances be desirable as will be readily apparent.

The material is a refractory fiber in the form of a mat or the like and is commonly used as an insulation material, although never heretofore used in any form in the manner set forth hereinafter. While it is called a refractory felt, it is obviously not used in this manner in the assembly, and yet it combines lightness, heat resistance in the ordinary sense, low conductivity and high sound-absorption qualities, the latter of course not being needed as far as this particular application is concerned. It is and has been used for a number of high temperature applications including such things as refractory linings for domestic oil burner combustion chambers, high temperature packing, but never in the form herein, in combination with the various other elements.

The material itself is further known to be of low thermal conductivity, light weight, and to be chemically stable, all the foregoing attributes being known by those who have used the material but it has never been used in the manner in which it is used in the instant invention, and even though it has long been known, this in and of itself idicates the novel improved attributes derived therefrom in the arrangement specified, these attributes having been availed of to provide the desired results from the use of this invention.

The material is provided in sheet form, subsequently wetted and laid up on a mandrel so as to form the type of member illustrated in FIGURE 3 and denoted **18**.

With the foregoing described parts about in the positions as indicated in FIGURE 2, there is thus formed a chamber **20** into which is to be introduced a combustible air gas mixture by suitable manifolds such as is indicated at **21**, **22** and **23**, these manifolds **21** to **23** inclusive being in turn connected to the chamber **20** by short pipes suggested at **24**, **25** and **26** in FIGURE 4.

The manifold members **21**, **22** and **23** are connected together by connecting pipes **27** and **28**, the lowermost manifold **22** shown being the main mixing manifold and being supplied from a mixing valve **30**.

The mixing valve **30** is in turn supplied with gas through the line **31** under about 7 inch water column pressure, air being supplied at 1½ ounces pressure per square inch through the line **32**, the mixing of the two taking place in the mixing valve **30** and supplied to the manifold **22** thence through the pipes such as **27** and **28** to the other manifolds such as **21** and **23**.

When the mixture thus formed is supplied as indicated, it passes through the short pipes **24**, **25** and **26** and impinges against suitable baffles such as indicated in FIGURE 1 at **31***a* which in turn distribute the air gas mixture substantially uniformly throughout the chamber **20** and cause the same to pass through the Cerafelt virtually uniformly, and upon ignition the Cerafelt supports the combustion on the surface at the inner side of the unit adjacent the innermost stainless steel mesh **17**, in turn causing this mesh to become incandescent and likewise supply additional infra-red radiation.

This alumina silica material **18** has been found to be particularly satisfactory for the purposes herein mentioned since it does become incandescent at the surface and there is no tendency of flash back or loading of the material which is relatively porous in nature and as such permits the air gas mixture to flow with a minimum obstruction and yet sufficiently slowly enough to be relatively efficient in its combustion process.

Under some circumstances it will be feasible to support the ovens in about the position shown in FIGURE 4 in perhaps a series, one after the other, where small parts are desirably heat treated therewithin, the temperatures in the oven being possibly of the nature of 1000 to 1500 degrees and controllable by controlling the air gas mixture as will be readily understood. Where an arrangement such as is illustrated in FIGURE 4 is contemplated an overhead track of the nature indicated at **32***a* may be provided and depending therefrom a series of work piece or part supports **33** carried on suitable rollers such as **34** may be useful with the parts **33** having hook portions **35** at the lower ends thereof upon which the parts may be hung.

As will be apparent from FIGURE 5, the ovens may be furnished in successive series and either provided from a main source of gas and air or separately supplied so that each oven is individually controllable all as will be

readily understood by those skilled in the art. It will be apparent that the overhead support of the parts permits the same to pass through the ovens or oven as the case may be and any preferred method of effecting this movement of the parts may be resorted to within the contemplation of this invention although forming no part specifically hereof.

I claim:

1. In an oven of the class described, in combination, an outer shell of non-permeable material, an air pervious member spaced therefrom, said member comprised of a non-catalytically activated refractory fibre mat whose fibres consist essentially of alumina and silica, means to support said member and provide a chamber between the material and member, means to supply a combustible mixture to the chamber and outwardly through the member whereby to cause combustion to take place on the surface of said member and said surface to become incandescent during said combustion.

2. The combination as claimed in claim **1**, wherein a mixture of air and gas is constantly supplied under pressure and distributed substantially uniformly through said member.

3. The combination as claimed in claim **1**, wherein the surface of the member on which combustion takes place is covered by a stainless steel mesh.

4. An oven as claimed in claim **1**, wherein the material is a refractory fibre mat approximately one-inch thick and of a density equal to about 10 pounds per cubic foot.

5. The combination as claimed in claim **1**, wherein the chamber comprises a slotted cylindrical unit, the member is positioned within the unit, combustible mixture manifolds supply mixture to the chamber, the mixture is burned in the interior of the unit on the surface of the pervious member, and means are provided to move parts to be treated through the unit.

References Cited by the Examiner

UNITED STATES PATENTS

1,830,826	11/1931	Cox	158—99
2,658,742	11/1953	Suter et al.	263—3
3,057,400	10/1962	Wagner	158—99
3,086,763	4/1963	Ruff et al.	263—3
3,087,041	4/1963	Vonk	158—99

FOREIGN PATENTS

1,228,433	8/1960	France.

OTHER REFERENCES

Fuels and Their Combustion by Haslam and Russell 1926. Page 150. Published by McGraw-Hill Book Co., Inc., New York, N.Y. and London, England.

WILLIAM F. O'DEA, *Primary Examiner.*

JOHN J. CAMBY, CHARLES SUKALO, *Examiners.*