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Smith et al.

[11] **3,857,669**

[45] **Dec. 31, 1974**

[54] **CATALYTIC HEATER HEAD**

[75] Inventors: **Jay N. Smith**, Wichita, Kans.; **Robert I. Schantz**, Burien, Wash.

[73] Assignee: **Impala Industries, Inc.**, Wichita, Kans.

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[52] **U.S. Cl.** **431/328**

[51] **Int. Cl.** **F23d 13/14**

[58] **Field of Search** 431/328, 329; 239/522, 239/523, 524, 568

[56] **References Cited**

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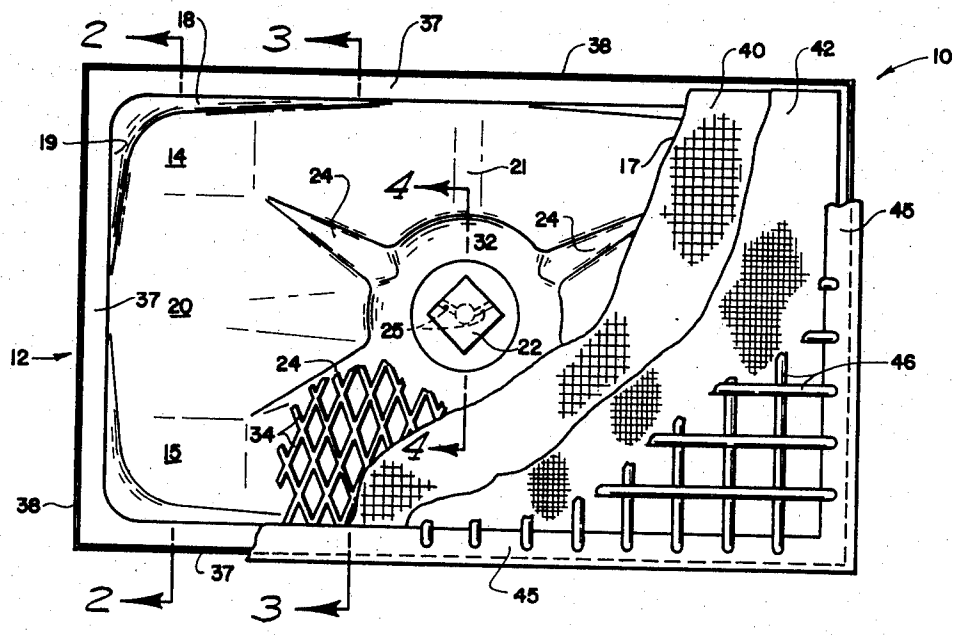
Primary Examiner—Meyer Perlin

Assistant Examiner—Ronald C. Capossela

[57] **ABSTRACT**

A catalytic heater head having a back pan forming a gas diffusion chamber behind a layer of catalytic mass; the back pan being rectangular shape with a central gas receiving port and a plurality of channels radiating outwardly therefrom to reservoirs located in the four corners of the pan.

8 Claims, 5 Drawing Figures



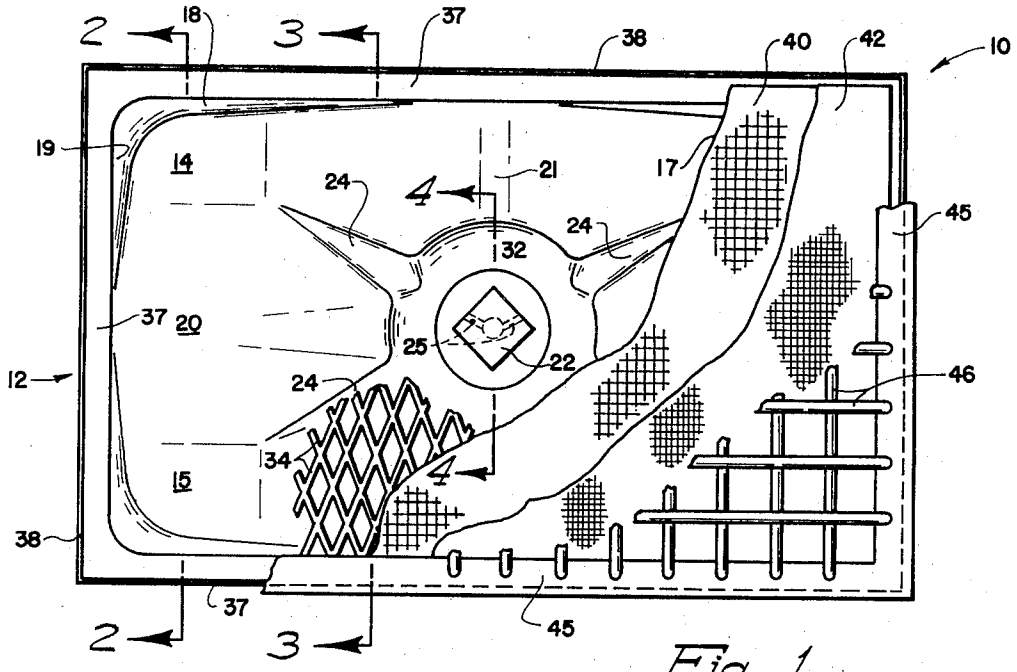


Fig. 1

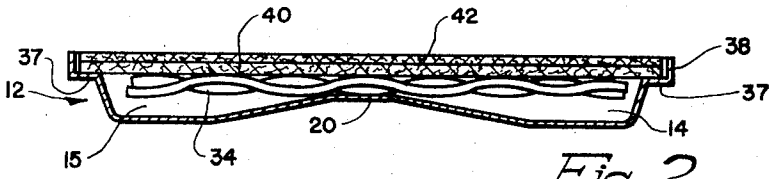


Fig. 2

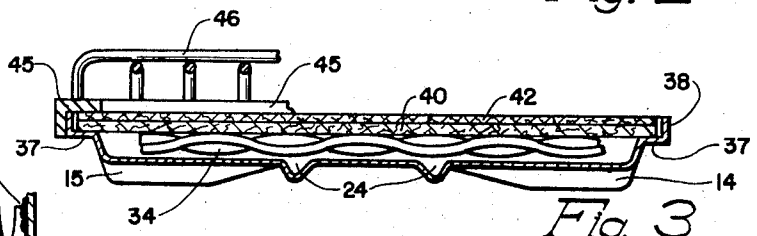


Fig. 3

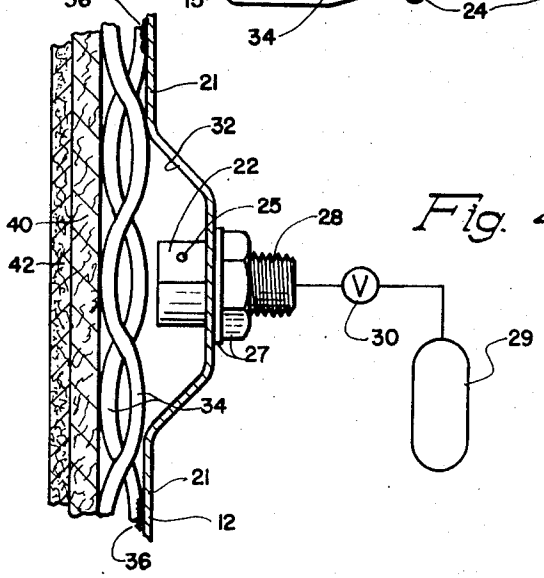


Fig. 4

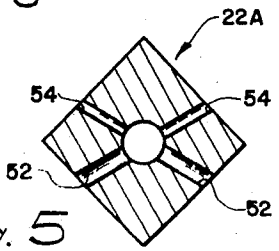


Fig. 5

JAY N. SMITH
ROBERT I. SCHANTZ
Miller & Bro

CATALYTIC HEATER HEAD

BACKGROUND OF THE INVENTION

It is well known that thermonic elements which function by catalytic oxidation of gas can afford satisfactory results only when a very uniform feeding of the gas is effected over the whole internal area of the catalytic mass. Whenever a catalytic head of the type shown in the present invention is vertically positioned, the heavier than air gas entering the back pan has a tendency to settle at the bottom of the pan before coming through the catalytic mass. This causes the unit when operating, to generate heat only in the lower portions of the catalytic element, which severely limits its overall heating capacity. If the gas used is lighter than air, such as natural gas, the problem is reversed with the gas gathering at the top portions of the catalytic element. Another type back pan design, shown in U.S. Pat. No. 3,073,379, has attempted to effect uniform flow of gas to the catalytic mass by the usage of an arcuate shaped manifold pipe having a series of small holes therein which emit the gas onto the catalytic element. This type of unit has been found to be very complex in structure and expensive to produce, and also, it does not achieve uniform distribution.

SUMMARY OF THE INVENTION

The catalytic heater head of the present invention employs a single gas emitter head with a back pan shaped with upwardly and downwardly directed channels and reservoirs at the corners thereof to better effect a more even gas distribution over the entire area of the catalytic element.

The primary object of the present invention is to provide a planar shaped catalytic heater head which effects even distribution of the gas through the catalytic mass.

A further object of the present invention is to provide a catalytic heater head with a maximum heat output for a minimum size catalytic mass.

Another object of the present invention is to provide a back pan design which replaces complex manifold structures for providing even gas distribution through the catalytic mass.

Another object of the present invention is to provide a head which utilizes heavier and lighter than air gases.

The invention, and its various objects and advantages, will be more clearly understood when the following description is read in connection with the accompanying drawings in which:

FIG. 1 is a plan view of the heater head with portions of the fibrous ceramic elements broken away to view the back pan structure;

FIG. 2 is a sectional view taken along lines 2 — 2 of FIG. 1;

FIG. 3 is a section taken along lines 3 — 3 of FIG. 1 with portions of the outer frame and protective grate broken away;

FIG. 4 is a fragmentary section to an enlarged scale, taken along lines 4 — 4 of FIG. 1 with a gas supply symbolically shown; and

FIG. 5 is a gas emitter head of a different embodiment.

In referring to FIG. 1, the catalytic heater head of the present invention is generally described by reference numeral 10. The head 10 includes a metal back pan 12 shaped to form a gas diffusion chamber behind the catalytic elements. Formed at each of the four corners of the back pan 12 are reservoirs or pockets 14, 15, 16 and 17, the latter two not being visible in FIG. 1. While the outer sides of reservoir 14 are clearly delineated by walls 18 and 19, the inner limits of reservoir 14 are defined by a gradually sloping bottom surface which terminates in a ridge 20 between reservoirs 14 and 15. A similar ridge 21 separates reservoirs 14 and 17. The reservoirs 16 and 17 on the right side of pan 12 are identical to reservoirs 14 and 15. Formed in the center of back pan 12 is a circular recessed area 32 which contains a gas emitter head 22. Radiating outward from the recessed area 32 are four channels 24 which connect the center area with each of the separate reservoirs previously mentioned. The gas emitter head 22 has a pair of orifices 25, each one being aligned with a channel 24 so that the gas stream emitted from the orifices will be enclosed by the channels 24 until the gas reaches the outer reservoirs 14 and 17. In viewing FIG. 4, the gas emitter head 22 passes through an opening in the back pan 12 and is held in place by a sealing nut and washer 27. The threaded fitting 28 on the emitter head is a standard fitting which can be attached to any conventional gas line. A tank 29 is symbolically shown supplying gas to the head through a regulator valve 30.

Positioned inside the back pan 12 is a rectangular piece of expanded metal 34 which prevents the pliable fibrous elements 40 and 42 from deflecting into the cavaties of the back pan. The expanded metal 34 is held in place by a weld 36. Surrounding the periphery of back pan 12 is an extended lip 37 which terminates in an upstanding flange 38. Positioned on top of the expanded metal 34 is a fibrous filter pad 40 made up of alumina-silica fibers. Pad 40 is manufactured under the trademark of "Kaowool," manufactured by the Babcox Wilcox Co., or "Fiberfrax" manufactured by the Carborundum Company. Positioned on top of the pad 40 is a thinner vacuum cast pad 42 formed of an alumina-silica fiber coated with a catalyst such as platinum. Both pads 40 and 42 have sufficient porosity for the gas to flow therethrough with a very low pressure in the back pan. The filter pad 40 can be eliminated with the usage of a single pad 42. Holding the two ceramic pads 40 and 42 in sealing engagement with lip 37 of the back pan is an outer frame 45. Covering the outer frame 45 and extending outwardly therefrom is a wire protective grate 46 which protects persons from touching the hot catalytic element 42.

OPERATION

The heating head 10 is generally used in a near vertical position. If it is tilted downward it has a minimum angle requirement of 15 percent from the horizontal to allow the by-products of combustion to escape. When using propane as a fuel, the head is positioned as seen in FIG. 1 with the reservoirs 14 and 17 at the top of the head so the gas streams from orifices 25 will be directed to the upper two reservoirs. As the gas flows out from orifices 25, the channels 24 tend to confine it into its respective reservoir 14 or 17. While a portion of the gas may find its way between the openings in the expanded metal 34, down to the lower reservoirs 15 and 16, most of the gas will be retained in its upper reservoirs 14 and 17 until it flows out through the catalytic element. The deep corners of the reservoir tend to improve the gas flow through the catalyst element at the corners. When using natural gas as a fuel, the gas emit-

ter head 22*a*, shown in FIG. 5, is utilized. Since natural gas is lighter than air, the primary gas orifices **52** are directed downward to the lower two reservoirs **15** and **16**. While some of the gas from orifices **52** will rise above the lower reservoirs, the additional smaller secondary orifices **54** are necessary to accumulate a sufficient amount of gas in the upper reservoirs.

Having described the invention will sufficient clarity to enable those familiar with the art to construct and use it, we claim:

1. A catalytic heater head for use with gaseous fuels, comprising:

a gas impervious rectangular back pan shaped to define a shallow gas diffusion chamber with an open front side;

a fibrous layer of catalytic-coated mass mounted on the front side of said back pan;

a gas emitter head centrally located in said back pan and including at least one orifice located to emit gas in a directed stream;

means to supply gas to said emitter head; and

said back pan being formed with separate reservoirs in each of the four corners thereof and channel means radiating outward from the gas emitter head terminating in at least one of the reservoirs, the volume of the channel means being substantially smaller than the volume of the reservoirs, the channel means being substantially aligned with the gas stream from the emitter head whereby the flowing gas is partially confined as it travels upward through the channel means into the respective reservoir and ridge means separating each of the reservoirs partially restricting the flow of gas between the reservoirs.

2. Apparatus according to claim **1**, wherein the channel means includes a pair of channels each extending into a separate reservoir at an upper corner of the back pan, and the emitter head includes two orifices each directing a gas stream into one of the said channels.

3. Apparatus according to claim **1**, wherein the back pan is formed to include a recessed center area surrounding the gas emitter head into which the channel means terminate.

4. Apparatus according to claim **1**, wherein the reservoirs decrease in depth as they extend away from the corners of the back pan.

5. Apparatus according to claim **1**, wherein the reservoirs decrease in depth as they extend away from the corners of the back pan terminating in said ridges which separate each reservoir.

6. Apparatus according to claim **1**, wherein the channel means includes a pair of channels each extending into a separate reservoir at an upper corner of the back pan, and the emitter head includes two orifices each directing a gas stream into one of the said channels, and a ridged layer of pervious material sandwiched between the layers of catalytic mass and the back pan to prevent the catalytic mass from deforming into the reservoirs and channels of the back pan.

7. Apparatus according to claim **1**, wherein the channel means includes a pair of channels each extending into a separate reservoir at an upper corner of the back pan, and the emitter head includes two orifices each directing a gas stream into one of the said channels, and a filter pad of ceramic fibrous material positioned under the layer of catalytic mass and a rigid layer of pervious material sandwiched between the filter pad and the back pan to prevent the fibrous layers from deforming in the reservoirs and channels of the back pan.

8. Apparatus according to claim **1**, wherein the channel means includes separate channels to each of the four reservoirs, the emitter heads including two primary orifices and two secondary orifices, the primary orifices each directing a gas stream downward into the two lower reservoirs while the secondary orifices are directed to the upper two reservoirs.

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