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CA 2416234 C 2012/07/10

(11)(21) 2 416 234

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(22) Date de dépôt/Filing Date: 2003/01/14

(41) Mise à la disp. pub./Open to Public Insp.: 2004/07/14

(45) Date de délivrance/Issue Date: 2012/07/10

(51) Cl.Int./Int.Cl. *F24H 3/06* (2006.01)

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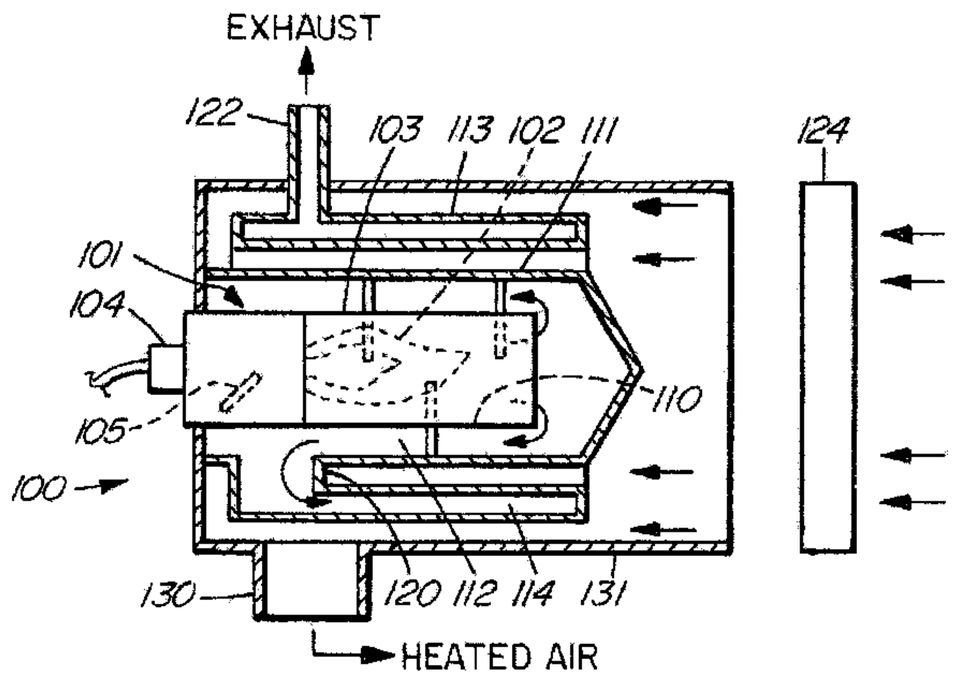
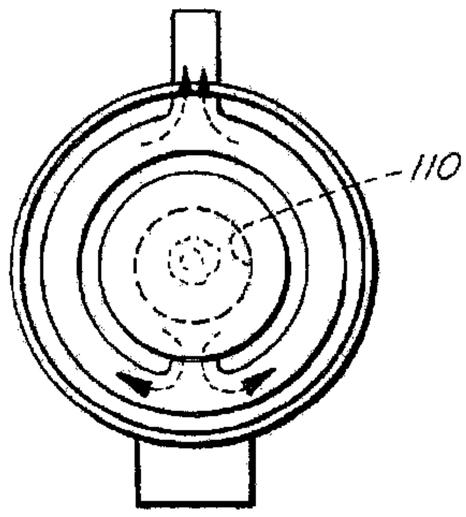
(54) Titre : GENERATEUR D'AIR CHAUD ET MODE DE FONCTIONNEMENT
(54) Title: HOT AIR HEATER AND METHOD OF OPERATING SAME





(57) Abrégé/Abstract:
A hot air heater having a burner tube surrounding a combustion area. The combustion gases travel from the burner tube through first and second circumferential and concentric annuluses surrounding the burner tube. Cool ambient air used for heating is blown over the outside surfaces of the annuluses and heat from the combustion gases is transferred to the ambient air used for heating by way of the surfaces of the jackets defining the annuluses.

ABSTRACT OF THE DISCLOSURE

A hot air heater having a burner tube surrounding a combustion area. The combustion gases travel from the burner tube through first and second circumferential and concentric annuluses surrounding the burner tube. Cool ambient air used for heating is blown over the outside surfaces of the annuluses and heat from the combustion gases is transferred to the ambient air used for heating by way of the surfaces of the jackets defining the annuluses.

TITLE

HOT AIR HEATER AND METHOD OF OPERATING SAME

INTRODUCTION

This invention relates to a diesel powered heater and, more particularly, to a diesel powered heater used for heating ambient air by utilising an increased surface area for heat transfer.

BACKGROUND OF THE INVENTION

In our United States Patent 6,085,738, there is disclosed a burner using diesel fuel which utilises an atomising nozzle and which is operable to heat hot water which hot water is used for heating the living areas of a boat, recreational vehicle or the like. The hot water is circulated through the burner and thence

may be directed to a heat exchanger or used directly in radiators for allowing the heat to emanate by radiation in the living environment. The burner there described in sold under the trademark HURRICANE (Trademark) by International Thermal Research of Richmond, British Columbia, Canada.

The use of hot water for living environment heating is, of course, known and attractive because of the absence of hot air and a more uniform temperature achieved over time. However, hot water heating also requires hardware including radiators and associated plumbing components to allow the hot water to circulate within the heating system without leaks. This entails costs. In many applications, it is not particularly desirable to incur such costs and hot water heating may be supplemented or replaced with hot air heated by the burner.

In order to heat the air being passed over the burner and then to distribute the heated air to a living environment in a hot air heater, it is necessary to transfer the heat generated by the burner to the cooler ambient air passing over the heated combustion chamber without commingling the ambient air with the air used for

combustion. This is so because the combustion air contains carbon monoxide and other byproducts which are harmful if ingested. Thus, heat transfer efficiency between the combustion air and the ambient air is a principal consideration.

In a known hot air heater, the cool ambient air used for heating passes over the outside of the combustion chamber. A plurality of fins are constructed which extend into the combustion chamber through the cylinder surrounding the combustion area, which fins are exposed on the outside to the cool ambient air passing thereover. The objective, of course, is to transfer the heat produced within the combustion chamber to the air passing over the fins outside the combustion chamber. The use of the fins increases the surface area which is exposed to both the combustion air and to the ambient air to be heated. Thus, heat transfer is improved between the combustion chamber and the cool ambient air using for heating the living areas. Fins are costly to produce and much material is used in their construction. Their efficiency, while good, is not particularly high. These characteristics are disadvantageous.

SUMMARY OF THE INVENTION

According to one aspect of the invention, there is provided a method of heating cool air, said method comprising inletting combustion air used for combustion within a burner, combusting said air with a fuel to produce hot combustion gases within a combustion area, passing said combustion gas from said combustion area into a first and second jacket surrounding said combustion area, each of said first and second jackets being defined by surfaces and heating cool ambient air passing over said surfaces of said first and second jackets.

According to a further aspect of the invention, there is provided a hot air heater comprising a combustion area for combustion of air and fuel, a first jacket surrounding said combustion area for allowing combustion gases to circulate therethrough, a second jacket outside said first jacket to allow said combustion gases to circulate therethrough and a combustion gas outlet to allow said combustion gases to exhaust from said hot air heater following passage through said first and second jackets.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

Specific embodiments of the invention will now be described, by way of example only, with the use of drawings in which:

Figure 1 is a diagrammatic and partial cross-sectional view of a hot air heater according to the invention and illustrating the combustion gas jackets surrounding the burner assembly; and

Figure 2 is an end view of the hot air heater of Figure 1.

DESCRIPTION OF SPECIFIC EMBODIMENT

Referring now to the drawings, a hot air heater according to the invention is generally illustrated at 100 in Figure 1. It comprises a burner generally illustrated at 101 which burner is of the air aspirated type and which utilises air under pressure to draw fuel into the nozzle 104 and in respect of which the flame 102 combusts the air and fuel within a burner tube 103 which burner tube 103 has an open end 110 opposed to the end of the burner tube 103 holding the nozzle 104. Such a burner is described in greater detail in our aforementioned United States Patent 6,085, 738 and

associated United States Patent 5,391,075.

A first jacket 111 surrounds the burner tube 103. First jacket 111 defines a first annulus 112 surrounding the burner tube 103 with an outlet for the combustion gases to allow the combustion gases to enter a second jacket 113 which second jacket 112 defines a second annulus 114 to allow the circulation of gases entering from the first annulus 112. An exhaust gas communication port 120 extends between the first and second annuluses 112, 114 to allow the exhaust or combustion gases to pass from the first annulus 112 within first jacket 111 to second annulus 114 within second jacket 113. An exhaust port 122 communicating with second annulus 114 provides venting for the hot combustion or exhaust gases following their circulation through second annulus 114.

A plurality of vanes 123 conveniently extend partially around the inside circumference of the first burner jacket 111. The vanes 123 provide a swirling passageway for the combustion gases as they travel from the burner tube 103 into and through the first jacket

111.

A heater annulus 131 is formed to surround the burner 101 and first and second jackets 111, 113. The heater annulus 131 is intended to provide a passageway for ambient and cool air inletted to the heater 100. A fan, diagrammatically illustrated at 124, blows cool ambient air over the circumferences of the first and second jackets 111, 114 and which air is traveling within the heater annulus 131 to an outlet 130 provided in the heater annulus 131. The heated ambient air then is ducted or otherwise conveyed to the areas of the vessel or vehicle where it is used for heating purposes as is usual.

OPERATION

In operation, the burner 101 commences operation by way of manual initiation or, if a thermostat (not illustrated) is intended to automatically initiate the operation of burner 101, by way of such thermostat falling below a desired temperature as the user may select. Air is provided under pressure to the burner 101 and such air is used to draw in the necessary fuel. An igniter 105 ignites the mixed air and fuel and combustion

is initiated with the resulting combustion flame 102.

The resulting combustion gases travel out the open end of burner tube 103 and into first annulus 112 defined by the outside of the burner tube 103 and the inside of first jacket 111, thence to exhaust gas communication port 120 and into second annulus 114 and eventually to exhaust port 122 where the combustion gases are normally ducted to the atmosphere.

During the travel of the exhaust gases through first and second annuluses 112, 114, the gases heat the inside and outside circumferences or surfaces of each jacket 111, 113. This surface area provides a substantial heat transfer area for transferring heat received from the combustion gases and passed to the circumferences of each jacket 111, 112 to the ambient cool air blown over the surfaces as will be explained.

Fan 124 commences operation when manually initiated or, again, under the control of a thermostat or other temperature initiation or timing device. Fan 124 has inletted cool air from the ambient surroundings and such air is blown over the outside circumference of first jacket 111 and over the inside and outside circumferences

of second jacket 113 as it travels within heater annulus 131. The heat produced by the exhaust gases is thereby transferred from the circumferential surfaces of the first and second jackets 111, 113, respectively to the cool ambient air which air, now heated, leaves by way of outlet port 130 and which air is used for heating purposes as may be desired.

Additional heat transfer area may conveniently be provided by providing fins which extend from the two annuluses 112, 114 though the circumferences of the jackets 111, 113, if desired. However, it is presently thought the addition of such fins may be unnecessary given the satisfactory heat transfer efficiency obtained with the invention as described.

Many modifications will readily occur to those skilled in the art to which the invention relates and the specific embodiments described herein should be taken as illustrative of the invention only and not as limiting its scope as defined in accordance with the accompanying claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

Claim 1. Method of heating cool air, said method comprising inletting combustion air used for combustion within a burner, said burner being an air aspirated burner, combusting said air under pressure to draw fuel for combustion and to produce hot combustion gases within a combustion area, passing said combustion gases from said combustion area into a first and second jacket surrounding said combustion area, each of said first and second jackets being defined by internal surfaces, at least one of said internal surfaces having means to provide guidance to said combustion gases passing over said at least one internal surface, heating cool ambient air passing over said surfaces of said first and second jackets and exhausting said combustion gases radially from said jacket of said burner.

Claim 2. Method as in claim 1 wherein said combustion gases are passed through an exhaust communication port between said first and second jackets.

Claim 3. Method as in claim 2 and further comprising passing said cool ambient air over the outsides of said first and second jackets by a fan.

Claim 4. Method as in claim 3 and further comprising exhausting said combustion gases following passage through said second jacket.

Claim 5. Method as in claim 4 wherein said cool ambient air is heated as said ambient air moves over said surfaces within a heater annulus surrounding said jackets.

Claim 6. Method as in claim 5 wherein said first and second jackets are formed to be concentric with said combustion area.

Claim 7. A hot air heater comprising a combustion area for combustion of air and fuel, a burner adjacent said combustion area having an air aspirated nozzle utilising air under pressure to draw said fuel into said nozzle, a first jacket surrounding said combustion area for allowing combustion gases to circulate therethrough, a second jacket outside said first jacket to allow said combustion gases to circulate therethrough, guide means in at least one of said jackets to provide guidance to said combustion gases, and a combustion gas outlet to allow said combustion gases to exhaust radially from said hot air heater following passage through said first and second jackets.

Claim 8. A hot air heater as in claim 7 wherein said combustion area is within a burner tube.

Claim 9. A hot air heater as in claim 8 wherein said first and second jackets are concentric with said burner tube.

Claim 10. A hot air heater as in claim 9 and further comprising an exhaust communication port between said first and second jackets.

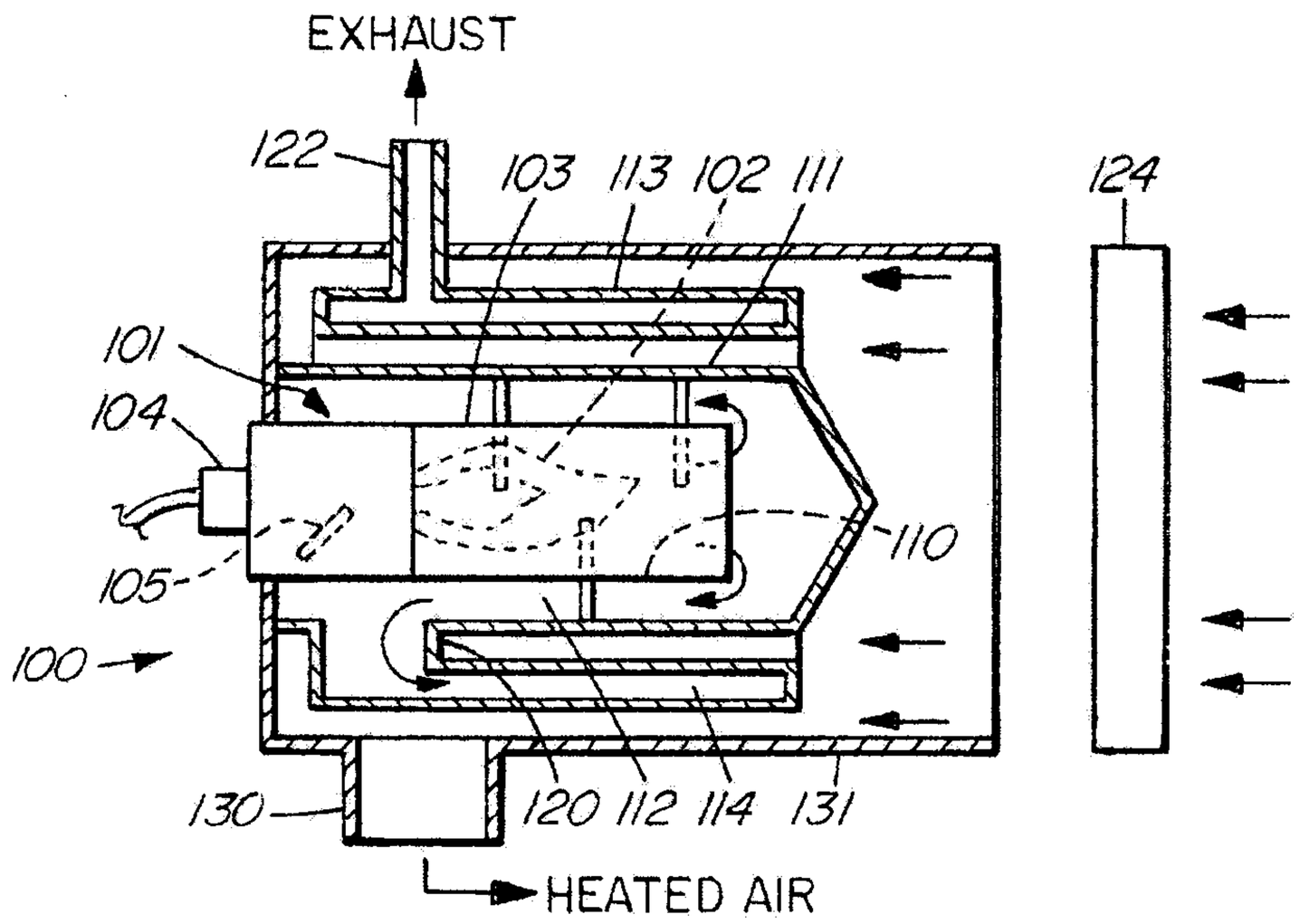
Claim 11. A hot air heater as in claim 10 and further comprising an exhaust port to radially exhaust said combustion gases from said second jacket.

Claim 12. A hot air heater as in claim 11 and

further comprising a source of cool air for heating said cool air by said combustion gases.

Claim 13. A hot air heater as in claim 12 wherein said first and second jackets are defined by surfaces and further comprising a fan to blow said cool air over said surfaces of said first and second jackets.

Claim 14. A hot air heater as in claim 13 wherein said cool air is heated within a heater annulus and further comprising an outlet for said heated ambient air from said heater annulus.


EXHAUST
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HEATED AIR

FIG. 1

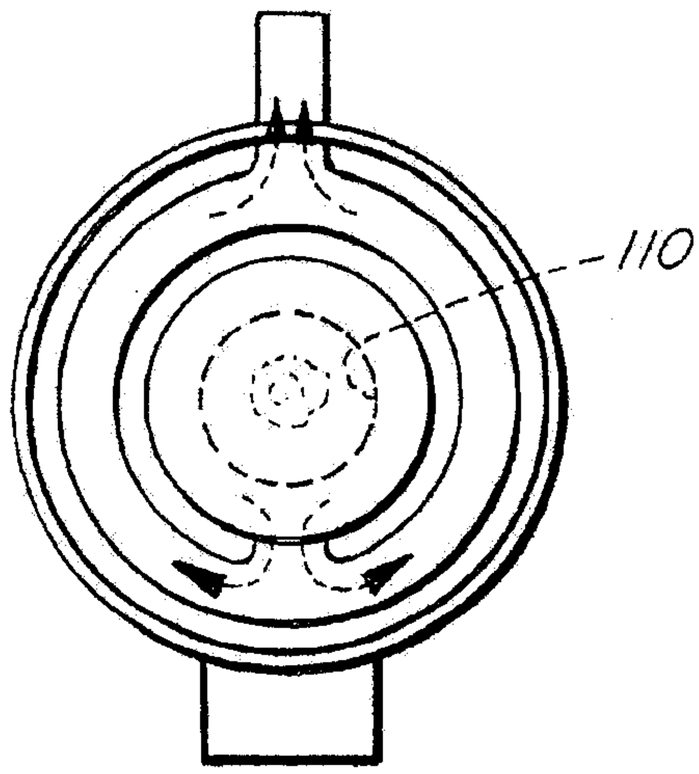
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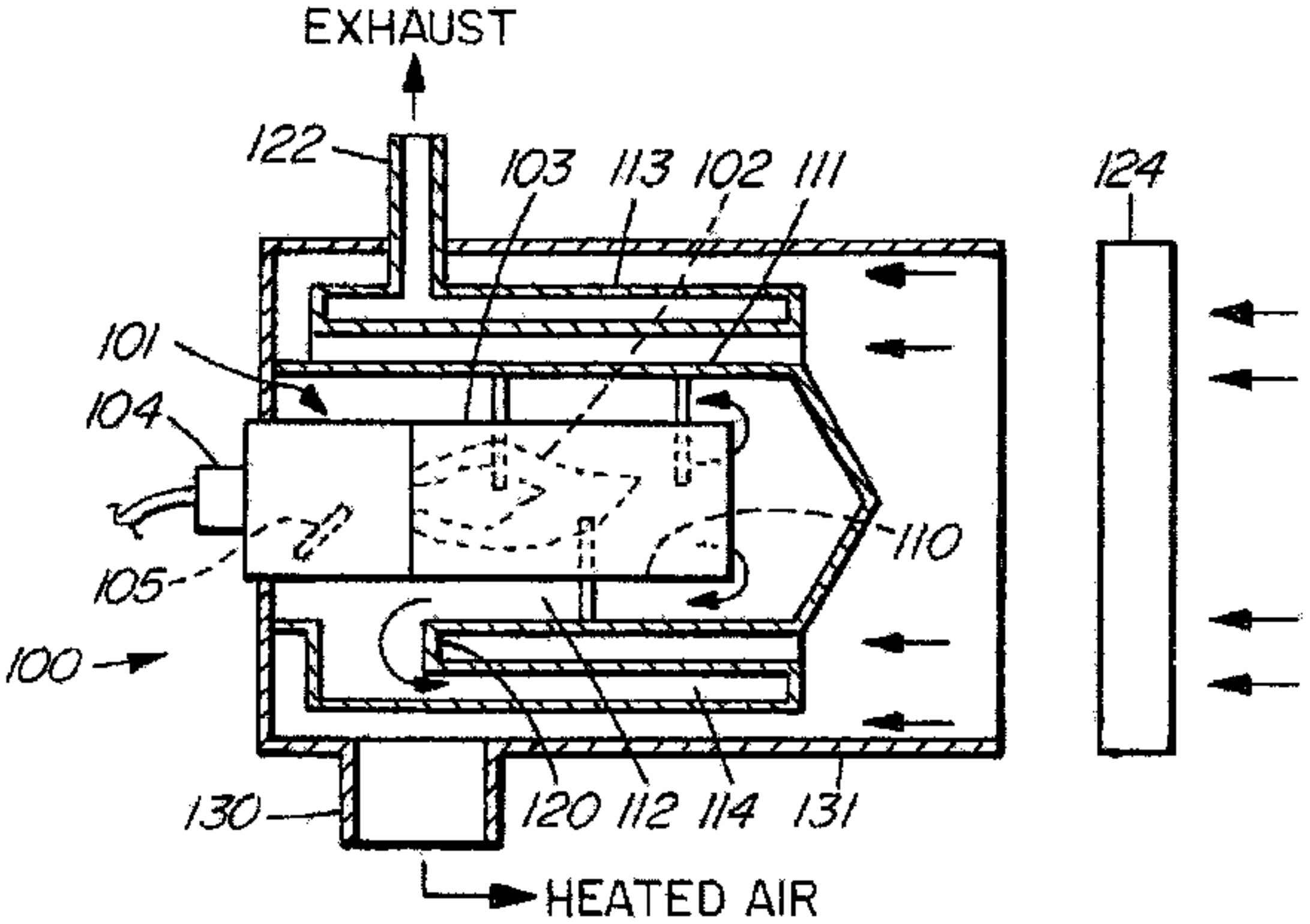
FIG. 2


EXHAUST
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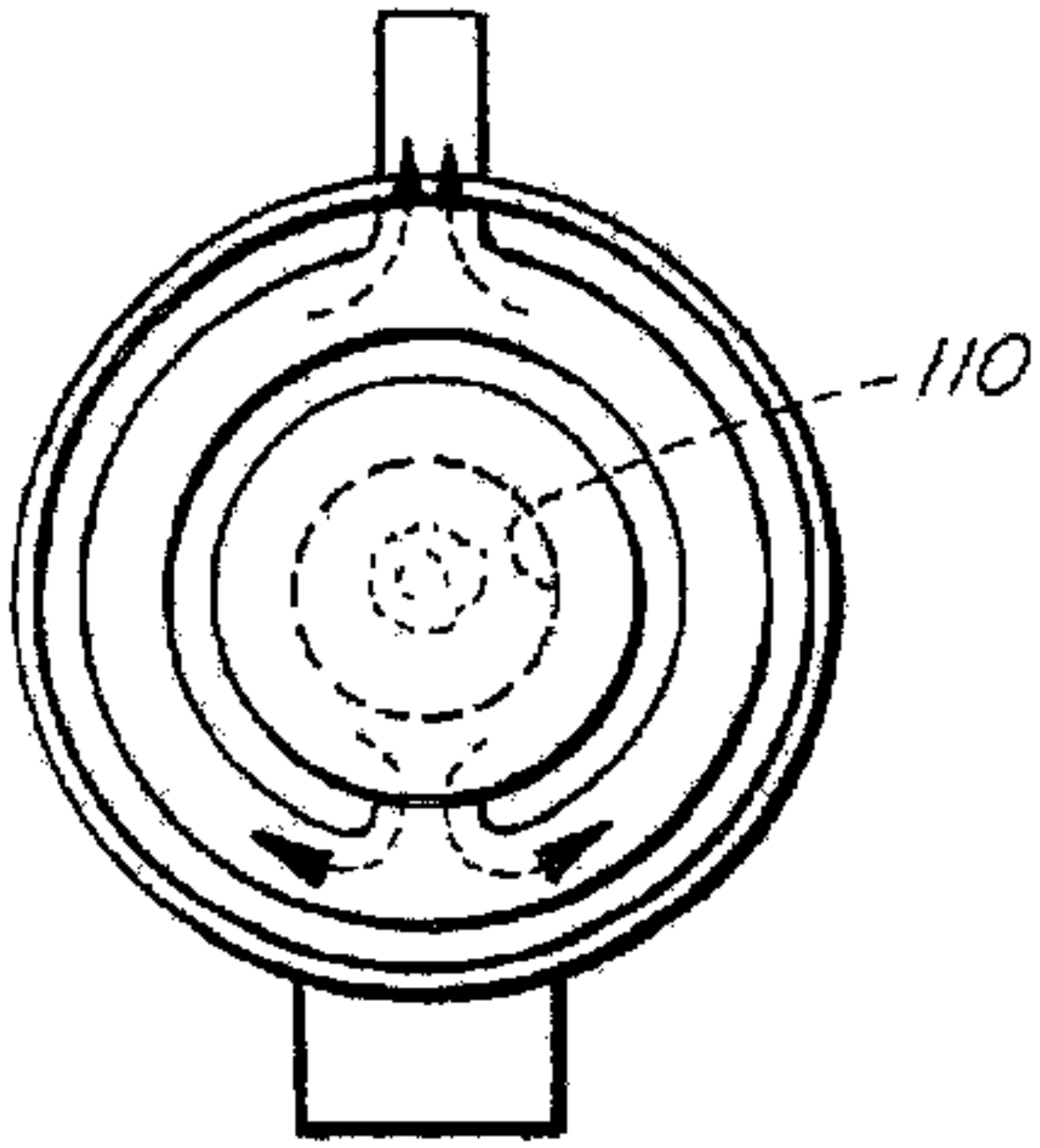
HEATED AIR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