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Rich

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[54] **SPACE HEATER CONSTRUCTION PARTICULARLY FOR MOTOR VEHICLES**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** ..... **126/90 R**, 126/91 R, 126/116 R

[51] **Int. Cl.** **F24c 3/00**

[58] **Field of Search** ..... 126/91 R, 90 R, 93, 65, 126/66, 116 R, 110 R

[56] **References Cited**

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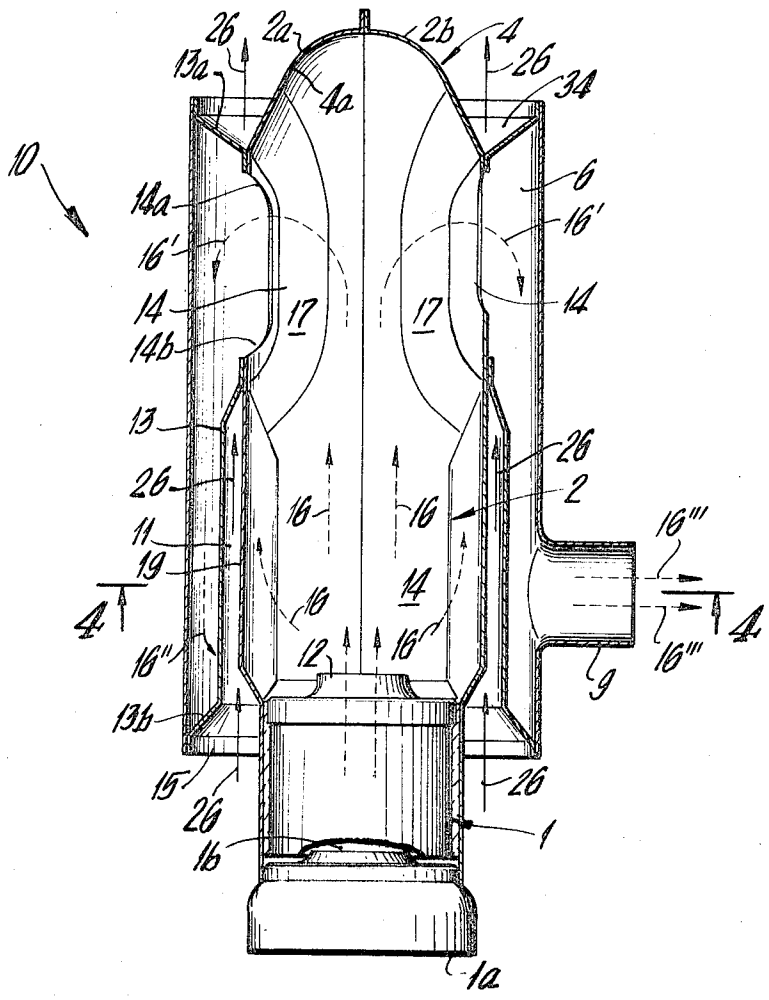
Assistant Examiner—Larry I. Schwartz
Attorney, Agent, or Firm—McGlew and Tuttle

[57] **ABSTRACT**

A space heater particularly for vehicles comprising an inner tubular wall defining a combustion chamber for the generation of heating gases having an inner closed end and a side wall with opposite heating gas flow openings. An outer tubular member surrounds the inner tubular member and has a heating air inlet surrounding said combustion chamber and an opposite end adjacent the end of the inner tubular member for the discharge of the heating air. The heating gas flow openings are a tear drop configuration and the heating gases flow from the combustion chamber is axially within the inner tubular member, out through the openings, and then rearwardly in reverse flow over the heating air flow in a flow passage between the outer tubular member and an outside casing.

4 Claims, 6 Drawing Figures



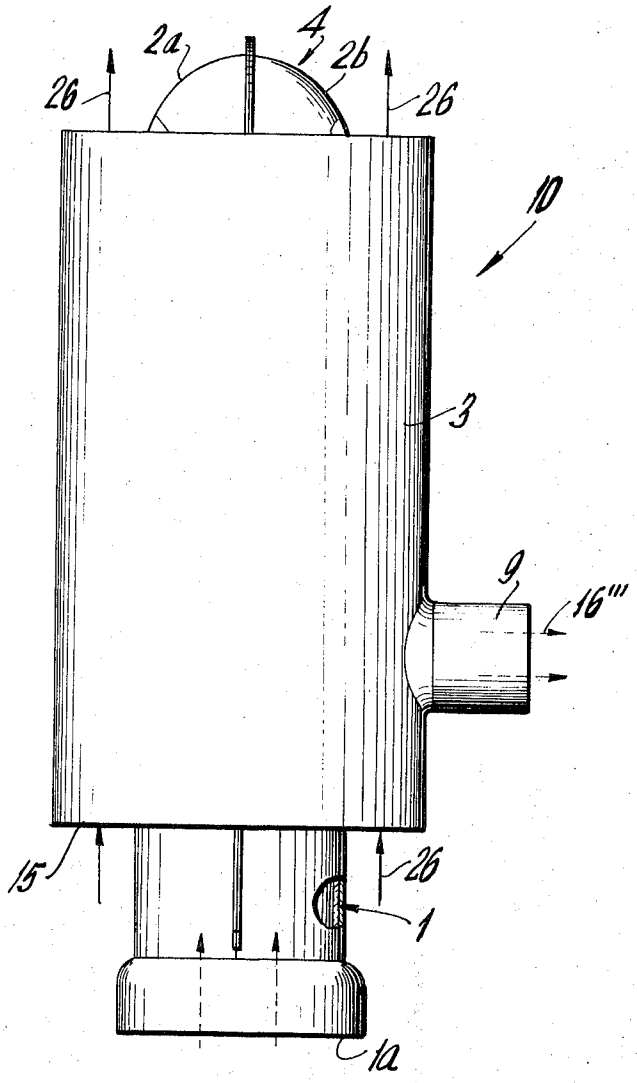


FIG.1

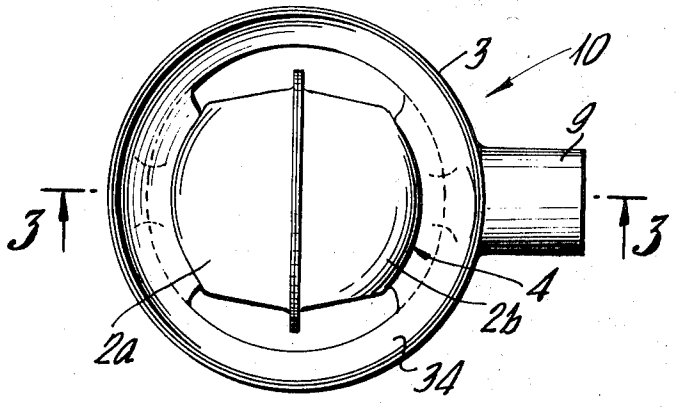


FIG.2

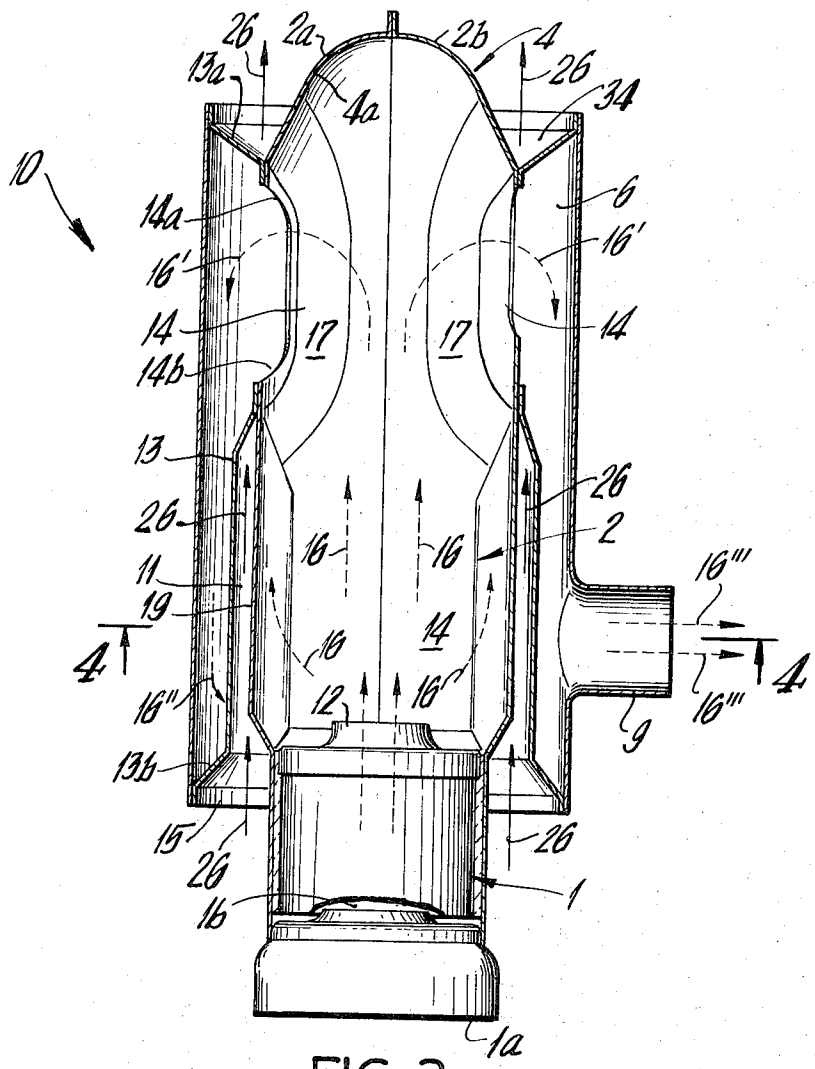

10
26
2a
2b
4
13a
4a
26
34
14a
6
16'
16'
14
17
17
14
14b
13
26
26
2
16
16
11
16'''
19
4
16
14
4
16''
12
16
16'''
9
13b
15
26
26
16
1
1a

FIG. 3

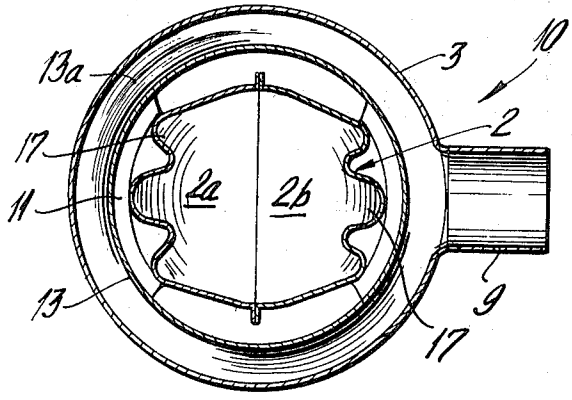

13a
3
10
2
17
2a
2b
11
9
13
17

FIG. 4

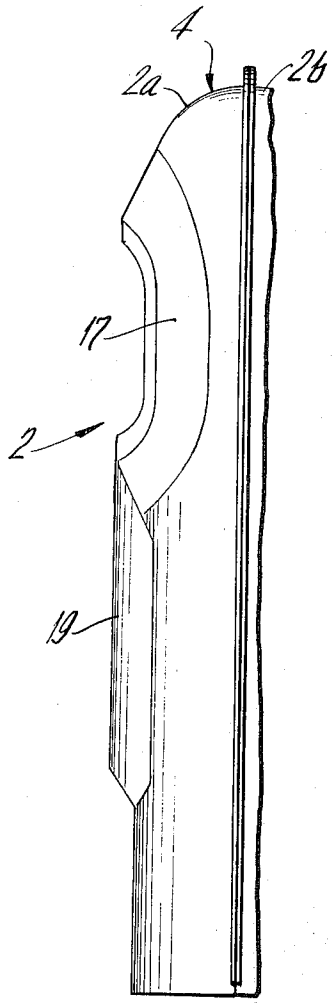


FIG.6

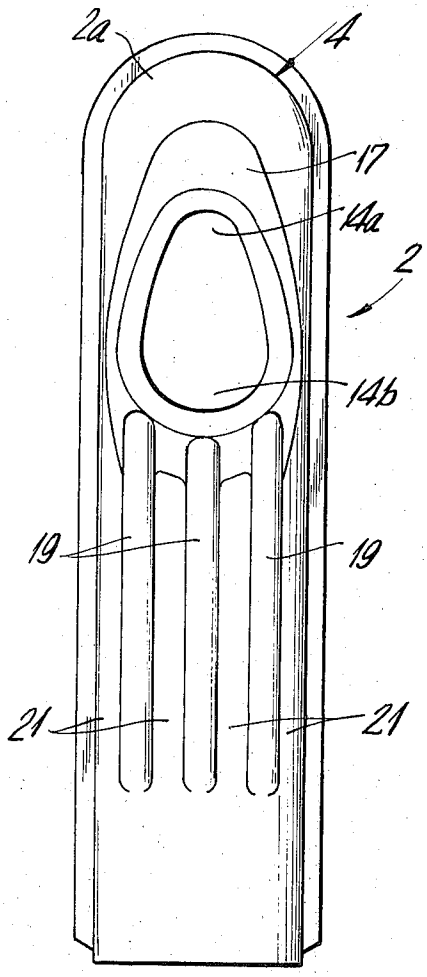


FIG.5

SPACE HEATER CONSTRUCTION PARTICULARLY FOR MOTOR VEHICLES

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to space heater construction and in particular to a new and useful space heater particularly for automobiles which includes an inner tubular member having a combustion chamber portion for generating combustion gases and an opposite curved end curved toward respective openings on respective opposite sides leading to reverse flow heating gas passages and which are formed of tear drop configuration.

2. Discussion of the Prior Art

In the known heater constructions for motor vehicles which are preferably operated with a burner which is associated with the heater and which generates combustion gases in a combustion chamber and which is independent of the engine, the pipe-section-type passage traversing the annular chamber for the heating air has a circular cross section or an oval cross section which is semi circular at its front end and rear end. This design of the known heaters has the result that the passage connecting the two chambers for the combustion air is subject to relatively rapid destruction of the material by annealing, particularly on its rear side or closed end side because a dead center is formed behind the passage with regard to the heating air surrounding it and having a cooling effect on it in the range of which the rear wall of the passage is unsufficiently cooled or is not cooled at all.

SUMMARY OF THE INVENTION

In accordance with the present invention there is provided a heater which is constructed so that premature material destruction of the parts by annealing is avoided at the critical point of the passage traversing the annular chamber surrounding the combustion chamber. In accordance with the invention the passage surrounding the heating gas passage has a cross section of a flow body or air foil section which is for example of tear drop form. This design prevents the breaking off of the heating air current and the formation of a dead center on the rear side of the passage. With the inventive arrangement the heating air covers the entire circumference of the passage and produces a uniform cooling so that premature combustion of the material on the rear side of the passage is avoided and the life of the heat exchanger is correspondingly extended. If the life expectancy of the known heat exchanger is to remain unchanged the filament power of the heater can be correspondingly increased without the necessity of increasing the effective surface of the heat exchanger.

In one embodiment of the invention, the heater includes an inner tubular member with a combustion chamber at its front end arranged to discharge axially toward the opposite closed end and out through passages or openings of tear drop configuration into an annular return flow passage for flow in an opposite direction toward a lateral discharge. The space heating air is directed inwardly in an annular space around the combustion chamber for flow between the combustion chamber and the outer passage for the reverse flow of the heating gases. The heating air is discharged at the opposite end from the inlet toward the closed end of the inner tubular member.

Accordingly it is an object of the invention to provide a heater particularly for motor vehicles which includes an inner tubular combustion chamber having discharge openings on respective opposite sides which are of tear drop configuration and which permit flow of the heating gases out through the openings and in through an annular reverse flow direction passage for lateral discharge in a space which surrounds a central passage for the flow of the space heating air.

A further object of the invention is to provide a heater which is simple in design, rugged in construction and economical to manufacture.

For an understanding of the principles of the invention, reference is made to the following description of typical embodiment thereof as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a top plan view of an automobile space heater constructed in accordance with the invention;

FIG. 2 is a front elevational view of the heater shown in FIG. 1;

FIG. 3 is a horizontal sectional view taken along the line 3—3 of FIG. 2;

FIG. 4 is a section taken along the line 4—4 of FIG. 3;

FIG. 5 is a top plan view of the upper part of the inner tubular member forming the annular combustion chamber; and

FIG. 6 is a side elevational view of the part shown in FIG. 5.

GENERAL DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings in particular, the invention embodied therein comprises an automobile space heater generally designated **10** which includes an outer casing or wall **3** in which is positioned an inner tubular member generally designated **2** which is made up of two half parts **2***a* and **2***b*. The inner tubular member surrounds a combustion device or heater **1** at its forward end which has a combustion air inlet **1***a* and includes means (not shown) for generating combustion or heating gases which are directed out of a pre combustion chamber **1**b through a wall **12** into a main combustion chamber portion **14** in which the heating gases flow in the direction of the dotted line arrows **16.** The inner tubular member **2** is closed at its rear or inner end **4** and is provided with interior curved walls **4***a* which aid in deflecting the heating gases in the direction of the curved arrow **16'** through openings or passages **14.**

An outer tubular member **13** is arranged within the shell **3** at a spaced location from its interior walls and from the exterior walls of the inner tubular member **2** except that the location of the openings **14.** At the location of the openings **14** the outer tubular member **13** is formed to cause a diversion of space heating air which flows in through an inlet **15** which surrounds the combustion device **1.** The space heating air flows in the direction of the arrows **26** through the inlet **15** at which location it surrounds the combustion device or heater **1** and along a passage **11** in heat exchange with the hot gases flowing in the direction of the arrow **16** toward

the rear end 4 and also in heat exchange with the heating gases which reverse their flow and flow in the annular space 6 between the outer tubular member 13 and the casing 3 in a direction indicated by the dotted line arrows 16''. The hot combustion gases then exit through a lateral discharge connection 9 as indicated by the dotted line arrows 16'''.

In accordance with the invention, the opening or passage 14 is of air foil or tear drop configuration and the rear or inner end 14*a* has a smaller diameter than the forward or front end 14*b*. In addition, the opening is bounded by inclined walls 17. The outer tubular member 13 includes a rear end wall 13*a* which extends obliquely outwardly to the outer casing 3. The opposite or front end includes an outward flaring end 13*b* which also extends out to the outer casing 3.

As shown in FIGS. 5 and 6, each of the inner casing parts 2*a* and 2*b* include longitudinally extending raised portions or corrugations 19 which at their highest points come close to the outer tubular member 13 and which define flow paths 21 for the incoming space heating air which flows in the direction of the arrows 26 from the inlet 15 and around the passage 14 and through a discharge opening 34 at the rear end of the unit between the inner tubular member 2 and the outer tubular member 13.

The space heating air which flows in the direction of the arrows 26 flows first against the high temperature combustion chamber 1 and also in heat exchange contact between the high temperature gases flowing in the direction of the arrow 16 and the returning gases flowing in the direction of the arrow 16'' so that the heat transfer is excellent. By forming the passage 14 in the form of a tear drop configuration the heating gases flowing in the direction of the arrow 16' do not break off on the wall 17 which bounds the passage so that no part of this wall region remains without a cooling by the flow of the gases quickly over the surface and thus the combustion of the material is impossible. The cross sectional flow area of the passage 14 diminishes toward the inner or closed end of the heating gas flow space defined between the outer tubular member 13 and the interior of the wall of the casing 3.

This construction improves the outflow of the heating gases and increased the surface bounding the opening 14 so that the possibility of the deterioration of the walls of the parts is reduced. The provision of the longitudinally extending ribs 19 insures that the space heating air will flow substantially parallel to the axis of the heat exchanger. When the parallelly flowing air arrives adjacent the passage 14 which is designed as an air foil configuration it insures that the flow around the air foil will be uniform and will cover the wall 17 which bounds the passage 14. By forming the inner tubular wall in two parts these parts may be easily and simply manufactured and the rib formations may be easily effected for the achievement of the desired flow characteristics for the space heating air.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A heater particularly for vehicles comprising an inner tubular member defining a combustion chamber for the generation of heating gases having an inner closed end and an opposite side wall with at least one heating gas flow opening, an outer tubular member surrounding said inner tubular member and having a space heating air inlet surrounding said combustion chamber and defining an annular flow space between said inner and outer tubular members having a discharge opening at the end opposite the combustion chamber, and an outer casing covering said inner and outer tubular members and being at a spaced location from the exterior of said outer tubular member and defining a heating gas passage between said outer tubular member and the interior of said casing and having a heating gas discharge at a spaced location from said heating gas flow opening in the direction toward said combustion chamber, the heating gas flow opening of said inner tubular member being of air-foil configuration and the outer tubular member having a closing end extending to said casing whereby the heating gases are deflected after they are generated in the combustion chamber and flow axially toward the inner end and thereafter through the opening and in a reverse direction for flow between said outer tubular member and said casing toward said heating gas discharge, said inner tubular member including a longitudinally extending and outwardly projecting rib which defines longitudinally extending space heating air flow passages between said inner and outer tubular members.

2. A heater according to claim 1, wherein said inner tubular member is of a shape that it defines an air foil heating gas flow opening which diminshes in area from the end adjacent the combustion chamber to the opposite end.

3. A heater according to claim 1, wherein said inner tubular member is made of two substantially identical half shell parts arranged together to define a tubular member, each shell part having an inner end with a curved closing wall and each part having a heating gas flow opening so that the openings are arranged opposite when the two parts are joined together.

4. A space heater for vehicles comprising combustion means for generating gaseous products of combustion, an inner tubular member surrounding said combustion means and extending longitudinally outwardly from one end thereof, said tubular member having a closed end opposite to said combustion chamber and having side walls with substantially diametrically opposite openings of tear drop configuration, an outer tubular member surrounding said inner tubular member and being spaced therefrom so as to define an air inlet adjacent said means for generating said gaseous products of combustion and a discharge adjacent the closed end of said inner tubular member and a passage for the space heating air between said inner and outer members, an outer casing surrounding said outer tubular member and defining a reverse flow heating gas passage between said casing and said outer tubular member, said outer tubular member having an end wall at each end extending to said casing closing off the gas flow passage at each end, said casing having a discharge opening at the end thereof adjacent said means for generating gaseous products of combustion, the opening of said inner tubular member communicating with the passage between said outer tubular member and said casing so that the gaseous products of combustion are directed from the interior of said inner tubular member through said opening for reverse flow in a passage between said outer tubular member and said casing heating gas dis-

charge, said inner tubular member and said outer tubular casing being shaped so that the space heating air flows from the end having said means for generating gaseous products of combustion to the opposite end and said heating gases flow in the same direction at the interior of said inner tubular member but they flow in an opposite direction after they pass through the openings in the space between said outer tubular member and said casing, said inner tubular member comprising two half shell portions each of substantially the same configuration and each having longitudinally extending projecting ribs which are spaced apart circumferentially to define space heating air flow passages therebetween.

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