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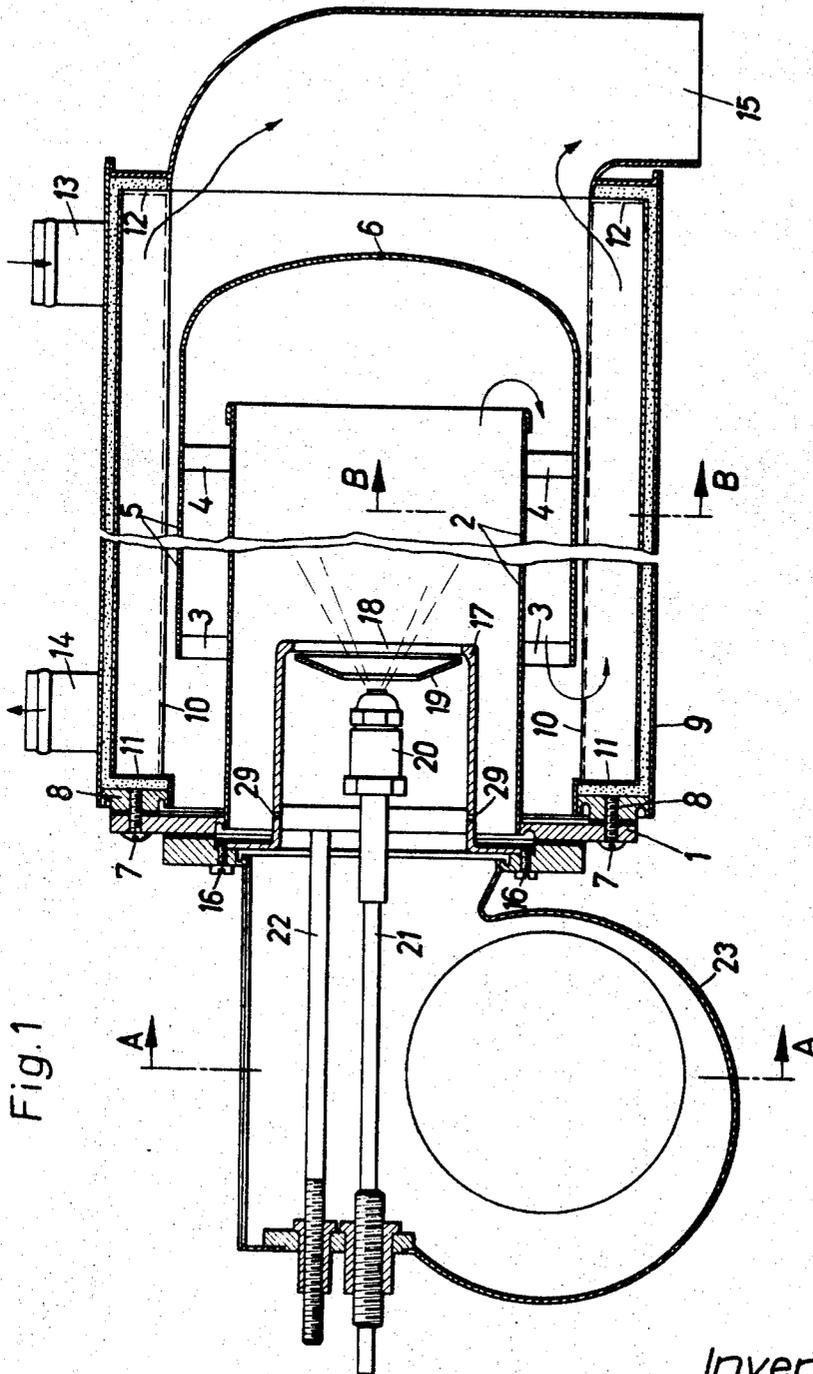
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LIQUID FUEL HEATER FOR MOTOR VEHICLE

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2 Sheets-Sheet 1



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Fig. 2

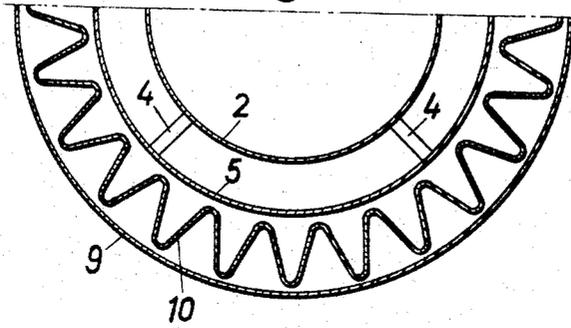
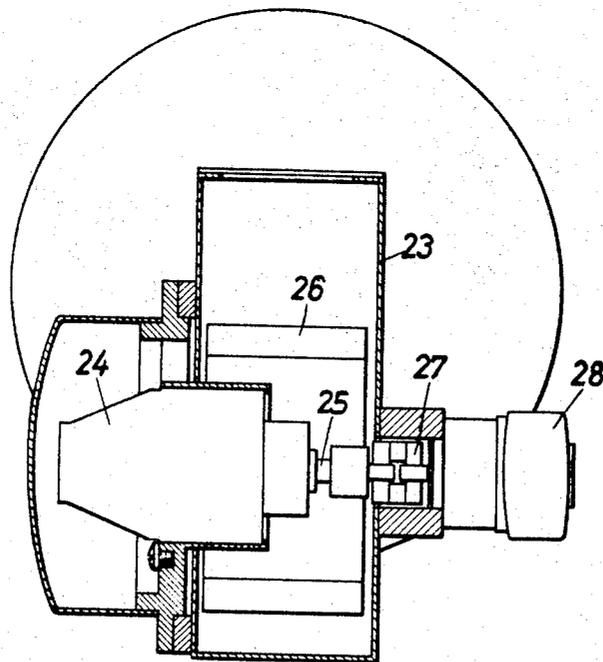


Fig. 3



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LIQUID FUEL HEATER FOR MOTOR VEHICLE
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ABSTRACT OF THE DISCLOSURE

Liquid fuel heater for heating motor vehicles or pre-
 heating engines which comprises a burner having a pres-
 sure spraying nozzle and an air nozzle around the burner,
 where the burner tube is surrounded by an inner chimney,
 an outer chimney and a heat exchanger as well as an inlet
 and an outlet for the medium to be heated, which is nor-
 mally air, and in which the flame is directed in a manner
 that it will not contact cold parts of the heat exchanger,
 which is achieved by the concentric arrangement of the
 components which extend the length of the path of the
 flame so that the heated gases release heat to the ex-
 changer only where the flame is completely burnt out.

Background of the invention

The present invention relates to liquid fuel operated
 heaters. More in particular the invention concerns extra-
 neous heaters for motor vehicles that burn liquid fuel and
 which comprise a burner, a flame chimney and a heat
 exchanger.

Heaters of this type are preferred for heating motor
 vehicles and, if desired, also for preheating engines. This
 purpose calls, on the one hand, for a small volume of
 structure and on the other hand, for great heat efficiency.

In spite of the small over-all dimensions required for
 such a heater, it is necessary that the flame length that is
 obtained be as great as possible to provide for good combus-
 tion. At the same time the flame should not come in
 contact with cold wall portions, as that results in incom-
 plete combustion. This is essentially the result of the type
 of fuel composition, which, in turn, is determined by the
 limited space conditions. Small length of the combustion
 chamber permits only small flame lengths, if flame contact
 with cold parts of the combustion chamber is to be
 avoided. Also, fuel atomization or vaporization cannot be
 employed with combustion chambers of small diameter,
 because the jet of fuel causes fuel deposits on the cold
 wall of the combustion chamber preventing complete combus-
 tion, and that results in poor fuel efficiency and in the
 formation of soot.

Summary of the invention

It is an object of the invention to improve the ignition
 response in liquid fuel heaters of the type mentioned
 above, to increase the burning efficiency of the fuel and to
 construct the heat exchanger in a manner that the above
 mentioned shortcomings may be avoided.

In accordance with the invention the problem is solved
 in that the combustion chamber is defined by a first inner
 flame chimney which concentrically encloses the air noz-
 zle, that a second outer flame chimney having a closed end
 surface encompasses the inner flame chimney, and that the
 flame chimney is thermally separated and insulated with
 respect to the concentric heat exchanger that surrounds it.

Due to the form of construction in accordance with the
 invention it is accomplished that also with crowded con-
 struction of the heater a relatively long burner flame can
 be obtained, which is diverted by means of the flame

chimneys so that the flame comes in contact only with
 heated flame chimneys. The concentric arrangement of
 the flame chimneys and of the heat exchanger, moreover,
 effects symmetric guidance or conduction of the gas.

A particularly efficient degree of operation of the heat
 exchanger is obtained if in accordance with a further con-
 cept of the invention the separation between the heating
 gases and the medium to be heated is by means of a fluted
 chimney or cylinder. The increase of the heat transfer sur-
 face obtained thereby provides for particularly advanta-
 geous use of the thermal contents of the heating gases.
 Due to the thermally spaced and insulated arrangement of
 the flame chimney with respect to the heat exchanger it
 is accomplished that the flame chimneys do not contact
 the medium to be heated, so that they can maintain the
 operating heat that is required for the forming of a long
 or extended burner flame while the deposit of soot is
 avoided.

The medium to be heated is preferably conducted radi-
 ally to the heat exchanger and picked up by a further
 radial stub. For conducting the medium on the one hand
 and the heating gases on the other hand, it is advantageous
 if the fluted cylinder is provided at its end with star-shaped
 closure baffles.

The symmetric conduction of the gas by the concentric
 arrangement of the flame chimney is advantageously sup-
 ported in that the waste gas release stub is arranged cen-
 trally of the heat exchanger.

A particularly efficient heater is obtained in accordance
 with the invention by the use of a burner having a pres-
 sure atomizer. In a burner of the pressure atomizer type
 efficient fuel utilization and faultless ignition conditions
 are obtained owing to the intimate mixing of the air of
 combustion and the fuel. As compared to known atomized
 or vaporized fuel burners the additional advantage is ob-
 tained that the ignition in a pressure atomizer takes place
 efficiently also at relatively low ambient temperatures.

In order to insure sufficient supply of air of combustion
 at the outer parts of the burner cone also with a relatively
 large angular spread of the fuel spray, a further feature
 of the invention provides auxiliary air mixture slots at
 the air entrance side of the air nozzle. Due to the differ-
 ence in pressure existing between the air nozzle and the
 burner chamber, the air of combustion enters the combus-
 tion chamber through these slots that are preferably radi-
 ally disposed, while flowing on the outside around the
 central air nozzle and seizing the outer fumes of the fuel
 spray.

It is also possible to insert a twisting element in the air
 nozzle opening of the burner chamber in a known manner,
 which increases the whirling of the fuel spray and causes
 more intimate mixing with the air of combustion.

A particularly compact form of construction is obtained
 if, in accordance with a further development of the inven-
 tion, the fuel pump is arranged by way of a fixed coupling
 on the shaft of the blower that is preferably driven by an
 electric motor.

If in accordance with a further advantageous feature of
 the invention the annular plate carrying the heat ex-
 changer is arranged on the supporting plate of the flame
 chimney and readily dismountable by means of screws
 or the like, then simple access to and cleaning facility for
 the heat exchanger is obtained.

Brief description of the drawings

Further objects and advantages of the invention will
 become apparent from the following specification with
 reference to the drawings which illustrate an embodiment
 of the invention, and in which:

FIG. 1 is a longitudinal section through a heater in
 accordance with the invention,

FIG. 2 is a section taken along the line B—B in FIG. 1, and

FIG. 3 is a section taken along the line A—A in FIG. 1.

Description of the preferred embodiment of the invention

In the embodiment illustrated in FIG. 1 an inner flame chimney 2 in the form of a hollow cylinder of steel sheet metal is arranged upon a support plate 1. An outer flame chimney 5 is concentrically secured to this inner flame chimney 2 by means of struts 3 and 4. This flame chimney has a closed end 6.

An annular plate 8 or ring, which is readily dismountable, is secured to the support plate 1 by means of screws 7 and carries the heat exchanger. The heat exchanger comprises an outer housing 9 and a fluted chimney 10. The fluted chimney 10 is provided at its end proximate the burner with a tar-shaped baffle 11 and at the end remote from the burner with a similar baffle 12. The heat absorbing medium is supplied to the hollow space by means of a supply socket 13 and is removed or discharged by way of socket 14 after being heated.

Centrally of the heat exchanger a tubular stub 15 for the waste gases is provided, which in the embodiment shown is in the form of an elbow.

The support plate 1 carries on its opposite side the burner assembly which is supported by means of screws 16. This assembly comprises on the one hand the air nozzle 17 having an outlet opening 18 and a whirling or twisting member 19. The pressure spraying nozzle 20 is secured preferably for axial displacement in the air nozzle 17. The supply of the fuel is by way of the fuel conduit 21. Furthermore an axially displaceable ignition electrode 22 is provided. The burner device in addition comprises the housing 23 for the blower in which an electromotor 24 is arranged, which has a shaft 25 that carries on the one hand the blower 26, and on the other hand is connected with the fuel pump 28 by way of a coupling 27.

In order to achieve favorable admixture with the air of combustion also in the areas of the burner cone, the invention provides as a further feature slots 29 for auxiliary air in the air nozzle 17. In the embodiment shown these slots extend radially; however, they may also be arranged obliquely. The difference in pressure that exists between the inner space of the air nozzle 17 and the combustion chamber permits exit of the air of combustion, which then flows in the combustion chamber axially and concentrically with respect to the air nozzle 17. In this manner it is avoided that the outer parts of the burner cone form deposits of soot on the adjacent parts of the inner flame chimney that could be caused by insufficient combustion due to lack of air of combustion.

The device in accordance with the invention operates in the following manner: The pressurized atomizing nozzle 20 is supplied with the liquid fuel by means of a conduit 21, and the air of combustion is forced into the air nozzle 17 by means of the blower 26. The air of combustion flows around the central nozzle 20. The fuel spray which passes through the aperture 18 and which is intimately mixed with air of combustion is ignited by the ignition electrode 22. The flame which develops extends in axial direction inside the flame chimney 2 and is diverted by the front end 6 of the outer flame chimney in the opposite direction. Due to the separate and insulated arrangement of the flame chimneys 2 and 5 with respect to the heat exchanger it is accomplished that the flame chimneys are not in contact with the medium that absorbs the heat, so that their walls can be constantly maintained at the most favorable temperature for the flame formation.

In accordance with the invention the outer flame chimney 5 is shorter than the inner flame chimney 2 so that at the end proximate the burner the waste gases are enabled to enter the heat exchanger. The heat absorbing medium, air, gas, or water for example, is introduced through the socket 13. The heat transfer between the waste gases and the heat absorbing medium takes place by way of the fluted chimney 10, which owing to its large surface makes possible a particularly favorable exploitation of the heat. The waste gases then flow forwardly in axial direction and are discharged through the waste gas discharging tube 15. The heated medium leaves the heat exchanger by way of the socket 14.

It is apparent from the foregoing description that the burner chamber and the heat exchanger in the heater in accordance with the invention are functionally and structurally completely separated, so that particularly when a pressurized fuel atomizer is used as the burner, efficient exploitation of a long burner flame is made possible in combination with compacted construction of the apparatus.

The invention is not limited to the embodiment illustrated and described. It encompasses all advantageous partial and sub-combinations of the features disclosed and, furthermore, structural modifications of details of the heater by the man skilled in the art. We, therefore, do not wish to be limited to the embodiment illustrated, but what we desire to protect by Letters Patent of the United States is set forth in the appended claims.

We claim:

1. Heater burning liquid fuel, particularly extraneous heater for motor vehicles, comprising a burner arranged in a burner chamber and including a fuel nozzle, an air nozzle, a whirling member disposed within said air nozzle with a space therebetween and having an aperture adjacent said fuel nozzle, a flame chimney and a heat exchanger, said burner chamber comprising a first, inner chimney disposed around and concentric with said air nozzle and having an open end remote from said air nozzle, a second outer chimney disposed around said inner chimney and having a closed end opposite said open end of said inner chimney and remote from said burner, said heat exchanger being disposed concentrically with said inner and said outer chimney and being thermally separated and insulated with respect thereto.

2. Heater in accordance with claim 1, including stelliform closure baffles at the ends of said fluted chimney.

3. Heater in accordance with claim 1, including a waste gas discharge duct element disposed centrally and endwise of said heat exchanger remote from said burner.

4. Heater in accordance with claim 1, where said air nozzle is provided with slots at its lower end permitting the entrance of air proximate the base of said nozzle.

5. Heater in accordance with claim 1 including a first annular member supporting said inner and outer chimneys, a second annular member supported on said first annular member and supporting said heat exchanger and a third member secured to said first annular member at the side opposite from said second annular member and supporting said air nozzle, said fuel nozzle, a motor, a pump and a blower.

References Cited

UNITED STATES PATENTS

2,430,227 11/1947 Jensen et al. 126—99
2,645,278 7/1953 Holthouse et al.

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