

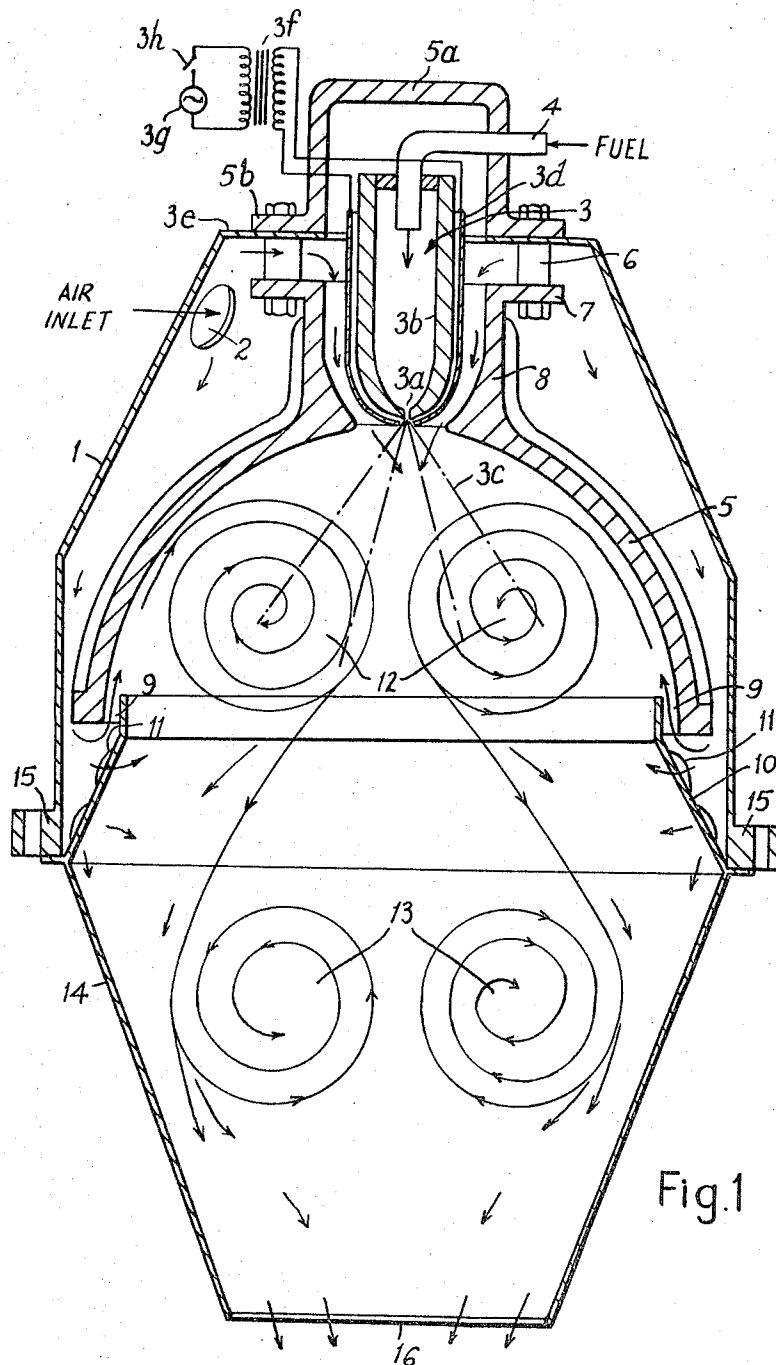
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SPACE HEATERS

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2 Sheets-Sheet 1



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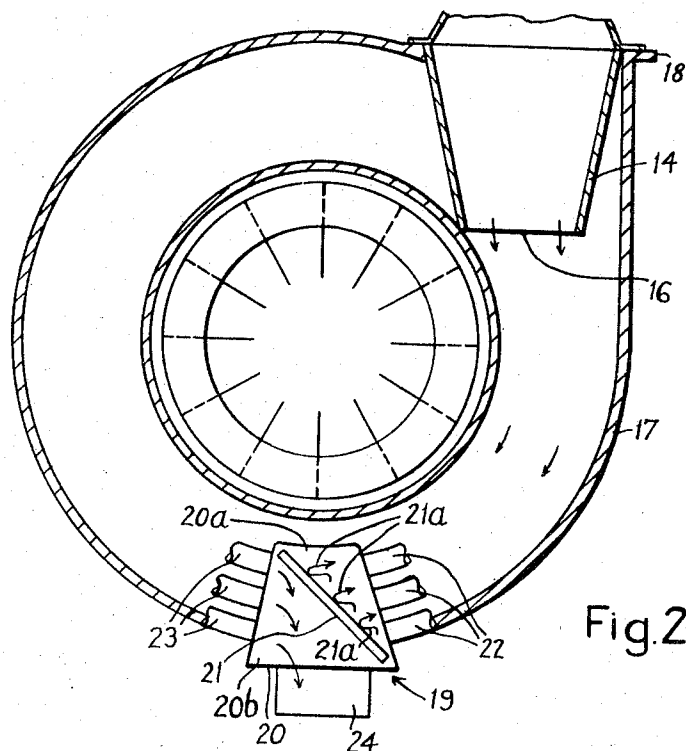
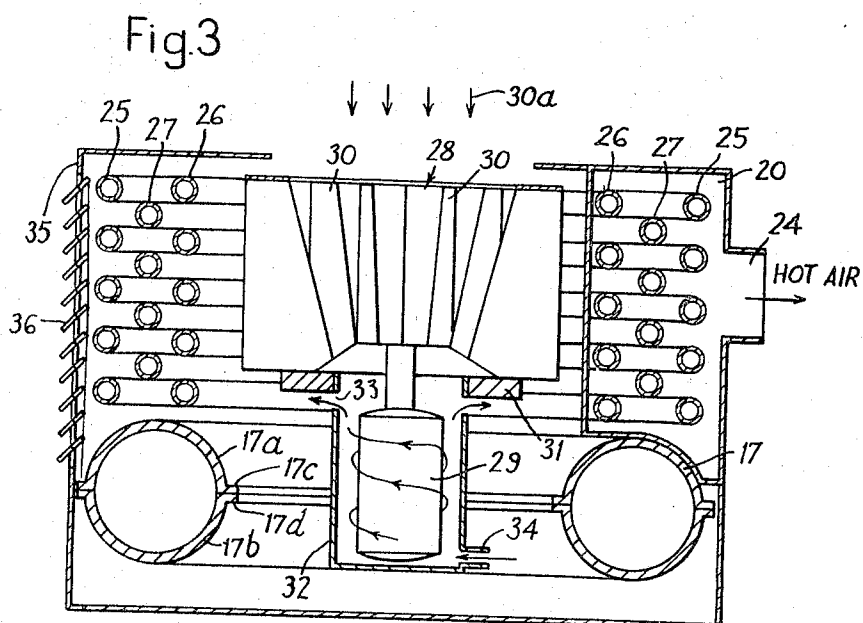


Fig.2



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SPACE HEATERS

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The present invention relates to space heaters and has for an object improvements therein. Space heaters are ordinarily very bulky and it is a specific object of the invention to reduce the size of space heaters as conventionally employed by increasing the efficiency of the heater itself.

According to the invention a space heater comprises a primary combustion chamber and a secondary combustion chamber and heat exchanger wherein means offering resistance to the flow of the gases is provided so as to cause recirculation of said gases.

In order that the invention shall be more clearly understood, reference will now be made to the accompanying drawings which show one specific embodiment thereof by way of example, and largely in diagrammatic form, and in which:

FIGURE 1 shows a longitudinal section through the primary combustion chamber,

FIGURE 2 shows a plan sectional view through the secondary combustion chamber and heat exchanger, to a smaller scale than that of FIGURE 1, and

FIGURE 3 shows an axial section through the secondary combustion chamber and heat exchanger, but rotated by 90° with respect to FIGURE 2 to show certain details.

Referring now to the drawings, FIGURE 1 shows the primary combustion chamber of a space heater according to the invention, which comprises an outer casing in two parts 1 and 14. The part 1 is provided with a tangential air inlet 2 and locates an oil burner, diagrammatically shown at 3, having an ejection orifice 3a and walls 3b. Oil fuel is admitted through an inlet pipe 4 into the burner and air entering via the inlet 2 is caused to be mixed with the fuel sprayed from the nozzle 3a in a conical formation 3c, the fuel air mixture being ignited at the nozzle 3a by an ignition device of any conventional kind, for example a pair of electrodes 3d, 3e connected to an ignition coil 3f energised from source 3g under the control of a switch 3h.

The combustion chamber is formed by a casing of bell shape, which is shown at 5 and this chamber is secured to the part 1 of the outer casing with the interposition of distance pieces 6, bolts passing through the distance pieces and the casing and through suitable apertures in a flange 7 of the chamber 5. To secure the parts in rigid relationship, the part 1 of the casing terminates in a pot-shaped casing 5a having a flange 5b forming a bearing surface for the distance pieces 6. Between the bell shape of the combustion chamber 5 and the flange 7 there is an annular wall 8 defining with the wall 3b of the burner a passageway through which the air from the air inlet 2 passes.

The air passed into the casing is compressed by any suitable compressor or blower fan (not shown); some of it passes between the gaps of the distance pieces 6 and along the passageway defined by the walls 3b and 8 to be directed to the nozzle 3a of the burner, where ignition takes place as referred to above. After the plant has been in operation for a short time, the outside of the combustion chamber 5 will become hot and consequently the incoming compressed air produced by the compressor or blower fan will be preheated before entering the ignition zone which is adjacent the nozzle 3a.

The incoming compressed air also passes down the outside of the bell shape of the chamber 5 in the direction

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of the arrows, whence it passes up a passage 9 between the periphery of the open mouth of the chamber 5 and a conical baffle 10. Thence the air passes up the inside of the chamber 5 and thus produces vortices in the spray cone 3c from the nozzle 3a, effecting thorough admixture of fuel and air. These vortices are illustrated at 12.

The baffle 10 is also provided with further louvres 11 to allow the compressed air to be introduced into a more forward part of the combustion chamber, shown at the lower part of FIGURE 1, and these louvres 11 are set so as to cause a tangential admission of the air whereby the air produces a zone of higher pressure centrifugally, thereby producing rotating vortices shown at 13 which have a direction of rotation opposite to that of the vortices 12. The forward part of the primary combustion chamber is limited by the wall 14 of the casing. The baffle 10 and the part 14 of the casing are secured to a flange 15 provided on the casing part 1. Burnt gases, which are largely carbon dioxide, pass out through the mouth 16 of the casing part 14.

FIGURES 2 and 3 show the secondary combustion chamber which is in the form of a two-part toroid 17, the two parts being shown at 17a and 17b, each of which has flanges 17c and 17d respectively, for securing the two parts together in any conventional manner e.g. by bolts. This toroid 17 is provided with a tangential inlet flange 18 for securing to the flange 15 on the primary combustion chamber so that the part 14 projects tangentially into the toroid 17, as will be seen from FIGURE 2. The hot gases pass out of the mouth 16 in the direction of the arrows and circulate around the toroid as shown, a large number of times.

At a point nearly diametrically opposite to the entry flange 18 of the toroid (in the embodiment shown) there is provided a distribution box 19, which extends above the level of the toroid in the form of a casing 20.

The casing 20 has an internal baffle 21 against which the circulating gases passing upwardly out of the toroid through an upper aperture therein, as is indicated by the arrows 21a, impinge, thereby creating resistance and causing circulation into a series of heat exchanger tubes, as indicated at 22 on FIGURE 2. The exchanger tubes are disposed so as to follow the shape of the toroid the gases flowing therein finally go back into the distribution box formed by the casing 20, utilising those parts of the tubes which are marked 23 in FIGURE 2. The casing 20 is thus divided into two parts viz. an entry part 20a and an exit part 20b and the exit part 20b to which the tube ends 23 connect, leads to the flue 24. FIGURE 3 is rotated by 90° with respect to FIGURE 2, to show the flue exit 24 more clearly. However, the baffle 21 is not shown in FIGURE 3.

FIGURE 3 shows more particularly the arrangement of the tubes of FIGURE 2 and shows that these are arranged in outer and inner loops 25 and 26 between which is a further series of loops 27. In the embodiment shown in the drawings there are fourteen complete loops of tubes but it will be appreciated that other numbers may be employed where desired.

Within the space defined by the tube loops, is provided a fan 28 driven by a motor 29 which is located within the space defined by the toroid 17. The blades 30 of the fan may have a backward or a forward or a radial curve, although this is not illustrated particularly in the drawings, provided that the fan acts as a centrifugal fan, to cause a flow of air to pass in at the arrows 30a, and through the heated looped tube system. The fan may be positioned to cause air flow in either sense, as desired. With this arrangement of the fan and the tube loops, there is an impingement of the air on to the tubes at substantially 90° which is the most efficient angle for causing a heat exchanging action. Lower impingement

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angles impair the efficiency of heat transfer. Thus the arrangement of the secondary chamber according to the invention produces the maximum theoretical efficiency of the system. The looped system allows the tubes to expand and contract without stressing the joints with the distribution casing 20.

Beneath the fan blades 30, subsidiary blades 31 are provided for cooling the motor 29, which is encased in a casing 32 having inlet and outlet ducts 33 and 34 for cooling purposes. A casing 35 is provided around the whole of the secondary combustion chamber unit which has a radial baffled outlet or louvres 36, again for the introduction of resistance, so as to effect recirculation of the fan-blown air over the tube system 25, 26, 27 before final passage outwards through the louvres. It will be appreciated that the hot air outlet may be either radial, as shown, or axial if preferred.

The wall unit comprising the primary and secondary combustion chambers is located within a casing (not shown) so that the flue 24 is radially disposed, and the louvre system 36 comprises adjustable horizontal louvres for varying the flow in any desired direction upward or downwards, and adjustable vertical louvres, which may be set or adjusted to vary the angular distribution in a horizontal plane. If desired however, the hot air outlet may be ducted instead of louvred.

It has been found that a space heater according to the invention has such an increased efficiency over conventional space heaters that it occupies only about one-sixth of the volume of such conventional heaters.

I claim:

1. A space heater system comprising a primary combustion chamber, said chamber having an outer casing in two coaxial parts for ease of assembly and maintenance, an air inlet leading tangentially into a first one of said parts, a fuel burner located in said first part, a bell-shaped casing also located in said first part and forming said combustion chamber proper, distance pieces interconnecting said first part of said outer casing and said bell-shaped casing, one end of said first part of said outer

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casing terminating in a pot-shaped casing, a flange on said pot-shaped casing, said flange forming a bearing surface for said distance pieces, a wall for said burner, an annular wall between said bell-shaped casing and said flange, said annular wall defining with said wall of said burner a passageway through which air from said air inlet may pass, said bell-shaped casing having an open mouth, a conical baffle in said first part of said casing, said open mouth and said baffle being spaced apart to form a passageway for the entry of air from said air inlet so as to create rotating vortices beneath said fuel burner, said primary combustion chamber having a forward part limited by a wall forming a second part of said casing, said second part terminating in an exit mouth, an outlet flange on said first part of said outer casing, and means securing said conical baffle and said wall to said flange.

2. A space heater system as set forth in claim 1, comprising louvres on said conical baffle, said louvres being set to cause a tangential admission of air from said air inlet passing over the outside of said bell-shaped casing, whereby the admitted air produces a zone of high pressure centrifugally, thus producing vortices which have a direction of rotation opposite to that of said vortices beneath said fuel burner.

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