

June 14, 1966

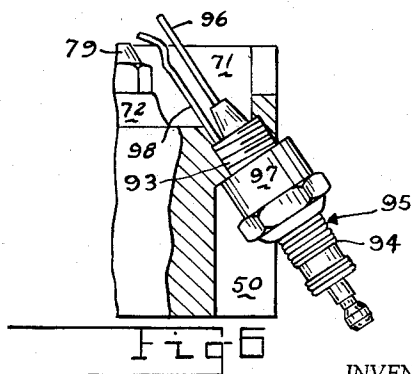
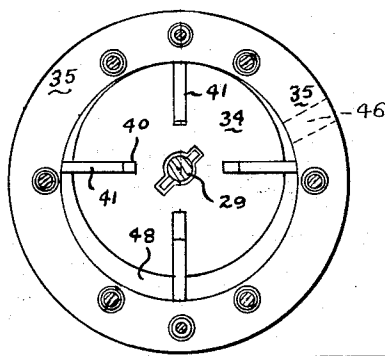
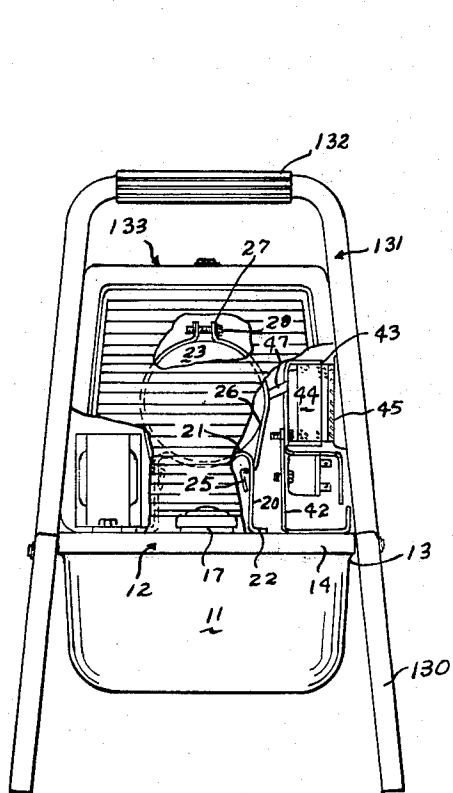
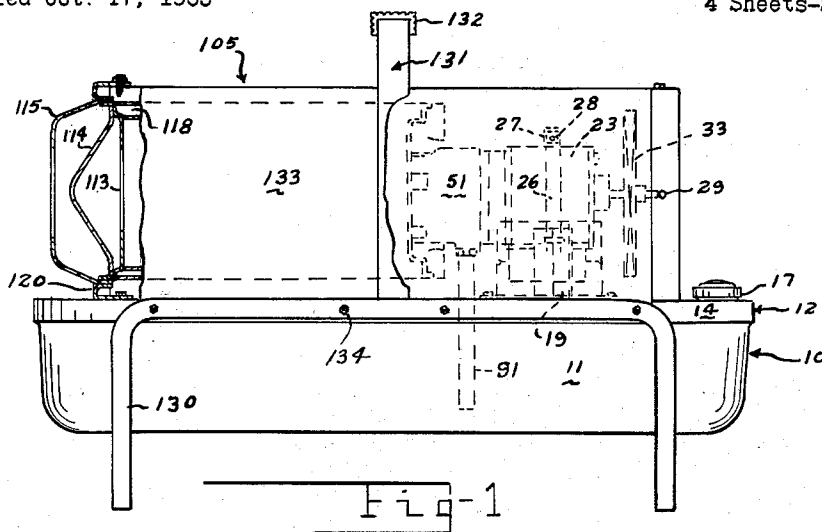
E. C. BRIGGS

3,256,003

PORTABLE OIL HEATER

Filed Oct. 17, 1963

4 Sheets-Sheet 1



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June 14, 1966

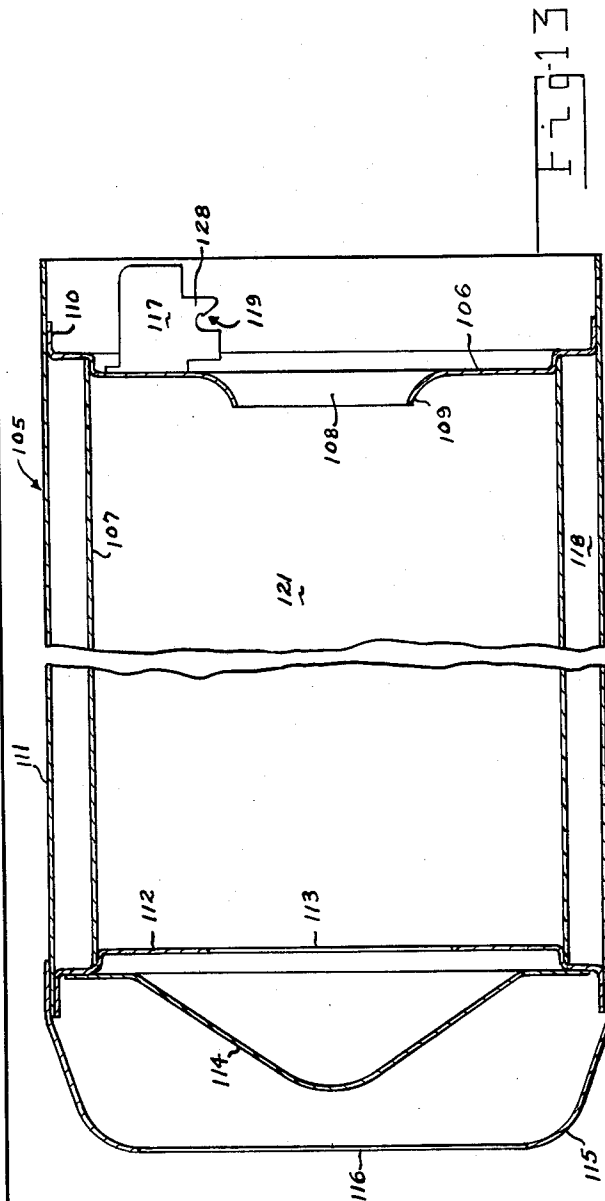
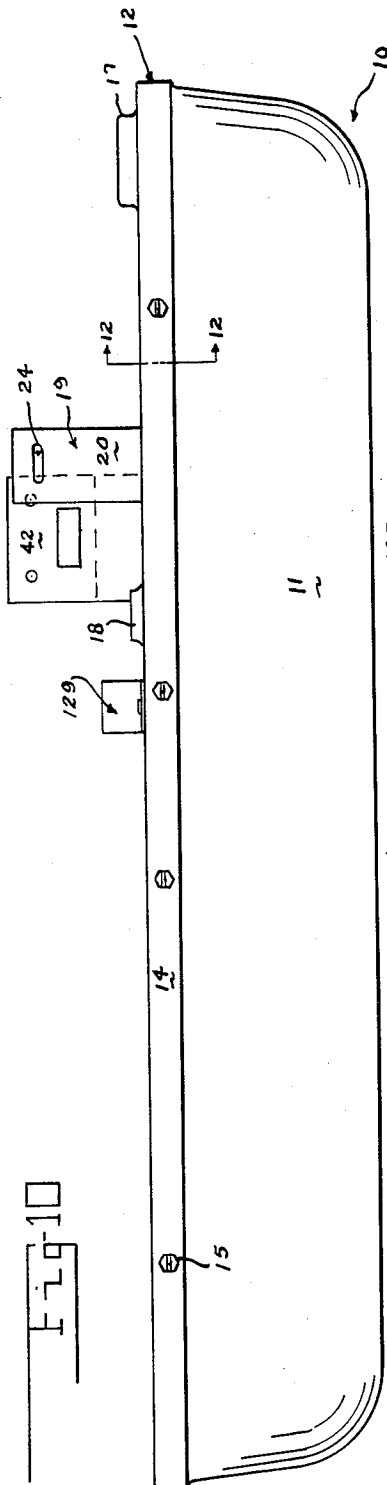
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PORTABLE OIL HEATER

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4 Sheets-Sheet 3



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PORTABLE OIL HEATER

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4 Sheets-Sheet 4

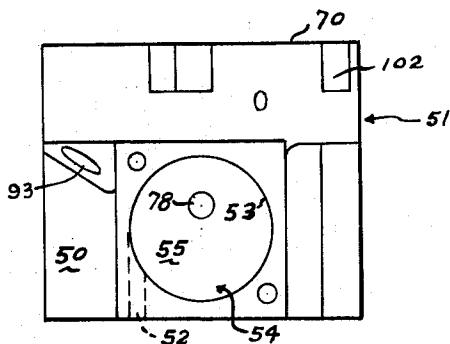
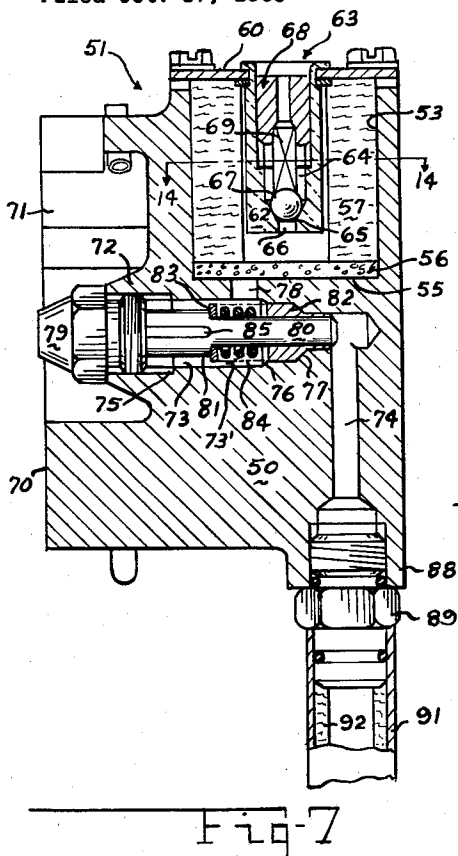


Fig-12

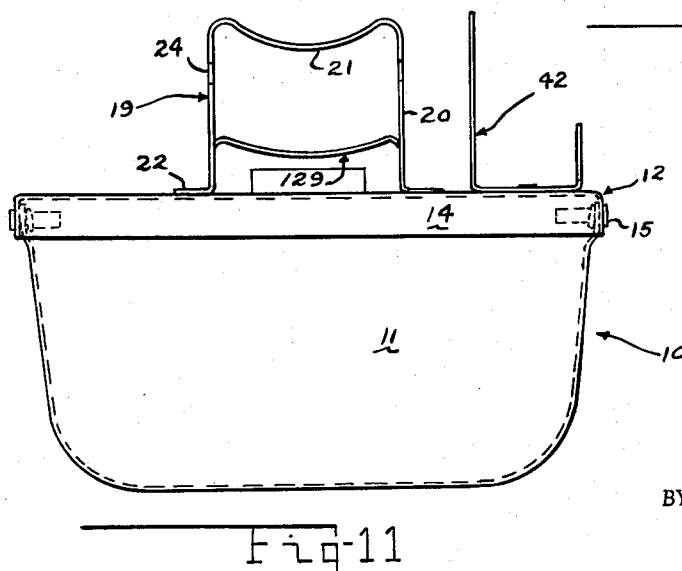
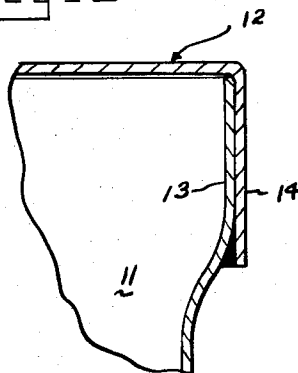
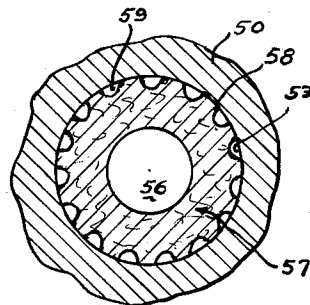


Fig-14



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1

3,256,003

PORTABLE OIL HEATER

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8 Claims. (Cl. 263—19)

This invention relates to improvements in heater components which may be so related to achieve a portable space heater both economical to fabricate and more efficient and satisfactory in use.

It is therefore a primary object of the invention to provide a portable space heater which is economical to fabricate, more efficient and satisfactory in use, adaptable to a wide variety of applications and unlikely to malfunction.

A further object of the invention is to provide improvements in heater components.

Another object of the invention is to provide a space heater of an extremely compact nature.

A further object of the invention is to provide an improved burner unit having particular advantage in application to space heaters.

Another object of the invention is to provide a burner unit the construction of which minimizes the need for external piping in application to space heaters.

An additional object of the invention is to provide an improved burner unit for a portable space heater or the like having, integrated therewith, an air compressor and a fan so related to eliminate the extensive hardware normally required for a delivery of air to support combustion.

Another object of the invention is to provide an improved fuel tank for use in portable space heaters and like structure.

A further object of the invention is to provide means for simplifying the interconnection of component portions of a portable space heater.

An additional object of the invention is to provide a novel unit which integrates a burner head and a pump.

Another object of the invention is to provide improved means for interconnecting superposed elements.

A further object of the invention is to provide an improved sparking device which enables a low voltage operation of space heaters or like structure.

An additional object of the invention is to provide improvements in igniters and ignition systems having a particular advantage in application to space type heaters.

Another object of the invention is to provide a more effective means for delivering air to support combustion in a space heater.

A further object of the invention is to provide an improved burner head for use in a space heater or the like.

Another object of the invention is to provide improvements in sparking devices enabling a maximum spark volume and low voltage operation.

Another object of the invention is to provide improvements in combustion chambers and the mount thereof in a portable space heater.

An additional object of the invention is to provide heater components and an assembly thereof possessing the advantageous structural features, the inherent meritorious characteristics and the means and mode of operation herein described.

With the above and other incidental objects in view, as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof and the mode of operation as hereinafter described or illustrated in the accompanying drawings, or their equivalents.

Referring to the accompanying drawing wherein is

2

shown one but obviously not necessarily the only form of embodiment of the invention,

FIG. 1 is a side elevation view of a portable space heater in accordance with the invention;

FIG. 2 is an end view of the device of FIG. 1 with parts broken away for clarity of disclosure;

FIG. 3 is a detail view of a burner unit in accordance with the present invention, shown partly in section;

FIG. 4 is a view taken on line 4—4 of FIG. 3;

FIG. 5 is a frontal view of the burner head incorporated in the burner unit of FIG. 3;

FIG. 6 is a fragmentary sectional view illustrating the improved electrode embodied in the present invention;

FIG. 7 is a cross-sectional view of the burner head of FIG. 5;

FIG. 8 reveals details of the body of the burner head;

FIG. 9 is a top view of the head as shown in FIG. 8;

FIG. 10 is a side elevation view of a fuel tank assembly in accordance with the present invention;

FIG. 11 is an end view of the tank of FIG. 10;

FIG. 12 is a fragmentary view of the fuel tank;

FIG. 13 is a view of the combustion chamber assembly, as embodied in the device of FIG. 1, and

FIG. 14 is a view taken on line 14—14 of FIG. 7, parts being eliminated for clarity of disclosure.

Like parts are indicated by similar characters of reference throughout the several views.

A preferred embodiment of the invention as illustrated in the drawings includes a fuel tank 10 fabricated of two drawn sheet metal parts. One forms a generally rectangular seamless tray 11, the corners of which are generally rounded, the other a cap 12. The uppermost wall portion of the tray 11 has an outward offset affording a rim 13 which provides the tray with a horizontal expansion. The cap 12 takes the form of a cover plate which includes, peripherally thereof, a co-extensive, continuous, dependent flange 14. As the cap covers the tray, the flange 14 depends immediately about the rim 13 and is secured thereto at spaced intervals by rivnuts 15. The parts 11 and 12 are further bonded and sealed by epoxy resin or an equivalent sealant, the latter being applied between the dependent edge of the flange 14 and the adjacent surface of the rim 13. In this manner, the invention provides for a very simply effected fuel tank which in the fabrication thereof requires no welding whatsoever.

A neck 17 is formed on one end of the cap 12 to define a fuel inlet for the tank 10. Spaced longitudinally from the neck 17, towards the center of the cap 12, is a vertically projected boss 18 which defines a fuel outlet. Centered on the top of the cap 12, intermediately of the neck 17 and the boss 18, adjacent the later, is a motor mounting bracket 19.

As seen in the drawings, the bracket 19 is formed from a single strap of metal. It includes parallel leg portions 20 which so mount to project vertically from the cap 12. As so positioned, the leg portions 20 are bridged to their upper ends by an arcuately concave strap portion 21. To their lower ends, the leg portions 20 each include a right angled foot portion 22 by means of which the bracket 19 is secured to the cap 12. The bracket 19 constitutes a motor support, its strap portion 21 supporting the cylindrical housing of a motor 23.

Each of the bracket leg portions 20 includes a horizontal slot 24, the slots 24 being in a common plane generally parallel to the upper surface of the cap 12. Each of the slots 24 receive therethrough a hook extremity 25 of an arcuate strap element 26. The strap elements 26 are so formed to have opposed curvatures whereby to mutually contain the motor housing to the portion 21 of the bracket 19. Their upper relatively adjacent extremities 27, which position to the top of the motor 23, are so

bent to project in spaced parallel relation, in a sense vertical to the plane of the cap 12. The portions 27 are conventionally interconnected by a single screw element 28 to strap the motor 23 in a fixed relation to the bracket 19 and fuel tank 10.

The motor 23 is of a conventional nature. It includes a tubular stator housing 30 capped to one end by a plate 31 and to its other end by a plate 32. Its rotor (not shown) embodies a drive shaft 29 the respective ends of which bear in and project through the end plates 31 and 32.

The one projected extremity of shaft 29 fixedly mounts a series of blades forming an integrated fan unit 33 adjacent and spaced from the end plate 31. Its other extremity nests in and fixedly mounts a disc type pump rotor 34. The rotor 34 is so positioned to have one face immediately adjacent the outer face of end plate 32.

The rotor 34 is rotatably housed within an eccentrically disposed ring 35 capped at one face by the end plate 32 and at its outer face by cover plate 36. Together, the ring 35 and the plate 36 comprise a pump body means. The depth of ring 35 is such to place the plate 36 in immediately adjacent relation to the outermost face of the rotor.

Noting FIG. 4 of the drawings, as the rotor is positioned in the ring 35, the one portion which is uppermost will always bear on the inner surface of the ring. To either side of its bearing portion, the spacing of the rotor relative the inner surface of the ring is gradually increased to achieve a maximum at its lowermost portion in a manner believed obvious.

The rotor 34 is a vaned rotor, the periphery of which includes radially oriented slots 40 spaced 90° apart. Each of the slots 40 nests a relatively slidable vane 41. As may be readily seen from FIG. 4 of the drawings, on energizing the motor 23 the shaft 29 will drive the rotor 34 and thereby induce the slidable vanes 41 to successively move outwardly of the rotor periphery to bridge the space between the rotor and the inner surface of the ring 35. The purpose of this structure will soon become obvious.

Fixed to the cap 12 at one side of the motor 23 is an L-shaped bracket 42 (FIGS. 2 and 10). The upper end of the bracket 42 mounts a housing 43 defining an air chamber 44. The side of the housing 43 which is outermost with reference to the ring 35 is open and bridged by an air filter 45.

As seen in FIGS. 2 and 4 of the drawings, the ring 35 has a radial aperture 46 accommodating one end of a tube 47. The other end of the tube 47 is fixed to project interiorly of the air chamber 44. Accordingly, on drive of the shaft 29 the vaned rotor will induce static air to be drawn from the vicinity of the air filter 45 interiorly of the housing 43 and through the tube 47 to the compression chamber 48 defined between the periphery of the rotor and the inner wall of the ring 35. As should be obvious from FIG. 4, as the vanes move past the uppermost portion of the ring 35, they will begin to project exteriorly of the rotor, to the extent permitted by its spacing from the inner surface of the ring. As each vane starts to project, it immediately passes the air intake aperture 46 and induces an inflow of air to chamber 48. This air is picked up by the following vane and carried in advance thereof to move therewith through the initially expanding and then contracting compression chamber 48. As a vane 41 moves past the lowermost portion of ring 35, it moves inwardly of the rotor 34 due to decreasing space between the rotor and the inner surface of the ring. In flow thereof, the air in advance of the retracting vane is then compressed until it reaches a point of access to a discharge opening 49 in the cover plate 36 (FIG. 3).

Fixed to the plate 36 so as to form an axial extension of the motor 23 and the ring 35 is the body 50 of a burner head 51. The body 50 has a cylindrical form,

with its opposite ends respectively defining a front operating face 70 and a rear mounting face, and includes an axially oriented flow passage 52 the entrance end of which communicates with the discharge opening 49 in the cover plate 36. The other end of the flow passage 52 is oriented to discharge in a sense tangential to a wall 53 formed by a cylindrical recess 54 in the top of the body 50. Seating on the recess base 55 is a disc-shaped filter plate 56 (FIG. 7 and 14). The plate 56 is porous and preferably formed of polyurethane. Nesting in the recess 54, in superposed relation to the filter plate 56, is a secondary filter 57. The filter 57, preferably of felt, has an annular form. It includes radially projected, longitudinally oriented ribs 58, the projected extremities of which abut the recess wall 53 to form therewith vertically oriented air passages 59.

The recess 54 is capped by an annular plate 60, the open center of which aligns with the open center of filter 57. Suspended from the plate 60 to depend interiorly of the filter 57 is a cylindrical housing 62 of a relief valve 63. The housing 62 has a central recess 64 successively stepped inwardly thereof to a conical shoulder 65 about a central opening 66 in its dependent base. Seated on the shoulder 65 is a ball valve element 67. A centrally apertured plug 68 is engaged to the valve housing 62 in the upper end of its recess 64. The inner end of the plug 68 is counter-sunk to nest one end of a coil spring 69 the other end of which abuts the ball valve element 67. As so contained, the spring 69 applies a bias to normally cause the valve element 67 to tightly seal the relief opening 66 in the bottom of the valve housing 62.

The body 50 provides the burner head 51 with a front operating face 70 having a central recess 71. The base of the recess 71 includes, at its center, a short conical projection 72, the outer end of which terminates short of the operating face 70. The body 50 also includes a central passage or recess 73 having an axial orientation. The passage 73 opens at its outer end through the center of the projection 72 while the inner end thereof terminates within the body 50 at an intersection with a downwardly directed fuel passage 74.

The passage 73 has successive reductions in its cross-sectional dimension from its outermost end at the projection 72 to its innermost end which intersects and communicates with the passage 74. This reduction provides the passage 73 with successively spaced shoulders 75, 76 and 77, the latter two of which are generally conical in form, relatively closely spaced and adjacent the passage 74. The body 50 also includes a vertical flow passage 78 providing a direct communication between the recess 54 and the passage 73 in advance of the shoulders 76 and 77.

Threadedly engaged to the body 50 in the outer end of the recess 73 is a siphon nozzle 79 the head of which abuts the outer extremity of the projection 72. The discharge end of the nozzle 79 positions slightly forward of the operating face 70. As shown in FIG. 7 of the drawings, the nozzle 79 includes a thin tubular shank portion 80 which extends inwardly of the passage 73 to communicate at its innermost extremity with the flow passage 74. Moreover, from a point adjacent and spaced from the nozzle head, its shank portion 80 is reduced in cross-section dimension to provide it with an external shoulder 81. Note that the cross-sectional dimension of the nozzle shank 80, in any event, is substantially less than that of the passage 73 through which it extends whereby to form about the nozzle shank an air chamber 73' forming part of the passage 73.

The shoulder 81 positions coaxial with and in opposed spaced relation to the shoulder 76 in the recess 73. A tubular washer 82, one end of which is conically tapered, mounts about the innermost portion of the nozzle shank 80 to have its tapered end abut the shoulder 77. The latter is positioned at the inner end of the recess 73 and

5

immediately adjacent the intersecting fuel passage 74. A flat washer 83 is positioned about the inner portion of the nozzle shank to have one face thereof in abutment with the shoulder 81 while its other face provides an abutment for one end of a coil spring 84. The other end of the spring 84, which positions generally concentric to the nozzle shank, abuts the outermost end of the washer 82 in the vicinity of the shoulder 76. The washer 82 is of plastically deformable material. Utilizing this characteristic of the washer 82, the bias of the spring 84 thereon is made sufficient to plastically distort the washer and cause it to expand in a transverse sense and form a seal of the passage 73 about the nozzle shank and preclude the passage of air from the recess 73 to the flow passage 74.

As mentioned previously, the fuel passage 74 functions as a channel for inflow of fuel to the innermost extremity of the nozzle shank. The nozzle shank defines an interior flow passage P (FIG. 5) which exits from the nozzle head. The head of the nozzle 79 is conventionally formed to include air flow passages inlet ends of which are defined by grooves 85 in the exterior portion of the nozzle shank 80 (FIG. 7). These grooves 85, as will be further described, provide for a pressurized inflow of air to the interior flow passage of the nozzle 79 in a manner to draw fuel from the tank 10, through the passage 74 and to atomize and entrain such fuel for discharge therewith from the head of the nozzle 79. The discharge occurs at a point directly forward of and in immediately adjacent relation to the operating face 70 of the burner head 51.

The flow passage 74 opens from the bottom of the body 50 through a vertically dependent tubular projection 88 accommodating one end of a threadedly engaged tubular adaptor 89. The outermost end of the adaptor 89 is suitably engaged in the discharge end of a fuel hose or pipe 91. The pipe 91 depends from the burner head 51 to extend through the outlet 18 in the cap 12 and terminate interiorly of the tray 11, adjacent its bottom. Lodged in the uppermost end of the fuel pipe 91, relatively adjacent the adaptor 89, is a cylindrical filter element 92. The upper end of the element 92 is centrally and axially recessed in a conventional manner.

The body 50 is also formed, adjacent its outer periphery, with a through passage 93 (FIGS. 6 and 8) extending from front to rear thereof and angularly inclined, in a radial sense, to open at its forward end to the recess 71, adjacent the conical projection 72. Engaged to the body 50 in the passage 93 is an igniter 95. The igniter 95 includes an insulating body 94 containing projected electrode 96. The outer tip of this electrode positions adjacent the forward extremity of the nozzle head. Mounted externally of the body 94 is a metallic sleeve 97 conductively engaged to the body 50, the latter being of metallic content. Fixed at one end, in conductive relation to the sleeve 97 and extending forwardly therefrom, is a wire-like ground element 98. The ground element projects adjacent and generally parallel to the electrode 96 until it reaches a point adjacent its projected extremity. At this point the projected extremity of the wire 98 is first angularly diverted towards the electrode to form a small gap therebetween and then diverted outwardly therefrom to achieve a V-shape. This structure produces a simple igniter means providing a relatively small spark gap and enabling a fan-shaped spark. It allows the use of low voltage (5,000 v.) ignition in lieu of conventional high voltage (10,000 v.) and the achievement of a large volume spark in a manner to be further described.

Referring more particularly to FIG. 5 of the drawings, it may be seen that the recess 71 is bounded by wall structure which in the main has a generally cylindrical form. Projected from the inner surface of this wall structure are arcuately formed fingers 101. The fingers 101 curve in a common direction so as to achieve, periph-

6

erally of the recess 71, a series of pockets 99 which are encompassed by arcuate wall sections 100. The wall structure which peripherally defines the recess 71 also includes circumferentially spaced, relatively angled, slots 102. Slots 102 are so oriented to provide for a peripheral inflow of air to the pockets 99 in a sense tangential to the arcuate wall sections 100 formed by the fingers 101. As may be readily seen, the slots 102 not only provide for a peripheral inflow of air to the recess 71 to swirl about the discharge end of nozzle 79 but also they are so positioned to lie in the operating face 70 of the body 50.

Referring more particularly to FIGS. 1 and 13 of the drawings, the invention provides a combustion chamber assembly 105. The assembly 105 includes concentric sleeves 107 and 111, the inner of which is shorter and longitudinally centered in reference to the outer sleeve 111. Nested in the one end of the inner sleeve 107 is a dish-shaped plate 106 having a central aperture 108. The aperture 108 is defined by a conically flared plate portion 109 which extends in a sense inwardly of the sleeve 107. Formed integral with the outer peripheral portion of the plate 106 are circumferentially spaced, radially projected fingers the extremities of which are bent to provide flanges 110. The flanges 110 are so formed to commonly abut the inner surface of the sleeve 111 and are fixed thereto in circumferentially spaced relation thereabout.

Nested in the opposite end of the inner sleeve 107 is a dish-shaped plate 112 having a central aperture 113 which positions co-axial to the aperture 108 in the plate 106. The plate 112 is peripherally formed like the plate 106. Thus at spaced points it abuts the inner wall of the sleeve 111 and is fixed thereto. Spaced to the outermost side of the plate 112 is a deflector plate 114 presenting a conically dished surface to its side immediately adjacent the aperture 113 in the plate 112. The plate 114 peripherally corresponds to and is fixed to the plate 112 in a manner believed obvious. The conically dished portion of the plate 114 projects centrally and forwardly of the adjacent end of the outer sleeve 111 which is capped by a convergent nose cone 115. The nose cone 115 is centrally apertured at 116.

Fixed to the plate 106 at its face most remote from the nose cone 115 are circularly spaced brackets, projected portions of which provide plate 117 of cylindrically arcuate form. Plates 117 if interconnected, would form a tubular projection extending substantially to the adjacent extremity of the sleeve 111. Included at one edge of each of the arcuate plate projections 117 is an arcuate extension 128, the projected edge of which is notched at 119 to accommodate a stud 103 (FIG. 3) or 103' on the burner head 51.

The combustion chamber 105 is assembled to peripherally confine and form an axial extension of the burner unit previously described by engagement of its plate portions 117 to form bayonet connections with studs 103 and 103' on the burner head 51 in a manner believed obvious. The single screw stud 103' may be conventionally utilized to fix the position of the combustion chamber in relation to the burner unit. On positioning the assembly 105 in connection with the burner unit, the end thereof most adjacent the burner unit seats to a saddle-shaped bracket 129 (FIGS. 10 and 11) formed on top of the cap 12 of the fuel tank 10. The projected extremity of the assembly 105 extends co-extensively with the cap 12 and is secured to the cap 12 through the medium of a supporting bracket 120, as may be seen in FIG. 1 of the drawings. Of the assembly 105, the sleeve 107 together with the end plates 106 and 112 form a combustion chamber 121. The plate 106 nests the operating face 70 of the burner head 51 in the interior of its flared portion 109. Further, the concentric sleeves 107 and 111 provide therebetween a tubular air passage 118 for use in a conventional manner.

The invention embodiment as above described mounts

to its cap 12 suitable connector means through the medium of which power may be fed to energize the motor 23. Simultaneous with the energizing of the motor 23 the drive shaft 29 turns the blades forming the fan unit 33 and the connected rotor 34. The blades 33 produce a pressured flow of air which is external to and proceeds forwardly of the burner unit to move about the burner head and through the tubular passage 118 defined about the combustion chamber 121 to exit as heated air through the central aperture 116 in the nose cone 115. The vane rotor 34 continuously rotates within its housing as defined by the ring 35, the motor end plate 32 and the cover plate 36. As the rotor turns, each vane 41 therein moves past the upper and relatively abutting surface of the ring 35 and shortly thereafter starts to project and passes the opening 46 in the ring 35. As each vane passes the opening 46 it induces an insuction or inflow of static air drawn through the air filter 45 to enter the chamber 44 and pass through the tube 47 to the compression chamber 48 in the path of a following vane 41. As each vane 41 rotates with the rotor 34 it will move outwardly of the rotor to the extent permitted by the eccentric ring 35. The vanes 41 drive the air in advance thereof to an initially expanding portion of the compression chamber 48 and then through a relatively contracting portion thereof until this air is brought in communication with the exit aperture 49 in the cover plate 36. The fuel flow directed to and through the nozzle 79 may be described as following a main flow passage, with the air reaching and flowing through the nozzle by way of grooves 85 following an auxiliary flow passage. These flows intersect, with the combined flow leaving the tip of the nozzle by what may be considered a main discharge passage.

As mentioned previously, the aperture 49 communicates with the burner flow passage 52 and thereby provides that compressed air is released from the compression chamber 48 to be discharged in a sense tangential to the inner wall 53 of the recess 54 in the burner head 51. The longitudinal passages 59 defined by the secondary filter 57 in the recess 54 facilitate the tangential inflow of the compressed air which swirls about and through the filter and gradually inwardly thereof to enable the filter to relieve the air of carbon particles as it moves inwardly to its center. As the air reaches the center of the recess 54 within the tubular filter 57 it passes through the base filter 56 to enter the flow passage 78 in communication with the recess 73 in the face of the burner head 51. The air will enter the recess 73 in a pressured flow to move about the shank 80 of the nozzle 79 to enter the grooves 85 in the shank exterior. Passing through the grooves 85 the compressed air swirls through the passages in the nozzle head to move interiorly of the fuel flow passage defined therethrough. As this air, which is under pressure, is swirled interiorly of the main flow passage through the nozzle 79, it will produce an insuction to draw fuel from the tank 10 to move up through the pipe 91 to pass through the filter 92, to move interiorly of the flow passage 74 and flow through the delivery passage as defined by the nozzle shank. The swirling air which enters the nozzle flow passage not only draws the fuel therethrough but atomizes the fuel, entrains it and causes the fuel to discharge therewith in an atomized condition. This discharge occurs immediately adjacent the operating face 70.

It is to be noted that the successive filtering of the air, as it moves to mix with the fuel removes substantially all the impurities which would normally interfere with a free flow of the entrained fuel through the nozzle 79 and a complete combustion thereof in chamber 121. Moreover, the inclusion of the biased washer 82 enables a most effective seal of the passage 74 from the recess 73. This last precludes an air inflow to the passage 74 which would produce a lowering of the efficiency of the air and fuel delivery system as provided by the invention.

As will be particularly noted from FIG. 7 of the drawings, the positioning of the filters 56 and 57 renders them highly accessible for cleaning and replacement.

The relief valve 63 is so provided as to insure a proper control of the pressure under which air is delivered to the recess 73.

As mentioned previously, the fan unit 33 will drive air past the burner head and interiorly of the combustion chamber assembly 105 through the tubular passage 118 to be heated and discharged thereby. As the air flows past the burner head, a portion thereof is induced to swirl inwardly through the slots 102 to enter the recess 71 in a sense tangential to the finger surfaces 100. The swirl of the air is increased thereby. This air which enters the recess 71 swirls therein to move outwardly thereof about the nozzle 79. It produces entrainment of the atomized fuel which issues from the nozzle, thereby providing additional air for combustion, further atomizing the fuel-air mixture as delivered from the nozzle and adding impetus thereto in flow thereof in direction of the combustion chamber 121. This flow is through the plate 106, guided by the flared edge of the opening 108.

The igniter 95 provides a set of points which are pre-formed and fixed. The spark gap as established by the end of its electrode 96 and the divergent extremity of the ground 98 is positioned immediately forward of the discharge end of nozzle 79. The spark which is developed at the inner end of the V established at the projected ends of the electrode 96 and ground 98 is fanned outwardly between the divergent portions thereof under the influence of the air which moves thereby from the recess 71. In this way, using only a relatively low voltage, one may develop a spark of maximum volume. This insures a most effective ignition of the super atomized fuel at its discharge from the nozzle 79 at a point immediately within the entrance to the combustion chamber 121. The association of the improved ignition features with the effective use of air delivered to the burner head 51 provides for essentially complete combustion of the fuel in the chamber 121 with essentially no deleterious residue. There is a minimal afterfume and optimum heating of the air passing through the chamber passage 118 to exit through the opening 116 in the nose cone.

It is to be noted that the igniter of the invention incorporates a single electrode in contrast to the conventional use of a pair of adjustable electrodes.

The embodiment of the invention as above described includes many features offering improvements in space heater elements and the composition thereof in a single compact unit. As indicated in the first instance, the means and manner whereby air is delivered to and through the nozzle 79 is significant in and of itself. The manner in which this is accomplished enables the elimination of much hardware and inhibits the occurrence of impurities which would normally cause an undesirable residue in burner units and their component structures. Further, the fuel control and ignition as achieved by the present invention is of considerable importance in developing space heaters of an improved character. Another feature of the invention is evidenced in the simple means by which the burner unit and combustion chamber is applied to a base structure offering an improved fuel tank. Additionally, the manner in which the nozzle is incorporated in the burner, as well as the construction of the burner head per se facilitates maintenance procedures and enables a most economical fabrication of burner units.

Thus, the space heater in accordance with the present invention achieves maximum economy in the fabrication thereof and maximum efficiency in the operation of its various components.

In addition to the above described features, the invention embodiment offers a novel package rendered portable by the following means. The entire structure superposed on the cap 12 of the fuel tank 10 including the

burner unit, the connected fan 33 and the assembly 105, to the extent of its outer sleeve 111, is enclosed by an outer wrapper 133 (FIG. 1) including a top and slightly divergent sides which depend to have their lower extremities overlap the sides of the cap 12 which are defined by the flange 14. A leg frame member 130 having a general U-shape is arranged to either side of the fuel tank 10 with the bridging portion thereof uppermost. This bridging portion is secured over the adjacent dependent extremity of the wrapper 133 and to the fuel tank by screws 134 which engage through the frame member 130, the wrapper portion thereunder and into the flange 14 of the cap 12. In this way the wrapper 133 has a fixed relation to the tank 10 and forms a hood-like superstructure thereon which encloses the superposed heater elements. Connecting to the bridging portions of frame members 130 and bridging the wrapper 133 in spaced relation thereto is a basket-type handle 131 having an inverted U-shape. The bridging portion of handle 131 includes a grip 132 which serves as a carrying means for the entire space heater structure. Since the handle 131 is secured to the leg frames 130 which are in turn fixed to the fuel tank 10 through the medium of the cap flange 14, by simply grasping the portion 132, and one may easily lift and transport the entire space heater unit incorporating its fuel tank. It may be seen from FIG. 2 of the drawings that the leg frames 130 are arranged to be slightly divergent as are the dependent leg portions of the basket-type handle 131. This achieves a symmetry of structure and facilitates a broad base support for the space heater which inhibits inadvertent displacement thereof from a desired location.

It is believed that the features of portability afforded by the invention embodiment by means of a simple fabricated support structure, are of significant value and lend many advantages as well as economies in the pertinent art.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principal involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise but one of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. A burner unit including a nozzle, said nozzle having flow passages which intersect to provide a main discharge passage, means defining a body structure mounting said nozzle to expose its discharge passage, means provided in said body structure for passage of fuel therethrough to at least a portion of said nozzle flow passages, means defining an airflow passage through said body structure and through said nozzle formed to produce a movement of air therethrough to another portion of said nozzle flow passages whereby on communication of said fuel passage with a fuel supply and said air flow passage with air under pressure to induce a flow of fuel to said nozzle and a discharge thereof from said nozzle in an atomized condition, and means defining a cylindrical recess in said body structure which intersects said airflow passage, the portions of said airflow passage to the upstream and downstream sides of said recess being oriented in a sense generally at right angles to each other and filter elements stacked in said recess to position in the path of air mov-

ing from said upstream to said downstream portions of said airflow passage.

2. A burner unit including a nozzle having a main flow passage and intersecting flow passages which merge to its discharge end characterized by a body structure having a recess accommodating a portion of said nozzle forming an air chamber thereabout in communication with said intersecting flow passages, said nozzle being releasably engaged in said body structure to expose its discharge end, means defining a fuel passage in said body structure leading to said air chamber and opening to the main flow passage in said nozzle on engagement thereof to said body structure means engaged about said nozzle and to said body structure to form a seal which separates said air chamber from said fuel passage, the wall of said air chamber about said nozzle being successively stepped in a sense inwardly from the discharge end of said engaged nozzle and having its most reduced portion, in absence of said nozzle in said air chamber, open to said fuel passage, the innermost end of said nozzle being arranged to nest in the innermost end of said air chamber and have the seal means thereabout in the form of a deformable washer, the innermost end of which abuts the innermost step in the wall which defines said air chamber, and biasing means interposed between a portion of said nozzle and said washer operative to deform said washer and thereby provide the seal about said nozzle and to said body structure whereby to prevent passage of air from said air chamber to said fuel passage.

3. A burner unit for space heaters and the like consisting of an integrally connected body structure including a burned head to one end thereof, a motor to its other end and a single housing formed therebetween, a drive shaft extending from said motor, one end of which terminates in said housing, a vaned rotor on said one end of said drive shaft positioned to form a compression chamber thereabout in said housing, means defining an inlet opening in said housing for inflow of air to said compression chamber under the influence of said rotor or drive thereby by said motor, means defining an outlet from said chamber for delivery of air therefrom under the influence of said rotor, means forming a circuitous passage in said burned head providing a direct extension of said chamber and enabling direct passage therethrough of air delivered from said chamber and a siphon nozzle mounted in said burner head having means defining a fuel passage in connection therewith and including openings which communicate with said circuitous passage to receive air, the latter passing through said nozzle and drawing fuel to mingle therewith and discharge from said nozzle in an atomized condition.

4. A burner unit including a burner head, a nozzle mounted to project therefrom and said nozzle having main and auxiliary flow passages which intersect to provide a main discharge passage, characterized by means defining an air compression chamber in direct connection with said head, said chamber having a first opening to the air about said burner unit and means defining a second opening therefrom in direct abutment to said head, means defining a flow passage through said head one end of which forms an extension of said second opening and the other end of which terminates in communication with a portion of the aforementioned main and auxiliary flow passages in said nozzle and means in said compression chamber operative to produce an insuction of air through said first opening and a pressured flow thereof from said second opening to and through said portion of said main and auxiliary flow passages whereby on communication of the remainder of said main and auxiliary flow passages with a supply of fuel to draw fuel therethrough for atomization thereby and discharge from said nozzle.

5. A space heater including a fuel tank having superposed thereon in fixed relation thereto a burner unit and means defining a combustion chamber which accommodates one end of the burner unit, characterized by a

11

carrying frame including an inverted U-shaped element fixed longitudinally of either side of said tank to have the leg portions thereof depend and provide an elevated support of said tank and a basket type handle transverse to and interconnecting the bridging portions of said U-shaped elements, said handle being so disposed to bridge said burner unit and combustion chamber in an elevated spaced relation thereto whereby to facilitate the positioning and transport of the space heater.

6. A burner device comprising, a nozzle unit, a burner head including a first recess accommodating said nozzle unit to mount thereto and project therefrom, a second recess in said burner head about the projected portion of said nozzle, said second recess being defined by a generally cylindrical wall structure including arcuate fingers which extend inwardly thereof to form pockets in said burner head which open laterally about said nozzle, the walls of said pockets being arcuately formed and providing peripheral openings for inflow of air thereto and for tangential delivery of such air to the wall structure defining said pockets whereby to induce a swirling of said air about said nozzle and produce an entrainment of the discharge therefrom, said pockets being formed in a circumferential series extending completely around said nozzle.

7. A burner device for use in a space heater or the like including a burner head having an operating face, a portion of which is recessed, a nozzle fixed in said burner head to have the discharge end thereof project in said recess, the peripheral wall of said recess having openings therein for inflow of air and arcuately formed fingers projecting inwardly thereof in the direction of the projected portion of said nozzle which fingers are operable to induce a swirling of the air thereabout to atomize and accelerate the discharge from said nozzle, said fingers being formed in a circumferential series extending completely around said nozzle.

8. A space heater, including a motor and burner, the latter having the form of a body provided with oppositely disposed front and rear faces and with a through fuel flow passage opening through the said front face of the body, ring means installed between said motor and said burner body interconnecting with said motor which provides its inner face and incorporating motor driven air pump

12

means, said ring means having means in connection therewith providing an outer face in intimately contacting relation to the rear face of said burner body and having further an air discharge passage opening through the said other face thereof, said burner body having an air flow passage intersecting at its one end said fuel flow passage and opening at its other end through the said rear face of said burner body, said burner body and said pump body means being so oriented relative to one another as to align said air flow passage and said air discharge passage therein.

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