

July 18, 1950

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2,515,262

LIQUID FUEL BURNER APPARATUS

Filed June 23, 1944

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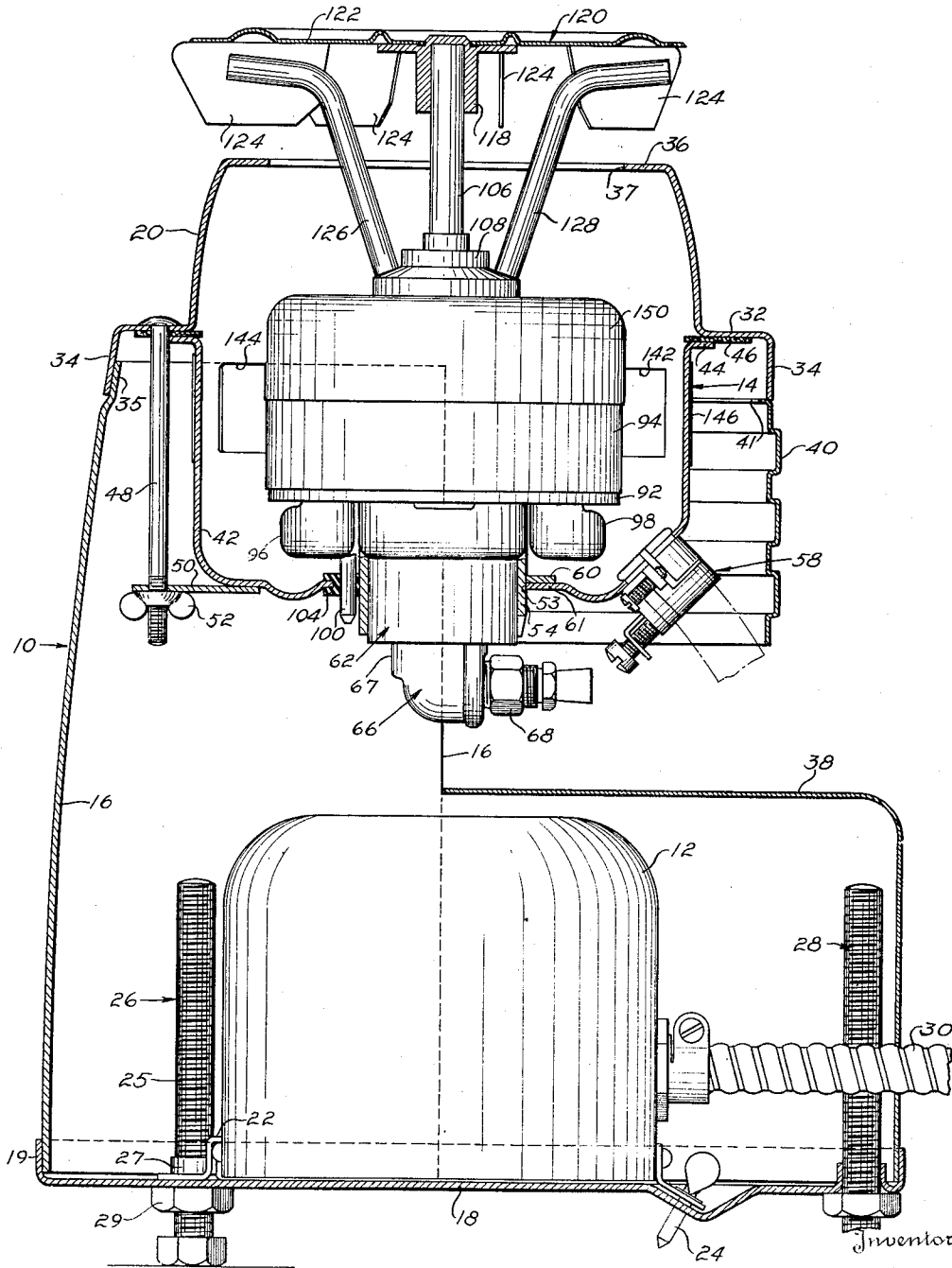


Fig. 1

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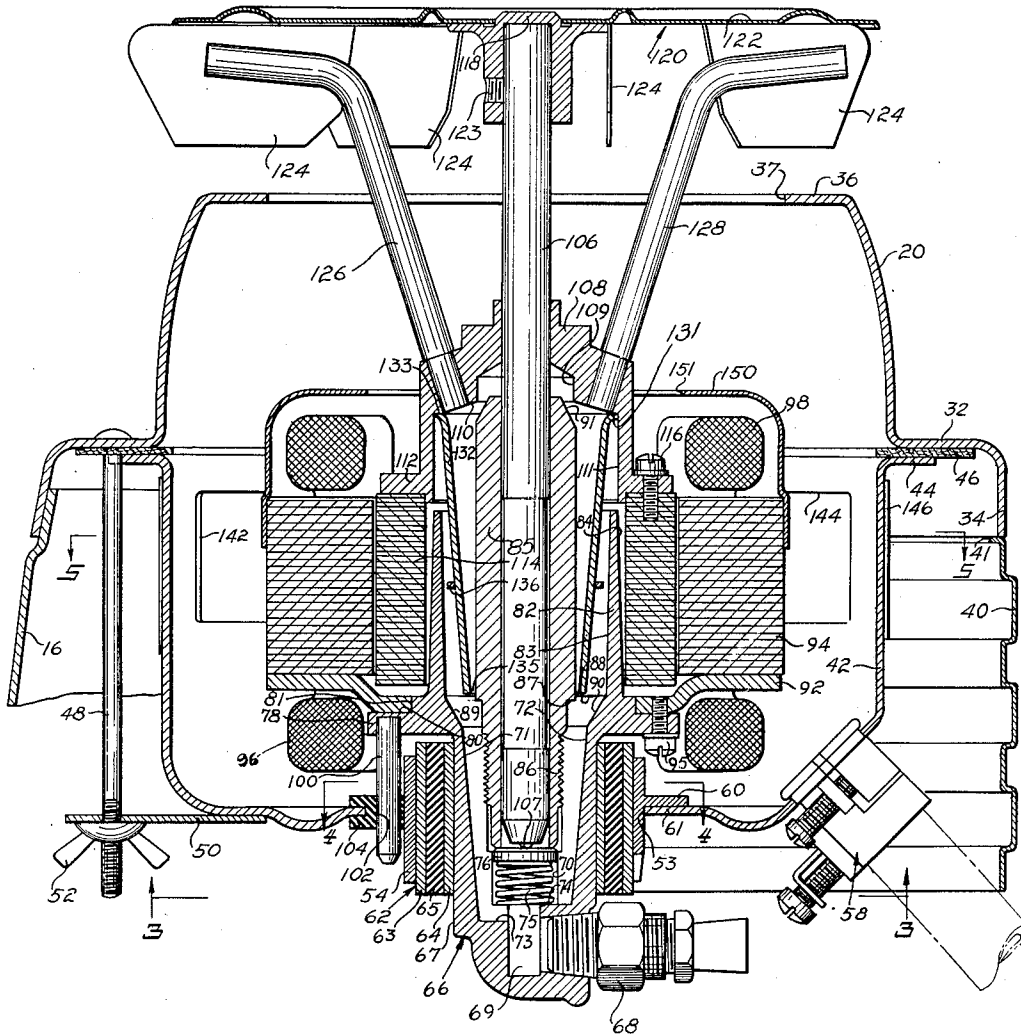


Fig. 2

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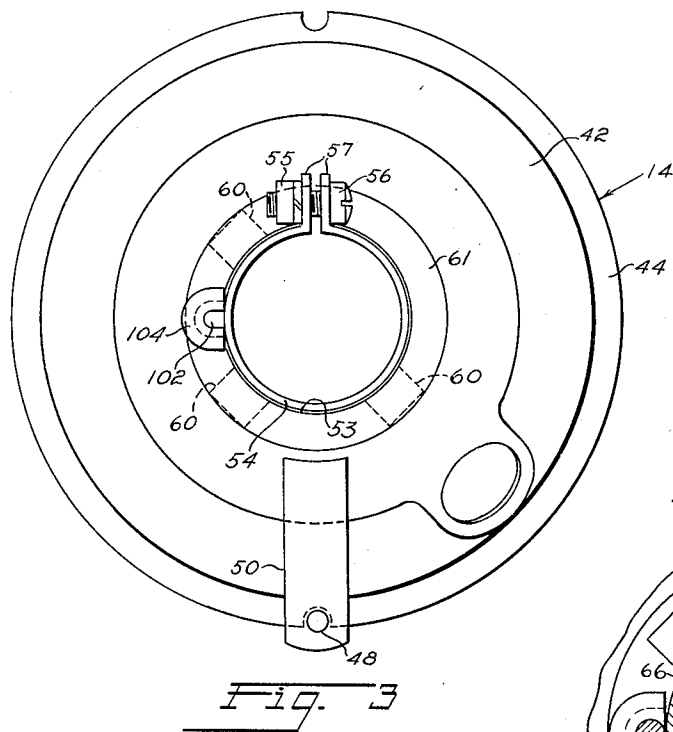


Fig. 4

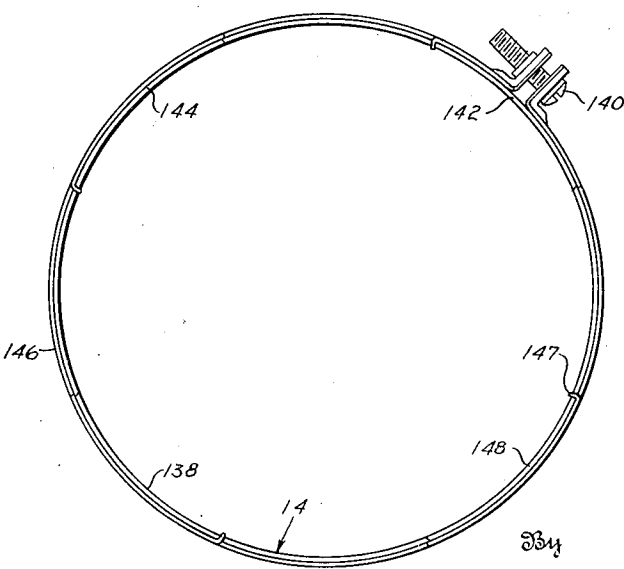
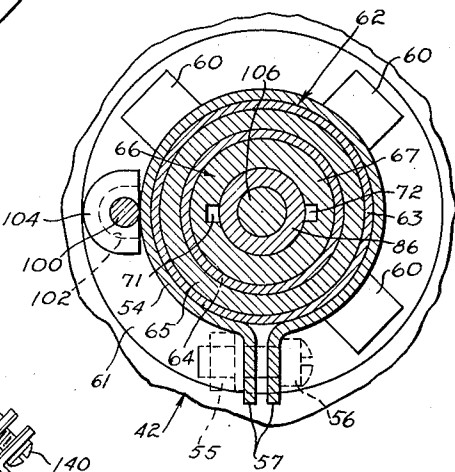


Fig. 5

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UNITED STATES PATENT OFFICE

2,515,262

LIQUID FUEL BURNER APPARATUS

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13 Claims. (Cl. 158—2)

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This invention relates to improvements in liquid fuel burning devices and has particular reference to improvements in a liquid fuel burning device of the type disclosed in United States Letters Patent No. 2,270,994, issued January 27, 1942, to Frank O. Cole for Liquid Fuel Burning Apparatus.

Oil burners wherein the fuel distributing mechanism comprises a rotary head driven by an electric motor are usually subject to objectionable mechanical vibrations and noises which are annoying to the senses and may even cause breaks in the oil or electric supply lines. Attempts have been made to reduce such vibration and noise, as by different types of mounting arrangements, but none has proved commercially successful to my knowledge.

The present invention contemplates mounting the entire burner motor rotor and rotary fuel distributing head driven thereby on a special vibration and noise dampening and absorbing support which effectively dampens and absorbs vibrations and prevents their transmission to the burner stand.

A major object of the invention is therefore the provision of a novel motor driven liquid fuel burner apparatus which is substantially free of noise and vibration.

A further object of the invention is to provide a liquid fuel burner apparatus wherein the burner motor and the fuel distributing mechanism are supported on a novel resilient mount to eliminate the undesirable effects of vibration during normal operation.

A further object of the invention is to provide a novel liquid fuel burner apparatus wherein a motor and fuel distributor assembly rests on a support with which it has a flexible connection permitting only limited relative rotation of the assembly and support.

A further object of the invention is to provide a novel resilient mounting device wherein a resilient body is secured between appreciably more rigid inner and outer shells, at least one of said shells being slightly radially stretchable or similarly radially deformable for permitting forced installation.

Other objects and advantages will be more particularly pointed out hereinafter or will become apparent as the description proceeds.

In the accompanying drawings, in which like reference numerals are used to designate similar parts throughout, there is illustrated a suitable mechanical embodiment for the purpose of disclosing the invention. The drawings, however, are for the purpose of illustration only and are

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not to be taken in a limiting or restrictive sense, since it will be apparent to those skilled in the art that various changes in the illustrated construction may be restored to without in any way exceeding the scope of the invention.

In the drawings:

Figure 1 is an elevation partly in section through a liquid fuel burner apparatus constructed according to a preferred embodiment of the invention;

Figure 2 is a sectional elevation on an enlarged scale of the burner mechanism of Figure 1;

Figure 3 is a bottom plan view of the motor housing of the burner unit, as indicated by line 3—3 of Figure 2, with the resilient bushing core member and associated parts omitted;

Figure 4 is a transverse section on line 4—4 of Figure 2; and

Figure 5 is a fragmentary section taken on the line 5—5 of Figure 2, illustrating the air control band and adjacent portions of the motor housing with the air admission openings closed.

Referring to the drawings in detail and particularly to Figure 1, the burner apparatus is provided with a stand or housing, preferably shaped as a half hollow cylinder and generally indicated at 10 carrying in its lower portion a transformer 12, and in its upper portion a liquid fuel pumping and distributing unit generally indicated at 14.

Stand 10 comprises a curved, tapered support member 16, preferably of relatively heavy sheet metal and generally semi-circular transverse cross-section, mounted at its lower end upon a base 18 and closed at its upper end by an annular preferably circular burner collar 20. In the arrangement illustrated, base 18 is a sheet metal plate having an upwardly bent peripheral flange 19 into which the lower end of support member 16 extends and to which it is secured by suitable means such as welding or brazing.

Base plate 18 has transformer 12 secured thereto by suitable means such as latch connection 22 and retaining screw 24, and also carries a plurality of adjustable legs, two of which are indicated at 26 and 28 in Figure 1. There are preferably three of these adjustable legs, each comprising a threaded bolt 25 extending through an internally threaded collar 27 welded or otherwise secured to base plate 18 and fixed in adjusted position by a suitable lock nut 29 beneath plate 18.

An electrical supply connection 30 leads into transformer 12, and suitable high potential connections are provided between the transformer and the fuel igniter associated with the combus-

tion chamber of the heating device, preferably in the manner disclosed in the above mentioned Patent 2,270,994.

Burner collar 20 is preferably made of formable but relatively heavy sheet metal and is provided with an integral annular radial flange 32 which is substantially horizontal in normal operative position. An integral rim 34 extends downwardly from annular flange 32 and is secured to an interfitted rim 35 integral with the upper end of support 16 by suitable means, such as welding or brazing. Burner collar 20 is provided with an upper internal radial flange 36 and a central aperture 37 through which the fuel distributor head projects. Collar 20 is preferably of cone shape, being inwardly flared towards its upper end. Flange 36 serves to direct combustion air towards the center of the fuel distributor head fan as will appear.

Transformer 12 is preferably enclosed by a rounded cover 38 preferably formed of sheet metal thinner than the metal of support 16 and base 18, and fuel pumping and distributing unit 14 is laterally enclosed by a cover 40 formed of relatively thin sheet metal and of generally semi-circular cross-sectional form. Cover 40 is apertured at 41 for communication with the space inwardly of flange 34, so that flange 34 and cover 40 comprise a substantially continuous cover arrangement. Covers 38 and 40 are suitably joined to support 16 at adjoining edges, so that covers 38 and 40 in effect comprise lower and upper extensions of housing stand 10.

An open top, generally cup-shaped, sheet metal motor housing or casing 42 is provided at its upper open end with an outwardly extending annular radial flange 44. A soft flexible annular gasket 46, formed of asbestos or some other suitable non-inflammable material, is interposed between flange 44 and burner collar flange 32. Casing 42 is secured to burner collar 20 by some suitable means, such as a plurality of suspension bolts, one of which is indicated at 48, each provided with a head resting on the upper surface of burner collar flange 32 and passing at their lower ends through apertures in suitable radial brackets 50 rigid with the bottom of casing 42. Casing 42 is forced upwardly against gasket 46 when wing nuts 52 on the lower ends of bolts 48 are tightened, thus providing a fluid tight shock absorbing joint between motor casing 42 and burner collar 20.

In its bottom wall, motor casing 42 is provided with a substantially central aperture 53 within which is mounted a clamp ring or band 54 adapted to be circumferentially contracted as by tightening a nut 55 on a bolt 56 extending through apertured radial lugs 57 integral with the ends of clamp ring 54 (see Figure 4). Bolt 56 is located below the bottom wall of casing 42 for accessibility. The bottom of motor casing 42 is also provided with a side aperture through which extends an electrical conduit 58 adapted to contain power leads (not shown) for supplying current to the burner motor.

Clamp ring 54 is mounted on the bottom wall of motor casing 42 by means of a plurality of radially extending arms 60 supported on the upper surface of a horizontal seating flange 61 extending partially about the periphery of aperture 53. Clamp ring 54 closely surrounds a cylindrical resilient bushing 62 which consists of an outer cylindrical metal shell 63, an inner concentric cylindrical metal shell 64 and a cylindrical body sleeve 65 of resilient material such

as relatively soft rubber disposed between the two shells. Sleeve 65 is preferably held under compression between the shells.

Bushing 62 supports a hollow core member generally indicated at 66. Core member 66 has an externally substantially cylindrical lower portion 67 terminating in a rounded bottom formed with an internally threaded side aperture into which fuel line terminal 68 is coupled. Core member 66 is preferably formed as a die casting and the external surface of lower portion 67 may have a slight inward taper from its lower end to facilitate removal from the die in which it is cast. This taper may be very slight and usually does not exceed a five degree angle in present die casting practice. This factor in practice makes bushing 62 receiving lower portion 67 of the core member substantially frusto-conical to a slight degree and might be expected to interfere with locating the inner shell of the resilient bushing on the core member without first subjecting the core member to a machining operation. I have found, however, that by making bushing inner shell 64 of a soft stretchable metal, such as copper or aluminum, bushing 62 can be forced onto the slightly frusto-conical portion of the core member and becomes firmly secured thereto by frictional adhesion, and no added machining of the surface at 67 is necessary.

Although inner shell 64, which is initially of about the same internal diameter as the outside diameter at 67, is stretched when forced onto the core member, its inherent resiliency urges it to contract about the upper regions of surface 67, so that shell 64 frictionally grips surface 67 over a wide surface area.

In assembly, bushing 62 is forced onto portion 67 of core member 66, and then clamp ring 54 is tightened about bushing 62.

Aside from its special adaptation for an oil burner motor and head support in the preferred embodiment of the invention, the above-described resilient bushing per se is an important phase of the invention.

While I have described a bushing wherein only the inner shell 64 is stretchable, it is clear that either the inner shell 64 or outer shell 63, or both, may be stretchable for desired force fitting to associated parts roughly of the required size for eliminating expensive machining operations.

Preferably, as stated above, the stretchable shell or shells are made of copper or aluminum, but they may be of brass, lead, fibrous materials, resilient plastics or even may comprise sections of woven steam hose having sufficient wall rigidity to provide adequate lateral support.

It is to be observed that these radially deformable shells may be stretched or contracted in one longitudinal zone while remaining unstressed in another longitudinal zone so that the bushing may be forced for example over a surface which is irregular both longitudinally and radially and the associated shell will adapt itself under stress to all such surface irregularities and provide a tight grip.

Core member 66 contains a bottom well 69 into which fuel line terminal 68 opens. The upper end of well 69 opens into a larger cylindrical bore 70 having two diametrically opposed internal wall grooves 71 and 72 which extend upwardly through cylindrical portion 67 of core member 66. Bore 70 is thus an effective continuation of well 69. Grooves 71 and 72 (see Figure 2) have inclined outer side walls so that they provide fluid passages of gradually and constantly increasing cross-section.

tion from their lower to upper ends. The lower end of groove 71 is also in fluid communication with well 69 by a radial passage 73. The lower end of bore 70 forms a flat horizontal shoulder 74 for seating a coil spring 75 which supports on its upper end a hard flat metal bearing step plate 76. Fluid communication between grooves 71 and 72 is obtained through the lower end of bore 70 containing spring 75.

At the upper end of portion 67, core member 66 is formed with an integral outwardly extending radial flange 78 provided on its upper surface with a horizontal step 80 and an annular lateral pilot surface 81 concentric with core member 66. Above flange 78, core member 66 comprises an upwardly extending annular portion 82 the inner cylindrical surface 83 of which is substantially parallel to the axis of core member 66 and the outer surface 84 of which is tapered slightly upwardly and inwardly.

A tubular, preferably cylindrical elongated bearing sleeve 85 has a reduced externally threaded lower end 86 screw-threaded into an internally threaded section of bore 70 above bearing step 76. Bearing sleeve 85 is provided with a downwardly facing external shoulder 87 which seats upon an upwardly extending annular flat horizontal surface 88 of core member 66 at the bottom of the annular portion 82. As illustrated in Figure 2, grooves 71 and 72 have increasingly flared upper end passage sections 89 and 90 respectively which open upwardly at the level of surface 88.

Above shoulder 87 sleeve 85 preferably has a straight cylindrical portion which extends appreciably above the level of annular portion 82 of core member 66 by an amount equivalent to approximately one-half of the actual length of that cylindrical portion. At its upper end, sleeve 85 is externally chamfered at 91 so as not to interfere with oil flow to the finger tubes.

When the bearing sleeve 85 is threaded into the lower portion of core member 66, it is solid with the core member and becomes functionally a portion thereof.

The flange 78 carries on its upper surface an annular plate 92 centered on pilot shoulder 81 and suitably supporting an annular motor stator 94 surrounding and annularly spaced from annular upper portion 82 of core member 66. Suitable fastening means such as machine screws 95 secure plate 92 to flange 78 of core member 66. The motor illustrated is of the shaded pole alternating current type and has a plurality of coils, indicated at 96 and 98, suitably mounted on stator 94 and electro-magnetically cooperating therewith. By this construction the stationary portion of the burner distributor head motor is rigidly secured to core member 66 and is thus resiliently supported by resilient bushing 62.

A vertical pin 100 is non-rotatably secured at its upper end to flange 78 and extends downwardly through a notch 102 provided in motor casing 42 at the edge of the aperture 53. Notch 102 is lined with a soft rubber grommet 104 so that pin 100 can move limitedly under the influence of torsional vibration, all torsional forces being transmitted through the resilient bushing 62, but pin 100 prevents any substantial relative rotation between the motor and the casing 42 supporting it and thus avoids stretching or fouling of the electric leads to the motor.

A distributor head shaft 106 extends through bearing sleeve 85 to a terminal materially above burner collar cone 29, and is provided at its lower end with a suitable point bearing, such as a hard-

ened steel ball 107, resting upon bearing step 76. At a location immediately above the upper end of the bearing sleeve 85, an inverted cup-shaped fuel distributor head 108 is non-rotatably secured to shaft 106, concentrically therewith. Internally, distributor head 108 is formed with an upper central recess 109 above the upper end of bearing sleeve 85, an intermediate annular downwardly outwardly flared wall 110 and a lower internal cylindrical wall 111. Distributor head 108 has an outwardly extending integral annular flange 112 to which there is secured a burner motor rotor 114, as by a plurality of cap screws 116. When the parts are in the assembled relation shown in Figures 1 and 2, rotor 114 is located in and substantially fills the space between the interior of the stator 94 and the outer surface of annular portion 82 of core member 66, with suitable clearance however to permit operative rotation.

On its upper end, shaft 106 carries a flanged cap 118 which supports a suitable air directing fan 120 comprising an apertured sheet metal disc 122 secured at its center to cap 118 and carrying on its under surface a plurality of vertically disposed fan blades 124. A suitable set screw 123 locks the fan non-rotatably to shaft 106. Blades 124 are directed generally radially outwardly from shaft 106, but may be more or less inclined toward a tangential position in order to provide desired conditions of combustion air volume, speed and direction of flow.

A pair of identical oil finger tubes 126 and 128 are secured at their lower ends within the upper wall of distributor head 108 so as to be in fluid communication with the interior of head 108 and extend upwardly and outwardly in diametrically opposite directions to spaces between fan blades 124. The upper ends of tubes 126 and 128 are bent outwardly relative to shaft 106, and are inclined upwardly from the horizontal by a small amount. Tubes 126 and 128 terminate radially inwardly of the outer edges of the fan blades as illustrated.

The portion of the bearing sleeve 85 above shoulder 87 is surrounded by a hollow frusto-conical fuel lifting pump member 132. Pump member 132 has its larger upper end formed with an integral outwardly turned flange 131 rigidly and non-rotatably secured as by force fit within distributor head 108 against a downwardly facing shoulder 133 and in contact with inner cylindrical surface 111, so that pump member 132 rotates with head 108 and rotor 114.

The smaller lower end of member 132 is slightly spaced vertically from upwardly facing surface 88 of core member 66 and closely surrounds the adjacent portion of the bearing sleeve 85, the annular fluid admitting space 135 between the lower end of member 132 and bearing sleeve 85 having a restricted predetermined area which prevents excessively rapid changes in the flow of fuel into pump member 132. Pump member 132 is provided intermediate its length with an external annular flange 136 constituting a dam or throw-off ring which prevents liquid fuel from creeping up the external surface of pump member 132 and over the upper end of the annular portion 82 of the core member. This arrangement serves to keep the motor and the interior of the motor and the casing free of fuel oil.

Flow of fuel oil is from the float chamber and automatic valve through a fuel line and the connection 68 into core member 66 at the lower end thereof. From the bottom of the well 69 the fuel oil flows upwardly through grooves 71 and 72 and

passages 89, 90 into the reservoir space within the lower part of annular portion 82 of core member 66, from where the fuel is picked up by conical pump or fuel lifting member 132 and raised into head 108 and the lower ends of distributing tubes 126 and 128. The latter throw the oil outwardly by centrifugal force in a direction generally radially of the burner head. The fuel is drawn upwardly through rotating pump member 132 and tubes 126 and 128 by reason of the generally upwardly flaring conical construction of these members and because the flow action, when the burner is operating, creates a pressure within pump member 132 and tubes 126 and 128 slightly less than the atmospheric pressure acting on the fuel in the reservoir at 82.

Oil arising in bore 70 lubricates spring 75, bearing 76 and the lateral shaft bearing with sleeve 85.

As shown in Figure 1, motor casing 42 is of greater diameter than the stator 94 thus providing therewithin an annular space entirely surrounding the motor unit. Casing 42 is provided with combustion air admission openings, indicated at 138, 140, 142, and 144 in Figure 5, the size of which may be adjusted by means of an adjustable apertured band 146 surrounding the portion of casing 42 provided with the openings. Band 146 is provided with corresponding registrable openings of similar shape and area to openings 138-144, and is slidable circumferentially of the motor casing to adjust the effective size of these air openings. Band 146 may be clamped in adjusted position by suitable means such as the machine screw assembly 148 extending through a pair of apertured lugs carried by the radially outwardly bent end portions of band 146.

At each opening band 146 is formed with an inwardly projecting lug 147 which extends within the corresponding opening in motor casing 42 and forms stop means defining fully open and closed limits of the registered openings. Band 146 can thus be rotated only clockwise toward open position from the closed position illustrated in Figure 5.

The combustion air is drawn into stand 10 beneath the lower edge of burner unit cover 40 and upwardly through the space surrounding the motor casing 42 and through the air admission openings in motor casing 42 to the space between motor casing 42 and motor stator 94 where it acts to extract excess heat from the operating motor unit. From this space, air flows upwardly through the burner collar 20 and out through aperture 37 to fan 126 which forces it radially outwardly toward the hearth.

The portion of the core member 66 projecting below bushing 62 is smaller in cross-sectional area than the bushing, so that when oil fitting 68 is removed and clamp ring 54 released, the entire fuel pumping and distributing mechanism including the motor may be lifted vertically upwardly through the opening in the upper end of burner collar 20 and removed from the motor casing, motor stator 94 being somewhat smaller than aperture 37.

A cover member 150, fitting over the upper portions of coils 96 and the stator 94, enables the mechanism to be removed in this manner without danger of injuring the coils of the motor unit and also assists in directing the combustion air upwardly toward aperture 37 in the burner collar. When the mechanism is so removed, pin 100 slides readily out of grommet 104 and there is no other connection or obstruction preventing lifting of the mechanism out of the case. The wires pro-

viding electrical connection to the motor have sufficient length to permit raising the motor unit sufficiently above the top of burner collar 20 so that the wires may be disconnected if it is desired to carry the mechanism away from stand 10.

Removal of the mechanism from the casing may be carried out in two stages if desired, since the fuel lifting and distributor head unit is removable separately from the rotor and core member. By simply lifting the fan 120, shaft 106 may be lifted out of bearing sleeve 85 carrying with it distributor head 108, motor armature 114 and pump member 132 without releasing any fastening elements, aperture 151 in the top of cover 150 being sufficiently large to permit the motor armature to pass therethrough.

The burner motor and distributor head mechanism are thus both supported by resilient bushing 62, so that vibration of any moving part of the mechanism will not be transmitted through the motor casing 42 to stand 10, and the entire fuel pumping and distributing mechanism may be removed from stand 10 as a unit by merely disconnecting fuel line coupling 63.

In the above construction the motor stator and rotor are all supported entirely by core member 66 which in turn is resiliently mounted on motor casing 42 by means of clamp ring 54 and bushing 62. When nut 55 is tightened, clamp ring 54 is drawn frictionally tight upon outer bushing shell 63, and as above described inner bushing shell 64 has a force fit on lower core portion or boss 67. Clamp ring 54 rests on flange 61 through arms 60, and core member 66 is held against upward vertical movement only by the weight of the parts it supports. Engagement of pin 100 within grommet 104 prevents undesired turning of core member 66 about its vertical axis during normal operation.

Bushing 62 is sufficiently longitudinally co-extensive with clamp ring 54 and core portion 67 that core member 66 is laterally supported against tilting during normal operation, so that shaft 106 remains normally vertical. Because of the resiliency of bushing 62 to torsional and all other forces, vibration and other shocks of operation are insulated from the motor casing, and normal operation of the device produces no objectionable external vibration or noise.

The height of the distributor head relative to burner collar 20 may be varied by loosening clamp ring 54 and vertically adjusting core member 66 to bring the head to the desired height and then tightening clamp ring 54 to lock the mechanism with the head in properly adjusted position.

The liquid fuel is carefully metered through the mechanism in such a way that there is no accumulation of excessive quantities of fuel therein and no possibility for the distributor head to eject slugs of solid fuel upon starting of the burner or to continue to eject fuel if the head slows down upon discontinuing burner operation, so that disagreeable fuel odors and smoke from the burner are eliminated. Furthermore, since burner motor casing 42 is sealed to the stand by deformable gasket 46, there is no air leakage around the top of the stand and no burner fumes are forced into the space outside the heating device, all of the air flowing through the burner unit being directed into the combustion chamber above the fan where all such fumes will eventually be drawn away through the chimney. Gasket 46 between motor casing 42 and stand 10 also eliminates any residual vibration that might be

transmitted to the motor casing in spite of the interposition of the resilient bushing 62 between the motor and the casing.

The device is not only extremely easy to assemble and disassemble for cleaning and maintenance purposes, but is so constructed that maintenance and cleaning are seldom, if ever, necessary. The device furthermore constitutes a compact and economical unit of pleasing appearance that may be installed in living quarters without any objection as to appearance, noise, vibration or disagreeable burner odor.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. In a fuel lifting and projecting device, a hollow core member providing a fuel inlet and carrying a motor stator affixed thereto and a motor rotor rotatable about said core member; a fuel lifting device rotatable with said motor rotor for raising fuel from said hollow core member; a motor casing having an apertured bottom wall through which said core member projects; a releasable clamp ring seated on said casing and disposed within said aperture; and an annular resilient mounting having its inner periphery secured about the lower end of said core member and its outer periphery frictionally gripped by said clamp ring.

2. In the fuel lifting and projecting device defined in claim 1, the lower end of said core member being adjustable axially of said resilient mounting, and being maintained in a desired position of vertical adjustment by said clamp ring.

3. In a fuel lifting and projecting device as defined in claim 1, said lower end portion of said core member being slightly frusto-conical in external contour, and said resilient mounting having an inner shell of stretchable metal having an initial diameter substantially the same as the diameter of the smaller end of said frusto-conical core member portion whereby said bushing may be forced onto said core member while stretching said inner shell, and said metal inner shell having the property of tending to return to its initial diameter after the stretching necessary to force it over said core member so that it frictionally grips said core member over a wide surface area.

4. Fuel burner apparatus comprising a stand, a motor casing mounted on said stand and having a bottom wall, a motor driven liquid fuel projecting unit resting upon the bottom wall of said casing, and interengaging parts providing a resilient connection between said unit and said casing permitting such slight relative rotation of said unit and casing as may arise from torsional vibration but preventing substantial relative rotation between said unit and said casing and said parts being separable vertically to permit free upward displacement of said unit for bodily removal from said casing, said casing being otherwise not secured to said unit.

5. In a fuel burning apparatus, a motor driven liquid fuel lifting and projecting unit, a motor casing at least partially surrounding said unit, a stand supporting said casing, a resilient mount-

ing between said unit and said casing comprising the only means fastening said unit and casing together; and means providing a substantially fluid tight shock absorbing connection between said casing and said stand.

6. In a fuel burner apparatus, a support having an upwardly facing surface, a mounting for a burner motor and fuel distributor assembly having an elongated boss adjacent its lower end, an annular resilient bushing surrounding said boss, a releasable clamp band surrounding said bushing having opposite ends interconnected by adjustable fastening means, and laterally projecting formations on said clamp band providing rests seating said clamp band on said upwardly facing surface of said support, and a vertically detachable resilient torque absorbing connection between said mounting and said support.

7. Fuel burner apparatus comprising a support, a motor casing on said support having a bottom wall provided with an opening, means mounting a motor driven liquid fuel projecting unit on said bottom wall of said casing, and a boss on said unit extending downwardly through said opening, said mounting for the unit comprising a vertically elongated resilient annulus interposed between concentric inner and outer metal members and disposed in said opening with the inner of said members secured to said boss and the outer of said members mounted on said bottom wall adjacent said opening, and said mounting having relatively movable telescoping parts for selecting and maintaining the vertical position of said unit with respect to said casing.

8. Fuel burner apparatus comprising a relatively stationary motor housing having an apertured bottom wall, a motor support member projecting upwardly through said apertured bottom wall, a motor comprising a stator secured to said member and a rotor rotatably mounted on said member, a fuel distributor head secured upon said rotor, a fuel inlet passage in said member and means providing supply of fuel from said passage to said head during rotation of said rotor, an elongated resilient bushing secured about said member below said stator and extending through said bottom wall aperture, and means mounting said bushing on said housing at said bottom wall aperture, said bushing being the sole support for said member upon said housing so that the housing is insulated from vibrations in said motor and head assembly.

9. In the fuel burner apparatus defined in claim 8, detachable interengaging parts on said bottom wall of the housing and said member for permitting said member to project through said bottom wall only when in one angular position with respect thereto, and resilient means coacting with said parts to absorb torsional vibrations while permitting limited relative rotation between said member and said housing.

10. Fuel burner apparatus comprising a relatively stationary motor housing having an apertured bottom wall, a motor support member projecting upwardly through said apertured bottom wall, a motor comprising a stator secured to said member and a rotor rotatably mounted on said member, a fuel distributor head secured upon said rotor, a fuel inlet passage in said member and means providing supply of fuel from said passage to said head during rotation of said rotor, an elongated resilient bushing secured about said member below the stator, means mounting said bushing on said housing at said bottom wall aperture and in alinement therewith, said bushing be-

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ing the sole support for said member on said housing so that the housing is insulated from vibrations in said motor and head assembly, and a flexible relative rotation resisting connection between said housing and said member.

11. Fuel burner apparatus comprising a relatively stationary motor housing having an apertured bottom wall, a motor support member projecting upwardly through said apertured bottom wall, a motor comprising a stator secured to said member and a rotor rotatably mounted on said member, a fuel distributor head secured upon said rotor, a fuel inlet passage in said member and means providing supply of fuel from said passage to said head during rotation of said rotor, an elongated resilient bushing secured about said member below the stator, said bushing comprising an annular body of resilient material having inner and outer peripheral shells secured thereto, and means mounting said bushing on said housing at said bottom wall aperture and in alinement therewith comprising means seating the outer shell on said housing bottom wall and means securing said inner shell to said member, said bushing being the sole support for said member upon said housing so that the housing is insulated from vibrations in said motor and head assembly.

12. Fuel burner apparatus comprising a relatively stationary motor housing having an apertured bottom wall, a motor support member projecting upwardly through said apertured bottom wall, a motor comprising a stator secured to said member and a rotor rotatably mounted on said member, a fuel distributor head secured upon said rotor, a fuel inlet passage in said member and means providing supply of fuel from said passage to said head during rotation of said rotor, a resilient bushing secured about said member below the stator, and means mounting said bushing on said housing at said bottom wall aperture comprising a releasable clamp ring surrounding and mounted on said bushing and seated on said housing bottom wall, said ring permitting relative vertical adjustment between said member and said housing, and said bushing being the sole support for said member upon said housing so that the housing is insulated from vibrations in the motor and head assembly.

13. Fuel burner apparatus comprising a motor

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easing having a bottom part provided with an opening, a motor driven liquid fuel projecting unit having a lower end part extending through said opening, and means resiliently mounting said unit on said casing comprising a vertically elongated resilient annulus interposed between inner and outer more rigid members surrounding said lower end part at said opening, means fixedly securing one of said members to one of said parts and a vertically adjustable telescoping connection between the other of said members and the other of said parts.

MILTON A. POWERS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
20 Re. 18,457	Lord	May 10, 1932
1,273,655	Overstrom	July 23, 1918
1,707,474	Heath	Apr. 2, 1929
1,724,373	Sauvage	Aug. 13, 1929
1,728,011	Simmons et al.	Sept. 10, 1929
1,750,016	Meyer	Mar. 11, 1930
1,830,118	Lord	Nov. 3, 1931
1,891,835	Perry	Dec. 20, 1932
1,973,187	Van Sciver	Sept. 11, 1934
2,004,346	Rodler	June 11, 1935
2,004,532	Mapes	June 11, 1935
2,005,639	Schroeder et al.	June 18, 1935
2,027,632	Chadwick et al.	Jan. 14, 1936
2,030,367	Grave	Feb. 11, 1936
2,032,291	Lum	Feb. 25, 1936
2,069,694	Brinkert	Feb. 2, 1937
2,113,020	Geyer	Apr. 5, 1938
2,130,471	Powers	Sept. 20, 1938
2,139,373	McKinley et al.	Dec. 6, 1938
2,161,220	Beckett	June 6, 1939
2,181,249	Powers	Nov. 28, 1939
2,245,334	Fredlund	June 10, 1941
2,265,053	Anderson	Dec. 2, 1942
2,270,994	Cole	Jan. 27, 1942
2,301,818	Sackett	Nov. 10, 1942

FOREIGN PATENTS

Number	Country	Date
811,248	France	Apr. 9, 1937