June 9, 1953 E. H. HAUGEN 2,641,189

LIQUID FUEL BURNER

Filed Jan. 28, 1949 2 Sheets-Sheet 1

Fig. 1

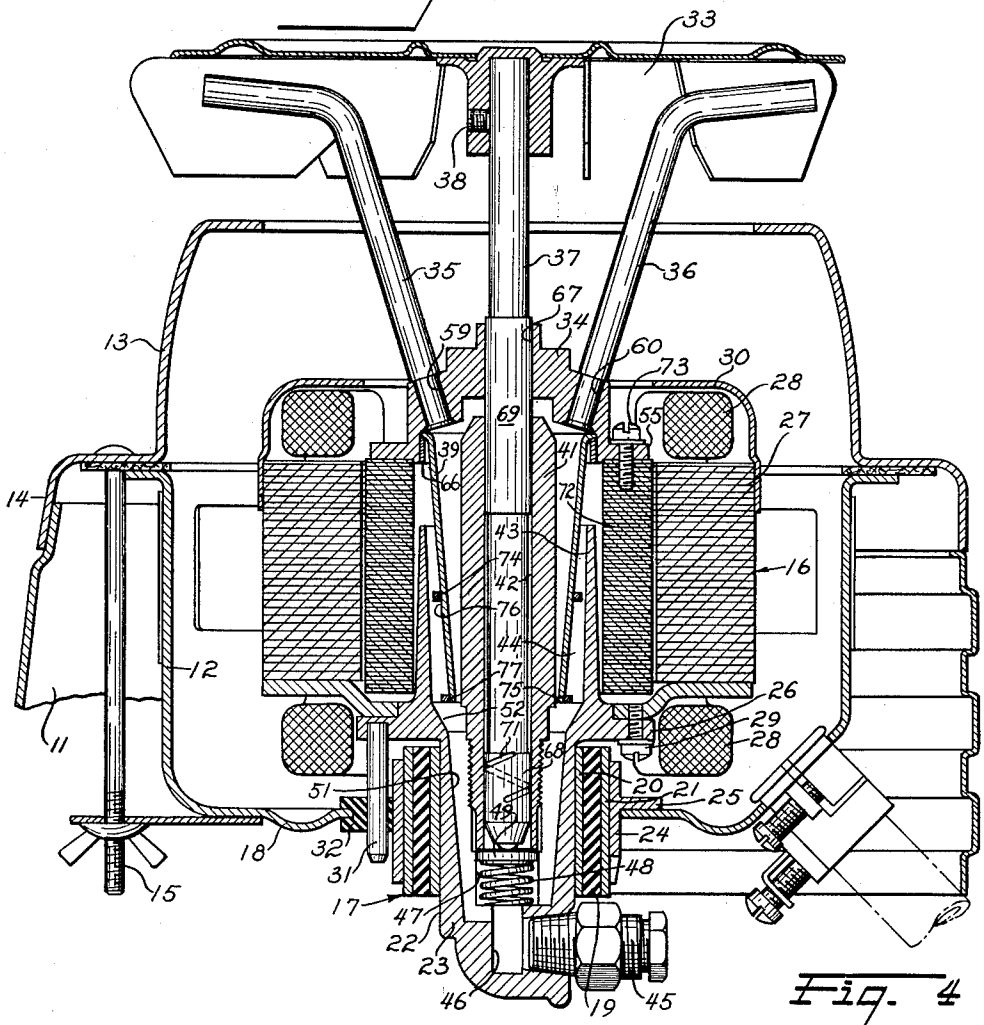


Fig. 4

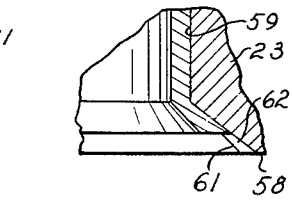


Fig. 2

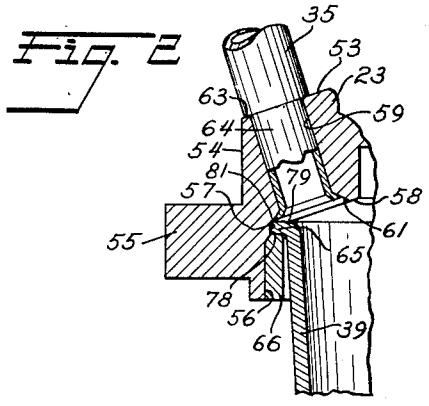
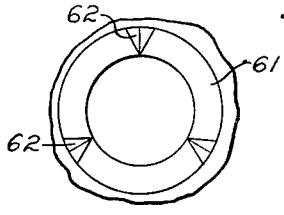


Fig. 3



INVENTOR.
Edmond H. Haugen
BY
Strauch & Hoffman
ATTORNEYS

June 9, 1953 E. H. HAUGEN 2,641,189

LIQUID FUEL BURNER

Filed Jan. 28, 1949 2 Sheets-Sheet 2

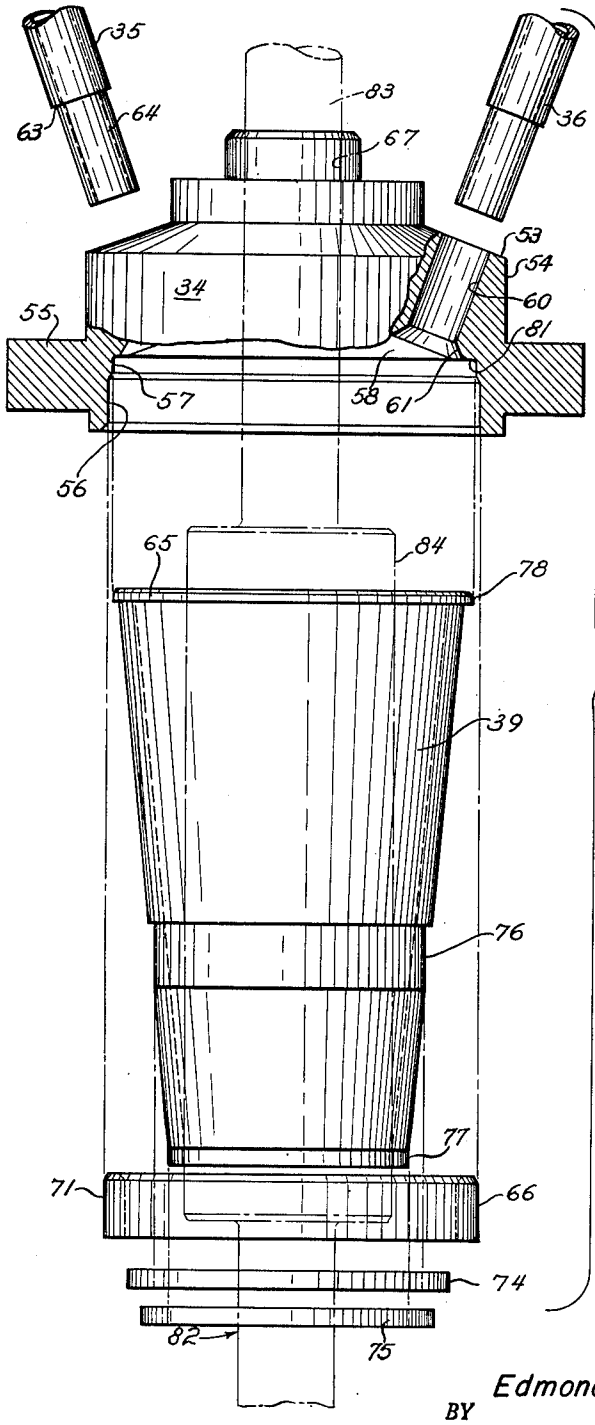


Fig. 5

INVENTOR.
Edmond H. Haugen
BY
Strauch & Hoffman
ATTORNEYS

Patented June 9, 1953 2,641,189

UNITED STATES PATENT OFFICE

2,641,189

LIQUID FUEL BURNER

Edmond H. Haugen, Birmingham, Mich., assignor to The Timken-Detroit Axle Company, Detroit, Mich., a corporation of Ohio

Application January 28, 1949, Serial No. 73,320

4 Claims. (Cl. 103—100)

1

This invention relates to liquid fuel burners and is particularly concerned with novel construction of a rotatable liquid fuel distributor for dispensing oil or like liquid fuel to be mixed with air and burned at a flame rim disposed about the burner.

This is an improvement on the burner construction illustrated in United States Letters Patent No. 2,515,262 issued July 18, 1950, the particular improvements consisting in details of construction and methods of assembly of the rotating distributor as will be hereinafter described in detail.

It is therefore the major object of my invention to provide a novel fluid fuel burner distributor construction and method of assembly which is speedy, efficient and inexpensive, and provides improved accuracy of relation of the parts, thereby producing a burner rotor assembly which is accurately balanced and has long life in operation without replacement or repair.

A further object of the invention is to provide a structure and method of assembly of a liquid fuel distributor wherein the flinger tubes are secured to the head in a novel manner.

It is a further object of my invention to provide an improved liquid fuel distributor and method of assembly wherein the cone which lifts liquid fuel to the level of the flinger tubes during rotation of the distributor is assembled with the distributor head in a novel manner.

A further object of the invention is to provide a novel liquid fuel burner distributor and method of assembly wherein each flinger tube has its lower portion press fitted into a suitable aperture in the distributor head with its lower end flared within the head to aid in anchoring the head and tube in a tight substantially permanent assembly.

It is a further object of my invention to provide an improved liquid fuel distributor and method of assembly wherein the liquid fuel lifting cone is press fitted within the distributor head in accurate alignment therewith, and anchored thereto in a novel manner.

Further objects of the invention will presently appear as the description proceeds in connection with the appended claims and the annexed drawings wherein:

Figure 1 is an axial vertical section through a liquid fuel burner constructed according to a preferred embodiment of the invention, illustrating the assembled distributor;

Figure 2 is a fragmentary enlarged section illustrating the manner in which the lower end of each flinger tube is anchored within the distributor head, and the head construction whereby the upper end of the cone is press fitted within the head and maintained there by a retainer ring;

Figure 3 is a fragmentary bottom end view of the flinger tube anchoring bore in the head, illustrating the V-grooves in the tapered rim;

Figure 4 is a fragmentary section illustrating how the metal from the lower ends of the flinger tubes is forced into the V-grooves in the assembly; and

Figure 5 is an exploded view in section illustrating the manner of assembly of the parts.

Referring to Figure 1, the burner of the invention is supported by a suitable upright stand 11 and is mainly enclosed within a housing comprising a lower cup-shaped motor casing 12 and an upper annular collar 13, both of which are secured to the stand and each other as by welding a down-turned rim 14 on the collar to stand 11 and by means of a bolt and wing nut assembly 15 extending between the collar and casing 12.

The burner motor is an electric motor indicated at 16 and is supported by a suitable resilient bushing 17 which is mounted on the apertured lower wall 18 of motor casing 12. Bushing 17 is centered with motor casing 12 and comprises an annular body of rubber 19 compressed between inner and outer metal shells 20 and 21, the inner shell 20 being rigidly press fitted upon the cylindrical portion 22 of a core member 23. The outer shell 21 has secured thereto a clamp band 24 formed with a radially projecting flange 25 adapted to overlie wall 18 of the motor casing when the motor assembly is seated within casing 12.

Above its cylindrical portion 22, core 23 is formed with a radial flange 26 for supporting the stator of the electric motor including the laminated core 27 and field coils 28, these being secured to flange 26 as by machine screws 29. Above upper coil 28, an inverted cup-shaped collar 30 is press fitted over the top of the core 27, being apertured to clear the rotatable distributor. A pin 31 rigid with flange 26 projects downwardly through a rubber grommet 32 in motor casing wall 18 to thereby resiliently restrain the entire motor assembly, which rests by its own weight on bottom wall 18 of casing 12, from turning about the vertical axis of the distributor during operation. The above desirable structure and resilient mounting of the motor assembly is described and claimed in said Letters Patent No. 2,515,262 to which attention is directed for detail.

The entire distributor head assembly comprising the fan 33, the distributor head 34, flinger tubes 35 and 36, shaft 37 upon the upper end of

which fan 33 is secured as by screws 38 and the oil lift cone 39 is removable as a unit from the assembly by pulling it straight upwardly through the aperture in collar 13.

As illustrated in Figure 1, the upper part of core member 23 is internally threaded to receive the lower end of a sleeve 41 that extends upwardly to about the level of the top of the stator core for receiving the shaft 37 and providing a long internal cylindrical bore 42 for supporting the shaft in a truly upright position during rotation.

An annular integral collar 43 on core flange 26 extends upwardly parallel to sleeve 41 to terminate a short distance below the top of the sleeve and form therewith an annular well 44 for collecting oil to be lifted to the flinger tube by the cone 39 during rotation as will be described.

Oil is supplied to well 44 through a conduit fitting 45 opening into the bore 46 in the lower part of core 23, and bore 46 is enlarged at 47 to receive a compression spring 48 that supports a flat hardened steel washer 49 just below the lower end of sleeve 41 and is adapted to serve as a thrust bearing upon which rests the ball bearing lower end of shaft 37. From bore 46, oil flows upwardly through channels 51 in core member 23 and through radial slots 52 in flange 26 into the bottom of well 44 in which the level is preferably maintained by a suitable gravity feed and level arrangement (not shown).

The distributor head 34 comprises an inverted cup-shaped member which is preferably a machined metal casting. Head 34 comprises an external conical shoulder 53 which terminates in a cylindrical portion 54 and a radial flange 55. Inwardly of flange 55, head 34 is machined to provide a cylindrical wall 56 and a smaller shorter cylindrical wall 57 in longitudinal succession. Upwardly of wall 57, head 34 is formed with an internal conical wall 58 generally parallel to shoulder 53.

Head 34 is formed with two diametrically opposite bores 59 and 60 which are inclined at equal angles, about 18° to the vertical. As illustrated in Figures 2 and 3, bore 59 is formed at its lower end with an enlarged conical countersunk rim 61 in which are indented a series, preferably three, of V-grooves 62 that increase in depth and width outwardly of the axis of the bore. Bore 60 is similarly terminated, and the purpose of these grooves will be later explained.

The lower ends of tubes 35 and 36 are shouldered at 63 to seat squarely on wall 53 and provide reduced thin-walled end portions 64 that press fit into bores 59 and 60. In assembly, each flinger tube is pressed into its bore 59 and 60, and then the end of the tube is flared outwardly against the rim 61. As illustrated in Figure 4, some of the metal of the tube end is forced into the grooves 62 during this operation, and the lower ends of the tubes are thus enlarged and anchored to restrain them against both longitudinal and rotational movement in the bores.

Cone 39 is press fitted within head 34 with its outturned cylindrical end flange 65 machined to fit tightly within the wall surface 57 so that when the cone advances into the head its flange 65 will be press fitted with the wall 57. In order to securely retain the cone within the head, additional securing means is provided in the form of an annular cylindrical attachment ring 66 press fitted within the wall 56 with its upper end tightly engaging the under side of cone flange 65. This manner of securing the cone within the head dispenses with the hitherto used silver soldered connections and provides a mechanical securing operation which is efficient and sure and which both accurately locates and retains the cone in assembled axial alignment with the central shaft receiving bore 67 of the head that is coaxial with walls 56 and 57.

Shaft 37 which is laterally supported by bore 42 is formed with spaced bearing surfaces 68 and 69 that fit bore 42 with a rotating running clearance. Lower bearing surface 68 is formed with a helical surface groove 71 that tends to lift oil up into the interior of the sleeve and lubricate the bearing surfaces at 68 and 69. The distributor head 34 is press fitted on the upper portion of bearing surface 69 well above the upper end of sleeve 41. The motor rotor 72 is secured to flange 55 as by machine screws 73 in surrounding relation to the collar 43.

Cone 39 carries an oil slinger ring 74 and a surge prevention ring 75. These rings are press fitted upon machined cylindrical surfaces 76 and 77 respectively on the outer surface of the cone prior to assembly of the cone with head 34.

The method of assembling the distributor of the invention is novel and produces an accurately aligned and centered assembly.

The first operation, after machining head 34 to provide bores 59, 60 and 67 and surfaces 56 and 57 of proper diameter, is to assemble the flinger tubes with the head. This is accomplished as above explained, by inserting the tube ends 64 into press fit relation with bores 59 and 60 and spinning over the inner ends of the tubes onto rims 61.

Next the cone 39 with the peripheral surface of flange 65 formed to size is inserted into the cup of the lower part of the head 34. Prior to insertion, cone 39, which is preferably a sheet metal stamping, is machined at flange 65 to provide a cylindrical circumferential surface 78 for press fit with surface 57 and a flat annular top surface 79 that abuts against an internal ledge 81 above surface 57 when the cone flange has been pressed into the position of Figures 1 and 2. Cone stamping 39 is also machined to provide cylindrical surfaces 76 and 77 for press fit of the slinger and surge prevention rings prior to incorporation of the cone assembly with head 34.

Preferably the cone assembly and head 34 are suitably, slidably and coaxially mounted with the cone on a suitable mandrel 82 having a part 83 extending through bore 67 and a larger diameter 84 to suit the lower cone opening, and while so maintained and guided in accurate alignment they are pressed together until surface 79 contacts ledge 81. Then the attachment ring 66 is pressed into surface 56 until its inner end abuts flange 65. Preferably ring 66 has the same axial length as surface 56, and it reenforces the joint between the head and the cone assembly.

Then the shaft 37 is press fitted into bore 67 and head 34 is located properly with respect to the fan and bearing ends of the shaft. Preferably this operation takes place while the head is in the same fixture as in pressing the cone into place. Now head flange 55 is machined to seat the motor rotor 72, the rotor attached to the shaft and fan 33 mounted on the shaft and the entire rotatable assembly is ready to drop into the stationary part of the burner.

Thus the several parts of the rotor assembly are all press fitted tightly together, without the necessity of silver soldered or brazed connections as heretofore was the case. This is understandably

a less expensive method of assembly but it also unexpectedly provides a considerably more accurate assembly particularly with respect to alignment of the cone and shaft axes. Where these parts had to be heated during assembly operations, as in soldering and brazing, there was a tendency toward warpage of the relatively thin metal cone and consequent misalignment with the shaft when cooled, and this is absolutely prevented by the process of the invention.

This advantage of accuracy of alignment and prevention of cone warpage is obtained by press fitting the slinger and surge prevention rings onto the cone instead of soldering them in place as previously was the practice. The spinning over of the lower flinger tube ends provides an anchorage that is superior to the hydrogen brazed attachment heretofore employed, and insures against misalignment of the tubes with respect to the shaft **37**.

Ordinarily all of the rotor parts are rust proofed with a gun metal finish before assembly.

The distributor shaft is preferably machined to final shape and then hardened before assembly with head **34**. Because it is easier to machine prior to hardening, groove **71** is therefore more accurately cut and it provides an improved positive pumping action. Preferably also the upper end of the shaft **37** is relieved to permit more accurate aligned assembly of the head and shaft, this preventing broaching of the head and enabling the shorter bearing surface **69** to be held to more accurate dimensions.

I have therefore provided a novel distributor rotor and method of assembly which contributes to a more accurate, uniform distribution of the oil spray for a wall flame burner and the accurately related and balanced parts provide a quietness of operation over a long life that has hitherto been not obtainable.

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 oil burner, a rotor comprising a head, angularly disposed oil flinger tubes secured upon said head, a central shaft secured to said head, an oil lift cone having its upper end press fitted into said head, and an attachment ring for said cone press fitted into said head into abutment with said cone.

2. In the fuel oil burner defined in claim 1, said cone being formed at its upper end with an outwardly directed flange that is press fitted into abutment with the correspondingly formed lower end of said head, and said attachment ring clamping the cone flange against said head.

3. In a fuel oil burner, a rotor comprising a head having a central vertical bore and equally spaced angularly disposed bores, angularly disposed oil flinger tubes secured in said spaced bores, a shaft press fitted into said vertical bore, an oil lift cone surrounding the shaft and having its upper end press fitted within said head, an attachment ring for said cone press fitted into said head into abutment with the cone, and an oil slinger ring press fitted onto the periphery of said cone intermediate its ends.

4. In an oil burner, an inverted cup-shaped head having a central bore and two diametrically opposite inclined side bores, the interior of said cup being formed with a bottom surface surrounding said central bore and intersected by said inclined side bores and an adjacent cylindrical side surface coaxial with said central bore, an oil lift cone having an upper flanged end press fitted with said cylindrical surface, and an attachment ring tight with said head abutting against said flange for securing said cone against axial displacement with respect to said bore.

EDMOND H. HAUGEN.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,058,542	Brown	Apr. 8, 1913
1,883,906	Hasselquist	Oct. 25, 1932
1,888,693	Powers	Nov. 22, 1932
2,181,249	Powers	Nov. 28, 1939
2,310,333	Wilson et al.	Feb. 9, 1943
2,515,262	Powers	July 18, 1950