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UNITARY MOTOR AND PUMP STRUCTURE

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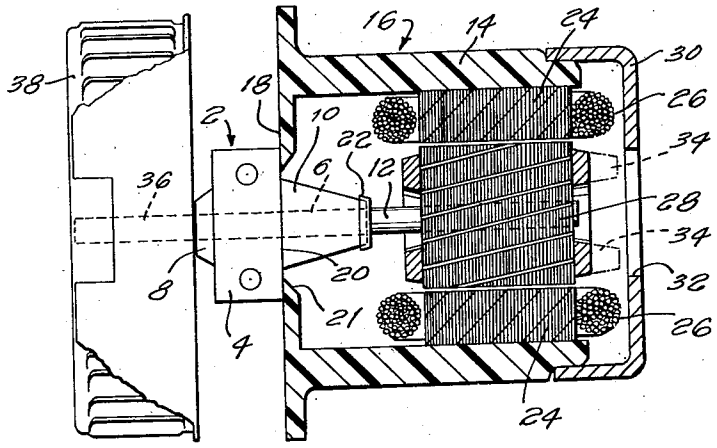


FIG. 1.

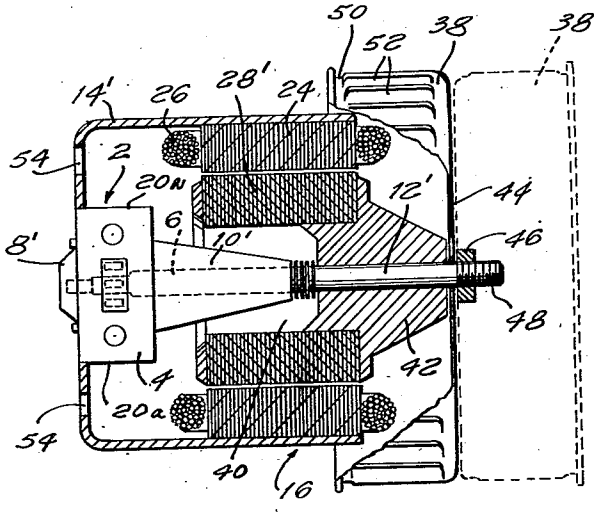


FIG. 2.

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UNITARY MOTOR AND PUMP STRUCTURE

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The present invention relates to a unitary motor and pump construction, in some cases including a blower, in which separate bearings for the motor shaft are dispensed with, and in which all of the bearings for the shaft parts are included in the pump structure so as to minimize lubrication problems.

Oil burners usually include a pump for the fuel oil and a blower for the air, both being motor driven and preferably by the same motor. Such equipment conventionally utilizes a standard pump and a standard motor the shafts of which are so connected that the former is driven by the latter. Separate blower units, comprising housing, blower wheel, shaft and bearings, the blower shaft being operatively coupled to the motor shaft, are often employed. While this standard arrangement has certain advantages from a procurement point of view, since the pumps, the motors and the blowers may all be purchased from different manufacturers, it has the disadvantages that by using a plurality of individual units mounting and alignment problems are multiplied, cost, size and weight are increased, and individual provisions must be made for lubricating the pump, motor and blower shafts respectively. Lubrication of the pump shaft rarely presents any problem, because such pumps are customarily so constructed that the pumped fuel oil itself constitutes the lubricating medium for the pump shaft. However, this convenient arrangement does not obtain with respect to the motor or the blower, and separate provisions for lubrication must therefore be provided in those units. One of the major sources of trouble in oil burners and the like is motor failure caused by improper lubrication of the motor shaft, excessive lubrication of the motor shaft tending to cause the electrical components of the motor to deteriorate through oil leakage and oil seepage, insufficient lubrication of the motor causing the bearings to deteriorate.

The present invention avoids these disadvantages by providing for a unitary pump and motor construction, to which a blower wheel may readily be directly connected. Therefore only a single unit need be mounted on the chassis of the burner, thus reducing size and weight and eliminating alignment problems without sacrifice of operating characteristics. In addition, the structure is such that the same fuel-oil-lubricated bearings which support the pump shaft also support the motor shaft, so that no separate provisions need be made for motor lubrication. Indeed, because the pump bearings are lubricated by the fuel oil, no separate lubricating means need be provided for any part of the unit. The motor casing is secured directly to the pump casing, the pump shaft extends out beyond its casing and into the motor casing, the pump bearing preferably being elongated in the direction in which the pump shaft projects in order to provide proper support therefor, and the rotary part of the motor is secured directly to the projecting portion of the pump shaft. The blower wheel may be secured directly to the same shaft portion as the motor rotor, or many be connected thereto in some other way. According to one specific embodiment of the invention, the motor casing may be open-

ended, the projecting pump shaft portion extending through the open end of the motor casing and having the blower wheel secured thereto so as to serve as a closure for the open motor casing end, rotation of the blower wheel acting to ventilate and cool the motor through the open casing end.

To the accomplishment of the above, and to such other objects as may hereinafter appear, the present invention relates to a unitary pump and motor assembly and to such an assembly in combination with a blower wheel, as defined in the appended claims and as described in this specification, taken together with the accompanying drawings, in which:

Fig. 1 is a side view, partially broken away and cross sectioned, showing one embodiment of the present invention; and

Fig. 2 is a similar view showing another embodiment thereof.

Referring first to the embodiment of Fig. 1, the pump 2 is preferably of the positive displacement type and comprises a casing 4 within which a shaft 6 is rotatable, that shaft being mounted at either end in substantially conventional bearings 8 and 10, those bearings usually being so constructed that the fuel oil serves as a bearing lubricant. The internal structure of the pump 2 forms no part of the present invention, and consequently is not here disclosed.

A portion 12 of the shaft 6 extends out beyond the right hand end of the bearing 10 and into the casing 14 of an electric motor generally designated 16 and here illustrated as of the induction type. The casing 14 is here shown as formed of plastic, but any other suitable material, such as metal, could be used. It is provided with a flange 18 at one end thereof which rests on a side surface 20 of the pump casing 4 and is there secured in any appropriate manner, as by adhesive, rivets, screws or the like. The right hand elongated pump bearing 10 and the shaft portion 12 extend into the motor casing 14 through an aperture 21 in the flange 18, an oil catching element 22 being secured to the shaft 12 adjacent the right hand end of the bearing 10 in order to prevent leakage of fuel oil lubricant into the motor casing 14. The casing 14 supports a motor stator defined by laminated pole pieces 24 disposed concentrically around the shaft portion 12 and through which the shaft portion 12 extends, energizing coils 26 surrounding the poles 24. The electric motor rotor 28, here shown as of the laminated slotted rotor induction type, is mounted on the shaft portion 12 inside the stator poles 24 in any conventional manner. (It will be understood that the specific type of motor construction employed could be varied at will from that here specifically disclosed.) The right hand end of the motor casing 14 is closed by a cap 30, here shown as metallic in nature, secured to the casing 14 in any appropriate manner, as by press fit, interlocking, rivets, or screws, that cap 30 preferably having a central aperture 32 to provide for ventilation of the interior of the casing 14. If desired, vane elements 34 (shown in phantom lines) may be provided on the end of the rotor 28 adjacent the opening 32 in order to facilitate such ventilation of the motor, as is conventional.

A portion 36 of the pump shaft 6 extends out to the left beyond the bearing 8, and a blower wheel 38 is secured thereto. This wheel will rotate within a conventional blower housing (not shown) in order to produce a forced flow of air.

It will be noted that only two bearings 8 and 10 are provided for the entire unit, those bearings supporting the pump shaft 6, as is conventional, and also supporting the shaft portion 12 which defines the motor shaft and the shaft portion 36 which defines the blower shaft. The shaft portions 12 and 36 project out beyond the bearings

10 and 8 respectively and are unsupported along their length. The elongated nature of the bearing 10 directed toward the motor rotor 28 is adequate to support and journal the shaft portion 12 (the motor shaft) despite the weight of the motor rotor 28.

In the embodiment of Fig. 2 the pump 2, as in Fig. 1, is provided with a casing 4 within which a shaft 6 is mounted, the ends of the shaft 6 being supported in bearings 8' and 10'. The bearing 8' differs from the bearing 8 in that it is closed at its end. The bearing 10' differs from the bearing 10 in that it preferably has a somewhat greater elongation. Only a single projecting shaft portion 12' is provided, extending out beyond the bearing 10'.

The motor casing 14', here shown as formed of metal, supports the laminated stator poles 24 with their energizing coils 26, the motor casing 14' being mounted on side surfaces 20*a* of the pump casing 4 so that the stator poles 24 are concentric with the shaft portion 12'. As shown in Fig. 2, substantially the entire body of the pump 2 is received within the motor casing 14' and, in order to further save space and reduce the size of the overall unit, a part of the elongated bearing 10' projects inside the stator poles 24. The motor rotor 28' may be electrically comparable to the rotor 28 of Fig. 1, but differs therefrom in having an axial recess 40 into which the bearing 10' extends, the rotor laminations being mounted on a conical supporting structure 42 through which the shaft portion 12' extends and which is made fast to the shaft portion in any appropriate manner. The right hand end of the motor casing 14' is open, the shaft portion 12' projects beyond the conical supporting structure 42, and the blower wheel 38 is secured to that projecting part of the shaft portion 12', the body 44 of the blower wheel 38 being clamped against the end of the conical supporting structure 42 by means of nut 46 received on the threaded tip 48 of the part of the shaft 12' which extends beyond the structure 42. The rim flange 50 of the blower wheel 38, in which the vanes 52 are formed, telescopes over the right hand end of the motor casing 14', the blower wheel 38 thus defining a closure for that casing end. As before, the blower 38 rotates within a conventional blower housing (not shown).

A comparison of Figs. 1 and 2 will reveal that the structure of Fig. 2, while having all of the operational advantages of the structure of Fig. 1, has the additional advantage that it takes up considerably less space. Moreover, since the pump shaft 6 only extends out from one end of the pump 2, the problem of preventing leakage of lubricating oil through the pump bearings is minimized. In addition, the blower wheel 38 itself defines a ventilating means for the motor 16, and apertures 54 may be formed in the left hand end of the motor casing 14' in order to provide for a constant flow of cooling air through the motor while it is operating. An additional advantage of the structure shown in Fig. 2 derives from the greater elongation of the bearing 10' which, in combination with the recess 40 in the motor rotor into which the bearing 10' extends, provides for more effective support of the shaft portion 12'.

Of course, the position of the blower wheel 38 could be reversed, as indicated in broken lines in Fig. 2, where blower mounting considerations so dictate.

Both of the illustrated embodiments define a unitary pump 2 and motor 16, preferably together with blower wheel 38, in which structure no lubricating oil need be employed and no special motor bearings are required. The fuel oil provides for lubrication of the entire unit. Where the pump 2 is not employed to force flow of a fluid having lubricating properties, special provision for lubrication of the bearings 8 and 10 or 8' and 10' must be made, but the instant invention would still be advantageous because no separate motor bearings are needed. The consequent considerable saving in money, space and weight is of equal significance with the simplification of assembly, elimination of alignment problems, and increased dependability of operation of the unit when compared with employing individual motor, pump and blower assemblies.

While but two embodiments of the present invention have been here disclosed, it will be apparent that many variations may be made therein, all within the scope of the present invention as defined in the following claims.

I claim:

1. In combination, an oil pump comprising a casing, a pumping element therein, and means operatively connected to said pumping element comprising shaft sections journaled in said casing and extending from said pump casing in opposite directions, said oil pump having inlet and outlet openings spaced from said extending shaft sections, a blower element secured to one of said shaft sections and supported and rotated thereby, and an electric motor comprising a motor casing secured to said pump casing into which said other shaft section extends, said other shaft section being unsupported within said motor casing except by said pump casing, a motor stator on said motor casing coaxial with said other shaft section and into which said other shaft section extends, and a motor rotor on said extending portion of said other shaft section and inside said motor stator.

2. The combination of claim 1, in which said pump casing projects out for an appreciable distance in the direction of said other shaft section, said other shaft section passing through and being journaled in said outwardly extending pump casing portion.

3. In combination, an oil pump comprising a casing, a pumping element therein, and means operatively connected to said pumping element comprising shaft sections journalled in said casing and extending from said pump casing in opposite directions, said oil pump having inlet and outlet openings spaced from said extending shaft sections, a blower element secured to one of said shaft sections and supported and rotated thereby, and an electric motor comprising a motor casing secured to said pump casing into which motor casing the other of said shaft sections extends, the other of said shaft sections being unsupported within said motor casing except by said pump casing, a motor stator on said motor casing coaxial with the other of said shaft sections and into which the other of said shaft sections extends, and a motor rotor on said extending portion of the other of said shaft sections and inside said motor stator, said motor casing being larger than said pump casing and having radially inwardly extending parts, said motor casing being secured to said pump casing by said inwardly extending parts.

4. The combination of claim 3, in which said pump casing projects out for an appreciable distance in the direction of the other of said shaft sections, the other of said shaft sections passing through and being journaled in said outwardly extending pump casing portion, said motor casing being secured to said pump casing independently of said outwardly extending pump casing portion.

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