

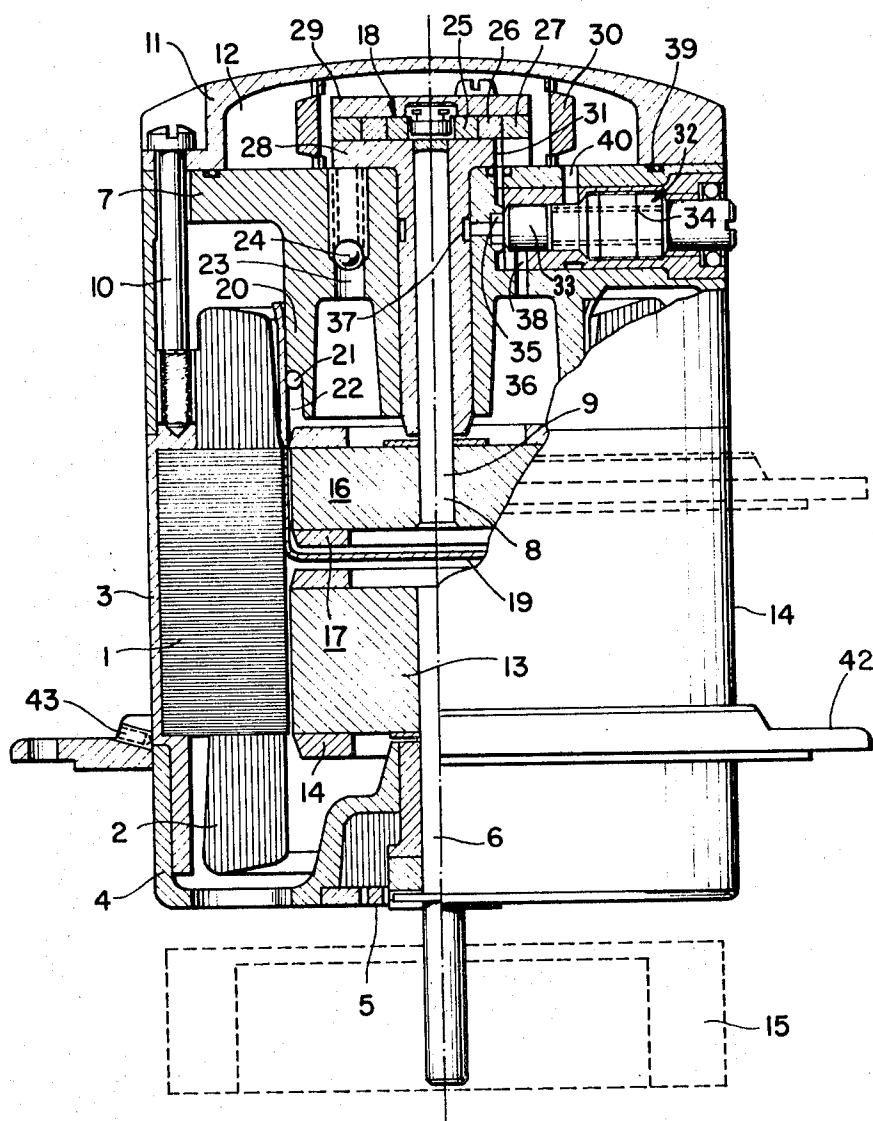
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MOTOR, PUMP AND BLOWER ARRANGEMENT FOR OIL BURNERS

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MOTOR, PUMP AND BLOWER ARRANGEMENT FOR OIL BURNERS

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4 Claims

ABSTRACT OF THE DISCLOSURE

The invention relates to an electric motor driven pump and blower assembly for oil burners. The assembly includes a single stage asynchronous motor having first and second independently rotatable rotors and a common stator. The rotors are respectively of greater and lesser inertia with the blower being connected to the first rotor and the pump being connected to the second rotor. The pump operates to pump oil when turned in one direction but is inoperative in the opposite direction. This apparatus is operated with a secondary winding and switching means so that, upon starting, the pump is first turned in the inoperative direction and, upon the blower reaching its normal operating speed, the pump direction is reversed so that there is a lag between the time the blower begins operating and the pump begins pumping. Upon stopping, both rotors are de-energized at the same time but the larger inertia of the blower rotor will cause the blower to rotate after the pump rotor has stopped.

The invention relates to a motor, pump and blower arrangement for oil burners.

Normally, a motor drives both the pump and the blower of the oil burner. Therefore the delivery of oil and that of air are closely associated, with, of course, the provision that when the motor starts up or slows down the air is always delivered in a quantity corresponding to the particular speed, whereas the supply of oil is restricted by means of a complicated cut-off valve between the pump and the nozzle, as long as there is insufficient oil-pressure. Thus, when switching on the motor for example, it is not possible to flush the firing chamber with fresh air prior to initiating the supply of oil so as to remove combustion gases still present. Similarly, when switching off the motor, it is not possible, after interrupting the supply of oil, to supply air at so great a flow velocity that any oil dripping from the nozzle is carried away.

A single-phase asynchronous motor is known for powering a piston compressor or a piston pump, which motor has two independent rotors of different inertia in a common stator. The rotor of greater inertia, powering the piston, is surrounded by a case, so that the associated drive-shaft does not require a stuffing box. The rotor of smaller inertia powers a cold-air blower. In order to achieve a greater starting moment for the pump rotor, the blower rotor carries a locking mechanism which prevents rotation in the direction of rotation of the pump rotor. Consequently, the pump rotor starts up first, after which the blower rotor starts up in the opposite direction.

The object of the invention is to provide an oil burner system, in connection with which a simple method is used for ensuring that, after the motor has been switched on, the blower is initially fully effective for some time before oil emerges from the nozzle, and that after the motor has been switched off the blower remains fully effective for some time after discharge of oil from the nozzle has been interrupted.

According to the invention, this object is achieved by the use of a single-phase asynchronous motor, known per se, comprising two rotors of differing inertia, each carrying a short-circuited winding, and a common stator, wherein the starting winding is only switched off in the secondary phase after the rotor of smaller inertia begins to rotate in a direction opposite that of the rotor of greater inertia; by the rotor of greater inertia being connected to the blower and the rotor of smaller inertia to the pump; and by the pump being ineffective as long as it is not driven in the direction opposite to the direction of rotation of the blower rotor.

The smaller inertia of the pump rotor has the effect of bringing the pump rapidly to a stop after the motor is switched off, especially as the oil to be supplied exercises a braking action. Conversely, the greater inertia of the blower rotor results in the blower speed being reduced slowly, so that a sufficient quantity of air is still provided for some time after interruption of the discharge of oil from the nozzle. Furthermore however, air is delivered considerably earlier than oil also when the motor starts up, since normal start-up occurs only for the blower rotor. The forces acting on the pump rotor however undergo reversal of the direction of rotation when the start-up of the blower rotor is completed, so that the pump can only become effective after the blower has started up.

It is particularly advantageous if the pump rotor has a shorter stack of laminations than the blower rotor. In this way the required difference in inertia is achieved, the diameters being equal.

There are various possible ways of rendering the pump ineffective when the drive is in the direction of rotation of the blower rotor. For example, the pump shaft can be provided with a locking means which prevents rotation in this direction. It is much more advantageous however, if the pump rotor first starts up in the "wrong" direction and later changes its direction of rotation, since the time-delay in the initiation of the delivery of oil becomes greater. A mode of operation of this kind is possible with, for example, a pump arrangement which delivers only in one direction of rotation, either by incorporating a valve mechanism dependent upon the direction of flow, or by using a known geared pump, in which an externally toothed inner wheel meshes with an internally toothed outer wheel.

A still greater time-delay between the initiation of the delivery of air and that of the delivery of oil when switching on can be achieved by means of a starting switch in the auxiliary phase, which switch can be switched off after both rotors start up in one direction, and can be brought in again to reverse the direction of rotation of the pump rotor.

In a preferred embodiment of the invention, the pump rotor rotates in a chamber which is filled with returned oil and which is formed between a pump casing, which seals off the motor at one end, and a cup-shaped element which is inserted in the stator and is pushed by its open end over a cylindrical port on of the pump casing. In this way the pump rotor is intensively cooled. Upon switching off it is also additionally braked by the oil in the chamber. The pump casing, together with the pump and the rotor, can be removed from the motor. All the other parts however are protected against wetting by the oil.

Furthermore, the rotor casing can surround the stack of stator laminations in the manner of a cylinder, by possibly comprising a cylindrical extension extending thereover, and a fixing flange can be displaced and secured on this cylindrical surface. Since the fixing flange can be displaced as required in the direction of the axis of the motor, the assembly can be fitted at any required depth. This proposal is particularly helpful if the stator is fairly

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long because of the presence of two rotors, this providing a good base for the displaceable fixing flange.

In accordance with a further feature, the screws which secure the pump casing to the motor casing also secure a cover on the pump casing, and a cylindrical filter surrounding the pump can be clamped between its cover and casing.

The invention will now be described in more detail by reference to an embodiment illustrated in the drawing in which is shown an assembly in accordance with the invention, partly in longitudinal section and partly in elevation.

A stack 1 of stator laminations together with a stator winding 2 is surrounded by a cylindrical motor casing 3. This casing is sealed at its one end by a cover 4, which comprises a bearing 5 for a blower shaft 6. Provided at the other end-face is a pump casing 7, which comprises a bearing 8 for a pump shaft 9. The screws 10, which connect the pump casing 7 to the motor casing 3, also secure a pump cover 11, which, together with the pump casing defines a suction chamber 12.

The motor has a first rotor 13, which incorporates a short-circuited winding 14, in particular a squirrel-cage, and which is mounted on the blower shaft 6 and drives a vane wheel 15; the motor also has a second rotor 16, which comprises a short-circuited winding 17, in particular a squirrel-cage, and which is mounted on the pump shaft 9 and drives a pump 18. The blower rotor 13 has a stack of laminations of greater width and therefore has a greater inertia than the pump rotor 16.

A cup-shaped element 19 is inserted in the stator 1, is pushed over a cylindrical portion 20 of the pump casing 7 and at that point is sealed by an O-ring. This creates a sealed chamber 22, in which the pump rotor 16 rotates. This chamber is filled with returned oil. It communicates with the suction chamber 12 through a passage 23 containing a non-return valve 24.

The pump 18 has an externally toothed inner wheel 25 mounted on the shaft 9 so as to rotate therewith, an internally toothed outer wheel 26, meshing with the inner wheel 25, a ring 27, in which the wheel 26 rotates, and two discs 28 and 29 which cover these parts on both sides and which contain passages, distributing grooves etc. The pump is surrounded by a cylindrical filter 30 which is pressed by the cover 11 against the casing 7 and is thereby secured.

A pressure passage 31 leads from the pump to a valve arrangement 32; this incorporates a piston 33, which is biased by an adjustable spring 34. The end-face of the piston presses against a valve-seat 35 and therefore forms a cut-off valve which monitors the supply pipe 36 running to the nozzle. This pipe communicates with a union on the outer periphery of the pump case 7 by way of an annular chamber 37 on the outer periphery of the bearing 8. The peripheral edge of the end-face of the piston 33 overrides the mouth of a return passage 38 and thus forms a pressure-regulating valve. The return passage is extremely short. The space 39 behind the piston 33 communicates with the suction chamber 12 by way of a likewise short bore 40.

If the motor is switched on, both rotors 13 and 16 rotate in the same direction. Shortly before the rotor 13 reaches its final speed, the elliptical field of the single-phase motor changes in such a way that the rotor 16 is reduced in speed and finally runs in the opposite direction. It therefore only reaches its nominal speed sometime after the rotor 13. Since the geared pump 18 can only deliver in the last-mentioned direction of rotation, because of the position of its suction and pressure passages, the pump

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arrangement only becomes effective when the pump-rotor 16, after reversal of the direction of rotation, approaches its nominal speed and so great an oil-pressure is generated that the piston 33 lifts from the valve-seat 35. The delay-time between the blower becoming fully effective and the initiation of delivery of oil depends upon the details of the construction of the assembly. To achieve particularly long delay-times, the usual starting switch, which is arranged in series with a resistor or a condenser and the secondary winding of the stator 1, can be opened for a certain time prior to the reversal of the direction of rotation of the rotor 16; reversal of direction then only takes place after the starting switch has been closed again.

When the motor is switched off, the pump rotor 16 comes rapidly to a stop because of its small inertia and because of the braking action exercised by the oil. The blower rotor 13 on the other hand remains fully effective over a fairly long period because of its greater inertia and the low resistance.

The peripheral surfaces of the motor casing 3, the cover 4 and the pump casing 7 form a continuous cylindrical surface 41 on which a fixing flange 42 can be displaced as required and then locked in position by means of a screw 43. In this way the depth at which the entire assembly is fitted can be selected as required.

To remove the pump, the screws 10 are loosened, and the pump casing 7 together with the pump 18 and the rotor 16 can be withdrawn as a single unit. The fitting of a repaired or replacement unit can be carried out just as easily.

I claim:

1. A pump and blower assembly for oil burners comprising a single phase asynchronous motor having a stator and a stator winding, said motor having first and second independently rotatable rotors of greater and lesser inertia respectively, said first rotor initially being driven in one direction by said stator field, said second rotor subsequently being driven in a direction opposite from said one direction by the combined effects of said stator field and the field of said first rotor, a blower drivingly connected to said first rotor and a pump drivingly connected to said second rotor, said pump being effective only in the direction opposite from said one direction.

2. A pump and blower assembly according to claim 1 wherein said first rotor has a longer stack of laminations than said second rotor.

3. A pump and blower assembly according to claim 1 wherein said pump is of the type having meshing internally and externally toothed gear wheels.

4. A pump and blower assembly according to claim 1 including casing means surrounding said second rotor and forming a chamber, and cut-off valve means having fluid communication with said chamber through a return passage.

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