(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 898 151 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
12.03.2008 Bulletin 2008/11

(51) Int Cl.:
F23D 11/36 *(2006.01)* ***F23D 11/44*** *(2006.01)*
F23K 5/12 *(2006.01)* ***F23K 5/20*** *(2006.01)*

(21) Application number: **07015341.6**

(22) Date of filing: **06.08.2007**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(30) Priority: **05.09.2006 IT TO20060633**

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(54) Oil burner for boilers and the like

(57) A motorized fan (4) is operatable to delivery an air stream through a ventilation pipe (8). A housing (12) houses a motorized sliding-vane mixer (40, 42, 44) operatable to draw air from the fan (4) and oil from an oil feeding circuit. The mixer emulsifies the oil in the air to form a homogeneous mixture and to send it to a delivery duit (62) at a relatively low pressure. A mixture-delivering pipe (68) is housed within the ventilation pipe (8) and has an inlet end connected to the delivery duit (62) and an opposite outlet end provided with a nozzle (70) near the delivery end of the ventilation pipe (8).

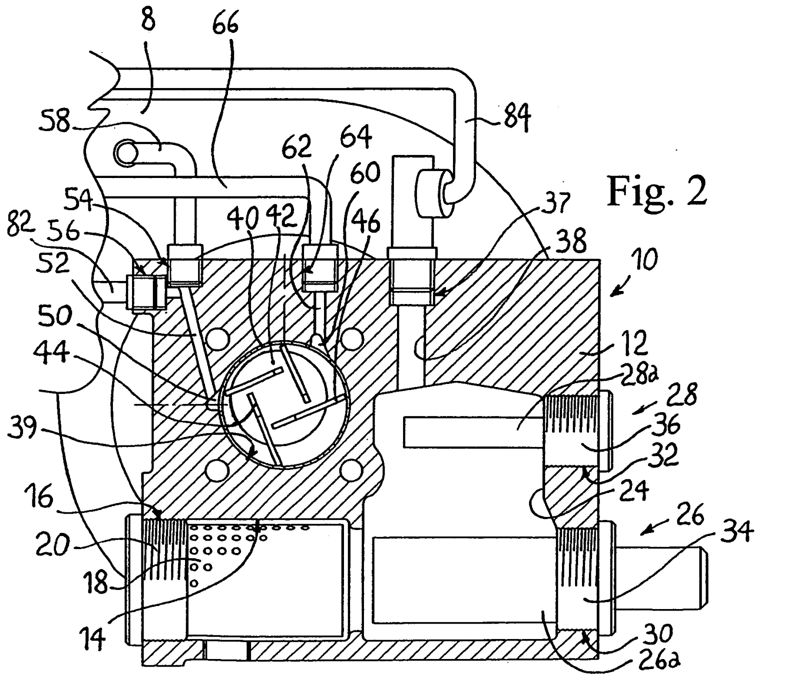

Fig. 2

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Description

[0001] The present invention relates to an oil burner for boilers, heat generators, and the like.

[0002] In most of the known oil burners, oil is fed to a nozzle under a relatively high pressure, e.g., 4 or 5 bar, from a pump which is operatively connected to a motor which also drives a fan deliverying the combustion air.

[0003] As well known to the person skilled in the art, in order to achieve a perfect combustion of the oil, particularly in relation to the reduction both of the consumption of the boiler and of the emission of pollutants (NOx, etc.), the above burners are only fed with oils having a relatively low viscosity, such as naphtha (which has a viscosity of about 50 °E at 50 °C), because such oils are more liable to become atomized at the nozzle.

[0004] The above burners are not even compatible with vegetable oils (e.g., colza oil) and other relatively coarse oils, such as exhausted oils collected in machine shops, garages, and the like, because these oils contain high percentages of residuals and potentially abrasive pollutants which could damage the internal mechanical components of the burner in a short time, mainly in consideration of the high operative pressure of the oil.

[0005] Therefore, it is a main object of the present invention to provide an oil burner having a high reliability and sturdiness, which is capable of operating effectively, with an optimum combustion, even with oils having a high viscosity as well as with potentially abrasive coarse oils, such as vegetable oils, collected exhausted oils, and the like.

[0006] It is another object of the invention to provide an oil burner having a small size in relation to its use in small-sized home boilers.

[0007] The above objects and other advantages, which will better appear in the following description, are achieved by an oil burner having the features recited in claim 1, while the other claims state other advantageous, thought secondary, features of the invention.

[0008] The invention will be now described in more detail with reference to a preferred, non-exclusive embodiment, shown by way of non-limting example in the attached drawings, wherein:

Fig. 1 is a view in side elevation of the oil burner according to the invention;

Fig. 2 is a broken-away view in side elevation and to an enlarged scale of the rear part of the burner of Fig. 1.

[0009] With reference to the above Figures, an oil burner 2 comprises a fan 4 of a conventional type, which is driven by a motor 6 and is provided with a ventilation pipe 8 deliverying an air stream.

[0010] Fan 4 integrally bears a compressor/mixer 10, which is also operated by motor 6, as will be better described below. Compressor/mixer 10 comprises a housing 12 having a cylindrical cavity 14 (Fig. 2) leading to a first threaded opening 16 that is open to the outside. A filter is received within cylindrical cavity 14, and consists of a perforated hollow cylinder 18 projecting coaxially from a threaded cylindrical base 20 which is screwed to first opening 16. Hollow cavity 14 is open laterally for receiving oil from an oil intake 22 (Fig. 1), whereby the oil from intake 22 is filtered via the lateral wall of filter 18. Cylindrical cavity 14 is in communication with a heating chamber 24 provided with a drain cock 25. Within heating chamber 24, a heater 26 is arranged, which has a substatially cylindrical profile and is placed coaxially in front of filter 18, as well as a thermostat 28 above the heater. Heater 26 and thermostat 28 are respectively inserted through a second threaded opening 30 and a third threaded opening 32 which are bored in housing 12 on the opposite side with respect to first opening 16. Heater 26 comprises a tubular resistor 26a projecting coaxially from a threaded base 34 that is screwed to second opening. Thermostat 28 comprises a cylindrical temperature sensor 28a projecting coaxially from a threaded base 36 that is screwed to third opening 32. Heating chamber 24 is open to receive returned oil from a oil return mouth 37 via a return passage 38.

[0011] Above cylindrical cavity 14, a cylindrical seat 39 is formed with its axis lying parallel and eccentric with respect to the axis of motor 6. Cylindrical seat 39 is internally lined with a liner 40 and houses a rotor 42 which is also operatively connected to motor 6 of fan 4. In a way known per se, rotor 42 has four equally-spaced rectilinear cuts such as 44, in which respective vanes such as 46 are slidably received. The vanes are biased to slide against liner 40 while the rotor swivels, by effect of the centrifugal force. Vanes 46 separate the gap between rotor 42 and liner 40 into four sunction/compression chambers; the volume of each of these chambers rises in a first part of the rotation (counterclockwise rotation in the Figures) and then decreases in a second part. Cylindrical seat 39 has a sunction port 50 near the narrowest section of the gap between liner 40 and rotor 42, on the side where the volume progressively rises. Sunction port 50 is connected to a sunction duit 52 which terminates with two branches respectively leading to an air intake 54 connected to the ventilation pipe 8 via an air-feeding pipe 58, and to an oil intake 56. Cylindrical seat 39 has a delivery port 60 near the narrowest section of the gap between liner 40 and rotor 42, on the side where the volume progressively decreases. Delivery port 60 is connected to a delivery duit 62 leading to a delivery mouth 64. Via a delivery pipe 66, delivery duit 62 is connected to an end of a mixture-deliverying pipe 68 (only diagrammatically shown in Fig. 1), which is coaxially arranged within ventilation pipe 8 and is provided with a nozzle 70 at its opposite end near the outlet end of ventilation pipe 8.

[0012] Having now particular reference to Fig. 1, heating chamber 24 has a lateral oil outlet 72, with a pipe 74 connected thereto which feeds a positive-displacement pump 76 of a type known per se, whose flow rate is adjustable via a knob 78. The outlet of positive-displacement pump 76 is connected to a magnetic valve 79 via a further pipe 80. A first branch of valve 79 is connected to oil intake 56 via a union pipe 82, while a second branch of magnetic valve 79 is connected to oil return mouth 37 via a return pipe 84. Valve 79 is selectively switchable to delivery oil from positive-displacement pump 76 either to the inlet of the sliding-vane mixer or to heating chamber 24.

[0013] A starting unit known per se (only diagrammatically shown in Fig. 1) is also received within ventilation tube 8 and comprises a plurality of electrodes 86 arranged around the mixture-deliverying pipe 68 and terminating with pointed ends bent towards nozzle 70. The electrodes are connected to a transformer T to generate ignition sparks determining the ignition of the flame.

[0014] The operation of motor 6, heater 26, thermostat 28, magnetic valve 79, as well as the starting unit, is governed by a control unit UC (also diagrammatically shown in Fig. 1) which is designed according to the normal knowledge of the person skilled in the art, therefore no further description will be given about it.

[0015] In the operation, the compressor receives oil from lateral intake 22, e.g., by gravity from a tank arranged at a higher position, or by means of an auxiliary pump (not shown) which is also driven by motor 6. The oil is filtered by filter 18 and then heated in chamber 24 by heater 26, which is controlled by thermostat 28. Positive-displacement pump 76, which is adjusted via knob 78, draws oil from heating chamber 24 and sends it to magnetic valve 79.

[0016] Before starting, a pre-washing operation is carried out in which magnetic valve 79 is switched to return the oil from pump 76 to heating chamber 24. Drain cock 25 allows water and any other pollutant within the heating chamber to be drained away. When the oil has reached a desired temperature, magnetic valve 79 is switched to send oil to compressor/mixer 10, and symultaneously the starting unit is energized to generate sparks at the ends of electrodes 86. The sliding-vane mixer emulsifies the oil coming from magnetic valve 79 via pipe 82 in the air coming from ventilation pipe 8. The mixture obtained is conveyed to nozzle 70 via delivery pipe 66 and mixture-deliverying pipe 68 at a relatively low pressure (preferably in the range 1 to 1,2 bar). The mixture delivered at the outlet end of pipe 68 is atomized by nozzle 70 and is mixed with the air stream generated by fan 4 via ventilation pipe. The sparks generated by the starting unit determine the ignition of the flame.

[0017] With the oil burner according to this invention, the oil from the feeding circuit upstream, which circuit is provided with filtering means, heating means, a positive-displacement pump and a magnetic valve, is pre-emulsified in the sliding-vane mixer, with a fraction of air drawn from the interior of the fan, thereby generating a homogeneous mixture which is suitable to become atomized at the nozzle even when high viscosity oils are used. This circumstance makes it possible to obtain a perfect combustion of the mixture, with consequent advantages in terms of reduction of the consumptions and of the emission of pollutants, and makes the burner compatible with various types of both refined and coarse oils, such as naphtha, gas oil, vegetable oils (e.g., colza oil), collected exhausted oils, and the like. Moreover, the relatively low delivery pressure, together with the compact, sturdy structure of the compressor/mixer, which incorporates all the components required to filter the oil and to heat it in a controlled way, makes the burner more reliable and less subject to wearing with respect to the known burners operating with higher pressures, particularly in relation to the use of oils containing high percentages of potentially abrasive residuals.

[0018] Preferably, in order to obtain a more effective atomization of the mixture, a nozzle 70 is used of the known type comprising a hollow, cylindrical main housing which is closed by a cap having a conical, perforated end and housing an atomizing nut provided with elicoidal grooves on its outer surface.

[0019] A preferred embodiment has been described herein, but of course many changes may be made by a person skilled in the art within the scope of the inventive concept. In particular, some components of the burner, such as the filter, the heater, the thermostat, and the nozzle, could be replaced with other components of a different type, without abandoning the scope of the invention.

Claims

1. An oil burner, **characterized in that** it comprises:

   - a motorized fan (4) operatable to delivery an air stream through a ventilation pipe (8),
   - a housing (12) which houses a motorized sliding-vane mixer (40, 42, 44) operatable to draw air from said fan (4) and oil from an oil-feeding circuit, to emulsify the oil in the air to form a homogeneous mixture, and to send said mixture to a delivery duit (62) at a relatively low pressure, and
   - a mixture-deliverying pipe (68) arranged within the ventilation pipe (8) and having an inlet end connected to said delivery duit (62) and an opposite outlet end provided with a nozzle (70) near the delivery end of the ventilation pipe (8).

2. The oil burner of claim 1, **characterized in that** said housing (12) has inner cavities (14, 24), which are arranged along said oil-feeding circuit and house filtering means (18) and heating means (26).

3. The oil burner of claim 2, **characterized in that** a first one of said cavities (14) has a substantially cylindrical profile and is open laterally to receive oil to be filtered, and said filtering means comprise a perforated hollow cylinder (18) arranged coaxially within

the first cavity (14) for filtering the incoming oil through its perforated wall.

4. The oil burner of claim 2 or 3, **characterized in that** a second one of said cavities is in communication with said first cavity to receive filtered oil from it, and consists of a heating chamber (24) housing a heater (26) in front of the filtering member, as well as a thermostat (28) above the heater.

5. The oil burner of any of claims 2 to 4, **characterized in that** it comprises a positive-displacement pump (76) whose flow rate is adjustable, which is arranged along said oil-feeding circuit between said inner cavities (14, 24) and said sliding-vane mixer (42).

6. The oil burner of claim 5, **characterized in that** said inner cavities (14, 24) are open to receive returned oil from said positive-displacement pump (76), and **in that** it comprises a valve (79) arranged along said oil-feeding circuit between said positive-displacement pump (76) and said sliding-vane mixer (42), which is switchable to selectively convey oil from the positive-displacement pump either to the inlet of the sliding-vane mixer (42) or to the inner cavities (14, 24).

7. The oil burner of any of claims 1 to 6, **characterized in that** it also comprises a starting unit (86, T) energizable to generate sparks for igniting a flame.

8. The oil burner of claim 1, **characterized in that** said delivery pressure is in the range 1 to 1,2 bar.

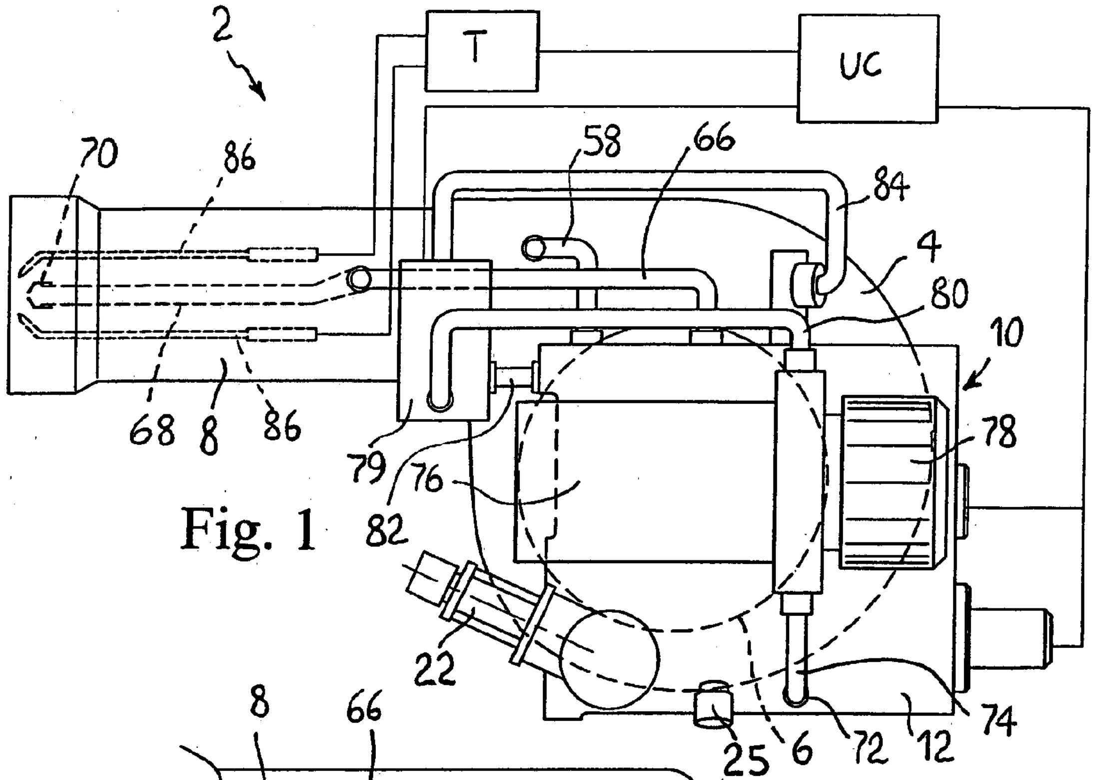
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Fig. 1

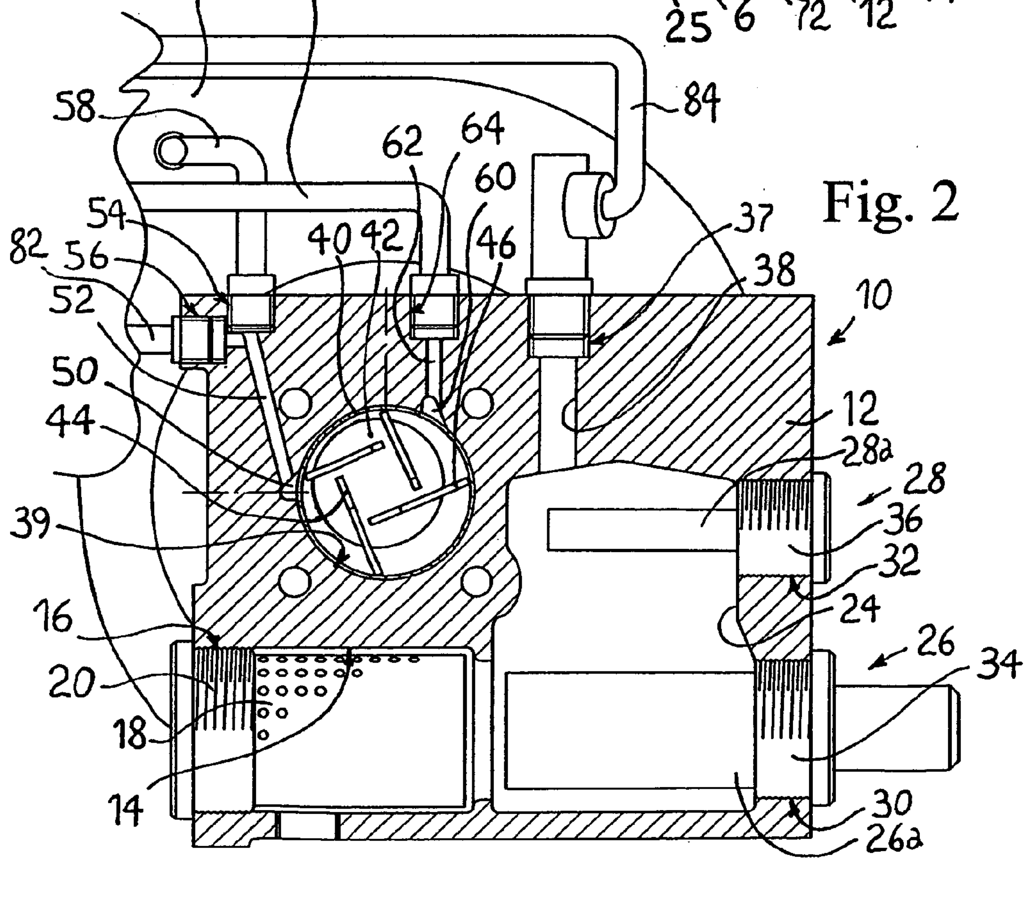
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Fig. 2