

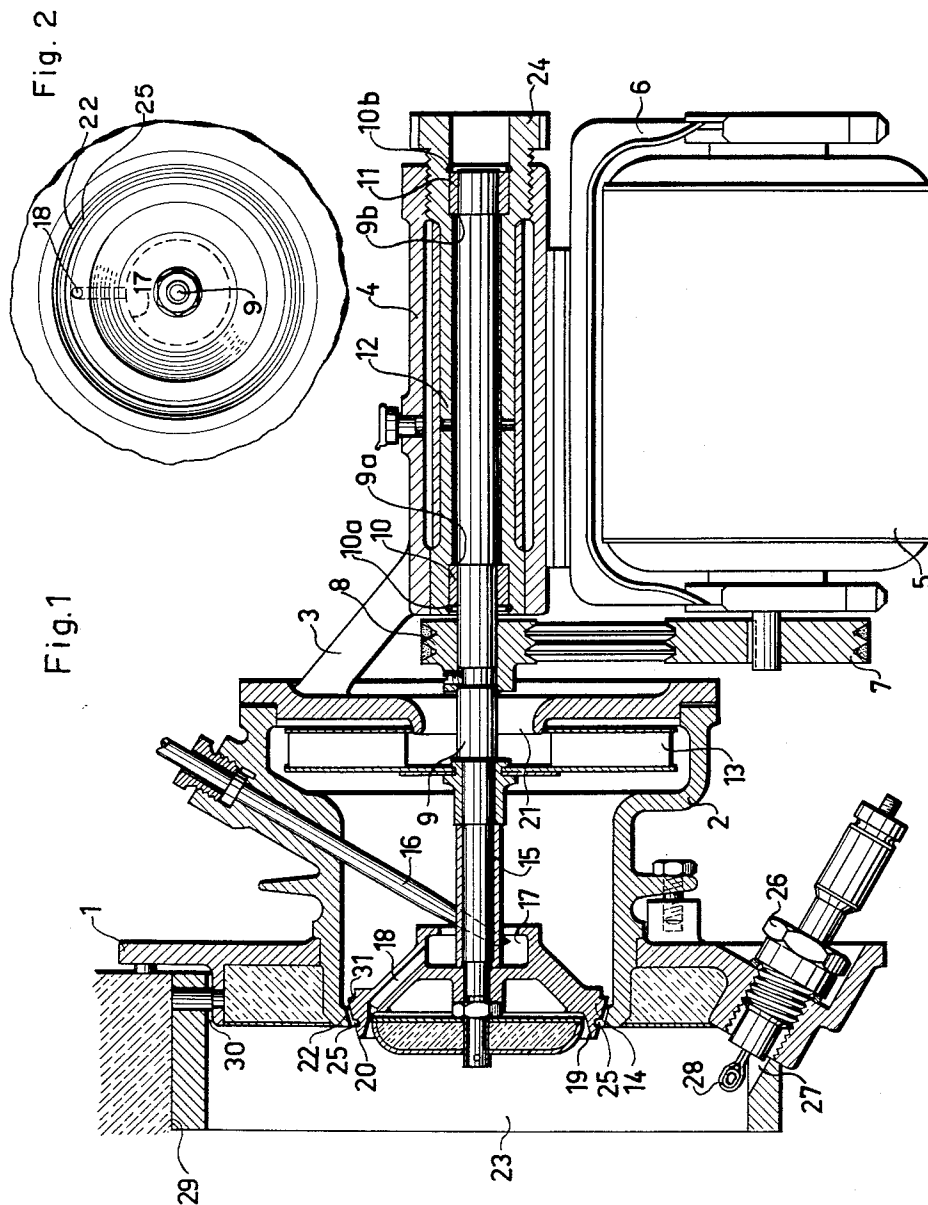
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ROTATING OIL BURNER

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1

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ROTATING OIL BURNER

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2 Claims. (Cl. 158-77)

The present invention relates to an improvement in oil burners of the type in which the fuel is thrown from a rotating oil distributing member and as or immediately after it is discharged therefrom is atomized by an air sheet which is forced by a fan through a clearance provided around the circumference of the rotating oil distributing member. The main object of this invention is to provide an oil burner of this type which can operate satisfactorily with a small rate of oil supply, so that the burner can operate continuously or substantially continuously even when the amount of heat which is desired to obtain from the burner is small per time unit. This results in a considerable improvement in heat economy.

This application is a continuation-in-part of our co-pending application Serial No. 609,223 filed on September 11, 1956, which was abandoned on January 29, 1960.

With oil burners of the type referred to above it has hitherto been difficult to maintain a small rate of oil combustion, as is desirable e.g. in small central heating furnaces for heating homes, but the lowest possible rate of oil supply has been considerably above that which is required by the needs for such purposes. For this reason it is necessary to operate the burner intermittently, the ratio between the periods when the burner is actually burning oil and the periods when it is shut-off being of the order of at most 1:3 and usually much less. This results in a poor over-all heat economy of the furnace. The reason why it is not possible to maintain the oil supply below a specific minimum is that the fuel layer discharged from the oil distributing member must have a certain, not unimportant thickness to achieve a satisfactory atomization by the air. It is also to be noted that the diameter of the rotating oil distributing member cannot be reduced below a specific limit in order to obtain a sufficient centrifugal action to achieve a satisfactory atomization at the speeds of rotation which are feasible in practice. Usually the diameter will not be below 30 mms.

In such known burners, however, the oil has been discharged from the entire circumference of the oil distributing member. According to the present invention the above mentioned disadvantage of prior art oil burners is eliminated thereby that the oil distributing member is so constructed and the fuel supply so arranged that a fuel layer is delivered from the oil distributing member along a small fraction only of the circumferential edge of the oil distributing member said fraction being within the range of from 1% to 10% of the length of the circumferential edge of the oil distributing member. Thereby, it is possible to maintain a small rate of discharge of oil and at the same time retain the requisite thickness of the oil layer discharged from a portion of the circumferential edge of the oil distributing member, even if the diameter of the oil distributing member is above the limit referred to above. Furthermore, the passage required to feed the oil to the edge of the distributing member may be given a sufficient width to prevent clogging.

The accompanying drawing illustrates by way of example an oil burner embodying the principles of this invention. FIGURE 1 shows the oil burner in vertical longitudinal cross-section while FIGURE 2 shows a front view of the burner head.

From an attachment plate 1 adapted to be mounted

2

on the furnace (not shown) there extends rearwardly a cylindrical fan housing 2 having a burner aperture therein and a frame 3, all of which members comprise a mounting means. A tubular part 4 of the frame 3 is constructed and arranged to support the electrical motor 5 which is associated with a cradle 6 with resilient rubber elements for the suspension. The motor shaft drives a pulley 7 which has V-belts over same. The pulley 7 through the means of the belts drives another pulley 8 which is fixed to the shaft 9 so that the shaft 9 is rotated. The motor 5 is pivotally connected to the frame part 4 and to obtain suitable tensioning of the V-belts there is arranged a tensioning screw in a manner known per se. The shaft 9 is journaled in bushings 10 and 11 which are in abutting relationship to shoulders 9a, 9b on shaft 9 and are locked in position in a sleeve 12 by means of rings 10a, 10b received in corresponding grooves in the sleeve. On the front portion of shaft 9 there are mounted a fanwheel 13 and the cup-shaped oil distributing member 14, which is positioned by means of a spacer sleeve 15.

Oil is delivered from a suitable external source through a pipe 16 to a rear cavity 17 of the oil distributing member, wherefrom it is forced by centrifugal force through a conduit or passage 18 to the inner surface 19 of the oil distributing member 14, said surface diverging conically towards the furnace. The passage 18 opens close to the inner surface 19 and only a short distance from its discharging edge 20, so that the oil, as it flows to the edge 20, is spread circumferentially only to a slight degree. Primary combustion air enters through the central inlet 21, is compressed by fan 13 and is delivered through the annular clearance 22 to the combustion chamber 23 where it is admixed with the oil discharged from the distributing member and atomizes this oil. A small amount of air also passes through passage 18, but does not atomize the oil therein. Since the oil is supplied only through a single passage 18, which may consist of a bore, as in the embodiment shown on the drawing, or consist of a particular tube, which opens close to the inner surface 19 and only a short distance from the edge 20, the rotating oil distributing member will discharge oil only from a fraction of the peripheral edge 20, said fraction being of the order of 1 to 10% of the edge 20. Due to the rotation of the oil distributing member, however, this amount of oil obtains contact with the total amount of air blown into the combustion chamber around the oil distributing member so that the flame will exhibit the same closed shape as when the oil is thrown out along the entire circumferential edge of the oil distributing member. In a specific example which was found particularly satisfactory in practice the length of the peripheral edge was 200 mms., the diameter of the passage 18 was 5 mms., and the distance from the mouth of the passage 18 to the peripheral edge 20 was 7 mms. In this example, oil was thrown out from about 5-7 mms. of the edge 20, i.e. about 2.5-3.5% of the total length of the edge 20. This oil distributing member was designed to operate at a speed of rotation of about 5000-6000 r.p.m.

The rate of primary air supply is controlled by axial displacement of the shaft 9 which is achieved by turning the sleeve 12 which is threadedly secured to the part 4. To this end, the sleeve 12 is at its rear end formed with a knob 24. To permit such control of the rate of air supply the outer circumferential surface 31 of the oil distributing member 14 is formed tapered similar to the corresponding opening in the front portion of the fan housing 2. An annular groove 25 is intended to prevent oil from running rearwardly into the fan housing. Rotation of knob 24 axially displaces the distributing member 14 relative to the aperture 22 in the housing 2 and thus controls the size of the air passage between member 14 and housing 2.

The amount of primary air supplied by the fan is not sufficient to achieve complete combustion. Therefore, the remaining amount of air is supplied as secondary air through the clearance 30 provided around the attachment plate of the burner. The amount of such air can be controlled, if desired, by arranging the burner so as to be axially movable relatively to the furnace.

Oil is supplied to the pipe 16, e.g. by gravity feed from a tank. To ignite the burner there is arranged a glow plug 26 which is fed with low voltage current from a transformer (not shown). The plug is so disposed in a pocket 27 of the annulus 29 that a small quantity of oil can remain in the vicinity of the glow wire 28. It was found that it is of importance for the starting characteristics of the burner that the pocket is properly disposed along the circumference of the annulus 29. An angle of about 45° to the vertical axis of the oil burner has been found satisfactory.

The burner is started in the following manner:

When a switch is turned on, the transformer is started so that an electric current is fed to the plug 26 which begins to get heated. After a period of time, determined by a relay, the electric motor is started. Oil flows to the distributing member and is thrown, admixed with air and atomized thereby, into the combustion chamber. Oil droplets which encounter the glow wire 28 are volatilized and ignite oil collected in the pocket 27. The small flame which develops ignites the mixture of atomized oil and air discharged from the oil member. Thus, a flame will be formed around the oil spraying member 20. A photocell may, in combination with a relay, supervise that ignition takes place properly and that the combustion then proceeds as desired. The relay may in a manner known per se be associated with thermostats, whereby automatic start and stop of the burner takes place in accordance with the necessary heat consumption.

If the fraction of the circumference of the oil distributing member from which oil is delivered is increased about 10%, it will not be possible to achieve a satisfactory combustion with a small supply of oil, because the oil layer will not be sufficiently thick and an irregular and pulsating flame will be obtained. As an illustrating example it may be mentioned that when the oil distributing member referred to above, in which the length of the peripheral edge 20 was 200 mms. and which had a single passage 18 of 5 mms. diameter, was provided with three additional passages 18, each of 5 mms. diameter, a pulsating flame was obtained at a rate of air supply of 1 liter per hour and a speed of rotation of about 5200 r.p.m., while the original oil distributing member functioned quite satisfactorily at this rate of oil supply. It is possible, however, to utilize more than

one passage 18 provided that the total fraction of the circumference, from which oil is discharged, is still below 10%. Usually, this will with the sizes of oil burners which may occur in practice, necessitate a single passage. The lower limit for this fraction is determined by the consideration that a smaller fraction will necessitate a narrower oil passage which could easily be clogged and for practical reasons it is not possible to increase the diameter of the oil distributing member above a certain limit. Usually the diameter will be less than 100 mms.

We claim:

1. An oil burner assembly comprising mounting means having an aperture therein, a shaft rotatably supported in said mounting means, a fan mounted on said shaft, an oil atomizing member mounted on said shaft in said aperture and spaced from the perimeter of said aperture to define a narrow substantially axial annular air passage between the perimeter of said aperture and the outer peripheral surface of said oil atomizing member, said atomizing member being formed with a cup-shaped front portion, a rear cavity and a passageway extending from said rear cavity to said cup-shaped front portion and in a direction diverging from said shaft, said passageway terminating adjacent the inner peripheral surface of said cup-shaped portion and close to the circumferential edge thereof, and means for supplying liquid fuel to said rear cavity, the size of said passageway being such that oil is atomized from about 1% to 10% of the circumference of said cup-shaped portion.

2. An oil burner assembly in accordance with claim 1, wherein said aperture in said mounting means is defined by a conically shaped terminal edge adjacent said cup-shaped member, said terminal edge having a smaller diameter at its discharge end than the diameter at its intake end, said cup-shaped member having a conically shaped outer surface substantially parallel to said conically shaped terminal edge, the forward portion of said cup-shaped member having an outer diameter less than the smaller diameter of said terminal edge, the rearward edge of said cup-shaped member having an outer diameter greater than the larger diameter of said conically shaped terminal edge, primary air inlet means in said mounting means and means for axially moving said shaft relative to said mounting means whereby the size of the primary air passage between said cup-shaped member and said conically shaped terminal edge is varied to control the amount of primary air passing around said cup-shaped member.

No references cited.