Feb. 27, 1945. J. G. FROST 2,370,345

HORIZONTAL ROTARY TYPE OIL BURNER

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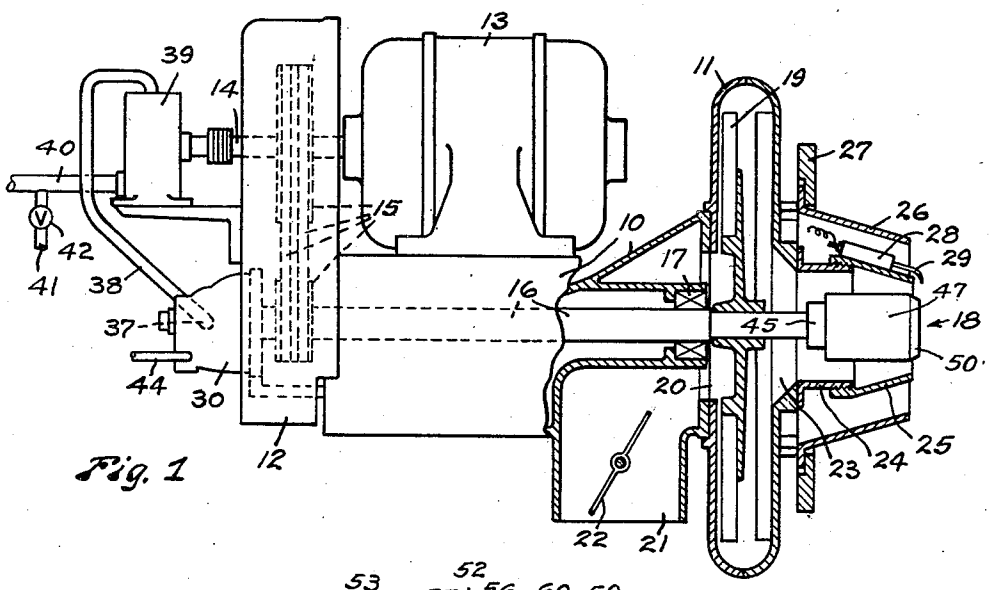


Fig. 1

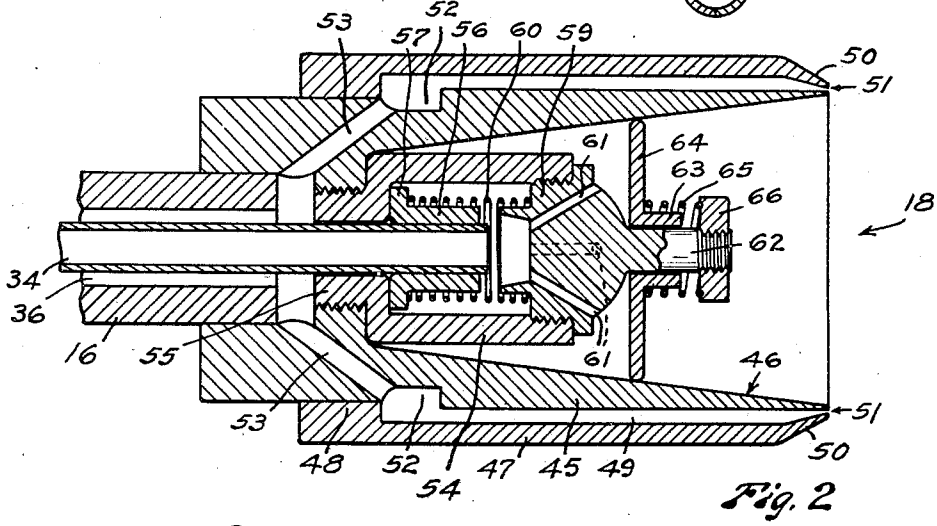
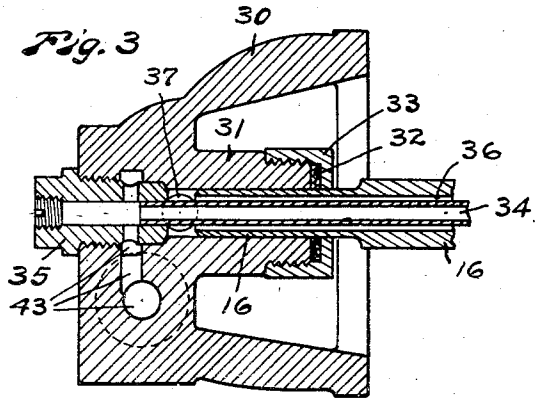


Fig. 2

Fig. 3



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HORIZONTAL ROTARY TYPE OIL BURNER

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4 Claims. (Cl. 158—77)

My invention relates to horizontal rotary oil burners of the type having an oil cup which is rotated at a relatively high speed and through which the oil is fed so that it will be discharged in a thin conical film from the open end of the cup. In burners of this type means are ordinarily provided for supplying low pressure blast air and air at atmospheric pressure around the rotating cup from which the oil is discharging. This low pressure blast air and atmospheric air furnish oxygen for combustion purposes but will not atomize ordinary cold fuel oil sufficiently to make it possible to ignite this cold fuel oil with a spark. For this reason it has heretofore been necessary to heat the fuel oil or to use gas or lighter oil such as Diesel oil or distillate for starting purposes.

In accordance with my invention I provide means for discharging a thin annular blast of relatively high pressure air around the rotating oil cup and into the discharging fuel oil film to thereby thoroughly break up and atomize this discharging film of fuel oil to such an extent that it can be ignited by an ordinary spark type electric igniter connected with an electric ignition transformer.

It is an object of my invention to provide means for embodiment in a horizontal rotary type oil burner which will make it possible to ignite cold fuel oil with an ordinary spark type igniter in starting the burner.

It is a further object of my invention to provide high pressure air supply means which may be incorporated into the construction of horizontal rotary type oil burners now in common use without alteration of any of the standard parts of the burner head except the rotary cup.

Another object of my invention is to increase the efficiency and capacity of an oil burner of this type by providing means for more efficiently atomizing the fuel oil that is being consumed by the burner.

Other objects will be apparent from the following description taken in connection with the accompanying drawing and appended claims.

In the drawing,

Figure 1 is a view partly in side elevation and partly in section of a horizontal rotary type fuel oil burner of standard construction having my invention installed in connection therewith.

Fig. 2 is a view in longitudinal section on a larger scale than Fig. 1, showing a rotary oil cup or nozzle modified in accordance with my invention.

Fig. 3 is a view in longitudinal section on a larger scale than Fig. 1, and a smaller scale than Fig. 2, showing an oil and air intake housing embodied in the invention.

Referring to Fig. 1, I show a horizontal rotary type oil burner of well known form to which my invention is applied. In said Fig. 1, the rotary burner cup and some parts of the air supply means have been altered in accordance with my invention and the remaining parts shown in said Fig. 1, are of well known, standard construction.

The standard burner parts shown in Fig. 1, comprise a main frame and housing 10 having a fan housing 11 connected with one end portion and a belt guard 12 connected with the other end portion. A motor 13 is mounted on the housing 10 and has a shaft 14 connected by belt drive means 15 with a rotatable burner tube 16 that is suitably journaled in the housing 10, as by bearings 17. The forward end portion of the burner tube 16 has a rotary burner cup secured thereto. This rotary burner cup, designated generally by 18, is made in accordance with my invention and is shown in section in Fig. 2. A fan 19 for low pressure air is secured to the burner tube 16 and operates within the fan housing 11. The fan housing 11 has an air intake opening 20 through which air entering by way of a passageway 21 past a butterfly valve 22 may be drawn into the fan housing. Blast air is discharged from the fan housing 11 through an opening 23 and through a convergent nozzle tube formed of two members 24 and 25 that extend around the burner cup 18 in spaced relation therefrom.

A conical nozzle guard and protector 26 preferably surrounds the nozzle 24—25 in spaced relation therefrom. Preferably air at atmospheric pressure may enter through the nozzle guard 26. Preferably a front plate 27 is secured to the nozzle guard 26 and both of these parts 26 and 27 are secured to the fan housing 11. The front plate 27 may be secured to a furnace door and the parts 18, 24, 25 and 26 may project through the furnace door and into a firebox when this device is installed in a furnace.

An electric igniter 28 is preferably positioned externally of the member 25 and is provided with spark terminal means 29 that projects into the path of the discharging oil.

The outer end portion of the rotatable burner tube 16, i. e. the end portion shown at the left in Fig. 1, extends into an oil and air intake housing 30 and is rotatively disposed within a hub member 31 in said housing and a packing washer 32 and screw cap 33 are provided in connection

with hub member 31 to prevent leakage around the rotatable burner tube 16.

An oil inlet pipe 34 is positioned axially within the burner tube 16 and secured to a screw plug 35 that is threaded into the end portion of the oil and air intake housing 30. The external diameter of the oil inlet pipe 34 is less than the internal diameter of the burner tube 16 so that an annular air inlet passageway 36 for high pressure air is provided. One satisfactory way to supply high pressure air to this passageway 36 is through an opening 37 in the housing 30 that is connected by a conduit 38 with a suitable device 39 for supplying high pressure air. The air pressure supply device 39 is driven by the motor 13.

Preferably air is taken into the high pressure air supply device 39 through an air inlet conduit 40. Another conduit 41 having a valve 42 is preferably connected with the conduit 40. If desired gas or heated air or steam or a mixture of two or more of the same may be admitted through conduit 41. Obviously this will not be needed for starting purposes in connection with my invention because oil burners equipped with my invention may be started with cold oil and ordinary atmospheric air. However under certain operating conditions gas may be admitted to enrich the fuel mixture or steam or heated air may be admitted to better atomize heavy oil.

Fuel oil under pressure is preferably supplied to the oil inlet pipe 34 through an opening 43 in the housing 30. The opening 43 is connected by a conduit 44 with any suitable supply of fuel oil under pressure. One satisfactory way to supply such fuel oil under pressure is to supply it through a pump driven from the motor 13.

The rotary burner cup 18, when constructed in accordance with my invention, as shown in Fig. 2, comprises an expanding cup member 45 having an inner wall 46 of frustro-conical shape along which fuel oil may flow until it discharges in a thin film and in a generally radial direction from the open end of said cup member 45.

The bottom end portion of the burner cup 45 is press fitted into, or otherwise rigidly secured to, the burner tube 16. A sleeve 47 is provided with an inwardly directed flange 48 that is press fitted or otherwise rigidly mounted on the exterior of the burner cup 45. The internal diameter of the major portion of the sleeve 47 is larger than the external diameter of the cup 45 to provide an annular air passageway 49 between the sleeve 47 and the cup 45. The sleeve 47 has a convergent annular tip 50 that terminates substantially flush with the forward end portion of the rotary cup 45 and that is of a suitable size and suitably positioned to form a narrow annular air discharge opening 51 through which a thin cylindrical sheet of high pressure air may be discharged into the conical film of fuel oil that is being discharged in a generally radial direction from the tip of the cup 45.

An annular external groove 52 is preferably provided on the burner cup 45 just forwardly of the flange 48 and a plurality of oblique openings 53 extend from this groove 52 inwardly and provide air passageways between the burner tube 16 and the annular air conduit 49.

A secondary cup 54 is disposed within the burner cup 45 and has a hub portion 55 that is threaded into the bottom portion of said cup 45. The oil inlet tube 34, which does not rotate, enters through the hub portion 55 of the secondary cup 54 and delivers fuel oil into said secondary cup 54. A sleeve 56 is positioned within the secondary cup 54 and on the end portion of the oil inlet tube 34. This sleeve 56 fits snugly but rotatively on the oil inlet tube 34 and has a flange 57 that sits snugly against the bottom of the secondary cup 54. The sleeve 56 thus forms a sealing member that tends to prevent oil from escaping into the air passageways and air from entering the oil chamber in the secondary cup member 54.

A plug fitting 59 is threaded into the outer end of the secondary cup 54. A compression spring 60 is interposed between the plug fitting 59 and flange 57 of sleeve 56 to hold the said flange 57 in contact with the bottom of the cup 54.

A plurality of oblique oil discharge openings 61 are provided in the plug fitting 59.

The plug fitting 59 has an axially disposed stem 62 upon which the hub portion 63 of a disc 64 is slidably mounted. A compression spring 65 is interposed between the disc 64 and a nut 66 on the stem 62 and tends to yieldingly hold the peripheral portion of the disc against the conical inner wall 46 of the burner cup 45. Oil under pressure within the rotating cup 45 must escape past the periphery of the disc 64 before it can discharge from the rotating cup. The disc 64 will thus act as an oil retarding member and as a deflector to insure that all of the oil follows along the wall 46 of the rotating cup.

In the operation of this device the fuel oil will flow in a thin film along the wall 46 of the rapidly rotating cup 45 and will discharge in a thin film like cone and in a generally radial direction from the end of the rapidly rotating cup 45. At the same time a cylindrical knife like sheet of high pressure air will discharge from the opening 51 across the path of the discharging film of fuel oil and will thoroughly atomize said fuel oil to such an extent that said fuel oil when cold can be ignited by the spark type igniter 28—29.

The atomization of the oil provided by the jet of air discharging from the opening 51 will be beneficial at all times during the operation of this oil burner and will increase both the efficiency and capacity of the burner.

To install this invention in a fuel oil burner of standard construction I preferably take a cup member 45 that is used with the standard burner and modify it by turning down the end portion that is shown at the left in Fig. 2 and by forming the groove 52 thereon and the passageways 53 therein. The tube 34 and parts within the burner cup 54 are the only new parts required to complete the device.

The foregoing description and accompanying drawing clearly disclose a preferred embodiment of my invention but it will be understood that this disclosure is merely illustrative and that changes in the invention may be made within the scope and spirit of the following claims.

I claim:

1. In an oil burner, a rotating air supply tube; a rotating oil burner cup secured to an end portion of said air supply tube, said cup having a cylindrical outer wall and a conical inner wall that expands toward the discharge end of the cup and said cup terminating in a relatively thin discharge edge over which oil will discharge in a conical film when the burner is in operation; an outer sleeve carried by said cup in spaced relation from the exterior of the cup to provide a cylindrical air conduit between the sleeve and the cup, said air conduit having an annular discharge passageway of narrow width positioned substantially flush with the discharge end of the

cup; a conduit connecting said annular air discharge passageway with said air supply tube; a secondary cup within the bottom portion of said burner cup and secured to said burner cup; a non-rotatable oil inlet tube positioned within said air supply tube and extending into said secondary cup; an inner sleeve within said secondary cup on said oil inlet tube providing oil and air sealing means between said cup and said oil inlet tube; spring means yieldingly holding said inner sleeve in sealing engagement with said secondary cup; a plug fitting carried by the outer end portion of said secondary cup and having oil discharge openings therein; a shank on said plug fitting; an oil deflector disc movably carried by said shank with its peripheral portion positioned in engagement with the conical inner wall of said oil burner cup; and resilient means yieldingly urging said deflector disc into engagement with said conical inner wall of said oil burner cup.

2. In an oil burner, a rotary burner cup having a thin edge over which an outwardly spreading cone shaped film of oil will discharge when the burner is operating; means adapted to supply fuel oil to the inside of said cup; high pressure air supply means; low pressure air supply means independent of said high pressure air supply means; air conduit means connected with said high pressure air supply means and positioned external to said burner cup and having an annular air discharge opening of narrow width extending around the discharge end of said cup in close proximity thereto positioned to direct a thin annular sheet of air into said discharging film of oil at substantially the location where said oil leaves said burner cup, said annular sheet of air being of a pressure high enough to thoroughly atomize cold fuel oil and condition said cold fuel oil for ignition in starting; electric igniter means positioned adjacent the point of discharge of said thoroughly atomized oil; and an air supply conduit connected with said low pressure air supply means and having outlet openings positioned external to said narrow annular high pressure air discharge opening adapted to supply air at relatively low pressure to said atomized fuel for combustion purposes.

3. In an oil burner, a rotating burner cup having a conical inner wall terminating at its larger end in an edge over which oil will discharge when the burner is in operation; oil pressure supply means connected with the inner end portion of said cup; an oil deflector disc carried within said burner cup and movable longitudinally of said cup and yieldingly urged against said conical inner wall and operable to deflect and distribute outflowing oil in an even film along the conical inner wall of said cup; high pressure air supply means; low pressure air supply means independent of said high pressure air supply means; air conduit means external to said cup and connected with said high pressure air supply means and having an annular air discharge opening of narrow width extending around the discharge end of said cup in close proximity thereto positioned to direct a thin annular sheet of high pressure air into said discharging film of oil at substantially the location where said oil leaves said burner cup, said annular sheet of air being of a pressure high enough to thoroughly atomize cold fuel oil and condition the same for easy ignition in starting; electric igniter means positioned in the path of the discharging oil; and air supply conduit means connected with said low pressure air supply means and positioned to deliver low pressure air to the burning fuel for combustion purposes.

4. In an oil burner, a rotating air supply tube; a rotating oil burner cup secured thereto; said cup terminating in a relatively thin discharge edge over which oil will discharge in a conical film when the burner is in operation; an outer sleeve surrounding said cup in spaced relation therefrom providing an air passageway having a narrow annular discharge opening extending around and substantially flush with the oil discharge edge of the cup; a conduit connecting said air passageway with said air supply tube; high pressure air supply means connected with said air supply tube; a secondary cup within the bottom portion of said oil burner cup and secured thereto; a non-rotatable oil inlet tube extending into said secondary cup adapted to supply oil thereto; an inner sleeve in said secondary cup on said oil inlet tube providing oil and air sealing means between said secondary cup and said oil inlet tube; spring means yieldingly holding said inner sleeve in sealing engagement with said secondary cup; and end means for said secondary cup supporting said spring means and having oil discharge openings therein.

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