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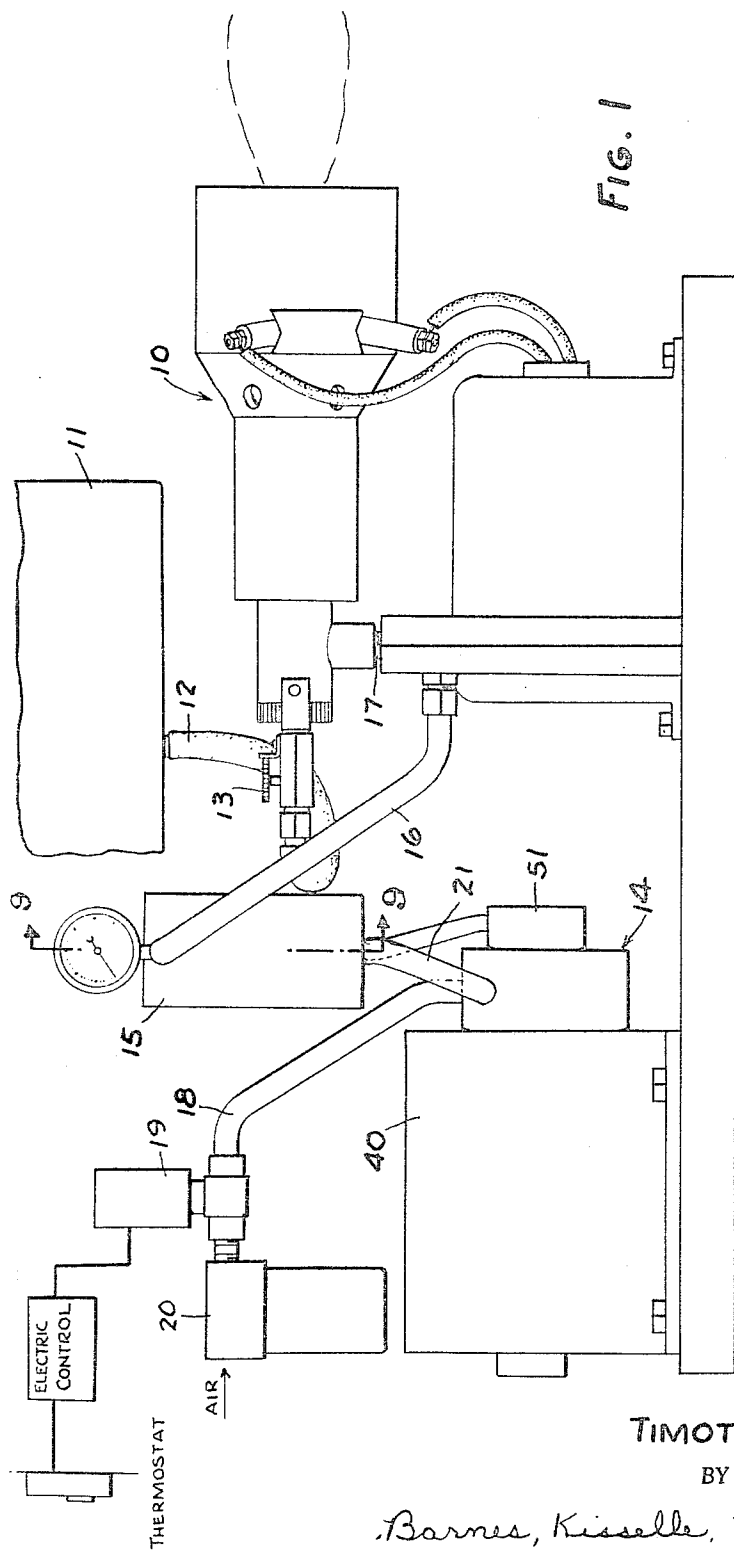
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3,302,686

BURNER APPARATUS

Filed June 1, 1964

3 Sheets-Sheet 1



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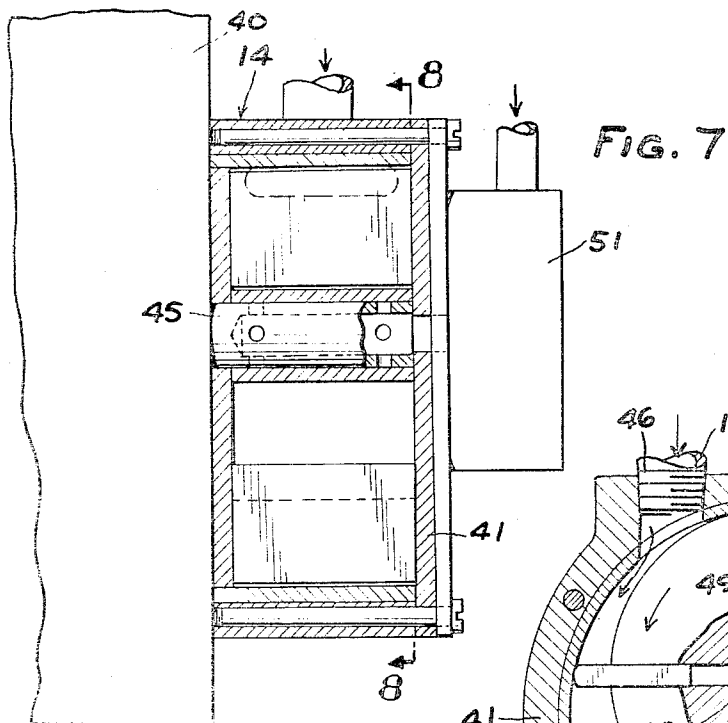
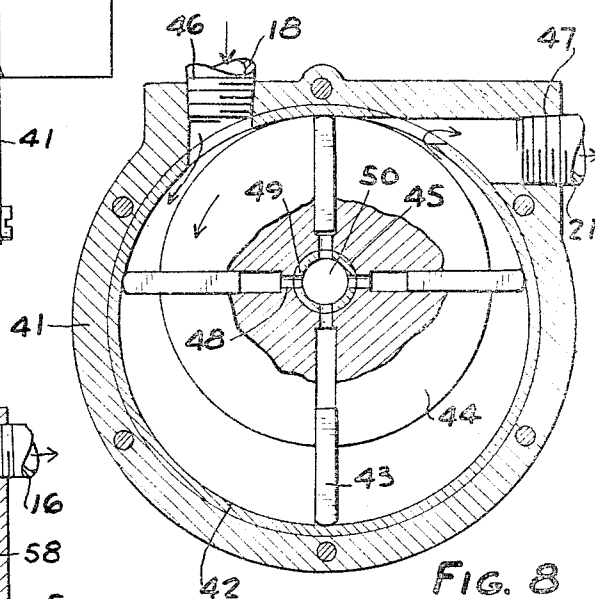
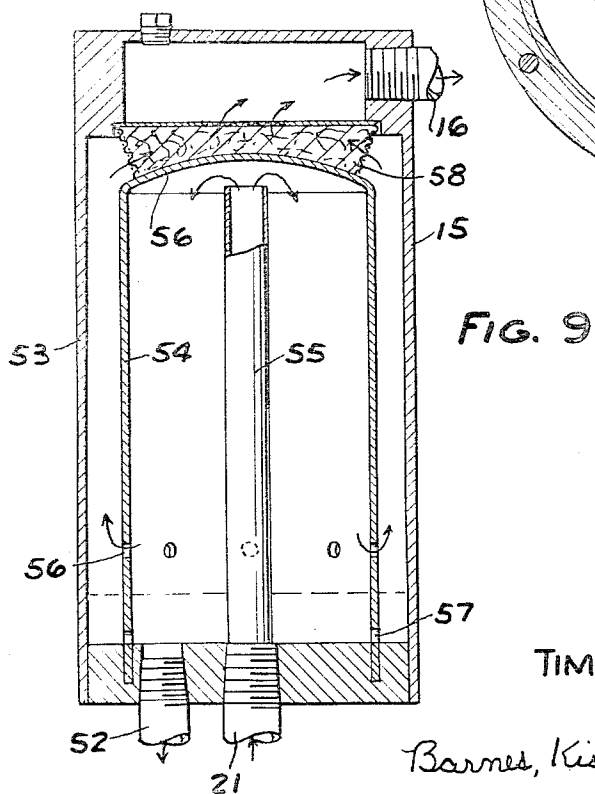
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BURNER APPARATUS

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3 Sheets-Sheet 3



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BURNER APPARATUS

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9 Claims. (Cl. 158-76)

This invention relates to burner apparatus and particularly to oil burner apparatus that can be used for residential and commercial heating.

It is an object of the invention to provide an oil burner apparatus which is reliable, requires substantially no maintenance, is capable of low firing rates, clean burning, low in cost, easily serviced, quiet, efficient and compact.

It is a further object of the invention to provide an oil burner apparatus wherein the flame can be modulated as desired in an efficient manner.

It is a further object of the invention to provide an oil burner apparatus which can be utilized in the home for home heating and hot water heating.

In the drawings:

FIG. 1 is a partly diagrammatic side elevational view of a burner apparatus embodying the invention.

FIG. 2 is a longitudinal part sectional view of the burner assembly utilized in the burner apparatus shown in FIG. 1.

FIG. 3 is a fragmentary enlarged sectional view of the nozzle portion of the burner assembly shown in FIG. 2.

FIG. 4 is a fragmentary plan view of the left end of the burner assembly shown in FIG. 2.

FIG. 5 is a fragmentary sectional view taken along the line 5-5 in FIG. 3.

FIG. 6 is a fragmentary sectional view taken along the line 6-6 in FIG. 3.

FIG. 7 is a sectional view of the compressor portion of the apparatus shown in FIG. 1.

FIG. 8 is a sectional view taken along the line 8-8 in FIG. 7.

FIG. 9 is a sectional view taken along the line 9-9 in FIG. 1.

Referring to FIG. 1, the burner apparatus embodying the invention comprises a burner assembly 10 to which oil is supplied from a tank 11 through a conduit 12, and flow control valve 13. Air under pressure is supplied from a compressor 14 through an oil separator 15 and conduit 16 to a pipe 17 and, in turn, to the burner assembly 10. Compressor 14 includes an inlet pipe 18 on which a control valve 19 and an air filter 20 are positioned. An outlet pipe 21 directs air under pressure from compressor 14 to the oil separator 18.

As hereinafter more fully described, the compressor 14 directs air under pressure to the burner assembly 10 and causes oil to be aspirated from tank 11 through the burner assembly 10 where combustion occurs. By adjusting the control valves 13 and 19, the flame may be modulated as desired.

Referring to FIGS. 2-6, burner assembly 10 comprises a body 22 that supports an extension tube or cylinder 23. An oil supply capillary tube 24 is provided within the cylinder 23. A fitting 25 is fixed to one end of capillary tube 24 as by silver soldering. The fitting 25 extends through an opening 26 in the body 22 and is provided with threads 27 on which an adjusting nut 28 is threaded to provide for axial adjustment of the tube 24 within the cylinder 23. Cleats 29 hold the adjusting nut 28 in position.

A nozzle insert 31 is fixed to the other end of capillary tube 24 and is threaded within a nozzle 32 which in turn is threaded into the end of tube 23. The oil entering through valve 13 passes axially into insert 25 and then through capillary tube 24. The air entering through

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pipe 17 passes through a space 33 in body 22 and then axially around capillary tube 24 to the nozzle 32. Nozzle 32 is provided converging passages 34 that extend to an annular area 35 cut in the periphery of insert 31. A plurality of radially extending ports 36 extend from passage 35 to an axial opening 37 in insert 31 through which the tube 24 extends in type relation. The air entering under pressure through radial passages 36 aspirates oil through the pipe 24 into the axial opening 37 and thereafter the mixture of oil and air passes outwardly beyond the end of the nozzle. By moving the tube axially relative to the radial passages 36, the portion of the radial passages 36 which is uncovered is varied thereby varying the amount of air passing through the passages.

The oil which is aspirated by the air through passages 36 passes into a chamber C formed by a bell-shaped housing 38 which is axially adjustably mounted on body 22. Housing 38 includes secondary air openings 39 and a large axial opening 39a that is aligned with the opening 37 in the nozzle 32. In order to insulate the housing, fire resistant material F is provided in the interior of the housing.

In operation, the burner assembly results in a uniform flame with uniform particle velocity passing outwardly through opening 39a which is achieved without recirculation of combustion gases.

As shown in FIGS. 7 and 8, the compressor 14 is driven by an electric motor 40. Specifically, compressor 14 includes a housing 41 having a cam ring 42 therein along which radial vanes 43 ride. The vanes 43 are mounted for radial movement in a rotor 44 that is eccentrically mounted with respect to the ring 42. The rotor 44 is driven by the shaft 45 of the electric motor 40.

As shown, an air inlet 46 communicates with inlet pipe 18 and an air outlet 47 into which outlet pipe 21 extends. The rotor 44 includes radial passages 48 that communicate with radial openings 49 and a drilled axial opening 50 in the shaft 45. An oil reservoir 51 is mounted on the housing 41 and communicates with the passage 50 in the shaft 45 to provide oil under pressure to the passage 50 and, in turn, through openings 49 and passages 48 to the inner ends of the vanes 43 and thereby yieldingly urge the vanes 43 outwardly against the cam surface of ring 42. In addition, the ends of the vanes 43 are preferably magnetized so that they tend, by magnetic action, to remain in contact with the surface of the ring 42 which is made of a magnetic material. The pressure to the oil in the reservoir 51 is provided by the air from the compressor and specifically, the air from the oil separator 15 through a pipe 52. By this combination of oil pressure on vanes 43 and magnetic action, compressor 14 produces a minimum of noise.

As shown in FIG. 9, oil separator 15 comprises an outer housing 53 and an inner housing 54. The oil-laden air from the compressor outlet 47 passes through pipe 21 into an axially extending vertical pipe 55 that terminates with its upper end adjacent transverse wall 56 of inner housing 54. The oil-laden air strikes wall 56 and is reversed in its movement, causing the oil and air to move downwardly along the outside of the pipe 55 and the inner wall of the housing 54. Openings 56 are provided on the lower end of the inner housing 54 and the air passes outwardly through these openings 56 axially upwardly between the inner and outer housings 53, 54, through filter material 58, and to the outlet pipe 16 at the upper end of the housing 53. This double reversal of direction of the oil-laden air causes the oil to drop downwardly and collect in the lower portion of the separator and pass through the outlet pipe 52 to the reservoir 51 which supplies oil to the inner ends of vanes 43. The air pressure within the oil separator 15 and

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above this oil forces the oil to urge the vanes 43 outwardly. As shown in FIG. 9, secondary openings 57 in housing 54 permit oil that may collect between the inner and outer housings 53, 54 to pass radially inwardly to the oil outlet 52.

The tank 11 may comprise the usual fuel tank in the home or building and the oil in the reservoir 51 which is applied to the inner ends of the vanes 43 may comprise fuel oil of the same type as utilized in the tank 11. If the oil in the reservoir 51 is of the same type as the oil being utilized for combustion in tank 11, then in some instances the oil separator can be eliminated.

In operation, the motor 40 is operated to cause air to be compressed and supplied to the burner assembly 10 to aspirate oil into the burner assembly 10. Initially, electrodes 60 having their ends adjacent the nozzle 32 and within chamber C, ignite the fuel (FIG. 2). Once the fuel is ignited, the electrodes can be de-energized, automatically in accordance with well-known practice.

It can be understood that automatic controls for the apparatus can be such as conventionally known in the art and are not a part of the present invention.

It has been found that it is possible to modulate the flame by simply varying the amount of air and/or fuel by means of automatic controls on valves 13, 19. For example, air valve 19 can be automatically controlled by a thermostat, as shown in FIG. 1. By this arrangement, the burner apparatus can be operated continuously without "on" and "off" cycles thereby extending the reliability and performance of the apparatus as contrasted to the burner apparatus which is operated on an on and off basis. The flames that can be obtained by the burner apparatus can be of different lengths, different colors such as bright yellow, luminous, or deep blue, and all such flames have been found to exhibit very complete combustion without soot or carbon deposition.

It has been further found that the burner apparatus can be operated at very low firing rates with complete efficiency.

The relatively simple and few number of parts results in a low installation cost and minimum maintenance. Whatever maintenance may be required is simple and easily achieved.

It has been further found that the burner apparatus operates at a low noise level which is not objectionable. A further contributing factor to the quiet operation of the burner apparatus is that it may be operated continuously without pulsations that cause objectionable noises.

It has been further found that the burner apparatus operates efficiently. This results in a lower fuel cost per B.t.u.

A further feature of the invention that is apparent from the above description is that the burner apparatus is compact, requiring a minimum of space for producing efficient results.

I claim:

1. In a burner apparatus, the combination comprising a burner assembly, means interconnecting said burner assembly and a source of fuel oil, a compressor including a plurality of radial vanes operable with a cam surface, said compressor having an air inlet and an air outlet, reservoir means associated with said compressor and communicating with the radially inner ends of said vanes for supplying fuel oil to said vanes to yieldingly urge said vanes radially outwardly into engagement with said cam surface, an oil separator including a chamber to which air from said compressor outlet is directed for separating the oil from said air, said oil separator having oil collecting areas and means connecting the oil collecting areas thereof with said reservoir means of said compressor whereby said

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oil from said separator is returned to said reservoir means of said compressor and air pressure is applied to the oil in the reservoir means through said connecting means to yieldingly urge the vanes radially outwardly,

and means providing communication for passage of air from said separator to said burner assembly whereby air under pressure is supplied to said burner assembly,

said burner assembly being of the oil aspirating type to draw fuel oil from said source when air under pressure is supplied thereto.

2. The combination set forth in claim 1 including means for controlling the flow of oil from said tank to said burner assembly, and means for controlling the flow of air to the inlet of said compressor.

3. In a burner apparatus, the combination comprising an oil aspirating type burner assembly,

an oil supply tank,

means interconnecting said burner assembly and the oil supply tank,

a compressor including a plurality of radial vanes operable within a ring,

said compressor having an air inlet and an air outlet,

an oil reservoir associated with said compressor and communicating with the radially inner ends of said vanes for supplying oil to said vanes to yieldingly urge said vanes radially outwardly into engagement with said ring,

an oil separator including a chamber to which air from said compressor outlet is directed for separating the oil from said air,

said air separator having an oil collecting area,

means connecting the oil collecting area of said separator with said reservoir of said compressor whereby said oil from said separator is returned to said reservoir of said compressor and air pressure is applied to the oil in the reservoir through said connecting means to yieldingly urge the vanes radially outwardly,

and means providing communication for passage of air from said separator to said burner assembly whereby air under pressure is supplied to said burner assembly to aspirate oil from said supply tank.

4. The combination comprising a compressor including a plurality of radial vanes operable within a cam surface,

said compressor having an air inlet and an air outlet,

and an oil reservoir associated with said compressor and communicating with the radially inner ends of said vanes for supplying oil to said vanes to yieldingly urge said vanes radially outwardly into engagement with said ring,

an oil separator including a chamber to which the air from said compressor outlet is directed for separating the oil from said air,

said air separator having means connecting the oil collecting areas thereof with said reservoir of said compressor whereby said oil from said separator is returned to said reservoir of said compressor and air pressure is applied to the oil in the reservoir to yieldingly urge the vanes radially outwardly.

5. The combination set forth in claim 4 including magnetic means urging said vanes toward said cam surface.

6. An aspirating type burner assembly comprising

a body having a chamber extending generally axially thereof,

a tube positioned centrally of said chamber and extending beyond the end of said chamber,

an inlet in said body for supplying oil to said tube, an inlet in said body for supplying air under pressure to said chamber,

and nozzle means closing the end of said chamber, said nozzle means having an axial opening therein

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into which the end of said tube projects to close said chamber,
said nozzle means and tube defining a space beyond the end of said tube,

said nozzle means having a plurality of generally radially extending passages therein providing communication between said chamber and said space. 5

7. The combination set forth in claim 6 including means for moving said tube axially relative to said radial passages to variably restrict said passages.

8. The combination set forth in claim 6 including a housing surrounding the open end of said passage and extending axially therebeyond, 10

said housing having an opening axially aligned with the opening in said transverse wall,
said housing having secondary air openings adjacent said transverse wall extending to the atmosphere.

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9. The combination set forth in claim 6 including sound absorbing and fire resistant material within said housing.

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