Nov. 15, 1966 W. E. GUSTAFSON ETAL 3,285,316

OIL BURNING COMBUSTION HEAD

Filed Jan. 27, 1964

FIG. 1.

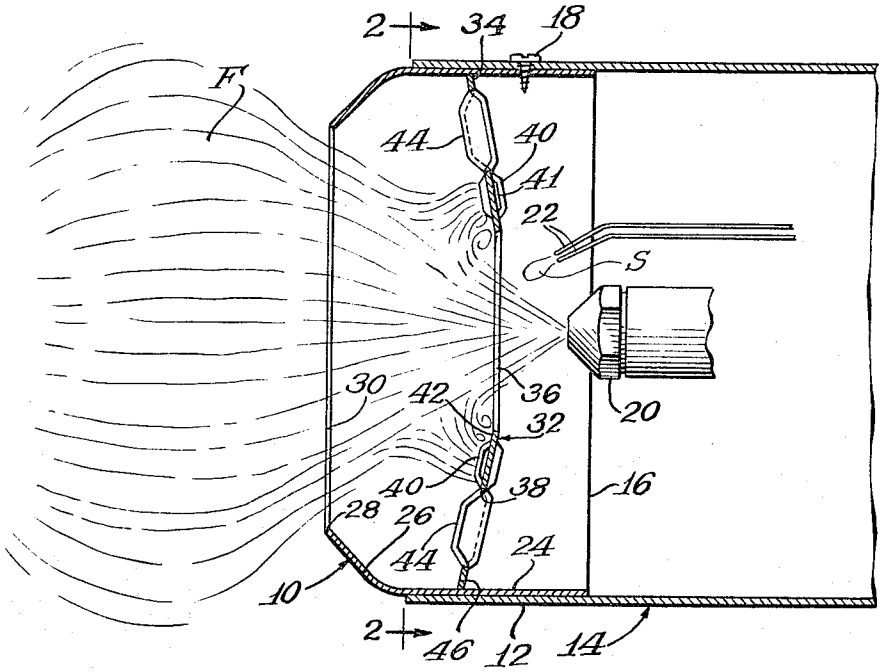


FIG. 2.

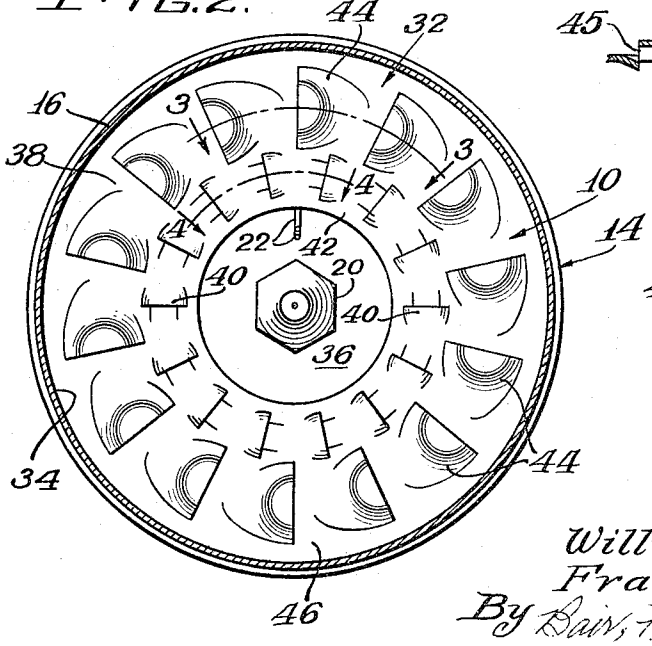
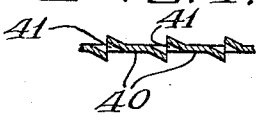


FIG. 3.



FIG. 4.



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OIL BURNING COMBUSTION HEAD

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This invention relates to an improved oil burner combustion head which is adapted to provide a generally improved performance for the oil burner.

In constructing an oil burner, a number of important factors are to be taken into consideration, and although there are various types of oil burners on the market, most such devices have one or more drawbacks. For example, one problem encountered with most types of oil burners is flame pulsation, which results in an inefficient use of fuel. Efficiency of combustion may also be improved by providing an intimate mixing of air and atomized oil. The oil burner flame should also be stable and quiet, and the oil burner construction should also provide smooth and efficient ignition or starting of the burner for each cycle. Although some prior art devices may overcome many of such design problems associated with oil burner construction, none are known to overcome such problems to the desired extent by simple and economical construction.

It is therefore an important object of this invention to provide an improved oil burner by providing a combustion head therefor wherein disadvantages of prior art devices are substantially avoided.

It is also an object of this invention to provide an improved oil burner combustion head wherein an improved mixing of air and atomized oil is provided.

It is a further object of this invention to provide an improved oil burner combustion head wherein a stable, quiet flame results.

It is another object of this invention to provide an improved combustion head for a domestic oil burner wherein smooth ignition or starting of the flame is provided for each cycle.

It is still a further object of this invention to provide an improved combustion head for a domestic oil burner wherein pulsation of the flame is substantially avoided.

It is still another object of this invention to provide an improved combustion head for an oil burner wherein the combustion head includes a central disc having an opening which is aligned with the air spray nozzle and vanes or openings are provided in the annular portion of the disc in order to create air currents which are adapted to maintain the burner flame in close proximity to the disc.

It is yet a further object of this invention to provide an improved oil burner combustion head wherein the combustion head has a coned end which preheats some of the combustion air, whereby the preheated air assists in providing a highly efficient and clean burning flame.

Further purposes and objects of this invention will appear as the specification proceeds.

A particular embodiment of the present invention is illustrated in the accompanying drawings, wherein:

FIGURE 1 is a longitudinal sectional view through my improved oil burner combustion head, shown in conjunction with an air supply tube and an oil spray nozzle;

FIGURE 2 is a sectional view taken along the line 2—2 of FIGURE 1;

FIGURE 3 is a sectional view taken along the line 3—3 of FIGURE 2; and

FIGURE 4 is a sectional view taken along the line 4—4 of FIGURE 2.

Referring to the drawings, my improved combustion head **10** is shown in secure attachment to the outer end **12** of an air supply tube **14**. As shown in FIGURE 2, both the air supply tube **14** and the combustion head **10** are substantially circular in cross-section, the combustion head **10** being adapted to telescope within the air tube **14** so that the outer cylindrical surface of the combustion head housing **16** and the inner cylindrical surface of the air tube **14** are in intimate or sealing contact. The head **10** is fastened to the air tube **14** by any suitable means, as by a sheet metal screw **18**. Centrally, positioned within the air tube **14** is an oil spray nozzle **20**, which is adapted to provide a fine spray of oil, suitable for efficient combustion. Ignition of the atomized oil emitting from the nozzle **20** is provided by an electric spark passing between a pair of electrical ignition points or leads **22** adjacent the nozzle **20**.

The housing **16** of the combustion head **10** includes a cylindrical portion **24**, which is maintained in intimate or sealing contact with the air tube **14**, and is also provided with an inwardly coned end portion **26**, which projects outwardly from the end **12** of the air supply tube **14**. The cone **26** terminates as a rim **28** which surrounds a central aperture **30**, through which the burner flame F passes.

A generally circular metallic plate or disc **32** is mounted along the inner periphery of the cylindrical wall of the combustion head housing **16**. The disc **32** is mounted transverse, preferably perpendicular, to the axis of the combustion head **10** and the air tube **14** and is located intermediate the air nozzle **20** and the coned end **26** of the housing **16**. The disc **32** has its outer edge or periphery **34** in substantially continuous contact with the inner periphery of the combustion head housing **16**, thereby allowing little if any passage of air between the housing **16** and the outer edge **34** of the disc **32**.

The circular plate **32** also includes a central opening **36** which is in substantial alignment with the oil spray nozzle **20** and with the central aperture **30** formed by the rim **28** of the cone **26**. The central opening **36** is of a smaller diameter than the aperture **30** at the coned end **26**. An annular portion **38** of the disc **32** is defined between the outer periphery **34** of the disc **32** and the central opening **36**. The anular portion **38** includes a first or inner set of vanes or louvers **40**, which define openings **41**, and a second or outer set of vanes **44**, which define openings **45**. The first set of vanes **40** are spaced inwardly a short distance from the central opening **36**, a rim **42** being located therebetween. The air-directing vanes **40** are spaced at substantially equal distances from each other and are also spaced inwardly from the central opening **36** at substantially equal distances. The outer set of openings of air-directing vanes **44** are also spaced a substantialy equal distances from each other and from the central opening **36** of the disc **32**. An outer rim **46** is provided on the disc **32** between the vanes **44** and the outer periphery **34** of the disc **32**. Dimensionally, the second or outer set of vanes **44** are larger than the inner set of vanes **40**, but the number of vanes in each set are equal to each other, as they are staggered with respect to each other, as shown in FIGURE 2.

Each set of vanes **40** and **44** may be simultaneously formed in the annular portion **38** of the disc **32** by any suitable means, as by stamping. The air passages or openings **41** and **45** defined by the vanes **40** and **44** are in a plane transverse to the plane of the disc **32** or, in other words, are in substantial alignment with the axis of

the combustion head **10**. Referring to FIGURES 3 and 4, cross-sectional views of the outer set of vanes **44** and the inner set of vanes **40** are shown. Both sets of openings **41** and **45** are defined by the forward edge of one vane and the trailing edge of the adjacent vane. The air openings **41** and **45** cooperate with the vanes **40** and **44** to direct air in a direction substantially transverse to the axis of the combustion head **10** to thus initially provide a swirling movement of air in the chamber defined by the disc **32** and the walls of the housing **16**. The movement of air, as viewed from FIGURE 2, is in a counterclockwise direction for both sets of vanes **40** and **44**, although the movement of air may be clockwise without affecting the operation of the combustion head **10**. A sufficient number of vanes **40** and **44**, having the general configuration of convolute protuberances, are required in order to provide uniform distribution of air and proper turbulence, in order to provide the desired results; it has been found that about 10–14 vanes are satisfactory for both sets.

Since the combustion head housing **16** and cooperating disc **32** are in direct contact with or in close proximity to the flame F, both the disc **32** and combustion head **10** are to be made of heat resistant metal. Preferably a high temperature stainless steel is used; AISI type –30a stainless steel is particularly satisfactory.

In operation, when oil is sprayed in a fine mist or atomized by the nozzle **22**, it is ignited by a spark S passing between the ignition points **22**. Simultaneously, air is directed by a blower (not shown) through the air supply tube **14** in a direction from the nozzle outwardly through the central aperture **30** at the coned end **26** of the housing **16**. The air passing through the inner set and outer set of vanes **40** and **44** create air currents or turbulence across the rim **42** adjacent the central opening **36** of the disc **32**. Similarly air or eddy currents are set up at the outer edges of the vanes **40** and **44**; the air currents at the inner set of openings **41** draw some of the fine oil spray from the nozzle **22** to the zone of low velocity opposite the rim **42**. This enables the flame F to be maintained at the rim **42** and at the edges of the vanes **40**, thus preventing the flame F from drifting away from the burner, as commonly encountered with conventional burners. Most of the air required for combustion is then admitted to the flame F through the larger openings **44** and through the central opening **36** in the disc **32**. The air from the openings **44**, flowing tangentially into the chamber formed between the cone **26** and disc **32** creates the air turbulence necessary to produce a substantially brush shaped flame.

Preferably, the coned portion **26** of the combustion head housing **16** extends into the combustion chamber (not shown). Due to the proximity of the flame F to the coned portion **26**, the cone becomes extremely hot; the cone **26** then causes preheating of the air passing through the second set of openings **44**, prior to introduction thereof to the flame F. This results in a flame which is of high efficiency and is clean burning; furthermore, the inwardly directed cone **26** causes the air to be directed towards the flame F.

While in the foregoing there has been provided a detailed description of a particular embodiment of the present invention, it is to be understood that all equivalents obvious to those having skill in the art are to be included within the scope of the invention as claimed.

What we claim and desire to secure by Letters Patent is:

1. An oil burner combustion head wherein said combustion head is mounted on an air supply tube and an oil spray nozzle is centrally located within said air tube and having ignition means adjacent the spray nozzle, said combustion head comprising a substantially cylindrical housing, an outer end portion on said hoising, a disc mounted interior of said housing intermediate said outer end portion and said nozzle and transverse to the axis of said housing, said outer end and said disc defining a chamber within said housing, said disc having a central

opening defining an inner rim and an annular portion, a first set of openings in said annular portion defined by convolute protuberances, said first set of openings being spaced inwardly from said central opening for creating air currents flowing generally tangentially into said chamber for drawing some of the fine oil spray from said nozzle to a zone of low velocity opposite said rim whereby the burner flame is maintained in close proximity to said rim and to said first set of openings, and a second set of openings in said annular portion intermediate said first set of openings and the inner surface of said housing, said second set of openings being defined by convolute protuberances for tangentially directing air into said chamber for creating air turbulence to provide a substantially brush-shaped flame and also assisting said first set of openings in creating air currents for maintaining said flame in close proximity to said disc.

2. Oil burner means comprising an air supply tube, an oil spray nozzle mounted within said air supply tube, a combustion housing secured to the outer end of said air supply tube, an inwardly coned outer end on said housing, a disc mounted interior of said housing intermediate said coned end and said nozzle, said disc being transverse to the axis of said housing and having a central opening defining an inner rim and an annular portion, said disc and said coned end defining a chamber therebetween and within said housing, a first set of openings in said annular portion defined by convolute protuberances spaced inwardly of said central portion for creating air currents flowing generally tangentially into said chamber for drawing some of the fine oil spray from said nozzle to a zone of low velocity opposite said rim whereby the burner flame is maintained in close proximity to said rim and said first set of openings, and a second set of openings in said annular portion defined by convolute protuberances positioned outwardly of said first set of openings and tangentially directing air from said air supply tube into said chamber for creating air turbulence to provide a substantially brush-shape flame and also directing air to said coned end so as to heat air prior to introduction thereof into the burner flame and further assisting in maintaining the burner flame in close proximity to said disc.

3. The oil burner means of claim **2** wherein said first set of openings is smaller in size than said second set, and all of said openings direct air in the same swirling direction and substantially tranverse to the axis of said housing.

4. Oil burner means comprising an air supply tube, an oil supply nozzle centrally mounted within said air supply tube, ignition means adjacent the nozzle, a substantially cylindrical housing secured to the end of said air supply tube, an inwardly coned outer end portion on said housing, an annular plate mounted along the inner surface of said housing and being transverse to the axis of said housing, said plate being located forward of said spray nozzle, rearward of said coned end, and having a central opening defining an inner rim and an annular portion, said central opening being in substantial alignment with said nozzle and permitting oil spray from said nozzle to pass therethrough, said plate and said coned end defining a chamber therebetween and within said housing, a first set of vanes defined by convolute protuberances spaced from each other in said annular portion and being located inwardly of said central opening, said first set of vanes directing air substantially tangentially into said chamber for drawing some of the fine oil spray from said nozzle to a zone of low velocity opposite said rim whereby the burner flame is maintained in close proximity to said rim and to said first set of vanes, and a second set of vanes of larger dimension than said first set of vanes, said second set of vanes defined by convolute protuberances, said second set of

vanes tangentially directing air into said chamber from said air supply tube and creating air turbulence to provide a substantially brush-shaped flame and also directing air to said coned end portion to preheat the air passing through said second set of vanes prior to introduction thereof to the flame, said second set of vanes further assisting in creating air currents for maintaining said burner flame in close proximity to said plate, both of said sets of vanes directing the air in a swirling direction within said chamber.

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