Jan. 3, 1961 J. L. BREESE ET AL 2,966,941

ELECTRICAL IGNITION ASSEMBLY FOR LIQUID FUEL BURNERS

Original Filed Nov. 4, 1955 3 Sheets-Sheet 1

Fig. 1

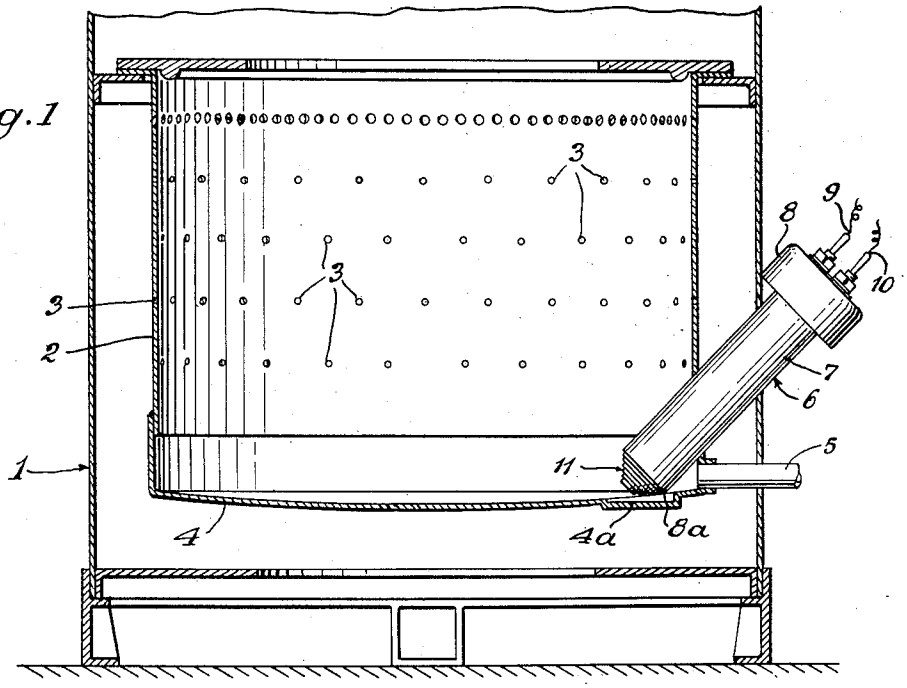


Fig. 2

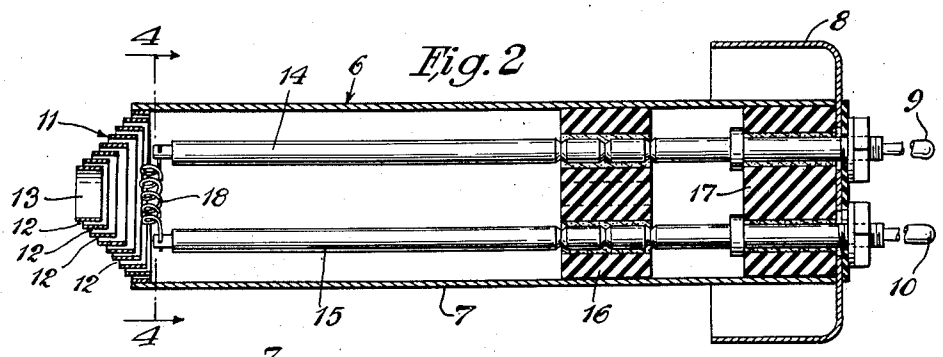
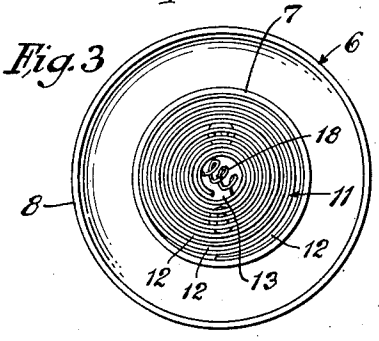


Fig. 3



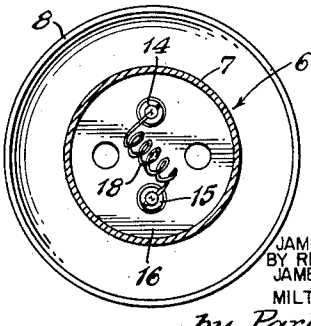


Fig. 4

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ELECTRICAL IGNITION ASSEMBLY FOR LIQUID FUEL BURNERS

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Fig. 5

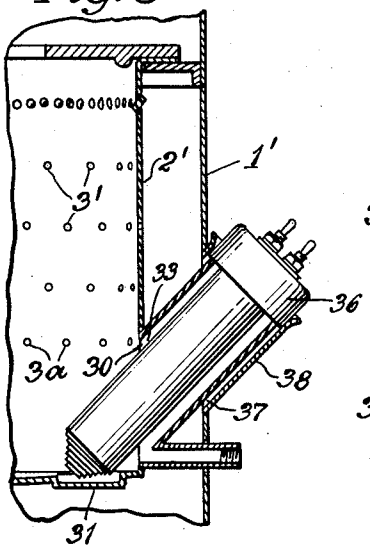


Fig. 7

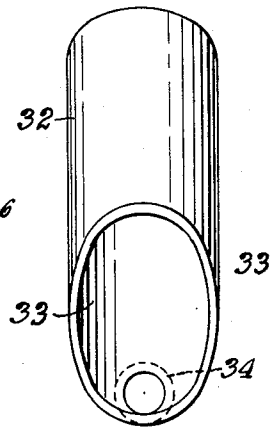


Fig. 6

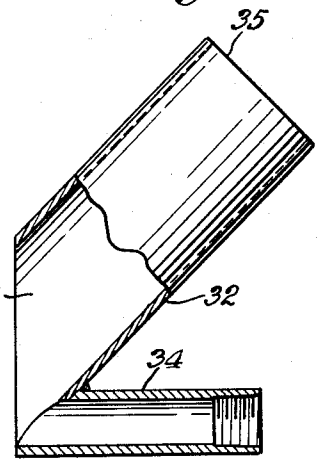
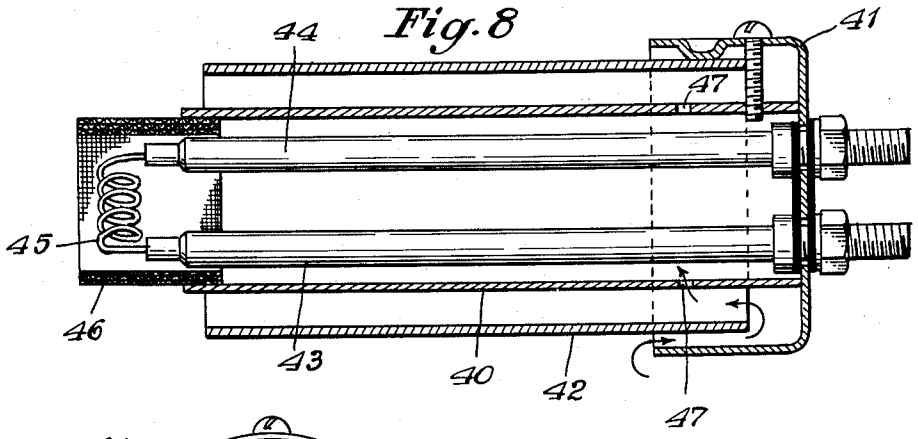


Fig. 8



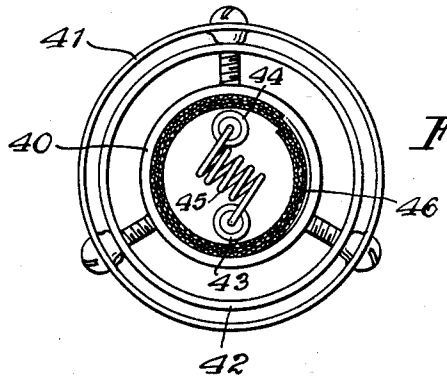


Fig. 9

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ELECTRICAL IGNITION ASSEMBLY FOR LIQUID FUEL BURNERS

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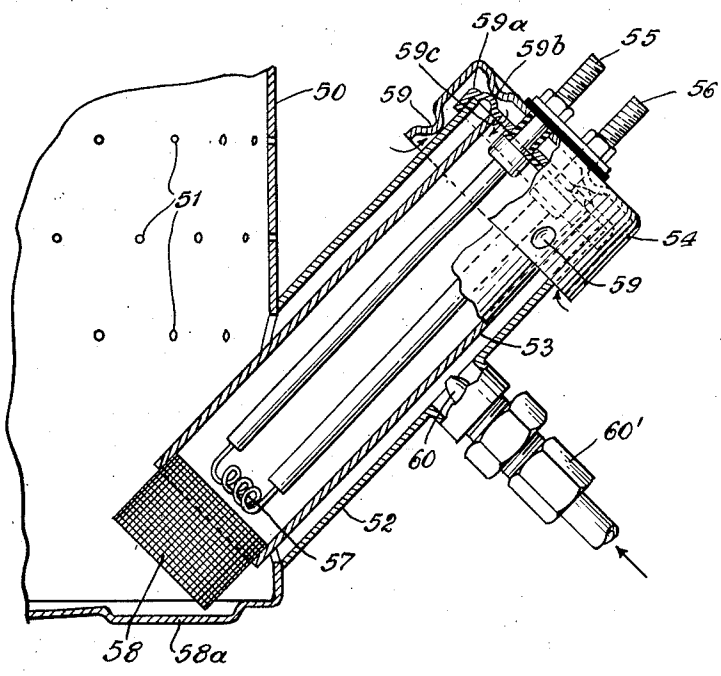


Fig. 10

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United States Patent Office 2,966,941 Patented Jan. 3, 1961

2,966,941

ELECTRICAL IGNITION ASSEMBLY FOR LIQUID FUEL BURNERS

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Original application Nov. 4, 1955, Ser. No. 544,918. Divided and this application Feb. 25, 1960, Ser. No. 11,085

3 Claims. (Cl. 158—91)

This invention is directed to a new and improved method and mechanism for igniting the fuel in oil burners, and is a division of co-pending application Serial No. 544,918, filed November 4, 1955.

One purpose of the present invention is to provide an improved method of ignition for oil burner pots wherein the possibility of explosions during the ignition period is materially lessened.

Another purpose is to provide a heat storage means for initially vaporizing a substantial volume of liquid hydrocarbon fuel at the starting stage.

Yet another object is to provide means for bringing an oil burner to a high fire condition with a minimum time lag after ignition.

Another purpose is an improved electrical ignition assembly for oil burners wherein a flame spreads rapidly and evenly throughout the pot upon ignition.

Another purpose is an improved supporting arrangement of a burner pot and electrical ignition assembly.

Other objects will appear from time to time in the course of the ensuing specification and claims.

Referring generally now to the drawings:

Figure 1 is an assembly view in section illustrating our improved ignition assembly in its supported position in a burner pot;

Figure 2 is a sectional view of the ignition assembly illustrated in Figure 1;

Figure 3 is an end elevation of the ignition assembly shown in Figure 2;

Figure 4 is a sectional view looking in the direction of the arrows shown at 4—4 in Figure 2;

Figure 5 is a sectional view of a modified form of the invention;

Figure 6 is an enlarged detail view of one element utilized in the assembly shown in Figure 5;

Figure 7 is an end view of the element illustrated in Figure 6;

Figure 8 is a sectional view of a further modification;

Figure 9 is an end view of the device illustrated in Figure 8; and

Figure 10 is a sectional illustration of another modification.

Like elements are designated by like characters throughout the specification and drawings.

Referring specifically now to the drawings and in the first instance to Figure 1;

We illustrate a heater casing 1 having the customary burner pot 2 supported therein. The burner pot 2 has the customary apertures 3 which are arranged in a plurality of horizontal rows for the purpose of admitting primary and secondary air to the interior of the burner pot. The space between the casing and the pot is the high pressure side and the area inside of and adjacent the pot wall is the low pressure side. The bottom of the pot 4 is adapted to receive a supply of oil for burning

within the pot. The fuel may be supplied by any suitable inlet represented diagrammatically at 5. We wish it to be understood that the details of the heater casing and burner pot may be widely varied and the showing of the casing and burner pot in Figure 1 should be taken in a diagrammatic sense.

The bottom of the pot may include a sump 4*a* adjacent the fuel inlet so as to create some "puddling" of fuel adjacent to the inlet 5.

An electrical ignition assembly, designated generally at 6, includes a generally cylindrical housing 7 which extends through the wall of the heater casing and the wall of the burner pot and terminates as at 8*a* adjacent the bottom of the pot and over the sump 4*a*. The ignition assembly 6 may contact the sump 4*a*. As will be clear in Figure 1, the housing 7 extends into the pot at an angle inclined to the horizontal and vertical. The assembly includes a circumferential shield 8 which fits over the upper end of the housing exteriorly of the heater casing. Represented at 9 and 10 are a pair of electrical leads which may be connected to any suitable source of electrical energy.

The housing 7 is preferably formed of metal so as to store heat therein.

According to the invention we provide means for conducting fuel vapor from the bottom of the pot to the interior of the housing 7. A wick element 11 is formed on the lower end of the housing. It preferably takes the form of a spirally wound stainless steel strip which provides a plurality of passages 12 between the convolutions of the spiral. The convolutions of the spiral surround and define a central aperture 13 which is generally coaxial with the axis of the housing 7. It should be noted that in Figure 2 the convolutions of the spiral are offset from one another so that the wick element has a plurality of the passages 12 extending to a point closely adjacent to the pot bottom as will be seen most clearly in Figure 1.

A pair of spaced electrically conductive poles 14 and 15 are positioned within the housing 7 and connected to the leads 9 and 10. The poles 14 and 15 may be supported by any suitable insulating members 16 and 17 which are snugly received within the housing 7. The poles 14 and 15 terminate adjacent the wick element 11. The poles 14 and 15 conduct electrical energy to a resistance heating element which takes the form of a coil 18. The resistance heating element may be formed of Nichrome wire or other equivalent material. The heating element 18 is opposed to the central opening or aperture 13 as is seen most clearly in Figures 3 and 4.

The housing 6 makes a snug fit with the openings in the pot wall and heater casing through which the housing extends. We find it particularly advantageous to position the housing 6 at an angle to the horizontal whereby the lower end of the housing is positioned adjacent the fuel inlet and adjacent the bottom of the pot.

The housing or tube 6 may be made liquid tight with respect to the wall of the burner pot 2 by any suitable means (not shown). It should be noted in this connection that the upper end of the tube or housing terminates at a point above the lowermost level of air inlet apertures 3. At the same time, the ignition tube can be made removable if desired, so that a rectilinear upward and outward pull will remove the tube.

Figures 5, 6 and 7 illustrate a modified form of the invention. In Figure 5, for example, the pot is designated at 2′ and is provided with air inlet apertures 3′. The heater casing is designated at 1′. In this form of the invention an opening 30 is formed in the pot wall adjacent the lower portion thereof and adjacent to the sump 31. An ignitor support 32, in the form of a

generally cylindrical sleeve has, at its lower end, an opening 33 corresponding in size to the opening 30. A fuel inlet pipe 34 is formed integrally with the support 32 and is disposed at an acute angle thereto as appears in Figure 6. The support 32 is adapted to be welded or otherwise affixed to the pot wall so that the axis of the support is inclined to the pot wall and to the bottom of the pot. The upper end of the support 32 is provided with an opening 35 through which an ignitor tube assembly, similar in all respects to that illustrated in Figure 2, is removably inserted. In this form of the invention, the shield 36 surrounds the upper end of the support 32.

It should be noted that the opening in the upper end of the support is positioned at least as high as the lowermost level of air inlet apertures in the pot wall, which we have designated at 3*a*.

The heater casing is formed with an opening 37 allowing passage of the support 32 therethrough. The heater casing may be also provided with a fitting 38 which has a diameter such as to snugly receive the shield 36.

In the form of the invention illustrated in Figure 8, the ignitor tube is designated at 40 and includes a shield 41 which is adapted to surround a support 42 which, for purposes of description, may be taken to be of the same form as the support 32 illustrated in Figures 5, 6 and 7. The shield 41 is spaced from the support 42 by indentations in the body of the shield, thus providing a space for the passage of air to the interior of the support. Electrically conductive poles 43 and 44 are fixed to the end wall of the shield 41 and extend through the tube or housing 40. A resistance heating element 45 is fixed to the poles adjacent the inner or lower end of the tube 40. Electrical leads may be connected to the ends of the poles adjacent the shield 41. In this form of the invention a metallic wick is formed of several super-imposed layers of stainless steel screen wire. The wick is designated at 46. It should be noted that the wick 46 surrounds the heating element 45 and is supported at the lower end of the tube 40. The upper end of the tube is provided with air inlet apertures 47 so that air may pass to the interior of the tube. The shield 41 is spaced from the support 42 so that a flow of air following the path of the arrows shown in Figure 8 may pass from the exterior of the burner pot to the interior of the tube.

The wick element 46 defines what is in effect, a combustion chamber at the lower end portion of the tube 40, and primary air for combustion passes to this combustion chamber from the apertures 47 while secondary air passes through the space between the support 42 and tube 40.

In Figure 10 the burner pot is designated at 50 and is provided with rows or levels of air inlet apertures 51. In this form of the invention a support 52 is joined to the pot wall and is inclined to the wall of the pot as well as the bottom of the pot in a manner similar to the support 32 in Figure 5. An ignitor tube 53 is removably inserted in the support 52. The ignitor tube is provided with a shield 54 at its upper end portion. Electrically conductive poles 55 and 56 with terminals at their outer ends extend through the shield and terminate adjacent the lower end of the tube. A resistance heating element 57 is connected to these two poles at their lower ends. A metallic wick of the form described with reference to Figure 8 is supported at the lower end of the tube as at 58. The wick 58 is positioned closely adjacent the sump 58*a* in the bottom wall of the burner pot. The sump 58*a* is important as it permits the pooling of a fair supply of oil to facilitate rapid vaporization for quickly bringing the burner to full fire.

The tube 53 stores up heat radiated from the ignitor elements and facilitates the vaporization of the oil drawn up by the wick 58. If the tube 53 is too close to the ignitor elements, the vapor becomes more of a fog and is not a combustible mixture, and, hence, is unsatisfactory. If, on the other hand, the clearance between the ignitor elements and the ignitor tube 53 is increased appreciably, the current requirements go up and the life of the ignitor elements is shortened. Preferably the clearance between the ignitor tube 53 and the ignitor elements is just sufficient to produce a combustible mixture as opposed to an incombustible fog.

The shield 54 is provided with indentations 59 that make a snug fit with the exterior of the support 53. An end plate 59*a* is joined to the tube 53 and overlies the upper end of tube 53. End plate 59*a* is spaced from the shield 54 as by indentations 59*b*. Apertures 59*c* are formed in the end plate so as to allow primary air for combustion to flow through the spaces between indentations 59, thence through the spaces between indentations 59*b* and down to the area adjacent heating element 57. The flow is indicated by the arrows in Figure 10. A fuel inlet is designated at 60'. It supplies fuel through a spray nozzle 60 which is located at approximately the mid-point of the support 52. Oil sprayed through the nozzle 60 may pass downwardly through the space between the support 52 and tube 53.

Whereas we have shown and described an operative form of our invention, we wish it to be understood that there are many modifications of this invention which will fall within the scope and spirit of the invention and which will be apparent to those skilled in the art. The drawings and description of the invention should be taken in a diagrammatic or illustrative sense and the scope of the invention should be limited only by the scope of the hereinafter appended claims.

The use and operation of our invention is as follows:

In each form of the invention we position an ignitor tube or housing at an angle to the horizontal. This angle is on the order of 45°. This particular disposition of the ignitor tube facilitates the location of the electrical leads at a point remote from the pot thus avoiding damage to the leads due to the heat in the pot. In each form of the invention, the upper end of the support or housing for the electrically conductive poles terminates at a level above the lowermost level of air inlet apertures in the pot. Thus if any flooding of the pot occurs fuel will "spill out" through the primary air apertures rather than through the ignition tube. In each form of the invention a metallic wick provides capillary passages for fuel vapors at a point adjacent the resistance heating element and in each form of the invention these passages surround an opening opposed to the heating element.

In each form of electrical ignition assembly the hydrocarbon fuel is initially heated and gasified by electrical energy. When current is supplied to the resistance heating element the metallic wick will be heated to a sufficient temperature in relation to the volume of fuel involved, so that when fuel begins to flow, and the wick fills with liquid fuel, the stored heat in the wick is itself sufficient to vaporize at least the initial increment of fuel to the wick. This vapor forms about the resistance heating element, and also, in the space immediately exterior to the wick. In effect, the wick and the adjacent portions of its support members including the housing and wick support tube form a reservoir.

In each form of the invention means are provided for circulating air through the area of the combustion chamber adjacent the heating element. In Figure 2, for example, air may circulate through the openings 12 and 13. In the forms of the invention illustrated in Figures 8 through 10 inclusive, air external to the burner pot is supplied through the ignition tube to the combustion chamber surrounding the heating elements. Secondary air is supplied to the area surrounding the wick. This flow of air in all cases is insufficient to cool the heating element, when energized, below the ignition temperature of the fuel. The flow of air is sufficient, however, to initiate primary combustion.

As the vapor due to the stored heat in the wick forms, or almost immediately after it begins to form, the vapor

in the housing within the tube and inside of the wick is ignited by the resistance and explodes out through the housing. This initial flame is directed downwardly toward the bottom of the pot and at a point relatively close to the pot side wall. At the same time, or instantaneously thereafter, the vapor in the space exterior to the wick is ignited and the end results is a substantial combustion of vaporized fuel which is effective to initiate further vaporization and consequent combustion, the ignition of the pot being thus started. Thus the flame will spread rapidly and evenly over the surface of oil covering the pot bottom.

In each form of the invention this ignition tube is simply inserted through the pot wall and may be removed for inspection and repair if necessary. The ignition tube may be removed by a simple rectilinear upward and outward pull. In Figures 5 through 10, the upper opening in the support is well above the lowermost row of air inlet apertures and fuel spillage due to flooding of the pot will occur through the lowermost row of apertures rather than through the support.

What is claimed is:

1. In a vaporizing type oil burner, the combination comprising a burner body having a floor and upstanding walls extending therefrom and wherein oil is adapted to be supplied to at least a portion of the floor of the burner body, an electric ignition element positioned within said body and vertically spaced from the floor, a hood surrounding a portion of said element and defining a

chamber around said portion, said hood having a wall portion between said element and said floor, said wall portion being spaced from said portion of said floor, said hood having an opening in a lower portion thereof, and a wick extending from at least immediately adjacent the portion of the floor of said burner body through said opening, said wick being out of contact with said element and terminating within said chamber, said opening in said lower portion of said hood being located in a position such that the portion of said wick adjacent said opening is subjected to radiant heat from said element, whereby oil is metered from said portion of said floor to said chamber by said wick and radiant heat from said element vaporizes a portion of the oil in said wick, the amount of oil which is vaporized depending on the degree of energization of said element and the size of said opening of said hood.

2. The structure of claim 1 characterized by and including means for delivering air through the interior of said hood and toward said wick.

3. The structure of claim 1 further characterized by means for pooling oil in said floor portion of the burner body adjacent said wick.

References Cited in the file of this patent

UNITED STATES PATENTS

2,553,975	Little	May 22, 1951
2,712,352	Manor et al.	July 5, 1955
2,779,398	Brown	Jan. 29, 1957