

UNITED STATES PATENT OFFICE

2,431,456

IGNITION SYSTEM FOR POT-TYPE OIL
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This invention relates to ignition systems and more particularly to an ignition system for a liquid fuel burner which is adapted effectively to initiate combustion of fuel and promote efficient burning.

This application is a continuation in part of my copending application, Serial Number 504,585, filed October 1, 1943.

An object of this invention is to provide an ignition system for liquid fuel burners which effectively initiates and promotes efficient combustion of the fuel and minimizes the possibility of ignition failure.

Another object of this invention is to provide an electrical ignition system for pot type oil burners which has the parts of the burner and its combustion system constructed and arranged to promote cooperative operation with the elements which serve to ignite the fuel.

Another object of this invention is to provide an electrical ignition system for pot type oil burners in which the ignition elements and air inlet ports are not only arranged to improve ignition and combustion of the oil, but also to prevent fouling of the ignition elements by the oil.

An additional object of this invention is to provide a construction and arrangement for a pot type burner including a wick-like ignition electrode which prevents continuous accumulation of fuel on the wick-like element during normal combustion, and thereby reduces the possibility of fouling the ignition by the building of carbon deposits.

A further object of this invention is to provide, in a pot type fuel burner, a wick-like ignition element adapted to carry a film of fuel for ignition purposes during ignition and initial combustion, but which is spaced from the bottom of the burner pot by an amount such that it is normally above the fuel level during combustion.

Another object of this invention is to provide an electrical ignition system for liquid fuel burners in which air is supplied in a manner which aids ignition and initial combustion and promotes rather than disturbs the natural and symmetrical air flow which maintains efficient combustion throughout the burner.

This invention specifically comprehends an electrical ignition system for a pot type liquid fuel burner in which the ignition element of the system is symmetrically located with respect to the burner and the air flow system thereof, so that the ignition and initial combustion, as well as efficient continued combustion are facilitated.

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Another specific comprehension of this invention is the provision of a protecting wall for the ignition element to a level above ports in the burner wall to prevent fouling of the ignition element by fuel, and the provision of an electrically conductive wick-like material around the protecting wall for quickly carrying fuel into contact with a spark for ignition.

Other objects and advantages of this invention will be apparent from the following description when considered in the light of the accompanying drawing, wherein:

Figure 1 is a side sectional view of a liquid fuel burner embodying one form and adaptation of this invention.

Fig. 2 is a sectional view with the section taken substantially on the line 2—2 of Fig. 1 and viewed as indicated by the arrows.

Figs. 3, 4 and 5 are fragmentary sectional views illustrating modifications of certain details of the invention.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring to the drawings wherein preferred embodiments of the present invention are illustrated in their adaptation to a liquid fuel burner of the pot type, Figs. 1 and 2 illustrate a pot type burner 10 having a burner pot 11 and an outer jacket or enclosure 12 which surrounds the burner pot and is spaced therefrom to provide a space 13 around the burner pot through which air for combustion is supplied. The other figures are fragmentary views of similar pot type burners in which the same reference numerals refer to like parts for which a single description will suffice. The jacket or enclosure 12 communicates with a conduit 14 through which the air for combustion is introduced into the jacket, and at least a portion of which is preferably integrally formed with the jacket. Series of ports or openings 15 are provided in the wall of the burner pot through which the air for combustion enters the pot from the surrounding jacket. Also a fuel supply pipe 16 extends through the wall of the burner pot, preferably adjacent or near the bottom of the pot.

A more complete disclosure of the adaptation of this burner to a heating device and the additional equipment which normally accompanies the burner in its operation are illustrated and described in my previously issued United States Letters Patent, Number 2,162,572, issued June 13, 1939, and are not duplicated here.

In the preferred embodiments of this invention which are illustrated, the burner pot preferably has a cylindrical side wall 17, an integral bottom 18, and an integral top flange 19 which fits over the top of the jacket or enclosure 12. The top flange 19 preferably has a shoulder 20 thereon which locates the pot with respect to the jacket. A ceramic choke ring 22 rests on the top surface of the flange 19 and desirably has an integral shoulder 23 which fits into the burner pot to locate the ring. A baffle 24 is preferably provided at one side of the conduit 14 adjacent the jacket 12 to control and direct the flow of air into the jacket.

An ignition electrode assembly comprises a tubular electrode holder 26, a central electrode 27 and an insulator 28 which insulates and separates the central electrode from the tubular holder at one end. The ignition electrode assembly is held in assembled relation by a collar 29 which is threaded into one end of the tubular electrode holder; an enlarged intermediate portion 30 of the insulator 28 being gripped between a portion of the holder 26 and the inner end of the collar 29. The inner ends of the insulator 28 and central electrode 27 are preferably spaced from the inner surface of the holder 26 to provide an additional passage for the flow of air from the jacket 12 into the burner pot 11 around the central electrode 27. This air enters the electrode holder through ports such as 32 in the wall thereof.

The electrode holder 26 extends into the burner pot 11 through an opening 33, which opening is preferably centrally located in the bottom 18 of the burner pot so that the electrode holder is symmetrically arranged with respect to the wall 17 of the pot. The electrode holder 26 preferably has a shoulder 34 on the outer surface which engages the inner surface of the bottom 18 of the pot, this shoulder being located at a distance from the end of the holder such that the holder provides a wall surrounding the central electrode 27 which extends upwardly into the burner pot to a level above the lower ports in the wall 17 of the pot. The central electrode 27 includes an electrode extension 35 which is axially spaced from the end of the electrode holder within the burner pot and extends transversely with respect to the axis of the electrode assembly to provide one end of an ignition spark gap. The ignition electrode assembly is secured in place in the burner by a nut 36 which is threaded onto the outer surface of one end of the electrode holder. A washer such as 37 is preferably provided between the nut 36 and the surface of the jacket 12. An ignition potential is provided to the central electrode 27 through a lead wire 38 which is connected to that electrode. The lead wire 38 extends to one terminal of a suitable source of ignition potential, not shown, the other terminal of which source is grounded to the burner.

In the form shown in Figs. 1 and 2, a pad or mass 39 of wick-like material preferably covers the outer surface of the electrode holder 26 within the pot 11 and extends from the bottom of the pot to a position near the extending end of the electrode extension 35. This pad or mass is electri-

cally conductive and may be made of wire mesh material which is sufficiently fine to conduct fuel from the bottom of the pot upwardly by capillary attraction. The pad or mass may be made of a series of rings of wire gauze material which fit around the outer surface of the electrode holder, as illustrated, or may comprise such wire gauze material wrapped around the outer surface of the electrode holder and secured in position. It is desirable that the upper portion of the pad or mass, particularly that part nearest the electrode extension 35 shall be sufficiently close to the electrode extension 35 so that the ignition spark will jump from the electrode extension to the mesh material which carries the fuel. It should be understood that the jet of air flowing into the burner pot through the electrode holder and around the electrode 27 has the effect of forcing the spark outwardly away from the inner portion of the central electrode 27.

In the forms of the invention shown in Figs. 3, 4 and 5, a cylindrical pad or mass 40 of electrically conductive wick-like material, such as wire gauze, is desirably compressed into form and fits snugly over the upper portion of the outer surfaces of the electrode holder 26. As in the form shown in Figs. 1 and 2, the electrode holder 26 extends to a level above that of the lower ports 15 in the side wall 17, but in these forms, the mass 40 of wick-like material extends to a level above that of the end of the electrode holder.

Referring to the form shown in Fig. 3, a washer or spacer 42 which may be made of metal is disposed around the electrode holder 26 between the shoulder 34 and the bottom 18 of the pot to serve as a spacer against which the bottom of the wick-like mass 40 rests. The thickness of the washer 42 is greater than the level of the fuel which accumulates in the bottom of the pot during normal burning operation. As a result of the presence of the spacer of this thickness, a small quantity of fuel collects in the bottom of the pot prior to the wetting of the wick-like mass 40 and the ignition of the fuel. However, since the thickness of the spacer 42 is greater than the level of the fuel in the bottom of the pot during normal burning operation, the wick-like mass is separated from the fuel during the burning, and consequently becomes and remains dried out between successive igniting operations. Keeping the wick-like mass dry in this manner, particularly during the burning operation, prevents the wick from continually carrying fuel, and thus prevents it from accumulating a carbon deposit which might in time prevent ignition by fouling. Another feature of this assembly, as well as those shown in Figs. 4 and 5, is that the cylindrical wick-like mass 40 may easily be slipped off of the end of the electrode sleeve 26 and replaced without disassembly of the ignition electrode assembly.

The forms of the invention shown in Figs. 4 and 5 operate in a manner similar to that of the form shown in Fig. 3. In the form shown in Fig. 4, however, the spacing of the wick-like mass 40 from the bottom 18 of the pot is accomplished by a flange 43 on the outer surface of the electrode holder 26. It is understood, also, that the spacer 42 of Fig. 3 and the flange 43 of Fig. 4 may be eliminated by providing a sufficiently snug fit between the wick-like mass 40 and the surface of the electrode holder that the wick-like mass can be pressed into place and adjusted to the proper level above the bottom of the pot at the time of placement. In the form shown in Fig. 5, the bottom 18 of the pot is contoured to pro-

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vide a spacing flange 44 of the proper height to separate the wick-like mass 40 from the fuel holding portion of the bottom of the pot during the normal burning operation.

In the operation of the burners disclosed and described, fuel is fed into the burner pot 11 through the supply pipe 16 and, prior to the commencement of combustion, flows across the bottom 18 of the pot into the pad or mass 39 of electrically conductive mesh material. This mesh material carries the fuel upwardly around the outer surface of the electrode holder 26 and provides a thin and diffused film of easily ignitable fuel at the ignition spark gap. The disposition of the electrode extension 35 is such that the ignition spark jumps to the edge or surface of the mass of mesh material to ignite the fuel. With normal fuel flow to the burner through the supply pipe 16 this action takes place considerably before the level of fuel in the bottom of the burner pot approaches the lower ports in the pot wall. However, if due to some abnormal circumstance the fuel fails to ignite within a sufficiently short period of time, the upwardly extending wall within the pot which is provided by the inwardly extending end of the electrode holder 26 prevents the fuel from fouling the ignition electrode assembly by preventing it from entering the space within the assembly and around the central electrode 27 so as to flood the ignition electrode assembly, because that wall extends to a level above the lower ports in the burner pot. The excess fuel flows out of the burner pot through the lower ports in the wall 17. This feature not only prevents fouling of the ignition electrode assembly but also tends to insure initial combustion of the fuel. The operation of the forms shown in Figs. 3, 4 and 5 differs from that of the forms shown in Fig. 1 only in that the normal accumulation of fuel in the bottom of the burner pot is separated from the wick-like mass during that burning operation, in order to keep the wick-like mass dry and prevent the accumulation of a carbon deposit thereon which might become detrimental to proper ignition.

The air forced into the jacket 12 which surrounds the pot 11 enters the pot through the ports 15 and through the ports 32 and the electrode holder. The air entering the ports 32 in the electrode holder assists the ignition and initial combustion, while the main supply of air for combustion is supplied through ports 15. The ports 15 are preferably arranged in rows and symmetrically disposed around the wall 17 of the burner pot. Since the ignition electrode assembly is centrally located in the bottom of the pot and symmetrically disposed with respect to the wall of the pot, the resulting air flow is more symmetrical and less turbulent, with the result that the combustion efficiency of the burner is improved. The flow of air through the jacket 12 is generally indicated by arrows.

I claim as my invention:

1. In a liquid fuel burner of the type comprising a burner pot having a substantially cylindrical side wall, a bottom, and a plurality of air inlet ports in the side wall; a fuel supply pipe extending into the pot adjacent the bottom thereof; and a jacket surrounding the exterior of the pot and having an air supply conduit communicating therewith through which air for combustion is supplied to the burner; the combination of an ignition electrode insulated from and extending upwardly through the bottom of the pot and sub-

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stantially centrally located with respect to the side wall; and a tubular member spaced from the electrode and extending through the bottom of the pot, a wick-like electrode member carried by said tubular member in predetermined spaced relationship to said ignition electrode and in a position to be wet by fuel from said fuel supply pipe, said tubular member providing an air passage for the flow of air from the jacket into the pot around the electrode and in substantially symmetrical relation with respect to air entering the pot through said inlet ports in the side wall.

2. In a liquid fuel burner of the type comprising a burner pot having a substantially cylindrical side wall, a bottom, and a plurality of air inlet ports in the side wall; a fuel supply pipe extending into the pot adjacent the bottom thereof; and a jacket surrounding the exterior of the pot and having an air supply conduit communicating therewith through which air for combustion is supplied to the burner; the combination of an ignition electrode extending upwardly through the bottom of the pot and substantially centrally located with respect to the side wall; and a tubular member spaced from the electrode and extending through the bottom of the pot, a wick-like electrode member electrically insulated from said ignition electrode and carried by the tubular member in spaced relation to said ignition electrode and in position to be wet by fuel from said fuel supply pipe, said tubular member forming a wall extending upwardly in the pot to a level above a portion of said air inlet ports in the side wall.

3. In a liquid fuel burner of the type comprising a burner pot having a substantially cylindrical side wall, a bottom, and a plurality of air inlet ports in the side wall; a fuel supply pipe extending into the pot adjacent the bottom thereof; and a jacket surrounding the exterior of the pot and having an air supply conduit communicating therewith through which air for combustion is supplied to the burner; the combination of an ignition electrode extending upwardly through the bottom of the pot and substantially centrally located with respect to the side wall; an electrode holder spaced from the electrode and extending through the bottom of the pot, said electrode holder forming a wall around the electrode extending upwardly in the pot to a level above the normal fuel level in the pot during ignition and combustion; and means in said pot comprising fine mesh wire gauze engaging the outside of said holder and extending upwardly from a level below the normal fuel level in the pot during ignition, said gauze providing a second electrode in cooperative relation to the first mentioned electrode.

4. In a liquid fuel burner of the type comprising a burner pot having a side wall, a bottom and a plurality of air inlet ports in the side wall; and means for supplying fuel to the bottom of the burner pot; the combination of an ignition electrode extending upwardly through the bottom of the pot inside the side wall; an electrode holder spaced from the electrode and extending upwardly from the bottom of the pot around said electrode, said electrode holder forming a wall around the electrode extending to a level above the normal fuel level in the pot during ignition and combustion; and means in said pot comprising electrically conductive wick-like material engaging the outside of said holder and adapted to contact the fuel in the bottom of the burner pot, said electrically conductive wick-like material

providing a second electrode in cooperative relation to the first mentioned electrode.

5. In a liquid fuel burner of the type including a burner pot comprising a bottom and a side wall having a plurality of ports therein, and a fuel supply pipe extending into the pot adjacent the bottom thereof, the combination of an ignition electrode extending through the bottom of the pot, an electrode holder electrically insulated from the electrode and enclosing the electrode to a level above the lower of said ports, and electrically conductive means outside of the electrode holder providing a second electrode which establishes a spark gap with the first mentioned electrode at a level above the lower of said ports, said electrically conductive means being made of electrically conductive wick-like material and acting as a wick to carry thin films of fuel.

6. In a liquid fuel burner of the type including a burner pot comprising a bottom and a side wall having a plurality of ports therein and means for supplying fuel to the burner, the combination of an ignition electrode extending through the bottom of the pot, an electrode holder electrically insulated from the electrode and enclosing the electrode to a level above the lower of said ports, and electrically conductive means outside of the electrode holder extending upwardly to close proximity with said ignition electrode at a level above the lower of said ports and providing a second electrode, said electrically conductive means extending downwardly to a position such that it engages fuel in the burner during ignition and being made of material having wick-like action to carry a film of fuel.

7. In a liquid fuel burner having a burner pot and means for feeding fuel to the bottom of the pot, means for initiating combustion of the fuel which comprises, in combination, an inner electrode, a tubular electrode holder separated from the inner electrode at one end by insulating material and spaced from the inner electrode at the other end, said electrode holder extending upwardly from the bottom of the pot, and means comprising fine wire mesh adapted to contact the fuel in the bottom of said burner pot and surrounding and covering a portion of the outer surface of the electrode holder at said other end to provide a spark gap with the inner electrode as well as a fuel carrying medium.

8. In a liquid fuel burner of the type comprising a burner pot having a side wall, a bottom, and a plurality of air inlet ports in the side wall; and means for supplying fuel to the bottom of the burner pot; the combination of an ignition electrode extending upwardly through the bottom of the pot inside the side wall; an electrode holder spaced from the electrode and extending upwardly from the bottom of the pot around the electrode, said electrode holder forming a wall around the electrode extending to a level above the normal fuel levels in the pot during ignition and combustion; and means in said pot comprising electrically conductive wick-like material engaging the outside of said holder and extending downwardly to a level above the normal fuel level in the pot during combustion and below the normal fuel level in the pot at the time of ignition, said electrically conductive wick-like material providing a second electrode in cooperative relation to the first mentioned electrode.

9. In a liquid fuel burner of the type comprising a burner pot having a side wall, a bottom, and a plurality of air inlet ports in the side wall; and means for supplying fuel to the bottom of the

burner pot; the combination of an ignition electrode extending upwardly through the bottom of the pot inside the side wall; an electrode holder spaced from the electrode and extending upwardly from the bottom of the pot around the electrode, said electrode holder forming a wall around the electrode extending to a level above the normal fuel levels in the pot during ignition and combustion; means in said pot comprising electrically conductive wick-like material engaging the outside of said holder and providing a second electrode in cooperative relation to the first mentioned electrode; and means spacing said wick-like material from the bottom of the pot a distance such that said material is above the normal fuel level in the pot after the commencement of combustion.

10. In a liquid fuel burner having a burner pot and means for feeding fuel to the bottom of the pot, means for initiating combustion of the fuel comprising, in combination, an inner electrode extending upwardly through the bottom of the pot, a tubular electrode holder separated from a portion of the inner electrode by insulating material and spaced from the inner electrode at one end, means comprising wick-like material covering a portion of the outer surface of the electrode holder to provide a spark gap with the inner electrode, said wick-like material extending along said electrode holder to a position near the bottom of the pot, and a spacer separating the wick-like material from the bottom of the pot by an amount such that fuel in the bottom of the pot normally contacts the wick-like material only during ignition and initial combustion.

11. In a liquid fuel burner of the type comprising a burner pot having a substantially cylindrical side wall, a bottom, and a plurality of air inlet ports in the side wall; means supplying fuel to the bottom of the pot; and means supplying air for combustion to the pot; the combination of an ignition electrode extending upwardly through the bottom of the pot and substantially centrally located with respect to the side wall; means spaced from the electrode and extending upwardly from the bottom of the pot, the last mentioned means forming a wall around the electrode extending upwardly in the pot to a level above the normal fuel level in the pot during ignition and combustion; and means in the pot comprising electrically conductive wick-like material engaging the outside of the last mentioned means and extending upwardly from a level below the normal fuel level in the pot during ignition, said wick-like material providing a second electrode in cooperative relation to the first mentioned electrode.

12. In a liquid fuel burner of the type including a burner pot comprising bottom and a side wall having a plurality of ports therein and means for supplying fuel to the burner, the combination of an ignition electrode extending through the bottom of the pot, means electrically insulated from the electrode and enclosing the electrode to a level above the lower of said ports, and electrically conductive means outside of the last mentioned means extending upwardly to close proximity with said ignition electrode and to a level above the lower of said ports and providing a second electrode, said electrically conductive means extending downwardly to a position such that it is adapted to engage fuel in the burner pot during ignition and being made of material having wick-like action to carry a film of fuel.

13. In a liquid fuel burner having a burner pot and means for feeding liquid fuel to the bottom of the pot wherein said burner pot and fuel feeding means are constructed and arranged for the burning of the fuel in the pot at a rate such that the level of fuel therein is maintained below a predetermined line after combustion has progressed for a short time, the combination of means for initiating combustion of the fuel comprising a pair of electrically insulated and separated electrodes having fixed positions relative to the bottom of the burner pot, one of said electrodes comprising a mass of wick-like material adapted to carry liquid fuel by capillary action, an element of effectively non-porous material supporting the last mentioned electrode at a distance from the bottom of the pot and above said predetermined line so that all of the wick-like material is normally dry during combustion, said last mentioned electrode being sufficiently close

to the bottom of the pot to be wet by the fuel during and for a short time after the initiation of combustion.

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