Nov. 22, 1932. M. A. POWERS 1,888,695

OIL BURNER IGNITION DEVICE

Filed July 1, 1931

Fig. 1.

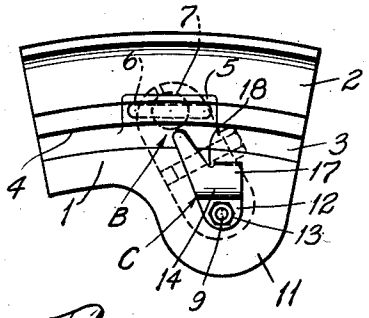


Fig. 2.

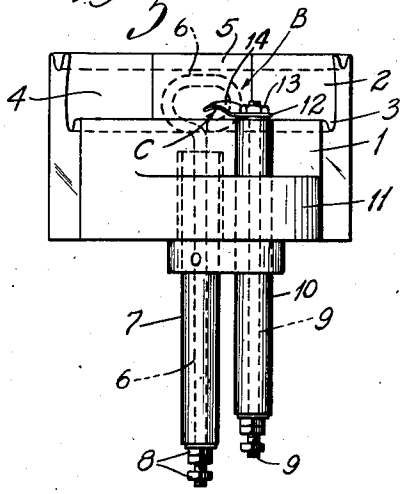


Fig. 3.

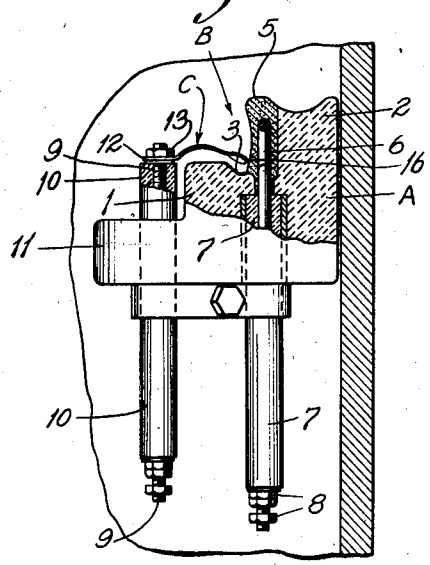


Fig. 4.

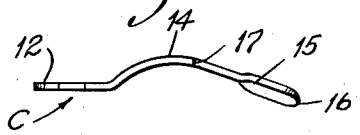
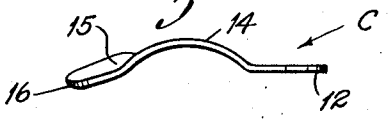


Fig. 5.



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UNITED STATES PATENT OFFICE

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OIL BURNER IGNITION DEVICE

Application filed July 1, 1931. Serial No. 548,094.

My invention relates to oil burner ignition systems, particularly ignition systems of the spark type for burners wherein ignition takes place around the periphery of a ring at the outer margin of a hearth member, fuel and air being sprayed to said combustion zone. The invention has for its principal object an electrode that will properly ignite the fuel under all service conditions and that will not become short-circuited by an accumulation of carbon at or near the spark gap. It also provides an ignition system substantially free from radio interference, a portion at least of such freedom being directly attributable to the maintenance of an atmosphere partially composed of hydrocarbon vapors surrounding the intensely hot ignition arc. The invention consists in an igniter having one elongated ribbon-like electrode of substantial width and comparatively little thickness disposed so as to intercept a portion of the air stream and direct it to the spark gap, thereby creating oxidation conditions that prevent accumulation of carbon in the vicinity of the spark gap. It also consists in an electrode shaped to allow the arc to move over a portion of its surface under outside influences. The invention further consists in the oil burner ignition devices and in the parts and combinations and arrangements of parts hereinafter described and claimed.

In the accompanying drawing,

Fig. 1 is a top plan view of an oil burner ignition device having an electrode member embodying my invention,

Fig. 2 is an elevation,

Fig. 3 is a vertical sectional view through the hearth ring at the location of the sparking members; and

Figs. 4 and 5 are detail views of the electrode members.

The drawing illustrates a stepped hearth ring A and a sparking device B of the general type illustrated in my copending application Serial No. 456,940 filed May 29, 1930. The hearth ring A comprises a lower inner ledge portion 1 and a higher outer rib portion 2, there being an annular groove 3 along the meeting edges thereof. Disposed in the face 4 or riser of the outer rib 2 of said hearth ring A is an electrode member 5 comprising a block of carborundum or other suitable refractory material conforming in shape to the face 4 of said rib 2 and having embedded therein a metallic conductor member 6 that extends through an insulator 7 that is disposed in a hole through the hearth ring A, the lower end of said conductor member 6 being provided with suitable nuts 8 for connecting it to the wiring system. The conductor member 9 for the other electrode C is likewise mounted in an insulator 10 which is secured in a hole in a lug 11 at the inner face of the inner or lower portion 1 of the hearth ring A.

The electrode C forming the subject matter of the present invention has a perforated end lug 12 by which it is secured to the top of the conductor member 9 as by a nut 13. This electrode C is a strip of heat resisting metal. Said electrode C has an upwardly curving portion 14 that extends from said lug 12 to the main body portion 15 of the electrode. The main body 15 of the electrode C slopes slightly downwardly from said curved portion 14 and its outer end terminates a short distance away from the refractory block 5 to form a spark gap. The outer tip portion 16 of the electrode C is shaped so that the arc will pass steadily between two points if there is no gas movement. However, upon movement of the surrounding atmosphere there will be a tendency for the arc to move along the top of the metal electrode and to wander over the surface of the back electrode. The somewhat blunt tip 16 serves to accentuate this characteristic. The upwardly curving portion 14 is provided with a lateral extension 17, said extension being on the side toward the air spray. A notch 18 is formed at the junction of the outer edge of the extension with the main body of the electrode.

The portion of the electrode in the vicinity of the spark gap and the gap itself, as well as the groove 3, are located in a position that is normally protected against air movements, the main flow of air moving upwardly past the inner edge of the lower ledge 1 of the

hearth ring (without entering the groove 3) and thence past the inner edge of top surface, where it mixes with the oil vapors arising from groove 3. Combustion then takes place entirely above the top of the segment. In starting while the hearth ring is cold the rate at which the oil is vaporized in groove 3 is reduced and some combustion may take place for a short period in this groove but the rate at which the vapor is evolved increases very rapidly and almost immediately the volume of vapor in groove 3 is so great as to preclude combustion due to a lack of air therein. Groove 3 therefore will normally serve to protect the gap against air currents, will surround it with oil vapor, and will aid in rapid propagation of the flame from the region of the gap around the periphery of the hearth member.

A detailed explanation of the functioning of this ignition system and the novel features incorporated in it are explained in my copending application Serial No. 369,863, filed June 10, 1929, while the later copending application referred to previously discloses features which reduce the possibility of radio interference. The discussion which follows will therefore serve to add to information already given in said applications without attempting to repeat here the fundamentals therein disclosed.

It has been found that all of the characteristics discussed in my said copending applications are effective in producing a very effective and successful ignition system for the rotary type burner. However in some cases difficulty has been encountered due to short circuiting of electrodes by carbon. Ordinarily this was caused by improper oil quality, but in some cases it occurred where there was no defect in the oil. It was found that when the arc was initiated with the electrodes thoroughly wetted with oil and with the arc completely protected against air movement, a fine threadlike string of carbon might bridge the gap and extinguish the arc. This threadlike structure might have a diameter of not over 1/64 inch at the beginning of formation and apparently was instantly formed throughout its whole length upon initiation of the arc. The tendency for this formation was most noticeable when the surrounding parts were cold. Ordinarily continuation of the current flow through the stringy structure would soon burn it away and normal operation ensue but this was not always the case. Increasing the current flow tended to open the gap more quickly. Installing a condenser across the gap increased the frequency and the oscillating circuit had more beneficial effect. Increasing the length of the gap seemed to be most beneficial, but all of these methods had limitations or were impractical. Success against such initial formation was obtained when the method explained below was adopted.

Complete protection of the gap against all air flow, while fundamentally proper, was not found to be essential in practice, while the scouring action of a small flow of oxidizing air redirected beneath the flat surface of the electrode has most beneficial and desirable effects. The electrode C is disposed substantially along the path of the air current, and this location together with the shape of the electrode serve to direct air towards the spark gap. The end portion 16 of the electrode C may be twisted so as to interpose a more extended surface in the air path immediately adjacent to the spark gap. The air directed to the vicinity of the arc serves to burn away any carbon which might tend to collect from any cause, among which most important are the incomplete burning of poor grades of oil, the cracking of oil in the intense heat of the arc, or the bridging action of stringy carbon structures described previously.

An added advantage resulting from the introduction of air to the vicinity of the spark gap exists when the burner is called upon to start with the hearth ring in a highly heated condition. Under such circumstances all of the oil discharged from the burner head is immediately vaporized upon impingement against the hearth ring. The large volume of vapors released immediately fills the groove in which the spark gap is located. As mentioned previously, during normal operation of the burner after the hearth ring has reached its operating temperature, the vapor in the groove is too rich for combustion which is limited to the area above the ring proper. The same conditions exist upon restarting hot and unless provision is made for introducing excess air at the gap, combustion does not take place immediately, vapors fill the firebox and when ignition finally succeeds, an explosion may occur. However, by introducing an excess of air at the gap, proper conditions exist at all times for prompt and reliable ignition.

While the air flow serves to burn away any carbon collection, it has other beneficial effects of considerable importance without the detrimental effects which would be expected. The air flow tends to extend the length of the arc and because of the large area of one of the electrodes the arc wanders over a portion of this electrode. Such wandering of the point of arc impingement eliminates any bad effects due to a slow building up of a pile of carbon as was sometimes noted when the arc remained stationary. The area over which the arc wanders is not sufficient to reduce appreciably the heat concentration effect discussed in the earlier applications.

It might be expected that increasing the arc length by the methods discussed would result in a marked increase of radio inter-

ference. However, this is not true to any appreciable extent for several reasons. In the first place the very high secondary current continues to maintain a very low gap resistance due to the continued release of a large amount of heat. It has also been found that the added flow of air past the gap proper, while diluting the rich hydrocarbon vapors, does not displace them to any extent. The arc, therefore, continues to flow through the hydrocarbon vapors and maintains its characteristic intensely white and bushy appearance. This color is in contrast to the same arc in the open air with its flaming reddish color, and is evidently due to the presence of incandescent carbon particles released by cracking of the vapors due to the intense heat. Under these circumstances I have noted that the gap resistance is much less than the same gap in the open air. As any reduction in gap resistance is of importance in reducing radio interference this effect is very desirable and follows as a direct result of my use of an intensely hot arc with its cracking effect upon the surrounding vapors.

Much has been done by others working with ignitions of a somewhat similar type to reduce the effects of radio interference caused by their systems. Conventional methods such as the use of condensers across the windings, choke coil resistances to reduce the flow of high frequency currents in the high voltage circuit, and the like, have been used with varying degrees of success. Their use is evidence of the need for such protection and is in direct contrast to the almost complete freedom from radio interference with my system.

Obviously numerous changes may be made without departing from the invention and I do not wish to be limited to the precise construction shown.

What I claim is:

1. A spark igniter for oil burners wherein ignition and combustion take place at the outer periphery of a hearth member toward which fuel and air are sprayed, said igniter having a sparking point located in a position normally protected against gas movement and deflecting means for directing an air flow to the vicinity of said sparking point.

2. A spark igniter for oil burners wherein ignition and combustion take place at the outer periphery of a hearth member toward which fuel and air are sprayed, said igniter having a sparking point located in a position normally protected against gas movement and deflecting means on one electrode for directing an air flow to the vicinity of said sparking point.

3. An electrode for spark type ignition systems for oil burners wherein ignition and combustion take place at the outer periphery of a hearth member towards which fuel and air are sprayed, the spark gap being located at a point protected from air movement, said electrode having a portion disposed in the path of air and shaped to intercept a portion of the air stream and direct it towards the spark gap.

4. An electrode for spark type ignition systems for oil burners wherein ignition and combustion take place at the outer periphery of a hearth member towards which fuel and air are sprayed, said electrode comprising a thin strip having an upwardly curving portion disposed in position to intercept a part of the air stream and a body portion sloping downwardly from said curved portion towards the spark gap.

5. An electrode for spark type ignition systems for oil burners wherein ignition and combustion take place at the outer periphery of a hearth member towards which fuel and air are sprayed, said electrode comprising a thin strip having an upwardly curving portion disposed in position to intercept a part of the air stream and a body portion sloping downwardly from said curved portion towards the spark gap, the tip portion of said body being twisted to interpose an extended surface in the air current.

6. A spark type ignition system for oil burners wherein ignition and combustion take place at the outer periphery of a hearth member towards which fuel and air are sprayed, comprising an electrode disposed in the path of air and shaped to intercept a portion of the air stream and direct it towards the spark gap and having a blunt tip and a second electrode having an extended surface adjacent to said tip.

7. An electrode for spark type ignition systems for oil burners wherein ignition and combustion take place at the outer periphery of a hearth member towards which fuel and air are sprayed, said electrode having an upwardly curving portion disposed in position to intercept a part of the air stream and a body portion sloping downwardly from said curved portion towards the spark gap, said upwardly curving portion having a lateral extension on the side toward the air spray.

8. In an oil burner of the type wherein oil and fuel are sprayed towards the outer periphery of a hearth member, a stepped hearth ring having a lower inner ledge and a higher outer rib, with a depressed annular groove along the meeting edges thereof, an electrode member in the face of said rib and a second electrode member having its sparking tip disposed in said groove so as to be in a position normally protected against jar movement and having a portion disposed in the path of air and shaped to intercept a portion of the air stream and direct it towards the spark gap.

9. In an oil burner of the type wherein oil and fuel are sprayed towards the outer periphery of a hearth member, a stepped

hearth ring having a lower inner ledge and a higher outer rib, with a depressed annular groove along the meeting edges thereof, an electrode member in the face of said rib and a second electrode member having its sparking tip disposed in said groove so as to be in a position normally protected against jar movement and having an upwardly curving portion disposed in the path of air and shaped to intercept a portion of the air stream and direct it towards the spark gap.

Signed at Detroit, Michigan, this 26 day of June 1931.

MILTON A. POWERS.