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SHROUD FOR FUEL BURNERS

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Fig. 1.

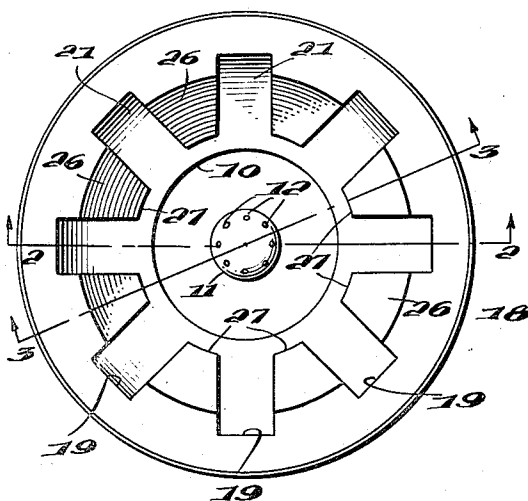


Fig. 4.

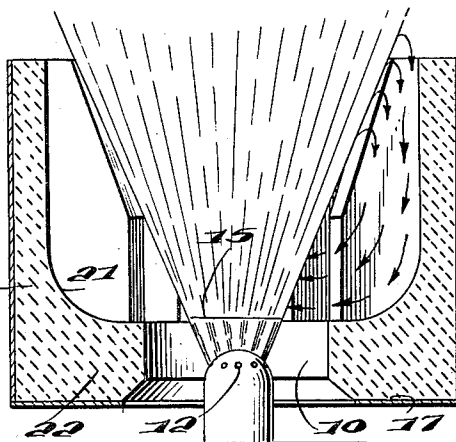


Fig. 2.

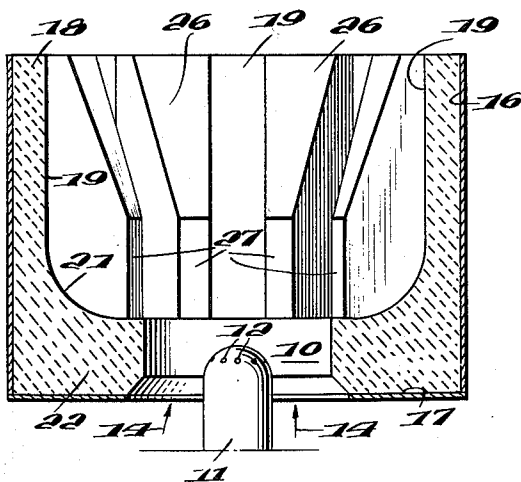
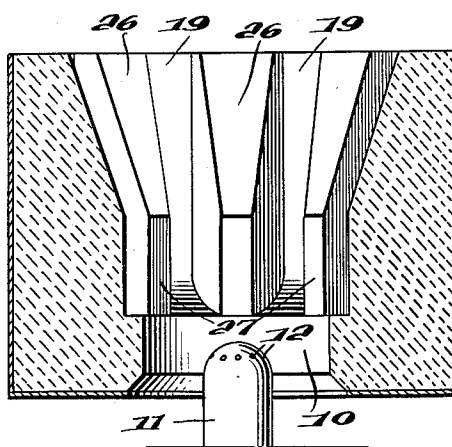


Fig. 3.



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SHROUD FOR FUEL BURNERS

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4 Claims. (Cl. 158—1)

The present invention pertains to a shroud for fuel burners and is designed to facilitate the burning of liquid fuels and those which are heavy or viscous but the shroud also has utility for burners supplied with gaseous fuels.

An object of the invention is to provide a shroud for a fuel burner or nozzle so shaped as to provide passages or channels between ribs thereof for return of hot gases from the burning fuel to the vicinity of the burner tip to promote improved vaporization of the liquid fuel and maintenance of kindling and to stabilize burning of the fuel.

A more specific object of the invention is to provide shrouding means for a fuel burner having circumferentially spaced ribs extending lengthwise therewithin forming channels between the ribs through which heat developed during combustion of the fuel within the shroud returns through the passages provided by the channels and is delivered to annular areas spaced about the flame immediately forward and adjacent the burner tip or nozzle.

Another object of the invention is to provide a shroud for a fuel burner having circumferentially spaced ribs therein forming channels between the ribs with the cross sectional areas of the channels increasing in area in proceeding towards the upstream end of the shroud to facilitate the return movement of heat to a position adjacent the burner tip.

A still further object of the invention is to provide shroud means for a fuel burner wherein the inner edges of the ribs define a conical outline which is substantially the same as the flared cone of burning fuel so that the flame produced sweeps closely over but not upon the inner edges of the ribs to thereby substantially close the passages between the ribs for the return of hot gases and air to the vicinity of the burner tip or nozzle.

Other objects and features of the invention will be appreciated and become apparent as the present disclosure proceeds and upon consideration of the accompanying drawing and the following detailed description wherein an embodiment of the invention is disclosed.

In the drawing:

Fig. 1 is a plan view of a burner shroud exhibiting the invention and depicting one type of burner tip that may be employed in association therewith.

Fig. 2 is an axial sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a similar view taken on the section 3—3 of Fig. 1.

Fig. 4 is a view illustrating the flame pattern and the manner in which heat is returned to the proximity of the burner tip.

The invention is directed to a shroud for fuel burners and it may be formed of any suitable material and preferably as a ceramic or refractory member of one piece construction. The shroud is provided with a cylindrical opening 10 in the upstream end thereof for accommodating a fuel burner tip or nozzle 11. The shroud has particular utility in connection with a burner for liquid

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fuels and the burner tip 11 may be of a conventional type for oil supplied thereto in accordance with the practice in the art. The discharge ports 12 are arranged in a circular outline as shown in Fig. 1. The axes of the discharge ports diverge from each other so as to deliver atomized liquid fuel in a conical pattern to provide a burning flame somewhat as represented by the phantom lines of Fig. 4. The discharge of liquid fuel and steam through the ports 12 sets up a low pressure area at and near the burner tip. The flame of the vaporized fuel does not extend to the ports 12 and in general takes place beyond the line 15. The opening 10 is larger than the burner nozzle so that air may move over the burner tip in the direction of the arrows 14 (Fig. 2).

The shroud is provided with a cylindrical exterior surface 16 and the upstream end 17 thereof is arranged in a plane at right angles to the periphery of the shroud. The circumference of the shroud and the upstream end face 17 may be covered with sheet metal. The opening 10 is of cylindrical configuration and is arranged coaxially with the periphery of the shroud.

The shroud may be regarded as being generally of cup-shape. In an area between adjacent ribs the shroud includes a wall 18 (Fig. 2) having inner surfaces 19 substantially parallel with the periphery 16 throughout a major portion of the length of the shroud. The straight character of each surface 19 continues in proceeding upstream of the shroud where it merges with an arcuate surface 21. This arcuate surface 21 is in part formed on an annular end wall 22 disposed around the opening 10. The arcuate surfaces 21 merge smoothly with the respective wall surfaces 19. The wall surfaces 19 are circumferentially spaced from each other and separated by ribs as shown in Fig. 1.

The shroud includes a plurality of circumferentially spaced ribs which project radially inward from the wall surfaces 19. These ribs have inclined inner edges 26 which define the outline of a cone. The inner edges 26 of the ribs converge toward each other in proceeding upstream of the shroud and each inclined surface merges with an inner edge 27 which outline a cylinder as will be appreciated from a consideration of Figs. 2 and 3. The axis of the cylinder defined by the rib edges 27 coincides with the axis of the shroud and the edges 27 define a circle which is of slightly larger diameter than the opening 10 (Fig. 1).

It will be appreciated that the structure described and shown in the drawing provides for channels or passages between the ribs. The cross sectional area of each passage or channel increases in proceeding towards an upstream end of the shroud as shown in Fig. 2.

In operation and when liquid fuel is discharged through the ports 12 it is atomized and sets up a low pressure area in the vicinity of the burner tip. The atomized fuel upon ignition provides a flame somewhat as shown in phantom lines in Fig. 4. The flame sweeps along the frusto-conical inner edges 26 of the ribs but it does not engage these faces. The flame sweeping close to the inner edges of the ribs substantially closes the channels or passages formed between these ribs. The heat produced by the burning fuel is in part caused to return to the vicinity of the burner tip 11 in what may be regarded as a regenerative action so as to supply greater quantities of heat to the liquid fuel being discharged from the ports 12 so as to further promote vaporization thereof. Such movement of the hot gases is indicated by the arrows of Fig. 4 and is to some extent induced by the low pressure zone developed in the vicinity of the nozzle 11. The arcuate surfaces at the base of the channels divert the hot gases radially inwardly in directions substantially at ninety degrees with respect to the axes of the shroud and the burner tip 11. The hot gases are thus delivered

to atomized fuel at a zone downstream of the burner tip but in close proximity thereto.

It will be observed that the inner edges 27 of the ribs which are arranged in cylindrical outline are spaced from the conical pattern of the atomized fuel and flame. Such a disposition of these edges of the ribs cause eddy currents to form between the edges 27 and the atomized fuel to further assist in the maintenance of a high temperature level downstream of the burner tip. The regenerative action of the shrouding means makes it possible to supply sufficient heat into the proximity of the burner so that fuels of higher viscosity than have been possible to burn in the past may be consumed in a fuel burner equipped with shroud means embodying the invention.

While the invention has been described with reference to a shroud having a particular structural shape it will be appreciated that changes may be made in the dimensions and arrangement of the various portions and that other materials may be employed in providing a shroud for a fuel burner. Such changes and others may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

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

1. A shroud for a fuel burner comprising, a generally cup-shaped member having an open end directed towards an area to be fired, a wall forming the upstream end of said member having an opening therethrough, a burner mounted within said opening with the tip thereof positioned upstream of the downstream face of said wall, said burner having a plurality of discharge orifices therein with the axes thereof diverging from each other so as to discharge fuel from the orifices in a substantially conical outline diverging in proceeding towards the open end of said member, circumferentially spaced longitudinally extending ribs within said cup-shaped member, an inner edge on each rib which converges towards the axis of said opening in proceeding from the downstream end of said member, said inner edges being at such an angle that the periphery of the conical outline of burning fuel sweeps along said inner edges of said ribs, said ribs in cooperation with the inner surfaces of the cup-shaped member between the ribs forming circumferentially spaced channels extending longitudinally of said member, and arcuate wall surfaces carried by said cup-shaped member between upstream ends of said ribs merging with the downstream face of said end wall.

2. A shroud for a fuel burner comprising, a generally cup-shaped member having an open end directed towards an area to be fired, a wall forming the upstream end of said member having an opening therethrough, said wall having a downstream face at right angles to the axis of said opening, a burner mounted within said opening with the tip thereof positioned upstream of said downstream face, said burner having a plurality of discharge orifices therein with the axes thereof diverging from each other so as to discharge fuel from the orifices in a substantially conical outline diverging in proceeding towards the open end of said member, circumferentially spaced longitudinally extending ribs within said cup-shaped member, an inner edge on each rib which converges towards the axis of said opening in proceeding from the downstream end of said member, said inner edges being at such an angle that the periphery of the conical outline of burning fuel sweeps along said inner edges of said ribs, said ribs in cooperation with the inner surfaces of the cup-shaped member between the ribs forming circumferentially spaced channels extending longitudinally of said member, arcuate wall surfaces carried by said cup-shaped member between upstream ends of said ribs merging with the downstream face of said end wall, and each rib adjacent the upstream end of the cup-shaped member having an edge surface which is substantially parallel to the axis of said opening and defining a circular outline.

3. A shroud according to claim 2 wherein the circular outline of edges on said ribs is of larger diameter than that of said opening.

4. A shroud according to claim 2 wherein the edge portions of the ribs which are parallel to the axis of said opening constitute minor lengths of the ribs.

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