Dec. 4, 1956 L. A. EGGLESTON 2,772,743

FIRE FOAM APPLICATOR

Filed April 7, 1955 2 Sheets-Sheet 1

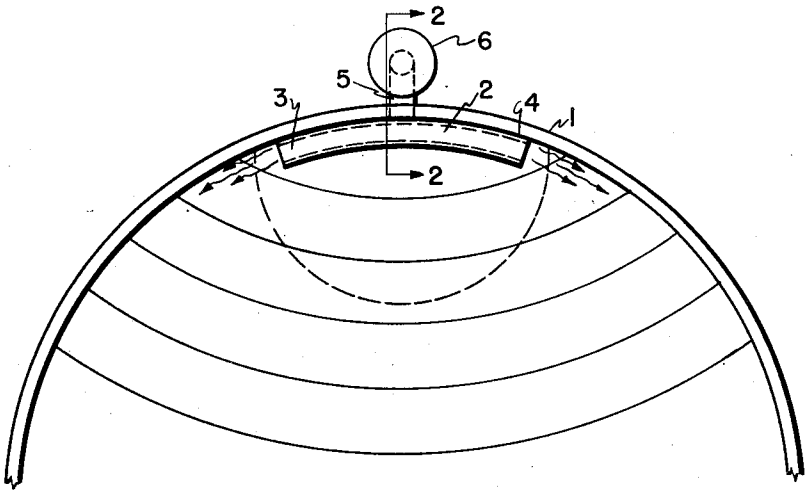


FIG. 1

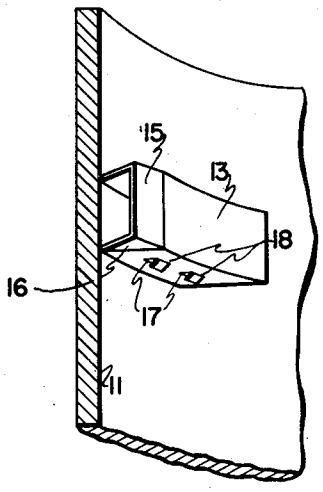


FIG. 4

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FIRE FOAM APPLICATOR

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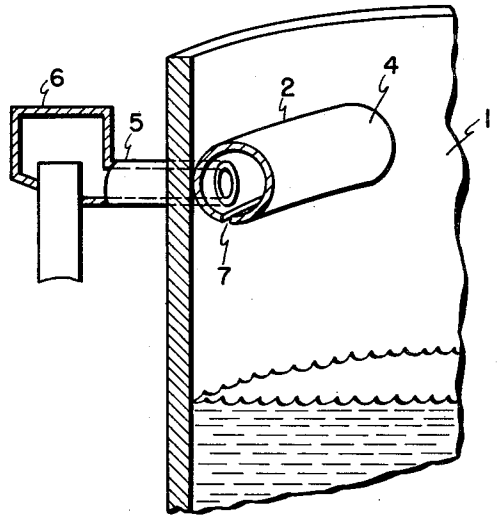


FIG. 2

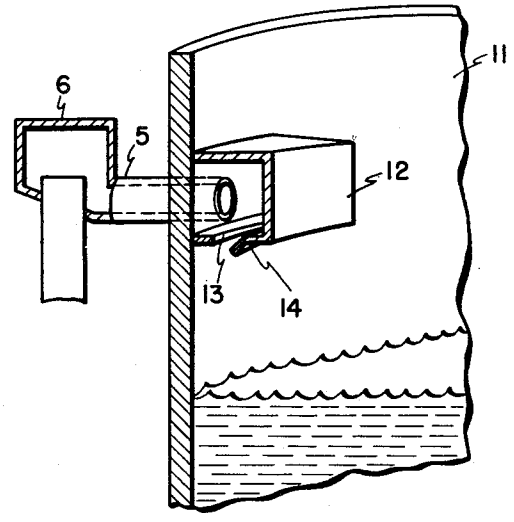


FIG. 3

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FIRE FOAM APPLICATOR

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8 Claims. (Cl. 169—4)

The present invention relates to an apparatus for spreading fire extinguishing foam over the surface of a liquid stored in a container therefor. More particularly it relates to a foam distributor for discharging a perpared fire foam onto the exposed surface of the liquid, in a container therefor, with a minimum disturbance of the liquid and at a maximum rate of application, to form a substantially continuous fire foam blanket over the liquid surface.

Many means for discharging a stream of fire foam onto the surface of a liquid have been devised in the past for substantially the same purposes as those of the present invention. Most frequently these devices have been found unsatisfactory because of a tendency for fire foam to be broken down and disrupted by direct impingement against either the spreading means or the surface of the liquid to which it is applied. It has also been found that in the use of previous devices, wherein a stream or sheet of foam may strike the liquid surface directly, the foam tends to penetrate the liquid surface causing a breakdown of the foam and resulting in a non-uniform or discontinuous foam blanket. Another difficulty experienced with previous devices for the application of fire foam as contemplated by this invention, has been due to the fact that such application usually is required to be made from a device supported by the wall or roof of the container in the upper portion thereof, and above the normal full level of liquid therein. Thus when the need for applying foam arises at a time when the level of liquid may be at a considerable distance below the level of introduction of the foam, the foam is substantially dissipated and broken up by the impact thereof upon the surface of the liquid.

It is an object of the present invention to provide a means whereby a stream of fire foam may be discharged onto the surface of a liquid in a container so as to form a substantially smooth and continuous blanket of foam thereon without disruptive impact of the stream against deflectors or other apparatus elements beyond the point of discharge of the stream. It is also an object of the invention to avoid such interference with the formation of the desired foam blanket as may be offered by impact with the liquid surface when such surface is at a considerable distance below the level of introduction of the foam into the container. Specifically the invention contemplates a foam discharge nozzle or conduit structure from which a stream of fire foam may be discharged so as to issue as a plurality of unbroken foam streams directed substantially without impact, sufficient to disrupt the stream, against the wall of the container, to flow downwardly over the surface thereof into contact with the liquid surface with a minimum of impact disruption at the level of liquid surface contact. It is also an object of the invention thus to avoid turbulence of the stream of foam at or prior to contact with the liquid surface and to avoid deep penetration of the liquid by the foam as applied thereto.

The invention and its objects may be more fully understood from the following description when read in conjunction with the accompanying drawings, in which:

Fig. 1 is a horizontal section through the upper end of a portion of a container, vessel or tank adapted to hold a body of a liquid such as a flammable liquid including hydrocarbon oils, and showing in plan view a foam discharge conduit and nozzle structure of the character contemplated by the present invention;

Fig. 2 is a vertical section substantially along the line 2—2 of the structure illustrated in Fig. 1 showing in vertical section one form of the device contemplated;

Fig. 3 is a view similar to that of Fig. 2 illustrating another form of the device as shown in Figs. 1 and 2; and

Fig. 4 illustrates modifications of the discharge conduit and nozzles respectively in perspective and from below.

Referring to the drawings in greater detail, in Figs. 1 and 2, the numeral 1 designates the wall of a storage vessel or container for liquids. Interiorly of the vessel and mounted on the inner surface of the wall thereof, adjacent the upper end, is a foam discharge conduit 2. The foam discharge conduit is a substantially elongated member mounted horizontally on the wall and having foam discharge nozzle portions 3 and 4 at opposite ends thereof. The nozzle portions 3 and 4 are directed into closely spaced substantially parallel surface alignment with the container wall. Opening radially through the container wall and into the foam discharge conduit, substantially midway between the nozzle end portions defined by the discharge conduit, is a foam supply conduit 5 communicating at its outer end with a foam forming chamber 6. As shown the foam forming chamber is also mounted at the upper end of the container wall, but as is well known in the art, this chamber may be located at some distance from the vessel being connected with the discharge conduit by extension of the foam supply conduit for any distance desired. Referring more specifically to the form of the device as shown in Fig. 2, the numeral 7 designates a supplementary foam discharge passageway which may be provided in the lower wall portion of the discharge conduit intermediate the foam discharge nozzle end portions thereof. The discharge conduit as shown in Fig. 2 is a tubular conduit cylindrical in form. The passageway 7 is a narrow passageway preferably having an area substantially less than either of the discharge nozzle portions of the conduit. As shown, the passageway 7 is an elongated slotted portion directed downwardly and inwardly toward the adjoining surface of the vessel wall. Although the defined passageway may be located at any point within an arc of 90° C., it is preferred that it be located within the limits of from about 30° to 60° below the horizontal.

Referring now to Fig. 3, the form of the foam discharge conduit in this illustration differs from that of the form shown by Figs. 1 and 2 primarily in its conformation and relationship to the container wall. As shown, the conduit designated by the numeral 12 is a generally U-shaped arcuate member having a radius of curvature at the open end of the U, substantially equal to that of the container wall 11. The end portions of the legs of the U-shaped member 12 are secured to the container wall 11 as by welding or otherwise, the U-shaped member with the container wall forming a discharge conduit substantially integral with the wall. Also as shown the U-shaped member with the wall forms a discharge conduit having a substantially flat bottom wall portion. In this form, a slotted passageway 13 is defined in the bottom wall of the discharge conduit by means of an upset or broached wall portion 14 extending angularly downward from the bottom wall so as to form a deflector lip extended in the direction of the adjoining wall surface.

As shown in Fig. 4 the discharge conduit of Fig. 3 is

viewed from below and in perspective. In this figure a modification of the discharge nozzle portions of the conduit **13** is shown. The modification consists of a lip portion **15** substantially integral with the innermost wall of the conduit extended angularly inward toward the container wall **11** and forming a deflector element adapted to direct a stream of foam from the foam discharge conduit toward the container wall. In addition to the lip portion **15** the upper and lower walls of the foam discharge conduit may be extended as at **16** to avoid expansion of the foam stream until the stream has passed beyond the outer edge of the lip portion. This modification is particularly applicable to any form of the device but especially one in which the discharge conduit does not exactly coincide with the curvature of the container wall. The deflector lip as indicated by the numeral **15** may also be adapted for employment in conjunction with the cylindrical foam discharge conduit **2** of Figs. 1 and 2 under similar circumstances.

Another modification of the device as shown by Fig. 4 is in the provision of a series of individual slotted or punched passageways **17** to replace the elongated passageway as illustrated either in Fig. 2 or in Fig. 3. As shown, the passageways may be formed in a manner similar to the passageway as illustrated in Fig. 3, each passageway having a substantially downwardly inclined deflector lip **18** extending toward the adjoining surface of the container wall.

In operation a stream of foam is delivered to the discharge conduit from a foam forming chamber such as chamber **6** of Fig. 1 by way of the supply conduit **5** to be discharged therefrom by way of the nozzles at opposite ends of the foam discharge conduit into substantially smooth surface contact with the adjoining surface portions of the container wall substantially in the manner indicated by the arrows in Fig. 1. At the same time if downwardly opening passageways are also defined in the discharge conduit in the manner shown by any of Figs. 2, 3 and 4, a smaller stream or smaller streams of foam are simultaneously discharged against the wall surface adjoining the lower area of the foam discharge conduit. Discharging the foam in this fashion, it tends to cling to the surface of the wall while moving smoothly downwardly thereover to contact the liquid surface below the discharge conduit. As discharge continues, there is a tendency for the foam to build up on the surface of the liquid below the conduit, and adjacent the container wall providing an accumulation which acts as a cushion for the further discharge of foam. As the foam builds up along the contact line between the liquid and the container wall, it spreads outwardly therefrom by gravity to form a foam pattern having an outline substantially as shown in Fig. 1. Also in Fig. 1 there is provided a comparison between the flow pattern of foam discharged by means of a device according to the present invention and that of the usual or conventional foam discharge system, the latter pattern being indicated by dotted lines.

Although the invention has been described with reference to a foam discharge conduit shown installed in fixed relation to a container vessel the forms of the device illustrated may be adapted for employment as a portable applicator and used in conjunction with any well known means for introducing such an applicator into the upper portion of a container vessel. In addition although only a single applicator device according to the present invention is shown in its association with a container vessel it is contemplated that two or more such applicators will be disposed in circumferentially spaced arrangement about the periphery of any such container.

What is claimed is:

1. Means for applying fire foam over the exposed surface of a liquid material in a walled container, having an upper end portion and an inner wall surface, comprising a substantially elongated foam discharge conduit, at least one continuous, contoured surface portion longitudinally of said conduit, said surface portion substantially corresponding to the surface contour of said container inner wall surface in a direction horizontally thereof, a foam discharge nozzle substantially defined by said conduit at each end thereof, each said nozzle being directed in substantially parallel alignment with the contour line of said conduit continuous, contoured surface portion, a foam supply conduit opening at one end into direct communication with said discharge conduit, and in right angular relation thereto substantially midway between said nozzles, and means including said container wall for supporting said foam discharge conduit horizontally in the upper end portion of said container in substantially coincident engagement with said container inner wall surface along said conduit contoured surface portion.

2. An apparatus according to claim 1, wherein said foam discharge conduit includes at least one foam discharge passageway intermediate the ends of said conduit, said passageway defined in a conduit wall portion to open downwardly and inwardly therefrom toward said container inner wall surface when said foam discharge conduit is supported in coincident engagement with said container wall.

3. An apparatus according to claim 2, wherein said foam discharge passageway is an elongated slotted portion defined longitudinally of said conduit and which slotted portion includes an inner edge portion adjacent said conduit contoured surface portion, an outer edge portion spaced from said inner edge portion peripherally of said conduit, and a lip on said outer edge portion protruding from the outer surface of said conduit angularly in the direction of said contoured surface portion.

4. An apparatus according to claim 3, wherein said foam discharge conduit is substantially rectangular in cross section, including imperforate longitudinal upper and side wall portions, and a lower wall portion, and wherein said foam discharge passageway is defined by said lower wall portion.

5. An apparatus according to claim 1, wherein said foam discharge conduit includes a series of at least two aligned, foam discharge passageways spaced longitudinally of said conduit intermediate the ends thereof and defined in a conduit wall portion to open substantially in the direction of said contoured surface portion of said conduit.

6. A means for applying fire foam over the exposed surface of a liquid material in a cylindrical walled container having an upper end portion and an inner wall surface, comprising an arcuately curved cylindrical foam discharge conduit, said conduit having an outside radius of curvature substantially equal to that of the container inner wall surface, and providing a continuous, contoured surface portion longitudinally of said conduit, substantially corresponding to the surface contour of said container inner wall surface in a direction horizontally thereof, a foam discharge nozzle substantially defined by said conduit at each end thereof, each said nozzle being directed in substantially parallel alignment with the arc of curvature of said conduit, a foam supply conduit opening at one end into direct communication with said discharge conduit and in radial relation thereto substantially midway between said nozzles, and means including said container wall for supporting said foam discharge conduit horizontally within the upper end portion of said container in substantially coincident engagement with said container inner wall surface along said conduit contoured surface portion.

7. An apparatus according to claim 6 which includes a narrow elongated slotted portion defining a passageway through the wall of said cylindrical foam discharge conduit longitudinally thereof and intermediate the ends, said passageway opening radially in the direction of the contoured surface portion of said conduit at an angle between about 20° and 90° below the horizontal when said foam discharge conduit is supported in engagement with said container inner wall surface.

8. In a walled container for flammable liquids, a means

for applying fire foam over the exposed surface of a liquid in said container comprising a substantially elongated, horizontal foam discharge conduit mounted interiorly of the upper end portion of said container wall, said discharge conduit defining a pair of foam discharge nozzle portions at opposite ends of said conduit directed into closely spaced substantially parallel surface alignment with said container wall, a foam supply conduit opening at one end radially through said container wall into said discharge conduit substantially midway between said nozzle portions defined by said discharge conduit and at

least one foam discharge passageway defined in the wall of said foam discharge conduit intermediate the ends thereof and opening generally downwardly therefrom.

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