June 4, 1940. H. M. HOE 2,203,301

APPARATUS FOR DEPOSITING FOAM ON LIQUID SURFACES

Filed May 24, 1938 2 Sheets-Sheet 1

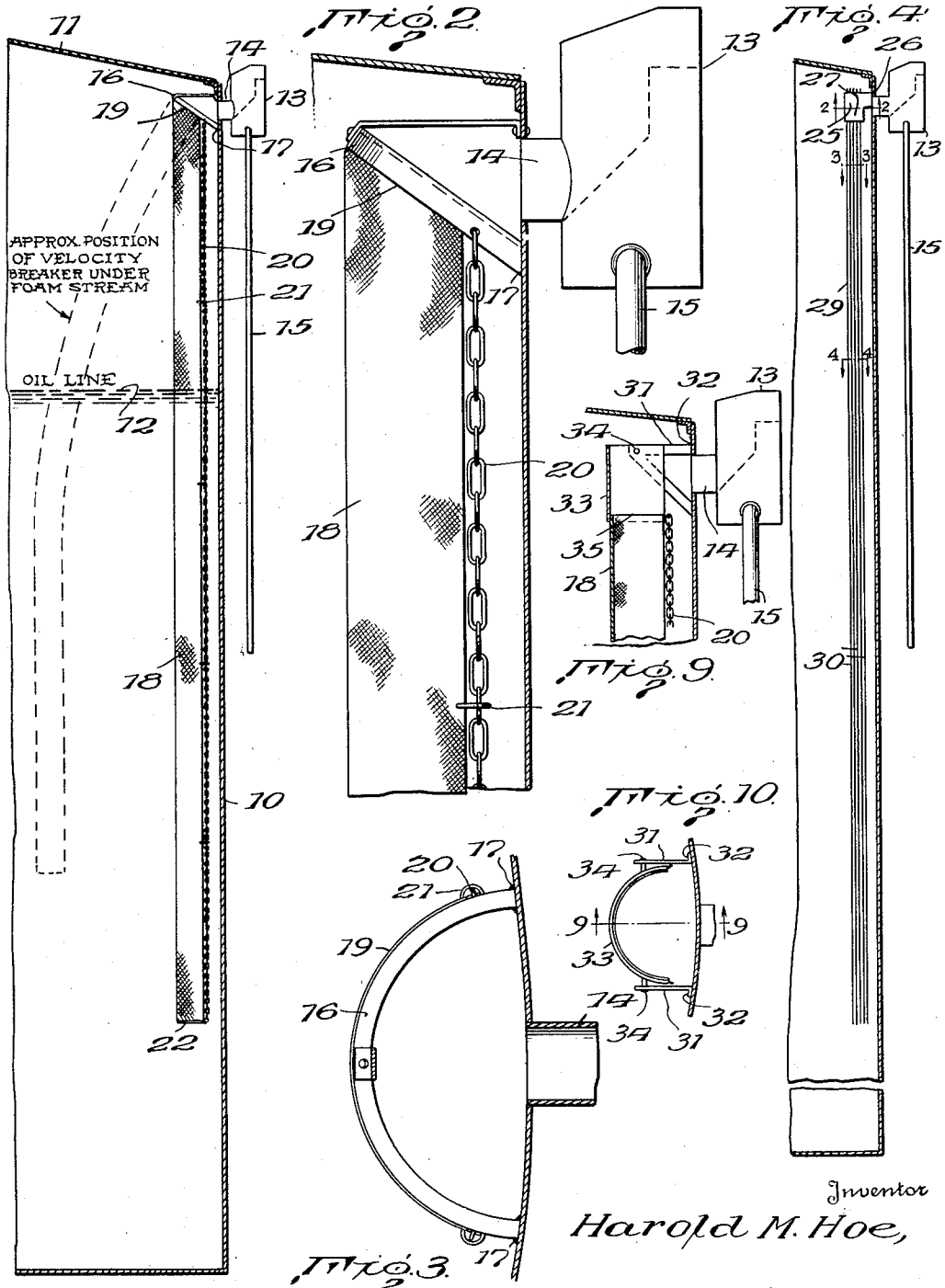


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 9.

Fig. 10.

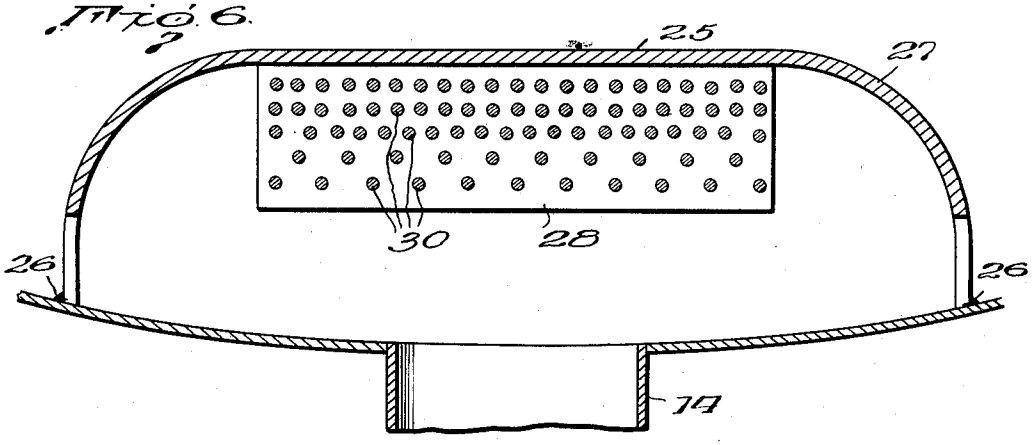
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His Attorney

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Fig. 6.



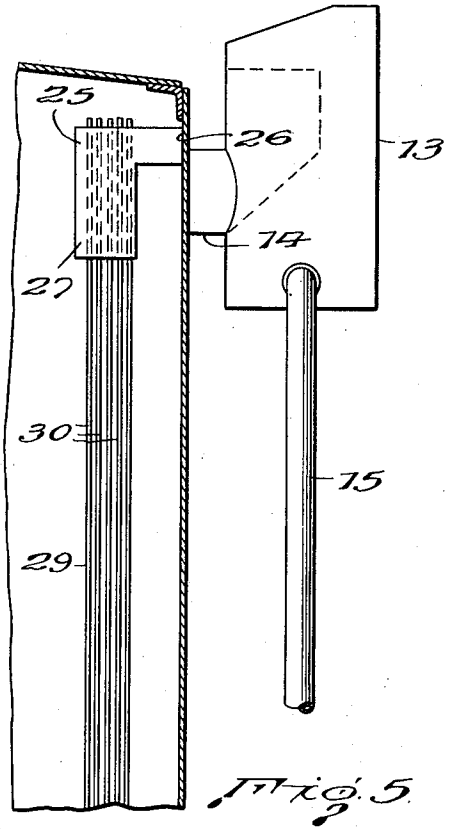


Fig. 5.

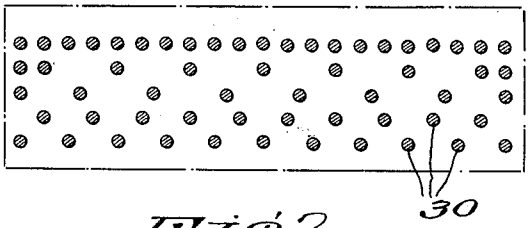


Fig. 7.

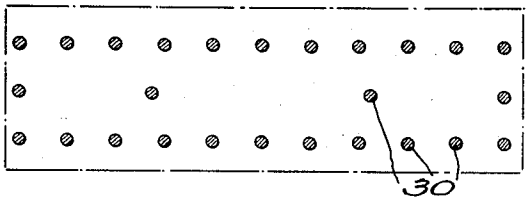


Fig. 8.

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UNITED STATES PATENT OFFICE

2,203,301

APPARATUS FOR DEPOSITING FOAM ON LIQUID SURFACES

Harold M. Hoe, Pittsburgh, Pa., assignor to Gulf Oil Corporation, Pittsburgh, Pa., a corporation of Pennsylvania

Application May 24, 1938, Serial No. 209,806

6 Claims. (Cl. 169—4)

This invention relates to apparatus for depositing foam on liquid surfaces; and it comprises in combination a tank or other receptacle adapted for storage of oil or other inflammable liquids, a supporting means within said tank adjacent the top thereof, a foam-deflecting and guiding apron of fire-resistant material attached to said supporting means and depending into said tank adjacent to the side wall thereof, said apron being spaced from said side wall throughout its length, and foam-supplying means adapted to feed fire-extinguishing foam against said apron between said apron and said tank wall; all as more fully hereinafter set forth and as claimed.

Stable carbon dioxide foams have been used extensively in the extinguishing of fires in oil tanks and other receptacles containing inflammable liquids. These foams, formed for example by mixing an aqueous solution of an acid material such as aluminum sulfate with a solution of an alkali carbonate such as sodium bicarbonate, and a foam stabilizer such as glue, licorice, or ferrous acetate, are floated on the surface of the oil or other inflammable liquid, thereby cooling the surface of the liquid and cutting off the air supply, thus smothering the fire.

Various means have been devised for applying fire-extinguishing foams to burning oil surfaces. These devices in general are open to several objections. In some cases, for example, the foam is simply generated at or near the top edge of the tank and allowed to drop without restriction to the surface of the burning oil. In such cases, the impingement of the foam, at high velocity, on the oil, results in destruction of a part of the foam. Also, portions of the dropping foam are projected below the surface of the oil and cause agitation and splashing of burning oil over the foam blanket already formed, with a resultant destruction of the foam and delay in blanketing the burning oil. In other cases, in an attempt to bring the foam gently to the surface of the oil, tubes have been used for carrying the foam from the point at which it is generated to the surface of the oil. However, the passage of the foam through these tubes tends to destroy much of the foam. Furthermore, the rate at which foam may be supplied to the surface of the oil through such tubes without projecting foam beneath the surface, is more or less limited.

I have now devised a new and improved means for depositing fire-extinguishing foam on the surface of a liquid, whereby a relatively large amount of foam may be conducted to, and gently deposited on, the surface in a relatively short time without substantial disturbance of the liquid, and with a minimum of breaking-up of the foam. In the device of my invention the foam is conducted without restriction from the point of its introduction into the tank to the oil level on the outer surface of a pendant guiding means referred to hereinafter and in the appended claims as an apron.

A more complete understanding of the elements and the operation of my invention may be obtained from the following description, reference being had to the accompanying drawings which show two embodiments of my invention, and in which—

Fig. 1 is a fragmentary diagrammatic view of an oil tank, showing in position a modification of my invention in which a flexible foam-deflecting and guiding apron is used;

Fig. 2 is an enlarged fragmentary diagrammatic view, showing the details of construction about the foam inlet in Fig. 1;

Fig. 3 is a plan view of the support for the flexible foam-deflecting and guiding apron shown in Fig. 1;

Fig. 4 is a fragmentary diagrammatic view in elevation of an oil tank, showing in position a second embodiment of my invention, in which a more or less rigid form of foam-deflecting and guiding apron is used;

Fig. 5 is an enlarged fragmentary diagrammatic view, showing the detail about the foam inlet in Fig. 4;

Fig. 6 is a sectional view along the line 2—2 in Fig. 4;

Fig. 7 is a sectional view along the line 3—3 in Fig. 4;

Fig. 8 is a sectional view along the line 4—4 in Fig. 4;

Fig. 9 is a fragmentary diagrammatic view of an alternative form of construction about the foam inlet, showing a flexible foam-deflecting and guiding apron, used in conjunction with a pivotally mounted sheet metal shield; and

Fig. 10 is a plan view of the construction shown in Fig. 9.

Referring now to the drawings, the reservoir for the inflammable liquid may be the usual type of tank having a cylindrical shell 10 and conical top 11, and containing inflammable liquid 12. A foam-mixing device 13 is affixed to the tank shell 10 and has a foam inlet 14 communicating with the interior of the tank and is connected with foam supply lines 15.

In the modification shown in Figs. 1, 2 and 3, a semicircular supporting member 16 is affixed to

the tank shell at its two ends 17 below the foam inlet, and extends upwardly at an angle from the tank shell sufficient to bring the outer edge of said support to a point substantially level with or above the top of the foam inlet. This supporting member may be of any suitable shape and may be attached to the tank shell, either above or below the foam inlet, so long as the support is adapted to maintain a portion of the fire-resistant apron in a position opposite the foam inlet and spaced from the side wall of the tank so that the foam, on being introduced into the tank between the apron and the side wall, will impinge upon the apron.

The fire-resistant apron 18 is attached to the support 16 at 19 and hangs freely, parallel to and spaced a short distance from the tank shell, and extends below the oil level in the tank. This apron may be formed of substantially any flexible fireproof material, such as an asbestos cloth or a woven metal fabric. The material used may be impermeable or partially permeable to the foam, and I have found fabrics having 4 to 10 mesh per inch quite satisfactory.

It is generally desirable in this form of my invention, to provide the apron along its vertical edges with an edging adapted to impart substantial weight to the apron. In the particular form illustrated, chains 20 are secured to the supporting member 16 adjacent the vertical edges of the apron and are loosely secured to the edges of the apron by means of rings 21 and are secured at their lower ends to a bent metal rod 22 affixed to the lower end of the apron. By this arrangement of parts, the apron is adapted to assume a chute-like form facing the tank shell and to maintain this form during delivery of foam to the oil surface. Furthermore, this heavy flexible edging material imparts to the apron sufficient weight to resist the pressure of the foam stream so that when foam is being delivered to the interior of the tank, the apron will not be lifted clear of the liquid, although it is free to bulge under the force of the stream of foam and move a short distance away from the tank shell to assume a position as illustrated in Fig. 1.

This construction is adapted to adjust itself to the velocity of the foam stream and to deposit the foam gently on the oil surface as rapidly as it is formed. The velocity of the foam stream is largely absorbed and gradually dissipated as the stream strikes and is restrained by the apron. The foam bridges the gap between the apron and the tank shell and may partially discharge around the side edges of the apron, although it is desired to keep it mainly within the chute formed by the bulging apron. In some cases it may partially discharge through the apron. The foam then slides down the apron and is gently deposited on the oil surface, the surface tension of the foam on the apron being sufficient to substantially resist the velocity of initial discharge and the acceleration due to gravity. When using this construction, the foam may be generated as rapidly as possible in the foam-mixing chamber, yet can be deposited at greatly reduced velocity on the surface of the oil. I have found that substantially less of the foam is broken down in being delivered to the surface of the oil by this apparatus than when it is delivered through an enclosed pipe-like means, or discharged into the tank without any restraint.

In the modification of my invention illustrated in Figs. 4, 5 and 6, the apron is more or less rigid in construction. In this construction, the supporting member 25 is in the form of a sheet metal shield or deflector affixed to the tank shell at its ends 26 above the foam inlet 14 and having a skirt portion 27 spaced from the tank shell and extending downward into the tank to a point below the lower edge of the foam inlet. The supporting member is also provided along the central portion of its top edge with a wide perforated flange 28, extending inwardly from the skirt portion of said support toward the tank shell. The fire-resistant apron 29 is formed of a plurality of rod-like members 30, individually supported on this flange 28. These individual rod-like members may be plain or deformed rods, tubes, chains or ropes of fire-resistant materials, preferably metal, and are in sufficient number and so spaced as to provide an apron partially permeable by the foam, and of sufficient length to extend down into the inflammable liquid. If desired, the rod-like members forming the apron may be of various lengths, so that the lower end of the apron will be formed of fewer rods than the upper end. Cross-sections taken at various levels of an apron formed in this manner are shown in Figs. 7 and 8.

In the operation of this form of my invention, the foam entering the tank through the foam inlet 14 impinges on the upper end of the apron 29 and the sheet metal skirt portion of support 25, and is deflected downward, the velocity of the foam stream being partially dissipated. The foam then flows unconfined down the pendant members 30 and is gently deposited on the surface of the oil or other liquid. The foam is unrestricted in its flow from the foam inlet to the surface of the oil, except that in descending from the top edge of the tank to the oil surface, the acceleration due to gravity is opposed by the surface tension of the foam on the apron. Thus the foam is deposited gently without breaking down a substantial portion of it, and the two principal objectionable features of the apparatus heretofore used for this purpose, are substantially eliminated.

In the alternative form of construction illustrated in Figs. 9 and 10, in which a flexible foam-deflecting apron is used in conjunction with a sheet metal shield opposite the foam inlet, brackets 31 are affixed to the tank shell at 32 on opposite sides of the foam inlet, a sheet metal shield 33 is pivotally mounted on said brackets at 34 and suspended opposite the foam inlet. The flexible apron 18 and chains 20 are attached to the lower edge of the metal shield at 35. By the use of this construction, the advantages of the flexible type of foam-deflecting apron and of a sheet metal shield opposite the foam inlet, are combined.

It will be seen that while my invention has been illustrated herein in connection specifically with one form of oil tank, it is applicable to substantially any form of storage container for inflammable liquids, and by the term tank as used herein and in the appended claims, I intend to include vat, reservoir, sump, or other usual form of storage container for inflammable liquids.

Furthermore, while I have illustrated my invention in its preferred form, it will be obvious that many changes and modifications may be made in the specific forms illustrated without departing from the spirit of the invention, and I do not intend that my invention shall be limited to the specific forms illustrated, except as hereinafter defined in the appended claims.

What I claim is:

1. A foam-protected tank which comprises in combination, a tank, a supporting means positioned within said tank adjacent to the top thereof, a foam-deflecting and guiding apron of fire-resistant material attached to and depending from said supporting means, said apron being spaced a short distance from the side wall of said tank throughout its length, and foam-supplying means adapted to feed foam against said apron between said apron and said tank wall.

2. A foam-protected tank which comprises in combination, a tank, a supporting means positioned within said tank adjacent to the top thereof, a flexible foam-deflecting and guiding apron of fire-resistant material attached to and depending from said supporting means, said apron being spaced a short distance from the side wall of said tank throughout its length, and foam-supplying means adapted to feed foam against said apron between said apron and said tank wall.

3. A foam-protected tank which comprises in combination, a tank, a supporting means positioned within said tank adjacent to the top thereof, a rigid foam-deflecting and guiding apron of fire-resistant material attached to and depending from said supporting means, said apron being spaced a short distance from the side wall of said tank throughout its length, and foam-supplying means adapted to feed foam against said apron between said apron and said tank wall.

4. A foam-protected tank which comprises in combination, a tank, a supporting means positioned within said tank adjacent to the top thereof, a partially permeable foam-deflecting and guiding apron of fire-resistant material attached to and depending from said supporting means, said apron being spaced a short distance from the side wall of said tank throughout its length, and foam-supplying means adapted to feed foam against said apron between said apron and said tank wall.

5. A foam-protected tank which comprises in combination, a tank, a supporting means positioned within said tank adjacent to the top thereof, a flexible and partially permeable foam-deflecting and guiding apron of fire-resistant material attached to and depending from said supporting means, said apron being spaced a short distance from the side wall of said tank throughout its length, and foam-supplying means adapted to feed foam against said apron between said apron and said tank wall.

6. A foam-protected tank which comprises in combination, a tank, a supporting means positioned within said tank adjacent the top thereof, a foam-deflecting and guiding apron of fire-resistant material attached to and depending from said supporting means and spaced a short distance from the side wall of said tank throughout its length, said apron comprising a plurality of rod-like members of varied lengths, and foam-supplying means adapted to feed foam against said apron between said apron and said tank wall.

HAROLD M. HOE.