July 11, 1950 F. L. BOYD ET AL 2,514,439

FIRE PROTECTING APPARATUS

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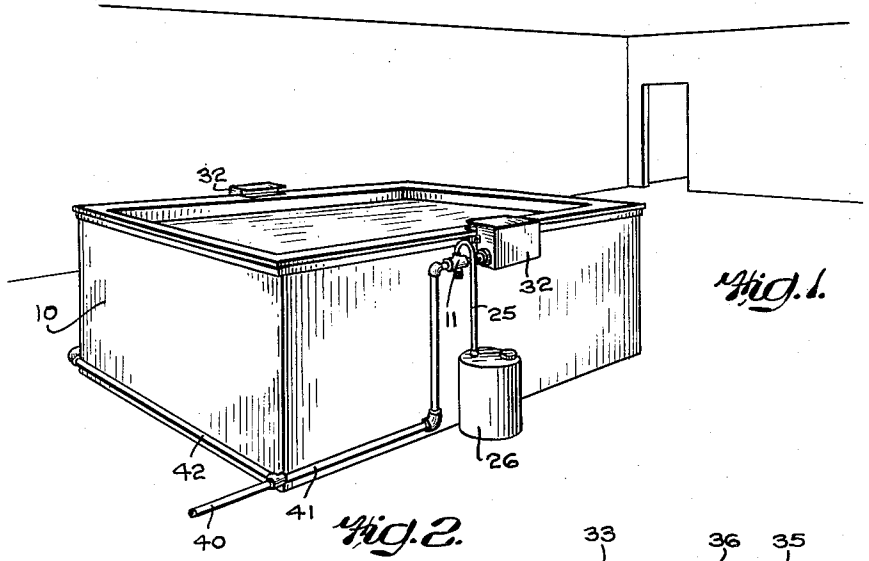


Fig. 1.

Fig. 2.

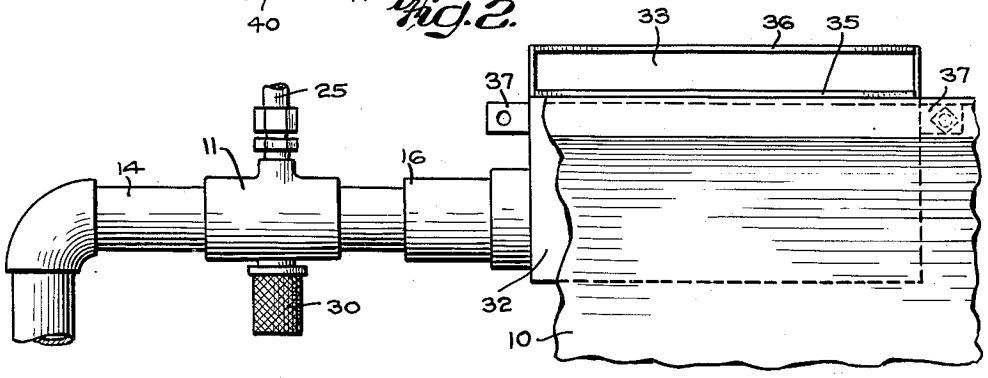
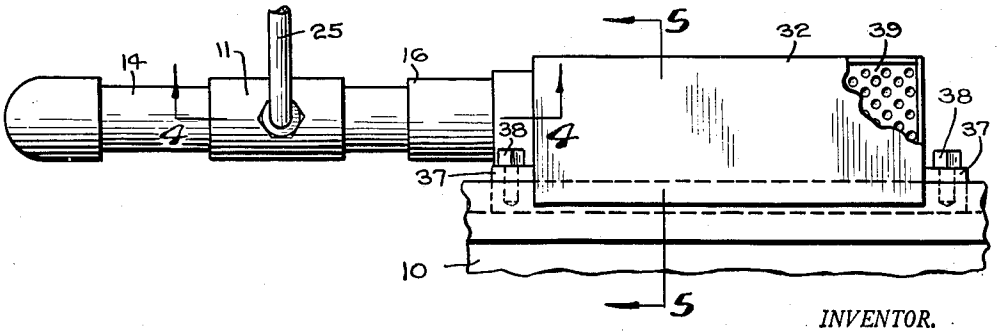


Fig. 3.



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Fig. 4.

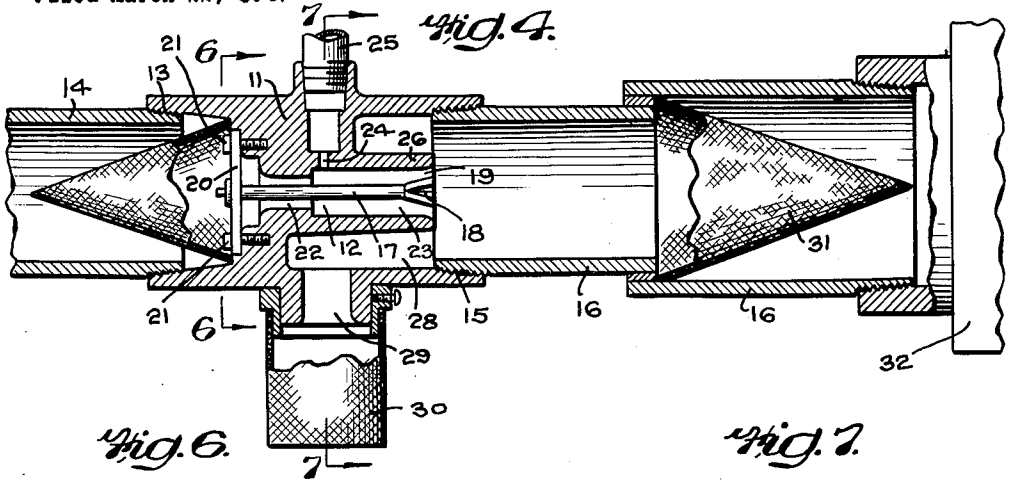


Fig. 6.

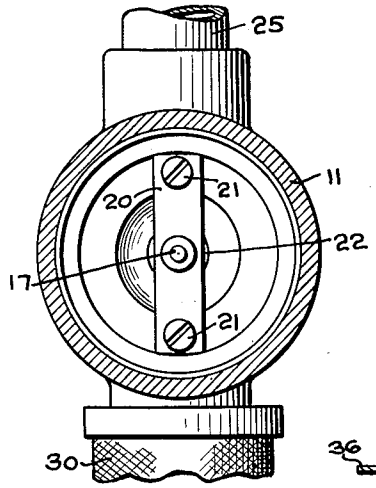


Fig. 7.

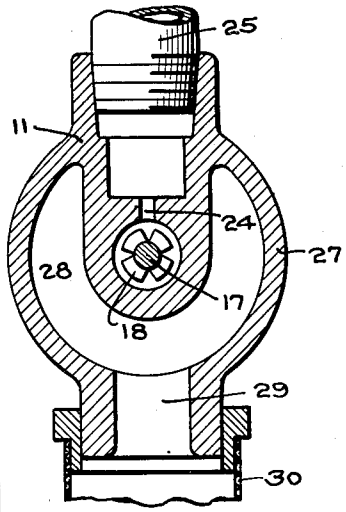
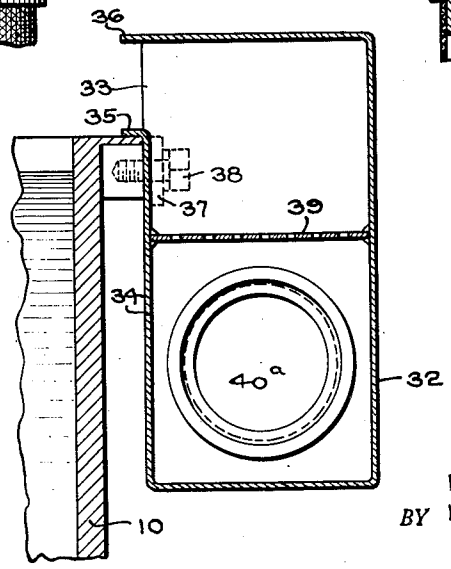


Fig. 5.



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FIRE PROTECTING APPARATUS

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Application March 22, 1947, Serial No. 736,478

4 Claims. (Cl. 169—4)

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This invention relates generally to air foam fire extinguishing apparatus and more particularly to an improved construction of apparatus which is especially adapted to generate and deliver mechanically produced fire extinguishing foam for the protection of dip tanks, spray booths and the like wherein highly flammable materials have relatively large surface areas thereof exposed to atmosphere.

Among the principal objects of the present invention is to provide a simple and relatively inexpensive apparatus for mechanically producing fire extinguishing foam which is adapted to be readily installed in close proximity to the surface to be protected and which is operable to gently apply over the surface of the flammable material a volume of foam adequate to quickly and effectively cover the entire surface of the burning material with a fire-smothering foam blanket, the apparatus being designed for operation under an extremely wide range of water pressure.

Other objects and advantages of the present invention will appear more fully hereinafter, it being understood that the invention consists in the combination, construction, location and relative arrangement of parts as hereinafter described in detail, as shown in the accompanying drawings and as finally pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a perspective view illustrating the application of the present invention to dip tank containing a highly flammable liquid to be protected against fire;

Figure 2 is an elevational view of the foam producing and delivery apparatus shown attached to one wall of the tank;

Figure 3 is a top plan view of the apparatus shown in Figure 2;

Figure 4 is a longitudinal sectional view of the foam producing apparatus as taken along the line 4—4 of Figure 3;

Figure 5 is a vertical sectional view taken along the line 5—5 of Figure 3; and

Figures 6 and 7 are transverse sectional views taken along the lines 66 and 7—7, respectively, of Figure 4.

Referring now more particularly to the drawings, it will be observed that the apparatus of the present invention has been illustrated applied to a dip tank 10 in which is stored the flammable liquid to be protected against fire. The apparatus for producing the fire extinguishing foam includes a nozzle body 11 having a central bore 12 extending axially therethrough, one end of the nozzle body

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being threadedly connected, as at 13, to a conduit 14 in communication with a suitable supply of water under pressure, the opposite end of the nozzle body being similarly connected, as at 15, to a short foam tube or conduit 16.

Suitably mounted in the central bore 12 of the nozzle body 11 is an axially extending stem 17 fitted at its outer end with a frusto-conical deflector element 18 which coacts with the terminal end of the bore 12 to provide an outwardly flaring annular opening 19 through which the water under pressure is discharged in the form of an outwardly divergent conical stream. The deflector element 18 and its stem 17 is supported by a bar 20, extending diametrically of the nozzle body and secured to the rear end thereof by the screws 21—21. The general design and arrangement of the deflector element 18 is shown and described in our copending application, Serial No. 649,698, filed February 23, 1946, now Patent No. 2,512,456, granted June 20, 1950, to which reference is herein made, in view of which further detailed description of the structure and function of said deflector element is believed to be unnecessary. Although we have shown the deflector 18 as a part of the nozzle body 11, it is to be understood that the present invention is not limited to the use of such deflector element for effecting dispersion of the stream as it is discharged from the nozzle body and that any other suitable means for this purpose may be employed, it being pointed out in this connection that the primary function of the nozzle body is to effect high velocity discharge of the foam forming solution from the central bore 12 thereof in the form of a stream capable of entraining therein a maximum amount of air from atmosphere.

For the purpose of introducing the foam-forming material into the water stream as the latter traverses the nozzle bore, said bore is provided with a restricted portion 22 in direct coaxial communication with an enlarged portion 23. As the water stream passes through the bore of the nozzle at high velocity it induces a suction action in the region where it emerges from the restricted portion 22 of the bore, this suction action being utilized to draw into the water stream a suitable foam-forming agent by way of a lateral port 24 in communication with a pick-up tube 25 connected to a suitable supply of liquid foam-forming material preferably stored in a container 26, as shown in Figure 1.

As clearly appears in Figures 4 and 7, the enlarged portion 23 of the central bore of the nozzle body extends through a tubular section 26 coaxial

with and of considerably less diameter than the outer embracing cylindrical shell portion 27 of the nozzle body, thus providing an annular chamber 28 which is freely open to atmosphere by way of the laterally extending passage 29 suitably fitted at its air intake end with a screen 30. The annular chamber 28 is in free communication with the interior of the foam tube or conduit 16 and thus permits air from atmosphere to be entrained in the diverging stream of foam-forming solution as the latter is discharged from the discharge opening 19, the air entrainment being effected in the foam tube. In order to increase dispersion of the foam-forming agent in the water stream and at the same time provide for uniform entrainment of air throughout the stream of the foam-forming solution, a reticulated cone 31 is included in the foam tube 16 as shown in Figure 4. In addition, this cone 31 serves the important function of uniformly distributing the foam throughout the area of the foam tube with the result that the volume of the foam as it emerges from the cone 31 completely fills the foam tube and moves at substantially reduced velocity toward the outlet end thereof.

Secured to the outlet end of the foam tube 16 is a foam chamber 32 of generally box-like form having a foam discharge opening 33 extending along the upper edge of its longitudinal side wall 34, the upper and lower edges of this opening being defined, respectively, by outwardly extending flanges 35 and 36. The lower flange 35 is adapted to overlie the upper edge of the tank 10 to be protected, the foam chamber being provided at its opposite sides with lugs 37—37 to facilitate mounting of the chamber rigidly upon the tank by means of securing bolts 38—38.

It will be observed, as appears most clearly in Figure 5, that the foam chamber is of substantial depth and that the foam tube 16 is in communication with its lower half portion. Also, it will be noted that said lower portion of the chamber 32 is separated from its upper portion by a horizontally disposed perforated plate 39 coextensive in area with the horizontal area of the chamber, this plate 39 being disposed well below the discharge opening 33. This perforated plate 39 functions in a manner similar to that of the perforated cone 31 in the foam tube 16 in that it serves as a baffle to spread the foam as it flows upwardly of the chamber from the foam inlet 40a (see Figure 5) toward the foam discharge opening. Thus, the baffle plate 39 serves to distribute the foam uniformly throughout the interior of the chamber above the baffle plate, in consequence of which a full volume of foam is continuously discharged from the full area of the discharge opening 33 of the foam chamber, the final discharge velocity of the foam being of such reduced order as to insure its flow gently down the internal surface of the dip tank wall onto the surface of the flammable liquid over which it spreads to provide a uniformly thick fire-smothering blanket.

If desired, depending upon the size of the tank to be protected, additional fire protection units of the present invention may be installed upon a given tank. Thus, as shown in Figure 1, a pair of such units are respectively mounted upon opposite sides of the tank, both units being commonly connected to the same source of water supply by a common conduit 40 branching off, as at 41 and 42, to supply water under pressure to the inlet ends of each nozzle body 11.

It will be understood, of course, that the present invention is susceptible of various changes and modifications which may be made from time to time without departing from the general principles or real spirit of the present invention, and it is accordingly intended to claim the same broadly, as well as specifically, as indicated by the appended claims.

What is claimed as new and useful is:

1. Apparatus for delivering fire-extinguishing air foam to the exposed surface of a flammable material comprising a closely coupled air foam generator and an elongated horizontally disposed chamber for receiving the generated foam, said chamber being provided along one side thereof with a foam discharge opening extending substantially the full length of the chamber for lateral discharge of the foam from said chamber, means in said chamber for uniformly distributing the flow of the foam therethrough toward the discharge opening thereof and for maintaining said chamber constantly filled with foam delivered thereto by the foam generator, said foam discharge opening being so disposed relatively to the surface of the flammable material as to provide for gentle flow of the foam over the surface of the flammable material, and a foam conveying conduit interconnecting said generator and said chamber, said conduit being in communication with atmosphere at the generator and being connected to said chamber at a point substantially below said foam discharge opening thereof.

2. In an apparatus of the character defined in claim 1 wherein said foam receiving chamber is generally in the form of a rectangular box, the interior of which is sepaarted by a perforated plate into a pair of vertically spaced compartments, the lower of said compartments receiving directly the foam delivered thereto by the foam generator and the upper of said compartments being provided with said foam discharge opening presenting toward the surface of the flammable material to be blanketed with foam.

3. Apparatus for delivering fire-extinguishing foam to an open tank or the like containing a flammable liquid comprising a foam maker and a chamber closely coupled therewith for receiving the foam, said chamber being of box-like form having a pair of vertically spaced compartments separated from each other by a perforated baffle plate, the upper compartment being provided with a foam discharge opening of substantial depth extending lengthwise along the upper edge of the foam chamber and the lower compartment being connected to said foam maker by a relatively short foam conveying conduit open to atmosphere at the foam maker end thereof.

4. In an apparatus for delivering fire extinguishing foam to the exposed surface of a flammable material, in combination, a jet discharger for a foam-forming solution having a bore extending axially therethrough and an annular recess coaxial with and separated from said bore, an inlet port for a liquid foam-forming agent in communication with said bore for introducing said agent into a water stream flowing through said bore, an air inlet port in communication with said annular recess for entraining air into said foam-forming solution as it issues from the discharge opening of said bore, a foam tube connected to said jet discharger with its interior commonly in communication with said coaxial discharge openings of said bore and recess, and a foam chamber connected to the discharge end of said foam tube, said chamber being provided with a foam discharge opening of substantial

area, said foam chamber including baffle means therein operative to uniformly distribute the flow of the foam through said chamber for full volume, low velocity discharge through said discharge opening whereby to effect gentle application thereof to the surface of the flammable material.

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