Jan. 28, 1969 C. F. THOMAE 3,424,250

FOAM-GENERATING APPARATUS

Filed Jan. 6, 1966

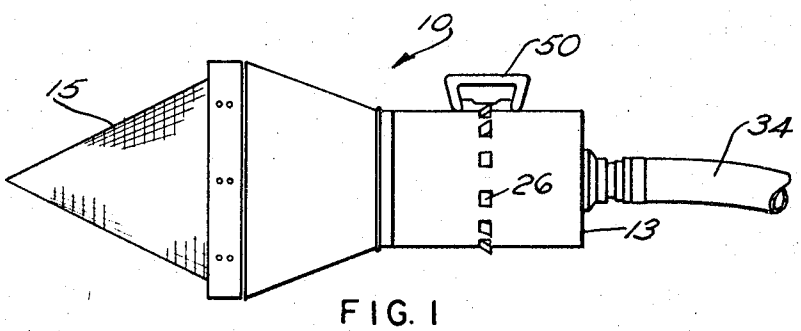


FIG. 1

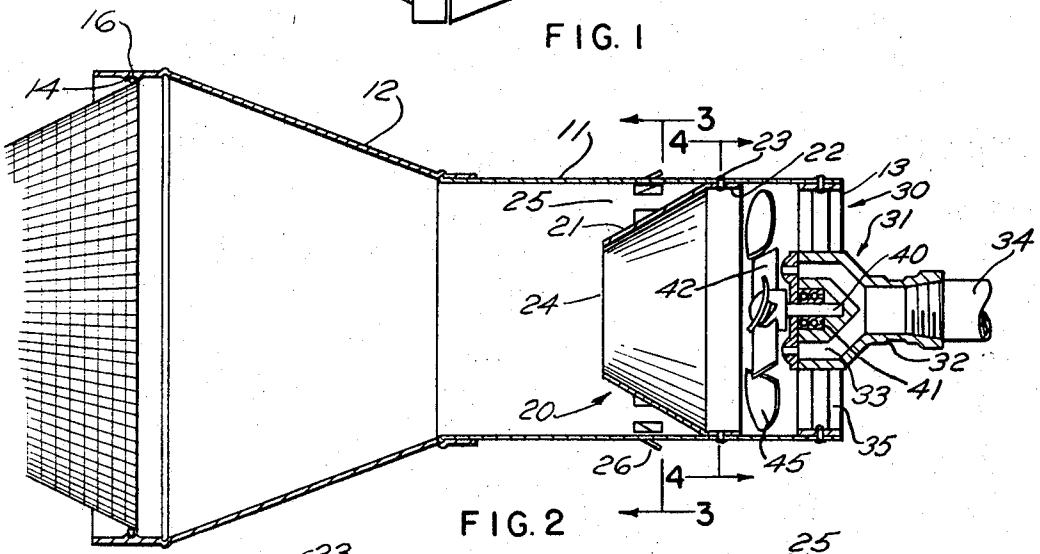


FIG. 2

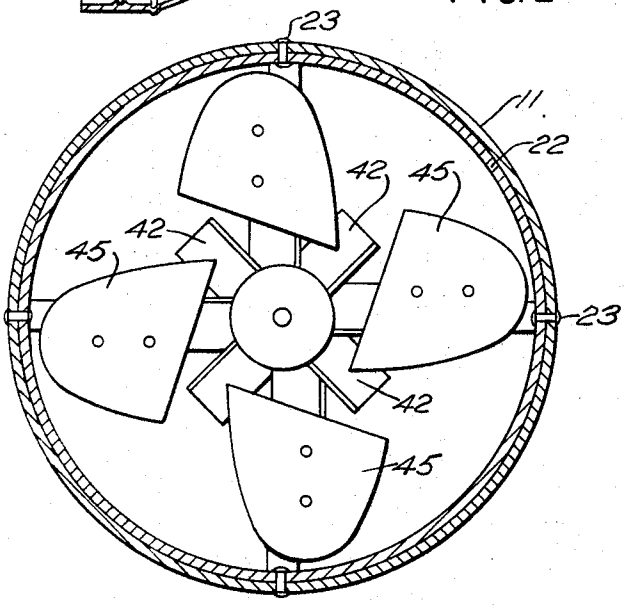


FIG. 4

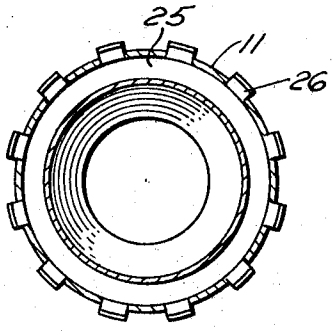


FIG. 3

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FOAM-GENERATING APPARATUS

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ABSTRACT OF THE DISCLOSURE

An apparatus for entraining air in a mixture of water and detergent compound to form a foam and then entraining further air in the foam to provide a high expansion foam for use in firefighting.

Foam used in firefighting is produced mechanically by entrainment of air in jets of liquid comprised of a mixture of water and a detergent compound.

Heretofore, expansion foam generators for expanding the volume of a liquid stream of foam compound have resulted in an expansion within the range of 8 to 1 and 14 to 1.

This invention, however, deals with much higher expansions in volume, something in the order of from 800 to 1 to 1200 to 1. In order that such higher expansions be obtained, considerable air intake into the apparatus must be attained, in fact, a greater amount of air than has been previously obtained in the proportioning of the air intake to the water and detergent compound.

High expansion foam generating apparatus constructed with considerations to produce large expansion in the liquid stream of water and detergent compound has proved, unwieldly, and it is one of the objects of the present invention to provide a compact foam generating apparatus capable of producing high expansion in a supply of water and detergent compound.

Apparatus for generating high expansion foam for use in firefighting, according to the present invention, comprises of a casing which is the nozzle, adapted to divide a supply of water and detergent compound under pressure to the nozzle into a ring of jets spaced to cause the water and detergent compound to impinge upon a rotatable mounted impeller, causing the impeller to rotate fan blades under the influence of the jets, the blades of the fan acting, during the rotation of the impeller, to draw air through the nozzle in the direction of the supply of water and detergent compound, effecting intimate mixing between the air and the supply of water and detergent compound at the forward end of the nozzle, the assistance of louvers in the nozzle casing head of the impeller and fan about a conical wall taking advantage of the venturi effect created by the cone wall, thereby causing further expansion.

It will be appreciated that by using both the velocity of the liquid jets and the action of the fan blades of the impeller to draw air into the apparatus, the size of the air intake required in order to draw a given volume of air into the liquid stream is smaller than would be the case where only the velocity of the liquid stream employed to draw in air into the nozzle casing is used.

The quality of foam generated by the apparatus of the invention depends on the effectiveness with which the air and the stream of water and detergent compound is mixed, without regard for a decrease in the forward velocity of the water and detergent compound.

Therefore, in this invention, it is an object to provide apparatus for generating foam for use in firefighting in which foam of improved volume is generated without regard for reduction of the forward velocity of the stream of water and detergent compound.

Thus, according to a preferred form of the invention, the means for effecting intimate mixtures of the air and the suppyl of water and detergent compound includes a conical nylon mesh net disposed forwardly of the nozzle casing and adapted to the nozzle casing by which the mixed air, water and detergent solution is deterred and through which the volume in the nozzle casing is forced to pass by volume without regard for velocity as opposed to low expansion foam generating equipment which operates with the intent to maintain a high degree of forward velocity.

With these and other objects in view, the invention consists of certain novel features of construction as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings:

FIG. 1 is an elevational view of the apparatus with a supply pipe of water and detergent compound connected thereto;

FIG. 2 is a sectional view of a fragmental portion of that shown in FIG. 1 on a somewhat larger scale;

FIG. 3 is a section on line 3—3 of FIG. 2; and

FIG. 4 is a section on line 4—4 of FIG. 2 of the fan and impeller.

With reference to the drawings, **10** designates generally a casing which has a cylindrical body portion **11** and an outwardly flaring nozzle portion **12**. Generally there is a passageway through the casing from the rear end portion **13** to the forward nozzle end portion, and this downstream or forward end portion is provided with a nylon mesh net **15** for the production of bubbles and foam-like fog which is to be produced by the device. This net is secured in place by an expansion wire hoop **16** fitted between inward projections **14** at the forward end of the nozzle.

In the cylindrical body portion of the casing **11** there is provided a confining means designated generally **20** which comprises a frusto conical wall **21** having a cylindrical rear portion **22** which may be secured by rivet means **23** to the cylindrical portion of the casing. This wall serves to confine the water-detergent compound and entrained air as the mixture passes in the rear end **13** of the casing and progresses forwardly through the casing. The wall **21** creates a venturi action by reason of the restricted end portion **24** thereof. Thus, in the area around this restricted portion and in this venturi formation, there is a lower pressure area such as at **25**, and about this wall **21** there is provided a plurality of openings shown in the form of louvers **26** opening into this area of lower pressure so that as the passage of entrained air and water-detergent mixture moves through the casing, there will be drawn into the casing through these louvers additional air to be mixed with the water-detergent compound and air which is passing therethrough, thus expanding the volume to many times that which has heretofore been attained.

In the rear portion of the casing **11**, that is, to the rear of this confining means **20** and adjacent the rear end of the casing, there is provided a spider **30** which spider provides a support for a liquid directing means **31** providing a common passage **32** which is divided into a plurality of passages **33** arranged circularly about the axis of the casing so that when liquid such as water and a detergent compound is supplied through a hose **34** screwed onto the common duct **32**, it will be forced inwardly axially of the casing and at points spaced outwardly radially from the center axis of the casing. Openings **35** are provided about this liquid directing means radially outwardly of the series of nozzles **33**. A shaft **40** is anti-frictionally mounted at the center of these nozzles, such as by means of a ball bearing **41**, and on the end of this shaft there is a rotating means comprising a plu-

rality of impellers **42** arranged radially so that as the liquid is forced out of the nozzles **33**, it will engage these impellers and turn this rotating means. Radially outwardly from the impellers **42** there are fan blades **45** which are so pitched that they will draw air inwardly from the rear end of the casing through the openings **35** about the nozzle and force the air forwardly to mix with the liquid from the nozzles as it passes the impellers and enters the frustro conical confining means **20**. The blades also serve to stir the liquid that is trapped in the area thereabout and thus assist in the air entrapment. The air/liquid mixture may expand after passing through the restricted end **24** of the confining means **20**, the primary action of mixing air, water and detergent having taken place. However, after the injected material has passed the confining means **20** and further expands in the foamed state, it is again further mixed with air to cause a much greater expansion to occur. The additional air enters through louvers **26**, being sucked in by the venturi action of confining means **20**. Accordingly, as the foam mixture moves outwardly, a second stage of mixing occurs. To complete the entrapment of air in foam solution, the mixture is projected through a net **15**, the net promoting contact between the finely divided liquid solution and the air in an action similar to a "bubble ring" toy.

By reason of this construction a much smaller and more easily handled device may be provided and yet one which provides greater expansion than heretofore available. The device may be carried about by means of a handle such as **50** as seen in FIG. 1.

I claim:

1. An apparatus for generating foam for use in firefighting comprising a tubular casing having an axial passage therethrough, a confining means within the casing and along said passage for restricting the passage and for providing a venturi action therein as air, liquid and detergent move forwardly axially along said passage, said casing having openings therein substantially adjacent the area about said confining means for admitting air into the casing, means for directing liquid axially into the casing generally centrally thereof, said casing being open about said liquid directing means to provide an entrance for the admission of air into the casing, rotary means

adjacent said liquid directing means for drawing air through the air entrance and moving it forward through said casing and an impeller adjacent said liquid directing means and positioned to be driven by the liquid moving through the liquid directing means for driving said rotary means whereby said rotary means substantially simultaneously contacts the liquid and air to mix the same and force the mixture downstream.

2. An apparatus as in claim **1** wherein said confining means is frustro-conical and supported from said casing.

3. An apparatus as in claim **1** wherein said confining means is frustro-conical and supported from said casing and said casing openings are midway of the axial extent of said confining means.

4. An apparatus as in claim **1** wherein said openings are louvers.

5. An apparatus as in claim **1** wherein said liquid directing means is divided into a plurality of separate streams.

6. An apparatus as in claim **1** wherein said liquid directing means is divided into a plurality of separate streams spaced from the axis of said tubular casing and arranged generally circularly about said axis.

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