Aug. 10, 1937. W. FRIEDRICH 2,089,646

APPARATUS FOR PRODUCING A FIRE EXTINGUISHING FOAM

Filed Feb. 25, 1935

Fig. 1

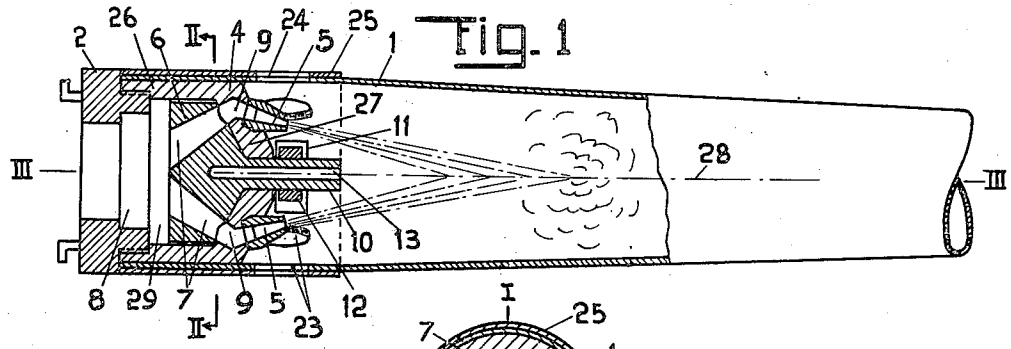


Fig. 2

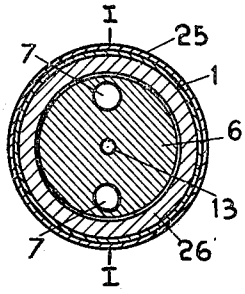


Fig. 3

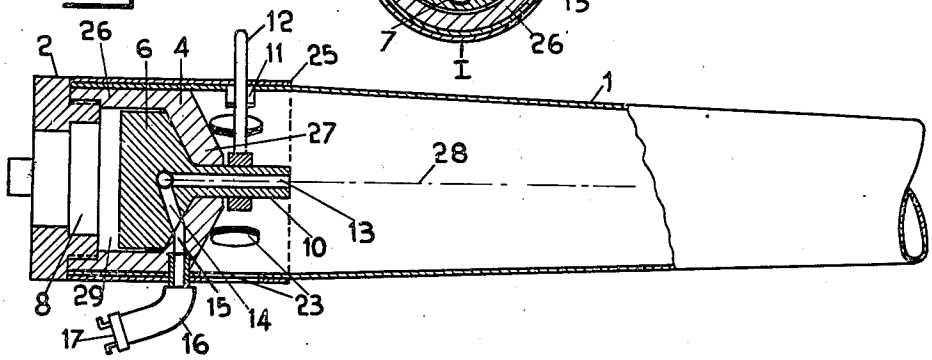


Fig. 4

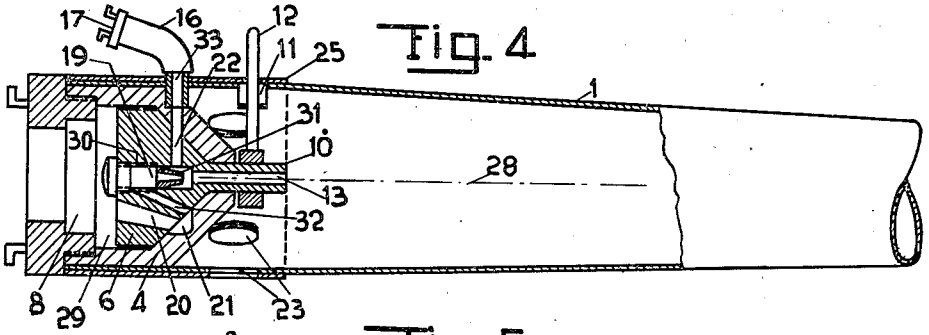
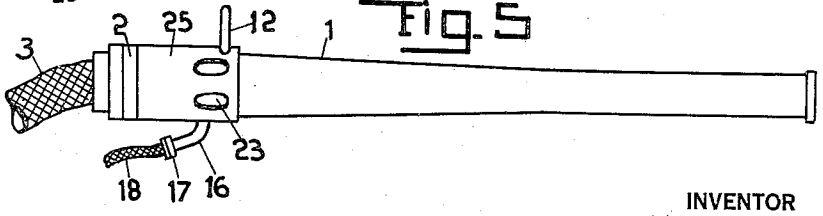


Fig. 5



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APPARATUS FOR PRODUCING A FIRE EXTINGUISHING FOAM

Wilhelm Friedrich, Berlin-Charlottenburg, Germany

Application February 25, 1935, Serial No. 8,062
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9 Claims. (Cl. 261—116)

(Granted under the provisions of sec. 14, act of March 2, 1927; 357 O. G. 5)

This invention relates to improvements in foam producers, particularly to foam producers for fire extinguishing purposes.

It is one object of the invention to facilitate the handling of such apparatus.

It is another object of the invention to simplify the structure of such an apparatus.

This improvement may be described more in detail by reference to the figures of the drawing in which Figure 1 is a cross section along the line I—I in Figure 2 through the entrance end of the apparatus according to the invention the discharge end of which is broken away. Figure 2 shows a cross section through the entrance end along the line II—II in Figure 1. Figure 3 shows a cross section through the tube according to Figure 1 along the line III—III in Figure 2. Figure 4 shows a cross section through the entrance end of a tube according to a modification of the invention; and Figure 5 shows a side view of such an apparatus.

A foam producer, particularly for fire extinguishing purposes, consists of a tube having an entrance and a discharge end. A quenching liquid under pressure, such as water from a hydrant or a fire pump, is led to the entrance end of the tube and allowed to discharge into the interior of the tube towards its discharge end. Particularly, turbulence may be imparted to the liquid before, or while being released into the tube so that it may enter the interior of the tube in a finely sub-divided state. Inlet means for gas are provided adjacent to the entrance end, such gas being preferably sucked in by the action of the quenching liquid entering with high velocity the interior of the tube. Particularly air from the surrounding atmosphere may be sucked in in this way. The gas sucked into the interior of the tube is mixed with the quenching liquid with which a foam promoting agent is admixed in any suitable way. The liquid being in a very finely divided state, a foam will be produced the volume of which equals eight and more times the volume of the quenching liquid introduced into the tube. The volume of the foam may equal up to 18–20 times, and more, the volume of the quenching liquid, depending upon the velocity of the liquid, its fine sub-division or atomization, on the amount of gas permitted to enter the tube under the sucking action of the liquid, and on the space within the tube wherein the mixing of air and liquid in the presence of a foam promoting agent takes place. The foam so produced will show very small bubbles, sometimes so small they cannot be recognized with the naked eye. The foam produced will be very enduring, depending upon the foam promoting agent used. Salts of an aromatic alkalyted sulfo acid, or salts of an alkyl naphthalene sulfo acid, or a sulfonated fatty alcohol, or mixtures of them, have been proven as particularly suitable types of foam producing agents.

As stated in my co-pending application Serial Number 701,069, December 5, 1933, now Patent No. 2,003,184 dated April 29, 1935, the fine subdivision or atomization of the stream of the quenching liquid may be achieved by diverting the stream, or imparting to it turbulence by other means (not shown), as for instance converting it into a substantially tubular stream of filmlike thickness, or dividing the unitary stream into a plurality of relatively small, free flowing and converging jets, which may impinge on each other, whereby a further subdivision and atomization may be obtained. The foam producing agent may be admixed with the unitary stream of liquid before being subdivided, or it may be admixed to one or more of the jets in which the stream is divided, or it may be admixed with the already sub-divided or atomized quenching liquid by injecting a stream containing such foam producing agent into the eddy of the quenching liquid produced within the tube.

According to the invention, a member is provided adjacent to the entrance end of the tube adapted to subdivide the quenching liquid and mix with it the foam producing agent, this member forming simultaneously a means for regulating the volume of the foam promoting agent admitted into the tube. In addition thereto, the member may be adapted for entirely shutting off the entrance of any such liquid and foam producing agent into the tube.

As a part of this member adapted to regulate and to close, as the case may be, the admission of liquid, means may be provided adapted to regulate the volume of gas, particularly air, permitted to enter the tube under the sucking action of the quenching liquid released into the tube. This means may regulate, and also shut off, the entrance of air, or gas.

Referring to Figures 1, 2, 3, 5, 1 designates a tube of suitable cross section and length adapted for the formation of consistent foam, which may be thrown off for a considerable distance. At the entrance end means 2 for coupling the tube with a suitable conduit for a quenching liquid under pressure are provided. Inside this end of the tube and the coupling means 2, a member 4 is provided, being cylindrical and hollow at one end 26 and closed by an almost conical part 27

on its other end towards the inner side of the tube. Two or more nozzles 5 are connected with, and carried by, the conical part 27. These nozzles are preferably inclined at an acute angle to the axis 28 of the tube and converging so that they impinge upon each other. The nozzles 5 communicate with passages 9 in the part 27 which communicate with the hollow space 29 within the cylindrical part 26 of the member 4. In this space 29 a member 6 is rotatably arranged, having in part a cylindrical circumference spaced from the inner surface of the part 26, and in part a conical fitting to the inner surface of the part 27. Passages 7 are arranged in this member 6 adapted to connect the space 29 with the passages 9 and thereby with the nozzles 5. The member 6 is further provided with a cylindrical projection 10 fitting in a cylindrical hole in the part 27 and passing through it into the interior of the tube 1. This part 10 serves as a pivot for the member 6. A handle 12 is fastened with its inner end to the outside of the tube, or pivot, 10. An opening 11 is provided in the tube 1 permitting the handle 12 to pass so that it can be served from outside.

The inner hollow 13 of the tube 10 is connected with another passage 14, Figure 3. A passage 15 is provided in part 4 (Figure 3) and is connected with a conduit 16 which is attached at 17 to a suitable conduit for the foam producing agent which might be dissolved in a liquid, preferably the same quenching liquid as that being introduced into the space 8.

Adjacent to the entrance end of the tube 1 inlets 23 of suitable number and cross sections are provided, permitting the entrance of the desired maximum volume of air into the tube 1. Another short tube 25 is rotatably arranged outside the entrance end of the tube 1 and provided with openings 24 of about the same size and arrangement as the inlet openings 23. The handle 12 passing the slit 11 passes also the tube 25 as shown in Figure 3.

The diameter of tube 1 decreases from its entrance to its discharge end, at least over a part of its length, as shown in Figure 5. The member 2 may be connected with a hose 3 and this hose may be connected to a hydrant on the street, or to a fire pump. The pipe 16 may be connected by means of the clutch 17 with a hose, or another conduit 18 leading to a container, not shown, of the foam promoting agent, which may be present in the container either in a dissolved state or in a powdery form and carried away by means of a liquid under pressure injected, or otherwise introduced, into the container. Suitable forms are described in the co-pending application No. 701,069, of the same inventor.

In operation, having connected the tube 1 with a source of quenching liquid and foam producing agent, the operator turns the handle 12 so that the passage 7 comes into alignment with passage 9 and the quenching liquid under pressure is admitted into the nozzle 5 and released in the interior of the tube in form of converging jets impinging upon each other. Thereby the liquid is finely sub-divided and atomized. Simultaneously the openings 23 and 24 are brought in alignment permitting the entrance of air into the tube 1 under the sucking action of the liquid injected and atomized therein. Through the hose 18, pipe 16, passages 15, 14, the foam promoting agent is moved into the passage 13 of the tube 10 and injected into the stream of liquid released from the nozzles 5. Thereby, the air entering the tube 1 is admixed to a finely sub-divided and atomized quenching liquid in the presence of a foam promoting agent, and the desired foam with very fine bubbles, and of considerable durability, is produced.

By turning the handle 12 the stream of quenching liquid is more or less choked off, and at the same time, the stream of the foam producing agent and the volume of air admitted into the tube. In one position of the handle 12 all these streams and the entrance of air may be closed. It is to be understood, however, that the tube 25 has not necessarily to be provided, and if provided it need not necessarily be connected with the handle 12, but may have other means for turning it from a closed into an open position.

In the modification according to Figure 4 the same reference numbers designate similar parts. There the hollow 13 in the pivot 10 is elongated to the rear ends of the member 6 at the left side in the drawing. In this elongation 30 a nozzle 31 is inserted, connected with the tubular part 19, which is screwed in the member 6 near to its rear end. Two passages 20 and 32 are provided in the member 6 and a connecting passage 21 in the part 9 of stationary member 4.

The passage 20 opens at one end permanently into the space 8 and with its other end in the position shown into the passage 21. The passage 32 is permanently connected with the hollow space within the tube 19 and opens with its other end in the position shown into the passage 21. Another passage 22 connects the space surrounding the nozzle 31 with another passage 33 leading through the tube 16.

The member 2 of the tube is to be connected with a hose 3 and the tube 16 is to be connected with a hose 18 in the same way as described before. The handle 12 being turned in the operating position, the quenching liquid under pressure will enter the tube 1 as described before. Part of the quenching liquid will enter the passages 20, 21, 32, then the tube 19 and will be ejected through the nozzle 31 into the hollow 13, sucking in thereby the foam promoting agent through the pipe 16 and passages 33, 12. This agent will be admixed to the jet of quenching liquid released from the nozzle 31 passing the hollow 13. In this way the foam producing agent, or a solution containing this agent, does not need to be led into the tube under pressure. By turning the handle 12, the passages 20, 32 will be brought more or less out of alignment with passage 21 and in the same way the passage 22 in respect to the passage 33, whereby a choking effect may be obtained. Lastly, by turning these rotatable passages entirely out of alignment with the stationary ones, a complete shutoff can be achieved simultaneously with shutting off the quenching liquid and the air from the interior of the tube 1.

It should be understood that the invention is not limited to the examples described herein, but may be performed in any other way without deviating from its spirit.

What I claim is:

1. An apparatus for producing a fire extinguishing foam, comprising a tube having entrance and discharge ends, a hollow support provided with at least one nozzle adapted to inject a jet of quenching liquid into the interior of said tube toward its discharge end, said support being connected with said entrance end; a member rotatively arranged within and adapted to cooperated with said hollow support, said member having a hollow pivot penetrating said support and

being open toward the interior of said tube; coordinated passages in said member and said support, a passage in said support communicating with a nozzle, a passage in said member communicating with a conduit for quenching liquid under pressure; another passage in said member communicating with the hollow of its pivot, another passage in said support coordinated to the latter passage in the member adapted to communicate with a conduit of a foam producing agent under pressure; the said passages in the member and support being in alignment in a relative position of said member and support, and out of alignment in another relative position, actuating means outside said tube adapted to rotate said member into the said different positions; and inlet means for air adjacent to said entrance end.

2. An apparatus for producing a fire extinguishing foam, comprising a tube having entrance and discharge ends; a hollow support provided with at least one nozzle adapted to inject a jet of quenching liquid into the interior of said tube towards its discharge end, said support being connected with said entrance end; a member rotatively arranged within and adapted to cooperate with said hollow support, said member having a hollow pivot penetrating said support and opening towards the interior of said tube; passages in said support and said member coordinated to each other, a passage in said support communicating with said nozzle, a passage in said member adapted to communicate with a conduit for quenching liquid under pressure; an aspirating nozzle arranged within the hollow of the pivot of said member, another passage in said member communicating with said nozzle, and a further passage in said member adapted to communicate with the conduit for quenching liquid under pressure, the last mentioned two passages being adapted to communicate with each other by means of and if facing a groove provided in the support; still a further passage arranged in said member communicating with the hollow of said pivot, said passage being coordinated to a passage arranged in said support and being adapted to communicate with a supply of a foam producing agent; the said coordinated passages of said member and support being in alignment and the other passages of said member facing said groove of the support in a relative position of said member and said support while being out of communication in another position; actuating means outside said tube adapted to rotate said member and said support relatively to each other into the said different positions; and inlet means for air adjacent said entrance end.

3. In an apparatus as claimed in claim 1, means adapted to open and to close the inlet means for air and being connected with the said actuating means outside the tube.

4. In an apparatus as claimed in claim 2, means adapted to open and to close the inlet means for air and being connected with the said actuating means outside the tube.

5. An apparatus for producing a fire extinguishing foam comprising a tube having entrance and discharge ends, means arranged inside said tube adjacent to said entrance end for introducing at least one high velocity stream of quenching liquid and a foam promoting agent into the interior of said tube toward its discharge end, means provided with passages for said liquid and foam promoting agent pivotally arranged adjacent to and co-operating with said introducing means, inlet means for air from the surrounding atmosphere adjacent to said entrance end following said introducing means, a slide rotatably arranged adjacent to and co-operating with said inlet means, and means adapted to be served from outside for rotating simultaneously said pivotally arranged means and said slide.

6. In an apparatus for producing a fire extinguishing foam, comprising a tube having entrance and discharge ends, means arranged inside said tube adjacent to said entrance end for introducing at least one high velocity stream of quenching liquid and a foam promoting agent into the interior of said tube toward its discharge end, means adjacent to said entrance end for controlling the volume of said stream of quenching liquid entering said introducing means, said introducing means and controlling means being rotatable relative to each other, means outside said tube for rotating said means, and inlet means for a gas into said tube following said introducing means adjacent to the entrance end of said tube.

7. In an apparatus for producing a fire extinguishing foam, comprising a tube having entrance and discharge ends, means arranged inside said tube adjacent to said entrance end for finely subdividing and introducing at least one high velocity stream of quenching liquid and a foam promoting agent into the interior of said tube toward its discharge end, means adjacent to said entrance end for controlling the volume of said stream of quenching liquid entering said introducing means, said introducing means and controlling means being rotatable relative to each other, means outside said tube for rotating said means, and inlet means for a gas into said tube following said introducing means adjacent to the entrance end of said tube.

8. An apparatus for producing a fire extinguishing foam, comprising a tube having entrance and discharge ends, at least one nozzle arranged inside said tube adjacent to said entrance end, adapted to inject a jet of quenching liquid and a foam promoting agent into the interior of said tube toward its discharge end, means arranged adjacent said entrance end for controlling the volume of said stream of quenching liquid entering said nozzle, said controlling means and said nozzle being rotatable relative to each other, means adapted to be served from outside for rotating said means and said nozzle relative to each other, and inlet means for a gas into said tube adjacent to its entrance end following said nozzle.

9. In an apparatus according to claim 8, said inlet means for a gas adapted to be regulated.

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