April 7, 1953 E. KLOSSE 2,633,859

MEANS FOR MIXING TWO LIQUIDS UNDER DIFFERENT PRESSURES

Filed Nov. 25, 1950 2 SHEETS—SHEET 1

Fig. 1.

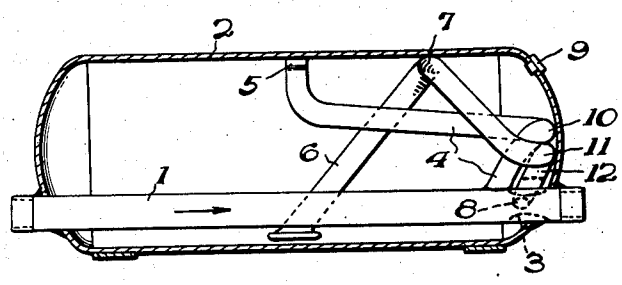


Fig. 2.

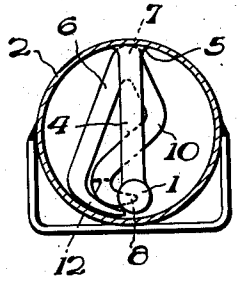


Fig. 3.

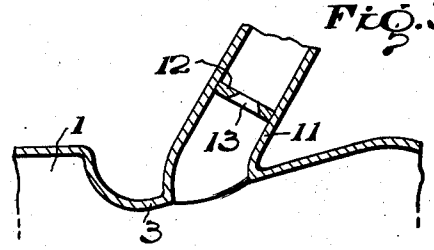


Fig. 12.

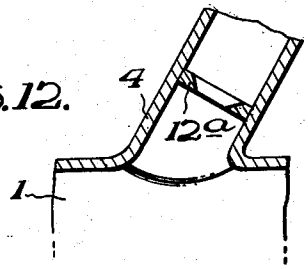


Fig. 4.

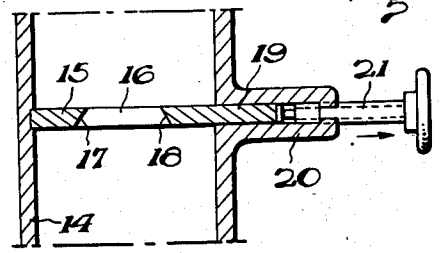
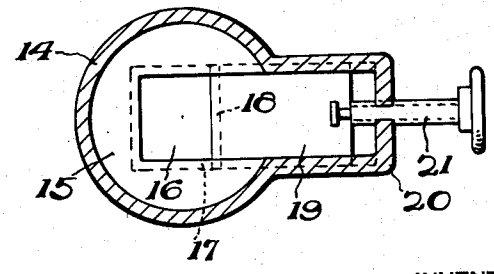


Fig. 5.



INVENTOR
Ernst Klosse.

BY Emory L. Groff
ATTORNEY

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Fig. 6.

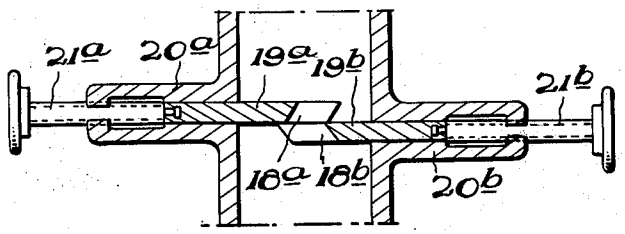


Fig. 7.

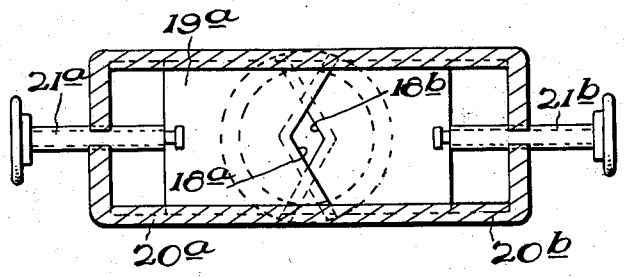


Fig. 8.

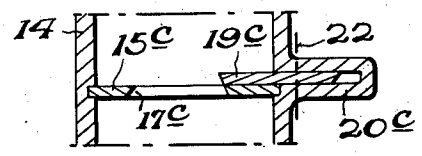


Fig. 9.

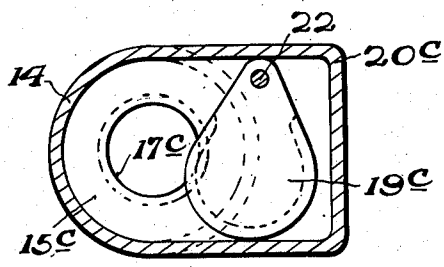


Fig. 10.

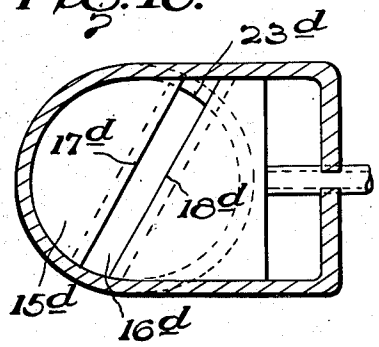
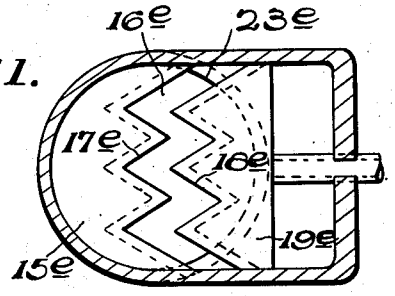


Fig. 11.



INVENTOR
Ernst Klosse.

BY

ATTORNEY

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2,633,859

MEANS FOR MIXING TWO LIQUIDS UNDER DIFFERENT PRESSURES

Ernst Klosse, Ladenburg (Neckar), Germany, assignor to Total Kommanditgesellschaft Foerstner & Co., Ladenburg (Neckar), Germany, a company of Germany

Application November 25, 1950, Serial No. 197,550
In Germany November 25, 1949

4 Claims. (Cl. 137—88)

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This invention relates to an apparatus for insuring a constant ratio of mixture of fire extinguishing water and of the foam stabilizing solution to be admixed to said water.

To produce an effective fire extinguishing foam it is essential, next to sufficiently changing the mixture of fire extinguishing water and foam stabilizing solution into foam, that even by fluctuating pressures or speeds of flow of the fire extinguishing water a constant ratio of mixture between the fire extinguishing water and the foam stabilizing solution is maintained.

The pumps, which are developed for admixing the fire extinguishing medium and which are driven by the fire extinguishing water, assure a constant ratio of mixture but demand a considerable expense for apparatus, while a constant ratio of mixture is not assured if the foam stabilizing solution is introduced at the narrowest portion of a Venturi tube inserted in the pipe line for the fire extinguishing water, because, while a considerable smaller cost for mechanical means is needed, the constant ratio of mixture depends thereby on the feed pressure of the fire extinguishing medium and the pressure in the Venturi tube and on the viscosity of said solution, especially if the feed pressure and the speed of delivery of fire extinguishing water fluctuates.

The invention relates to a new apparatus for maintaining constant the ratio of mixture of the fire extinguishing water and of the foam stabilizing solution introduced at the narrowest portion of a Venturi tube inserted into the pipe line for the fire extinguishing water comprising the steps of creating a pressure level in the pipe line for the fire extinguishing medium and maintaining this pressure level in a constant ratio to a predetermined pressure level in the current in the Venturi tube. The pressure level in the pipe line for the foam stabilizing solution may stand thereby in a constant ratio to the entire pressure level created by the Venturi tube in the pipe line for the fire extinguishing water or also to a partial pressure level in the Venturi tube, whereby the pressure level in the pipe line for the foam stabilizing solution may also be equal to the predetermined pressure level in the pipe line for the fire extinguishing water.

The constant ratio between the two pressure levels is maintained in a simple manner by throttling the delivery of the foam stabilizing solution whereby in developing the idea of the invention further, the initial pressures of the two pressure levels may be used for controlling a regulator determining the quantity of the foam stabilizing

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solution to be added when the final pressures of the two pressure levels are equal.

The same result is obtained by disposing the disturbing body, such as a damper, in the secondary pipe line for the fire extinguishing water.

The disturbing bodies have preferably the form of dampers provided with bevel-edged passages of reduced diameter in relation to the cross section of the pipe line, whereby the size of the passages is adapted to be adjustable preferably without sudden steps for the purpose of changing the ratio of the mixture. Care is to be taken that by changing the size of the passage the hydrodynamic form of the cross section of the passage is not changed so that, even with different cross sections of the passage, a wide constancy of current values in relation to different Reynolds values is maintained.

For instance, on a damper having a rectangular passage, one of the edges of the passage may be arranged on a part disposed slidably in the plane of the damper or two slidable parts complementing each other to form the cross section of the passage may be disposed opposite to each other or so that they overlap each other. In case the stationary edges of a slot-like passage cannot be made with bevel edges, care is to be taken that their length for each adjustment remains considerably shorter than the length of the adjustable beveled edges and has no hydrodynamic effect.

Some of the possible embodiments of the disturbing cross plates and an admixer provided with the damper in accordance with the invention are hereinafter described with reference to the drawing, wherein

Figure 1 is a longitudinal sectional view of an admixer for a constant ratio of mixture;

Figure 2 is a cross sectional view of Figure 1;

Figure 3 is an embodiment of the damper in a larger scale;

Figure 4 is a sectional view taken of the axis of an adjustable damper;

Figure 5 is a top view thereof;

Figure 6 is a sectional view taken on the axis of a second embodiment;

Figure 7 is a view in cross section thereof;

Figures 8 and 9 are views in axial and cross section, respectively, of a third embodiment;

Figures 10 and 11 are two further embodiments of the damper shown in the cross section through the pipe line containing them;

Figure 12 shows a variation of the branch pipe line feeding liquid to the container.

The pipe 1 conducting the main liquid, which is

under pressure, extends through the storage container 2 for the liquid to be admixed. Adjacent to the point where the pipe 1 leaves the container 2 a Venturi nozzle 3 is built into the pipe 1. Before the inserted Venturi nozzle 3 a branch pipe line 4 extends from the pipe 1 and ends with a flared-out expanded portion 5 below the upper wall of the container. From the bottom of the container, a siphon pipe 6 extends having an elbow 7 which is located below the upper wall of the container and leads to an admixing nozzle 8 provided in the Venturi insert 3.

The inlet 9 of the container 2 is disposed in the front wall thereof and is arranged so that it is located approximately at the same level with the elbow 7 and below the flared outlet 5 if the pressure pipe 1 and the container 2 are arranged horizontally. Thereby, the filling level of the container 2 is located also below the outlet 5 and the elbow 7 so that no liquid can escape through the branch pipe line 4 or the siphon pipe 6 during the filling.

Furthermore, the branch pipe line 4 and the branch of the siphon pipe 6 leading the admixing nozzle 8 are also formed into siphons, the elbows 10, 11 of which are located higher than the inlet 9 when the pressure pipe 1 and the container 2 are arranged vertically so that in this position also an undesired outflowing of liquid to be admixed from the container 2 cannot occur.

When a liquid under pressure flows through the pressure pipe 1, a portion of this liquid enters through the branch pipe line 4 into the filled container 2 whereby a mixing of the two liquids is prevented by the flared outlet 5. By the pressure liquid entering into the container 2 the admixture liquid is conducted from the container 2 through the siphon pipe 6 and the admixing nozzle 8 to the pressure pipe 1 and is mixed with the pressure liquid. It is not necessary to overcome thereby a delivery level since the level of the liquid in the container 2 remains always at the level of the siphon elbow 7. Furthermore, all stop valves or other movable or adjustable parts or armatures are omitted.

If the liquid to be admixed is of lower specific gravity than the pressure liquid, the connections of the pipes 4 and 6 to the pressure pipe 1 are interchanged. The pressure pipe may also be extended alongside the container 2, while the container 2 may also lie above the pressure pipe 1. Moreover, two admixing containers, which may be connected as required, may be provided in association with the pressure pipe.

In the pipe 11, just before it enters into the Venturi pipe 3, a damper 12 (Fig. 3) is inserted. The damper 12, which is provided with a passage 13 having beveled edges causes a difference in pressure in the part located before the damper 12 and the Venturi tube 3 or a turbulence of the fire extinguishing medium causing said difference in pressure. For the efficiency of the new damper it is sufficient that the pressure level created thereby is either equal or at a certain ratio to a predetermined pressure level in the current in the Veturi tube 3 of the pipe line 1 for the fire extinguishing water.

It is sufficient to provide a fixed damper to assure a constant ratio of mixture in the pipe line 1 even by fluctuations in the pressure or in the quantity of fire extinguishing water passing through.

In case it is necessary to figure with greater fluctuations of pressure or quantities of liquid passing through or if the ratio of mixture is to be adjustable, an adjustable damper in accordance with Figures 4–11 is preferably used.

In accordance in Figures 4 and 5, a damper 15 is set into the pipe 14 and the damper 15 has a variable rectangular passage 16 provided with fixed beveled edges 17. The edge 18 is formed by a slide 19 located in the plane of the damper 15. The slide is guided in the extension 20 on the pipe 14 and is adjustable by means of a spindle 21.

According to Figures 6 and 7, two dampers 19^a, 19^b are disposed in the guide extensions 20^a, 20^b of the pipe 14 by means of spindles 21^a, 21^b so that they are adapted to be adjusted in opposite directions in relation to each other. The guide extensions are disposed oppositely to each other and are offset in axial direction to each other. The two slides 19^a, 19^b slide on top of each other and are provided in their control edges with bevel-edged angular cut-outs 18^a, 18^b. The two spindles are preferably connected with each other for the purpose of being rotated simultaneously.

In the modification shown in Figures 8 and 9, a round damper 19^c is disposed in the area of the round passage 17^c of a damper 15^c so that it is adapted to be turned into said passage.

According to the arrangement shown in Figures 10 and 11, the control edges 17^d, 18^d, and 17^e, 18^e, respectively of the damper parts 15^d, 19^d, and 15^e and 19^e, respectively, may also define a slanting slot 16^d or a zig-zag slot 16^e. If the stationary control edges 23^d and 23^e, respectively, are not beveled, their length should be held short for each adjustment of the width of the slot.

In place of the arrangement of the damper in the pipe 11 for the foam stabilizing solution, the damper 12^a may be disposed in the branch pipe line 4 for the fire extinguishing water, as shown in Figure 12.

From the foregoing, it will be seen that the invention relates to a new method of maintaining constant the mixing ratio between the extinguishing water and the foam stabilizing solution added thereto at the narrowest point of a Venturi tube provided in the extinguishing water duct, wherein a pressure stage is set up in the delivery duct for the foam stabilizing solution and this pressure stage is maintained at a fixed ratio to a pre-selected pressure stage in the flow of the Venturi tube. This pressure stage in the foam stabilizing solution duct may bear a fixed ratio to the full pressure stage formed by the Venturi tube in the extinguishing water duct or to a low-pressure stage in the Venturi tube, the pressure stage in the foam stabilizing solution duct also being, if desired, equal to the pre-selected pressure stage in the foam stabilizing solution duct.

The fixed relation between the two pressure stages is maintained in a simple manner by throttling the delivery of foam stabilizing solution, while in accordance with a further development of the invention the initial pressures of the two pressure stages may be employed to control a regulator determining the quantity of foam stabilizing solution delivered, the end pressure of the two pressure stages being the same.

The same result is achieved if the disturbing element producing this pressure stage, such as a diaphragm, is provided in the subsidiary duct for the extinguishing water.

The disturbing elements preferably have the form of diaphragm discs having a sharp-edged passage narrowed in relation to the cross-section of the duct, the size of the passage being preferably steplessly adjustable for the purpose of

varying the mixing ratio. Care must be taken that the hydrodynamic form of the cross-section of the passage is not varied by the variation of the size of the passage, in order that a wide range of constancy of the through-flow values may be maintained in dependence upon different Reynolds values even with different cross-sectional areas of through-flow.

Thus, for example, with a diaphragm having a rectangular passage one of the edges of the passage may be arranged at a part displaceable in the plane of the diaphragm element, while two slide valve portions combining to form the cross-section area of the passage may be provided opposite one another or one above the other. If the fixed boundary edges cannot be made with sharp edges for a slot-like passage, it is merely necessary to ensure that the length thereof for each adjustment remains substantially below the length of the adjustable sharp-edged sides and has no hydrodynamic influence.

I claim:

1. Apparatus for admixing a liquid with a second flowing liquid under different pressure, for fire extinguishers and the like, comprising, a container having a filling inlet provided with a cap, a pressure pipe extending therethrough, a venturi in the discharge end of the pressure pipe, an admixing nozzle in the venturi, a branch pipe connected to the pressure pipe anterior to the venturi and having a flared outlet disposed close to one side of the container, and a siphon pipe communicating at one end with the admixing nozzle and having its inlet end disposed adjacent the wall of the casing opposite the flared outlet of the branch pipe.

2. Apparatus according to claim 1, wherein the container is arranged in such relation to the pressure pipe that its liquid level lies at least at the height of the admixing nozzle.

3. Apparatus according to claim 1, wherein the siphon pipe has an elbow lying at the level of liquid in the container in its filling position.

4. Apparatus according to claim 1, wherein the pressure pipe lies near to the bottom of the container, and the branch pipe and the siphon pipe are situated in the container in such a position in relation to the filling inlet thereof that when the container is held in vertical position the portions thereof connecting with the pressure pipe are disposed above the liquid level determined by the filling inlet.

ERNST KLOSSE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,085,348	Ledoux	Jan. 27, 1914
1,168,490	Duncan	Jan. 18, 1916
2,181,261	Breese	Nov. 28, 1939
2,188,066	Timpson	Jan. 23, 1940