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AIRFOAM LIQUID PROPORTIONING SYSTEM

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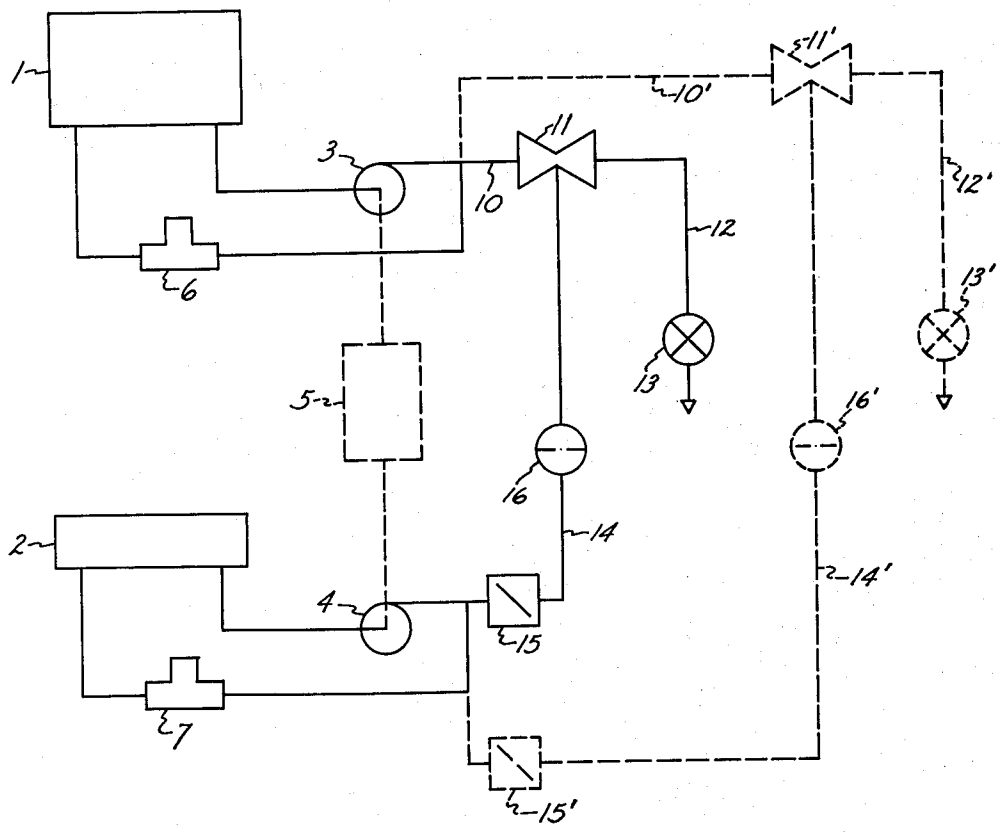

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AIRFOAM LIQUID PROPORTIONING SYSTEM

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This invention has to do with the making of airfoam for fire extinguishing purposes and is concerned specifically with the problem of establishing and maintaining correct proportioning of the water and foam liquid ingredients in situations such as are experienced, for example, in the case of fire trucks, where a number of discharge nozzles may be available, all supplied from the same liquid sources but each individually controlled. Such trucks are commonly provided with a turret nozzle, controlled by an operator on the truck itself, and with a number of hand lines or hoses, each controlled by an operator at the nozzle or discharge end of the line at a station more or less remote from the truck.

The principal object of the invention is to provide a system wherein each operator will be assured of discharging, at his particular station, the requisite proportions of ingredients for satisfactory foam production, without conscious attention on his part and without regard to the activity or otherwise of the other operators, at their particular stations.

The invention will be readily understood from the following description and accompanying drawing, the latter illustrating schematically a system incorporating a preferred form of the invention.

Assuming this preferred form to be applied to a fire truck, the water and foam liquid supplies are carried in suitable tanks and two pumps are provided, one for supplying the water under pressure and the other for supplying the foam liquid under pressure, both pumps being driven by the truck engine. Centrifugal pumps, governor or othrewise controlled are preferred because they lend themselves to design such that their discharge pressures will vary proportionally, or approximately so, as the engine speed varies. According to the invention, the water pressure and foam liquid pressure are so correlated as to establish, in cooperation with a venturi, predetermined pressure differentials which are applied to control the discharge of the foam liquid. Such control is effected by means of any appropriate type of check valve located in the foam supply line and adapted to open in a downstream direction in response to pressure drop in the venturi throat occasioned by liquid flow therethrough.

Referring now to the drawing, the illustrated system includes water and foam liquid tanks 1 and 2 and water and foam liquid pumps 3 and 4, the latter driven by a comman means such as the truck engine 5. The reference numerals 6 and 7 indicate relief valves, as one convenient means of controlling the pump discharge pressures. However controlled, these pressures are so predetermined that the water pressure exceeds the foam liquid pressure. For example, the former might be of the order of 200 p.s.i. and the latter 175 p.s.i.

The water supply line 10 is connected to the inlet of a venturi 11, to the outlet of which is coupled a discharge line 12 incorporating a manual shut-off valve 13. As will be understood, the latter may be a nozzle valve located at the discharge end of a hand line as much as 150' or more in length. The foam liquid supply line 14 from pump 4 is connected to the throat of the venturi and in this line is a valve 15. It is diagrammatically shown as a swing check valve, opening in a downstream direction. In other words, this valve is closed when the pressure on its downstream side exceeds that on its upstream side and

open when these pressures are reversed. At 16 is indicated a metering orifice.

It will be recognized from the foregoing that with the pumps in operation and the manual shut-off valve closed, the static water pressure in the system, exceeding that of the foam liquid supply, will maintain the check valve closed. However, when the manual shut-off valve is opened and there is a flow through the venturi, its throat pressure immediately drops; and it is a simple matter of design to cause it to drop to a point where the pressure tending to hold the check valve 15 closed is less than that of the foam liquid supply—say, to 150 p.s.i. Thereupon, of course, the swing check valve immediately opens and the requisite amount of foam liquid for the water supplying the line in question is metered to the venturi throat and thence with the water, to the point of discharge. When the manual shut-off valve is again closed to terminate the discharge through the particular line, the static pressure in the venturi throat is restored, with the result that the excess of water pressure over foam liquid pressure causes the swing check valve to close and terminate the flow of foam liquid.

It will be apparent that the system can be applied to any number of discharge lines, all supplied by the same engine-driven pumps. The broken lines in the drawing (with corresponding components identified by primed reference characters) indicate a second such line, subject to control in precisely the same manner as the first and entirely unaffected by it so far as the proper proportioning of the water and foam liquid supplies is concerned—and so with as many additional lines as may be necessary. With each it is the venturi throat pressure in the particular line which controls the foam liquid supply to that line, without regard to whether the other lines are active or inactive. It is to be noted that the discharge lines, which may be long and hence of considerable capacity, are filled either with water or with water plus foam liquid and never with foam liquid alone and, accordingly, there is no waste of foam liquid. This is an especially important consideration for truck and analagous uses, where the supply of foam liquid is necessarily limited.

It the light of the foregoing exemplification of the principles of the invention, the following is claimed.

1. A system for proportioning water and airfoam liquid comprising the combination of a plurality of venturis; a water supply line for each venturi; a discharge line from each venturi incorporating a manual shut-off valve; a foam liquid supply line connected to the throat of each venturi; a check valve in ecah foam liquid supply line adapted to open in a downstream direction; means for supplying water under pressure to the water supply lines, said means adapted to establish a predetermined static pressure in the system when the shut-off valves are closed and a reduced pressure in a venturi throat when the shut-off valve in the discharge line of such venturi is open; and means for supplying foam liquid to the foam liquid supply lines at a pressure less than said static pressure but greater than said reduced pressure, whereby the check valve in any one of the liquid supply lines opens in response to the opening of the shut-off valve in the discharge line of the venturi to which such foam liquid line is connected and closes in response to the closing of such shut-off valve.

2. A system for proportioning water and airfoam liquid comprising the combination of a venturi; a water supply line therefor; a discharge line from the venturi incorporating a manual shut-off valve; a foam liquid supply line connected to the throat of the venturi; a check valve in the foam liquid supply line adapted to open in a downstream direction; means for supplying water under pressure to the water supply line and establishing a predetermined

static pressure in the system when the shut-off valve is closed; and means for supplying foam liquid to the foam liquid supply line at a pressure less than said static pressure but greater than the pressure in the venturi throat when the shut-off is open, whereby the check valve opens when the shut-off is opened and closes when the shut-off valve is closed, such closure preventing the flow of foam liquid to the venturi throat and the said discharge line.

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