United States Patent

[11] 3,618,856

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[21] Appl. No. **634,551**
[22] Filed **Apr. 28, 1967**
[45] Patented **Nov. 9, 1971**

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[54] **METHOD AND MEANS FOR DISPERSING FOAM**
3 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **239/8,** 239/77, 239/343
[51] **Int. Cl.** **A01n17/02,** A62c 1/12
[50] **Field of Search** 252/359.5; 169/15; 239/77, 78, 343

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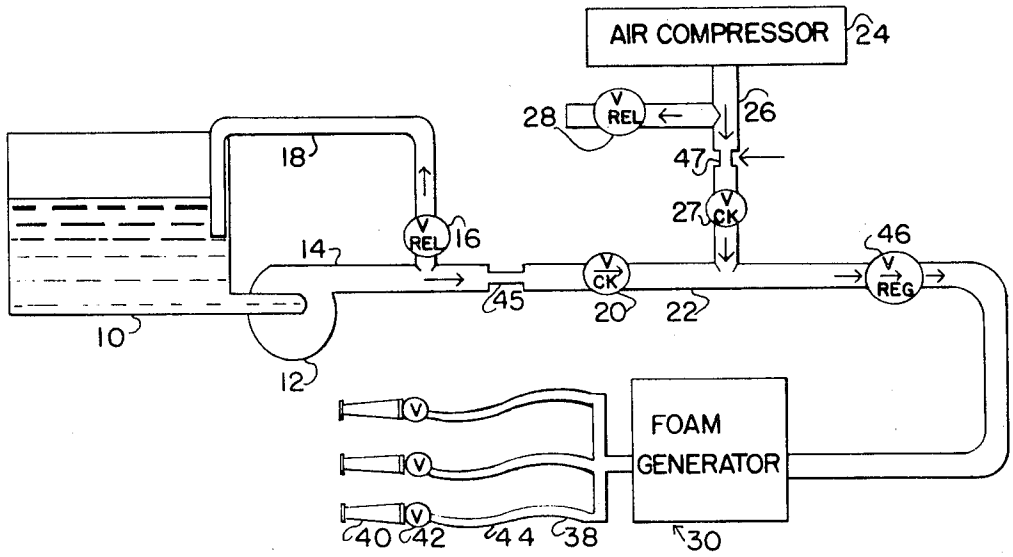
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Attorney—Charles W. Coffee

ABSTRACT: Foam is generated by mixing water, foam material, and compressed air under pressure. The foam is released from a nozzle by a valve at the nozzle, resulting in better control and a more constant product. One method of distribution of the foam is to disperse it in an airblast to be subsequently carried by the wind and spread for agricultural purposes.



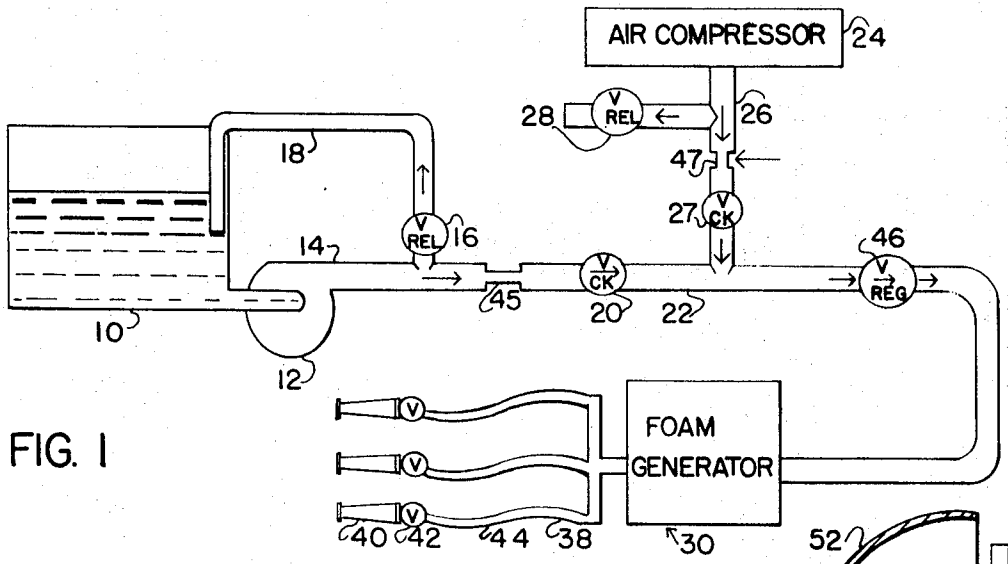


FIG. 1

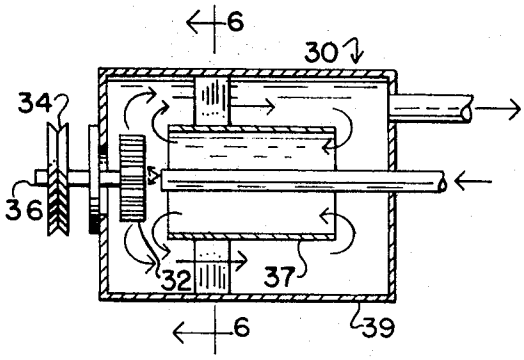


FIG. 5

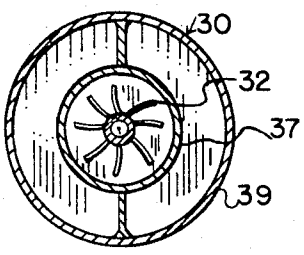


FIG. 6

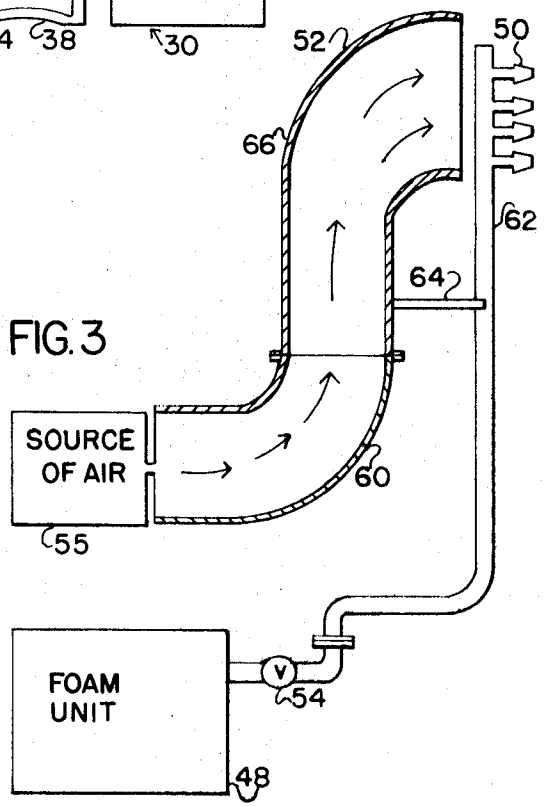


FIG. 3

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FIG. 4

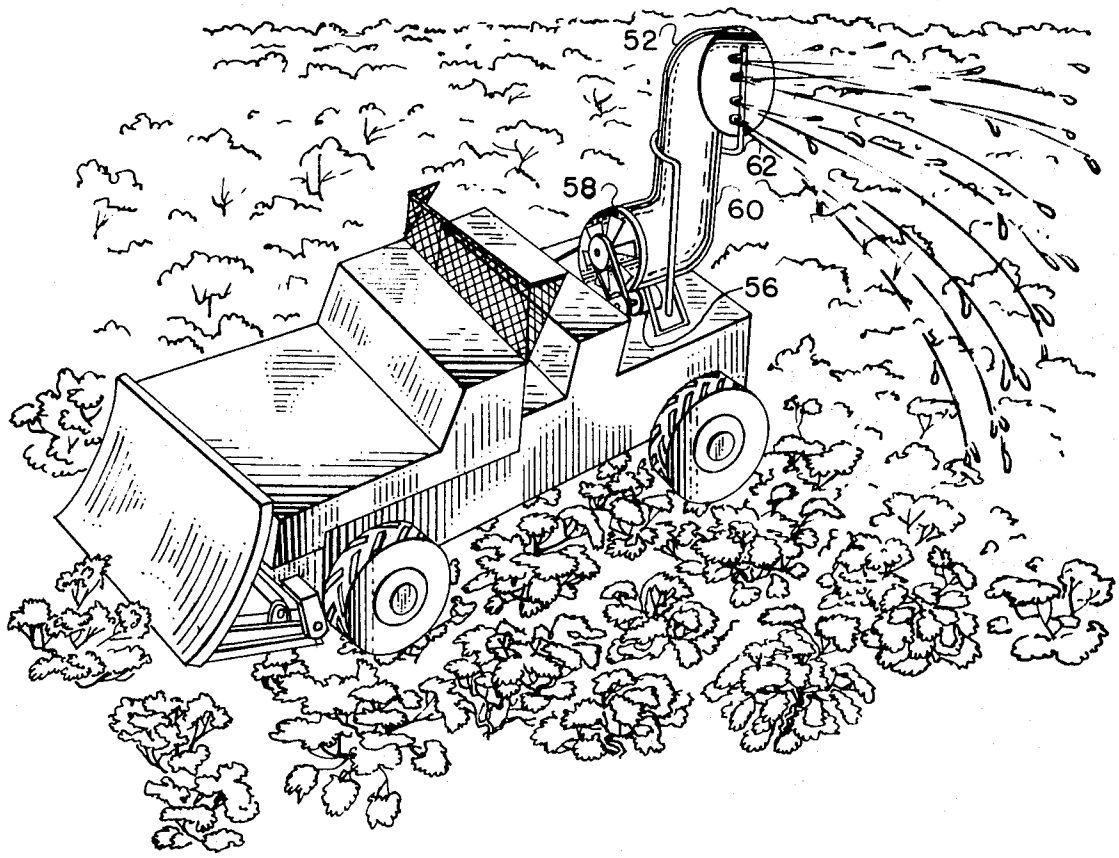
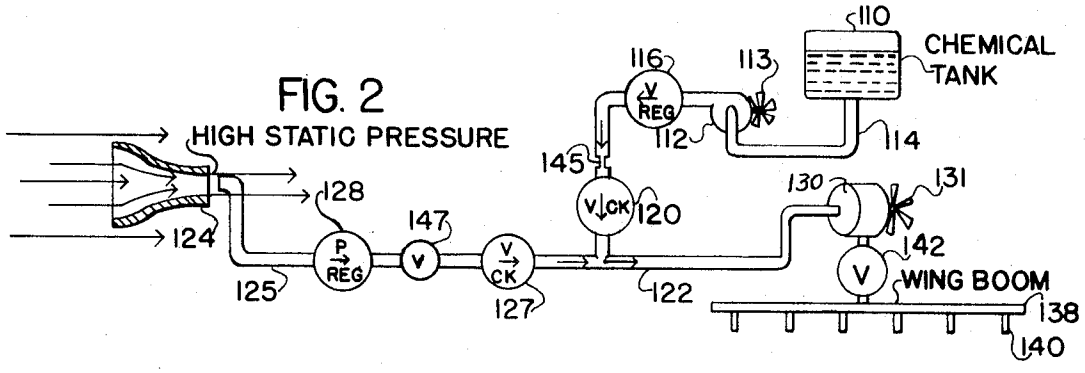


FIG. 2



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METHOD AND MEANS FOR DISPERSING FOAM

Applicant's application Ser. No. 561,740, filed June 30, 1966, now U.S. Pat. No. 3,368,183 entitled "Method and Product For Agricultural Purposes" discloses the use of foam such as produced by the method of the instant application.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to foam generation and, more particularly, to generating and dispersing foam for agricultural applications.

2. Description of the Prior Art

At present, foam is generated by many different methods, such as mixing air and fluid at the nozzle with or without the aid of mechanical agitation. Foam is sometimes generated by mixing a gas and a liquid under pressure but without mechanical agitation; a common example of this type is aerosol shaving cream or whipping cream.

More generally, the foam is dispersed by its own force leaving the nozzle. It has been suggested by White, et al., U.S. Pat. No. 3,096,819, issued July 19, 1963, that the foam could be carried in a gas stream; however, in that application, the gas stream and foam were always confined within a string of pipe.

SUMMARY

I have invented an apparatus which generates the foam by supplying water and air both under pressure to a mechanical agitator which agitates the products under pressure. From there, the mixture is conveyed under pressure through a conduit to a nozzle where it is released. When the nozzle is closed, pressure regulating valves prevent an excessive buildup of pressure.

Also, to get a broadcast distribution and coverage, the foam is carried in an airblast in addition to its own propulsion as it jets away from the nozzle.

An object of this invention is to produce foam.

Another object is to broadcast foam.

Further objects are to achieve the above with a device that is sturdy, compact, durable, simple, safe, versatile, and reliable, yet inexpensive and easy to manufacture, operate, and maintain.

Still further objects are to achieve the above with a method that is rapid and inexpensive and does not require skilled people to adjust, operate, and maintain.

The specific nature of the invention, as well as other objects, uses, and advantages thereof, will clearly appear from the following description and from the accompanying drawing, the different views of which are not necessarily to the same scale.

DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic representation of a first embodiment of this invention.

FIG. 2 is a schematic representation of a second embodiment of this invention, particularly illustrating a model adapted to be mounted on aircraft.

FIG. 3 is a schematic representation of a modification for broadcast distribution.

FIG. 4 is a perspective view showing the broadcast dispersion from a distance.

FIG. 5 is a sectional view of the mixing chamber of the foam generator.

FIG. 6 is a cross-sectional view taken substantially on line 6—6 of FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring more particularly to FIG. 1, water and a suitable foam material are mixed in tank 10. Foam materials are well known and commercially available on the market and, therefore, will not be further described here.

As the ultimate purpose contemplated for the use of the foam is agricultural, at this point, the particular chemical to be applied also would be included in the tank 10. For example, if the material was to be used to kill brush, as described in my prior application identified above, a herbicide would be mixed in the tank 10; if the foam material was to control insects, an insecticide would be mixed in the tank 10.

From the tank 10, the mixture is pressurized by pump 12. The pressure in water pipe 14 on the outlet of the pump cannot exceed a predetermined value because pressure relief valve 16 will relieve the pressure through relief line 18 back to the tank 10. The regular flow of fluid through the relief line 18 will act to agitate the fluid in the tank 10 and prevent separation of the materials therein.

Check valve 20 separates the water pipe 14 from mixing pipe 22. The check valve permits flow from the water pipe to the mixing pipe but prevents reverse flow. Air compressor 24 forces compressed air into the mixing pipe 22 through air line 26 through check valve 27. Air pressure relief valve 28 limits the maximum pressure of the air into the mixing pipe. The outlet of the pressure relief valve 28 is directed to the inlet of the air compressor, viz., the atmosphere. The mixing pipe 22 discharges the mixture of water, foam material, chemical, and air, all under pressure, into foam generator 30.

In the foam generator, the mixture is thoroughly agitated or frothed by agitator 32. (FIGS. 4 and 5) The agitator is rotated by pulley 34 on shaft 36 which is connected to the agitator 32. The impeller from an automotive water pump acts well as the agitator. However, it will be noted that there is no increase in pressure through the agitator, but that the fluid is pushed through the generator by the pressure within the mixing pipe 22. Internal baffle 37, which is concentric with the shaft 36 and case 39 of the generator 30, provides internal circulation of the fluid mix in the case 39. Therefore, the fluid is more thoroughly frothed while flowing and also maintained in a frothed condition when the outlet is closed as described hereafter.

The outlet from the generator is connected to manifold 38 to which is connected at least one nozzle 40. The flow of the foam to the nozzle 40 is controlled by hand valve 42 at the nozzle.

In operation, the pump 12, air compressor 24, and agitator 32 are operated continuously. When the valve 42 is open, the material under pressure in the manifold 38 and in foam hose 44 from the manifold to the valve 42 is discharged as foam from the nozzle 40. The material immediately foams and there is no liquid flow initially when the valve is opened.

Pressure regulator valve 46 in the mixing pipe 22 limits the pressure upon the foam generator 30 when all the valves 42 are closed.

The equipment has worked well by setting the pressure relief valve 16 to relieve at 35 to 45 p.s.i. and the air pressure relief valve 28 to relieve at 40 to 50 p.s.i. and the pressure regulator valve 46 to limit the pressure upon the generator 30 to 20 to 30 p.s.i. I have found the equipment described operates well with one nozzle 40 used intermittently or all three nozzles 40 used continuously. The proper flow of material to the mixing pipe 22 is aided by fixed resistance or orifice 45 in water pipe 14 and variable resistance or needle valve 47 in air line 26.

It will be understood that, in application with the embodiment shown in FIG. 1, the equipment would be mounted upon a vehicle, either a small truck or a specially constructed vehicle, and therefore operators for each of the nozzles 40 would direct the foam upon individual plants manually. Also, it will be understood that use of foam has many applications other than its application to plants. The equipment described is adaptable for many other uses.

The embodiment of FIG. 2 is particularly adapted to be attached to an airplane for aerial distribution of foam. Water-chemical-foam material mix in tank 110 is pressurized into water pipe 114 by pump 112 driven by propeller 113. From the pump 112, the mix goes through pressure regulator 116, orifice 145, and check valve 120 into mixing pipe 122. There it is mixed with pressurized air from high-static pressure device 124 through pressure regulator 128 in air pipe 125 and

airflow control valve 147 and check valve 127. High-static pressure devices are known to the art and are adapted to be mounted on the airplane exposed to high-velocity air. From the mixing pipe 122, the mix is frothed by foam generator 130 driven by propeller 131. From the generator, the frothed material passes through valve 142 to nozzles 140 on wing boom 138 which is adapted to be mounted under the wing of the aircraft.

The modification in FIG. 3 illustrates an alternate method of distributing the foam rather than by the use of a manifold with a plurality of nozzles. In FIG. 3, the foam is generated by foam unit 48 the same as in the previous embodiments, i.e., foam unit 48 would include tank 10 or 110, pump 12 or 112, air compressor 24 or 124, and generator 30 or 130. The frothed air-liquid mixture from the foam unit would be discharged from a plurality of nozzles 50 in front of an air jet from horn 52. The flow of foam to the nozzles would be controlled by valve 54. The air jet is produced by source of air 55 which could be a fan and motor as described below or an air scoop similar to device 124.

In FIG. 4, motor 56 drives fan 58 to blow air into duct 60 which discharges it through the horn 52. The discharge from the horn is generally outward, although at the upper portions it will be upward as much as 27° from horizontal. The lower portion of the horn 52 will downwardly direct the jet of air and foam therefrom. The nozzles 50 are mounted upon header 62 which is attached by suitable brace 64 to upper part 66 of horn 52. The upper part 66 of the horn and the header 62 are mounted for rotation about a vertical axis so that the foam produced therefrom may be directed in any one of several directions.

Referring more particularly to FIG. 4, the horn 52 and the foam unit 48 are adapted to be mounted upon a vehicle and the foam distributed as the vehicle slowly traverses one side of the area to be treated. The vehicle would transverse to the windward side and the horn 52 directed downwind. The airblast from the horn 52 will carry globulets of foam for considerable distances. Also, what wind may be available will carry the globulets of foam over quite a long distance. Therefore, a very large area of land may be covered quickly and economically. Although the light globulets of foam will be carried long distances, they will come down within a more predictable area than a water mist. Chemicals carried in a water mist sometimes carry for a considerable, unpredictable distance. Inasmuch as herbicides are extremely harmful to certain crops, it is desirable that the carry distance be predictable.

It will be apparent that the embodiments shown are only exemplary and that various modifications can be made in operation, construction, materials, and arrangement within the scope of the invention as defined in the appended claims.

I claim as my invention:

1. The method of producing foam comprising:
mixing foam material with water, then
supplying said water-foam material mix to a mixing chamber under pressure,
controlling the flow of said water-foam material mix into the mixing chamber by a pressure regulator valve,
further controlling the flow of said water-foam material mix into the mixing chamber by a restriction in the flow path,
simultaneously supplying air under pressure to said mixing chamber,
controlling the flow of said air into the mixing chamber by a pressure regulator valve,
further controlling the flow of said air into the mixing chamber by a restriction in the flow path,
also limiting the pressure in the mixing chamber by a pressure regulator valve,
thoroughly agitating the water-foam material mix and air under pressure in the mixing chamber,
thereafter transporting the agitated mixture to at least one nozzle,
jetting the agitated mixture from the nozzle
responsive to operation of a valve located at the nozzle.

2. The invention as defined in claim 1 with the additional limitations of:
continuously supplying water-foam material mix and air under pressure to the mixing chamber independently of operation of the valve located at the nozzle, and
continuously operating the agitator in the mixing chamber independently of operation of the valve located at the nozzle.

3. The method of dispersing foam for application to plants comprising:
generating an airstream,
generating foam,
transporting the foam to the airstream,
dispersing the generated foam from nozzles in the airstream, thereby
breaking the generated foam into globulets by the airstream, and
carrying the globulets of generated foam in the airstream, said foam being generated by
mixing foam material with water, then
supplying said water-foam material mix to a mixing chamber under pressure,
controlling the flow of said water-foam material mix into the mixing chamber by a pressure regulator valve,
further controlling the flow of said water-foam material mix into the mixing chamber by a restriction in the flow path,
simultaneously supplying air under pressure to said mixing chamber,
controlling the flow of said air into the mixing chamber by a pressure regulator valve,
further controlling the flow of said air into the mixing chamber by a restriction in the flow path,
also limiting the pressure in the mixing chamber by a pressure regulator valve
thoroughly agitating the water-foam material mix and air under pressure in the mixing chamber.

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