

July 18, 1944.

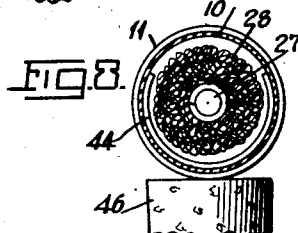
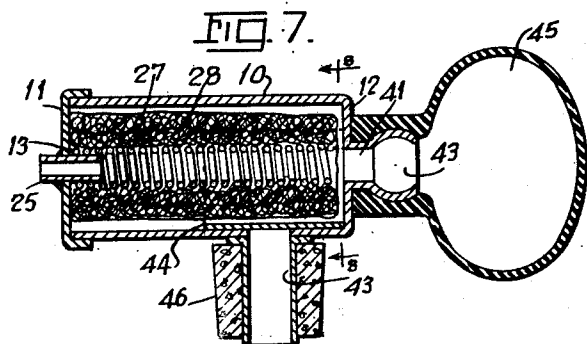
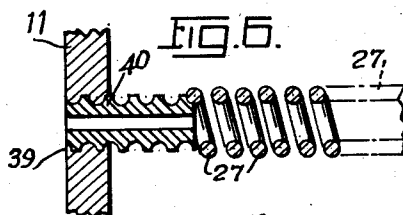
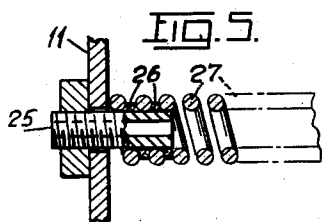
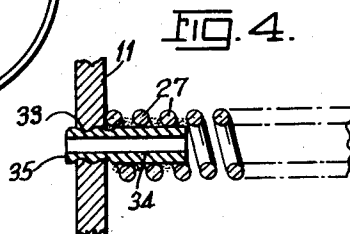
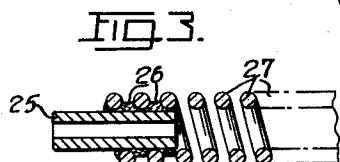
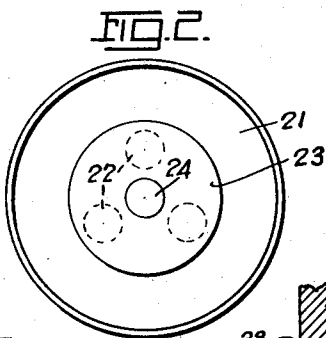
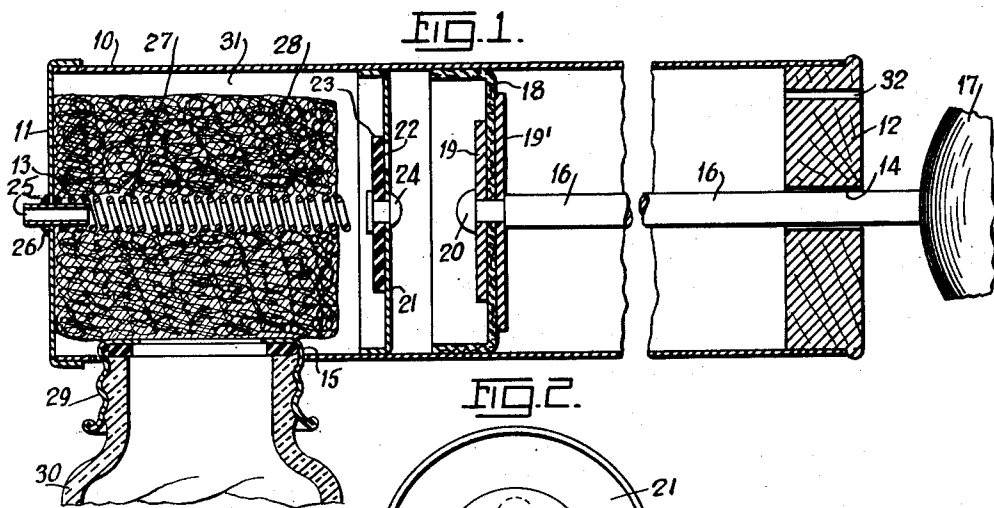
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2,354,064

LIQUID SPRAYING DEVICE

Filed Dec. 11, 1942

2 Sheets-Sheet 1



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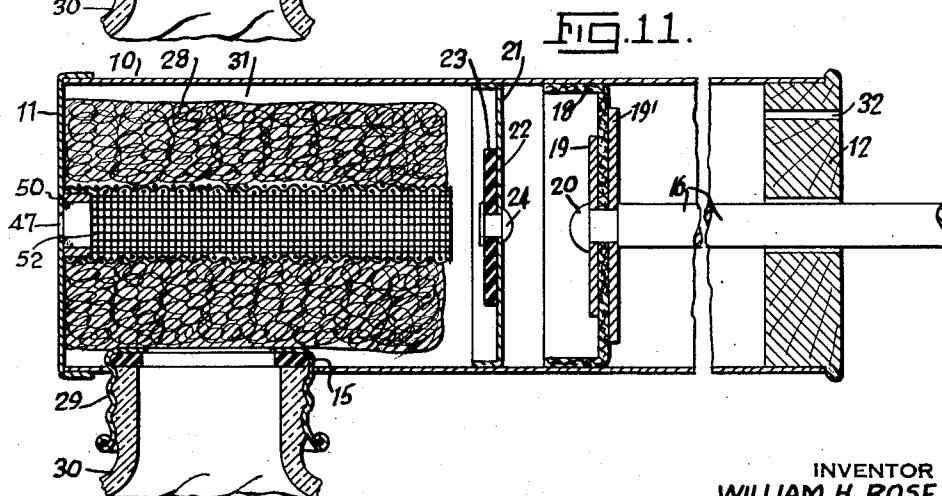
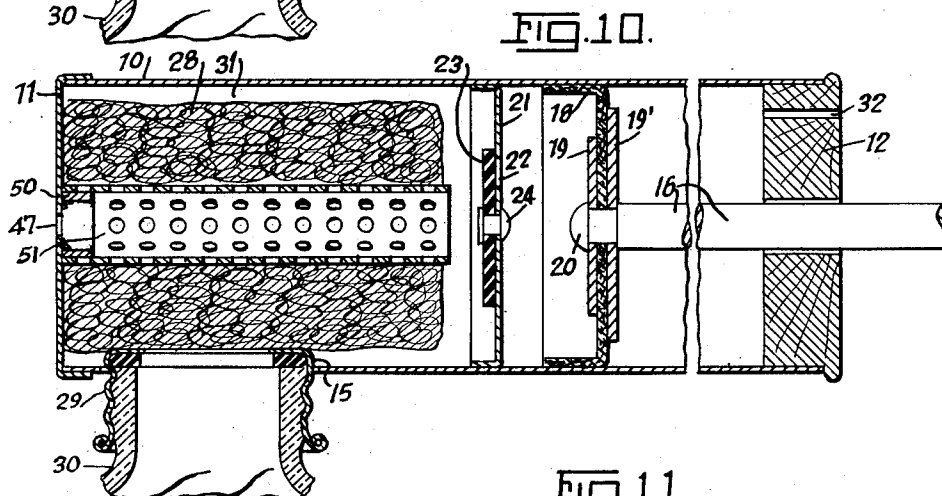
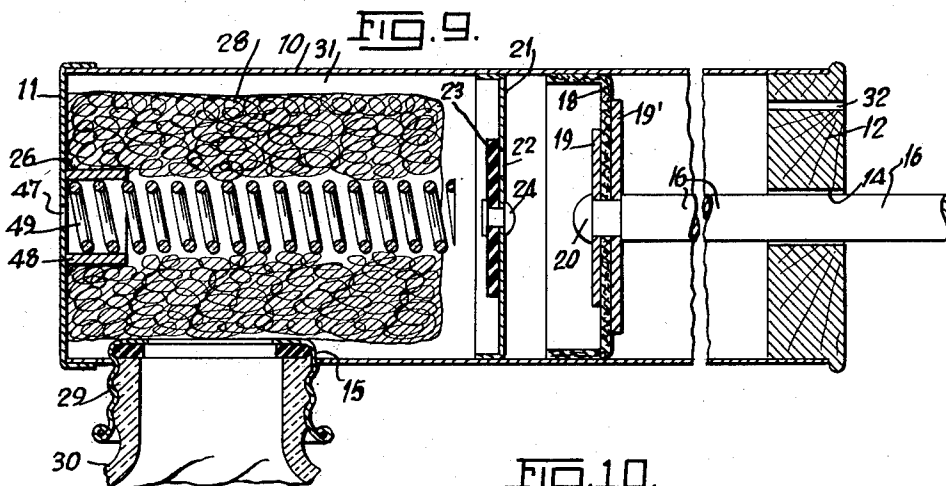
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2,354,064

LIQUID SPRAYING DEVICE

Filed Dec. 11, 1942

2 Sheets-Sheet 2



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2,354,064

LIQUID SPRAYING DEVICE

William H. Rose, Jersey City, N. J.

Application December 11, 1942, Serial No. 468,634

18 Claims. (Cl. 299-88)

This application is a continuation-in-part of my copending application Serial No. 416,786, filed October 28, 1941, now abandoned, and of application Serial No. 381,107, filed February 28, 1941, granted March 24, 1942, as Patent No. 2,277,530.

My invention relates to liquid atomizers or sprayers, and refers particularly to devices of this character adapted for the atomizing or spraying of liquids from absorbent materials.

In devices of the described character, the casing of the device contains a liquid absorbent material containing a liquid, and air is passed through the device in such a manner as to carry a portion of the liquid with it allowing it to issue in the form of a fine spray.

Devices of the absorbent character differ widely from those in which a full supply of liquid is delivered to the air current at the point of atomization by means of a tube inserted within the liquid to be sprayed.

In absorbent devices, novel means must be employed to accomplish the delivery of a sufficient amount of liquid to the air current to produce a proper spray effect and various means have been suggested to accomplish this desirable and necessary result.

The devices of my invention comprise a longitudinally positioned member within a casing, said member being surrounded by a liquid absorbent material and means for passing air through the absorbent material containing a liquid in such manner as to eject the liquid in the form of a fine spray.

I have found that considerable difficulty is experienced in obtaining satisfactory results from devices of this character in which the coil-spring extends through the exit opening of the casing, and that, therefore, the mixture of air and liquid is ejected directly from within the coil-spring into the outside atmosphere.

Among the difficulties incident to devices of this character, the following are particularly objectionable:

In order to attach the exit end of the coil-spring to the casing exit opening, it is necessary to solder it to the casing end, an operation which is difficult to accomplish and which frequently results in the flow of solder between the coils of the spring and into the spring passage, thus reducing the area of this passage or entirely closing it.

Another objectionable feature of devices of the described character is that the interior diameter of the coil-spring is the same throughout its entire length, that is, in the spring portion passing

through the absorbent material and at its exit end, thus allowing a free unimpeded movement of the air and liquid mixture throughout the entire coil-spring passage and into the atmosphere.

Experience has shown that this construction frequently results in an unsatisfactory spray effect of the liquid.

My investigations show that this unsatisfactory result is due, chiefly, to three causes; an insufficient supply of liquid to the air current; the absence of any, or sufficient, restriction of the current of air and liquid at the exit point; and indefinite and uncontrollable decreases in the area of the air and liquid passage.

The devices of my invention, therefore, are directed to the elimination of the above described, and other objectionable features of devices of this character.

The exit end portion of my devices may comprise rigid tubular members which can be readily attached to the casing by soldering or otherwise without danger of clogging, or closing the coil-spring passage, the tubular member being passed through the opening in the casing and extending both inwardly and outwardly therefrom. It is evident that a much more secure attachment can be made between the casing end and such a tubular member than can be accomplished by the attachment of a coil-spring thereto.

As an alternative, the exit end portion of my devices may comprise a simple aperture on the end member with a circular band or collar attached to the inner face of the end member and surrounding the exit aperture.

When the longitudinally positioned member within the casing of the devices of my invention consists of a coil-spring, this may be attached to the outer face of the inwardly extended portion of the tubular exit member by soldering or otherwise. It will be noted that, when soldering is employed as attaching means, there is no possibility of the solder flowing into the coil-spring longitudinal passage. However, as will be indicated hereinafter with reference to the drawings, the coil-spring may be fixedly positioned with respect to the end member of the casing without necessarily soldering it or using a tubular member passing through the opening in the end member of the casing.

As will be described hereinafter in connection with the drawings, various arrangements may be utilized for attaching or engaging the longitudinally disposed member within the casing to or with the end member of the casing.

Another important feature of my device is that

the diameter of the longitudinal passages are always greater than the diameters of the passages in the exit members.

This relationship of dimensions has a very material and beneficial effect upon the results of the operation of my devices, and overcomes the undesirable effects present in the previously described devices of this character.

The increased surface of the longitudinal passage allows the flow of a greater amount of liquid into said passage from the absorbent material, and the increased cross-section area of that portion of the longitudinal member within the absorbent material over the cross-section area of the exit opening causes a more forceful flow of air and liquid through the exit opening than would be possible if these two elements had the same cross-section areas.

It is evident, therefore, that the construction of my devices allows of a small exit opening with an excessive supply of air and liquid for the production of spray results, thus producing a much more constant, uniform spray of finer atomization than is possible in those devices of uniform diameter dimensions throughout the entire air and liquid passage.

The novelty of my devices and their advantages will be evident upon a consideration of my specification and its accompanying drawings, in which similar parts are designated by similar numerals.

Figure 1 of the accompanying drawings is a vertical cross-section of one form of the device of my invention;

Figure 2 is a plan view of the valve member of Figure 1;

Figure 3 is an enlarged vertical cross-section of the exit end member of Figure 1;

Figure 4 is a vertical cross-section of a modified form of exit-end members of a device of my invention;

Figure 5 is a vertical cross-section of a modified form of exit-end members of a device of my invention;

Figure 6 is a vertical cross-section of a modified form of exit-end members of a device of my invention;

Figure 7 is a vertical cross-section of a modified form of exit-end members of a device of my invention;

Figure 8 is a section through the line 8-8 of Figure 7;

Figure 9 is a vertical cross-section of another form of the device of my invention;

Figure 10 is a vertical cross-section of still another form of the device of my invention; and

Figure 11 is a vertical cross-section of a further form of my invention.

The particular form of a device of my invention shown in Figures 1, 2 and 3 comprises a casing having the side member 10, and the two end members 11 and 12. The end member 11 has a centrally positioned opening 13, the end member 12 has a centrally positioned opening 14 and the side member 10 has an opening 15.

Within the casing there is a reciprocating plunger comprising the rod 16 extending through the opening 14 of the end member 12 and terminating in a suitable handle 17, the inner end of the rod 16 carries a cup-shaped washer 18 of leather, rubber or other suitable material, the sides of which abut upon the inner face of the side member 10, the washer 18 being attached to the rod 16 by two annular metallic members 19, 19' and the rivet head 20.

Fixedly attached to the inner face of the side member 10, is a flap-valve comprising the base member 21 having a plurality of openings 22 therethrough. A valve 23 of leather, rubber or other suitable material is fixedly attached to the base member by means of a screw, bolt, or other means, 24. The valve 23 is of such material that it will open and close the openings 22 of the base member 21 during the reciprocating movements of the plunger within the casing.

Within the forward end portion of the casing is an absorbent-supporting member comprising a tubular exit member 25 extending through the opening 13 of the end member 11 and soldered at 26 to the end member 11.

Soldered to the portion of the exit member 25 within the casing is an elongated coil-spring 27 surrounded by a somewhat compact but liquid and air pervious absorbent material 28. The absorbent material serves to partially support the coil-spring 27, and is probably spaced from the inner face of the side member 10, abuts upon the inner face of the end member 11 and is spaced from the valve member.

The opening member 15 of the side member 10 is adapted to receive the neck, 29 of a liquid container 30, the latter being shown in part.

It will be noted that in this form of my device, the tubular exit member 25 and the coil-spring 27 are soldered together, thus forming a unitary element, the exit tubular member 25 being inserted through the opening 13 of the end member 11 and attached thereto by solder.

The operation of this form of my device is as follows:

The absorbent material 28 is saturated with the liquid in the liquid container 30 by shaking the container 30 in order that some of the liquid therein may be splashed through the opening 15 of the casing and thus be absorbed by the absorbent material 28.

When the absorbent material 28 has thus absorbed some of the liquid, the device is positioned as shown in Figure 1.

When the plunger is in the rearward end portion of the casing and moved inwardly, the flap-valve 23 closes the openings 22 in the base member 21, and the air within the casing is forced forwardly through the space 31, between the absorbent material and the casing, through the absorbent material 28 into and between the coils of the coil-spring 27 and through the central longitudinal passage within the coil-spring 27. It will be noted that the passage of air through the central longitudinal passage within the coil-spring 27 assists in drawing some of the air and absorbent liquid through the absorbent material 28 and forces all of this air and liquid outwardly through the exit member 25, the latter acting as an atomizer to produce a mist-like spray of the liquid.

The rearward movement of the plunger causes the flap-valve 23 to move away from the openings 22 of the base member 21, and air is drawn inwardly through the exit member 25 for the next plunger movement.

A small opening 32 may be placed in the end member 12 or in the side member 10, if desired, to permit the entrance of air into and the exit of air from the space between the plunger and the end member 12.

The valve member may be omitted, if desired, but I prefer to incorporate it, in order to overcome any tendency of the liquid to be drawn from the chamber forward of the plunger into the

chamber rearward of the plunger during the operation of the device.

Figure 4 is an illustration of a modified form of that portion of my device relating to the coil-spring and means for attaching it to the end of the casing. In this modification, the end member 11 of the casing has a threaded opening 33, and the exit member 34 has a threaded end 35 to mesh with the threaded opening 33 and the coil-spring 27 is soldered to the other end portion of the exit member 34. It will be noted that in this form of my device, the exit member 34 and the coil-spring 27 are of unitary construction and can be attached to the end member 11 by simply threading it into the threaded opening 33.

In the modification shown in Figure 5, the exit member 25 has an externally threaded end portion 26 and the coil-spring 27 is soldered to the inner end portion of the exit member 25. To attach this form of my device to the forward end member 11, the forward threaded end portion 26 of the exit member 25 is passed through the opening 37 of the end member 11 and affixed thereto by means of a threaded nut 38.

In the modification of my device shown in Figure 6, the end member 11 has a spiral grooved opening 39 and the exit member 40 has a spiral grooved outer face. In this form of my device I prefer that the casing end 11 be of a plastic or synthetic resin composition and that the exit member 40 be molded in the end member 11 to form a unitary construction, and thus in order to assemble the parts it is simply necessary to thread the coil-spring 27 upon the spirally threaded exit member 40. In this figure, the coil-spring 27 is shown into a position for threaded attachment to the exit member 40.

The modified form of a device of my invention shown in Figures 7 and 8 comprise a casing having the side 10, and the ends 11 and 12. The end 11 has an exit opening 13 carrying a tubular exit member 25 to the inner portion of which is attached the coil-spring 27. The end 12 carries the extended tubular member 41 having the bulb-like end portion 42 and the side member 10 carries the downwardly extending tubular member 43. Positioned within the casing and above the tubular member 43 is a valve-member 44 preferably formed of paper or similar suitable material, this valve member being a horizontal section of a tubular shaped member of the employed material. A mass of absorbent material 28 is positioned within the casing and a compressible bulb-shaped member 45 is carried by the extended member 41 of the casing end 12. The extended tubular member 43 of side member 10 is passed through an opening in a cork 46 of a liquid container, not shown.

When the bulb 45 is compressed, air and liquid will be forced through the device and outwardly of the exit member 25, as previously described, this pressure forcing the valve member 44 across the opening of the tubular member 43, thus allowing all of the air caused by the bulb compression to pass through this device, and upon the release of the bulb pressure, the pressure upon the valve 44 will be released thus allowing the introduction of liquid from the liquid receptacle to be introduced into the device.

While I have shown the tubular exit member as extending outwardly from the outer face of the end member, it is evident that it can be flush therewith, and in referring to the exit tubular member I include both forms of that member.

In Figures 9, 10 and 11, for example, I have

shown three modifications of the devices of my invention.

In Figure 9 the exit end member 11 of the casing is provided with an aperture 47 and on the inside face of the member 11 there is provided a circular member or ring 48 within which may be fitted a spring member 49.

In Figure 10 the exit end member 11 of the casing is provided with an aperture 47 surrounded on the inside face of the end member 11 by a ring 50 about the periphery of which is positioned a foraminous tubular member 51.

In Figure 11 the exit end member 11 of the casing is provided with an aperture 47 surrounded along the inner face of the end member 11 by a circular member or ring 50 along the outer periphery of which is positioned a member 52 of wire mesh.

It will be understood that where the term "coil-spring" is used in the specification, I do not intend to limit myself to a coil member of resilient material such as spring steel, but that this term is employed and intended to denote a coil of material adapted to produce the described results.

It is to be noted that in my device the air and liquid passage, that is, the passage within the coil-spring is of greater diameter than that of the exit member, thus allowing me to have a constant reserve supply of air and liquid beyond the quantity forced through the exit opening, thus insuring a constant stream of atomized air and liquid, and further, because in my device the force of introduced air is exerted against a larger cross-sectional area of air and liquid than that of the exit member, the exit stream of atomized air and liquid will exit with greater force and will be thrown further into the atmosphere than if the coil passage and the exit member represented an unimpeded passage of uniform cross-sectional area.

It will be understood that while I have described certain particular embodiments of my invention, it is not my intention thereby to limit my invention to the particular construction, arrangement of parts, size, shape, appearance, procedure, materials or proportions herein described or illustrated in the drawings inasmuch as my invention may be modified according to individual preference or conditions without departing from the spirit of this disclosure and the scope of the appended claims.

I claim:

1. In a liquid spraying device, in combination, a casing, means adapted for the introduction of air under pressure into the rearward end thereof, a tubular exit member carried by the forward end of said casing and extended inwardly therefrom, a coil member within said casing and carried by said tubular member, liquid absorbing material surrounding said coil member and means adapted for the introduction of a liquid to said liquid-absorbing material.

2. In a liquid spraying device, in combination, a casing, means adapted for the introduction of air under pressure into the rearward end thereof, a tubular exit member carried by the forward end of said casing and extended inwardly therefrom, a coil member within said casing and carried by the outer face of said tubular member, liquid absorbing material surrounding said coil member and means adapted for the introduction of a liquid to said liquid-absorbing material.

3. In a liquid spraying device, in combination, a casing, means adapted for the introduction of air under pressure into the rearward end thereof,

a tubular exit member carried by the forward end of said casing and extended inwardly therefrom, a coil member within said casing and fixedly carried by said tubular member, liquid absorbing material surrounding said coil member and means adapted for the introduction of a liquid to said liquid-absorbing material.

4. In a liquid spraying device, in combination, a casing, means adapted for the introduction of air under pressure into the rearward end thereof, a tubular exit member carried by the forward end of said casing and extended inwardly therefrom, a coil member within said casing and removably carried by said tubular member, liquid absorbing material surrounding said coil member and means adapted for the introduction of a liquid to said liquid-absorbing material.

5. In a liquid spraying device, in combination, a casing, means adapted for the introduction of air under pressure into the rearward end thereof, a tubular exit member carried by the forward end of said casing and extended inwardly therefrom, a coil member within said casing and fixedly carried by the outer face of said tubular member, liquid absorbing material surrounding said coil member and means adapted for the introduction of a liquid to said liquid absorbing material.

6. In a liquid spraying device, in combination, a casing, means adapted for the introduction of air under pressure into the rearward end thereof, a tubular exit member carried by the forward end of said casing and extended inwardly therefrom, a coil member within said casing and removably carried by the outer face of said tubular member, liquid absorbing material surrounding said coil member and means adapted for the introduction of a liquid to said liquid-absorbing material.

7. In a liquid spraying device, in combination, a casing, means adapted for the introduction of air under pressure into the rearward end thereof, a tubular exit member carried by the forward end of said casing and extended inwardly therefrom, a coil member within said casing and carried by said tubular member, liquid absorbing material surrounding said coil member, means adapted for the introduction of a liquid to said liquid absorbing material and means for opening and closing said liquid introductive means.

8. In a liquid spraying device, in combination, a casing, a partition having openings therein within said casing dividing it into a rearward end and a forward end, means adapted for the intermittent introduction of air under pressure into the rearward end thereof, a tubular exit member carried by the forward end of said casing and extended inwardly therefrom, valve means carried by said partition adapted to open and close said partition openings during the intermittent introduction of air into said rearward end, a coil member within said casing and carried by said tubular member, liquid absorbing material surrounding said coil member and means adapted for the introduction of a liquid to said liquid-absorbing material.

9. In a liquid spraying device, in combination, a casing, means adapted for the introduction of air under pressure into the rearward end thereof, a tubular exit member carried by the forward end of said casing and extended inwardly therefrom, a coil member within said casing and carried by the outer face of said tubular member, liquid absorbing material surround-

ing said coil member, means adapted for the introduction of a liquid to said liquid-absorbing material and means for opening and closing said liquid introductive means.

10. In a liquid spraying device, in combination, a casing, a partition having openings therein within said casing dividing it into a rearward end and a forward end, means adapted for the introduction of air under pressure into the rearward end thereof, a tubular exit member carried by the forward end of said casing and extended inwardly therefrom, valve means carried by said partition adapted to open and close said partition openings during the intermittent introduction of air into said rearward end, a coil member within said casing and carried by the outer face of said tubular member, liquid absorbing material surrounding said coil member and means adapted for the introduction of a liquid to said liquid-absorbing material.

11. In a liquid spraying device, in combination, a casing, plunger means adapted for the introduction of air under pressure into said casing, exit means in said casing, an annular member carried by the forward end of said casing adjacent said exit means and extending inwardly therefrom, a pervious member held in longitudinal position within said casing and in association with said exit means by said annular member, liquid absorbing material surrounding said longitudinally disposed member, and means adapted for the introduction of a liquid to said liquid absorbing material.

12. In a liquid spraying device, in combination, a casing, plunger means for the introduction of air into said casing, exit means in said casing, an annular member carried by the forward end of said casing adjacent said exit means and extending inwardly therefrom, a member provided with a plurality of apertures along the surface thereof held in longitudinal position within said casing and in association with said exit means by said annular member, liquid absorbing material surrounding said longitudinally disposed member, and means adapted for the introduction of a liquid to said liquid absorbing material.

13. In a liquid spraying device, in combination, a casing, plunger means adapted for the introduction of air into said casing, exit means in said casing, an annular member carried by the forward end of said casing adjacent said exit means and extending inwardly therefrom, a tubular foraminous member held within said casing in association with the exit means therein by said annular member, liquid absorbing material surrounding said foraminous tubular member, and means adapted for the introduction of a liquid to said liquid absorbing material.

14. In a liquid spraying device, in combination, a casing, plunger means adapted for the introduction of air into said casing, exit means at one end of said casing, a foraminous cylindrical member in association with said exit means, means for maintaining said exit means and said cylindrical member in predetermined relationship including an annular member carried by the forward end of said casing adjacent said exit means and extending inwardly therefrom, liquid absorbing material surrounding said cylindrical member, means adapted for the introduction of a liquid to said liquid absorbing material, and means for forcing under pressure from said spraying device a spray consisting of air and said liquid.

15. In a liquid spraying device, in combination, a casing, means adapted for the introduction of air under pressure into the rearward end thereof, a tubular exit member carried by the forward end of said casing and extending inwardly therefrom, a hollow pervious member within said casing and carried by said tubular member, liquid absorbing material surrounding said hollow pervious member, and means adapted for the introduction of a liquid to said liquid absorbing material.

16. In a liquid spraying device, in combination, a casing, means adapted for the introduction of air under pressure into the rearward end thereof, a tubular exit member carried by the forward end of said casing and extending inwardly therefrom, a pervious member within said casing carried by the outer face of said tubular member, liquid absorbing material surrounding said pervious member, and means adapted for the introduction of a liquid to said liquid absorbing material.

17. In a liquid spraying device, in combina-

tion, a casing, means adapted for the introduction of air under pressure into the rearward end thereof, a tubular exit member carried by the forward end of said casing and extending inwardly therefrom, a perforated member within said casing and carried by said tubular member, liquid absorbing material surrounding said perforated member, and means adapted for the introduction of a liquid to said liquid absorbing material.

18. In a liquid spraying device, in combination, a casing, means adapted for the introduction of air under pressure into the rearward end thereof, a tubular exit member carried by the forward end of said casing and extending inwardly therefrom, a tubular wire mesh member within said casing and carried by said tubular member, liquid absorbing material surrounding said tubular wire mesh member, and means adapted for the introduction of a liquid to said liquid absorbing material.

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