

Feb. 27, 1934.

G. L. NEELY

1,948,533

SPRAYING DEVICE

Original Filed March 19, 1929

2 Sheets-Sheet 1

FIG. 1

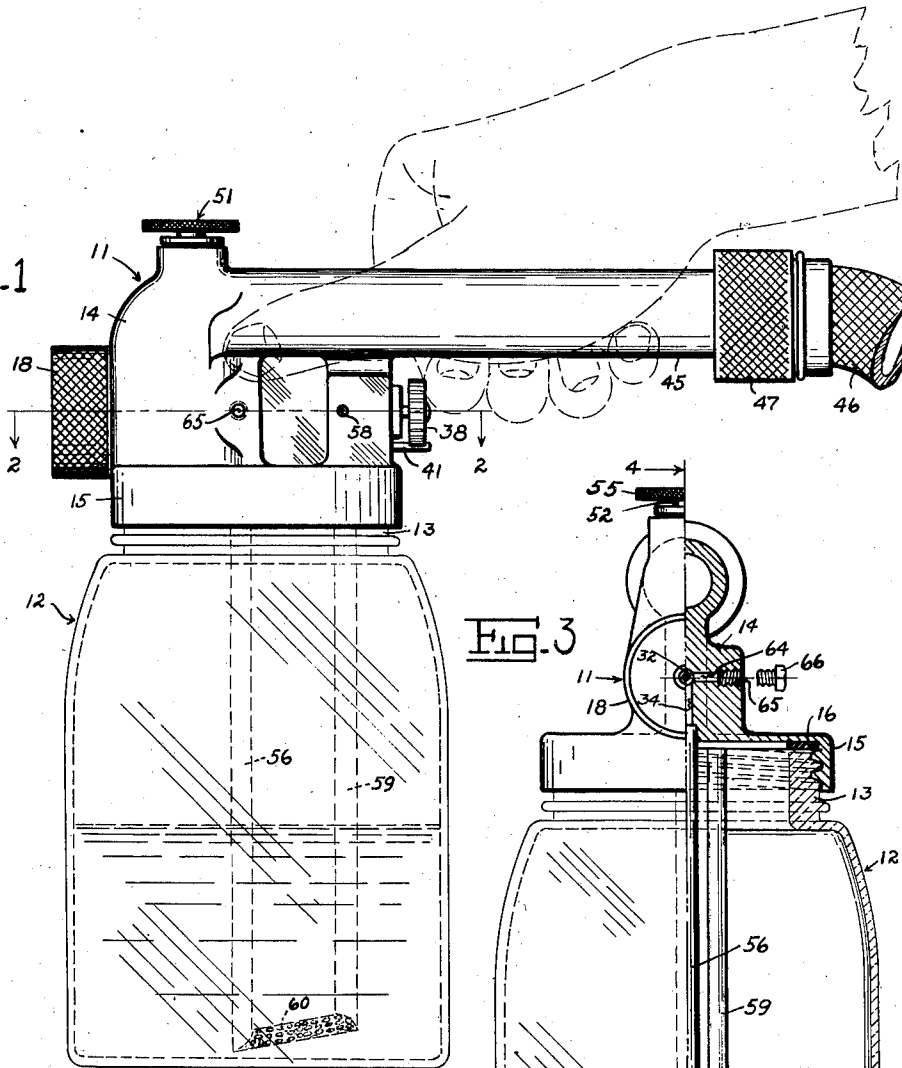
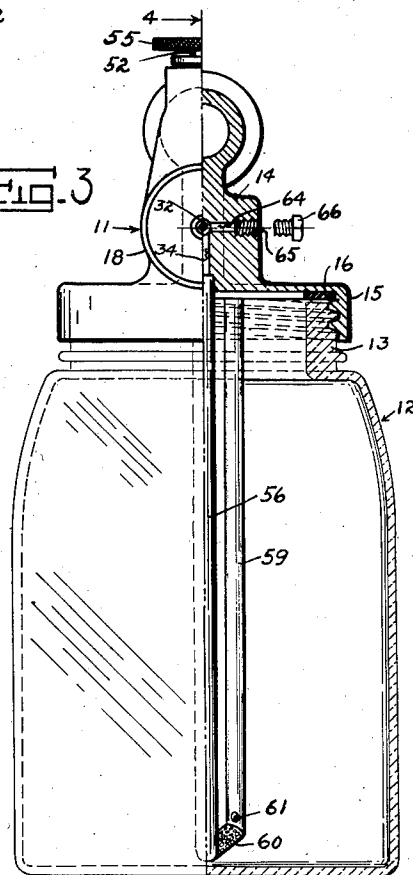


FIG. 3



3

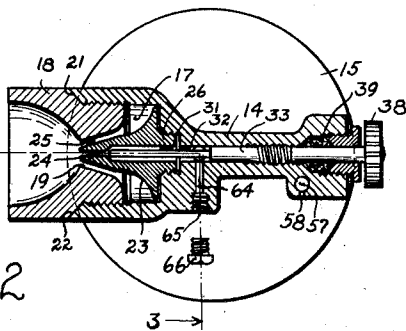


FIG. 2

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Fig. 4

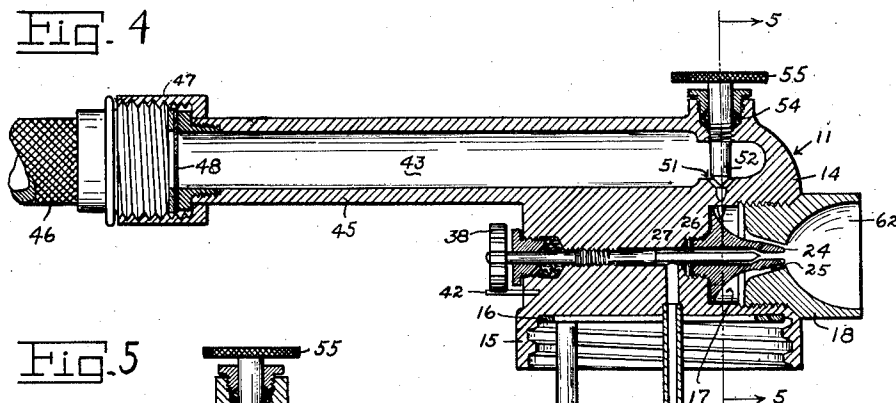


Fig. 5

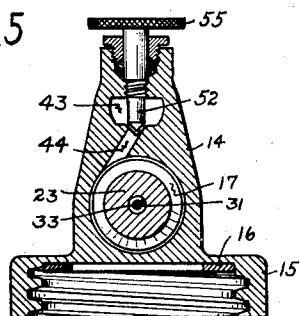
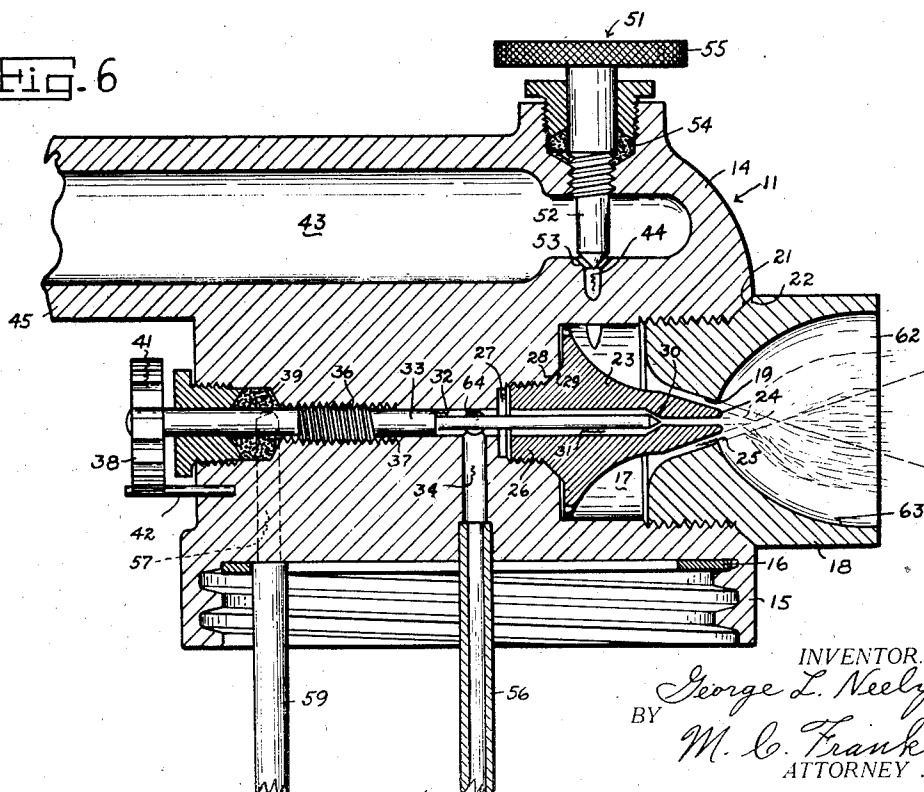


Fig. 6



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UNITED STATES PATENT OFFICE

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SPRAYING DEVICE

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Application March 19, 1929, Serial No. 348,164

Renewed April 24, 1933

3 Claims. (Cl. 299—88)

The invention relates to a device for simultaneously mixing two fluids while effecting a directed discharge of the mixture as a spray.

An object of the invention is to provide an improved device of the class described to which one ingredient is arranged to be supplied under pressure to provide the motive power for atomizing and discharging the mixture.

Another object of the invention is to provide an improved device of the class described which operates on the ejector, or aspirator, principle and in a particularly efficient manner with respect to the separated ingredient of the mixture.

A further object of the invention is to provide in the device means for controlling the flow of the aspirated ingredient independently of the flow of the motive fluid.

Still another object of the invention is to provide a device having a reservoir for the liquid to be aspirated fixedly associated therewith.

An additional object is to provide in the device means whereby the removal of the aspirated liquid may be positively indicated, and is effected at a constant pressure.

A still further object is to provide for the selective mixture of either air or the liquid from the reservoir with the motive fluid, and by means controllable by the operator of the device during the use thereof.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of a preferred form of the invention which is illustrated in the accompanying drawings, in which:

Figure 1 is a side view of the device, the same being shown as attached to a hose for delivering a fluid thereto, and a supporting hand for the device being indicated in operative position with respect thereto.

Figure 2 is a plan section taken on the line 2—2 in Figure 1, a supplementary port closing screw being shown axially removed from its operative position.

Figure 3 is a partially sectional elevation taken on the broken line 3—3 in Figure 2.

Figure 4 is a side sectional view of the device taken on the line 4—4 in Figure 3.

Figure 5 is a vertical section on the line 5—5 in Figure 4.

Figure 6 is an enlarged view of a portion of the showing of Figure 4.

By reference to said drawings, the device of my invention is seen to essentially comprise a spray gun 11 and a vessel 12 providing a reservoir

for a fluid to be discharged from the gun, said spray gun and vessel being fixedly related. As particularly shown, the vessel 12 comprises a glass jar having a threaded neck 13 for the reception of a closure cap therefor. The gun 11 is seen to include a body member 14 having a bottom portion 15 thereof formed to provide a cap which is internally threaded for receiving the jar neck 13 in fitted engagement therein. For reasons to be hereinafter brought out, the cap 15 is arranged to provide a sealed closure for the jar 12, and a suitable gasket 16 is accordingly engaged between the jar rim and the inside end of the cap for effecting said seal.

Extending into a side of the body 14 adjacent the cap portion thereof is a cylindrical cavity 17 having its axis transverse to that of the cap. A member 18 is mounted at the outer end of the cavity 17 as a closure therefor; as shown, the side of the cavity is internally threaded at the outer end portion thereof for threaded engagement with and about an inner portion of the member 18. The member 18 is provided with a central opening 19 conically tapering toward an apex forwardly of the member thereat. To insure a centered disposal of the member 18 in its operative position, the outer end of the cavity side beyond the threads thereof is formed to provide a seat 21 which is conically and inwardly tapered, and a complementary conically and inwardly tapered shoulder 22 is provided on the member 18 at the outer end of the threads thereof for fitted engagement against the seat 21 when the member 18 is mounted in place; in this manner, an axially centered disposal of the member 18 with respect to the cavity is positively assured.

Extending axially from the inner end wall of the cavity 17 is a conically tapered nozzle 23, said nozzle having its forward tip portion 24 axially disposed in the opening 19 of the member 18 to extend forwardly from the member thereat but without contacting the member, said tip portion being conically tapered to the same degree and in the same manner as is said opening whereby said tip and the member 18 cooperate to define a port 25 of angular and decreasing section about and along the nozzle 23. The nozzle 23 may comprise an integral portion of the body 14; but, for purposes of accurate assembly of the gun, it is preferred to make the same as a separate member. As shown, the nozzle 23 is provided with an axial and rearwardly extending boss 26, said boss being externally threaded for fixed engagement in a threaded socket 27 ex-

tending rearwardly and axially from the wall 22. Preferably, and as shown, a conically and inwardly tapered seat 28 is provided along the outer rim of the socket 27, while a complementarily tapered fillet 29 is provided at the base of the boss 26 whereby a centered fit is insured for the nozzle member 23. In the present embodiment of the invention, no relative adjustment of the members 18 and 23 will usually be required, and said members will remain at all times in their set positions; it is noted, however, that gaskets (not shown) might be used at the centering bearings if relative axial adjustment of the members 18 and 23 is desired, the independent mounting of these members in the body 14 facilitating such use of gaskets for relatively adjusting the members. Preferably, and as shown, the tapered surface of the nozzle 23 is slightly concave rearwardly of the tip portion 24 thereof whereby the passage to the port 25 is smoothly tapering.

It will now be noted (Fig. 6) that the passage of the nozzle member 23 is axial thereto and is stepped to provide a conical valve seat, 30 therein, the passage portion of least section being toward the discharge end of the member. The inner and larger portion 31 of the nozzle passage is seen to axially register with the end of a straight bore 32 provided in the body and extending to the opposite side thereof. A valve needle 33 is disposed in and through the bore 32 and extends centrally through the nozzle passage portion 31 for axial adjustment with respect to the seat 30 at the forward end of said passage portion. A duct 34 extends transversely from the bore 32 and downwardly through the top wall of the cap; in this manner, the duct 34, bore 32, and the nozzle passage cooperate to provide a conduit for removing fluid from the reservoir and through the spray gun, the effective size of said conduit being controlled by the valve needle 33. Preferably, and as shown, the valve needle slidably engages the bore 32 rearwardly of the opening of the duct 34 therein and is reduced opposite and forwardly of said opening to provide a fluid passage about and forwardly along it, the section of said passage being no less than, and desirably greater than, that of the duct 34.

Means are provided for variably setting the needle 33 in adjusted relation to the seat 30; as particularly shown, said means comprises the provision of threads 36 on the needle 33 for engagement in a threaded portion 37 of the bore 32, and the provision of a knob 38 on the extending end of the needle whereby the latter may be axially shifted by and upon a rotation thereof. For preventing any fluid movement through the portion of the bore 32 rearwardly of the duct 34, a stuffing-box 39 of a usual structure is provided for the needle 33 at its point of emergence from the body 14. The knob 38 is seen to be provided with an axially serrated periphery 41, and a spring detent rod 42 is mounted in the body 14 to extend therefrom in generally parallel relation to the needle axis and for engagement in the notches of the knob periphery. In this manner, the needle is arranged to be held in adjusted relation to the seat 28 and, by starting from a known setting of the needle, a predetermined and adjusted opening thereof may be made in terms of the number of knob notches which pass the detent rod 42. The knob notches are thus seen to function as the graduations of a setting dial as well as a detent means.

A duct 43 is provided at the top of the body 14,

a portion thereof lying radially opposite the cavity 17 and being connected therewith by means of a duct 44. As particularly shown, the duct 43 is parallel to the axis of said cavity and extends through a radially extending body portion 45, said extension being more or less cylindrical and being arranged for connection to a hose 46 containing fluid under pressure. As shown, a coupling sleeve 47 is mounted at the extremity of the extension 45, which extension, it is noted, is arranged to be grasped as a handle for supporting and manipulating the device; the use of the extension 45 as a handle is seen to be indicated in Figure 1. A filter screen 48 is preferably provided, either at the coupling 47 as particularly shown or elsewhere in the duct 43.

The duct 44 is seen to constitute the sole outlet from the duct 43 and preferably enters the cavity 17 tangentially thereof, as is particularly brought out in Figure 5. In this manner, a fluid entering the cavity 17 through the duct 43 will be given a swirling motion through the annular space defined about the nozzle 23 as it approaches the port 24 whereby it will flow through and from said port in a conoidal and vortically forward moving stream. It is noted that the structure provided is essentially that of concentric nozzles in which one nozzle discharges axially within the stream of the other, the effective passage of the outer nozzle being the port 25 which is defined between the member 18 and the tip of the nozzle 23; in view of this fact, the member 18 may, on occasion, be also referred to as a nozzle member.

If desired, valve means may be provided as part of the spray gun structure for controlling the fluid flow to and through the duct 44; as particularly disclosed, a needle valve 51 is provided having the needle 52 thereof operative against a seat 53 at the inlet end of the duct 44 and extending from the body 14 through a stuffing box 54. The needle 52 is threadably engaged in the body and is provided at its free end with means for turning it to adjust the effective opening at the mouth of the duct 44; as shown, a knurled knob 55 is provided as a valve setting means.

It will now be noted that liquid emerging from the port 25 provided by the nozzle 18 will create a suction at the outlet of the nozzle 23 whereby it will tend to exhaust fluid through the passage thereof. Accordingly, and as shown, a suction pipe 56 is extended from the duct 34 to the bottom of the reservoir 12 whereby liquid may be aspirated from said reservoir by reason of the suction created by the fluid stream emitted from the port 25. The reservoir being sealed by the cap, an air inlet duct 57 is provided through the body, the inlet port of said duct being at a side of the body, as at 58, and the outlet thereof being at the inner side of the cap top. Preferably, and as shown, a pipe 59 extends from the outlet of the duct 57 downwardly into the reservoir and is open only at its bottom end whereby the necessary suction head will be constant without regard to the depth of the liquid in the reservoir.

As particularly disclosed, the pipes 56 and 59 form integral portions of a piece of tubing bent generally to form a U, the pipes 56 and 59 providing the sides of the U and being connected by an intermediate bottom tube portion 60. The tube portion 60 slopes upwardly from the lower end of the pipe 56 and is finely perforated as an intake screen for said pipe. The air out-

let for the pipe 59 is seen to comprise a side perforation 61 adjacent the bottom thereof. Preferably, the body 14 and the aforesaid tubing are formed of a non-corroding material such as aluminum.

Referring now to the nozzle member 18, it is seen that the outer end thereof is concavely cupped to provide a hood 62 surrounding the streams from the two nozzles at, and somewhat beyond, their junctures. The specific shape of the inner hood face 63 and the apical angle of the cone of the port 25 are found to be important elements of design as affecting the operation of the device. Preferably, and as shown, the hood face 63 is generally paraboloidal and the apical angle of the port 25 is not far from thirty-five degrees. Under such conditions, a maximum suction is created within the cone of discharge from the port 25, the liquid from the reservoir is atomized and mixed with the stream from the port 25, and the resulting spray mixture is discharged axially of the nozzles and in a definite stream. It is noted that, from an operative standpoint, the fluids to be mixed may be either gaseous or liquid.

A duct 64 extends laterally through the body 14 from the passage portion of the bore 32, said duct terminating at a port 65, and a screw plug 66 is provided for threaded engagement in the port 65 if and when desired. The inlet port 58 of the duct 57 and the port 65 are both preferably located at the same side of the body 14 and within easy reach of the thumb, or a finger, of an operator grasping the body extension 45 whereby one or the other of these ports may be closed as desired or required.

It will now be noted that the flow of a stream from the nozzle port 25 will, when the port 65 is open, merely draw air through the latter and no fluid will be drawn from the reservoir. To charge said stream with fluid from the reservoir, it is therefore necessary to close the port 65 by applying a finger thereover or installing the plug 66, the action taken depending on whether a temporary or constant mixing of fluids is desired. When the plug 66 is in use, the discharge of fluid from the reservoir may be stopped by applying the finger to close the port 58. In this manner, the discharge of fluid from the reservoir and through the nozzle 23 is arranged to be controlled by an operator entirely independently of the flow of the motive fluid from the nozzle 18.

While the present device may be used, as has been indicated, in mixing either gaseous or liquid fluids, the present embodiment thereof has been particularly designed for simultaneously mixing two liquids and discharging the mixture in atomized form. Specifically, applicant has had in mind the mixing of liquids for which a pre-mixing is not practical. Thus, a water dilution of material to be diluted and sprayed may be effected at the time of spraying and the water pressure is utilized to provide the motive force. Furthermore, materials which may not be pre-mixed on account of chemical, or other, inter-action may be handled satisfactorily with the present device. Thus, it is noted that oil emulsions or chemical compounds may be primarily formed and discharged in spray form at one operation. It will thus be evident that the mixing of two fluids externally of the device is an important feature thereof, as well as the fact that the mixture impinges against no atomizing surface after mixing. And the relation of the streams from the two nozzles is such that a particularly fine spray of

the mixture is produced without other atomizing means being required.

A use for which the present device is particularly intended is in spraying with fungicides or insecticides. For such spraying, the extension 45 is connected to a hose 46 containing water under pressure and the valve 51 set to provide for the desired quantity flow of water from the port 25. The liquid to be diluted and discharged is placed in the jar 12 and is aspirated therefrom for mixing with the stream from the port 25 in such proportion to the water as may be desired, an appropriate disposal of the valve needle 33 being made for the purpose. Liquids of this particular class frequently contain emulsions or solid particles (as of sulphur) in suspension, and the present device handles such liquids and true solutions in an equally efficient manner. The device is seen to be particularly compact and may be attached to a garden hose and carried by an operator for directing the spray therefrom where desired. It is noted that when the reservoir 12 contains a liquid, the air escaping from the opening 61 of the air inlet pipe 59 as the liquid is removed bubbles upwardly through the liquid and so positively indicates the aspirating action of the device with respect to the liquid in the reservoir.

From the foregoing description taken in connection with the accompanying drawings, the advantages of the construction and method of operation will be readily understood by those skilled in the art to which the invention appertains, and while I have described the principle of operation, together with the device which I now consider to be the best embodiment thereof, I desire to have it understood that the device shown is merely illustrative, and that such changes may be made, when desired, as fall within the scope of the appended claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent of the United States the following:

1. In a fluid mixing device, a body member providing fluid passages and a handle, means connecting one of said passages with a source of fluid under pressure, a closed reservoir for a liquid carried by and beneath said body for connection with a second passage thereof, a duct extending downwardly into the liquid in the reservoir from said second passage, an air inlet duct for said second passage, an air inlet duct for said reservoir discharging beneath the liquid therein, the inlet ports of said inlet ducts being disposed for selective engagement by a finger of an operator's hand while said hand grips said handle, and means whereby the stream from said first passage is operative to create an aspiration at the outlet of said second passage.

2. In a fluid mixing device, a body member providing fluid passages and a handle, means connecting one of said passages with a source of fluid under pressure, a closed reservoir for a liquid carried by and beneath said body for connection with a second passage thereof, a duct extending downwardly into the liquid in the reservoir from said second passage, an air inlet duct for the aforesaid duct, an air inlet duct for said reservoir, the inlet ports of said inlet ducts being provided in said body and being disposed for selective engagement by a finger of an operator's hand while said hand grips said handle, and nozzle means in said body operative to utilize the stream from said first passage to create an aspirating suction in said second passage for

withdrawing fluid therethrough and discharging it into said stream.

3. In a fluid mixing device, a body member providing fluid passages and a handle, means connecting one of said passages with a source of fluid under pressure, a closed reservoir for a liquid disposed below said body for connection with a second passage thereof, a duct extending downwardly into the liquid in the reservoir from said second passage, an air inlet duct for said

second passage, an air inlet duct for said reservoir discharging beneath the liquid therein, the inlet ports of said inlet ducts being arranged for selective closing by the application of a portion of an operator's hand while said hand grips said handle, and means whereby the stream from said first passage is operative to create an aspiration at the outlet of the said second passage.

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70	145
75	150