Nov. 24, 1936. G. G. BUDWIG 2,061,932

MEANS AND METHOD FOR MIXING LIQUIDS

Filed Dec. 15, 1934

Fig. 1.

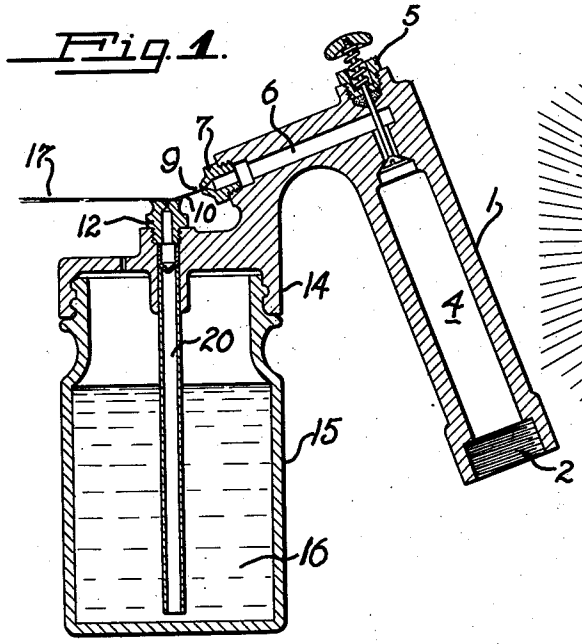


Fig. 2.

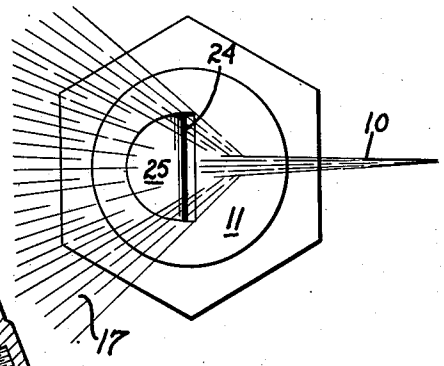


Fig. 3.

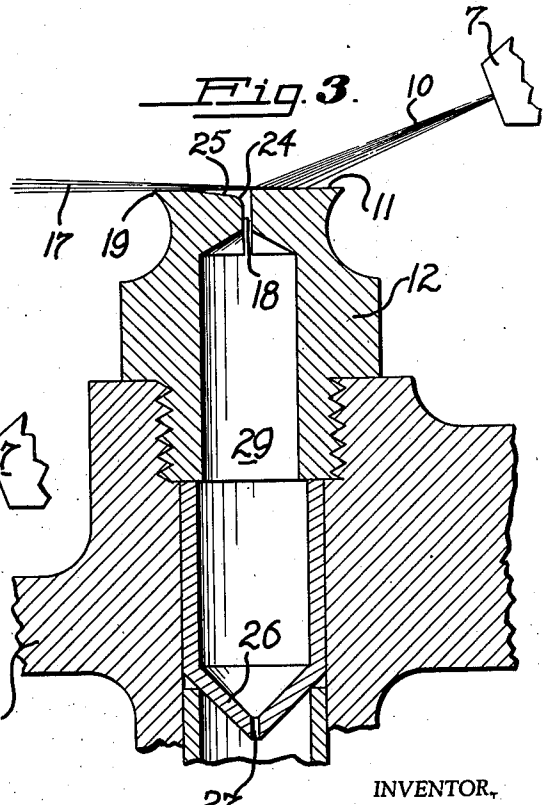


Fig. 4.

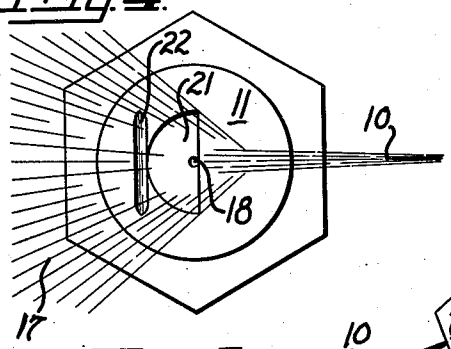
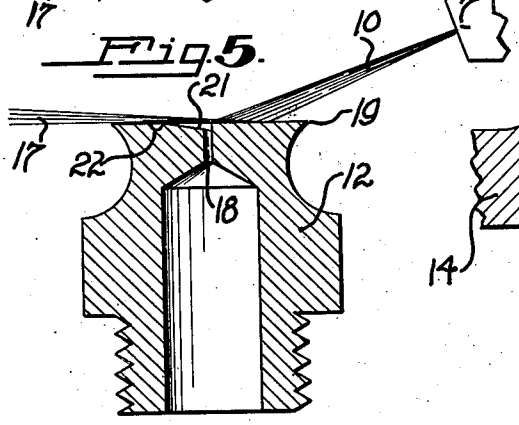


Fig. 5.



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MEANS AND METHOD FOR MIXING LIQUIDS

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Application December 15, 1934, Serial No. 757,640

4 Claims. (Cl. 299—84)

My invention relates to liquid spray apparatus, and more particularly to an apparatus and method by which liquids having differing characteristics may be mixed in preferred percentages and applied to external objects in the form of a spray. This application is a continuation-in-part of my prior application, Serial Number 708,031, filed January 24, 1934.

The principal object of my invention is to provide a spray gun, or similar device, adapted to aspirate and mix various liquids.

Other objects of my invention are: To provide a spray gun operated by liquid under pressure; to provide a means for mixing liquids of differing characteristics; to provide means for mixing different liquids having different pressures; to provide means for mixing liquids having different pressures, the percentage of combination being largely independent of these pressures; to provide a means for mixing fertilizing chemicals with a stream of water; to provide a means for mixing insecticides with a stream of water; to provide a spray gun adapted to be attached to a hose carrying liquid under pressure, whereby other liquids may be mixed in definite proportions with the first mentioned liquid and thereafter applied to external objects; to provide a simple means of diluting concentrated chemicals, and thereafter applying them to external objects; to provide a means and method for forming a water spray, and in certain cases to provide means for mixing a different liquid into the spray; and to provide a means and method of insuring an intimate mix and certain suction.

My invention possesses numerous other objects and features of advantage, some of which, together with the foregoing, will be set forth in the following description of specific apparatus embodying and utilizing my novel method. It is therefore to be understood that my method is applicable to other apparatus, and that I do not limit myself, in any way, to the apparatus of the present application, as I may adopt various other apparatus embodiments, utilizing the method, within the scope of the appended claims.

In the drawing attached hereto:

Figure 1 is a longitudinal sectional view of a preferred embodiment of my invention.

Figure 2 is a plan view of one form of distributing surface and suction aperture.

Figure 3 is an enlarged sectional view of a portion of a gun illustrating one form of metering, the distributing surface being that shown in plan in Figure 2.

Figure 4 is a plan view of another arrangement of distributing surface and aperture.

Figure 5 is a longitudinal sectional view of a suction block carrying the distributing surface shown in plan in Figure 4.

There have, in the past, been placed on the market, and made available to the public, various devices for mixing chemicals with water, utilizing the action of water in a garden hose. The chemicals have generally been of two distinct types. First, fertilizing chemicals, so that lawns, shrubs and like growing plants may be sprinkled and simultaneously fertilized. It is quite customary, however, to utilize the identical devices for applying insecticides, mildew preventing substances and like materials to plants. As most of the prior devices have handled either class of materials without modification, the instant invention is likewise adapted for all these types of materials. Furthermore, in this specification I do not wish to be limited to such chemicals as may be actually in solution, as certain desirable materials may be carried in liquids by suspension. An example of this latter type is colloidal sulphur and some of the lime sprays, both of which can be readily handled by my devices.

My device is adapted to handle any form of liquid, preferably in concentrated form, mixed with a stream of water and then sprayed on the desired external object.

In broad terms, my invention comprises a flat mixing surface, preferably having an aperture therein, which aperture is connected with a supply of concentrated liquid material. A jet of water, or other liquid under pressure, is directed against the flat surfaces, thereby causing the liquid to spread out and leave the surface in the form of a spray. During its passage over the surface, it passes over the aperture. The reduced pressure, caused by the passage of the jet liquid over the aperture, causes the concentrated liquid to be sucked through the aperture and mixed with the spray. I prefer to provide means adjacent the aperture to insure an intimate mix of the two liquids, and to so shape the aperture to create maximum suction. If by so shaping the aperture, I enlarge it to the point that too great an amount of liquid would be aspirated, then I prefer to provide a storage chamber immediately below the aperture, and meter the amount of liquid admitted into the storage chamber.

The gross structure of my preferred form of gun is shown in Figure 1, in longitudinal section.

A body portion, preferably a single die casting, comprises a hollow handle 1 provided at one end with threads 2 to which the ordinary garden hose may be attached, thus supplying the hollow 4 of the handle with water under pressure. A hand-operated valve 5 controls the entrance of water into a nozzle bore 6, the end of which is closed by the insertion of a nozzle 7 having therein a jet hole 9 adapted to project, at a slight angle, a preferably round, pencil-like jet of water 10 onto a substantially flat distributing surface 11. This surface is preferably formed on the top of a suction plug 12 which in turn is screwed or otherwise

fastened to a cap portion 14 of the body casting.

The cap portion 14 is provided with suitable threads to receive an ordinary fruit jar 15 containing a liquid 16 to be aspirated. This liquid may be insecticide, fertilizer, or any other dye or chemical, preferably in concentrated form, which it is desired to mix with the water in the jet.

After the jet has impinged upon the distributing surface, it spreads into a water fan or sheet 17, and a suction aperture 18 is positioned in the surface 11 so that the water sheet passes completely thereover. The suction plug 12 is preferably provided with a sharp edge 19 to reduce drip. The suction aperture is then connected without vent to the atmosphere to the liquid 16 to be aspirated through a conduit 20.

I have found that certain modifications of the distributing surface may be made to both increase suction and to insure intimate mix.

For example, in Figures 4 and 5 I have shown a circular suction aperture 18 provided with a laterally extending cut 21, deepest at the aperture and rising to meet the distributing surface at a slight angle, away from the nozzle 7. In this case there is a tendency for the emerging aspirated liquid 16 to enter the sheet 17 just above the aperture, thus giving the central portion of the fan a greater proportion of aspirated liquid than the edge portions.

There are several means by which better and more uniform mixing may be accomplished. In Figures 4 and 5, I position a laterally extending recess 22 beyond the depression 21, this recess being completely separated from the lateral cut 21, and preferably parallel thereto. Apparently, when the combined liquids pass over this recess, cross currents are developed in the sheet thus causing commingling of the central and edge portions, although the forward progression of the liquids is not perceptibly lessened, nor is the sheet broken up or greatly distorted. Experiments with blue dye as the aspirated liquid and clear water in the jet conclusively prove the fact that the uniform dispersal of the dye laterally in the sheet is greatly aided by the recess.

Another means of creating both an increased suction and intimate mixture is shown in Figures 2 and 3. Here the suction aperture 18 is in the form of an elongated rectangular slot cut straight through into the suction conduit 20, the fan liquid completely sealing the aperture.

With this type of suction aperture the liquid to be aspirated is subjected to increased suction due to the lateral extent of the slot, and the liquid, after rising in the supply conduit mixes with the water in the fan along the entire extent of the slot, thus making a more complete mixture. Furthermore, by providing the far edge of the slot with a rounded edge 24 and then joining the distributing surface with a plane surface 25 at an angle in the order of 10°, I am still further able to aid the intimacy of mixture.

I have found therefore that either a laterally extending aperture, or a laterally extending recess beyond a central round aperture, accomplish practically the same results in perfecting the admixture of the two liquids, and I am of the belief at present that the better admixture is due to the creation of cross currents in the stream in both cases, although I do not in any way wish to be limited solely to this explanation as to the function of the means described.

When an elongated suction aperture is used, as described above and shown in Figures 2 and 3, too great an amount of liquid 16 may be aspirated, due to the enlarged aperture. I am able to control the amount without reducing the suction by providing the conduit 20 with a baffle 26 pierced by a metering hole 27. I prefer to mount this baffle so that there is a substantial storage chamber 29 above it between the metering hole 27 and the suction aperture 18. The amount of suction therefore is determined by the size and shape of the suction aperture while the amount of aspirated liquid is controlled by the size of the metering hole 27. In any case where it is deemed advisable for any reason to increase the size of the suction aperture beyond the point where it can itself act as a metering aperture to limit the amount of liquid aspirated, I prefer to use the baffle with a separate metering aperture. I prefer to cone the baffle so that liquid remaining in the chamber 29 can drain back into the jar 15.

I am therefore able to provide complete mixing of the two liquids either at or beyond the aperture, and to increase suction at the aperture without changing the percentage of mix, the latter being regulatable independently of the suction generation.

I claim:

1. In liquid spray apparatus comprising a means providing a substantially flat distributing surface, a nozzle positioned to direct a jet of liquid obliquely against said distributing surface to form a fan-shaped sheet of liquid in contact with said surface, said surface having a suction aperture therein opening beneath said sheet, a conduit connecting said aperture with a source of liquid to be aspirated, and a baffle in said conduit, said baffle having a metering aperture therein, said metering aperture being smaller in cross-sectional area than said suction aperture.

2. In liquid spray apparatus comprising a means providing a substantially flat distributing surface, a nozzle positioned to direct a jet of liquid obliquely against said distributing surface to form a fan-shaped sheet of liquid in contact with said surface, said surface having a suction aperture therein opening beneath said sheet, a conduit connecting said aperture with a source of liquid to be aspirated, and means interfering with the flow over said aperture to cause circulating currents in said sheet varying from the general direction thereof to mix the aspirated liquid with the liquid of the sheet.

3. In liquid spray apparatus comprising a means providing a substantially flat distributing surface, a nozzle positioned to direct a jet of liquid obliquely against said distributing surface to form a fan-shaped sheet of liquid in contact with said surface, said surface having a suction aperture therein opening beneath said sheet, a conduit connecting said aperture with a source of liquid to be aspirated, said surface having a depression therein in the path of the mixed liquids shaped to create cross currents in said sheet to more thoroughly mix said liquids.

4. The method of more completely mixing two liquids one of which is raised by suction exerted by the second in passing over an aperture in a distributing surface, which comprises creating cross currents in the mixed flow after said liquids have been combined but before said liquids leave said distributing surface.

GILBERT G. BUDWIG.