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SPRAYER NOZZLE ASSEMBLY

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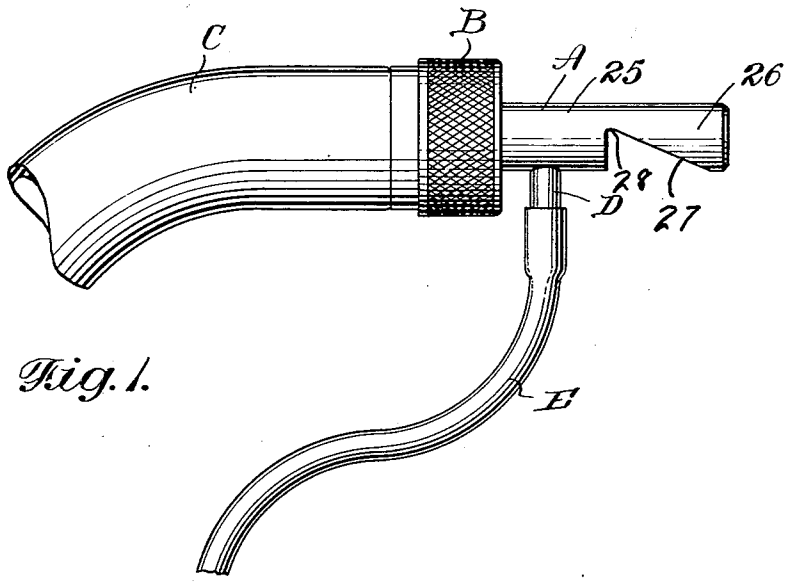


Fig. 1.

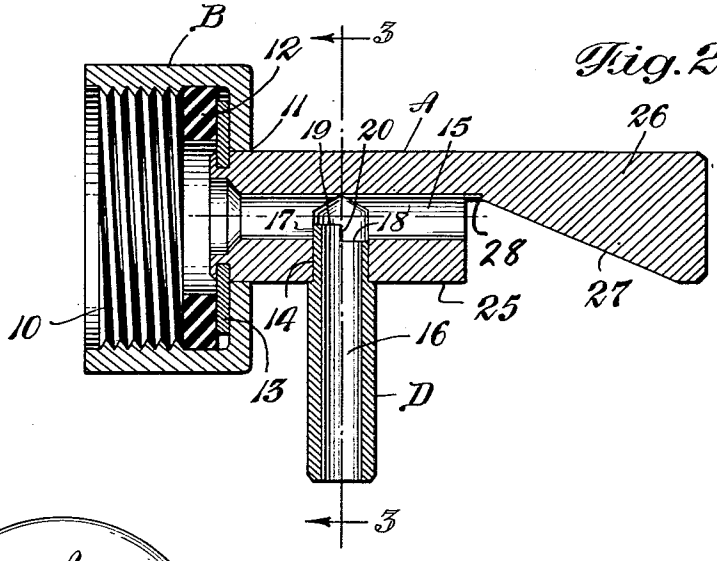


Fig. 2.

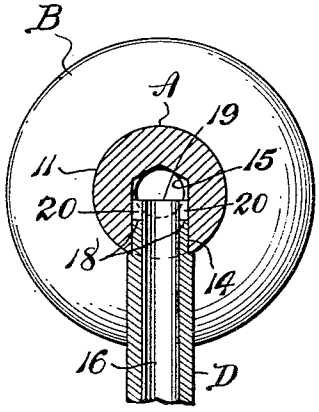


Fig. 3.

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SPRAYER NOZZLE ASSEMBLY

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3 Claims. (Cl. 299—84)

The invention relates to a proportioning mixing spray nozzle assembly of the end-of-hose type, particularly intended for spraying mixtures of liquids moving under fluid pressure and liquids with or without solid materials in suspension moving under vacuum created in the nozzle assembly as a result of the movement of the pressure fluid through said assembly.

One of the objects of the invention is to provide a nozzle assembly capable of producing adequate vacuum for accurately proportioning a mixture of liquids made up of one liquid flowing under pressure from a hose, a pipe or similar source and a liquid with or without solid material in suspension drawn by vacuum into the nozzle assembly from a suitable supply source.

A further object of the invention is to provide a nozzle assembly of the general type already described which will function over a wide range of liquid pressures in the inlet hose or pipe so that variations of pressure during the use of the nozzle assembly will not substantially affect its proportioning action.

A still further object of the invention is to provide a nozzle assembly of the type already described in which the bores of the tubular openings, through which the liquids under pressure pass and through which pass the liquid with or without solid matter in suspension under vacuum, are of sufficiently large diameter to prevent the nozzle assembly from being clogged by large particles of the suspended materials.

Still another object of the invention is to provide a nozzle assembly of the type already described in which the dimensions and relative positions of important elements of the assembly may be varied over a wide range, thereby satisfying all general performance requirements for a device of this type.

And a further object of the invention is to provide a nozzle assembly which is more economical and simpler to manufacture than any similar device heretofore developed.

Our invention consists of three principal parts, namely, a nozzle body with a cylindrical bore, a means for attaching the nozzle body to a source of liquids flowing under fluid pressure, and a tubular insert extending through the wall of and into the cylindrical bore of the nozzle body.

One of the many practical applications of our invention is found in applying agricultural insecticides and chemicals in diluted form of desired proportions by the use of the water pressure available in an ordinary garden hose.

The invention will be more readily understood by reference to the accompanying drawings and the following detailed description in which a specific embodiment of the invention reduced to practice, in a form suitable for agricultural purposes, is set forth by way of illustration rather than by way of limitation.

In the drawings:

Fig. 1 is a side elevation of a nozzle assembly showing the same attached to a garden hose and with the tubular insert portion of such assembly provided with a flexible tube for supplying chemicals to the bore of the nozzle body;

Fig. 2 is a longitudinal section on a larger scale than Fig. 1 through the component parts of the nozzle assembly but with the hose connections omitted; and

Fig. 3 is a section on line 3—3 of Fig. 2.

Referring to the drawings, A denotes generally a suitable nozzle body with cylindrical bore intended to spray agricultural chemicals under pressure through its outlet end, B denotes a hose coupling nut carried by the nozzle body and freely rotatable relative thereto, said nut being adapted to be detachably connected through one end of a section C of garden hose, while D represents a suitable tubular insert member secured to and extending angularly from the nozzle member A, to which tubular insert a flexible pipe or hose E is detachably connected, said hose E communicating at its opposite end with a supply of liquid agricultural chemicals with or without solid materials in suspension (not shown).

As shown, the member B is a standard hose coupling nut internally threaded with standard garden hose thread 10. This nut is so pierced at 11 that it fits freely on the end of the nozzle body A, enabling the user to rotate the nut, thus making it easy to attach said nut to the male fitting (not shown) on one end of the garden hose section C. A garden hose washer 12 of rubber or the like may be provided within the nut B to provide a seal between the garden hose male fitting (not shown) and a flange herein shown as in the form of a brass washer 13 carried by the nozzle body A. The rubber washer 12 is of such size in outside diameter that when it is inserted into the coupling nut B it will be held in place by the internal threads 10 thereof. As shown, the brass washer 13 is riveted under the rear end of nozzle body A sufficiently tightly to prevent leakage between the two parts. This brass washer serves to hold the nozzle body A in proper position in relation to the coupling nut B. If desired the washer 13 could be made integral with the nozzle body A but it is less expensive to use two separate pieces and rivet them together.

As shown, the member D comprises a tubular insert which is press fitted into a cross drilled hole 14 in the wall of nozzle body A. This cross drilled hole goes all the way across the longitudinal bore 15 of nozzle A, being preferably drilled with a drill having a 140° included angle point. The drill goes far enough into the wall portion of the member A so that the point of the drill enters the far wall of the bore 15. This arrangement is of great importance in the design of the device in order to secure the desired vacuum within the cylindrical bore 16 of the tubular member D which extends axially through the center of such tubular member.

As shown, a portion 17 of the tubular insert D extends into the cylindrical bore 15 of the nozzle member A, and in accordance with this embodiment of our invention the front portion or the portion on the side opposite the water supply is milled away, leaving a flat surface 18 considerably lower than the top surface 19 of the portion of the insert on the side toward the water supply. A shoulder 20 is provided between the surfaces 18 and 19, which shoulder is substantially perpendicular to the direction of flow through the nozzle bore 15. The extent to which the end of the insert projects into the bore 15 of the nozzle member is of importance since it affects the degree of vacuum which will be obtained in the bore 16.

As shown, the nozzle body A includes a tubular portion 25 through which the cylindrical bore 15 extends, and a deflector member 26 in front of the outlet or bore 15. This deflector member 26 is provided with a deflector surface 27 inclined at an angle of approximately 22½° to the center line of the nozzle so as to provide a

fan spray to the liquid emerging from the bore 15. As shown, the inclined deflector portion 26 of the nozzle member A is formed integral with the tubular portion 25 and this arrangement is preferred although it would be possible to provide a separate piece to serve as a deflector. It will be noted that between the end of cylindrical bore 15, which cylindrical bore extends slightly beyond the end of nozzle body 25, and deflector surface 27, that there is a short flat surface 28 which acts to prevent a drip or back splash when spraying is being done with the nozzle assembly.

In operation the nozzle assembly shown in Fig. 2 is screwed onto the end of the garden hose section C by the use of coupling nut B and the flexible tubing E of rubber or the like is fastened onto the outside of the tubular insert D. When the water supply is turned on through the hose C the passage of water through the cylindrical bore 15 of nozzle A causes a vacuum in the lateral bore 16 of insert D, which in turn causes a vacuum in the tubing E. The remote end of tubing E is placed in a container of liquid (not shown) and may be held in the container by means of a weight if the container is not an integral part of the assembly.

The degree of vacuum may be varied by changing the position of the outlet end of tubular insert D with reference to the cylindrical bore 15 in the nozzle body. Furthermore, the vacuum may also be varied by changing the contour or shape of the outlet end of insert D or by rotatably changing the position of that end with reference to the axis through cylindrical bore 15.

By changing the size of the cylindrical bore 15 of nozzle body A and/or the bore 16 in insert D the proportion of plain water entering the nozzle from hose C and passing through the cylindrical bore 15 in relation to the chemicals entering laterally through the bore 16 of insert D may be varied.

By these variations, which are possible of accomplishment, in the relative position of the tubular insert and in the diameters of the bores in nozzle body A and tubular insert D, the desired mixtures of chemicals issuing from the nozzle may be accurately controlled over a wider range of fluid pressure than in any similar device.

The present design of the nozzle assembly has been found to result in an extremely high vacuum. The nozzle assembly is of extremely simple construction and is inexpensive to manufacture. In particular, such manufacture involves no dies, tapered holes or complicated operations. Such manufacture is almost entirely a screw machine operation with only a few secondary operations.

This particular design of the nozzle assembly with its extremely high vacuum is of great importance in today's market since so many chemicals are being recommended for agricultural work, which chemicals are not completely soluble in water and result in particles of such size that they will not pass through nozzles having small or restricted size openings. The openings in the present nozzle assembly may be of such large diameter that it is almost impossible to clog the nozzle even when using liquid mixtures of agricultural chemicals found on today's market.

The cylindrical bores in the nozzle body and in the tubular insert are particularly important, both because of the fact that these bores are cylindrical each of one diameter and that for certain requirements our device will operate with larger diameter bores than will other devices offered for the same use. Many similar devices have very small bores through which solid matter in suspension cannot be passed. Other devices have bores of varying diameters and some have conical bores.

The variables in the device represent the keynote by which the device can be developed for various and sundry types of applications. First, the diameter of the two bores may be changed. Also, they may be changed with relation to each other. Moreover, the distance which the tubular insert extends into the main passage of the nozzle body may be varied with very definite change results. Thus complete control of the vacuum produced is secured by the changes which can be made in the amount of the projection into the bore and with the shape and design of the one end of the tubular insert which projects into the bore. Further, changing results can be accomplished by rotating the position of this tubular insert so that the projected end has different relationships with the axis through the main passage of the nozzle body. Again, varying results may be gotten by penetrating the wall of the passageway in the nozzle body opposite the point where the tubular insert enters the walls of the nozzle body.

All of these variables make it possible by different combinations to get different ratios of mixing and do the mixing in different periods of time.

The angular relationship between the axis of the tubular insert and the axis of the nozzle body is not limited to approximately 90° as shown in the drawing. This is another factor which can be varied with changed results.

The invention has been described in detail for the purpose of illustration but it will be obvious that numerous modifications and variations may be resorted to without departing from the spirit of the invention.

We claim:

1. An airtight proportioning mixing spray nozzle assembly of the character described, comprising a tubular body portion provided with a main passage of uniform diameter for liquid pressure fluid extending axially therethrough from an inlet to an outlet end, an integral portion extending beyond the outlet end of the main passage and having an inclined deflecting surface for liquid passing from the outlet end of the main passage, the wall of the nozzle body being drilled to provide an opening for a tubular insert for supplying liquid chemical mixtures to the main passage, the opening being so drilled that the point of the drill enters the far wall portion of the passage and said main passage being drilled so that the point of the drill passes beyond the outlet end of the main passage into the integral extension, providing means to prevent drip or back splash when using the nozzle.

2. An airtight proportioning mixing spray nozzle assembly of the character described, comprising a tubular body portion provided with a main cylindrical passage for liquid pressure fluid extending axially therethrough from an inlet to an outlet end, an integral portion extending beyond the outlet end of the main cylindrical passage and having an inclined deflecting surface for liquid passing from the outlet end of the main cylindrical passage, the wall of the nozzle body being drilled to provide an opening for a tubular insert for supplying liquid chemical mixtures to the main cylindrical passage, the opening being so drilled that the point of the drill enters the far wall portion of the cylindrical passage and said main cylindrical passage being drilled so that the point of the drill passes beyond the outlet end of the main passage into the integral extension, providing means to prevent drip or back splash when using the nozzle.

3. A sprayer nozzle assembly comprising a nozzle member having a main cylindrical passage extending axially therethrough adapted to be connected at its inlet end to a source of liquid pressure fluid, and a tubular insert carried by said nozzle member adapted to be connected at its inlet end to a source of liquid chemical mixture, said insert having a cylindrical passage therethrough the axis of which is angularly disposed with reference to the axis of the main passage, and having a portion projecting part way into the main passage providing a venturi action whereby liquid chemical mixture is drawn from the source through said insert and mixed with the pressure fluid passing through the main passage of the nozzle member, the nozzle member being provided with a cross drilled hole extending entirely through the main passage and

into the far wall of such passage, said hole being adapted to receive the tubular insert.

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