Oct. 16, 1951 C. S. DAILEY 2,571,424

DILUTION OF LIQUID CONCENTRATES

Filed Aug. 6, 1946

Fig. 1

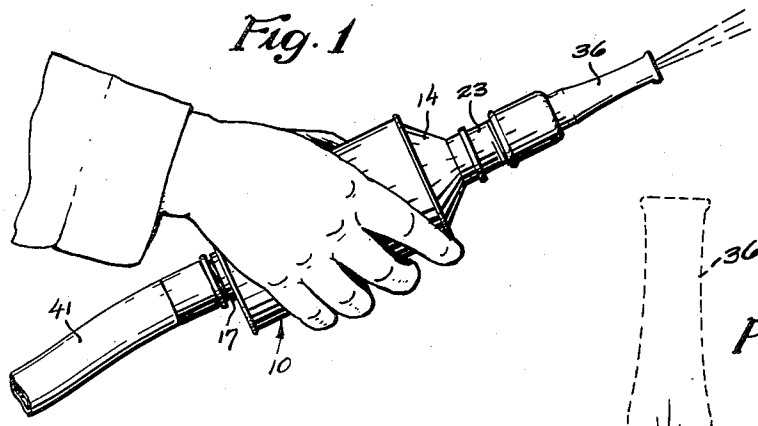


Fig. 2

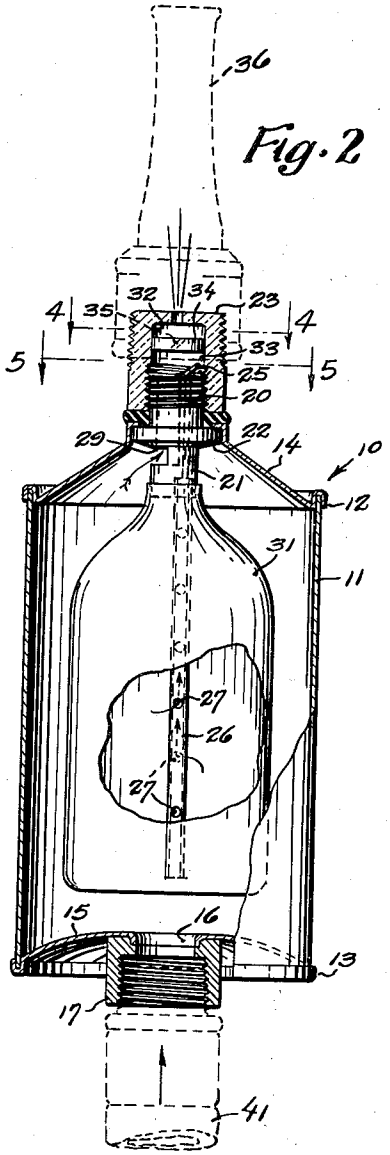


Fig. 3

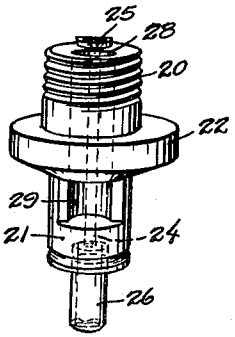


Fig. 4

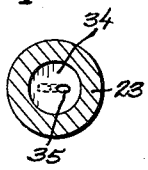


Fig. 5



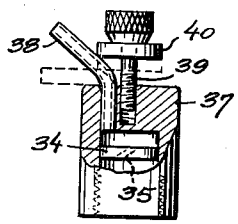


Fig. 7

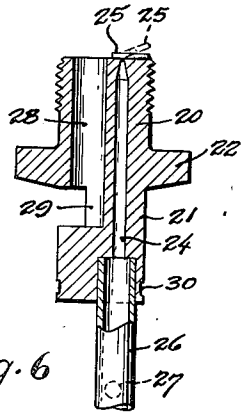


Fig. 6

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DILUTION OF LIQUID CONCENTRATES

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Application August 6, 1946, Serial No. 688,625

5 Claims. (Cl. 299—83)

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This invention relates to spraying machines, and particularly that character of spraying machine in which a supply of a water-soluble liquid chemical is carried in a compressible sack or other functionally equivalent storage receptacle and delivered in metered quantities and under the pressure influence of a pressure source of water supply into a confined stream of water flowing from said source. This general type of sprayer is illustrated and described in three Letters Patent of the United States, one issued April 4, 1939 and numbered 2,153,240, and the other two issued April 30, 1940 and numbered 2,199,110 and 2,199,151.

One important object of the present invention is to provide a machine so devised as to give visual indication to the operator at such time as the chemical receptacle becomes emptied of its contents.

It is a further and important object to devise a light-weight and especially compact machine which may be applied by one end to a water hose and which accommodates the reception, upon the other end, of a conventional spray nozzle, the water being delivered by the hose into the machine and being discharged, with admixed chemical, from the nozzle, the machine being held in the hand and operated with an ease equal to that of an ordinary hosing operation.

It is a further object still to engineer a sprayer comprised simply of a can, preferably of pint size, to serve as the machine's pressure tank and containing a sack of a water-soluble liquid concentrate, the can having a fixed head through which both water and chemical are ejected and in which the respective flow ducts are of fixed flow capacity such that no adjustment of any nature whatsoever is required in order that the mixture of water and concentrate delivered through the head will remain uniform and exactly conform to a predetermined strength.

As a further object still, the invention aims to provide a sprayer of a non-refillable character, and hence giving a positive assurance to the user that the chemical contained within the sack has not been tampered with and conforms to the standards laid down by the manufacturer.

Other objects and advantages, with the foregoing, will appear and be understood in the course of the following description and claims, the invention consisting in the novel construction and in the adaptation and combination of parts hereinafter described and claimed.

In the drawing:

Figure 1 is a view in side elevation illustrating

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a sprayer produced in accordance with the now preferred embodiment of the invention, and indicating the manner of its usage.

Fig. 2 is a vertical sectional view of the sprayer with parts in elevation and using a scale enlarged from that of Fig. 1.

Fig. 3 is a perspective view taken to a scale enlarged from that of Fig. 2 and showing the machine's metering head detached from the can and from the concentrate-carrying sack, the view being fragmentary to the extent that I have shown only the upper end of the tube which delivers the concentrate to the chemical-feed duct.

Figs. 4 and 5 are horizontal sectional views on lines 4—4 and 5—5, respectively, of Fig. 2.

Fig. 6 is a vertical sectional view on the substantial median line of the metering head, the scale employed being approximately the same as that of Fig. 3; and

Fig. 7 is a view partly in section and partly in elevation to illustrate a modified form of cap which is applicable to the invention where it is unimportant that a fine spray be delivered, this modified cap obviating need for the employment of a separate nozzle.

Indicated generally by the numeral 10 is a can, preferably of metal by reason of the inexpensive nature of the latter, but which could as well be composed of glass, plastic, or the like. As illustrated, the metal can is comprised of a body shell 11 having a pressure-tight connection by suitable seams 12 and 13 with top and bottom end walls 14 and 15, respectively. Each of these top and bottom walls presents a center opening, and there is soldered or otherwise fixedly applied to the bottom wall 15 to register with the opening 16 of the latter a fitting 17 internally threaded to accommodate the male threads of a hose coupling.

Fitting within the top-wall opening and, as with the fitting 17, made a fixed part of the can is a metering head, and this head has a nipple 20 and a neck 21 extending in an axial direction from opposite sides of a centrally placed flange 22. The nipple is adapted to project outwardly beyond the top wall and is externally threaded whereby it may accommodate the attachment of a cap 23, hereinafter described.

The metering head is bored longitudinally to provide a pair of ducts, and one of these ducts, which I denote 24 and refer to hereinafter as the chemical duct, is of fairly large diameter throughout the greater part of its length but is reduced as it approaches the upper end limit, terminating in a minute orifice (see Fig. 6).

Functional to this orifice is a check-valve **25** composed preferably, of a rubber flap cemented along its back edge to the face of the nipple. This valve-forming flap is desirably given color contrast in relation to the nipple. At the originating end of the duct **24**, connection is had with a fixed pipe **26** which lies more or less axial to the can and runs the greater part of the latter's length, and communication with the interior of this pipe is provided by a severalty of wall openings **27** spaced at intervals of the length. The other of the two ducts, denoted **28**, and which I will refer to hereinafter as the water duct, is given a large diameter throughout its length, and this water duct finds its origination in a recess **29** notched into the side of the neck **21** immediately below the flange **22**. The size of the chemical-discharge orifice in its relation to the water-discharge port is fixed, and will depend upon the particular ratio of water to chemical for which each sprayer is designed.

Between the recess **29** and the lower limit of the neck is a peripheral groove **30**, and cemented or otherwise held tight by its upper end within this groove is a non-porous flexible sack **31** enclosing the pipe **26** and arranged to contain the chemical which is to be sprayed.

Reverting to the cap **23**, the same is composed of a clear plastic or other transparent material of a nature unaffected by the chemical which is to be supplied. This cap has a discharge opening in its end wall, and beyond the threads which accommodate the nipple is formed to present a relatively deep recess partitioned by a false ceiling **34** into an upper compartment **32** and a lower compartment **33**. This false ceiling finds a press fit within the cap and is drilled diagonally to form a flow duct **35** connecting the two compartments. The diagonal run of the duct serves to impart a spinning action to the stream as the latter is delivered under pressure through the duct into the upper chamber **32**, and this spinning action is advantageous as a means of mixing the chemical and water. However, where a spray nozzle is applied to the cap, and I show external threads for this purpose, the spinning action is unnecessary inasmuch as a complete and uniform mixing action as between the chemical and the water inherently takes place in the course of the pressure stream's confined travel through the nozzle. A spray nozzle of the type customarily used upon a garden hose is entirely suitable for my purpose, and I denote such a nozzle by the numeral **36**.

In Fig. 7 I have illustrated a modified cap **37** in which the mixture of water and chemical is delivered through an attached flexible tube **38**, and there is made functional to this tube for opening and closing the same at will a knurled-headed screw **39**, the head of the screw acting against a washer **40** and the washer in turn bearing upon the tube. Where using a cap of this type, a nozzle such as I have illustrated in Figs. 1 and 2 would be dispensed with. It will be self-evident that a nozzle could be made in which the socket-forming base would be transparent and become a functional counterpart of the transparent cap **23**, in which event a transparent cap as a separate part would be unnecessary.

In producing my sprayer, the chemical which is to be sprayed, and be it "Black Leaf 40," "water-soluble DDT," "Creosole," "Hypochlorites," or other water-soluble material, is sealed by the manufacturer within the can-carried sack, and as one means of closing the chemical duct to effectuate such sealing a rubber cork (not shown) is placed upon the flap **25** and caused to be compressed by the act of screwing the cap **23** onto the nipple, the compression pressure of the cork holding the flap closed. A surface seal such as is found on spirituous liquors is by preference thereupon applied to the cap, and it is also desirable that a plug (not shown) be applied to the fitting **17** in order that no foreign matter will enter the interior of the can. When the sprayer is to be used, this surface seal is broken, the cap unscrewed to remove the cork, and the cap then replaced. A hose **41** connected with a pressure source of water supply is attached to the lower fitting **17**, replacing the plug, and the nozzle **36** is threaded upon the cap **23**, whereupon the sprayer is in condition for use. As water is allowed to flow through the hose, and the nozzle opened to permit this water to be delivered as a pressure spray, the pressure of the water within the can compresses the sack **31** to force the chemical through the minute discharge orifice of the chemical duct **24** into the chamber **33**, whereat it mixes with the water entering through the duct **28** and the water and chemical become admixed and flow to and through the nozzle. As this action takes place and the chemical concentrate emerges under pressure from the chemical duct, the chemical stream acts upon the colored flap **25** and sets up a noticeable vibratory action, and the operator can readily determine whether there still remains a supply of concentrate within the sack by periodically inspecting the flap through the transparent wall of the cap. Upon depletion of the chemical, the flap is forced downwardly into closed position and the vibrational movement stops. A closing of the nozzle outlet will, of course, also cause the flap to close, and the flap will remain closed and the chemical be precluded from "bleeding" into the chamber **33** as long as there remains within this chamber a static condition of the pressure water. Should the water be turned off at the faucet, and the user desire to store the sprayer for use at a later date, it is only necessary that the can be stored upright or that the cork be again inserted within the cap **23**.

It is here pointed out as an alternative means of visually indicating a depletion of the chemical supply, that a coloring agent may be added to the concentrate where such addition will not adversely affect the same. Also, some water-soluble concentrates are inherently colored. In the event of being so colored, either naturally or by addition of a non-active agent, the fine stream of concentrate can be then seen quite readily as it emerges through the discharge orifice from the chemical duct **24**.

It is to be noted that the invention adapts itself to a number of uses other than that of spraying a water-soluble concentrate. To mention only a few examples of such other applications, it is entirely feasible to use the invention as a means of combining syrups with carbonated water in soda fountains, or to combine syrups and plain water for use in canneries. Also, in machine-shop practice, the invention lends itself to the operation of combining water with water-soluble oils in the cutting of metals. Irrespective of the particular usage to which the invention is put, it only becomes necessary that the openings from the water duct and from the chemical be given the proper ratio. Black Leaf 40 is, for example, customarily mixed at 200 to 1, whereas Creosole, and the same is true of a 7% Hypochlorite solution, is custom-

arily applied 150 to 1. Water-soluble DDT is most usually mixed at 20 to 1, while the proportion of syrups to water is even closer. It is of course unnecessary that the machine be a portable unit, although it will be quite evident that a chemical-carrying can which may be held in the hand and to the opposite ends of which a hose and a nozzle can be attached has very distinct advantages.

From the above detailed description of the invention, it is believed that the construction and use thereof will at once be apparent. No limitations are, however, to be implied therefrom, it being my intention that all forms of construction and variations in detail coming within the scope of the hereto annexed claims are to be considered as comprehended by the invention.

What I claim is:

1. In a machine for diluting a liquid concentrate, a pressure tank, a fitting carried by one end of the tank arranged to be connected with a pressure source of water supply for delivering pressure water to the interior of the tank, a freely compressible sack operating as a receptacle for the liquid concentrate and carried within the tank with its interior isolated from the water contained within the latter, and a fitting carried by the other end of the tank and arranged to receive a spray head providing a mixing chamber and a spray-governing nozzle, said fitting providing ducts for the water and for the concentrate leading through said fitting to connect with the mixing chamber of the applied spray head and having a pipe fixedly associated therewith and extending into the sack as a prolongation of the admission end of the concentrate duct, said pipe having a plurality of wall openings spaced at intervals of the length.

2. In a machine for diluting a liquid concentrate, a pressure tank, a compressible sack for the chemical received in said tank, a mixing chamber, means for supplying water from a pressure source of supply to the interior of the tank but exteriorly of the sack for compressing the latter, a hollow pipe fixedly associated with the tank and extending into the sack for every nearly the full length of the latter and provided in its wall with a plurality of openings located at spaced intervals of the length, means for supplying water from said pressure source to the mixing chamber, and means for delivering liquid concentrate subjected to the compression pressure of the compressed sack from the interior of the pipe to the mixing chamber.

3. In a machine for diluting liquid concentrate, a pressure tank formed with openings in the opposite ends, and inlet fitting for one of said openings allowing a hose leading from a pressure source of water supply to be attached thereto for supplying water under pressure to the interior of the tank, an outlet fitting for the other opening presenting an externally projecting threaded nipple and an internally projecting neck, a compressible sack suspended from the neck to lie within the tank, said outlet fitting being formed with two separated fluid-flow ducts each opening by egress ports onto the end face of the fitting and having the ingress ends fed, one said duct from the interior of the suspended sack and the other said duct from the interior of the tank but exteriorly of the suspended sack, and a cap piece removably threaded onto the nipple, said cap piece being formed with a relatively expansive recess exposed to both of said egress ports to serve as a mixing chamber for the water and concentrate fed from the latter and also having an outlet from said recess so dimensioned in relation to the flow capacities of the two ducts as to establish a back pressure within the recess.

4. The machine of claim 3 having a thin flap of flexible material attached to the end face of said nipple in overlying relation to the egress port for the concentrate to serve as a check valve for the latter.

5. The machine of claim 3 having means in said recess partitioning the same into upper and lower cells and drilled to provide a communicating constricted opening therebetween functioning to create a swirling motion within the upper said cell of mixed concentrate and water fed through said opening from the lower said cell.

CARL S. DAILEY.

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