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MIXING DEVICE

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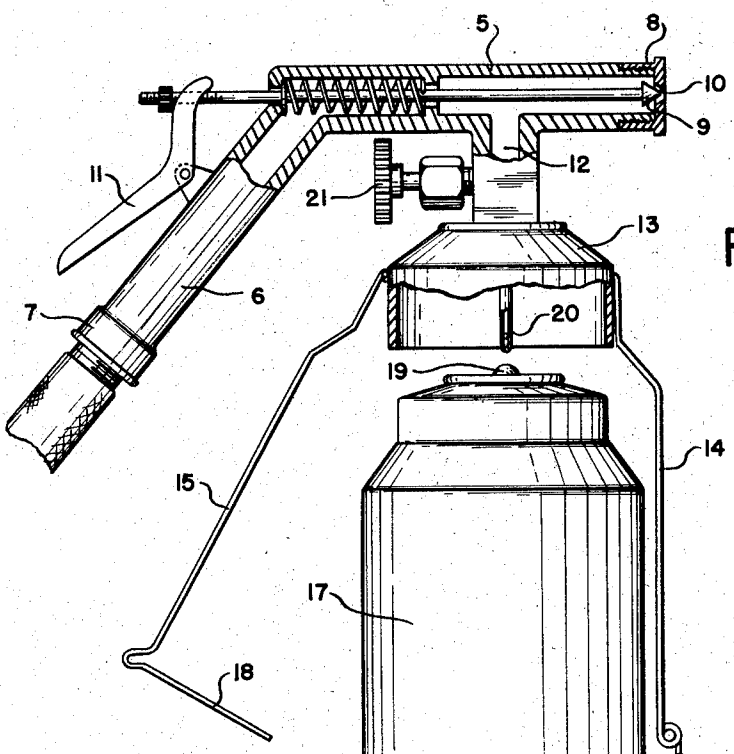
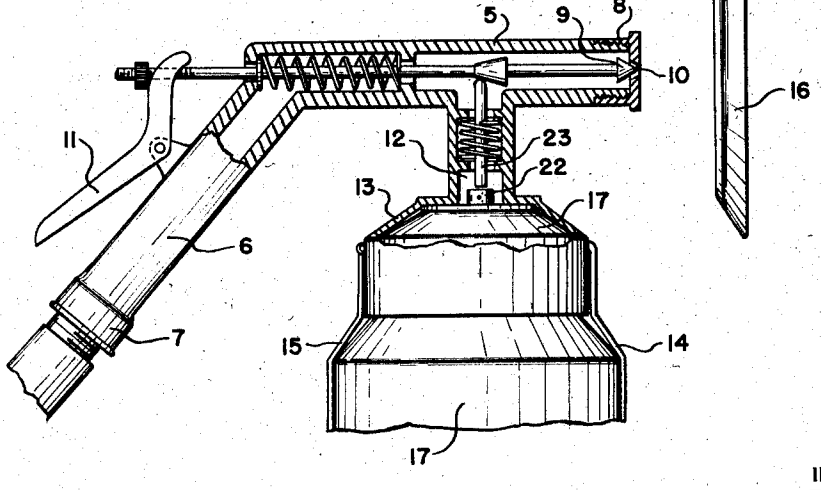


FIG. 1

FIG. 2



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MIXING DEVICE

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2 Claims. (Cl. 239—310)

This invention relates to mixing devices and, more particularly, to a device for mixing a pressurized fluid treating agent with a carrier fluid.

A wide variety of mixing devices has been proposed and used heretofore for incorporating a treating agent into a carrier stream. For example, in order to introduce a fertilizer composition into a stream of water so that the resulting fertilizer solution can be applied to a garden or lawn, a number of mixing devices has been developed wherein the water flowing through the watering hose flows in contact with a cartridge of solid but water-soluble fertilizer. Other mixing devices for this purpose utilize a siphon action of the water flowing through the hose so as to draw into the water stream a concentrated solution of the fertilizer from an appropriate container. However, the effectiveness of the solid cartridge arrangement is limited to the solubility characteristics of the cartridge and is further limited to the use of water-soluble materials, thus excluding the use of many available insecticides, fungicides and the like; the use of a siphoning device also has an inherent disadvantage in that the treating agent must be premixed and separately charged to the container, with the attendant jeopardy of handling and transferring chemical treating agents which are frequently noxious and dangerous.

I have now developed a mixing device in which an optimum concentration of a treating agent can be incorporated in a carrier fluid regardless of the solubility characteristics of the treating agent in the carrier fluid and regardless of the rate of flow of the carrier fluid. This result is achieved pursuant to my invention by utilizing a pressurized container of the treating agent as the supply source of this material and by connecting the pressurized container into a mixing chamber in such manner that any controlled rate of flow of the pressurized fluid treating agent can be introduced into the stream of the carrier fluid flowing through the mixing chamber. Thus, the mixing device of my invention comprises a valve housing having a carrier fluid inlet and a discharge outlet for the mixture of treating agent and carrier fluid. A carrier fluid flow control valve is positioned within the valve housing, and the housing is further provided with a fluid treating agent inlet positioned between the carrier fluid inlet and the mixture discharge outlet. A container support is mounted on the valve housing, this support being adapted to hold a pressurized container of the treating agent in operative position adjacent the treating agent inlet so as to discharge its content of treating agent into the treating agent inlet. The mixing device is further provided with a treating agent flow control valve adapted to control the flow of pressurized fluid treating agent from the container into the valve housing.

These and other novel features of the mixing device of my invention will be more readily understood by reference to the accompanying drawings in which

Fig. 1 is a sectional elevation of the mixing device of the invention; and

Fig. 2 is a sectional elevation of another modification of my mixing device.

As shown in Fig. 1 the mixing device of my invention includes a valve housing 5 one end of which is provided with a carrier fluid inlet 6 advantageously having a water or air hose coupling 7. The other end of the valve housing 5 is provided with a conventional spray nozzle 8 which serves as a discharge outlet for the mixture of carrier fluid and treating agent which is produced within the valve housing 5. The valve housing is provided with any suitable type of conventional valve for controlling the rate of flow of the carrier fluid, such as water, from the carrier fluid inlet 6 to the mixture discharge outlet 8. For this purpose, however, I found it advantageous to combine the carrier fluid flow control valve with the discharge outlet by using a valve stem 9 and a valve seat 10 of the discharge opening as both the valve and the spray outlet. This valve arrangement lends itself to manual control by a hand lever 11 pivotally mounted on the valve housing 5 so as to retract the valve stem 9 when the control handle 11 is depressed. Thus, movement of the control handle 11 controls the rate of discharge of the mixture of treating agent and carrier fluid from the valve housing.

The admixture of the treating agent with the carrier fluid is obtained by introducing the treating agent into the interior of the valve housing 5 through a treating agent inlet 12 positioned between the carrier fluid inlet 6 and the mixture discharge outlet 8. In the presently preferred embodiment of my invention, the lower end of the treating agent inlet 12 is provided with a supporting structure adapted to hold a container of the pressurized fluid treating agent in operative position so as to introduce its pressurized contents directly into the treating agent inlet. This structure advantageously comprises a bell-shaped cap 13 from the skirts of which depend locking straps 14 and 15. The locking strap 14 is provided at its lower extremity with a seating ring 16 adapted to receive and to support the bottom of a container 17 of the pressurized treating agent. The supporting strap 15 is advantageously hinged at its upper end to the skirt of the cap 13, and the lower end of this strap is provided with a perpendicular foot portion 18 adapted to engage and hold the lower surface of the supporting ring 16 in a position such as to maintain the container 17 in operative position adjacent the treating agent inlet. It must be understood, however, that other supporting structures may be used such, for example, as a bayonet lock the components of which are distributed between the interior of the cap 13 and the top portion of the container 17.

Although a variety of mechanical expedients may be also used for transferring the pressurized contents of the treating agent supply container 17 to the treating agent inlet 12, the arrangement shown in Fig. 1 is particularly satisfactory. In this arrangement, the discharge outlet of the pressurized container 17 comprises a rubber grommet 19 capable of being pierced by a slender transfer tube 20 depending from the lower interior portion of the treating agent inlet 12. When the container 17 is forced upwardly against the tube 20, the tube pierces the grommet 19 and provides a direct transfer connection between the interior of the container 17 and the interior of the treating agent inlet 12. The flow of pressurized fluid treating agent from the container 17 through the treating agent inlet 12 is controlled advantageously by a needle valve 21. Thus, although the container 17 itself is not provided with a discharge control valve, the mixing device of my invention provides for this control so that the rate at which the treating agent is transferred from the container 17 to the stream of carrier fluid flowing through the valve housing 5 may be carefully established.

The modification of treating fluid inlet shown in Fig. 2

makes possible the use of a pressurized container 17 provided with a conventional type of discharge valve 22. Operation of this valve is effected by a valve linkage 23 mounted within the valve housing 5. Retraction of the valve stem 9 of the mixture discharge outlet valve causes a tapered projection on the stem to depress the valve linkage 23 and thus depress the container discharge valve 22. With this valve arrangement, the more the mixture outlet valve stem 9 is retracted, the more the container discharge valve 22 is depressed, with resulting automatic control of the rate of transfer of the pressurized treating agent from the container 17 to the stream of carrier fluid flowing through the valve housing 5.

The carrier fluid used with the mixing device of my invention advantageously comprises a stream of water such as that obtained from a garden hose. However, it must be understood that a different carrier fluid such as air may be used, the choice of carrier fluid depending in part upon the nature of the treating agent to be discharged and the manner in which this treating agent is used.

The treating agents which are mixed with the carrier fluid pursuant to my invention comprise all fluid materials capable of being charged to a pressurized container. Thus, not only may fungicides and insecticides such as rotenone, chlordane, pyrethrum and piperonyl butoxide be used as the treating agent but a liquid fertilizer such as calcium monophosphate or ammonium phosphate may be the treating agent. The propellant or pressurizing gas for this purpose may be Freon, carbon dioxide, or the like, and the pressure within the container may vary from low to high in accordance with conventional practice. Regardless of the degree of miscibility of the pressurized fluid treating agent with the carrier fluid, the mixing of these two components within the valve housing 5 and the discharge outlet 8 is sufficient to promote the desirable distribution of the treating agent throughout the mixture discharged from the mixing device. Where the treating agent is to be applied to the surface of vegetation, the pressurized treating agent may further contain any of the conventional surface wetting agents which are used to promote wetting of the surface of the vegetation with the treating agent mixture.

Although, as described hereinbefore, the amount of treating agent delivered into the treating agent inlet 12 may be automatically controlled by the carrier fluid flow control valve, it is desirable in some instances to maintain still more careful control over the concentration of the treating agent in the carrier fluid. For this purpose, it is advantageous to use the modification of my device shown in Fig. 1 wherein the rate of introduction of the pressurized treating agent into the valve housing can be independently controlled by the needle valve 21. With this arrangement, it is possible to obtain visible control of the concentration of the treating agent in the carrier

fluid-treating agent mixture by incorporating a suitable dye (such as the food coloring dyes and the like) in the treating agent charge in the pressurized container 17. Thus, by controlling the needle valve 21 for any setting of the carrier fluid flow control valve, a predetermined color of the carrier fluid-treating agent mixture discharged from my mixing device may be obtained to insure a predetermined optimum concentration of the treating agent in this mixture.

I claim:

1. In combination with an independently pressurized replaceable container of fluid treating agent sealed by a removable spring-loaded container valving element, a mixing device for mixing the treating agent with a carrier fluid and comprising a valve housing having a carrier fluid inlet and a discharge outlet for the mixture of treating agent and carrier fluid, a carrier fluid flow control valve positioned within the valve housing, the valve housing being further provided with fluid treating agent inlet means positioned between the carrier fluid inlet and the mixture discharge outlet, a container support mounted on the valve housing and adapted to removably secure said independently pressurized container of the treating agent in operative position adjacent the treating agent inlet means in position to discharge its content of treating agent from said spring-loaded container valving element into the treating agent inlet means, and treating agent flow control means positioned within the valve housing, said treating agent flow control means being operatively associated with said carrier fluid flow control valve whereby to control said container valving element in predetermined relation to said carrier fluid flow control valve and thus control the flow of pressurized fluid treating agent from the container into the valve housing.

2. A mixing device according to claim 5, in which said carrier fluid flow controlling valve comprises an elongated rod extending through said valve housing and having a portion adapted to be received in said discharge outlet, said carrier fluid valve being operative upon movement of said rod with respect to said housing to control the flow of fluid to said discharge outlet, said treating agent flow control means including a cam-like portion carried by said rod and adapted upon movement of said rod with respect to said housing to actuate said container valving element.

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