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SPRAY DEVICE AND METHOD

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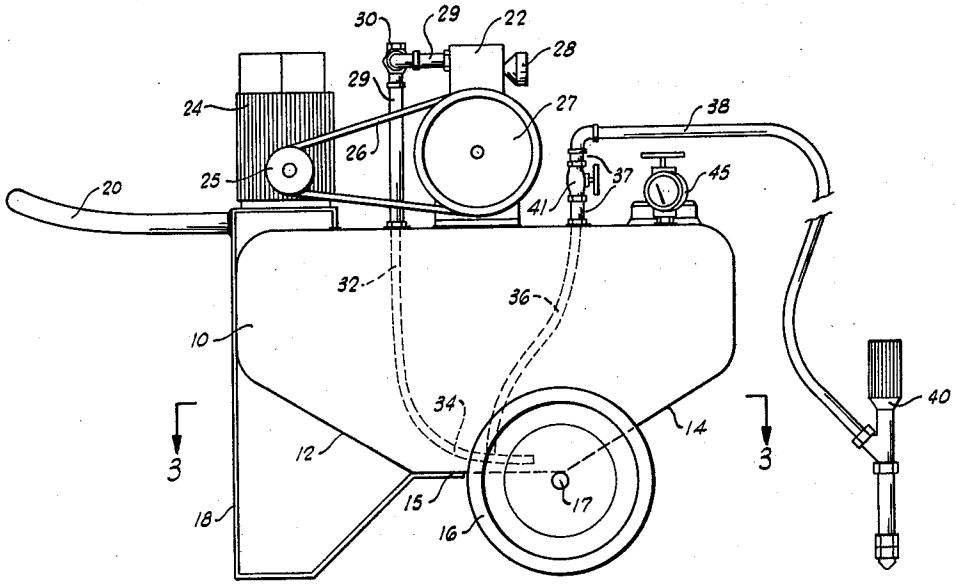


FIG. 1

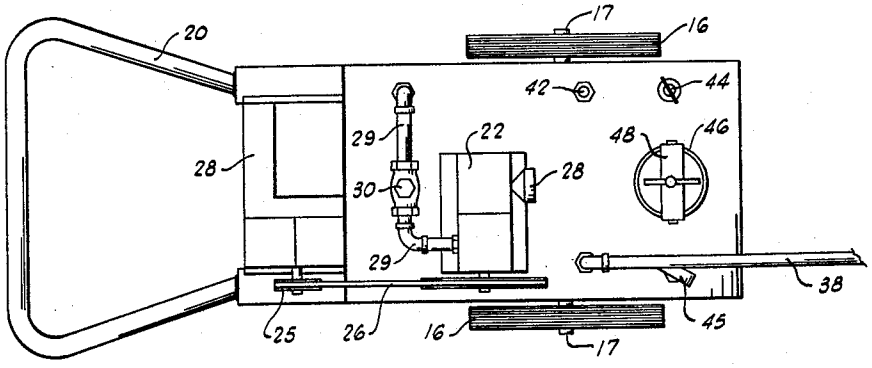


FIG. 2

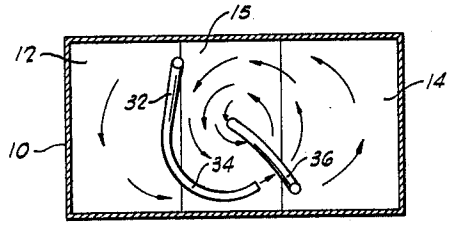


FIG. 3

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SPRAY DEVICE AND METHOD

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This invention relates generally to improvements in power spraying devices, and more particularly, but not by way of limitation, to a method of continually agitating spray solutions during the spraying procedure.

Many liquids requiring application by spraying processes are either colloids or emulsions. Within recent years particularly, a great number of new chemicals have been developed whose application requires the use of a spraying process which must be sprayed as colloids or emulsions. Much work has been concentrated in perfecting herbicides and ground sterilants, most of which must be sprayed over the area to be treated in order to be effective.

Most ground sterilants, as an example, must be hydrophobic chemicals. Otherwise, after application to the ground where destruction of vegetation is required, they would soon be leached away by the action of rain waters. The application of ground sterilants requires that they be sprayed onto the area to be treated in an economic base medium such as water. Thus, a spraying system must be provided, which will spray normally oil soluble, hydrophobic suspensions. To achieve uniform applications of these hydrosols, homogeneity must be maintained in the liquid at all times during the spraying process.

Many other chemicals which are best applied by the spraying process are also colloids. A number of insecticides are specifically made oil-soluble so that residue left by the spray will not be quickly washed away by rain or irrigation water. These chemicals also require a means to maintain colloidal suspension during the spraying process. In some instances emulsifiers or dispersants have been used. Economics and harmful effects to vegetation, however, have limited their use.

Some materials which are applied by spraying are emulsions, paint being a very common example. In order to preserve homogeneous interspersing of such emulsions, the liquid must be constantly agitated during the spraying operation.

One means of agitating during the spraying process consists in the mechanical actuation of a paddle, or groups of paddles, in the liquid. Another means is the use of a rotating propeller to stir the liquid. In some instances, these methods are satisfactory; however, they have some disadvantages. To provide separate mechanical power arrangements to actuate paddles or to rotate propellers is relatively expensive compared to the cost of customary spraying equipment. Most spraying equipment includes a compressor actuated by an electric motor or gasoline engine. To actuate a paddle or propeller requires an additional power source or an expensive gear arrangement associated with the compressor power source.

Many chemicals which must be sprayed are corrosive to metals. Mechanical paddles and propellers therefore require a great deal of maintenance and upkeep. The spraying equipment also must be kept clean. With existing agitation means, the cleaning of the spraying equipment is difficult and time consuming.

It is therefore an object of my invention to overcome these objections in modes of agitation of liquids in spray equipment.

Another object of my invention is to provide a means of agitation readily adaptable to ordinary spraying equipment.

Another object of my invention is to provide a means of spray equipment agitation which will not be affected by corrosive fluids.

Another object of my invention is to provide a means of spray equipment agitation which will facilitate easy cleaning of the spraying equipment.

These and other objects of my invention may be better understood by referring to the accompanying specifications and claims taken in conjunction with the drawings in which:

FIGURE 1 is a side elevational view of the complete spraying device;

FIGURE 2 is a top view of the complete spraying device, and

FIGURE 3 is a sectional view of the interior bottom of the tank taken along the line 3—3 of FIG. 1, with the wheels and brace structure not shown.

Referring first to FIG. 1 and FIG. 2, the numeral **10** indicates a tank which serves to retain a supply of liquid and also serves as the main structural member by which other components are supported. The configuration of tank **10** is such, with sloping end walls **12** and **14**, that the cross sectional area of the bottom **15** is relatively small when compared to the remaining horizontal areas of tank **10**. Wheels **16**, supported by axle **17** are provided for portability of the sprayer. A brace structure **18** supports the sprayer in a level position while in operation. A handle **20** is conveniently provided for use in moving the sprayer.

A positive displacement compress **22** is mounted on tank **10**. A gasoline engine prime mover **24** is also mounted on tank **10**. A drive pulley **25** is affixed to the drive shaft of the engine **24** whereby power is delivered to the compressor **22** by belt **26** and compressor pulley **27**.

An air inlet filter **28** is provided through which air is drawn into the compressor **22**. Outlet piping **29** serves to conduct the compressed air from the compressor **22** to the tank **10**. Inserted in the outlet piping **29** is a spring loaded valve **30**. An input extension tube **32** connects to piping **29** to convey the compressed air into the tank **10**. The input tube extends near the tank bottom **15** and terminates with a curved partial volute portion **34**. This is best shown in FIGURE 3. By action of the curved portion **34** the discharged air tends to flow in a circuitous path near the tank bottom **15** indicated by the arrows in FIG. 3.

A discharge tube **36** extends from near the bottom **15** to the top of the tank **10** where connection is made with spray piping **37**. The lower end of tube **36** is preferably positioned at a point about which the tube portion **34** is bent, as illustrated in FIG. 3. A flexible hose **38** connects to piping **37** and a spray nozzle **40**. An adjustable valve **41** is inserted in the hose piping **37** whereby the volume of liquid passing to the spray nozzle **40** may be varied.

A relief valve indicated at **42**, is placed in the top of the tank **10** so that air pressure within the tank will not exceed a predetermined amount. A hand valve **44** is provided so that air compressed within the tank may be discharged to the atmosphere when necessary. A gauge **45** is so mounted to indicate the pressure within the tank **10** at all times.

An enlarged opening **46** is provided in the top of the tank **10** for use in charging the tank **10** with insecticides, herbicides, paint or other chemicals and liquid carriers to be sprayed. A quick opening cover **48** seals the opening **46** air tight while the sprayer is in use.

Operation

The operator first places the material to be sprayed, as for instance an insecticide, in the tank **10**, followed by a sufficient amount of water or other liquid vehicle. The cover **48** is next hermetically secured over opening **46**.

The engine **24** and compressor **22** are started. The

spring loaded back pressure valve 30 is set at a relatively high pressure-about 500 pounds per square inch in practice. In the first few seconds of compressor operation, no air passes through back pressure valve 30 into tank 10 because sufficient pressure has not accumulated to force the back pressure valve 30 open. However, after a few strokes, approximately three or four in practice, the compressor 22 builds up air pressure in the outlet piping 29 between the back pressure valve 30 and the compressor 22 which acts as a small reservoir to force the back pressure valve 30 open. This permits a sudden burst of air from this small reservoir, discharging through tube 32 into the tank 10. When back pressure valve 30 opens, the air pressure is immediately reduced in the outlet piping 29 between the back pressure valve 30 and the compressor 22. The spring tension in the back pressure valve 30 will then force it to close. The back pressure valve 30 will stay closed for a few more strokes of the compressor 22 until sufficient pressure is again accumulated to open it. Thus a continuous alternating series of bursts of high pressure air is discharged into the tank 10 from tube 32.

The relief valve 42 will remain closed until the pressure in the tank 10 reaches a predetermined point desired as the optimum spray pressure, about 110 pounds per square inch in practice. If the spray nozzle 40 does not discharge air as fast as it is pumped into the tank 10, the pressure will gradually accumulate within the tank 10. After the pressure within the tank 10 reaches the predetermined set pressure of the relief valve 42, it will open discharging air to the atmosphere. Obviously, pressure within the tank 10 will therefore never exceed this predetermined amount. Thus, when back pressure valve 30 opens, air will be discharged from a pressure of about 500 pounds to a pressure in the tank 10 never exceeding about 110 pounds. Air discharging from tube 32 will be a continuous series of sudden bursts. This process of releasing continuous bursts of air pressure violently agitates the liquid in the tank 10. This turbulent, ebullient action of high pressure air entering the tank 10 serves to maintain colloid and emulsion liquids in a completely interspersed, homogeneous state.

The tube lower portion 34, being bent to discharge the air at the periphery or outer edge of the tank bottom 15, establishes a circuitous movement of the total liquid contained in the tank 10. This continuous motion of the spray liquid helps prevent settling which might otherwise take place.

Air supplied by compressor 22, through outlet piping 29, back pressure valve 30 and tube 32 serves two functions. First, to agitate the fluid in the tank and second to deliver air under pressure to force the spray liquid out through discharge tube 36, pipe 37, adjustable valve 41, hose 38 and spray nozzle 40 where it can be directed as required by the operator.

It can be seen that the method of agitation of this invention is readily adaptable without proportionally large expense to most sprayers. The tube 32 can be easily and inexpensively made of materials such as brass or stainless steel which are not ordinarily subject to corrosion. The problem of corrosion encountered in the use of paddles, propellers or other mechanical means of agitation is thereby eliminated. In one embodiment, bottom portion 15 is of circular cross section adjacent sloping side portions 12 and 14, while outlet pipe 29 is attached tangentially from the outside near the bottom.

The tube 32 and discharge tube 36 can be readily removed, leaving the interior of the tank 10 free of obstacles, making cleaning of the tank 10 much simpler.

A spring loaded back pressure valve 30 is shown in this disclosure as the means selected to control the intermittent discharge of high pressure air into the liquid. It is obvious that other means exist by which the intermittent discharge of high pressure air may be obtained. One example would be a valve which is mechanically opened and closed. It is therefore not intended to limit this disclosure to the use of spring loaded back pressure valves 30 as a means of achieving fluid agitation.

Various air pressures have been indicated in this disclosure by way of examples. It is understood that the principles of this invention are not predicated on particular pressures, nor particular ranges of pressures, but concern primarily the discharge of air from a greater to a lesser pressure as a means of achieving agitation of spray liquid. Nor is it intended to limit the principles of this invention to the agitation of spray liquids only, but to include the agitation of fluids in general.

Although this invention has been described in a certain degree of particularity, it is manifest that many changes may be made in the embodiment of the principles of this disclosure without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. In a liquid spraying device having a confined tank containing said liquid, an air compressor, outlet piping extending from said compressor into said liquid, spray piping and a nozzle extending from said liquid to the outside of said tank, the improvement for agitating said liquid, comprising a back pressure valve interposed in said outlet piping, biasing means in said valve for closing said valve against the passage of compressed air from said compressor until the pressure of air in said outlet piping upstream from said valve has become substantially higher than the pressure required to cause air to flow from said compressor into said tank.

2. A liquid spraying device comprising a pressure tank having side walls tapering inwardly toward a flat bottom portion; a compressor; an engine drivingly connected to said compressor; outlet piping extending from said compressor for conveying compressed air therefrom; a spring-loaded valve on the end of said piping, the resiliency and response time of the spring of said valve being such that air from said compressor is alternately stored in and released from said outlet piping in a short burst and under high pressure; extension piping extending from said valve means into said tank and terminating substantially parallel to said flat bottom portion and adjacent thereto in a volute; spray piping and a nozzle extending from a point in said liquid centrally located with respect to said volute to a point outside said tank; and a pressure relief valve in said tank set at a substantially lower pressure than said spring-loaded valve.

3. A device to agitate a liquid comprising in combination, a compressor; an engine for driving said compressor; a reservoir connected to said compressor for receiving compressed air from said compressor; tube means connected to said reservoir and extending into said liquid; and an interrupting means interposed between said tube means and said reservoir whereby flow of said compressed air is interrupted, said interrupting means including a spring loaded back pressure valve.

References Cited in the file of this patent

UNITED STATES PATENTS

688,261	Parks	Dec. 3, 1901
1,907,086	Nason	May 2, 1933
1,998,217	Benoit	Apr. 16, 1935
2,424,468	Keathley	July 22, 1947
2,492,309	Miller	Dec. 27, 1949
2,504,009	De Phillips et al.	Apr. 11, 1950
2,720,342	Fleck	Oct. 11, 1955
2,923,440	Ve Horn	Feb. 2, 1960

FOREIGN PATENTS

22,212	Australia	Feb. 4, 1936