United States Patent

[11] 3,586,215

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[21] Appl. No. **835,985**
[22] Filed **June 24, 1969**
[45] Patented **June 22, 1971**

[54] **PLANT DUSTING APPARATUS**
11 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **222/193,** 222/333
[51] **Int. Cl.** **B67d 5/54**
[50] **Field of Search** 222/193, 333; 302/37

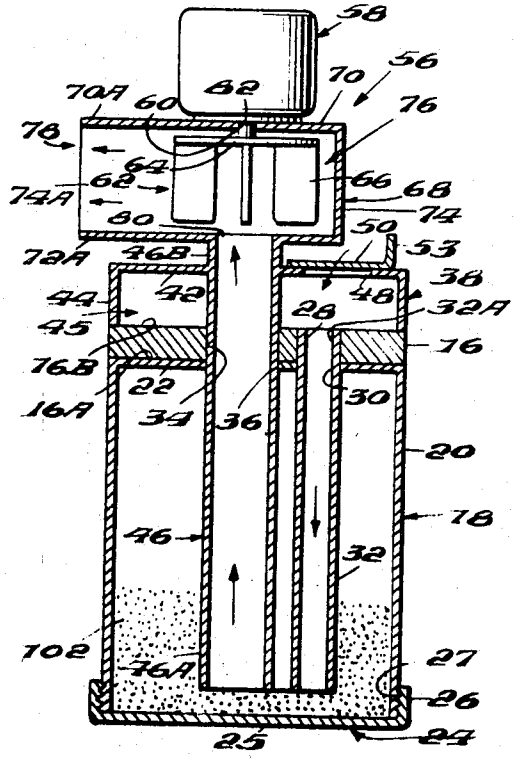
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ABSTRACT: Apparatus for dispensing dry powdered, particle or particulate compositions of matter on plantlife and including a handle, means on the handle for supporting a receptacle for the matter, and pump means carried on the supporting means and operatively connected with the receptacle to effect broadcasting of the matter.



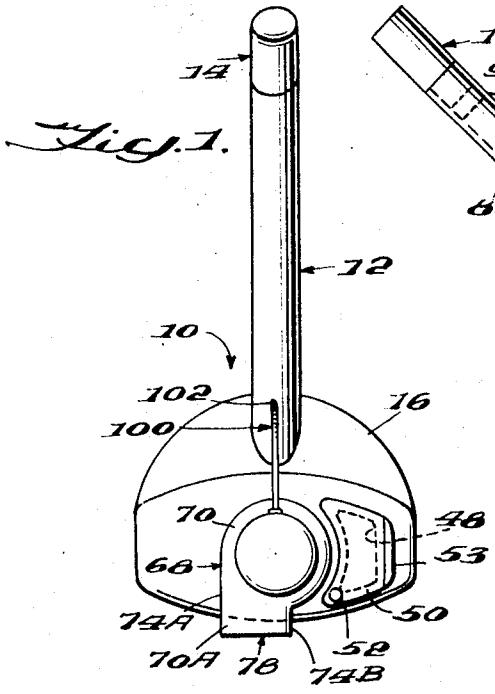


Fig. 1.

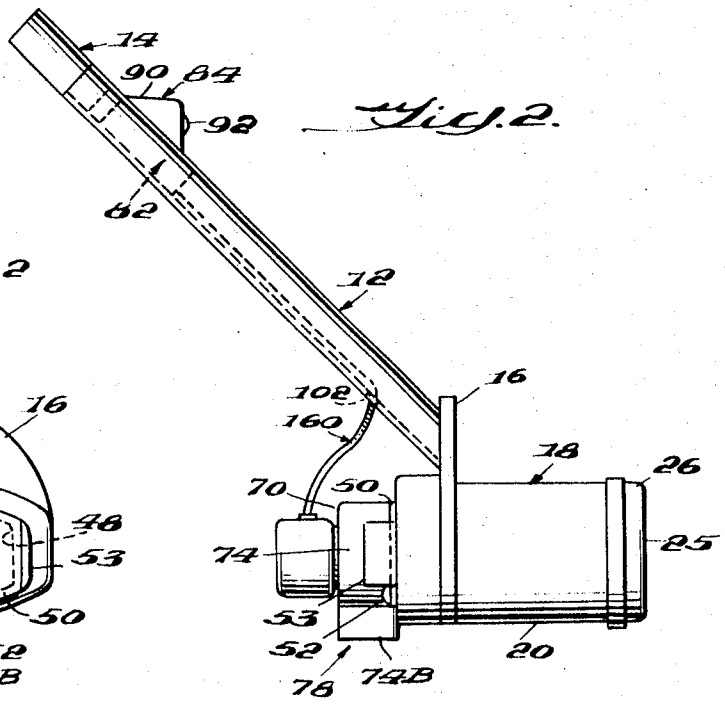
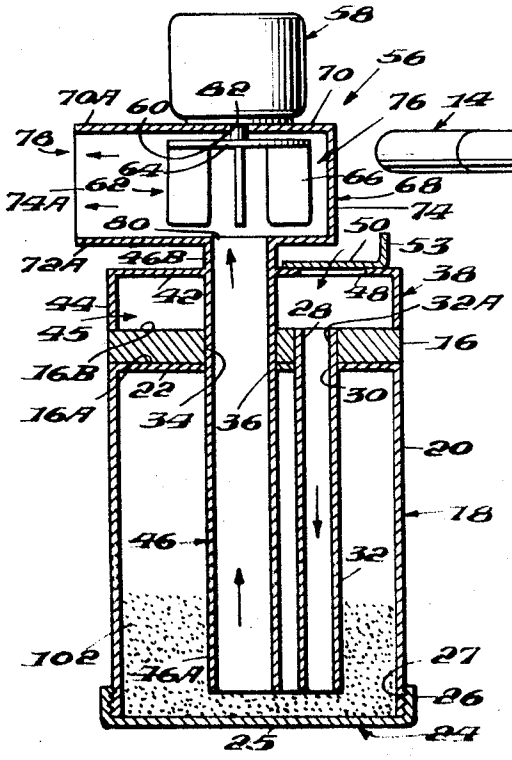


Fig. 2.

Fig. 4.

Fig. 3.



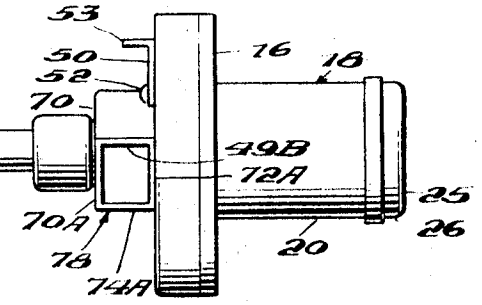
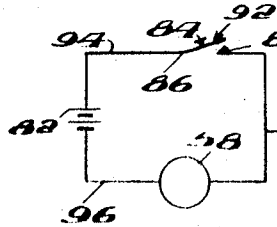


Fig. 7.



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Fig. 5.

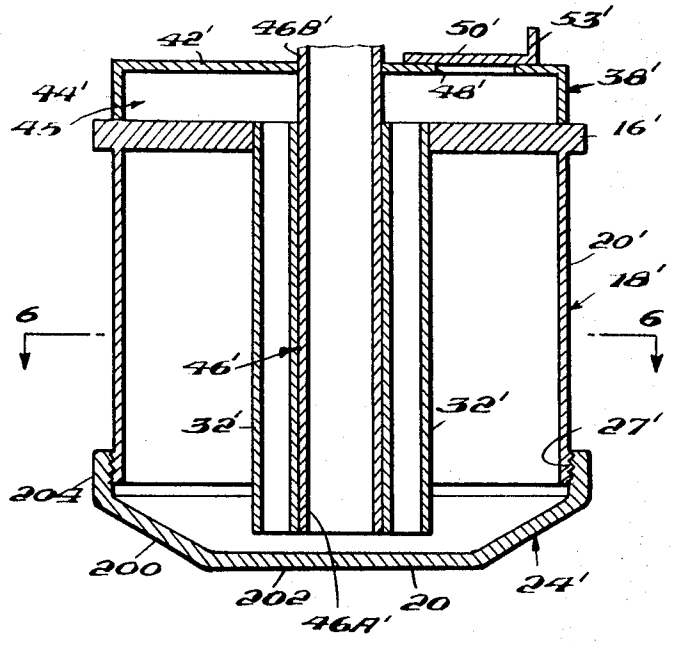
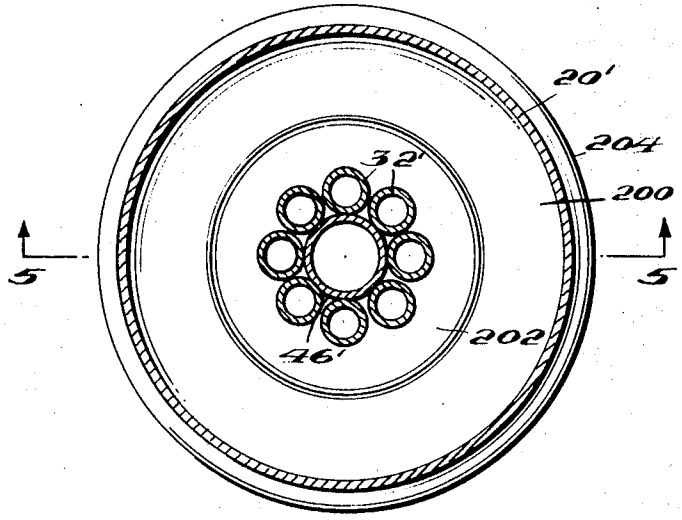


Fig. 6.



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PLANT DUSTING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a handle supported receptacle or container having a dry powdered insecticide or like material therein, and motor-driven air pump means supported on the handle and communicating with the receptacle to draw the insecticide therefrom for discharge through nozzle means as a dust to treat plantlife, and valve means for controlling the rate of material discharge.

2. Description of the Prior Art

Apparatus for spraying plantlife with an insecticide is not, per se, new in the several arts. For the most part, however, such apparatus involves the use of liquid sprays with an insecticide in suspension or in solution with a liquid carrier, and this involves the use of a relatively high-powered motor for driving the required pump means, and this is attendant with a high-pressure discharge spray and, of course, high operational costs. Examples of such apparatus are those sprays or dispensing means as are employed in spraying trees and orchards and those trees which appear in urban developments.

Handheld liquid spray means are also involved in the art, but for the most part these devices, if motor-driven, require connection to a conventional high voltage outlet source and are, thus, subject to short circuiting and have but limited utility depending upon the availability of the outlet plug. Such apparatus also tends to leak causing other obvious problems.

Liquid spray devices for treating plantlife of the manually operated pump type are also old and well known, but to be effective, the air pump piston therefor must reciprocate a relatively long distance in its chamber (usually the handle means), and the operation of such apparatus requires the expenditure of appreciable energy. Further, and because of the usual long handle found in such equipment such devices are not only cumbersome but require considerable room in which to operate, for to the length of the handle must be added the length of the piston rod when extended. Still further, such hand-operated spraying mechanisms, like their power driven counterparts, are subject to leakage and other failures and disadvantages which are well known especially to amateur and professional gardeners.

Dusting mechanisms, that is, power driven mechanisms for distributing a powdered material, are also known, but these devices have not been developed for the use in the treating of plantlife. Generally such devices which have been designed for the spraying of powdered material have a common disadvantage in that they will clog and the moving parts will bind. Dust will accumulate in bearings increasing the frictional characteristics thereof which leads to excessive wear and frequent replacement of parts.

None of the mechanisms referred to above meet the challenge of suitably dusting, dispensing, broadcasting or otherwise treating plantlife such as, for example, delicately petaled flowers and foliage, vines and plants of this same general class, and still other plantlife which may be easily destroyed when liquid sprayed or dry dusted with the high-pressure apparatus or mechanisms of the known prior art.

SUMMARY

This invention pertains to the provision of a unitary, self-contained power driven apparatus for dusting, dispensing, distributing, dry spraying and otherwise broadcasting a dry powdered insecticide or other powdered treating compositions on plantlife to promote the growth thereof and to inhibit or totally prevent damage thereto by inamicable pests, fungus, parasites, and other agents which tend to damage or destroy plant growths. To accomplish the desired objects, the apparatus of this invention is lightweight and very compact, and the apparatus includes elongated handle means to be single-handedly held and manipulated by the user, the handle means being substantially hollow throughout its length and having a support or mounting plate fixedly secured on one of its ends, and on the latter is mounted a receptacle or container to receive the powdered material. Electrically operated air pump means is also supported on the aforementioned one end of the handle means, and the invention is further characterized in providing a source of electrical energy in the handle means for connection to the air pump motor. Electrical circuitry connects the motor with the energy source, and the circuitry includes a control switch mounted on the handle means for convenient operation by the user. Of importance to this invention is the provision of air valve control means for controlling the rate of discharge of the dispensed material.

The invention further proposes the provision of such apparatus which is noncomplex in construction and assembly, inexpensive to manufacture and to maintain, and which is rugged and durable in use.

Other and further objects and advantages of the instant invention will become more manifest from a consideration of the following specification when read in the light of the annexed drawings.

BRIEF DESCRIPTION OF THE DRAWINGS In the drawings:

FIG. 1 is an end elevational view of one embodiment of this invention;

FIG. 2 is a side elevational view of FIG. 1;

FIG. 3 is a bottom plan view of FIG. 2;

FIG. 4 is a detail cross-sectional view of the device or apparatus of FIG. 1;

FIG. 5 is a longitudinal detail cross-sectional view of a receptacle or container for the powdered material, the receptacle or container being constructed in accordance with the second embodiment of this invention and illustrating other components thereof, FIG. 5 being taken substantially on the plane of line 5–5 of FIG. 6, looking in the direction of the arrows;

FIG. 6 is a transverse detail cross-sectional view, FIG. 6 being taken substantially on the plane of line 6–6 of FIG. 5, looking in the direction of the arrows; and

FIG. 7 is a schematic wiring diagram for energizing the air pump motor. As has been stated above, the device or apparatus of the instant invention is directly concerned with means for dry dusting, spraying, broadcasting or dispensing powdered materials on plantlife to inhibit, prevent or materially reduce attacks thereon. The dusting composition or material has been heretofore referred to as a dry powdered, particle or particulate form of insecticide material. However, and by way of general definition, the composition of the matter to be dry sprayed or broadcast may, in addition to insecticides, also include dry powdered fungicides, bactericides, herbicides, and all other dry powdered compositions which normally promote the growth of plantlife, and other materials especially compounded to offset, reduce or eliminate the onslaughts of destruction for whatever the cause. Thus, in the detailed description of the invention which follows, infra, such powdered, particle or particulate dry compositions of compounded matter will be generally referred to as a powdered "-material." It will also be understood that the same apparatus may be utilized in broadcasting powdered material for the purpose of killing, destroying, or otherwise preventing, prohibiting, or reducing to a minimum, unwanted plant growths such as, for example, weeds and crabgrass.

Thus, and referring now more specifically to FIG. 1 to 4, inclusive, of the first embodiment of this invention, reference numeral 10 designates, in general, a unitary, self-contained apparatus or device constructed in accordance with the teachings of one embodiment of this invention. As such, the apparatus is seen to include an elongated substantially hollow cylindrical handle member 12 having a pair of opposed open ends. One end of the handle member 12 is closed by a cap 14 which is secured thereon by conventional friction means (not

shown), and its opposed end is fixedly connected, by conventional means (not shown), to the upper end of the support or mounting plate **16** having any suitable peripheral configuration. Preferably, the support or mounting plate **16** is provided with opposed substantially planar sides **16A, 16B**.

At **18** is denoted an elongated substantially hollow receptacle or container for the powdered material, and as is seen in the several Figures of the drawings, the container or receptacle **18** comprises an elongated substantially hollow cylindrical sidewall **20** having a pair of opposed open and closed ends. One end of the cylindrical sidewall **20** is closed by a substantially flat discoidal or cylindrical end wall **22** which may be integrally formed therewith or fixedly connected thereon. The other end of the container **18** is provided with a removable closure member **24** which includes a substantially flat cylindrical cap plate **25** from the peripheral marginal edge of which laterally projects an annular internally threaded flange **26**. The cap **24** is normally threadedly engaged with the threads **27** externally formed on the aforementioned other end of the sidewall **20**.

The end wall **22** may be integrally formed with or adhesively or mechanically connected substantially flush on the side **16A** of the support or mounting plate **16** so as to, preferably, effect a seal therebetween. The connection is such as to prevent undesirable leakage of the powdered material disposed within the receptacle or container **18**.

The mounting or support plate **16** and the end wall **22** are formed with coaxial bores **28, 30**, respectively, each having identical diameters, and with the bores **28, 30** being offset with respect to the center point of the end wall **22**.

Reference numeral **32** indicates an elongated substantially hollow cylindrical air inlet conduit having an upper end **32A**, reference being made to FIG. **4** of the drawings, fixedly connected adhesively, frictionally or mechanically (if desired) in the bores **28, 30**, with its upper terminal end being disposed substantially in the plane of the side **16B** of the mounting or support plate **16**. The outer end of the conduit **32** projects beyond the side **16A** into the receptacle **18**, and terminates in inwardly spaced relationship relative to the cap plate **25**.

With further reference to FIG. **4** of the drawings, it is seen that the mounting or support plate **16** and the end wall **22** are constructed with additional coaxially aligned bores **34, 36**, respectively, these bores being of the same diameter, and this diameter is greater than the diameter of the bores **28, 30**. The function of the bores **34, 36** will be related below.

A substantially hollow cylindrical casing bears the general reference numeral **38**, casing **38** being constructed of a substantially cylindrical closure wall **42** from the peripheral marginal edge of one side of which laterally projects an annular flange **44**. The mounting plate **16**, the flange **44**, and the closure wall **42** cooperate to limn a hollow air chamber **45**. An elongated substantially hollow cylindrical material discharge pipe **46** extends transversely through the closure wall **42** and has opposed end portions, **46A** and **46B**, respectively, projecting laterally from the opposed sides thereof. The conduit **46** is secured on the closure wall **42** in an offcenter relationship relative thereto, and has an outside diameter substantially equal to the coaxial bores **44, 46** in which it is adapted to be received and secured to serve a function to be described. As is seen in the drawings, the lower terminal end of the end portion **46B** is substantially coplanar with the lower terminal end of the air pipe **32**, reference being had to FIG. **4**.

The closure wall **42**, also at an offcenter location, is formed with a transversely extending air valve opening **48**. A valve plate **50** is pivotally mounted by conventional means on the outer side of the closure wall **42** for sliding swinging movement thereon towards and away from the opening **48** to effect the opening and closing thereof. A finger-engageable valve plate manipulating flange **53** projects laterally from the marginal edge of the plate **50** to enable the user of the device to easily move the valve plate **50** to an adjusted position relative to the air valve opening **48**.

Reference numeral **56** generally indicated a conventional air pump and aspirating mechanism. The mechanism **56** includes the usual electric motor **58** and its drive shaft **60** on which is fixedly secured an impeller assembly **62** for rotation therewith. The assembly **62** includes a cylindrical mounting plate **64** having a side thereof rigidly connected to the drive shaft **60**, and **70** A, its respectively, side laterally project a plurality of air impeller blades **66**.

The mechanism **56** further comprises a combined hollow housing for the impeller blades **66** and a material discharge nozzle for the device, this unit being identified by the reference numeral **68**. The unit **68** may be considered as having a convolute configuration and comprises an opposed pair of arcuately shaped spaced and substantially parallel sidewalls **70, 72** having extensions **70A, 72A**, respectively and an arcuate end wall **74** which terminates at its respective ends in tongues **74A, 74B**. The arcuate sidewalls **70, 72** and the arcuate end wall **74** are assembled so as to partially surround the impeller blade assembly **62** in spaced relationship relative thereto and to define a hollow material receiving and discharge chamber **76**. The extensions **70A, 72A** and the tongues **74A, 74B** are assembled to form a substantially hollow rectangular material discharge nozzle **78** having its inner end opening into the chamber **76** and its other end opening into the ambient atmosphere. The unit is further provided with a material inlet opening **80** which is formed in the sidewall **72** which, at one end, opens into the air chamber **76**. As is clearly shown in FIG. **4** of the drawings, the electric motor **58** is supported on the arcuate sidewall **70** and is secured thereon by conventional means (not shown), and its drive shaft **60** extends through a suitable opening **82** that extends transversely through the last-mentioned sidewall. Any suitable conventional means (not shown) may be used to connect the outer terminal end **46B** of the pipe end **46** to the peripheral marginal edge of the opening **80**.

Disposed and supported in the handle **12** is one or more batteries here carrying the general reference numeral **82**. The batteries **82** are removable and replaceable after having first removed the handle cap **14**. The batteries **82** comprise the EMF source for energizing the motor **58** and are electrically connected thereto by any conventional electric circuit here schematically illustrated as a series circuit of FIG. **7**. The series circuit includes the motor **58**, the battery or batteries **82** and a conventional single pole single throw control switch generally designated by the reference numeral **84**.

The switch **84** includes a switch arm **86** constantly biased to its open position and a fixed switch contact **88**. The switch arm **86** and its associated contact **88** are mounted and received within a housing **90** fixedly connected on the handle **12** adjacent its cap **14**. The housing **90** also serves as a mounting support for the conventional pushbutton actuator **92** for the switch arm **86**.

The series circuit also includes a wire **94** which leads from one side of the battery **82** to the switch arm **86**, this wire being preferably located in the handle **12**. Wires **96, 98** lead from the other side of the battery and the fixed switch contact **88**, respectively, to the opposed sides of the motor **58**. These last-mentioned wires are preferably joined as a cable **100** to extend through the handle **12**, exiting therefrom through a handle opening **102** for electrical connection with the motor **58** in the customary manner.

To operate the apparatus **10** constructed and assembled as above described, the closure member **24** is removed and the receptacle or container **18** is filled with the desired dry powdered material **102** which is to be dusted or sprayed over the plantlife to be treated. The cover or closure member **24** is then replaced.

With the handle **12** grasped in the hand of the user, the nozzle **78** is then brought into juxtaposition relative to the plants or area to receive the dusting. The pushbutton actuator **92** for the switch **84** is conveniently located for digital operation and is pushed inwardly to close the switch arm **86** against the fixed switch contact **88**. This completes the circuit to the motor **58**,

and with the motor energized, the impeller assembly **62** is rotatably driven.

Assuming that the valve plate **50** is closed, the driven impeller assembly **62** will act as an aspirating mechanism to draw the dry powdered material **102** upwardly through the material discharge pipe or conduit **46**, the material passing into the chamber **76** for ultimate discharge through the nozzle means **78**.

Where conditions warrant the broadcasting of the powdered material over wider areas or where heavier dusting is required, the valve plate **50** may be swung to uncover the air valve opening **48** to a greater or lesser degree. Atmospheric air is then admitted through the opening **48** into the air chamber **45**, and is drawn through the air conduit or pipe **32** towards the lower end of the receptacle or container **18**, reference being made to FIG. **4**. Here the material **102** becomes entrained with the air and is drawn upwardly through the discharge pipe or conduit **46** into the chamber **76**. The impeller blades **66** now force the air and its entrained material through the discharge nozzle **78** and onto the plantlife to be treated. The rate of discharge is, of course, controlled by the position of the valve plate **50** across its associated air valve opening **48**. FIG. **5** and **6** illustrate the second embodiment of this invention. Consequently, elements of these Figures finding counterparts in the first embodiment bear the same reference numerals but to which has been added a prime mark to effect the differentiation therebetween.

In this embodiment, the receptacle **18'** is constructed with a cylindrical sidewall **20'** which, in FIG. **5**, is shown as being integrally formed with the support or mounting plate **16'**. The opposed end of the receptacle **20** is externally threaded at **27'** and is closed by a cap member **24'**. This cap member **24'** has a frustoconical configuration and includes a sidewall **200**, an end wall **202** disposed in the plane of its frustum, and an integrally formed internally threaded annular flange **204** at its base end. The flange **204** is adapted for threaded connection with the threads **27'** on the sidewall **20**.

The material discharge pipe or conduit **46'** is here shown as being coaxial with the container or receptacle **18'** instead of offcenter as is shown in the previous embodiment, and in this second embodiment there is provided a plurality of air inlet pipes or conduits **32'** arranged in tangential engagement with the discharge pipe or conduit **46'**.

One other point of distinction may be made between the two embodiments of this invention, namely, in the latter embodiment, the lower ends of the conduits or pipes **32'**, **46'**, reference being made to FIG. **5**, extend beyond the adjacent lower end of the receptacle or container **18'** and into the cap member **24'**. This facilitates the loading of the container or receptacle **18'** without danger of inadvertently or accidentally pouring some of the material into the conduits or pipes **32'**, **46'** for collection in the air chamber **45'** or in the impeller chamber **76**. Such misadventure could clog both chambers. With respect to the chamber **45'**, the available air supply would be reduced, and concerning the chamber **76**, an unnecessary and unwanted starting load would be imposed on the motor **58**.

In all other respects, the second embodiment of this invention follows the teachings of the first.

The two embodiments of this invention herein specifically described and illustrated are now defined in the appended claims.

What I claim is :

1. Apparatus as defined in claim **1** and apparatus for dusting plantlife with a dry powdered, particle, or particulate material and comprising:

an elongated handle having a pair of opposed ends;

a mounting plate having a pair of opposed sides with one end of said handle being fixedly connected on one side thereof;

a substantially hollow material receiving receptacle having a pair of opposed ends with one of its ends fixedly connected on and sealed against the other side of said mounting plate;

removable closure means extending across the other end of said receptacle;

means air venting said receptacle to the atmosphere;

a material discharge conduit having a pair of opposed open ends with one of its said ends in communication with said receptacle and the material therein;

pump means including a material discharge nozzle at one side thereof, and a material inlet opening connected with the other end of said material discharge conduit; and

means for actuating said pump means to draw said material from said receptacle and to broadcast said material therefrom through said nozzle;

means providing an air chamber for said receptacle, said air chamber means comprising a substantially cylindrical closure wall having a continuous flange at a peripheral marginal edge projecting laterally from a side thereof and secured to said one side of said mounting plate to define said air chamber therebetween; and

said air venting means including an opening extending transversely through said closure wall, and an elongated conduit having opposed ends with one end opening into said receptacle and its other end opening into said air chamber.

2. Apparatus as defined in claim **1** wherein

said one end of said material discharge conduit and said air vent conduit terminate in coplanar relationship relative to one another and in spaced relationship relative to said removable closure means.

3. Apparatus as defined in claim **2** wherein

said removable closure means comprises a cylindrical cap plate having a continuous flange projecting from a side thereof for releasable connection on said other end of said receptacle.

4. Apparatus as defined in claim **3** wherein

said releasable connection comprises friction means.

5. Apparatus as defined in claim **3** wherein

said other end of said material discharge conduit extends transversely through and beyond said air chamber closure wall and is connected with said air pump means inlet and supports said air pump means thereon.

6. Apparatus as defined in claim **5** and

valve means controlling the flow of air through said opening formed in said closure wall.

7. Apparatus as defined in claim **6** wherein

said valve means comprises a plate pivotally mounted on said closure wall for selective swinging movement across said opening.

8. Apparatus as defined in claim **7** wherein

said material discharge and air venting conduits extend parallel to one another and are disposed in offcenter but parallel relationship relative to the longitudinal axis of said receptacle.

9. Apparatus as defined in claim **7** wherein

said material discharge conduit is substantially coaxially aligned with the longitudinal axis of sad receptacle, and a plurality of air venting conduits are provided in tangential engagement with said material discharge conduit.

10. Apparatus as defined in claim **9** wherein

the other ends of all of said conduits extend beyond the adjacent end of said receptacle.

11. Apparatus as defined in claim **1** and Apparatus for dusting plantlife with a dry powdered, particle, or particulate material and comprising:

an elongated handle having a pair of opposed ends; a mounting plate having a pair of opposed sides with one end of said handle being fixedly connected on one side thereof;

a substantially hollow material receiving receptacle having a pair of opposed ends with one of its ends fixedly connected on and sealed against the other side of said mounting plate;

removable closure means extending across the other end of said receptacle;

means air venting said receptacle to the atmosphere;

a material discharge conduit having a pair of opposed open ends with one of its said ends in communication with said receptacle and the material therein;

pump means including a material discharge nozzle at one side thereof, and a material inlet opening connected with the other end of said material discharge conduit; and

means for actuating said pump means to draw said material from said receptacle and to broadcast said material therefrom through said nozzle;

means providing an air chamber for said receptacle, said air chamber means comprising a substantially cylindrical closure wall having a continuous flange at a peripheral marginal edge of projecting laterally from a side thereof and secured to said one side of said mounting plate to define said air chamber therebetween;

said closure means comprising a substantially frustoconical hollow sidewall, an end wall disposed substantially in the plane of the frustum of said sidewall, and a flange projecting from the base end of said sidewall for connection to said other end of said receptacle;

said other end of said material discharge conduit extending transversely through and beyond said air chamber closure wall and connected with said air pump means inlet to support said air pump means thereon;

said material discharge conduit being substantially coaxially arranged with respect to the longitudinal axis of said receptacle;

said venting means further including a plurality of elongated conduits having opposed ends with one of their respective ends opening into said receptacle and their other respective ends opening into said air chamber, said one ends of said plurality of conduits terminating in substantially coplanar relationship relative to the adjacent end of said material discharge conduit; and

said last-named ends of all of said conduits having an axial length greater than the axial length of said receptacle with said adjacent ends of all of said conduits extending beyond the adjacent end of said receptacle.