July 20, 1965 R. E. WARD, JR 3,195,264

NOZZLE FOR ELECTROSTATIC DUSTING DEVICES

Filed Oct. 1, 1963

Fig-1-

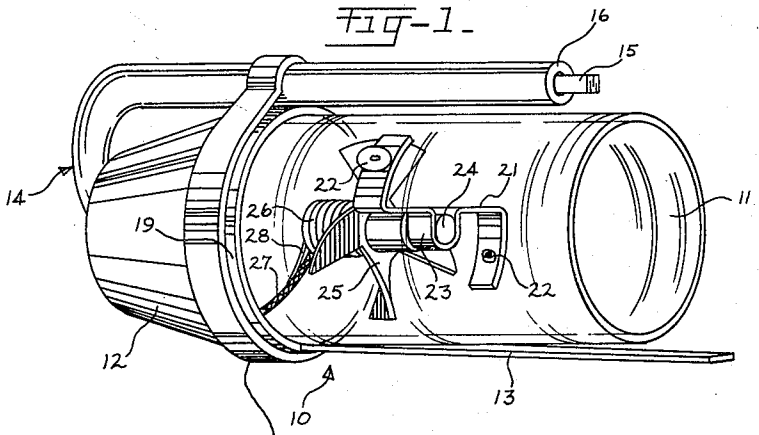
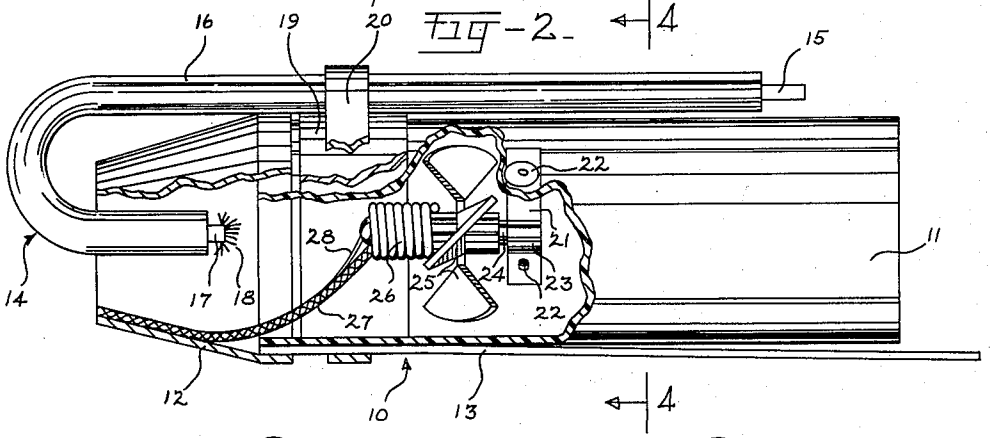


Fig-2-



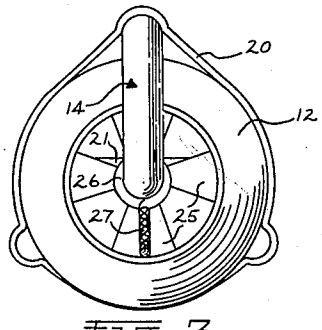


Fig-3-

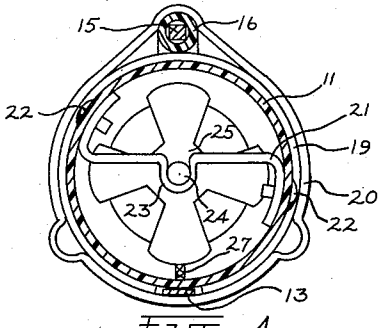


Fig-4-

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NOZZLE FOR ELECTROSTATIC DUSTING DEVICES

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This invention relates to agricultural implements and more particularly to nozzles used in conjunction with electrostatic dusting devices.

In the last few years considerable work has been done in the field of electrostatically charging insecticides, pesticides, fungicides and other materials used in conjunction with various types of plant life. In controlled laboratory tests extremely good and consistent results have been obtained, but when the devices were placed in actual field trials, very erratic and unpredictable results were forthcoming. During certain observed outdoor operations 6 to 8 times the application rate was noted for the charged particles as compared to non-charged particles. At other times no noticeable increase of application rate was observed. It has also been observed that at times one polarity will increase the application rate while at other times it is necessary to reverse polarity to obtain the same results.

The desire to obtain consistent increased application rate through the use of electrostatic dusting devices has prompted much experimentation in this field to determine a means to eliminate the disadvantages of inconsistent results and to obtain more reliability. As a result of much research in this field, it has been discovered that the interior of the conical shaped electrode becomes coated with a very thin layer of fine particles which, even though at times hardly distinguishable with the naked eye, insulates such electrode to an extent that the advantages of the electrostatic field and therefore the charge placed on the particles is greatly reduced, even to the point where no perceptible advantage is obtained over conventional dusting methods.

Having finally recognized one of the main causes of inconsistent field results in the use of the electrostatic dusting principle, the present invention has been developed to eliminate the problem and therefore greatly increase the predictable application rate of electrostatically charged dusting operations.

It is therefore an object of the present invention to provide an electrostatic dusting nozzle having a means for preventing the buildup of dust particles on the nozzle electrode.

Another object of the present invention is to provide a brushing means to prevent undesirable buildup of particles on the nozzle electrode, said brush means being activated by the flow of dust-laden air.

Another object of the present invention is to provide a nozzle for electrostatic dusting devices which incorporates a propeller mounted in the air stream of the nozzle to activate a cleaning device for preventing the buildup of undesirable film on the electrode of the nozzle.

A further object is to provide a means of adjusting the distance between the electrodes of an electrostatic dusting device to obtain the maximum electrostatic field without arcing of high voltage therebetween.

Other objects and advantages of the present invention will become apparent and obvious from a study of the following description and the accompanying drawings which are merely illustrative of the present invention.

In the drawing:

FIGURE 1 is a perspective of the improved nozzle of the present invention;

FIGURE 2 is a cutaway side elevational view of the present invention;

FIGURE 3 is the present invention as viewed from the front of the nozzle; and

FIGURE 4 is a sectional view of lines 4—4 of FIGURE 2.

With further reference to the drawings, a nozzle 10 is provided for use in connection with electrostatic dusting devices. When such nozzle is being readied for use, the generally cylindrical hose or pipe 11 is connected to the hose (not shown) coming from the blower unit of the dusting device (also not shown).

The hose of pipe 11 may be composed of any suitable material such as plastic or metal. It has been found in certain cases to be advantageous to have a clear plastic hose to make that portion of the device more or less a sight gage into the type and rate of material moving through the device. If a plastic hose 11 is used, it is necessary to ground the frusto-conical electrode 12. This is accomplished by a grounding member 13 which is attached to the frustro-conical electrode at one end and to some part of the dusting device (not shown) at the other end. If a metal hose is used, no ground is of course needed.

A centrally disposed electrode indicated generally at 14 is provided having an electrically conductive member 15 which is connected to the high voltage supply of the dusting device (not shown) and which is insulated from the other portions of the device by a sleeve 16.

The central electrode 14 is curved at one end in a cane shape so as to dispose the terminal 17 centrally within the frustro-conical electrode 12. Said terminal 17 has a number of small diameter, electrically conductive, wires 18 fixed thereto. The purpose of these wires is to maximize the field strength in the immediate vicinity of the terminal 17 so as to create a strong electrical or corona type of discharge of predetermined direction of current flow between the two electrodes.

A support member 19 is provided circumventionally about the pipe 11 just rearwardly of the frustro-conical electrode 12. Secured about said support member 19 is a clamp 20 which is so arranged that the centrally disposed terminal 17 of electrode 14 may be adjusted along the longitudinal axis of the nozzle 10, thereby allowing the distance between terminal 17 and electrode 12 to be adjusted so that such distance is just greater than the distance at which the high voltage will arc between electrodes 17 and 12. In other words due to the frustro-conical shape of electrode 12, as the centrally disposed electrode 17 is moved rearwardly, the distance between such electrodes is increased, or conversely, as the electrode 17 is moved forward or toward the exhaust end of the nozzle 10, the distance between such electrode and the frustro-conical electrode will decrease. Due to this feature of adjustability of the distance between electrodes, the point of greatest saturation may be obtained while arcing may be prevented.

A bracket or support member 21 is interiorly mounted within the hose or pipe 11 and is secured to the interior walls of such pipe by rivets or similar securing means 22.

Bracket 21 is so constructed and mounted that the center of a U shaped portion 23 is disposed on the longitudinal axis of said hose or pipe 11. Mounted within the U shaped portion 23 is a shaft 24 upon which is mounted a propeller 25.

A spring or other securing means 26 is provided which holds a brush 27 in fixed relation with the propeller 25.

A spring member 28 is provided which is interiorly mounted within the brush 27 at one end and may be in contactive relation with a portion of the securing means 26 or the shaft 24. The purpose of spring member 28 is to aid in maintaining brush 27 in proper contactive relation with the interior of the frustro-conical

electrode 12 at all times from zero revolution per minute of the propeller 25 to high speed rotation of the same. It has been found that most agricultural dusting devices operate with an air flow rate of between twelve and ninety miles per hour.

In actual operation of the device of the present invention, any dusting device from hand dusters to extremely large multi nozzle field dusters may be used. The duster chosen is connected to the hose 11 so that when the device is put in operation, the dust laden air will pass through the hose 11 and out the frustro-conical nozzle 12. The conductive member 15 is connected to the high voltage power supply of the dusting device and the grounding member 13 is connected to a reference ground of the power supply. The centrally disposed electrode or terminal 17 has been previously adjusted centrally within the frustro-conical electrode 12 so that when electrical potential of the predetermined desired amount is applied, a maximum field charge will be obtained without arcing.

After all connections have been properly secured to the overall dusting device, the device may be set into operation and as a dust laden air passes through hose 11, such air stream will activate the propeller 25 thereby causing the brush 27 to move about the interior of the frustro-conical electrode 12 in such a manner that any film or coating of dust which would tend to build up on the interior of such frustro-conical electrode will be removed thereby at all times allowing a maximum field charge to be maintained within the nozzle.

To prevent the brush 27 from getting out of line and not properly keeping the interior of the electrode 12 clean, a reinforcing member or spring 28 which, due to its relative stiff nature, at all times retains and holds the brush 27 in a predetermined fixed relation with the propeller 25 whether said propeller is at rest or is rotating at a high number of revolutions per minute.

It will be obvious from the foregoing specification and accompanying drawings that the electrostatic dusting nozzle of the present invention is simple to construct, cheap to manufacture, meets a long felt need for a reliable electrostatic dusting device, is capable being so adjusted for maximum field strength without arcing, and will at all times maintain the interior of the frustro-conical electrode in a clean condition so that said electrode will not become insulated by a build up of a thin film of dust particles thereby impairing or completely preventing the proper operation of the electrostatic feature of the dusting device.

The terms "forward," "rearward," etc. have been used herein merely for convenience in the foregoing specification and in the appended claims to describe the electrostatic dusting nozzle and its parts as oriented in the drawings. It is to be understood, however, that these terms are in no way limiting to the invention since the nozzle may obviously be disposed in many different positions when it is used.

The present invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive and all changes coming within the meaning and equivalency range of impending claims are intended to be embraced therein.

What is claimed is:

1. A nozzle used in conjunction with an electrostatic dusting device comprising a hose, a dust reservoir, a blower and a frustro-conical electrode, said hose being connected at one end to said dust reservoir and blower and at the other end to said frustro-conical electrode, a power supply having a reference ground, an electrode centrally disposed and adjustably mounted within said frustro-conical electrode and connected to said power supply, a grounding means connecting said frustro-conical electrode to said reference ground of said power supply, a propeller centrally mounted within and in axial alignment with the longitudinal axis of the hose, and a brush means secured to said propeller at one end and bearing against the interior of the frustro-conical electrode at the other end whereby when dust laden air is forced through the hose by the blower, the propeller will become activated causing the brush to rotate about the interior of the frustro-conical electrode thereby maintaining said electrode in a clean condition.

2. The device of claim 1 in which the centrally disposed electrode is adjustable along the longitudinal axis of the frustro-conical electrode.

3. A nozzle used in conjunction with an electrostatic dusting device comprising a high voltage power supply, a generally cane shaped, electrically conductive member having an electrode terminal at one end and being connected to said high voltage power supply at the other end, a second electrode mounted about said first electrode at such a radius that a maximum field of charge is provided between said electrodes without the arcing of electric current between the same, a hose through which particle laden air is forced to flow, a source of air supply, said hose being connected at one end to said second electrode and at the other end to said source of air supply, a propeller means mounted within said hose, and a brush means in contactive relation with the interior of the second electrode at one end and fixedly secured to the propeller means at the other end whereby a buildup of an insulating film on the interior of the second electrode will be prevented by said brush whenever air is flowing through said hose.

4. The device of claim 3 in which the propeller means is adapted to rotate in an air stream between twelve and ninety miles per hour.

5. In an electrostatic particle charging device having a first electrode circumventionally mounted about a second centrally located electrode the improvement comprising a brush, said brush being rotatably mounted within the first electrode and in contactive relation therewith, a propeller, said propeller being fixedly secured to said brush and acting as a means of rotating said brush when an air stream is produced within said circumventionally mounted first electrode whereby said first electrode may be maintained in a clean condition.

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