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[54] **APPARATUS FOR COATING ELONGATED ARTICLES**
19 Claims, 2 Drawing Figs.

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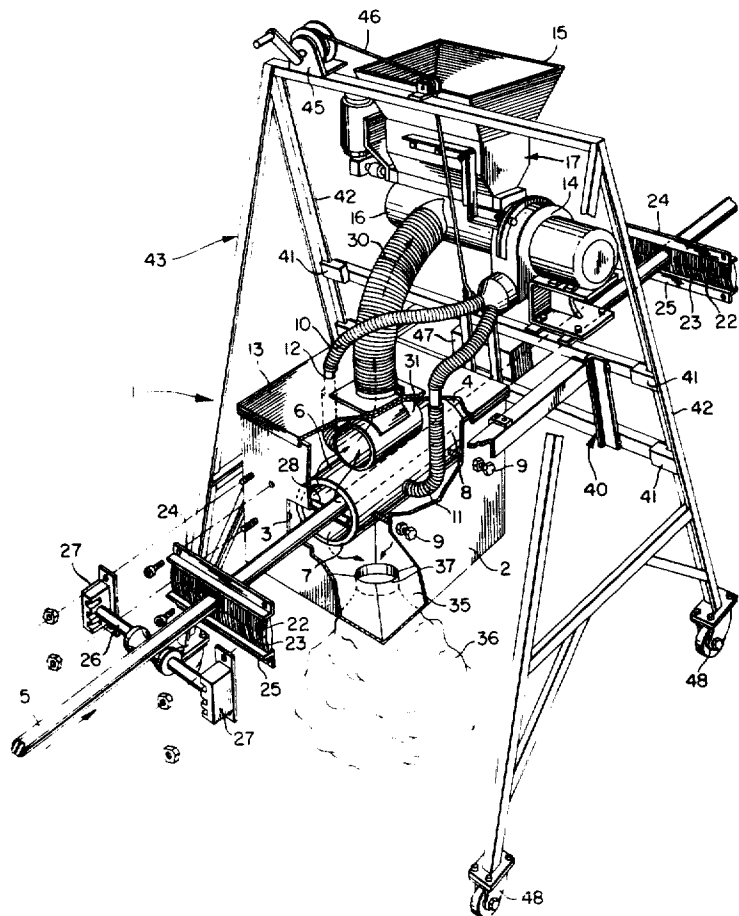
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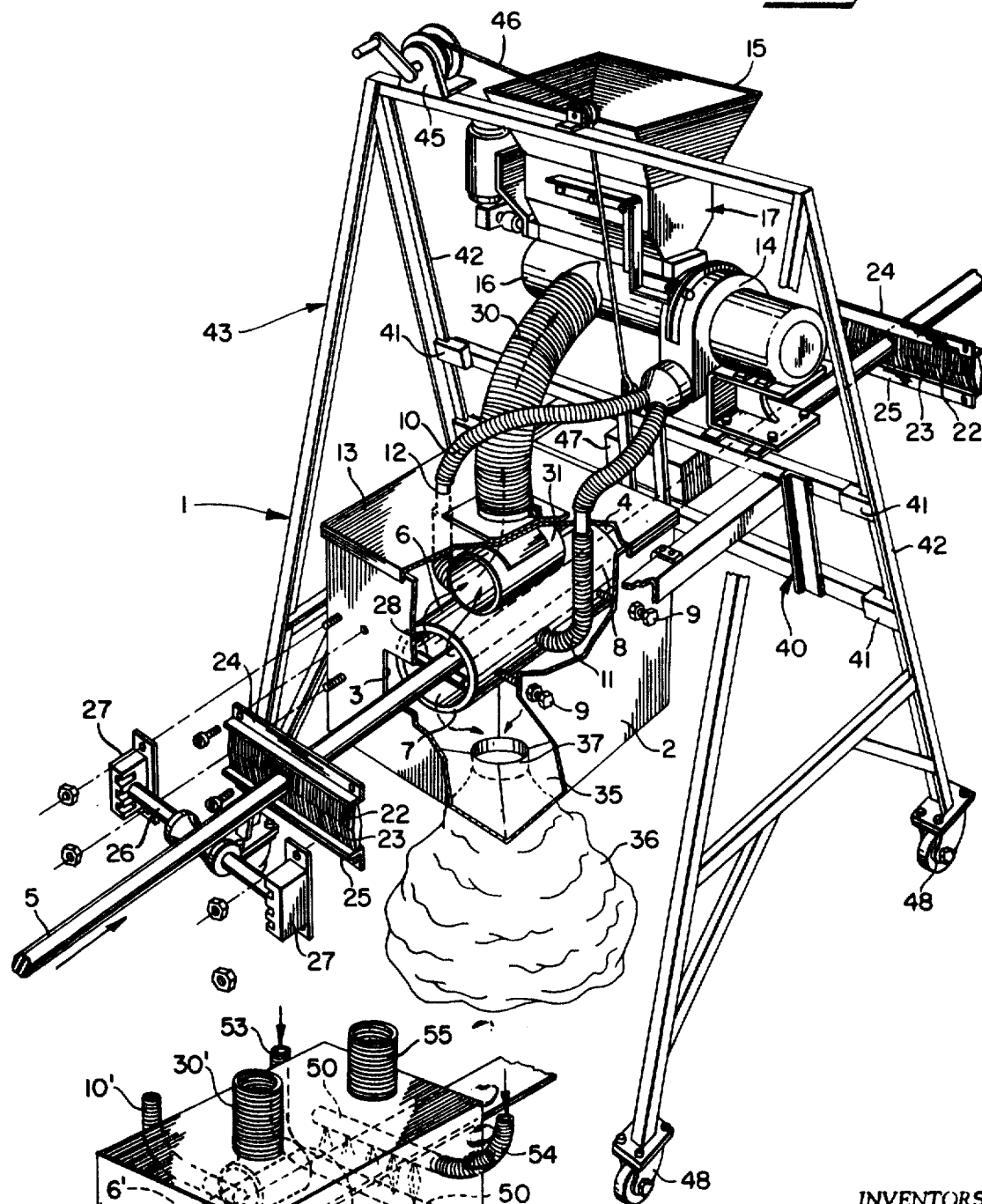
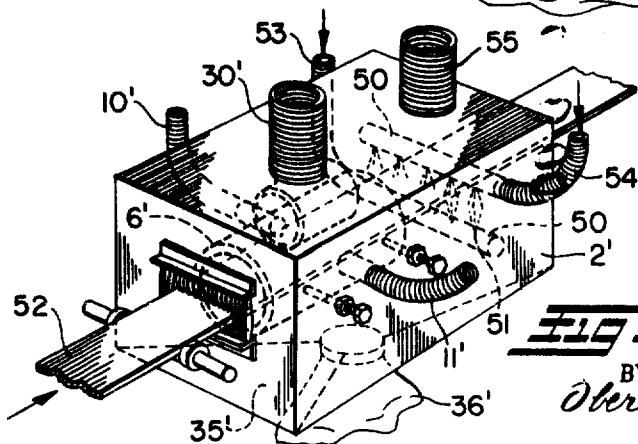
ABSTRACT: A coating device having a dusting tube into which the coating dust is blown from opposite sides to provide a dust suspension for applying a uniform coating to a work-piece passing therethrough, and a larger chamber surrounding the dusting tube for confining the excess suspension exiting from the open ends of the dusting tube from which a portion of the dust suspension is recirculated back into the dusting tube.



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Fig. 1



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Fig. 2

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APPARATUS FOR COATING ELONGATED ARTICLES

BACKGROUND OF THE INVENTION

The present invention relates generally as indicated to a coating apparatus, especially suited for applying a uniform coating of powder or dustlike particles to continuously moving articles and other material of substantial length.

In the manufacture of certain types of elongated articles and other material of substantial length, it is often desirable or necessary to apply a protective or decorative coating thereto, which can be most expeditiously accomplished by passing the material through a coating chamber in which is suspended the desired coating material. However, considerable difficulty has been encountered in achieving the desired uniformity and thickness of coating on the material, and the entrance and exit openings in the chamber for passage of the material therethrough may permit the escape of considerable dust into the atmosphere. Not only does this result in substantial waste, but the dust contaminates the air and may be a serious health hazard despite the use of expensive collectors and filtering equipment.

Some success has previously been achieved in controlling the uniformity and thickness of the coatings on the material and eliminating the escape of dust into the atmosphere, but not without increasing considerably the complexity and cost of the coating device.

SUMMARY OF THE INVENTION

With the foregoing in mind, it is a principal object of this invention to provide a coating device which substantially overcomes the above-enumerated problems and yet is relatively simple and inexpensive.

A further object is to provide a coating device for uniformly coating all sides of an elongate traveling workpiece.

Another object is to provide such a coating device which is relatively compact and may be made portable to permit ready movement wherever desired.

Still another object is to provide such a coating device which may be vertically adjusted for proper alignment with the material to be coated.

These and other objects of the present invention may be achieved by providing the coating apparatus with a dusting tube into which the coating dust is blown from opposite sides for uniformly coating the material passing therethrough about its circumference as a result of turbulent movement of the dust suspension created in the tube. A larger chamber surrounds the dusting tube to prevent the excess dust suspension exiting from the open ends of the dusting tube from escaping into the atmosphere thus eliminating the need for expensive filtering equipment. At least a portion of the dust suspension is recirculated back into the dusting tube through a closed system. A pair of vertically spaced dusting manifolds may also be contained in the chamber adjacent one end of the dusting tube for use in coating wide, flat material if desired.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but several of the various ways in which the principles of the invention may be employed.

BRIEF DESCRIPTION OF THE DRAWING

In the annexed drawing:

FIG. 1 is an isometric view of a preferred form of coating apparatus in accordance with this invention having certain parts exploded and others broken away to show the interior of the dust collecting chamber; and

FIG. 2 is an isometric view with portions broken away of another form of coating device in accordance with this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1 there is illustrated by way of example a coating device 1 in accordance with this invention which desirably includes a rigid boxlike chamber or other such enclosure 2 having entrance and exit openings 3 and 4 in opposite ends for passage of an elongated article or other material 5 into and out of the chamber 2. Contained within the chamber 2 is an elongated open-ended cylindrical dusting tube 6 of a length substantially greater than the size of the opening therethrough. The dusting tube 6 is supported in the chamber 2 with its opposite ends 7 and 8 in alignment with the entrance and exit openings 3 and 4 as by means of bolts 9 extending through aligned openings in the walls of the tube and chamber, whereby an elongated workpiece 5 passing through the chamber 2 will also pass through the dusting tube 6 in spaced relation from the wall thereof.

Connected to side openings in the dusting tube 6 intermediate its ends desirably directly opposite each other is a pair of dust feed conduits 10 and 11 which extend through apertures 12 in the top wall 13 of the chamber 2 for connection to a motor driven blower 14. A suitable coating material of powder or dustlike particles of comminuted material is metered from a hopper 15 into a manifold 16 by a suitable metering device 17 preferably of the type shown in U.S. Pat. Nos. 3,070,264 and 3,073,607, granted to Daniel LaMar Christy on Dec. 25, 1962, and Jan. 15, 1963, respectively. The dust within the manifold 16 is pulled along with air through the blower 14 and blown through the dust-feed conduits 10 and 11 into the dusting tube 6 which is otherwise imperforate, whereby the turbulence is such as to create a uniform dust suspension throughout the length of the dusting tube for applying a uniform coating about the circumference of the material 5 as the air and dust flow toward opposite ends of the dusting tube and the material is continuously fed through the device. As an example, the material 5 may be uncured extruded rubber of round, square, or tubular cross section and the coating material may be zinc stearate, talc, or soapstone for protecting the rubber during handling, shipment, and storage. However, it should be understood that other materials and articles may also be coated with dry coatings of various types by passing the same through the device disclosed herein.

The excess dust suspension within the dusting tube 6 that does not adhere to the material 5 is carried by the air out both ends 7 and 8 of the dusting tube where it is confined within the chamber 2 which is desirably considerably larger than the dusting tube 6. There is desirably approximately three to four inches clearance between the ends of the dusting tube 6 and the adjacent ends of the chamber 2, with adequate clearance completely around the dusting tube to permit free circulation of the dust within the chamber.

The entrance and exit openings 3 and 4 for the chamber 2 are desirably of a rectangular configuration and are large enough to allow various material sizes and shapes to freely pass therethrough. However, escape of dust from the chamber 2 through such openings 3 and 4 is substantially eliminated by covering the same with brushes 22 and 23 carried by brushholders 24 and 25 suitably fastened to the ends of the chamber 20 adjacent the upper and lower edges of the entrance openings 3 and 4 so that the ends of the brushes are contacting each other, such brushes being sufficiently distortable to conform to the configuration of the material passing therethrough. Guide roll bars 26 supported by guide roll support blocks 27 secured to the ends of the chamber 2 guide the material 5 into and out of the device 1, and additional guide rolls 28 may be mounted within the dusting tube 6 or chamber 2 to support the material 5 out of contact with the wall of the dusting tube. The brushes 22 and 23 adjacent the exit opening 4 may perform the additional function of wiping off any excess powder or dust as the material leaves the device.

For recirculating at least a portion of the suspended dust within the chamber 2 back through the device 1, there is pro-

vided a vacuum conduit 30 having one end attached to the top wall 13 of the chamber 2 and the other end connected to the manifold 16 to form a closed recirculating system. The suction created by rotation of the blower 14 produces a partial vacuum in the conduit 30 which pulls a portion of the dust suspension within the chamber 2 up into the manifold 16 for recirculation back through the dust feed conduits 10 and 11 along with the additional dust that is metered into the manifold 16 by the metering device 17, as aforesaid. An open-ended cylindrical exhaust member 31 having a T-connection with the conduit 30 may be secured to the inner surface of the top wall 13 with its axis parallel to the axis of the dusting tube 6 to direct the vacuum pulling force toward the ends of the dusting tube where the dust is concentrated thus to increase the amount of dust recirculated through the system. The dust not picked up by vacuum settles to the bottom 35 of the chamber 2 which is sloped to funnel the dust into a collector bag 36 suitably connected to a hole 37 in the bottom 35.

To facilitate cleaning of the interior of the chamber 2, the top wall 13 is desirably hinged at one end, and the dust feed conduits 10 and 11 and vacuum conduit 30 are desirably flexible to permit raising and lowering of the top wall 13 about the hinged end. Moreover, the entire coating device 1, including the chamber 2, blower 14, manifold 16, and metering device 17 with hopper 15 attached thereto, is desirably supported by a carriage 40 having sliding connections 41 at opposite ends with the vertical supports 42 of a main frame 43 to facilitate raising and lowering of the coating device by actuation of a winch 45 carried by the main frame and cable 46 connected to the carriage 40 for bringing the device into alignment with the material 5 as it comes off an extruder or other means for continuously advancing the material through the device. A vibrator 47 may also be mounted on the carriage 40 to shake loose the dust or powder adhering to the internal surfaces of the device. The main frame 43 may be supported on casters 48 for ease of movement of the device wherever desired.

The dust which is introduced into the sides of the dusting tube is substantially uniformly suspended in the dusting tube as a result of turbulent movement where the dust is confined around the material rather than blown into the large chamber 2 thus to provide a uniform coating around the entire circumference of material passing therethrough, and the thickness of the coating may readily be controlled by proper metering of the dust. Moreover, the enlarged chamber surrounding the dusting tube with brushes covering the entrance and exit openings substantially eliminates the escape of dust into the atmosphere. In actual practice, it has been found that such a dusting tube is very effective in applying a uniformly thick coating to material having round, square, and tubular sections. Where the material is relatively flat and wide, it may be desirable to provide a pair of vertically spaced dusting manifolds 50 within the chamber 2' adjacent one end of the dusting tube 6', as shown in FIG. 2. Each dusting manifold 50 has a plurality of spaced apart apertures 51 therein for directing the dust at opposite sides of the material 52 passing therebetween. A blower and metering device similar to that shown in FIG. 1 may be connected to the dusting manifolds 50 through dust feed conduits 53, 54 for supplying dust thereto and a vacuum conduit 55 provided for recirculating a portion of the dust from the chamber back through the device. When the dusting manifolds are being used, the dust supply to the dusting tube 6' may be cut off or continued, as desired. In either event, the material will still be guided through the dusting tube 6' which is of sufficient diameter to accommodate a wide range of material sizes. Alternatively, the dusting manifolds 50 may be contained in a chamber separate from the chamber 2' thus to provide a separate unit.

After passing through the coater, the material may have other operations performed thereon, or may be coiled or cut into specified lengths for handling, shipping, and storage.

We, therefore, particularly point out and distinctly claim as our invention:

1. A coating device comprising an open-ended dusting tube of a length substantially greater than the size of the opening therethrough, means for introducing a flow of dustlike particles into said dusting tube to provide a dust suspension therein, said dusting tube having at least one side opening intermediate the ends thereof through which such dustlike particles are introduced, said dusting tube being otherwise impermeate, whereby such dust suspension is provided throughout the entire length of said dusting tube, and an enlarged chamber having entrance and exit openings for a workpiece completely surrounding said dusting tube for confining the dust suspension exiting from the open ends of said dusting tube.

2. The coating device of claim 1 wherein said chamber has entrance and exit openings in opposite ends thereof in line with the open ends of said dusting tube, and means adjacent said entrance and exit openings to preclude passage of dust from said chamber.

3. The coating device of claim 1 further comprising means providing a closed system for recirculating a portion of the dust entering said chamber from said dusting tube back into said dusting tube.

4. The coating device of claim 1 wherein said means for introducing dustlike particles into said dusting tube as aforesaid comprises a blower, means for metering coating dust into said blower, and conduit means leading from said blower to openings in opposite sides of said dusting tube intermediate the ends thereof.

5. The coating device of claim 4 further comprising a manifold into which the coating dust is metered before being drawn through said blower, and a vacuum conduit interconnecting said chamber with said manifold through which a portion of the dust entering said chamber from said dusting tube is pulled by said blower for recirculation back into said dusting tube.

6. The coating device of claim 1 further comprising guide means for guiding an elongated workpiece through said dusting tube in spaced relation from the wall thereof.

7. The coating device of claim 1 further comprising a main frame, and means mounting said coating device for limited vertical movement on said main frame.

8. The coating device of claim 7 wherein said last-mentioned means comprises a carriage having sliding connections with vertical supports on said main frame, a winch mounted on said main frame and a cable interconnecting said winch with said carriage.

9. The coating device of claim 7 wherein said main frame is mounted on casters to facilitate movement from one place to another.

10. The coating device of claim 1 further comprising means associated with the bottom of said chamber for collecting the dust particles that settle to the bottom.

11. The coating device of claim 1 further comprising a pair of vertically spaced dusting manifolds within said chamber adjacent one end of said dusting tube, each of said manifolds having a plurality of spaced apart apertures therein for directing dust at opposite sides of a workpiece passing therebetween, and means for introducing coating dust into said manifolds under pressure for discharge through said apertures.

12. The coating device of claim 1 further comprising means for vibrating said chamber and dusting tube contained therein to shake loose any dust adhering thereto.

13. A device for applying a uniform coating of dustlike particles to an elongated workpiece passing therethrough comprising a chamber having entrance and exit openings for the workpiece, a dusting tube mounted within said chamber in spaced relation from the walls thereof, said dusting tube being of a length substantially greater than the size of the opening therethrough, guide means for guiding the workpiece through said dusting tube, and means for providing a dust suspension within said dusting tube throughout the entire length thereof to coat the workpiece during passage through said dusting

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tube, said dusting tube having open ends for discharge of the excess dust from said dusting tube into said chamber.

14. The device of claim 13 wherein said guide means supports the workpiece in spaced relation from the wall of said dusting tube during such passage therethrough to permit application of a uniform coating around the entire periphery of such workpiece.

15. The device of claim 13 wherein said entrance and exit openings are larger than the workpiece passing therethrough and means are provided for precluding the escape of dust through said openings.

16. A dusting device comprising an enclosure, a horizontal dusting tube mounted within said enclosure spaced from the walls of the latter, said dusting tube being of a length substantially greater than the size of the opening therethrough, said enclosure having openings therein aligned with the ends of said tube for passage of a continuously travelling elongated workpiece therethrough, blower means for introducing a flow of air to said tube intermediate its ends and discharge from both ends into said enclosure, means for supplying finely comminuted material to such air flow for dusting on such travelling workpiece, exhaust means communicating with the upper side of said enclosure for withdrawing air and a portion of such comminuted material flowing from the respective ends of said tube and recirculating them to said blower means, and collector means at the bottom of said enclosure for collecting comminuted material dropping out of the suspension therein.

17. A coating device comprising an open-ended dusting tube, means for introducing a flow of dustlike particles into said dusting tube to provide a dust suspension therein, an enlarged chamber completely surrounding said dusting tube for confining the dust suspension exiting from the open ends of

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said dusting tube, said means for introducing dustlike particles into said dusting tube as aforesaid comprising a blower, means for metering coating dust into said blower, and conduit means leading from said blower to opposite sides of said dusting tube, a manifold into which the coating dust is metered before being drawn through said blower, a vacuum conduit interconnecting said chamber with said manifold through which a portion of the dust entering said chamber from said dusting tube is pulled by said blower for recirculation back into said dusting tube, and an open-ended cylindrical exhaust member within said chamber, said vacuum conduit being connected to said cylindrical exhaust member intermediate the ends of the latter, the axis of said cylindrical exhaust member being parallel to the axis of said dusting tube to direct the vacuum pulling force toward the ends of said dusting tube.

18. A coating device comprising an open-ended dusting tube, means for introducing a flow of dustlike particles into said dusting tube to provide a dust suspension therein, an enlarged chamber completely surrounding said dusting tube for confining the dust suspension existing from the open ends of said dusting tube, an open-ended cylindrical exhaust member within said chamber, a vacuum conduit connected to said cylindrical exhaust member intermediate the ends of the latter, and means for creating a vacuum in said vacuum conduit to exhaust a portion of the dust entering said chamber from said dusting tube and recirculating such dust back into said dusting tube.

19. The coating device of claim 18 wherein the axis of said cylindrical exhaust member is parallel to the axis of said dusting tube to direct the vacuum pulling force toward the ends of said dusting tube.

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