

March 17, 1970

E. W. DE WITT ET AL  
POWDER DISPENSING DEVICE

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2 Sheets-Sheet 1

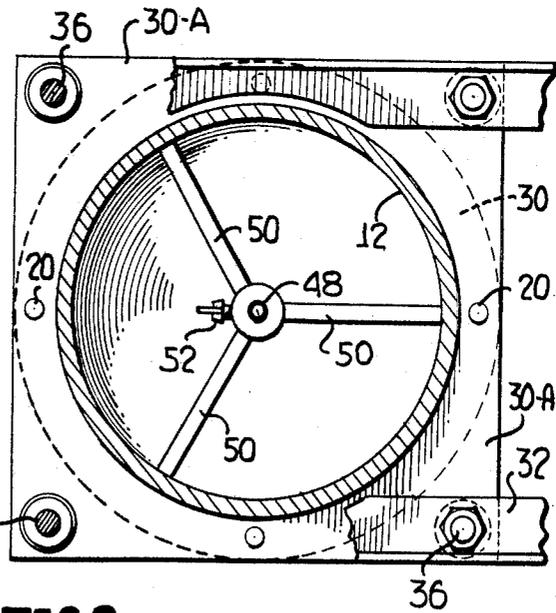
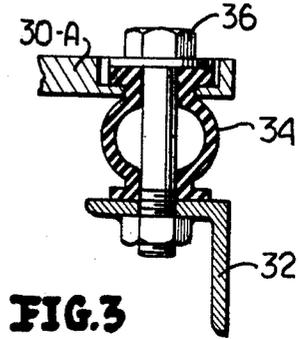
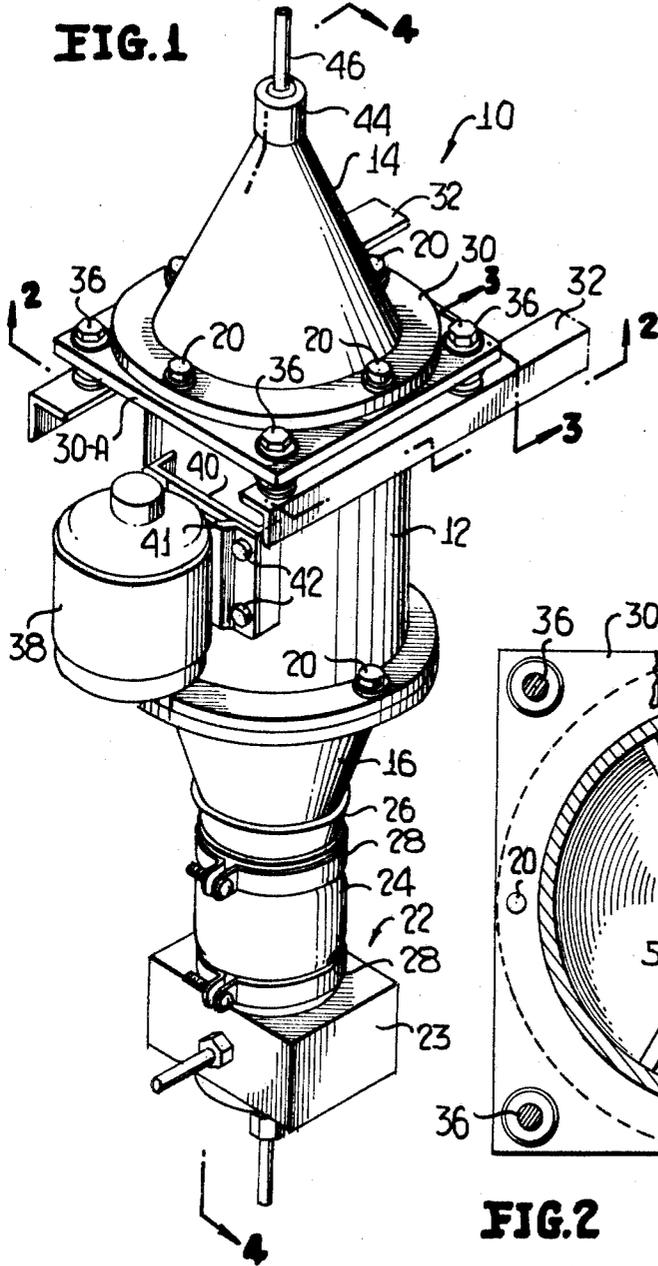


FIG. 2

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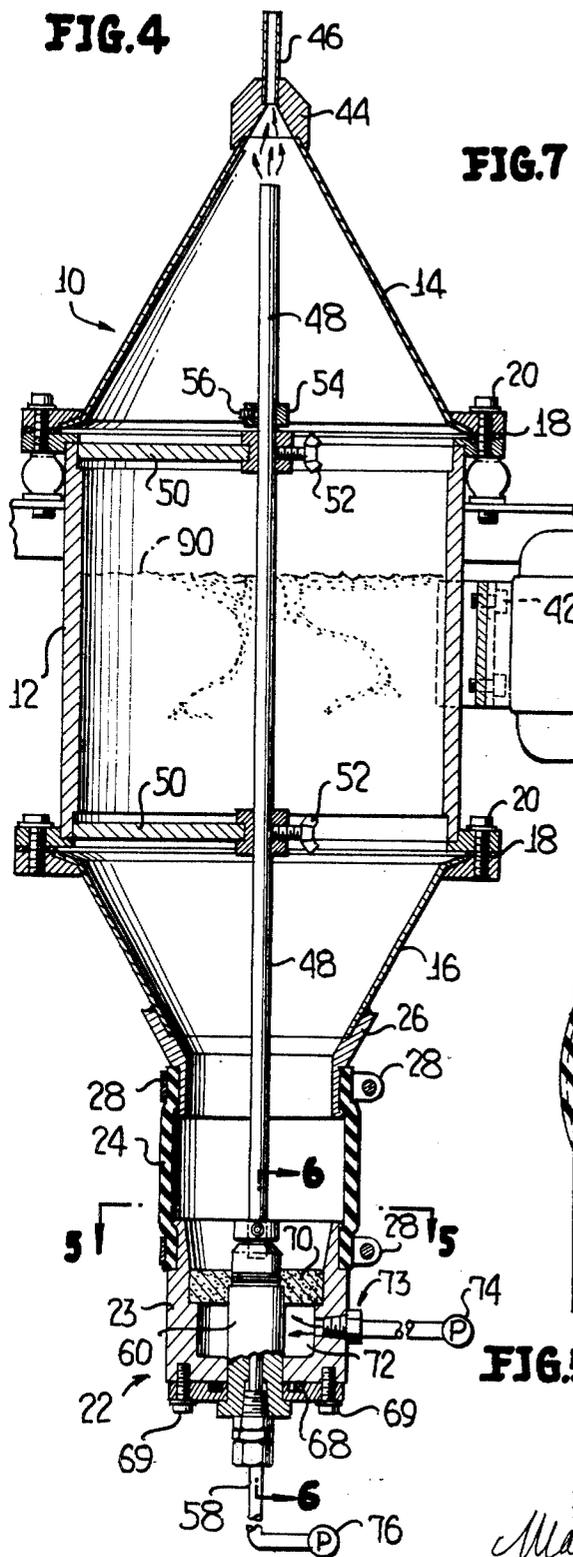


FIG. 4

FIG. 7



FIG. 6

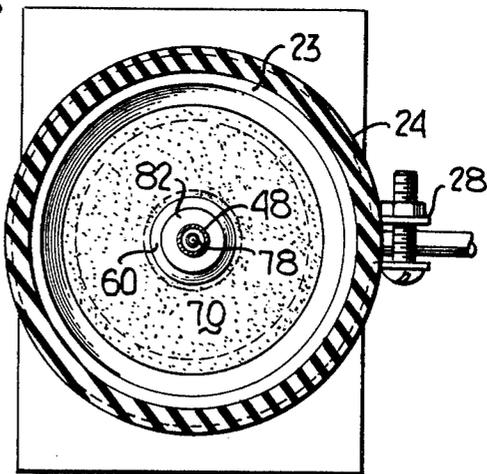
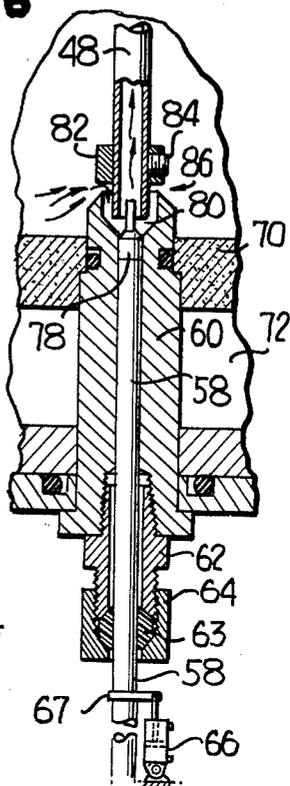


FIG. 5

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3,501,062

**POWDER DISPENSING DEVICE**

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5 Claims

**ABSTRACT OF THE DISCLOSURE**

An apparatus for dispensing fine powder through a small conduit by entraining the powder in a stream of air. An aspirator tube is adjustably mounted so that the powder flow can be shut off and the flow of air continues to prevent powder from settling in and clogging the conduits.

**BACKGROUND OF THE INVENTION**

This invention relates to the field of coating wherein a spray nozzle is utilized to deposit a film of coating material upon an article. More particularly, the apparatus has special utility in coating the side-stripe seams of cans, or containers, wherein it is desirable to protect the seam area and beautify the finished container.

In the prior art, it has been generally the practice to coat side seam areas of containers with liquid lacquer carried in a suitable solvent. After application, the solvent evaporates and contaminates the surrounding atmosphere. The present invention is part of a system which avoids the use of solvents thereby avoiding the need for solvents and avoiding the contamination inherent in the prior art.

**SUMMARY**

The present apparatus provides for continuously dispensing small quantities of dry resin powder for side-stripping application. The powder dispenser consists basically of an aspirator assembly and a closed tank or reservoir wherein the powder is fluidized. The fluidized powder is accelerated through the aspirator and up a central spouting tube which terminates above the powder level and below the reservoir outlet. Since a positive pressure exists within the closed reservoir, the fluidized powder is continuously ejected to the outlet and into a small delivery tube which may be approximately 1/8" in inside diameter. The rate of powder flow is controlled by the internal pressure in the reservoir and by air flow at the opening of the aspirator assembly.

It is an object of this invention to dispense finely divided powders into a gaseous medium transport through narrow conduits or ducts.

A further feature of this invention is the provision of control over the quantity of powder aspirated into small diameter tubing.

Another, and perhaps the salient feature of this invention, is the provision of means for completely stopping the flow of powder without interrupting the gaseous flow through the small ducts thereby avoiding clogging of the ducts during intermittent use.

**BRIEF DESCRIPTION OF THE DRAWINGS**

FIGURE 1 is a perspective view of the powder dispensing device and shows the device as being resiliently mounted upon supporting rails in order to allow the unit to vibrate in response to the input of the vibrator motor which is shown as being attached to a central chamber portion of the dispensing device.

FIGURE 2 is a fragmentary sectional view taken along line 2-2 of FIGURE 1 and shows additional details of

the mounting means and also the interior of the upper funnel portion of the chamber.

FIGURE 3 is a fragmentary sectional view taken on line 3-3 of FIGURE 1 and shows a resilient grommet for dampening vibrations.

FIGURE 4 is a vertical sectional view taken on line 4-4 of FIGURE 1 and shows the interior of the powder dispensing device.

FIGURE 5 is a horizontal sectional view taken on line 5-5 of FIGURE 4 and shows the interior arrangement of the lower chamber member.

FIGURE 6 is an enlarged sectional view, taken on line 6-6 of FIGURE 4, and shows the aspirating structure and apparatus for varying the powder-inlet passageway which leads to the exit port of the powder dispensing device.

FIGURE 7 is an enlarged sectional view of the aspirator tip.

**DESCRIPTION OF THE PREFERRED EMBODIMENT**

As is best shown in FIGURES 1 and 4, a powder dispensing device, generally indicated by the numeral 10, includes a center housing 12, an upper funnel section 14 and a lower funnel section 16. Suitable gaskets 18 and bolt means 20 provide a hermetic seal between the center housing 12 and the upper and lower funnel sections 14 and 16.

A fluidizing section, generally indicated by the numeral 22, includes a lower chamber member 23 which is connected to the lower funnel section 16 by a flexible hose member 24. A support collar 26 is hermetically sealed to the lower funnel section 16 and suitable hose clamps 28 tightly seal the hose member 24 to the support collar 26 and lower chamber member 23.

As is best shown in FIGURES 1-3, the powder dispensing device 10 is preferably provided with a flange 30 which is attached to a support plate 30A which is resiliently mounted upon a pair of support channels 32 by a series of flexible grommets 34 and bolt means 36. A vibrator 38 (commercially available as Vibco #US 100) is fixedly secured to the center housing 12 by a suitable support plate 40, bracket 41 and bolt means 42. The purpose and function of vibrator 38 will be described later in further detail.

As is best shown in FIGURE 4, upper funnel section 14 is provided with a cap member 44 and tube 46. It is to be understood that the tube 46 provides an exit port from the powder dispensing device 10 and leads to suitable nozzles (not shown) which direct a powder spray upon that portion of an article which is being coated.

Directly below the cap member 44 and tube 46, a hollow feed tube or spouting tube 48 is adjustably mounted within the powder dispensing device 10 by means of a plurality of support rods 50 and thumb screws 52, it being preferred that a collar 54 and setscrew 56 be provided above the upper support rods 50.

As is best shown in FIGURES 4 and 6, an aspirator tube 58 is mounted in alignment with hollow feed tube 48 and is adjustably mounted for sliding movement within a hollow stem member 60. Stem member 60 is internally threaded at its lowermost end and is provided with a tube fitting 62, packing 63 and adjustable nut 64 to provide a seal which can be adjusted to permit sliding movement of aspirator tube 58, which movement may be produced by fluid motor 66 and conventional clamp means 67. Hollow stem member 60 is fixedly secured to lower chamber member 23 by cap 68 and conventional cap-screws 69.

A porous block 70 is seated upon a shoulder within lower chamber member 23 and secured thereto by suitable adhesives or the like. Porous block 70 is positioned so as to provide a plenum chamber 72 which is provided

with a flow of air, or other fluid, through an inlet port 72 by means of a pump 74. A second flow of air, or other fluid, is directed through aspirator tube 58 by means of a pump 76.

As is best shown in FIGURES 6 and 7, aspirator tube 58 is provided with an aspirator tip 78 which is disposed within a cavity 80 formed in the uppermost end portion of stem member 60. Hollow feed tube 48 has its lowermost portion disposed within cavity 80 and is provided with a metering collar 82 which is adjustably mounted by means of set screw 84. The spacings between hollow feed tube 48, aspirator tube 58 and stem member 60 provide an adjustable gap or passageway, generally indicated by the numeral 86, which can be adjusted in two different ways. First, gap 86 can be adjusted by movably positioning metering collar 82 along hollow feed tube 48, thereby varying the gap between collar 82 and hollow stem member 60. Second, gap 86 can be adjusted, and at times completely closed, by loosening the adjustable nut 84 and moving aspirator tube 58 relative to hollow feed tube 48. As is apparent from FIGURE 7, aspirator tip 78 has a tapered portion 88 which cooperates with the uppermost end portion of hollow feed tube 48 to provide a sealing fit whereby adjustable gap 86 is completely shut off without interrupting the flow of air from pump 76 through aspirator tube 58, through hollow feed tube 48, and through the exit port at tube 46. This feature of the invention allows the apparatus to purge the feed line to the nozzle (not shown) so that, when the system is being shut down, powder in the feed line does not settle and cause blockage of the same.

As is shown by the broken line 90, in FIGURE 4, a supply of finely divided powder is placed within center housing 12 and is supported therein by lower funnel section 16. One known type of powder suitable for use with the present apparatus is the powder which is commercially available as Armstrong Powder E7100; of course, other types of powder, or toner, are commercially available and suitable for use. As is well known, such powders readily become packed and take on the nature of a solid; the purpose of lower funnel section 16 is to cause the powder to pack about feed tube 48 and prevent a large mass of the powder from falling on to porous block 70 and possibly clogging the gap or passageway 86.

During operation of the powder dispensing device 10, vibrator 38 causes a small portion of powder to gravitate and feed downwardly toward fluidizing section 22. A flow of air from pump 74, into plenum chamber 72, passes through porous block 70 and fluidizes the powder thereabove such that the powder is aspirated, by the air flow through the aspirator tip 78, through the gap 86 and into the hollow feed tube or spouting tube 48. As is shown in FIGURE 4, the powder exits from tube 48, in the form of a fountain, just below cap member 44 and tube 46. The dispensing device 10 constitutes a pressure vessel such that the air, or other gas, from pumps 74 and 76 create a positive pressure therein and causes a flow of powder to exit from the dispensing device 10 and become entrained in the feed lines which lead to nozzles (not shown). Depending upon the demand for powder, vibrator 38 can be continuously, or intermittently, operated to cause additional powder to fall from lower funnel section 16 toward porous block 70.

It is easily understandable that if the flow of aspirating air is discontinued, powder in the various tubes and feed lines would quickly come to rest and cause blockage of the apparatus. In order to prevent such undesirable results, aspirator tube 58 and aspirator tip 78 are moved relative to feed tube 48 such that tapered portion 88 seats within the lowermost portion of feed tube 48 thereby preventing additional powder from entering the feed lines without interrupting the flow of air from pump 76. Thus, the feed lines to the nozzles, which lines may be 10 to 20 feet long, can be completely cleared of powder.

As previously pointed out, the present invention is particularly useful for coating side seam areas of welded containers. When being used in such an environment, it has been found that tube 46, and the feed lines (not shown) should have dimensions approximately on the order of an outside diameter of  $\frac{3}{8}$ " and an inside diameter of approximately  $\frac{1}{10}$ ". If the tubing is much larger, it becomes extremely difficult to keep from greatly exceeding the maximum desired output of powder. Upon testing of the present apparatus, it was noted that there is a need to very accurately adjust the gap 86 through which the powder is aspirated. The necessary adjustment means has been provided by locating aspirator tip 78 within cavity 80 and providing metering collar 82 to prevent choking of the aspirator means with excessive quantities of powder.

While preferred forms and arrangement of parts have been shown in illustrating the invention, it is to be clearly understood that various changes in details and arrangement of parts may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. A powder dispensing device including a chamber for storing a quantity of powder particles, an exit port in said chamber, a hollow feed tube mounted in said chamber and having one end thereof located adjacent said exit port, an aspirator tube located adjacent the other end of said hollow feed tube, means for directing a flow of fluid through said aspirator tube into said hollow feed tube and through said exit port for causing powder particles to be drawn into said feed tube and forced through said exit port, a hollow stem mounted adjacent said other end of said hollow feed tube and surrounding said aspirator tube, a passageway formed between said hollow stem and said hollow feed tube, means for adjusting the size of said passageway including adjustable collar means mounted on said hollow feed tube adjacent said other end, and means for providing relative movement between said hollow feed tube and said aspirator tube for closing said passageway and shutting off flow of powdered particles through said exit port while maintaining said flow of fluid through said exit port.

2. A powder dispensing device including a chamber for storing a quantity of powder particles, an exit port in said chamber, a hollow feed tube mounted in said chamber and having one end thereof located adjacent said exit port, an aspirator tube located adjacent the other end of said hollow feed tube, means for directing a flow of fluid through said aspirator tube into said hollow feed tube and through said exit port for causing powder particles to be drawn into said feed tube and forced through said exit port, a hollow stem mounted adjacent said other end of said hollow feed tube and surrounding said aspirator tube, a passageway formed between said hollow stem and said hollow feed tube, and means for adjusting the size of said passageway including motor means for causing relative movement between said aspirator tube and said hollow stem.

3. A powder dispensing device including a chamber for storing a quantity of powder particles, an exit port in said chamber, a hollow feed tube mounted in said chamber and having one end thereof located adjacent said exit port and slightly spaced therefrom, an aspirator tube located adjacent the other end of said hollow feed tube, and means for directing a flow of fluid through said aspirator tube into said hollow feed tube and through said exit port for causing powder particles to be drawn into said feed tube and forced through said exit port, a porous block mounted adjacent a lowermost end of said chamber, and means for forcing a flow of gas through said porous block for fluidizing said powder particles adjacent said other end of said hollow feed tube.

4. A powder dispensing device as in claim 3 including vibrator means attached to said chamber for causing said powder particles to gravitate toward said porous block.

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5. A powder dispensing device including a chamber for storing a quantity of powder particles, an exit port in said chamber, a hollow feed tube mounted in said chamber and having one end thereof located adjacent said exit port, an aspirator tube located adjacent the other end of said hollow feed tube, means for directing a flow of fluid through said aspirator tube into said hollow feed tube and through said exit port for causing powder particles to be drawn into said feed tube and forced through said exit port, a lower chamber member, means for mounting said aspirator tube in said lower chamber member, and flexible means connected between said chamber and said lower chamber member.

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