United States Patent [19]

Blankemeyer et al.

[11] **3,719,030**

[45] **March 6, 1973**

[54] **PLASTIC POWDER SPRAYING RECOVERY METHOD AND APPARATUS**

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[22] Filed: **March 12, 1971**

[21] Appl. No.: **123,515**

[52] **U.S. Cl.** .....**55/97,** 55/300, 55/305, 55/341, 55/356, 55/502, 55/505, 98/115 SB

[51] **Int. Cl.** **B01d 46/04**

[58] **Field of Search**.....55/97, 341, 300, 304, 305, 55/356, 422, 481, 502, 505; 117/102, 93.4; 118/326, 603, 610; 98/115 R, 115 SB

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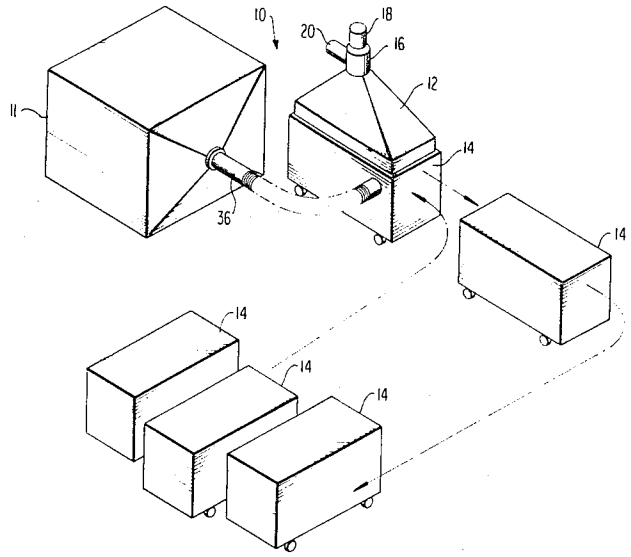
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[57] **ABSTRACT**

A method and apparatus for reclaiming excess powder spray in a coating process utilizes portable filtering units connected between a spray booth and an exhausting hood. Flexible bellows and a camming lock permit a rapid connection of a different filtering unit for each color plastic or type of plastic to prevent contamination.

9 Claims, 5 Drawing Figures



PATENTED MAR 6 1973

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SHEET 1 OF 2

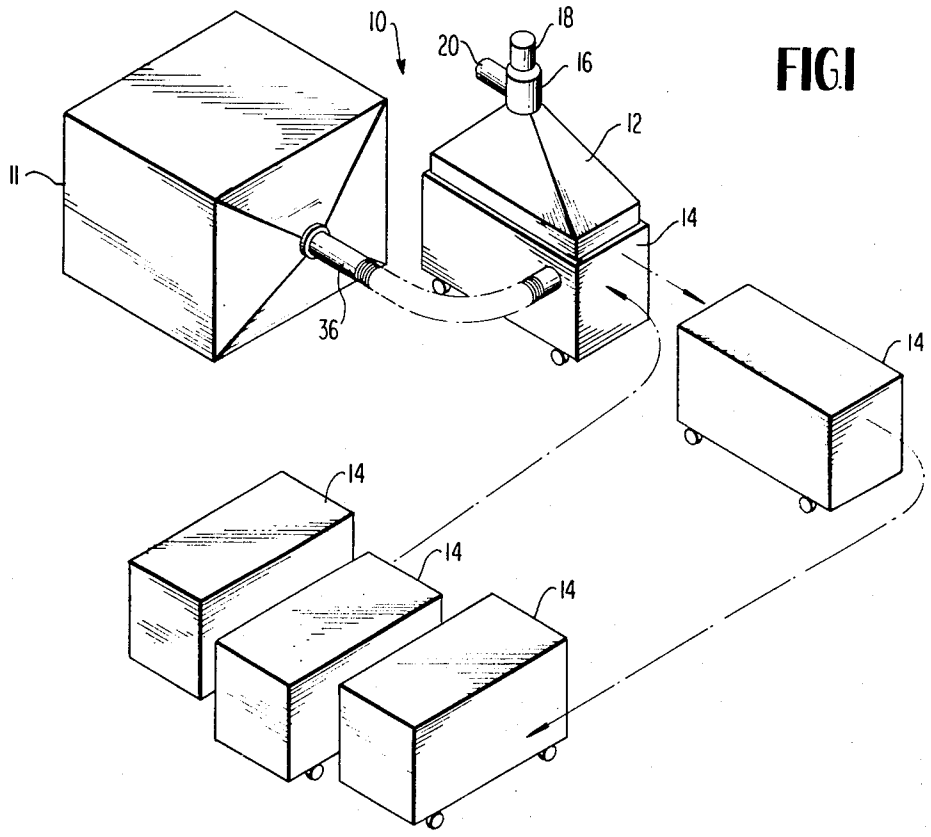


FIG.1

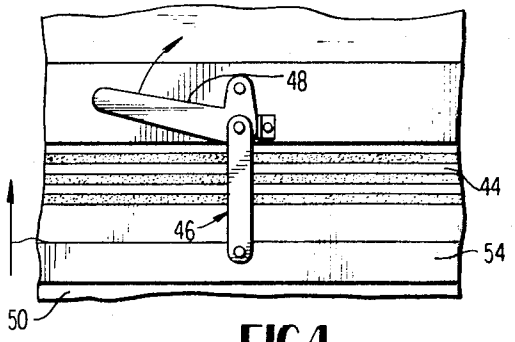


FIG.4

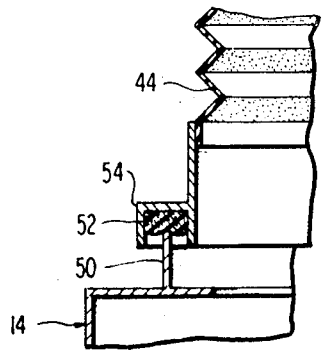


FIG.5

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FIG3

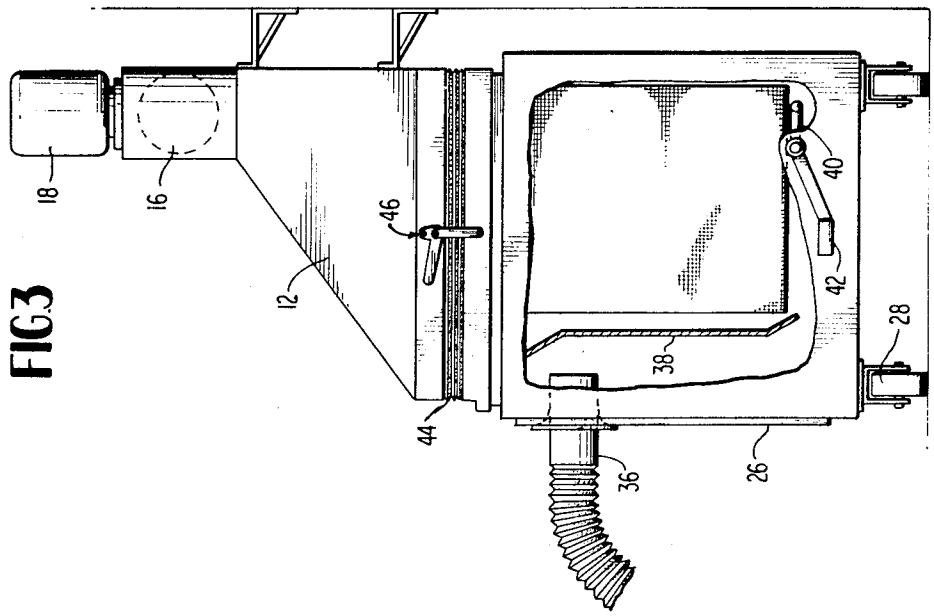
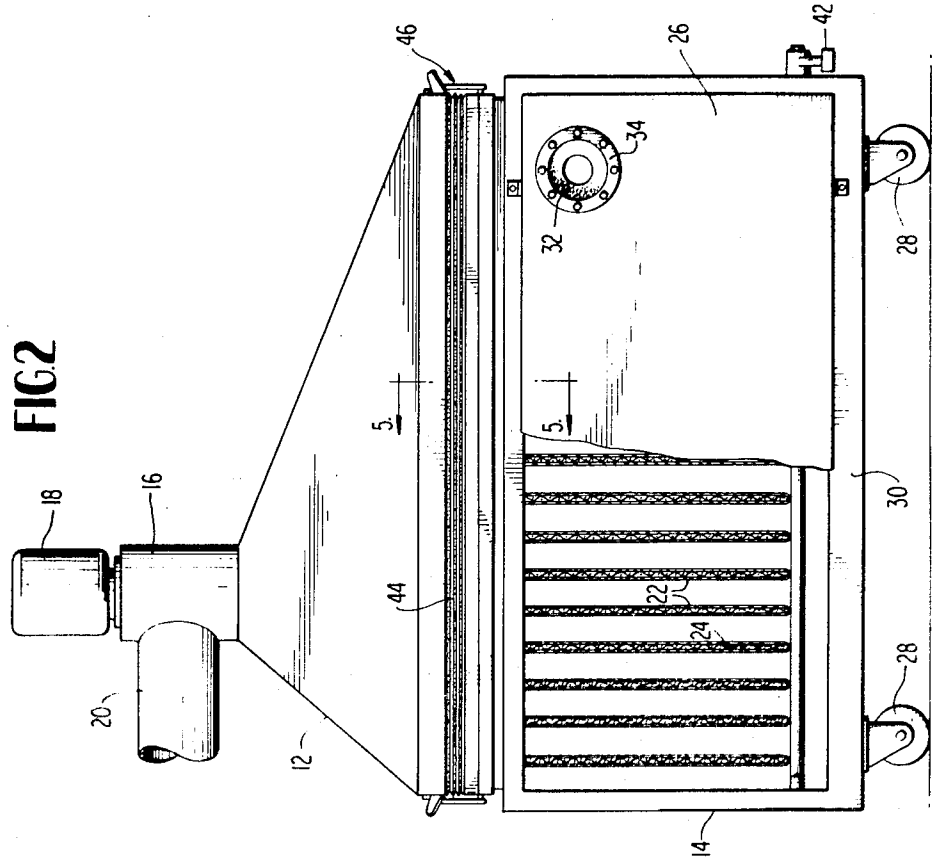

18
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FIG2


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PLASTIC POWDER SPRAYING RECOVERY METHOD AND APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention is directed to a method and apparatus of collecting powdered materials for reuse in a coating system. It is especially useful in reclaiming different colored powdered material where the coating system uses several colored materials.

2. Description of the Prior Art

Manufacturing processes today utilize the application of a plastic powder to provide a base coat or finishing coat on a product. One of the methods of applying this plastic powder is by spraying the powder on a heated object or by electrostatically charging the plastic powder and causing it to be attracted to a metallic grounded object. The advantages of this dry method of coating a manufactured product over the conventional painting or coating systems are that the plastic powders are 100 percent solids and have no solvent vehicles that evaporate during the drying process thereby causing pollution and potential fire hazards.

A number of parameters affect the efficiency of the plastic powder coating technique such as the speed or flow of the plastic powder against the object and the sandblasting effect of the plastic powder against the plastic powder already accumulated on the surface of the object. The net result of these various parameters is to render the efficiency of coating an object somewhat less than 100 percent and accordingly creating a problem of both the accumulation of spent plastic powder and a corresponding economic loss associated with a surplus of plastic powder. In the conventional painting or coating systems that utilize a wet spray, this overage of coating material is generally lost. However, a further advantage of the dry powder coating system is that the overspray material can be collected by filtering or a cyclone type dust collector and thereby permits the spent plastic powder to be reused in the spraying system.

A persistent problem that has plagued the use of coating with plastic powders in the manufacturing environment is the inability of conventional dust collectors to handle more than one color or type of powder and the expensive downtime required in a manufacturing process in both cleaning and replacing the conventional plastic powder collectors. Thus the conventional plastic powder collecting system generally requires a separate dust collector apparatus to be used with each type and color of powder in a given operation to avoid cross-contaminating the materials and colors utilized. Generally the plastic powder coating material, which can consist of epoxy, vinyl, butyrate, polyester, and other similar materials, accumulates as a result of overspraying or dusting in the coating booth of certain plastic finishing, coating and dry painting systems and requires an extensive cleaning operation whenever a change of color or material is to be accomplished in the manufacturing process. Generally this cleaning time has been measured in units of hours with the accompanying downtime for valuable equipment that raises the per unit cost of the manufactured items that are to be coated.

SUMMARY OF THE INVENTION

The present apparatus and method of reclaiming sprayed plastic powder solves many persistent problems that have plagued the prior art. By utilizing the present invention it is possible to accommodate, for example, multi-color powder spraying or coating systems with a minimum of downtime and no danger of color contaminating the powdered resins that are reclaimed. The apparatus of the present invention permits a changing from one or more types or colors of coating resins to another in a mere matter of minutes while at the same time consuming a minimum of floor space in the work area. The problems of removing all the filter bags and vacuuming out the filter section when changing from one particular type or color of powdered resin to another is eliminated.

Basically the powder reclaiming system utilizes a stationary hood attached to an appropriate fan outlet which draws the oversprayed or spent plastic powder from the spraying booth. The lower base of the stationary hood incorporates a rubber or fabric bellows with an appropriate cam lock lever for accommodating a plurality of roll-away filter units. A sponge rubber seal or its equivalent assures an airtight fastening of the stationary hood to the roll-away filter unit. The roll-away filter unit incorporates a plurality of fabric filters that are basically bag assemblies hung from the top of the filter unit in a vertical direction.

At an appropriate location on the roll-away filter unit an exhaust pipe from the spraying booth enters the filter unit and is sealingly engaged by a resilient or sheet rubber gasket which is drawn snugly against the exhaust pipe due to the differential in pressure from the inside to the outside of the roll-away filter unit. An acceptable form of dust collecting bag is manufactured by the Torit Corporation, etc. and is identified as Filter Bags for "Dust Collectors Models." The filtering fabric to be used can be composed of cotton, rayon, nylon, etc. The number of filter bags installed in each filtering unit shall be governed by the spray coating booth size and desired air velocities through the booth and an amount of powdered plastic and particle size to be collected. Generally the base of the roll-away filter section incorporates an eccentrical shaft for engaging the filter bags when it is desired to shake the filters and relieve them of accumulated powder. The filter bags themselves are sealed at the top of the roll-away filter unit adjacent to the stationary hood and generally enclose a wire mesh surrounded on both sides by a fabric filter material. The purpose of the wire mesh being to insure a clear air passage through the filtering unit. The bottom of the roll-away filter section incorporates means for permitting the mobility of the unit. A preferred method is the incorporation of swivel wheels. Egress is provided to the filter unit for the purpose of removing the reclaimed powder from the base of the roll-away filter section.

A roll-away filter unit is provided for each color or type of material that is desired to be utilized in a particular manufacturing coating process. By virtue of the quick attachment of each filtering unit to the stationary hood of the air removal system and the convenient insertion of the exhaust pipe from the spraying booth a change in either material or color can be accomplished in a matter of minutes without suffering downtime in

expensive spraying equipment. Thus the present system permits a separate filtering section for each type of coating material or color while eliminating any possible cross-contamination and using only a minimum of floor space in the coating area. In the case of temperature sensitive materials, the roll-away filter sections with their reclaimed powder can be stored in an air-conditioned room.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic of the reclaiming powder spraying system of the present invention;

FIG. 2 is a side elevational view of the roll-away filter unit connected to the stationary hood;

FIG. 3 is an end elevational view of the invention shown in FIG. 2;

FIG. 4 is a partial side elevational view of the locking cam lever; and

FIG. 5 is a cross-sectional view of the sealing connection of the roll-away filter unit with the stationary hood.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The powder reclaiming system **10** of the present invention can be best seen in FIG. 1 of the drawing. The powder reclaiming system **10** utilizes a stationary hood **12** and a roll-away filter unit **14**. An article is coated in spray booth **11** with the excess powder being withdrawn by the exhaust pipe **36**. A fan **16** driven by a fan motor **18** exhausts filtered or clean air through the exhaust duct **20**.

The roll-away filter unit **14** comprises basically filter bags **22** that are fastened to the top of the roll-away filter unit **14** by fastening means not shown. The filter bags **22** hang from the top of the roll-away filter unit **14** and generally comprise a central wire mesh **24** with a surrounding fabric filter **25**. The top of the filter bags **22** are sealed to insure that the powder-laden air passes through the bags as it travels upward to the stationary hood **12**. The powder is separated by the fabric filter **25** and either falls to the bottom of the roll-away filter unit **14** or accumulates on a surface of the fabric filter **25**. The bottom member **30** of the roll-away filter unit **14** stores the reclaimed powder from the powder-laden air. The powder-laden air is introduced via the spray booth exhaust pipe **36**. The spray booth, for example, an electrostatic spray booth **11** is generally positioned some ten feet from the roll-away filter unit **14**. An entrance port **27** is located in one of the wall members, for example, wall member **26** of the roll-away filter unit **14**. The entrance port **27** includes a rubber or elastic sheet gasket for sealingly engaging the spray booth exhaust pipe **36**. The flexible gasket **32** is held in position by a fastener **34** on the wall member **26** and due to the pressure differential on both sides of the elastic gasket **32**, an air-tight seal is formed about the exhaust pipe **36**. The exhaust pipe **36** is designed to be swingable or retractable from the roll-away filter unit **14**. A deflection baffle **38** is located adjacent the entrance port **27** to direct the powder-laden air in a downward direction thus encouraging a dispersion of the powder onto the bottom member **30** of the roll-away filter unit **14**. The powder that remains in the air is finally separated by the fiber bags **22**. It is clear that other forms of gaseous medium than air can be utilized in the present invention. An eccentric cam member **40** is located in the bottom of the roll-away filter unit **14** and is operated via a foot lever **42** as disclosed in FIG. **3**. By appropriate movement of the foot lever **42** the eccentric cam shakes the filter bags **22** to cause any accumulated powder on the surface of the fabric filter **25** to fall to the bottom of the roll-away filter unit **14**.

The stationary hood section **12** is provided with bellows **44** of either rubber or fabric to permit a rapid disengagement of the stationary hood **12** with the roll-away filter unit **14**. Lift and hold-down clamps **46** are activated by a cam lever **48** to engage and disengage the lip **50** of the roll-away unit **14**. An appropriate seal **52**, for example, sponge rubber, is utilized on a channel member **54** of the stationary hood **12** to provide an effective seal between the hood **12** and the roll-away filter unit **14**.

The mobility of each roll-away filter unit **14** is provided in the form of swivel wheels **28** or other appropriate means of transport. Generally the stationary hood **12** is provided with an explosion relief door that is not shown as a safety feature. The location of the entrance of the exhaust pipe **36** from the spray booth **11** can vary on the roll-away filter unit **14**, for example, it can be mounted on any of the sides of the roll-away filter unit **14**.

In the preferred embodiment the wall member **26** is made removable either totally or in pivotal fashion to permit ready access for removing the reclaimed powder resting on the bottom member **30** of the roll-away filter **14**.

A fan capable of overcoming all static pressures within the filtering-reclaiming system such as, inlet and exhaust pipe resistance and be able to move a desired and calculated volume of air depending on spray coating booth size and total area of any openings, shall be driven by a total enclosed electric motor of sufficient horsepower to move a volume of air sufficient to cause an air flow velocity across any spray coating booth openings of between 50 and 150 feet per minute. The total area of all spray booth openings, plastic powder particle size and the volume of powder to be reclaimed within a given unit of time shall determine the number and type of filter bags used in a given filtering unit and the size and rating of fan and motor required.

As a result of the present invention a versatile and time-saving powder reclaiming system is provided which permits the removal of a roll-away filter unit **14** from a stationary hood **12** in a matter of minutes. Thus a roll-away filter unit **14** can be used for each type and color of powder material so that the problems or dangers of cross-contamination of the powdered resins can be eliminated while at the same time permitting the costly spraying apparatus to be utilized to its full extent.

In operation the appropriate roll-away filter unit **14** is quickly attached to the stationary hood **12** by the lift and hold-down clamps **46**. The exhaust pipe **36** from the spray booth **11** is inserted through the elastic gasket **32**. The powder reclaiming system **10** is now operative and the powder spraying can be commenced in the spray booth with the assurance that the roll-away filter unit **14** will be capable of removing the oversprayed "dust" which accompanies the coating operation. Once the initial coating process is completed and either a different item is to be coated or a second coating process

is to be accomplished, the lift and hold-down clamps **46** are released and the exhaust pipe **36** is removed from the particular roll-away filter unit **14** and a second roll-away filter unit, identical to the first roll-away unit, can be quickly fastened to stationary hood **12** and placed into an operative relationship with the spray booth **11**.

While the above description of the preferred embodiment described both an operative method and apparatus it is clear that numerous changes can be accomplished by one skilled in the art and the present invention accordingly should be determined from the scope of the following claims.

What is claimed is:

1. A method of reclaiming excess powder spray during a coating process of articles using separate plastic powder materials having different properties without contamination comprising the steps of:

spraying in successive steps a separate plastic powder for coating an article in accordance with a predetermined coating process;

collecting the excess plastic powder from the spraying step with an exhausting gas flow;

filtering the excess plastic powder from the gas flow with a portable filtering unit;

removing the portable filtering unit and replacing it with another each time a separate plastic powder material is used in accordance with the predetermined coating process;

reusing the reclaimed plastic powder in the spraying step whereby the separate plastic powder materials are not contaminated.

2. The method of claim **1** where the plastic powder materials sprayed for coating an article differ only in the property of color.

3. A filtering and collecting apparatus for reclaiming excess plastic powder spray during a coating process of articles using separate plastic powder materials having different properties without intermixing, comprising:

means for spraying in successive steps different plastic powders on the articles to be coated;

means for collecting the overspray material including a source of gas flow to transport the overspray material;

means for filtering the overspray plastic powder material from the gas flow including a plurality of portable filtering units used one at a time and a stationary hood connected to the gas flow;

means for removably connecting the portable filtering units to the stationary hood so that each individual filtering unit is capable of being quickly fastened and released from the stationary hood, and

means for collecting the overspray plastic powder material so that the plastic powder can be resprayed and one portable filtering unit can be used with each separate plastic powder material.

4. The filtering and collecting apparatus of claim **3** where the means for collecting the overspray material includes a pipe for carrying the overspray material, and the portable filtering unit having an entrance port with a resilient gasket for permitting the pipe to be rapidly connected to the portable filtering unit without leakage.

5. The filtering and collecting apparatus of claim **3** where the means for removably connecting the portable filtering units and the stationary hood includes a flexible bellows.

6. The filtering and collecting apparatus of claim **5** where the means for removably connecting the portable filtering units and the stationary hood further includes a camming lock to securely fasten a portable filtering unit and the stationary hood.

7. The filtering and collecting apparatus of claim **5** where the portable filtering units include filtering bags and means for shaking the filtering bags to remove accumulated excess plastic powder.

8. The filtering and collecting apparatus of claim **7** where the portable filtering unit includes swivel wheels.

9. The filtering and collecting apparatus of claim **5** where the portable filtering units include a deflection baffle adjacent the entrance port.

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