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ELECTROSTATIC COATING

Original Filed Aug. 8, 1946

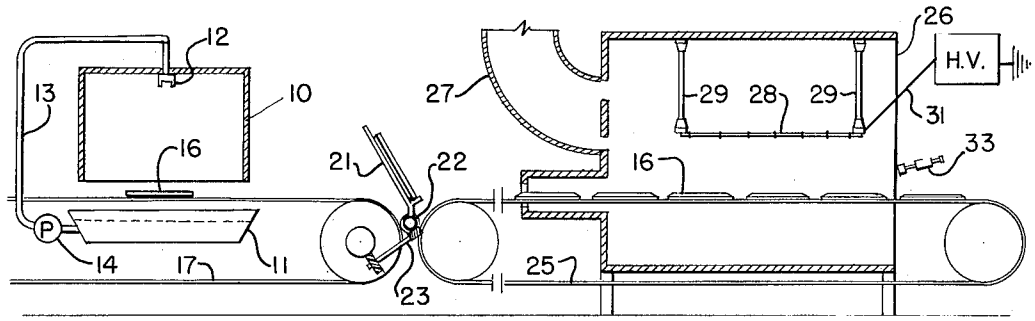


Fig. 1

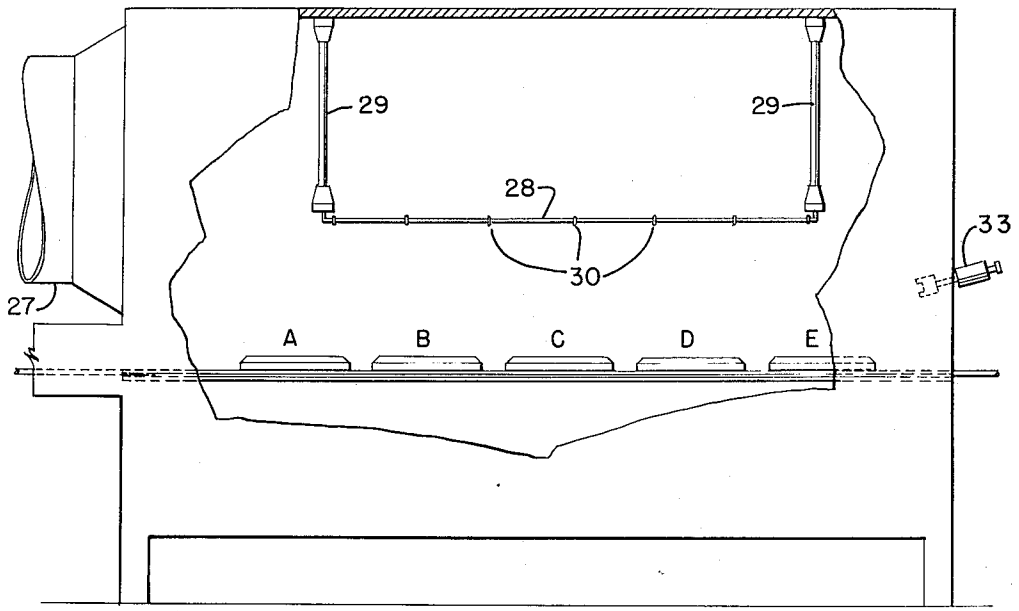


Fig. 2

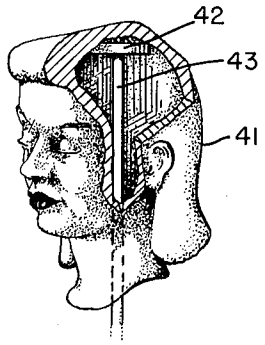


Fig. 4

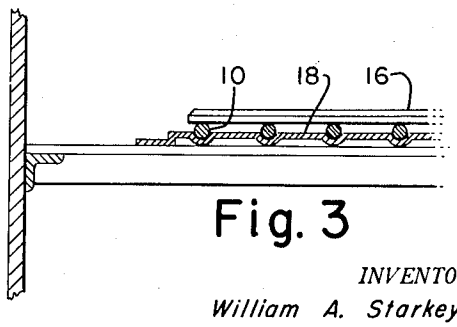


Fig. 3

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ELECTROSTATIC COATING

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Original application August 8, 1946, Serial No. 689,116. Divided and this application June 10, 1950, Serial No. 167,361

1 Claim. (Cl. 117—47)

The present invention relates to electrostatic coating of articles and material and is a division of my application Serial No. 689,116, filed August 8, 1946, and now abandoned.

In the electrostatic coating of articles it is often desirable to coat articles made of materials that possess electrical insulating properties. Heretofore, it has been found difficult to coat some types of such articles by electrostatic coating means.

One object of the present invention is to provide a simple and inexpensive method and apparatus for coating, with improved results, material that normally possesses electrical insulating properties.

A further object of the present invention is to provide an improved method and apparatus whereby coating material whether miscible or immiscible with water can be applied more effectively to porous, electrically insulating materials.

In accordance with the present invention an article to be coated possessing electrical insulating properties is treated with conducting liquid to temporarily reduce its capability of accumulating a surface charge and thereafter is coated with electrically charged coating particles.

The fact that the reduction in the electrical insulating properties of the article to be coated is only temporary can be very desirable where the restored electrical insulating properties of the coated article are of importance in its ultimate use.

An article to be coated, which is receptive to impregnation by liquids, may be treated by spraying with, or dipping in, conducting liquids, one of the most common of which is water.

If the coating material being used has hydrophobic characteristics, it is desirable not to have it come in contact with water. In such case, either water should not be used as the treating liquid, or, if it is used, the impregnation of the article to be coated should be partial so that the surface to which the coating material is applied is not wetted by the water.

The coating material may be atomized, charged and deposited on the article to be coated by means such as that described in U. S. Patent No. 2,247,963 of Harold P. Ransburg et al., entitled Apparatus for Spray Coating Articles, or in the application of Edwin M. Ransburg and myself for Method and Apparatus for Electrostatically Coating Articles, Serial No. 556,390, filed September 29, 1944, now Patent No. 2,685,536, or any other suitable charging apparatus.

As examples of electrical insulating materials capable of accumulating a surface charge in an electrostatic field, I may mention acoustic tile, wood or compressed wood fibers, fiber board such as Celotex, compressed asbestos fibers, papier-maché, plaster of Paris, cardboard and fabrics.

Examples of aqueous coating materials which may be used with this invention are solutions or emulsions of casein paint such as those known in the trade as calcimine, Kemtone and Texolite. However, other coating materials

of nonsetting or setting character or materials adhesive in character, such as lacquers, paints or varnishes may be used.

For a better understanding of the invention, together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawings, while its scope will be pointed out in the appended claim.

Referring now to the drawings:

Fig. 1 is a diagrammatic side view of one embodiment of the invention;

Fig. 2 is an enlarged diagrammatic side view of a portion of the apparatus shown in Fig. 1;

Fig. 3 is a transverse sectional elevation on an enlarged scale of a portion of the conveying mechanism shown in Fig. 2; and

Fig. 4 illustrates an article that may be coated.

Referring now to Fig. 1 at one end thereof is shown a liquid treating apparatus which includes an overhead housing **10** and a drain basin **11**. A nozzle **12** is inserted in the top of the housing **10** as shown and is connected to the basin **11** by piping **13**. In the piping **13** is inserted a pump **14** to move the liquid from the basin **11** to the nozzle **12** so that the drained liquid may be re-used. The conducting liquid used in the liquid treating apparatus is introduced to it preferably by a connection, not shown, leading to the basin **11**.

While a liquid treating apparatus adaptable to fully automatic operation is desirable my invention is not limited to such apparatus. Articles may also be treated by hand dipping or any other suitable means or method.

An article to be treated, for example, article **16**, which is a piece of acoustic tile, may be introduced to the liquid treating apparatus by a suitable conveyor **17** having a grooved supporting bed **18** over which ride a number of cables **10** as more clearly shown in Fig. 3.

When it is desired a turn-over mechanism may be provided at the exit end of the conveyor **17**. This mechanism includes a supporting member **21** which is driven by the conveyor **17** through a gear ratio device **22** and a drive shaft **23** as shown in Fig. 1.

Adjacent the turn-over mechanism is another conveyor **25** which, as shown, may be of the same construction as conveyor **17** (see Fig. 3). The conveyors **17** and **25** and the turn-over mechanism are so arranged that the treated articles are taken from the conveyor **17** by the turn-over mechanism, turned over and placed on the conveyor **25** with the untreated side of the article exposed. The conveyor **25** moves the treated articles into a spray booth which preferably is ventilated by drawing a current of air in the general direction of the spray by means of the ventilating system which includes an exhaust chamber **27**. An electrode frame structure **28** is supported from the top of the spray booth **26** by insulators **29**. The frame **28** supports a plurality of suitable ionizing or discharge electrodes **30**, which in this embodiment are shown as fine wires and extending transversely to the path of the conveyor **25**.

The frame **28** is connected to one terminal of the high-voltage source by conductor **31**. The other terminal of the high-voltage source may be grounded, in which case the conveyor **25** is also grounded; or it may be connected directly to the conveyor **25**. The high-voltage source is of a type to supply a sufficiently high voltage to produce an electrostatic ionizing field between the frame **28** and the bed of the conveyor **25**. At the exit end of the booth **26** are positioned one or more spray guns **33** preferably of the type which project into the electrostatic field finely divided liquid coating particles in the form of a spray. The spray guns **33** are positioned preferably so that the streams therefrom are directed into the electrostatic field, the axis of such streams being more nearly parallel than

normal to the plane of the surface of the material being coated as shown in Fig. 2. The velocity of the streams from the guns **33** is adjusted so that when the particles from the streams reach the electrostatic field they are deposited on the top and sides of the articles. In some cases it is desirable to direct each gun so that its stream travels substantially parallel to the scurface being coated and in still other cases it can be directed away from parallel to the material surface. In these latter cases it is found that with these gun positions the action of gravity combined with the distributing ionizing action of an extended field reduces the velocity of the particles and increases the uniformity of the coating obtained.

The character and quality of the coverage of a particular article is determined by the number of guns employed, their positioning, the velocity of the stream from the guns, and the size and shape of the article being coated.

While two conveyors are shown in Fig. 1, this is not a limitation to the invention here disclosed. Any suitable apparatus for presenting the materials or articles to be coated to their various treatments may be used.

In the modification shown in Fig. 4, a hollow manikin head **41** is supported on a grounding support comprising a disc or spider **42** and a rod **43**. The head **41** is composed of plaster of Paris, papier maché or similar porous material. Water or other electrically conducting liquid may be sprayed or poured into the interior of the head and thus the material of the head may be wetted to any desired degree. The penetration of the liquid in the material depends on the character of the liquids, length of time the liquid remains in contact with the material and the character of the material of which the head is composed. When the desired degree of penetration is obtained, the head is removed from contact with the liquid source, and the head **41** may be coated by a suitable electrostatic coating apparatus. During electrostatic coating the head is grounded and made one terminal of the field by the internal contact as shown.

When water is used to treat such article as head **41** or article **16** as shown in Fig. 1, it is not necessary to prevent full penetration if a coating material readily miscible with water is used. But care should be exercised to

avoid excessive penetration, if a coating material immiscible with water is used. Complete penetration in the latter case may result in blisters or poor adhesion of the coating material.

By hydrophobic material when used herein I mean a material which is immiscible with water. By hydrophylic material when used herein I mean a material which is miscible with water.

The invention claimed is:

The method of electrostatically applying a coating to one side of an article having two generally parallel sides of substantial planar extent and made of electrically insulating material, which comprises treating the side of said article opposite to said one side with a volatile conducting liquid over an area of said opposite side corresponding generally to the area of said one side to be coated, to effect only partial penetration of said liquid to temporarily reduce the capability of the article to accumulate a charge on said one side, maintaining the treated opposite side of the article at a particle attracting electrical potential, introducing such treated article into a coating zone with said one side exposed to said zone, and introducing finely divided, charged coating material particles into said coating zone adjacent said one side of the article for electrostatic deposition on the last mentioned side of the article.

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