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E. M. RANSBURG

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ELECTROSTATIC COATING APPARATUS

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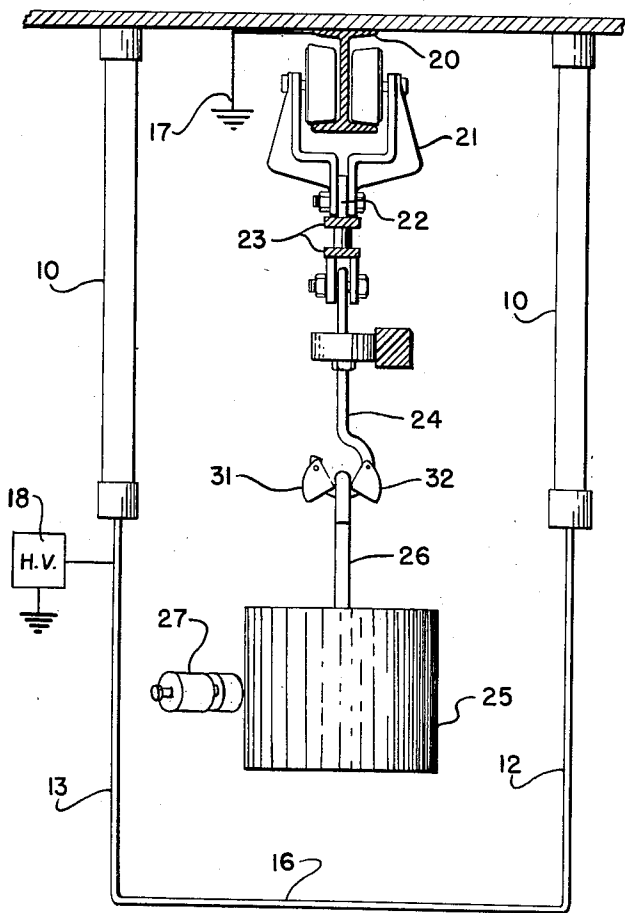


Fig. 1

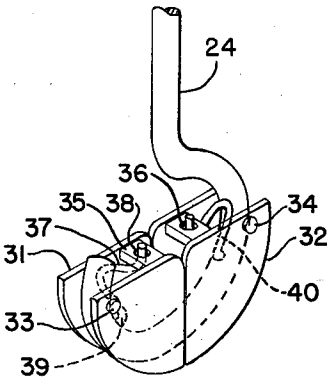


Fig. 2

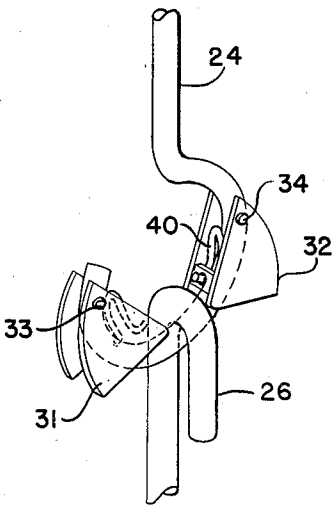


Fig. 3

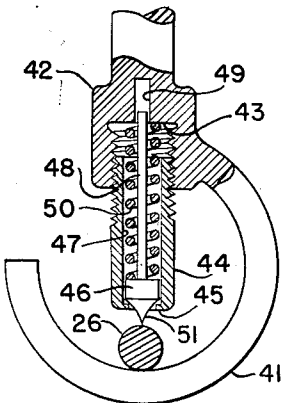


Fig. 4

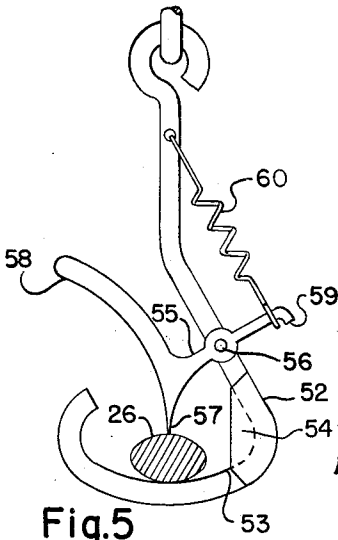


Fig. 5

INVENTOR.
EDWIN M. RANSBURG
BY *Harry E. Downer*
George A. Ordway.

UNITED STATES PATENT OFFICE

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ELECTROSTATIC COATING APPARATUS

Edwin M. Ransburg, Indianapolis, Ind., assignor,
by direct and mesne assignments, to Ransburg
Electro-Coating Corp., Indianapolis, Ind., a
corporation of Indiana

Original application March 16, 1946, Serial No.
654,830. Divided and this application May 7,
1947, Serial No. 746,527

17 Claims. (Cl. 91—18)

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This invention relates to apparatus for coating articles in an electrostatic field and more particularly to means for mounting the articles in preparation for their passage through the field. The present application is a division of application Serial No. 654,830 of Edwin M. Ransburg, filed March 16, 1946 and now abandoned.

In electrostatic coating apparatus in which the article to be coated is supported on a grounded conveyor and is moved past a high potential electrode while liquid coating material is sprayed into a zone surrounding the article, it is desirable that a good electrical contact be maintained between the article and the conveyor. As any given support for articles is repeatedly returned to the electrostatic coating field, it accumulates over a period of time a considerable coating of liquid material, which may prevent proper electrical connection between an article placed thereon and the conveyor. Also, when the support passes through the coating zone unoccupied by an article, the contacting portion of the support may become coated. Accumulation of coating material upon the contacting portions of the supports is objectionable because it tends toward preventing proper electrical connection being established between the article and the conveyor. A poor or defective electrical connection not only interferes with proper coating of the article, but also permits the latter to accumulate a capacity charge which may raise the potential of the article sufficiently above ground potential to cause a spark to the grounded conveyor, and create a fire hazard.

An object of this invention is to provide electrostatic coating apparatus for applying a liquid coating material to an article in which the article is maintained as one terminal of the electrostatic field.

Another object of this invention is to provide a support for an article in an electrostatic apparatus which support insures that there is at all times, during the coating operation, an electrical connection between the article and the source of electrical potential in the apparatus.

Another object of this invention is to provide a support for an article in an electrostatic coating zone whose electrical contact portion is shielded to prevent deposition of coating material thereon.

Another object of the invention is to provide in an electrostatic coating apparatus, a support for an article to be coated which resiliently maintains an electrical connection with the article.

Another object of the invention is to provide in

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an electrostatic coating apparatus, an electrical contact means for an article to be coated that is so shaped that coating material will be inhibited from collecting thereon.

In accordance with the present invention, there is provided apparatus for electrostatically coating an article which includes a source of high potential and an electrode connected to the source. There is also provided means for supporting an article adjacent and spaced from the electrode and for electrically associating the article with the source so that an electrostatic field is created between the article and the electrode. Means are provided for introducing suitable particled or finely divided coating material into this electrostatic field. Shielding means are provided for protecting the supporting and contacting means from the coating material.

In one embodiment of this invention, the supporting and contacting means comprises a supporting member associated with an overhead conveyor. The supporting member may be in the form of a hook or any other suitable shape which serves to support and positively contact an article. In this embodiment the shielding means preferably is spring biased and is mounted on the hook in such a manner that when the hook is not supporting an article, the shielding means protects the supporting portion of the hook from coating material. When an article is placed on the hook, the shielding means yields sufficiently to permit the article to directly contact the hook. The shielding means in its altered position cooperates with the article being supported to protect the hook from coating material. It is readily seen that while the supporting member in this embodiment is supported from an overhead conveyor, this member and its spring biased shielding means could be readily modified for use with a conveyor which supports articles from below.

In another embodiment of this invention, the supporting means may comprise a support member and a hollow member. The support member serves to support and carry an article into field creating relationship with respect to the electrode. A contact member is mounted within the hollow member and means are provided for moving the contact member into engagement with an article on the supporting member. When the contact member is surrounded by the hollow member, this hollow member serves to shield the contact member from coating material. A separate shielding means may also be provided in this embodiment by movably mounting a sleeve

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within the hollow member so that it may be moved over the contact member.

In still another embodiment of this invention, the support and contact means may include a support member preferably sharpened or serrated at its inner supporting edge, a shielding means and a spring biased contact member with a contact point. The contact member is normally biased into a position in which the shielding means protects the contact point. The contact member is adapted to be moved against the force of its biased spring to contact an article being supported on the support member.

The present invention will be described in greater detail in connection with the accompanying drawings in which are illustrated preferred embodiments of the invention by way of example and in which,

Fig. 1 is a view in elevation of an electrostatic coating apparatus including an overhead conveyor with an article support,

Fig. 2 is a detailed view of the support in Fig. 1 as it appears without an article supported thereon,

Fig. 3 is a detailed view of the support shown in Fig. 1 as it appears when it is supporting an article,

Fig. 4 is a side elevation partly in section of a modified support, and

Fig. 5 is a side elevation of still another modified support.

Referring now to Fig. 1, a plurality of insulator posts 10 support electrode frames 12 and 13 in a suitable arrangement. Each electrode frame carries a plurality of fine wires, for example, as illustrated in Fig. 4 of the application of Harold P. Ransburg, Serial No. 589,719, for Method of Coating Articles, filed April 23, 1945. The frames are secured together by a bottom electrode portion 16. The electrode wires are maintained at a high electrical potential of the order of one hundred thousand volts by a source of electrical potential 18. The conveyor, which will be described in greater detail hereafter, is maintained at a potential of opposite polarity to that of the electrode wires either by direct connection to the source of electrical potential or by being grounded as shown at 17.

The conveyor comprises an I-beam 20 which serves as a track for a trolley 21. A member 22 depends from the trolley 21 and is associated with a conveyor chain 23 as shown, by which it is moved. An article support, indicated generally at 24, depends from chain 23. Its free end may be in the form of a hook or other suitable supporting shape. This support serves to hold an article 25 directly or by means of a hanger or bail 26 so that the article may be moved adjacent the electrode frames 12, 13 and 16. This support is shown in greater detail in Figs. 2 and 3.

A spray nozzle 27 of any suitable type is supported to introduce into the electrostatic field between the article 25 and the electrodes, a stream of finely divided coating material, such as a settable finishing fluid preferably accompanied by a carrier air stream, which coating material is electrostatically deposited upon the surface of the article 25. By reason of the contact between the engaging portion of the hook and the article 25, a good electrical connection is established from the article to the source of potential or to ground. The contacting portion of the support 24 remains relatively free of coat-

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ing material due to the protection given it by shielding means which will be described hereafter.

Figs. 2 and 3 show in detail the support 24 shown in Fig. 1. As previously mentioned, the free end of the support 24 may be in the form of a hook. Shields 31 and 32 are pivotally connected to the hook at 33 and 34 respectively. These shields 31 and 32, which are preferably made of sheet metal, are braced by struts 35 and 36 respectively, as shown. These shields form a housing about the hook portion of the support 24. A spring 37 has one end connected to the opening 38 in strut 35 and its other end is anchored in a suitable niche 39 in the hook. A spring 40 is connected in a similar manner between strut 36 and the hook. The springs 37 and 40 tend to hold the shields 31 and 32 in the position shown in Fig. 2. When the article hanger 26 is placed on the hook 24, it pivots one or both of the shields 31 and 32 downwardly, causing them to assume the positions shown in Fig. 3, and it makes an electrical contact with the support 24. The shields 31 and 32 protect the hook from accumulating coating material when it passes through the electrostatic coating zone. It will be understood that if desired, the shields 31 and 32 may be replaced by a single pivoted shield or housing.

In the modification shown in Fig. 4, the support includes a hook 41 and a shank 42 which may be bored and threaded to provide a socket 43. This socket receives a hollow exteriorly threaded shielding sleeve 44 having an inturned flange 45 at its lower end. A plunger 46 is mounted in a sleeve bore 47 and has a stem 48 which is positioned to be guided by shank bore 49. A spring 50 is positioned to surround the stem 48 and engage the plunger 46, as shown, to urge its pointed end 51 into contacting relationship with the hanger 26. This hanger is positively contacted by the point 51 to assure an electrical connection between the supported article and the source of potential or ground. The sleeve 47 may be adjusted upwardly and downwardly by turning it to cover or expose the point 51 of the plunger 46.

In the modification illustrated in Fig. 5, the support includes a hook 52 which may be formed with a relatively flat portion 53. The hook at this portion may be sharpened or serrated at its inner edge. A pair of plates 54 are affixed to the hook 52 in a suitable manner such as that shown in Fig. 5. These plates form a shield or pocket whose function shall be described hereafter. A lever 55 is preferably pivotally connected to the hook 52 at 56. This lever may comprise a sharpened contact point 57, a thumb piece 58 and an extension 59. The contact point is adapted to engage the article hanger 26 to assure an electrical connection between the article and the source of potential or ground. A spring 60 is connected between the hook and the extension 59 and it assists in maintaining the contact point 57 in engagement with the hanger 26. When the hook 52 is unoccupied by an article, the spring 60 serves to hold the contact point 57 within the pocket formed by the plates 54, and thus the pocket serves to shield the point when the latter is in ineffective or out-of-control position with a hanger 26. The thumb piece 58 is provided for easily disengaging the point 57 from the hanger 26.

The various shielding elements embodied in the above described structures, if made of metal or

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other conducting material electrically connected to the hangers, will act to shield the point of contact not only mechanically but also electrically; and they therefore need not completely enclose the contact point in order to inhibit deposition effectively.

The invention may be embodied in various other forms without departing from the spirit or scope thereof.

I claim:

1. In apparatus for electrostatically coating an article and including means for creating an electrostatic field with the article serving as one terminal thereof, the improvement which comprises a conductive support for supporting the article and being electrically connected to said field-creating means, and resilient guard means mounted on said support for shielding its contact portion.

2. Apparatus for coating an article comprising means for creating an electrostatic field, said means including a conveyor and an electrode spaced therefrom, means for introducing particled coating material into said field, and a conductive support connected to said conveyor and comprising a hook portion for carrying an article, a hollow shank member, a sleeve member movably mounted in said shank member, and a resilient member mounted within said sleeve member and normally adapted to contact an article on said hook portion, said sleeve member being adapted to be moved into position to shield said contact member from said coating material.

3. Apparatus for coating an article comprising means for creating an electrostatic field, said means including a conveyor and an electrode spaced therefrom, means for introducing particled coating material into said field, a conductive support connected to said conveyor and having a sleeve portion and a hook portion, said hook portion being adapted to carry an article, and a spring biased member movably mounted within said sleeve portion and normally adapted to contact an article on said hook portion.

4. Electrostatic coating apparatus having in combination an article support comprising a hook portion and a hollow shank, a sleeve threaded within said shank, a pointed plunger within said sleeve and a spring for urging said point toward said hook.

5. Electrostatic coating apparatus having in combination an article support comprising a supporting member, a hollow member associated with said supporting portion, a contact member mounted in said hollow member, and means for moving said contact member into engagement with an article on said supporting portion.

6. Apparatus for coating an article comprising means for creating an electrostatic field, said means including a conveyor and an electrode spaced therefrom, means for introducing particled coating material into said field, a support connected to said conveyor for carrying an article adjacent said electrode, a shield associated with said support, and a spring biased member with a contact point, said member being connected to said support to move relative thereto and being normally held in a position whereby said shield protects said contact point from said coating material, said member being movable out of its shielded position into contacting relationship with an article on said support whereby the article becomes one terminal of said electrostatic field.

7. Electrostatic coating apparatus having in

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combination an article support comprising a supporting member, a shield and a movable spring biased contact member having a contact point, said contact member normally being biased into a position whereby said shield protects said contact point, said contact member being adapted to be moved against the force of its biasing spring into contacting relation with an article on said hook.

8. Apparatus for electrostatically coating an article comprising ionizing means, conveyor means for moving the article adjacent said ionizing means, an article support associated with said conveyor, a spring biased pointed electrical contact member connected to said support for engaging an article on said support, means for creating an electrostatic field between the article and said ionizing means, and means for introducing particled coating material into said electrostatic field.

9. Electrostatic coating apparatus including a source of electric potential and an electrode having in combination an article support comprising a support member for presenting an article adjacent said electrode, and a resilient member movably mounted on said support and adapted to contact an article on said support for electrically connecting it into a circuit with said electrode whereby the article and the electrode cooperate to create an electrostatic field.

10. Apparatus for electrostatically coating an article including a source of electrical potential and an electrode connected thereto having in combination a support for presenting an article adjacent said electrode and a resilient contact member electrically associated with said source for maintaining the article on said support at a potential opposite in polarity to that of said electrode.

11. Apparatus for coating an article comprising a conductive support having a hook shaped portion for engaging an article, means electrically connected to said support for creating an electrostatic field over the article, means for introducing coating material into said field, and resilient guard means mounted on the hook portion of said support for shielding said hook portion from said coating material, said guard means moving under the weight of an article on said support to expose a sufficient portion of said hook portion to permit electrical contact with the article.

12. Apparatus for coating an article comprising a conductive support for supporting an article, means electrically connected to said support for creating an electrostatic field over the article, means for introducing coating material into said field, and a plurality of spring biased guard members mounted on said support and normally biased toward a shielding relationship with the article-contacting portion of said support to prevent the accumulation of coating material on said article-contacting portion, said guard members being movable out of such shielding relationship to permit the article to contact the support.

13. Apparatus for coating an article comprising a conductive support for supporting an article, means electrically connected to said support for creating an electrostatic field over the article, means for introducing coating material into said field, and spring biased guard means mounted on said support and being normally biased toward a shielding relationship with the article-contacting portion of said support to prevent the accumula-

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tion of coating material on said article-supporting portion, said guard means being movable out of such shielding relationship to permit the article to contact the support.

14. Apparatus for coating an article comprising a conductive support for supporting an article, means electrically connected to said support for creating an electrostatic field over the article, means for introducing coating material into said field, guard means for shielding the article-supporting portion of said support, and resilient means for normally maintaining said guard means in shielding position, said guard means being adapted to be moved to a non-shielding position by an article on said support.

15. Apparatus for electrostatically coating an article having, in combination, means for supporting an article including a contact means of electrically conducting material for engaging the article, means electrically connected to said contact means for creating an electrostatic field with the article serving as one terminal thereof, guard means, and means for mounting said contact means and guard means on said supporting means for relative movement between a first relative position in which the contact means is shielded by the guard means from accumulating coating material when the supporting means is not occupied by an article and a second relative position in which the guard means and contact means are relatively displaced from said first position and the contact means engages an article on the supporting means.

16. The invention set forth in claim 15, with the addition of biasing means acting to urge said contact and guard means toward said first relative position.

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17. Apparatus for electrostatically coating an article having, in combination, a high voltage source, an electrode electrically connected to one terminal thereof, means for supporting an article adjacent to and spaced from said electrode and including an article engaging contact portion of electrical conducting material electrically connected to the other terminal of said source for establishing a potential difference between said electrode and the article, means for introducing coating material between said electrode and the article, a guard, and means for mounting said contact portion and guard on said supporting means for relative movement between a first relative position in which the contact means is shielded by the guard from accumulating coating material when the supporting means is not occupied by an article and a second relative position in which the guard and contact portion are relatively displaced from said first position and the contact portion engages an article on the supporting means.

EDWIN M. RANSBURG.

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