April 24, 1951 E. M. RANSBURG 2,549,927

ELECTROSTATIC DETEARING APPARATUS

Filed Aug. 4, 1945

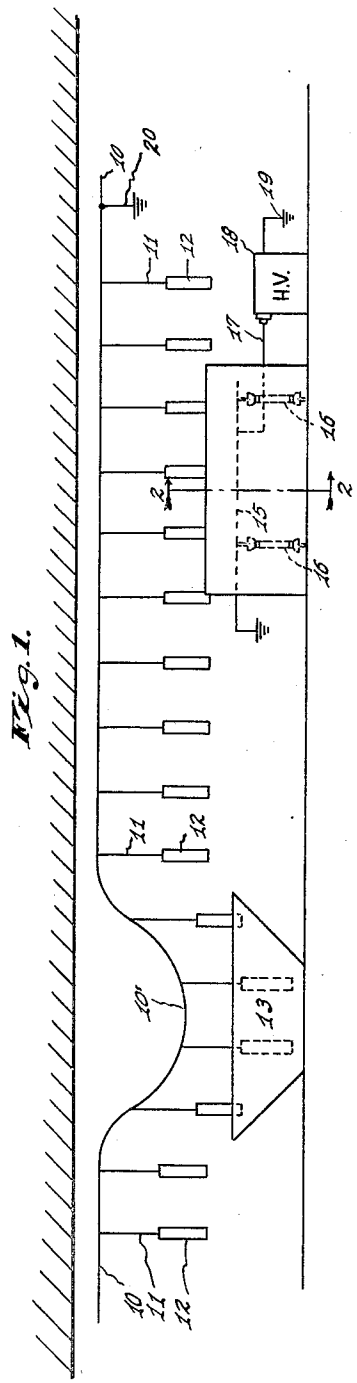


Fig. 1.

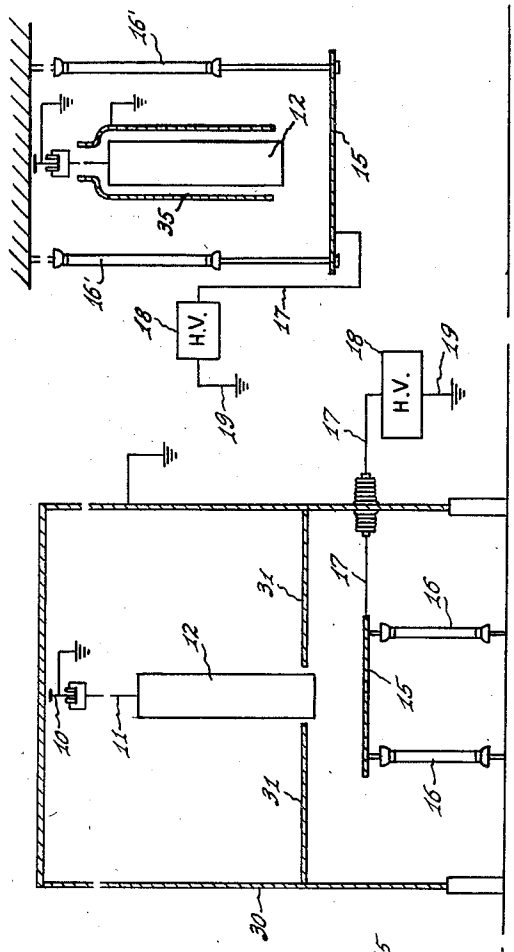


Fig. 4.

Fig. 3.

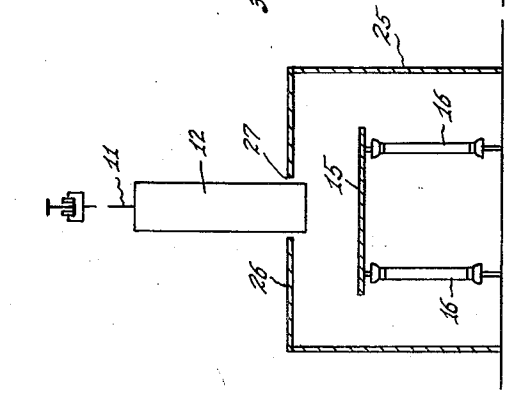


Fig. 2.

INVENTOR.
EDWIN M. RANSBURG,
BY
ATTORNEYS.

Patented Apr. 24, 1951 2,549,927

UNITED STATES PATENT OFFICE

2,549,927

ELECTROSTATIC DETEARING APPARATUS

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

Application August 4, 1945, Serial No. 608,965

4 Claims. (Cl. 91—18)

1

This invention relates to apparatus and methods for coating articles, and more particularly to improvements in the method and apparatus of United States Letters Patent No. 2,359,476, granted October 3, 1944, on the application of Charles K. Gravley. In practicing the invention of the Gravley patent, the articles to be coated are first provided, as by dipping, with an excess of the desired coating material and are then moved into association with an electrode between which and the articles there is maintained an electrostatic field of sufficient intensity to cause the excess coating material to leave the article. By this process, the excess coating material which would otherwise form "sags" or "tears" is removed and the coating material permitted to set in a film substantially free from abrupt variations in thickness.

In the commercial utilization of the Gravley invention difficulties have sometimes been encountered because of the re-deposition on the article of coating-material particles once removed therefrom by the electrostatic field. Several factors may contribute to such re-deposition. Coating material in an unset condition may accumulate on the grid to a point where the action of the electrostatic field will cause it to leave the grid and be attracted to the article. Air currents resulting from an exhaust system or induced by heat from means employed to speed setting of the coating on the articles may carry coating material away from the grid and to the article. In most installations, the article being deteared is grounded, while the electrode is maintained at a high potential, with the result that particles of coating or other material which become charged by the grid are attracted to any grounded object; and in many situations the redeposition of material on grounded portions of the apparatus would be as objectionable as would redeposition on the articles being treated. Throughout this application, the term "redeposition" is employed to designate the deposit of particles which have acquired a charge from the electrode upon the article being treated or upon parts of the apparatus which are charged similarly to the article and upon which it is desired to prevent the formation of a coating.

It is the object of this invention to prevent undesirable redeposition of material in the process of electrostatic detearing. More specifically, it is the object to prevent particles of coating or other material which have acquired a charge similar in sign to that of the detearing electrode from becoming redeposited upon the article or

2

elsewhere where their presence would be objectionable.

In carrying out my objects, I associate with the detearing apparatus a screen shaped and positioned to intercept particles moving toward the article, from the general vicinity of the grid, such screen being provided with an opening between the detearing electrode and that surface portion of the article from which coating material is being deteared. Preferably, such screen is of conducting material and is electrically charged similarly to the article being deteared; but in such an arrangement the screen is arranged so as to avoid electrical shielding of that portion of the article from which the coating material leaves in the detearing operation.

The accompanying drawing illustrates my invention:

Fig. 1 is aside elevation, somewhat diagrammatic in character, illustrating one form of apparatus suitable for use in practicing my invention; Fig. 2 is a vertical section on an enlarged scale on the line 2—2 of Fig. 1; Fig. 3 is a view similar to Fig. 2 illustrating a modified form of the invention; and Fig. 4 is another view similar to Fig. 2 illustrating a further modification.

The apparatus illustrated in Fig. 1 comprises an overhead conveyor 10 along which move a series of spaced hangers 11 carrying the articles 12 to be coated. The conveyor 10 includes a depressed portion 10' beneath which there is located a tank 13 containing a bath of liquid coating material in which the articles 12 are immersed as they pass over the depressed conveyor-portion 10'. In the drawing, it is contemplated that the articles will be placed on the hangers 11 at the left of the tank 13 and will move to the right through an beyond such tank.

Beyond and preferably spaced from the tank 13 in the direction of conveyor travel there is disposed a horizontal detearing electrode 15 positioned vertically so that the lower ends of the articles 12 will pass in spaced relation to it as they are moved to the right by the conveyor. The electrode 15 is mounted on supports 16 of insulating material and is connected through a conductor 17 with one terminal of a high-voltage source 18 the other terminal of which is grounded as at 19. The hangers 11 are of conducting material, and the conveyor 10 is grounded as indicated at 20, so that an electrostatic field will be created between the electrode 15 and the articles 12 passing in succession above it.

The apparatus as so far described is not novel, but instead represents a commercial embodiment

of the invention of the aforesaid Gravley patent. Articles emerging from the tank 13 lose some of the excess coating material which they acquire therein as they pass from the tank toward association with the electrode 15. As the articles enter into association with the electrode 15, the electrostatic field between them and the electrode causes excess coating material on the surface of the article, and especially excess coating material hanging in "tears" from the lower surface of the article, to be attracted to the electrode 15. This process has proved very effective in detearing articles coated by the dip method or by any other method which results in the application of an excess of coating material.

The major part of the coating material removed from the articles 12 by the action of the electrostatic field collects on the electrode 15 and acquires an electrical charge similar in sign to that of the electrode. If enough coating material collects on the electrode in a sufficiently fluid state, some of it may be repelled therefrom in the form of fine particles and attracted back to the article to be deposited thereon. I have found, especially if that portion of the article presented toward the electrode is relatively sharp-edged, that much of the material so redeposited returns to the article on other portions of the surface thereof. Coating material so redeposited is relatively dry as the result of its exposure to the air during its movement from and back to the article; and as a result, it may not flow but instead may remain more or less unassimilated into the coating to create an uneven and unsightly appearance.

I have discovered that the redeposition of coating material particles on the article being deteared can in large measure be prevented by providing a screen shaped and positioned to intercept any coating material particles moving from the grid toward surface portions of the article other than those from which detearing takes place. In the arrangement shown in Figs. 1 and 2 I employ a screen having side walls 25 and a top wall 26, the latter being provided with a longitudinally extending slot 27 through which the lower ends of the articles 12 project for a short distance. Preferably the screen, or at least the wall 26 thereof, is made of metal or other conducting material and grounded so that it will have substantially the same potential as the articles 12. If the screen-wall 26 is of conducting material, it may be foraminous in character, but if it is of non-conducting material it is desirably imperforate except for the slot 27. Where the screen portion 26 is of non-conducting material, it is not important that the article 12 project below it; but if the screen is of conducting material, the article should project below it, as illustrated, in order to prevent the screen from electrically shielding those surface portions of the article 12 from which detearing occurs.

Except for the function of the screen 26, the apparatus of Figs. 1 and 2 operates after the manner of the Gravley patent to remove excess coating material from the articles 12 as they pass in association with the electrode 15. However, should the coating-material particles reaching the electrode 15 acquire the charge thereof and become attracted to any article 12 or parts similarly charged, such particles will be intercepted by and become deposited upon the screen 26 and will not strike the article 12 to mar the surface thereof.

In the arrangement illustrated in Fig. 3, the electrode 15 is located within the lower portion of a booth 30 which extends upwardly to enclose the conveyor 10 and the articles 12 supported therefrom. In this arrangement, the screen takes the form of shields 31 projecting inwardly from the side walls of the booth 30 to points adjacent the sides of the articles 12. As in the case of the screen-portion 26 shown in Fig. 2, the shields 31 are of conducting material, are grounded, are located a short distance above the lowermost point of the articles 12, and may be foraminous. If the shields 31 are of non-conducting material, they are desirably imperforate, and need not necessarily be located above the lower ends of articles 12.

In the arrangement shown in Fig. 4, the electrode 15 is supported from overhead through insulators 16', and the screen takes the form of shields 35 extending vertically in closely spaced relation to the sides of the articles 12 and terminating at their lower edges short of the lower ends of the articles 12 in order to avoid electrical shielding of such lower ends, where detearing takes place.

In some coating processes embodying the step of electrostatic detearing, it is customary to subject the articles being deteared to the action of heat to expedite the setting of the coating material. In some instances, it is also customary to provide for ventilation of the region occupied by the detearing electrostatic field. In either case, air currents are created which in most instances would favor the movement of coating-material or other particles toward the articles for redeposition thereon or for redeposition on any grounded parts of the apparatus. A screen such as is employed in the practice of my invention is especially effective where such air currents exist.

In showing the detearing electrode 15 as having a greater extent transversely of the path of article-travel than do the articles themselves, the drawing reflects common detearing practice. As a result of the fact that the electrode 15 has a horizontal extent greater than that of the articles 12, many particles of coating material or other substance which otherwise would move generally upwardly along paths spaced from the articles and from parts of the apparatus at the sides of the articles acquire a charge from the grid and become attracted to the articles or to grounded portions of the apparatus. In the absence of my screen, many of such particles would become deposited on the side surfaces of the articles or on other grounded objects where their presence would be objectionable; but with the screen present, such particles are intercepted by and deposited on such screen where their presence is not objectionable.

I claim as my invention:

1. In electrostatic detearing apparatus, a horizontally disposed electrode, a conveyor for conveying articles to be deteared over and in spaced relation to the electrode, a screen of conducting material disposed over said electrode and a short distance above the lower ends of articles moved over the electrode by the conveyor, said screen having a longitudinal slot through which the lower ends of the articles project, and means including a source of high-voltage electricity for maintaining between said screen and the lower ends of the articles on the one hand and said electrode on the other an electrostatic field for urging excess coating material on such articles toward the electrode.

2. In electrostatic detearing apparatus, an electrode, means for supporting in spaced relation to said electrode an article to be deteared, means for maintaining between said electrode and an article on said support an electrostatic field capable of causing excess coating material on that surface portion of the article nearest the electrode to leave the article and move toward the electrode, and a screen of conducting material positioned intermediate said electrode and other portions of said article surface for electrically shielding said other portions.

3. In apparatus for detearing a plurality of articles, means for conveying the plurality of articles in a column over a predetermined path, an electrode spaced from said column of articles and positioned so that it is nearest to one surface portion of each of the articles and is more remote from other surface portions of each of the articles, means for maintaining between said electrode and said column of articles an electrostatic field capable of causing excess coating material on the nearest surface portions of the articles to leave them and move toward said electrode, and screening means of conducting material extending longitudinally on both sides of said conveyor means and being adjacent to and spaced from said column of articles to shield the more remote surface portions of the articles from

deposition thereon of particles of material charged by said electrode, said screening means being electrically connected with said field maintaining means.

4. In an electrostatic detearing apparatus, means for supporting an article to be deteared in a predetermined position, a detearing electrode spaced from the article to be deteared, means for establishing between said article and said electrode an electrostatic field capable of causing excess coating material on that portion of the article nearest the electrode to leave it and move toward said electrode, screening means located intermediate such nearest portion and more remote portions of the article to reduce to substantially zero the electrostatic field over said more remote portions, and means for maintaining said screen at substantially the same potential as the article to be deteared.

EDWIN M. RANSBURG.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,417,798	Ransburg et al.	Mar. 18, 1947
2,425,652	Starkey	Aug. 12, 1947