United States Patent [19]

Milleson

[11] **3,908,036**

[45] **Sept. 23, 1975**

[54] **METHOD OF REMOVABLY MARKING A CONTAINER**

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[22] Filed: **Feb. 13, 1974**

[21] Appl. No.: **442,113**

Related U.S. Application Data

[62] Division of Ser. No. 333,621, Feb. 20, 1973.

[52] **U.S. Cl.** **427/10;** 427/14; 427/180; 427/204

[51] **Int. Cl.²** **B05B 5/02**

[58] **Field of Search** 117/17, 25, 33, 17.5; 118/300, 303, 304, 308, 620, 621, 629; 427/10, 14, 180, 204

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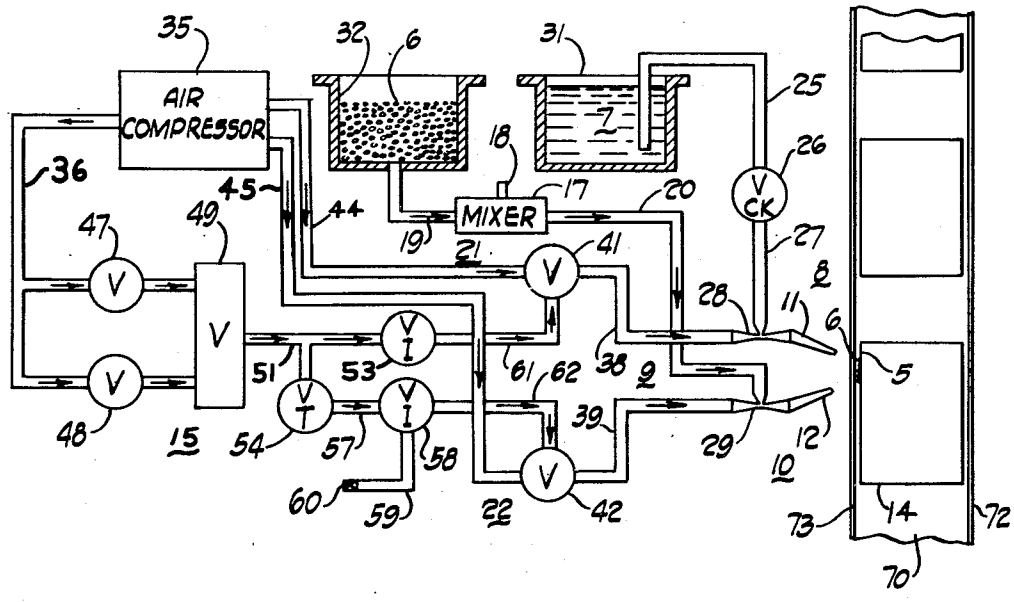
[57] **ABSTRACT**

A method is disclosed for applying a readily removable marking to a food or beverage container located within a humid environment with a plurality of reflective glass beads. A liquid such as alcohol is used to prepare the moist surface for attraction with the glass beads which produce a reliable reflection even when located on a glaring surface. The marking can be removed by a stream of water and is suitable for automatic container distribution in a dairy, beverage or a food process plant. The foregoing abstract is merely a resume of one general application, is not a complete discussion of all principles of operation or applications, and is not to be construed as a limitation on the scope of the claimed subject matter.

8 Claims, 2 Drawing Figures



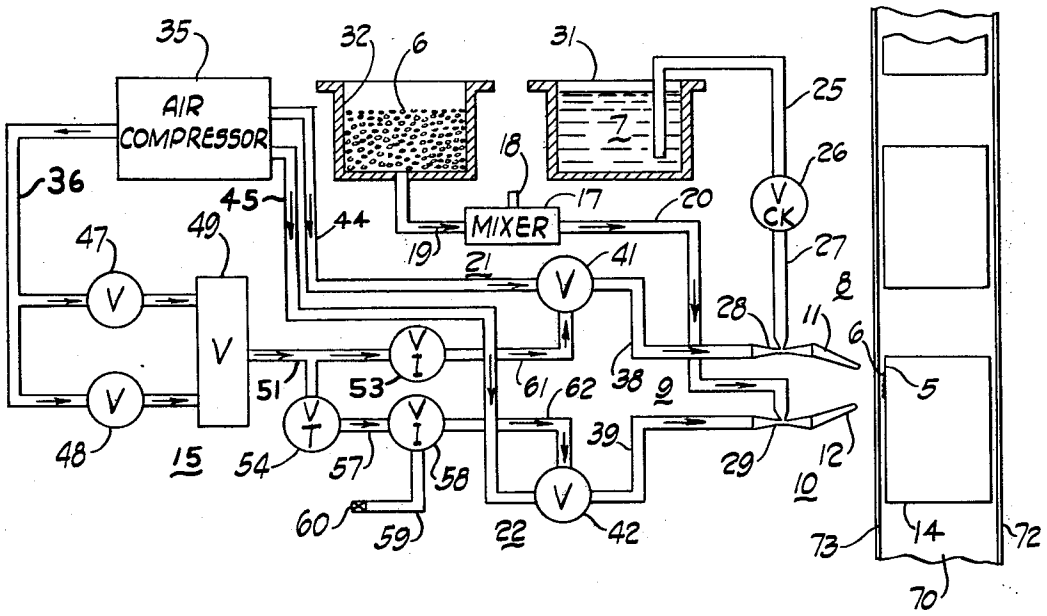

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Fig. 1

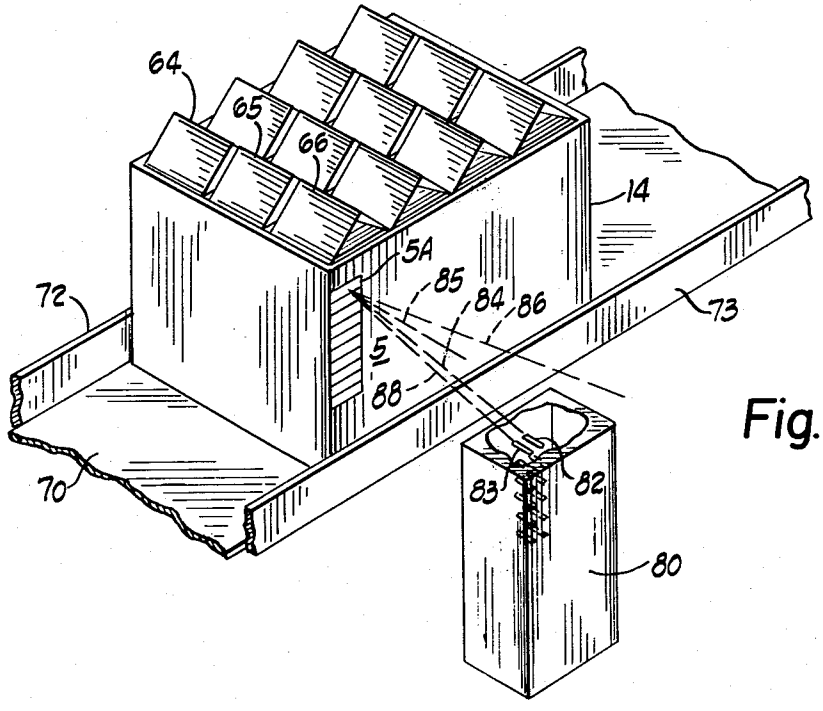
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Fig. 2

METHOD OF REMOVABLY MARKING A CONTAINER

This is a division of application Ser. No. 333,621 filed Feb. 20, 1973.

BACKGROUND OF THE INVENTION

This invention relates to surface markings and more particularly to readily removable reflective markings on a food or beverage container.

The prior art has known many types of marking systems to enable automatic reading of information upon a surface. In many cases it is desirable to mark an article with a specific coding and to subsequently read the coding and accordingly distribute the article. This procedure has been applied to various articles from railroad cars to beverage cases located in bottling plants. One of the most recent developments in the art of marking was the use of retro-reflective tape comprising glass reflective beads secured to a substrate having an adhesive backing. The tape was bonded to a dry surface to reflect light from a light source to enable detection by a light sensitive device. The retro-reflective tape has substantially solved the majority of problems involved in permanently marking a dry article but the reflective tape does not adhere to a moist surface. However, once the tape was bonded to a surface it was difficult to remove and required manual labor to remove. For example, in a dairy or a bottling plant it is desirable that cases containing different products be temporarily marked in order to automatically distribute the product to a warehouse. In a dairy it is important to quickly distribute the processed dairy products to a refrigerated warehouse to insure a wholesome product. The relative humidity of a dairy approaches 100% and the cases containing the dairy products normally have moist surfaces. The prior art has attempted to solve the problems of marking such surfaces using plastic cards and the like but false readings were generally encountered from the glaring moist surfaces of the dairy cases. The application of retro-reflective tape to dairy containers solved the problem of undesired glaring but such reflective tape was not readily removable to enable recycling of the container with a different dairy product.

Therefore, an object of this invention is to provide a method of marking a surface which marking is readily removable.

Another object of this invention is to provide a method of marking a surface which is able to adhere to a moist surface in a humid environment.

Another object of this invention is to provide a method of marking a surface which is sanitary and can be operated within a food product plant.

Another object of this invention is to provide a method of marking a surface which can produce an accurate reflecting signal off a glaring surface.

Another object of this invention is to provide a method of marking a surface which produces a reflectivity many times greater than a marking which is secured by adhesive means.

Another object of this invention is to provide a method of marking a surface wherein the reflecting particles can be recycled.

Another object of this invention is to provide a method of marking a surface which is inexpensive and reliable.

SUMMARY OF THE INVENTION

The invention may be incorporated in an apparatus for applying a marking to a container surface with a plurality of dielectric reflecting particles and using a fluid to prepare the surface, comprising in combination, means for directing the fluid to the surface to prepare the surface for an attractive force with the reflecting particles, and means for directing the reflecting particles to the prepared surface to cooperate with the prepared surface to create an attractive force to hold the particles.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a symbolic representation of an apparatus for applying a marking to a surface; and,

FIG. 2 is an isometric view of an apparatus for reading a marking on a case.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 is a schematic representation of an apparatus for applying a readily removable marking to a surface **5** with a plurality of dielectric reflecting particles **6** and using a fluid **7** to prepare the surface **5** which comprises means shown generally as **8** for directing the fluid **7** to the surface **5** to prepare the surface **5** for attraction with the reflecting particles **6.** The invention includes means shown generally as **9** for establishing an attractive force between the reflecting particles **6** and the prepared surface **5** and means shown generally as **10** for directing the reflecting particles **6** to the prepared surface **5** to be held thereat by the attractive force. The means **9** for establishing an attractive force creates the attractive force prior to contact of the particles **6** with the surface **5** in this embodiment. Means **8** for directing the fluid **7** to the surface **5** includes first director means **11** shown as a nozzle and first motive means **21** for propelling the fluid **7** to the surface **5.** Means **10** for directing the reflecting particles **6** to the prepared surface **5** includes second director means **12** shown as a nozzle and second motive means **22** for propelling the reflecting particles **6.** Control means **15** activates the first motive means **21** to direct the fluid **7** which is shown as a volatile liquid to the surface **5** to cover the surface **5** with a layer of the volatile liquid **7** to prepare the surface **5** for an attractive force. Subsequently the control means **15** activates the second motive means **22** to direct the dielectric particles **6** to the surface **5** to be held thereat only by the attractive force after evaporation of the volatile liquid **7.** FIG. **1** is an example of the invention applied in a high humidity bottling or food packaging plant such as a dairy wherein surfaces are generally moist. A case **14** containing dairy products such as cartoned or bottled milk can be made of plastic, wood or metal. The surface **5** upon which the marking is located is merely a portion of the outside surface of the case **14** and is not treated in any special way. The fluid **7** is shown as a liquid stored in a first reservoir **31** and connected by a conduit **25,** a check valve **26** and a conduit **27** to a venturi **28.** The check valve **26** insures the presence of fluid **7** within the conduit **25** between the check valve **26** and the venturi **28.** The dielectric reflecting

particles 6 are shown as glass beads having the substantial shape of spheres ranging in size about a median diameter of 0.002 inch. Each glass sphere has approximately one-half of the surface thereof covered with a reflective coating such as silver or aluminum. The spheres are able to reflect a light beam incident upon a surface to return in a direction substantially parallel to the incident beam. Examples of reflecting particles suitable for use with this invention can be found in U.S. Pat. Nos. 2,726,161; 2,790,723; 2,842,446; 2,853,393; 2,870,030; 3,025,764 and 3,149,016. This optical characteristic of the dielectric reflecting particles 6 enables a reliable reading of the marking even when the mark is located on a glaring surface. The reflecting particles 6 are located in a second reservoir 32 and are connected by a conduit 19 to a mixing chamber or mixer 17. The mixing chamber 17 has an air vent 18 to allow mixing of the dielectric particles 6 with air to create a stream through a conduit 20 to a venturi 29.

The motive element of the first and second motive means 21 and 22 is shown as an air compressor 35 having a high pressure output and two low pressure outputs. The low pressure output conduits 44 and 45 are connected to a first and a second valve 41 and 42 which are respectively connected to the venturis 28 and 29 by conduits 38 and 39. The control means 15 includes conduit 36 connected to the high pressure output of the air compressor 35 which is connected to a manual air pressure valve 47 and an automatic air pressure valve 48. The automatic valve 48 can be activated by a signal such as the position of the case 14 to automatically energize the control means 15 to mark the case 14 when the case is in the proper position. The manual valve 47 and the automatic valve 48 are each connected to a shuttle valve 49, the output of which is applied to a conduit 51. The conduit 51 is connected to an impulse valve 53 and a throttle valve 54 which throttle valve is connected by a conduit 57 to an impulse valve 58. The impulse valves 53 and 58 convert an air signal activated by either valve 47 or 48 having a fixed pressure and a variable time duration into an air signal having a fixed pressure and a fixed time duration. A delay line conduit 59 having an end which is sealed by a plug 60 is connected to the impulse valve 58 to delay the output of the impulse valve 58 relative to the output of the impulse valve 53. The outputs of the impulse valves 53 and 58 are fixed in pressure and time duration but the output of the impulse valve 58 is delayed relative to the output of impulse valve 53. The output of impulse valves 53 and 58 are connected by conduits 61 and 62 to the activating input of the first and second valve 41 and 42 to energize the valves thereby.

The apparatus shown in FIG. 1 operates in the following manner. Upon activation of either the manual valve 47 by an operator or the automatic valve 48 by a sensor sensing the position of the case 14, an air pressure signal is applied through the shuttle valve 49 to the impulse valve 53 and the throttle valve 54. The throttle valve 54 applies a modified signal through the conduit 57 to the impulse valve 58. The throttle valve 54 in conjunction with the length of the delay conduit 59 determines the delay of the output of impulse valve 58 relative to the output of the impulse valve 53. Upon an output of fixed duration of the impulse valve 53, the first valve 41 is energized applying low pressure air from the air compressor 35 to the venturi 28 to exit through the nozzle 11. By Bernoulli's Principle, the liquid 7 stored in the conduit 27 and the reservoir 31 is drawn to the venturi 28 to be sprayed out the nozzle 11 to the surface 5 with a stream of air. The stream of the liquid 7 contacts the surface 5 and produces a thin layer of liquid coating on the surface 5 to prepare the surface for an attractive force with the dielectric particles 6. Subsequently, an output from the impulse valve 58 is applied to the second valve 42 by the conduit 62. Upon activation of the second valve 42, low pressure air from the air compressor 35 through the conduit 45 is applied to the venturi 29 to exit from the nozzle 12. The dielectric reflecting particles 6 stored in the reservoir 32 are mixed with air in the mixing chamber 17 and are drawn by venturi effect through the conduit 20 to exit through the nozzle 12 with a stream of air upon the prepared surface 5. The spray of the dielectric particles 6 through the nozzle 12 can either overlap or be a distinct duration in time relative to the spray of the liquid from the first nozzle 11. The nozzles 11 and 12 may be movable to mark a surface in various locations to enable a code to be marked on the surface.

An apparatus has been constructed in accordance with FIG. 1 and has operated as heretofore described. The complete mechanism which causes the reflecting dielectric particles 6 to be retained on the surface 5 is not completely understood. The dielectric particles 6 display a pronounced electrostatic charge and at least one mechanism which comprises the attractive force is an electrostatic attraction. The electrostatic charge is thought to be generated by tribo-electrofication between other particles, with the venturi 28 or with the nozzle 12. The static charge of the dielectric particles 6 is so strong that the particles have been observed to stick on glass, paper, plastic, wood metal and the like. Particles have also been observed to attract together in a cluster when subjected to a liquid having a high surface tension such as water. In the operation of the actual apparatus, the fluid was sprayed through nozzle 11 approximately one-tenth of a second prior to the spraying of the dielectric particles 6 through the nozzle 12. The nozzle to surface distance was between two and three inches producing a three quarter inch diameter marking. If the beads are sprayed onto the surface 5 prior to spraying of the fluid, then the beads fall off the surface 5. It is evident that the surface is prepared in some manner by use of the fluid. Among but not exclusive of the fluids used in developing this invention are methyl, ethyl and isopropyl alcohol and diluted glycerin. After the surface 5 has been sprayed with the liquid 7, the dielectric particles 6 that are sprayed from the nozzle 12 stick to the surface 5. One possible explanation for this phenomena is the fact that the liquid 7 on the surface 5 creates a thin liquid barrier which absorbs the impact of the sprayed dielectric particles 6 to eliminate the possibility of the dielectric particles 6 bouncing off. The dielectric particles 6 then remain by electrostatic charge with the liquid evaporating to leave only the reflecting dielectric particles 6. The dielectric particles 6 are not effected by the humid condition of the adjacent areas wherein the relative humidity approaches 100% providing that the evaporation of fluid 7 takes place in the code application area. The dielectric particles 6 have been observed to remain on the surface 5 for a period of months but can be brushed off by mechanical means or by a case washer using a water jet. Although several alcohols and glycerin have been used in this apparatus, the alcohols work superior to

the glycerin. In the development of this invention, a gelatin as used with the retro-reflective beads was tested in an effort to provide adherence of the dielectric particles to the surface but the gelatin material would not give adequate reflectivity. Water soluble adhesives were tested for adherence of the dielectric particles to the moist surface but the adhesives covered portions of the dielectric particles and thereby greatly reduced the reflectivity of the marking. In addition, when an adhesive was used, the dielectric particles would form a marking several layers thick of the reflective particles. This invention produces a layer substantially one bead thick. Consequently, more beads had to be used in order to obtain the same reflectivity. For example, experiments have demonstrated that using the reflective glass beads with a volatile fluid produces a reflectivity of 10 to 100 times brighter than the equivalent area of using beads with adhesive incorporating the same number of identical glass beads. Marking the surface **5** with the glass beads **6** in the absence of a binder is of great economic importance in the application of this invention.

The invention has been described in FIG. **1** as a pneumatic system, however, the control means **15** which energizes the first and second valves **41** and **42** can be replaced by a mechanical cam or an electronic circuit to provide the proper valve timing. In addition, the application of the fluid **7** and the dielectric particles **6** need not be done in the presence of an air stream. The application of the fluid and the dielectric particles **6** can be applied by various mechanical applicators or in a cascade fashion along the surface **5.** Consequently, the invention also resides in the method of temporarily marking a surface with a plurality of dielectric particles which comprises steps of preparing the surface for attraction with the dielectric particles. The preparation of the surface **5** for attraction includes removing sufficient moisture from the surface to allow attraction and to decrease evaporation time of a moist surface and is shown in FIG. **1** to comprise spraying the surface **5** with a fluid **7.** The spraying fluid prepares the surface in at least one of the aforesaid possible mechanisms. The next step in the method is establishing an attractive force between the dielectric particles and the prepared surface. The step of establishing an attractive force includes charging the dielectric particles with an electrostatic charge by some method such as triboelectrification. The next step of the method is depositing the particles at the prepared surface to be held thereat by the attractive force which includes an electrostatic force to retain the glass beads on the prepared surface until removed by a stream of water directed at the dielectric particles.

FIG. **2** is an isometric view showing the case **14** containing a plurality of milk cartons including **64–66.** The case **14** is resting on a conveyor **70** between guard rails **72** and **73** in order to move the milk cartons from one location to another, for example, from a packaging plant to a refrigerated warehouse. The case **14** passes in proximity to a reading device **80** which has a plurality of light sources and a light sensitive device. A light source **82** and a light sensitive device **83** are shown by the cut out of the reading device **80.** The light source **82** is established to project a beam **84** to a marked surface **5A** of the surface **5** which has an angle of approximately 3° to 10° from a normal **85** projecting from the surface **5A.** For a glaring surface, an incident beam **84** impinging thereon will produce a reflected beam **86,** but since the surface **5A** comprises a plurality of light reflecting particles having the characteristic of reflecting the beam substantially along the same path as the incident beam, the majority of light reflected by the surface **5A** will return along a beam **88** to the light sensitive device **83.** Only if the surface **5A** is covered with the plurality of reflecting particles as described in this invention, will the light sensitive device **83** receive a light signal generated by the light source **82.** In the absence of the dielectric reflecting particles on the surface **5A,** the reflection from the incident beam **84** will be along the beam **86.** The surface **5** in FIG. **2** illustrates an example of a coding system including ten blocks representative of the ten possible positions in which to place a marking. Consequently, ten light sources and ten light sensitive devices are required to read the code on the case **14.** If a single light source and light sensitive device is desired then the light source and light sensitive device must be able to scan each of the possible positions of the marking. An output from the reading device **80** can be used to automatically route the case **14** into the proper storage area.

The apparatus and method for applying a readily removable mark to a surface has been described with emphasis upon the packaging of food products such as dairy, bottling, food products and the like. The invention has the ability to be applied in these situations since the materials used are non-toxic and suitable for use in making products for human consumption. However, the invention can be incorporated into any application where a readily removable marking is desired having a high reflectivity which has the possibility of being located in a moist or damp environment.

The present disclosure includes that contained in the appended claims, as well as that of the foregoing description. Although this invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. The method of temporarily marking a surface associated with a container with a plurality of dielectric particles each particle having a portion of the surface thereof covered with a light reflecting coating, comprising the steps of:

applying a liquid to the surface to prepare the surface for attraction with the dielectric particles;

establishing an attractive force between the dielectric particles and the prepared surface;

depositing the particles at the prepared surface to be held thereat by the attractive force;

shining an incident light beam on the deposited particles from one side of a plane being substantially perpendicular to the surface at the point of incidence;

detecting a reflected light beam from the light reflecting coating of the deposited particles on the same side of the plane as the incident beam for conveying information thereby;

and removing the particles to allow remarking of the surface.

2. The method as set forth in claim 1, wherein the step of establishing an attractive force includes charging the dielectric particles with an electrostatic charge.

3. The method of applying a readily removable light reflecting marking to a moist surface associated with a container located within a humid environment with a plurality of glass beads having substantially half of the surface thereof covered with a reflecting coating, comprising the steps of:

spraying the moist surface with water miscible liquid to combine with the moisture on the surface to prepare the surface for electrostatic attraction;

charging triboelectrically the glass beads;

applying the charged glass beads to the prepared surface to be held by electrostatic force between the prepared surface and the glass beads to convey information thereby;

and removing the glass beads from the surface to allow remarking of the surface.

4. The method as set forth in claim 3 wherein the step of spraying includes mixing the miscible liquid with air in a venturi;

and projecting the air and liquid mixture through a nozzle at the moist surface.

5. The method as set forth in claim 3 wherein the step of charging the glass beads includes propelling the glass beads to rub against a container surface.

6. The method as set forth in claim 3 wherein the step of applying the charged glass beads includes mixing the glass beads with an air stream in a venturi,

and projecting the air stream with the glass beads through a nozzle to impinge upon the prepared surface.

7. The method as set forth in claim 3 wherein the step of applying the charged glass beads includes spraying the charged glass beads on the moist surface prepared with a layer of the water miscible liquid to allow the water miscible liquid layer to decelerate the impact of the charged glass beads on the moist surface to prevent the charged glass beads from bouncing off the moist surface.

8. The method as set forth in claim 3 wherein the step of spraying includes spraying the moist surface with a volatile liquid capable of evaporation after application of the charged glass beads.

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