

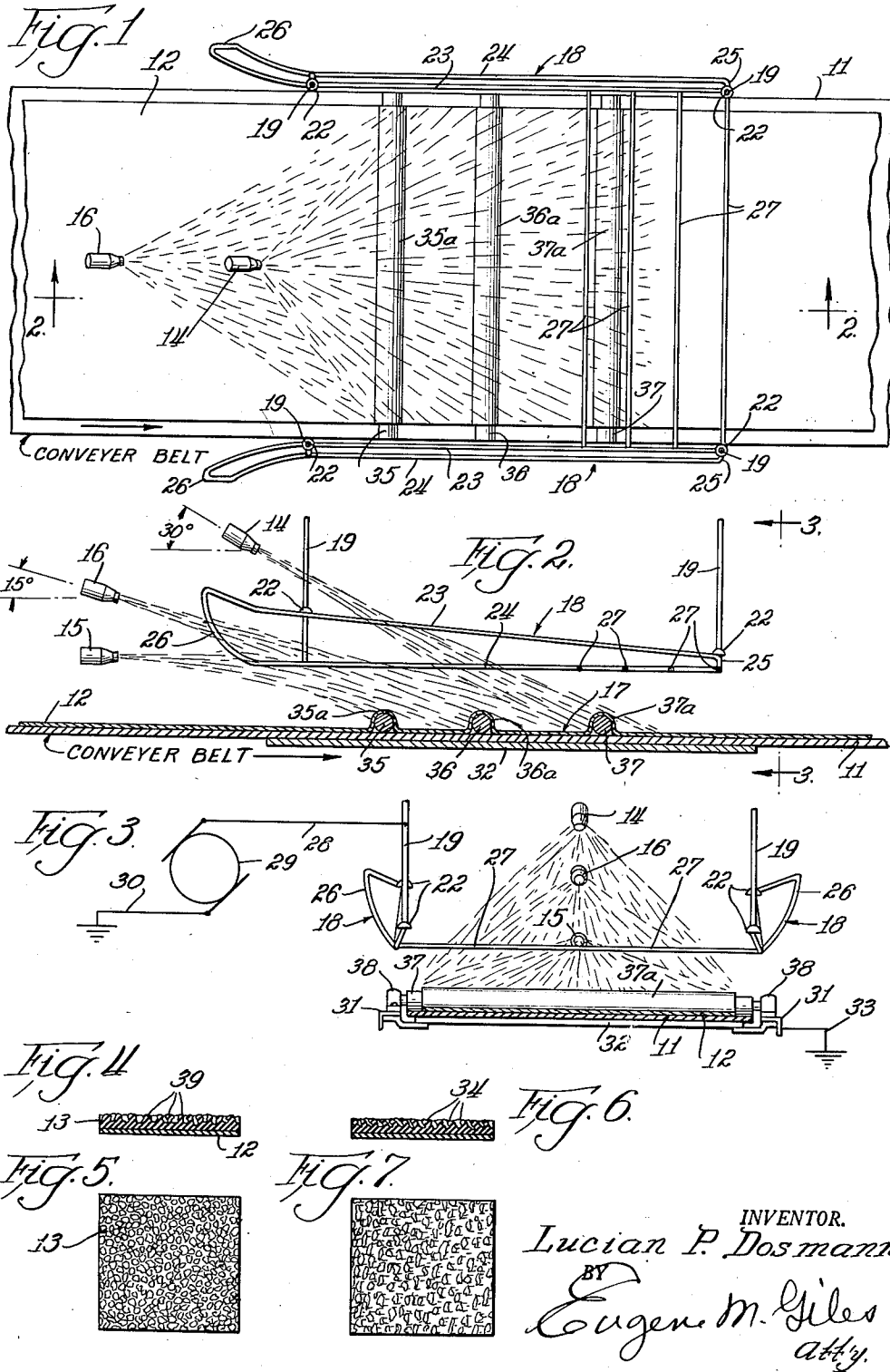
May 6, 1952

L. P. DOSMANN

2,595,342

METHOD AND APPARATUS FOR APPLYING OBLIQUE SPRAY

Filed July 30, 1948



UNITED STATES PATENT OFFICE

2,595,342

METHOD AND APPARATUS FOR APPLYING
OBLIQUE SPRAY

Lucian P. Dosmann, South Bend, Ind., assignor
to Mishawaka Rubber and Woolen Manufac-
turing Company, Mishawaka, Ind., a corpora-
tion of Indiana

Application July 30, 1948, Serial No. 41,528

6 Claims. (Cl. 117-93)

1

My invention relates to the spraying of continuously advanced flexible sheet material with a spray which is directed at an acute angle to the direction in which the sheet is passed through the spraying zone and has reference more particularly to a method of and apparatus for applying the sprayed particles perpendicularly on the sheet.

In quantity production of spray surfaced flexible sheet materials, it is customary to pass the sheet material in a continuous manner through the spraying zone.

Moreover, it has been found advantageous and desirable, not only for the purpose of avoiding wastage of the spraying material due to overspray beyond the margins of the sheet, but also for the purpose of greater uniformity of spray application across the width of the sheet, to employ electrostatic control of the character disclosed in Ransburg Patents 2,247,963, 2,270,341, 2,334,648 and 2,428,991.

In accordance with the principles of said patents, charged electrodes of like polarity, are arranged at opposite sides of the path of the spray so as to create between the electrodes an electrostatic field in which the sprayed particles become charged with electricity of that same polarity, and an electric charge of opposite polarity is impressed on the article or material to be sprayed so that said article or material attracts the charged particles of the spray thereto.

For effective electrostatic control in spraying sheet material which is continuously advanced through the spraying zone, the spraying devices are arranged to discharge at an acute angle to the direction of movement of the sheet material so that the direction of spray is somewhat lengthwise of the moving sheet and of the electrodes, which latter are located just beyond the lateral margins of the sheet and extend a considerable distance along the path of the sheet to insure sufficiently prolonged exposure of the sprayed particles to the electrostatic field to become adequately charged.

In some sheet spraying operations, however, for example, in making sprayed latex sheet materials, such as disclosed in co-pending application Serial No. 550,964, now Patent 2,501,839, granted March 28, 1950, which I filed jointly with Virgil H. Bodle and George W. Blair, wherein the sprayed particles are accumulated or piled up on the sheet in somewhat individualized formations simulative of tufted or pile carpeting, while the electrostatic control of the spraying is quite desirable in order to avoid wastage of the latex and

2

to contribute uniformity to the spraying across the width of the sheet, the angularity of the spraying, somewhat lengthwise of the sheet, which is required for the electrostatic control, causes a building up of the tuft or pile simulative formations at an undesirable inclination toward the source of the spray so that they appear to lean in that direction, whereas it is desirable that the formations be upright or perpendicular to the surface of the sheet.

Moreover, it is important in making sheet materials with such sprayed formations, that the sprayed particles be applied to the sheet perpendicularly as better attachment thereof is effected thereby and a surfacing of better wearing properties is obtained.

The principal objects of my invention are to provide an improved method and improved facilities for spraying on sheet material a surfacing simulative of tufted or pile carpeting; to insure perpendicular application on a sheet of particles which are sprayed in a direction non-perpendicular to the direction in which the sheet is passed through the spraying zone; and to provide an improved method and improved facilities for electrostatic spraying, these and other objects being accomplished as pointed out more fully hereinafter and as shown in the accompanying drawing, in which:

Fig. 1 is a top view of equipment for spraying sheet material in accordance with my invention;

Fig. 2 is a view taken on the line 2-2 of Fig. 1;

Fig. 3 is a view of the equipment of Fig. 2 taken substantially on the line 3-3 of Fig. 2;

Figs. 4 and 5 are sectional and top views respectively of spray surfaced material simulative of tufted or pile carpeting as made in accordance with the present invention; and

Figs. 6 and 7 are views corresponding respectively to Figs. 4 and 5 and showing simulative tufted or pile carpeting material as made with electrostatically controlled spraying equipment like that of Figs. 1, 2 and 3 but without the facilities of the present invention for perpendicular application of the spray.

Referring to the drawing which is illustrative of a preferred form of equipment for making a sprayed surfacing which simulates tufted or pile carpeting, the reference numeral 11 indicates a conveyer belt, which is made of rubber coated fabric, and operated continuously in the direction indicated by the arrows in Figs. 1 and 2 to support and convey flexible sheet material 12 horizontally through a zone wherein the surfac-

3

ing is sprayed onto the top surface of the sheet material 12.

For making a surfacing, such as referred to particularly hereinbefore and illustrated at 13 in Figs. 4 and 5, which simulates tufted or pile carpeting, a coagulable dispersion, such as latex, is employed and sprayed, together with a spray of suitable coagulant, onto the sheet 12 as the latter is carried by the conveyor 11 through the spraying zone.

The spray is electrostatically controlled in a manner hereinafter described, and for effective electrostatic control the latex and coagulant spray nozzles are arranged substantially as shown in Figs. 1, 2 and 3 wherein 14 and 15 indicate upper and lower latex spray nozzles respectively, and 16 a coagulant spray nozzle, each of which nozzles is located in a plane midway between the lateral margins of the belt 11 and produces a fan-like spray extending flatwise across and of sufficient spread to cover the width of the sheet material 12 on the conveyor belt.

The lower latex nozzle 15 is positioned to spray horizontally in the direction of movement of the conveyor belt 11 and the coagulant nozzle 16 is located directly above the horizontal nozzle 15 and arranged to discharge at an angle of approximately 15° to the horizontal plane of the belt 11, the elevation of said nozzle 16 being such that the plane of discharge of the spray from the nozzle 16 intersects the belt at substantially the location indicated at 17 in Fig. 2.

The upper latex nozzle 14 is located at the front of and at an elevation above the coagulant nozzle 16, and is directed at an angle of approximately 30° to the plane of the belt 11, the arrangement being such that the plane of discharge of the spray from said nozzle 14 intersects the belt at substantially the same place 17 as the spray plane of the coagulant nozzle 16.

Thus, the latex sprays are at opposite sides of and intersect the coagulant spray so that the sprayed latex particles are commingled with the sprayed coagulant and substantially coagulated thereby before deposit of said latex particles on the sheet 12, and the direction of all of the sprays is generally lengthwise of the belt in the direction of movement thereof.

For electrostatic control of the spray from the nozzles 14, 15 and 16, a pair of corresponding long electrodes 18 are provided which extend respectively along the lateral margins of the belt from a transverse plane just behind the upper latex nozzle 14 to a transverse plane substantially beyond the place 17 where the spray planes of the two nozzles 14 and 16 intersect the belt 11, as indicated in Fig. 2, said electrodes being suspended by hangers 19 and in an insulated manner, through insulators 22, at substantially the same elevation above the belt 11 as the nozzle 15.

Each said electrode 18 comprises a wire frame of electrically conductive wire with upper and lower lengths 23 and 24 respectively of the wire joined together somewhat closely at the ends remote from the nozzles, as indicated at 25, and diverging toward the nozzle ends where these upper and lower lengths 23 and 24 are connected by outwardly flared wire loops 26. Spaced cross wires 27 also connect the lower wire lengths 24 at the end of the electrodes remote from the nozzles as indicated in Figs. 1, 2 and 3.

These electrodes 18 which are electrically connected together by the cross wires 27 are connected by a conductor 28 to the negative pole of a high potential direct current generator 29, the

4

other positive pole of which is grounded as indicated at 30.

Metal frame members 31 extend along the lateral margins of the belt 11 at the spraying zone and support a metal plate 32 upon which the conveyor belt 11 slides and this metal plate 32 and the frame members 31 are grounded through the ground connection 33 so as to receive a positive charge from the grounded positive pole of the generator 29.

Thus, when the generator 29 is in operation and latex and coagulant are sprayed from the respective nozzles 14, 15 and 16, the electrodes 18 and their cross wires 27 are negatively charged and create a negative field between the electrodes and around the cross wires 27 which imparts a negative charge to the latex particles and coagulant sprayed from the nozzles 14, 15 and 16, and when the particles are thus charged, the corresponding negative polarity of the electrodes 18 and cross wires 27 provide a barrier effect by which the sprayed particles are confined to the zone over the belt 11 and wastage of latex due to overspray beyond the lateral margins of the belt is thus substantially avoided.

Moreover, the confinement or localization of the spray over the belt 11 is further promoted by the positive polarity of the belt underlying plate 32 which thereby has an attraction for the negatively charged particles of the spray which tends to draw them down upon the surface of the overlying belt 11.

In normal operation of this equipment a base sheet 12 of flexible material is supported on the belt 11 and conveyed thereby through the spraying zone and the plate attracted negatively charged spray particles are deposited on the surface of the sheet 12.

By proper location of the nozzles 14, 15 and 16 and proper control of the spray from these nozzles and exposure of the sheet 12 in the spray zone for a sufficient length of time, all as explained in the aforesaid co-pending application Serial No. 550,964, the sprayed particles deposit on the sheet 12 in irregular rough surfaced more or less individualized formations simulative of tufts or pile elements of tufted or pile carpeting and the spray surfaced sheet greatly resembles such carpeting.

In practicing this present invention, I have used a belt 11 which is 60 inches wide and obtain uniform coverage of a base sheet 12 of approximately belt width with a single set of nozzles 14, 15 and 16 positioned midway of the width of the belt and located respectively at elevations of 31 inches, 22 inches and 12 inches above the belt. The electrodes 18 are of an overall length of approximately 90 inches and the bottom of the electrodes 18 is approximately 11 inches above the surface of the belt 11.

While the above described electrostatic spray control is advantageous and desirable because it avoids overspray and wastage of latex, the necessary disposition of the nozzles to discharge in a direction generally lengthwise of the electrodes 18 and of the sheet 12 results in building up of tuft or pile-like formations on the sheet 12 which lean, as indicated at 34 in Fig. 6, toward the source of the spray.

This is undesirable, not only from the standpoint of appearance, but also because the oblique application of the latex particles on the sheet (which causes the leaning effect) does not effect as firm attachment of the latex particles, nor

as durable a wearing surface as perpendicular application thereof.

To overcome this disadvantage of electrostatic spray control and insure substantially perpendicular application of obliquely sprayed particles on the sheet 12, I provide means whereby the sheet 12 is progressively looped upwardly from the belt 11 at selected locations so as to present one side of each loop substantially directly in the path of the spray.

For this purpose idler rolls, such as indicated at 35, 36 and 37 are provided which are located at spaced intervals along the belt 11 at the zone of spray application, and sufficiently above the belt to preclude contact therewith.

These idler rolls are of metal and journaled at their opposite ends to rotate freely in bearings 38 on the side rails 31 so that these rolls are grounded through the grounded rails 31 and acquire a positive charge when the generator 29 is in operation.

The sheet 12 on the conveyer belt 11 is laid over the rolls 35, 36 and 37 and when the spraying device is in operation and the sheet 12 is advanced with the conveyer 11 through the spraying zone, the sheet progressively climbs over the rolls 35, 36 and 37 successively and hugs these idler rolls closely, as indicated at 35a, 36a and 37a. These rolls, as hereinbefore indicated, turn freely in their bearings 38 and rotate with the movement of the sheet 12 thereover.

These rolls 35, 36 and 37 are all located within the zone of spray application, the rolls 35 and 37 near the entrance, and exit ends respectively and the roll 36 substantially midway therebetween, as shown, and each roll 36 and 37 is located sufficiently beyond its respective preceding roll so that substantially the entire uprising side of the portions 36a and 37a of the sheet 12 are exposed to the spray without obstruction thereof by the preceding roll.

Spray from the lower horizontal latex nozzle 15 is deflected downwardly by the angular coagulant spray from the nozzle 16, and this, together with the charging of the latex particles by the electrodes 18 and the attraction of the plate 32 for these charged particles, causes a substantial latex deposit on the sheet 12 at the front and top of the first roll 35. Therebeyond the portion of the spray from the nozzle 15 which is not intercepted by the fold 35a, and the spray from the 30° nozzle 14 are directed, by the conjoint effect of all the nozzles and the attraction of the plate 32, generally in the direction of the rolls 36 and 37 so that there is a substantial deposit of latex on the uprising portions of the sheet at the front and top of the rolls 36 and 37.

The direction of movement of the spray particles at the roller locations 35, 36 and 37 is generally substantially perpendicular to the sheet 12 at the place of impact therewith and thus the tuft or pile-like formations are built up substantially perpendicularly on the sheet 12, as indicated at 39 in Fig. 4 and the undesirable leaning or inclined arrangement of the tuft or pile-like formations which otherwise would result, as indicated at 34 in Fig. 6, from the oblique direction of the spray is completely avoided.

Moreover, by reason of this perpendicular application of the spray particles to the sheet 12 a more substantial attachment of the particles to the sheet 12 and to one another results and a surfacing of superior wearing properties is assured.

Furthermore, as the sheet 12 passes over the rolls 35, 36 and 37 the curvature imparted thereto

spreads apart the accumulating formations 39 and permits sufficient penetration of latex particles therebetween to anchor the formations more securely in place and maintain them more effectively in upright position.

From the foregoing it will be understood that I have provided an effective method and simple and convenient facilities whereby particles, which are sprayed obliquely to the plane of movement of flexible sheet material through the spraying zone, as in electrostatically controlled spraying, may be applied perpendicularly onto the sheet surface.

While I have shown and described my invention in a preferred form, I am aware that various changes and modifications may be made therein without departing from the principles of my invention, the scope of which is to be determined by the appended claims.

What is claimed is:

1. In a spraying device for spraying sheet material, the combination of a horizontal conveyer for supporting and advancing the sheet, an idler roll extending transversely over the conveyer, and spraying means positioned to discharge spray therefrom in a direction lengthwise of the conveyer and toward one side of said idler roll, said idler roll being operable to locally deflect the sheet material upwardly from the conveyer.

2. In a spraying device for spraying sheet material, the combination of a horizontal conveyer for supporting and advancing the sheet, an idler roll extending transversely over the conveyer, spraying means positioned to discharge spray therefrom in a direction lengthwise of the conveyer and toward one side of said idler roll, said idler roll being operable to locally deflect the sheet material upwardly from the conveyer, electrostatic spray charging electrodes above the conveyer and extending lengthwise thereof at opposite sides respectively of the path of the spray from said spraying means, a source of electrostatic current having poles of opposite polarity, one of which is electrically connected with said electrodes, and electrode means under said spray path and over which electrode means the sheet material is advanced by the conveyer, said electrode means being electrically connected to the other of said poles of the electrical energy source.

3. In the coating of flexible sheets wherein a sheet is continuously fed edgewise through a spray zone and the direction of the spray is towards the sheet, in the direction of the travel thereof and at an acute angle thereto, the step of diverting the path of travel of the sheet from the plane thereof at a selected point in said spray zone, said sheet being diverted and conducted in a path transversely across the spray at substantially right angles thereto.

4. In the coating of flexible sheets wherein a sheet is continuously fed edgewise through a spray zone and the direction of spray is towards the sheet, in the direction of the travel thereof and at an acute angle thereto, the steps of diverting the path of travel of the sheet at selected points in said spray zone, said sheet being diverted and conducted in separate paths transversely across the spray at substantially right angles thereto and exposed to the spray.

5. In the spray coating of flexible sheets wherein a sheet is continuously fed edgewise through an electrostatic field having a spray zone therein and the direction of the spray being towards the sheet in the direction of travel thereof and at an acute angle thereto, the step of diverting the

7

path of travel of the sheet from the plane thereof at a selected point in the spray zone, said sheet being diverted and conducted in a path transversely across the spray at substantially right angles thereto.

6. The method of spray surfacing a flexible sheet, which said method comprises continuously advancing the sheet along a substantially horizontal path in a spray zone with one side of the sheet facing upwardly; maintaining in said spray zone above said path a spray of surfacing material particles moving in a direction lengthwise of and gradually approaching said path in the direction of travel of said sheet and constantly accumulating some of said particles on said upwardly facing side of the sheet as it advances along said substantially horizontal path;

8

at a selected place in said spray zone continuously advancing the sheet upwardly from said substantially horizontal path along an abruptly ascending path, and around a curved path to an abruptly descending path.

LUCIAN P. DOSMANN.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,883,535	Burnett	Oct. 18, 1932
2,281,558	Cross	May 5, 1942
2,283,372	Kolmar	May 19, 1942
2,446,953	Ransburg	Aug. 10, 1948