Sept 17, 1957 J. W. THACKARA ET AL 2,806,803

METHOD OF MAKING PAINTING ROLLER

Filed July 11, 1952 2 Sheets-Sheet 1

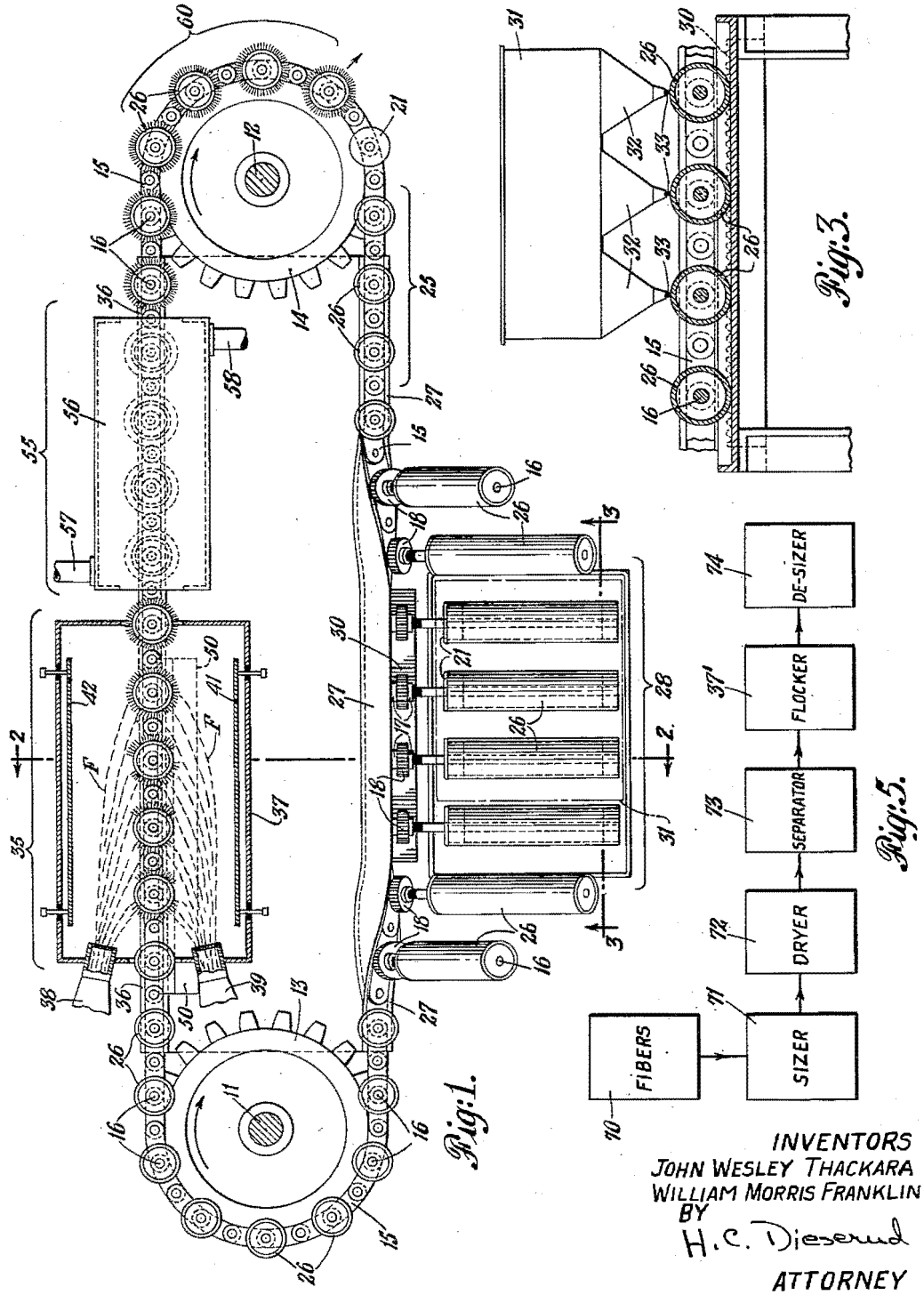

Fig. 1.

Fig. 3.

Fig. 5.

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Fig:4.

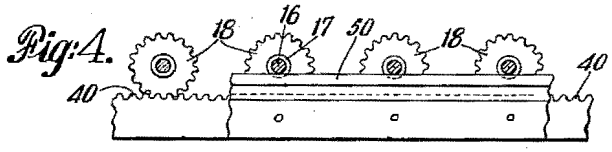

Fig:2.

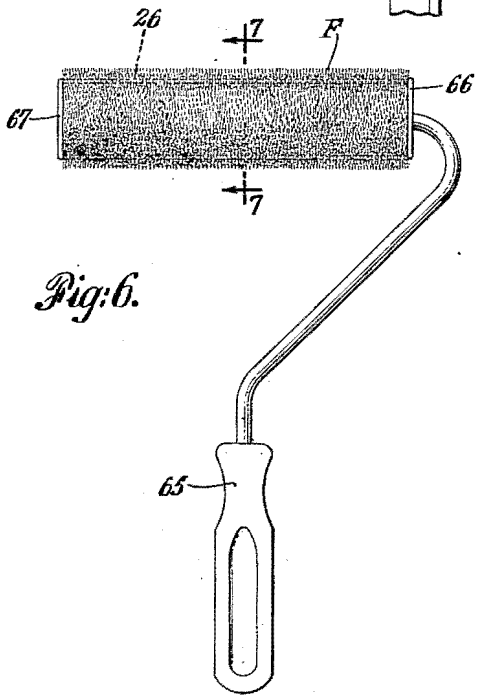

Fig:6.

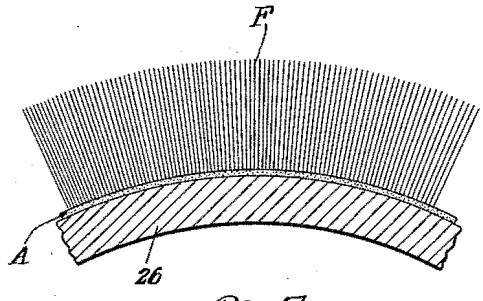

Fig:7.

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METHOD OF MAKING PAINTING ROLLER

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1 Claim. (Cl. 117—17)

The present invention relates to applicators for paint and the like and more particularly to applicators of the roller type for applying paint and other coating materials to walls, ceilings and other surfaces.

A principal object of the invention has been to provide a novel and improved roller type applicator for paint and the like.

More particularly, it has been an object of the invention to provide an inexpensive paint applicator of the above type having a seamless, paint absorbing pile.

Another object of the invention has been to provide a paint applicator having a pile comprising relatively long, thin, flocked fibers.

Still another object of the invention has been to provide a simple and efficient flocking process for producing a roller type paint applicator having a seamless pile.

Other and further objects, features and advantages of the invention will appear from the following description.

In accordance with the invention, the roller-type paint applicator comprises a cylindrical sleeve or roller and a seamless absorbent covering surrounding the roller, the covering comprising a plurality of closely spaced flocked fibers adhesively attached to the roller and projecting substantially perpendicularly therefrom. Also in accordance with the invention, the paint applicator is produced by applying a coating of adhesive material to a cylindrical sleeve or roller while the roller is in a substantially horizontal position, advancing the roller through an electrostatic field provided between a plurality of electrodes, one of which constitutes a support for the roller, causing the roller to revolve about its longitudinal axis while within the electrostatic field, and directing a stream of flock fibers onto the roller within the electrostatic field.

The invention will now be described in greater detail with reference to the appended drawings in which:

Fig. 1 is a plan view of a machine for producing paint applicators according to the invention;

Fig. 2 is a sectional view taken along the line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 1;

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 2;

Fig. 5 is a block diagram, in the nature of a flow sheet, illustrating a process, in accordance with the invention, for producing a roller-type paint applicator having a seamless paint absorbing pile formed of relatively long, thin, flock fibers;

Fig. 6 is an elevational view of a paint applicator and handle according to the invention; and

Fig. 7 is an enlarged sectional view taken along the line 7—7 of Fig. 6.

Referring now to the drawings and more particularly to Figs. 1 through 4 thereof, there is illustrated a machine for carrying out the process of the invention. The machine is provided with a supporting frame or table 10 adjacent either end of which are journaled a pair of vertical shafts 11 and 12. Each of shafts 11 and 12 has

affixed thereto adjacent its upper end a respective one of a pair of sprocket wheels 13 and 14 which are adapted to carry a flexible chain or belt 15 having spaced notches adapted to mate with the teeth of the sprocket wheels. Means, which may include a suitable electric motor (not shown), are provided for rotating one of the shafts, 11 and 12, thereby causing the belt 15 to travel with the sprockets 13 and 14 and rotating the other of shafts 11 and 12.

The belt 15 is provided with sockets at spaced intervals along the length thereof for rotatably carrying a plurality of support pins or rods 16. As is best shown in Fig. 2, the pins 16 are journaled at their lower ends in suitable sockets or holes in the belt 15, the belt being provided with a substantial width to insure adequate support for the pins 16. Slightly above the plane of the upper edge of the belt 15, the pins 16 are each provided with a sleeve or bushing 17 for carrying a gear 18. Just above the bushing 17, the pins 16 are provided with an electrically insulating section 19 the purpose of which will be made clear hereinafter.

Above the section 19, each of the pins 16 is provided with a collar 20 having a flange 21 of somewhat greater diameter affixed to the bottom thereof. Another collar 22, having the same diameter as the collar 20, is affixed to each of the pins 16 adjacent the upper end thereof.

As shown in Fig. 1, the belt 15 travels in a clockwise direction at a suitable predetermined speed through a number of stations or operating positions. The first of these stations, which may be termed the loading station, is located along the belt 15 as it leaves the sprocket 14 and is indicated generally by the numeral 25. In this station, cylindrical rollers or sleeves 26 are placed over the collars 20 and 22. The rollers 26 may be placed in position manually, or suitable mechanical means (not shown) may be employed.

As the belt 15 leaves the sprocket 14, it enters a guide channel 27 having a generally U-shaped cross section and which guides the belt until it is engaged by the sprocket 13. The channel 27 is so shaped that at either end thereof the opening of the U faces upward, while in the middle portion thereof which is co-incident with a station generally indicated at 23, the opening of the U faces sideways. Intermediate the middle and end portions thereof, the channel goes through a relatively even transition to carry the belt 15 smoothly from a horizontal plane in station 25 to a substantially vertical plane in station 28 and back to a horizontal plane before the belt 15 is engaged by the sprocket 13. While the belt 15 is disposed in a substantially vertical plane, i. e., while it is within the station 28, the pins 16, on which are mounted the rollers 26, are disposed in a substantially horizontal plane.

While within the station 28, the gears 18 on the pins 16 mesh with a rack bar 30 suitably mounted on the table 10. Thus, as the belt 15 carries the pins 16 and their associated gears 18 through the station 28, the pins 16 are caused to rotate about their longitudinal axes by the meshing of gears 18 and rack bar 30.

As best shown in Figs. 2 and 3, there is provided at the station 28 a tank 31 containing a fluid adhesive suitable for coating the rollers 26 and causing flock fibers to adhere thereto. The tank 31 is provided with three ducts or nozzles 32 for dispensing the fluid adhesive at a desired rate on the rollers. If desired, each of the ducts 32 may be provided with a sponge-like applicator 33 arranged to contact the surfaces of the rollers 26. The exit portions of the ducts 32 and the applicators 33 are relatively narrow in the direction of travel of the belt 15 although sufficient width must be provided to insure a complete adhesive coating for each roller 26. As pointed out above, each roller 26 is rotated as it passes through the station

28, so that the outer surface of each roller is provided with a complete coating of adhesive. Application of adhesive in the manner described reduces the wastage of adhesive and consequent clogging of moving elements to a minimum. The tank 31 and its associated elements has been omitted from Fig. 1 in order to provide a clearer illustration of the station 28. Other adhesive dispensing arrangements may be employed. For example, one or more rotatable wheels each having a porous outer coating arranged to contact the rollers 26 may be provided. Such a wheel would be provided with a supply of adhesive for coating the rollers 26.

After leaving the station 28, the pins 16 and their adhesive coated rollers 26 are returned to a vertical position and are carried with the belt 15 around the sprocket 13 to a station 35. Between the sprockets 13 and 14, the belt 15 is carried in a guide channel 36 having a generally U-shaped cross section and having the opening of the U facing upward, as shown in Fig. 2.

The station 35, which may be termed the flocking station, comprises a generally rectangular housing 37 enclosed on all sides. The housing 37, which is supported on the table 10, is provided with openings in either end thereof for the entrance and exit, respectively, of the pins 16 and the rollers 26. The openings are made as small as conveniently possible to minimize the escape of flock fibers. A generally rectangular opening is provided in the entrance wall of housing 37 on each side of the belt 15. A pair of ducts 38 and 39 are fitted in the openings and arranged to direct flock fibers F blown therethrough onto the rollers 26 passing through the housing 37. The flock fibers, which may be separated by any suitable means such as beating, or otherwise, are blown through the ducts 38 and 39 under pressure from a supply (not shown). Means (not shown) may be provided for collecting and recirculating flock fibers not caught by the rollers 26.

As best shown in Fig. 2, the ducts 38 and 39 are rectangular in shape and have a length slightly shorter than the axial length of the rollers 26. The openings of the ducts are screened to provide further separation of the flock fibers. Means (not shown) may be provided periodically to agitate or brush the screens to free any clumps of fibers which may become caught in the mesh of the screens.

A rack bar 40, suitably supported on the base 10, is provided below the bottom of the housing 37. The rack bar 40 is arranged to engage the gears 18 thereby to cause the pins 16 and the rollers 26 to rotate while passing through the housing 37. In this manner, the entire outside surface of each roller 26 is disposed within the path of the flock fibers from nozzles 38 and 39 for sufficient time to insure formation of a relatively thick seamless pile thereon.

Thin plate electrodes 41 and 42 are provided on each side of housing 37. As shown in Figs. 1 and 2, the electrodes 41 and 42 are vertically disposed and have a height substantially coextensive with the height of the rollers 26 within the housing 37. Electrodes 41 and 42 extend almost the entire length of the housing 37. Electrode 41 is supported within the housing 37 by tubular conductors 43 and 44 which pass through and are suitably insulated from the wall of the housing 37. Electrode 42 is similarly supported by tubular conductors 45 and 46 extending through and being insulated from the other side wall of the housing 37. Conductors 43—46 are interconnected by a conductor 47 which is connected to a negative terminal of a source of potential 48. For simplicity, source 48 is illustrated in Fig. 2 as a generator, although it should be understood that the actual source of high direct voltage used would be a rectifier circuit or other suitable source of high direct voltage. The negative terminal of source 48 is grounded at 49. The positive terminal of source 48 is connected to a spring brush 50, which rides against the pins 16 as they pass through the housing 37. The brush 50 contacts the pins 16 above the insulating sections 19 thereof. It is evident therefore that an electrostatic field is set up within the housing 37 and extending between the electrodes 41 and 42 and the pins 16. The strength of the field should be selected to provide the desired effect on the flock fibers in view of the spacing between the pins 16 and the electrodes 41 and 42. The potential difference is preferably higher than 50,000 volts and may be as high as or higher than 100,000 volts, depending upon the spacing and other operating conditions. The electrostatic field will straighten the flock fibers as they pass through the housing 37 toward the rollers 26 and, since the field extends radially from the pins, will tend to cause the fibers to be embedded in the adhesive coating on the rollers 26 and extend radially therefrom. If desired, suitable means such as a mechanically operated reversing switch may be provided periodically to reverse the potentials of the electrodes 41 and 42 and the electrodes 16.

After the rollers 26 leave the housing 37, they enter a station 55 wherein the adhesive is heated to cause the fibers permanently to adhere to the surface of the rollers 26. The station 55 comprises a housing 56 having an opening at either end thereof for the entrance and exit, respectively, of the rollers 26. The housing 56 is also provided with pipes 57 and 58 for admitting warm air to heat the adhesive. It should be understood of course that any suitable heat or baking process may be employed at this station. In some cases, this station may be eliminated.

Upon leaving the station 55 the rollers 26 are carried on the belt 15 around the sprocket 14. At a station 60, which may conveniently correspond to a portion of the sprocket 14, the rollers 26 are removed from the collars 20 and 22 and are then ready to be assembled on a suitable handle or to be further processed, if desired. The pins 16 from which the rollers have been removed are carried to the station 25 where new rollers 26 are placed thereon as described above.

A complete roller or dip-type paint applicator is shown in Fig. 6. This paint applicator comprises a cylindrical sleeve or roller 26 having a coat of adhesive A on the outer surface thereof. Embedded in the adhesive A is a seamless paint absorbing pile composed of closely spaced radially extending flock fibers F. Handle 65 having any suitable shape, such as shown in Fig. 6, is provided with a shaft which may be inserted in the roller 26 to serve as an axle about which the roller 26 rotates. For this purpose, the shaft of the handle 65 is preferably journaled in suitable rings 66 and 67 provided in respective ends of the roller 26.

The flock fibers F may be made of any suitable material, such as, for example, glass, cotton, viscose, keratin or acetate rayon. The fibers, which are preferably of an inexpensive material such as those mentioned above, are preferably cut to equal lengths and separated before being blown through the ducts 38 and 39. It has been found that, for the application of most types of paint, a fiber length lying within the range of about $\frac{3}{16}$ to $\frac{19}{16}$ inch is desirable, with $\frac{7}{16}$ inch constituting a preferred length. It has also been found desirable that the fiber diameters lies within the range of about .0009 to .002 inch, with a diameter of .00095 inch being preferred. It has been found that fibers having dimensions lying within the ranges given above provide a pile having the most desirable paint absorbing and applying qualities.

An important aspect of the invention is the formation of the pile on rollers 26 without a seam. Pile fabric paint rollers, as heretofore constructed, have either had a substantially straight seam which leaves an objectionable mark in the work or the pile fabric has been wound about the roller in a spiral or similar form to minimize marking of the work by the seam. This latter method of applying a pile fabric to a roller is obviously very expensive and does not completely eliminate the undesirable marking of the work. A paint roller, in accordance with the inven-

tion, is relatively inexpensive to manufacture and has no seam which can leave a mark on the work.

In the electrostatic flocking of long, thin fibers, some difficulty has been encountered in maintaining the fibers sufficiently rigid while being blown into the adhesive coating. In accordance with a further aspect of the invention, the fibers may be sized before the flocking process in order to insure proper rigidity, and then de-sized after completion of the flocking process. A flow sheet illustrating a suitable process of this type is shown in Fig. 5.

Referring now to Fig. 5, fibers of any suitable type are fed from a hopper **70** to a sizer **71** where they are mixed with water soluble gelatin, glue, dextrine, gum-tragacanth, starch, flaxseed, or other suitable sizing agent. The sized fibers are then dried in a drier **72**, which may be of any suitable type, and then separated through some suitable process such as beating in a separator **73**. The separated fibers are then electrostatically flocked on a roller in a flocker **37'**, which may conveniently be constructed as described above. The rollers, which are provided with a flock pile in the electrostatic flocker **37'**, are then de-sized in a de-sizer **74**. The de-sizing process may be constituted by a water wash or, in the case of flaxseed size, either a water wash or a brushing operation.

While the invention has been described in particular embodiments thereof and in particular use, it should be understood that it is not limited thereto for obvious modifications thereof will occur to those skilled in the art without departing from the spirit and scope of the invention as set forth in the appended claim.

What is claimed is:

A process of producing a cylindrical paint applicator roller having a seamless pile coating wherein substantially uniformly distributed fibers extend radially outwardly of the roller, comprising mounting a plurality of untreated rollers in vertical, spaced positions on a conveying means, advancing said conveying means and simultaneously inverting said rollers to horizontal positions, rotating each of said rollers about its longitudinal axis and simultaneously applying a liquid adhesive coating material to each of

said rollers, returning said rollers to vertical positions, advancing said coated rollers into an electrostatic field extending radially outwardly of said rollers and substantially uniformly along the entire length of the longitudinal axes thereof, rotating said coated rollers about their longitudinal axes while in said electrostatic field, spraying separated sized flock fibers on said coated rollers while said coated rollers are rotating and advancing in said electrostatic field, the spraying of said fibers being directed against the exterior sides of said rollers from points on opposite sides of the planes of said rollers and along substantially the entire length thereof and at an acute angle with respect to the path of travel of the rollers through said electrostatic field, said fibers having lengths within the range of from about 0.1875 inch to about 0.6250 inch and having diameters within the range of from about 0.0009 inch to about 0.0020 inch, thereby producing a seamless, paint-absorbing pile coating on said rollers, de-sizing the fibers in said pile and thereafter subjecting said rollers to heat in order to harden the adhesive coating thereon.

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