July 7, 1970 F. B. BURNS ET AL. 3,518,970

PAINT ROLLER AND METHOD AND APPARATUS OF MANUFACTURE

Original Filed Dec. 3, 1964

Fig. 1

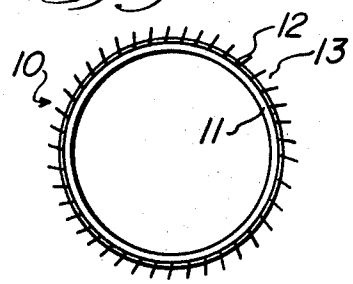


Fig. 2

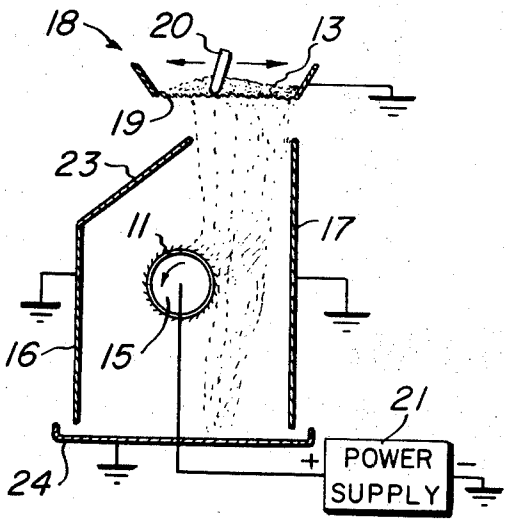


Fig. 3

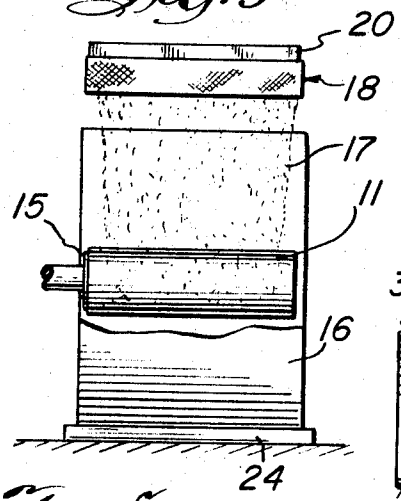


Fig. 4

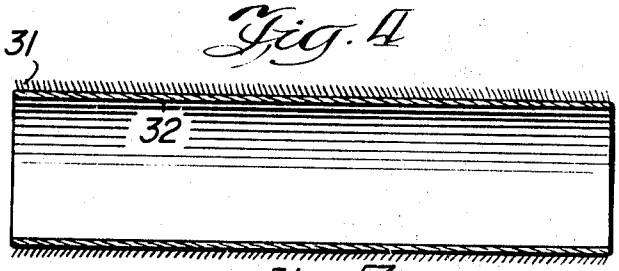


Fig. 5

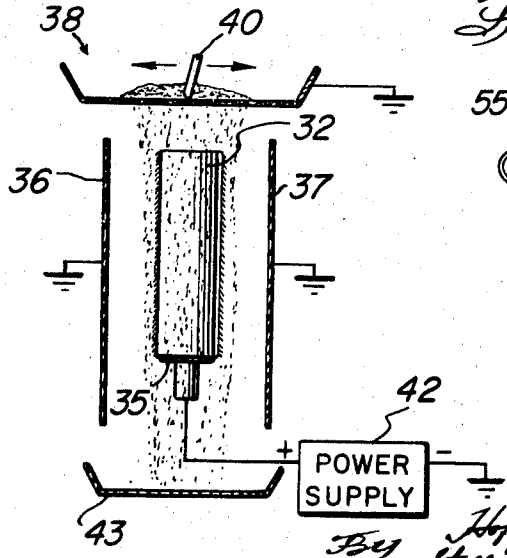
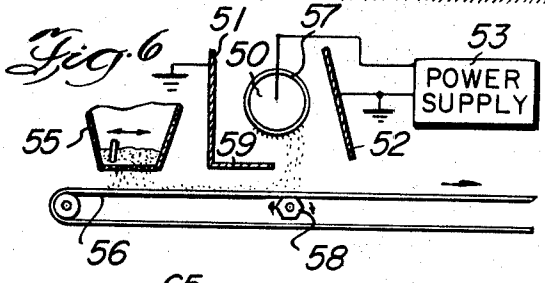


Fig. 6



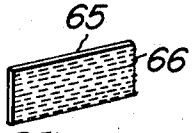


Fig. 7



Fig. 8

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PAINT ROLLER AND METHOD AND APPARATUS OF MANUFACTURE

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Original application Dec. 3, 1964, Ser. No. 415,624, now Patent No. 3,411,931. Divided and this application May 17, 1968, Ser. No. 753,311
Int. Cl. B05b 5/00
U.S. Cl. 118—640 7 Claims

ABSTRACT OF THE DISCLOSURE

A flocked paint roller sleeve having the flock fibers generally at a uniform acute angle with respect to the sleeve surface, in one form inclined peripherally and in another inclined axially of the roller. A method and apparatus for manufacturing such sleeves provides a radial electrostatic field and effects relative movement between the roller sleeve and fibers which has an unidirectional component peripheral of the sleeves.

This application is a division of our application Ser. No. 415,624, filed Dec. 3, 1964, now Pat. 3,411,931.

This invention is concerned with an apparatus for manufacture of a point applicator.

It has in the past been proposed to manufacture paint roller sleeves by a flocking process in which short fiber particles are electrostatically deposited on a cylindrical base member. See, for example, Thackara et al. 2,806,803. We have found, however, that sleeves manufactured in a manner similar to that of the Thackara patent are unsatisfactory. When painting with such a sleeve, the roller will wobble back and forth or walk across the surface at an angle to the direction the roller is moved by the painter. The finish imparted to the surface is unsatisfactory. Furthermore, such a roller sleeve is rather difficult to use. We believe this action is due to the orientation of the fibers in different directions with respect to the surface of the base member. This gives the roller sleeve an irregular nap and the resiliency of the fibers apparently causes the roller to move longitudinally as it is used.

A principal objective of this invention is to provide a flocked paint applicator in which the fibers have a generally uniform orientation with respect to the base, preferably extending from the base at an angle rather than normal thereto, overcoming the difficulties described above.

One feature of the invention is the provision of a paint roller sleeve comprising a cylindrical base having fibers secured to the outer surface thereof, each fiber extending outwardly from the base and generally at an acute angle with respect to a plane tangent to the base and the orientation of the fibers with respect to the associated plane being substantially the same. In accordance with one aspect of the invention the fibers lie in generally radial planes, at right angles to the longitudinal axis of the base and each forms an acute angle with respect to the related tangent plane. In another form of the invention the fibers lie in planes extending longitudinally of the base and passing through the longitudinal axis.

Yet a further feature of the invention is the provision of an apparatus for depositing fibers on a sleeve in which the fibers are dropped from a source past a sleeve supporting spindle with means establishing an electrostatic field between the spindle and electrodes adjacent thereto.

Further features and advantages of the invention will

readily be apparent from the following specification and from the drawings, in which:

FIG. 1 is an end view of a paint roller sleeve embodying the invention;

FIG. 2 is a diagrammatic elevation of an apparatus for manufacturing the sleeve of FIG. 1;

FIG. 3 is a view taken from the left of FIG. 2;

FIG. 4 is a longitudinal section through a modified sleeve;

FIG. 5 is a diagrammatic illustration of an apparatus for manufacturing the sleeve of FIG. 4;

FIG. 6 is a diagrammatic view of another apparatus for manufacturing applicators embodying the invention;

FIG. 7 is a perspective view of another paint applicator embodying the invention; and

FIG. 8 is an edge view thereof.

In the prior art as illustrated in the Thackara patent, adhesive coated cylindrical base members for paint rollers are moved on supports through a flocking chamber in an upright position. Flock entrained in air is blown into the chamber through two nozzles, one on either side of the path of the adhesive coated cores. An electrostatic field extends between the base supports and electrodes along the inner walls of the housing. Most of the fibers impinge on the cylindrical base members from two different directions and as a result do not have the same orientation or angular relation to the base. This gives rise to the unsatisfactory painting characteristics described above.

The apparatus herein produces a flocked paint applicator which does not have the erratic painting characteristics of other flocked applicators. It is our theory that the application of the flock material in a manner in which the fibers have substantially the same orientation with respect to the base eliminates the tendency of the applicator to move laterally during use.

In FIG. 1 of the drawings, a paint roller sleeve **10** has a cylindrical base **11** which may be formed of a spiral wrapped multi-ply paper impregnated with a waterproofing substance. A layer **12** of adhesive covers the outer surface of the sleeve. Flock fibers **13** have their ends embedded in the adhesive **12** and extend outwardly from the sleeve surface. The fibers **13** each lie in a generally radial plane at right angles to the longitudinal axis of the tubular base **11** and form an angle of the order of 15° with respect to an extension of the radius, or an angle of 75° with respect to a plane tangent to the surface of the base. Substantially all of the fibers are oriented so that they extend generally in the same relative direction with respect to the surface of the base.

The fiber material, diameter and length are determined primarily by the specific use for which the roller sleeve is intended. A fiber suitable for enamels may not be satisfactory for a water base paint, for example. Preferably, however, the fibers are of a synthetic plastic material, as nylon.

An apparatus for depositing fibers on the base in the manner shown in FIG. 1 is illustrated in FIG. 2. The cylindrical base **11** has its outer surface coated with a suitable adhesive and is mounted on a rotating conductive spindle **15** located between conductive electrode panels **16** and **17**. A flock sifter **18** is located above the spindle and has a screenlike or foraminous bottom **19** through which flock fibers **13** are discharged, to fall under the influence of gravity between the spindle and the electrode. A reciprocating blade **20** agitates the fibers in the sifter and insures a continual and relatively uniform flow to the flocking enclosure. A power supply **21** has one terminal connected with conductive spindle **15** and the other connected with ground **22** and thus to grounded electrodes **16** and **17**.

The fibers drop from the grounded sifter **18**, acquire a charge and are attracted to the charged spindle inside base **11**. Some of the fibers are charged as they leave the sifter while others fall against electrode **17**, acquire a charge and are then attracted to the spindle. This attraction causes the ends of the fibers to be embedded in the layer of adhesive on the outer surface of the sleeve with the fibers extending outwardly therefrom. To insure that all the particles are oriented in the same direction, the movement of the particles is directed peripherally around the spindle and base in only one direction. In the apparatus of FIG. 2, this is achieved by providing a baffle element **23** which is a portion of grounded conductive electrode **16**. The baffle extends above at least one-half of the spindle **15** and roller sleeve base **11** and along the length of the base. Baffle **23** prevents flock fibers from traveling counterclockwise about base **11** and being attracted to the base with an orientation different from those which pass clockwise about the same. Rotation of the spindle exposes all portions of the base to the flow of fibers and insures uniform coating with the fibers.

The air within the flocking enclosures is preferably maintained in a quiescent condition so that the pattern of the falling fibers is not disturbed.

Flock fibers which are not deposited on the sleeve as they pass downwardly between the spindle and electrodes are received in a pan **24** below the electrodes. Flock particles may be returned from the pan **24** to sifter **18** if desired. For example, a blower (not shown) may continuously recirculate the particles.

After a sleeve is fully coated with flock fibers, the adhesive is cured in a suitable manner, as by placing the sleeve in an oven.

A specific mechanism for rotating spindle **15** is not illustrated herein. Any suitable mechanism may be used. Such, for example, as that shown in the Thackra et al. patent where the spindle is moved on a continuous chain conveyor and carries a spur gear at one end which engages a fixed conveyer and carries a spur gear at one end which engages a fixed rack to effect rotation.

Turning now to FIGS. 4 and 5, another form of roller sleeve **30** embodying the invention is illustrated. Here, the fibers **31** lie in planes which extend longitudinally of the cylindrical base **32** and pass through the longitudinal axis of the base.. The fibers **31** are oriented in the same direction as can be seen in FIG. 4, and have an angle of the order of 150° to 20° with respect to a radial plane or of 75° to 70° with respect to a plane tangent to the surface of the base. Again, the uniform orientation of the fibers eliminates erratio operation and assures a smooth, even application of paint.

The apparatus illustrated in FIG. 5 applies the flock fibers in a manner which produces the roller sleeve **30** of FIG. 4. Cylindrical sleeve base member **32** is mounted on a conductive spindle **35** which extends vertically between grounded conductive electrodes **36** and **37**. The flock fibers are discharged through the bottom of the sifter **38** as blade **40** moves back and forth. As in FIG. 2, the conductive spindle **35** is connected with a terminal of power supply **42**, the other terminal of which is grounded. The electrostatic field set up between the spindle and electrodes **36** and **37** attracts the fibers and their ends are embedded in the adhesive covering of the sleeve base. As a result of the downward movement of the particles and the effect of gravity, the fibers hang downwardly from a horizontal plane imparting the uniformly oriented angular relationship illustrated in FIG. 4. Again, the majority of the fibers are not randomly applied to the base, but are oriented uniformly.

Spindle **35** need not be rotated if it is positioned under sifter **38** in such relation that the flow of fibers is generally uniform all the way around the sleeve.

In this embodiment of the invention the flock fibers have no component of movement peripherally of the sleeve base **32**, but travel longitudinally with respect thereto. For the purpose of this invention, the concept of unidirectional peripheral movement discussed above and incorporated in the claims is defined as including axial or longitudinal movement where the peripheral component is zero.

The fibers which pass by the sleeve are collected in grounded pan **43** and may be returned to sifter **38** in a suitable manner.

FIG. 6 illustrates another apparatus embodying the invention. Spindle **50** is positioned in a generally horizontal plane between grounded electrodes **51** and **52**. The spindle is connected with a suitable power supply **53** establishing an electrostatic field between the spindle and the electrodes. The flock fibers **54** are deposited from a hopper **55** on a conveyor belt **56** which travels beneath the spindle **50**. As the particles pass beneath the spindle, they are drawn upwardly by the electrostatic field and deposited on the adhesive coated surface of roller sleeve base **57** which is mounted on the spindle. An agitator bar **58** located beneath the conveyor belt **56** may be rotated to disturb the fibers subjected to the influence of the field which then draws them upwardly to be deposited. A portion **59** of electrode **51** extends beneath spindle **50** and serves as a baffle to direct the fibers to the right hand side of the spindle so they have a unidirectional component of motion with respect to the sleeve base. As in FIG. 2, the spindle is rotated to insure uniform distribution of the fibers.

FIGS. 7 and 8 illustrate another form of the invention in which the applicator is flat rather than cylindrical. A flat applicator may be useful in applying paint in corners or to small surfaces which cannot readily be coated with a roller. The applicator has a flat planar base **65** to which are secured fibers **66**, as by an adhesive layer **67**. As in the sleeve-type rollers, the fibers **66** are deposited on the base at an acute angle (of the order of 75° with respect to the surface of the base, for example). As best seen in FIG. 7, substantially all the fibers have the same orientation with respect to the base so the applicator will move smoothly across the surface to be coated.

While we have shown and described certain embodiments of our invention, it is to be understood that it is capable of many modifications. Changes, in the construction and arrangement may be made without departing from the spirit and scope of the invention.

We claim:

1. Apparatus for depositing fibers on the outer surface of a cylindrical base to form a paint roller sleeve, comprising:

means, including an electrode, supporting said base in a quiescent atmosphere;

means providing a source of fibers adjacent said supporting means;

a source of high voltage connected with said electrode;

electrode means spaced from said base supporting means and connected with said high voltage source to establish an electrostatic field extending radially of said base across a fiber application zone; and

means for directing fibers from said source to said fiber application zone for deposition on said base, the peripheral component of movement of the fibers with respect to the cylindrical base being unidirectional.

2. The apparatus of claim **1** wherein said base supporting means includes a horizontally extending rotating spindle, the electrode means includes a conductive member spaced radially from and on one side of said spindle and said means for directing fibers includes a baffle extending the length of said spindle and located between said source and the other side of the spindle.

3. The apparatus of claim **2** in which said means providing a source of fibers and said baffle are located generally vertically above said spindle.

4. The apparatus of claim **2** in which said means pro-

viding a source of fibers and said baffle are located generally vertically below said spindle.

5. Apparatus for depositing fibers on the outer surface of a cylindrical base to form a paint roller sleeve, comprising: means for dropping flock fibers into a quiescent atmosphere; means rotatably supporting said base with its longitudinal axis in a generally horizontal plane below said flock fiber discharging means; means directing the flow of discharged fibers past only one side of said sleeve; and means establishing an electrostatic field extending generally radially with respect to said sleeve and through which said fibers fall.

6. The apparatus of claim 5 including a grounded baffle extending axially the length of said base and covering substantially one-half the upper surface of said base.

7. Apparatus for depositing fibers on the outer surface of a cylindrical base to form a paint roller sleeve, comprising: a flock sifter having a discharge port in the bottom thereof; a conductive rotating spindle extending horizontally below said sifter; electrodes of conductive material adjacent said spindle, including a baffle portion extending the length of and above one-half of said spindle; and a source of high potential connected between said

spindle and said electrodes establishing a radial electrostatic field with respect to said spindle.

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PETER FELDMAN, Primary Examiner

U.S. Cl. X.R.

29—120; 118—636

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,518,970 Dated July 7, 1970

Inventor(s) FREDRICK B. BURNS and ERIK HENNINGSEN

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, change the spelling of the inventor's name from "Frederick" to -- Fredrick --.

SIGNED AND
SEALED
SEP 29 1970

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents