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METHOD OF MAKING PAINT ROLLERS

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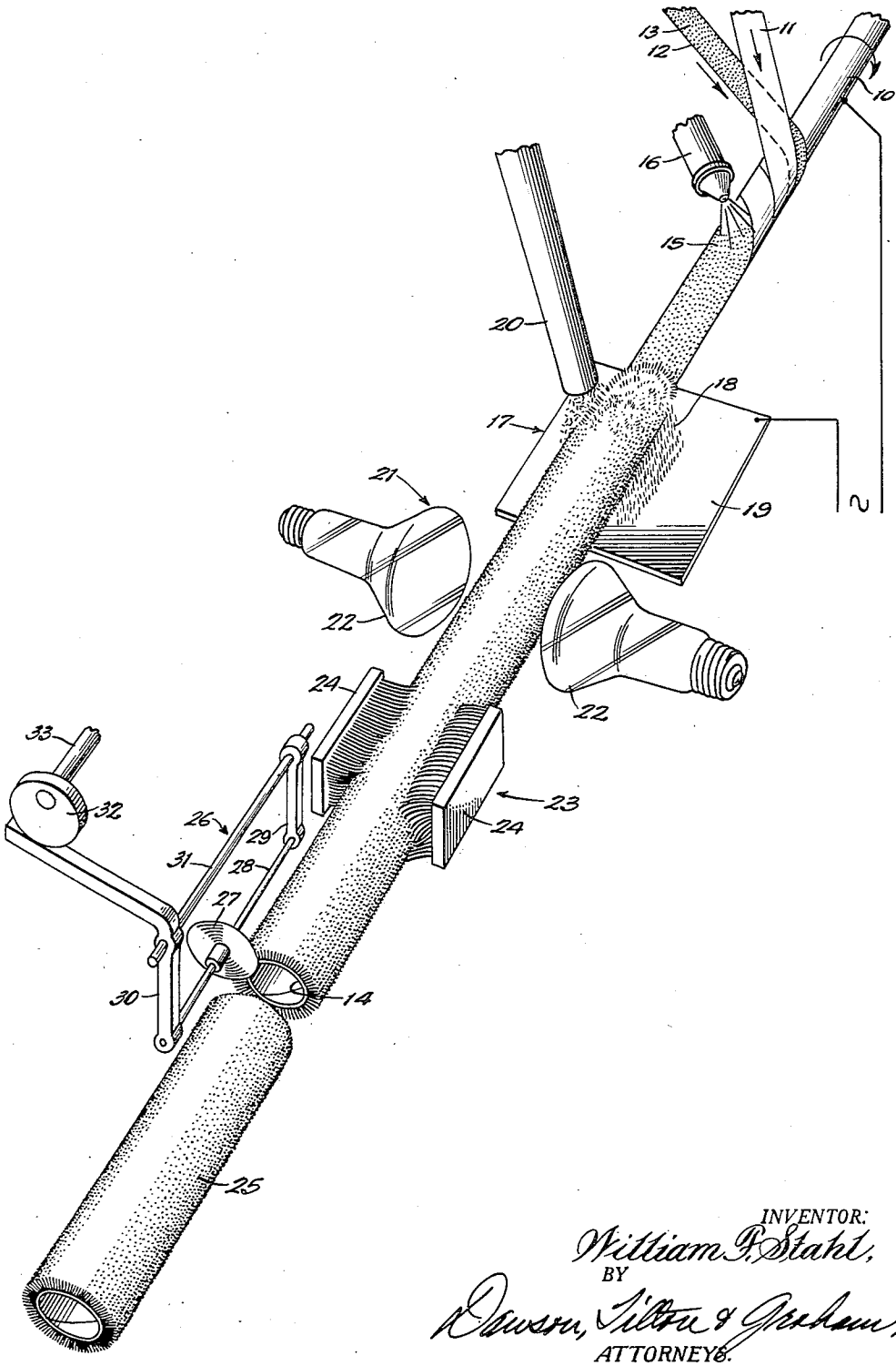

INVENTOR:
William F. Stahl,
BY
Dawson, Tilton & Graham,
ATTORNEYS.

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METHOD OF MAKING PAINT ROLLERS

William F. Stahl, Kenilworth, Ill.

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9 Claims. (Cl. 154—83)

This invention relates to a method of depositing material on tubular structures, and more particularly to a method in which, in a continuous operation, a laminated tube is formed and has fine particulate matter secured thereto. The small or fine particles may be varied in form and character and, for example, the material may be flock or filaments, and the method may be employed in making paint rollers.

As is well known, the use of paint rollers has become extremely popular in recent years for they enable even an unskilled person to substantially duplicate the quality of work of a skilled painter using a brush, while also permitting the amateur to cover large surface areas quickly and with relative ease. The rollers are expensive items and are intended for reuse and are made to be cleaned and otherwise reconditioned after each use thereof.

The rollers are expensive for they comprise a stiff tubular backing member that is covered with a woven fabric (either of natural or synthetic fibers) having freely extending filaments adapted to first pick up paint from a supply source and thereafter deposit the paint on a surface traversed by the roller. The fabric must be drawn tightly about the backing tube and cut to size so that the ends thereof can be brought into abutting relation to provide a uniform, substantially indistinguishable seam. An uneven seam is undesirable for it will cause defects in the paint finish deposited by the roller.

The use of a woven fabric is expensive and the expense thereof is increased because there is a considerable loss of fibers in weaving the material and a subsequent loss of material when it is sized or fitted to the backing tube. Moreover, the fibers must all be of substantially the same length, and this necessitates a shearing operation that entails a further loss of fibers. Altogether it is estimated that there is a loss of about three-quarters of the original fibers. The weaving and fitting and other operations and the material loss creates expense that requires the roller to be of the reuseable type. That factor in itself demands that both the fabric and its backing tube be sturdy and made from expensive material able to withstand for long periods the solvents of the paint as well as the cleaning solvents. The present methods of making paint rollers then, while providing structures that are useable and generally satisfactory, result in the provision of rollers that are expensive.

It is an object of this invention to provide a novel method of making paint roller and like articles inexpensively, so that the article can be sold at a low price with the result that in the case of paint rollers, the rollers may be discarded after being used. Another object is in providing a method of making paint roller structures in which the completed rollers are made in a substantially continuous and substantially automatic process. Still another object is in providing a method of making paint rollers in which the steps of weaving a fabric applicator cover, fitting it and securing it to a tubular backing member are eliminated; the method comprising the step of securing a plurality of individual fibers to a tubular backing member in a uniform distribution about the surface thereof.

A further object is in the method of forming paint rollers and like structures in which a tubular backing member is formed by spirally winding a plurality of laminating strips about a mandrel, coating the surface of the spirally wound tube so formed with an adhesive and thereafter depositing or imbedding a plurality of fiber filaments in endwise relation upon the adhesive to form a flock coating over the tubular backing member, the flock coating being of relatively uniform distribution and providing a myriad of fibers that extend outwardly from the tube and that have substantially the same lengths. Still a further object is in the provision of means for depositing the fiber filaments upon the tubular backing member by electro-deposition, whereby there is no loss of the valuable fibers.

Yet a further object of the invention is in providing a method in which fine or particulate matter may be secured to a tubular structure as a step in the forming of that tubular structure. Yet an additional object is to provide a method of making a roller in which a plurality of laminating strips are spirally wound about a mandrel to form a continuous tube and in which particulate matter—for example, abrasives or filaments, etc.—are anchored to the surface of the tube after the forming thereof. Additional objects and advantages will appear as the specification proceeds.

An embodiment of the invention is illustrated in the accompanying drawing in which the single figure presented is a perspective view showing the steps comprising the complete method of forming paint rollers.

Illustrated in the drawing is an elongated mandrel 10 that is preferably metallic and is rotatably driven by appropriate mechanism that is not shown. Mandrels for forming spirally wound tubes and the means for rotating the same are well known in the art, and it is believed that a detailed showing and description of a mandrel and the driving mechanism therefor is not necessary to an understanding of the present invention. Spirally wound about the mandrel 10 are the laminating layers 11 and 12. It will be appreciated that any number of laminating layers may be employed, depending upon the thickness of the tube desired and the rigidity and other mechanical characteristics that it is necessary to provide. In the specific illustration given, two laminating layers are shown.

At least one surface of the contiguous laminating layers should be covered with an adhesive, such as the adhesive 13 shown in the drawing. The adhesive may be a pressure-sensitive adhesive, it may be an adhesive that is applied to one surface of the laminating strip 12 prior to its being wound about the mandrel, or it may be a remoistening type of adhesive that is wetted with suitable moistening agents by passing the adhesive coating over wetting wicks or rollers, etc. in its path of travel to the mandrel 10. In the forming of tubular backing members for paint rollers, it will be apparent that the particular adhesive used to rigidly secure together contiguous laminating layers should have such characteristics that it is substantially impervious or resistive to the solvents and other elements used in paint, at least for limited periods. Adhesives of this character are well known in the art and, for example, may be polyvinyl rubber base adhesives, polyvinyl chloride, casein, etc.

The spirally wound tube so formed is designated with the numeral 14, and after the formation thereof it moves

longitudinally along the mandrel 10, and finally moves outwardly and off of the mandrel.

As the formed tube 14 moves along the mandrel 10, it passes through the position in which an adhesive is applied to the outer surface thereof. The adhesive may be applied to the tube by any suitable means and, for example, an adhesive 15 may be sprayed onto the tube through a spray nozzle 16. The tube 14 is rotating as it passes beneath the nozzle 16, and then the entire surface area of the tube will have the adhesive 15 applied thereto. Other means may be employed for applying the adhesive to the tube, such as the use of rollers that engage the surface of the tube and apply an adhesive thereto or by doctor blades, etc. The adhesive employed must be resistive to the solvents used in paint, where paint rollers are being made, and may be similar to the adhesive 13 heretofore described, and if desired the same adhesive may be employed.

As the adhesive coated tube 14 advances along the mandrel 10, it passes a station designated generally with the numeral 17 at which material is deposited upon the surface of the tube. At the station 17 the fine or particulate material is designated with the numeral 18. The material 18 may take varied forms and have numerous different characteristics depending upon the ultimate use for the completed roller structure. For example, the material 18 may be sand or emery particles or other abrasive material or, as in the specific illustration given, the material may be fibers or filaments useful in making paint rollers. The fibers or filaments are deposited on the surface of the tube 14 in an endwise relation. Preferably the fibers are all of substantially the same length, and are deposited upon the tube in such a manner that one end of each of the filaments is adjacent to and is secured to the surface of the tube, while the remaining length of each filament extends freely outwardly therefrom. When the tube is at the station 17, the adhesive coating 15 about the surface of the tube will be soft and tacky so that the particulate matter 18 can be secured readily thereto.

I prefer to deposit the fiber filaments 18 (or other particulate matter) on the tube 14 by an electrodeposition in which a plurality of the filaments are supported upon a plate 19 that forms one electrode of the electrodeposition system through a feeder tube 20 that simply deposits the filaments upon the surface of the plate 19 as they may be required. The mandrel 10 forms the other electrode, as is shown in the drawing, and the two electrodes 19 and 10 are connected to a source of electric energy that develops an electro-static field between the plate 19 and mandrel 10 that is effective to draw the filaments 18 from the plate and against the adhesive coating 15 on the tube 14. The arrangement is effective to draw the filaments 18 toward the tube in a lengthwise arrangement so that fibers tend to be normal to the surface of the tube at the point of engagement therewith. When the end portions of the filaments engage the tacky adhesive they are gripped thereby and held in position. The electric field developed between the electrodes 19 and 10 may be provided in any suitable and conventional manner and, for example, may be a high static field or may be a field provided by the application of a high A. C. voltage between the plate and mandrel.

In the case of paint rollers, the fibers 18 may be either natural or synthetic materials and, for example, may be wool, mohair, nylon, Dacron, etc. Any of the suitable materials now used in making the fabric covering for paint rollers may be employed to provide the fiber filaments 18. The roller 14 rotates as it advances along the mandrel 10 and passes the station 17, and it is found that a uniform distribution of the fibers 18 is deposited over the entire surface area of the tube. At substantially all points the fibers are generally normal to the surface of the tube and extend freely outwardly therefrom. Since the fibers are all initially of substantially the same length, after deposition thereof they provide a flock covering or applicator covering about the tube comprising a myriad of filaments all having generally the same length.

After deposition of the fibers upon the adhesive coated surface of the tube 14, the tube advances through a curing station, designated generally with the numeral 21. At the curing station the adhesive coating 15 of the roller or tube 14 is cured to harden the same and thereby rigidly anchor the fiber filaments 18 to the tube. At the same time, if any curing is required of the adhesive 13, it may be taken care of at the curing station 21. In the specific illustration given, the curing station comprises heater elements that may take the form of infrared bulbs 22 that will be connected into an appropriate electric circuit. Thus, the curing station 21 is a heat curing station, but it will be appreciated that other forms of curing may be employed such as passing air, preferably heated, over the tube 14 and the flock coating thereover.

The tube then advances through a cleaning and combing station 23 wherein the fiber filaments 18 are treated for removing loose filaments, etc. Preferably, the cleaning station 23 comprises one or more brush members 24 having bristles that engage the flock coating about the tube 14. However, the cleaning station may comprise a suction or air blast treatment wherein loose filaments are removed from the tube 14.

Thereafter, the tube 14 and the flock coating thereover is severed into appropriate lengths to form the completed paint roller 25. It will be apparent that the length of the roller 25 can be varied to meet any particular requirements and, as is well known, the lengths of paint rollers vary substantially from those that are very short and that are useful in painting small areas to rollers that are quite long and that are particularly useful in painting large surface areas. The tube is severed by a cutting assembly that is designated generally by the numeral 26.

The knife assembly 26 may take any suitable form and may be any of the mechanisms presently used in severing sections from a spirally wound tube that are presently employed in the making of laminated paper tubes. The structure illustrated comprises a cutter wheel 27 that is rotatably mounted upon a shaft 28. The wheel 27 is also slidably mounted upon the shaft 28 and is free to move longitudinally therealong within the limits provided by the support arm 29 and the lever arm 30, each of which are pivotally supported upon a shaft or rod 31. The lever arm 30 is essentially a cam follower and is adapted to be pivoted by a cam 32 that, in the specific illustration given, is a wheel mounted eccentrically upon a shaft 33.

When the shaft 33 is rotated to engage the cam whel 32 with the lever 30, the cutter wheel 27 is rotated or pivoted forwardly and into engagement with the tube 14, as is illustrated in the drawing. On the other hand, when the shaft 33 is rotated to release the cam 32 from the lever 30, the wheel 27 will be swung rearwardly and away from the tube 14. It will be apparent that since the tube 14 is moving axially, that means must be provided to permit the cutter wheel 27 to move along with the tube. The slidable mounting of the wheel upon the shaft 28 permits such movement during a cutting operation. At the same time, means will be provided, which are not shown, to move the wheel 27 in the opposite direction along the shaft 28 to reposition it for a subsequent cutting operation.

The method disclosed is effective for making paint rollers that are quite inexpensive when compared to the cost of paint rollers now commercially available. The method includes a continuous process in which all of the elements of the roller are formed in successive continuous stages. There is substantially no wastage of materials for the backing tube 14 is made continuously in the spiral winding operation wherein laminations are wound one upon another about the mandrel 10. Immediately after formation of the tube, the outer surface thereof is coated with an adhesive and thereafter the fibers or fila-

ments are deposited upon the adhesive coating of the tubing in such a manner that each of the filaments has an end portion thereof secured to or partially imbedded in the sticky adhesive. Any of the fibers that do not adhere to the tube simply drop back onto the plate 19 and are available again as a possible coating for a subsequent area of the tube. Since the fibers may all have substantially the same length initially, there is little subsequent loss of those fibers for shearing operations are generally not required in that each of the filaments is secured at an end to the tube and the remaining length of each fiber extends outwardly therefrom. The fibers are deposited in a tightly packed and uniform arrangement upon the surface of the tube, and a seamless and relatively uniform surface coating is thereby provided. There is no subsequent loss of the tube sections for the severing knife is simply positioned to cut off desired lengths from the tube. Further, the starting materials employed may be relatively inexpensive as, for example, paper laminations that are used in forming the tube for the inexpensive roller item produced is intended to be discarded after a single use thereof and the need for expensive starting materials is then obviated.

As has been brought out, the method may be employed as a continuous process for making tubular structures and coating the same with surface material having any desired characteristics. For example, the particulate matter secured to the adhesive coating of the tube may be any of the well known abrasive particles presently employed. Further, the precise deposition of the material on the surface can be controlled in a simple manner by coating the surface of the tube only at appropriate areas. That is to say, if it is desired to provide a decorative coating — for example, on the surface of the tube — the adhesive coating 15 may be deposited so as to provide the desired decorations, and the particulate matter will then be secured to the tube only in the areas thereof coated with the adhesive.

While in the foregoing specification an embodiment of the invention has been set out in considerable detail for purposes of illustration, it will be apparent that the details of the method steps disclosed can be varied considerably by those skilled in the art without departing from the spirit and principles of the invention.

This application is a continuation of application Serial No. 454,136, filed September 3, 1954, now abandoned.

I claim:

1. In a method of the character described, the steps of forming a continuous tube about a mandrel while advancing the same longitudinally therealong and rotating it about its longitudinal axis, applying an adhesive coating to the surface of said tube at one station as the tube advances therethrough, depositing relatively fine particulate matter on the adhesive coating at a subsequent station as the tube passes therethrough and prior to the curing of said adhesive, and curing said adhesive at another station to anchor said particulate matter to said tube, the adhesive application, and deposition being carried on while said tube is advancing and rotating.

2. The method of claim 1 wherein said tube is severed into appropriate lengths at a station following the curing of the adhesive.

3. The method of claim 1 in which said tube is brushed to remove unsecured particulate matter therefrom after said adhesive has been cured.

4. In a method of the character described, the steps of spirally winding laminating strips about a mandrel to form a continuous tube advancing longitudinally therealong and rotating about its longitudinal axis, applying an adhesive coating to the surface of said tube at one station, depositing filaments all of substantially the same length on the adhesive coating at a subsequent station and prior to the curing of the adhesive, and curing said adhesive at a further station to anchor said filaments to said tube, the adhesive application, deposition and curing being carried on while said tube is both advancing and rotating.

5. The method of claim 4 in which the deposition of said filaments upon the adhesion coating of said tube is an electrostatic deposition wherein the filaments are all anchored at one end thereof to said tube.

6. In a method of making a coated tube, the steps of forming a continuous tube at one station, applying an adhesive coating to said tube at another station, depositing particles on the adhesive coating of said tube at still another station, and at another station curing said adhesive to anchor said particles to said tube, the forming, application of adhesive, deposition and curing being all carried on as the tube advances through the various stations.

7. In a method of making paint rollers, the steps of spirally winding laminating layers about a mandrel to form a continuous tube advancing longitudinally along the mandrel, applying an adhesive to the surface of said tube at one station, applying filaments to the adhesive coating on said tube at another station before the adhesive is cured, curing the adhesive to anchor the filaments to said tube, and at another station severing the filament-equipped tube into segments, the application of adhesive, filament deposition, curing and severing operations being all carried on at longitudinally spaced points along the tube while the length of the tube is being increased by the spirally winding operation.

8. The method of claim 7 in which the filament coating on the tube is brushed to remove loose filaments therefrom following the curing operation.

9. In a method of making paint rollers, the steps of spirally winding a plurality of laminating layers about a mandrel to form a continuous tube advancing longitudinally along that mandrel and rotating about its longitudinal axis, coating the surface of said tube with an adhesive at one station, electrostatically depositing fiber filaments upon the adhesive coating of said tube at another station prior to the curing of the adhesive, curing the adhesive at still another station to anchor the filaments to the tube, brushing the filament-equipped surface of the tube to clean the same of loose filaments at still another station and severing the tube into selected lengths at yet another station, all of the steps being carried on while the tube is advancing through the various stations and while it is rotating about its longitudinal axis.

References Cited in the file of this patent

UNITED STATES PATENTS

2,203,752	Smith	June 11, 1940
2,411,842	Adams	Dec. 3, 1946
2,497,696	Smith	Feb. 14, 1950
2,545,700	MacKey	Mar. 20, 1951
2,647,300	Thomas et al.	Aug. 4, 1953
2,694,661	Meyer	Nov. 16, 1954