United States Patent

Clifton et al.

[15] **3,668,752**

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[54] **COATING ROLLER AND METHOD OF MANUFACTURE**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 6,623, Jan. 28, 1970, abandoned.

[52] **U.S. Cl.** **29/124**

[51] **Int. Cl.** **B21b 31/08**

[58] **Field of Search** 29/124; 100/DIG. 17; 118/212; 101/378

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[57] **ABSTRACT**

A coating roller and method of manufacture is disclosed wherein the roller is comprised of a magnetic cylinder and a plurality of magnetically attracted roller coverings individually supported on the outside surface of the roller. The edges of the coverings are separated to define distinct coating impressions on the product which is coated. Each covering of the roller is easily removed and replaced as required while keeping the remaining coverings substantially intact.

7 Claims, 5 Drawing Figures

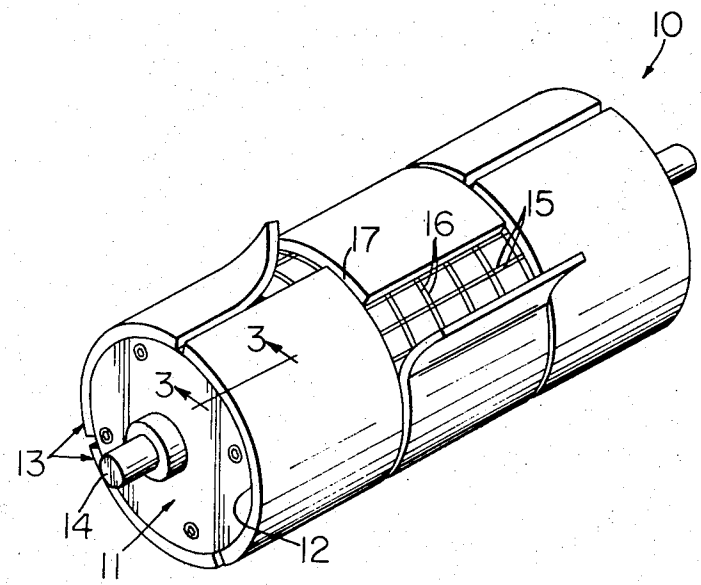


FIG-1

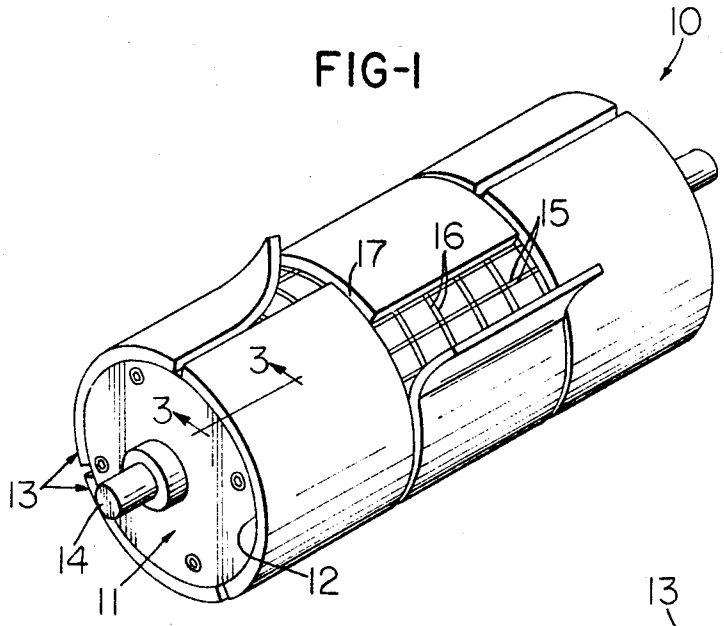


FIG-2

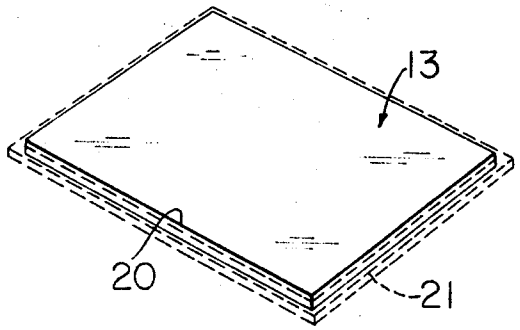


FIG-3

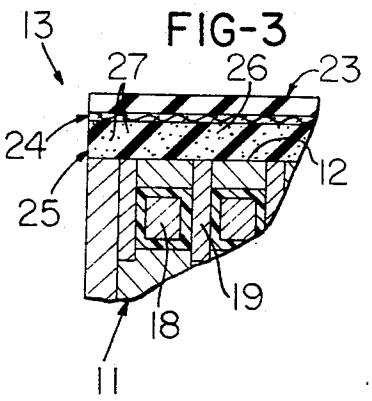


FIG-4

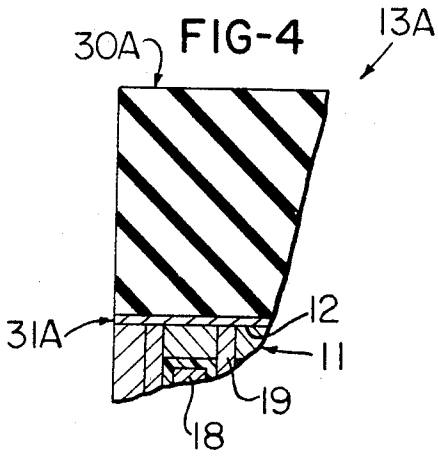
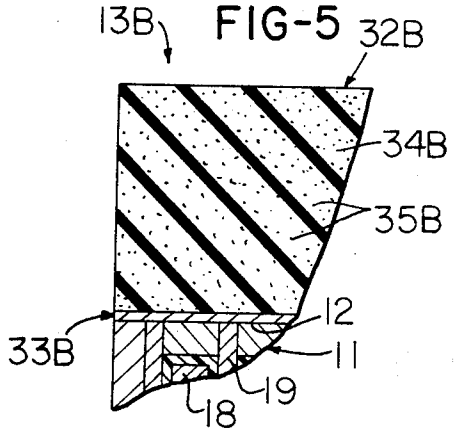


FIG-5



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COATING ROLLER AND METHOD OF MANUFACTURE

This application is a continuation-in-part of U.S. application Ser. No. 6,623, filed Jan. 28, 1970 now abandoned.

BACKGROUND OF THE INVENTION

In many industries, such as the can making industry, it is important to apply certain coatings to the metal plate which aid in the manufacturing process. For example, sizing must be applied to improve the bonding characteristics of the metal to other materials. A lacquer coating is frequently applied to the inner surface of the can to protect the contents from reaction with the metal. An opaque coating is frequently applied to the outer surface as a preparatory step to the printing of the information on the cans, and while it is possible to apply this coating on a conventional printing press, certain of the opaque and marproof coatings used today render it more practical to apply such a coating on a coating machine. Finally, finishing varnishes are often applied over the printed cans to minimize scratching of the surface during subsequent operations, as well as to provide certain protection for the can.

A conventional method of applying coating materials is to utilize a roller having a rubber coating in which a desired coating pattern is cut into the coating in the form of a stencil. Such rollers, however, are frequently unwieldy, require a considerable length of time to change, and also must be stocked in a large variety to supply the various patterns required for cans of different sizes. Alternatively, the pattern may be applied by the use of a blanket that is mechanically locked to the surface of the roller. The blanket system has created certain problems because of the stretchability of the blanket itself, which leads to inaccuracy in the stencil pattern.

The popular coating rollers in current use consist of a rubber surface having grooves or similar separations integrally formed therein to define corresponding separations on the coating applied to a specified surface. The conventional blanket type covering is bonded to the entire outer surface of a cylinder, and suitable grooves are provided in the coverings to define separations in the coated surface. When a portion of a coating roller or a portion of the surface of a single covering is damaged or wears excessively, it becomes necessary to replace the entire roller or covering, and such replacement is very expensive and inefficient.

SUMMARY

This invention provides an improved coating roller and method of making same consisting of a magnetic cylinder and magnetically attracted coverings or segments individually supported on its outside surface. The covering may be a single unit or a number of units which are separated to define corresponding separations on the coated product. Each covering may be easily removed and replaced as required while keeping the remaining coverings intact; the resulting roller may be utilized with optimum efficiency, versatility, and economy.

Other details, uses, and advantages of this invention will be described by means of the following embodiments.

BRIEF DESCRIPTION OF THE DRAWING

The accompanying drawing shows present exemplary embodiments of this invention, in which:

FIG. 1 is a perspective view of one embodiment of a coating roller of this invention comprised of a magnetic cylinder having a plurality of magnetically attracted coverings individually supported thereon, with two of such coverings illustrated with corners pulled away from the outside surface of the cylinder to illustrate marking means on such surface.

FIG. 2 is a perspective view of a typical covering illustrating by dotted lines an extension of reduced thickness which may be placed around the periphery of the covering.

FIG. 3 is an enlarged fragmentary cross-sectional view taken essentially on the line 3—3 of FIG. 1, illustrating one embodiment of a roller covering which may be used on the cylinder of FIG. 1.

FIGS. 4 and 5 are fragmentary cross-sectional views similar to FIG. 3 and illustrating two other embodiments of a covering which may be used on the cylinder of FIG. 1 in lieu of the covering shown in FIG. 3.

DESCRIPTION OF ILLUSTRATED EMBODIMENTS

Reference is now made to FIG. 1 of the drawing which illustrates one exemplary embodiment of a coating roller of this invention which is designated generally by the reference numeral 10. The coating roller 10 comprises a magnetic cylinder 11 having a right circular cylindrical supporting surface 12 that is particularly adapted to support a plurality of magnetically attracted flexible roller coverings each designated by the reference numeral 13, even though such coverings have coating areas of different sizes. The cylinder 11 has a central shaft 14 which is particularly adapted to rotatably support the cylinder, on which are placed the coverings 13. The roller is employed on a mechanism in a manner well known in the art.

The outer surface 12 is provided with positioning means or marks in the form of longitudinally extending parallel lines 15 and circumferential lines 16. The cylinder 11 may be of any well-known construction and in this example has a plurality of permanent magnets 18 fixed therein in an alternating manner, with annular spacers or pole pieces 19 along the cylinder. The cylinder 11 is so designed as to have optimum magnetic holding power along its full length. The lines 15 and 16 simplify the precise placement of the roller coverings 13 against the magnetic supporting surface 12 of the magnetic cylinder 11, with their edges spaced to assure suitable separation means in the form of grooves 17 between adjacent coverings.

The separation means or grooves 17 serve the same function as integral grooves provided in the outer coating-receiving layers of coating rollers of standard construction, providing greater versatility of the coating roller 10. In particular, it will be appreciated that during the course of using the coating roller 10, portions thereof may become damaged or excessively worn; by utilizing a plurality of roller coverings 13 it is a simple matter to remove a worn or damaged covering and replace it with a new one without replacing the entire surface of the coating roller as in previous constructions.

As previously indicated, each covering 13 may be precisely positioned using the positioning marks or lines 15 and 16, so that the roller 10 utilizes the grooves 17 between adjacent coverings 13 to define and provide the desired separation on the coating which is applied.

The flexible coverings 13 illustrated in FIG. 1 of the drawing are positioned in spaced relation in a single layer to define the grooves 17 between coverings 13, and each covering has a substantially uniform height throughout its entire area. The coverings also have sharp peripheral edges as illustrated by solid lines 20 in FIG. 2. However, it will be appreciated that each covering may be provided with an integral extension of reduced thickness as indicated by the peripheral portion 21, shown by dotted lines. The portion 21 enables coverings made in this manner to be placed with their side edges in adjoining relation while still providing grooves similar to the grooves 17 about the entire periphery of the roller.

The roller coverings may be of any suitable construction as determined by the intended use; as seen in FIG. 3, the exemplary covering 13 is a three-ply member. The covering 13 comprises an outer coating-receiving layer 23, an intermediate bonding and load-carrying layer 24, and an inner layer 25 which is comprised of a matrix 26 made of an elastomeric material with a plurality of magnetically attracted particles 27 embedded therein. The outer layer 23 may be made of any known elastomeric material such as rubber, polyurethane, or the like, and formed in any manner well known in the art. The intermediate layer 24 may be comprised of a high-strength woven fabric which may be rubber impregnated and suitably reinforced to give the desired structural characteristics. The matrix 26 of the inner layer 25 may be made of any suitable rubber material and the magnetic particles 27 may be in the form of ferrous particles, or the like.

Any suitable thickness may be provided for the various layers of the covering **13** depending upon the coating application; however, coverings having a thickness ranging between 0.065 and 0.075 inch (with a nominal thickness of 0.070) have been successfully made and are defined by an inner layer 0.040 inch thick, an intermediate layer 0.010 inch thick, and an outer layer 0.020 inch thick.

Reference is now made to FIG. **4** of the drawing which illustrates another exemplary embodiment of a roller coring, designated generally by the reference numeral **13A**. A plurality of coverings may be utilized on the magnetic cylinder **11** of FIG. **1**. The covering **13A** comprises an outer coating-receiving layer **30A** which may be made of any suitable known rubber-like material such as rubber, polyurethane, or the like, and the body is provided with an inner layer or flexible metal backing **31A** which is made of a ferrous material. The outer layer **30A** is suitably bonded to the inner layer **31A** using any known technique and the coverings **13A** may be installed in position on the magnetic cylinder **11** in a manner similar to that described for the coverings **13** and using the positioning marks or lines **15** and **16**.

Another exemplary embodiment of a flexible roller covering which may be used on the magnetic cylinder **11** is illustrated in FIG. **5** of the drawing. The covering of FIG. **5** is designated generally by the reference numeral **13B**, and is comprised of an outer coating-receiving layer **32B** which is suitably bonded against a standard backing layer **33B**, and may be made of a suitable high strength fabric, or the like. The outer coating-receiving layer preferably is formed of a rubber-like matrix **34B** which has magnetic particles in the form of ferrous particles **35B** suitably dispersed and embedded therein in a uniform manner. Each covering **13B** may be placed in position on the magnetic cylinder **11** in a manner similar to that previously described in connection with the coverings **13** and **13A** and utilizing the positioning marks **15** and **16**. The amount of ferrous particles **35B** used in the outer layer **32B** is accurately controlled to assure that the covering is magnetically held in position in a satisfactory manner without adversely affecting the ability of such layer to retain coating in the required manner.

The outer coating-receiving layers **30A** and **32B** of coverings **13A** and **13B**, respectively, may be made of any suitable thickness and successful results have been obtained by making each of such layers with a thickness ranging between 0.250 and 0.500 inch. In addition, the inner layers **31A** and **33B** of the coverings **13A** and **13B**, respectively, may be made with any suitable thickness and successful results have been obtained with each of the inner layers having a thickness ranging between 0.010 and 0.015 inch.

Irrespective of the particular construction of the covering used on the supporting surface **12** of the magnetic cylinder **11**, whether it be covering **13**, **13A**, **13B**, or a combination of these or similar coverings, it will be appreciated that the resulting coating roller has optimum versatility. In each case the separations between associated portions of a coating pattern of a particular product may be readily changed merely by changing the arrangement and sizes of the various coverings which are placed on the supporting surface **12**. The coating roller **10** of this invention also permits optimum operating economy, because it is possible to replace individual coverings. It should be borne in mind, however, that this replaceable covering may encompass the entire peripheral surface of the roller, if desired.

It should be understood that the term "rubber" is intended to refer to either natural or synthetic rubber. It will also be appreciated that even though two-ply and three-ply flexible roller coverings have been illustrated, any number of plies may be used. In this presentation of the invention, each of the roller coverings **13**, **13A**, and **13B**, which could also be referred to as "roller covering segments," is shown as having magnetically attracted materials used in association with a magnetic cylinder. However, it will be appreciated that a standard ferrous cylinder which is not magnetized may be provided while incorporating magnets in each roller covering so that the same magnetic interaction occurs.

While present exemplary embodiments of this invention and methods of practicing the same have been illustrated and described, it will be recognized that this invention is embodied within the scope of the following claims.

We claim:

1. A coating roller for applying distinct coating impressions to a surface comprising in combination a supporting cylinder including integral internally located permanent magnet means and having longitudinally and circumferentially extending positioning lines on the outer periphery thereof, and a plurality of magnetically attractable flexible roller covering segments positioned on said periphery in a single layer and held thereto by said magnet means, the edges of selected covering segments being separated and positioned on said periphery in accordance with selected positioning lines to define a desired pattern of said covering segments for creating a corresponding pattern of coating impressions on said surface, each of said covering segments capable of being individually removable from and replaceable on said periphery into modified patterns while allowing the remaining covering segments to remain in position thereon.

2. A combination as set forth in claim **1** in which each of said segments has an outer coating-receiving layer, an intermediate load-carrying layer, and an inner layer comprised of a matrix having magnetically attracted particles embedded therein.

3. A combination as set forth in claim **1** in which each of said segments comprises an outer coating-receiving layer laminated against a flexible metal backing.

4. A combination as set forth in claim **1** in which each of said segments comprises an outer coating-receiving layer bonded against a backing layer, said coating-receiving layer having magnetic particles dispersed uniformly therein.

5. A combination as set forth in claim **4** in which said coating-receiving layer contains sufficient magnetic particles to create a firm magnetic attraction to said cylinder, without impairing the coating-receiving capability of its outer layer.

6. A combination as set forth in claim **1**, in which at least one of said segments has a peripheral extension of reduced thickness to maintain separation between adjacent coverings.

7. A method of making a coating cylinder having optimum versatility comprising the steps of providing a supporting cylinder having internally located permanent magnet means, placing longitudinally and circumferentially extending positioning lines on the outer periphery of said cylinder, providing covering segments having magnetically attractable means therein, placing said segments on said supporting cylinder in a single layer, and positioning selected segments on said periphery with separations between adjacent edges thereof in accordance with selected positioning lines whereby said magnetic means cooperate with said covering segments to maintain the position of said segments to form a desired pattern.

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