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METHOD OF TREATING PLASTIC SURFACES

James R. Spencer, Four Winds, Greene, Roanoke, Va., assignor to Socony Products Company, Hartford, Conn.

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This invention relates to the treatment of plastics and more particularly to a method for treating the surface of plastic textile carriers such as cones and the like.

The manufacture and packaging of many types of strand material generally requires the use of holders such as tubes, cones, and spools which holders are generally referred to as "carriers." In the textile industry, carriers such as cones are widely used for the packaging of textile yarn and such textile cones are made from various materials such as paper, plastic, wood, metal and the like. Cones made of paper are used throughout the textile industry for the packaging of yarn primarily as a cause of their light weight and low cost and their suitability as a shipping package for yarn. Not only is yarn shipped on paper cones but paper cones are sometimes used in what is referred to as an "integrated mill" wherein yarn is both wound and unwound from the cones.

In such integrated mills, reuse of cones can be economically accomplished but paper cones are not sufficiently rugged to permit repeated reuse. The surface of a paper cone is frequently damaged after only a few uses or, on occasion, after only a single use by the yarn wound on the cone or as a result of rough handling after the yarn has been removed from the cone. Damage to the cone surface generally results in rendering the cone unsuitable for subsequent use and the cone must be discarded or otherwise disposed of. In some applications, the reuse of paper cones is undesirable in that, paper cones absorb dye and other chemicals which may contaminate the yarn wound on the cone. This limited useful life of a paper cone is generally accepted in the industry as a result of the low cost of the paper cone.

In textile mills such as an integrated mill wherein repeated use of a cone is practical, there is a requirement for cones composed of more durable material than paper so as to permit repeated reuse as well as overcoming the yarn contamination problem referred to above. Cones composed of plastic have been widely accepted for use as carriers in many textile operations as plastic cones lend themselves to molding from readily available synthetic resinous materials or plastics and such plastic materials are sufficiently durable to resist damage as well as being impervious to moisture or other liquids. Furthermore, plastic textile cones are dimensionally stable and highly resistant to chemical attack.

The increased useful life and other advantages of a textile cone composed of plastic has promoted the acceptance of the plastic cone in the textile industry. However, such plastic material possesses a smooth slippery outer surface common to plastic which permits yarn wound on the cone to slip or slide on the cone during the winding and unwinding of the yarn. This slipping of yarn on the plastic cone surface is highly undesirable and many efforts have been made to roughen the outer surface of the cone lossly such as by suitable treatment of the cone surface or otherwise forming a rough yarn-retentive finish on the winding surface of plastic cones such as by molding or the like.

Many techniques have been advanced for providing a slip-resistant surface on a plastic cone, many of which have added materially to the cost of the plastic cone as a result of the difficulties which do not lend themselves to high speed production or which require the use of expensive molds for molding a yarn-retentive surface on the plastic cone. Furthermore, many of these present day practices result in plastic cone finishes which do not exert precisely the degree of yarn retention desired and, therefore, tend to interfere with the yarn winding and unwinding operation.

Accordingly, a primary object of this invention is to provide a new and novel method of treating a plastic surface to provide a slip-resistant finish thereon.

Another object of this invention is to provide a new and novel method of treating the surface of a plastic textile cone to provide a surface finish which resists the slipping of yarn wound thereon.

A further object of this invention is to provide a new and novel method of treating the surface of a plastic textile carrier such as a cone to provide a velvety slip-resistant surface which utilizes the plastic material of the cone and which may be carried out in a simple and inexpensive operation at a high production rate and a low unit cost.

Still another object of this invention is to provide a new and novel method of treating the surface of a plastic textile carrier such as a cone which utilizes textile card clothing and which method may be carried out at a relatively high production rate without overheating of the plastic surface to provide a velvety-like slip-resistant finish on the carrier surface.

Other objects and advantages of the invention will become apparent from the following description taken in conjunction with the accompanying drawings.

In general, the objects of the invention and other related objects are accomplished by providing a strip of support material having a plurality of upstanding, substantially identical wire teeth secured at one end to the strip. The wire teeth are arranged uniformly in laterally spaced relationship and are bent adjacent the free end to form an inclined elbow or knee. Such material with wire teeth is generally referred to in the textile industry as card clothing. The method of the invention is practiced by engaging the teeth of the card clothing with the plastic surface to be treated which may be a textile plastic cone.

The plastic surface is moved relative to the teeth in the opposite direction from that of the inclined free end portion or knee of the teeth with the teeth in engagement with the plastic surface to abrade the surface and form a slip-resistant finish. This slip-resistant finish forms a rough surface on a plastic article such as a plastic cone which retains strand material such as yarn wound on the cone against slipping.

The novel features which are believed to be characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation will be best understood by reference to the following description taken in conjunction with the accompanying drawings in which:

FIGURE 1 is an isometric view of a textile plastic cone treated in accordance with the invention;
FIGURE 2 is a plan view of apparatus used to carry out the method of the invention;
FIGURE 3 is an elevation view of the apparatus of FIGURE 2:
FIGURE 4 is a sectional view taken substantially along line 4—4 of FIGURE 3 in the direction of the arrows;
FIGURE 5 is an enlarged sectional view taken substantially along line 5—5 of FIGURE 2 in the direction of the arrows; and
FIGURE 6 is an enlarged sectional view taken substantially along line 6—6 of FIGURE 1 in the direction of the arrows.

As generally illustrative of the invention, there is shown in FIGURE 1 a tubular plastic carrier or plastic cone designated generally by the numeral 10 suitably formed...
by molding or the like from a synthetic resinous material such as polyethylene. The plastic cone 10 before treatment has a smooth slippery surface 11 which is then treated by the novel process described herein to form a velvet-like or napped surface 12 which resists the slipping of yarn or similar strand material wound on the cone 19. Preferably the tip 13 of the cone 10 is maintained smooth to permit easy takeoff of the yarn from the cone during unwinding. It should be understood that any plastic surface may be treated in accordance with the invention but the invention is particularly adaptable to a plastic cone.

Suitable apparatus is provided for treating the surface 11 of plastic cones 10 in accordance with the invention and one such apparatus is shown in the drawings. In order to provide for a high rate of production of treated cones, the apparatus shown in FIGURE 2 includes a frame bed 16 on which is mounted a rotatable plate or turret 17 on which are rotatably supported a plurality of circumferentially arranged spindles 18 each of conical shape for receiving a plastic cone 10.

The spindles 18 are fixed on shafts 19 rotatably supported in bearing housings 21 and shafts 19 have mounted thereon planetary gears 22 arranged in meshing engagement with a sun gear 23 as shown best in FIGURE 4. The sun gear 23 is fixed to a shaft 24 rotatably mounted in the turret 17. Shaft 24 is supported at one end in a bearing pedestal 26 supported on the bed plate 16 as shown in FIGURE 2.

Means are provided for rotating the shaft 24 and thereby driving all of the planetary gears 22 together through the sun gear 23. More specifically, in the specific embodiment illustrated, a pulley 27 is secured to the shaft 24 and is connected by means of belts 28 with a drive pulley 29 connected to a shaft of a drive motor 30 suitably secured to the bed plate 16 as shown in FIGURE 2.

Means are provided for advancing and indexing the spindles 18 carrying cones 19 into the cone treating position. More specifically, a ring gear 31 is fixed to the rotatable turret plate 17 by means of rods 32 for simultaneous rotation therewith. The ring gear 31 meshes with a pinion 32 secured to the end of a shaft 33 mounted in a bearing 34 and connected at its other end to any suitable indexing drive means 36 shown diagrammatically in FIGURE 2.

In order to treat the surface of a plastic cone 10 in accordance with the invention, treating means are provided which are designated generally by the numeral 37. Treating means 37 comprise a strip 38 of support material carried by a plate 39 of which is provided with upstanding substantially identical wire teeth 39 secured at one end to the strip as shown best in FIGURE 5. This treating material 37 is generally referred to in the textile industry as card clothing.

Each of the wire teeth 39 are bent to provide an inclined free end portion 41 forming an elbow or knee bend which contribute substantially to the novel results of the invention. A relatively narrow elongated section of the treating material or card clothing 37 is suitably secured as shown best in FIGURE 2 to a belt 42 and extends spirally as shown so as to progressively treat successive portions of a cone 19 mounted on the spindle 18 during movement of the belt 42.

As shown best in FIGURE 4, the belt 42 carrying the card clothing 37 is supported for rotation between two cylinders 43, 44 mounted on a frame 46. Posts 47 are provided for adjusting the vertical height of the frame 46 and consequently the belt 42 above the surface 11. In addition, the belt 42 is movable in the direction of the arrows 1 to adjust the depth of the card clothing 37 relative to the cone 10 by means of a hand wheel 48. The hand wheel 48 moves a support member 49 in a slot 51 of a block 52 positioned on the machine bed plate 16.

The belt 42 is arranged to be driven by means of a motor 53 connected to the cylinder 43 through a speed reducer 54 having a control lever 56 for controlling the belt speed.

As shown in FIGURES 2, 4, an opening 57 is provided in the machine bed plate 16 in which is positioned a perforated plate 58. The opening 57 communicates with a duct 59 connected to a suitable source of vacuum pressure for removing the shreds or particles of plastic removed from the treated cone 19 during treatment.

Referring now to FIGURES 2, 3, a cam plate 61 is provided which engages a cone 10 molded on the spindle 18 as the spindle moves towards the treating position urging the cone into snug fitting engagement with the spindle to retain the cone on the spindle in the proper treating position. This cam plate 61 is mounted on a rod 62 supported on pedestals 63 supported in turn on the machine bed plate 16.

In order to provide for the removal of treated cones 10 from the spindles 18, a tubular sleeve 66 such as a paper tube or the like is supported on hangers 67 carried by rod 62. The sleeve 66 is arranged in coaxial alignment with a spindle 18 in the position shown in FIGURE 3. A reciprocating ejector rod 68 having an upstanding extension 69 is also provided which is moved from the solid line to the dotted line position of FIGURE 3 by any suitable means (not shown) to engage the base of the cone 10 after treatment of the cone and propel the cone into the sleeve 66 as shown.

In the practice of the invention, the spindles 18 are rotated by means of the drive motor 30. Plastic cones 10 which has been molded with a smooth outer surface are placed on the spindles 18 which are accessible to the operator. The cone indexing drive means 36 rotates the turret plate 17 intermittently and the spindles 18 moving by the operator are successively loaded with a cone.

As the spindles 18 carrying the cones 10 move in the direction of the arrow P of FIGURE 4, the tip of the cones engage the cam member 61 which causes the cone firmly into the proper axial position on its spindle. Each cone 10 on its spindle 18 moves into the treating position as shown in FIGURE 2 where its surface is engaged by the teeth of the card clothing 37 moving in the direction of the arrow P.

At this time, the rotation of the belt 42 carrying the card clothing 37 is established by adjustment of the speed reducer 54 connected to the drive motor 53 by means of the lever 56. The vertical and horizontal position of the card clothing 37 is also preadjusted so that the wire teeth 39 on the card clothing 37 properly engages the surface 11 of the cone 19 in substantially parallel relationship.

The speed of the belt 42 and card clothing 37 is preferably between 235 and 450 feet per minute although any suitable speed in accordance with the surface treatment desired, may be utilized. The spindles 18 may be rotated at any desired speed in the direction of the arrows T shown in FIGURE 5 and it has been found that the speed of approximately 1950 r.p.m. for the spindles gives satisfactory results.

The surface 11 of the rotating cone 10 is moved in a direction opposite to that of the card clothing 37 which card clothing moves in the direction in which the bent portions 41 of the teeth are slanted. Engagement of the teeth 39 with the plastic of the cone surface 11 produces an unusual scratching or abrading effect on the cone surface 11 as a result of the elbow or knee bend 41 which results in the highly unusual and novel velvet-like or napped surface 12 on the cone.

The spiral pattern of the card clothing 37 on the belt 42 produces engagement of the teeth with respective portions of the cone 10 to break up the pattern on the finished surface 12 and to eliminate the formation of grooves. The cone surface 11 may be swept through any desired number of times depending on the end result desired.

When the treatment of the surface of each cone 10...
is complete, the indexing means 36 rotates the plate 17 as described above a predetermined amount and moves the treated cone downwardly where it eventually reaches the position occupied by the spindle 18′ in FIGURE 3. At this time the ejector rod 68 is moved forwardly by suitable means (not shown) so as to base the cone 10a and propel the cone forward into the sleeve 66 for stacking and packaging. The particles of plastic removed from the surface 11 of cone 10 as shown in FIGURE 5 are carried away through the duct 59 shown in FIGURE 4 to a suitable disposal means as a result of the vacuum pressure applied to the duct.

It should be understood that considerable variation in the type of surface finish produced in accordance with this invention on the plastic cone 10 may be obtained by varying such factors as the speed of the belt 42 and card clothing 37 secured thereto, the length of time the wire of the card clothing 37 is maintained in engagement with the cone surface 11, the speed of the spindles 18 and the size and spacing of the wires in the card clothing 37.

With the novel method of this invention, there has been provided a novel arrangement for obtaining a highly unusual slip-resistant finish on a plastic surface such as a molded plastic textile cone which resists the slipping of yarn wound thereon. The use of readily available card clothing with a knee bend or elbow in the wire teeth of the clothing appears to produce the highly unusual results of the invention which are not obtainable by grinding with straight wires or a wire brush or even wires running in the wrong direction. The method of the invention lends itself to a high production rate and is particularly advantageous in that plastic cones may be molded with a plain surface which surface can be treated quickly and inexpensively with a minimum waste of plastic material to provide the highly unusual surface finish of the invention.

While there has been described what at present is considered to be the preferred embodiment of the invention, it will be understood by those skilled in the art that various changes and modifications may be made therein without departing from the invention and, therefore, it is the aim of the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

Having thus described the invention, what is claimed is:

1. A method of treating the plastic surface of a tubular plastic article comprising the steps of, providing a strip of card clothing having upstanding, substantially identical wire teeth secured at one end thereto and arranged in laterally spaced relationship, said wire teeth being bent uniformly to provide an inclined free end portion on said teeth, engaging said plastic surface with said teeth and rotating said tubular plastic article relative to said teeth in a direction opposite from that of the inclined free end portion of said teeth with said teeth in engagement with said plastic surface to abrade said surface and produce a velvet-like slip-resistant finish thereon.

2. A method of treating the plastic surface of a tubular plastic article comprising the steps of, providing a strip of card clothing having upstanding, substantially identical wire teeth secured at one end thereto and arranged in laterally spaced relationship, said wire teeth being bent uniformly to provide an inclined free end portion on said teeth, engaging said plastic surface with said teeth and moving said plastic surface and said strip in opposite directions with said strip moving in the inclined direction of said teeth free end portions and with said teeth in engagement with said plastic surface to abrade said plastic surface and produce a velvet slip-resistant finish thereto.

3. A method of treating the plastic surface of a tubular plastic article comprising the steps of, providing a strip of card clothing having upstanding, substantially identical wire teeth secured at one end thereto and arranged in laterally spaced relationship, said wire teeth being bent uniformly to provide an inclined free end portion on said teeth, engaging the surface of said plastic article with said teeth, advancing said strip in the inclined direction of said teeth free end portions with said teeth in engagement with said article plastic surface, rotating said tubular plastic article in the opposite direction from the direction of advance of said strip to abrade said article plastic surface and produce a velvet-like slip-resistant finish on said plastic article.

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