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MACHINE FOR APPLYING PAINT ROLLER COVERINGS TO CORE TUBING

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This invention relates to improvements in the manufacture of covered tubes such as those having a fluid-retaining covering and used in paint rollers or the like. More particularly, the invention relates to a novel machine and method for continuously applying an outer covering to tubing.

As is well known, roller type fluid applicators for paint or the like utilize an applicator tube having an outer covering of fabric, lamb's wool, pile or other suitable paint-retaining material. The covered tube is supported on a core structure which is in turn rotatably mounted on the axle portion of a generally T-shaped handle. Heretofore, such covered applicator tubes have been made by relatively slow and inefficient techniques involving manual operations to a large extent, e. g. by manually guiding an elongated strip of covering material or fabric so that the latter is spirally wound on a rotating cardboard or heavy paper tube. Moreover, because of the relatively slight rigidity of the tube it has been considered necessary to utilize a mandrel or like device for supporting the tube internally during rotation.

A primary object of the present invention is to provide a novel machine for making covered tubes which is adapted for high speed continuous operation with a minimum of manual operations.

A further object of the invention is to provide a novel machine and associated apparatus for spirally winding and adhering a covering strip on a length of tubing.

Another object of the invention is to provide a machine of the character described which eliminates the need for an internal mandrel to support the rotating tube.

Still another object of the invention is to provide a machine of the character described having novel means for rotating and axially advancing the tube during spiral winding of the covering strip thereon.

An additional object of the invention is to provide a machine of the character described having novel means for regulating the rate of axial movement of the tube to compensate for variations in the width of the covering strip being wound thereon.

A still further object of the invention is to provide a novel method for making covered tubes.

Other objects and advantages of the invention will become evident from the subsequent detailed description taken in conjunction with the accompanying drawings wherein:

Fig. 1 is a perspective view at one side of a machine for making paint roller tubes and comprising one specific embodiment of the invention;

Fig. 2 is a fragmentary perspective view of a portion of the machine as seen from the opposite side;

Fig. 3 is a fragmentary perspective view on an enlarged scale of a portion of the machine shown in Fig. 1;

Fig. 4 is a perspective view of a completed paint roller tube;

Fig. 5 is a top plan view on an enlarged scale of the portion of the machine seen in Fig. 3;

Fig. 6 is a sectional view looking toward one end of the machine as taken along the line 6—6 of Fig. 5;

Fig. 7 is a fragmentary enlarged sectional view as taken along the line 7—7 of Fig. 6; and

Fig. 8 is a sectional view looking toward the opposite end of the machine as taken along the line 8—8 of Fig. 5.

As best seen in Figs. 1 and 2, the machine comprises a drive and winding section designated generally at 11 into which an elongated tube 12 of cardboard, heavy paper, plastic or the like is fed continuously. The tube 12 is composed of individual sections of suitable length which are frictionally fitted together by means of joining plugs such as cylindrical wood plugs 13. Each such individual section is of sufficient length to form a number of finished paint roller tubes. As heretofore described in detail, the drive and winding section 11 effects both rotation and axial advancement of the tube 12 at a controlled rate.

An elongated continuous strip of suitable covering material is fed from a supply coil 15 rotatably supported on a spindle 16 (Fig. 2) and after application of a suitable adhesive is spirally wound under pressure on the tube 12 by reason of the simultaneous rotary and axial movement of the tube.

For convenience, the covering material 14 is frequently referred to as fabric, but it will be understood that in the case of paint rollers at least the covering material need not be strictly a fabric. In fact it is frequently a pile or lamb's wool having a fluid-absorptive or fluid-retentive side and a relatively smoother backing at the opposite side which is adhered to the roller tube.

The strip 14 extending from the coil 15 passes through a guide 17 and over and under a pair of guide spools or rollers 18 and thence to an adhesive applicator roll 19. The smooth side of the strip 14 passes in contact with the roll 19 which is partially submerged in a body of suitable fluid adhesive material in a container 21. The container 21 is fed with adhesive from a fountain supply bottle 22 communicating through a conduit (not shown).

Any suitable fluid adhesive may be used. For example, a commercially available rubber base adhesive is particularly suitable for paint rollers since in its cured state it is highly resistant to the action of the usual solvents and thinners contained in paints. From the adhesive applicator roll 19 the strip 14 then passes under a guide roll 24 and through a drying rack or section 26 which comprises a plurality of upper and lower rollers or pulleys 27 and 28 journaled in an upright rectangular frame 29. As will be evident from Fig. 1, the strip 14 with the freshly applied adhesive on its smooth side is trained around the pulleys 27 and 28 and is twisted axially through 180° between each successive pair of pulleys 27 and 28 so that only the uncoated fluid-retentive side of the strip is in contact with the pulleys.

After passage through the drying section 26 the adhesive coating on the strip 14 is substantially dry and has permeated the backing of the strip sufficiently so that a second adhesive coating can now be applied without soaking into the backing to an excessive degree. For this purpose another fountain type adhesive applicator is provided at the opposite end of the frame 29 which is substantially the same as the applicator means 19—21—22 heretofore described. Thus, the exit strip 14 with the preliminarily dried adhesive coating passes under a guide roller 31 and thence over an adhesive applicator roll 32 mounted on an adhesive container 33 which is supplied through a conduit 34 from a fountain supply bottle 36. In this case, the adhesive applicator structure and the roller 31 are supported on an elongated guide channel 37 having a swivel mounting 38 on the frame for a purpose to be described below. Following the application of the second adhesive coating, the strip 14 passes under another guide roller 39 on the channel 37.
and travels at a predetermined feed angle into the drive and winding section 11.

In section 11 the continuous strip 14 is spirally wound and moves axially through section 11, the adhesive coated side of the strip 14, of course, being in contact with the tube. The tube 12 with its wound covering then passes through an elongated heated oven 41, the inlet end of which is seen in Fig. 1. The oven is maintained at a suitable temperature for drying and curing the adhesive so that the covering is firmly bonded to the tube. For example, in the case of a commercially available rubber base adhesive a temperature of about 240° F. will be satisfactory but this may vary somewhat dependent upon the nature of the adhesive, the length of the oven, and the axial speed of the tube. Although not shown in the drawings, the covered tube as it emerges from the oven 41 is then cut into suitable lengths which are subjected to additional finishing operations for making the completed paint roller tubes. In Fig. 4, a completed paint roller tube is shown comprising a number of inner tubing 42 with the spirally wound and bonded outer covering indicated at 43. The end portions of the pile or wool covering are preferably beveled or chamferred, as at 44.

Referring particularly to Figs. 2, 3 and 5–8, the mechanism in section 11 for driving the tube 12 will now be described. A pair of spaced uppers 46 and 47 are supported on a base structure 48 and are provided with openings 49 and 51, respectively, through which the tube 12 extends, the wall 46 being at the inlet or feed end of section 11 and the wall 47 being at the outlet or discharge end. Between the walls 46 and 47, a plurality of elongated support bars 50 are provided in rigid fixed relation. In this instance, three such bars 52, 53, and 54 are provided, spaced around the tube 12 at approximately equal radial distances therefrom and with substantial peripheral circumferential spacing between the bars (Figs. 6 and 8). The bars 52, 53, and 54 are rigidly secured at their ends to the walls 46 and 47 by means of sets of clamping blocks 55 which are adjustable on the walls 46 and 47 for varying the radial spacing of the bars 52, 53, and 54 whereby to accommodate different diameters in the tube 12. Each bar 52, 53, and 54 has mounted thereon a smooth surfaced freely rotatable caster wheel 56 which firmly engages the interior of the tube 12 closely adjacent the portion of the tube being wrapped for rigidly holding the tube against lateral movement while at the same time permitting rotation of the tube about its axis. The caster wheels 56 are journaled in a plurality of radially extending yokes 57 each of which is in turn adjustable mounted on the bars 52–53–54 by means of a bracket structure including a pair of plates 58 clamped at opposite sides of the support bars by bolts 59. As best seen in Fig. 5, the casters 56 are preferably arranged in axially spaced relation along the tube 12 so that each caster is positioned as closely as possible to the portion of the tube being wrapped without interference with the spiral wrapping operation. By loosening the bolts 59, the supporting clamps can be adjusted longitudinally along the bars 52–53–54 and thereby the bolts 59 are tightened for holding the casters 56 in fixed position relative to each other and axially of the tube 12. The entire drive section 11 may be adjusted longitudinally along the base 48 by means of an elongated adjusting screw 60 (Figs. 1 and 3) which has a rotatable connection in the end wall 46 and extends in threaded engagement through an apertured plate 65 rigidly mounted on the base 48.

Intermediate the casters 56 and the wall 46 at the feed end of the device, three sets of adjustable driving elements are mounted on the base 48–52–53–54 for rotating and axially advancing the tube 12. Each set of driving elements comprises a plurality of rollers in the form of double flanged pulleys 61, three such pulleys being provided in side-by-side relation in each set in this instance. The parallel spaced flanges of the pulleys 61 are toothed or serrated, and in making driving engagement with the exterior of the tube 12, and each pulley 61 is rotatably supported in a yoke 63 having a swivel mounting 64 on the corresponding bar 52, 53, or 54. For driving the pulleys 61, I provide a plurality of drive shafts 66 rotatably mounted between the end walls 46 and 47 to their respective locations. In these embodiments driving outwardly of the fixed bars 52–53–54. Each shaft 66 has a set of three pulleys 67 rotatable with the shaft and having belt driving connections 68 with the respective toothed pulleys 61. A main drive for the unit is provided through a motor 69 (Fig. 1) mounted on the base 48 adjacent the wall 46, a gear reduction 71, a pulley 72, a belt drive 73, and a pulley 74 mounted on one of the drive shafts 66. The drive shaft 66 having the pulley 74 is in turn drivingly connected to the other two shafts 66 by means of a plurality of sprocket wheels 76 mounted on the shafts 66 adjacent the wall 47 and a chain drive 77. A tensioning roller 78 operatively engages the chain 77 and is carried on a lever arm 79 pivotally mounted on the end wall 47 for adjustment of slack in the chain for different radial positional settings of the bars 52, 53, and 54.

By the above-described arrangement it will be seen that the drive shaft in unison of the toothed pulleys 61 effects direct or positive rotary driving of the tube 12 without the necessity for an internal supporting mandrel or the like. At the same time the angular positions of the driving pulleys 61 are regulated so that axial movement of the tube 12 is also obtained. It is also possible, by reason of the swivel mounting of the yokes 63, the axes of rotation of the pulleys 61 can be positioned at some predetermined angle, less than 90° relative to the axis of the tube 12 so that the driving force imparted by the teeth 62 has both a rotational component and an axial component whereby simultaneously rotary and axial movement of the tube 12 is obtained. For reasons to be described shortly it is important that this angular relation be adjustable in order to control and coordinate the axial speed of the tube. To this end, each swivel yoke 63 has rigidly attached thereto an outwardly extending lever arm 81 and the parallel outward extension of the arms 81 for each set of yokes 63 are interlinked or linked by means of an axially adjustable rod as indicated at 82, 83, and 84. In the form shown, the rods 82–83–84 extend through apertures in the ends of the corresponding arms 81 and are pinned to the respective yokes. As best seen in Fig. 5, the rod 82 is provided with a threaded end portion (not shown) which extends in operative engagement through an internally threaded adjusting nut 86 rotatably supported on the end wall 46. The adjusting nut 86 has an operating portion 87 provided with a plurality of radial bores 88 into which a detachable handle 89 may be fitted for turning the nut 86. As will be evident, by rotating the nut 86 in either direction the rod 82 is shifted axially for either increasing or decreasing the driving angle of the interconnected toothed pulleys 61 relative to the axis of the tube 12.

In order to coordinate the angular positions of each set of drive pulleys 61, the rods 82, 83, and 84 are interconnected so that any rotary adjustment of the rod 82 is substantially duplicated by the rods 83 and 84. Thus, the rod 83 is provided with an adjusting nut 91 having an internal threaded engagement with the rod 83, and the nuts 86 and 91 have intermeshing external gear teeth so that they move into unison. The nut 91 also has an operating portion 92, similar to the portion 87 of the nut 86, so that the desired adjustment may be made with the handle 89 on either of the nuts 86 or 91. The nut 86 has a tubular extension 93 provided with a nut to receive its outer end a sprocket wheel 95 which is connected by a chain drive 94 to a sprocket wheel 96 (Fig. 8) having a
similar threaded nut operatively engaging the rod 84. The gear connection between the nuts 86 and 91 on the rods 82 and 83 and the sprocket and chain connection between the rods 82 and 84 thereby provide a fixed ratio between all three of the rods 82, 83, and 84 so that adjustment of either the nut 86 or the nut 91 is sufficient to change the angular positions of all of the pulleys 61 substantially equal.

As previously mentioned, the adhesive coated strip 14 as it emerges from the guide channel 37 extends at a predetermined feed angle to the axis of the tube 12 so as to obtain the desired continuous spiral wrapping of the covering strip on the tube. The rotation of the tube 12 exerts a pull on the strip as it passes through the guide channel 37 which is sufficient to insure a tight wrap of the strip on the tube and is also adequate to overcome all frictional resistance throughout the adhesive application and drying sections of the apparatus. Thus, unwinding of the freely rotatable reel or supply roller 15 is automatic in response to rotation of the tubular and no positive drive for the strip 14 is needed.

In fact, the frictional drag or resistance on the strip during its passage through the adhesive application and drying stages is an advantage in that it provides a substantially uniform tension in the strip during the spiral wrapping operation and thereby minimizes the chance of variations in tension and width of the strip 14 as it emerges from the guide channel 37. Furthermore, the maintenance of proper tension in the strip 14 by the aforementioned frictional drag provides the necessary pressure during winding of the adhesive-coated strip on the tube 12 to obtain effective adhesive bonding of the strip to the tube.

However, it is necessary that provision be made for insuring proper butt edge relation between successive spiral turns of the strip 14 as it is wound on the tube 12. For this purpose I provide a carriage 97 (see Figs. 5 and 6) movably mounted on the bar 52 by means of a plurality of rollers 98 engaging the top and sides of the bar so as to permit free longitudinal movement of the carriage along the bar 52. At the underside of the carriage 97 an adjustable mounting block 99 is carried which is preferably disposed substantially perpendicularly across the width of the strip 14 as it extends from the guide channel 37. A pair of rods 101 project outwardly from the block 99 adjacent the side edges of the strip 14 and carry a pair of longitudinally and angularly adjustable blocks 102. The blocks 102 have depending spindles 103 which mount a pair of elongated guide elements or rollers 104 and 106 adapted to engage the longitudinal side edges of the strip 14, as seen in Figs. 2, 5, and 6. The axes of the rollers 104 and 106 are preferably canted slightly to insure effective operative engagement with the edges of the strip 14. In addition, as best seen in Fig. 5, the roller 104 is positioned outwardly on its supporting rod 101 at a relatively remote distance from the carriage 97 and the tube 12, i.e., in the direction of the channel 37, while the roller 106 is located closely adjacent the carriage 97 and the tube 12. It will, of course, be understood that the relative adjustability of the blocks 102 on the rods 101 and of the spindles 103 in the blocks 102 permits positioning of the rollers 104 and 106 at the desired locations and angles.

The carriage 97 is positioned on the bar 52 so that the roller 104, which engages the trailing side edge of strip 14 as it emerges from the channel 37, tends to urge the strip 14 bodily toward the already wrapped portion of the tube 12, i.e., the automatic control may be viewed in Fig. 2. In the absence of the roller 106, the incoming strip 14 would thus tend to overlap at its marginal leading edge the adjacent spiral edge of the preceding turn on the tube 12. However, the transverse spacing between the rollers 104 and 106 at their points of engagement with the side edges of the strip 14 is somewhat less than the width of the strip 14 so that the roller 106 located closely adjacent the tube 12 acts as a back-up roller and causes bulging or buckling of the strip under the pressure of the roller 104 (see Fig. 7). As a result of this bulging of the strip 14, the leading edge of the strip adjacent the roller 106 is prevented from overlapping the edge of the previously wound turn and is guided into edgewise abutment or alignment with the previously wound turn. As long as the width of the strip 14 is uniform, proper spiral winding of the strip on the tube is readily obtained with the edges of adjacent turns in desired butting relation and completely covering the tube 12. Moreover, for a strip of uniform width the reaction forces on the rollers 104 and 106 are substantially equal so that there is no tendency to shift the carriage 97.

As a practical matter, however, the width of the strip 14 is subject to variation as a result of different tension effects in the strip which is stretchable to some extent. Also in the manufacture of the strip of covering material, such strip is formed by slitting a wider piece and the cutting is not always exact so that there are unavoidable differences in the lateral dimension of the strip from time to time. Inasmuch as a wider strip of covering material will cover a correspondingly greater length of the tube 12 than a narrower strip, it will be seen that when the strip 14 is wider than usual the axial feed of the tube 12 may be increased. Conversely, when the strip 14 is narrower than usual it will be necessary to decrease the axial feed of the tube 12 in order to avoid gaps between successive spiral turns of the wrapping to the strip. With the arrangement above described, variations in the width of the strip 14 will be reflected by a visible shifting movement of the carriage 97 along the bar 52. Thus, if the width of the strip 14 increases, an excessive force is developed in the buckled or bulged strip as a result of the reaction between the butt edge of the incoming strip and the coating edge of the previous turn on the tube, thereby causing a greater reaction force on the roller 104 and gradual movement of the carriage toward the feed end of the machine, i.e., toward the end wall 46. The channel 37 being freely pivotable about its swirl support 38 also swings toward the wall 46 to accommodate automatically the feed angle of the strip to the increasing strip width. If the width of the strip 14 decreases appreciably, the reaction force on the roller 106 is decreased accordingly, and the reaction force on the roller 104 is, therefore, greater so that the carriage 97 is shifted in the opposite direction along the bar 52 with the guide channel 37 swinging in the opposite direction about its pivot 38.

The movement of the carriage 97 is readily observed by the operator of the machine and signals the need for an adjustment in the axial speed of the tube 12. To facilitate this observation, since the movement of the carriage is usually slight, a fixed arm 107 is rigidly fastened to the upper carriage 97 and has a pointed indicator portion 108 (Fig. 3) disposed over the upper visible portion of the carriage 97. A scale having index marks or other indicia (not shown) is preferably provided on the movable carriage adjacent the pointer 108 so that even slight movements of the carriage are readily apparent. As the operator observes a persistent trend of movement of the carriage 97 in one direction or the other he can readily make the proper adjustment, heretofore described, of the nut 86 or 91 so that the drive arm of the pulleys 61 is appropriately changed either to speed up or slow down the rate of axial movement of the tube 12 as the case may be whereby to compensate for variations in the width of the strip 14. Although not shown, it will be evident that the automatic control may be arranged to exert control between the indicator carriage 97 and the adjusting nuts 86 or 91 so that the axial speed of the tube 12 would be regulated automatically in response to movement of the carriage 97 in either direction.

It will be apparent that my invention provides a highly advantageous continuous tube wrapping machine and method which can be operated efficiently with a minimum of manual operations and at relatively high production rates. The mechanism for adjusting the speed of axial travel of the tube to accommodate variations in width of
the covering material insures a uniformly acceptable finished product under practical operating conditions and with normally available materials. Although the invention has been described with particular attention to a certain structural embodiment, it is to be understood that various modifications and equivalents may be resorted to without departing from the scope of the invention as defined in the appended claims.

1. An apparatus for wrapping a tube of the character described comprising tube-driving means including a plurality of rotating driving elements frictionally engageable with the exterior of the tube for simultaneously rotating and axially advancing the tube, means for continuously supplying an adhesive-coated strip of covering material to said tube forwardly of said driving elements, said strip being spirally wrapped around the tube during rotation and axial advancement of the latter, and support means comprising a plurality of rollers disposed intermediate said driving elements and the portion of the tube being wrapped, said rollers being engageable with the exterior of the tube closely adjacent the portion thereof being wrapped for laterally supporting and retaining the tube during wrapping thereof.

2. An apparatus for spirally wrapping a strip of covering material around an elongated tube of relatively slight rigidity, comprising rotating tube-driving means engageable with the tube at only the exterior thereof for rotating the tube about its axis, said tube-driving means also including means for axially advancing the tube simultaneity with rotation thereof, means for continuously feeding an adhesive-coated strip of covering material to said tube forwardly of said tube-driving means for spirally wrapping the strip around the tube during rotation and axial advancement of the latter, and supporting means engageable with the unwrapped tube only at its exterior for imparting lateral rigidity to the tube without the use of an internal mandrel, said supporting means comprising a plurality of rollers adapted to engage the outer periphery of the tube forwardly of said tube-driving means and closely adjacent the portion of the tube being wrapped and said rollers being spaced circumferentially around the tube.

3. An apparatus for performing an operation on an elongated tube of relatively slight rigidity whereby the tube is subjected to forces tending to move the tube laterally, said apparatus comprising tube-driving means including a plurality of rotating driving elements frictionally engageable with the exterior of the tube at circumferentially spaced points therearound for simultaneously rotating the tube about its axis and axially advancing the tube, and a plurality of supporting rollers spaced forwardly from said driving elements and engageable with the exterior of the tube closely adjacent to the portion of the tube being operated upon, said rollers also being spaced circumferentially around the tube for imparting lateral rigidity to the tube.

4. The apparatus of claim 3 further characterized in that said driving elements comprise a plurality of rollers having teethed surfaces for frictionally engaging and rotating the tube.

5. In an apparatus for wrapping a tube of the character described, a plurality of rotating driving elements frictionally engageable with the exterior of the tube for rotating the tube about its axis, a plurality of radially extending yokes located at circumferentially spaced points around the tube and carrying said driving elements, means operatively connected to said driving elements for driving the same in unison, means providing a swivel support for each of said yokes individually, a plurality of actuating arms extending outwardly from said yokes and rigidly connected thereto, a plurality of axially movable rods operatively connected to said actuating arms, and rotary adjustment means operatively interconnecting said rods for shifting the rods axially in unison and thereby swiveling said yokes in unison whereby to vary the angular relation of said driving elements to the axis of the tube and thereby effecting axial advancement of the tube at a predetermined rate simultaneously with rotation of the tube.

6. In an apparatus for wrapping a tube of the character described, a plurality of rotating driving elements frictionally engageable with the exterior of the tube for rotating the tube about its axis, a plurality of radially extending yokes located at circumferentially spaced points around the tube and carrying said driving elements, means operatively connected to said driving elements for driving the same in unison, means providing a swivel support for each of said yokes individually, a plurality of actuating arms extending outwardly from said yokes and rigidly connected thereto, a plurality of axially movable rods operatively connected to said actuating arms, and rotary adjustment means operatively interconnecting said rods for shifting the rods axially in unison and thereby swiveling said yokes in unison whereby to vary the angular relation of said driving elements to the axis of the tube and thereby effecting axial advancement of the tube at a predetermined rate simultaneously with rotation of the tube.

7. In an apparatus for spirally wrapping a strip of covering material around an elongated tube, a plurality of sets of rotating driving elements frictionally engageable with the exterior of the tube at circumferentially spaced points around the tube, each of said sets comprising a plurality of rotating driving elements arranged in side-by-side relation axially of the tube, axially movable sets of rotating driving elements operatively connected to said driving elements for driving the same in unison, a plurality of swivel supports for individually supporting the driving elements in each of said sets, a plurality of actuating arms extending outwardly from said swivel supports and rigidly connected thereto, means interconnecting the actuating arms for each of said sets of driving elements for movement thereof substantially as a unit, and adjustable means having operating connections with each set of interconnected actuating arms whereby to vary in unison the angular relation of said driving elements to the axis of the tube and thereby effecting axial advancement of the tube at a predetermined rate simultaneously with rotation of the tube.

8. The apparatus of claim 7 further characterized in that said means interconnecting the actuating arms for each set of driving elements comprises a plurality of axially movable rods, each rod having rigid connections with one set of arms, and said adjustable means comprises a plurality of rotatable members threadedly engaged with said rods for axially moving the rods in response to rotary adjustment of the rotatable members, said rotatable members being operatively interconnected for effecting movement of the rods in unison upon adjustment of one of said rotatable members.

9. An apparatus for spirally wrapping a strip of covering material around an elongated tube, comprising a pair of spaced upright walls with aligned apertures therein adapted to have the tube extend therethrough, a plurality of elongated members extending rigidly between said walls and spaced radially from and circumferentially around the tube, a plurality of radially extending yokes swivelly mounted on said elongated members and carrying rotatable driving elements frictionally engageable with the exterior of the tube for rotating the tube about its axis, drive means operatively connected to said driving elements for driving the same in unison, means for continuously supplying an adhesive-coated strip of covering material to said tube forwardly of said driving elements for spirally wrapping the strip around the tube during rotation thereof, a plurality of radially extending yokes supports rigidly mounted on said elongated members and carrying rotatable caster wheels engageable with the outer periphery of the tube forwardly of said driving elements and closely adjacent the portion of the tube being wrapped, said caster wheels imparting lateral support and rigidity to the tube during wrapping thereof, and adjust-
able means operatively connected to said yokes for varying in unison the angular relation of said driving elements to the axis of the tube, thereby to regulate the rate of axial advancement of the tube.

10. The apparatus of claim 9 further characterized in that said drive means comprises a plurality of rotatable shafts extending between said walls adjacent said elongated members, means operatively interconnecting said shafts for rotation thereof in unison in response to driving of one of the shafts, and individual driving connections between said shafts and said driving elements.

11. An apparatus for wrapping a tube of the character described comprising tube-driving means including a plurality of rotating driving elements frictionally engageable with the exterior of the tube for effecting simultaneous rotation and axial advancement of the tube, means for continuously feeding an adhesive-coated strip to the tube for spirally wrapping the strip on the tube during rotary and axial movement of the latter, guide means coating with said strip for urging the incoming portion of said strip forwardly of the tube into butt edge relation with the portion of the strip already wrapped on the tube, shiftable means operatively connected to said guide means and movable in response to changes in width of the strip, and means for regulating the rate of axial advancement of the tube to compensate for changes of the width of said strip.

12. An apparatus for wrapping a tube of the character described comprising tube-driving means including a plurality of rotating driving elements frictionally engageable with the exterior of the tube for effecting simultaneous rotation and axial advancement of the tube, means for continuously feeding an adhesive-coated strip to the tube for spirally wrapping the strip on the tube during rotary and axial movement of the latter, swirl support means for said driving elements, guide means coating with said strip for urging the incoming portion of the strip forwardly of the tube into butt edge relation with the portion of the strip already wrapped on the tube, shiftable means operatively connected to said guide means and movable in response to changes in the width of the strip, and adjustable means operatively connected to said swirl support means for varying the angular relation of said driving elements to the axis of the tube and thereby permitting regulation of the rate of axial advancement of the tube to compensate for changes in the width of said strip.

13. An apparatus for wrapping a tube of the character described comprising tube-driving means including a plurality of rotating driving elements frictionally engageable with the exterior of the tube for effecting simultaneous rotation and axial advancement of the tube, means for continuously feeding an adhesive-coated strip to the tube for spirally wrapping the strip on the tube during rotary and axial movement of the latter, a shiftable carriage mounted for movement longitudinally of the tube, a guide element rigidly supported from said carriage and engageable with the trailing side edge of said strip for effecting transverse bulging of the strip and alignment of the leading side thereof in tight butt edge relation with the portion of the strip already wrapped on the tube, said carriage being movable in response to changes in width of the strip, and means for varying the angular relation of said driving elements to the axis of the tube thereby permitting regulation of the rate of axial advancement of the tube to compensate for changes in the width of said strip.

14. The apparatus of claim 13 further characterized in that said drive means comprises an elongated guide channel adapted to direct the incoming portion of the strip at a predetermined feed angle to the tube for obtaining spiral wrapping of the strip on the tube, and means swivelly supporting said guide channel at the inner end thereof, said guide channel being swingable about its swivel support for varying said feed angle in response to variations in the width of said strip.

15. An apparatus for spirally wrapping a strip of covering material around an elongated tube, comprising tube-driving means including a plurality of rotating driving elements frictionally engageable with the exterior of the tube at a predetermined angle to the axis of the tube for simultaneously rotating and axially advancing the tube, shiftable means for directing an elongated adhesive-coated strip to said tube at a predetermined feed angle for obtaining spiral wrapping of the strip around the tube during rotation and axial advancement of the latter, said swingable means being pivotally movable for changing said feed angle in response to variations in the width of said strip, and means for varying the angular relation of said driving elements to the axis of the tube thereby permitting regulation of the rate of axial advancement of the tube to compensate for changes in the width of said strip.

16. An apparatus for spirally wrapping an elongated strip of covering material around an elongated tube, comprising tube-driving means including a plurality of rotating driving elements frictionally engageable with the exterior of the tube for simultaneously rotating and axially advancing the tube, and means for applying a second adhesive coating to said strip, and means for directing the strip from said first applicator means to the rotating and axially advancing tube at a predetermined feed angle for obtaining spiral wrapping of the strip under tension on the tube.

17. An apparatus for spirally wrapping an elongated strip of covering material around an elongated tube, comprising tube-driving means including a plurality of rotating driving elements frictionally engageable with the exterior of the tube for simultaneously rotating and axially advancing the tube, and means for applying a second adhesive coating to said strip, and means for directing the strip from said first applicator means to the rotating and axially advancing tube at a predetermined feed angle for obtaining spiral wrapping of the strip under tension on the tube.
forwardly of said driving elements and closely adjacent the portion of the tube being wrapped, said caster wheels imparting lateral support and rigidity to the tube during wrapping thereof, a shiftable carriage movably mounted on one of said elongated members for back and forth movement longitudinally of said tube, guide means rigidly supported from said carriage and coacting with the side edges of said strip for urging the incoming portion of the strip forwardly of the tube into butt edge relation with the portion of the strip already wrapped on the tube, said carriage thereby being movable in response to changes in the width of the strip, and adjustable means operatively connected to said yokes for varying the angular relation of said driving elements to the axis of the tube and thereby permitting regulation of the rate of axial advancement of the tube to compensate for changes in the width of said strip.

References Cited in the file of this patent

UNITED STATES PATENTS

1,883,401 Rolfs et al. Oct. 18, 1932
2,489,503 Sampson et al. Nov. 29, 1949
2,502,638 Becht Apr. 4, 1950
2,625,979 Harris et al. Jan. 20, 1953