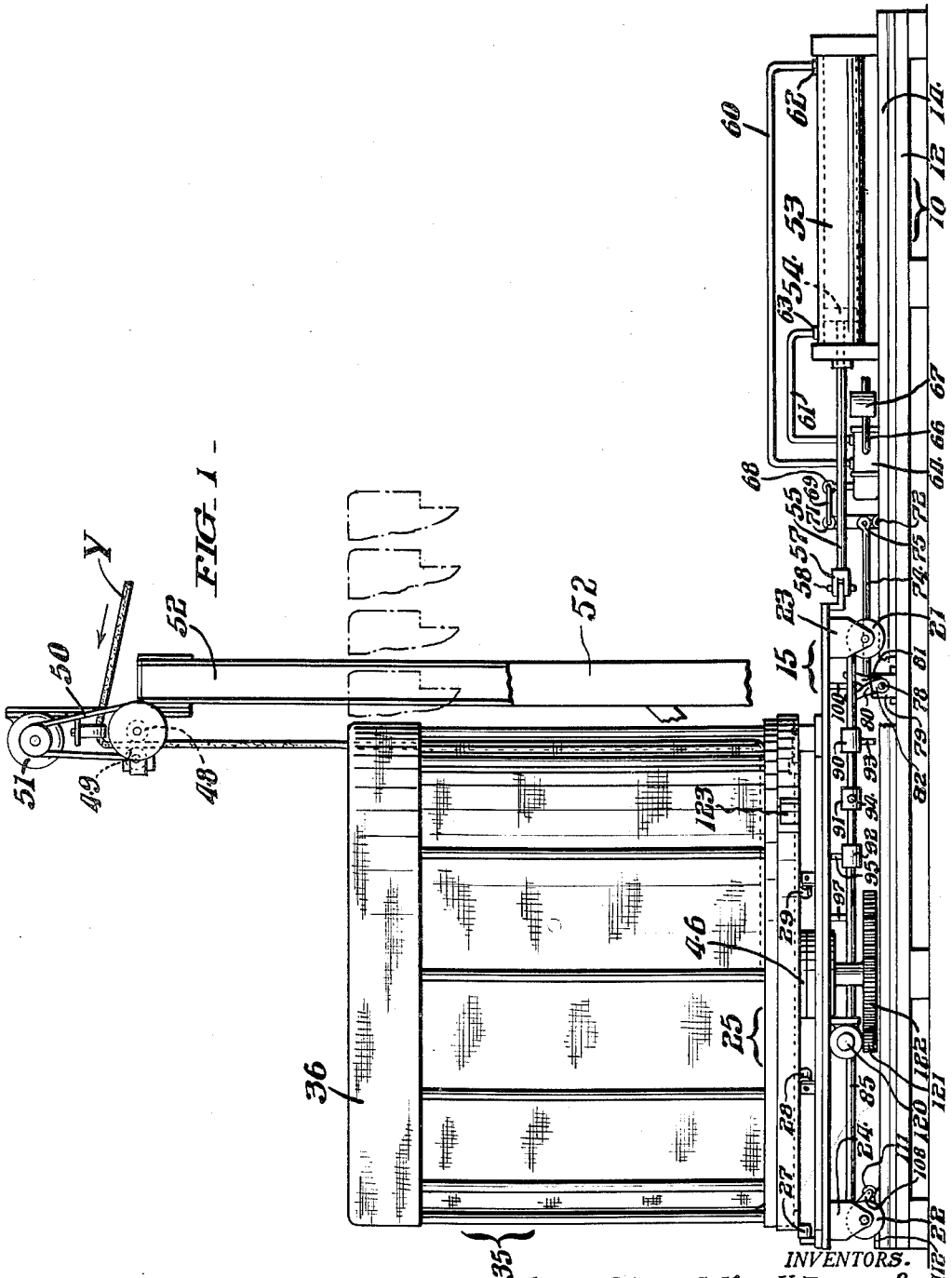
March 19, 1963 T. F. SUGGS ET AL 3,081,511

TEXTILE PACKAGING AND HANDLING APPARATUS

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FIG. 1



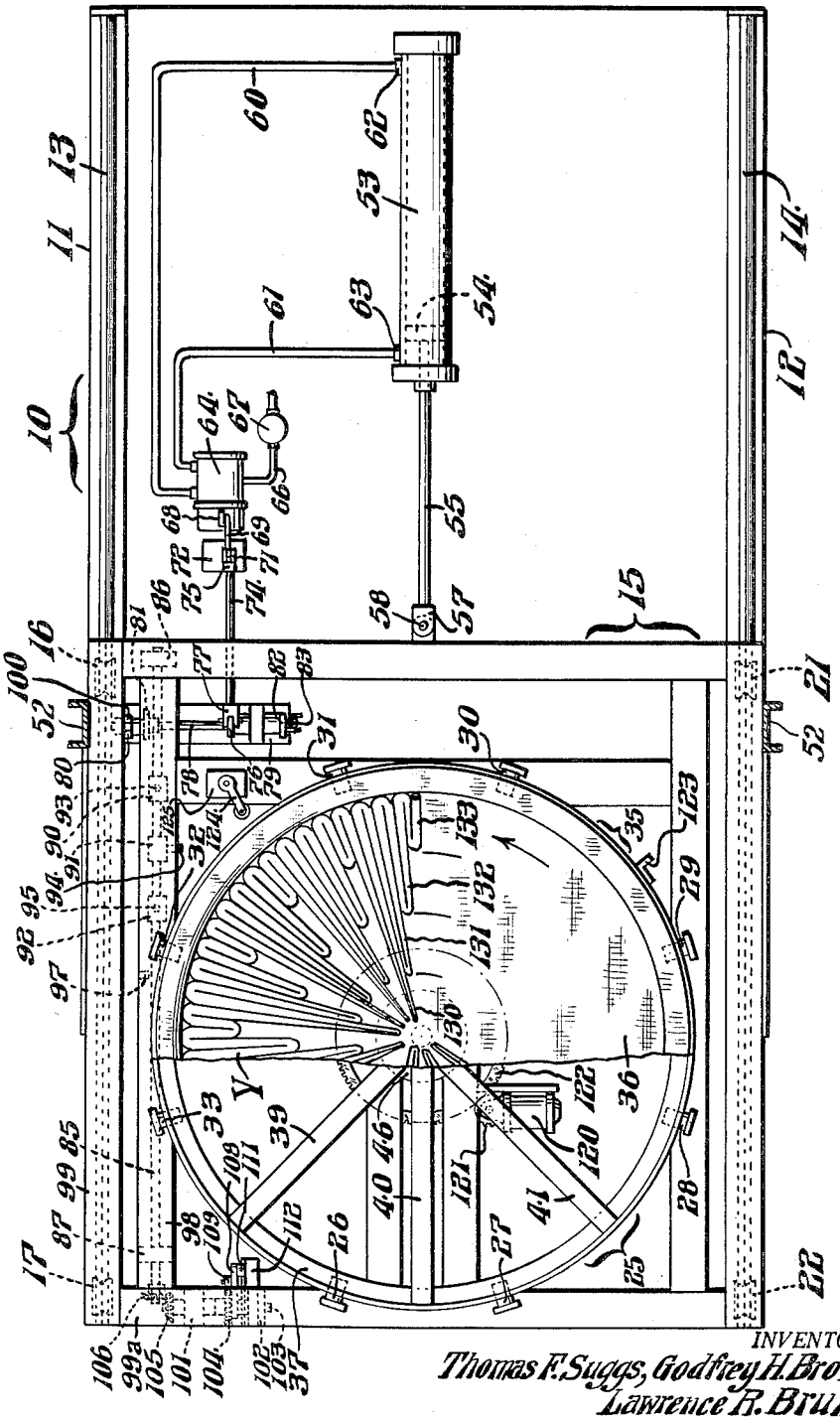
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TEXTILE PACKAGING AND HANDLING APPARATUS

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FIG. 2



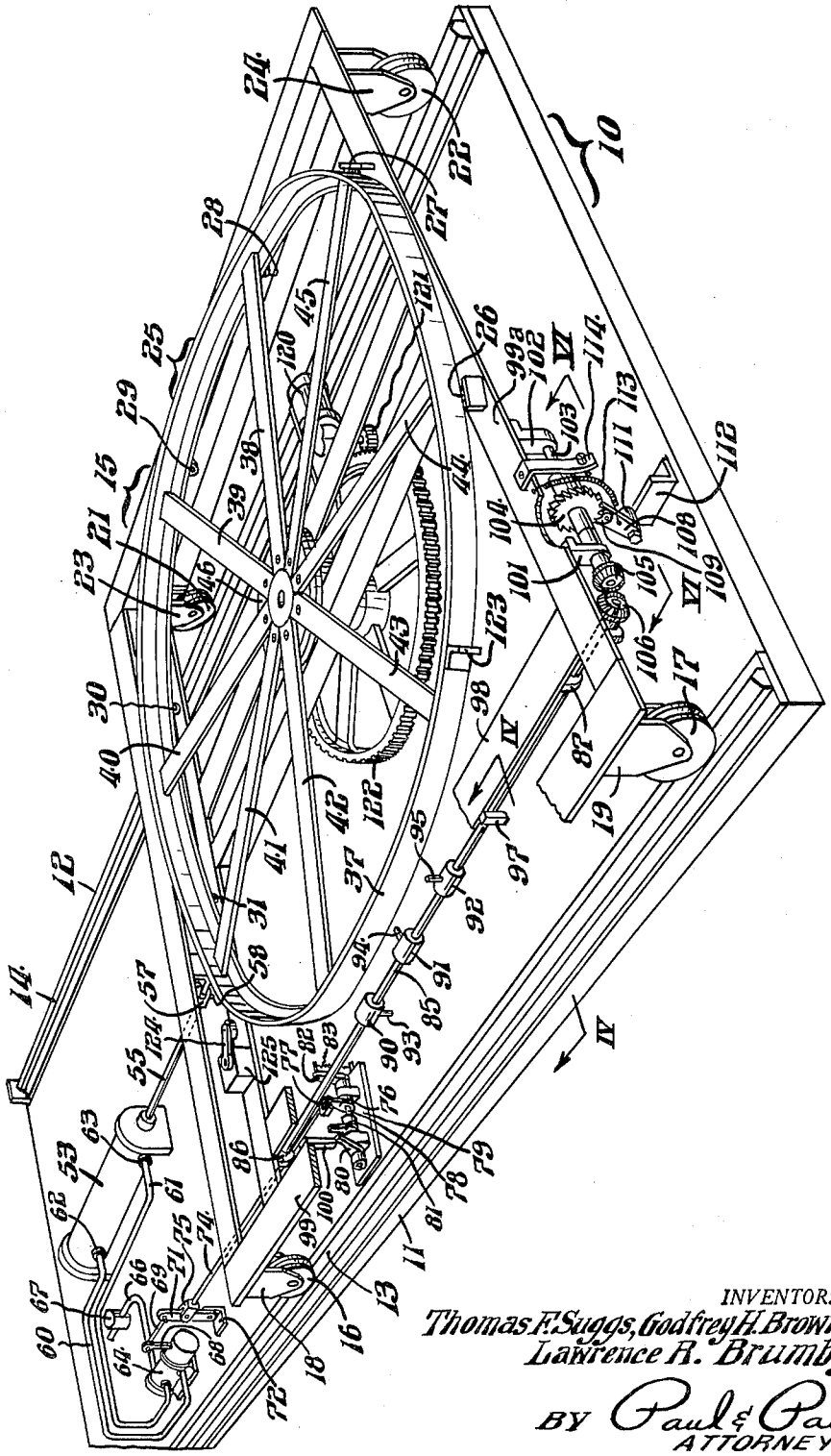
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TEXTILE PACKAGING AND HANDLING APPARATUS

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FIG. 3



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TEXTILE PACKAGING AND HANDLING APPARATUS

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FIG. 4

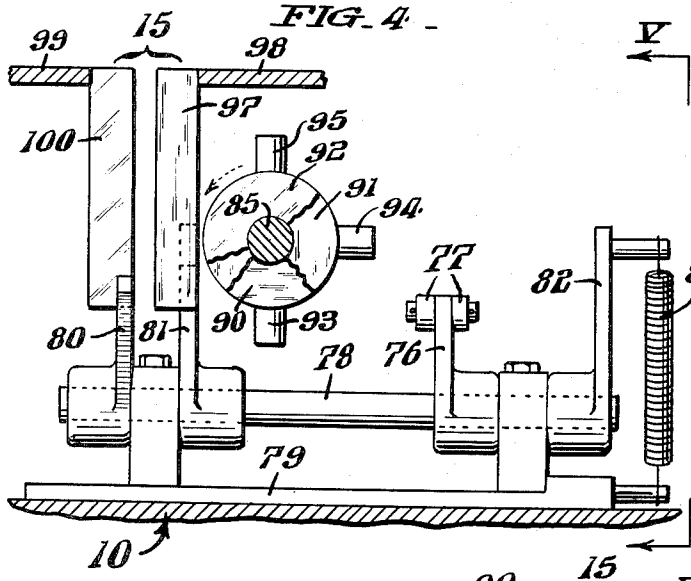


FIG. 5

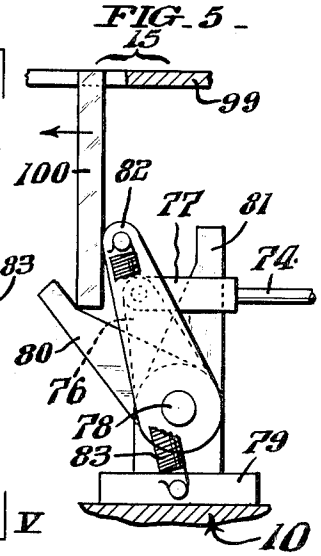


FIG. 6

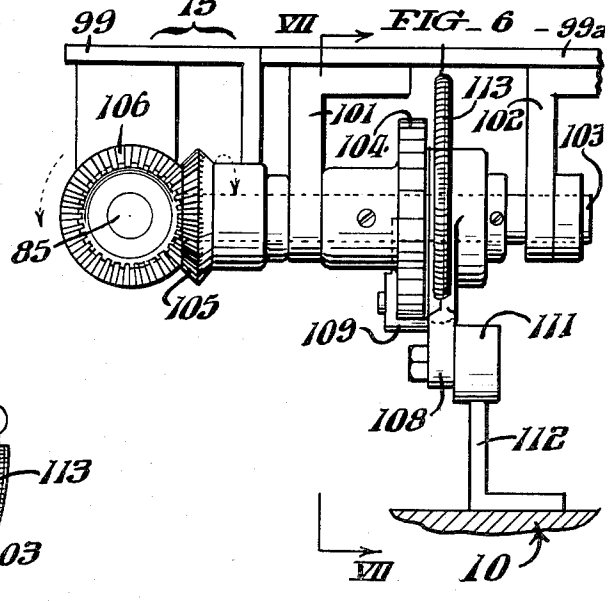
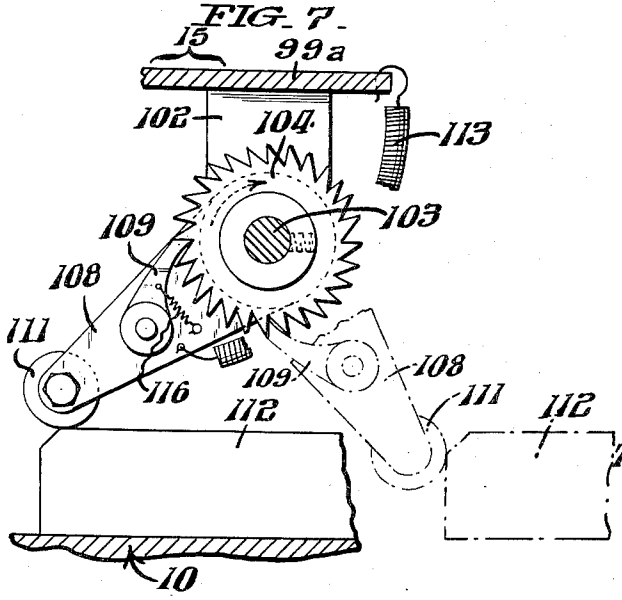


FIG. 7



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3,081,511

TEXTILE PACKAGING AND HANDLING APPARATUS

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Filed Nov. 2, 1960, Ser. No. 66,717
14 Claims. (Cl. 28—21)

This invention relates to a textile handling apparatus and method. More particularly, this invention relates to apparatus for the automatic coiling, laying and packaging of textiles such as yarn, filaments, sliver, rovings, tows, ribbons, fabrics and similar elongated flexible materials for package dyeing, bleaching, heat setting and like operations.

It is an object of this invention to provide automatic textile treating or handling apparatus and method whereby the textile may be placed into a bag or similar container so that it is evenly distributed over the entire area of the bottom of the bag or other container and whereby said bag or container may be filled by an even distribution of the textile, thereby producing a level package with an even density throughout.

It is another object of this invention to provide automatic textile packaging apparatus and method which provides a very compact package of textile which is distributed in even layers throughout.

It is another object of this invention to provide automatic textile packaging apparatus and method whereby a package of even density is produced which will allow the treating agent to pass through the entire package at an even rate of flow, thereby coming into contact with all of the textile being processed.

It is another object of this invention to provide automatic textile packaging apparatus and method whereby the textile may be layered in containers both rapidly and efficiently while maintaining a high degree of precision in the positioning of said textile.

Other objects and attendant advantages of the invention will become further apparent hereinafter and in the drawings, wherein:

FIG. 1 is a view in side elevation of a yarn packaging apparatus as provided in accordance with this invention;

FIG. 2 is a view in plan of the apparatus partly broken away to illustrate the lay of the yarn;

FIG. 3 is a view in perspective of the base of the yarn packaging apparatus as seen from the rear;

FIG. 4 is a cross-sectional view of a part of the apparatus taken as indicated by the numerals IV—IV in FIG. 3;

FIG. 5 is a sectional view of a part of the apparatus taken as indicated by the numerals V—V of FIG. 4;

FIG. 6 is a sectional view of a part of the apparatus taken as indicated by the numerals VI—VI of FIG. 3; and

FIG. 7 is a sectional view of a part of the apparatus taken as indicated by the numerals VII—VII of FIG. 6.

The following description is directed to the specific form of the apparatus as illustrated in the drawings and is not intended to be addressed to the scope of the invention itself, which is capable of being practiced in a wide variety of forms and arrangements.

Adverting herewith to the specific form of the invention illustrated in the drawings, the numeral 10 designates a base for the apparatus in accordance with this invention near the opposite edges 11 and 12 of which are positioned rails 13 and 14 which carry a rectangular frame or carriage 15. The carriage 15 is arranged for longitudinal movement on the base 10 and rails 13 and 14 by means of rollers 16 and 17 journalled in the supports 18 and 19

and arranged to roll along the rail 13 and rollers 21 and 22 journalled respectively in the supports 23 and 24 and arranged to roll on the rail 14. A turntable 25 mounted on rollers 26, 27, 28, 29, 30, 31, 32 and 33, suitably affixed to the frame 15 for that purpose, is provided for the support of a basket frame 35 within which may be positioned a bag or other flexible container 36, all as shown in FIG. 1. The turntable 25 comprises a rim flange 37 to which are secured the strips or spokes 38, 39, 40, 41, 42, 43, 44 and 45 which radiate from a central hub 46. Positioned above the basket frame 35 are a pair of draft rolls 48 and 49 which are driven by an endless belt 50 connected to a motor 51. As may be seen in FIG. 1, the draft rolls 48 and 49 and the motor 50 are affixed to a supporting standard 52. A yarn or plurality of yarns Y is arranged to pass between the draft rolls 48 and 49 and to fall into the bag or basket 36 arranged on the basket frame 35.

An air cylinder 53 is provided for supplying the motive force for the movement of the frame 15 along the rails 13 and 14 and contains a reciprocating piston 54 which is connected to the piston rod 55 which is itself secured to the frame 15 at its distal end by means of a fitting 57 and bolt 58. Air lines 60 and 61 are provided for supplying air to the air cylinder 53 respectively at the opposite ends 62 and 63 thereof. The air lines 60 and 61 both lead into an air valve 64 which is in turn in connection through a third air line 66 with a solenoid valve 67 for a purpose to be explained more fully hereinafter. The air valve 64 is operable to admit air through either of the lines 60 or 61 by means of a valve lever 68 connected by a rod 69 to a vertical lever 71 pivotally secured to support 72 affixed to the base 10. A second rod 74 is connected at one end thereof to the vertical pivoted lever 71 through the fittings 75 and at the opposite end thereof to an operating lever 76 through a second fitting 77. The lever 76 is secured for rotation to a rotatable bar 78 mounted in a support 79 affixed to the base 10. Similarly affixed to the rotatable bar 78 are a rim lever 80 and a limit lever 81 on one side of the lever 76 and on the other side a positioning lever 82 to which is secured a spring 83 for positioning the bar 78 in a manner and for a purpose to be described more fully hereinafter.

Secured to a rotatable shaft 85 suspended from the frame 15 by the supports 86 and 87 are secured limiting stops 90, 91, and 92, each of which bear lugs 93, 94, and 95, respectively. The limiting stops 90, 91, and 92 are secured for rotation with the shaft 85 and are arranged so that the longitudinal axis of the lug of each stop forms a 90° angle with the longitudinal axis of the lug of the adjacent stop and so that no two lugs of the aforesaid stops project in the same direction from the shaft 85 at the same time. As may be seen in FIG. 3, when the lug 93 of the stop 90 projects downwardly, the lug 94 of the stop 91 projects horizontally, so that the axis thereof forms a right angle with the axis of the lug 93 and the lug 95 of the stop 92 projects upwardly so that the axis thereof forms a 90° angle with the axis of the lug 94 of the stop 91 and is parallel to the axis of the lug 93 of the stop 90.

As may best be seen in FIG. 3, a center stop 97 is immovably fixed to a cross piece 98 of the frame 15 in alignment with the limit lever 81. Also affixed to a cross-piece 99 of the frame 15 is a rim stop 100 arranged in alignment with the rim lever 80 and adapted to trip the aforesaid lever, as shown in FIG. 3, in a manner and for a purpose to be explained more fully hereinafter. It will be clear that the center stop 97 and each of the lugs 93, 94 and 95 of the limiting stops 90, 91 and 92 when said stops are respectively rotated by the shaft 85 so that the respective lugs thereof project downwardly toward the base 10, are arranged to trip the limit lever 81 when the

frame or carriage 15 is drawn by the rod 55 in the direction of the aforesaid lever, all in a manner and for a purpose to be described more fully hereinafter.

Suspended from a cross-piece 99*a* of the frame 15 at the free end opposite the air cylinder 53 are supports 101 and 102 for a rotatable bar 103 which has affixed centrally thereof a ratchet wheel 104. To the distal end of the rotatable bar 103 there is affixed a bevel gear 105 which is arranged to engage a second bevel gear 106 secured to the distal end of the shaft 85. A ratchet lever 108 is also affixed to the rotatable bar 103 adjacent the ratchet wheel 104 and has pivoted thereto a pawl 109 which is adapted to engage the ratchet wheel 104. To the distal end of the ratchet lever 108 there is affixed a roller 111 which is arranged for engagement with a stop 112 mounted on the base 10. As may be seen in FIGS. 3 and 6, a spring 113 is secured at one end thereof to the ratchet lever 108 and at the opposite end thereof to the cross-piece 99*a* and normally urges the ratchet lever outward from the frame 15, that is, in a counter-clockwise direction when viewing the lever from the side 11 of the base 10. Also affixed to the cross-piece 99*a* is a limiting stop 114 which cooperates with the ratchet wheel and lever in a manner and for a purpose to be explained more fully hereinafter.

As may best be seen in FIG. 7, a second spring 116 affixed to the ratchet lever 108 and the pawl 109 normally urges the aforesaid pawl in the direction of the ratchet wheel 104.

As may best be seen in FIGS. 1 and 3, the turntable 25 is driven by a reversible motor 120 through a gear train which comprises a pinion gear 121 and a drive gear 122 affixed axially to the hub 46 of the turntable 25. To the outer surface of the rim 37 of the turntable 25 there is affixed a lug 123 which is arranged to engage a reversing lever 124 connected to an electrical reversing switch 125. The aforesaid reversing switch 125 is in electrical connection with the reversible motor 120 and is adapted to reversing the direction of the motor upon the tripping of the switch lever 124 in a manner and for a purpose to be explained more fully hereinafter.

In operation, the apparatus as provided in accordance with this invention is adapted to lay down yarn in the container 36 in a specific pattern illustrated diagrammatically in FIG. 2. Specifically the yarn Y is coiled in a series of loops 130, 131, 132 and 133 having their lengths equal to the radius of the circular frame 35, three-fourths of the radius, one-half of the radius and one-fourth of the radius, respectively. The pattern is then repeated again and again until the entire bottom surface of the bag or container 36 is covered evenly by the aforedescribed loops, after which the pattern is again repeated in a second layer laid down upon the first.

The aforedescribed yarn pattern, or lays, are laid down in the following manner:

The motor 51 is started and at the same time the reversible motor 120 of the turntable is started so that the aforesaid turntable 25 will begin to rotate. The motors 51 and 120 are synchronized and are in electrical connection with the solenoid valve 67 which admits air into the air valve 64 immediately upon the starting of the aforesaid motors (electrical connections not shown). With the carriage positioned so that the yarn falls into the container 36 at the rim of the frame 35, as shown in FIG. 1, and with the rim lever 80 tripped by the rim stop 100, as shown in FIG. 3, the operating lever 76 is pulled forward to the position indicated by the dotted lines in FIG. 5 and, as a consequence, the lever 71 and the lever 68 are pulled forward by the rod 74. Movement of the lever 68 closes the air line 60 in the air valve 64 and opens the air line 61, thereby admitting air into the air cylinder 53 at the end 63 thereof and forcing the piston 54 backward in the aforesaid air cylinder. Movement of the piston 54, backward in the air cylinder causes the carriage 15 to move toward the air cylinder 53 by retraction of the piston rod 55 into the cylinder. As the carriage moves forward, one side of the loop 130 is laid down on the bottom of the container 36 by the continual movement of the yarn Y into the aforesaid container. When the carriage 15 has advanced toward the air cylinder to the point where the center stop 97 encounters the limit lever 81, stop 97 trips the aforesaid lever 81 causing the bar 78 to rotate and pushing the rod 74 and the lever 71 in the direction of the air cylinder 64. The aforesaid movement acts upon the lever 68 of the air valve 64 to cause the air line 61 to be closed and the air line 60 to be opened thereupon admitting air into the end 62 of the air cylinder 53. The aforesaid air under pressure forces the piston 54 forward again in the air cylinder 53 thereby moving the piston rod 55 outward causing the carriage 15 to start backward again to its initial rim position. When the carriage 15 has moved backward far enough that the rim stop 100 again trips the rim lever 80, the roller 111 affixed to the ratchet lever 108 simultaneously contacts the stop 112 thereupon causing the ratchet lever 108 to move forward with the result that the pawl 109 forces the ratchet wheel 104 to revolve in a clockwise direction when viewed from the side 11 of the base 10. Rotation of the ratchet wheel 104 causes the rotation of the bar 103 with the consequent rotation of the bevel gear 105 which being engaged to the bevel gear 106 also causes the rotation of the stop control shaft 85. The rotation of the stop control shaft 85 in turn rotates each of the stops 90, 91, and 92 through 90°. It will be clear that the rotation of the aforesaid stops 90, 91, and 92 through 90° causes the lug 95 to be lowered from its upward position to a horizontally projecting position and similarly causes the lug 94 to be raised from its horizontally projecting position to an upward position. Likewise, the lug 93 is turned from its downward position to a horizontal position. In like manner as before, the tripping of the rim lever 80 by the rim stop 100 causes the rotation of the bar 78 and consequent movement of the rod 74, whereupon levers 71 and 68 close the line 60 in the air valve 64 and open the line 61. Consequent passage of air into the air cylinder at end 63 again moves the carriage 15 forward as the piston 54 and rod 55 are retracted and, accordingly, the carriage 15 advances until the limiting stop 95 reaches the limit lever 81 thereby laying down the first half of loop 131. As the lug 95 trips the limit lever 81 the air valve 64 is once again reversed and air again admitted through line 60 into the end 62 of the air cylinder and the piston moves forward, once again pushing the carriage 15 back toward the rim position until, once again, the ratchet lever 108 is tripped by the stop 112 causing a one-quarter turn of the bar 103 and likewise a quarter turn of the shaft 85. With the second quarter turn of the shaft 85, the lug 94 of the limiting stop 91 is caused to assume a horizontal position and as the carriage 15 moves backward again toward the air cylinder 53, as a result of the tripping of the rim lever 80 by the rim stop 100, the lug 94 now approaches the limit lever 81, at which time the first half of the third loop 132 is laid down. The lug 94 trips the limit lever 81 to cause the carriage to move forward again until the limiting stop 100 trips the rim lever 80 and stop 112 trips ratchet lever 108. As a result, now, of the rotation of the ratchet wheel 104, the shaft 85 is rotated again through 90° and, the lug 93 of the stop 90 is moved into alignment with the limit lever 81. As the carriage 15 moves toward the air cylinder 53 once again, it now moves backward until the stop 93 reaches the limit lever 81, consequently tripping it. At this time, the first half of the fourth loop 133 is laid down in the container 36. As a consequence of the tripping of the limit lever 81 by the stop 93, the carriage will move back to its original rim position and the ratchet lever 108 upon being tripped by the stop 112 will force the rotation of the shaft 85 through a quarter of its circumference, causing the limiting stops 90, 91, and 92 to assume their original positions as at the beginning of the aforedescribed cycle.

Thereafter, the cycles, as described, are repeated again and again while the turntable **25** is rotated by the motor **120** through the gears **121** and **122** so that the lug **123** finally reaches the position of the reversing lever **124** of the reversing switch **125**. The moving turntable causes the lug **123** to trip the switch **124** whereupon the motor **120** is reversed and causes the gears **121** and **122** to move in the opposite rotational direction with the consequent change in rotation of the turntable **25**. The turntable **25** continues in its reverse motion until again the lug **123** approaches the reverse switch **124** and trips it in the opposite direction, again reversing the motor **120** and the direction of rotation of the turntable **25**. As a result of the aforedescribed motions of the carriage **15** and the turntable **25**, repeated layers of yarn are laid down in the container **36** in a definite and repeated pattern to cause the container to be progressively filled evenly and compactly.

It will be apparent that it is an important advantage of automatic packaging device, as aforedescribed, that the yarn is evenly distributed over the entire area of the bottom of the container and will continue to be so evenly distributed until the container has been filled thereby providing a level package with an even density throughout and affording a yarn package which allows a treating agent to pass through the body thereof at an even rate of flow and to come into contact with all of the yarn that is being treated.

Although this invention has been described with general reference to elongated textiles, the invention is particularly effective and useful in the handling of texturized or crimped synthetic textile materials such as nylon, Orlon, Dacron, and the like, which have been specially treated in order to alter the shape of the filaments of such textiles, thereby giving them greater body, warmth and loft. Although this invention is not limited thereto, it has particular benefit in processing continuous filament yarns or the like which have been produced in accordance with the disclosure and claims of the patent to Rosenstein et al. No. 2,715,309. When such yarns are ejected from the crimping chamber, the crimps that have been formed therein can be either wholly or partially destroyed by applying tension to the yarns prior to the time that they have been heat set. Therefore, it is important to maintain the yarns in a limp or non-tensioned form at all times after crimping and prior to heat setting. This presents a very substantial difficulty in practice, because it prevents winding up the crimped yarn on cones or the like for the purpose of transporting such yarns to the heat setting or dyeing apparatus or the like. It is therefore an important and advantageous feature of the method according to this invention, that the crimped textiles are allowed to remain in relaxed condition and are laid into their container while maintaining them under substantially zero tension during the entire packaging operation. The textile material thus packaged, may readily be transported to a heat setting or dyeing apparatus, without pulling out or destroying the crimp that has been imparted to the textile. Moreover, in accordance with the method of this invention, the textile is laid down in its container in such a way that it is readily and completely permeated either by steam, or by hot dye solution, or by any other medium with which it is to be treated, in order to impart a permanent set to the textile.

Although this invention has been disclosed with reference to specific forms and embodiments thereof, it will be evident that a great number of variations may be made without departing from the spirit and scope of this invention. For example, not only may yarns be handled in the manner described in the specific embodiment of this invention but also any flexible elongated textile material, including rovings, sliver, tow, filaments, ribbons and fabrics. Furthermore, parts may be reversed, equivalent elements may be substituted for those specifically disclosed and certain features of the invention may be used independently of other features, all without departing from the spirit and scope of this invention as defined in the appended claims.

Having thus described our invention, we claim:

1. Apparatus for coiling flexible, elongated material into a container comprising a support for said container, means for feeding said material into said container at a predetermined rate of speed, means for turning said container as said material is fed thereinto, means connected to said turning means for providing translational motion to said container as said material is fed thereinto whereby said material is laid down in said container in repeated coiled lengths thereof and means disposed adjacent said support for varying the distance through which said container is moved.

2. The apparatus defined in claim 1, wherein said turning means is arranged for alternately turning said container first in one direction and then in another.

3. The apparatus defined in claim 2, wherein said container is rotated through a full 360° prior to each change of direction.

4. Apparatus for coiling flexible, elongated material into a container comprising a support for said container, means for feeding said material into said container at a predetermined rate of speed, means for turning said container as said material is fed thereinto, and means connected to said turning means for providing reciprocal movement of said container as said material is fed thereinto and in a direction at right angles to the direction of movement of said material, no two successive movements of said container in the same direction with respect to said material being of equal length.

5. Apparatus for coiling flexible, elongated material into a container comprising a base for said apparatus, a carriage mounted on said base and arranged for reciprocal movement thereon, a turntable mounted on said carriage and arranged for movement thereon, a support for said container disposed upon said turntable and arranged for movement therewith, means for feeding said material into said container, means for turning said turntable, means for moving said carriage back and forth on said base, and means for varying the distance of travel of said carriage on said base.

6. The apparatus defined in claim 5, wherein means are provided for reversing the direction of motion of said turntable after each turn thereof through 360°.

7. The apparatus defined in claim 5, wherein the distance travelled by said carriage in any given cycle of backward and forward movement is different from the distance travelled by said carriage in the immediate preceding and succeeding cycles.

8. Apparatus for coiling flexible, elongated material into a container comprising a base for said apparatus, a carriage mounted upon rails affixed to said base, said carriage being arranged for reciprocal movement back and forth on said base, a turntable mounted on said carriage and arranged for the support of said container thereon, said turntable and said container being arranged for turning movement on said carriage, means for feeding material into said container, means connected to said turntable for the turning thereof, means connected to said turning means for the reversal thereof, drive means connected to said carriage for the movement thereof on said base and means connected to said drive means and arranged to vary the reciprocal movement of said carriage on said base.

9. Apparatus for coiling flexible, elongated material into a container comprising a base for said apparatus, a carriage mounted upon rails affixed to said base, said carriage being arranged for reciprocal movement back and forth on said base, a turntable mounted on said carriage and arranged for the support of said container thereon, said turntable and said container being arranged for turning movement on said carriage, means for feeding material into said container, a reversible motor connected to a gear train of said turntable for the turning thereof, an air cylinder mounted on said base and affixed to an end of

said carriage for the reciprocal movement thereof, means connected to said motor for the reversal thereof, and means connected to said air cylinder and arranged to limit the reciprocal movement of said carriage on said base.

10. Apparatus for coiling flexible, elongated material into a container comprising a base for said apparatus, a carriage mounted upon rails affixed to said base, said carriage being arranged for movement back and forth on said base, an air cylinder mounted on said base at one end thereof and connected to said carriage for the reciprocal movement thereof, an air valve connected to said air cylinder and arranged to admit air into the opposite ends thereof, a plurality of limiting stops affixed to said carriage and arranged to operate said valve to change the direction in which air is admitted into said cylinder, whereby the direction of the movement of said carriage is changed at predetermined points in its path, a turntable mounted on said carriage and arranged for the support of said container thereon, a reversible motor mounted on said base and connected to said turntable for the rotation thereof, a reversing switch connected to said motor and disposed adjacent said turntable, means affixed to said turntable for tripping said reversing switch, and means positioned above said container for feeding said material thereinto at a predetermined rate of speed and at right angles to the direction of movement of said carriage.

11. Apparatus for coiling flexible, elongated material into a container comprising a base for said apparatus, a carriage mounted upon rails affixed to said base, said carriage being arranged for movement back and forth on said base, an air cylinder mounted on said base at one end thereof and connected to said carriage for the reciprocal movement thereof, an air valve connected to said air cylinder and arranged to admit air into the opposite ends thereof, a pair of limiting stops immoveably affixed to said carriage and arranged to operate said valve to change the direction in which air is admitted to said cylinder, whereby said stops respectively delimit the maximum movement of said carriage toward and away from said cylinder, a plurality of additional limiting stops positioned intermediate said first mentioned stops and arranged for successively delimiting the forward movement of said carriage toward said air cylinder, a turntable mounted on said carriage and arranged for the support of said container thereon, a reversible motor mounted on said base and connected to said turntable for the turning thereof, a reversing switch connected to said motor and disposed adjacent said turntable, means affixed to said turntable for tripping said reversing switch, and means positioned above said container for feeding said yarn thereinto at a predetermined rate of speed and at right angles to the direction of movement of said carriage.

12. Apparatus for coiling flexible, elongated material into a container comprising a base for said apparatus, a carriage mounted on said base and arranged for reciprocal movement thereon, drive means mounted at one end of said base and arranged for the longitudinal movement of said carriage thereon, a pair of limiting stops immovably affixed to said carriage and arranged to reverse said drive means and limit the maximum movement of said carriage toward and away from said drive means, a rotatable shaft mounted on said carriage, a plurality of additional limiting stops affixed to said shaft and arranged for successive actuation of said drive means for said carriage to delimit the forward movement thereof as said shaft is rotated above the axis thereof, a turntable mounted on said carriage and arranged for the support of said container thereon, reversible rotary means mounted on said base and connected to said turntable for the rotation thereof, and means positioned above said container for feeding said material thereinto at a predetermined rate of speed and at right angles to the direction of movement of said carriage.

13. The apparatus defined in claim 12, wherein means are provided on said base for rotating said shaft through 90° whenever said carriage moves back a maximum distance from said drive means and wherein said limiting stops on said shaft are successively moved into actuating position by the rotation of said shaft.

14. The apparatus defined in claim 13, wherein three limiting stops are mounted on said rotatable shaft, said stops limiting the forward movement of said carriages respectively to one-fourth, one-half and three-fourths of the maximum distance through which said carriage moves forward toward said drive means.

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