March 5, 1963 H. BURR 3,079,747

APPARATUS AND METHOD FOR STRANDING AND PACKAGING

Filed June 14, 1961 3 Sheets-Sheet 1

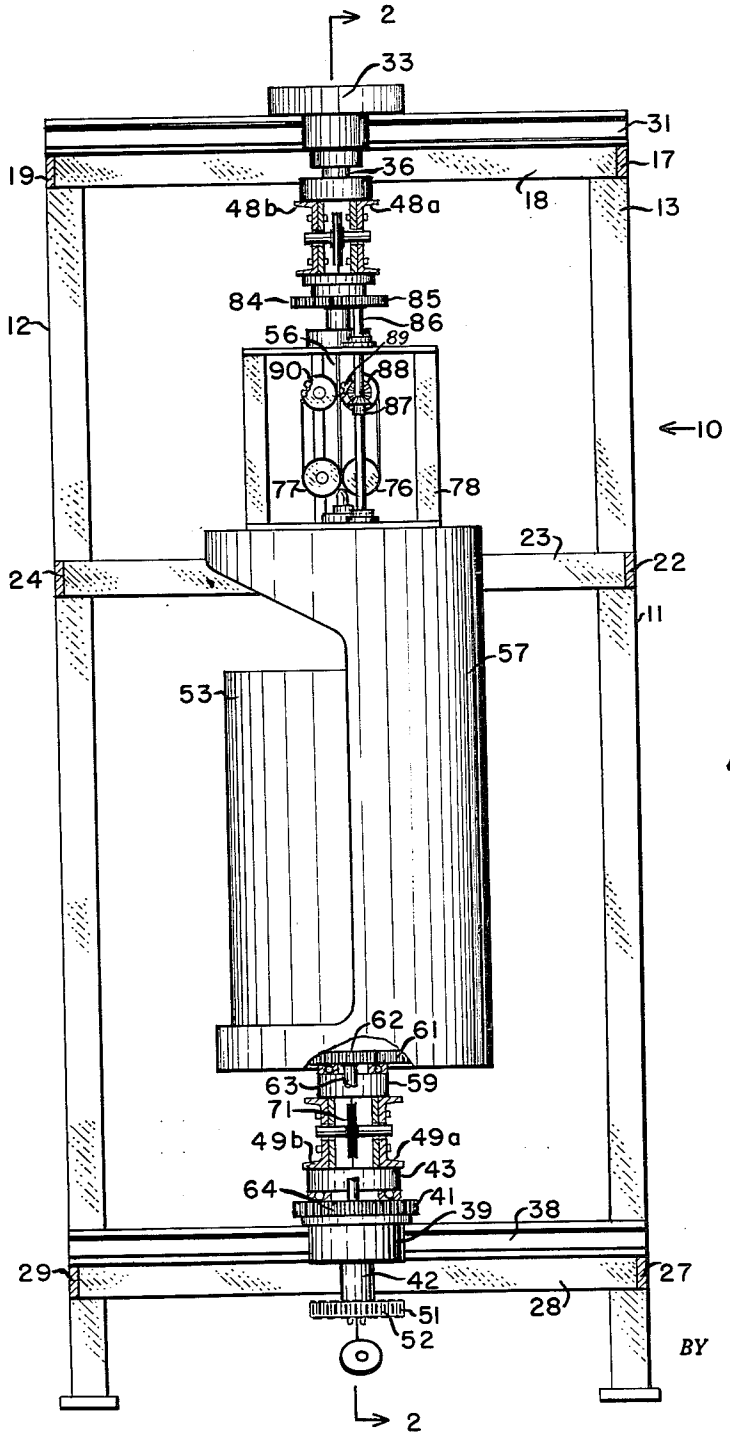


Fig. 1

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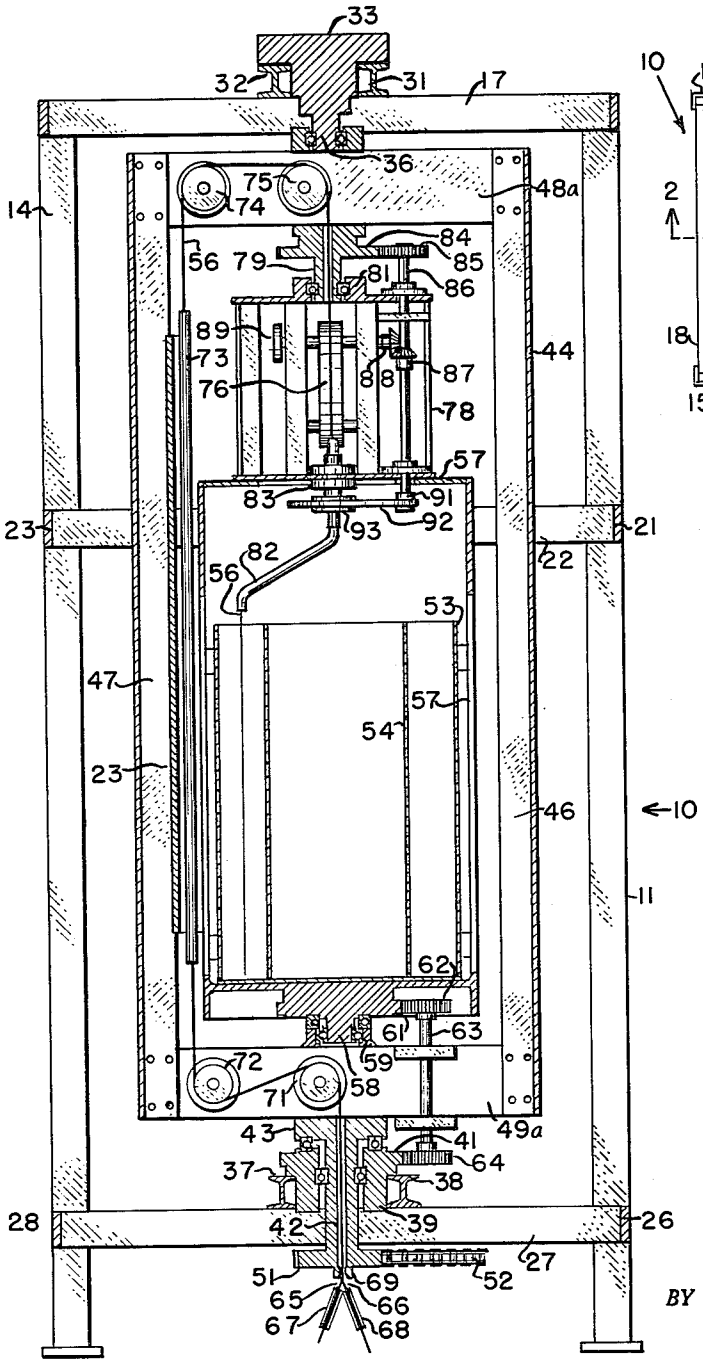


Fig. 2

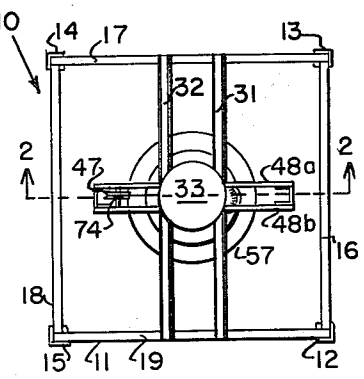


Fig. 3

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APPARATUS AND METHOD FOR STRANDING AND PACKAGING

Filed June 14, 1961 3 Sheets-Sheet 3

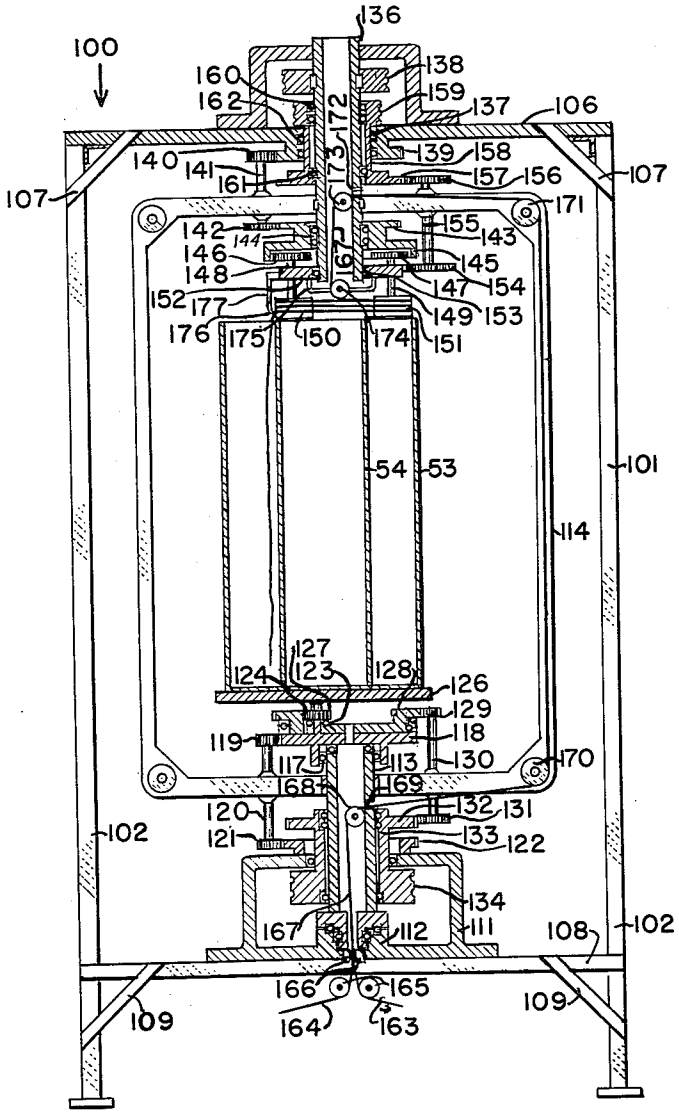


Fig. 4

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APPARATUS AND METHOD FOR STRANDING AND PACKAGING

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8 Claims. (Cl. 57—58.67)

My invention relates to apparatus and method for continuously twisting together a plurality of strands, and particularly to such apparatus and method wherein the strands are deposited directly into a concentric-walled drum.

It has long been known to twist together elongated strands such as insulated telephone wires to form twisted pairs and to take up the twisted strands onto reels for shipping, storing, or further processing. More recently a practice has been growing in industry of storing and shipping elongated strand in concentric-walled drums instead of reels. Such drums may be constructed of fiberboard and will have the advantages of cheapness and light weight compared to reels capable of holding an equal amount of strand. It has also been found that wire can be removed from drums at very high speed without any of the problems of inertia and braking that are created when heavy reels are rotated at high velocity. While it has been a simple and convenient matter to pay off directly into concentric-wall drums from such manufacturing operations as wire-drawing and extrusion, in the case of the stranding operation the twisted strands have conventionally been taken up on reels. Where it has been desired to ship such strands in concentric-wall drums it has been necessary to go through a separate operation of removing the strands from the reels and depositing them within the drums. In addition to the cost of a separate operation this procedure has had the disadvantage that splices or discontinuities in the strands are bound to occur due to the fact that the reels are not the same size as the drums.

I have invented apparatus for twisting together a plurality of strand of indefinite length and depositing said strands directly into a vertical drum. My apparatus comprises means for supporting the drum, means located beneath the drum for bringing the strands together and means for revolving the strands around the drum thereby twisting together such strands. It also comprises means for continuously advancing the strands and depositing them within the drum. Preferably the speed of revolving the strands around the drum will have a functional relation to the speed of advancement of the strands. My apparatus may include rotating means above the drum for guiding the strand in an approximately circular path between the partition and the wall of the drum and concentric thereto, and means for maintaining the drum and its support stationary with respect to rotation. My apparatus will preferably include a vertical frame encompassing a drum and its supporting means and means for rotating said frame on a vertical axis, a first guide means mounted centrally on the frame beneath the drum and receiving and guiding the strands onto the frame, a second guide means mounted centrally on the frame above the drum and supporting means associated with the frame directing the strands from the first to the second of said guide means. In one embodiment of my invention the axis of rotation of the frame is eccentric to the axis of the drum and there are means for guiding the strands into the drum in the form of loops eccentric to the axis of the drum.

I have invented a method of simultaneously twisting and packaging strands of indefinite lengths into a vertically mounted drum. My method comprises the steps of continuously bringing together the strands to be twisted at a point beneath the drum, revolving the strands on a vertical axis around the drum, continuously advancing the strands to a point above the drum, and continuously lowering the twisted strands in the form of loops into the drum.

A full and complete understanding of my invention may be obtained from a study of the drawing.

In the drawing:

FIG. 1 is a side elevation of one embodiment of my invention partly sectionalized and with some elements omitted for clarity.

FIG. 2 is a partially sectionalized front elevation of the embodiment of my invention shown in FIG. 1.

FIG. 3 is a plan view of the apparatus of FIG. 2.

FIG. 4 is a partially sectionalized elevation of another embodiment of my invention.

Referring to FIGS. 1 and 2 a twinner 10 is mounted in a framework 11 with upright members 12, 13, 14, 15 and horizontal braces 16, 17, 18, 19 at the top, additional horizontal braces 21, 22, 23, 24 above the middle height of the upright members and still additional horizontal braces 26, 27, 28, 29 near the bottom of the frame. Two I-beams 31, 32 fixedly mounted across the braces 17 and 19 support a spindle block 33 which terminates in a stub shaft 36. At the bottom of the frame another pair of I-beams 37, 38 supported on the braces 27, 29, support, in turn, a heavy thrust bearing 39 around which is sweated a toothed gear 41. Mounted in the thrust bearing 39 by means of a hollow vertical shaft 42 with a collar 43 is a rotating flyer indicated generally at 44. The flyer 44 is comprised of vertical members 46, 47 connected through an upper horizontal beam 48 comprised of two channels 48*a* and 48*b* and a lower beam 49 comprised of two channels 49*a* and 49*b*. The flyer 44 is rotatably driven by means of a sprocket 51 on the hollow shaft 42 and a chain 52 which is, in turn, driven by a motor and sprocket not shown. A fiber drum 53 with a concentric core 54 is mounted in my apparatus for receiving a twisted strand 56. Although it is advantageous to use a drum 53 made from fiberboard it will be readily understood that metal pails may also be used. I do not intend to limit my apparatus to any particular container. The drum 53 fits into an open steel barrel 57 supported on a stub shaft 58 in a thrust bearing 59 on the beam 49 of the flyer 44. A toothed gear 61 concentric to the shaft 58 is welded to the bottom of the barrel 57. The gear 61 meshes with a gear 62 attached to a shaft 63 that passes through the beam 49. The lower end of the shaft 63 is fitted with a gear 64 which meshes with the stationary gear 41. The ratios of the gears 62—61 are the same as the gear ratio 64—41 with the result that the barrel 57 and the drum 53 remain stationary relative to the framework 11 regardless of the rotation of the flyer 44. It will be understood that, although in this embodiment of my invention I prefer to hold the drum 53 stationary my invention is not limited to this mode of operation and any degree of relative motion desired can be given to the drum 53 relative to the framework 11 by changing either or both of the gear ratios 62—61 and 64—41 in a well-known manner.

The twisted strand 56 is shown to be made up of two separate wires 65 and 66 fed from separate outside sources, not shown, over sheaves 67, 68 through a constricted opening 69. When the wires 65, 66 come together at the constriction 69 they are twisted around each other once for each rotation of the flyer 44. It will be understood that although I have shown just the two wires 65, 66 my apparatus will work equally well for a greater number of wires brought together at the constriction 69. Having received one twist for each rotation of the flyer 44 at a point beneath the center of rotation of the said flyer the twisted strand passes over sheaves 71, 72 mounted on the beam 49, upwardly through a tube 73 which prevents undue ballooning of the strand, onto sheaves 74, 75 which are mounted on the beam 48. The sheave 71 is located to receive the strand 56 at the center of rotation of the flyer 44 and the sheave 75 is located to deliver the strand 56

at the center of rotation of the flyer 44. The strand 56 is urged forward by a pair of cooperating bells 76—77 which constitute a capstan mounted in a frame 78 rigidly attached to the barrel 57. In progressing from the sheave 75 to the capstan 76—77 the strand 56 passes through a hollow spindle 79 attached to the beam 48 and rotating in a bearing 81 on the frame 78. Since the sheave 75 is rotating along with the flyer 44 relative to the framework 11 whereas the capstan 76—77 does not rotate on a vertical axis, in passing from the sheave 75 to the capstan 76—77 the strand 56 receives an additional twist for each rotation of the flyer 44, thus the strand receives a double twist for each rotation of the flyer, one on entering the constriction 42 and the other on entering the capstan 76—77. The capstan 76—77 passes the strand 56 through a guide tube 82 mounted in a bearing 83. The spindle 79 has sweated onto it a toothed gear 84 which rotates with the flyer 44. The gear 84 meshes with a gear 85 on a vertical shaft 86 through the frame 78. Mounted on the shaft 86 is a bevel gear 87 which serves to drive the capstan 76—77 through a matching bevel gear 88 and a pair of spur gears 89—90. Also mounted on the shaft 86 is a pulley 91 which drives the guide tube 82 through a belt 92 and a pulley 93. By means of the apparatus hereinabove described two or more wires can be fed from stationary pay-off stations through guide means such as the sheaves 67, 68 and a twisted strand will be deposited in the drum 53 without any intermediate operation of reeling and mounting the reels in a strander. Moreover, because of the double twist imparted by my machine the speed of operation is doubled. Or, to look at it another way, if the speed is determined by the speed with which it is safe to rotate a frame having the dimensions of the flyer 44, the amount of strand delivered per unit time into the drum 53 will be twice the amount that could be delivered by a machine which imparted only a single twist.

Referring now to the embodiment of my invention of FIG. 4, the stranding and packaging apparatus indicated generally at 100 is mounted in a frame 101 having upright members 102, an upper horizontal plate 106 reinforced by braces 107 and a lower platform 108 reinforced by braces 109. The platform 108 rigidly supports a heavy mounting 111 within which a thrust bearing 112 rotatably supports a hollow vertical shaft 113 to which is rigidly fastened a flyer 114. Rotatably mounted at the top of the shaft 113 by means of a heavy thrust bearing 117 is a circular table 118 the outer rim of which is toothed in the form of a gear. The toothed table 118 meshes with a gear 119 on a shaft 120 passing through the flyer 114 and supporting a gear 121 which meshes with a sun gear 122, rigidly attached to the mounting 111. I prefer to have the number of teeth in the gear 118 equal the teeth in the gear 122 and the teeth in the gear 119 equal the teeth in the gear 121 whereby the table 118 will remain stationary relative to the mounting 111. Mounted eccentrically on the table 118 by means of a thrust bearing 123 is a stub shaft 124 projecting from the center of a platform 126 supporting the fiber drum 53. The stub shaft 124 is keyed to a gear 127 which meshes to an internally toothed gear 128 concentric to the platform 118 and rotating thereon. The gear 128 also has external teeth that mesh with a gear 129 on a shaft 130 passing through the flyer 114 and terminating in another gear 131. The gear 131 meshes in turn with a gear 132 on a hollow shaft 133 over the shaft 113 and rigidly connected to a pulley 134 connected by means of drive belts not shown to an outside power source also not shown. By means of the outside source of power and the pulley 134, shaft 133, gears 132, 131, shaft 130, and gears 129, 128, 127 the platform 126 and drum 53 can be made to rotate at any desired speed. This speed will normally be slow compared to the rotation of the flyer 114. The flyer 114 which we have seen to be supported by the bearing 112 at the bottom on the shaft 113 is rigidly attached at the top to a hollow shaft 136 journalled in a bearing 137 in the plate 106. A pulley 138 is keyed to the shaft 136 whereby the shaft 136, flyer 114, and shaft 113 can be rotated at any desired speed by means of belts and an external motor not shown. Rigidly mounted on the plate 106 is a sun gear 139 concentric to the shaft 136. The gear 139 meshes with a gear 140 on a shaft 141 which passes through the frame of the flyer 114 and terminates in a gear 142 meshing with the external teeth of a gear 143 rotatably mounted on the shaft 136 by means of a bearing 144. The gear 143 is also internally toothed at 145 to mesh with two gears 146, 147 connected respectively through shafts 148, 149 to grooved pulleys 150, 151. The shafts 148, 149 pass through a plate 152 rotatably mounted on the shaft 136 by means of a bearing 153. The plate 152 is circular and has external teeth that mesh with a gear 154 on a shaft 155 which passes through the frame of the flyer 114 and terminates in another gear 156. The gear 156 meshes with a gear 157, mounted on a hollow shaft 158 rigidly connected to a pulley 159. By means of bearings 160, 161, 162 the assembly 157, 158, 159 is free to rotate between the shaft 136 and the plate 106. The pulley 159 is connected by means of belts, not shown, to an external motor also not shown. By turning the pulley 159 the two grooved pulleys 150, 151 are driven at any desired speed by reason of the rotation of the plate 152 turning the gears 146, 147 against the stationary internal gear 145. I have shown two wires 163, 164 being fed into my apparatus over pulleys 165, but it will be understood that my invention is not limited to two. The wires 163, 164 pass through a guide 166 held in the mounting 111 where they are brought together and twisted into a strand 167 by reason of the rotation of a pulley 168 internally attached to the rotating hollow shaft 113. From the pulley 168 the twisted strand passes through an aperture 169 in the shaft 113 over sheaves 170, 171 on the flyer 114, through an aperture 172 in the shaft 136 over an internally mounted pulley 173 to another pulley 174 directly beneath it. The pulley 174 is mounted by means of a bracket 175 to the toothed plate 152 which is driven by the gear 154. Between the pulleys 173 and 174 the strand will be given a further twist due to the fact that the flyer 114 and shaft 136 carrying the pulley 173 are rotating much faster than the plate 152. Leaving the pulley 174 the strand passes in multiple turns around the pulleys 150, 151 which serve as a capstan to advance the wires through the apparatus into the drum 53. The direction of rotation of the pulleys 150, 151 is opposite to that of the plate 152 which has the effect of reducing the speed of the strand 167 relative to the drum 53. A spring finger 176 mounted on the plate 152 by means of a bracket 177 holds the strand 167 in the lowermost groove of the pulley 150 under a gentle pressure. From the finger 176 the strand 167 drops directly into the drum 53. I prefer that the average speed of advancement of the strand 167 shall equal the linear speed of rotation of a point between the core 54 and the outer wall of the drum 53 such that if a circle were drawn through the said point concentric to the core the area of the space between the core 54 and said circle would equal the area of the space between said circle and the outer wall of the drum 53. Since the plate 152 and grooved pulleys 150, 151 rotate around the center of the shaft 136 which is eccentric to the center of the platform 126 and to the vertical axis of the drum 53 the strand leaving the finger 176 will fall in eccentric loops.

The lay of the twist imparted to the wires 164, 165 to form the strand 167 is determined by the ratio between the speeds of the pulleys 138 and 159. I prefer to maintain the speed of the pulley 138 thus the speed of the flyer 114 at a constant high speed, to select the speed of the pulley 159 so as to give the desired number of twists per inch to the strand, and to select the speed of the pulley 134 so as to rotate the drum 53 at a speed commensurate

with the speed of the strand 167 as hereinbefore described.

I claim:

1. Apparatus for twisting together a plurality of strands of indefinite length and depositing said strands directly into a vertical drum, comprising means for supporting said drum, means located beneath said drum for bringing together said strands, means for revolving said strands around said drum, thereby twisting together said strands, and means for continuously advancing said strands and depositing said strands within said drum.

2. Apparatus for twisting together a plurality of strands of indefinite length and depositing said strands directly into a vertical drum, comprising means for supporting and rotating said drum, means for bringing together said strands at a point beneath said drum, means for continuously advancing said strands, means for revolving said strands around said drum and said supporting means thereby twisting together said strands at a speed having a functional relation to the speed of advancement of said strands, rotating guide means for depositing said strands in said drum.

3. Apparatus for twisting together a plurality of strands of indefinite length and depositing said strands directly into a vertical drum, comprising means for supporting said drum, means for bringing together said strands at a point beneath said drum, means for revolving said strands around said drum and said supporting means thereby twisting together said strands, rotating means above said drum for guiding said strands in an approximately circular path within said drum and concentric thereto, and means for advancing said strands at a speed functionally related to the speed of revolution of said strands.

4. Apparatus for twisting together a plurality of strands of indefinite length and depositing said strands directly into a vertical drum, comprising means for supporting said drum, means located beneath said drum for bringing together said strands at a point beneath said drum, means for revolving said strands around said drum and said supporting means thereby twisting together said strands, means for maintaining said supporting means and said drum stationary with respect to rotation, means above said drum for guiding said strands in an approximately circular path within said drum and concentric thereto, and means for advancing said strands.

5. Apparatus for twisting together a plurality of strands of indefinite length and depositing said strands directly into a vertical drum, comprising means for supporting said drum, a vertical frame encompassing said supporting means and said drum, means for rotating said frame on a vertical axis, a first sheave mounted centrally on said frame beneath said drum, said sheave receiving and guiding said strands onto said frame, a second sheave mounted centrally on said frame above said drum, means associated with said frame guiding said strands from said first sheave to said second sheave, and means for advancing said strands into said drum.

6. Apparatus for twisting together a plurality of strands of indefinite length and depositing said strands directly into a vertical drum having an external vertical wall and an internal vertical partition substantially concentric to said wall, comprising means for supporting said drum, a vertical frame encompassing said platform and said drum, means for rotating said frame on an axis of rotation eccentric to the axis of said drum, a first sheave mounted centrally on said frame beneath said drum, said sheave receiving and guiding said strands onto said frame, a second sheave mounted centrally on said frame above said drum, means associated with said frame guiding said strands from said first sheave to said second sheave, means for advancing said strands at a speed proportional to the speed of rotation of said frame, and means for guiding said strands into the space between said partition and said wall in the form of loops eccentric to said partition.

7. Apparatus for twisting together a plurality of strands of indefinite length and depositing said strands directly into a vertical drum, comprising a platform supporting said drum, means for rotating said platform and said drum, a vertical frame encompassing said platform and said drum, means for rotating said frame on an axis of rotation eccentric to the axis of rotation of said platform, a first sheave mounted centrally on said frame beneath said drum, said sheave receiving and guiding said strands onto said frame, a second sheave mounted centrally on said frame above said drum, means associated with said frame guiding said strands from said first sheave to said second sheave, means for advancing said strands at a speed proportional to the speed of rotation of said frame, and means for guiding said strands into said drum.

8. The method of simultaneously twisting and packaging a plurality of strands of indefinite length into a vertically mounted drum comprising the steps of continuously bringing together said strands at a point beneath said drum, revolving said strands on a vertical axis around said drum, continuously advancing said strands to a point above said drum and continuously lowering said twisted strands in the form of loops into said drum.

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