Jan. 27, 1948. M. J. RARICK 2,434,964

YARN-TRANSFER MECHANISM

Filed July 26, 1946 6 Sheets-Sheet 1

Fig. 1.

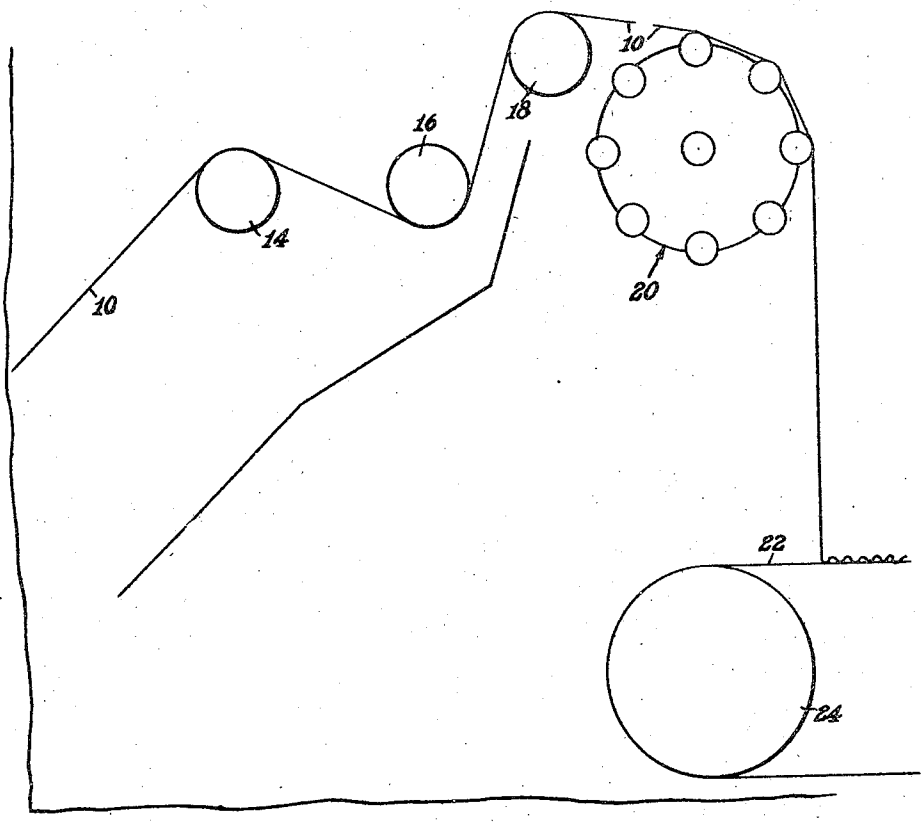
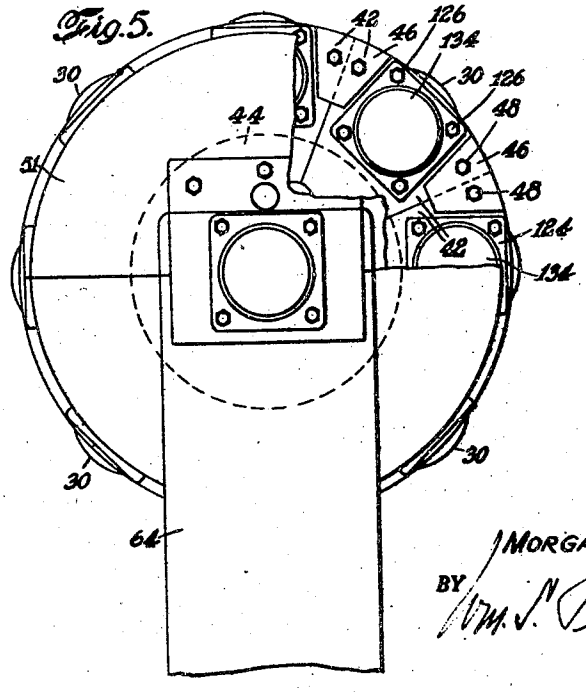


Fig. 5.



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YARN-TRANSFER MECHANISM

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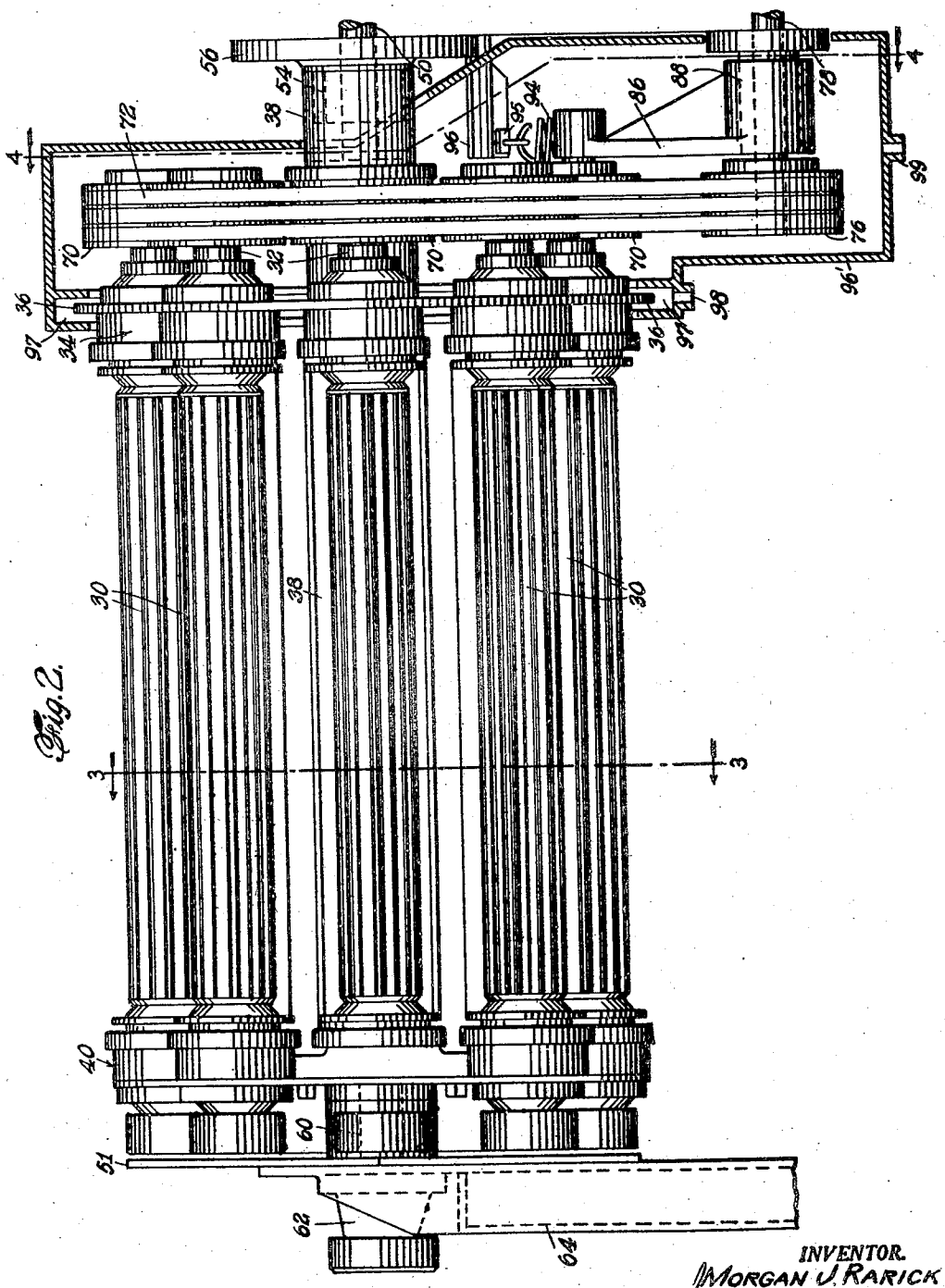


Fig. 2.

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YARN-TRANSFER MECHANISM

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Fig. 3.

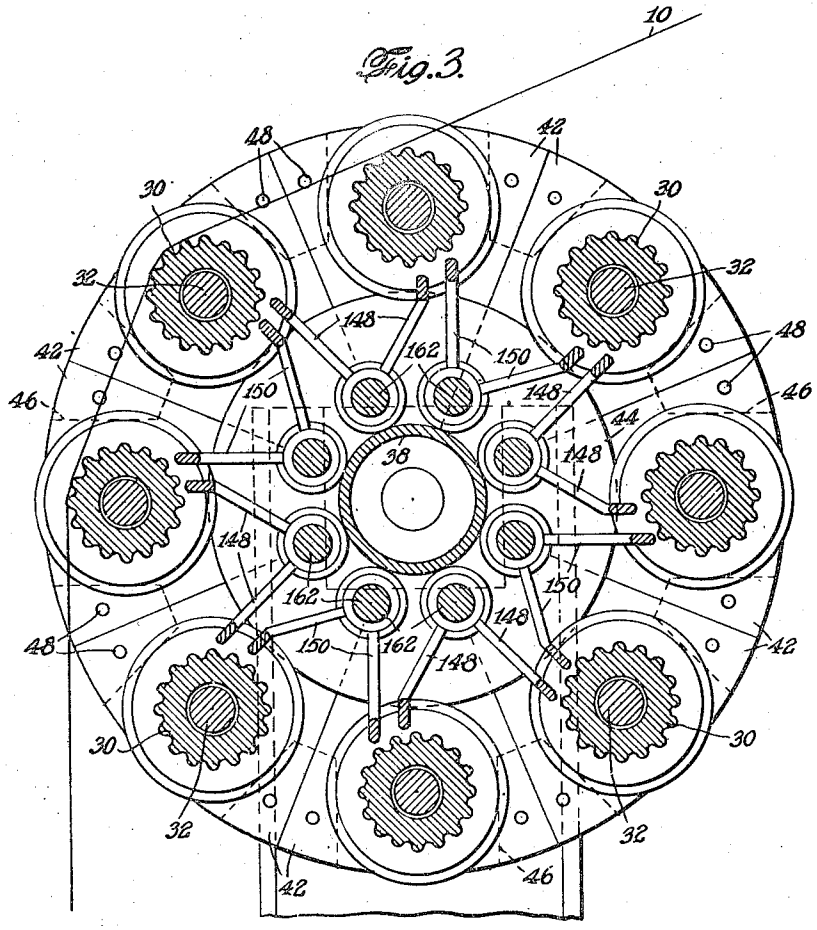
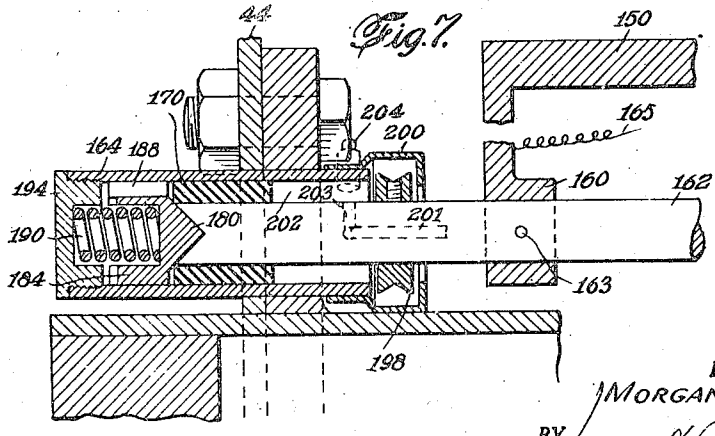


Fig. 7.



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YARN-TRANSFER MECHANISM

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Fig. 4.

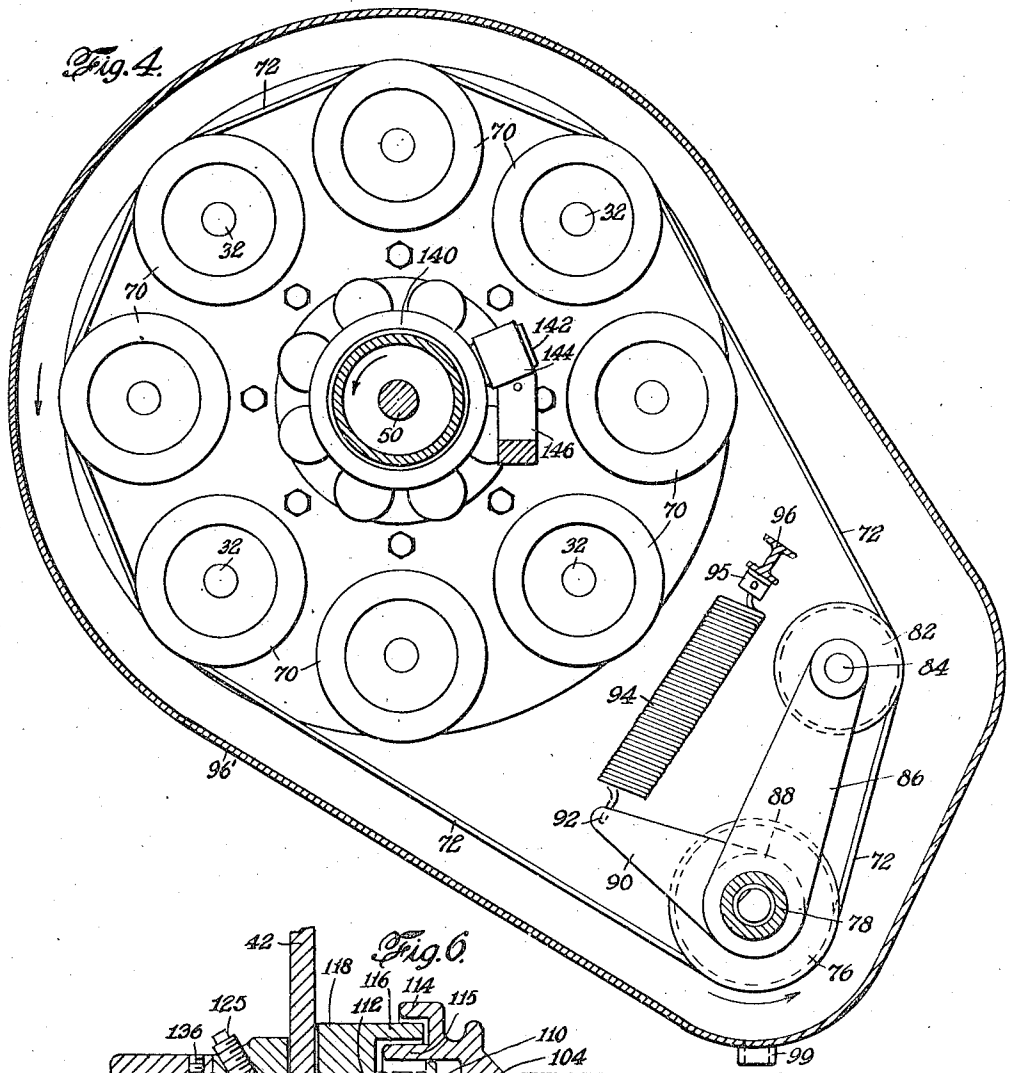
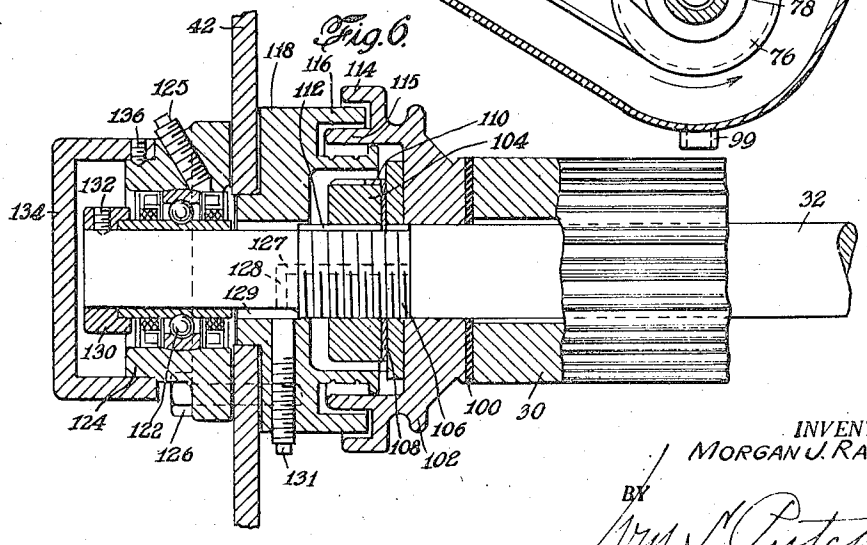


Fig. 6.



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YARN-TRANSFER MECHANISM

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Fig. 8.

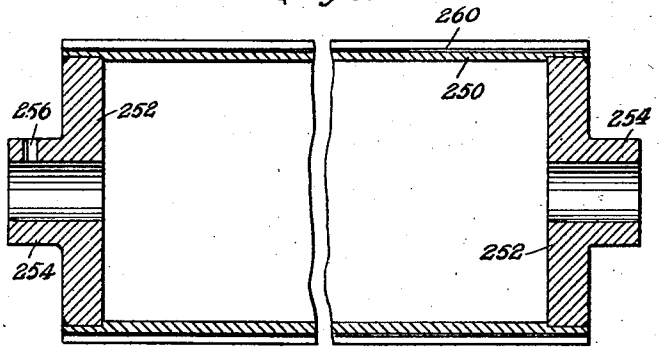


Fig. 9.

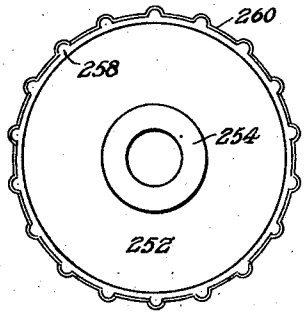


Fig. 10.

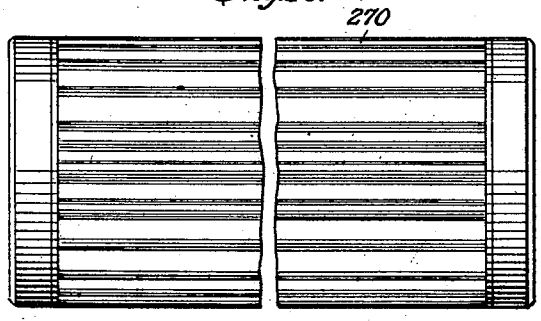


Fig. 11.

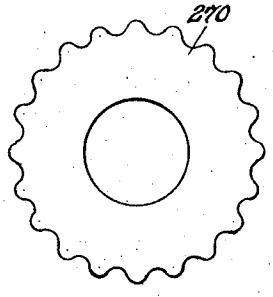


Fig. 12.

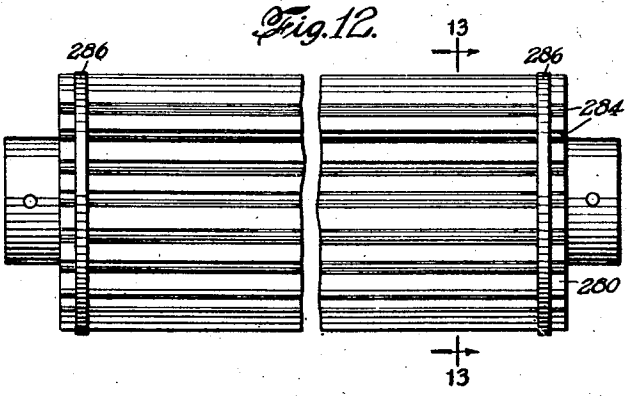
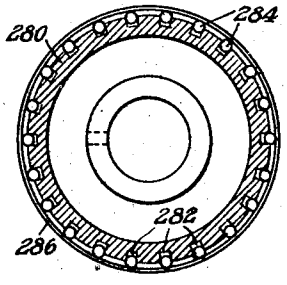


Fig. 13.



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YARN-TRANSFER MECHANISM

Filed July 26, 1946 6 Sheets-Sheet 6

Fig. 14.

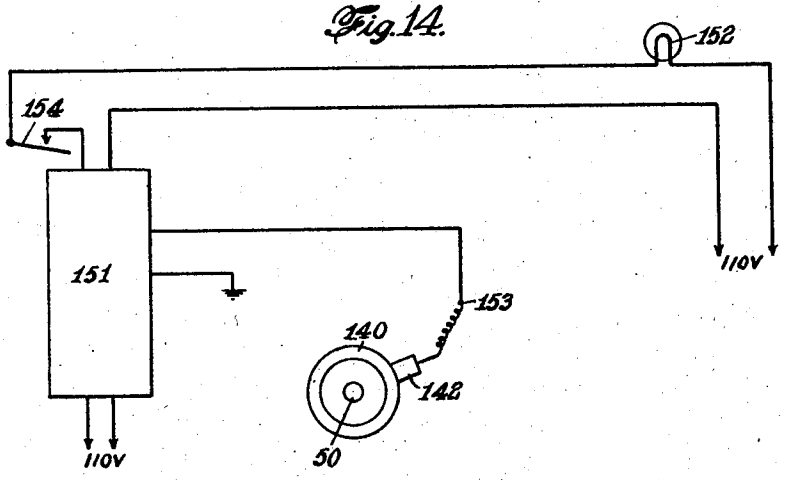
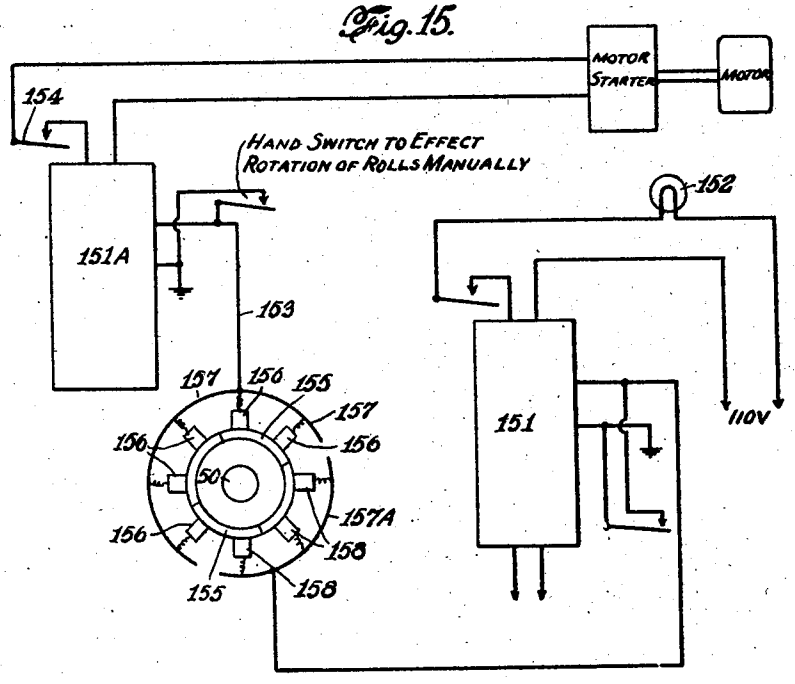


Fig. 15.



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Patented Jan. 27, 1948 2,434,964

UNITED STATES PATENT OFFICE

2,434,964

YARN-TRANSFER MECHANISM

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Application July 26, 1946, Serial No. 686,395

15 Claims. (Cl. 28—71.6)

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This invention relates to a new and improved apparatus for transferring yarn from an element where the yarn is at a positive tension level to an element where the yarn assumes a substantially zero tension level. More particularly, it relates to an apparatus for transferring a plurality of wet viscose rayon yarns in the form of a warp sheet from positively driven processing rolls to a yarn-collecting surface beneath the yarn-transfer mechanism.

An object of this invention is to provide a new and improved yarn-transfer mechanism.

Another object of this invention is to provide a yarn-transfer mechanism which will transfer a plurality of yarns simultaneously.

An additional object of this invention is to provide a yarn-transfer mechanism for simultaneously transferring a plurality of yarns and which permits the removal of the wrapping of one or more yarns without interrupting the continuity of the operation.

Other and additional objects will become apparent hereinafter.

The objects of the invention are accomplished, in general, by rotatably mounting a plurality of small individual fluted rolls on the periphery of a large rotatable wheel in such a manner that some of the fluted rolls are positively driven and some are stationary. The driving mechanism for the small fluted rolls is so constructed that the top rolls are positively driven while the bottom rolls are stationary. The driven fluted rolls include those which receive the plurality of yarns in the form of a warp sheet and advance them through the mechanism to the fluted roll from which the yarns are discharged. The fluted roll from which the yarns are discharged is also driven and the point of discharge of the yarns is that at which a line tangent thereto is perpendicular to the floor so that the yarns upon discharge will descend in a vertical path to the collection device.

Normally, during the transfer of the yarns by the fluted rolls above described, the rotatable wheel is stationary. When, however, a wrap develops on one of the rotating small fluted rolls, the wheel is rotated to a position wherein the roll on which the wrap has developed is stationary. The rotation of the wheel also advances one or more of the fluted rolls which were previously in the inoperative stationary position into operative (rotating) position. During the removal of the roll on which the wrap developed from operative to inoperative position, the continuity of the transfer of the other yarns was not interrupted. While in the stationary position, the wrap is removed from the roll on which it developed also without interrupting the continuity of the operation of the mechanism with respect to the other yarns.

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Means cooperating with each of the fluted rolls are provided to warn the operator when a wrap has developed. In one form, such means comprise electrodes positioned in close, but spaced, proximity to the periphery of each fluted roll. Upon the development of a wrap, the electrodes actuate an electronic relay which, in turn, operates a visible or audible signal to warn the operator. Alternatively, the electronic relay can be attached to a motor starter, whereby upon development of a wrap the wheel will be automatically rotated to move the roll having the wrap from operative to inoperative position.

The details of the invention will be more clearly apparent by reference to the following detailed description when taken in conjunction with the accompanying drawings, wherein:

Figure 1 is a diagrammatic elevation showing the yarn-transfer mechanism in position to receive the yarns under a positive tension from processing rolls and deliver said yarns onto a yarn-collecting device where the yarns assume substantially zero tension;

Figure 2 is a side view, partly in section, of the transfer mechanism;

Figure 3 is a section taken on the line 3—3 of Figure 2;

Figure 4 is a section taken on the line 4—4 of Figure 2;

Figure 5 is an end view, partly broken away and looking to the right in Figure 2;

Figure 6 is a section of the end bearing and seal of the fluted roll;

Figure 7 is a cross-section of the electrode bearing and also shows a portion of an electrode in section;

Figure 8 is a vertical section of one form of fluted roll;

Figure 9 is an end view of the roll in Figure 8;

Figure 10 is a side elevation of another embodiment of the fluted roll;

Figure 11 is an end view of the roll shown in Figure 10;

Figure 12 is a side elevation of still another form of fluted roll;

Figure 13 is a section taken on the line 13—13 of Figure 12;

Figure 14 is a wiring diagram of a circuit including a visible or audible signal to warn the operator of the development of a wrap; and

Figure 15 is a wiring diagram of a modified construction.

Referring now to the drawings, wherein like reference numerals designate like parts, and particularly to Figure 1, the reference numeral 10 designates a plurality of wet rayon yarns arranged in spaced parallel relationship to form a warp sheet being drawn from a series of stretching rolls, on which each yarn has been subjected to high tension, by positively driven rolls 14, 16 and 18. The warp sheet 10 is delivered to the transfer device, generally designated by the reference numeral 20, from which it is discharged to a moving collecting belt 22 positioned beneath the yarn-transfer mechanism 20. The collecting belt 22 is of the continuous type trained over a pair of spaced rolls 24, only one of which is shown, and conveys the yarns for further processing, such as washing and purification. In the form shown, the surface of the belt 22 which receives the yarn is horizontal and parallel to the floor. The speed of travel of the belt 22 is such that no tension will be imposed on the freely-falling yarns. Consequently, each of the yarns collected on the belt 22 assumes a substantially zero tension level.

The yarn-transfer mechanism 20 comprises a plurality of small fluted rolls 30 arranged in a squirrel cage assembly. All of the fluted rolls 30 are of identical construction and each roll 30 is secured to its respective shaft 32. The shafts 32 are mounted identically in the mechanism, and hence the mounting of one shaft 32 will be described in detail.

The rear end of shaft 32 is rotatably mounted in a rear bearing, generally designated by the reference numeral 34 and carried on a rear bearing support 36 which, in turn, is secured on a hub 38. The front end of each shaft 32 is rotatably mounted in an individual front bearing, generally designated by the reference numeral 40. Each of the front bearings 40 is carried in a separate section 42, which is secured adjacent the bottom thereof to a central flange 44.

As shown in Figures 3 and 5, each section 42 is in the form of a trapezoid, and the sections 42 are arranged so that the side edges of adjacent sections are in abutting relationship with the smaller bases disposed on the central flange 44. A gusset 46 is positioned over each of the joints formed by the abutting edges of adjacent sections 42, and, by means of bolts 48, join the adjacent sections 42 together.

The central flange 44 is secured to the hub 38 which extends transversely of the mechanism. At the rear end (see Figure 2), the hub is secured to a shaft 50, which is operatively connected to means whereby it is driven in a manner hereinafter more fully explained. The shaft 50 is rotatably mounted in a bearing 54 carried by a bearing support 56 appropriately mounted in the machine.

The hub 38 at the front end of the mechanism is secured to a shaft 60, which is rotatably mounted in a bearing 62 carried on a channel iron frame 64.

The front end of the device is protected by a guard plate 51. It is to be noted that the upper half of the guard plate 51 is removably bolted to the channel 64. When removed from position, any of the rolls 30 exposed thereby can be removed as a unit as will hereafter be more fully explained.

The hub 38, together with the rear bearing supports 36 and the central flange 44 to which the sections 42 are secured, constitute a large wheel which is rotatably mounted and will be rotated when rotary movement is imparted to the shaft 50. Upon rotation of the wheel, the fluted rolls 30 which are mounted in the periphery of the wheel will be revolved and thus advanced to different positions along the periphery.

Each of the shafts 32 of each of the rolls 30 is provided at the rear end thereof with an individual sheave 70. A belt 72, driven as hereafter explained, passes over only certain of the sheaves 70 to impart rotary motion thereto. Rotation of such sheaves will be transmitted to the respective shafts 32 on which they are mounted and the rotation of such shafts will be imparted to the respective rolls 30 carried thereon. The sheaves over which the belt 72 does not pass remain stationary, and hence the rolls on the shafts 32 which carry such rolls also remain stationary.

In the form shown (see Figure 4) eight fluted rolls 30 are mounted in the periphery of the wheel and the belt 72 is so positioned that it will rotate five of the rolls while three of the rolls are stationary. As shown in Figure 4, the rolls which are rotated are in substantially the upper half of the wheel.

The belt 72 is driven by a sheave 76 secured on a shaft 78 continuously driven by any suitable means (not shown). Means are also provided to take up any slack in the belt 72. In the form shown, this is secured by a belt-tightening roll 82 continuously engaging the inner surface of the belt 72. The roll 82 is rotatably mounted on a stud 84 carried at one end of a link 86 of a bell-crank lever. The bell-crank lever is provided with a boss 88 through which the shaft 78 extends and on which the bell-crank lever is pivotally disposed. The other arm 90 of the bell-crank lever is secured at the end thereof, as at 92, to one end of a spring 94. The other end of the spring 94 is secured to a fixed support 95 carried on an I-beam 96 appropriately positioned in the machine. As is apparent, the length of the link 86 determines, to a certain extent, the number of sheaves which will cooperate with the belt drive 72.

It will be apparent that, due to the tension of the spring 94, the roll 82 will be continuously urged against the belt 72 and serve as a belt tightener.

The fluted roll drive mechanism is enclosed in a housing 96'. The inner end of the housing is provided with an annular channel 97 into which the rear bearing support 36 extends. The channel 97 receives the liquid which may pass from the yarn. A drain 98 permits removal of such liquid from the channel. The housing is also provided with a drain 99.

The rear and front bearings 34 and 40 are substantially identical in construction and are of the standard flanged and sealed types.

Referring now to Figure 6 wherein such a bearing is shown, the reference numeral 100 designates a gasket which is positioned intermediate the end of the roll 30 and the rotatable member 102 of the seal. The rotatable member 102 is positioned in tight intimate relationship with the gasket 100 by means of a nut 104 interiorly of the rotatable member 102 and is threaded on a threaded portion 106 of the shaft 32. The nut 104 is seated on a washer 108 and is locked in position by means of a star lock 110. A key slot 112 also aids in securing the nut 104 and the

washer 108 in position. The rotatable member 102 is provided with an annular groove formed between flanges 114 and 115 and into which a flange 116 of the non-rotatable member 118 of the seal extends. The non-rotatable member 118 is provided with an annular groove formed by the flange 116 and a flange 117, and the flange 115 of the rotatable member 102 extends therein. The non-rotatable member 118 is carried by the section 42. The bearing is of the ball-bearing self-aligning type and is generally designated by the reference numeral 122. The bearing housing 124, the segment 42 and the non-rotatable member 118 of the seal are secured together by screws 126. A grease cup 125 permits greasing of the bearing. A retaining ring 130 is secured to the shaft by means of the set screw 132 and aids in maintaining the bearing in position. A guard 134 is secured to the bearing housing 124 by means of a set screw 136.

In the preferred form, compressed air is utilized for scavenging the bearing and seal of moisture-filled air which might cause corrosion. In the form shown, this is obtained by continuously feeding compressed air (supplied in any convenient manner at the operator's end of the apparatus) to a drilled passage 127 in the shaft 32. The passage 127 communicates through a passage 128 to the passage 129 which is connected to an outlet pipe 131.

The construction of the bearing and seal just described is that at the front of the machine. The bearing at the rear of the machine is identical in construction, except that it is secured to the bearing support 36 instead of the sections 42.

From the foregoing description, it is apparent that upon removal of the upper section of the guard plate 51 at the front end of the machine and removal of the bolts securing the appropriate section 42 to adjacent sections and on the central flange 44, a roll can be removed from the machine by sliding endwise after being released from the rear bearing. Thus, any roll can be advanced to a position along the upper half of the periphery of the wheel and be removed for any desired purpose and subsequently returned to position for future advance into operation.

The apparatus is provided with means which will warn the operator when a wrap has developed on one of the rolls 30. In the form shown (see Figure 4), a collector ring 140 is mounted on the shaft 50. A brush 142, carried in a holder 144 mounted on a bracket 146 appropriately carried in the machine, is in electrical contact with the collector ring 140.

As shown in Figure 3, a plurality of pairs of electrodes 148 and a plurality of pairs of electrodes 150 are alternately arranged so that one electrode 148 and one electrode 150 are mounted in cooperative relationship with each roll 30, as hereafter more fully explained, so that they are in close but spaced proximity to the peripheral surface of each of the rolls 30. Each electrode 148 is grounded to the frame, and each electrode 150 is connected, as by a pigtail, to the collector ring 140.

As shown in the wiring diagram (Figure 14), the circuit includes a well-known electronic relay 151 and a signal 152 of either the visible type, such as a lamp, or audible type, such as a bell. The electronic relay 151 has a terminal 153 connected to the brush 142 and will function to close the switch 154 of the circuit, including the signal 152, whenever the terminal 153 is connected to ground.

When a wrap develops on a roll, it will quickly become of a size so that it will contact the electrodes, causing a short circuit whereby the brush 142 will be grounded and the electronic relay 151 actuated to close the circuit with the signal 152, and the operator will be warned of the presence of a wrap of yarn on the roll periphery. When such a condition exists, the wheel is revolved, without any interruption of any of the other parts, about the shaft 50 until the roll which contains the wrap is moved to a position along the periphery of the wheel where it is stationary and not rotated about its shaft by the belt 72. In this position, the wrap is removed. During the revolving of the entire mechanism about the shaft 50 and the removal of the wrap from the roll on which it developed, the continuity of the feed of the warp sheet of yarns was not interrupted.

If desired, the wheel can be automatically revolved when a wrap develops on any of the rolls 30 to remove such roll to a position along the periphery of the wheel where it is stationary and where the wrap is removed and simultaneously advance a number of rolls into rotating position to correspond with the number of rolls removed to stationary position. The automatic rotation of the wheel can be in addition to warning the operator of the development of a wrap.

Referring now to Figure 15, the reference numeral 155 designates four segments of a rotating commutator rigidly secured to the drive end of the shaft 50 which is returned to ground through grounded electrodes 148. Five stationary wired brushes 156 connected in parallel cooperate with the commutator segments 155, and each of the electrodes 150 is connected progressively to a commutator bar 155. A bus bar 157 is connected to the terminal 153 of an electronic relay 151A. A bus bar 157A connecting three of the wired brushes 158 leads to electronic relay 151. Upon the formation of a wrap, the electronic relay 151A will be actuated to close the switch 154 of the circuit, which includes a motor starter whereby the motor which is operatively connected to the shaft 50 will drive said shaft. Upon advancement of any segment 155 beyond contact with the wired brushes 156 associated with bus bar 157, the circuit to the electronic relay 151A will be opened and rotation of shaft 50 will cease while the circuit to the electronic relay 151 is closed, actuating the warning device. By proper positioning of the wired brushes 156, a roll 30 can be made to rotate out of operating position into a stationary position. This results because the commutator, being attached rigidly to the shaft 50, is in approximately the same angular position as that of the wrapping roll and will move with this roll to a position selected out of operating position.

The electrodes 148 and 150 are mounted at a fixed spaced distance relative to the periphery of the respective roll with which they cooperate and in a manner which will permit the electrodes to be pushed away from the roll, and, after the force pushing the electrodes has been released, the electrodes will return to their original position. Thus, when a wrap develops on a roll, it will rapidly increase in diameter and engage the electrodes which will be pushed in a direction away from the roll. Upon removal of the wrap as herein described, the electrodes will be restored to their original position.

Each of the electrodes 148 and 150 is of identical construction and extends over the entire width of the roll. As shown in Figure 7, each

electrode is provided with an arm at each end thereof which carries a boss 160 through which a shaft 162 extends. A taper pin 163 passing through aligned holes in the boss 160 and the shaft 162 secures the shaft in the respective boss.

The shafts 162 which carry the electrodes 150 are formed of a suitable non-conductive material. The shafts 162 which carry the grounded electrodes 148 can be formed of any appropriate material, either conductive or non-conductive. As shown in Figure 7, a pigtail 165, connected at one end thereof to the electrode, is connected at the other end thereof either to the ground or to the collector ring, depending on which pair of electrodes are mounted on the respective shaft 162.

One end of each individual shaft 162 (see Figure 7) is rotatably mounted in a long sleeve 164 appropriately mounted in the apparatus. A short bushing 170, formed of, for example, a phenol formaldehyde condensation product with a fibrous binder, is positioned intermediate the sleeve 164 and adjacent the end of the shaft 162. The end of the shaft 162 is provided with a chisel point depression in which a chisel point 180 is normally seated. The chisel point is formed at the bottom of a cup 184 which is slidably positioned in the sleeve 164. A key 188 between the cup 184 and the sleeve 164 prevents backlash. A spring 190 is positioned in the cup and is maintained therein by a flanged cap 194, threadedly secured in the interior of the sleeve 164.

From the foregoing description of the electrode bearing, it is manifest that, when an electrode is moved by any force whatsoever away from the roll, the shaft 162 will be rotated. Upon rotation of the shaft 162, the chisel point 180 will ride to the left in Figure 7, compressing the spring 190. Upon release of the force moving the electrode, the chisel point 180 will ride to the right in Figure 7, thus rotating the shaft to its original position.

The electrode can be positioned to any fixed distance relative to the periphery of the roll by rotation of the shaft 162 to the position required. Thereafter, the chisel point 180 is positioned in the depression and secured therein under the spring tension.

Even though the electrode shaft 162 is nominally a good insulator, the entire shaft may become a conductor due to moisture and acid spray from the yarn being transferred. To prevent short circuiting of the electrode wired to the electronic relay, the final contact of the shaft is kept dry. This is obtained by securing onto the shaft 162 a collar 198 having a grooved periphery which is designed to deflect drip. A shield 200 secured to the sleeve 164 protects the shaft from any spray.

Preferably, means are also provided to scavenge the electrode shaft bearing of moisture-filled air which might cause corrosion. In the form shown, this is obtained by continuously feeding compressed air, supplied in any convenient manner, at the operator's end of the apparatus through a drilled passage 201 extending in the shaft. The drilled passage communicates through a port 202 with a passage 203 which, in turn, is connected to an outlet pipe 204.

The electrode bearing at the opposite end of the shaft is substantially identical with that hereinbefore described except that the spring and chisel point construction are omitted.

As previously mentioned, each shaft 162 carries a pair of electrodes 148 or a pair of electrodes 150. In the construction shown in Figure 3, both of the electrodes carried by a single electrode shaft 162 do not cooperate with one roll, but the electrodes on one shaft cooperate with adjacent rolls.

The rolls are constructed from materials which are resistant to the treating solutions to which the yarn was subjected prior to transfer. In the case of viscose yarns, the elements of the roll should be constructed of a material which is resistant to water, dilute acids, complex inorganic sulfur compounds, and mineral salt solutions. Examples of such construction materials are hard rubber, stainless steel, plastics, glass, porcelain, enameled steel, rubber covered steel, etc.

Several illustrative embodiments of rolls which can be used are shown in Figures 8 to 13 inclusive. Referring now to Figure 8, the roll therein shown comprises a tubular steel body member 250 which is secured at each end thereof, as by welding, to end pieces 252. Each end piece is provided with a central hub 254 in which a shaft (not shown) is mounted. The roll is secured to the shaft in any appropriate manner, as by a set screw passing through the holes 256 in the hubs 254. The tubular member 250 is formed with spaced rounded upward projections 258 which extend across the entire width of the roll. A rubber covering 260 extends over the entire peripheral wall of the tubular member 250 and forms a fluted roll in which the yarn-contacting surface is rubber.

Figure 10 discloses a fluted roll 270.

Figure 12 discloses a roll 280 in which the periphery of the roll is provided with a plurality of spaced grooves 282. The top corners of the grooves are rounded and in each of the grooves a glass rod 284 is positioned. The glass rods are secured in place by bands 286.

In operation, a plurality of wet viscose rayon yarns, in the form of a warp sheet 10, are withdrawn by the rolls 14, 16 and 18 and are fed so that the yarns will be delivered to a roll 30 adjacent the top of the transfer apparatus. While the yarn is being delivered thereto, the wheel is stationary, i. e. not being revolved by shaft 50. However, due to the belt drive, five of the rolls 30 in the upper half of the wheel are being rotated about their shafts 32 while the three rolls in the lower half of the wheel are stationary. The rotation of the roll on which the yarn is received advances it to the rotating roll in front thereof.

The advancing of the yarn from one roll 30 to the next roll 30 is continued until it has been advanced to a roll 30 which has a point on the periphery thereof from which a tangent is perpendicular to the floor. When the yarn reaches this point, the roll discharges the yarn and it descends in a vertical path to the collection device. The yarn is discharged at a discharge point by reason of the flute being rapidly withdrawn from the yarn and the force of gravity on the free-falling yarn.

During the above operation, the bottom three rolls remain stationary. When a wrap develops on one of the rotating rolls 30 which advances the yarn through the apparatus, it will rapidly build up and engage the electrodes, which will in turn actuate the electronic relay and indicate that a wrap has developed. At this time, the shaft 50 is rotated at a relatively low rate of speed, such as, for example, 4 R. P. M.

Rotation of the shaft 50, as mentioned, will revolve the wheel and it will be stopped when the roll on which the wrap developed is advanced to a position along the periphery of the wheel where it is not driven by the belt drive and is stationary.

At this position, the wrap is removed. During the rotation of the wheel about the shaft 50, the transfer of the yarn was not interrupted. As soon as one roll 30 was removed out of cooperative relationship with the belt 72, another roll was advanced into position where it was driven by the belt drive so that, at all times in the construction shown, five rolls were being continuously rotated about their respective axes to advance the yarn through the apparatus to the discharge point.

The source of power for driving the shaft (not shown) can be a gear-reducer motor combination which is switched on and off to produce the desired part of a revolution of the unit. Any clutch or other momentary engaging device coupled to a constantly rotating shaft of the correct speed can also be used. A magnetic brake for quickly stopping can be used so long as there is insufficient friction in the unit to bring it to rest when the power is disconnected.

The individual fluted rolls 30 can be operated to provide a surface velocity of 1,000'' to 20,000'' or higher per minute.

For 1100-denier yarn, the yarn tension at the input may vary up to a high value of 50 grams. The oncoming tension level depends on the difference in speed between the yarn and the transfer rolls. Though slippage is not critical, best results are obtained when there is from 2% to 5% slippage between the rolls and the yarn.

In the construction shown, wherein the assembly contains eight rolls, five of which are driven, the yarn should enter the unit so that it will contact at least four of the rotating rolls from the point of entrance to the point of discharge.

With yarn of 1100-denier, the free-fall distance from the discharge point of the yarn to the collecting receiver must be at least 27'', although it is desirable that this free-fall distance be at least 40''.

The invention is particularly suitable with the transfer of yarns of a denier above 500, such as 1100, 2200, etc. However, the invention can be employed to transfer yarns of deniers less than 500, such as 250, 150, etc. In general, the lower the denier, the greater the free-fall distance. Thus, with yarns below 500 denier, the free-fall distance must be greater than 40''. The precise free-fall distance for any particular denier can be obtained by experiment.

The moisture content of the yarn is not critical. However, for best results the yarn should be soft and pliable, such as is the condition when viscose yarn is wet with 200% to 600% of water.

The invention is particularly suitable with viscose rayon tire cord yarn but can be used, in general, for the transfer of yarn from a positive tension level to a collection device at substantially zero tension level or for the transfer of yarn for any purpose whatsoever.

Though in the embodiment described the squirrel cage assembly consists of eight rolls, the invention is not restricted to such number of rolls. Transfer mechanisms wherein the squirrel cage assembly contains six rolls can be employed. When the apparatus contains six rolls, the four rolls in the upper part of the wheel will be driven and the yarn should be fed therein so that it will be conveyed by at least three of the four driven rolls to the point of discharge.

In place of fluted rolls, mechanisms, including transfer belts and chains of the type disclosed in the co-pending application of Edward S. Balthrop, Jr., Serial No. 677,890, filed June 19, 1946, can be used. Additionally, the transfer mechanisms disclosed in copending application of Edgar H. Schmidt, Serial No. 680,389, filed June 29, 1946, can be substituted for the fluted rolls.

Since it is obvious that many changes and modifications can be made in the above-described details without departing from the nature and spirit of the invention, it is to be understood that the invention is not to be limited thereto except as set forth in the appended claims.

I claim:

1. In an apparatus for simultaneously transferring a plurality of yarns arranged in a warp sheet to a collection device positioned at a spaced distance therebeneath, a rotatable wheel having a plurality of yarn-supporting means rotatably mounted in spaced relationship on the periphery thereof, means to continuously rotate a predetermined number of said yarn-supporting means including those which receive and advance the yarns to discharge position on one of said yarn-supporting means while the remaining yarn-supporting means are stationary, and means to rotate said wheel to dispose a yarn-supporting means into stationary position and simultaneously advance a previously stationary yarn-supporting means into position where it is rotated.

2. In an apparatus for simultaneously transferring a plurality of yarns arranged in a warp sheet to a collection device positioned at a spaced distance therebeneath, a rotatable wheel having a plurality of yarn-supporting means rotatably mounted in spaced relationship on the periphery thereof, means to continuously rotate a predetermined number of said yarn-supporting means including those which receive and advance the yarns to discharge position on one of said yarn-supporting means while the remaining yarn-supporting means are stationary, means cooperating with each of said yarn-supporting means to indicate when a wrap of yarn develops on the respective rotating yarn-supporting means, and means to rotate said wheel to dispose the yarn-supporting means on which the wrap develops into position where it is stationary and simultaneously advance a number of yarn-supporting means into rotating position to correspond with the number of yarn-supporting means removed to stationary position.

3. In an apparatus for simultaneously transferring a plurality of yarns arranged in a warp sheet to a collection device positioned at a spaced distance therebeneath, a rotatable wheel having a plurality of yarn-supporting means rotatably mounted in spaced relationship on the periphery thereof, means to continuously rotate a predetermined number of said yarn-supporting means including those which receive and advance the yarns to discharge position on one of said yarn-supporting means while the remaining yarn-supporting means are stationary, means to rotate said wheel to position the yarn-supporting means on which a wrap develops into position where it is stationary and simultaneously advance a number of yarn-supporting means into rotating position to correspond with the number of yarn-supporting means removed to stationary position, and means actuating the means to rotate said wheel when a wrap develops on any of said yarn-supporting means.

4. In an apparatus for simultaneously transferring a plurality of yarns arranged in a warp sheet to a collection device positioned at a spaced distance therefrom, a rotatable wheel having a

plurality of yarn-supporting means rotatably mounted in spaced relationship on the periphery thereof, means to continuously rotate a predetermined number of said yarn-supporting means including those which receive and advance the yarn to discharge position on one of said yarn-supporting means while the remaining yarn-supporting means are stationary, means to rotate said wheel to dispose a yarn-supporting means on which a wrap develops into position where it is stationary and simultaneously advance a number of yarn-supporting means into rotating position to correspond with the number of yarn-supporting means removed to stationary position, a pair of electrodes cooperating with each of said yarn-supporting means and adapted to be engaged by the yarn of a wrap which develops on the respective yarn-supporting means, and means electrically connected to said electrodes to actuate a warning signal when the yarn on any yarn-supporting means engages said electrodes.

5. In an apparatus for simultaneously transferring a plurality of yarns arranged in a warp sheet to a collection device positioned at a spaced distance therefrom, a rotatable wheel having a plurality of yarn-supporting means rotatably mounted in spaced relationship on the periphery thereof, means to continuously rotate a predetermined number of said yarn-supporting means including those which receive and advance the yarn to discharge position on one of said yarn-supporting means while the remaining yarn-supporting means are stationary, means to rotate said wheel to dispose a yarn-supporting means on which a wrap develops into position where it is stationary and simultaneously advance a number of yarn-supporting means into rotating position to correspond with the number of yarn-supporting means removed to stationary position, a pair of electrodes cooperating with each of said yarn-supporting means and adapted to be engaged by the yarn of a wrap which develops on the respective yarn-supporting means, and means electrically connected to said electrodes to actuate the means to rotate said wheel when the yarn on any yarn-supporting means engages said electrodes.

6. In an apparatus for simultaneously transferring a plurality of yarns arranged in a warp sheet to a collection device positioned at a spaced distance therefrom, a rotatable wheel having a plurality of yarn-supporting means rotatably mounted in spaced relationship on the periphery thereof, means to continuously rotate a predetermined number of said yarn-supporting means including those which receive and advance the yarn to discharge position on one of said yarn-supporting means while the remaining yarn-supporting means are stationary, means to rotate said wheel to dispose a yarn-supporting means on which a wrap develops into position where it is stationary and simultaneously advance a number of yarn-supporting means into rotating position to correspond with the number of yarn-supporting means removed to stationary position, a pair of electrodes cooperating with each of said yarn-supporting means and adapted to be engaged by the yarn of a wrap which develops on the respective yarn-supporting means, and means electrically connected to said electrodes to actuate a warning signal and the means to rotate said wheel when the yarn on any yarn-supporting means engages said electrodes.

7. In an apparatus for simultaneously transferring a plurality of yarns arranged in a warp sheet to a collection device positioned at a spaced distance therefrom, a rotatable wheel having a plurality of yarn-supporting means rotatably mounted in spaced relationship on the periphery thereof, means to continuously rotate a predetermined number of said yarn-supporting means including those which receive and advance the yarn to discharge position on one of said yarn-supporting means while the remaining yarn-supporting means are stationary, means to rotate said wheel to dispose a yarn-supporting means on which a wrap develops into position where it is stationary and simultaneously advance a number of yarn-supporting means into rotating position to correspond with the number of yarn-supporting means removed to stationary position, a pair of electrodes cooperating with each of said yarn-supporting means and adapted to be engaged by the yarn of a wrap which develops on the respective yarn-supporting means, each pair of electrodes being mounted on a shaft, means cooperating with said shaft to permit it to be rotated in a direction so that said electrodes when engaged by a wrap will be moved away from said yarn-supporting means and restored to original position upon removal of said wrap, and means electrically connected to said electrodes to actuate a warning signal when the yarn on any yarn-supporting means engages said electrodes.

8. In an apparatus for simultaneously transferring a plurality of yarns arranged in a warp sheet to a collection device positioned at a spaced distance therefrom, a rotatable wheel having a plurality of yarn-supporting means rotatably mounted in spaced relationship on the periphery thereof, means to continuously rotate a predetermined number of said yarn-supporting means including those which receive and advance the yarn to discharge position on one of said yarn-supporting means while the remaining yarn-supporting means are stationary, means to rotate said wheel to dispose a yarn-supporting means on which a wrap develops into position where it is stationary and simultaneously advance a number of yarn-supporting means into rotating position to correspond with the number of yarn-supporting means removed to stationary position, a pair of electrodes cooperating with each of said yarn-supporting means and adapted to be engaged by the yarn of a wrap which develops on the respective yarn-supporting means, each pair of electrodes being mounted on a shaft, means cooperating with said shaft to permit it to be rotated in a direction so that said electrodes when engaged by a wrap will be moved away from said yarn-supporting means and restored to original position upon removal of said wrap, and means electrically connected to said electrodes to actuate the means to rotate said wheel when the yarn on any yarn-supporting means engages said electrodes.

9. In an apparatus for simultaneously transferring a plurality of yarns arranged in a warp sheet to a collection device positioned at a spaced distance therefrom, a rotatable wheel having a plurality of yarn-supporting means rotatably mounted in spaced relationship on the periphery thereof, means to continuously rotate a predetermined number of said yarn-supporting means including those which receive and advance the yarn to discharge position on one of said yarn-supporting means while the remaining yarn-supporting means are stationary, means to rotate said wheel to dispose a yarn-supporting means on

which a wrap develops into position where it is stationary and simultaneously advance a number of yarn-supporting means into rotating position to correspond with the number of yarn-supporting means removed to stationary position, a pair of electrodes cooperating with each of said yarn-supporting means and adapted to be engaged by the yarn of a wrap which develops on the respective yarn-supporting means, each pair of electrodes being mounted on a shaft, means cooperating with said shaft to permit it to be rotated in a direction so that said electrodes when engaged by a wrap will be moved away from said yarn-supporting means and restored to original position upon removal of said wrap, and means electrically connected to said electrodes to actuate a warning signal and the means to rotate said wheel when the yarn on any yarn-supporting means engages said electrodes.

10. In an apparatus for simultaneously transferring a plurality of yarns arranged in a warp sheet to a collection device positioned at a spaced distance therefrom, a rotatable wheel having a plurality of fluted rolls rotatably mounted in spaced relationship on the periphery thereof, means to continuously rotate a predetermined number of said fluted rolls including those which receive and advance the yarn to discharge position on one of said fluted rolls while the remaining fluted rolls are stationary, means to rotate said wheel to dispose a fluted roll on which a wrap develops into position where it is stationary and simultaneously advance a number of fluted rolls into rotating position to correspond with the number of fluted rolls removed to stationary position, a pair of electrodes cooperating with each of said fluted rolls and adapted to be engaged by the yarn of a wrap which develops on the respective fluted roll, and means electrically connected to said electrodes to actuate a warning signal when the yarn on any fluted roll engages said electrodes.

11. In an apparatus for simultaneously transferring a plurality of yarns arranged in a warp sheet to a collection device positioned at a spaced distance therefrom, a rotatable wheel having a plurality of fluted rolls rotatably mounted in spaced relationship on the periphery thereof, means to continuously rotate a predetermined number of said fluted rolls including those which receive and advance the yarn to discharge position on one of said fluted rolls while the remaining fluted rolls are stationary, means to rotate said wheel to dispose a fluted roll on which a wrap develops into position where it is stationary and simultaneously advance a number of fluted rolls into rotating position to correspond with the number of fluted rolls removed to stationary position, a pair of electrodes cooperating with each of said fluted rolls and adapted to be engaged by the yarn of a wrap which develops on the respective fluted roll, and means electrically connected to said electrodes to actuate the means to rotate said wheel when the yarn on any fluted roll engages said electrodes.

12. In an apparatus for simultaneously transferring a plurality of yarns arranged in a warp sheet to a collection device positioned at a spaced distance therefrom, a rotatable wheel having a plurality of fluted rolls rotatably mounted in spaced relationship on the periphery thereof, means to continuously rotate a predetermined number of said fluted rolls including those which receive and advance the yarn to discharge position on one of said fluted rolls while the remaining fluted rolls are stationary, means to rotate said wheel to dispose a fluted roll on which a wrap develops into position where it is stationary and simultaneously advance a number of fluted rolls into rotating position to correspond with the number of fluted rolls removed to stationary position, a pair of electrodes cooperating with each of said fluted rolls and adapted to be engaged by the yarn of a wrap which develops on the respective fluted roll, and means electrically connected to said electrodes to actuate a warning signal and the means to rotate said wheel when the yarn on any fluted roll engages said electrodes.

13. In an apparatus for simultaneously transferring a plurality of yarns arranged in a warp sheet to a collection device positioned at a spaced distance therefrom, a rotatable wheel having a plurality of fluted rolls rotatably mounted in spaced relationship on the periphery thereof, means to continuously rotate a predetermined number of said fluted rolls including those which receive and advance the yarn to discharge position on one of said fluted rolls while the remaining fluted rolls are stationary, means to rotate said wheel to dispose a fluted roll on which a wrap develops into position where it is stationary and simultaneously advance a number of fluted rolls into rotating position to correspond with the number of fluted rolls removed to stationary position, a pair of electrodes cooperating with each of said fluted rolls and adapted to be engaged by the yarn of a wrap which develops on the respective fluted roll, each pair of electrodes being mounted on a shaft, means cooperating with said shaft to permit it to be rotated in a direction so that said electrodes when engaged by a wrap will be moved away from said fluted rolls and restored to original position upon removal of said wrap, and means electrically connected to said electrodes to actuate a warning signal when the yarn on any fluted roll engages said electrodes.

14. In an apparatus for simultaneously transferring a plurality of yarns arranged in a warp sheet to a collection device positioned at a spaced distance therefrom, a rotatable wheel having a plurality of fluted rolls rotatably mounted in spaced relationship on the periphery thereof, means to continuously rotate a predetermined number of said fluted rolls including those which receive and advance the yarn to discharge position on one of said fluted rolls while the remaining fluted rolls are stationary, means to rotate said wheel to dispose a fluted roll on which a wrap develops into position where it is stationary and simultaneously advance a number of fluted rolls into rotating position to correspond with the number of fluted rolls removed to stationary position, a pair of electrodes cooperating with each of said fluted rolls and adapted to be engaged by the yarn of a wrap which develops on the respective fluted roll, each pair of electrodes being mounted on a shaft, means cooperating with said shaft to permit it to be rotated in a direction so that said electrodes when engaged by a wrap will be moved away from said fluted rolls and restored to original position upon removal of said wrap, and means electrically connected to said electrodes to actuate the means to rotate said wheel when the yarn on any fluted roll engages said electrodes.

15. In an apparatus for simultaneously transferring a plurality of yarns arranged in a warp sheet to a collection device positioned at a spaced distance therefrom, a rotatable wheel having a

plurality of fluted rolls rotatably mounted in spaced relationship on the periphery thereof, means to continuously rotate a predetermined number of said fluted rolls including those which receive and advance the yarn to discharge position on one of said fluted rolls while the remaining fluted rolls are stationary, means to rotate said wheel to dispose a fluted roll on which a wrap develops into position where it is stationary and simultaneously advance a number of fluted rolls into rotating position to correspond with the number of fluted rolls removed to stationary position, a pair of electrodes cooperating with each of said fluted rolls and adapted to be engaged by the yarn of a wrap which develops on the respective fluted roll, each pair of electrodes being mounted on a shaft, means cooperating with said shaft to permit it to be rotated in a direction so that said electrodes when engaged by a wrap will be moved away from said fluted rolls and restored to original position upon removal of said wrap, and means electrically connected to said electrodes to actuate a warning signal and the means to rotate said wheel when the yarn on any fluted roll engages said electrodes.

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The following references are of record in the file of this patent:

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