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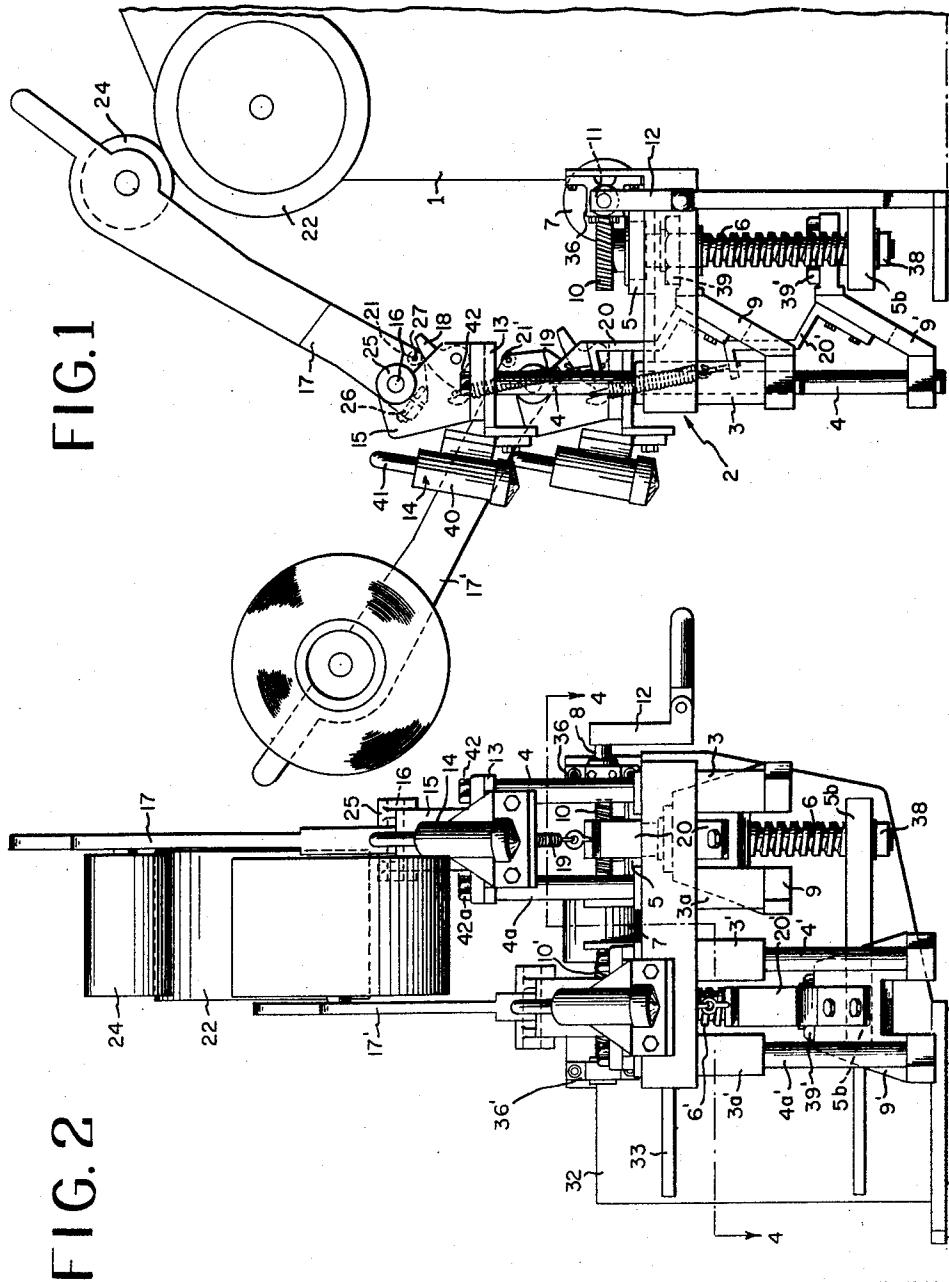
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2,957,635

YARN WINDING

Filed Jan. 21, 1955

2 Sheets-Sheet 1



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FIG. 4

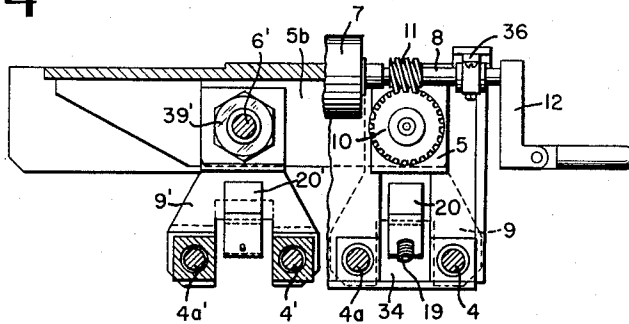


FIG. 3

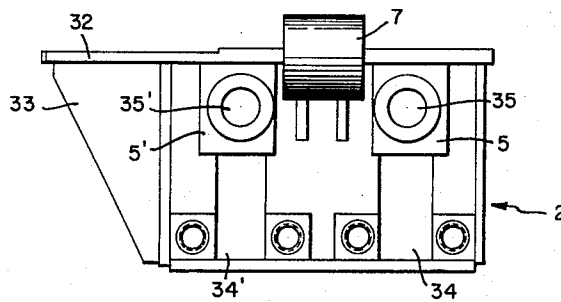
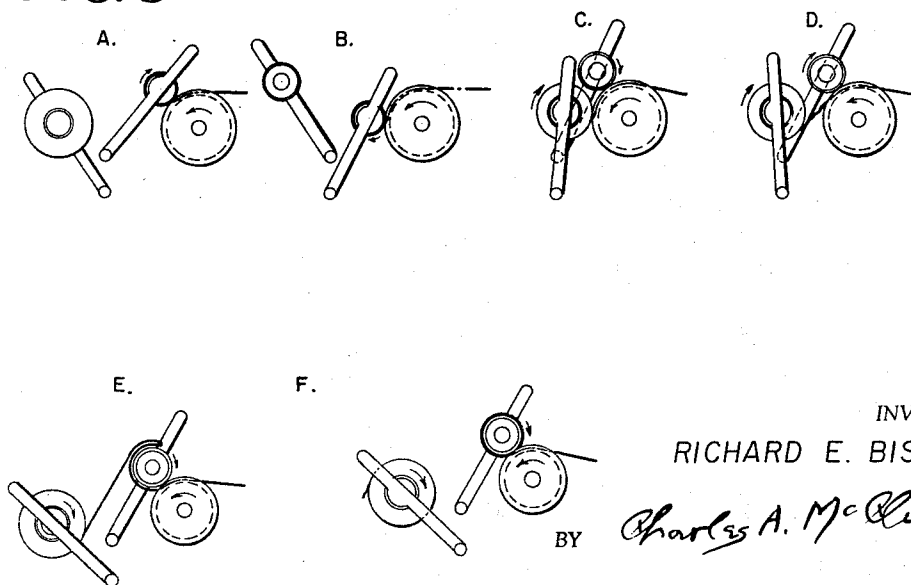


FIG. 5



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YARN WINDING

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1 Claim. (Cl. 242—18)

This invention relates to winding of yarn, concerning especially winding transfer from one package to another.

In formation and processing of yarns and like funicular materials it is customary to collect the product by winding onto individual packages. Effective winding is a continuous or extended operation, but filling of separate packages necessarily is discontinuous; substitution of an empty package for a full one during winding customarily entails lost time and waste product, at least in the present textile industry. Normally when a collection package is filled, the yarn traveling thereto is broken and transferred to wind on a waste roll while the completed package is replaced by a fresh package core. Even expeditious doffing of completed packages and donning of empty cores, together with prompt yarn severance, waste roll string-up, and subsequent string-up of the new core, heretofore has failed to eliminate this undesirable loss, which is noticeably costly when a large number of winding positions is involved.

A primary object of the present invention is transfer of winding from one package to another without interruption in continuity of winding. Another object is elimination of waste during doffing of a completely wound package and donning of a fresh package core. Other objects of this invention, together with methods and means for accomplishing the various objects, will be apparent from the following description and the accompanying diagrams.

Figure 1 is a side elevation of an apparatus embodiment of this invention. Figure 2 is a front elevation of the apparatus of Figure 1. Figure 3 is a plan view of a portion of the same apparatus. Figure 4 is a plan section of the same apparatus taken at 4—4 of Figure 2. Figure 5 is a sequential schematic elevation showing arrangements of apparatus at successive intervals in the practice of this invention.

In general, the objects of this invention are accomplished by an apparatus featuring horizontally pivoted vertically reciprocable swing arms.

Figures 1 and 2 show the apparatus from the side and front, respectively. Frame 1 carries bearing bracket 2 extending frontward therefrom and fixedly supporting aligned slide bearings 3, 3a, 3', and 3a', which align and guide four corresponding vertical guide rods 4, 4a, 4', and 4a'. (Elements denoted by the primed reference characters are to the left side of a viewer looking at the apparatus from the front, as in Figure 2.) This bracket appears in plan view in Figure 3, being trapezoidal with a generally rectangular body having extension 32 along the back and flange 33 joining the extension to the left front corner of the body. The four slide bearings

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are located in two equally spaced pairs in a line near the front edge and parallel thereto. Between guides 3 and 3a is rectangular slit 34 (visible in Figures 3 and 4) extending completely through the body of the bracket, with similar slit 34' between bearings 3' and 3a'. To the rear of the slits are respective apertures 35 and 35' located to admit vertical lead screws 6 and 6'. The bearing bracket also carries horizontal supports 5 and 5' directly above and 5b below the nearby apertures. Each of these holds ball bearings arranged in a race about the upper and lower ends of screws 6 and 6'. At the rear this bracket also carries journal bearing 7 for drive shaft 8 received by pillow block 36 and collar 36' attached to the bracket near the right and left rear corners respectively.

Each of the double-threaded lead screws carries a nut threaded thereon, screw 6 threading into nut 39 and screw 6' into nut 39', fitted in the top of an angled support. Each of these supports, 9 and 9', extends downward to bifurcate at the base of the near pair of guide rods, to each of which it is attached by set screws. Support 9 threaded onto lead screw 6 carries guide rods 4 and 4a, while support 9' on screw 6' carries rods 4' and 4a'. The top of each lead screw carries a driven helical gear, screw 6 carrying gear 10, and screw 6' gear 10'. The gears, which are oppositely pitched, mesh with corresponding helical drive gears 11 and 11' mounted on drive shaft 8, which attaches at one end to crank 12. The lead screws are pitched similarly so that rotation of the shaft reciprocates the respective pairs of guide rods oppositely up and down. The bottom of each lead screw is equipped with a collar at the lower edge of support 5b; collar 38 terminates screw 6, collar 38' screw 6'.

At its upper end each of the guide rods carries a support plate mounting a spring-actuated plunger type of shock absorber and other elements. Only the elements on the right side will be mentioned here, as those on the left side, denoted by primed reference characters, make up a mirror image thereof (reflected on a vertical plane passing from front to back midway of the apparatus). Guide rods 4 and 4a carry support plate 13 extending to the front, to which is fastened shock absorber 14 comprising cylindrical housing 40 capped at the bottom, with plunger 41 extending from the top. Carried above the support plate by nuts 42 and 42a affixed to the pair of vertical rods is pin bracket 15. This bracket supports horizontal pivot pin 16 fitting in bore 25 of the slit end of swing arm 17 and fastened thereto by bolt 26 passing through one side of the slit end across the slit and threaded into the other side. The arm has spindle-supporting means (hidden from view) extending horizontally near its opposite or top end, which terminates in a handle shape. The bracket also pivotally mounts cam shoe 18 against roller follower 21 carried on a pin in bore 27 of the swing arm. Spring 19 hooks at one end over a projection at the front of the cam shoe and fastens at the other end to bracket 20 secured to support 9, the spring and the support bracket passing (as required during reciprocation of the elements) through slit 34. The cooperating parts on the two sides are shown in positions corresponding to location of their respective swing arms.

Figure 4 shows the innermost parts of the apparatus in plan view passing horizontally just above lowered support 9' then jogging up and horizontally above the top of driven gear 10 and the crank and drive shaft. The bifurcated end on angled support 9' appears clearly at the

front of the left side, along with guide rods 4' and 4a', which it surrounds at the bottom; the upper end of the bracket also appears holding nut 39' enclosing lead screw 6'. Midway of the bracket appear portions of support brackets 20 and 20' for springs 19 and 19'.

In the middle of Figure 4, as the view rises to an upper plane, the right half of journal 7 appears at the rear of the drawing with the drive shaft carrying drive gear 11 extending therefrom and terminating in crank 12 after passing through pillow block 36. The tops of guide rods 4 and 4a, surrounded and partly concealed by their respective bearings, also appear in this half of the sectional plan view. Part of spring 19 is visible through slit 34.

Drive roll 22 supported by conventional means omitted from the drawing for clarity of the showing appears at the top of Figure 1. Left-hand swing arm 17' appears in lowered position in the first two drawings with the top of the arm swung back from the drive roll, while right-hand arm 17 carrying package core 24 is in raised position with the core engaged against the face of the drive roll. The package core is supported conveniently on a holder and a spindle therefor carried in conventional manner by a spindle plug, as taught in Patent 2,164,426 of Renfro; nor is the engaged position of the swing arm supporting the package and related elements out of the ordinary.

Operation of this apparatus is readily understood. As shown in Figure 1, yarn supplied from a more or less distant source (not shown) travels from the right edge of the drawing to the top surface of the drive roll, about which it passes counterclockwise through an appreciable arc (such as about 30°) before passing between the nip of the roll and the adjacent package. It then winds clockwise onto the annular package to form successive layers thereof. As the package increases in diameter, the desired contact between the surfaces of the package and the drive roll is maintained through cooperation of the roller carried near the base of the swing arm and the adjacent cam shoe, which controls the spring tension pressing the arm against the roll. Sometime during the winding of a package on the engaged swing arm, a package core is mounted manually on the other swing arm, then in the disengaged or rest position (i.e., swung back to rest against the plunger of the shock absorber).

Before the wound package reaches full size, the operator rotates the crank in the appropriate direction to lower the support for the swing arm carrying the package being wound (counterclockwise when the right-hand arm is engaged) and to raise the support for the swing arm carrying the empty package core. The engaged swing arm rotates slightly at this time as the supported package moves downward in continuous contact with the curved surface of the drive roll to form a larger angle with the initial direction of travel of the yarn (such as 60°). The operator moves the other swing arm to the engaged position above the nearly completed package, contact of the drive roll with the empty core starting it rotating. The yarn meanwhile travels through the nip of the fresh core and the drive roll to continue winding about the package just wound.

When the winding package is full, the operator moves the swing arm back out of contact with the drive roll, whereupon rotation of the package decreases because of friction present in the spindle and associated elements. As the rate of rotation falls off, the yarn being supplied undergoes a lessening of tension or "slackens" just before reaching the full package; the yarn then begins to wind about the fresh core and breaks between the package thus newly started and the old package as continued rotation of both greatly increases the tension in the yarn between the two. The operator moves the swing arm carrying the full package on back to the rest position and subsequently removes the completed package, whereupon a fresh core may be substituted for similar subsequent use.

The sequence of operations is illustrated in Figure 5, which shows the main elements rather schematically in side elevation, including the swing arms, the packages thereon, and a grooved traversing drive roll. At "A" the package on the near arm is being wound in contact with the drive roll at an appreciable angle (subtended at the center of the drive roll) measured between the nip so established and the direction of travel of the yarn being supplied to the drive roll; a full package core appears on the far swing arm, which is in the rest position. At "B" the package being wound appears at a lower position in contact with the drive roll, thus increasing the angle through which the yarn passes about the drive roll before being wound onto the package; the full package having been removed, the far arm, whose pivot point now is above that of the near arm, carries a fresh core instead. At "C" the fresh core carried on the far swing arm is engaged in contact with the drive roll at the smaller angle previously established by the winding package (as in "A"). At "D" the completed package has just separated from the drive roll, and yarn within the previously mentioned increased angle appears slackened perceptibly. At "E" the yarn has wound perceptibly onto the fresh core, while the wound package is being swung back toward the rest position. At "F" the yarn has wound onto the new core sufficiently to break between the two packages, "tails" from the break having been wound onto each. Subsequent repetition of the illustrated sequence with the arms reversed completes the entire cycle of operation.

It is noteworthy that this principle of automatic transfer of yarn in winding from onto an old to a new package is compatible with other means for supporting the packages and methods for placing them into and out of contact with the drive roll. The drive roll itself may be grooved to traverse the yarn being wound, as suggested by the yarn path recessed below the roll surface in Figure 5, or other traverse means may be associated conventionally with a solid-surfaced roll; the present invention is independent of the type of drive roll employed for surface-driving of the yarn packages. The operation can be rendered completely automatic with consequent economical limitation in human expenditure of time and effort, but the prototype here described effectuates an optimum compromise at the present development of requirements for automatic winding apparatus. Additional steps may be superimposed upon those described here without altering the fundamental procedure: for example, the operator may swab or spray the fresh package core to facilitate diversion of the yarn thereonto from winding onto the full package or may cut the yarn between the packages as the fresh core takes on yarn. While supporting of the yarn packages on pivoted arms has many advantages, as suggested above, means adapted to move the packages along straight paths instead may be substituted without sacrifice of the over-all benefits of the described practice. It is convenient, though not necessary, for an operator to be present from time to time during the winding of each package so as to observe the workings of whatever mechanism may be employed and to inspect the corresponding package condition. The degree to which the steps of the process are controlled and performed automatically rather than manually depends primarily upon economic and social (rather than technological) factors, as various methods and means conforming to practice of the present inventive concept will come readily to mind in the light of the above teachings.

The claimed invention:

Apparatus comprising a drive roll, a first swing arm and a second swing arm both adapted to support yarn packages rotatably in contact with a portion of the periphery of the drive roll sufficient in extent to accommodate simultaneously a full yarn package and an empty yarn package, first and second mountings for the respective swing arms reciprocally interconnected to place the yarn

packages supported thereby interchangeably at opposite limits of the available portion of the periphery of the drive roll by effecting appropriate movement of the swing arms with respect thereto.

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