Sept. 26, 1961 W. C. HILL, JR., ET AL 3,001,732

CONTINUOUS YARN WINDUP APPARATUS

Filed April 9, 1957 5 Sheets-Sheet 1

Fig. 9

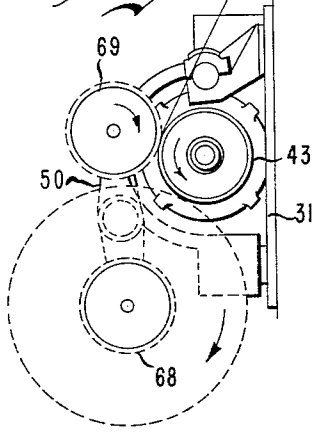


Fig. 1

Fig. 10

INVENTORS
WALTER C. HILL, JR.
GERALD W. IBBS

BY Harry J. McCauley

ATTORNEY

Sept. 26, 1961 W. C. HILL, JR., ET AL 3,001,732

CONTINUOUS YARN WINDUP APPARATUS

Filed April 9, 1957 5 Sheets-Sheet 2

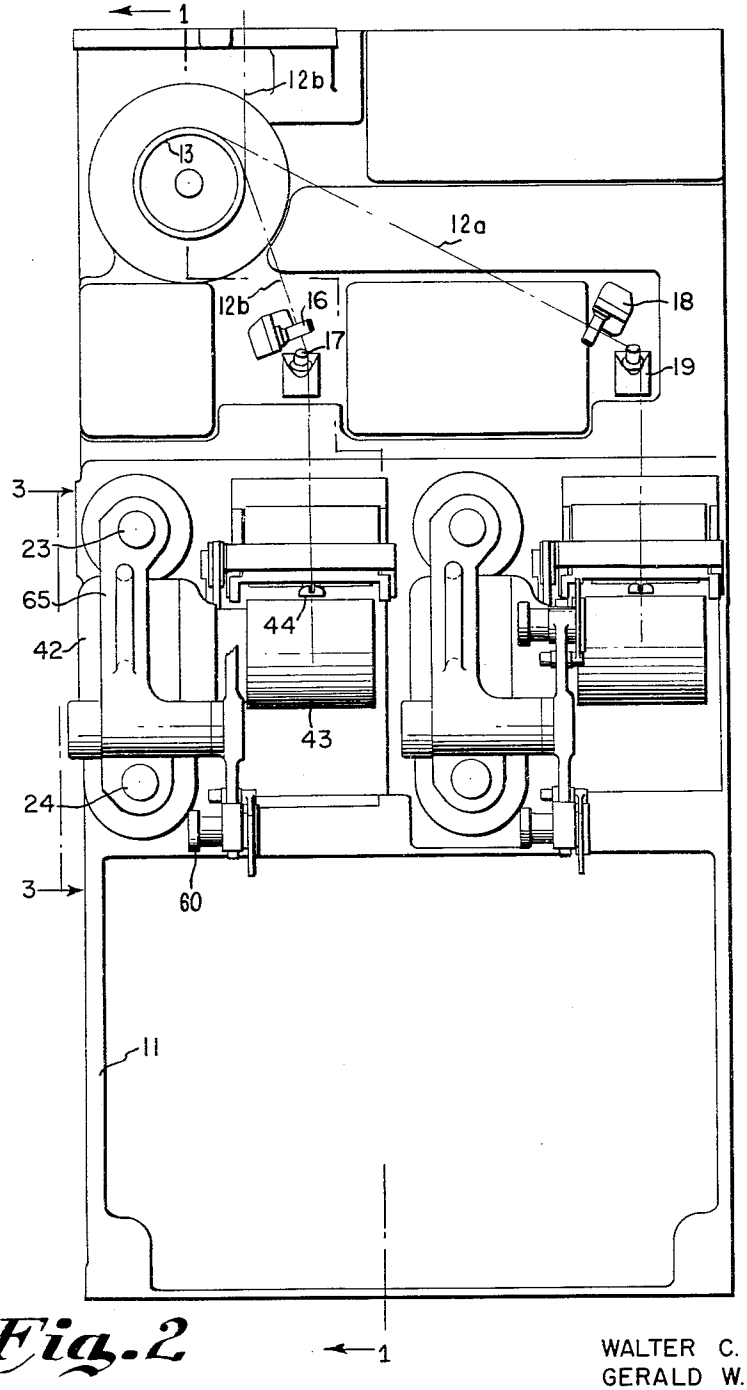


Fig. 2

INVENTORS
WALTER C. HILL, JR.
GERALD W. IBBS

BY Harry J. McCauley

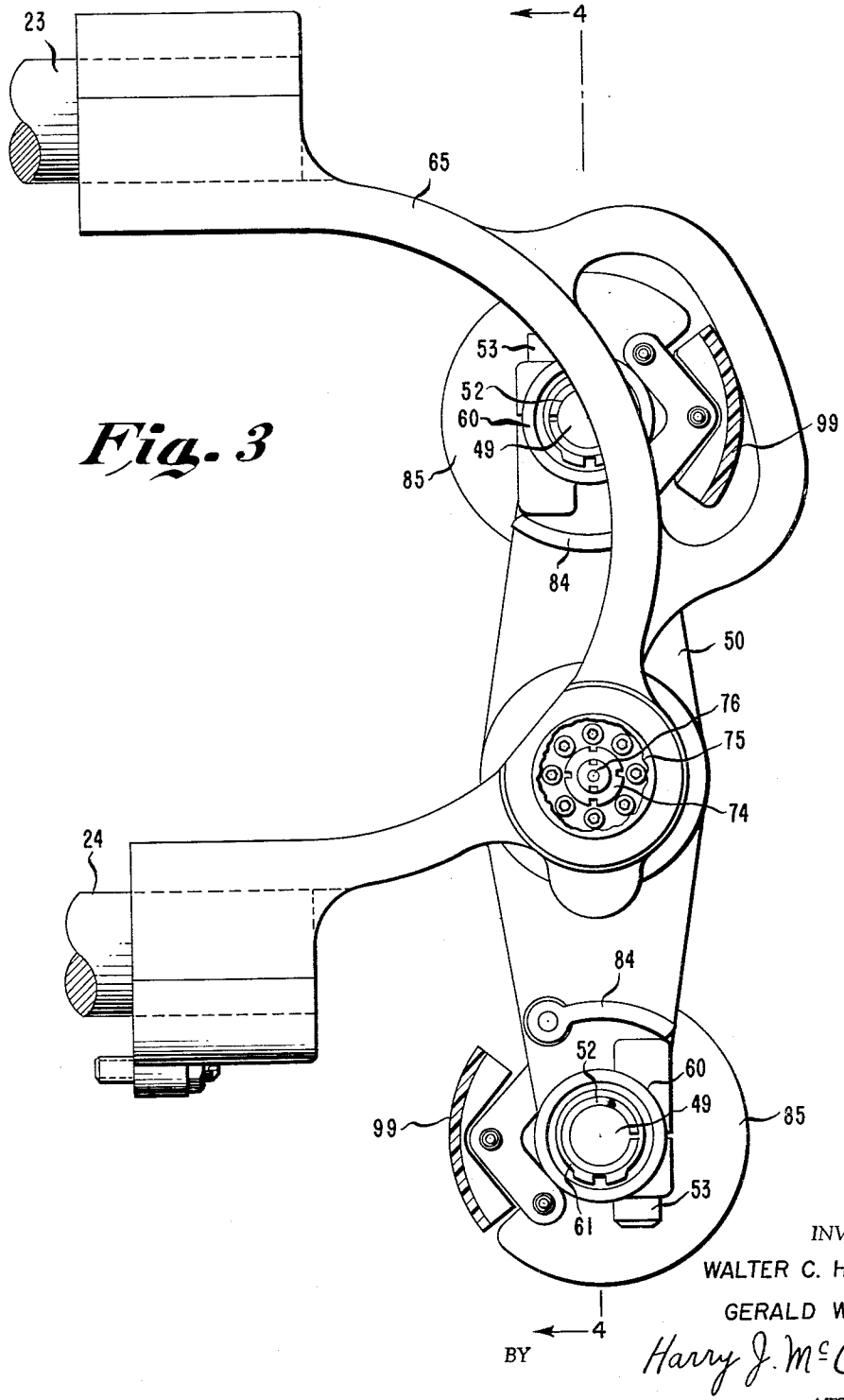
ATTORNEY

Sept. 26, 1961 W. C. HILL, JR., ET AL 3,001,732

CONTINUOUS YARN WINDUP APPARATUS

Filed April 9, 1957 5 Sheets-Sheet 3

Fig. 3



INVENTORS
WALTER C. HILL, JR.
GERALD W. IBBS
BY Harry J. McCauley
ATTORNEY

Sept. 26, 1961 W. C. HILL, JR., ET AL 3,001,732

CONTINUOUS YARN WINDUP APPARATUS

Filed April 9, 1957 5 Sheets-Sheet 4

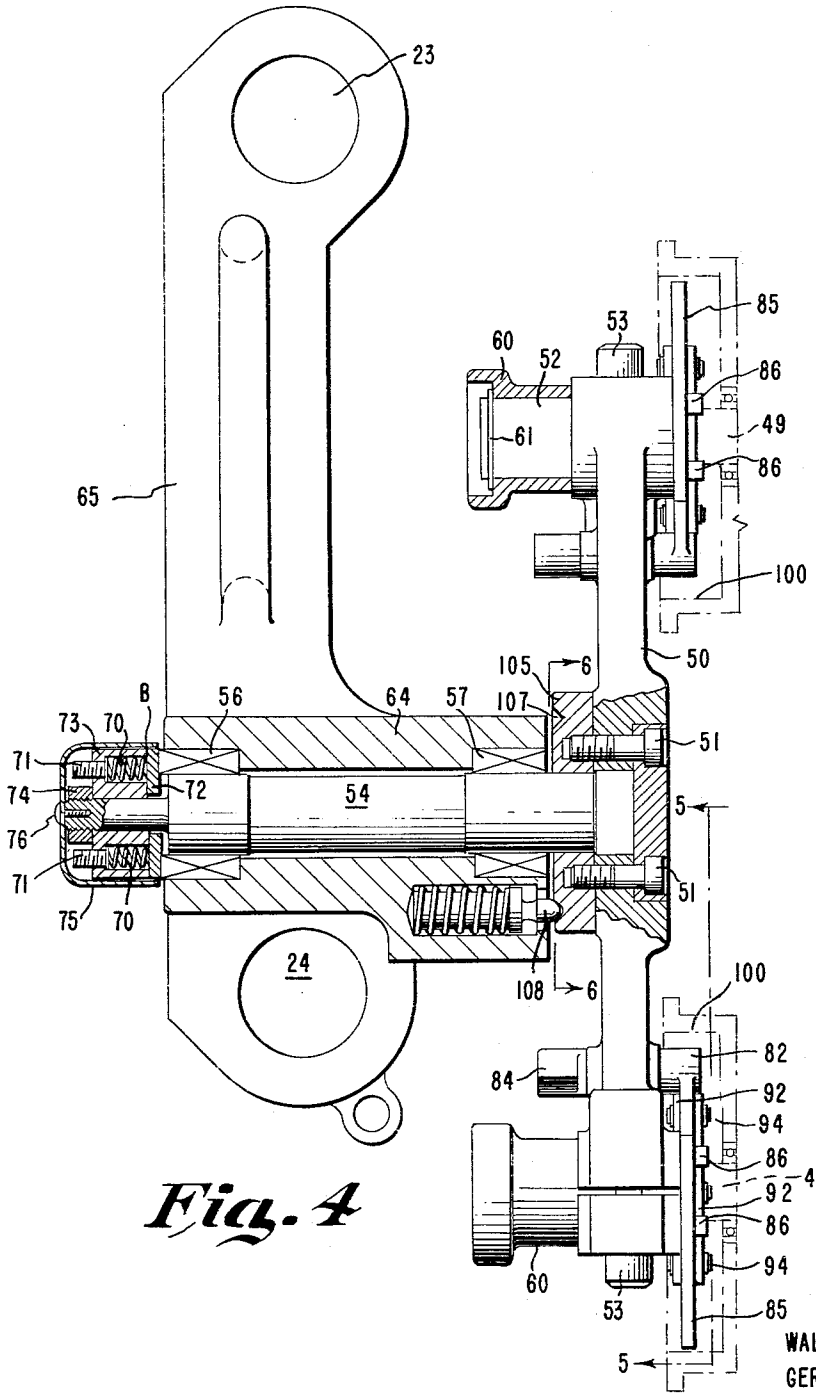


Fig. 4

INVENTORS
WALTER C. HILL, JR.
GERALD W. IBBS

BY Harry J. McCauley
ATTORNEY

Sept. 26, 1961 W. C. HILL, JR., ET AL 3,001,732
CONTINUOUS YARN WINDUP APPARATUS
Filed April 9, 1957 5 Sheets-Sheet 5

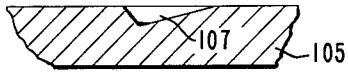


Fig. 7

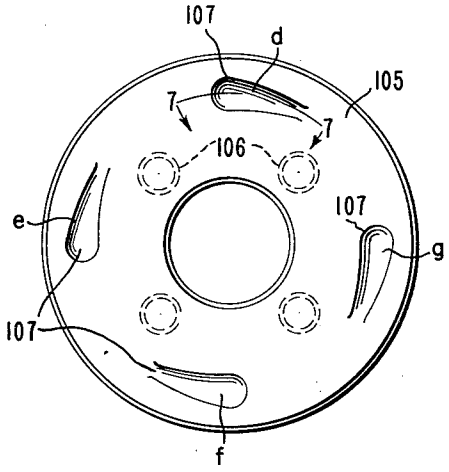


Fig. 6

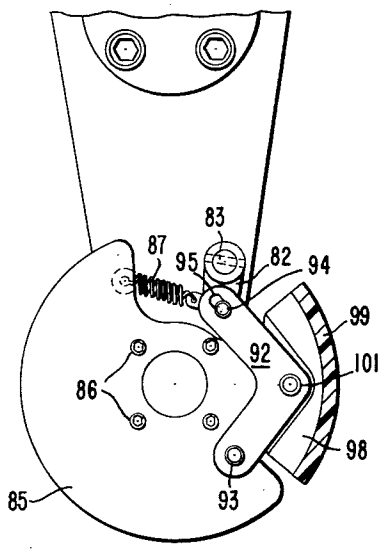
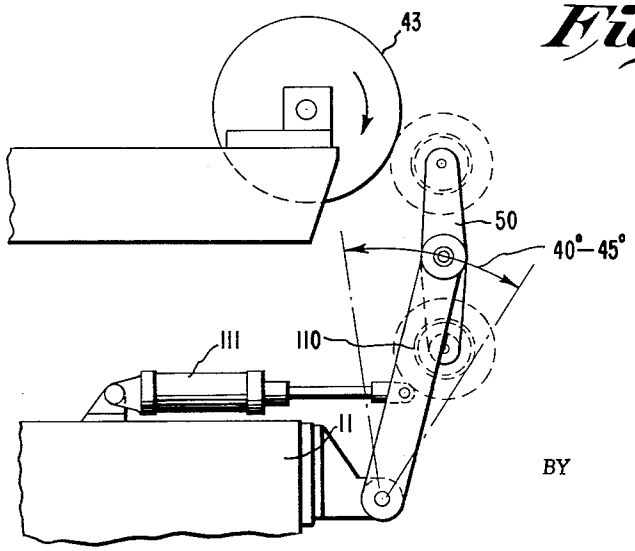


Fig. 5

Fig. 8



INVENTORS
WALTER C. HILL, JR.
GERALD W. IBBS
BY Harry J. McCauley
ATTORNEY

United States Patent Office 3,001,732 Patented Sept. 26, 1961

3,001,732

CONTINUOUS YARN WINDUP APPARATUS

Walter C. Hill, Jr., Wilmington, Del., and Gerald W. Ibbs, Newtown Square, Pa., assignors to E. I. du Pont de Nemours and Company, Wilmington, Del., a corporation of Delaware

Filed Apr. 9, 1957, Ser. No. 651,702
4 Claims. (Cl. 242—18)

This invention relates to a continuous yarn windup apparatus and particularly to a continuous yarn windup apparatus with an improved doffing mechanism.

The change over from full to empty bobbins in textile yarn manufacture presents a serious problem of wastage, particularly at high manufacturing speeds such as obtained in the industry today. Previously, it has been the practice to break the running yarn when it became necessary to replace a full bobbin with an empty one, permitting temporary windup of the supplied yarn upon a feed wheel during the time interval in which the full bobbin was removed and replaced by an empty bobbin. After the empty bobbin was in place, the winding end was broken again and strung up on the new bobbin, following which the yarn wound during the interim period on the feed wheel had to be cut away and discarded to waste.

It is a primary object of this invention to provide a continuous yarn windup apparatus wherein the running yarn can be passed from a full bobbin to an empty one without any waste whatever. Another object of this invention is the provision of a twin bobbin support which permits more leisurely and reduced labor on the part of the operator in servicing the yarn winding operation Another object of this invention is to provide a yarn windup apparatus with an associated doffing mechanism which is low in first cost and also in maintenance. The manner in which these and the other objects of this invention is accomplished will become apparent from the detailed description and the following drawings, in which:

FIG. 1 is a side elevation view in section along line 1—1, FIG. 2, of a preferred embodiment of apparatus according to this invention shown in normal operating position with yarn being wound on a nearly full bobbin and with a replacement bobbin mounted on the other chuck, the rear bearings of the frame supporting the reciprocatory carriage and its associated swivel arm being shown in partial section,

FIG. 2 is a front elevation of the winding apparatus of FIG. 1 showing two adjacent stations, the upper end of the left-hand swivel arm being broken away to permit full showing of the yarn drive roll,

FIG. 3 is a side elevation taken on line 3—3 of FIG. 2 showing the swivel arm,

FIG. 4 is a partial sectional view taken on line 4—4 of FIG. 3, showing the positions of the inner ends of the bobbin chucks in broken line representation,

FIG. 5 is an end elevation taken on line 5—5, FIG. 4,

FIG. 6 is a side elevation view of the detent plate taken on line 6—6, FIG. 4,

FIG. 7 is a section taken on line 7—7 of FIG. 6, and

FIG. 8 is a schematic representation of a second embodiment of this invention, and,

FIGS. 9 and 10 are fragmentary views of the drive roll, swivel arm and bobbins of FIG. 1 showing their relative positions during transfer of the yarn end from a full to an empty bobbin and for removal of a full bobbin while conducting windup of the yarn on a replacement bobbin, respectively.

In general, the apparatus of this invention comprises a frame provided with a power-actuated yarn drive roll, and a movable support biased towards the yarn drive roll carrying a rotatable swivel arm on which is mounted, at one end, a bobbin frictionally driven by the continuously

rotating yarn drive roll and, at the other end, a second bobbin so disposed as to be at will simultaneously rotated by the yarn drive roll with the first bobbin, and thereafter to be threaded up as a replacement for the first bobbin when the first bobbin is taken out of contact with the yarn drive roll.

Referring to FIGS. 1 and 2, which depict a preferred embodiment of this invention, frame 11 is a support for a multiplicity of winding mechanisms, each of which constitutes an individual windup for a single yarn end supplied from any source, such as the two-end thread line represented schematically at 12*a* and 12*b*. These yarn ends are fed to the winding positions by power driven feed wheel 13 around which they are wrapped a sufficient amount to obtain feeding in the direction of the winding positions as shown in FIG. 2. Yarn end 12*b* is led off over roller guides 16 and 17 to the left-hand winding position, while yarn end 12*a* is trained over roller guides 18 and 19 to the right-hand winding position.

Each winding position is identical with every other, and therefore a description of one suffices for all. Each of the winding positions is provided with a reciprocatory carriage, indicated generally at A of FIG. 1, which incorporates an upper cylindrical rod 23 and a lower cylindrical rod 24 which are each slideably mounted in a pair of axially aligned bearings 25 supported by bosses 26 integral with frame 11. An intermediate cylindrical rod 27 is supported at the outer end by a common vertical member 28 secured at opposite ends to rods 23 and 24. The inner end of rod 27 is slideably journaled in bushing 29, integral with the rear wall of frame 11, so that rod 27 is free to reciprocate in a horizontal plane as a unit with rods 23 and 24. The inner end of rod 27 is provided with a connection 32 to which is attached the upper end of flexible strap 33, and rear wall 30 of frame 11 is apertured for free passage of strap 33 therethrough. Strap 33 is trained over roller 37, which is journaled on a stud 38 carried by bracket 39 bolted on the rear side of wall 30, and carries at its lower end counterbalancing weight 34.

The front wall 31 of frame 11 carries, on the rear face, bracket 40 supporting traverse drive motor 41, which drives traversing mechanism 44, whereas the front face supports drive roll motor 42 to the shaft of which is secured drive roll 43. As best seen in FIG. 1, drive roll 43 has yarn end 12*b* disposed in contact with the roll and, during rotation, feeds the yarn end to the bobbins 68 and 69, shown in broken line representation in FIG. 1 together with the yarn wound thereon. The bobbins are rotated by frictional contact between their outer surfaces, or the yarn cakes thereon, with the periphery of drive roll 43.

The apparatus utilizes twin bobbin chucks which may be of the design taught in U.S. Patent 2,747,809, the spindles 49 (refer FIG. 4) of individual chucks having journaled thereon the bobbin supports and the spindles being retained in opposite ends of swivel arm 50. Swivel arm 50 is secured by bolts 51 to shaft 54 journaled in bearings 56 and 57. The attachment of the bobbin spindles to swivel arm 50 is conveniently effected by employing a spring lip construction at the ends of the arm, each adapted to receive a spring lip type bushing 52 within which is mounted the end of spindle 49. Retaining bolts 53 are located inwardly of the diameters of spindles 49 and bushings 52, the spindles being drilled tangentially to a circle with center on their centerlines and of radius less than the spindle radius so as to receive the bolts 53, which thereby simultaneously lock the shafts, bushings and split arm ends together in unitary assembly. To provide a handle for the operator's grasp, annular knobs 60 are fitted over the ends of bushings 52 and held in place by "Truarc" spring washers 61. Bear-

ings 56 and 57 are mounted in housing 64, which is integral with bracket 65.

Referring to FIGS. 3 and 4, the end of swivel shaft 54 remote from swivel arm 50, is provided with a friction brake, indicated generally at B, the purpose of which is to provide a preselected drag on the rotational movement of arm 50, so that the bobbins or yarn cakes will remain in contacting position with respect to drive roll 43 at all times unless the operator manually changes the relationship. Brake B consists of eight compression springs 70 adjusted as to loading by studs 71 which bias annular plate 72, mounted in free slideable relationship on the outer reduced diameter end of shaft 54, against the end of the stationary race of bearing 56 carried within housing 64. Studs 71 engage with interior threads formed in collar 73, which is held in place on shaft 54 by lock nut 74, the entire brake assembly being protected from dust or other foreign material by friction cap 75 (shown cut away in part in FIG. 3), attached by screw 76. By proper adjustment of studs 71, a braking resistance to rotation is imposed by brake B on swivel arm 50 which prevents free rotation of the latter out of orientation with respect to drive roll 43 except through the manual effort of the operator.

Bracket 65 is fixedly secured at the upper end to the front end of rod 23, and at the lower end to the front end of rod 24, the complete assembly thus consisting of reciprocating carriage A, swivel arm 50 and appurtenances and the yarn winding bobbins 68 and 69 in various stages of windup, the assembly being balanced by counterweight 34, so that it is possible to maintain about 6 lbs. or less of bias force between drive roll 43 and the bobbins in the course of operation. It will be understood that, as yarn is wound on a bobbin in contact with drive roll 43, carriage A automatically and progressively advances forwardly from wall 31 of frame 11 to accommodate for the increase in diameter occurring in the course of build-up of the product cake. As is conventional, traverse mechanism 44 driven by drive motor 41, previously described, distributes the yarn over the bobbins during the winding process.

To facilitate the operator's labor the ends of swivel arm 50 are provided with individual bobbin brakes, one satisfactory design of which is detailed in FIGS. 3, 4 and 5. The brakes comprise lugs 82 fixedly secured adjacent the bobbin chucks to pins 83 journaled in holes drilled through arm 50. The other ends of the pins are provided with handles 84 adapted to be depressed by the operator, i.e., moved in a clockwise direction as viewed in FIG. 3, when it is desired to brake the rotation of the associated bobbin.

Each end of arm 50 is provided with a guard plate 85 attached to the arm by bolts 86, and lugs 82 are biased toward the guard plates by tension springs 87 attached at the ends to each of these members. A pair of L-shaped brake levers 92 is provided, one on either side of plate 85, both of which are attached at the lower ends to guard plates 85 by a common pin 93 and at the upper ends to lug 82 by a common pin 94 slideably engaging with elongated slots 95, which are dimensioned to permit sufficient freedom in a radial sense on the part of levers 92 to effect braking action. The brake assemblies are completed by sector-like brake shoes 98 provided with frictional brake linings 99 confronting the inside peripheral surfaces of the bobbin chuck skirts 100, brake shoes 98 being mounted loosely on pins 101 so as to be self-equalizing in operation. It will be understood that the operator is enabled by this construction to brake a rapidly rotating bobbin by merely depressing brake handle 84, which results in limited counterclockwise arcuate movement of lug 82, as viewed in FIG. 5, thereby moving the two brake levers 92 outwardly in unison to bring frictional linings 99 into retarding contact with chuck skirts 100. Release of handles 84 by the operator immediately restores the shoe 98 to non-braking position under the tension of spring 87.

There is finally provided a detent plate 105, FIGS. 4, 6 and 7, which is securely attached to swivel arm 50 and shaft 54 by bolts 51, the inner ends of which engage tapped threads 106 in the plate. Plate 105 is provided on the side away from the bobbin chucks with four tear drop-shaped detents 107 similarly oriented and spaced at 90° intervals around the plate, which have a general arcuate sectional configuration such as that shown in FIG. 7. A spring-biased pin 108, mounted in housing 64, is adapted to engage with a selected one of detents 107 at the operator's option, and thereby permit controlled rotary location of arm 50 and bobbins 68 and 69 (refer FIG. 1) with respect to drive roll 43. The biasing spring of pin 108 is selected to have a strength sufficient to hold arm 50 against accidental or unintended rotation but still be weak enough so that the operator can readily overcome its action to permit manual rotation of swivel arm 50 in either direction. Thus, detent plate 105 locks swivel arm 50 and its bobbins against accidental movement while still preserving complete freedom of action on the operator's part. To facilitate the explanation of operation hereinafter set forth detents 107 of FIG. 6 are denoted by the individual letters *d*, *e*, *f*, and *g* in counterclockwise sequence from twelve o'clock position, detent pin 108 being shown in engagement with detent *f* in FIGS. 1 and 4.

FIG. 1 shows the apparatus of this invention in the condition where bobbin 68 is substantially full and empty bobbin 69 has been mounted on swivel arm 50 for replacement purposes. In practice the operator is warned by a flashing light or other alarm actuated by a time clock or other conventional device that the time has arrived when bobbin doffing is in order. This is accomplished simply by grasping lower knob 60 and rotating swivel arm 50 180° in a clockwise direction as viewed in FIG. 1, retaining the yarn cake of bobbin 68 in driven contact with respect to drive roll 43 at all times, while simultaneously bringing empty bobbin 69 into contact with the drive roll so that it is brought up to speed prior to effecting transfer of the yarn end from the full to the empty bobbin. In the course of this operation the yarn cake on bobbin 68 is shifted in contact to a lower point on the periphery of roll 43, whereas bobbin 69 is brought into contact with the roll at a point somewhat above that vacated by the full bobbin 68. The two bobbins are thus brought into the positions shown in FIG. 9 wherein both are driven simultaneously by drive roll 43. This shift of the bobbins requires unlatching detent *f* and latching detent *d* and, of course, linear accommodation of swivel arm 50 is provided by movement of carriage A.

When empty bobbin 69 has been brought up to speed, which occurs very quickly, the operator rotates arm 50 a little farther in the clockwise direction, taking full bobbin 68 out of contact with drive roll 43. He then applies the brake to the full bobbin, by depressing handle 84, which creates a slack loop in the yarn which encircles empty bobbin 69, now in the upper position, and the yarn is wrapped thereon. As soon as bobbin 69 takes up the slack in the yarn loop it breaks the yarn connection with bobbin 68, because of the difference in rotational speed between the two bobbins and, thereafter, yarn is wound exclusively on bobbin 69. The operator anc then leisurely remove the full bobbin 68 from its chuck and replace it with an empty bobbin, which is conveniently done as shown in FIG. 10 by indexing arm 50 clockwise 90° to a position where detent *e* is engaged, at which time arm 50 is horizontal but bobbin 69 is still driven at constant speed by drive roll 43, although by contact with a different point of the roll. When the full bobbin is removed and replaced by an empty bobbin, arm 50 is backed up 90° by rotation in a counterclockwise direction until detent *d* of plate 105 is again latched, thus restoring the apparatus to the same condition as

shown in FIG. 1 so that the winding cyclie can then be repeated.

FIG. 8 shows, somewhat schematically, a second embodiment of this invention employing a swing arm as the movable bobbin chuck support instead of the reciprocating carriage. In this design the swing arm **110** is pivotally mounted at its lower end on frame **11** and is biased in the direction of the yarn drive roll **43** by a spring or pneumatically urged piston, indicated generally at **111**. The construction of swivel arm **50** and the two bobbin chucks mounted at either end thereof can be identical with that described for the embodiment of FIGS. 1–6. For use in winding the usual sizes of yarn packages, swing arm **110** can be approximately 16" in length and there should be provision for unobstructed movement of the swing arm through an angle of 40–45° during operation. Although swing arm **110** moves arcuately with respect to the front face of frame **11**, as distinguished from linearly for carriage A, this can be tolerated when the arm is made sufficiently long; however, the reciprocating carriage embodiment is still preferred because of the somewhat greater convenience afforded the operator in doffing operations.

From the foregoing it will be seen that our yarn winding apparatus permits easy transfer of yarn during the doffing of bobbins without any loss of yarn whatever, and that the work of the operator is at the same time rendered more leisurely and less demanding in skill requirements than hitherto. It will be apparent that this invention may be modified in numerous ways within the skill of the art without departure from its essential spirit and it is intended to be limited only by the scope of the following claims.

We claim:

1. A yarn windup and doffing apparatus comprising in combination a frame provided with a power-actuated yarn drive roll, a movable support biased toward said yarn drive roll, a rotatable swivel arm journaled on said movable support adjacent said yarn drive roll, and a pair of yarn windup chucks, one of said chucks being attached at each end of said swivel arm in disposition to present bobbins mounted on said chucks into driven contact with said yarn drive roll, said swivel arm being dimensioned with respect to said yarn drive roll to permit both individual and simultaneous frictional driving of said bobbins, depending upon the orientation of said swivel arm in relationship to said yarn drive roll.

2. A yarn windup and doffing apparatus comprising in combination a frame provided with a power-actuated yarn drive roll, a carriage reciprocally mounted on said frame and biased towards said yarn drive roll, a rotatable swivel arm journaled on said carriage adjacent said yarn drive roll, and a pair of yarn windup chucks, one of said chucks being attached at each end of said swivel arm in disposition to present bobbins mounted on said chucks into driven contact with said yarn drive roll, said swivel arm being dimensioned with respect to said yarn drive roll to permit both individual and simultaneous frictional driving of said bobbins, depending upon the orientation of said swivel arm in relationship to said yarn drive roll.

3. A yarn windup and doffing apparatus according to claim 2 wherein said rotatable swivel arm is provided with detent means selectively engageable so as to maintain in preselected relationship said orientation of said swivel arm with respect to said yarn drive roll.

4. A yarn windup and doffing apparatus comprising in combination a frame provided with a power-actuated yarn drive roll, a carriage reciprocally mounted on said frame and biased towards said yarn drive roll, a rotatable swivel arm journaled on said carriage adjacent said yarn drive roll, frictionl braking means cooperating with said rotatable swivel arm to maintain a preselected orientation of said swivel arm with respect to said yarn drive roll, and a pair of yarn wind-up chucks, one of said chucks being attached at each end of said swivel arm in disposition to present bobbins mounted on said chucks into driven contact with said yarn drive roll, said swivel arm being dimensioned with respect to said yarn drive roll to permit both individual and simultaneous frictional driving of said bobbins, depending upon said orientation of said swivel arm in relationship to said yarn drive roll.

References Cited in the file of this patent

UNITED STATES PATENTS

2,237,759	Kwitek	Apr. 8, 1941
2,528,713	Thomson	Nov. 7, 1950

FOREIGN PATENTS

836,664	France	Oct. 17, 1938
912,992	Germany	June 8, 1954
761,689	Great Britain	Nov. 21, 1956