April 16, 1968 C. W. NUISSL 3,378,211

AUTOMATIC DOFFING AND LOADING MACHINE

Filed March 14, 1966 2 Sheets-Sheet 1

FIG. 1

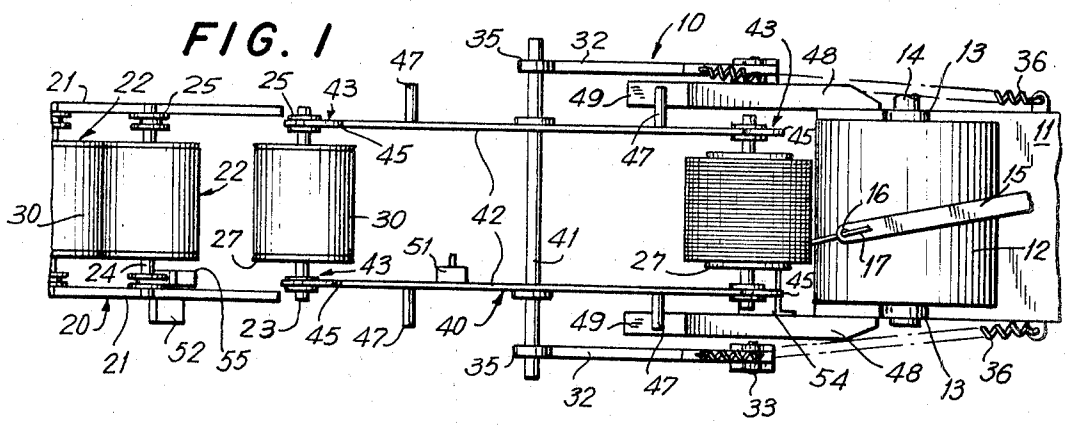
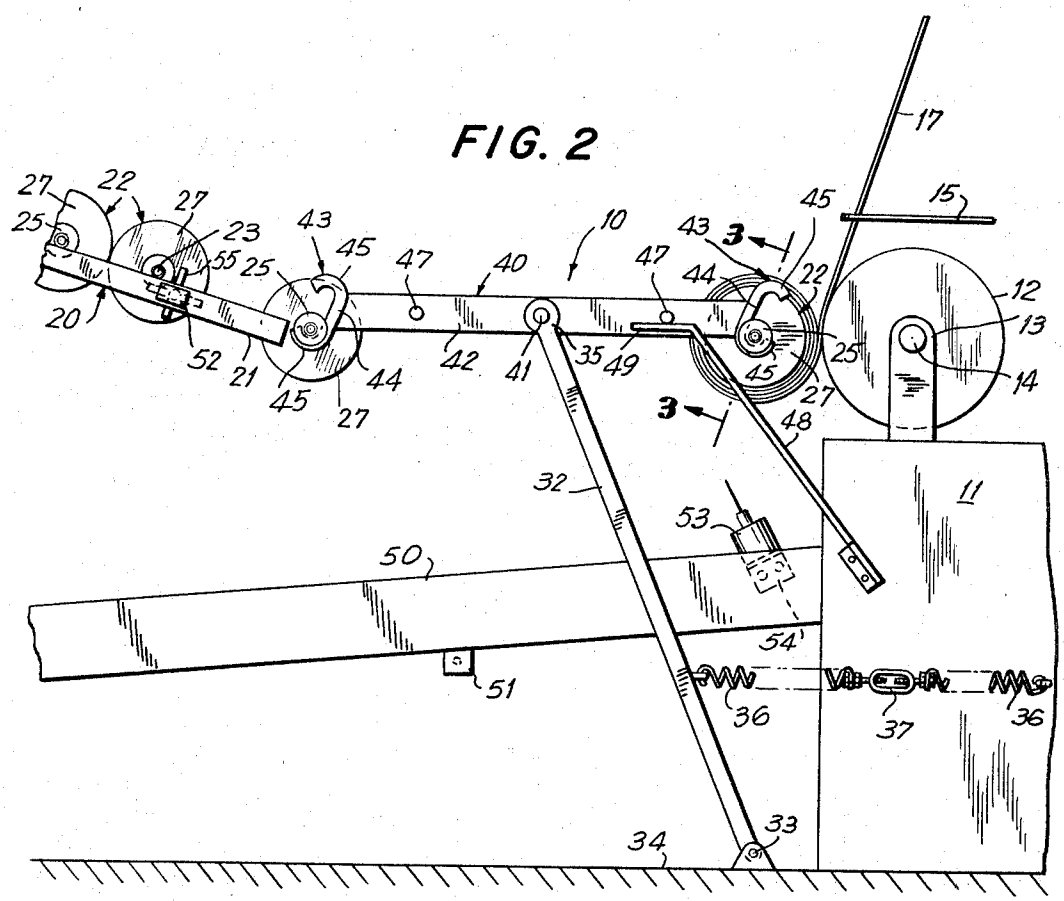


FIG. 2



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AUTOMATIC DOFFING AND LOADING MACHINE

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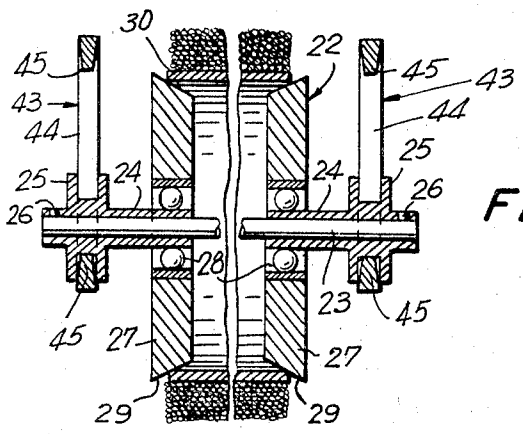



FIG. 3

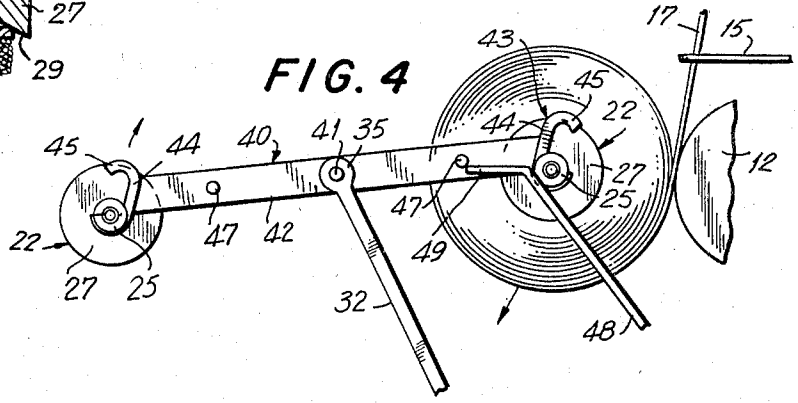



FIG. 4

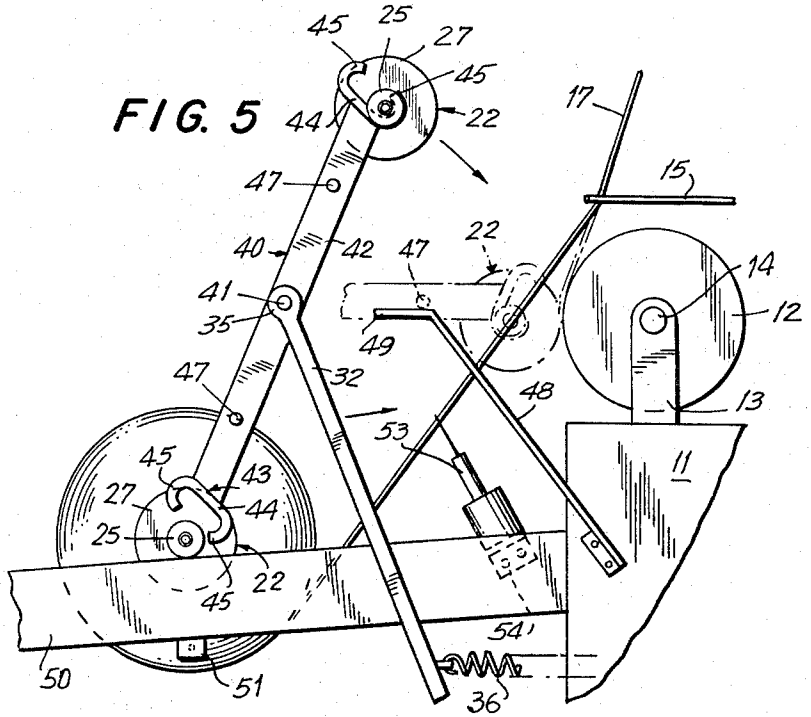



FIG. 5

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3,378,211

# AUTOMATIC DOFFING AND LOADING MACHINE

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11 Claims. (Cl. 242—18)

## ABSTRACT OF THE DISCLOSURE

This invention relates essentially to apparatus for the automatic doffing and loading of yarn tubes comprising, tube-supply means, means to drive a tube for winding the yarn to be wound on the tube and means for holding the yarn tubes, which means are adapted to receive and rotatably support a yarn tube during the winding of yarn thereon and to rotate out of a winding position to effect gravitational discharge of a wound roll upon completion of the winding of the yarn spool.

This invention relates generally to textile machinery, and is especially concerned with unique improvements in doffing apparatus.

As is well known to those versed in the art, doffing involves the removal of yarn from yarn-processing equipment, and the coiling or winding of the yarn on tubes, cones, spools or the like.

It is an important object of the present invention to provide yarn-doffing apparatus which is extremely simple in structure, requiring a minimum of parts, highly automatic in operation, and which is durable and reliable throughout a long useful life.

More particular objects of the present invention reside in the provision of unique structure for the feeding and transfer of empty tubes or the like from a supply thereof to a winding station for winding of yarn on the tubes. The invention further contemplates the provision of highly advantageous means for effecting the winding of yarn on a tube, or the like, and subsequent discharge of the wound tube, cutting of the yarn from the wound tube. The above-recited operations are simply and efficiently performed continuously at a relatively high speed, and with minimum supervision, to uniformly produce neatly and accurately wound yarn-carrying tubes.

Still a further object of the instant invention resides in the provision of doffing apparatus having the advantageous characteristics mentioned in the preceding paragraphs, which is durable and reliable throughout a long useful life, and can be economically manufactured, installed and maintained.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings, which form a material part of this disclosure.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts, which will be exemplified in the construction hereinafter described, and of which the scope will be indicated by the appended claims.



In the drawings:

FIGURE 1 is a top plan view showing doffing apparatus constructed in accordance with the teachings of the present invention;

FIGURE 2 is a side elevational view of the doffing apparatus of FIGURE 1;

FIGURE 3 is a partial sectional view taken generally along the line 3—3 of FIGURE 2;

FIGURE 4 is a partial side elevational view, similar to FIGURE 2, but illustrating a later stage in the operational cycle of the apparatus; and

FIGURE 5 is a side elevational view similar to FIGURES 2 and 4, but illustrating still a later stage in the cycle of operation.

Referring now more particularly to the drawings, and specifically to FIGURES 1 and 2 thereof, the doffing apparatus is there generally designated **10**, and includes a fixed mounting structure **11**, having mounted thereon a horizontally disposed drive roll **12**. The drive roll **12** may be rotatably supported by upstanding, pedestal bearings **13**, and a shaft **14** may extend axially from one end of the drive roll **12** for connection to a suitable power source, such as a motor or the like (not shown). Over the powered drive roll **12** may be located an oscillatory yarn guide or traverse **15**, having at its end an eye **16** for slidably receiving and guiding yarn **17** to be wound. The yarn **17** may be supplied from any previous yarn-processing operation. Also, any suitable means may be provided for oscillating the traverse **15** in suitably timed relation with rotation of the drive roll **12**.

Tube-supply means is generally designated **20**, and may include a pair of generally parallel, laterally spaced rails **21**, or other suitable gravitational conveying means declining toward and having its lower end spaced laterally to one side of the drive roll **12**. Retained on the rails **21** of tube-supply means **20** are a plurality of tubes or tube assemblies **22**, as by at least one feeder **55**, say in the form of a star or Geneva wheel. The feeder **55** is indexable, as will appear more fully hereinafter, to rotate a predetermined angular distance, for gravitationally passing a single tube assembly **22**.

A tube assembly **22** is best seen in FIGURE 3. It will there be apparent that an axle or shaft **23** is provided adjacent to its opposite ends with a pair of sleeves **24**, each concentrically carrying an externally grooved wheel **25**. The sleeves **24** are detachably fixed in any suitable manner, as by setscrews **26**, retaining rings or other securing means, to the axle or shaft **23**. Concentrically circumposed about each sleeve **24**, adjacent to the inner end thereof, is a disc or flange **27**, being rotatably mounted on the respective sleeve by suitable bearing means, such as antifriction bearing means **28**. The flanges **27** are generally disclike in configuration, each being provided on one face with the generally conical, concentrically located boss **29**, the bosses **29** being on the facing sides of the flanges **27**. Interposed between the flanges **27** is a generally cylindrical tube proper **30**. The tube proper **30** is concentrically located with respect to the axle **23** by engagement of the bosses **29** in opposite ends of the tube; and, it will now be apparent that the tube proper **30** may be readily detached from the remaining parts of the tube assembly **22**

by removal of one of the sleeves 24 and its associated flange 27 from the axle. The removed sleeve 24 and flange 27 may then be replaced, together with another tube proper for repeated use.

It will now be understood that the tube assemblies 22 each include axle means, as defined by the axle 23 and sleeves 24, extending beyond opposite ends of the tube proper 30. The axle means 23, 24 at opposite ends of the tube assembly may rest on respective rails 21 of supply means 20 for gravitational rolling of the tube assemblies downwardly along the rails. The wheels 25 may be located between the rails 21 to maintain the tube assemblies properly centered.

A pair of support members or arms 32 are laterally spaced from each other and may have their lower ends respectively pivoted, as at 33, to a supporting surface 34. The support members or arms upstand from their lower pivotal mounting into the space between the supply means 20 and drive roll 12, the upper ends of support members 32 terminating in journal bearings 35. The pivotal supports 33 extend generally parallel to the axis of drive roll 12, to mount the support members 32 for swinging movement of their upper ends 35 in the space between supply means 20 and drive roll 12, toward and away from the latter. Suitable means are provided for yieldably, resiliently biasing the support members 32 in their direction of movement toward the drive roll 12, such as a pair of tension springs 36 each connected between a respective arm 32 and the fixed structure 11. The tension springs 36 are preferably of adjustable tension, by any suitable means, such as an intermediate turnbuckle 37.

The upper, journal-bearing ends 35 of the support members 32 are in substantial alignment with each other, generally parallel to the drive roll 12, and serve to rotatably support a carrier generally designated 40. The carrier 40 may include a shaft 41 extending between and having its opposite ends journaled in respective support-member bearings 35, and a pair of arms 42 extending in substantial parallelism with each other and fixedly secured at their mid-regions to the shaft 41. Thus, the arms 42 are mounted for free rotation about the axis of shaft 41, carried by the support members 32. It will therefore be appreciated that the carrier 40 and its arms 42 are capable of both rotation about the axis of shaft 41, and movement with the support members 32 toward and away from the drive wheel 12. Of course, a support structure other than that of arms 32 may be employed to achieve the same motion; and also, the carrier 40 may be of other structure, if desired.

At opposite ends of each carrier arm 42 there are provided tube holders, generally designated 43, for rotatably receiving and holding tube assemblies 22. More specifically, the tube holders 43 each include a pair of generally C-shaped receiver members 44 fixed to the carrier-arm ends with their open sides generally radially outward of the carrier axis 41. It has been found satisfactory to arrange the C-shaped receiver members 44 with their opposite bight or closed-end portions 45 at different radii from the shaft 41. More specifically, in accordance with a predetermined direction of carrier rotation, being clockwise as seen in FIGURE 2, the leading bight portion 45 of each C-shaped receiver member 44 is at a lesser radius from shaft 41 as the trailing bight portion of the same receiver. Thus, while the C-shaped receivers 44 open generally radially outwardly, they are disposed generally oblique to the radially extending carrier arms 42.

It will therefore be appreciated, as best seen in FIGURE 2, that the lower bight portion 45 of the leftward receiver members 44 is disposed for receiving the end portions of a tube assembly 22 from the tube-supply means 20. More specifically, the lowermost tube assembly 22 is adapted to roll off the lower ends of rails 21 into the adjacent tube holder 43, such that the grooved wheels 25 each engage with a respective lower bight portion 45 of



the receivers 44. In this condition, the tube proper 30 of the received tube assembly 22 is freely rotatable about its axle 23.

Projecting outward from each arm 42 of the carrier 40, generally parallel to and spaced radially from the shaft 41, are a pair of abutment members or pins 47. A cooperating pair of fixed abutment members or arms 48 are provided on each side of the mounting structure 11, extending obliquely upward therefrom and having generally horizontal end portions 49 extending generally radially inward toward and terminating short of the shaft 41. In the position of support means 32 as seen in FIGURE 2, it will be apparent that the rightward abutment pins 47 are engageable with the fixed abutment members 49 to limit clockwise rotation of the carrier 40 to the illustrated position.

Below the carrier 40 is a delivery conveyor 50, such as a chute or rails declining from beneath the carrier. As will appear presently, the delivery conveyor 50 is located to receive a yarn-wound tube assembly and convey the latter to a storage location.

Mounted on the delivery conveyor 50 may be an actuating switch 51 adapted to be engaged by a discharged, yarn-wound tube. The switch 51 may serve to energize a motor clutch 52 for operating the feed wheel 55. Also, the switch 51 may serve to operate a motorized yarn cutter or severance means 53, say mounted on the discharge conveyor 50 by a bracket 54, for a purpose appearing presently.

In operation, as from the condition shown in FIGURES 1 and 2, it will be seen that counterclockwise rotation of drive wheel 12 effects winding of yarn 17 about the tube assembly 22 at the rightward end of carrier 40. That is, the rightward tube assembly 22 is in frictionally driven relation with the drive wheel 12, thereby being rotated in a clockwise direction to wind upon itself the yarn 17. The traverse 15 insures uniform winding of the yarn along the length of the tube assembly. As more yarn 17 is wound on the tube assembly 22, the effective diameter thereof becomes larger and serves to move the support means 32 away from the drive wheel 12 against the force of springs 36. The rightward pins 47 are thus caused to move leftward, or radially inward along respective abutment members 49. A condition is reached, as in FIGURE 4, where the rightward abutment pin 47 rides over or beyond the end of its adjacent abutment member 49, and the weight of the wound tube assembly causes the carrier 40 to rotate clockwise. As the carrier 40 swings clockwise about shaft 41, the wound tube assembly 22 moves downward, and at a lower position of arm movement the wound tube assembly falls free of the tube holder 43 through the outwardly open side thereof. From the tube holder 43 the wound tube assembly 22 falls to the discharge conveyor 50 and engages the switch 51, as seen in FIGURE 5.

Simultaneously with this downward swinging movement of a wound tube assembly, the leftward tube assembly 22 as seen in FIGURE 2 is swung upward over the axis of shaft 41 in its tube holder 43, and gravitationally slides to the opposite or radially inner bight portion 45 of the tube holder. This condition is shown in FIGURE 5. Upon continued clockwise rotation of carrier 40, the now rightward abutment pins 47 engage with the abutment members 49 to limit carrier swinging movement, the carrier support 32 having swung toward the drive wheel 12 to locate the pins 47 for such abutting engagement. In this condition the empty rightward spool assembly 22 is in frictionally driven relation with the drive wheel 12, the yarn 17 extending through the nip of tube assembly and drive wheel to be wound on the latter. If desired, the tube assembly 22 may be provided with suitable adhesive on its outer surface to further insure prompt winding action of the yarn thereabout.

During the above-described operation, the yarn-severance means or cutter 53 was operated to sever the yarn

supply from that wound on the discharged, wound tube assembly. In practice, it has been found that mere discharge of the wound tube assembly is sufficient to effect yarn severance for many types of yarns. Also, the feed wheel **55** was indexed 90 degrees to feed an empty tube assembly to the now empty leftward tube holder. Of course, the above-described operation may continue indefinitely, it being only necessary to provide supplies of tube assemblies **22** and yarn **17**.

From the foregoing, it is seen that the present invention provides a doffing apparatus which fully accomplishes its intended objects and is well adapted to meet practical conditions of manufacture and use.

Although the present invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain chainges and modifications may be made within the spirit of the invention and scope of the appended claims.

What is claimed is:

**1.** In a doffing machine for winding yarn on tubes and the like; the combination comprising a powered rotary drive roll mounted for engagement with yarn to be wound on a tube, tube-supply means spaced from said drive roll, support means mounted for movement between said supply means and drive roll, a carrier rotatably mounted on said support means for movement therewith and swinging movement relative to said support means past said drive roll, a plurality of tube holders mounted at spaced locations on said carrier for swinging movement therewith to rotatably hold and carry empty tubes from said supply means into proximate relation with said drive roll, abutment means located to stop carrier swinging movement when each successive tube holder is proximate to said drive roll, and biasing means yieldably urging said support means toward said drive roll to maintain a held tube in frictionally driven relation with said drive roll for winding yarn on the driven tube, said abutment means being configured to release said carrier for continued swinging movement past said drive roll upon support-means movement away from said drive roll responsive to a predetermined winding of yarn on a tube.

**2.** The combination according to claim **1**, said carrier being freely rotatable about a generally horizontal axis, for gravitational swinging movement of said carrier upon release by said abutment means.

**3.** The combination according to claim **2**, said tube holders each opening radially outwardly away from said horizontal axis for gravitationally receiving a tube from said supply means, transporting the received tube over said axis to said drive roll and gravitationally discharging the tube upon continued swinging carrier movement past said drive roll.

**4.** The combination according to claim **2**, said abutment means comprising a fixed abutment member extending generally radially of said axis, and a carrier abutment member carried by said carrier and engageable with said fixed abutment member when said carrier swings an empty tube to said drive roll, said carrier abutment member being movable along said fixed abutment member during tube winding and riding over said fixed abutment member upon completion of tube winding.

**5.** In a doffing machine for winding yarn on tubes and the like, the combination comprising a powered rotary drive roll mounted for peripheral engagement with yarn to be wound on a tube, tube-supply means spaced from said drive roll, support means mounted for movement between said tube-supply means and drive roll, bias means urging said support means toward said drive roll, a carrier pivoted to said support means for movement therewith and swinging movement relative to said support means, and a plurality of tube holders mounted at spaced locations on said carrier for swinging movement therewith from a position adjacent said supply means to a position adjacent said drive roll to rotatably receive empty tubes from said tube-supply means and transport said received tubes toward said drive roll, said biasing means urging said transported tubes into frictional driven relation with said drive roll to wind yarn upon a driven tube, said tube supply means including feed means for passing a tube gravitationally to an empty one of said tube holders when it is adjacent said supply means.

**6.** The combination according to claim **5**, said carrier being freely rotatable about a generally horizontal axis, and said tube holders each opening radially outwardly from said horizontal axis for receiving an empty tube from said supply means and transporting the received tube over said axis to said drive roll and gravitationally discharging a transported tube upon continued swinging carrier movement past said drive roll.

**7.** A doffing apparatus comprising a generally horizontally disposed powered drive roll mounted for engagement on one side with yarn to be wound on a tube, tube-supply means spaced laterally from said drive roll on said one side thereof, a carrier intermediate said drive roll and supply means, mounting means mounting said carrier for rotation about an axis generally parallel to said drive roll, and a plurality of tube holders at spaced locations on said carrier for rotation therewith from a receiving station adjacent to said supply means through a winding station adjacent to said drive roll to a discharge station below said axis, said tube holders each comprising receiver means opening outwardly away from said axis for rotatably receiving a tube from said supply means at said receiving station and transporting a received tube over said axis into frictionally driven relation with said drive roll at said winding station for rotating and winding yarn on the transported tube, carrier rotation beyond said winding station effecting gravitational discharge of a wound roll from its receiver means.

**8.** A doffing apparatus according to claim **7**, in combination with axle means for mounting axially on each tube extending beyond the ends thereof, said receiver means comprising a pair of spaced generally C-shaped receivers for rotatably receiving respective end extensions of said axle means.

**9.** A doffing apparatus according to claim **7**, in combination with discharge means below said carrier for receiving discharged tubes.

**10.** A doffing apparatus according to claim **7**, in combination with yarn-severing means for severing yarn from a wound tube responsive to discharge thereof.

**11.** A doffing apparatus according to claim **7**, in combination with feeding means on said supply means for feeding tubes to said receiver means, and means for actuating said feeding means when a receiver means is in said receiving station.

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