Nov. 29, 1960 R. ESCURSELL PRAT 2,961,822

DOFFING AND DONNING APPARATUS

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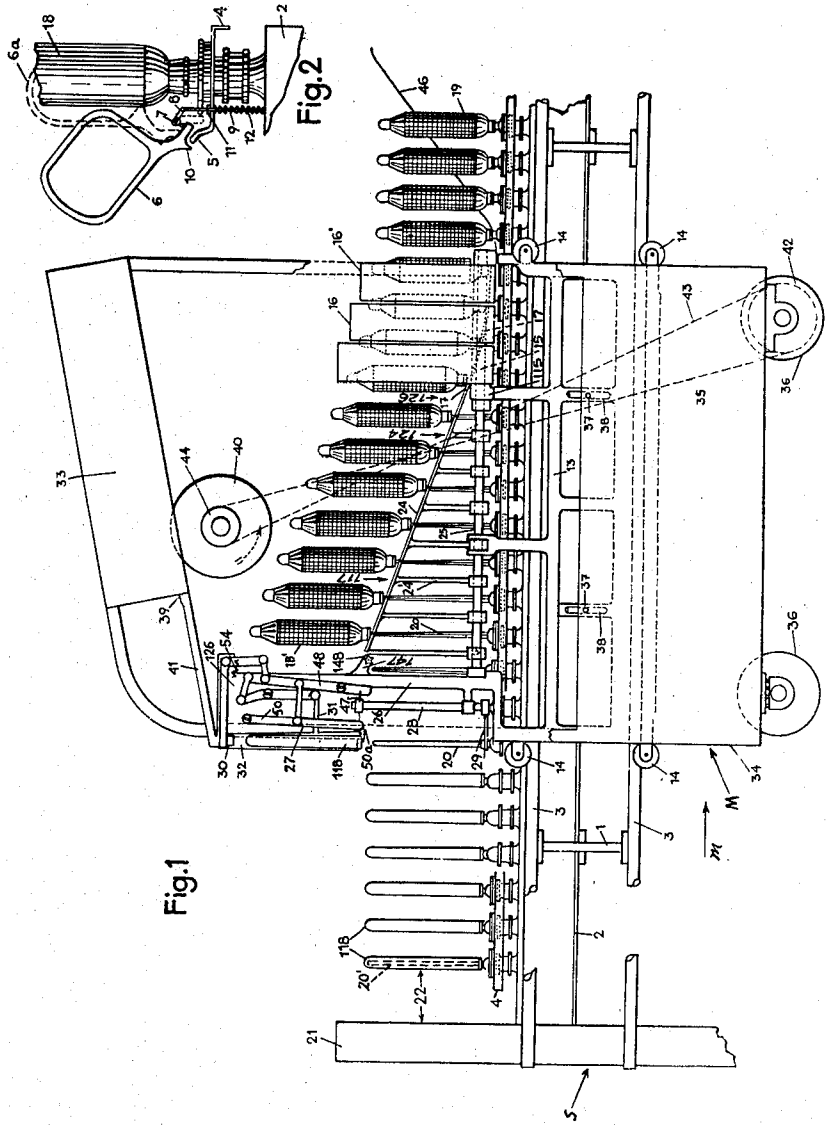


Fig.1

Fig.2

INVENTOR.
ROBERTO ESCURSELL PRAT

Nov. 29, 1960 R. ESCURSELL PRAT 2,961,822

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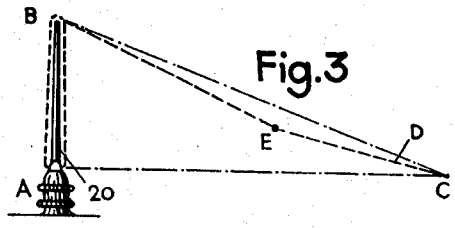


Fig.3

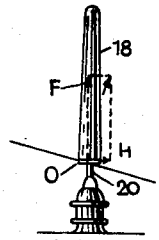


Fig.4

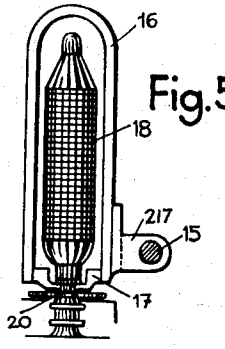


Fig.5

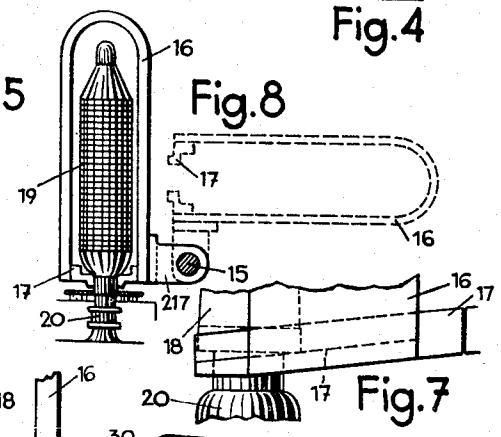


Fig.8

Fig.7

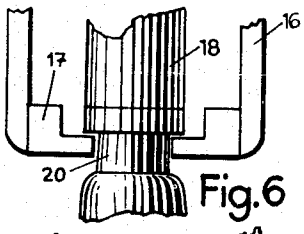


Fig.6

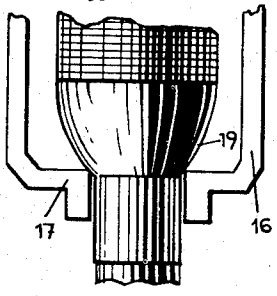


Fig.9

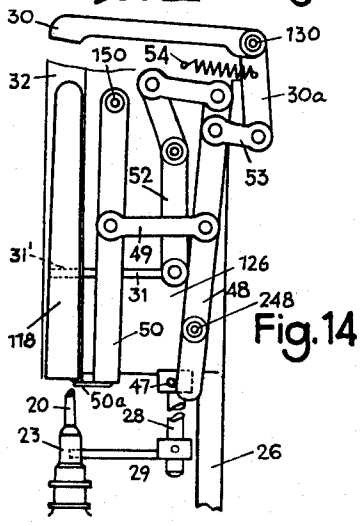


Fig.14

INVENTOR.
Roberto Escursell Prat
BY
Michael S. Striker
Attorney

Nov. 29, 1960 R. ESCURSELL PRAT 2,961,822

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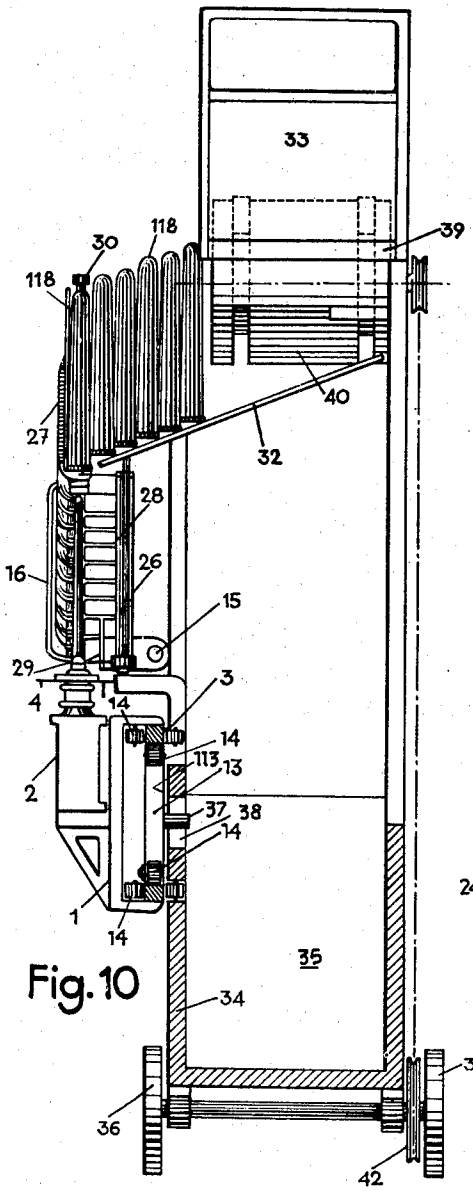


Fig.10

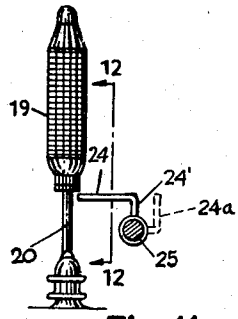


Fig.11

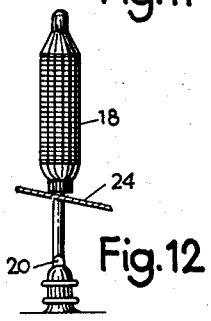


Fig.12

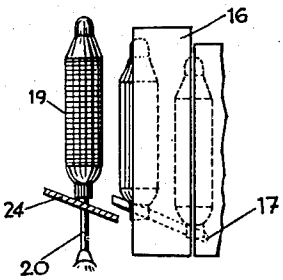


Fig.13

INVENTOR.
Robert Escursell Prat

BY
Michael S. Striker
Attorney

Nov. 29, 1960 R. ESCURSELL PRAT 2,961,822

DOFFING AND DONNING APPARATUS

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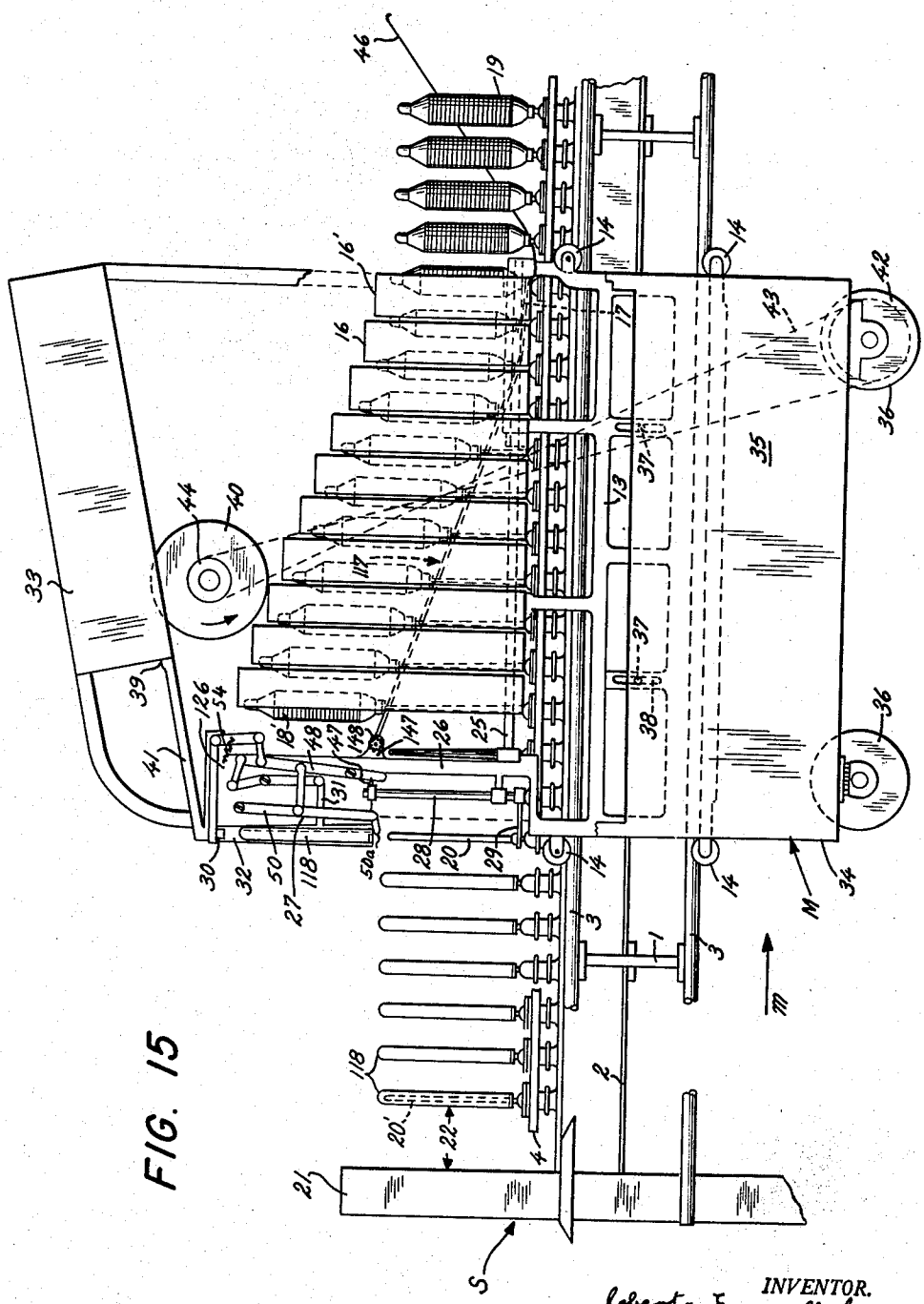


FIG. 15

INVENTOR.
Roberto Escursell Prat
BY
Michael S. Striker
Attorney

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DOFFING AND DONNING APPARATUS

Roberto Escursell Prat, Avenida Mandri 35, Barcelona, Spain, assignor of one-half to Juan Hostench Serra, Barcelona, Spain

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Claims priority, application Spain Jan. 5, 1957

25 Claims. (Cl. 57—53)

The present invention relates to a method and device for the mechanical doffing of full cops and the replacement thereof by empty tubes, applicable to continuous spinning machines and the like.

The present invention represents a considerable improvement with respect to the conventional systems, wherein a simultaneous replacement of tubes on a machine is performed with the great inconvenience that a considerable and complicated mechanism is required which occupies much space on the machine.

These difficulties have resulted in that all attempts made to solve this problem, have failed and not been considered practical, and the removal of full cops is accomplished as yet by hand, with a consequent considerable loss of time and labor.

For a better comprehension of the essence of the present invention, the fundamental characteristics of the device of the present invention and the method and the manner in which it is carried out, will hereinafter be described with reference to the accompanying drawings, showing preferred embodiments of the invention. The device will have to be constructed in accordance with the required number of tubes and cops, and all modified devices that are constructed based on the disclosed general idea, will be considered no other than variations that are likewise covered and protected by the appended claims.

Fig. 1 is a front view of the device as used with a spinning machine;

Fig. 2 is a side elevation of the mechanism utilized as an anti-ballooning separator;

Fig. 3 is a diagram illustrating outlines of cam tracks formed by doffing means;

Fig. 4 is a diagrammatical view showing the resolution of forces effective during the doffing operation;

Fig. 5 is a side view of a doffing means removing a wooden tube cop;

Fig. 6 is a fragmentary side view on an enlarged scale, of a detail showing how a doffing cam engages the base of the tube;

Fig. 7 is a fragmentary front view on an enlarged scale showing the cam supporting portion of the doffing means;

Fig. 8 is a side view similar to that shown in Fig. 5, showing a doffing means removing a thin paper or plastic tube cop, wherein the broken lines indicate a retracted inoperative position of the doffing means;

Fig. 9 is a fragmentary side view showing on an enlarged scale, a detail of Fig. 8;

Fig. 10 is a lateral view, partially in section, of the device in use on a spinning machine as viewed from the left hand side of Fig. 1.

Fig. 11 represents a lateral view of a modified doffing means, located in the region of the arrow 124 in Fig. 1, wherein the broken lines indicate the inoperative position of the modified doffing means;

Fig. 12 is a sectional view of the modified doffing means; taken on line 12—12 in Fig. 11;

Fig. 13 is a front view which illustrates partly in section a modified cam track for a paper tube bobbin at the leading portion of the device located in the region of arrow 224 in Fig. 1;

Fig. 14 is a fragmentary front view, on an enlarged scale, of the mechanism for donning empty tubes; and Fig. 15 is a fragmentary front view illustrating a modified embodiment of the invention.

The device of the present invention will now be described with reference to the drawings in which corresponding parts are indicated by the same reference numerals.

The device M of the present invention is shown in Figs. 1 and 10 as used with a conventional spinning machine S. The spinning machine includes supporting end members 21, of which only one is shown, supporting a longitudinal beam 2 on which a row of spindles 20 is mounted. Supports 1 are secured to beam 2 and carry a pair of longitudinal rails 3. The device of the present invention has wheels or rollers 14 which are mounted on rails 3 so that the device M can be moved along the spinning machine.

In the event that separators for preventing ballooning of the thread are provided on the spinning machine, as shown in Fig. 2, it is necessary to move the separators from the normal operative position 6*a*, shown in broken lines in Fig. 2 to an inoperative position 6, shown in solid lines in Fig. 2, before the device of the present invention is operated. A bar 5 is connected to the rail 4 of the spinning machine, and drops with the rail 4, as will be understood by those skilled in the art. Each seperator 6 has a projecting arm 7 articulated to another arm 8 which is articulated to a rod 9 secured to beam 2. Rod 9 passes through an opening in member 4, and is further guided by a ring 11 which is fixed to member 4. A coil spring 12 surrounds rod 4 and abuts against members 4 and 2. In the position illustrated in Fig. 2, member 4 is in its lower position, and separator 6 is lowered while its guide portion 10 rests on bar 5. When member 4 is raised, separator 6 is urged by bar 5 to turn about the joint between members 7 and 8 into the position 6*a*, illustrated in broken lines, in which each separator is located between two adjacent bobbins 18 on spindles 20. Separators 6 are not shown in Fig. 1 for the sake of clarity. As the description of the device proceeds, it will be understood that separators in the normal position 6*a* would obstruct the operation of the device M of the present invention.

The device M of the present invention includes a trolley 34 mounted on wheels 36. A carriage 113 is mounted on trolley 34, and includes a supporting frame 13, and rollers 14 on frame 13. Guide pins 37 project into vertical slots 38 of trolley 34, so that carriage 113 can move in vertical direction relative to trolley 34, but is taken along when trolley 34 is pushed along the spinning machine S while the rollers 14 roll on rails 3. Shafts 15 and 25 are supported on bearings 115 on frame 13. As shown in Figs. 1, 2, 5 and 8, doffing means 16, 17 are mounted on shaft 15 for turning movement between the position shown in solid lines in Figs. 5 and 8, and the position shown in broken lines in Fig. 8.

Each doffing means has a U-shaped part 16, a pair of cam track members 17 secured to the ends of the legs of the U-shaped part 16, and a bracket 217 which is turnably suported on shaft 15. Cam track members 17 are made of a wear-resistant material, and are inclined to the horizontal, as best seen in Fig. 7. Fig. 5 shows cam tracks 17 engaging the end portion of a wooden bobbin 18, and Figs. 8 and 9 show cam track 17 engaging the opposite sides of the base of the yarn wound on a tube made of cardboard or any other thin material.

The cam tracks of each pair of cam tracks 17 are spaced from each other a distance corresponding to the

thickness of the spindles **20** if the device is used for wooden bobbins. When cardboard bobbins **19** are used, cam tracks **17** are spaced from each other so as to engage the yarn base wound on the bobbin instead of the end portion, as shown in Fig. 8.

Three doffing means **16**, **17** are shown in Fig. 1. In the embodiment illustrated in Fig. 1, a stationary shaft **25** is mounted on frame **13**, extending in direction of shaft **15** or being a portion of the same. Shaft **25** supports modified doffing means including a supporting arm **24'** and a single cam track **24** for turning movement between the position illustrated in solid lines in Fig. 11, and the inoperative position **24***a* illustrated in broken lines. Fig. 12 shows that the single cam track **24** is inclined to the horizontal in the same manner as the pairs of cam tracks **17**, described with reference to Figs. 5 and 8. Since only a single cam track **24** is provided for the modified doffing means shown in Figs. 11 and 12, the U-shaped part **16** is omitted.

The cam tracks **17** and **24** are arranged to form an inclined track which slides under the end portions of the bobbins **18** when the device M is moved along the spinning machine. This inclined track is diagrammatically shown in Fig. 3 as the hypotenuse B—C of a triangle A—B—C, one side of which is formed by a spindle **20**. Point C corresponds to the position of the cam tracks **17** shown in Fig. 5, whereas point B indicates the position of the last cam track **24** in Fig. 1 so that the bobbin **18** is raised off the spindle **20**. The number of doffing means is so chosen that the inclination of the track corresponds to the forces which have to be applied to bobbins **18** for removing the same from the spindles **20** on which bobbins **18** are tightly seated. In this manner, the perpendicular component F in the vertical direction (see Fig. 4), causes no damage to the elements constituting the spindle. That is to say, the number of spindles between the spindle at whose base the lowest cam track **17** acts, to the upper end of the last spindle at which the composite track **117** terminates, will vary in accordance with the resistance to being doffed or the adhesion of the tube to the spindle.

Although, preferably, the indicated straight shape is used for the composite inclined track **117**, it appears more convenient with regard to the effects of the pressure of the horizontal component H on the spindle, to reduce the horizontal force H at the beginning of the cop doffing operation, so that the inclined track acquires the polygonal shape B—E—D—C, or else the curved shape as indicated in Figure 1, although, nevertheless, corresponding to the indicated straight line B—C. Therefore, as will be observed in Figure 4, in principle it is achieved that, as soon as the doffer means **16**, **17** establish contact underneath the bobbin of the maximum zone of stress, that is to say, when cam tracks **17** have to remove the tube from the conical seat of the spindle **20**, the horizontal component O—H is very small, as the cam track forms a small angle with the horizontal, whereas after the tube has been loosened, the angle may be larger due to the fact that the force is merely destined to lift the weight of the bobbin so that the horizontal component O—H can by no means be so great as to bend or damage the spindle.

In the event that cardboard tubes are used, the double cam track members **17** exert pressure on the yarn base to loosen the cardboard bobbins **19** on spindles **20**. After the bobbin has been loosened, the single cam tracks **24** may engage the cardboard tube itself, as shown in Fig. 13. Consequently the last double cam track **17** has a trailing end which is located above the leading end of the first single cam track **24**. In this manner the great pressure required for loosening the bobbin is exerted on the yarn package, whereas the lesser pressure required for raising the bobbin is exerted on the paper tube.

The width of doffing means **16**, **17**, and of doffing means **24**, as viewed in Fig. 1, should be slightly less than the distance between a bobbin, not shown, on the first spindle **20'** and the end portion **21** of the spinning machine S. In this manner, each doffing means can be turned from the inoperative position shown in broken lines in Fig. 8 into the space **22** to assume the position shown in solid lines in Figs. 5 and 8, so that the bobbins will successively pass through the U-shaped parts **16**, as the device M is moved along the spinning machine in direction of the arrow *m*.

A corresponding space is provided at the other end of the machine, so that each doffing means can be turned from its operative vertical position to its inoperative position to pass the other end portion of the spinning machine.

The doffing means are operated as follows:

The device M is rolled to a position adjacent the left end portion of the spinning machine S as viewed in Fig. 1. Rollers **14** are placed on rails **3**, so that carriage **113** is slightly raised, and the guide pins **37** are in the position shown in Fig. 10 in which carriage **113** is no longer supported on trolley **34**. Consequently, when trolley **34** is moved along the spinning machine, together with carriage **113**, the carriage **113** will not be displaced in vertical direction by uneven portions of the floor on which wheels **36** roll.

At the beginning of the operation, all doffing means are in inoperative positions, and the leading doffing means **16'** is located adjacent the space **22**. The leading doffing means **16'** is turned to the position shown in solid lines in Fig. 8, and the device is moved in direction of arrow *m* until the double cam track **17** engages the end portion of a bobbin seated on the first spindle **20'**. When the device has been moved, the second doffing means is turned into space **22**, and the operation is continued, so that finally all doffing means are in operative position, and together form an inclined cam track on which the bobbins ride upwardly. Fig. 1 shows a position in which the device M has moved a certain distance along the row of spindles. The last bobbin **18'** is raised so high as to completely release the spindle **20**, and to drop into a receptacle **35** in the trolley **34**.

Due to the fact that the double cam tracks **17** of the leading doffing means have a small inclination, the required great vertical lifting force for loosening the bobbins on spindles **20** is produced when the cam tracks of the leading doffng means pass under and engage opposite sides of the bobbin. Since the bobbins are supported on both sides as they are raised vertically by the cam tracks, they will be prevented from tilting with respect to the spindle and binding thereon. The loosened bobbins are further raised by the more inclined cam tracks of the trailing doffing means. While only three double track doffing means **16**, **17** are shown in Fig. 1, double track doffing means **16** may be substituted for the single track doffing means **24**.

The modified embodiment illustrated in Fig. 15 corresponds in every respect to the doffing device described with reference to Fig. 1, with the exception that only doffing devices **16**, **17** having double-cam tracks are used so that the single cam track doffing devices are eliminated. One leg of the U-shaped part **16** is extended below the double-cam track **17** and carries the bracket **217** which is turnably supported on shaft **15** as described with reference to Figs. 5 and 8.

A mechanism **27** for placing empty bobbins on spindles **20** forms part of the device M. As best seen in Fig. 14, an empty bobbin **118** is located in a chute **32** and is held in the same by a transverse projection **50***a* of a lever **50** turnably mounted at **150** on the frame part **126** which is connected to the other parts of frame **13** by a vertical support **26**. Another lever **48** is turnably mounted on frame part **126** on a pivot pin **248** and is connected to lever **50** by an articulated link **49**. Another link **53** connects lever **48** with a lever **30***a* which is

connected to a lever 30 for turning movement about an axis 130. An articulated linkage 52 connects the end of lever 48 with a finger 31 which is retracted from the chute 32 in the illustrated position but is movable with linkage 52 to assume a position 31' located in the path of movement of the empty bobbin located in chute 32 behind the leading bobbin 118. A compression spring 54 is connected to frame 126 and to lever 30*a* and exerts pressure on the lever system in the position illustrated in Fig. 14.

A shaft 28 is mounted on the frame means 13, 126 for turning movement, and has a projecting arm 47 engaging the other end of lever 48, and another feeler arm 29 shown to engage the base 23 of a spindle 20. It will be understood that feeler arm 29 is located spaced from lug 50*a*, as shown in Fig. 1, and that shaft 28 and spindle 20 are shown broken off and displaced in Fig. 14.

Spring 54 tends to turn lever 30, 30*a* in counterclockwise direction, and lever 48 in clockwise direction, but such turning movement is not possible as long as feeler arm 29 engages a spindle 23, 20 since arm 47 is blocked. When feeler arm 29 releases a spindle 23, 20 during movement of the device M along the spinning machine, spring 54 turns lever 48 through levers 30*a* and 53 in clockwise direction, while arms 47 and 29 perform an angular motion. Rocking of lever 48 effects rocking of lever 50 through link 49, so that lug 50*a* releases the empty bobbin 118 permitting it to drop onto spindle 20 which at this moment is located exactly under chute 32. At the same time, spring 54 turns levers 30*a* and 30 so that lever arm 30 exerts a hammer blow onto the top of the empty bobbin 118 whereby a tight seat of bobbin 118 on spindle 20 is assured.

As best seen in Fig. 10, the chute 32 is inclined so that a row of empty bobbins 118 slides down chute 32 to consecutively assume the position of the foremost bobbin 118 shown in Figs. 14 and 1. The linkage 52 is also operated to turn in clockwise direction when feeler arm 29 releases a spindle 20, and finger 31 is advanced to the position indicated at 31' in dotted lines. Consequently, the next following bobbin 118 is held in the chute 32 by finger 31, and cannot drop out together with the foremost bobbin 118. When the next spindle 20, 23 is engaged by arm 29, finger 31 is retracted since all parts assume the position illustrated in Fig. 14 so that finger 31 releases the following bobbin 118 for sliding movement into the position located at the front end of the chute and above the row of spindles 20.

Feeler arm 29 is so located with respect to the track means 17, 24 that the spindles 20 from which the full bobbins 18 are removed, are provided with a new empty bobbin 118. Thus, as the device M is moved along the spinning machine, all full bobbins are removed from the spindles and deposited in the container 35, while directly thereafter new empty bobbins are placed on the spindles so that the spinning machine is ready for the next operation after a single passage of device M along a row of spindles.

A receptacle 33 for empty bobbins 118 is supported on trolley 34 and has a bottom 39 provided with grooves corresponding to the shape of the empty bobbins.

The inclined bottom 39 has a cut-out into which a drum 40 projects. Side rails 41 connect bottom 39 with the inclined chute 32. When the empty bobbins arrive at the lowermost point of the bottom 39 and drop into chute 32, each bobbin turns about a projection engaging its end located on the left of Fig. 10 until it assumes an upright position in which its lower end rests on the bottom of chute 32 where all bobbins 118 slide toward the donning mechanism 27.

Drum 40 is rotated in order to facilitate the orientation and transport of the bobbins 118 stored in receptacle 33. As shown in Fig. 1, a pulley 42 is connected to one of the wheels 36 for rotation. Another pulley 44 is connected to drum 40 for rotation, and is connected by a belt 43 to pulley 42 so that drum 40 is turned as long as wheel 36 turns. It is evident that the belt drive can be replaced by bevel wheels and a shaft, or by cog wheels and a rack which in this case can be on a guide rail.

The operation of the device for the application of the method of the invention, is as follows: having placed the device at the end of the spinning or twisting machines at which a doffing of full cops is required, the descent of the bobbin rail 4 will determine a spreading of the anti-ballooning separators 6, thus affording a free passage of the doffing means.

As soon as said bobbin rail descends and after having lifted the thread guides, the first member 16 is inserted in the space 22 between the headstock 21 of the machine and the first spindle 20' by means of a corresponding rotation on its shaft 15, while simultaneously by its own weight the thread-separator member 46 will occupy its correct position for the separation of the threads. Immediately thereafter a displacement of the entire device M will be accomplished by hand or mechanical means by an advance movement of the trolley 34, while at the same time successive members 16 that carry the doffing cam tracks 17 are inserted in space 22 between the head stock 21 and the first spindle 20'. The rotation movement of each doffing means 16 into the operative position takes place with the aid of a coil spring that exerts pressure on the rotated member.

The separator 46 rides along the whole row of cops or bobbins separating the threads and thereafter, upon reaching the first bobbin 20' the two cam tracks 17 pass under the lower end thereof causing the bobbin 18 by the force of the wedge action of their wedge or inclined faces, to rise from the base of the spindle 20, on such machines as use thick wooden or plastic tubes. The same pressure is applied to the bottom end of the thread package on bobbins 19 having thin paper or plastic tubes, thus forcing the tubes to rise on their spindles in consequence of the aforementioned pressure of the cam tracks 17, as described with reference to Figs. 9 and 13.

When a bobbin has reached a height on the spindle that permits the raising thereof with no further effort than such as corresponds to its own weight then, a more inclined cam track which tends to remove same from the spindle passes underneath the bobbins until the trailing bobbin loses all support. At this moment, it is engaged on one side by member 147 and drops away from member 147 into the box 35, with which the trolley 34 is provided, while the thread is cut by the knife 148 (see Fig. 1), so that in this manner a consecutive and continuous doffing is accomplished, as shown in Figure 1, because the bobbins from one end to the other of the composite inclined cam track 117 and with the spindles as an internal guide, reach the different heights on the inclined track 117 so that immediately after the arrival of highest track portion of track 117 at the highest point of the spindle, first of all the drop of the bobbin or cop into the box 35 is effected and thereafter due to the movement of the trolley 34 and the framework 13 which supports the cam tracks 17, the second cop will drop, and so on, while the leading part of the cam track is inserted under other cops to loosen the same on the spindles, as has already been described.

Thereafter and due to said displacement of the trolley 34, the empty bobbin 118 (see Fig. 14) which has to be donned on the just doffed spindle 20 arrives over a spindle 20 while at the same time, by the action of the lever 29 (see Figs. 1, 10, 14) which bears upon the base 23 of the spindle, the lug 50*a* that prevents a lowering of the empty bobbin 118 moves away, while simultaneously the bobbin receives a blow at the upper end thereof by member 30, so as to accelerate its descent, which is likewise controlled by the lever 29 that bears upon the spindle base and in turn, actuates separator finger 31 which facilitates a frictionless drop of the bobbin

by separating same from the other bobbins contained in the feed chute 32.

Thereby the bobbin is seated right down to the base 23 when dealing with wooden tubes, or only a fraction thereof if it is a paper tube and immediately after the placing of the tube, the lug 50*a* is closed and the hammer mechanism 30 is raised, so that the lever 31 (see Fig. 1) which prevents a displacement of the tubes inside the feed chute 32 is opened, whereafter the first tube passes on to the lug 50*a* which prevents its descent, while all the tubes will then follow by sliding along the inclined bottom of the feed chute 32 that is supplied from the receptacle 33 containing the empty tubes and which leave same with the aid of the drum 40.

The aforementioned tube donning method is applied to each of the spindles on the machine and is accomplished as heretofore defined, by a displacement of the device M by means of which the full cops are also conveniently doffed.

As soon as the mobile device M reaches the other end of the machines, the doffing means 16 and 24 are automatically and successively removed, while located in the space between the last spindle 20 of the spinning or twisting machines and the corresponding headstock, by means of the articulation applied to the doffing means on the shafts 15 and 25, whereby the doffing operation of all full cops 18 or 19 is accomplished which are dropped into the box 35 at the bottom of the trolley 34 while when likewise the empty tubes will have passed from the receptacle 33 on to all the spindles 20 of the spinning machine.

After the same operation has been executed by another apparatus M on the other side of the machine S, or after the same apparatus has been applied to said other side, the spinning machine can be set in motion.

The method and device of the present invention has been described with reference to the conventional type of continuous spinning or twisting machines having fixed end parts 21. However, should these be modified at their end frame, so that they can be transversed easily in a direct manner, that is to say, without having to avail oneself, as at present, of the space between the first spindle and the end frames 21, then the articulation of the double and single doffing means 16, 17 and 24 on shafts 15 and 25, as also of the rail setters 27, could be done away with, and only one piece would constitute the doffing means and thus simplify the assembly. In other words, when the spinning machine is of the type in which no end frames project into the horizontal plane above the spindle rails where the spindles are located, the entire cam track 117 can be provided on one member, corresponding to member 16, which need not be articulated on frame 13 since it can enter at one end of the spinning machine and leave at the other end thereof which is not possible if the spinning machine is provided with end frames 21.

The advantages ascribed to the method and device to which reference is made heretofore will appear evident, as they considerably reduce the time that such machines have to be stopped during the doffing and donning operations. The present invention moreover has the great advantage of saving labor.

What is claimed is:

1. A device for doffing bobbins from a row of spindles supported on a machine, the device comprising, in combination, doffing means including a pair of cam track members spaced from each other so as to be adapted to be located on opposite sides of the spindles for engaging bobbins on the spindles; and means supporting said doffing means for movement along the row of spindles whereby bobbins engaged by said pair of cam track members are loosened and raised on the spindles.

2. A device for doffing bobbins from a row of upright spindles supported on a machine, the device comprising, in combination, doffing means including a pair of cam track members spaced from each other so as to be adapted to be located on opposite sides of the spindles for engaging bobbins on the spindles; and means supporting said doffing means for movement along the row of spindles whereby bobbins engaged by said pair of cam track members are loosened and raised on the spindles, the trailing portions of said cam track members being located higher than the leading portions of said cam track members a distance adapted to correspond to the vertical length of the spindles so that a bobbin supported on said trailing cam track end portions is removed from the respective spindle.

3. A device for doffing bobbins from a row of upright spindles supported on a machine, the device comprising, in combination, doffing means having a cam track inclined to a horizontal plane, at least the lower portion of said cam track including a pair of cam track members inclined to a horizontal plane and spaced from each other so as to be adapted to be located on opposite sides of the spindles for engaging bobbins on the spindles; rail means adapted to be secured to the machine to extend parallel to the row of spindles; and carriage means mounted on said rail means movable thereon and supporting said doffing means for movement along the row of spindles whereby bobbins engaged by said pair of cam track members are loosened and raised on the spindles.

4. A device for doffing bobbins from a row of upright spindles supported on a machine, the device comprising, in combination, doffing means including at least one pair of cam track members inclined to a horizontal plane and spaced from each other; and carriage means supporting said doffing means and being movable with the same along the row of spindles, said carriage means including means supporting said doffing means for movement between an inoperative position located spaced from the row of spindles and an operative position in which said cam track members are adapted to be located on opposite sides of the spindles for engaging bobbins on the spindles during movement of said carriage means whereby bobbins engaged by said cam track members are loosened and raised on the spindles.

5. A device for doffing bobbins from a row of upright spindles supported on a machine, the device comprising, in combination, a plurality of doffing means, each doffing means having a cam track element inclined to a horizontal plane, said cam track elements forming together a composite cam track inclined to a horizontal plane, at least the cam track elements at the lower portion of said cam track including a pair of cam track members spaced from each other; and carriage means supporting said doffing means and being movable with the same along the row of spindles, said carriage means including means supporting said doffing means for movement independently of each other between an inoperative position located spaced from the row of spindles and an operative position in which said cam track members are adapted to be located on opposite sides of the spindles for engaging bobbins on the spindles during movement of said carriage means whereby bobbins engaged by said cam track members are loosened and raised on the spindles by the higher cam track elements to a position located above the spindles and detached from the same.

6. A device for doffing bobbins from a row of spindles supported on a machine, the device comprising, in combination, doffing means including a pair of cam track members spaced from each other so as to be adapted to be located on opposite sides of the spindles for engaging bobbins on the spindles and a U-shaped connecting portion connecting said cam track members and having a shape adapted to clear bobbins engaged by said cam track members; and means supporting said doffing means for movement along the row of spindles whereby bobbins engaged by said pair of cam track members are loosened and raised on the spindles.

7. A device for doffing bobbins from a row of upright spindles supported on a machine, the device comprising, in combination, doffing means including at least one pair of cam track members inclined to a horizontal plane and spaced from each other and a U-shaped connecting portion connecting said cam track members; and carriage means supporting said doffing means and being movable with the same along the row of spindles, said carriage means including means supporting said doffing means for movement between an inoperative position located spaced from the row of spindles and an operative position in which said cam track members are adapted to be located on opposite sides of the spindles for engaging bobbins on the spindles during movement of said carriage means whereby bobbins engaged by said cam track members are loosened and raised on the spindles while being located within said U-shaped connecting portion.

8. A device for doffing bobbins from a row of upright spindles supported on a machine, the device comprising, in combination, a plurality of doffing means, each doffing means having a cam track element inclined to a horizontal plane, said cam track elements forming together a composite cam track inclined to a horizontal plane, at least the cam track elements at the lower portion of said cam track including a pair of cam track members spaced from each other and a U-shaped connecting portion connecting said cam track members; and carriage means supporting said doffing means and being movable with the same along the row of spindles, said carriage means including means supporting said doffing means for movement independently of each other between an inoperative position located spaced from the row of spindles and an operative position in which said cam track members are adapted to be located on opposite sides of the spindles for engaging bobbins on the spindles during movement of said carriage means whereby bobbins engaged by said cam track members are loosened while being located within said U-shaped connecting portion and raised on the spindles.

9. A device for doffing bobbins from a row of upright spindles supported on a machine, the device comprising, in combination, a plurality of doffing means, each doffing means including a pair of cam track members spaced from each other, each pair of cam track members being inclined to a horizontal plane, and a U-shaped connecting portion connecting said cam track members, said pairs of cam track members forming together a composite cam track inclined to a horizontal plane; and carriage means supporting said doffing means and being movable with the same along the row of spindles, said carriage means including means supporting said doffing means for movement between an inoperative position located spaced from the row of spindles and an operative position in which said cam track members are adapted to be located on opposite sides of the spindles for engaging bobbins on the spindles during movement of said carriage means whereby bobbins engaged by said cam track members are loosened and raised on the spindles while being located within said U-shaped connecting portions.

10. A device for doffing bobbins from a row of upright spindles supported on a machine, the device comprising, in combination, a plurality of doffing means, each doffing means including a pair of cam track members spaced from each other, each pair of cam track members being inclined to a horizontal plane, the lower pairs of cam track members being less inclined to the horizontal plane than the higher pairs of said cam track members, and a U-shaped connecting portion connecting said cam track members, said pairs of cam track members forming together a composite cam track inclined to a horizontal plane; and carriage means supporting said doffing means and being movable with the same along the row of spindles, said carriage means including means supporting said doffing means for movement between an inoperative position located spaced from the row of spindles and an operative position in which said cam track members are adapted to be located on opposite sides of the spindles for engaging bobbins on the spindles during movement of said carriage means whereby bobbins engaged by said cam track members are loosened and raised on the spindles while being located within said U-shaped connecting portions.

11. A device for doffing bobbins from a row of upright spindles supported on a machine, the device comprising, in combination, doffing means including a pair of cam track members spaced from each other so as to be adapted to be located on opposite sides of the spindles for engaging bobbins on the spindles; and means supporting said doffing means for movement along the row of spindles whereby bobbins engaged by said pair of cam track members are loosened and raised on the spindles, the trailing portions of said cam track members being located higher than the leading portions of said cam track members a distance adapted to correspond to the vertical length of the spindles so that a bobbin supported on said trailing cam track end portions is removed from the respective spindle, the lower portions of said cam track members being less inclined to a horizontal plane than the higher portions of said cam track members.

12. A device for doffing bobbins from a row of upright spindles supported on a machine, the device comprising, in combination, doffing means including a pair of cam track members spaced from each other so as to be adapted to be located on opposite sides of the spindles for engaging bobbins on the spindles and a U-shaped connecting portion connecting said cam track members; and means supporting said doffing means for movement along the row of spindles whereby bobbins engaged by said pair of cam track members are loosened and raised on the spindles, the trailing portions of said cam track members being located higher than the leading portions of said cam track members a distance adapted to correspond to the vertical length of the spindles so that a bobbin supported on said trailing cam track end portions is removed from the respective spindle, the lower portions of said cam track members being less inclined to a horizontal plane than the higher portions of said cam track members.

13. In combination with a machine having two upright end portions, a horizontal beam between said end portions, and a row of upright spindles supported on said beam, the spindles at the ends of the row being spaced, respectively, a predetermined distance from said upright end portions; a doffing device comprising a plurality of doffing means, each doffing means including a pair of cam track members inclined to a horizontal plane, each doffing means extending in horizontal direction a distance smaller than said predetermined distance; and carriage means supporting said doffing means and being mounted on said machine for movement along the same and along said row of spindles, said carriage means including means supporting each of said doffing means for independent movement between an inoperative position located spaced from the row of spindles and an operative position, each doffing means being shiftable to and from said operative position when located opposite the space between one of said end portions and the respective spindle at the end of the row, said cam track members being located on opposite sides of the spindles in said operative position of said doffing means for engaging bobbins on the spindles during movement of said carriage means whereby bobbins engaged by said cam track members are loosened and raised on the spindles.

14. A device for donning empty bobbins on a row of upright spindles supported on a machine, the donning device comprising, in combination, carriage means movable along said row of spindles; chute means for successively moving bobbins to a discharge portion thereof located above the row of spindles; a blocking means mounted on said carriage means for movement between

a blocking position blocking said discharge portion of said chute means and a releasing position for releasing a bobbin located in said discharge portion; spring-loaded hammer means movable to and from an operative position engaging the bobbin in said discharge portion for driving the same onto a spindle; and feeler means adapted to successively engage the spindles during movement of said carriage means and being operatively connected to said hammer means and to said blocking means to effect successive movement of said blocking means to said releasing position and movement of said hammer means to said operative position when sensing a spindle located underneath said discharge portion of said chute means.

15. A device for donning empty bobbins on a row of upright spindles supported on a machine, the donning device comprising, in combination, carriage means movable along said row of spindles; chute means for successively moving bobbins to a discharge portion thereof located above the row of spindles; a blocking means mounted on said carriage means for movement between a blocking position blocking said discharge portion of said chute means and a releasing position for releasing a bobbin located in said discharge portion; spring-loaded hammer means movable to and from an operative position engaging the bobbin in said discharge portion for driving the same onto a spindle; linkage means operatively connecting said spring-loaded hammer means and said blocking means so that said hammer means moves to said operative position shortly after said blocking means moves to said releasing position; and feeler means adapted to successively engage the spindles during movement of said carriage means and being operatively connected to said linkage means to effect successive movement of said blocking means to said releasing position and movement of said hammer means to said operative position when sensing a spindle located underneath said discharge portion of said chute means.

16. A device for donning empty bobbins on a row of upright spindles supported on a machine, the donning device comprising, in combination, carriage means movable along said row of spindles; chute means for successively moving bobbins to a discharge portion thereof located above the row of spindles; a blocking means mounted on said carriage means for movement between a blocking position blocking said discharge portion of said chute means and a releasing position for releasing a bobbin located in said discharge portion; spring-loaded hammer means movable to and from an operative position engaging the bobbin in said discharge portion for driving the same onto a spindle; linkage means operatively connecting said spring-loaded hammer means and said blocking means so that said hammer means moves to said operative position shortly after said blocking means moves to said releasing position; holding means mounted on said carriage means for movement between an inoperative retracted position and a holding position projecting into said chute means so as to engage a bobbin adjacent the bobbin in said discharge portion for holding said adjacent bobbin while the first bobbin is being discharged, said holding means being operatively connected to said linkage means to be moved to said inoperative retracted position directly after return of said blocking means to said blocking position so that the adjacent bobbin can move into said discharge portion in said chute means; and feeler means adapted to successively engage the spindles during movement of said carriage means and being operatively connected to said linkage means to effect successive movement of said blocking means to said releasing position and movement of said hammer means to said operative position, and movement of said holding means to said holding position when sensing a spindle located underneath said discharge portion of said chute means.

17. A device as set forth in claim 16 wherein said feeler means effect movement of said blocking means, hammer means and of said holding means when releasing a spindle during movement of said carriage means.

18. A device for donning empty bobbins on a row of upright spindles supported on a machine, the donning device comprising, in combination, carriage means movable along said row of spindles; chute means for successively moving bobbins to a discharge portion thereof located above the row of spindles; a blocking means mounted on said carriage means for movement between a blocking position blocking said discharge portion of said chute means and a releasing position for releasing a bobbin located in said discharge portion; a holding means mounted on said carriage means for movement between an inoperative retracted position and a holding position projecting into said chute means so as to engage a bobbin adjacent the bobbin in said discharge portion for holding said adjacent bobbin while the first bobbin is being discharged, said holding means being operatively connected to said blocking means to be moved to said inoperative retracted position directly after return of said blocking means to said blocking position so that the adjacent bobbin can move into said discharge portion in said chute means; and feeler means adapted to successively engage the spindles during movement of said carriage means and being operatively connected to said blocking means to effect successive movement of said blocking means to said releasing position, and movement of said holding means to said holding position when sensing a spindle located underneath said discharge portion of said chute means.

19. A device for doffing bobbins from a row of upright spindles supported on a machine, the device comprising, in combination, doffing means including at least one pair of cam track members inclined to a horizontal plane and spaced from each other; and carriage means supporting said doffing means and being movable with the same along the row of spindles, said carriage means including means supporting said doffing means for automatic movement between an inoperative position located spaced from the row of spindles and an operative position in which said cam track members are adapted to be located on opposite sides of the spindles for engaging bobbins on the spindles during movement of said carriage means whereby bobbins engaged by said cam track members are loosened and raised on the spindles.

20. A device for doffing bobbins from a row of upright spindles supported on a machine, the device comprising, in combination, a plurality of doffing means, each doffing means having a cam track element inclined to a horizontal plane, said cam track elements forming together a composite cam track inclined to a horizontal plane, at least the cam track elements at the lower portion of said cam track including a pair of cam track members spaced from each other; and carriage means supporting said doffing means and being movable with the same along the row of spindles, said carriage means including means supporting said doffing means for successive automatic movement independently of each other between an inoperative position located spaced from the row of spindles and an operative position in which said cam track members are adapted to be located on opposite sides of the spindles for engaging bobbins on the spindles during movement of said carriage means whereby bobbins engaged by said cam track members are loosened and raised on the spindles by the higher cam track elements to a position located above the spindles and detached from the same.

21. A device for doffing full bobbins from, and for donning empty bobbins on a row of upright spindles supported on a machine, the device comprising, in combination, doffing means including at least one pair of cam track members inclined to a horizontal plane and spaced from each other; carriage means supporting said doffing means and being movable with the same along the row of spindles, said carriage means including means supporting

said doffing means for movement between an inoperative position located spaced from the row of spindles and an operative position in which said cam track members are adapted to be located on opposite sides of the spindles for engaging bobbins on the spindles during movement of said carriage means whereby bobbins engaged by said cam track members are loosened and raised on the spindles; chute means on said carriage means for successively moving bobbins to a discharge portion thereof located above the row of spindles; a blocking means mounted on said carriage means for movement between a blocking position blocking said discharge portion of said chute means and a releasing position for releasing a bobbin located in said discharge portion; spring-loaded hammer means movable to and from an operative position engaging the bobbin in said discharge portion for driving the same onto a spindle; and feeler means adapted to successively engage the spindles during movement of said carriage means and being operatively connected to said hammer means and to said blocking means to effect successive movement of said blocking means to said releasing position and movement of said hammer means to said operative position when sensing a spindle located underneath said discharge portion of said chute means.

22. In a method of doffing bobbins from spindles, in combination, the step of moving a pair of wedges having small gradually increasing equal gradients and located on opposite sides of a spindle past the spindle while the wedges extend under and engage a bobbin tightly seated on the spindle to exert a greater upward pressure on the bobbin for loosening the same and a smaller upward pressure for moving the bobbin toward the free end of the spindle.

23. A device for doffing bobbins from a row of upright spindles supported on a machine, the device comprising, in combination, doffing means having a cam track inclined to a horizontal plane, at least the lower portion of said cam track including a pair of cam track members inclined to a horizontal plane and spaced from each other so as to be adapted to be located on opposite sides of the spindles for engaging bobbins on the spindles; rail means adapted to be secured to the machine to extend parallel to the row of spindles; carriage means mounted on said rail means movable thereon and supporting said doffing means for movement along the row of spindles whereby bobbins engaged by said pair of cam track members are loosened and raised on the spindles; trolley means adapted to move on a floor along the machine; and means for mounting said carriage means on said trolley means for relative movement in vertical direction only so that said carriage means moves along said rail means while said trolley means is moved on an irregular floor surface.

24. A device for doffing bobbins including a tube and a yarn package thereon, from a row of upright spindles supported on a machine, the device comprising, in combination, doffing means including a first cam track and a second cam track, said cam tracks being inclined to a horizontal plane, the higher end portion of said first cam-track being located vertically spaced above the lower end portion of said second cam track, at least said first cam track including a pair of cam track members spaced from each other so as to be adapted to be located on opposite sides of the spindles for engaging the opposite sides of the bases of yarn packages of bobbins on the spindles, and said second cam track being adapted to engage said tubes of the bobbins; and means supporting said doffing means for movement along the row of spindles whereby bobbins whose yarn packages are engaged by said pair of cam track members are loosened and whereby whose tubes are engaged by said second cam track are raised on the spindles.

25. A device for use in breaking the driving connection to and doffing bobbins from the spindles of a row of upright spindles supported on a machine, the device comprising in combination, doffing means having a cam track means inclined to a horizontal plane and adapted to be moved under and engage the lower portions of the bobbins on the spindles, at least the lower leading portion of said cam track means having a smaller inclination to a horizontal plane which provides a large lifting component as the cam track means passes under the bobbins to break the driving connection between the bobbin and spindle; and means supporting said doffing means for movement along the row of spindles whereby the bobbins are successively engaged by said cam track means.

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