United States Patent [19]

Hirschle et al.

[11] **3,908,348**

[45] **Sept. 30, 1975**

[54] **BOBBIN TUBE LOADING APPARATUS**

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[73] Assignee: **Rieter Machine Works, Ltd.,** Winterthur, Switzerland

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[30] **Foreign Application Priority Data**

June 22, 1973 Switzerland 9160/73

[52] **U.S. Cl.** **57/53**

[51] **Int. Cl.** **D01h 9/10**

[58] **Field of Search** 57/52, 53

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Primary Examiner—John Petrakes

Attorney, Agent, or Firm—Kenyon & Kenyon Reilly Carr & Chapin

[57] **ABSTRACT**

A carriage is provided which can be moved along a row of tube take-up pins on a ring spinning or ring twisting machine. The carriage has a tube transfer means which receives the bobbin tubes from a chute in a horizontal position and which moves each tube into a vertical position at a take-up position above a take-up pin. The movement of the transfer means is synchronized with the movement of the carriage along the machine and the pins to permit dropping of the tubes when the tubes are directly over the pins.

18 Claims, 8 Drawing Figures

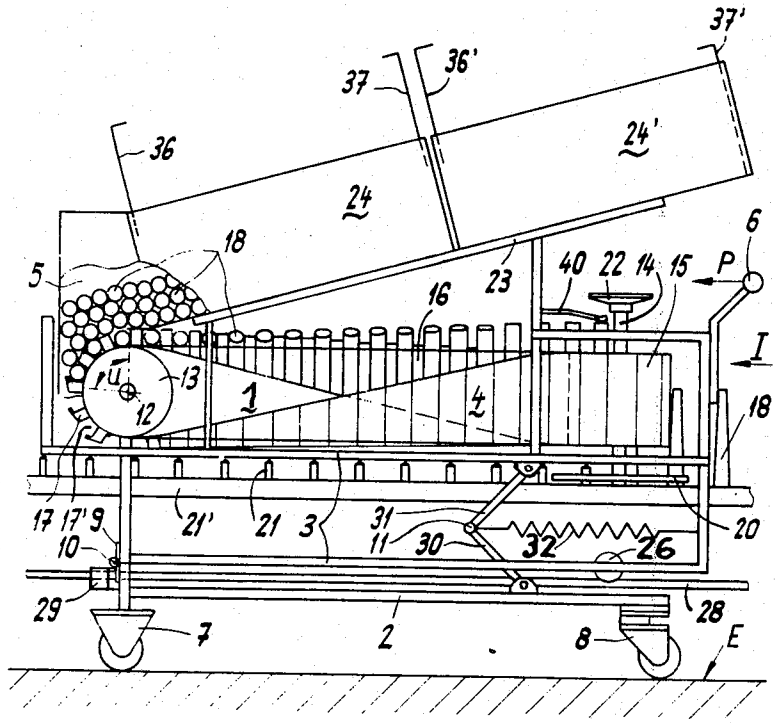

Fig. 1

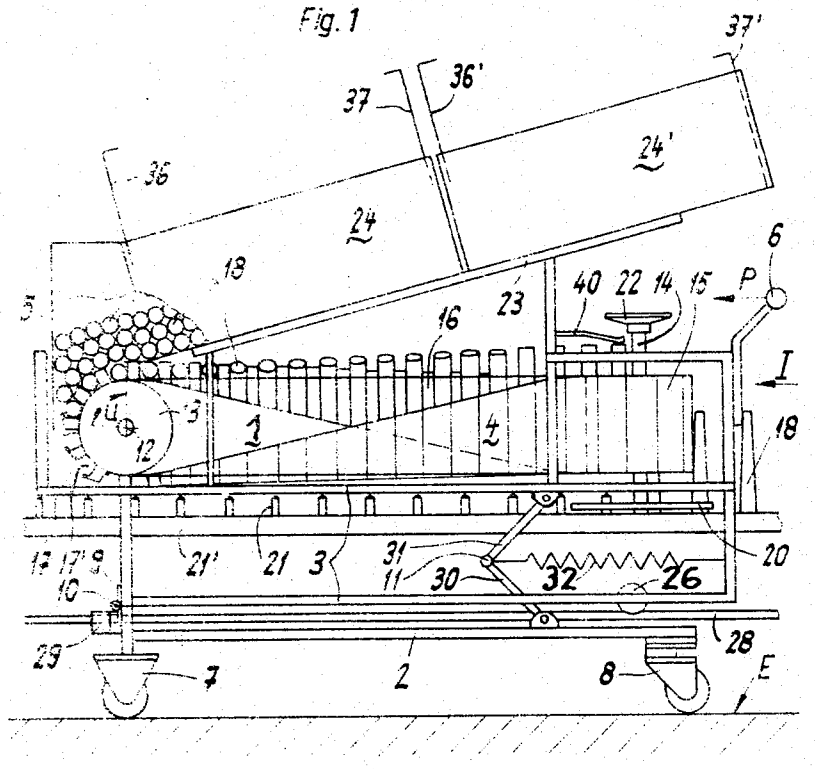
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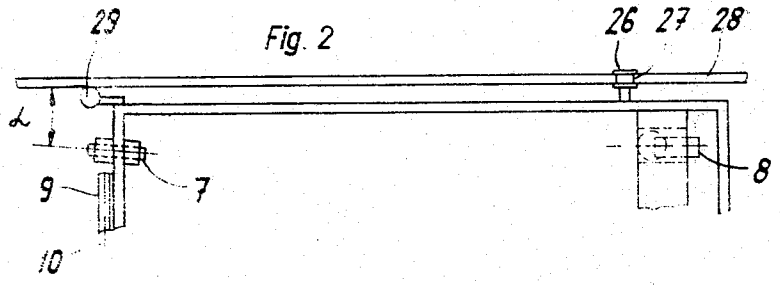
Fig. 2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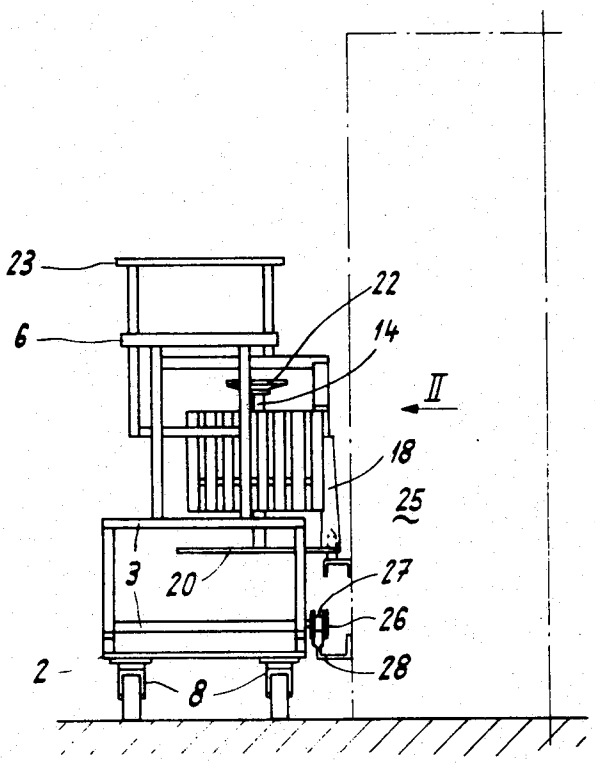

Fig. 3

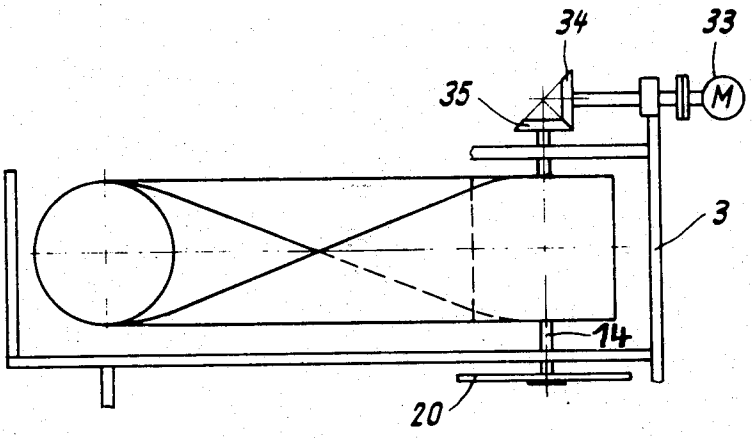

Fig. 7

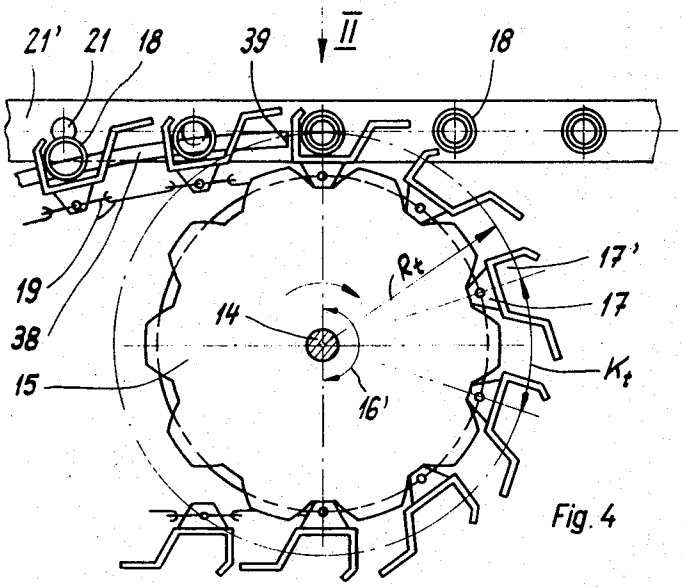

Fig. 4

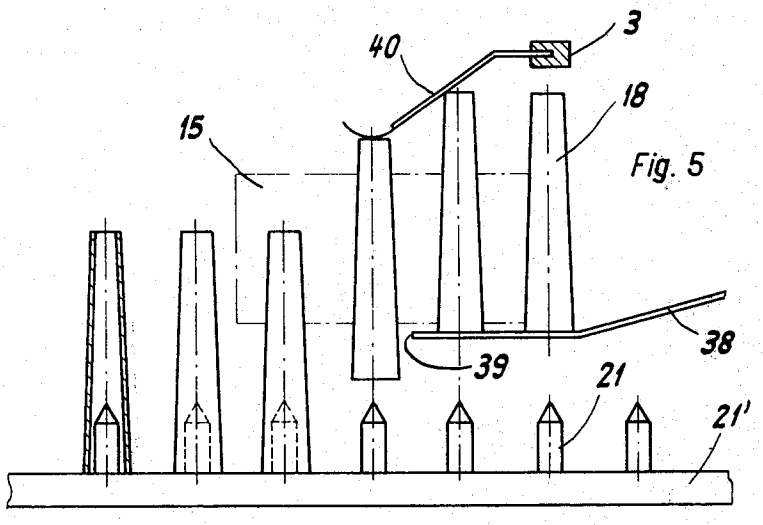

Fig. 5

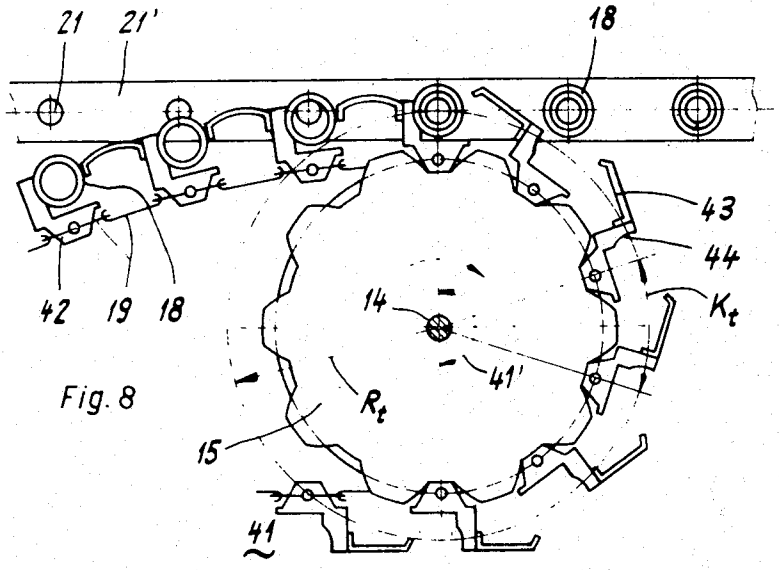

Fig. 8

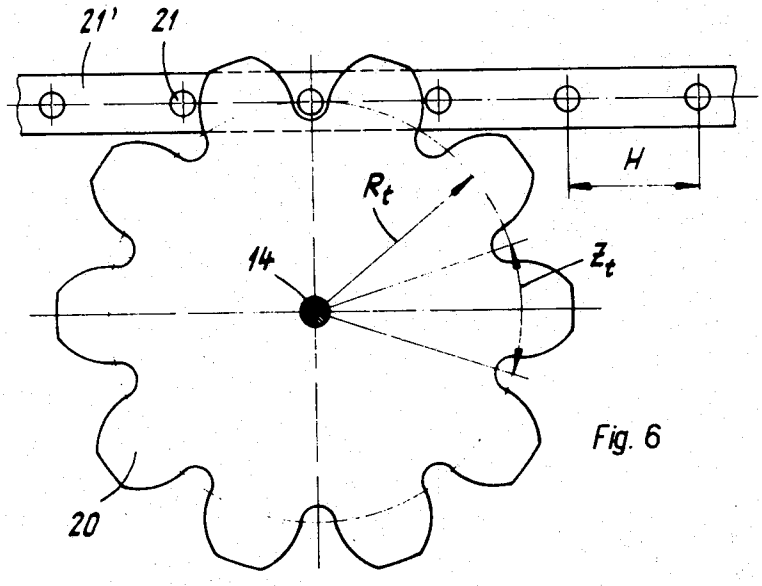

Fig. 6

BOBBIN TUBE LOADING APPARATUS

This invention relates to a bobbin tube loading apparatus and particularly to a bobbin tube loading apparatus used in combination with a ring spinning machine or a ring twisting machine.

As is known, the programming of the work on ring spinning or ring twisting machines, particularly the doffing of full bobbins and the donning of empty tubes, has led to two basically different systems. On one hand, one system uses carriage doffers for doffing a larger number of spinning or twisting machines and, on the other hand, the other system uses stationary or integral doffing devices.

The advantage of the known integral doffing device over the movable carriage doffing device resides in its relatively simple, reliable and low-maintenance construction.

The disadvantage of the known construction, however, resides in that the supplying of the empty tubes into a readiness position for the donning operation, i.e. for gripping by the donning device, can not be performed by the doffing and donning device itself.

Heretofore, devices for supplying empty bobbin tubes to a readiness position have been known in which a rotating conical member provided with slots or pockets for taking up empty tubes is arranged in such manner that the empty tubes are taken over substantially in a horizontal position and are transferred substantially in a vertical position to a transporting belt provided with take-up or holding pins. In this arrangement, the axis of the conical member is contained in a plane extending parallel to the direction of movement of the transporting belt and is inclined under an angle of 45° with respect to the transporting belt, i.e. the direction of movement of the circumference of the conical member at the point where the tubes are given off is at right angles to the direction of movement of the belt taking up the tubes. In addition, a stationary rail has been used to guide each tube at the lower end only until the tube is ready for depositing onto the transporting belt. The transporting belt extends along a spinning machine which is equipped with an integral doffing device. The idle position of the belt represents the position of readiness mentioned above, from which position the empty tubes are taken over or gripped by the doffing device. In use, the device is stopped after the number of tubes needed has been placed onto the transporting belt. These devices thus are provided as stationary units for each row of spindles of a spinning or twisting machine.

One of the disadvantages of a device of this type resides in that the direction of motion of the tube on the conical member at the moment of tube transfer is at right angles to the direction of motion of the transporting belt taking up the tube. As a result, the conical member and the transporting belt must be stopped for each tube transfer, i.e. in such manner that the tube which is to be unobstructedly dropped from the guide rail has time to reach the pin located below. A further disadvantage resides in that in order to ready the tubes for transfer to the doffing and donning device by means of transporting belts, the coordination of the positions of the pin taking up the empty tube on the transporting belt and of the spindle to which the bobbin is to be donned, needed for the transfer of the tubes to the doffing and donning device, is achieved with great difficulties. For example, any change in length of the transporting belt caused by any influence biases the coordination in such manner that disturbances can occur. Also, a disadvantage resides in that stationary units of this type are to be provided for each spindle row of a spinning or twisting machine. This complicates the individual machine and makes the machine more expensive.

Accordingly, it is an object of the invention to create a bobbin tube loading apparatus which, as a complementary device of the known doffing and donning devices integrated into a machine, brings empty tubes mechanically and semiautomatically into a position of readiness from which position the doffing and donning device can grip the tubes for donning to the spindles.

It is another object of the invention to provide a simple technique for loading bobbin tubes unto a tube take-up device of a ring twisting or spinning machine.

It is another object of the invention to provide a bobbin tube loading apparatus which can be easily integrated with a ring twisting or spinning machine.

It is another object of the invention to provide a high speed bobbin tube loading apparatus.

Briefly, the invention provides a bobbin tube loading apparatus which can be used with a ring twisting machine or a ring spinning machine having an integral doffer and a take-up means including a row of tube take-up pins. The loading apparatus includes a movable carriage, a chute on the carriage for receiving a supply of bobbin tubes and a tube transfer means on the carriage for moving the tubes from the chute to a transfer position above each respective pin of the machine. The tube transfer means includes a horizontally disposed drum disposed under the chute, a vertically disposed drum disposed adjacent the transfer position, and an endless transporting chain guided about the drums for taking up the tubes in a horizontal position from the chute and for transporting the tubes into a vertical position at the transfer position. The chain includes a plurality of links each of which has a recess for receiving a tube.

The loading apparatus also has a holding means for preventing the tubes from sliding down from the recesses during movement to the transfer position and for releasing the tubes from the recesses at the donning position. In addition, a drive mechanism is provided for rotating the drums to drive the chain as well as a means for synchronizing operation of the drive mechanism with movement of the carriage along a predetermined path alongside the row of take-up pins. This latter means includes a gear which is operably connected with the drums and which has a tooth gauge corresponding to the gauge of the pins. The gear is disposed in meshing engagement with the pins when the loading apparatus is brought to the machine so that upon movement of the loading apparatus along the machine, the gear synchronizes the operation of the drums and chain with this movement to drop a series of the bobbin tubes on the take-up pins.

The carriage of the loading apparatus is provided with suitable means such as wheels which allow the carriage to move along the machine. These wheels can be mounted so that the front end of the carriage is biased toward the machine while the rear end is able to pivot relative to the machine. Additional guide rolls can also be provided to guide the front end of the carriage horizontally and vertically along the machine.

The carriage is also constructed with a carriage frame on which the wheels are mounted and a support frame which is pivotally mounted on the carriage frame and carries the tube transfer means and bobbin tube chute. The support frame is spring-supported on the carriage frame under the influence of a pretensioned force so as to compensate for the weight of the chute and any empty bobbin tube reserve boxes in the chute.

The holding means can be formed as a part of the carriage or can be formed as part of the chain in order to hold the bobbin tubes in the chain until transfer is to take place.

These and other objects and advantages of the invention will become more apparent from the following detailed description and appended claims taken in conjunction with the accompanying drawings in which:

FIG. 1 illustrates a side view of a bobbin tube loading apparatus according to the invention;

FIG. 2 illustrates a portion of a top view of the lower part of the bobbin tube loading apparatus of FIG. 1;

FIG. 3 illustrates a rear view of the bobbin tube loading apparatus according to FIG. 1 as seen in the direction designated I in FIG. 1;

FIG. 4 illustrates an enlarged top view of a portion of the transporting chain of the bobbin tube loading apparatus at the transfer position;

FIG. 5 illustrates a half-schematic side view of the apparatus at the transfer position as seen in the direction designated II in FIG. 4;

FIG. 6 illustrates an enlarged top view of the gear of the bobbin tube loading apparatus according to FIG. 1;

FIG. 7 illustrates a further embodiment of a drive mechanism for a bobbin tube loading apparatus of the invention; and

FIG. 8 illustrates a modified embodiment of the transporting chain.

Referring to FIG. 1, a bobbin tube loading apparatus 1 consists of a carriage having a carriage frame 2 and a support frame 3, a tube transfer means 4 and a tube reserve chute 5. The bobbin tube loading apparatus 1 is pushed by means of a handle 6 provided on the support frame 3 in the direction designated P by an operator (not shown). The carriage frame 2 has two fixed rolls 7 (one only shown each in FIGS. 1 and 2) arranged at the front end as seen in the direction of movement and two rolls 8 (only being shown each in FIGS. 1 and 2) pivotally arranged at the back end for rollably moving the carriage frame 2. The pivotal rolls 8 can be pivoted, as needed, for changing the direction of movement. The support frame 3 is pivotably linked to the front end of the carriage frame 2 by a link pivotable about the link axis 10 (FIG. 2).

The tube transfer means 4 consists of a drum 13 disposed horizontally and supported by a shaft 12 in the support frame 3 and of a drum 15 disposed vertically and supported by a shaft 14 also in the support frame 3 as well as of a transporting chain 16 guided on these two drums 13, 15. The transporting chain 16 consists of transporting links 17 each provided with a recess 17' for taking up of tubes 18 located in the tube reserve chute 5 and of connecting links 19 (FIG. 4 and FIG. 8, respectively) connecting the individual transporting links 17. The lower end of the shaft 14 is provided with a gear 20 (FIGS. 1, 3 and 6) so as to be operably connected with the drums 13, 15.

The loading apparatus 1 is positioned to move along a predetermined path alongside a ring spinning machine 25 (partially indicated in FIG. 3). The machine 25 has a take-up means which includes a row of tube take-up pins 21 mounted on a rail 21'. These pins 21 are spaced apart at a distance H (cf. FIG. 6) which corresponds to the distance between neighboring spindles (not shown) of the machine 25.

The gear 20 of the loading apparatus 1 has a tooth gauge Z_t (FIG. 6) on the pitch circle of the radius R_t (FIGS. 4, 6 and 8) which corresponds to the spacing H of the tube take-up pins 21. In like manner, the chain link gauge K_t corresponds to the pin spacing H (FIGS. 4 and 8). A hand wheel 22 (FIGS. 1 and 3) is provided on the upper end of the shaft 14 to provide a means for rotating the gear 20 and drums 13, 15. In this way, the apparatus 1 can be advanced along the machine 25 while the gear 20 synchronizes the operation of the drums 13, 15 and chain 16 with the movement of the apparatus 1 to drop a series of tubes 18 onto the pins 21.

As shown in FIG. 1, the tube reserve chute 5 is arranged above the horizontal drum 13 and is connected with the support frame 3. The length and width of the chute 5 are chosen such that the tubes 18 in the chute 5 substantially cover the upper half of the transporting chain 16 surrounding the drum 13. This surrounding sector is designated U in FIG. 1.

Referring to FIGS. 1 and 3, a support member 23 is mounted on and attached to the support frame 3 to take up tube reserve boxes 24 and 24'. As shown, the lower face side of the tube reserve box 24 neighbors the tube supply chute 5.

Referring to FIG. 3, the side of the bobbin tube loading apparatus 1 facing the spinning machine 25 is provided with a guide roll 26 on the support frame 3. This roll 26 has a circumferential recess 27 which surrounds a guide rail 28 attached to the spinning machine 25 when as the bobbin tube loading apparatus 1 is brought into working position. The term "working position" of the bobbin tube loading apparatus 1 is explained later on.

Referring to FIG. 2, the fixed rolls 7 attached to the carriage frame 2 are arranged in such manner that they face the guide rail 28 under an angle α as the bobbin tube loading apparatus 1 is brought into working position. These rolls 7 thus give the bobbin tube loading apparatus 1 a tendency to move towards the guide rail 28 as the apparatus 1 moves in the direction of the movement P. This tendency causes a guide element, such as a roll 29, provided on the side of the carriage frame 2 facing the spinning machine 25 to contact the guide rail 28 under slight pressure in such manner that the bobbin tube loading apparatus 1 is definitely guided parallel to the spinning machine 25.

Referring to FIG. 1, a knee-shaped link 11 is connected with one leg 30 to the carriage frame 2 and with the other leg 31 to the support frame 3. This link 11 is adapted to be opened in a vertical direction. As the link 11 is opened, the support frame 3 is pivoted upward about the link axis 10. A pretensioned tension spring 32 which connects the link 11 with the support frame 3 is progressively released as the link 11 is opened and, respectively, is progressively tensioned as the link 11 closes. The pre-tension of the tension spring 32 is chosen such that the part force given off by the link 11 acting upwards onto the support frame 3, according to the movement, can be used to take up most of the load resulting from the support frame 3, the empty tube sup-

ply chute 5 and the empty tube reserve boxes 24 and 24'. Further use can be made of the link 11 under the influence of the tension spring 32 in combination with the pivotability of the support frame 3 and the carriage frame 2 about the link axis 10 insofar as any unevenness of the runway encountered by the roll 8 is levelled out. In this way, any unevenness in the runway does not act in the zone of the vertical drum 15 or of the tube transfer point, i.e. the transfer position, upon the support frame 3 supported by the roll 26. Any unevenness encountered by the fixed rolls 7 only negligeably influences the zone of the vertical drum 15. Thus, a disturbance-free tube transfer is ensured along the full length of the spinning machine 25.

Referring to FIGS. 4 and 5, a holding means in the form of a guide rail 38 is provided on the support frame 3 to prevent the tubes 18 in the chain 16 from falling out of the links 17. The rail 38 extends under the chain 16 from a point (not shown) at which the tubes 18 might otherwise slide down from the links 17 to a point adjacent the transfer position. The rail 38 allows release of the tubes 18 at the transfer position as shown in FIG. 5.

The bobbin tube loading apparatus 1 shown in FIGS. 1 and 3 in operation is pushed by an operator in the direction of movement P. An alternative construction is shown in FIG. 7, in which a gear drive motor 33, via bevelled gears 34 and 35, drives the shaft 14 and thus the gear 20. This gear 20, in turn, upon meshing with the bobbin tube take up pins 21, moves the bobbin tube loading apparatus 1 in the direction P.

Referring to FIG. 8, the transporting chain 41 may alternatively consist of transporting links 42 each of which is provided with a holding means such as an elastic holding member 43 as well as connecting links 18. Each transporting link 42 is provided with a recess 44 for taking up a tube 18.

In operation, the bobbin tube loading apparatus functions as follows. After the bobbin tube reserve boxes 24 and 24' filled with tubes 18 are placed upon the bobbin tube loading apparatus 1, slides 36 and 37 provided on the boxes 24 and 24', or, slides 36' provided on the box 24' are opened in such manner that the bobbin tubes 18 contained in the boxes 24, 24' can be transferred into the bobbin tube supply chute 5. A slide 37' also provided on the rear of the bobbin tube reserve box 24' remains closed. For mutual exchangeability, the bobbin tube reserve boxes 24 and 24' are of identical construction. The bobbin tubes 18 transferred into the bobbin tube supply chute 5 reach the transporting chain links 17 or the recesses 17' therein in the zone U (FIG. 1). As the operator rotates the hand wheel 22 clockwise, new transporting chain links 17 are filled with tubes 18 consecutively. The hand wheel 22 is rotated, or the gear drive motor 33 is activated, until the first chain link 17 containing a tube 18 has reached the vertical drum 15. Then, the bobbin tube loading apparatus 1 is moved towards the spinning machine 25 in such manner that the guide element 29 contacts the guide rail 28. Subsequently, the guide roll 26 is lifted onto the guide rail 28 by the operator who slightly lifts the support frame 3 for this purpose. At the same time, the gear 20 meshes with the first bobbin take-up pin 21 (not shown separately) and thus is brought into working position. As the bobbin tube loading apparatus 1 is pushed in the direction P (FIG. 1), the engaged gear 20 drives the drum 15 via the shaft A and thus the transporting chain 16. Thus, a successive transporting chain links 17 are filled with tubes 18 from the bobbin tube supply chute 5. The lower ends of the tubes 18 are then moved along a guide rail 38 (FIGS. 4 and 5) in order to prevent the tubes 18 in the transporting chain links 17 from slipping down from the transporting links 17 as the tubes 18 are brought from the horizontal to the vertical positions. This guide rail 38 ends shortly before the tube 18 reaches a vertical position in such manner that the tube 18 sliding down over the end edge 39 (FIGS. 4 and 5) of the guide rail 38 is placed onto the bobbin tube take-up pin 21 located below.

The downward motion of the tube 18 from the guide rail 38 onto the bobbin tube take-up in 21 is accelerated by a spring 40 (FIG. 5) connected to the support frame 3. The spring 40 is arranged above the transporting chain 16 in such manner as to be pushed up by each tube 18 as each tube 18 moves into an almost vertical position and thus is tensioned. The spring 40 subsequently releases the accumulated force as the tube 18, having reached a vertical position, moves downward towards a pin 21.

If the transporting chain 41 (FIG. 8) is used, the guide rail 38 can be eliminated as the tube 18 is pressed against the recess 44 by the elastic holding member 43 while being transported from the horizontal drum 13 to the vertical position. As the transporting chain 41 bends around the vertical drum 15, the transporting links 42 are opened in such manner that the holding member 43 is lifted off the tube 18, whereupon the tube 18 drops down onto the bobbin tube take-up pin 21 located below. The tube 18 placed onto the corresponding bobbin tube take-up pin 21 at the moment of the tube transfer contacts the gear 20. However, as the bobbin tube loading apparatus 1 is pushed further along the machine, the tube 18 drops further until contacting the rail 21'.

Furthermore, the use of the guide rail 38 is not limited to the example shown in FIG. 4, but its use in combination with the transporting chain 41 according to FIG. 8 also is possible. In this case, the holding members 43 merely prevent the tubes 18 from rolling out of the recesses 44.

The invention thus provides a bobbin tube loading apparatus which operates on a simple and substantially disturbance-free principle. In addition, the speed of the tube at the tube transfer point or transfer position, i.e. as the vertical position is reached, is the same, but in the opposite direction, as the speed of the bobbin tube loading apparatus. The speed relationship is such that the absolute horizontal speed of the tube is zero. As a result, precise placement of the tube is made possible. Further, unevenness of the runway of the bobbin tube loading apparatus does not influence the bobbin tube transfer.

The bobbin tube loading apparatus of the invention also possesses an advantage in that as the tubes are taken over by the transporting chain, a certain vibrating effect is created in the bobbin tube supply chute which favorably influences the transfer of the tubes located in the bobbin tube supply chute and in the tube reserve boxes adjacent above. Further, the functions of the bobbin tube loading apparatus in operation can easily be supervised visually. Also, the apparatus requires practically no maintenance.

Still further, a plurality of spinning machines can be supplied with the same bobbin tube loading apparatus.

Also, a high bobbin tube loading speed (about four bobbins per second) can be achieved. In addition, the apparatus has a manageable height of construction, i.e. the bobbin tube reserve boxes are arranged at a height favorable for the operator.

Once the tubes **18** have been placed on the take-up pins **21**, an integral donning and doffing device (not shown) on the machine **25** can then effect donning of the tubes **18** onto the spindles (not shown) in a suitably known manner.

What is claimed is:

1. A bobbin tube loading apparatus comprising

a movable carriage;

a chute on said carriage for receiving a supply of bobbin tubes;

tube transfer means mounted on said carriage for moving tubes from said chute to a transfer position, said means including a horizontally disposed drum disposed under said chute, a vertically disposed drum disposed adjacent said transfer position, and an endless transporting chain guided about said drums for taking up the tubes in a horizontal position from said chute and for transporting the tubes into a vertical position at said transfer position, said chain including a plurality of links each having a recess for receiving a tube;

holding means for preventing the tubes from sliding down from said recesses during movement to said transfer position and for releasing the tubes from said recesses at said transfer position;

drive mechanism for rotating said drums to drive said chain; and

means for synchronizing operation of said drive mechanism with movement of said carriage along a predetermined path alongside a row of take-up pins on one of a ring spinning machine and a ring twisting machine.

2. A bobbin tube loading apparatus as set forth in claim **1** further comprising at least one detachable bobbin tube reserve box for feeding bobbin tubes to said chute.

3. A bobbin tube loading apparatus as set forth in claim **1** wherein said carriage consists of a carriage frame and a support frame pivotable upwards and linked to said carriage frame.

4. A bobbin tube loading apparatus as set forth in claim **3** wherein said support frame is pivotably connected to said carriage frame about a link axis arranged in a front part of said apparatus relative to the direction of movement.

5. A bobbin tube loading apparatus as set forth in claim **3** wherein said support frame is spring-supported on said carriage frame in a back part of said apparatus relative to the direction of movement.

6. A bobbin tube loading apparatus as set forth in claim **3** wherein said carriage frame includes two fixed rolls at a front end and with two pivotably arranged rolls at a back end for rollably moving said carriage frame.

7. A bobbin tube loading apparatus as set forth in claim **1** wherein said holding means includes a guide rail guiding the lower face side of the tubes, said guide rail extending from said horizontal drum along said chain towards said vertical drum and terminating shortly before said transfer position.

8. A bobbin tube loading apparatus as set forth in claim **1** wherein said holding means includes a plurality of holding members each attached to a transporting link, each said holding member being directed towards on adjacent transporting link to hold a tube located in said recess of said transporting link while the tube is transported from the horizontal position until reaching said vertical position and to release the tube upon reaching said vertical position at said transfer position.

9. A bobbin tube loading apparatus as set forth in claim **8** wherein said holding member is an elastic member.

10. A bobbin tube holding apparatus as set forth in claim **1** which further comprises means for accelerating the tube transfer at said transfer position.

11. A bobbin tube holding apparatus as set forth in claim **10** wherein said accelerating means is a spring on said carriage disposed in the path of movement of the tubes in said chain to be tensioned by each tube transported along under said spring until the tube reaches said vertical position and to be released as the tube is transferred.

12. A bobbin tube holding apparatus as set forth in claim **1** wherein said carriage includes a handle for manual movement.

13. A bobbin tube holding apparatus as set forth in claim **1** which further comprises a drive means for moving said carriage.

14. A bobbin tube holding apparatus as set forth in claim **13** wherein said drive means is a gear motor positively engaged and driving said vertical drum.

15. The combination of at least one of a ring spinning machine and a ring twisting machine having an integral doffer and a take-up means including a row of tube take-up pins, and a bobbin tube loading apparatus for transferring tubes onto said pins;

said bobbin tube loading apparatus including

a movable carriage;

a chute on said carriage for receiving a supply of bobbin tubes;

tube transfer means mounted on said carriage for moving tubes from said chute to a transfer position above each respective pin of said machine, said means including a horizontally disposed drum disposed under said chute, a vertically disposed drum disposed adjacent said transfer position, and an endless transporting chain guided about said drums for taking up the tubes in a horizontal position from said chute and for transporting the tubes into a vertical position at said transfer position, said chain including a plurality of links each having a recess for receiving a tube;

holding means for preventing the tubes from sliding down from said recesses during movement to said transfer position and for releasing the tubes from said recesses at said transfer position to drop over a respective one of said pins; and

a gear operably connected with said drums, said gear having a tooth gauge corresponding to the spacing of said pins and being disposed in meshing engagement with said pins whereby upon movement of said apparatus along said machine, said gear synchronizes the operation of said drums and said chain with said movement to drop a series of the bobbin tubes onto said pins.

16. The combination as set forth in claim **15** which further comprises a drive mechanism between said gear and at least one of said drums for rotating said one drum upon rotation of said gear.

17. The combination as set forth in claim 15 wherein said machine includes a guide rail extending along said take-up means and wherein said carriage includes a guide roll at a front end for guiding said front end horizontally along said rail and a guide roll at a back end rollably mounted on said guide rail to guide said back end horizontally and vertically along said guide rail.

18. The combination as set forth in claim 17 wherein said carriage frame includes two fixed rolls at said front end disposed at an angle more than zero degrees and less than five degrees with said guide rail, and two pivotally arranged rolls at said back end for rollably moving said carriage frame.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,908,348
DATED : September 30, 1975
INVENTOR(S) Werner Hirschle et al

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, line 14, change "in" to --pin--.

Column 8, line 3, change "on" to --an--.

Signed and Sealed this

Twenty-ninth Day of *May 1979*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

DONALD W. BANNER
Commissioner of Patents and Trademarks