

Aug. 27, 1968

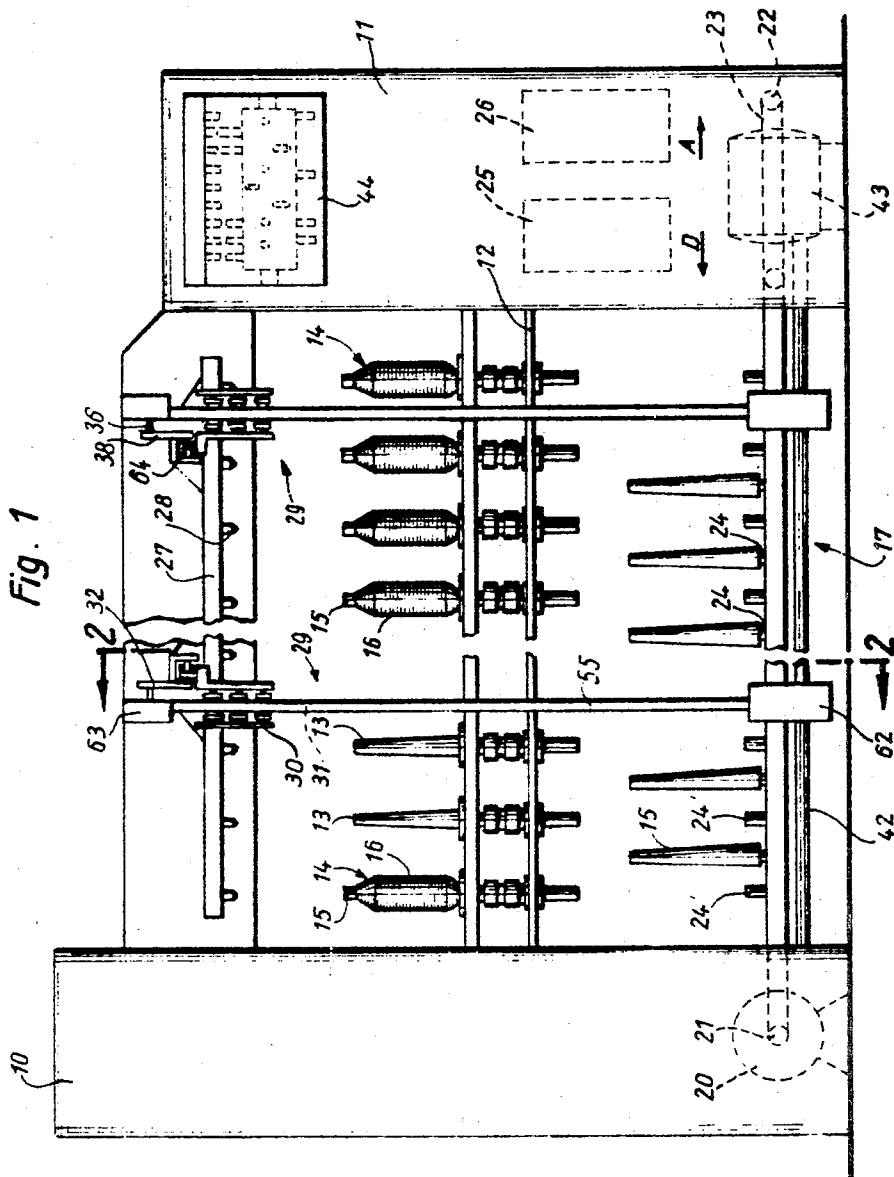
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3,398,519

TRANSPORTING APPARATUS FOR THE TUBE CHANGER OF A TEXTILE MACHINE

Filed Sept. 28, 1967

3 Sheets-Sheet 1



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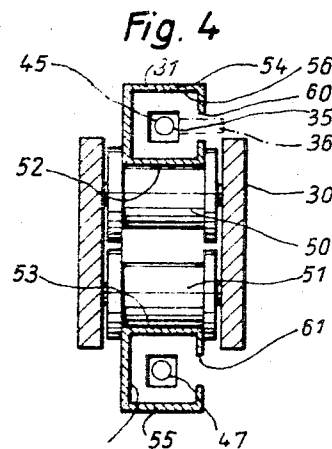
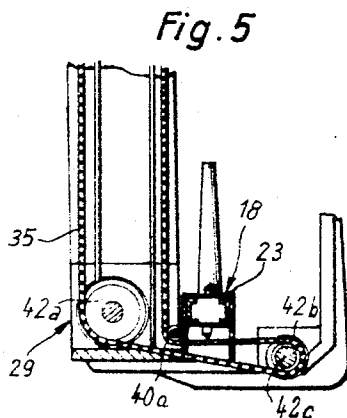
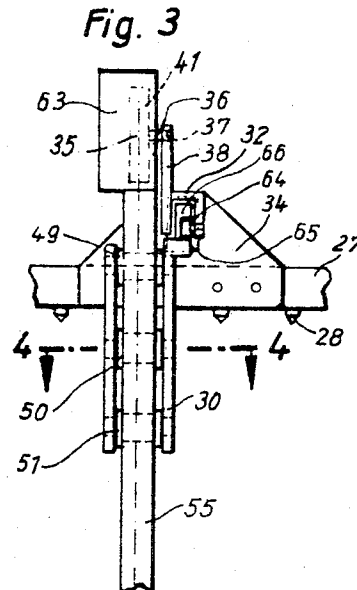
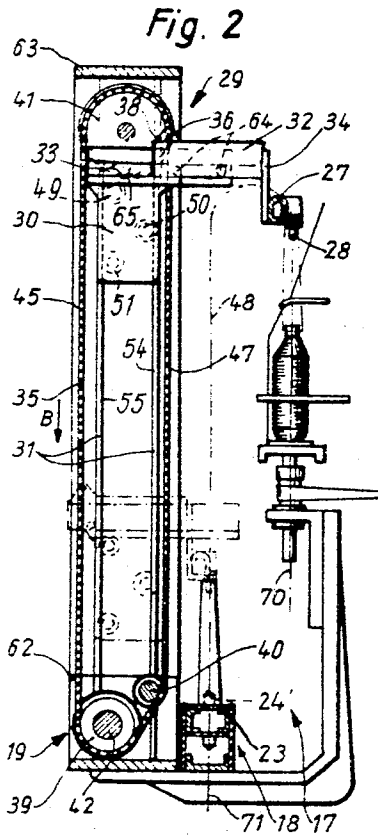
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3 Sheets-Sheet 2



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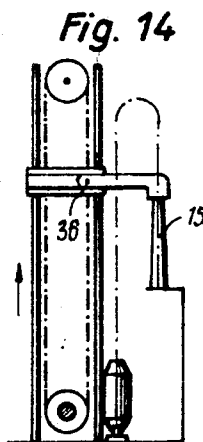
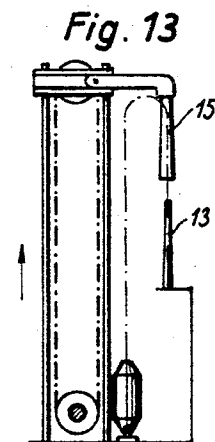
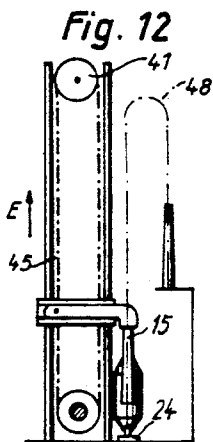
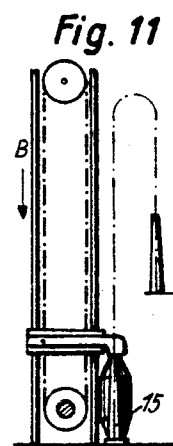
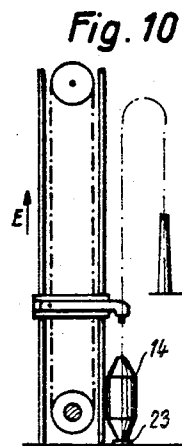
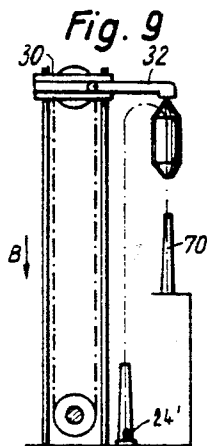
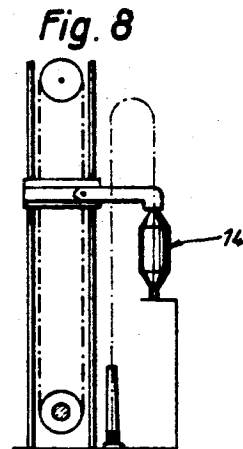
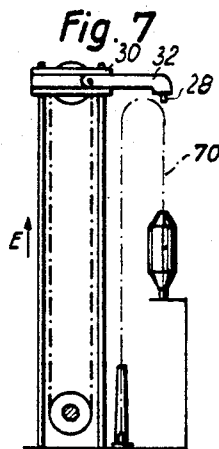
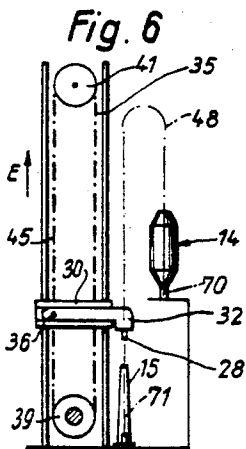
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3 Sheets-Sheet 3



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3,398,519

TRANSPORTING APPARATUS FOR THE TUBE CHANGER OF A TEXTILE MACHINE

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Z 12,445

10 Claims. (Cl. 57—52)

ABSTRACT OF THE DISCLOSURE

Full tubes are doffed by gripper means from textile spindles located in a first plane and placed on tube holders located in a second parallel plane, whereupon empty tubes are taken from the tube holders and donned on the spindles. The gripper means are mounted on a carriage which is movable on another carriage transverse to the planes, and with the other carriage parallel to the planes, and an endless chain is connected to the first mentioned carriage to move the gripper means between positions cooperating with the full tubes on the spindles and the empty tubes on the tube holders.

Background of the invention

The present invention is an improvement of donning and doffing apparatus by which full tubes having a yarn package thereon are exchanged for empty tubes on which a yarn is then wound to form a package.

Apparatus of this type is particularly used in spinning and twisting machines. A known apparatus has parallel guide bars along which carriages are moved on which a rail carrying grippers is mounted. The guide bars are mounted on a common shaft and turnable about an axis parallel to the plane of the spindles. By moving the carriage along the guide bars, and by angularly displacing the latter, the grippers can be placed in a position for gripping the full tubes, and in another position for placing the full tubes on tube holders on a conveyor band. In the same manner, empty tubes can be taken from the conveyor band and placed by the grippers on the spindles. This construction according to the prior art has the disadvantage that independent drives and control means are required for the tilting movement of the guide bars, and for the up and down movements of the carriages thereon. In some spinning and twisting machines, cam means are located under the spindle so that it is difficult to build the tube changing apparatus into the machine, particularly if the apparatus is to be added to an existent machine.

Summary of the invention

It is one object of the invention to overcome the disadvantages of known tube transporting and exchanging apparatus for textile machines, and to provide a tube transporting apparatus of simple construction which can be built into existent textile machines without major modifications of the machine, and which is controlled by simple operating and drive means.

Another object of the invention is to provide a tube transporting apparatus for doffing and donning tubes on the spindles of a spinning machine or twisting machine, and which is arranged and constructed so as to form no obstruction to the spinning and twisting operations.

With these objects in view, one embodiment of the invention comprises a row of spindles mounted on a spindle rail and located in a first vertical plane, conveyor means having a row of tube holders located in a second plane parallel to the first plane and spaced from the same a predetermined distance; tube transporting means for transporting tubes between the spindles and the tube

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holders; and drive means including an operating means movable along a path having two main path portions parallel to the planes and spaced the predetermined distance, and a connecting path portion.

In accordance with the invention, the tube transporting means include a first carriage guided for movement parallel to the first and second planes in vertical direction, a second carriage mounted on the first carriage and guided for movement in a horizontal direction transverse to the vertical planes, and gripper means mounted on the second carriage and movable with the same between first and second positions located in the first and second vertical planes, respectively. The operating means, preferably a stud secured to an endless chain, is connected with the second carriage for moving the same relative to the first carriage the predetermined distance while the operating stud moves along the connecting path portion formed by a chain portion passing over a chain wheel. In this manner, the grippers are moved between positions located in the first and second vertical planes. When the operating stud has moved to a position located in a straight chain portion, the second carriage is moved with the first carriage parallel to the first and second planes in vertical direction so that the grippers are moved between positions gripping and releasing tubes on the spindles and the tube holders.

In the preferred embodiment of the invention, the tube holders are spaced from each other half the distance which the spindles are spaced, and every second tube holder carries an empty tube. Full tubes are doffed from the spindle and placed on empty tube holders, whereupon empty spindles are taken from every other tube holder and donned on the spindles. The conveyor with the tube holders is moved stepwise between positions in which the grippers are located in the planes of the empty tube holders, or in the planes of the empty tubes on every other tube holder in order to doff full tubes from the spindles, or to don empty tubes on the same when the direction in which the controlling chain is driven is reversed.

The construction of the invention has the advantage that all required movements of the grippers can be derived from reversal of the movement of a single drive means which effects reciprocation of the drive chain. Another advantage is that the tube transporting apparatus can be mounted in a region of an existent spinning or textile machine where there are no other parts of the machine which would render the addition of the tube transporting apparatus difficult, or impossible.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

Brief description of the drawing

FIG. 1 is a front view of a ring spinning machine provided with a tube transporting apparatus according to the invention, known parts not required for an understanding of the invention being omitted for the sake of clarity;

FIG. 2 is a cross-sectional view taken on line II—II in FIG. 1;

FIG. 3 is a fragmentary front view illustrating a detail of FIG. 1 on an enlarged scale;

FIG. 4 is a sectional view taken on line IV—IV in FIG. 3;

FIG. 5 is a fragmentary sectional view corresponding to FIG. 2 and illustrating a modification; and

FIGS. 6 to 14 are schematic side elevations illustrating successive operational positions of the apparatus.

Description of the preferred embodiment

The ring spinning machine shown in FIG. 1 has a head stock 10, a tail stock 11, and a plurality of spindles 13 arranged in a row on a spindle rail 12. During a normal operation, full tubes 14 including a tube 15 and a package 16 are located on the spindles 13, but in the view of FIG. 1, two full tubes 14 have been removed from two spindles for the purpose of clearer illustration. During a preceding operation, yarn was drawn, twisted, and then wound on empty tubes 15 on spindles 13 so that yarn packages 16 were formed on tubes 15.

FIG. 1 only illustrates the spindle rails and spindles on the front of the machine, and a corresponding spindle rail and spindles are provided on the rear of the machine. Each row of spindles 13 cooperates with a tube transporting apparatus according to the present invention, only the tube transporting apparatus in front of the machine being shown in FIG. 1, and it will be understood that a corresponding apparatus is provided at the rear of the machine.

The tube transporting apparatus of the invention simultaneously exchanges all full tubes on the spindles 13 for empty tubes 15, which requires delivery of empty tubes, and removal of full tubes in longitudinal direction of the machine by a conveyor means 17 having a row of alternate tube holders 24 and 24'. Empty tubes 15 are placed on every second tube holder 24, while tube holders 24' are empty for receiving full tubes 14.

Conveyor 17 is driven by a motor 20 driving a drive roller 21 of conveyor 17 whose other end passes over a roller 22. The number of tube holders 24 and 24' on conveyor 17 is twice the number of spindles 13 on the spindle rail, but the distance between two adjacent tube holders 24 and 24' is half the distance between two spindles 13 so that all empty tube holders 24' are aligned with spindles 13 carrying full tubes 16, although transversely spaced from the same as best seen in FIG. 2.

During movement of conveyor 17 in the direction of the arrow D, empty tubes 15 were placed on every second tube holder 24 by a tube supply device 25 of known construction. After the full tubes 14 are placed on the empty tube holders 24', and the empty tubes 15 are placed on the spindles 13 in a manner which will be explained hereinafter, the direction of movement of conveyor 17 is reversed so that the full tubes on tube holders 24' move in the direction A under a receiving station in which the full tubes are detached from tube holders 24' and dropped into a container in a manner well known to those skilled in the art, and which does not form part of the present invention.

The exchange of the full and empty tubes on spindles 13 is effected by tube transporting apparatus generally indicated by reference numeral 19, and including a plurality of tube transporting means 29 spaced along the spindle rail and conveyor 17.

Each tube transporting means has a first carriage 30 which is guided along vertical guide means 31 which are parallel to the vertical plane defined by the axes of spindles 13. Guide means 31 include two guide rails 54 and 55, see FIG. 4, having inner confronting guide faces 52 and 53 in contact with three rollers 49, 50, 51 rotatably mounted between two plates of the first carriage 30.

A second carriage 32 carries a rail 27 on which grippers 28 are mounted spaced from each other the same distance as spindles 13. The second carriages 32 are respectively mounted on the first carriages 30 for movement in a horizontal direction perpendicular to the plane 70 defined by the axes of the spindles. The gripper rail 27 extends along the machine substantially over the length of the spindle rail 12, and is secured to the second carriages 32 of all tube transporting means by brackets 34. The construction of the grippers 28 which automatically

grip the tube ends and release the same again, is known and not an object of the present invention.

The second carriage 32 of each tube transporting means 29 is driven by operating means which include an endless roller chain or other flexible means 35, and a coupling means in the form of a coupling stud 36 secured to the roller chain 35 and projecting into a bearing bore 37 in an arm 38 of carriage 32, as best seen in FIG. 3.

The endless roller chain 35 passes over a drive chain wheel 39, a guide roller 40 and a return wheel 41 so that the chain has two main chain portions 45 and 47 parallel to a plane 70 of spindles 13, and a connecting semi-circular chain portion passing over wheel 41. The drive chain wheels 39 are fixed to a drive shaft 42 extending in longitudinal direction of the machine and being located under the guide means 31 of carriage 30. Drive shaft 42 is driven by a reversible drive motor 43 which is started and reversed by control apparatus schematically indicated at 44 in FIG. 1 and being of a conventional construction known to those skilled in the art and forming no part of the present invention.

As best seen in FIG. 2, the coupling stud 36 effects movement of carriage 32 along guide means 33 of carriage 30 in a direction transverse to the vertical plane 70 when coupling stud 36 moves along a semi-circular path defined by chain wheel 41. While coupling stud 36 moves with one of the straight chain portions 45 or 47, carriage 32 is moved up or down parallel to plane 70 and since it is positively connected with carriage 30, the same is also moved up or down along the guide rails 55, 54 of guide means 31.

As best seen in FIG. 2, the tube holders 24, 24' on conveyor 18 are all located in a vertical plane 71 which is parallel to the plane 70 passing through the axes of spindles 13, and spaced a predetermined distance from the same. The vertical plane defined by guide rails 54 and 55 is perpendicular to planes 70 and 71, and the endless chain 35 is located in the same plane, the chain portions 45 and 46 being located within the guide rails 54 and 55, as best seen in FIG. 4.

The main chain portions 45 and 47 are spaced the same distance as planes 70 and 71 so that the grippers 28 move along a path 48, shown in chain lines in FIG. 2, having two main portions parallel to chain portions 45 and 47, and a curved connecting portion parallel to the chain portion passing over wheel 41. While coupling stud 36 moves along a semi-circle to a position located diametrically opposite the position shown in FIG. 2, gripper rail 27 and grippers 28 are moved from a position located in plane 70 above the spindles and full tubes to a position located in the plane 71 and above the tube holders 24' since carriage 32 is moved by coupling stud 36 the distance between planes 70 and 71. The spacing between path 48 and chain 35 corresponds to the distance between coupling stud 36 and grippers 28.

FIGS. 3 and 4 illustrate parts of the tube transporting means on a larger scale, and show the rollers 49, 50 and 51 of carriage 30 in rolling contact with confronting surfaces 52, 53 of guide rails 54 and 55. The main portions 45, 47 of roller chain 35 are located within the hollow guide rails 54, 55 which are provided with lateral slots 60, 61 through which coupling stud 36 projects into bearing bore 37 of arm 38 of the second carriage 32. The hollow prismatic guide rails 54, 55 are secured to a box 62, see FIG. 2, in which the drive chain wheel 39 is located. Another box 63 is carried by the upper ends of the guide rails 54, 55. The carriage 32 has two guide rolls 64 which project into a transverse groove 65 of a guide member 66 secured to carriage 30. The transverse groove 65 is straight and guides carriage 32 along a straight transverse path on carriage 30. Carriage 32 is located laterally of the plane passing through the main portions 45, 47 of chain 35, but has a bracket 34 crossing this plane and carrying the gripper rail 27.

The doffing and donning operations carried out by the

tube transporting means 29 will now be explained with reference to FIGS. 6 to 14.

In the position of FIG. 6, carriages 30 and 32, and gripper means 28 are in a position of rest in which the grippers 28 are located above the tube holders and empty tubes on conveyor 17. Coupling stud 36 is located on the straight chain portion 45. Drive chain wheel 39 is now rotated in clockwise direction so that the straight chain portion 45 moves in the direction of the arrow E until carriages 30 and 32 are raised in the position of FIG. 6 to the level of the axis of chain wheel 41. While coupling stud 36 moves on chain wheel 41 along a semi-circular path, carriage 32 is moved relative to carriage 30 to a position in which the grippers 28 are located in plane 70 and respectively above full tubes 14, as shown in FIG. 7. Further movement of the chain moves carriages 32 and 30 downwards along a straight path portion, while grippers 28 move down in plane 70 to a position engaging and gripping the full tubes 14, as shown in FIG. 8.

Thereupon, the drive wheel 39 is reversed by reversing the direction of rotation of drive motor 43 which drives shaft 39 so that the carriages and grippers holding the doffed full tubes are raised to the position shown in FIG. 9 while the chain moves in the direction of the arrow B. This movement is continued so that coupling stud moves along a semi-circular path portion on chain wheel 41 so that carriage 32 is moved to the left relative to carriage 30, and the grippers carry the full tubes along a curved path portion into plane 71. Further movement of the chain in the direction B places the full tubes on the empty tube holders 24 which are respectively located in parallel vertical transverse planes passing through the axes of spindles 13 and empty tube holders 24'.

Thereupon, the direction of rotation of drive chain wheel 39 is reversed so that chain 35 moves in the direction of the arrow E, and since the grippers release the full tubes, the same remain on tube holders 24' while the grippers and carriages rise again, as shown in FIG. 10.

This movement of the grippers and carriages is not continued, but at this moment, conveyor 17 is controlled to move in longitudinal direction of the machine and spindle rail a step corresponding to half the distance between spindles 13, so that empty tubes 15 are placed under the grippers 28, respectively. Thereupon, the direction of rotation of drive wheel 39 is again reversed so that the chain moves in the direction B until the grippers respectively engage the empty tubes 15, as shown in FIG. 11.

The direction of rotation of drive wheel 39 is again reversed so that the chain moves in the direction E, raising the carriages and grippers which take the empty tubes 15 off the tube holders 24, as shown in FIG. 12. Further movement of the chain in the direction E places the empty tubes 15 respectively above the spindles 13 in a manner explained with reference to FIGS. 6 to 8, and this movement is continued until the grippers place the empty tubes 15 on the respective spindles 13, as shown in FIG. 14 whereupon the direction of movement of the chain is again reversed, and the grippers and carriages are returned to the position of FIG. 6.

FIG. 5 illustrates a modified construction of the chain drive. The drive shaft 42 is not located under the vertical guide rails 54 and 55 on which carriage 30 is guided, but a guide roller 42a and a guide roller 40a guide a loop portion of chain 35 over a small drive chain wheel 42b. All drive chain wheels 42b of the several tube transporting means 29 are secured to a drive shaft 42c which is located on the side of conveyor band 23 and conveyor 18 remote from chain 35. Since drive shaft 42 is not located under the tube transporting means 29, the spaces between the individual tube transporting means 29 remain free, and drive shaft 42c extends parallel to the conveyor means 18 and along the same.

It will be understood that each of the elements described above, or two or more together, may also find a

useful application in other types of doffing and donning apparatus for tubes mounted on spindles of a textile machine differing from the types described above.

While the invention has been illustrated and described as embodied in a tube transporting means including two relatively movable carriages carrying gripper means and controlled by reversible drive to first doff full tubes from the spindles, and then don empty tubes on the same, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

I claim:

1. Tube transporting apparatus for textile machines, comprising, in combination; supporting means; a row of spindles mounted on said supporting means and located in a first plane; conveyor means having a row of tube holders located in a second plane parallel to said first plane and spaced from the same a predetermined distance in a direction transverse to said planes; at least one tube transporting means for transporting tubes between said spindles and said tube holders, said tube transporting means including first carriage means mounted on said supporting means for guided movement parallel to said first and second planes, a second carriage means mounted on said first carriage means for guided movement in said transverse direction, and gripper means mounted on said second carriage means and movable with the same between first and second positions located in said first and second planes, respectively, said gripper means being operable to grip and release said tubes; and drive means including operating means movable along a path having two main path portions spaced said predetermined distance and a connecting path portion, said operating means being connected with said second carriage means for moving the same relative to said first carriage said predetermined distance while said operating means moves along said connecting path portion and said gripper means move between said first and second positions, and for moving said second carriage means with said gripper means in said first and second planes while said operating means move along said main path portions so as to move said gripper means between positions gripping and releasing tubes on said spindles and said tube holders.

2. Apparatus as claimed in claim 1 wherein said operating means include flexible means, wheel means for guiding said flexible means so that the same has two straight main portions parallel to said first and second planes and being spaced said predetermined distance, at least one curved connecting portion, and a coupling means secured to said flexible means for movement along said path and engaging said second carriage means.

3. Apparatus as claimed in claim 2 wherein said flexible means is an endless chain means having two main portions parallel to said first and second planes and being spaced said predetermined distance.

4. Apparatus as claimed in claim 3 wherein said first and second planes are parallel vertical planes; and wherein said flexible endless chain means is located in a vertical plane perpendicular to said first and second planes.

5. Apparatus as claimed in claim 1 wherein said tube holders are spaced from each other half the distance which said spindles are spaced; and comprising means controlling the operations of said operating means, of said grip-

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per means, and of said conveyor means so that said transporting means doff full tubes from said spindles and place the same on every second tube holder of said row, and take empty tubes from every other second tube holder and don the empty tubes on said spindles; a plurality of said tube transporting means, each comprising said first and second carriage means, and a plurality of said operating means respectively connected with said second carriages.

6. Apparatus as claimed in claim 5 wherein said drive means include a shaft extending under said tube transporting means and driving said plurality of operating means.

7. Apparatus as claimed in claim 5 wherein said drive means include a drive shaft driving said plurality of operating means and being located on the side of said conveyor means remote from said tube transporting means.

8. Apparatus as claimed in claim 1 wherein said supporting means includes a pair of straight guide rails parallel to said first and second planes for guiding said first carriage means along said main portions of said path; and wherein said first carriage means has a plurality of guide elements in contact with said guide rails.

9. Apparatus as claimed in claim 8 wherein said guide

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rails are hollow and prismatic; wherein said operating means include a flexible means having two main portions parallel with said first and second planes and spaced said predetermined distance, a curved connecting portion, and a coupling stud secured to said flexible means and connected with said second carriage, said main portions of said flexible means being located in said hollow guide rails, said guide rails having slot means through which said coupling stud projects.

10. Apparatus as claimed in claim 9 wherein said second carriage means is located laterally of said guide rails and has a bore engaged by said coupling stud.

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