United States Patent [19]

Kawauchi

[11] **3,791,123**

[45] **Feb. 12, 1974**

[54] **METHOD AND APPARATUS FOR REPLACING BOBBINS ON SPINNING OR TWISTING MACHINES**

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[73] Assignee: **Kabushiki Kaisha Toyoda Jidoshokki Seisakusho**, Kariya-shi, Japan

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[52] **U.S. Cl.** **57/52**, 57/156
[51] **Int. Cl.** **D01h 9/08**
[58] **Field of Search** 57/52, 54, 156

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Primary Examiner—Donald E. Watkins
Attorney, Agent, or Firm—Maleson, Kimmelman and Ratner

[57] **ABSTRACT**

A method of and apparatus for simultaneous doffing full packaged bobbins from respective spindles and donning fresh bobbins on the empty spindles of a spinning or twisting machine. This doffing and replacing operation is carried out by gripping the head of each bobbin by means of bobbin gripping members disposed on a horizontal holding bar which can be displaced upward or downward parallel to the spindle rail of the spinning or twisting machine.

6 Claims, 18 Drawing Figures

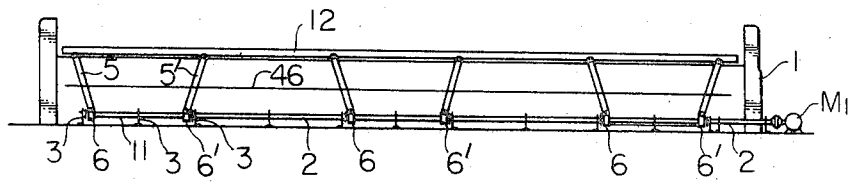


Fig. 1

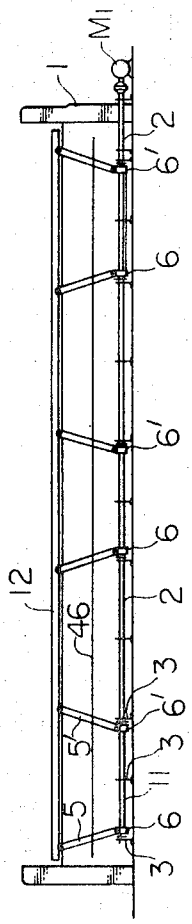
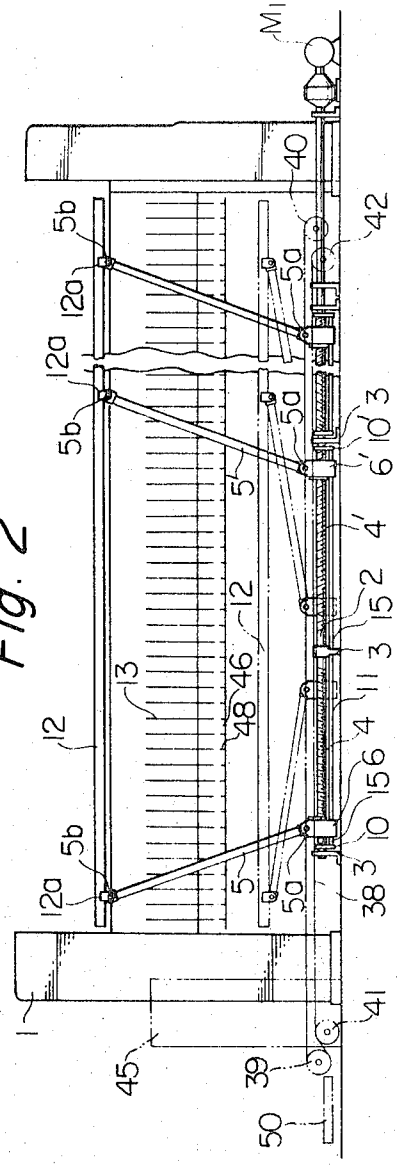

M1
1
2
6'
6
6'
6
2
12
46
3
6'
5'
3
11
6
5
6
3

Fig. 2


M1
40
42
5b
12a
5a
12a
5b
5a
5'
3
10
6'
4'
2
15
12
3
11
13
46
48
12
4
6
15
10
5b
12a
5
5a
38
3
41
1
45
39
50

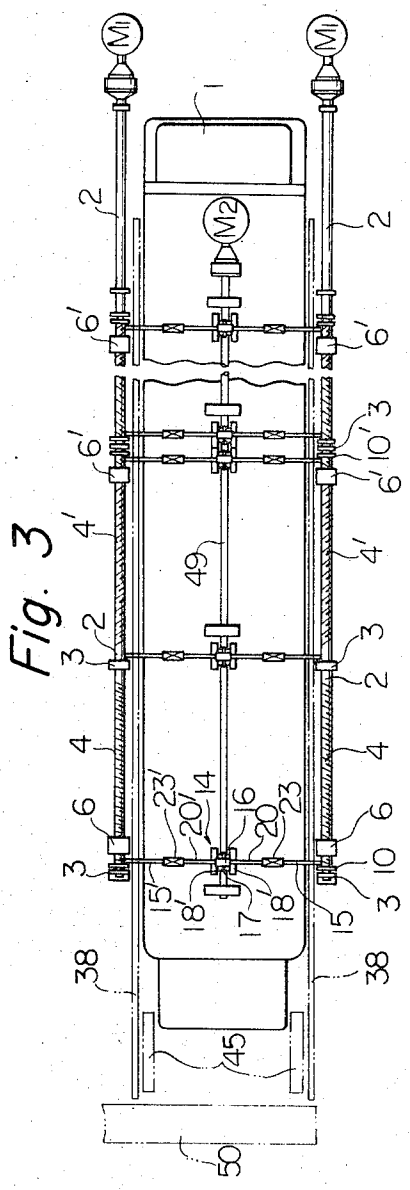

M1
M1
M2
1
2
2
6'
6'
6'
6'
10'
3
4'
4'
49
3
2
3
2
4
4
6
6
23'
14
16
20'
20
23
3
10
15'
18'
17
18
15
3
38
38
45
50

Fig. 3

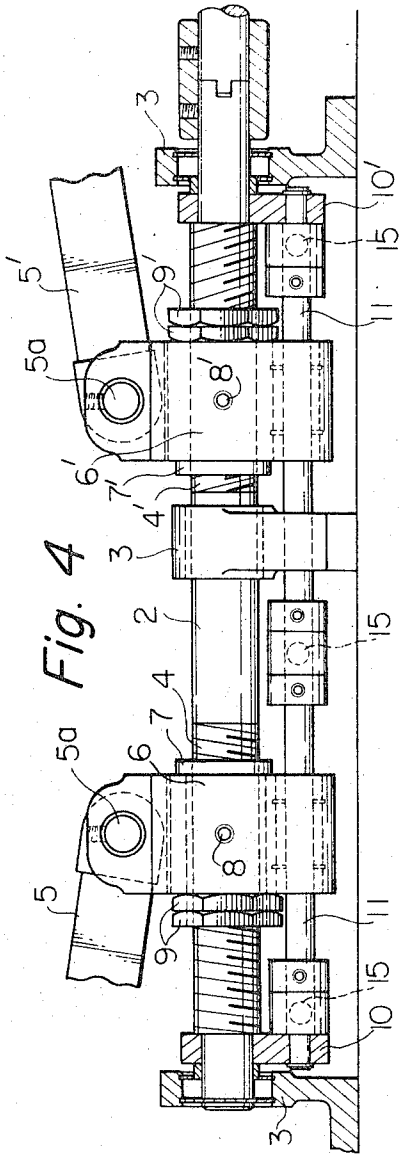

3
10'
15
5'
9'
11
5a
8'
6'
7'
4'
3
2
15
4
7
5a
6
8
5
9
11
15
10
3

Fig. 4

Fig. 5

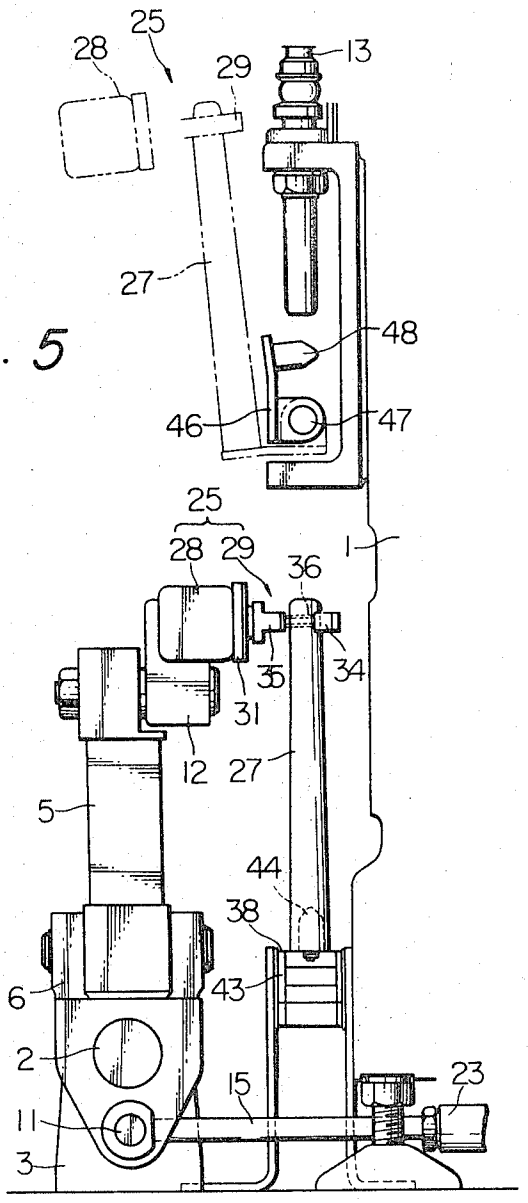

25
28
29
13
27
48
46
47
25
28
29
36
1
35
34
31
12
27
5
44
38
6
43
2
15
23
11
3

Fig. 6

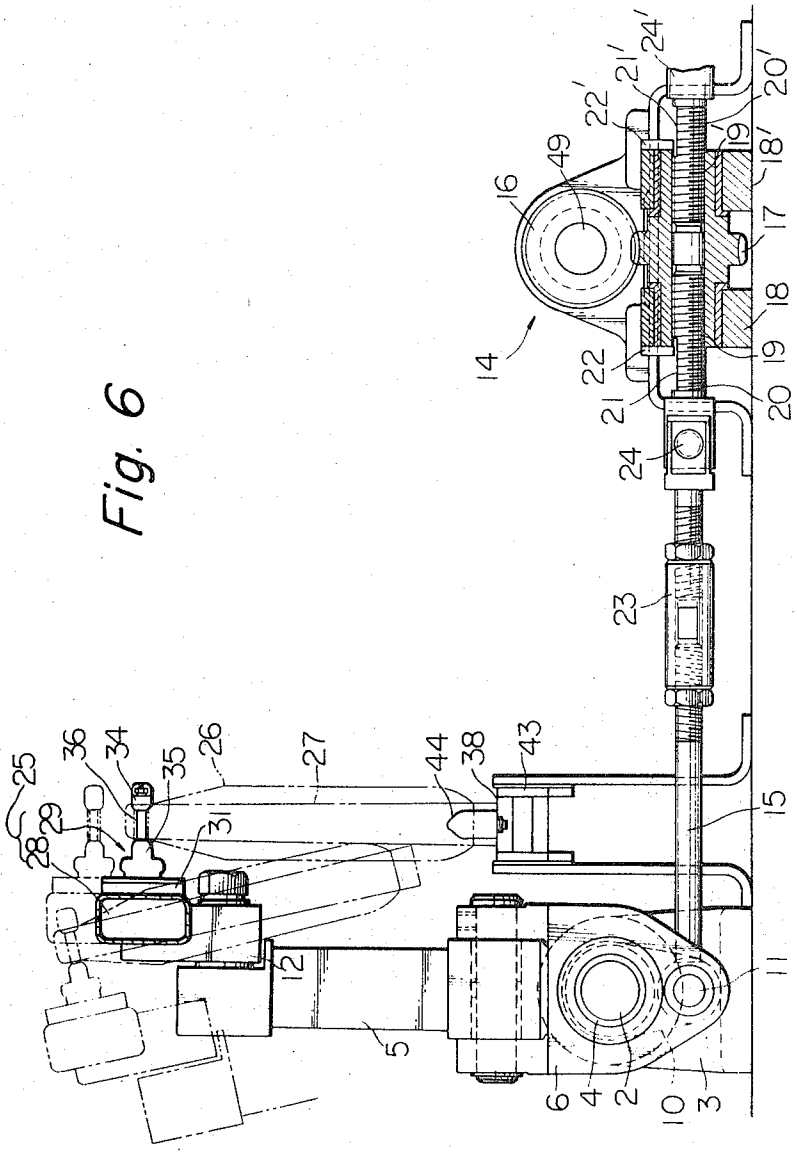

24'
21'
22'
20'
19'
18'
49
16
17
18
14
22
19
21
20
24
23
25
36
34
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4
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10
3

Fig. 7

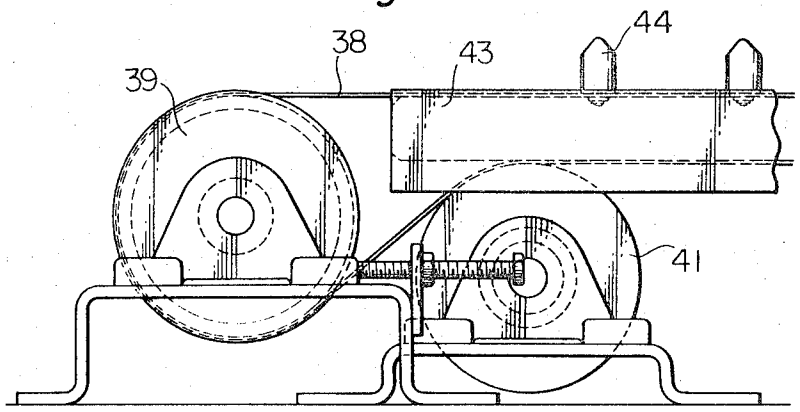


Fig. 8

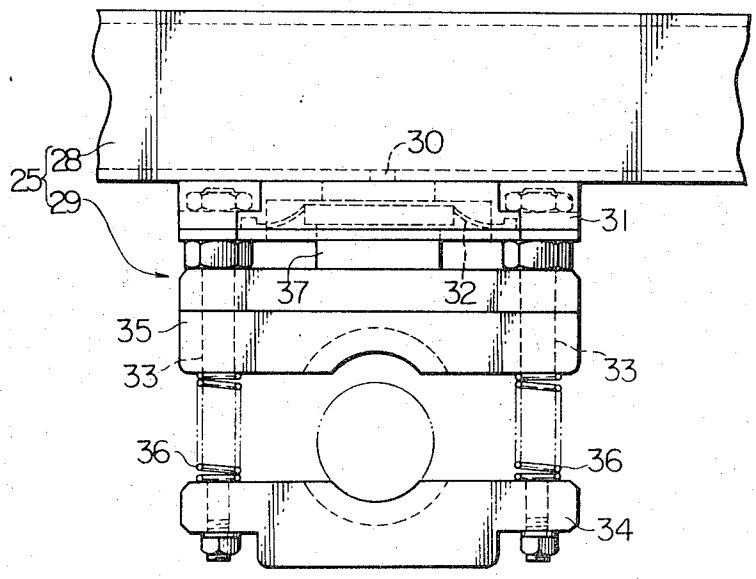


Fig. 9A

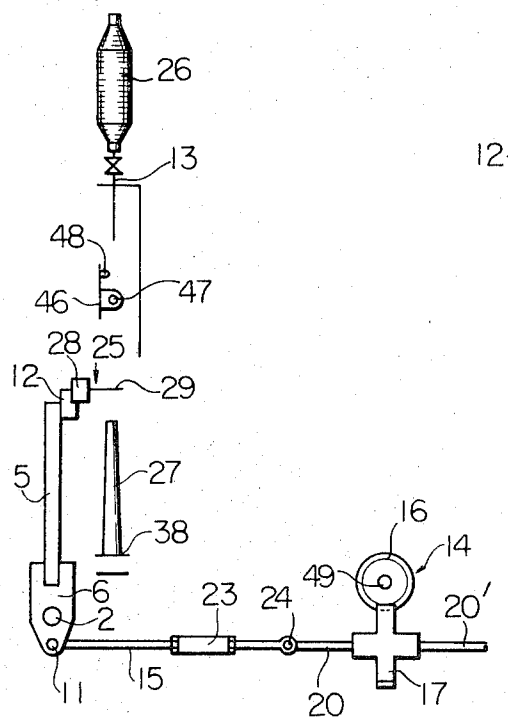

26
13
48
46
47
28
25
12
29
5
27
38
16
14
49
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2
23
24
20'
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20
17

Fig. 9B

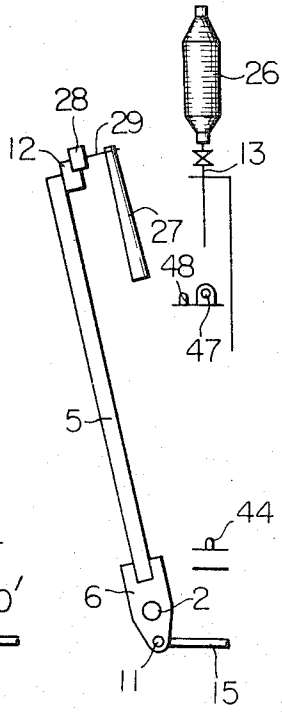

26
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29
12
13
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48
47
5
44
6
2
11
15

Fig. 9C Fig. 9D Fig. 9E

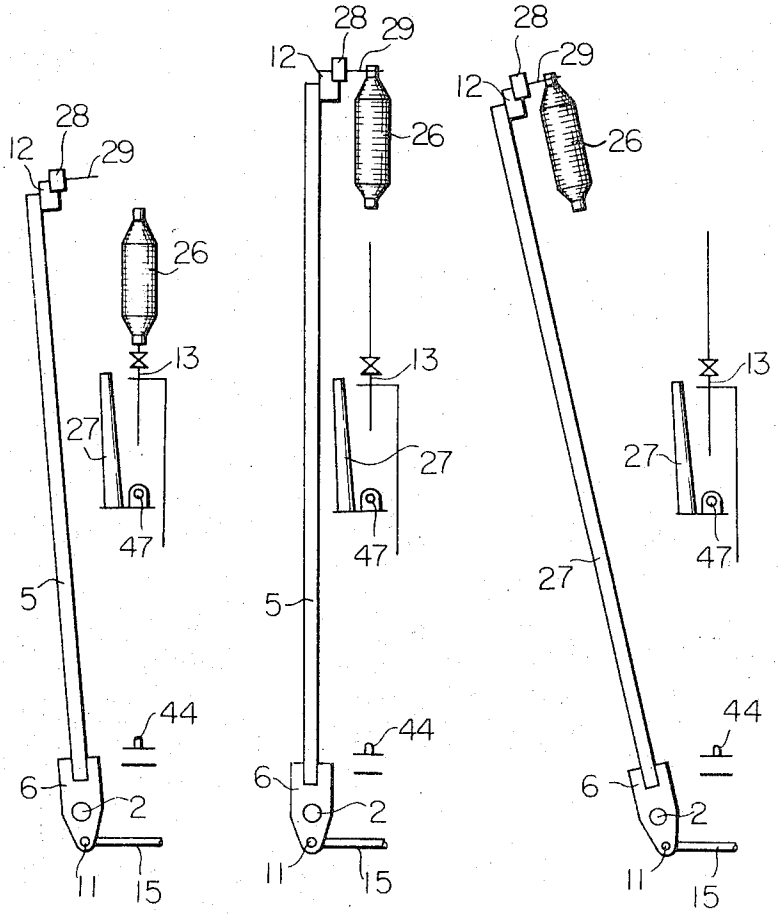
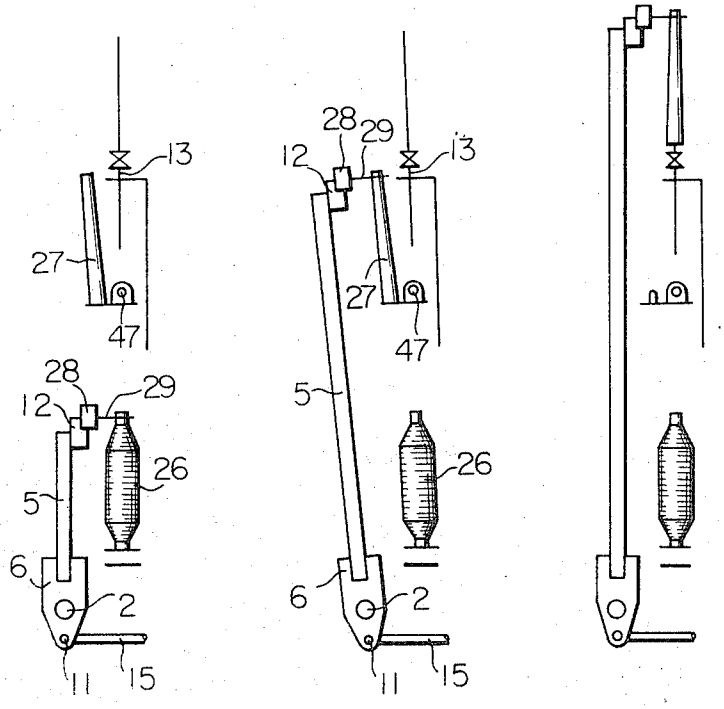


Fig. 9F Fig. 9G Fig. 9H



INVENTOR

BY

ATTORNEY

Fig. 9I

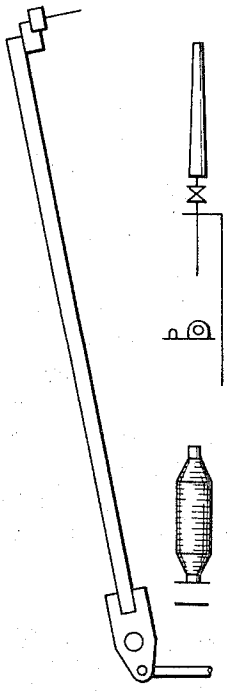
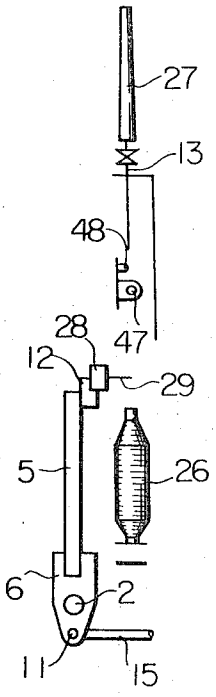


Fig. 9J



METHOD AND APPARATUS FOR REPLACING BOBBINS ON SPINNING OR TWISTING MACHINES

BACKGROUND OF THE INVENTION

The present invention relates to a method of and apparatus for simultaneously doffing full packaged bobbins from respective spindles and donning fresh bobbins on the empty spindles of a spinning or twisting machine.

In the spinning or twisting operation, when the yarn package formed on a bobbin held by each spindle reaches a predetermined full size, the full packaged bobbins have to be doffed from the respective spindles and carried outside of the spinning or twisting machine, then fresh bobbins have to be mounted upon the respective empty spindles. The term "empty spindle" mentioned above means a spindle from which a full packaged bobbin has been doffed.

It is well-known that several automatic apparatus of this type have been applied practically in spinning and twisting machines. One of these apparatus is a type characterized by displacing the apparatus along the spindle rail of a spinning or twisting machine so that the doffing and donning operation is carried by successive spindles one by one. It is well-known that the apparatus disclosed in U.S. Pat. No. 3,307,340 (Y. Suzuki et al.) belongs to this first type. However, it is required to stop the apparatus at precisely the working position for each spindle. Consequently, the positioning mechanism to attain the above-mentioned purpose must be included and, as a result, the mechanism for this apparatus becomes complex. Moreover, as the apparatus works stepwisely for each spindle while displacing along the spindle rail of the machine, there is a certain time limitation to speeding up the doffing and donning operation. Because of the above-mentioned drawbacks of this type of apparatus, it is the tendency world-wide not to use this type of apparatus.

An apparatus which is mounted on each spinning or twisting machine as an auxiliary equipment was disclosed in U.S. Pat. No. 3,370,411 (Schulz et al.). In this second type of doffing and donning apparatus, the doffing or donning operation is carried out simultaneously upon all spindles of a spinning or twisting machine, that is, a full packaged bobbin is doffed from each of the spindles simultaneously by a mechanical gripping means, and the doffed bobbins are transferred onto respective pegs arranged at a half distance of the spindle pitch upon a conveyor belt, and the conveyor belt is then displaced so as to position the pegs, which hold fresh bobbin on each peg, at positions corresponding to the respective spindles. However, it is our opinion that, as the distance of the two adjacent pegs is half of the spindle pitch, this distance restricts the size of the full packaged bobbin, and it is necessary to limit the size of the gripping means. Further, as the displacement of the conveyor belt is required to be carried out precisely, the doffing and donning motion becomes complicated.

The third type of apparatus is shown in French Pat. No. 1,579,214 (Nuova San Giorgio S.P.A.). It is our opinion that the above-mentioned limitation of the second type of apparatus is eliminated by this third type of apparatus characterized by the bobbin gripping means which is capable of simultaneously gripping fresh bobbins and full packaged bobbins so as to displace bobbins upon corresponding spindles and pegs which are arranged at the same intervened distance as the spindle pitch. However, in this third type of apparatus the size of the gripping means is required to be large enough for the above-mentioned two functions of gripping fresh bobbins and full packaged bobbins.

SUMMARY OF THE PRESENT INVENTION

It is a principal object of the present invention to provide method of and apparatus for simultaneous doffing of full packaged bobbins from corresponding spindles and donning fresh bobbins on the spindles wherein the above-mentioned problems found in the second and third type of apparatus are eliminated. Generally, in the apparatus of the present invention, a plurality of bobbin gripping members are disposed on a horizontal holding bar in a row at an intervened space equal to the spindle pitch. The holding bar is mounted to a spinning or twisting machine in a condition parallel to the spindle rail so as to be able to be displaced between several predetermined positions for carrying out the doffing and donning operations, that is, the holding bar is displaced between a waiting position, a first position above the spindle arrangement, a second position for gripping a head portion of each bobbin, held by the corresponding spindle, by each gripping member, a third position above the means for delivering full packaged bobbins outside the machine, such as a belt conveyor, a fourth position for gripping fresh bobbins which are arranged at the same intervened distance as the spindle pitch upon a fresh bobbin reserving member according to a predetermined program, and the simultaneous doffing and donning operations are carried out according to the above-mentioned motion of the holding bar connected to a particular lifting mechanism mounted to the machine. During the above-mentioned doffing and donning operation by means of the holding bar with the bobbin gripping members, it is an essential step that full packed bobbins are taken from the respective spindles and reserved temporarily at a waiting station being parallel to the spindle rail, or fresh bobbins are taken from the belt conveyor and reserved temporarily at the above-mentioned waiting station, alternatively, according to the sequential order of the operations.

In practice, very severe conditions are imposed on the doffing and donning apparatus. Therefore, during our development of the apparatus, so-called practical use of the developing apparatus has been repeated. As a result of these mill tests, a very practical apparatus, which will be hereinafter illustrated, was created.

Further objects and advantages of the present invention will be apparent from the following description, reference being made to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic front view of the doffing and donning apparatus mounted to a ring spinning frame according to the present invention,

FIG. 2 is a more detailed schematic front view of the doffing and donning apparatus shown in FIG. 1,

FIG. 3 is a fragmental elevational view of the apparatus shown in FIG. 2,

FIG. 4 is a fragmentary front view of driving mechanisms for actuating a pair of connecting rods utilized in the apparatus shown in FIG. 2,

FIG. 5 is a fragmental side view of the apparatus shown in FIG. 2,

FIG. 6 is a fragmental side view in connection with a driving mechanism for turning the connecting rods of the apparatus shown in FIG. 2,

FIG. 7 is a fragmental front view of a part of conveyor for holding fresh bobbins, shown in FIG. 2,

FIG. 8 is an elevational view of a gripping member utilized with the apparatus shown in FIG. 2,

FIGS. 9A, 9B, 9C, 9D, 9E, 9F, 9G, 9H, 9I and 9J show the operation of the gripping member in accordance with the motion of the connecting rod in removing a full packaged bobbin and replacing it by a fresh bobbin,

In the embodiment shown in FIG. 1 a horizontal screw rod 2 extends along a spindle rail (not shown) at a bottom position of the ring spinning frame 1 and is supported by a plurality of brackets 3 secured to the floor of the spinning room. A plurality of pairs of thread portions are formed upon the horizontal screw rod 2, in each pair of thread portions 4, 4', a pair of threads having opposite direction of thread are provided and a pair of guide members 6, 6' are mounted on the respective thread portions 4, 4' so as to be displaced along the rod 2 by turning thereof. As shown in FIG. 4, a pair of flanges 7, 7' are engaged with the respective thread portions 4, 4' and the guide members 6, 6' are mounted on the respective flanges 7, 7', and each guide members 6, 6' is secured to the respective flanges 7, 7' by means of the respective set screws 8, 8' and nuts 9, 9'. A pair of arms 10, 10' are turnably mounted on the horizontal screw rod 2 and a guide rod 11 is held by arms 10, 10', while the guide rod 11 is secured to the guide members 6, 6'. When the arms 10, 10' are held in a stationary relationship with the screw rod 2, the guide members 6, 6' can be displaced in opposite ways by driving the horizontal screw rod 2.

A horizontal holding bar 12 provided with a plurality of bobbin gripping members is connected to the guide members 6, 6' by way of a plurality of connecting rods 5, 5'. That is, a plurality of brackets 12*a* are secured to the horizontal holding bar 12 and both end portions of the connecting rod 5 or 5' are pivotally connected to the bracket 12*a* and the guide members 6 or 6' respectively. Consequently, when a motor M_1 connected to one end of the screw rod 2 is actuated to drive clockwise or counterclockwise, each pair of guide members 6, 6' are displaced along the screw rod 2 in opposite directions, that is, the guide members 6, 6' are displaced towards the outside or inside. By this outside or inside displacement of the guide members 6, 6', the horizontal holding bar 12 can be displaced in an upward or downward direction between the position represented by the solid line or the position represented by the dotted line in FIG. 2.

As mentioned above, the horizontal holding bar 12 is displaced upward or downward, however, to carry out the doffing and donning operation, it is necessary for the horizontal holding bar 12 to approach and then withdraw from the series of spindles 13. In FIGS. 5 and 6, a mechanism 14 to approach and withdraw the horizontal holding bar 12 is shown. A rod 15 is connected to the guide rod 11 and the mechanism 14. (FIG. 6). The mechanism 14 is provided with a screw gear 16, which is driven by the motor M_2 by way of a shaft 49, and a screw gear 17 which engages with the gear 16. Both ends of the screw gear 17 are rotatably supported by a pair of brackets 18, 18', and a pair of screw threads 19, 19' are formed upon the inside cylindrical walls of both ends thereof respectively. The directions of threads 19, 19' are opposite. A screw thread 20 or 20' is formed at an end portion of each connecting rod 15 so as to engage with the corresponding screw thread 19 or 19'. Each screw thread 20 or 20' is provided with a partly flat portion 21 or 21' so as to make contact with the corresponding plate 22 or 22' disposed to the above-mentioned bracket 18 or 18'. Consequently, even through the screw gears 16, 17 are driven, the rod of the screw thread 20 or 20' can not turn, but is displaced outward from or inward towards the mechanism 14, and the rods of screw threads 20 and 20' are displaced in opposite directions. Consequently, the guide rod 11 can be turned about the screw rod 2. In this embodiment, 23, 23', and 24, 24' represent turn buckles and joints respectively. As the guide rod 11 is secured to the guide members 6, 6', the guide members 6, 6' are simultaneously turned in accordance with the turning motion of the arms 10, 10', so that the horizontal holding bar 12 can be approached to or withdrawn from the series of spindles 13. In this embodiment, motors M_1, M_2 are connected to the ends of rod 2 and the shaft 49, however, the connecting portion of these motors M_1, M_2 may be changed to any intermediate portion of the rod 2 or shaft 49 to prevent torsion thereof.

By applying the above-mentioned mechanism, the horizontal holding bar 12 can be displaced upward or downward while being approached or withdrawn from the spindles 13, consequently, by actuating the bobbin gripping means 25 at the doffing or donning position of the holding bar 12, replacing full packaged bobbins by fresh bobbins on the respective spindles can be successfully carried out.

The detailed mechanism of the bobbin gripping means 25 is shown in FIG. 8. The bobbin gripping means 25 comprises a pneumatic duct 28 secured to the horizontal holding bar 12 and a plurality of bobbin gripping member 29 which are arranged at the same intervened distance as the spindle pitch and connected to the duct 28 by way of a connecting passage 30. A connecting piece 31 disposed between the duct 28 and the member 29 is sealed by an elastic sheet 32. When it is required to actuate the bobbin gripping means 25, compressed air is supplied into the duct 28. A stationary gripping piece 34 and a movable gripping piece 35 are supported by a guide member 33 held by the connecting piece 31, a pair of compression helical springs are disposed between the above-mentioned two pieces 34, 35. As a projected portion 27 of the piece 35 contacts the back of the elastic sheet 32, the elastic sheet 32 is positioned at a retracted position by the action of the springs 36. However, when compressed air is supplied into the duct 28, the elastic sheet 32 is pushed by the force of the compressed air through the passage 30, consequently, the movable piece 35 slides on the guide member 33 thus compressing the spring 36, and the head portion of a bobbin is gripped by the pieces 34 and 35.

To prepare fresh bobbins for replacing the full packaged bobbins, and to transfer the full packaged bobbins outside of the spinning frame 1, a conveyor 38 is extended in an intermediate horizontal space between the

spinning frame 1 and the screw thread rod 2. As shown in FIG. 7, the conveyor 38 is belted around a pair of guide rollers 39 and 40 disposed at positions adjacent to the gear end or out end frame of the spinning frame 1, and is guided by a guide plate 43 and a pair of guide rolls 41 so as to control the driving passage thereof. A plurality of pegs 44 are mounted on the conveyor 38 at the same intervened distance as the spindle pitch. A fresh bobbin supply device 45 is disposed at one side of the spinning frame 1 so as to mount a fresh bobbin upon each peg 44 when the conveyor 38 is driven. In this operation, the same number of fresh bobbins are mounted on the pegs 44 of the conveyor 38.

Detailed description of the fresh bobbin supply device is omitted, because, any mechanism such as described in the British Pat. No. 1,155,320 (Zinser) can be satisfactorily applied to attain the above-mentioned function.

In this embodiment, the fresh bobbin, carried by the gripping means 25 from the above-mentioned conveyor 38, are temporarily positioned at their waiting position before they replace the full packaged bobbins on the respective spindles. This is one of characteristic features of the first embodiment. For this purpose, a receiving platform 46 is disposed in an intermediate space between the spindles 13 and the conveyor 38. A horizontal shaft 47 is mounted to the spinning frame 1 at a horizontal position below the spindles 13 and the platform 46 is rotatably supported by the horizontal shaft 47 as shown in FIG. 5. A plurality of pegs 48 are mounted on this platform 46 at the same intervened distance as the spindle pitch. As the pegs 44 of the conveyors 38, pegs 48 of the platform 46 are arranged at the same intervened distance as the spindle pitch, the transfer of the fresh bobbins from the pegs 44 to the pegs 46, and from the pegs 46 to the corresponding spindles 13 can be steadily carried out without any additional motions of the gripping means 25.

The doffing and donning operations carried out by the apparatus of the first embodiment will now be explained with reference to FIGS. 9A, 9B, 9C, 9D, 9E, 9F, 9G, 9H, 9I and 9J.

In the position of FIG. 9A, the spinning operation is being carried out, and the platform 46 and the bobbin gripping means 25 are in a position of rest. In this condition, the yarn package is about to be made a full package, and a plurality of fresh bobbins 27 have been deposited upon the respective pegs of the conveyor 38. When the inertia driving of the spinning frame 1 is commenced in accordance with the signal created by an automotive device, such as the well-known autocounter which senses the production of a predetermined length of yarn as a full packaged bobbin, an automatic programming mechanism (not shown) is actuated so as to drive the motor M_1. Consequently, the screw rod 2 is rotated so that the bobbin holding bar 12 is displaced downward and the bobbin gripping means 25 is positioned so that the bobbin gripping members engage with the head portion of the fresh bobbin 27 held upon the conveyor 38. Next, compressed air is fed into the duct 28 so that the bobbin gripping members 29 grip the head portion of the respective fresh bobbins 27. At this condition, as the screw 2 is slightly turned in the direction for displacing the holding bar 12 upward, the fresh bobbins 27 are taken from the respective pegs 44. Next, the mechanism 14 is actuated so that the guide members 6 (6') and the respective connecting rods 5 (5') are turned about the screw rod 2, and further, the screw rod 2 turns. Consequently the holding bar 12 with the bobbin gripping means 25 is displaced upward. When the bottom end of the fresh bobbins 27 arrive at a horizontal position which is a little above the tip of the pegs 48 of the platform 46 which is in a working position, the lifting motion of the holding bar 12 is stopped (FIG. 9B).

Next, the holding bar 12 is displaced so as to approach the bottom end of the fresh bobbins 27 held by the bobbin gripping means 29 to the respective pegs 48 and mount them upon the pegs 48, and after completion of this motion, the compressed air in the duct 28 is discharged so that the fresh bobbins 27 are released from the respective bobbin gripping members 29. The holding bar 12 is then displaced upward, the fresh bobbins 27 are held by the respective pegs 48 of the platform 46.

The holding bar is stopped at a horizontal position a little above the tip of the full packaged bobbins 26 (FIG. 9C).

Next, the mechanism 14 is actuated so as to displace the bobbin gripping means 25 to a position right above the full packaged bobbins 26 held by the respective spindles 13. Then the holding bar 12 is displaced downward a little so that the bobbin gripping members 29 engage with the tip portion of the respective bobbins of full package. At this condition, compressed air is supplied to duct 28. Consequently, the bobbin gripping members 29 grip the tip of the respective bobbins 26, and doffing of the full packaged bobbin 26 from the respective spindles 13 can be carried out by upward displacement of the holding bar 12 (FIG. 9D). In the position of FIG. 9E, the bobbin gripping means 25 is withdrawn from the spinning frame 1, and the full packaged bobbins 26 are in a position to transfer them onto the respective pegs 44 of the conveyor 38 when the holding bar 12 is displaced downward to the position shown in FIG. 9F.

When the compressed air in the duct 28 is discharged, the full packaged bobbins 26 are held by the respective pegs 44. These full packaged bobbins 26 can be carried outside of the spinning frame 1 by driving the conveyor 36 so as to be transferred to a conveyor 50 arranged beside the spinning machine 1 (FIGS. 2 and 3).

To carry out the donning of the fresh bobbin 27 upon the respective spindles 13, the bobbin holding bar 12 is displaced upward and when the bobbin gripping members 27 are positioned so as to engage with the tip of the bobbins 27 held by the pegs 48 of the platform 46, compressed air is supplied into the duct 28 so that the bobbin gripping means 25 grips the fresh bobbins 27 (FIG. 9G). Next the holding bar 12 is displaced upward to a horizontal position a little above the head of the spindles and the bobbin gripping means is approached so as to position the bottom of the fresh bobbins right above the respective spindles 13. Then the holding bar 12 is displaced downward so as to mount the fresh bobbins 27 upon the respective spindles 13 and then the compressed air in the duct 28 is discharged (FIG. 9H). After completion of the above-mentioned motion, the holding bar 12 is again lifted so as to withdraw the bobbin engaging means 25 from the fresh bobbins 27 and the holding bar 12 is withdrawn from the spinning frame 1 (FIG. 9I). Then the holding

bar **12** is returned to its rest or waiting position (FIG. **9J**) and the spinning operation is commenced.

During the spinning operation, fresh bobbins for the successive spinning operation are prepared on the respective pegs **44** after the full packaged bobbins **26** on the conveyor **38** are transferred to the outside of the spinning frame. In the above-mentioned embodiment, full packaged bobbins **26** may be temporarily held by the pegs **48** of the platform **46** instead of the fresh bobbins **27.**

In the above-mentioned embodiment, motions of the bobbin gripping means **25,** bobbin holding bar **12** and the conveyor **38** are carried out in sequence according to a predetermined program. A programming control means (not shown) actuates and controls the above-mentioned motions. In this programming control of the above-mentioned motions, the motors M_1, M_2 ; M_1, M_2 and M_3 are actuated by the output signal of the programming control means. Further, the turning motion of the platform **46** is carried out by a rotary actuator (not shown) which is actuated by an output signal of the programming control means. However, as the programming control means are well-known in the automatic apparatus applied to the spinning mills, the detailed illustration of the programming control means is abbreviated.

Further, a sliding chute for carrying the full packaged bobbins **26** into a receiver disposed outside of the spinning frame **1** can be used instead of the above-mentioned conveyor **38.** In this connection, two separate conveyors may be used for the apparatus of the present invention.

As mentioned above, it will be understood that various modification may be made which are equally within the spirit and scope of the invention and that the true measure of the invention is as defined in the claim as hereinafter set forth.

I claim:

1. A method of doffing full packaged bobbins and donning fresh bobbins upon said spindles of a spinning and twisting machine, which comprises the following steps:

carrying a plurality of fresh bobbins by conveying means extending parallel to the spindle rail from an end of said machine to a reserving position where fresh bobbins are positioned at corresponding horizontal positions below respective spindles,

next doffing full packaged bobbins simultaneously from spindles and then donning said fresh bobbins simultaneously upon said spindles by gripping means characterized in that, said doffing and donning operations are carried out sequentially; taking said full packaged bobbins from the respective spindles and temporarily reserving said full packaged bobbins at a waiting station which is parallel to said spindle rail, or taking said fresh bobbins from said conveying means and temporarily reserving said fresh bobbins at said waiting station alternatively, at a first step of said sequential operations; transferring said full packaged bobbins to corresponding positions upon said conveying means where said fresh bobbins were reserved respectively.

2. A method of doffing full packaged bobbins and donning fresh bobbins according to claim **1,** which comprises the following steps:

stopping the spinning operation when each yarn package reaches a predetermined full size;

displacing said horizontal holding bar from a waiting position to a horizontal position above said conveying means;

gripping said fresh bobbins, perpendicularly arranged in a row at an intervened space equal to said spindle pitch upon said conveying means, by said bobbin gripping members respectively;

displacing said holding bar to said waiting station adjacently below said spindle rail;

releasing gripping action of said bobbin gripping members so as to transfer said fresh bobbins upon said waiting station;

displacing said holding bar to a horizontal position above said spindle rail;

gripping the full packaged bobbins mounted to said spindles by said bobbin gripping members respectively;

next, after displacing said holding bar upward for doffing of said full packaged bobbins from corresponding spindles, displacing said holding bar downward to said horizontal position above said conveying means;

releasing gripping action of said bobbin gripping members so as to transfer said full packaged bobbins from said bobbin gripping members to said conveying means;

displacing said holding bar to said horizontal position above said waiting position and then actuating said bobbin gripping members for gripping said fresh bobbins reserved on said waiting station;

next, displacing said holding bar to said horizontal position above said spindle rail so that said fresh bobbins are mounted on the respective spindles;

releasing gripping action of said bobbin gripping members;

next displacing said holding bar to said waiting position;

commencing spinning operation;

carrying said full packaged bobbins to the outside of said spinning or twisting machine by said conveying means while supplying said fresh bobbins to a reserving position;

controlling said steps of operation sequentially according to a predetermined program.

3. A method of doffing full packaged bobbins and donning fresh bobbins according to claim **1,** which comprises the following steps:

stopping the spinning operation when each yarn package reaches a predetermined full size;

displacing said horizontal holding bar from a waiting position to a horizontal position above said spindle rail and displacing downward;

gripping the full packaged bobbins of said spindles by said bobbin gripping members respectively;

next, after displacing said holding bar upward for taking off said full packaged bobbins from corresponding spindles, displacing said holding bar downward to said waiting station;

releasing gripping action of said bobbin gripping members so as to transfer at an intervened space equal to said spindle pitch upon said waiting station;

displacing said horizontal holding bar to a horizontal position above said convying means and displacing downward;

gripping said fresh bobbins, reserved upon said conveying means, by said bobbin gripping means respectively;

displacing said holding bar to a horizontal position above said spindle rail, and releasing said gripping members so that fresh bobbins are mounted on corresponding spindles respectively;

displacing said holding bar to a horizontal position adjacently above said waiting station and displacing downward and then actuating said gripping members for gripping said full packaged bobbins;

next, displacing said holding bar upward and then displacing to a horizontal position above said conveying means, next releasing said gripping members so that said full packaged bobbins are transferred to corresponding positions of said conveying means where fresh bobbins were reserved;

next, displacing said holding bar to said waiting position;

commencing spinning operation;

carrying said full packaged bobbins to the outside of said spinning or twisting machine by said conveying means while supplying said fresh bobbins to said reserving position;

controlling said steps of sequential operations according to a predetermined program.

4. An automatic apparatus for simultaneously doffing full packaged bobbins from spindles and then simultaneously donning fresh bobbins upon said spindles of a spinning or twisting machine comprising:

means for conveying said fresh bobbins from outside of said machine and conveying said full packaged bobbins to the outside of said machine, said conveying means having a plurality of pegs arranged in a row at an intervened distance equal to the spindle pitch for supporting said bobbins and extending parallel to the spindle rail,

a plurality of gripping members for gripping said full packaged bobbins or fresh bobbins,

a horizontal holding bar for holding said bobbin gripping members in a row at an intervened distance equal to said spindle pitch,

a horizontal platform disposed at an adjacent position to said spindle rail, said platform being capable of supporting either one of said full packaged bobbins or fresh bobbins,

means for displacing said holding bar between the following positions in a predetermined sequential order, a horizontal position for resting said holding bar during the spinning operation, a position for carrying out said doffing and donning operation, a position for taking up said fresh bobbins from said conveying means and transferring said full packaged bobbins to said conveying means, a position for transferring either one of the said full packaged bobbins or fresh bobbins from said gripping members upon said platform and for taking said full packaged bobbins or fresh bobbins from said platform by said gripping members at a separate step during sequential operations of said doffing and donning operations,

means for controlling said motions of said holding bar, and

means for actuating said bobbin gripping members according to a predetermined program.

5. An automatic doffing and donning apparatus according to claim **4**, wherein, said horizontal holding bar extends along the spindle arrangement of said machine; said displacing means comprises a horizontal screw bar turnably disposed at a horizontal position adjacent to the front bottom of said machine and is provided with several pairs of screw segment portions, each pair of screw segment portions is provided with two thread portions having opposite thread directions; several pairs of guide members mounted on the respective segments; several pairs of connecting rods pivotally connecting both end portions of each connecting rod to said horizontal bar and corresponding guide members; means for approaching or withdrawing said holding bar to and from said spindle rail; driving means for turning said screw rod; said approaching or withdrawing means and said driving means are controlled by said control means.

6. An automatic doffing and donning apparatus according to claim **5**, wherein said approaching and withdrawing means comprises a plurality of bracket turnably mounted on said screw rod, each bracket rigidly connected to said guide member; a horizontal rod extended below said screw rod passing through a portion of each bracket; a plurality of actuating rods transversely disposed below said spindle arrangement and said screw bar, the free end of said actuating rod is pivoted to said horizontal rod, an actuating means for telescopically extending or retracting said free end, said actuating means disposed below said machine and connected to the other end of said actuating rod; said motion of actuating means is controlled by said control means.

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