

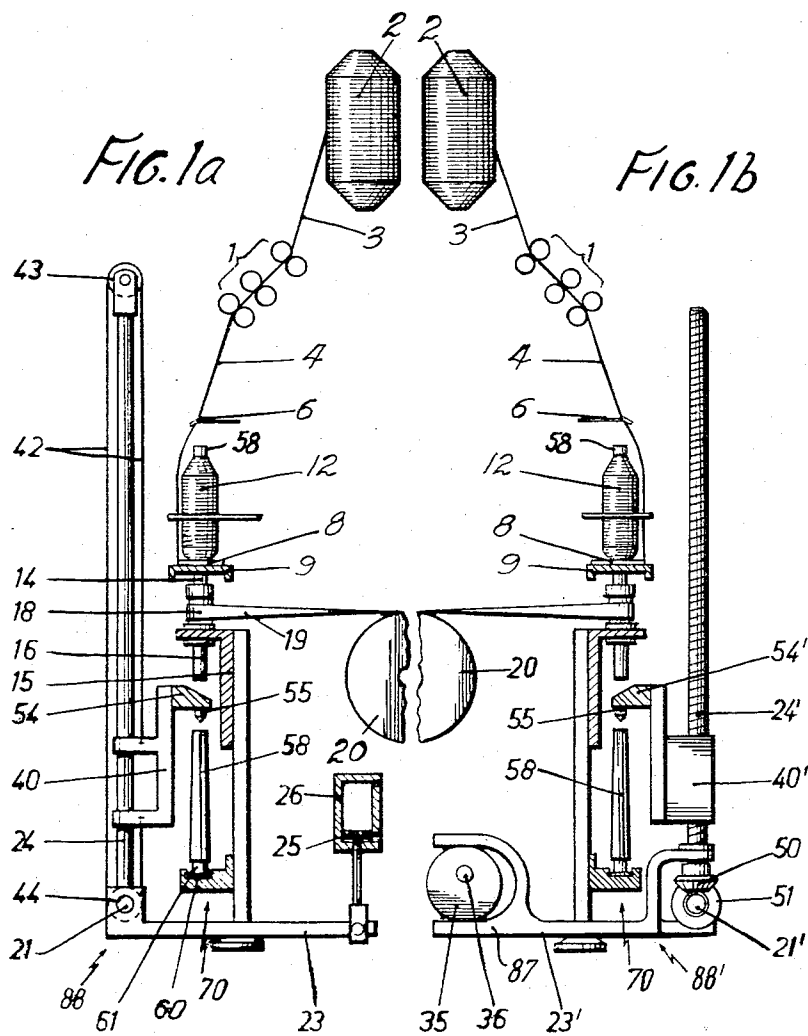
Feb. 27, 1968

G. SCHULZ ET AL
METHOD AND APPARATUS FOR REPLACING BOBBIN TUBES ON SPINNING
OR TWISTING MACHINERY

3,370,411

Filed Dec. 17, 1965

5 Sheets-Sheet 1



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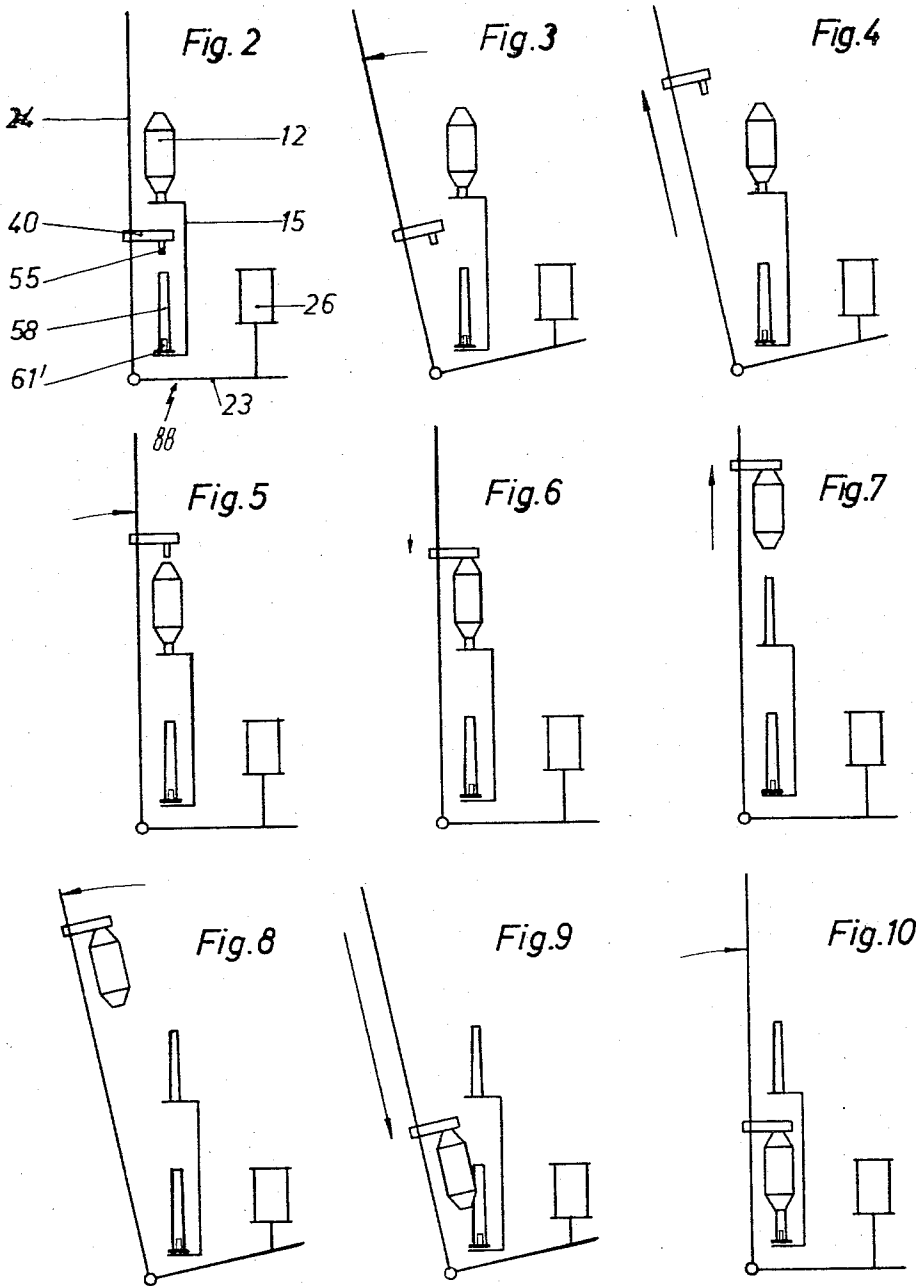
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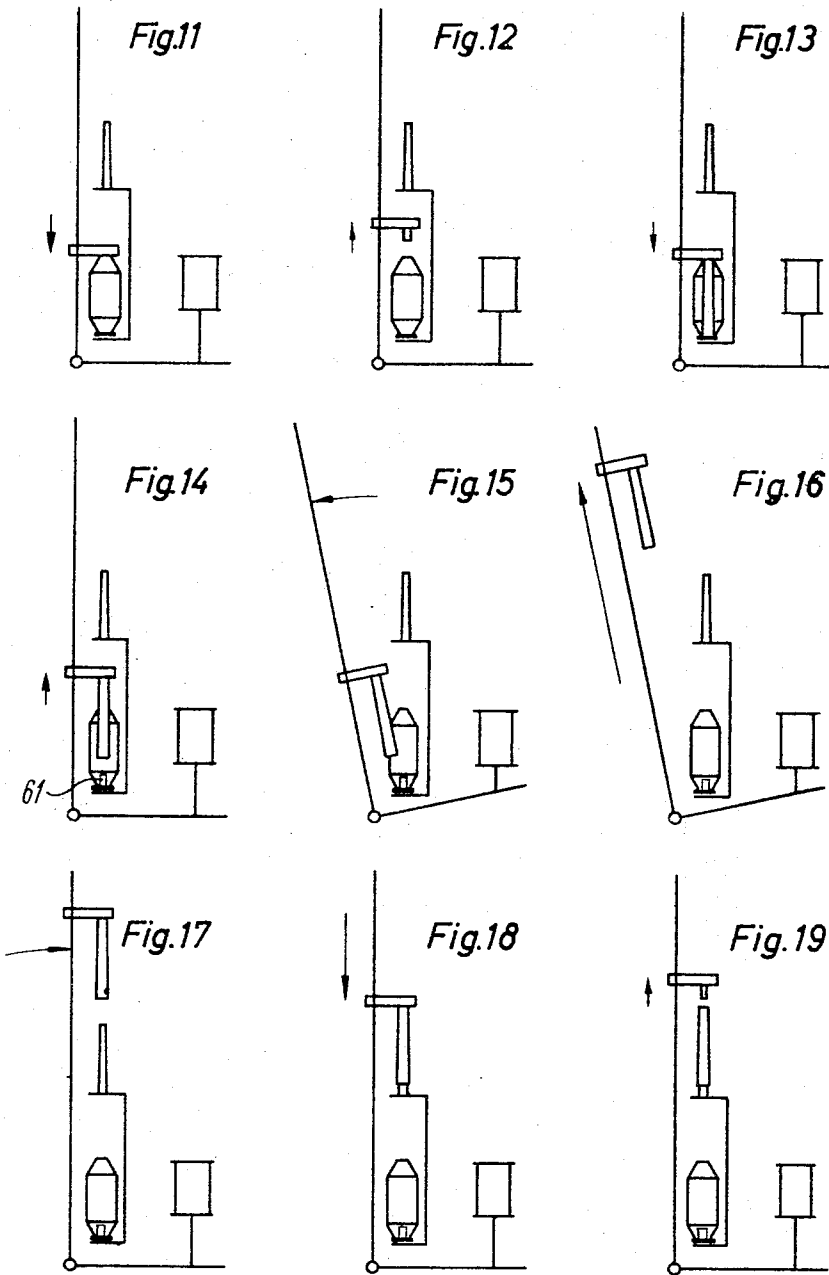
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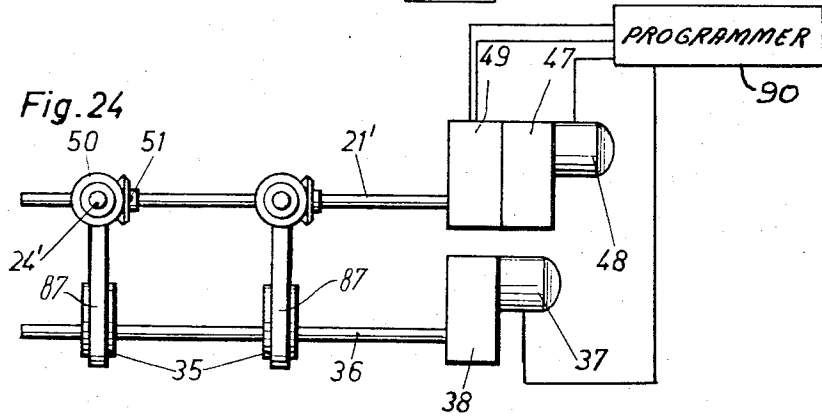
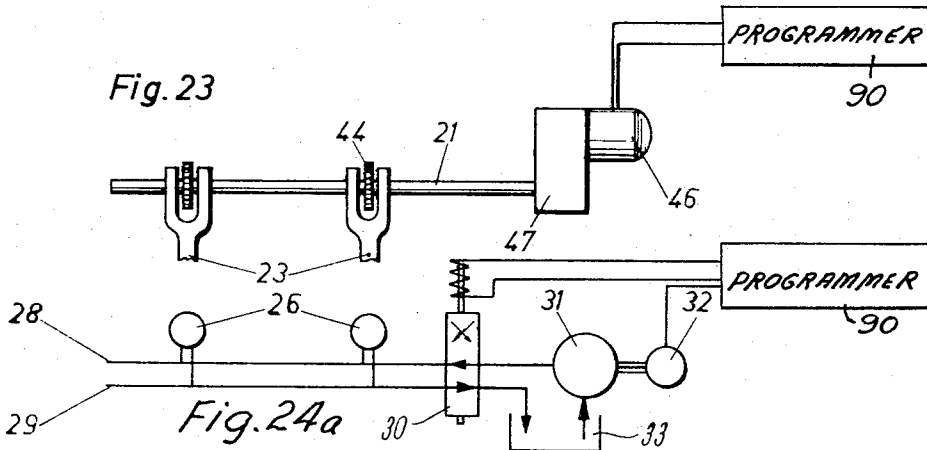
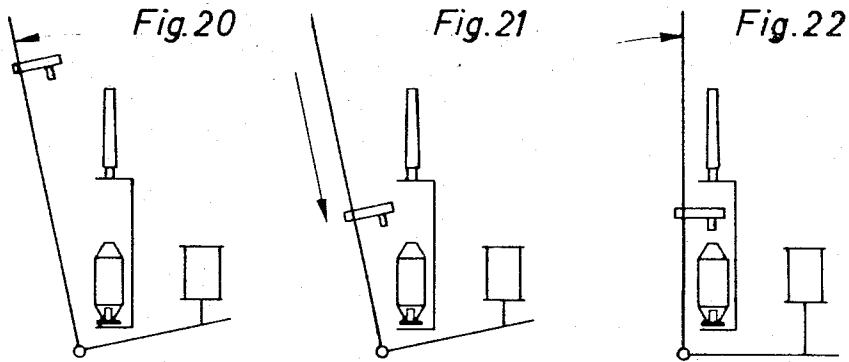
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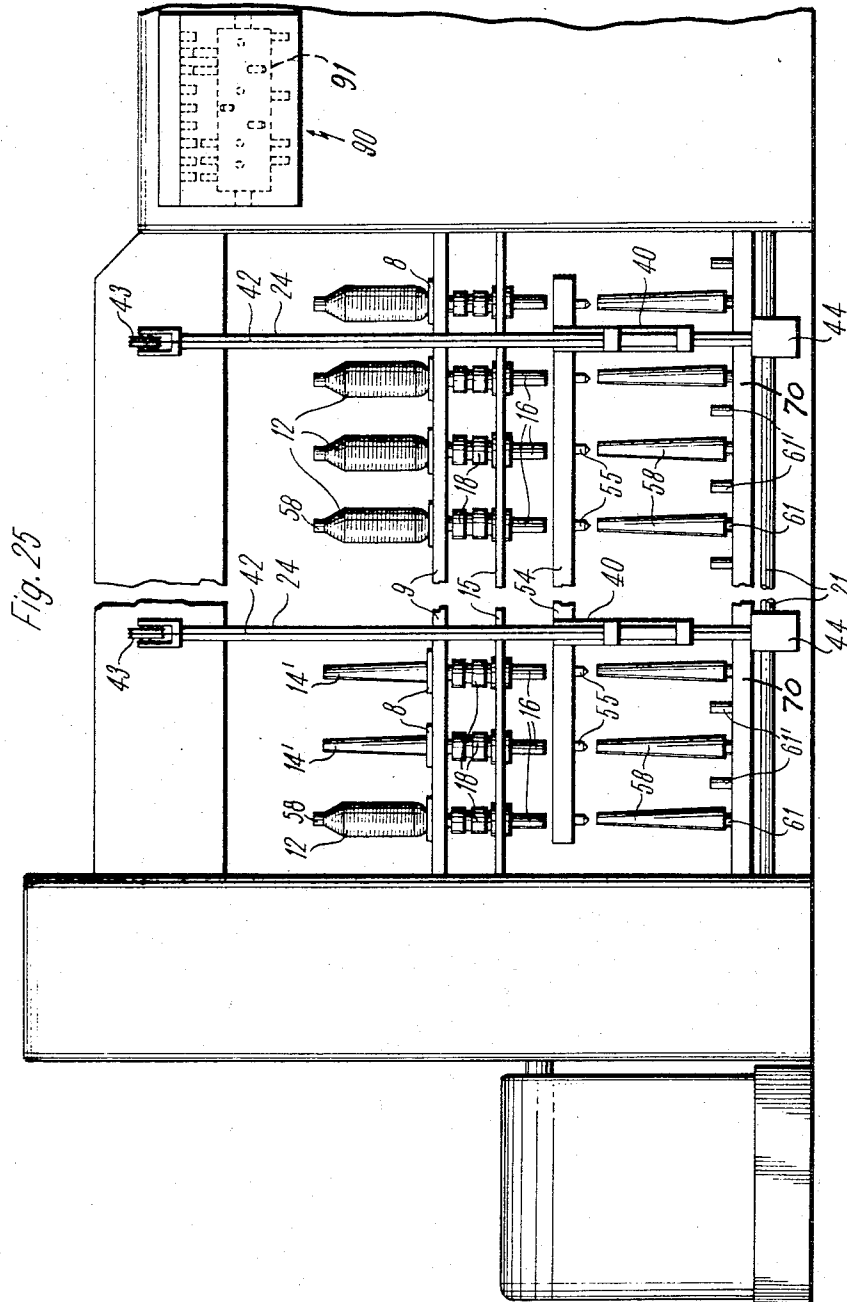


Fig. 25

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3,370,411

METHOD AND APPARATUS FOR REPLACING BOBBIN TUBES ON SPINNING OR TWISTING MACHINERY

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 Filed Dec. 17, 1965, Ser. No. 514,575
 Claims priority, application Germany, Dec. 23, 1964, Z 11,245
 18 Claims. (Cl. 57—52)

ABSTRACT OF THE DISCLOSURE

A method of and apparatus for removing full bobbins wound on tubes on a series of spindles of a spinning or twisting machine using a tube gripping arrangement wherein the tube gripping arrangement is moved between a tube receiving means for supporting both full bobbin tubes and empty tubes and the spindles under control of a control means for effecting substantially simultaneous removal of full bobbins from the spindles and replacement thereof by empty tubes, the gripping arrangement being guided on one arm of a pivotably bell crank under control of a mechanical or hydraulic system.

The present invention relates to a method and device or mechanism for the removing of bobbins wound on tubes mounted on rotatable spindles and their replacement by empty tubes for the winding of additional bobbins. The invention is more particularly related to spinning frames such as ring spinning frames or flyer frames but it is not an essential feature of the invention that a process of attenuation of doubling or the like should take place in the particular machine whose bobbins are to be removed and replaced by empty bobbin tubes.

In a known method for replacing full bobbins by empty tubes, the empty tubes and the full tubes are gripped by an individual gripping device and removed from their respective locations; the empty tubes are then placed on the spindles and then the full tubes are placed on a conveyor belt. This method requires comparatively complicated devices for carrying out the operation, and therefore one object of the present invention is to provide a method and apparatus which is simpler than the method and apparatus of the prior art.

The invention accordingly consists of a method of removing bobbins wound on tubes from a series of parallel spindles of a spinning or twisting machine, placing the removed bobbins on a row of receiving means having the same spacing as the spindle, and, using the same tube gripping means that is used for removing the full bobbins to place empty bobbin tubes on the spindles, the sequence of operations being as follows:

- (a) movement of the tube gripping means from a rest position to full bobbins;
- (b) gripping the tubes of the full bobbin by means of the gripping means;
- (c) removal of the full bobbins from the spindles;
- (d) placing the full bobbins on the bobbin receiving means;
- (e) movement of the gripping means to empty bobbin tubes;
- (f) gripping the empty bobbin tubes by means of the gripping means;
- (g) movement of the empty tubes to spindles having no bobbins on them;
- (h) placing the empty tubes on to the spindles; and
- (i) return of the gripping means to its rest position.

Preferably, the empty tubes, after the full bobbins have

been set down, are moved in the direction of movement of the gripping means. After empty bobbin tubes have been placed over spindles by the tube gripping means, the gripping means can cease to grip the tubes and they are then used to press the tubes on to the spindles in a direction parallel to the axes of the spindles.

The invention also consists in an apparatus for doffing bobbins from a series of parallel spindles of a spinning or twisting machine, comprising bobbin tube gripping means, a row of bobbin receiving means having the same spacing as the spindles, and control means for causing the bobbin tube gripping means to fulfill the aforesaid sequence of operations.

The device or apparatus for carrying out the method of the invention more particularly consists of a gripping device for each spindle group including a number of gripper elements corresponding to the number of spindles, actuating means for selectively actuating the individual gripper elements, guide support means for guiding and positioning the gripping device through the various bobbin tube transfer operations between the spindles and a plurality of tube carriers disposed on a conveying means for supporting both the full and empty bobbin tubes, and control means for automatically controlling said gripping device actuating means and said guide support means. The apparatus has the advantage that the same gripper elements may be utilized for removing, inserting and transporting the full and empty tubes, thereby not only reducing the number of gripper elements required, but also considerably simplifying the overall construction of the entire apparatus and materially increasing the safety of operation thereof.

Preferably the row of bobbin receiving or carrying means is placed on a further means, which may be a conveyor, on which there are also mounted means for holding empty bobbin tubes, the means for receiving the full bobbins and holding the empty tubes forming a single row. For example, the means for holding the empty bobbin tubes can be placed between the means for receiving the full bobbins.

It has been found convenient to place the bobbin receiving means under the spindles and to carry the gripping elements on guide means which can tilt about an axis running parallel to the spindles. Thus the gripping means can be arranged to be driven along the guide means from a shaft whose axis forms the axis of tilt of the guide means. The guide means can include one arm of a bell-crank, the other arm being connected with a drive means, for example, an eccentric, for causing tilting of the guide means.

It is an object of the instant invention to provide a method and apparatus for automatically replacing bobbin tubes on spinning or twisting machinery which overcomes or otherwise substantially eliminates the disadvantages of known methods and apparatus of a similar kind.

It is another object of the instant invention to provide a method and apparatus as herein described which is of simplified construction, having less working parts than comparable known devices.

It is a further object of the instant invention to provide a method and apparatus as herein described which is more economical to manufacture, is safer in operation, and is less space-consuming than known devices.

It is still another object of the instant invention to provide a method and apparatus as herein described which is readily adaptable to automatic control and capable of effecting a series of operations independently upon initial actuation thereof.

These and other objects, features and advantages of the instant invention will become more apparent from the following detailed description of the construction thereof when taken in conjunction with the accompany-

ing drawings, which show various features of the invention, and wherein:

FIGURE 1a is an end view of a spinning frame contrived to illustrate one embodiment of the invention, and FIGURE 1b illustrates a further embodiment of the invention;

FIGURES 2 to 22 show the operation of the gripping means in accordance with the invention in removing a full bobbin and replacing it by an empty bobbin tube;

FIGURE 23 diagrammatically shows the means for moving the gripping device in accordance with the embodiment of the invention shown in FIGURE 1a;

FIGURE 24 shows the drive arrangement used in the embodiment of the invention shown in FIGURE 1b;

FIGURE 24a shows a hydraulic control circuit utilized with the invention; and

FIGURE 25 is a diagrammatic side view of the embodiment of the invention shown in FIGURE 1a.

In the drawings, like reference numerals have been used to designate similar elements in the several views wherever possible so as to facilitate an understanding of the various novel features of the instant invention.

As shown in FIGURES 1a and 1b, a ring spinning frame includes conventional drafting devices 1 in which roving 3 supplied by the roving bobbins 2 is drafted into yarn and then runs down through guides 6 to runners which rotate on rings 8 arranged on ring supports 9. The spun yarn is wound onto bobbin tubes 58 to form full tubes or bobbins 12. The bobbin tubes 58 are carried on spindles 14 which in turn are carried on supports 15 in spindle bearing housing 16. Spindle pulleys 18 provided on each of the spindles are driven by belts 19 which in turn are driven by wheels 20.

In the illustrated embodiments of the invention, the spindles form a spindle group whose bobbin tubes when full are removed and then replaced automatically. As shown in FIGURE 25, two bobbin tubes 58 have been removed from two spindles 14' on the upper level purely for the sake of illustration. Below, but advantageously not precisely underneath the spindle supports 15, there is provided on each side of the machine shafts 21 and 21', which extend along the length on either side of the machine and serve for vertically displacing the support members 54 and 54' for the gripping means 55, which support members form part of slides 40 and 40', carried on guides 24 and 24', respectively. Simultaneously, the axes of these shafts 21 and 21' serve as the pivot axes for the guides 24 and 24', which form with arms 23 and 23' bell-cranks 88 and 88'. The bell-cranks 88 and 88' can be tilted about the axes of the shafts 21 and 21' by actuating means, which may be provided in several forms, two of such means being illustrated in FIGURES 1a and 1b, so as to displace the gripping means in a direction toward and away from the machine thereby avoiding obstructions in the vertical displacement of bobbins or empty tubes.

The actuating means in one case illustrated in FIGURE 1a may consist (for each guide 24) of a piston 25 in a cylinder 26, which by means of ducts 28 and 29 (see FIGURE 24a) is connected with a four-way reversing valve 30 of well known construction supplied with fluid under pressure from a reservoir 33 by means of a pump 31 driven by an electric motor 32. The other embodiment illustrated in FIGURE 1b bell-cranks 88' provided with another form of actuating means having their arms 23' in the form of forks 87 into which eccentrics 35 fit. Several eccentrics 35, corresponding to the various guides 24' are arranged on a common shaft 36, extending substantially over a whole length of the spinning frame. The shaft 36 is driven by an electric motor 37 through a reduction gear 38, as seen in FIGURE 24.

While the machine in accordance with the instant invention is provided in FIGURE 1a with a hydraulic arrangement for actuating the bell-crank 88 and in FIGURE 1b with a mechanical arrangement including ec-

centrics 35 for actuating the bell-cranks 88', it should be apparent that these bell-cranks 88 and 88' may be actuated by other means, either hydraulic or mechanical, as known in the art, or otherwise, without departing from the spirit and scope of the present invention.

The drive of the slide 40 on the guides 24, which are preferably in the form of smooth guide rods, as illustrated in FIGURES 1 and 25, is brought about by endless chains 42 driven by the shafts 21. The chains 42 pass over pulleys 43 at the tops of the rods and at the bottom pass around and engage with sprocket wheels 44 (see FIGURE 1a) fixed on the shaft 21.

The slide 40', shown in FIGURE 1b, is carried on guides in the form of threaded shafts 24' driven by bevel gears 50 and 51 secured to the shafts 24' and 21', respectively. The shaft 21 is driven by means of a reversible electric motor 46 (FIGURE 23) coupled with a reduction gearing 47, while the shaft 21' is driven by means of an electric motor 48, a reduction gearing 47 and a reversing gearbox 49 (see FIGURE 24).

Naturally, the means for driving the two shafts 21 and 21' may be interchanged without departing from the scope of the invention, that is to say, in a spinning frame embodying the invention, as shown in FIGURE 1b, the shaft 21' may be driven by the reversible motor 46 and the reduction gearing 47; while similarly, in the spinning frame embodying the invention, as illustrated FIGURE 1a, the shaft 21 may be driven by the motor 48, the reduction gearing 47 and the reversing gearbox 49.

The slides 40 and 54 or 40' and 54' extending along the whole group of spindles and are provided with one gripping element 55 for each spindle (see FIGURE 25 where the slide 40-54 is shown in its lower position).

It is possible to use gripping means of known construction, for instance, electromagnetically operated means which expand inside the upper ends of the bobbin tubes. In addition, the gripping means disclosed, for example, in copending application Serial No. 514,574, filed December 17, 1965, in the name of Gunter Schulz, and assigned to the same assignee as the instant application, may be used with the subject invention.

Disposed below the support 15 for each spindle there is provided an endless conveyor chain or belt 60 carried on a support 70, and on this chain or belt there are arranged pins 61 and 61' spaced at intervals equal to one-half the spacing between spindles. The pins 61' serve as means for receiving the full bobbin tubes 58 while the alternate pins 61 carry empty bobbin tubes 58. It will be noted that the use of a spindle support 15 with an L-shaped cross-section instead of a U-shaped cross-section, as is usual, is a particularly advantageous space-saving feature and allows the slides 40, and 40' to be held above the empty tubes 58 on the pins 61 without interference.

When the bobbins 12 are of full size, the support 9 carrying the rings 8 is automatically moved down below the bottom ends of the tubes 58 so that some yarn is wound on to the spindle or a collar fixed to it and the spindles are then stopped. The yarn guides 6 are then swung upward to allow the operation of the slides 40 and 40', the actuating means for bell-cranks 88 and 88', and the conveyor chain 60, to effect exchange of empty tubes for full tubes preferably automatically by means of a programming device 90, (see FIG. 25) for example, a switching arrangement of known type containing a rotating drum 91 with pins for actuating switches. Alternatively, other methods of control can be used, for instance terminal switches arranged to be actuated by the slides and punched tape control units of known construction.

In operation of the invention, as shown in FIGURES 2 through 22, with the bell-cranks 88 positioned so that the slides 40 with the gripping elements 55 are in their rest position, the bell-cranks 88 are moved by means of the piston and cylinder, as shown in FIGURE 3, via control from programming device 90. By switching on

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the electric motor 46 (FIGURE 23) and the means for controlling the rotation of the shaft 21, the slide 40 is moved upward along the guides 24, as shown in FIGURE 4. The guides are then moved back into the position shown in FIGURE 5 so that the gripping elements 55 are located over the tops of the tubes of the completed bobbins. The gripping elements are then moved down to engage with the top openings of the bobbin tubes of the completed bobbins, as shown in FIGURE 6, and are caused to grip the inside walls of the tops of the bobbin tubes by hydraulic pressure actuated by programmer 90, in the manner indicated in the above-referenced co-pending application. Next, as shown in FIG. 7, the slide 40 is raised along the guides 24 and then the guides are tilted by means of the piston 25 and cylinder 26, as shown in FIGURE 8, so that all the completed bobbins are swung to the side clear of the spindles where they can be lowered, as shown in FIGURE 9. Then, as shown in FIGURE 10, the guides 24 are swung back into their vertical position so that the bobbins can be lowered on to the pins 61' (see FIGURE 11).

As shown in FIGURE 12, the slide 40 is raised after the gripping elements have been released and the conveyor chains 60 carrying the pins 61 and 61' are moved through a distance equal to half the pitch, i.e., spacing of the spindles, so as to bring the pins 61 carrying the empty tubes 58 underneath the gripping elements 55. Then the gripping elements on the slide 40 are lowered, as shown in FIGURE 13, and then raised, as shown in FIGURE 14, lifting the empty tubes 28 clear of the pins 61. Next the guides 24 are tilted again so that the empty tubes 58 can be lifted to a level above the spindles, as shown in FIGURE 16. As shown in FIGURE 17, the guides 24 are then returned to their vertical positions and the tubes are lowered on to the spindles, as shown in FIGURE 18. The gripping elements 55 are then released and the slide 40 lifted somewhat, as shown in FIGURE 19. Following this, the guides 24 are again tilted to allow the slide 40 to be returned to its original position, as shown in FIGURES 21 and 22.

As should be apparent from the foregoing description taken in conjunction with the accompanying drawings, modifications within the skill of the ordinary worker in the art can be made with regard to specific structural details of the invention without departing from the spirit and scope thereof. For example, the means for effecting vertical displacement of the gripping means may be other than that specifically disclosed and transverse movement of the gripping means away from the machine may be effected by any known or obvious arrangement.

Therefore, while certain embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

We claim:

1. A method of removing full bobbins wound on tubes on a series of spindles of a spinning or twisting machine using a tube gripping device and replacing said full bobbins by empty tubes on said spindles comprising:
 moving said tube gripping device from a rest position to a position adjacent a full bobbin;
 gripping the tube of said full bobbin with said gripping device and removing said tube from the spindle;
 transporting to and placing said full bobbin on a tube receiving means,
 releasing said full bobbin and moving an empty tube adjacent to said gripping device,
 gripping said empty tube with said gripping device and moving the tube to the spindle vacated by said full bobbin,
 placing said empty tube on said vacated spindle, and moving said gripping device to its rest position.

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2. A method as defined in claim 1 wherein after placing said full bobbin on a tube receiving means, both said full bobbin and said empty tube are moved simultaneously to displace said empty tube into the path of movement of said gripping means.

3. A method as defined in claim 2 wherein said full bobbins when on the tube receiving means are positioned closely adjacent said empty tubes.

4. An apparatus for removing full bobbins wound on tubes in a series of spindles of a spinning or twisting machine and replacing said full bobbins by empty tubes on said spindles comprising

a plurality of spindles arranged in substantial alignment, each capable of supporting a bobbin tube thereon,

bobbin tube gripping means including a plurality of gripper elements, each associated with a spindle for acquisition, conveyance and release of a bobbin tube, tube receiving means for supporting both full bobbin tubes and empty tubes and capable of movement into position for acquisition by said bobbin tube gripping means,

moving and guide means for effecting displacement of said bobbin tube gripping means between said spindles and said tube receiving means, and

control means for controlling said moving and guide means and said actuating means to effect removal of a full bobbin tube from a spindle and replacement thereof by an empty bobbin tube by a common gripper element of said bobbin tube gripping means.

5. An apparatus as defined in claim 4 wherein said tube receiving means is in the form of a movable conveyor having a plurality of tube receiving elements spaced by half the distance between adjacent spindles.

6. An apparatus as defined in claim 5 wherein said tube receiving elements are in the form of pegs arranged in a row.

7. An apparatus as defined in claim 5 wherein said tube receiving elements are positioned below said spindles with alternate ones thereof being in substantial vertical alignment with said spindles.

8. An apparatus as defined in claim 4 wherein said moving and guide means includes at least one guide member pivotable about an axis parallel to and offset from a plane passing through said spindles, said bobbin tube gripping means being mounted on said guide member for selective movement along the length thereof between said spindles and said tube receiving elements.

9. An apparatus as defined in claim 8 wherein said moving and guide means further includes means for driving said bobbin tube gripping means along said guide member under control of said control means.

10. An apparatus as defined in claim 9 wherein said moving and guide means further includes means for pivoting said guide member about said axis under control of said control means during movement of said bobbin tube gripping means from said spindles and said tube receiving elements.

11. An apparatus as defined in claim 10 wherein said guide member is provided in the form of a bell-crank with said bobbin tube gripping means engaging one arm thereof and said means for pivoting said guide member including drive means connected to the other arm thereof for effecting tilting of said one arm.

12. An apparatus as defined in claim 11 wherein said drive means includes a cylinder having a piston therein connected to said other arm of said bell-crank and means for actuating said piston between first and second respective positions placing said bobbin tube gripping means in substantial alignment with said spindles and said tube receiving elements or displaced therefrom, respectively.

13. An apparatus as defined in claim 11 wherein said drive means includes an eccentric shaft and a motor for rotation thereof, and said other arm of said bell-crank is provided with a slot engaging said eccentric shaft.

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14. An apparatus as defined in claim 9 wherein said means for driving said bobbin tube gripping means includes an endless chain mounted for rotation between the ends of said guide member, said chain being connected to said gripping means, and means for rotating said chain. 5

15. An apparatus as defined in claim 9 wherein said means for driving said bobbin tube gripping means includes a threaded shaft serving as said guide member and being in threaded engagement with said gripping means, and means for rotating said shaft adjacent the position of said gripping means. 10

16. An apparatus as defined in claim 4 wherein said control means is provided for controlling said moving and guide means and said actuating means to effect substantially simultaneous removal of the full bobbin tubes from said spindles and replacement thereof by empty bobbin tubes by a respective gripper element of said bobbin tube gripping means. 15

17. An apparatus as defined in claim 5 wherein said full bobbin tubes are placed on said tube receiving means by said moving and guide means so as to alternate with empty tubes. 20

18. A method of removing full bobbins wound on

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tubes on a series of spindles of a spinning or twisting machine using a tube gripping apparatus and replacing said full bobbins by empty tubes on said spindles comprising gripping the tubes of said full bobbins with said gripping apparatus,

removing said bobbin tubes substantially simultaneously from the spindles,

transporting to and placing said full bobbins on a tube receiving means,

releasing said full bobbins and moving empty tubes adjacent to said gripping apparatus,

gripping said empty tubes with said gripping apparatus, moving the tubes substantially simultaneously to the spindles vacated by said full bobbins,

placing said empty tubes on said vacated spindles, and withdrawing said gripping apparatus to its rest position.

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WILLIAM S. BURDEN, *Primary Examiner.*