(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 448 530 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **91830104.5**

(51) Int. Cl.[5]: **D01H 9/18**, B65H 67/06

(22) Date of filing: **15.03.91**

(30) Priority: **20.03.90 IT 934990**

(43) Date of publication of application:
25.09.91 Bulletin 91/39

(84) Designated Contracting States:
BE DE ES FR GB

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(54) Means for the supply of full reels and removing empty tubes from a continuous spinning machine.

(57) The means for the supply of continuous spinning machines with reeled material comprises: a frame (3) extending longitudinally along the spinning machine (1), guide means (17) upon the said frame for a carriage (19) which can move along said spinning machine, means (5A, 5B, 7) for suspending reels of the material which is to be fed to the spinning machine which are fixed with respect to the frame, and on said carriage (19), means (23, 25) for handling the reels and tubes, the means (23, 25) for handling the reels and tubes incorporating a support (23) for supporting the reels which is brought up from beneath against the means (5A, 5B, 7) for suspension of the reels in order to transfer the reels from the carriage to the means of suspension.

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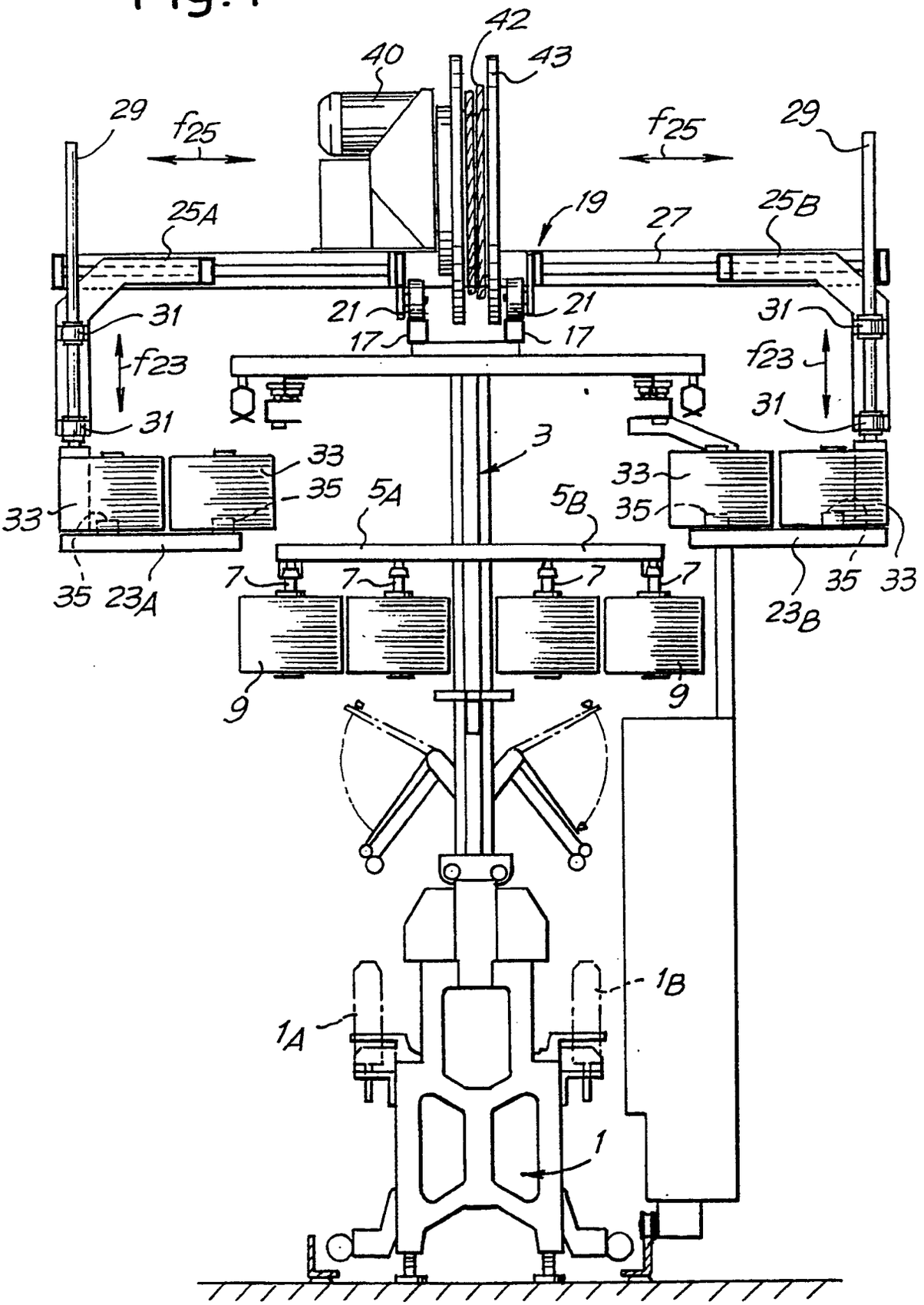
Fig. 1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MEANS FOR THE SUPPLY OF FULL REELS AND REMOVING EMPTY TUBES FROM A CONTINUOUS SPINNING MACHINE

The invention relates to means for the supply of continuous spinning machines with reeled material, and in particular to means of the type comprising a frame extending longitudinally along the spinning machine, guide means upon said frame for a carriage which can move along said spinning machine, means for suspending reels of the material which is to be fed to the spinning machine, and on said carriage, means for handling the reels and tubes.

Equipment of this type is known for example from European patent application 878301225 (publication no. 0 240 473). This equipment provides for a series of units supporting the reels of material which is to be fed to the underlying spinning units, each of which comprises a plurality of supporting mandrels for said reels, part of said mandrels extending upwards and part extending downwards. While the mandrels extending downwards support the reels of material which is fed to the underlying spinning machine, the upwardly directed mandrels receive new reels of material from the moving carriage which replace those beneath when these have been used up. Empty reels are replaced by full reels by rotating the member supporting said mandrels through 180 . This involves the need for a unit to rotate each reel support unit. This results in rather costly equipment which is difficult to operate.

The object of the invention is equipment of the abovementioned type whereby one or more spinning machines can be automatically supplied with reels of the material which is to be spun, in a simpler and more economical manner, and in a manner which is easier to operate.

These and other objects which will be clear to those skilled in the art from a reading of the following text are achieved through means in which the means for handling the reels and tubes supported by said carriage which moves along the spinning machine comprise a support upon which the reels rest, which is placed alongside the means for suspension of said reels to transfer the reels from the carriage to the suspension means, said suspension means being fixed with respect to the frame. The resulting means thus has a series of reel suspension means along the spinning machine which are substantially fixed and do not therefore require motor means in order to replace the reels, as occurs in the known means according to the state of the art. Reels are supplied to the suspension means through the carriage, the handling means of which are effectively the only moving parts in the entire device. This makes the equipment both simpler and more economical from the manufacturing point of view, and also simpler to operate, in that the programming means have to operate only the carriage automatically and not the individual reel support units above the spinning machine.

It should also be noted that the means according to the invention may easily be applied to an existing spinning installation of the completely manual type, thereby simply and quickly effecting complete automation of reel feed operations. In fact traditional spinning installations which make no provision for the automation of reel replacement have fixed supports, in the form of creels or the like equipped with mandrels, upon which are suspended the reels from which the roving is drawn off to the underlying spinning units. Empty tubes are replaced by full reels manually and no automatic means of transport and handling are provided. With the means according to the invention, these installations can be fully automated simply by the addition of a track on which the carriage may run, without in any way modifying the preexisting reel support structure.

Other particularly advantageous embodiments of the means according to the invention will be described in the appended subsidiary claims.

The invention also relates to a spinning installation comprising at least one continuous spinning machine and means for feeding reels of material to said spinning machine, characterized in that it comprises means for supplying reeled material of the type described above.

The invention will be better understood from the description and the appended drawing which shows a non-restrictive practical embodiment of the invention. In the drawing:

Figure 1 shows a diagrammatical transverse cross-section of a spinning machine equipped with the means according to the invention,

Figure 2 shows a cross-section similar to that in Figure 1 with the means in a different arrangement,

Figure 3 shows a side view of a portion of the spinning machine in Figure 1,

Figure 4 shows a plan view along IV-IV in Figure 3,

Figure 5 shows a diagrammatical plan view of a spinning installation with several spinning machines, an area in which the reels of material which is to be spun are stored, and machines for producing these reels,

Figure 6 shows a diagrammatical side view in partial cross-section of a shuttle for feeding bobbins to the carriage which moves along the spinning machine,

Figure 7 shows a diagrammatical transverse cross-section along VII-VII in Figure 6,

Figure 8 shows a cross-section along VIII-VIII in

Figure 7, and

Figure 9 shows a side view in partial cross-section of a mandrel for supporting the reels with releasable means of restraint.

Initially with reference to Figures 1 to 4, 1 indicates a continuous spinning machine as a whole, for example a so-called ring spinning machine, provided with two banks of spindles 1A and 1B. Each bank may include a large number of spindles, even several hundreds per bank. Above spinning machine 1 there extends a frame indicated as a whole by 3, bearing a plurality of arms 5A and 5B, each of which bears, in the example illustrated, two mandrels 7 for supporting reels 9 of material which is to be fed to the underlying spinning units 1A, 1B. Mandrels 7 supporting reels 9 are advantageously of the type illustrated in Figure 9, with releasable expansion mechanisms. These mandrels, of a type which are in themselves known, incorporate expansion fins 11 mounted at the end of the mandrel, the draw-off movement of which is controlled by an internally releasable mechanism, which is not illustrated and which is in itself known, activated by a collar 13 which moves along body 14 of mandrel 7. Collar 13 of frustoconical shape is able to act in concert with the upper edge of the tube of each reel in such a way that pressure on said tube causes collar 13 to move and as a consequence activates the mandrel release device. Mandrel 7 is attached to corresponding arm 5A or 5B by means of a joint 15 which allows limited oscillation of said mandrel with respect to the supporting arm so as to assist drawing-off of the roving from the reel while the spinning operation is in progress.

As the operation of spinning the material from reels 9 supported by mandrels 7 proceeds, the abovementioned reels gradually become exhausted and therefore have to be replaced by full reels. For this purpose guide means 17 in the form of a pair of rails are provided on frame 3 for the movement of a carriage indicated as a whole by 19, which picks up full reels from one or both of the two ends of the spinning machine and transports them to support means 5A, 5B, 7, where the reels supported by mandrels 7 are running out and have to be replaced. As illustrated diagrammatically in Figures 1 to 4, carriage 19, equipped with wheels 21 to run upon and to be guided along rails 17, has four supports indicated by 23A, 23B, 23C and 23D respectively. Each of supports 23A, 23B, 23C and 23D is carried by a corresponding slide 25A, 25B, 25C and 25D. Each slide 25 is secured to carriage 19 by means of guides 27, and can make horizontal and transverse movements with respect to the axis of the spinning machine in order to bring corresponding support 23 closer to and further from the median plane of corresponding spinning machine 1. Also each support 23 is secured to corresponding slide 25 by means of a pair of guide rods 29, which can slide in guide bushes 31 integral with corresponding slides 25 in such a way as to allow vertical raising and lowering movement of said supports 23 with respect to frame 3 of the spinning machine and with respect to reel supporting means 5A, 5B, 7. Actuator means incorporating a hydraulic piston, a thread with recirculating ball bearings, a rack and pinion or other such system, not illustrated, control the movement of slides 25 with respect to carriage 19 and other actuators which are not illustrated control the movement of supports 23 with respect to corresponding slides 25. Definitively therefore, supports 23A, 23B, 23C and 23D may be moved independently of each other both vertically and horizontally with respect to reel supports 5A, 5B, 7 suspended above the spinning units of spinning machine 1. Through their movements said supports 23A, 23B, 23C and 23D can pick up empty tubes and replace them with full reels in the manner described below.

In order to pick up the empty tubes attached to mandrels 7 and replace them with new reels of the material to be spun, carriage 19 picks up a set of new reels to replace those which have run out using two of its own supports 23, for example supports 23A, 23B, in a manner which will be described below. As shown in the example illustrated in the drawing, supports 23 can each accept eight reels in such a way that carriage 19 can replace up to 16 reels simultaneously in a single operation. While opposing supports 23A, 23B are loaded with full replacement reels, indicated by 33 in Figures 1 to 3, the other supports 23C and 23D are empty and are used to pick up the empty tubes from mandrels 7 so that they can be replaced by new reels 33. With this object empty supports 23C, 23D are first lowered in the direction of arrow f23 (Figures 1 and 2) and then moved towards the median plane of spinning machine 1 so as to place a set of pins 35, illustrated by dashed lines in Figures 1 to 4, opposite corresponding mandrels 7 and therefore opposite the corresponding tubes which have to be removed. At this point an upward movement of supports 23C and 23D in the direction of arrow f23 causes contact between the corresponding tubes and said supports 23C and 23D and thus the lifting thereof which causes corresponding collars 13 of mandrels 7 to slide so as to operate the mechanism which controls the inward movement of fins 11 of mandrels 7. In this way the empty tubes are released from mandrels 7 and rest on corresponding supports 23C, 23D, remaining in a vertical position thereupon as a result of pins 35. At this point supports 23C and 23D can be lowered again and moved away from the axis of the spinning machine, and carriage 19 can then be moved so as to move supports 23A, 23B opposite arms 5A, 5B, from which the corresponding empty tubes are removed: supports 23A and 23B can be moved below and opposite mandrels 7 by a lowering and approach movement towards the axis of the spinning machine in the direction of arrows f25 and f23 as

in the case of supports 23C and 23D in the previous stage of the removal of empty tubes. The position adopted by carriage 19 and its systems at this point is that illustrated in Figure 3. Supports 23C and 23D are on the left of the drawing and carry the empty tubes indicated by 37: supports 23A and 23B are on the right, positioned in such a way as to offer full reels 33 to empty mandrels 7 above, which are ready to receive said reels 33. This arrangement is also illustrated in transverse cross-section in Figure 2. Subsequent partial lifting of supports 23A and 23B in the direction of arrow f23 causes the collars 13 of corresponding mandrels 7 to be activated, fins 11 to be released outwards and thus reels 33 to be secured to the abovementioned mandrels 7. Subsequently supports 23A and 23B can be partly lowered in the direction of f23, moved away from the median plane of spinning machine 1 in the direction of arrows f25 and raised again in the direction of arrows f23 to adopt a position in which carriage 19 can again be moved away from the position in which the reel replacement operation was performed and thus again moved to the end of the spinning machine to set down the empty tubes supported on its supports 23C and 23D and pick up a new set of sixteen reels using supports 23A and 23B to make a further replacement in another section of the spinning machine.

From what has been described it is obvious that the operations of replacing the empty tubes with full reels in the various sections of spinning machine 1 are made extremely simple and rapid by carriage 19, which is the only member which has means for handling the tubes and reels, while the remainder of the equipment consists exclusively of fixed or in any event non-motorised members. Carriage 19 is moved along rails 17 by motor means 40 which receives power and control pulses via a cable 42 wound on a drum 43. The pulses for controls to the actuators which effect the vertical and horizontal movements of supports 23 and slides 25 also pass through this cable 42. The supply to motor 40 may also be provided from batteries carried by carriage 19. The control pulses for the handling systems may also be transmitted by infrared rays, radio, or by other means, instead of by cable.

Carriage 19 may be used to replenish one or several spinning machines, depending on the times necessary for loading and for handling individual reels, and also on the length of the spinning machine. Figure 5 illustrates a schematic arrangement of a spinning installation comprising a plurality of spinning machines 1, each of which is equipped with rails 7 for the movement of carriage 19. This carriage 19 may serve several parallel spinning machines 1, and with this object is provided with a shuttle 51 which can move parallel to the front of spinning machines 1 and transverse to the axis of said spinning machines in the direction of arrow f51, which can transport carriage 19 from one of the various spinning machines to another. Shuttle 51 also has a store of reels and means for loading said reels from the store onto carriage 19, which then distributes them along corresponding spinning machines 1. Opposite the area in which shuttle 51 moves in relation to the span of spinning machines 1 there is provided a storage area 53 in which pallets with full reels are positioned by an overhead crane or by other means not illustrated, after the reels have been produced by appropriate machines which are in themselves known and indicated generally by 54.

Figures 6 and 7 show shuttle 51 and the means for loading the reels from said shuttle onto carriage 19 positioned thereon in greater detail. It is however obvious that shuttle 51 may also be replaced by fixed means for loading carriage 19, in particular when the latter serves a single spinning machine, and does not therefore have to be transported from one spinning machine to another.

Shuttle 51 has a frame 55 with four wheels 57 to run on its supporting plane. A motor/reduction gear 59 controls rotation of two of the four wheels 57 via a shaft 61. Shuttle 51 has a store for reels 63, which are stacked on rods 65 on a frame 67, 68. Frame 67, 68 has a first lower portion 68 with which rods 65 are integral, and a second upper movable portion 67 on which reels 63 rest. Raising of movable portion 67 upwards (achieved in the manner described below) causes reels 63 to slide off rods 65 for the purposes indicated below. Rods 65 are positioned in a manner corresponding to the arrangement which the reels must adopt on carriage 19 in order to be loaded onto spinning machine 1. More particularly frame 68 bears sixteen rods 65 in a symmetrical arrangement with respect to the plane of symmetry of the shuttle, in two groups of eight rods, each group having two rows of four rods each. The upper portion 67 of frame 67, 68 can be gradually raised by chain means 70 attached to slides 79 integral with guide bushes 77 which run along tubular guide bars 69 supported by uprights 71. Chains 70 are controlled by a shaft 73 operated by a motor/reduction gear 75. Projections 81 which engage the upper portion 67 of frame 67, 68 causing it to rise when said slides 79 are moved upwards by chains 70 are integral with slides 79. The upward movement supplies carriage 19 with reels 63 placed in layers on said frame 67, 68.

The arrangement of frame 67, 68 with rods 65 as described above makes it possible to handle reels of different diameter using the same equipment, given that the reels are centred by means of rods 65 with reference to the internal surface of the corresponding tubes and not as happens in known equipment with reference to the outer surface of the reels and the walls of their containers.

Shuttle 51 has in a central position a structure 83 to support a pair of rails 85 which support wheels 21 of carriage 19 when the latter is positioned above

shuttle 51. Structure 83 also bears two tubular guide bars 87 on either side of the shuttle (Figure 6) for the movement of guide bushes 89 integral with a shaped beam 91 to which are secured arms 93 which bear releasable mandrels 95 of a type similar to mandrels 7 provided on the frame of spinning machine 1. Mandrels 95 may also be of the pneumatically or similarly controlled type, instead of having a mechanical release control. Each of the two shaped beams 91 placed on the two sides of shuttle 51 can be raised and lowered by a pair of central actuators 97, 98 for a guided lifting and lowering movement of tubular rods 87. A lowering movement of shaped beam 91 by means of lower actuator 98 causes mandrels 95 to take up the same position as the tubes on which reels 63 of the underlying reel store are wound. Subsequent raising of upper portion 67 of frame 67, 68 by means of chains 70 causes the upper layer of reels 63 to move and be inserted on mandrels 95, which thus secure reels 63 from the upper layer of reels stored on shuttle 51. With the subsequent raising of shaped beam 91 the abovementioned upper layer of reels 63 is also raised so as to bring it to the height illustrated in Figures 6 and 7. In this position reels 63 can be released from mandrels 95 and supported on supports 23A and 23B of carriage 19 by means of a procedure similar to that used to release the empty tubes from mandrels 7 of the frame of spinning machine 1. More particularly, from the arrangement illustrated in Figure 7, supports 23A and 23B are displaced in the direction of arrow f towards the centre of shuttle 51 in order to align pins 35 with mandrels 95. At this point shaped beam 91 is lowered by means of upper central actuator 97 so as to bring reels 63 to rest on supports 23A, 23B, and in this way release mandrels 95 which release reels 63 onto supports 23A and 23B, on which they remain in position until subsequently transferred onto corresponding spinning machine 1 in order to replace empty tubes in accordance with the procedure described above with reference to Figures 1 to 4.

While the rear portion of shuttle 51 (on the right in Figure 6) is used to load full reels onto supports 23A, 23B of carriage 19, the front portion of shuttle 51 (on the left in Figure 6) is used for unloading the empty tubes placed on supports 23C and 23D of carriage 19. An arrangement similar to that described above for loading full reels 63 is provided for unloading the empty tubes from supports 23C and 23D. More particularly the central structure 83 of shuttle 51 has further tubular guide rods 101, in addition to tubular rods 87, on which are mounted bushes 103 integral with a shaped beam 105 similar to shaped beam 91 and bearing a series of arms 107, each of which is equipped with mandrels 109, in a similar way to arms 93 equipped with mandrels 95. Mandrels 109 may be of the mechanical release type or of the pneumatically controlled type or the like. When carriage 19 is located on shuttle 51 supports 23C and 23D are located beneath mandrels 109, in a position such as to bring corresponding pins 35 with empty tubes 37 into alignment with the corresponding mandrels 109 borne by arms 107. Two coupled actuators 115, 116 located at the centre of each shaped beam 105 are used to raise and lower said beam. When supports 23C, 23D are positioned, with the empty tubes supported upon them, below mandrels 109, actuator 115 causes mandrels 109 to move downwards and therefore become inserted in the tubes beneath, which are secured by said mandrels to be then lifted together with shaped beam 105 by means of a reverse movement of actuator 115. The position adopted by the tubes is indicated by 37 in Figure 6. At this point supports 23C and 23D are moved away from the median plane of shuttle 51 by a distancing movement. Transverse members 111, which extend under mandrels 109 and bear a plurality of pins 113 in alignment with said mandrels 109 are provided for subsequent unloading of the tubes from mandrels 109 attached to shaped beam 105. Shaped beam 105 is lowered by means of lower actuator 116 (corresponding to actuator 98) so that tubes 37 are caused to rest on the underlying transverse members 111 with pins 113 inserted in the central hole of corresponding tubes 37. Subsequent further lowering of beam 105 causes the release means of mandrels 109 to be released and thus tubes 37 to be released upwards to corresponding transverse members 111 in the position indicated by 37X in Figure 6. Transverse members 111 may at this point be caused to rotate about an axis A-A so as to unload overlying tubes 37X into a plurality of cradle seats 117 borne by a flexible transport member 119 in which the empty tubes take up position 37Y. Flexible transport member 119 moves in the direction of arrow f119 and carries tubes 37Y towards a conveyor belt 121 which extends transversely along the front of spinning machines 1 (Figure 5) and discharges the empty tubes into a collection area which is not shown. The movement of transverse members 111 is such that the empty tubes take up a position 37Y with a constant orientation in cradles 117. In this manner the tubes are unloaded onto , conveyor belt 121 all with the same orientation, which aids the subsequent removal of remains of roving from the tubes before they are subsequently reused.

It is however obvious that the tubes may also be gathered in a different manner, for example within a container borne by the same shuttle 51. In this case transporter 119 and conveyor belt 121 will no longer be necessary.

Supporting frame 67, 68 for reels 63 is supported on a structure 131 constructed using a boxed section forming a closed rectangular frame positioned within shuttle 51 close to the base thereof. Structure 131 can move on rollers 133 (see in particular Figures 7 and 8) placed along the long sides of structure 131, above

and below it, to provide guided movement with respect to shuttle 51. Structure 131 may be withdrawn from shuttle 51 in the direction of arrow f131 by means of an actuator 135. When in the drawn out position a frame 67, 68 loaded with reels 63 may be supported on structure 131. Figure 5 shows the position adopted by structure 131 in the drawn out arrangement for loading a frame 67, 68 of full reels by means of an overhead crane which is not illustrated, which picks up said frame from storage area 53.

It is to be understood that the drawing only shows one example given merely as a practical demonstration of the invention, which may be varied in shape and arrangement without thereby going beyond the scope of the concept embodying the invention itself. The presence of reference numbers in the appended claims is intended to aid reading of the claims with reference to the description and the drawing, and does not restrict the scope of the protection represented by the claims.

Claims

1. Means for the supply of continuous spinning machines with reeled material comprising: a frame (3) extending longitudinally along the spinning machine (1), guide means (17) upon said frame for a carriage (19) which can move along said spinning machine, means (5A, 5B, 7) for suspending reels of the material which is to be fed to the spinning machine, and on said carriage (19) means (23, 25) for handling the reels and tubes; in which said means (23, 25) for handling the reels and tubes comprise a support (23) upon which the reels rest, which is placed alongside the means (5A, 5B, 7) for suspension of the reels to transfer the reels from the carriage to the suspension means, said suspension means (5A, 5B, 7) being fixed with respect to the frame (3).

2. The means as claimed in claim 1, in which the support (23) is able to be raised and lowered by a vertical movement and make horizontal movements towards and away from the means (5A, 5B, 7) for suspension of the reels in order to come alongside said means of suspension from beneath.

3. The means as claimed in claim 1 or 2, in which said carriage (19) comprises two independent supports (23) for handling the reels and tubes for each working bank supplied by it.

4. The means as claimed in one or more of the preceding claims, in which said suspension means (5A, 5B, 7) comprises mandrels (7) with release mechanisms (11, 13) to hold the reels.

5. The means as claimed in one or more of the preceding claims, in which said mandrels (7) are free to oscillate in a limited way with respect to said frame (3).

6. The means as claimed in one or more of the preceding claims, comprising in addition a shuttle (51) bearing a store of reels (63) to supply said carriage (19).

7. The means as claimed in claim 6, in which said shuttle (51) bears guide means (85) on which said carriage (19) is positioned while it is being supplied.

8. The means as claimed in claim 7, in which a carriage (19) supplies several spinning machines, said shuttle (51) transferring said carriage from one of said spinning machines to another.

9. The means as claimed in claim 7 or 8, in which said shuttle includes handling means (91, 93, 95, 97) to pick up the reels from the reel store and place them on the support (23) of the carriage (19).

10. The means as claimed in claim 9, in which said handling means (91, 93, 95, 97) comprise a moving frame (91, 93) bearing a plurality of support mandrels (95) for said reels (63).

11. The means as claimed in one or more of claims 7 to 10, comprising in addition handling means (105, 107, 109, 115) to unload the empty tubes from said carriage (19).

12. The means as claimed in claim 11, in which said handling means (105, 107, 109, 115) for unloading the empty tubes from said carriage (19) has a moving frame (105, 107) bearing a plurality of pick-up mandrels (109) for said tubes to pick the empty tubes from the support (23) of the carriage and unloading means (111) to pick up said tubes from the mandrels (109) of the frame and unload them onto means for removing them (119).

13. The means as claimed in claim 12, in which said means of removal comprise a conveyor (119) with a flexible member borne by said shuttle (51), which transports the empty tubes on a conveyor belt (121) which carries them away from the shuttle (51).

14. The means as claimed in claim 12 or 13, in which the unloading means (111) are constructed in such a way as to unload the tubes onto said means (119) of removal in such a way that the axes of the tubes all have the same orientation.

15. The means as claimed in one or more of claims 6 to 14, in which a frame (67, 68) for supporting the reels (63), which has a first lower portion (68) which is fixed with respect to the shuttle (51) and is equipped with rods (65) on which said reels (63) are placed, and a second movable portion (67) to slide said reels (63) off said rods, is provided in said shuttle (51).

16. The means as claimed in one or more of claims 6 to 15, in which said shuttle (51) comprises a structure (131) which can be drawn out and upon which is placed a frame (67, 68) for supporting the reels (63).

17. A spinning installation comprising at least one continuous spinning machine and means for feeding reels of material to said spinning machine, comprising means for supplying reeled material in accordance with one or more of claims 1 to 16.

Fig.1

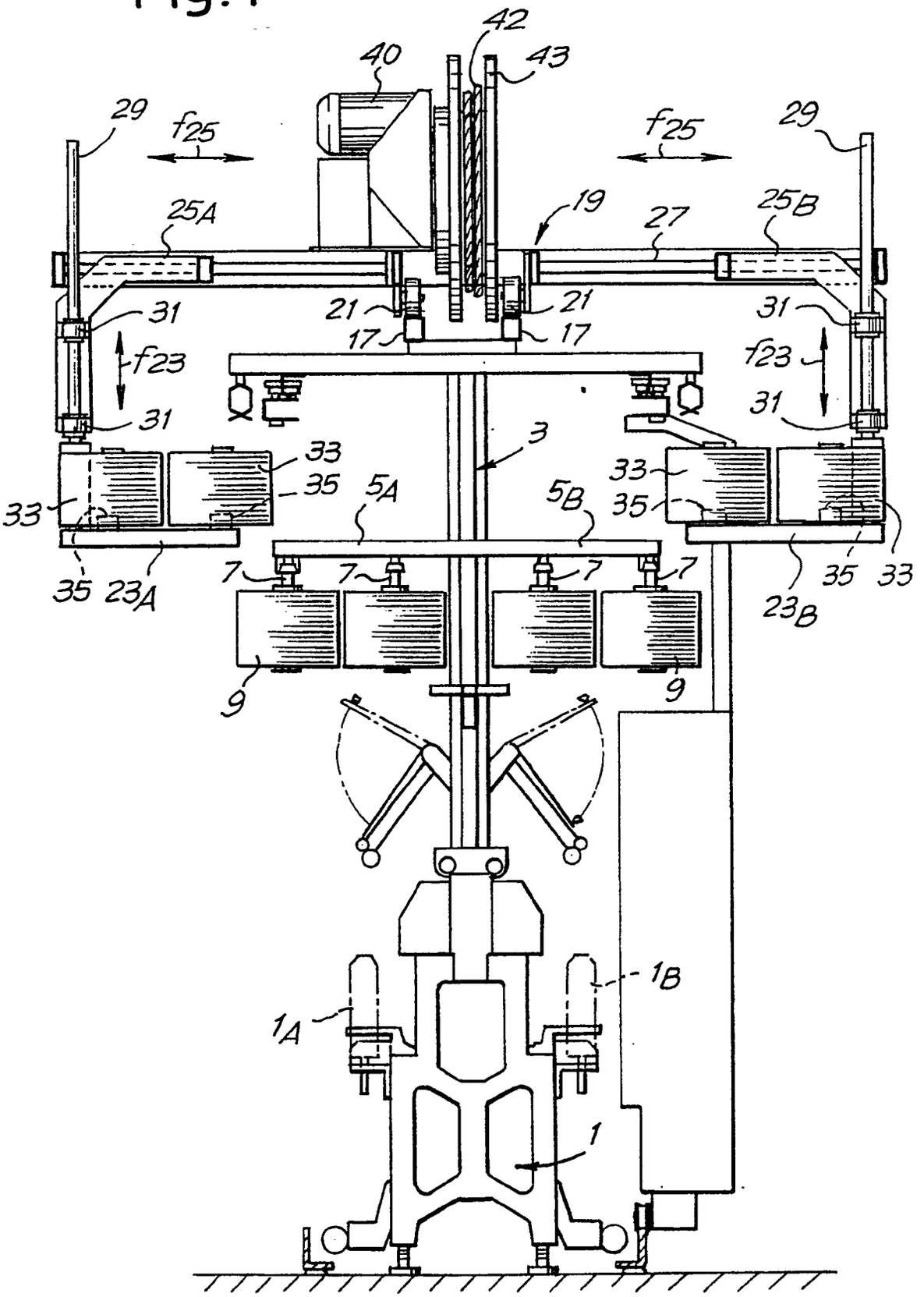
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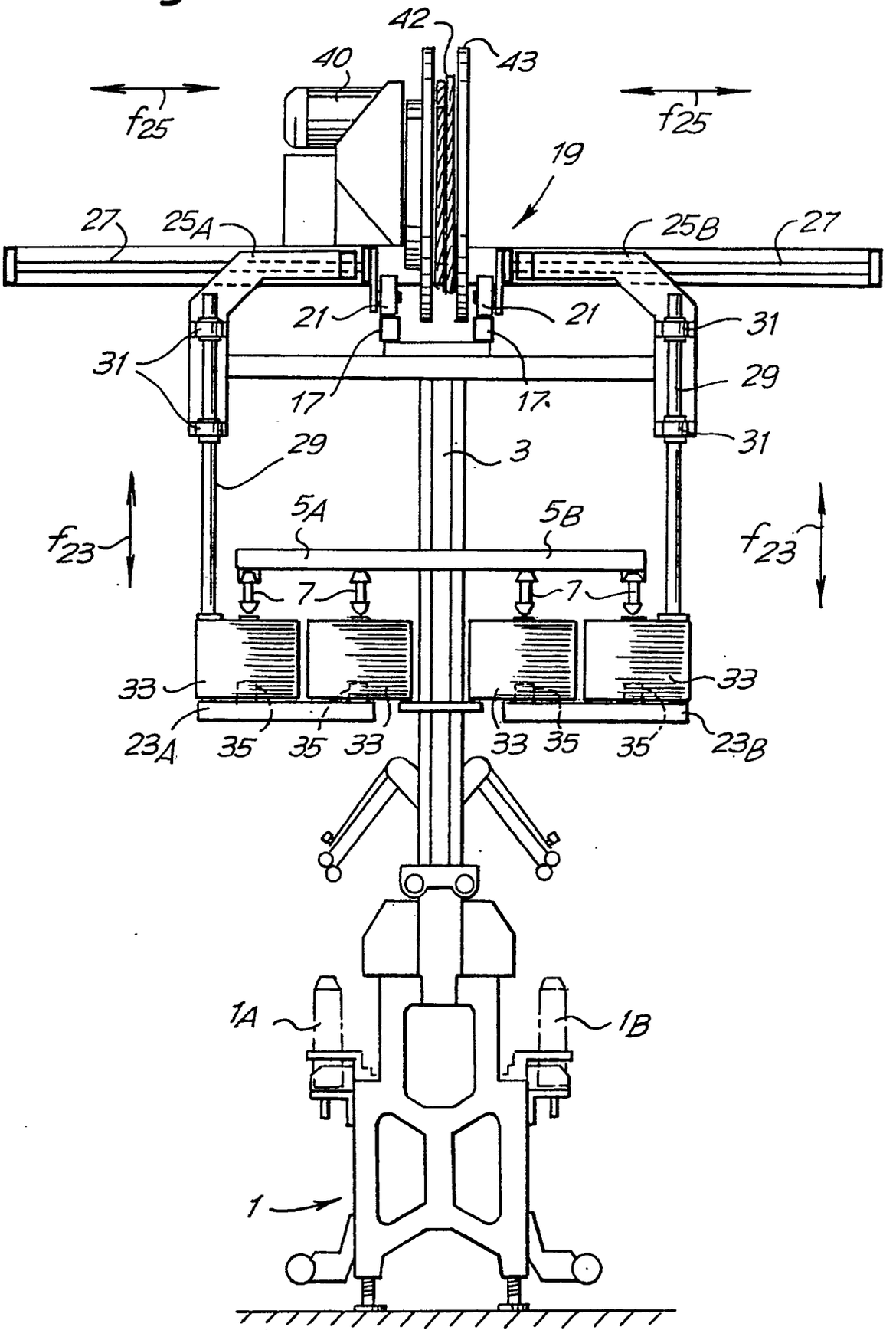
Fig. 2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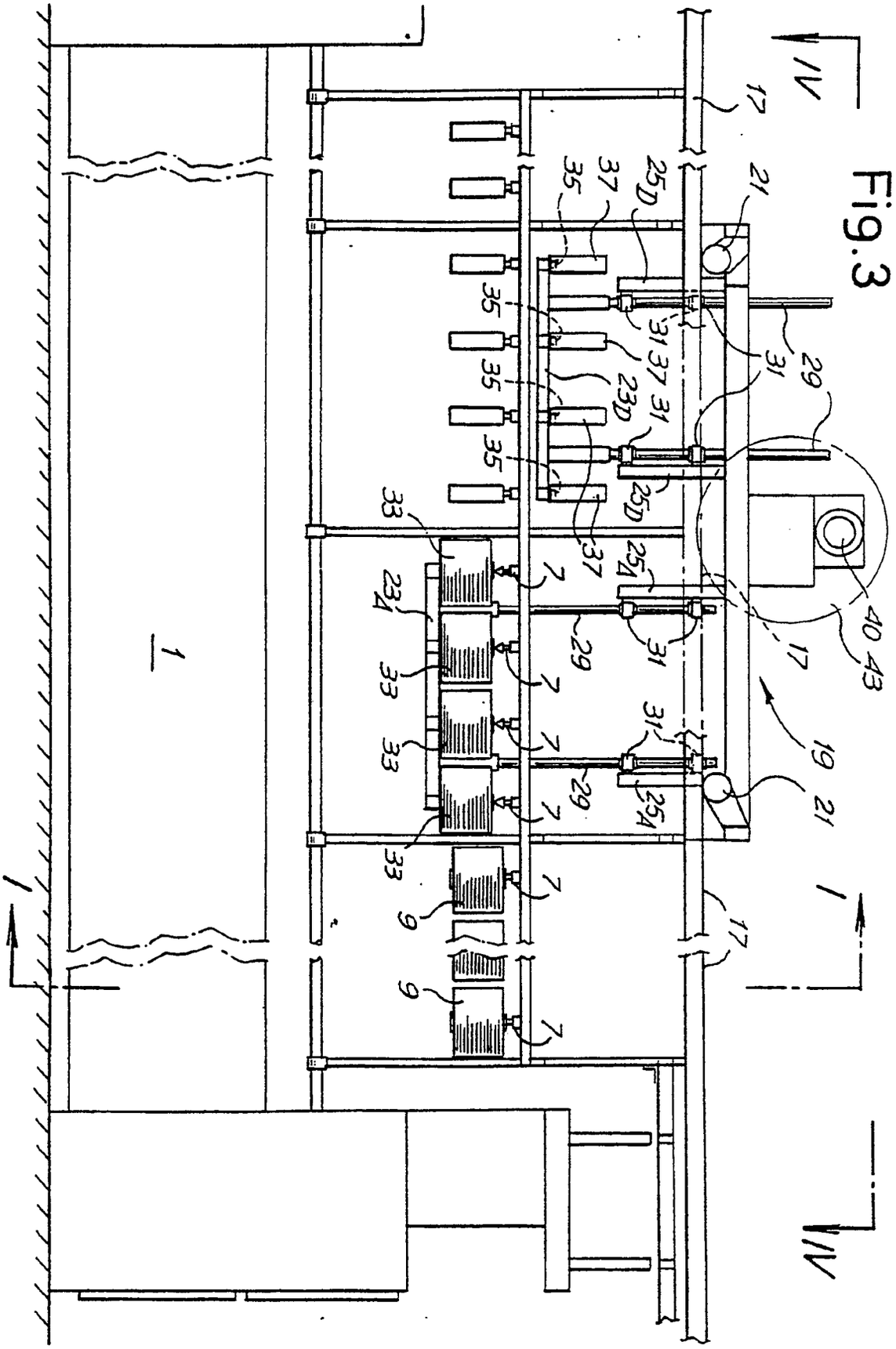

Fig.3

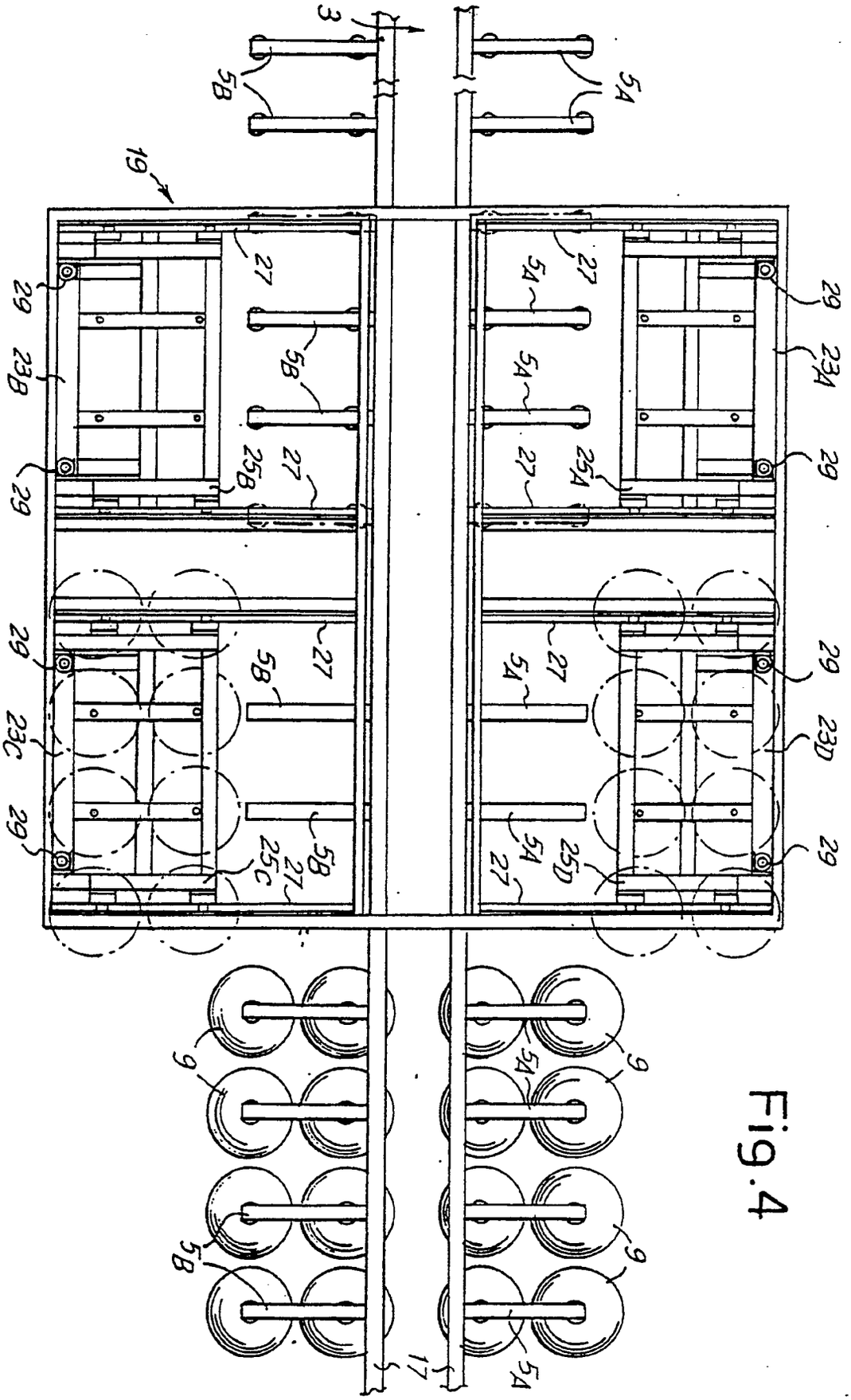

Fig.4

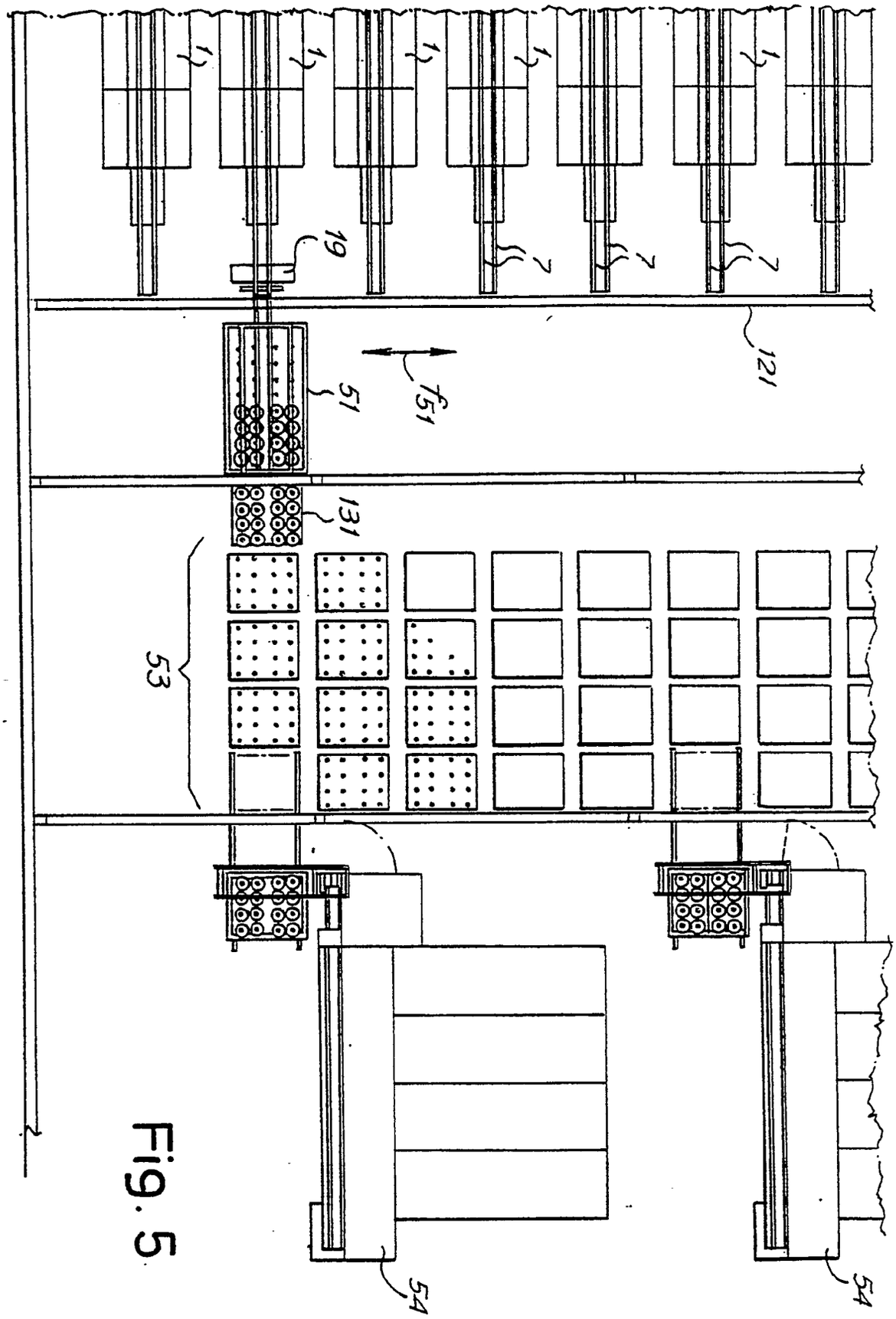

Fig. 5

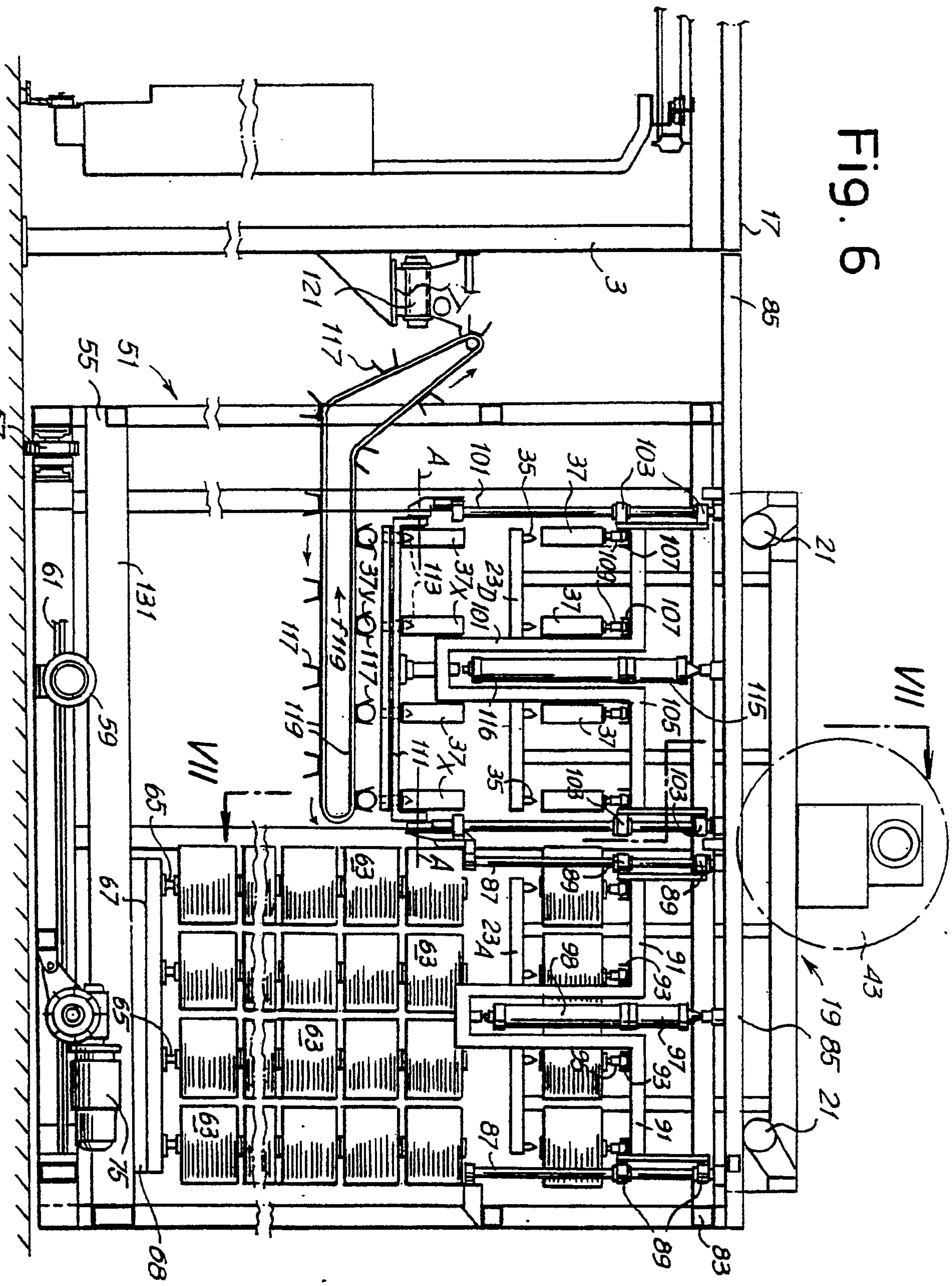

Fig. 6

Fig. 7

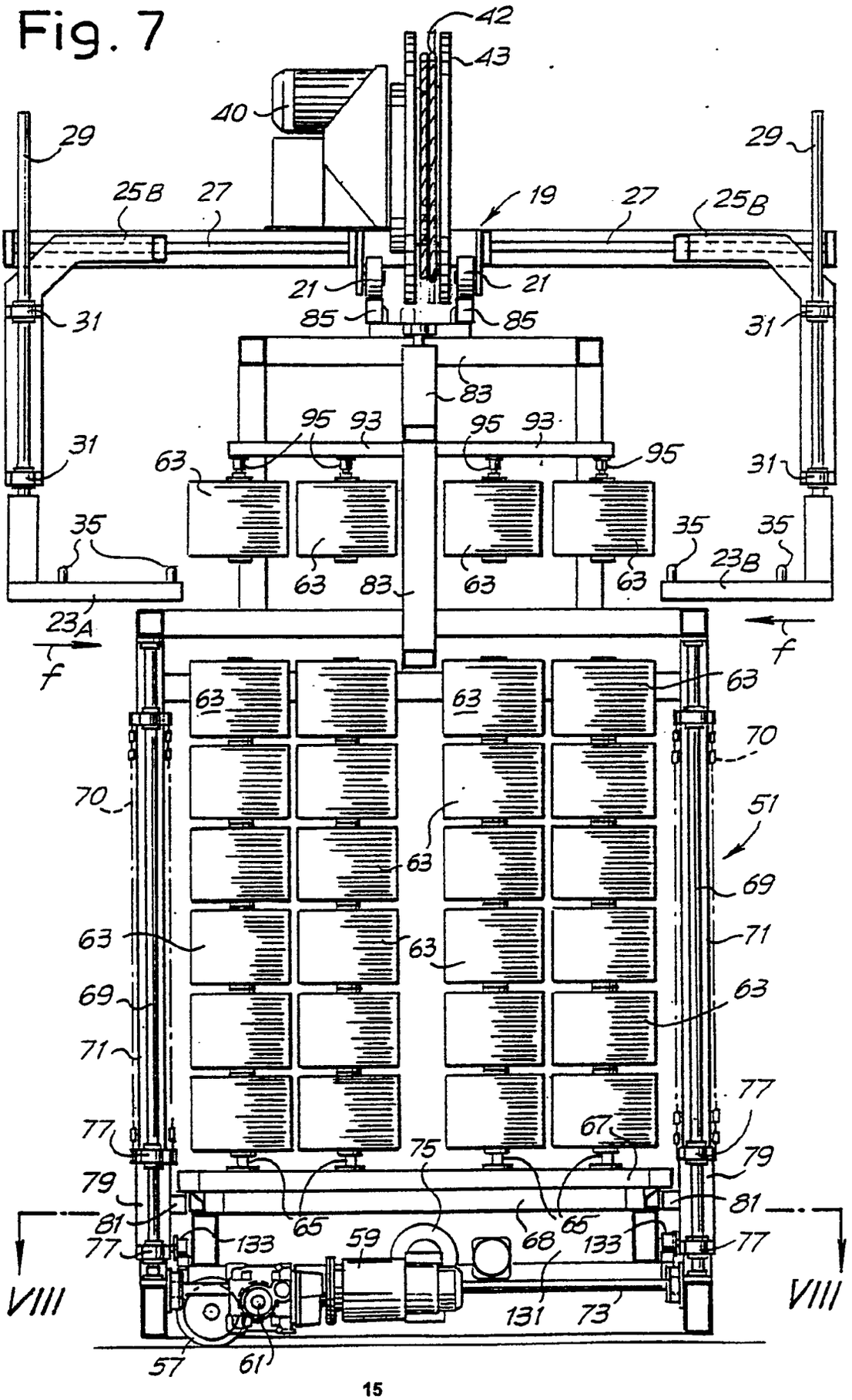
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Fig. 8

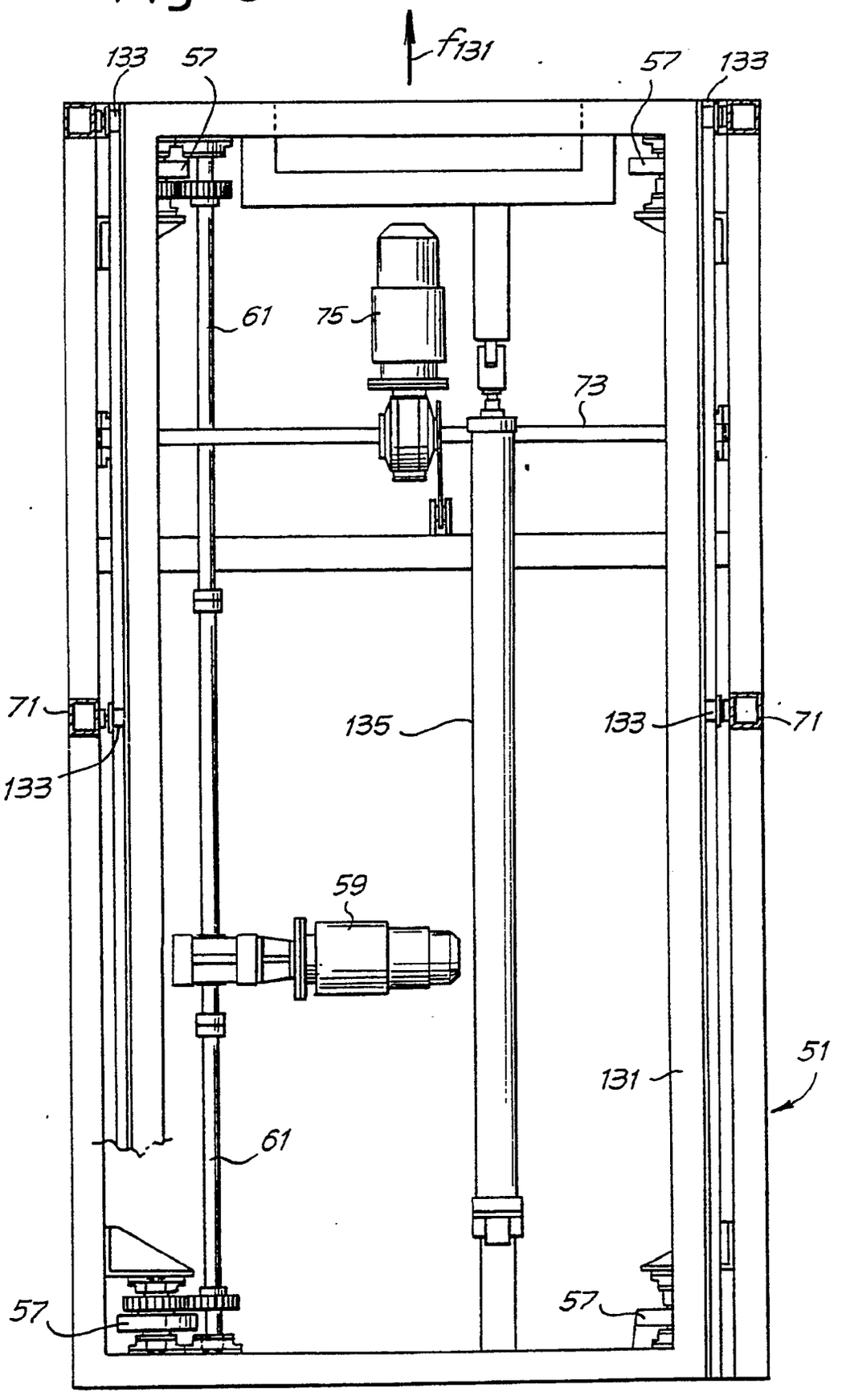

Fig. 9