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(54) **Apparatus and method for conveying winding tubes to ring spinning spindles and aligning them therewith.**

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Description

This invention relates to an apparatus and a method for conveying both winding tubes empty of wound yarn and winding tubes filled with wound yarn on holding pegs rigidly fixed to the upper part of a plurality of flat elements and for aligning the tubes in correspondence with the spinning spindles of a ring spinning machine, said apparatus being arranged to serve and to cooperate with an automatic doffing device in the ring spinning machine.

This apparatus, for conveying and positioning winding tubes and the pegs holding said winding tubes, is used in operational correlation with an automatic doffing device which automatically removes the winding tubes filled with wound yarn from the spindles and replaces them with a like number of tubes empty of wound yarn to allow further yarn collection. Said spindles are normally the spinning machine of a ring spinning machine.

The tubes when filled with yarn are the so-called yard packages, which accumulate the yarn spun by the individual spindles.

In modern ring spinning machines the tendency is to completely mechanise the operations involved in conveying and withdrawing the yarn-wound tubes or the yarn-free tubes and replace manual operations by suitable automatic devices and equipment.

Ring spinning machines are already known which incorporate automatic doffing devices.

Whatever their structure and method of operation, all known devices have the common problem of correctly feeding the winding tubes empty of wound yarn to replace the tubes filled with wound yarn, these latter being automatically withdrawn from the spinning spindles.

In the present case, the preference is for a device with gripper elements projecting from a longitudinal bar which is driven with the necessary movement for simultaneously withdrawing all the tubes filled with wound yarn from the spindles and simultaneously positioning tubes empty of wound yarn on all said spinning spindles in suitable sequence. After each gripper element has handled one tube filled with wound yarn, it is made to grip a tube empty of wound yarn and mount it on the spindle. The gripper elements the levers or the other means of the automatic doffing device do not form part of the present invention and can therefore be of any constructional type suitable for this purpose. They will therefore be neither represented on the accompanying drawings nor described in the description.

The automatic doffing device in ring spinning machines is known to function in operational correlation with conveyors in the form of two endless flexible steel belts, one for each spinning face, which are driven by drive rollers along suitable guides carried by a fixed structure which extends longitudinally along the entire spindle line.

Said flexible belt conveyors comprise a plurality of pegs fixed to them at regular intervals for holding and supporting both the tubes filled with wound yarn which the gripper elements of the automatic doffing device have removed from the relative spindles, and for receiving and holding the tubes empty of wound yarn which are to replace the yarn packages extracted from the spindles.

The flexible belt conveyors, which extend along the entire length of the machine between the respective ends, can move horizontally and parallel to the machine length to bring the pegs coaxial with the axes of the various spindles.

It is thus possible to discharge the tubes filled with wound yarn and withdraw the tubes empty of wound yarn by means of the gripper elements of the automatic doffing device.

When doffing is complete and the tubes empty of wound yarn have been placed on the spindles, the flexible belts are made to resume their intermittent or continuous movement along the front sides of the spinning machine, and as this latter again starts to newly accumulate wound yarn the tubes filled with wound yarn are unloaded from the respective support pegs by known means and also, by known means, new tubes empty of wound yarn are loaded onto the pegs.

A conveyor apparatus of this type with flexible belts for moving the winding tubes is presented and described for example in US-A-3 382 659.

By way of example, current ring spinning machines can comprise many hundreds of spindles along a single working face. When the tubes are full of wound yarn they are withdrawn from the relative spindles and deposited in ordered arrangement on a belt or conveyor element.

For the tube withdrawal and replacement operation to proceed without any difficulty it is necessary for all the tube holding elements fixed to the flexible belt conveyor to assume positions which exactly correspond to the positions in which the gripper elements will make their withdrawal and deposition.

The conveyor system or device of the aforesaid U.S. patent and others of the known art operate on the friction drive principle. Devices of this construction are subject to more or less extensive slippage if the conveying length is long. To limit this slippage to acceptable values a considerable increase in the installed tension of the flexible conveyor belt is required in order to increase the contact pressure on the drive roller and so increase the friction force along the contact arc between said drive roller and the inner surface of the flexible belt which wraps it. This belt is susceptible to

longitudinal elastic deformation, which increases as the installed tension is increased and therefore gives rise to a increasing linear non-uniformity in the distance between the peg which hold the winding tubes. This compromises the operation of the entire conveying system during the action of the aforesaid automatic doffing device in the ring spinning machine.

In addition, said known belt conveyor devices with rigidly fixed pegs and friction drive suffer from further drawbacks.

In this respect, several lateral guide elements are required to prevent off-centered operation arising, this giving rise to lateral slippage of the flexible belt and, in the limit, its escape from the drive and return rollers. In this latter case, movement is blocked. The use of lateral guides complicates the construction and makes it expensive.

Furthermore, said lateral guides have to act with force-against the longitudinal edges of the flexible belt to retain it within the guide, and this results in rubbing friction which because of its abrasive effect is damaging for the entire flexible belt and increases the power required to drive said belt.

The aforesaid arrangements of the known art also present some constructional complication in obtaining precise positioning of the many hundreds of holding pegs which have to be fixed rigidly in an integral manner to the flexible belt. Even if said holding pegs, which follow each other along the flexible belt, are fixed by special means to limit the true tolerance of their pitch, they can, because of the series addition of tolerances, find themselves in an unsuitable position for proper operation with the gripper elements of the automatic doffing device.

In addition, the lengthy flexible belt used for conveying can after a prolonged period of operation suffer considerable wear and deformation which together with temperature variations can result in non-uniform pitch of the pegs. These latter no longer become correctly aligned with the winding tube feed and withdrawal means, and this results in blockage of the entire handling system which extends along the face of the ring spinning machine.

From DE-A-37 12 027 there is known a device and a process for conveying both winding tubes empty of wound yarn and winding tubes filled with wound yarn in a textile machine, having the features of the preamble of claims 1 and 7. In this known device the flat elements are guided by guide rails which are pushed forwards and returned intermittently. Means are provided for advancing the flat elements with their pegs during the forward moving stroke of the guide rails and for locking the flat elements in positions corresponding to the spindles during the return moving stroke of the guide rails. The pegs are thus positioned with satisfactory precision, but a complex structure is required owing to the arrangement of a locking means at each spinning position.

The object of the present invention is to obviate the aforesaid drawbacks by providing an apparatus and a method for conveying winding tubes filled with wound yarn or empty of wound yarn and for aligning them in correspondance with the spinning spindles along the faces of a ring spinning machine, which have the following advantages:

- the winding tube assembly is conveyed without the need for considerable drive force;
- the winding tubes can be moved automatically along any horizontal distance without even the minimum hindrance arising, the motion transmission being of high efficiency with perfect guiding along the entire path of movement;
- the apparatus is of simple construction, with very small transverse dimensions along its entire longitudinal extension, this being combined with simple operation such that the replacement of the tubes filled with wound yarn by the tubes empty of wound yarn can be carried out rapidly:
- even after a prolonged period of operation under substantial temperature variations, the exact repositioning of all the pegs holding their winding tubes in a manner aligned and coaxial with the respective spinning spindles is ensured so that the gripper elements of the automatic doffing device can simultaneously and with perfect operational reliability deposit all the tubes filled with wound yarn onto said pegs and, under the same conditions of operational reliability, successively and simultaneously grip all the tubes empty of wound yarn and withdraw them from said pegs;
- installation along and about existing spinning machines is possible without considerable constructional modification being required to the spinning machine itself.

These and further advantages are attained by an apparatus having the features claimed in claim 1 and by a method as claimed in claim 7. Preferred embodiments of the apparatus are claimed in claims 2 to 6.

The invention is described in detail hereinafter with reference to the embodiments which are shown diagrammatically on the figures of the accompanying drawings and for which further details and characteristics are given hereinbelow.

On the accompanying drawings:

Figure 1 is a diagrammatic isometric perspective view of an apparatus of the present invention which with two drive belts revolves along the two spinning fronts of the ring spinning

machine, of which those parts not required for an understanding of the invention have been omitted, the fixture also indicating the stage in which the assembly of tubes empty of wound yarn held on the relative pegs of the flat elements is stationary, said tubes having been positioned by the tensioning brake in positions perfectly coaxial with the axes of the spinning spindles on both faces, awaiting the commencement of automatic doffing, and further shows the clamping engagement between the tensioning brake and the last plate of the articulated chain, the flat elements of which are tensioned by the dragging movement of the two underlying endless mobile belts, one for each machine face;

Figure 2 is an isometric perspective view of a flat element of the articulated chain of Figure 1 to a slightly enlarged scale, this being connected by articulated swivel joints in the form of connecting rods to the two flat elements adjacent to it, ie the one which follows it and the one which precedes it, and also indicates diagramatically the presence on its lateral surface of a means identifiable by a position transducer which is also shown facing said means in close proximity thereto;

Figure 3 is a diagrammatic plan view of the tensioning brake supported by an underlying slide with its clamping lever mechanism in its open rest position immediately before being activated in order to engage the last flat element of the articulated chain;

Figure 4 is a diagrammatic plan view of the tensioning brake at the precise moment in which its lever mechanism, after being activated, commences its braking contact with the lateral surfaces of the last flat element, to slow down the movement of the articulated chain;

Figure 5 is a diagrammatic plan view of the tensioning brake with its lever mechanism clamped against the sides of the last flat element and its braking levers positioned against mechanical positioning elements which provide the clamping action and preserve the exact coaxiality between the pegs holding the winding tubes and the spindle axes along the two spinning faces;

Figure 6 is a diagrammatic perspective isometric view of the apparatus of the present invention in which the articulated chain of flat elements is subjected to movement about the spinning machine by the underlying endless mobile belts in order to discharge the tubes filled with wound yarn which have been previously withdrawn from the spindles by the automatic doffing device and simultaneously mount the tubes empty of wound yarn onto the pegs in order to restore the operational situation shown in Figure 1, and also shows known blocking levers which engage between the flat elements to cause these to intermittently advance stepwise for the upward withdrawal of said tubes filled with wound yarn and the simultaneous mounting of said tubes empty of wound yarn downwards onto the pegs;

Figure 7 is a perspective isometric view of the terminal part of the articulated chain to a slightly enlarged scale when in the curve transit position guided by lateral guides which extend along the entire endless track about the spinning machine, and also shows the connecting rod which forms the articulated swivel joint of adjustable length and the elements for connecting it to the flat elements;

Figure 8 is a diagrammatic perspective isometric view of an apparatus of the present invention extending about the entire ring spinning machine on several underlying drive belts, and shows the stage in which all the tubes empty of wound yarn are stationary as illustrated Figure 1.

In the figures like elements have the same reference numbers. Furthermore, for the purpose of clarity of the whole parts which are not necessary for the understanding of the invention like the driving assemblies for the varies drip belts and the various supporting structures as well as the winding tube supplying and doffing means have been omitted. In said accompanying figures:

1 is a flat element comprising on its upper part holding pegs, of which in the proposed preferred application one peg holds and supports the winding tube empty of wound yarn and the other peg holds and supports the winding tube filled with wound yarn. Said flat element 1 rests by gravity on the upper surface of an underlying mobile drive belt. 2 is the tube empty of wound yarn mounted on one of the two pegs which are rigidly fixed to the flat element 1. 3 is the machinery housing of the ring spinning machine having two opposing spinning faces formed from some hundreds of adjacent spindles one adjacent the other. 4 is the last element of the articulated chain ready to engage with the lever mechanism of the tensioning brake. 5 and 6 are the mobile flat belts arranged along the respective spinning faces to support and drive the articulated chain of mutually connected flat elements 1. Said endless mobile belts can be advantageously driven with continuous motion and thus free of electrical or electronic locks linked to the operating cycle sequences relative to the withdrawal, insertion and positioning devices for the winding tubes. 7 are the end structures, one opposite the other, of the ring spinning machine. 8 and 10 are arrows indicating the respective directions of motion of the upper branches of the two endless mobile belts 6 and 5. 9 and 11 are the

respective idle return rollers for the two endless mobile belts 6 and 5. 12 and 14 are the respective drive rollers for driving the endless mobile belts. 15 is the block for transmitting motion to the drive rollers 12 and 14. 16 are the pegs for holding and supporting the winding tubes 2. Said pegs 16 are fixed rigidly to the flat elements 1 by a lower shank pin 17 about which a connecting rod 25 is pivotally engaged to form the swivel joint for two consecutive flat elements 1. 18 is a threaded element rigid with a respective flat element 1 and screwed into the respective connecting rod 25 to allow the precise and adjustable axial positioning of two consecutive flat elements 1. 19 is a position transducer which cooperates with identifiable means 21 applied to the lateral surfaces of the flat elements 1. 20 is the drive source for operating the drive rollers 12 and 14. 22 is the support slide for the lever mechanism of the tensioning brake. Said slide 22 is normally stationary in position 22 and moves into position 22a when it is required to move the lever mechanism of the tensioning brake together with the articulated chain through a distance equal to the distance between the axes of the two pegs 16 fixed on a single flat element 1, ie the pitch of said consecutive pegs 16. 24 are blocking levers operated by known means for engaging between the flat elements 1 and causing them to advance intermittently. 25 is the connecting rod which connects two consecutive flat elements and which at one end is connected to the pin shank 17 to form the swivel joint and at the other end 13 connected to the threaded element 13 to allow adjustable axial positioning. 26 is the articulated chain formed from the plurality of flat elements 1 which surround the ring spinning machine. 27 (Fig.1) is the device which contains both the accumulation of tubes 2 empty of wound yarn and the known means for mounting said tubes 2 in the direction of the arrow 46 onto the pegs 16 of the flat elements 1. 28 is the container bin for the tubes 50 filled with wound yarn which are conveyed into it by the chute 29 after being seized and withdrawn from the pegs 16 by any known withdrawal device 52, the linkages or operating means of which are located in the block 30. 32 (Fig.3-5) is the actuator which moves the support slide 22 for the tensioning brake. 50 is a tube filled with wound yarn which is withdrawn from a spindle by the gripper element of the automatic doffing device and held on a peg 16 to be then moved by the articulated chain 26 to its position for withdrawal and conveying in the direction of the arrows 48 to place it in the bin 28. 33 is a section bar or structure of suitable shape which acts as a lateral guide track, and along the portions free of the mobile belt acts as the track for supporting the flat elements 1 of the articulated chain 26. Said guide and support section bar 33 passes around the end structures 7 of the spinning machine and about the whole spinning machine forming an endless slide track. 34 is the rod of the actuator 32. 35 and 36 are the levers of the tensioning brake lever mechanism which engage with the frusto-conical sides of the last flat element 4. Said engagement is implemented by the action of the actuator 44, which by pressing the levers 41 and 42 pivoted on the pivots 39 and 40 causes the levers 35 and 36 to gradually approach the frusto-conical sides of the flat element 4 with the aid of the elastic elements 43. 37 and 38 are two mechanical positioning elements in the form of brackets fixed rigidly to the levers 41 and 42, against said brackets there being positioned the two levers 35 and 36 at the end of their engagement with the flat element 4. 6a, 6b and 6c (Fig.8) are endless mobile flat belts which can replace the belt 6 and which together cover one whole spinning face, their motion being perfectly identical. Their upper branches are driven in the direction indicated by the arrow 8. 5a, 5b and 5c are endless mobile flat belts which can replace the belt 5 and which together cover the other spinning face, their motion being perfectly identical. Their upper branches are driven in the direction indicated by the arrow 10. 55 are optional mobile flat belts in a transverse position, they being driven substantially with the same motion as the longitudinal belts 5 and 6.

The operation of the apparatus for conveying and positioning winding tubes in correspondence with the spinning spindles and around the spinning machine, shown on the accompanying figures, is as follows.

The winding tubes 2 empty of wound yarn are already, as shown in Figure 1, arranged in a position in front of the spinning spindles awaiting operational correlation with the automatic doffing device which when a winding is complete replaces the tubes filled with wound yarn and mounted on the relative spindles, with said tubes 2 empty of wound yarn and held stationary on the pegs of the articulated chain 26.

This latter is taut and aligned along the two spinning faces by the clamping action of the levers 35 and 36 of the tensioning brake which nullifies movement due to the friction dragging action exerted on the lower surface of the flat elements 1 by the endless mobile belts 5 and 6 extending along the two longitudinal sides of the spinning machine. In Figure 1 it can be seen that the tubes 2 empty of wound yarn are present on only two partial portions of the articulated chain 26. Each portion extends frontally along the line of spinning spindles of a single face. Along the remaining length of the articulated chain 26 there are no winding tubes 2. In the practical embodiment of the present invention the winding tubes 2 are held in a line on

alternate pegs at a distance apart equal to the spindle pitch, the spindle pitch being the distance between the axes of two adjacent spindles. With this construction the holding pegs 16, fixed in pairs on the flat elements 1, follow each other at a distance apart equal to one half the pitch of the spinning spindles of the ring spinning machine.

In view of the aforegoing, when the automatic doffing device is activated the gripper elements firstly remove all the tubes filled with wound yarn simultaneously from both spinning faces by withdrawing them from their spindles and immediately mounting them on the free pegs 16 which alternate with the tubes 2 empty of wound yarn.

Said free pegs 16 are stationary in positions perfectly coaxial with the axes of the various spindles, this correct precise location being determined by the clamping action of the levers 35 and 36 of the tensioning brake (see Figure 5), while the endless belts 5 and 6 exercise by their movement according to arrows 8 and 10 the tensioning and aligning action on the individual flat elements 1. When unloading of the tubes 50 filled with wound yarn is complete the gripper elements are released and rise from them, after placing them on the relative pegs 16, by the distance needed not to obstruct the subsequent movement of the articulated chain 26. After disposing of the tubes filled with wound yarn, the same gripper elements are preferably made to grip tubes empty of wound yarn and mount them on the spindles.

The gripper elements can be of any construction suitable for the purpose. However it is preferable to use gripper elements of a type such as those described in EP-A-0 290 063.

The actuator 32 is then activated to move the slide 22 into the position 22a (see Figure 5, dashed-line position). The entire lever mechanism of the tensioning brake, which continues to clamp the flat element 4, moves rigidly with said slide 22 to produce the aforesaid movement of the articulated chain 26. This latter advances through one half the spindle pitch by the dragging action of the endless mobile belts 5 and 6.

By this means all winding tubes 2 are positioned aligned and in perfect coaxiality with the spindle axes along both spinning faces.

Consequently, said winding tubes 2 lie in perfect verticality bellow the gripper elements. These latter, on activation of the automatic doffing device of known type, then grip the winding tubes 2 to convey them and fix them onto the respective spindles. Thus by means of the apparatus of the present invention correct and precise unloading of the tubes 50 filled with wound yarn and pick-up of the tubes 2 empty of wound yarn is obtained even when simultaneously using several hundreds of gripper elements which require exact gripping positions.

The mobile belts 5 and 6 are preferably operated continuously at least during the entire doffing cycle so that by the friction dragging action which they exert on the flat elements 1 they produce a continuous positioning tension throughout the articulated chain 26.

Said positioning tension, which arises by the simultaneous cooperation between the clamping action of the levers 35 and 36 of the tensioning brake and the dragging movement according to arrows 8 and 10 of the endless belts 5 and 6, is necessary to preserve the alignment of the flat elements 1 along the two horizontal longitudinal sections of the spinning faces of the spinning machine, and also to ensure operational coaxiality between the holding pegs 16 and the axes of the many hundreds of spindles.

When doffing is complete and the winding tubes 2 have been placed on the spinning machine spindles, this latter again operates to produce a new batch of wound yarn and the actuator 44 is activated to pull the levers 41 and 42 pivoted on the pivots 39 and 40 and cause the levers 35 and 36 to open and release the flat element 4. The articulated chain 26 immediately advances with its ordered load of tubes 50 filled with wound yarn in the direction of movement indicated by the arrows 8 and 10 by the action of the two flat belts 5 and 6. In this respect, these latter exert contact friction on the lower surface of the flat elements 1 to cause the articulated chain 36 to move along the circuit unidirectionally and convey the first tube 50 filled with wound yarn along the side of the end structure 7 and under an automatic withdrawal device 52 which removes it vertically by withdrawing it from its peg 16 and conveys the tube 50 along the direction indicated by the arrows 48. Said winding tube 50 is stored in the container 28 by way of the chute 29.

The expulsion of the individual winding tubes 50 from the respective pegs 16 of the articulated chain 26 can be continuous or intermittent in known manner.

Intermittent operation, which is preferred and is illustrated on the accompanying figures, requires the presence of blocking levers 24 operated by known means, these latter being coordinated by known position transducers 19 to correctly engage said levers 24 between the flat elements 1 and compel the articulated chain 26 to advance intermittently stepwise. While the manipulator 52 continues to withdraw the tubes 50 filled with wound yarn, at a certain moment the first flat element 1 from which the first tube 50 was withdrawn arrives below a mechanism, not shown, which takes a tube 2 empty of wound yarn from the container 27 and mounts it on the respective peg 16 of said first flat

element 1 as indicated by the arrow 46.

The insertion mechanism and pickup device can be of any known type suitable for the purpose.

After the aforesaid operation in which the levers 35 and 36 of the tensioning brake release the flat element 4 by the action of the actuator 44, the slide 22 is repositioned by the actuator 32 in its normal rest position 22 to again await the operational situation shown in Figure 3, said levers 35 and 36 remaining in the open position during this waiting period.

The withdrawal and insertion cycles for the tubes 50 filled with wound yarn and the tubes 2 empty of wound yarn proceed by assuming the intermediate configuration shown in Figure 6 and then returning to the initial configuration shown in Figure 1.

Immediately before its return to this latter initial configuration the flat element 4, as it terminates its complete revolution about the spinning machine, is pincered by the levers 35 and 36 of the tensioning brake. Said levers approach the lateral frusto-conical surfaces of the flat element 4 and gradually self-lock around it (see Figures 4 and 5) to halt and correctly position the entire articulated chain 26 along the two spinning faces of the ring spinning machine. This is attained for arranging the pegs 16 with the respective tubes 2 in operational correlation with the known automatic doffing device which when yarn winding onto the winding tubes is complete replaces on the spindles the tubes filled with wound yarn by tubes empty of wound yarn. While awaiting yarn winding completion on the winding tubes the endless belts 5 and 6 can be advantageously halted. They are then reactivated substantially at the start of the known doffing cycle. Said endless mobile belts 5 and 6 are driven by the same drive source 20 (see Figures 1 and 6) which by way of a reduction gear and inverter block 15 causes the two drive pulleys 12 and 14 to rotate substantially synchronized but in reverse directions. These latter drive the two endless belts 5 and 6 at a substantially identical rate, their upper branches moving in opposite directions in accordance with the arrows 10 and 8.

The operational stages involving movement of the various parts of the apparatus according to the invention and the activation of the actuators or drive sources for the various aforesaid devices together with the operational correlation with the automatic doffing device are controlled overall by position transducers 19 associated with identifiable means 21, both of known type, these latter being positioned advantageously on the lateral surfaces of the flat elements 1 (see Figure 2).

Furthermore, during its installation the articulated chain 26 is adjusted in length by making micrometric adjustments on the screw connections between the elements 18 and the connecting rods 25 of consecutive flat elements 1, this precision then not changing with time because their movement within the apparatus of the present invention does not involve any forced dragging, the sliding of the chain also being smooth about curves because of the facility for considerable swivelling between said flat elements 1 (see Figure 7).

The belts 5 and 6 shown in Figures 1 and 6 for moving the articulated chain 26 are only one example of the many possible dragging means, such as moving by several short-length belts disposed along the individual spinning faces. They are driven in the same direction and in substantial synchronism along their individual spinning face.

Figure 8, shows one possible arrangement in which the belts 5a, 5b and 5c are driven in the direction indicated by the arrow 10 whereas the belts 6a,6b and 6c of the opposite spinning face are driven in the direction indicated by the arrow 8. Figure 8 also shows the presence of transverse belts 55 which can be installed to improve the movement of the articulated chain 26. The aforesaid embodiment involving two or more dragging belts enables two spindle faces, one opposite the other, to be served with a single articulated chain, and a construction of this type cooperating with an automatic doffing device acting simultaneously on both faces is therefore economically interesting.

According to a modification, not shown, an installation can be desirable consisting of a double apparatus of the type according to the invention, one for each spinning face, to cooperate with an automatic doffing device which operates on only one face of the spinning machine independently of the other face, to allow spinning of different batches of yarn.

Each apparatus in this case extends horizontally about the spindle line of one spinning face in an arrangement comprising a return track for the articulated chain entering and underlying the machinery housing 3 of the spinning machine. Both apparatuses then assume an arrangement symmetrical to each other about the longitudinal axis of the spinning machine.

The pegs 16 could be fixed one following the other on the flat elements 1 at a distance apart equal to the spindle pitch of the ring spinning machine.

In this modification, the gripper elements of the automatic doffing device would firstly remove the tubes filled with wound yarn from the spindle and place them temporarily on stationary pegs fixed to a rod or similar element fixed rigidly to the spinning machine frame, to then grip the tubes empty of wound yarn and fix them onto the spindles, and then again grip the tubes filled with wound yarn and transfer them from the pegs on which they are

held to the pegs 16 of the flat elements 1 of the apparatus according to the invention. Such an automatic doffing cycle and device are known in the art and thus no further description is necessary. It is apparent that in this latter modification the slide 22 of the tensioning brake would no longer be moved through the aforesaid half spinning spindle pitch.

The purpose of these various modifications is specifically to allow the apparatus of the present invention to be incorporated in the different automatic doffing cycles and devices provided in the overall automation of ring spinning machines far the production of different textile articles.

The apparatus must also be made compatible with the movement of other elements such as travelling cleaner devices, yarn rejoining trolleys etc.

Preferred embodiments with some modifications have been described, but other embodiments are possible.

For example, the number of pegs 16 fixed on each flat element 1 can vary; the shapes and dimensions of said holding pegs 16 can vary; a single transfer belt could be provided extending along the entire spinning face opposite that spinning face comprising the tensioning brake; a plurality of transfer belts could be provided driven with identical or slightly different speeds; dragging elements other than belt elements could be provided; it would also be possible to provide a different lever mechanism for the tensioning brake; and drive sources could be added or removed to advantageously coordinate the movement of the dragging belts with all the various operating stages of the devices provided in the apparatus of the present invention.

Claims

1. An apparatus for conveying both winding tubes (2) empty of wound yarn and winding tubes (2) filled with wound yarn on holding pegs (16) rigidly fixed to the upper part of a plurality of flat elements (1) and for aligning the tubes (2) in correspondance with the spinning spindles of a ring spinning machine, said apparatus being arranged to serve and to cooperate with an automatic doffing device in the ring spinning machine, characterised by comprising:
   - articulated swivel joints of adjustable length for connecting together each of the flat elements (1);
   - endless mobile elements (5, 6; 5a, 5b, 5c, 6a, 6b, 6c) which support said flat elements (1) and drive them by friction dragging;
   - a tensioning brake (35-44) which halts the flat elements (1) by clamping the tail end (last element 4) of the articulated chain (26) formed by said flat elements (1) connected together, to align the holding pegs (16) and position them in coaxial coincidence with the axes of the spinning spindles.

2. An apparatus as claimed in claim 1, characterised in that the articulated swivel joints of adjustable length each consist of a connecting rod (25) which connects together two consecutive flat elements (1) and which at one end is pivotally connected to a pin (17) rigid with one of the two flat elements (1) to form the articulated swivel joint, and at its other end is connected to a threaded element (18) rigid with the other flat element (1) to allow precise and adjustable axial positioning of said flat elements (1).

3. An apparatus as claimed in claim 1, characterised in that the flat elements (1) have their lateral surfaces provided with means (21) identifiable by position transducers (19).

4. An apparatus as claimed in claim 1, characterised in that the tensioning brake is gradually engageable with a last plate element (4) of the articulated chain (26), the flat elements (1) of which are subjected to a continuous friction dragging movement of the underlying endless mobile element (5, 6; 5a, 5b, 5c, 6a 6b, 6c).

5. An apparatus as claimed in claims 1 and 4, characterised in that the tensioning brake comprises a lever mechanism having:
   - adjustable friction braking levers (35, 36) to slow down the motion of the articulated chain (26); and
   - mechanical positioning elements (37, 38) which ensure locking of said levers (35, 36) and said last plate element (4) and preservation of exact alignment between the holding pegs (16) for the winding tubes (2) and the spinning spindles.

6. An apparatus as claimed in claim 1, characterised in that each of the flat elements (1) comprises two pegs (16) spaced apart by half the distance between the spinning spindles, and in that the tensioning brake is arranged on a support slide (22) movable in the direction of the articulated chain (26) and fixable in two positions spaced apart by a distance corresponding to the distance between the axes of two adjacent pegs (16).

7. A method for conveying both winding tubes (2) empty of wound yarn and winding tubes (2) filled with wound yarn and for aligning the tubes (2) in correspondence with the spinning spindles of a ring spinning machine by means of an apparatus as claimed in one of the preceding claims, wherein the tubes (2) are carried by holding pegs (16) rigidly fixed to the upper part of a plurality of flat elements, characterised by the following steps:
   - frictionally dragging said flat elements (1) by the surface of endless mobile elements (5, 6; 5a, 5b, 5c, 6a, 6b, 6c) on which the flat elements (1) adhere by gravity, and
   - aligning the axes of the winding tube holding pegs (16) and positioning them in perfect frontal coaxiality with the axes of the spinning spindles by braking the motion of the flat elements (1) on said endless mobile elements (5, 6; 5a, 5b, 5c, 6a, 6b, 6c) by clamping the tail end of the articulated chain (26) formed by said flat elements (1) connected together.

Patentansprüche

1. Vorrichtung zum Transportieren von Spulenhülsen (2), die kein aufgewickeltes Garn aufweisen, und von Spulenhülsen (2), die mit einer Garnwicklung versehen sind, auf Haltestiften (16), die fest am oberen Teil einer Anzahl von flachen Elementen (1) befestigt sind, und zum Ausrichten der Hülsen (2) in Übereinstimmung mit den Spindeln einer Ringspinnmaschine, wobei die Vorrichtung mit einer automatischen Abnehmereinrichtung in der Ringspinnmaschine zusammenwirkt,
   gekennzeichnet durch,
   gelenkige Schwenkverbindungen von einstellbarer Länge zum Verbinden der flachen Elemente (1) miteinander, endlose bewegliche Elemente (5, 6; 5a, 5b, 5c, 6a, 6b, 6c), welche diese flachen Elemente (1) tragen und sie durch Reibungseingriff antreiben, eine Spannungsbremse (35-44), welche die flachen Elemente (1) durch Klemmen des hinteren Endes (letzten Elementes 4) der gelenkigen Kette (26) hält, die durch die miteinander verbundenen flachen Elemente (1) gebildet wird, um die Haltestifte (16) auszurichten und sie in koaxialer Übereinstimmung mit den Achsen der Spindeln zu positionieren.

2. Vorrichtung nach Anspruch 1,
   dadurch gekennzeichnet,
   daß die gelenkigen Schwenkverbindungen von einstellbarer Länge jeweils aus einer Verbindungsstange (25) bestehen, die zwei aufeinanderfolgonde flache Elemente (1) miteinander verbindet und die an einem Ende mit einem Zapfen (17) schwenkbar verbunden ist, der in einem der zwei flachen Elemente (1) starr angebracht ist, um eine gelenkige Schwenkerbindung zu bilden, und an ihrem anderen Ende mit einem Schraubelement (18) verbunden ist, das an dem anderen flachen Element (1) befestigt ist, um eine genaue und einstellbare Axialstellung des flachen Elementes (1) zu ermöglichen.

3. Vorrichtung nach Anspruch 1,
   dadurch gekennzeichnet,
   daß die flachen Elemente (1) auf ihren Seitenflächen eine Einrichtung (21) aufweisen, die durch eine Positionsübertragungseinrichtung (19) identifizierbar ist.

4. Vorrichtung nach Anspruch 1,
   dadurch gekennzeichnet,
   daß die Spannungsbremse allmählich mit einem letzten Plattenelement (4) der gelenkigen Kette (26) in Eingriff bringbar ist, deren flache Elemente (1) einer kontinuierlichen Reib-Schlepp-Bewegung des darunterliegenden endlosen beweglichen Elementes (5, 6; 5a, 5b, 5c, 6a, 6b, 6c) ausgesetzt sind.

5. Vorrichtung nach Anspruch 1 und 4,
   dadurch gekennzeichnet,
   daß die Spannungsbremse einen Hebelmechanismus umfaßt, der einstellbare Reibungsbremshebel (35, 36) aufweist, um die Bewegung der gelenkigen Kette (26) zu verlangsamen, und mechanische Positionierelemente (37, 38), die das Sperren dieser Hebel (35, 36) und dieses letzten Plattenelementes (4) gewährleitsten und für die exakte Ausrichtung zwischen den Haltestiften (16) für die Spulenhülsen (2) und den Spindeln sorgen.

6. Vorrichtung nach Anspruch 1,
   dadurch gekennzeichnet,
   daß jedes flache Element (1) zwei Stifte (16) umfaßt, die um den halben Abstand zwischen den Spindeln beabstandet sind, und daß die Spannungsbremse auf einem Gleitträger (22) angeordnet ist, der in Richtung der gelenkigen Kette (26) bewegbar und in zwei Stellungen fixierbar ist, die um einen Abstand beabstandet sind, der dem Abstand zwischen den Achsen von zwei benachbarten Stiften (16) entspricht.

7. Verfahren zum Transportieren sowohl von Spulehülsen (2), die keine Garnwicklung aufweisen, als auch Spulenhülsen (2), die eine Garn-

wicklung aufweisen, und zum Ausrichten der Hülsen (2) entsprechend den Spindeln einer Ringspinnmachine mittels einer Vorrichtung nach einem der vorhergehenden Ansprüche, wobei die Hülsen (2) durch Haltestifte (16) getragen werden, die fest am oberen Teil eine Anzahl von flachen Elementen befestigt sind, gekennzeichnet durch folgende Schritte:
Mitnehmen der flachen Elemente (1) durch Reibung durch die Oberfläche von endlosen beweglichen Elementen (5, 6; 5a, 5b, 5c, 6a, 6b, 6c), auf denen die flachen Elemente (1) durch Schwerkraft aufliegen, und
Ausrichten der Achsen der Haltestifte (16) für die Spulenhülsen und Positionieren von diesen in perfekter frontaler Koaxialität mit den Achsen der Spindeln durch Bremsen der Bewegung der flachen Elemente (1) auf den endlosen beweglichen Elementen (5, 6; 5a, 5b, 5c, 6a, 6b, 6c) durch Klemmen des hinteren Endes der gelenkigen Kette (26), die durch die miteinander verbundenen flachen Elemente (1) gebildet wird.

Revendications

1. Appareil pour acheminer les tubes d'enroulement (2) vides de filé, ainsi que les tubes d'enroulement (2) remplis de filé, sur des tenons de maintien (16) solidarisés de la partie supérieure d'une pluralité d'éléments plats (1) et pour aligner les tubes (2) avec les broches de filage d'un métier à filer continu à anneau, ledit dispositif étant disposé de façon à charger, en coopérant avec elle, une machine automatique à faire la levée dans le méfier à filer à anneau, caractérisé par le fait qu'il comprend :
   - des joints articulés de pivotement, de longueur réglable, permettant de relier ensemble les éléments plats (1),
   - des éléments mobiles sans fin (5, 6; 5a, 5b, 5c, 6a, 6b, 6c) qui soutiennent lesdits éléments plats (1) et les déplacent par entraînement par friction,
   - un frein à mâchoires (35-44), qui arrête les éléments plats (1) en pinçant le dernier élément (4) formant extrémité arrière de la chaîne articulée (26) formée par lesdits éléments plats (1) liés ensemble, pour aligner les tenons de maintien (16) et les positionner de façon à ce qu'ils soient en coïncidence coaxiale avec les axes des broches de filage.

2. Dispositif selon la revendication 1, caractérisé en ce que chaque joint articulé de pivotement, de longueur réglable, se compose d'une tige de liaison (25) qui relie ensemble deux éléments plats (1) consécutifs et qui est, en une extrémité, reliée de façon pivotante à un axe (17) solidaire de l'un des deux éléments plats (1) afin de former le joint articulé de pivotement, et est reliée, en son autre extrémité, à un élément fileté (18) solidaire de l'autre élément plat (1) pour permettre un positionnement axial réglable et précis desdits éléments plats (1).

3. Dispositif selon la revendication 1, caractérisé en ce que les surfaces latérales des éléments plats (1) sont pourvues de moyens (21) pouvant être identifiés par des capteurs (19) de position.

4. Dispositif selon la revendication 1, caractérisé en ce que le frein à mâchoires peut porter de façon progressive contre le dernier élément en plaque (4) de la chaîne articulée (26) dont les éléments plats (1) sont soumis à un mouvement continu d'entraînement par friction par l'élément mobile sans fin (5, 6; 5a, 5b, 5c, 6a, 6b, 6c).

5. Dispositif selon les revendications 1 et 4, caractérisé en ce que le frein à mâchoires comprend un mécanisme de levier avec :
   - des leviers (35, 36) réglables de freinage par friction qui ralentissent le déplacement de la chaîne articulée (26), et
   - des éléments mécaniques (37, 38) de positionnement qui garantissent le verrouillage desdits leviers (35, 36) et dudit dernier élément (4) en plaque, ainsi que le maintien d'un alignement précis entre les tenons de maintien (16) des tubes d'enroulement (2) et les broches de filage.

6. Dispositif selon la revendication 1, caractérisé en ce que chaque élément plat (1) comprend deux tenons (16) espacés de la demi-distance séparant les broches de filage, et en ce que le frein à mâchoires est installé sur une glissière de support (22) déplaçable dans la direction de la chaîne articulée (26) et immobilisable en deux positions espacées d'une distance correspondant à la distance qui sépare les axes de deux tenons (16) adjacents.

7. Procédé pour acheminer des tubes d'enroulement (2) vides de filé ainsi que des tubes d'enroulement (2) remplis de filé et pour aligner ces tubes (2) en correspondance avec les broches de filage d'un métier à filer continu à anneau, grâce à un dispositif tel que revendiqué dans l'une quelconque des précédentes

revendications, procédé dans lequel les tubes (2) sont portés par des tenons de maintien (16) solidarisés de la partie supérieure d'une pluralité d'éléments plats (1), procédé caractérisé par les étapes suivantes :

- entraînement par friction desdits éléments plats (1) par la surface d'éléments mobiles sans fin (5, 6; 5a, 5b, 5c, 6a, 6b, 6c) sur lesquels les éléments plats (1) adhèrent par gravité, et
- alignement des axes des tenons de maintien (16) des tubes d'enroulement et positionnement de ceux-ci en coaxialité frontale parfaite avec les axes des broches de filage, grâce au freinage du déplacement des éléments plats (1) sur lesdits éléments mobiles sans fin (5, 6; 5a, 5b, 5c, 6a, 6b, 6c) effectué par pincement de l'extrémité arrière de la chaîne articulée (26) formée par lesdits éléments plats (1) reliés ensemble.

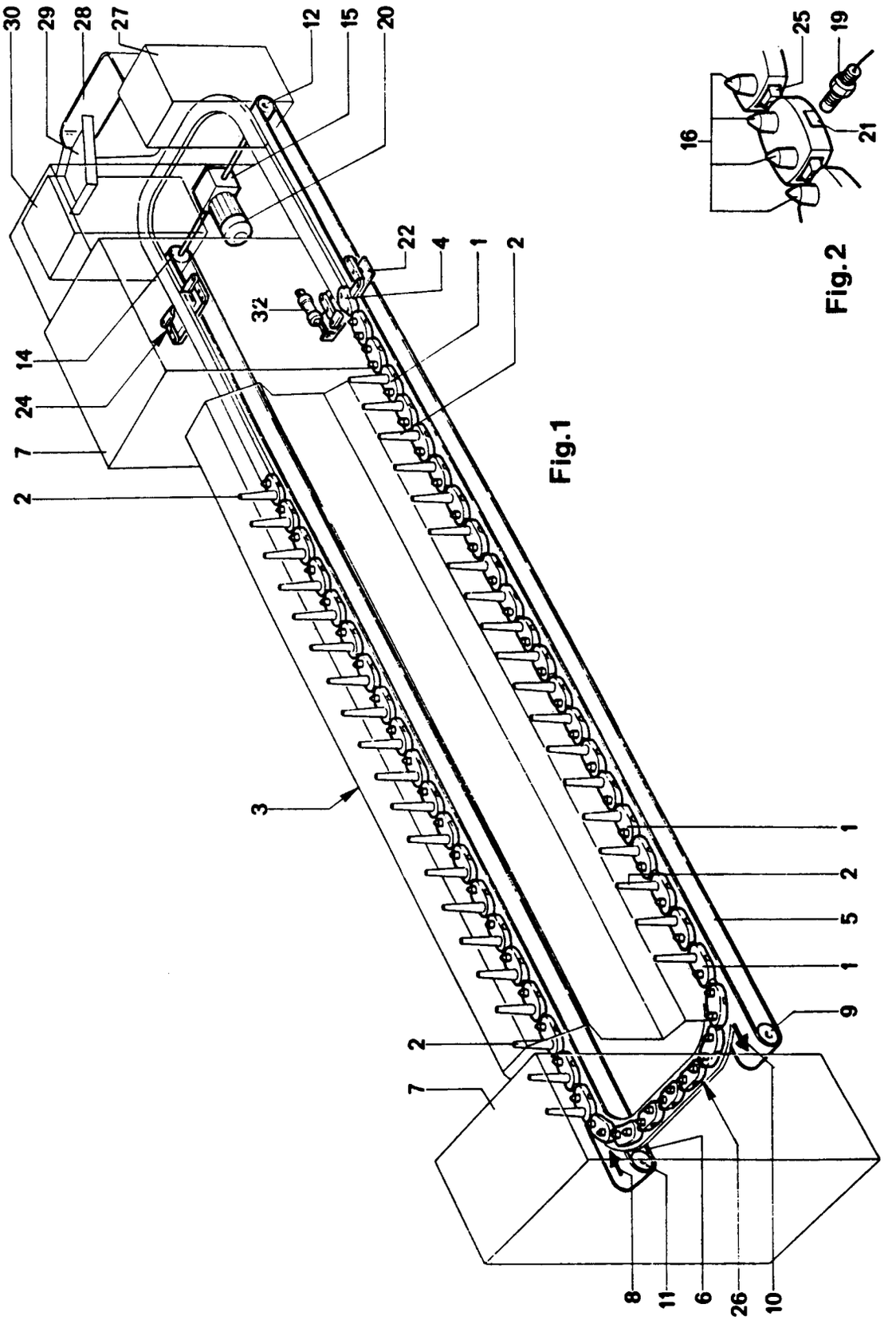
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Fig.1

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Fig.2

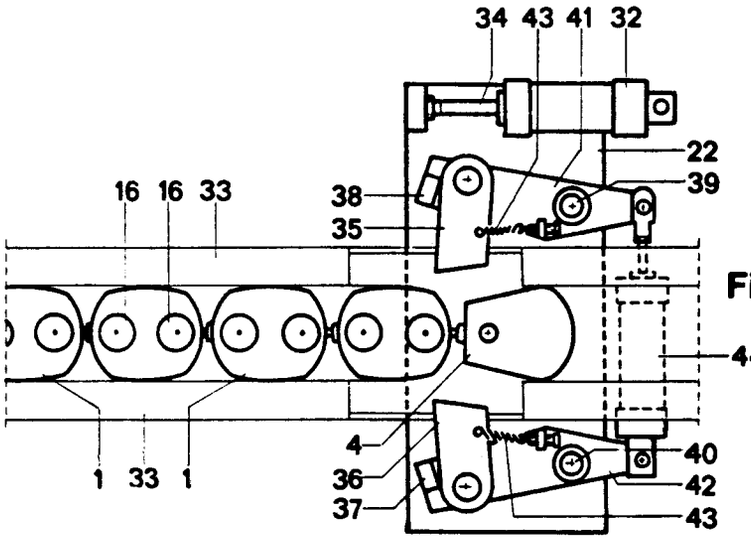

Fig.3

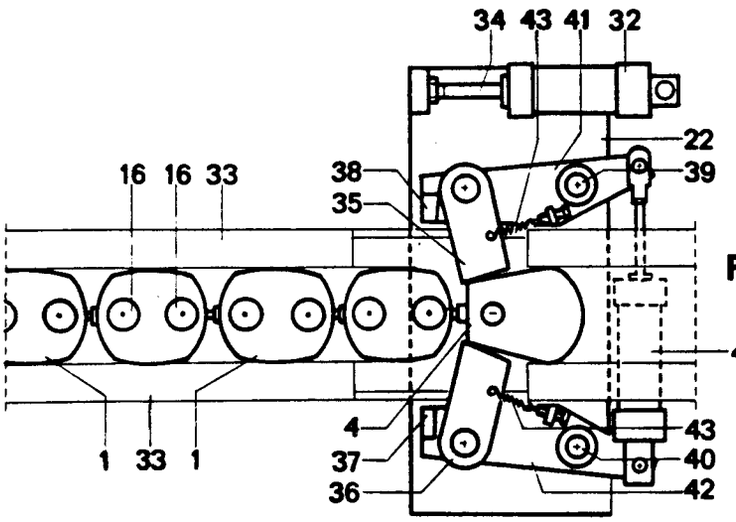

Fig.4

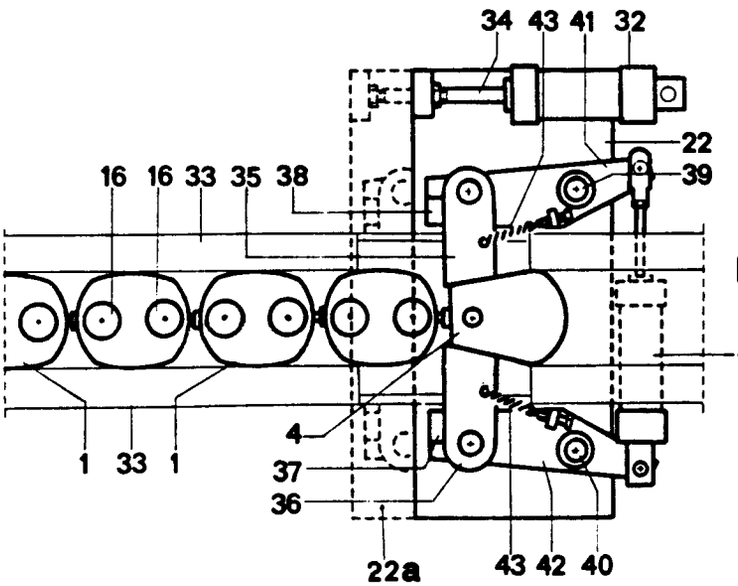

Fig.5

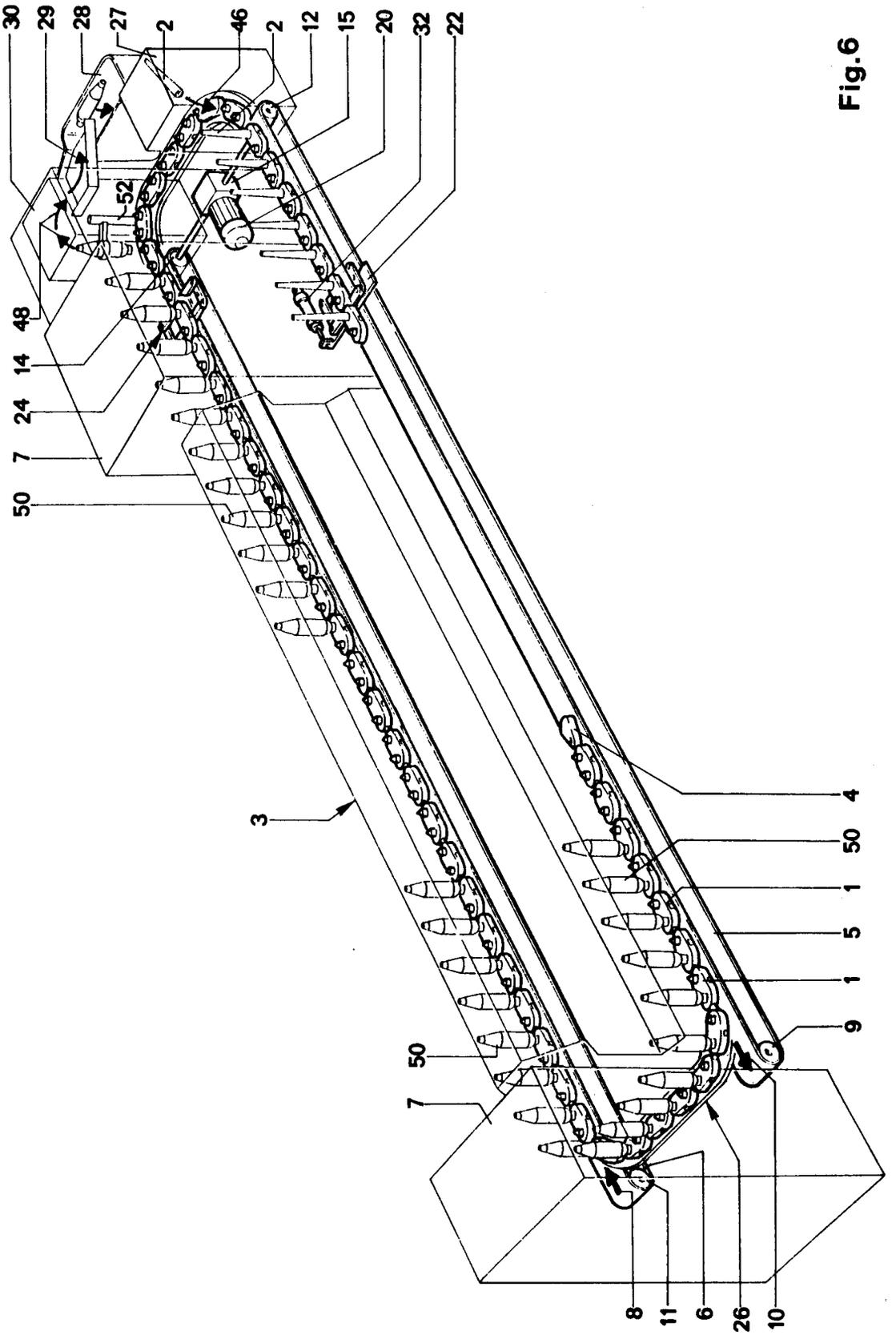
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Fig.6

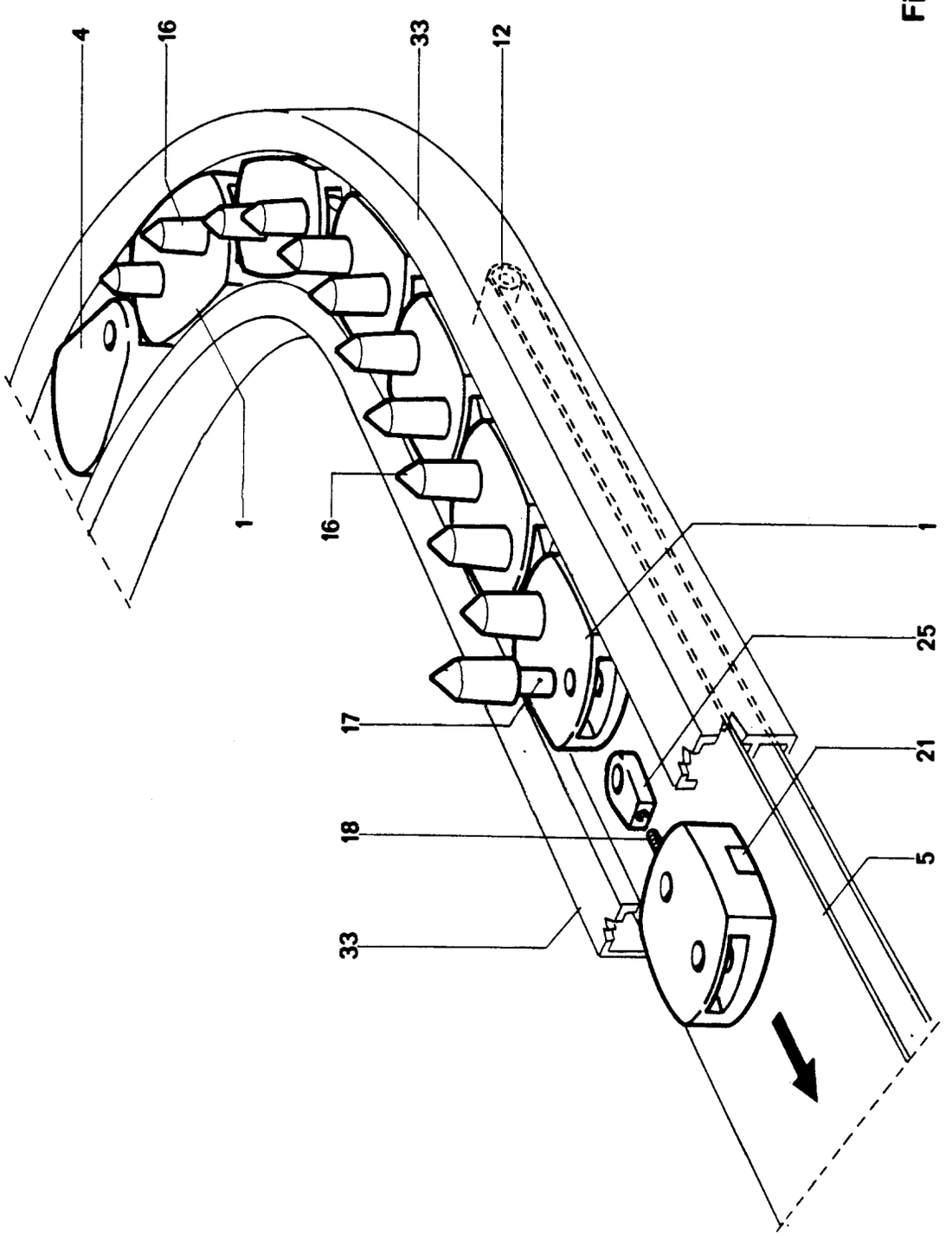

Fig.7

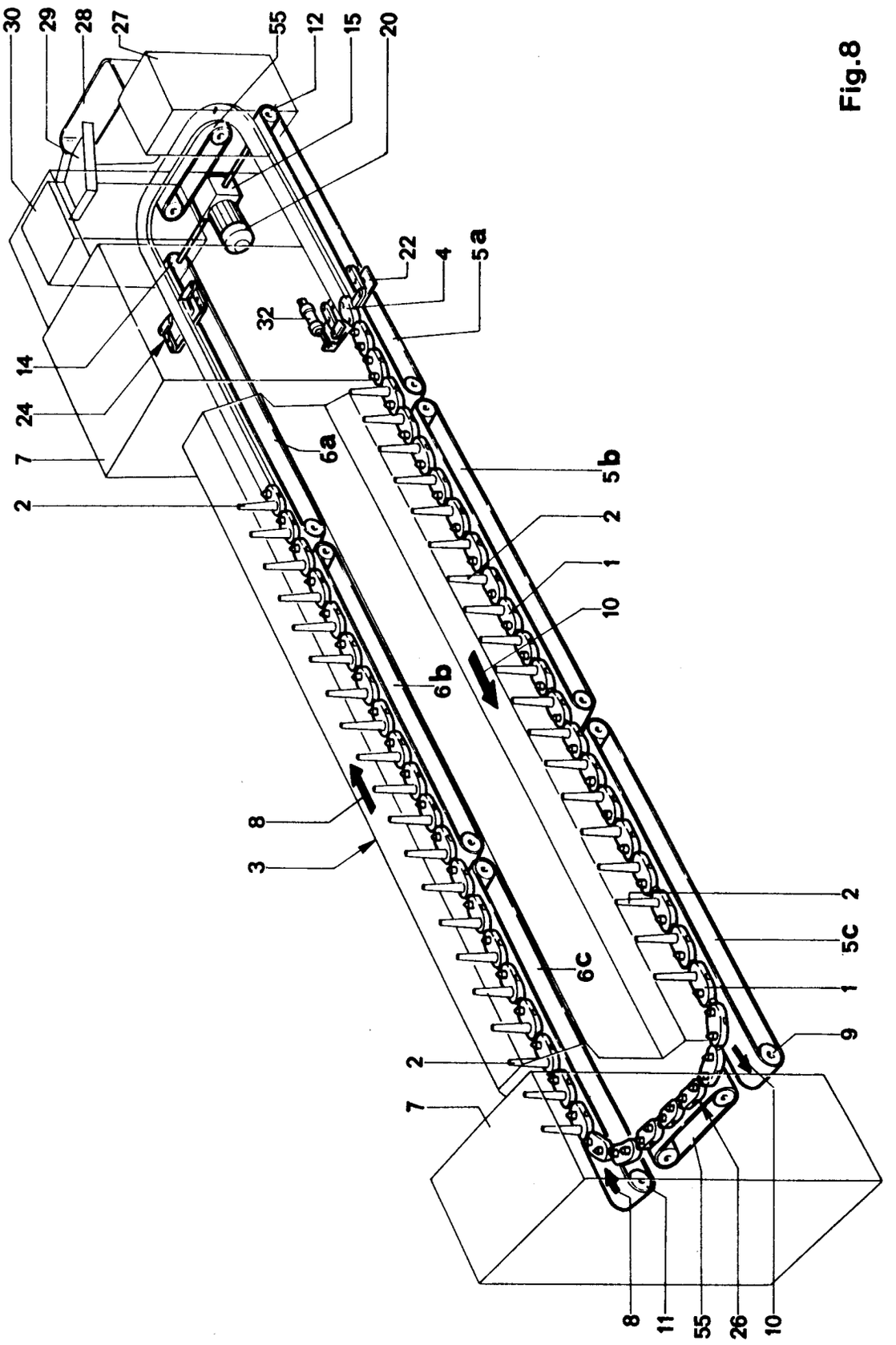
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Fig.8