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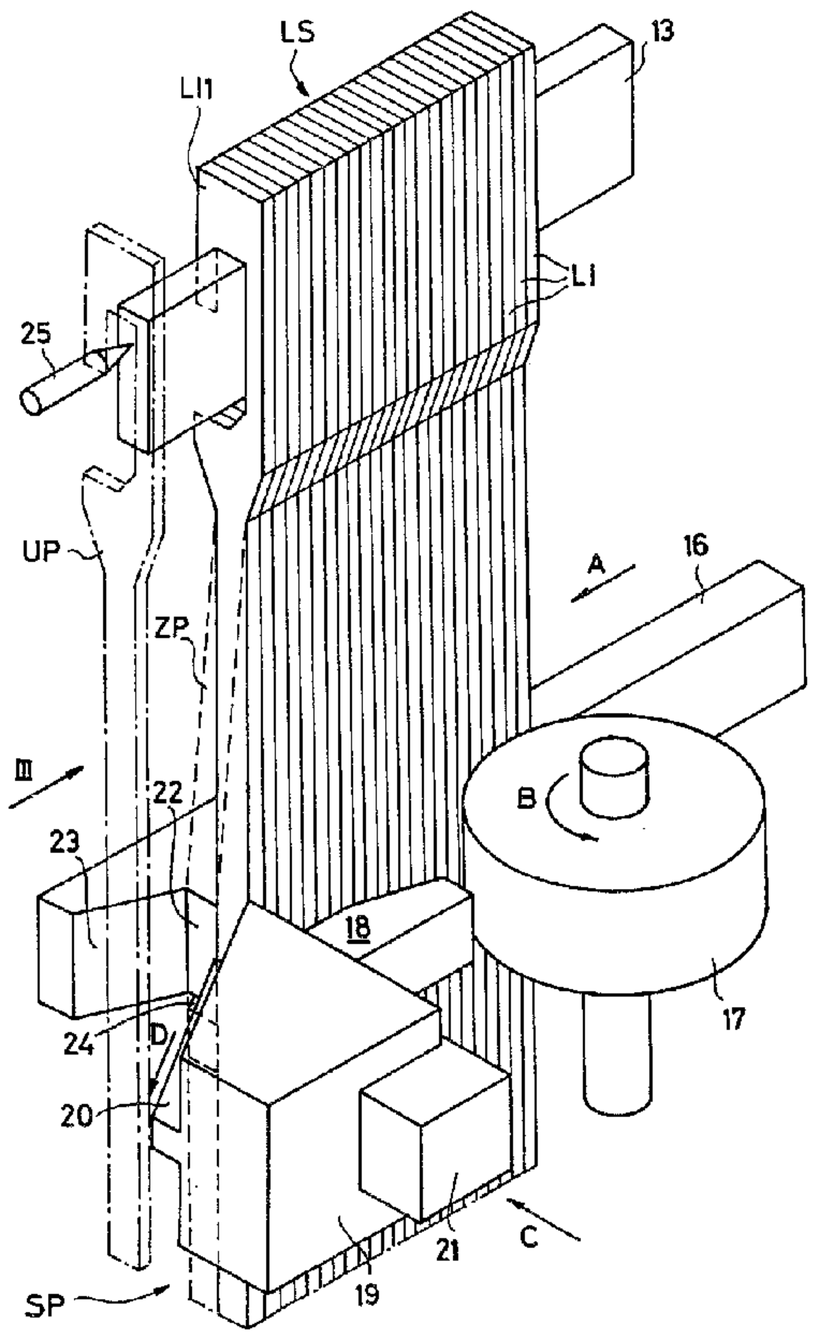
(54) **DISPOSITIF DE SEPARATION DES LICES POUR MACHINE DE RENTRAGE DE CHAINE**

(54) **DEVICE FOR SINGULARIZING HEALDS FOR WARP-THREAD DRAWING-IN MACHINES**



(57) The device contains a selecting member (21) for the healds (LI) fed in the form of a stack (LS), which selecting member (21) separates in each case the front- most heald (LI1) from the stack and makes it available for the drawing-in of the warp threads. The selecting member (21) is formed by a piston which can perform a stroke essentially transversely to the heald stack (LS), during the working stroke of which piston the healds (LI1) are transported from the heald stack (LS) into an intermediate position (ZP). A transfer means (24) for transferring the respective heald (LI1) to a transport unit (25) for transporting the heald to its drawing-in position is provided in this intermediate position (ZP). All types of heald can thereby be selected from the heald stack, and neither a special preparation of the healds nor the use of a special type of heald is necessary. In addition, the heald separation and the further removal are completely uncoupled, which not only permits the use of means optimally adapted to the individual functions but also considerably simplifies the rectification of faults.

Abstract

The device contains a selecting member (21) for the healds (LI) fed in the form of a stack (LS), which selecting member (21) separates in each case the front- most heald (LI1) from the stack and makes it available for the drawing-in of the warp threads. The selecting member (21) is formed by a piston which can perform a stroke essentially transversely to the heald stack (LS), during the working stroke of which piston the healds (LI1) are transported from the heald stack (LS) into an intermediate position (ZP). A transfer means (24) for transferring the respective heald (LI1) to a transport unit (25) for transporting the heald to its drawing-in position is provided in this intermediate position (ZP).

All types of heald can thereby be selected from the heald stack, and neither a special preparation of the healds nor the use of a special type of heald is necessary. In addition, the heald separation and the further removal are completely uncoupled, which not only permits the use of means optimally adapted to the individual functions but also considerably simplifies the rectification of faults.

(Fig. 2)

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Device for singularizing healds for warp-thread drawing-in machines

The present invention relates to a device for singularizing healds for warp-thread drawing-in machines, having a selecting member for the healds fed in the form of a stack, which selecting member separates the healds from the stack and makes them available for the drawing-in of the warp threads.

In devices of this type known hitherto, the selecting member is formed by a needle which sticks into the heald stack directly after the frontmost heald of the same and then displaces the frontmost heald in the longitudinal direction of the heald stack, that is in the feed direction, to the drawing-in position. The healds used are either provided with a taper at their narrow edges at the selecting point or they must have a so-called keyhole. This means that healds without tapered narrowed edges or a keyhole could not hitherto be drawn in automatically.

The invention, then, is intended to specify a universally useable device for singularizing healds, which device enables all types of healds to be removed.

This object is achieved according to the invention in that the selecting member is formed by a piston which can perform a stroke essentially transversely to the heald stack, during the working stroke of which piston the healds are transported from the heald stack in a positive-locking manner into an intermediate position. In the device according to the invention, the frontmost heald, during the selection, is therefore not pushed further in the feed direction as hitherto but is moved laterally out of the heald stack. This means an uncoupling between the actual singularizing operation and the following removal, which enables optimally adapted means to be used for the now uncoupled operations. The piston, which can perform a stroke, is able to select all types of

heald from the heald stack so that the healds need not be specially prepared. Since the selection is effected in a positive-locking manner, the healds are always fully under control.

A preferred further development of the invention is characterised in that a transfer means for transfer-ring the respective heald to a transport unit for transporting the healds to their drawing-in position is provided in the said intermediate position.

This transfer means represents an interface between the actual selecting device and the transport unit and, if of suitable design, opens up the possibility of being able to interrupt the connection between selecting device and transport unit when required, for example in the event of faults.

The invention is described in greater detail below with reference to an exemplary embodiment and the drawings, in which:

Fig. 1 shows a perspective overall representation of a drawing-in machine according to the invention,

Fig. 2 shows a schematic perspective representation of a detail of the drawing-in machine in Fig. 1,

Fig. 3 shows a view in the direction of arrow III in Fig. 2; and

Fig. 4 shows a view in the direction of arrow IV in Fig. 3.

According to Fig. 1, the drawing-in machine consists of a mounting stand 1 and various subassemblies arranged in this mounting stand 1, each of which subassemblies represents a functional module. A warp-beam truck 2 with a warp beam 3 arranged thereon can be recognized in front of the mounting stand 1. In addition, the warp-beam truck 3 contains a so-called lifting device 4 for holding a frame 5, on which the warp threads KF are clamped. This clamping is effected before the actual drawing-in and at a location separate from the

drawing-in machine, the frame 5 being positioned at the bottom end of the lifting device 4 directly next to the warp beam 3. For the drawing-in, the warp-beam truck 2 together with warp beam 3 and lifting device 4 is moved to the so-called setting-up side of the drawing-in machine and the frame 5 is lifted upwards by the lifting device 4 and it then assumes the position shown.

The frame 5 and the warp beam 3 are displaced in the longitudinal direction of the mounting stand 1. During this displacement, the warp threads KF are directed past a thread-separating group 6 and as a result are separated and selected. After the selection, the warp threads KF are cut off and presented to a drawing-in needle 7, which forms a component of the so-called drawing-in module. The selecting device used in the warp tying machine USTER TOPMATIC (USTER - registered trademark of Zellweger Uster AG) can be used, for example, for the selection of the warp threads.

Next to the drawing-in needle 7 can be recognized a video display unit 8, which belongs to an operating station and serves to display machine functions and machine malfunctions and to input data. The operating station, which forms part of a so-called programming module, also contains an input stage for the manual input of certain functions, such as, for example, creep motion, start-stop, repetition of operations, and the like. The drawing-in machine is controlled by a control module which contains a control computer and is arranged in a control box 9. Apart from the control computer, this control box contains a module computer for every so-called main module, the individual module computers being controlled and monitored by the control computer. The main modules of the drawing-in machine, apart from the modules already mentioned - drawing-in module, yarn module, control module and programming module, are the heald, drop-wire, and reed modules.

The thread-separating group 6, which presents the warp threads KF to be drawn in to the drawing-in needle 7, and the path of movement of the drawing-in needle 7, which runs

vertically to the plane of the clamped warp threads KF, define a plane in the area of a support 10 forming part of the mounting stand 1 which plane separates the setting-up side already mentioned from the so-called taking-down side of the drawing-in machine. The warp threads and the individual elements into which the warp threads are to be drawn in are fed at the setting-up side, and the so-called harness (healds, drop wires and reed) together with the drawn-in warp threads can be removed at the taking-down side. During the drawing-in, the frame 5 having the warp threads KF and the warp-beam truck 2 having the warp beam 3 are moved to the right past the thread-separating group 6, in the course of which the drawing-in needle 7 successively removes from the frame 5 the warp threads KF clamped on the latter.

When all warp threads KF are drawn in and the frame 5 is empty, the latter, together with the warp-beam truck 2, the warp beam 3 and the lifting device 4 is located on the taking down-side.

Arranged directly behind the plane of the warp threads KF are the warp-stop-motion drop wires LA, behind the latter the healds LI and further to the rear the reed. The drop wires LA are stacked in hand magazines and the full hand magazines are hung in sloping feed rails 11, on which they are transported to the right towards the drawing-in needle 7. At this location they are separated and moved into the drawing-in position. Once drawing-in is complete, the drop wires LA pass on drop-wire supporting rails 12 to the taking-down side.

The healds LI are lined up on rails 13 and shifted manually or automatically on the latter to a separating stage. The healds LI are then moved individually into their drawing-in position and, once drawing-in is complete, are distributed over the corresponding heald shafts 14 on the taking-down side. The reed is likewise moved step-by-step past the drawing-in needle 7, the corresponding reed gap being opened for the drawing-in. After the drawing-in, the reed is likewise located on the taking-down side. A part of the reed WB can be recognized to the right next to the heald shafts 14. This

representation is to be understood purely as an illustration, since the reed, at the position shown of the frame 5, is of course located on the setting-up side.

As further apparent from the figure, a so-called harness truck 15 is provided on the taking-down side. This harness truck 15, together with the drop-wire supporting rails 12, fixed thereon, heald shafts 14 and holder for the reed, is pushed into the mounting stand 1 into the position shown and, after the drawing-in, carries the harness having the drawn-in warp threads KF. At this moment, the warp-beam truck 2 together with the warp beam 3 is located directly in front of the harness truck 15. By means of the lifting device 4, the harness is now reloaded from the harness truck 15 onto the warp-beam truck 2, which then carries the warp beam 3 and the drawn-in harness and can be moved to the relevant weaving machine or into an intermediate store.

The mode of operation of the individual sub-assemblies is not the subject-matter of the invention and is therefore not to be described further here. The essential factor is that the functions are distributed over a plurality of modules and that these modules represent virtually autonomous machines which are controlled by a common control computer. The cross connections between the individual modules run via this higher-level control computer, and there are no direct cross connections between the individual modules. If the structure of the drawing-in machine described is considered, the drawing-in machine system receives drawing-in data, control data, harness and yarn as well as energy and delivers processed operating data, status information and the drawn-in harness.

The separating stage, designated by SP, for the healds LI is shown in Figs. 2 to 4. Fig. 2 shows a perspective representation (not true to scale or proportion) which is intended to provide an overview of the separating principle; Figs. 3 and 4 each show a view to the scale of 1:1.

As already mentioned in the description of Fig. 1, the healds LI are lined up on rails 13 and shifted

automatically or manually on the latter to the separating stage SP. The displacement direction is designated in Fig. 2 by an arrow A; the displacement is preferably effected automatically. For this purpose, the heald stack LS bears at one of the narrow edges of the healds LI against a guide rail 16 along which the displacement is effected. A transport means which displaces the heald stack LS in the direction of arrow A is arranged at the other narrow edge (the front edge in the figure) of the healds. According to the representation, this transport means is represented by a brush-like roller 17 which acts on the front narrow edge of the healds LI and has on its circumference a brush-like or plushy or elastic lining for driving the healds. During rotation of the roller 17 in the direction of rotation designated by an arrow B, the healds LI are pushed in the direction of arrow A. Instead of the roller 17 or in combination with the same, a conveying belt stretched over two rollers can also be used which is provided either with a suitable lining or with individual, preferably brush-like, driving elements.

Directly in front of the separating stage SP, a guide rail 18 is also arranged in the area of the front narrow edge of the healds LI, which guide rail 18 has a sloping, funnel-like entry part so that the healds LI are fed in an ordered manner to the separating stage in a guide channel formed by the two guide rails 16 and 18. In the separating stage, in each case the frontmost heald LI1 of the heald stack LS is separated or selected from the latter and transferred to a transport unit which successively moves the individual healds to the drawing-in position in which the warp threads are drawn in.

Two separating stages SP are provided, of which one acts on the healds LI in their top area and the other acts on the healds LI in their bottom area (see Fig. 3). Both separating stages are driven synchronously.

With the aid of Fig. 2, in which the main parts of the separating stage SP arranged in the area of the top heald end are shown, the operating principle of the heald separation

is now to be explained: a stop element is arranged directly in front of the removal end of the guide channel formed by the guide rails 16 and 18, which stop element runs transversely to this guide channel and is formed by a rib 20 projecting from an essentially prismatic guide body 19. Its distance from the removal end of the guide channel is selected in such a way that the frontmost heald LI1 bearing against the rib 20 is located completely outside the guide channel. The distance between rib 20 and guide channel is adjustable; the adjustment is preferably made by exchanging the guide body 19, various guide bodies 19 being available in which the stop surface of the ribs 20 is in each case stepped to varying degrees from the corresponding base surface of the guide body 19. In practice, three to four guide bodies 19 of this type are sufficient, with which the entire range of the heald thicknesses which occur can be covered.

The frontmost heald LI1 therefore lies in the area of the rib 20 outside the guide channel but is still held with its end lugs on the rails 13. The separation is now effected, that is, the separation of the frontmost heald LI1 from the heald stack LS, for which purpose the centre part of the frontmost heald LI1, which centre part lies between the end lugs, is pushed laterally out of the heald stack. This pushing-out is effected by a piston-like selecting member 21 which is mounted in the guide body 19 so as to be adjustable in its stroke transversely to the longitudinal direction of the healds LI and transversely to their guide direction A and, during its working stroke in the direction of arrow C, pushes the centre part of the frontmost heald LI1 away from the heald stack LS in a positive-locking manner into the intermediate position ZP drawn in broken lines. During this displacement, the said centre part slides along a guide plane 22 until it comes to a stop at a stop 23. In the intermediate position ZP, the heald is held at its end lugs by the rails 13 and in the area of its centre part between the stop 23 and the front edge of the selecting member 21.

A plunger 24 displaceable in the direction of arrow

D is arranged below the guide plane 22, the end face of which plunger 24 is set back slightly relative to the guide plane 22 against the direction of arrow D. The plunger 24 is now moved in arrow direction D and displaces the centre part of the heald LI1 from the intermediate position ZP on an inclined path parallel to the inclined end face of the rib 20 into a transfer position UP drawn in chain lines. During this displacement produced by the plunger 24, the heald centre part bent during the separation relaxes again and assumes its straight position again in the transfer position UP. If the transfer position UP is compared with the initial position before the separation, only a displacement in the transport direction A has taken place between these two positions indirectly via the intermediate position ZP, the heald being guided in a positive-locking manner during the entire displacement. In the transfer position UP, the heald is no longer held with its end lugs by the rails 13 but is slipped over needle-like holding means 25 which form part of a transport unit for transporting the heald to the drawing-in position. The plunger 24 is then moved back into its initial position, and the selecting member 21, already moved back into its initial position against the direction of arrow C during the transport stroke of the plunger 24, can perform a further working stroke and as a result separate the next heald LI from the heald stack LS.

Figures 3 and 4, partly in section, show a true-to-scale representation of the two separating stages SP and their arrangement. Each separating stage SP is fixed to a support 26, of which only the one for the top separating stage is drawn in the figure. The selecting member 21, which is carried by a pneumatically drivable piston 27, will be recognized on the right hand side of the heald LI in Fig. 3. The piston 27 is mounted in a housing 28 provided with compressed-air connections. The selecting member 21 is guided in the guide body 19, and a stop pin 29 passes through it for limiting its stroke. In the area of its front part separating the heald LI, the selecting member is of U-shaped design and surrounds the

rib 20.

Recognizable on the left hand side of the heald LI in Fig. 3 are a first component 30, consisting of a basic body 31 fixed to the support 26 and of a sensor 32 fixed to this basic body 31 and having a contact spring 33 (see Fig. 4), a second component 34 likewise fixed to the support 26 and having guide plane 22 and stop 23, as well as the guide rail 16. The sensor 32 serves to detect the heald separation by the contact spring 33 being pressed against the sensor 32 by the heald LI during its displacement into the intermediate position ZP. In general, it can be said that the movement of the selecting member 21 and the movement of the plunger 24 is also monitored by sensors. If one of these sensors does not respond, the relevant function is repeated.

As further apparent in Fig. 3, a further piston housing 35 in which a pneumatically drivable piston 36 is mounted is fixed to the support 26. This piston is connected in an articulated manner to a blade-like pivoted lever 37 which is pivoted into the plane of the healds LI when the piston 36 is actuated so that healds possibly adhering to one another at the heald eyes LA can be mechanically detached from one another. The traverse of the pivoted lever 37 is limited by a stop 38 whose position is selected for the maximum length of the healds LI used. If shorter healds are thus to be removed, as indicated in Fig. 3, an additional stop pin 39 (drawn in chain lines) is mounted on the support 26 in order to limit the traverse of the pivoted lever 37 to the upper of the two end positions (likewise drawn in chain lines).

The arrangement of the likewise pneumatically operable plunger 24 is apparent from Fig. 4, which plunger 24 is not drawn in Fig. 3 for the sake of clarity. The plunger 24 is in each case arranged on the inside of the two separating stages, that is, below the top separating stage SP and above the bottom separating stage SP. According to the representation, the longitudinal axis of the essentially prismatic plunger 24 lies at an angle to the feed direction A of the healds LI and its end face contacting the healds LI

correspondingly runs at an angle to the longitudinal axis, or in other words parallel to the longitudinal axis of the selecting member 21 (arrow C). The plunger 24 has an elongated slot 40 which surrounds a bolt 41 serving to guide it during its stroke movement. A pneumatically drivable piston 43 mounted in a piston housing 42 serves to drive the plunger 24.

The device described for singularizing the healds is preferably designed in such a way that the entire arrangement, that is, the separating stage together with the heald supporting rails and the transport means for feeding the healds is mounted on a common mounting stand. This mounting stand is of mobile construction and can thus be moved into the warp-thread drawing-in machine in a simple manner. There is a detachable connection in the form of a locking coupling between the device for singularizing the healds and the following transport unit for transporting the healds to their drawing-in position. The various functions of the individual parts, such as selecting member 21, plunger 24 and pivoted lever 37, are separately controlled; the various functional sequences are synchronized via the module computer of the heald module.

Patent claims

1. Device for singularizing healds for warp-thread drawing-in machines, having a selecting member for the healds fed in the form of a stack, which selecting member separates the healds from the stack and makes them available for the drawing-in of the warp threads, characterised in that the selecting member (21) is formed by a piston which can perform a stroke essentially transversely to the heald stack (LS), during the working stroke (arrow C) of which piston the healds (LI1) are transported from the heald stack in a positive-locking manner into an intermediate position (ZP).

2. Device according to Claim 1, characterised in that a transfer means (24) for transferring the respective heald (LI1) to a transport unit (25) for transporting the healds to their drawing-in position is provided in the said intermediate position (ZP).

3. Device according to Claim 2, having heald supporting rails in which the healds are hung with their end lugs, characterised in that the healds (LI) are hung in the heald supporting rails (13) during the selection by means of the selecting member (21).

4. Device according to Claim 3, characterised in that the healds (LI) are hung in the heald supporting rails (13) during the transfer by the transfer means (24) and are released from the heald supporting rails only during the transfer to the transport unit (25).

5. Device according to one of Claims 1 to 4, characterised in that two separating stages (SP) are provided, of which each has a selecting member (21) and acts on one of the two heald halves.

6. Device according to Claim 5, characterised by guide and transport means for feeding the healds (LI) to the separating stages (SP), the guide means being formed by guide rails (16, 18) which are arranged on either side of the heald stack (LS) and form a guide channel.

7. Device according to Claim 6, characterised in that the transport means are formed by rotatable members acting on

one narrow side of the heald stack (LS), preferably by rollers (17) having a brush-like lining and/or by conveying belts provided with brushes.

8. Device according to Claim 6, characterised by a stop (20) arranged at the front end of the guide channel (16, 18) facing the separating stage (SP), the distance of which stop (20) from the guide channel is greater than the single thickness and less than twice the thickness of a heald (LI1) to be separated.

9. Device according to Claim 8, characterised in that the stop (20) is formed by a rib made on a guide body (19) for the selecting member (21), and in that the selecting member surrounds the rib in a U-shape at its end contacting the heald (LI1).

10. Device according to Claim 9, characterised by a guide surface (22) for the heald, which guide surface (22) is arranged on the side of the heald (LI1) remote from the rib (20) and adjoins the front end of the guide channel (16, 18) and along which the heald is guided during the working stroke of the selecting member (21) and which is limited by a stoppage (23) for the heald, which stoppage (23) defines the said intermediate position (ZP).

11. Device according to Claim 10, characterised by a sensor (32, 33) which detects the point at which the heald (LI1) reaches the intermediate position (ZP) and has a flexible member (33) which contacts an opposing element (32) when the heald strikes against the stoppage (23).

12. Device according to Claim 5, characterised in that the transfer means (24) is formed by a plunger adjustable in its stroke in the transport direction (A) of the heald stack (LS) or at an angle to this transport direction (A).

13. Device according to Claim 2, characterised in that the transport unit has needle-shaped holding means (25) which are provided for the end lugs of the heald (LI1) to be slipped over.

14. Device according to Claims 6 and 13, characterised in that the needle-shaped holding means (25) are in alignment

with the axis of the guide channel (16, 18).

15. Device according to Claim 5, characterised in that a detaching member for detaching healds possibly adhering to one another is provided in the longitudinal direction of the healds (LI) between the two separating stages (SP), which detaching member has a detaching blade (37) pivotable into the plane of the healds.

16. Device according to Claim 15, characterised in that the detaching blade (37) is mounted at one of its ends about a pivot axis and is connected in an articulated manner to a drive means (36) adjustable in its stroke.

17. Device according to Claims 12 and 16, characterised in that the selecting member (21), the plunger (24) and the drive means (36) for the detaching blade (37) are each driven by a pneumatically operable piston.

18. Device according to Claim 6, characterised in that the separating stages (SP), the heald supporting rails (13) and the transport means (17) for feeding the healds (LI) are mounted on a common mounting stand.

19. Device according to Claim 18, characterised in that the common mounting stand is designed as a displaceable truck and is detachably coupled to the functional stage of the warp-thread drawing-in machine containing the transport unit.

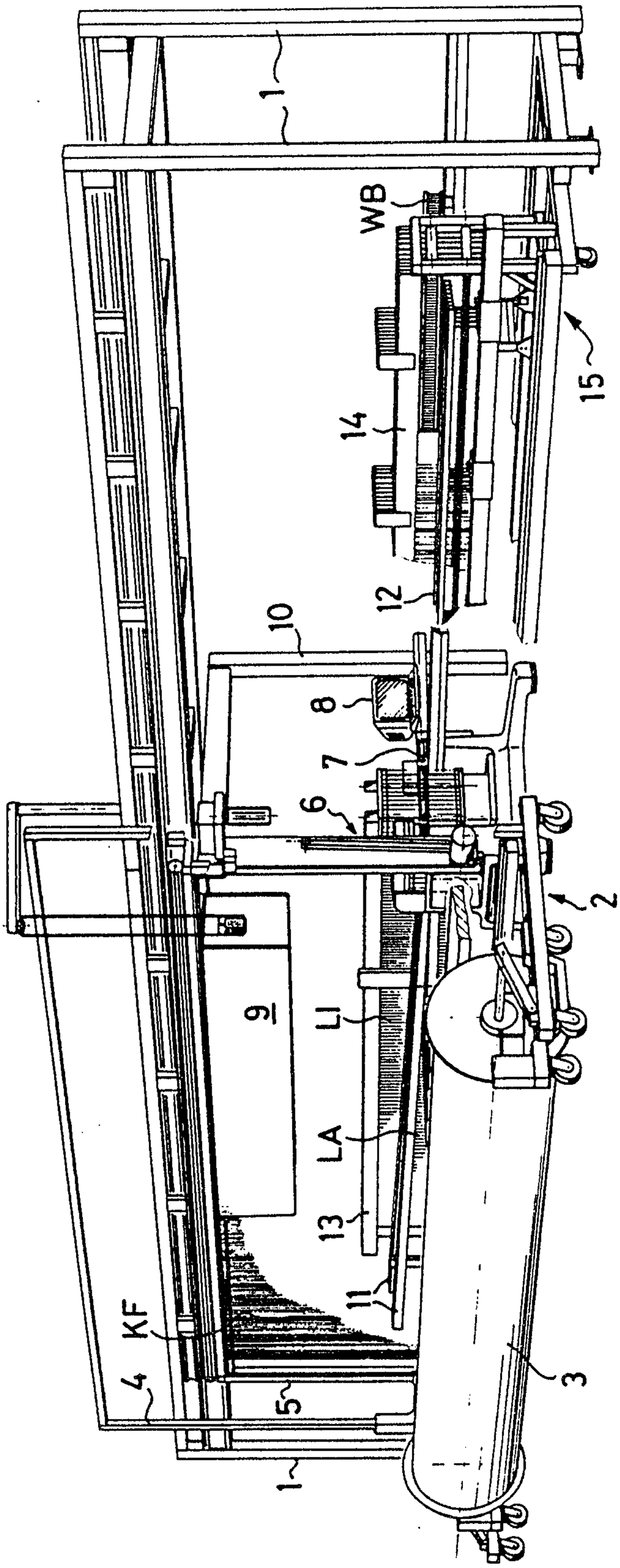

FIG.1

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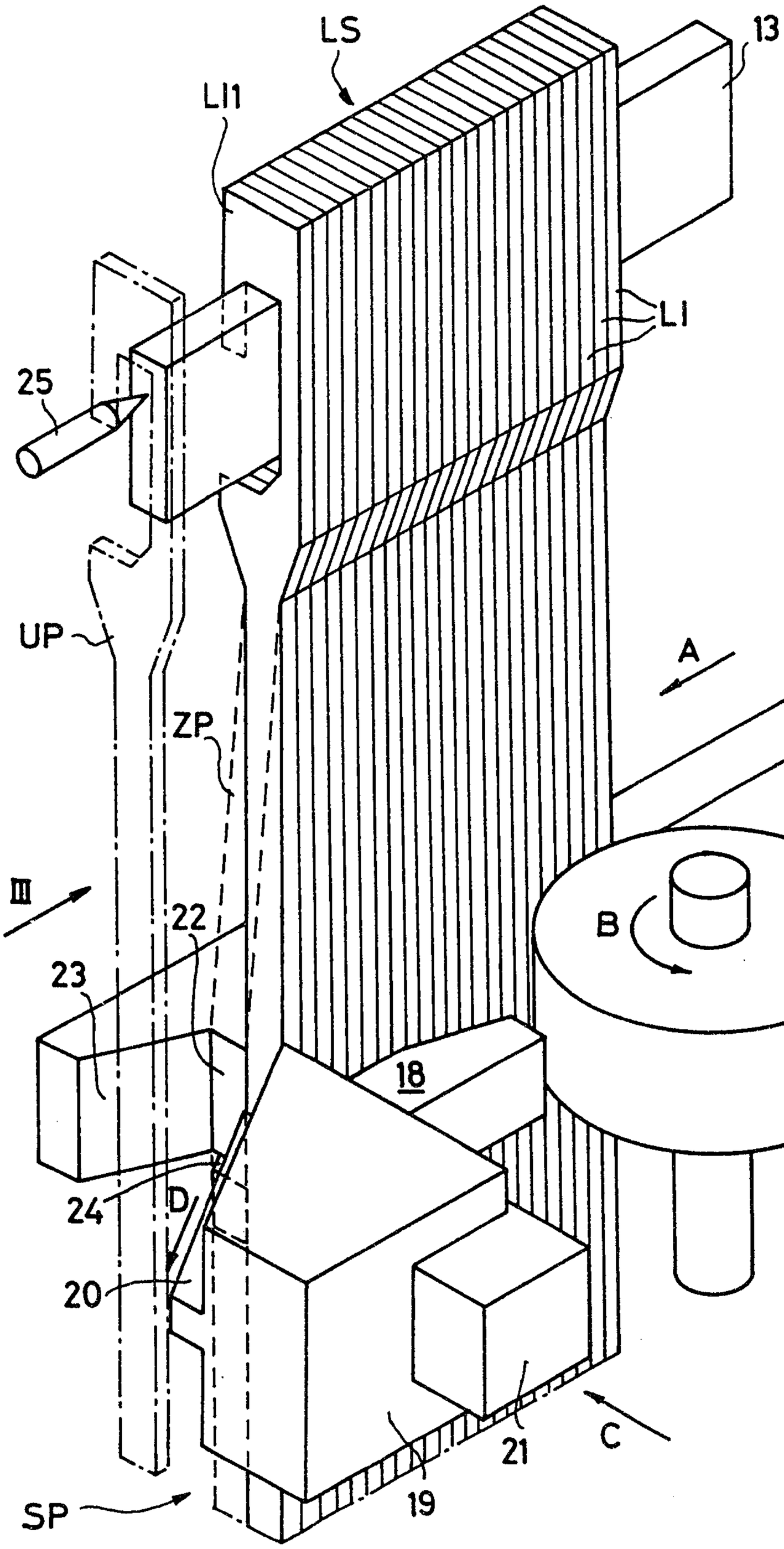
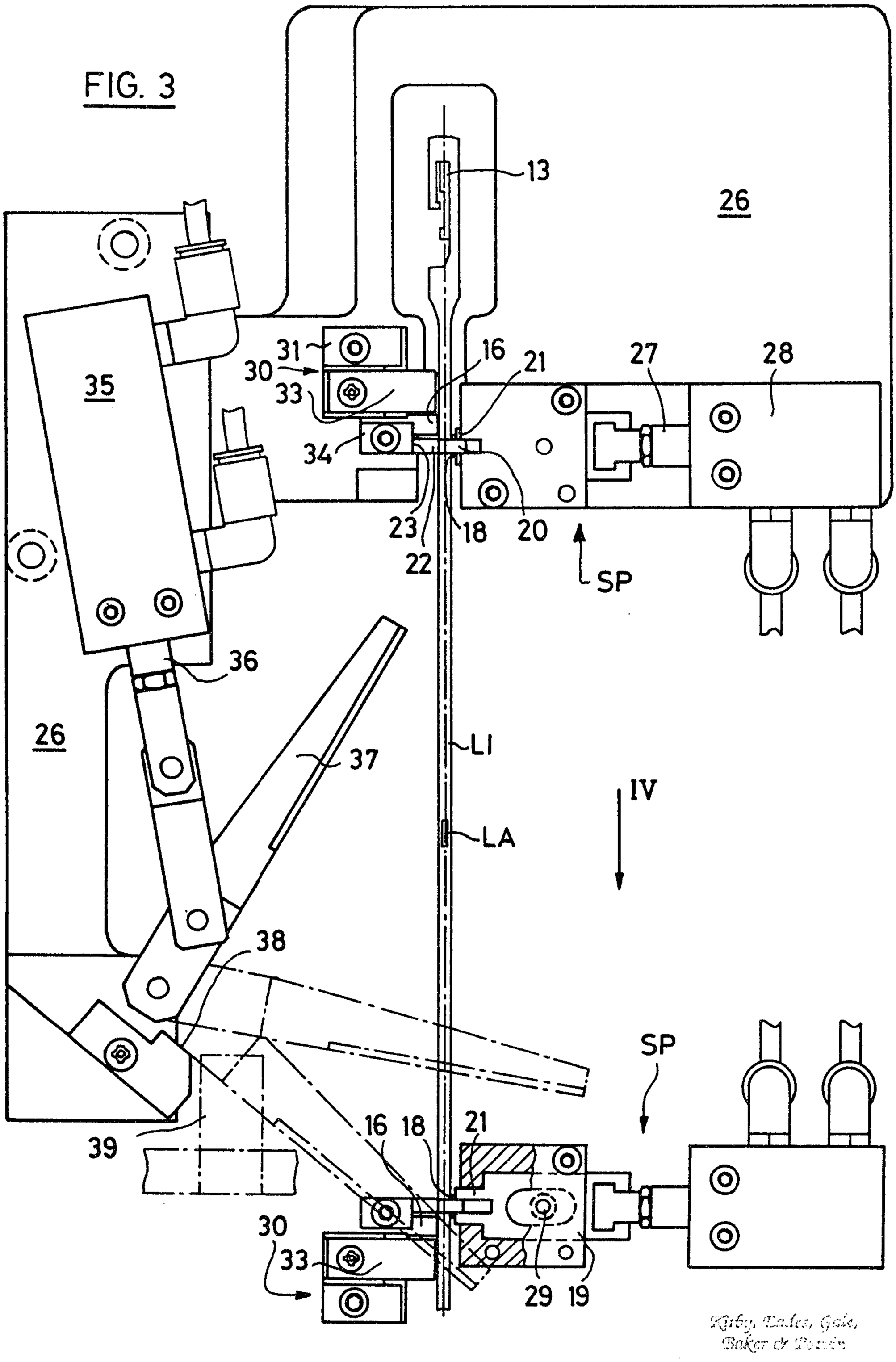


FIG. 2

FIG. 3



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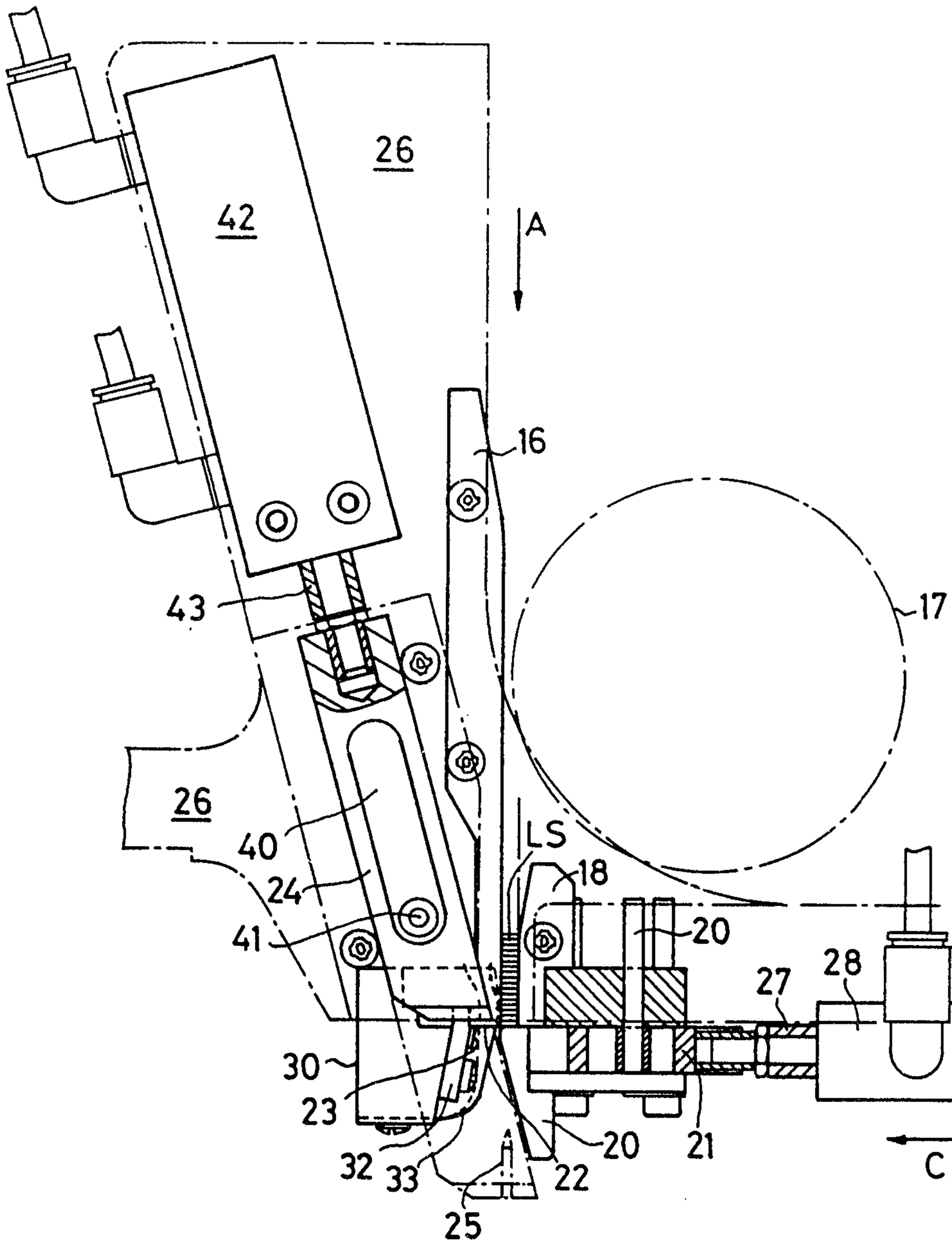

FIG. 4