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(54) **Method and apparatus for packaging a mattress in a package composed of multiple wrappings arranged one inside the other**

(57) The present invention relates to a method and an apparatus for packaging a mattress (M) in a package

composed of at least two wrappings arranged one inside the other around the mattress, which consist of material in sheet form taken from at least one respective reel.

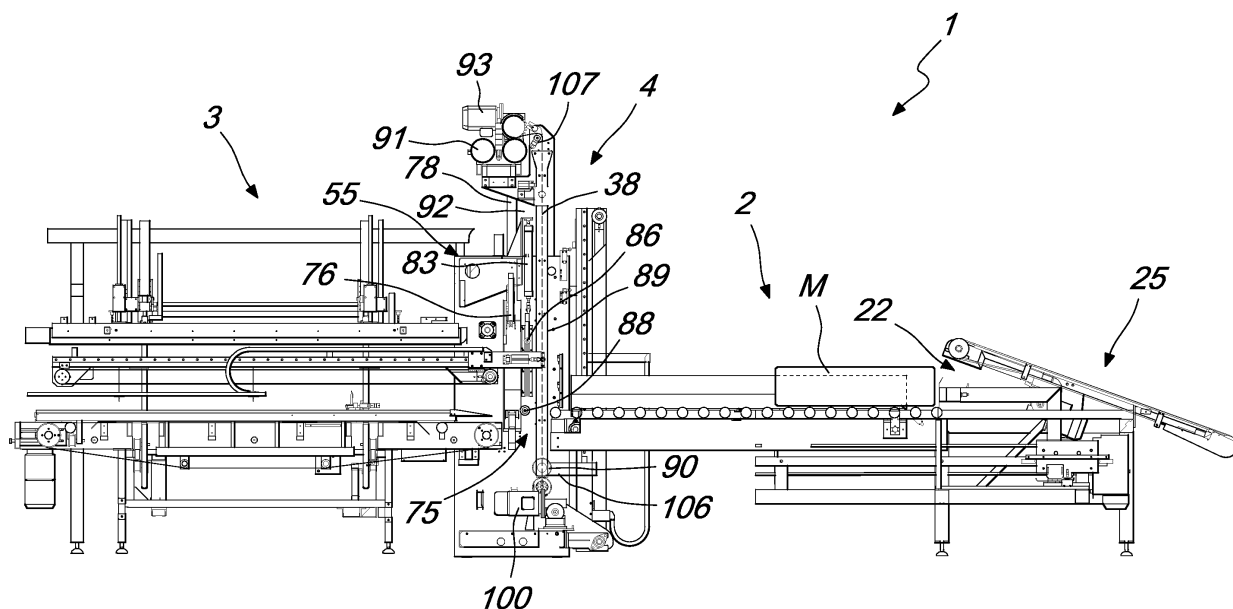


Fig. 1

Description

[0001] The present invention relates to a method and an apparatus for packaging a mattress in a package composed of multiple wrappings arranged one inside the other.

[0002] Mattresses, in order to be protected against dust and during the handling that they undergo during sorting and transport operations, are currently contained in a package consisting of a sheet of plastic material that is closed hermetically and is usually transparent for making the characteristics of the contained product visible.

[0003] However, the package, due to tearing caused by breakage or due to the dirt and dust that has deposited thereon during storage, often is scarcely acceptable to buyers and does not make the informational and advertising lettering, often provided on the outside of the package, fully visible.

[0004] In order to obviate the above described drawbacks, it has already been proposed to protect mattresses by introducing the first wrapping of the package in a second outer wrapping. In this manner, if the outer wrapping is damaged in any way, it can be removed, so as to make the inner one, which is still intact, visible.

[0005] However, the Applicant is not aware of any machines proposed on the market that are capable of forming continuously a double wrapping around a mattress. With known machines the outer wrapping is in fact applied separately, i.e., independently of the inner one, by using a secondary packaging machine onto which the mattress provided with a first wrapping is transferred.

[0006] The aim of the present invention is to devise a method for packaging a mattress in a package composed of multiple wrappings arranged one over the other around the mattress.

[0007] Within this aim, an object of the present invention is to provide a method for packaging a mattress in a package composed of two wrappings arranged one inside the other around the mattress, which consist of material in sheet form taken from at least one respective reel.

[0008] This aim and this and other objects which will become better apparent hereinafter are achieved with a method for packaging a mattress in a package, which comprises:

- preparing a first conveyor for the advancement of the mattress and a second conveyor for receiving and transferring the mattress so as to form a mattress resting surface and form a separating opening between said conveyors, such that it can be bridged by a mattress that is moved from one conveyor to the other by way of adapted movement means,
- preparing above said conveyors a reel of a sheet that can be heat-sealed and one end of which is joined to a fixing element that is guided through said opening,
- providing means for engaging and actuating said sheet fixing element between a position that lies be-

low said resting surface, in which said sheet remains stretched through said opening, and a position that lies above said resting surface up to such a height as to allow the passage of a mattress between said resting surface and said fixing element,

- providing, above said resting surface, heat-sealing and cutting means that can be operated synchronously with said fixing element and said mattress movement means for
- retaining, in a first step of operation, the fixing element below the resting surface and cause the advancement of the mattress from the first conveyor toward the second conveyor in order to produce the wrapping of said sheet in a loop around said mattress and the perimetric closure by heat-sealing and cutting of said sheet and the formation of a first wrapping, which is separate from the sheet unwound from said reel,
- lifting, in a second step, the sheet fixing element above the resting surface and transferring the mattress onto the advancement conveyor,
- returning, in a third step, said fixing element below the resting surface and
- in a fourth step, producing the advancement of the mattress on the second receiving and transfer conveyor in order to wrap a second sheet around the first wrapping and perform the consequent heat-sealing and cutting of the sheet, forming a second wrapping that is separate from the first one.

[0009] Another object of the present invention is to provide an apparatus for performing the method described above.

- [0010]** This aim is achieved with an apparatus for packaging a mattress in a package, **characterized in that** it comprises a first conveyor for the advancement of the mattress and a second conveyor for receiving and transferring the mattress, said conveyors forming a resting surface and being mutually separated by an opening, means for actuating said conveyors to transfer said mattress from one conveyor to the other by bridging said opening, a structure for supporting a reel of a sheet that can be heat-sealed above said conveyors, means for engaging an element for fixing the end of the sheet unwound from said reel, means for actuating and guiding said fixing element through said opening between a lower position, which lies below said resting surface and in which said sheet is stretched through said opening, and an upper position, which lies above said resting surface, up to such a height as to allow the passage of a mattress between said resting surface and said fixing element, heat-sealing means arranged above said resting surface, said means for actuating the fixing element, for heat-sealing and cutting and moving the mattress being functionally coordinated so that in a first step, with the fixing element arranged below the resting surface, the mattress is transferred from the first advancement conveyor toward the second receiving and transfer conveyor, thus causing

the wrapping and closure in a loop by heat-sealing and cutting of said sheet around said mattress and the formation of a first wrapping; in a second step, the fixing element is raised above the resting surface and the mattress is returned onto the advancement conveyor; in a third step, the fixing element is again lowered below the resting surface so as to again stretch said sheet through said opening; in a fourth step, the mattress is again transferred onto the receiving and transfer conveyor and the wrapping of a second enclosure around the first enclosure, the heat-sealing and cutting of the sheet, with formation of a second wrapping that is not connected to the first one, are completed.

[0011] Further characteristics and advantages of the present invention will become better apparent from the following detailed description of two embodiments of an apparatus for carrying through the method, which are illustrated by way of example in the accompanying drawings, wherein:

Figure 1 is a side elevation view of an apparatus according to the invention;

Figure 2 is a perspective view of the mattress advancement conveyor;

Figure 3 is a side elevation view of the mattress advancement conveyor, taken along the line III-III of Figure 4;

Figure 4 is a plan view of the advancement conveyor;

Figure 5 is a perspective view of the conveyor for receiving and transferring the mattress and of the device for closing the package;

Figure 6 is a perspective view of the receiving and transfer conveyor, taken from the opposite position with respect to Figure 5;

Figure 7 is an enlarged-scale view of a detail of Figure 6, related to the package closing device;

Figure 8 is a plan view of the receiving and transfer conveyor;

Figure 9 is a sectional view, taken along the line IX-IX of Figure 8;

Figures 10 to 14 are views of the apparatus in successive operating steps for forming the first wrapping of the package;

Figure 15 is a side elevation view of a variation related to the formation of two wrappings provided by means of sheets taken from respective reels during the step for removing the sheet to form the first wrapping;

Figure 16 is a view of the step for removing the sheet to form the second wrapping;

Figures 17, 18 and 19 are three perspective views of a means for locking the fixing element;

Figure 20 is a sectional view, taken along the line XX-XX of Figure 15.

[0012] With reference to Figure 1, the reference numeral 1 generally designates an apparatus, which can be assumed to be composed of two working assemblies

2 and 3, designed to move a mattress M, between which a third working assembly 4 is arranged which is designed to close the two wrappings that compose the package.

[0013] The first assembly 2, shown in greater detail in Figures 2-4, constitutes an advancement conveyor (designated hereinafter by the same reference numeral 2 for the sake of convenience) and comprises a rectangular frame 5 that is composed of two lateral longitudinal members 6, which are connected at their opposite ends by two cross-members 7. The frame 5 rests on the ground, at one end, by means of uprights 8, which are connected by longitudinal stringers 9 and transverse stringers 10. In the two corners of the end that lies opposite the uprights 8, there are provided respective feet 11, shorter than the uprights 8, by means of which the frame 5 is arranged on resting elements of the assembly 4. The reference numeral 12 designates two bars, which are parallel to the longitudinal members 6 and whose opposite ends are fixed to the cross-member 7 and, by means of raised portions 12a, to the stringer 10.

[0014] Two series of parallel rollers 13 and 14 are pivoted in the bars 12 and in the longitudinal members 6 and form respective rolling surfaces, which allow the movement of the mattress during the formation of the package. An elongated opening 15 remains between the bars 12 and below them there are two beams 16, which, at one end, hang down below the cross-member 7 and, at the opposite portion, rest and are fixed on the transverse stringers 10. The beams 16 support sliding guides 16a for a slider 17 (see Figures 3, 4), which is connected to a driving chain 18, which is closed in a loop around a respective driving gear 19 and driven gear 20, which are supported so that they can rotate on brackets 21 that are fixed on the beams 16. Specifically, the driving gear 19 is actuated by a reversible gearmotor 21a, which is coupled by means of a flange below the cross-member 7. A pusher 22 is fixed on the slider 17 and forms, with the rolling surfaces consisting of the rollers 13, 14, the advancement conveyor 2, which, by means of the closure assembly 4, transfers the mattress toward the working assembly 3, as will become better apparent in the further description. The pusher 22 consists in a bar 23, which is parallel to the rollers 13, 14 and is fixed to an L-shaped arm 24, which rises from the slider 17 on which it is fixed. With the actuation of the gearmotor 21a, the arm 24 moves along the opening 15, while the bar 23 of the pusher 22, by moving above the rollers 13, 14, can push the mattress M to be packaged toward the assembly 3 once said mattress has been deposited on the rollers by a feeder conveyor 25.

[0015] The feeder conveyor 25 (see Figures 2, 3) can be of any type. In the example shown, it advantageously consists of a frame 26 on which multiple parallel belts 27 are mounted, their upper portions being mutually coplanar so as to form a surface for conveying the mattress. The belts 27 are closed in a loop on respective guiding pulleys 28 and driving pulleys 29, of which the driving pulleys 29 are keyed on a shaft 30 that is supported ro-

tatably by the frame 26. The shaft 30 is motorized, by means of a transmission 31, by a gearmotor 32 mounted below the frame 26. The conveyor 25 is fixed obliquely with respect to the frame 25 (see Figure 2) by brackets 33, and its length is such as to overlap the driving pulleys 29 on the rollers 13, 14, so as to be able to unload the mattress M in front of the bar 23 of the pusher 22, which, due to the L-shaped configuration of the arm 24, can return below the belts 27.

[0016] The advancement conveyor 2 described so far is completed by a further motor drive, which is designed so as to allow the free rotation of the rollers 13, 14 when the pusher 22 pushes the mattress M in the advancement direction A from the initial position (i.e., for receiving the mattress M from the feeder conveyor 25) toward the assembly 3 by way of suitable means. Vice versa, when the rollers 13, 14 are actuated positively, they entrain the mattress that arrives from the assembly 3 in the direction B for return of the pusher 22 toward the starting position.

[0017] Said motor drive means consist of two shafts 34, 35 (see Figures 2, 4), which are perpendicular to the rollers 13, 14 and can rotate within supports that are fixed below the lateral longitudinal members 6 and are actuated by respective gearmotors 36, 37 that are fixed to said longitudinal members by means of flanges. For transmitting the motion from the gearmotors 36, 37 to the rollers 13, 14 belts 38 are provided, which are closed in a loop around the shafts 34, 35 and around pulleys (not visible in the drawings) that are keyed to the ends of the rollers.

[0018] Each mattress M deposited on the advancement conveyor 2 is transferred onto the assembly 3, which in combination with the working assembly 4 stretches and wraps around the mattress M a first sheet 38 of plastic material, which is unwound from a respective reel 39 (see Figure 10) and is wider than the mattress. After the sheet 38 has been closed around the mattress M so as to form a first hermetic wrapping, the mattress is again returned to the advancement conveyor 2, so to be able to start a second identical packaging operation for wrapping around the mattress a second sheet that is separate from the first one.

[0019] The assembly 3 (see Figures 5, 6, 8) consists of a frame 40, which is composed of two lateral longitudinal members 41 connected by cross-members 42. Two rollers 43, 44 are supported rotatably at the opposite ends of the longitudinal members 41, and belts 45 which are mutually parallel and spaced are closed in a loop around said rollers. The upper portions of the belts are coplanar and slightly raised at the opposite ends by means of rollers 46, which are keyed to respective shafts 47 supported within the longitudinal members 41 proximately to the rollers 43, 44. Moreover, the upper portions of the belts 45 are in sliding contact with the top of a slab 48, which is fixed on the frame 40 between the rollers 43, 44 and the lateral longitudinal members 41. The function of the roller 43 is to drive the belts 45. For this purpose, it is actuated by a gearmotor 49, which is flanged to a longi-

tudinal member 41 and is of the reversible type in order to actuate the belts in both directions A and B of sliding on the slab 48. In this manner, the assembly 3 acts like a conveyor, which after receiving the mattress from the advancement conveyor 2 and after the formation of the first wrapping, transfers it onto the conveyor 2 in order to start the formation of the second wrapping.

[0020] The opposite ends of the longitudinal members 41 rest on, and are fixed to, two cross-members 50, 50a. The cross-member 50 extends between two posts 52, which are lateral with respect to the longitudinal members 41 and are mutually connected at the top by a cross-member 53, which lies in a bridge-like arrangement above the belts 45. The opposite ends of the cross-member 50a are fixed between the two columns 54 of a bridge-like frame 55 which is arranged between the assemblies 2 and 3 and constitutes the supporting structure of the closure assembly 4.

[0021] The structure 55 is strengthened by a beam 51 that extends between the tops of the columns 54 and is connected to the cross-member 53 by two upper beams 56 and two lower beams 57. Two bearings 57a are fixed to each lower beam 57 in order to support two shafts 58, which are parallel and perpendicular to the belts 45. Corresponding sprockets 59 are keyed to the opposite ends of the two shafts 58 and mesh with a transmission chain (not visible in the drawing because it is covered by a housing 59a), which is wound around them and constrains the rotation of the shafts 58 in the same direction. Further, two pinions 60 are keyed to each shaft 58 and mesh with respective vertical racks 61, which are fixed to vertical strips 63 that are kept guided between pairs of free rollers 62, which are mounted below the cross-members 57 and to the lower end of which a panel 64 is fixed whose faces are flat and parallel to the underlying slab 48 and which forms with said slab a compartment for accommodating the mattress M. The opposite ends of two strips 64a (see Figures 8, 9) are jointly connected above the cross-members 57 and two fluid-operated jacks 65 are supported between said strips, their stems being coupled to the panel 64, and actuate the lifting and lowering of the panel 64 with respect to the slab 48. The panel 64 acts as a presser designed to reduce the thickness of the mattress before the sheet 38 is closed so as to form the wrapping.

[0022] Two transverse rails 66 are fixed below the lateral longitudinal members 41 of the frame 40, and two supporting carriages 67, for heat-sealing elements adapted to close hermetically at its sides the package that will be formed, can be arranged on said rails, one for each side of the frame 40 and so as to be mutually opposite.

[0023] Each carriage 67 is composed of two elements 68, which are substantially C-shaped and are mutually connected by strips 69. Each one of the elements 68 comprises a lower arm which is provided with wheels 70 for the gliding of the carriage 67 on the rails 66 and an upper arm which protrudes in a cantilever fashion above

the slab 48 and supports a fluid-operated jack 71. The stems of the jacks 71 of each carriage extend downward and a heat-sealing bar 72 hangs down from them, parallel to the belts 45, a bar 73 being arranged opposite the heat-sealing bar 72 in a lower region, fixed to brackets 73a of the carriage and acting as a contrast member for the heat-sealing bar to perform the heat-seals for the lateral closure of the wrapping.

[0024] In order to allow the heat-sealing bars 72 to preserve their parallel arrangement relative to the respective contrast bars 73 when the jacks 71 are actuated, said jacks are provided with adapted mechanisms that constrain the stems of the pair of jacks 71 mounted on each carriage 67 so as to follow identical paths. In the illustrated example, these mechanisms are not shown, since they are assumed to be fully traditional, consisting of, for example, racks which are formed in the stems of the jacks and mesh with pinions that are keyed to the ends of a shaft 74a which can rotate in supports that are jointly connected to the upper arms of the carriage. Substantially, the mechanisms are similar to what is described above with respect to the elements 58, 60, 61 by means of which the vertical movements of the plate 64 are restrained kinematically.

[0025] The advancement conveyor 2 and the receiving and transfer conveyor 3 are mutually spaced so as to form, between the roller 44 and the rollers 13, 14, an opening 75 (see Figures 1, 10-14) at which the structure 55 of the third operating assembly 4 is arranged which comprises the means that stretch the packaging sheet which is ready to be wrapped in a loop around the mattress and then complete its hermetic sealing in combination with the lateral heat-sealing performed between the heat-sealing bars 72, 73.

[0026] Said means (see Figures 7-9) consist of a heat-sealing bar 76 and a corresponding contrast bar 77, which extend transversely between the columns 54 of the structure 55. The heat-sealing bar 76 is of the type that produces two parallel heat-sealing lines and a separation cut between the two heat-sealing lines.

[0027] The heat-sealing bar 76 hangs down, at its opposite ends, from the stems of two jacks 78, which are accommodated vertically in the columns 54 and of which only the cylinders are visible in the figures. In order to allow the heat-sealing bar 76 to maintain the horizontal arrangement during its actuation, the stems of the jacks 78 are mutually coupled by a mechanism that is identical to the one described earlier with respect to the stems of the jacks 71 that move the lateral bars 72. Of this mechanism, it is possible to recognize in Figure 7 the longitudinal shaft 79 and the pinions 80, which mesh with the respective racks provided in the stems of the jacks 78 and are concealed within the columns 54.

[0028] Two vertical guides 81, for a slider 82 that can be actuated vertically by means of a pair of fluid-operated jacks 83 mounted on the beam 51, are fixed to the opposed faces of the columns 54 and proximately to the heat-sealing bar 76. The slider 82 is composed of a strip

84, which is provided at its ends with brackets 85, which support a roller 86 and are provided with sliders 87 that slidably engage the guides 81. By means of the jacks 83, the roller 86 can be lowered onto a further roller 88, which is supported so that it can rotate within the columns 54 at the height of the belts 45 and rollers 13, 14 and at the opening 75, so as to provide an additional support for the mattress M during its transfer from the working assembly 2 to the other assembly 3. The roller 86, in the raised position, forms together with the roller 88 the inlet to the compartment for accommodating the mattress between the straps 45 and the plate 64. Two profiles 89 are arranged adjacent to the guides 81 and form vertical channels in which the opposite ends of a cylindrical rod 90 are engaged slidably (see Figures 1, 7, 10-14), and the end edge of the sheet 38 of heat-sealing material designed to form the package and taken from the reel 39 is fixed to said rod so that it rotates jointly with said rod. The reel 39 rests so as to roll on two counter-rotating rollers 91, which are supported by shoulders 92 that rise from the top of the columns 54. One of the rollers 91 is actuated by a gearmotor 93 of the reversible type, which is mounted on a shoulder 92 and is adapted to control the unwinding of the sheet 38 from the reel 39. It should be noted that in Figures 5-9, the reel 39, the rollers 91 and the gearmotor 93 have not been shown for the sake of clarity of the drawing.

[0029] The apparatus described so far is completed by a device for allowing the movement of the rod 90 from a height that lies below the resting surface of the mattress M on the advancement conveyor 2 and on the receiving and transfer conveyor 3, i.e., the plane formed by the rollers 13, 14 and by the belts 45, to a level that lies above the resting surface by a height that is at least greater than the thickness of the mattress.

[0030] Said device comprises a pair of belts 94, each of which is closed vertically in a loop around two pulleys 95, 96, the upper ones 95 of which can rotate on the internal faces of the columns 54 and the lower ones 96 of which are keyed to the ends of a shaft 97 that is supported rotationally in brackets 98 fixed in a cantilever fashion to a base 99 of the structure 55. The belts 94 are moved by a reversible gearmotor 100, which is mounted on the base 99 and transmits motion to the shaft 97 by means of a transmission 101. A vertical guide 102 for the sliding of a sliding block 103 is arranged to the side of each belt 94 and said sliding block is fixed in a cantilever fashion to a portion of the respective belt so that it can perform upward and downward strokes. A fluid-operated actuator 104 is incorporated in each sliding block 103 and is provided with stems 105 to which an engagement element is jointly connected which consists of a fork 106 (see Figures 1, 7), which protrudes horizontally toward the guide 81. By activation of the actuators 104, the forks 106 can engage and disengage the ends of the fixing rod 90 of the sheet when it lies below the plane of the rollers 13, 14.

[0031] The operation of the apparatus is described

hereinafter with reference to Figures 10-14.

[0032] First of all, a portion of the sheet 38 is unwound from the reel 39 and its end is fixed to the rod 90. The rod is then lowered below the plane of the rollers 13, 14 and engaged at the opposite ends by the forks 106 actuated by the actuators 104, so that the unwound portion of sheet is stretched through the opening 75. Conveniently, in the shoulders 92 that lie above the columns 54 there is a guiding roller 107, which spreads the sheet on a vertical plane that passes through the channels 89 (see Figure 10).

[0033] After unloading onto the rollers 13, 14 the mattress M to be packaged by means of the feeder 25, the pusher 22 is activated and, from its position below the feeder 25, pushes the mattress M in the direction A against the sheet 38, forcing it between the plane of the belts 45 and the plate 64 of the presser (see Figure 11).

[0034] With the insertion of the mattress in the compartment formed between the belts 45 and the plate 64, a further portion of sheet 38 unwinds from the reel, so that when the mattress is fully transferred onto the belts 45, the front, upper and lower faces of the mattress are covered by the sheet.

[0035] Then (see Figure 12), after lowering the roller 82 into abutment against the roller 88 and thus moving mutually closer the superimposed flaps of the sheet, the transverse heat-sealing unit 76, 77 is actuated and joins the superimposed flaps of the sheet along two parallel and adjacent heat-sealing lines and cuts them along a line that is intermediate with respect to the heat-sealing lines, causing at once the formation of a first wrapping (which will be the inner one) which is closed around the mattress but is separated from the sheet, whose continuity is restored from the reel 39 up to the fixing rod 90. After the heat-sealing bars 76, 77 have been opened, the actuators 104 are activated and release the rod 90 by retracting the forks 106. Then, with the subsequent activation of the gearmotor 100, by means of the shaft 97 and the belts 94, the rod 90 is raised to a level that lies above the upper face of the mattress M (see Figure 13). At the same time, by means of the activation of the gearmotor 93 and the rotation of the rollers 91, rewinding onto the reel 36 is provided for the portion of sheet that otherwise would be loose upon lifting of the rod 90. Once these steps have been completed, the mattress M is advanced by means of the belts 45 and is positioned below the plate 64, which, by activating the jacks 65, moves downward, compressing the mattress M and reducing its thickness, so that at the end of the packaging operations the volume of the packaged mattress is reduced significantly (however, it is noted that in Figure 13 the mattress is not shown in the compressed position). Moreover, when the mattress M is in the compressed condition and the sheet 38 is closed in a loop around it, the lateral heat-sealing units 72, 73 are activated and, by heat-sealing the superimposed lateral flaps of the sheet, complete the perimetric closure of the sheet, providing a hermetically closed wrapping.

[0036] As soon as the perimetric heat-sealing has been completed, the plate 64 is lifted again, thus releasing the mattress M so that by activating the belts 45 in the opposite direction B, the mattress, passing below the rod 90, can be transferred onto the conveyor 2 (see Figure 14). At this point, the rod 90 is lowered again below the plane of the rollers 13, 14, so as to stretch a new portion of sheet through the opening 75, thus restoring the initial conditions that make it possible to form a second wrapping in the manner described above for forming the first wrapping.

[0037] As can be seen, the invention achieves perfectly the intended aim and objects. In particular, it is noted that with the apparatus it is possible to obtain two separate wrappings, so that the outer one can be removed easily in case of damage or for various reasons, for example for reasons of presentability of the contained product, or in case of undergone damage and so forth.

[0038] The described apparatus is susceptible of modifications and variations, all of which are within the scope of the appended claims.

[0039] According to a second embodiment of the invention, shown more clearly in Figure 7 and adapted to ensure more exact and crease-free handling of the wrapping of the sheet around the mattress, a gear 108 is provided, which is keyed to one end of the fixing rod 90 and is arranged adjacent to the plane of advancement of the fork 106, so as not to interfere with said fork. A pinion 109 is supported at the lower end of the channel 89 and is adapted to mesh with the gear 108 when said gear is positioned at the lower stroke limit. The pinion 109 is actuated by means of a gearmotor 110, which is mounted on a post 111 jointly connected to the base 99. The function of the gearmotor 110 is to impart to the gear 108, once it has been meshed with the pinion 109 and at the end of the closure of each wrapping, a rotation by means of which a number of turns is transmitted to the rod 90 which is sufficient to rewind a portion of the sheet that might remain loose after heat-sealing and cutting and restore the spreading thereof that is necessary to ensure the wrapping of the sheet around the mattress.

[0040] It should be noted that with this embodiment the portion wrapped around the rod 90 can be unwound on the belts 45 at the same advancement speed as the mattress, so as to avoid the sliding of the mattress on the underlying sheet portion and ensure perfect spreading of the sheet below the mattress.

[0041] Figures 15, 16 illustrate a further embodiment, which makes it possible to provide packaging by using two sheets taken from two different reels and is therefore capable of forming two wrappings that have different aesthetic characteristics, or of providing an outer wrapping with stronger sheets or to function as a support for advertising messages and so forth.

[0042] The variation provides, to the side of the first reel 36, a second reel 112, which is also supported by a pair of rollers 113 actuated by a gearmotor 114 mounted on the shoulder 102. The second sheet 115 is wrapped

around the reel 112, its end being fixed to a second fixing rod 116, whose opposite ends are guided in the same channels 89 in which the rod 90 is guided.

[0043] Two actuators 117, 118 are associated with each shoulder 102, below the rollers 91, for the actuation of respective arms 119, 120 which are substantially horizontal. By activation of the actuators, the arms 119, 120 move between a position of engagement in the channels 89 and a position of extraction from them through adapted recesses formed in the shoulders of the channels.

[0044] The actuators 117, 118 are actuated alternately for switching the drawing of the sheets from one reel to the other after formation of the first wrapping.

[0045] After formation of the first wrapping with the sheet 38 in the manner specified above in Figures 10-14, the rod 90 for fixing the sheet 38 is lifted by the forks 106 to the height of the lower arm 120 and then retracted out of the channels 89 by the actuators 118.

[0046] Conveniently, the arms 119, 120 are curved upward, so that the rod 90 can continue to be retained on the arms 120, allowing the forks 106 to be retracted and lifted to the height of the arms 119 on which the rod 116 was deposited earlier during formation of the first wrapping. At this point the forks 106 are activated to engage the upper rod 116 and the arms 119 are disengaged from the channels 89 by activation of the actuators 117, so that by actuation of the belts 94 the rod 116 is lowered below the plane of the rollers 13, 14 for being able to proceed with the formation of the second wrapping and the completion of the packaging process.

[0047] Advantageously, as shown in Figures 17-19, both rods 90 and 116 are each provided, at at least one end, with a gear 108, 121, and at least the fork 106, which is adjacent to the gears 108, 121 and therefore cooperates with the arms 119, 120, has a toothed sector 122, which is guided in a U-shaped member 123 that is fixed to one face of the fork 106. The toothed sector 122 is connected to the stem of an actuator 124 that is fixed to the opposite face of the fork. Depending on the requirements, the toothed sector 122, by engaging the set of teeth of the gears 108, 121, can block the rotation of the rods 90, 116 during movements along the channels 89 or during the steps for wrapping and unwinding the sheets on the part of the elements 109, 111. Conveniently, additional toothed sectors 125, 126 are jointly connected to the arms 119, 120 and, by actuation of the actuators 117, 118, engage the gears 108, 121, retaining the rods 90, 116 at the heights provided for pickup by the forks 106.

[0048] The disclosures in Italian Patent Application No. BO2008A000614 from which this application claims priority are incorporated herein by reference.

[0049] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of exam-

ple by such reference signs.

Claims

1. A method for packaging a mattress in a package, comprising:

- providing a first conveyor (2) for the advancement of the mattress (M) and a second conveyor (3) for receiving and transferring the mattress so as to form a mattress resting surface (45, 13-14) and form a separating opening (75) between said conveyors, such that it can be bridged by a mattress that is moved from one conveyor to the other by adapted movement means (22, 13-14, 45),
- providing above said conveyors a reel (39) of a sheet (38) that can be heat-sealed and one end of which is joined to a fixing element (90) that is guided through said opening,
- providing means (94-106) for engaging and actuating said element for fixing the sheet (38) between a position that lies below said resting surface (45, 13-14), in which said sheet is stretched through said opening (75), and a position that lies above said resting surface up to such a height as to allow the passage of a mattress (M) between said resting surface and said fixing element (90),
- providing, above said resting surface, heat-sealing and cutting means (72-73, 76-77) that can be operated synchronously with said fixing element and said mattress movement means for
- retaining, in a first step of operation, the fixing element (90) below the resting surface and causing the advancement of the mattress from the first conveyor (2) toward the second conveyor (3) in order to produce the wrapping of said sheet in a loop around said mattress and the perimetric closure by heat-sealing and cutting of said sheet and the formation of a first wrapping, which is separate from the sheet unwound from said reel,
- lifting, in a second step, the sheet fixing element (90) above the resting surface (45, 13-14) and transferring the mattress onto the advancement conveyor (2),
- returning, in a third step, said fixing element below the resting surface (45, 13-14) and
- in a fourth step, producing the advancement of the mattress on the second receiving and transfer conveyor (3) in order to wrap a second sheet around the first wrapping and perform the consequent heat-sealing and cutting of the sheet, forming a second wrapping that is separate from the first one.

2. An apparatus for packaging a mattress in a package, **characterized in that** it comprises a first conveyor (2) for the advancement of the mattress and a second conveyor (3) for receiving and transferring the mattress, said conveyors forming a resting surface (45, 13-14) and being mutually separated by an opening (75), means (34-37, 43-49) for actuating said conveyors to transfer said mattress from one conveyor to the other by bridging said opening, a structure (55) for supporting a reel (39) for a sheet (38) that can be heat-sealed above said conveyors, means (94-101) for engaging an element (90) for fixing the end of the sheet unwound from said reel, means (89) for guiding said fixing element through said opening between a lower position, which lies below said resting surface and in which said sheet is stretched through said opening, and an upper position, which lies above said resting surface, up to such a height as to allow the passage of a mattress between said resting surface (45, 13-14) and said fixing element (90), heat-sealing means (76, 72-73) arranged above said resting surface, said means for actuating the fixing element, for heat-sealing and cutting and moving the mattress being functionally coordinated so that in a first step, with the fixing element (90) arranged below the resting surface, the mattress is transferred from the first advancement conveyor (2) toward the second receiving and transfer conveyor (3), thus producing the wrapping and closure in a loop by heat-sealing and cutting of said sheet around said mattress and the formation of a first wrapping; in a second step, the fixing element is raised above the resting surface and the mattress is returned onto the advancement conveyor (2); in a third step, the fixing element (90) is again lowered below the resting surface so as to again stretch said sheet through said opening (75); in a fourth step, the mattress is again transferred onto the receiving and transfer conveyor (3) and the wrapping of a second sheet around the first wrapping, the heat-sealing and cutting of the sheet, with formation of a second wrapping that is not connected to the first one, are completed.
3. The apparatus according to claim 2, **characterized in that** said first advancement conveyor (2) comprises two series of rollers (13, 14), which form respective roller beds between which there remains an opening (15) and a pusher (22) that can move along said opening and is adapted to operate on the mattress (M) to be packaged, which is deposited on said rollers, for transferring said mattress onto said second conveyor (3).
4. The apparatus according to claim 3, **characterized in that** said rollers (13, 14) can rotate freely during the advancement of the pusher (22) in the direction (A) for transfer of the mattress toward said second conveyor (3) and can be actuated positively in the opposite direction (B) when the mattress returns from said second conveyor onto said roller beds (13, 14).
5. The apparatus according to one of claims 3 and 4, **characterized in that** said pusher (22) consists of a bar (23), which can move above the roller bed (13, 14) and is connected to a slider (17) that can slide on guides (102) arranged below said roller bed and is actuated with a reversible motion.
6. The apparatus according to one of claims 3 to 4, **characterized in that** the rollers (13, 14) of each series are actuated by a gearmotor (36, 37), which actuates said rollers by means of a transmission that comprises a shaft (34, 35) which is supported at right angles to said rollers and is connected to them by respective belts (38).
7. The apparatus according to one of claims 3 to 7, **characterized in that** a feeder (25) of mattresses is associated with said advancement conveyor (2) and is of the type with belts (25), the end of which for unloading the mattresses lies above said roller beds.
8. The apparatus according to claim 1, **characterized in that** said receiving and transfer conveyor (3) comprises a plurality of horizontal belts (45) in sliding contact on a supporting slab (48), which form a plane that is substantially coplanar with respect to the plane of the rollers (13, 14), said belts being actuated by a reversible gearmotor (49).
9. The apparatus according to claim 8, **characterized in that** it comprises a plate (64), which is supported above said slab (48) and forms with it a compartment for accommodating the mattress to be packaged, means (60-65) being provided for the actuation of said plate from a raised position into a lowered position for compressing the mattress.
10. The apparatus according to claim 9, **characterized in that** heat-sealing means (72, 73) are arranged laterally to said plate (64) for heat-sealing the lateral edges of the packaging sheet wrapped around said mattress arranged in said compartment.
11. The apparatus according to claim 10, **characterized in that** said heat-sealing bars (72, 73) are supported on carriages (67), which are arranged at the sides of said plane with belts (45) and at an adjustable distance with respect to it.
12. The apparatus according to one of claims 2 to 11, **characterized in that** said structure (55) comprises two columns (51), at the top of which rollers are supported for supporting at least one reel (39) for a sheet

for forming the package, a first pair of guides (89) associated vertically with said columns (51) for guiding the opposite ends of a rod (90) that constitutes said element for fixing the sheet (38), a second pair of guides (102), which are parallel to the first ones (89), for guiding respective sliding blocks (103) for supporting actuators (104) which actuate elements (106) for engaging the ends of said rod (90), where said sliding blocks can be actuated by said means (94-101) so that said rod can be raised and lowered between a position that lies below said roller bed and a position that lies above said roller bed at a height that is greater than the thickness of the mattress.

13. The apparatus according to claim 12, **characterized in that** a second reel (112) for a sheet (115) is arranged on said structure (55), said sheet (115) having an end that is fixed to a second rod (116), whose opposite ends are guided slidably within the same guide (89) of said first rod (90), stop means (119, 120) being provided for retaining said rods at a height, with respect to the resting surface, that is greater than the thickness of the mattress, and being controlled by control means to allow the individual release of said engagement elements (106).
14. The apparatus according to one of claims 12 and 13, **characterized in that** said stop means comprise arms (119, 120), which are actuated by actuators (117, 118) jointly connected to said structure (55) between a support position and a release position of said rods (90, 116).
15. The apparatus according to one of claims 12-14, **characterized in that** a gear (108, 121) is keyed to the opposite ends of each rod (90, 116) and **in that** said engagement elements consist of a fork (106), on which a toothed sector (122) is associated slidably which is actuated by an actuator (124) between a position for engaging said gear (108, 121) in order to block the rotation of said rod (90, 116) and a position for disengagement from said gear (108, 121) in order to allow the rotation of said rod (90, 116).
16. The apparatus according to one of claims 12-15, **characterized in that** at the lower end of said first guides (89) there is a pinion (109), which can be actuated by a gearmotor (110) and is adapted to mesh with the gear (108, 121) that is keyed to the rod in order to stretch said sheet.

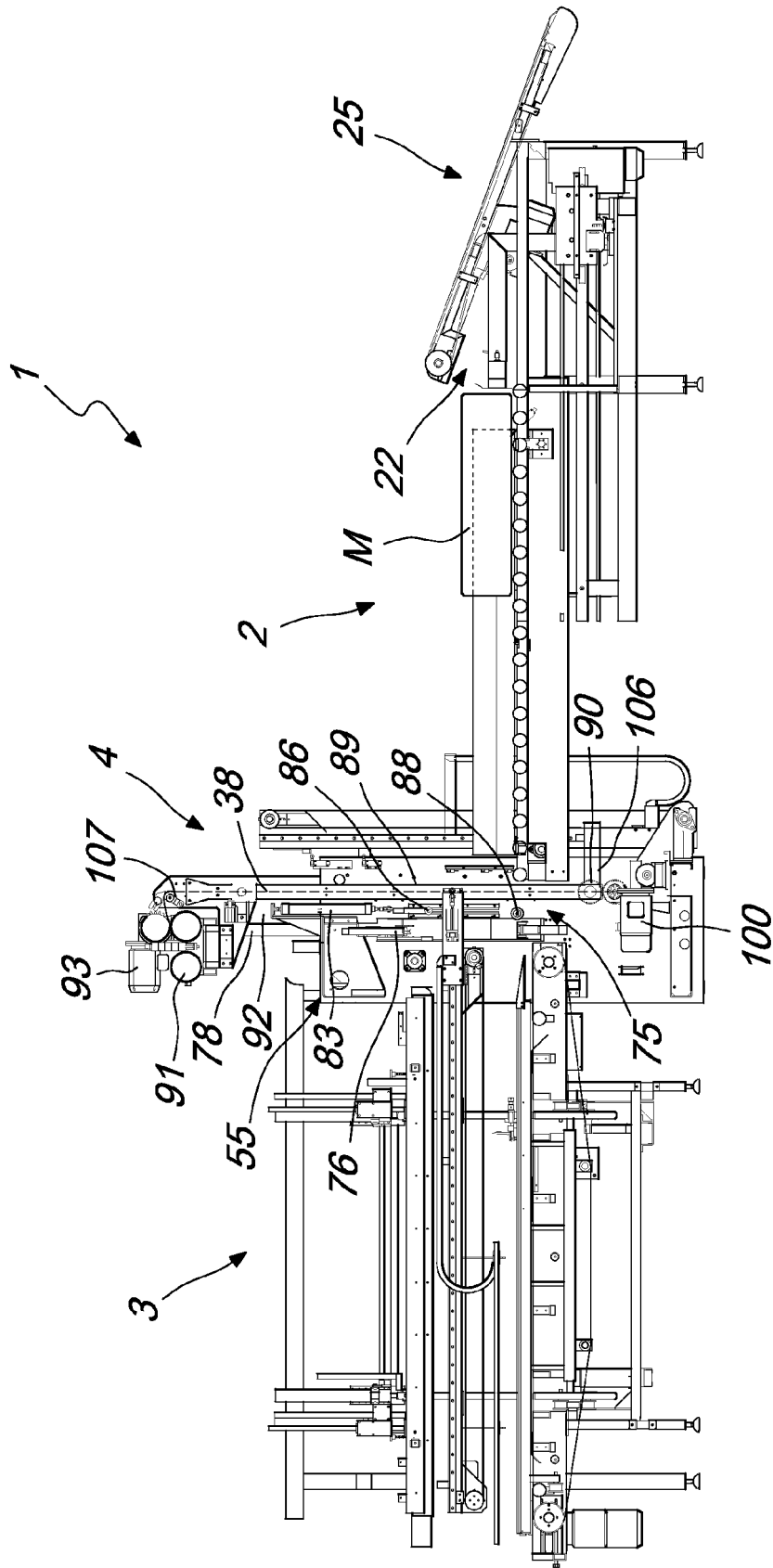
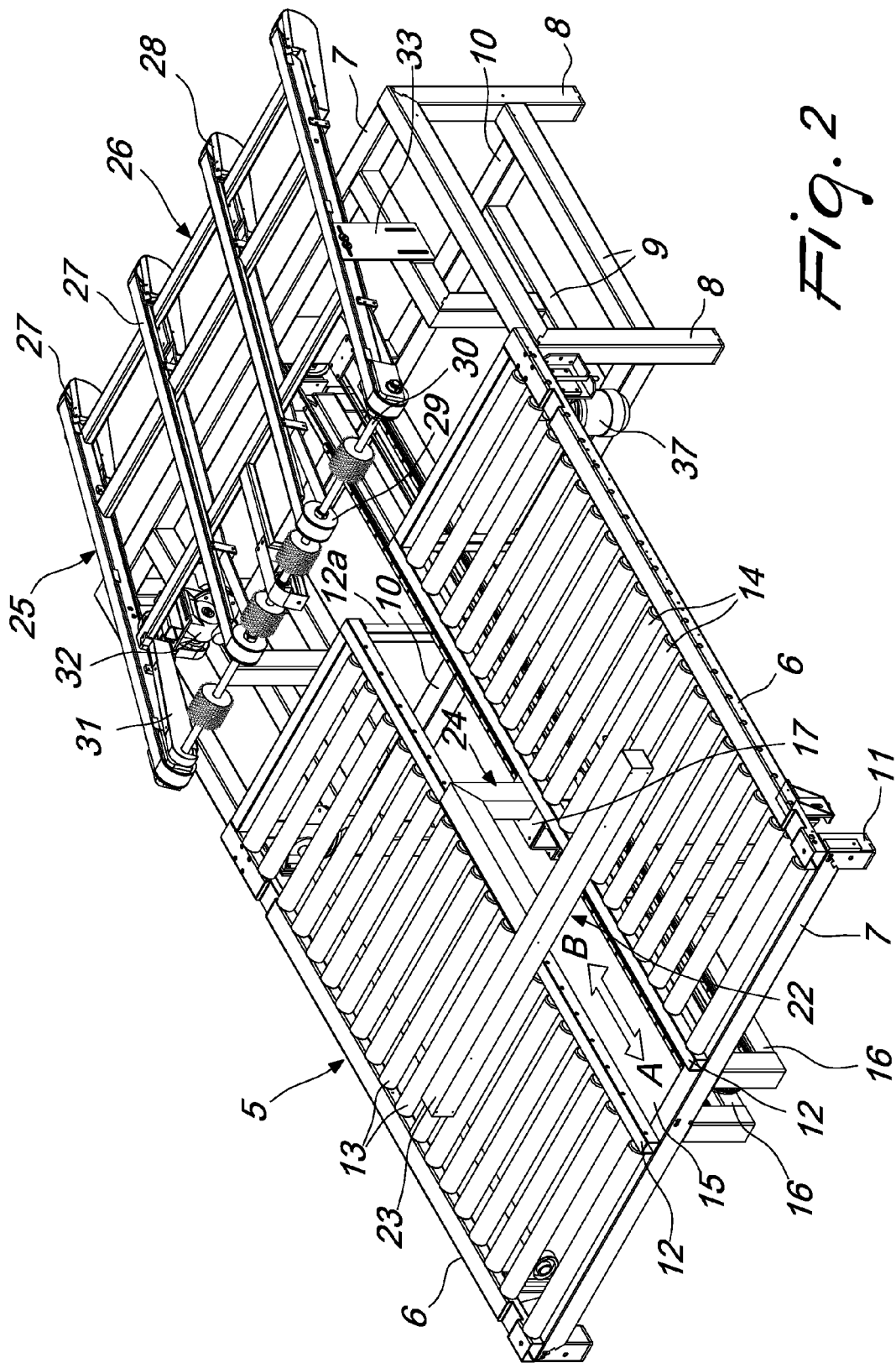


Fig. 1



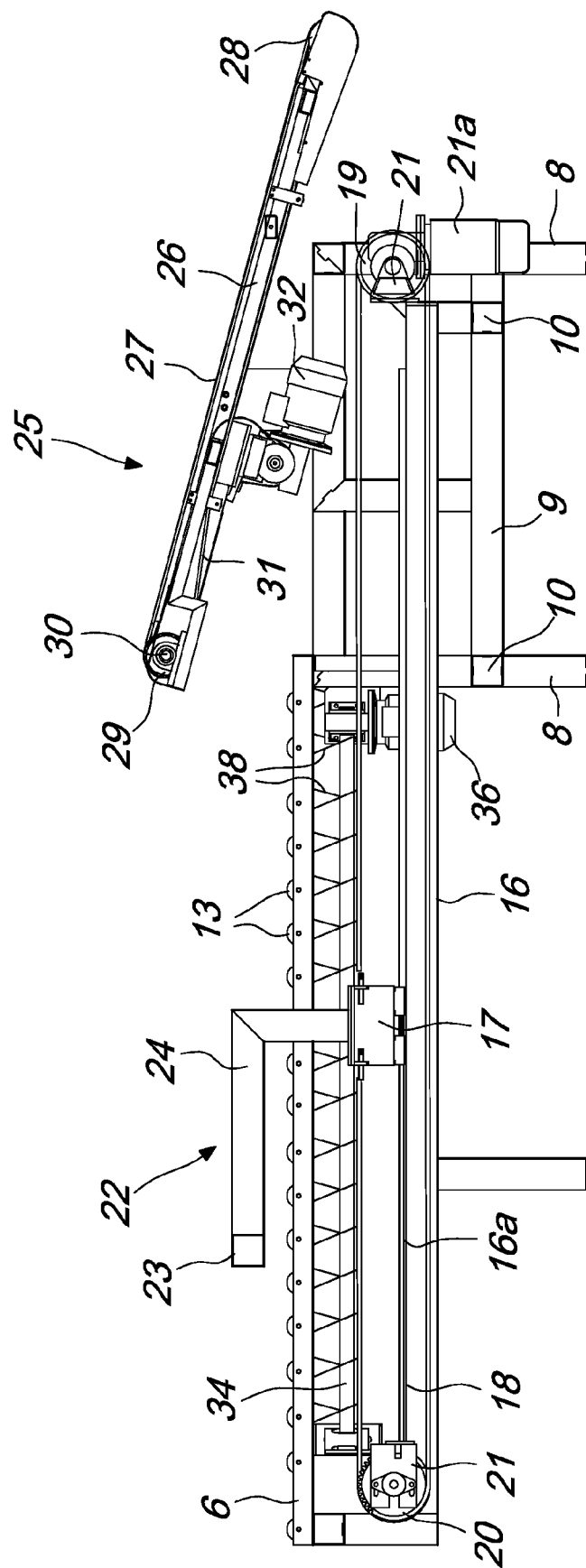


Fig. 3

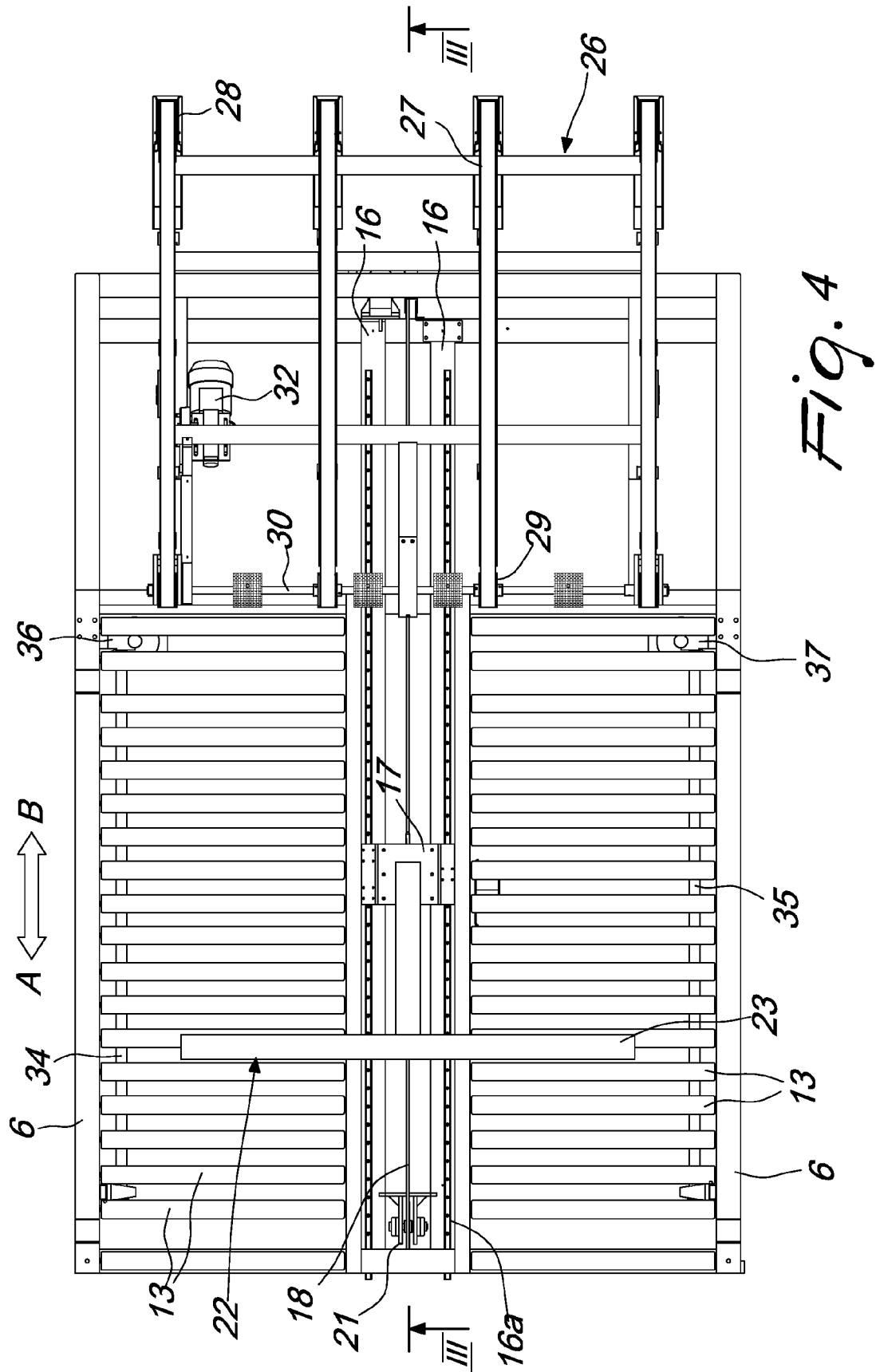


Fig. 4

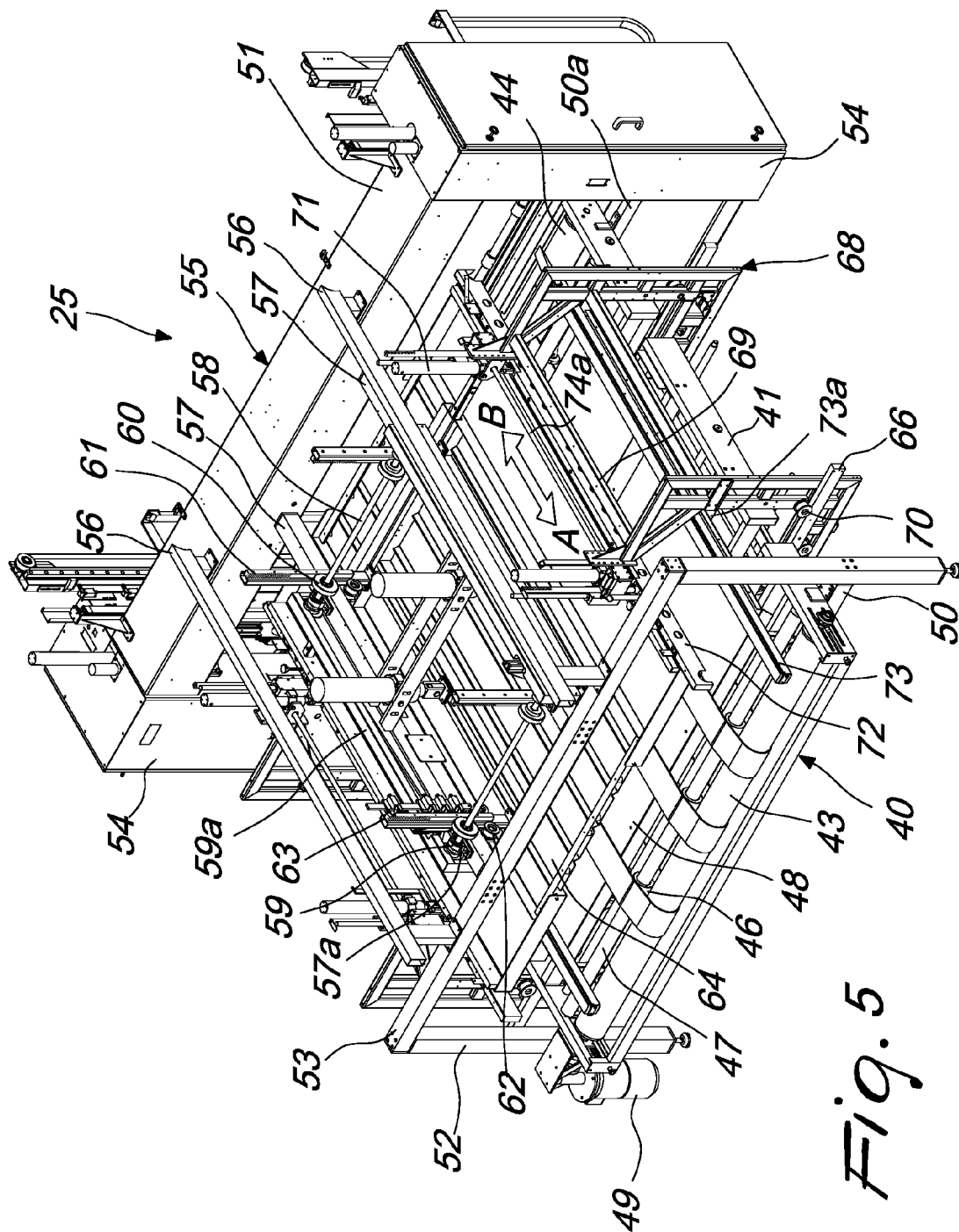


Fig. 5

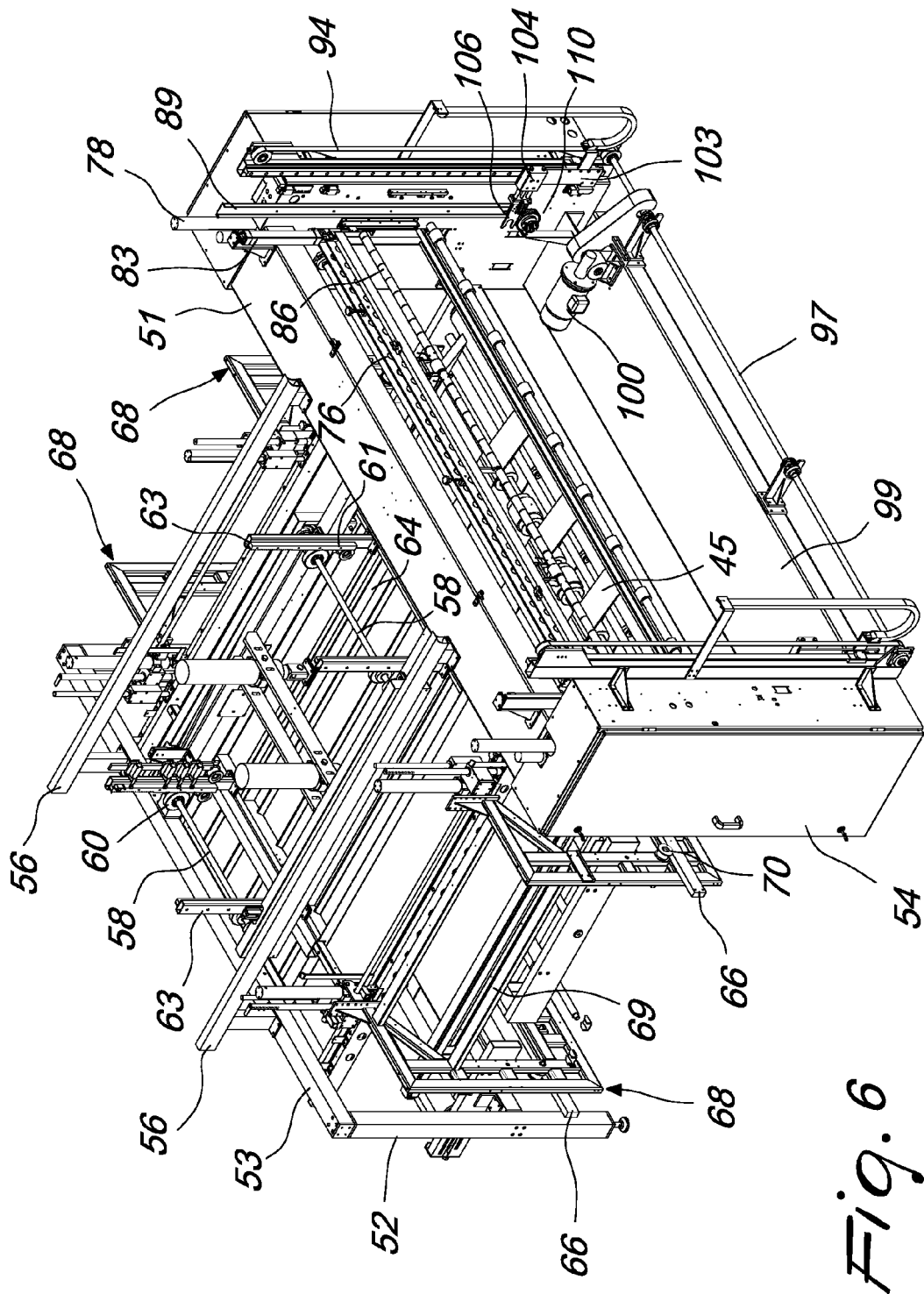


Fig. 6

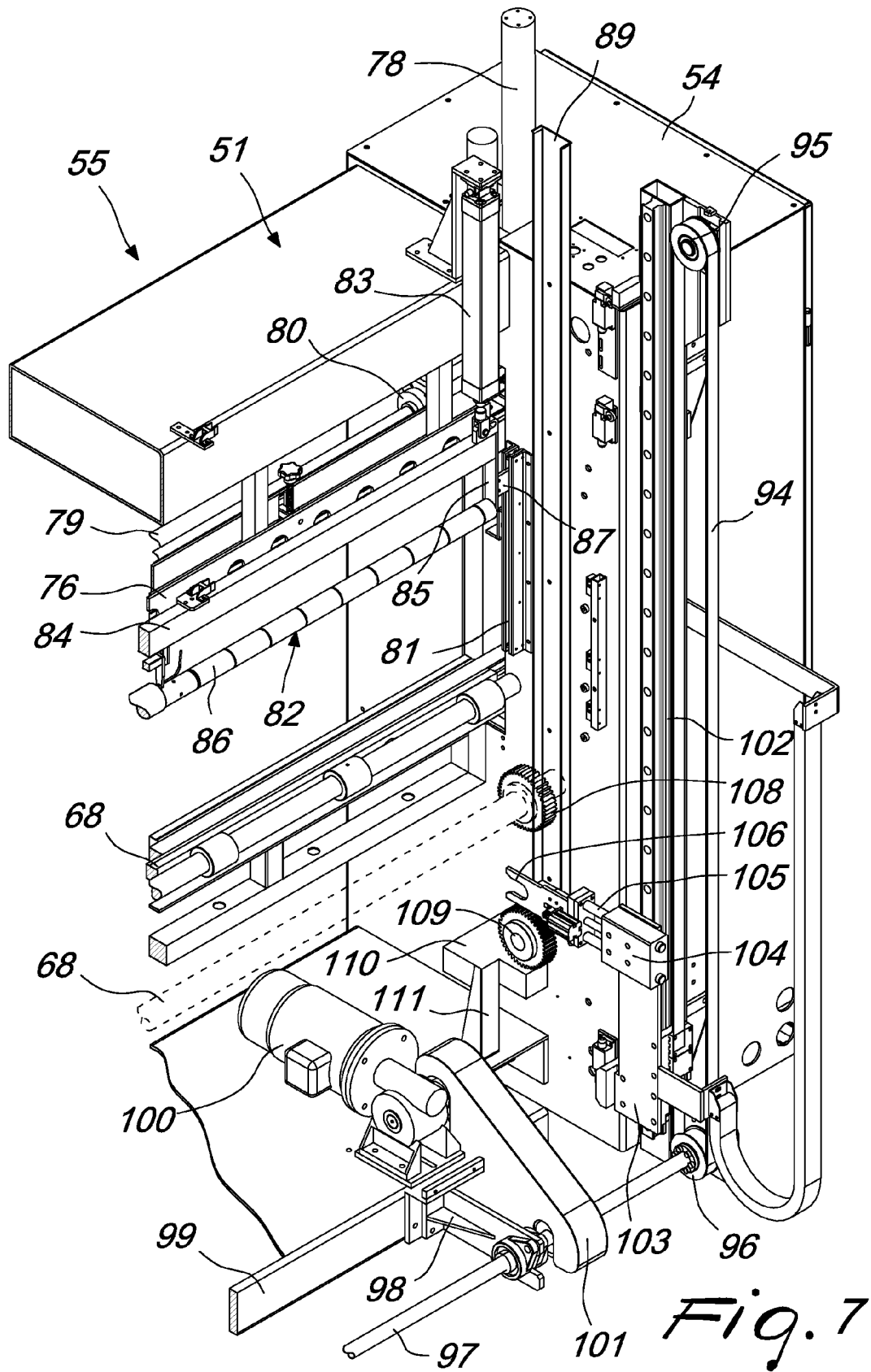
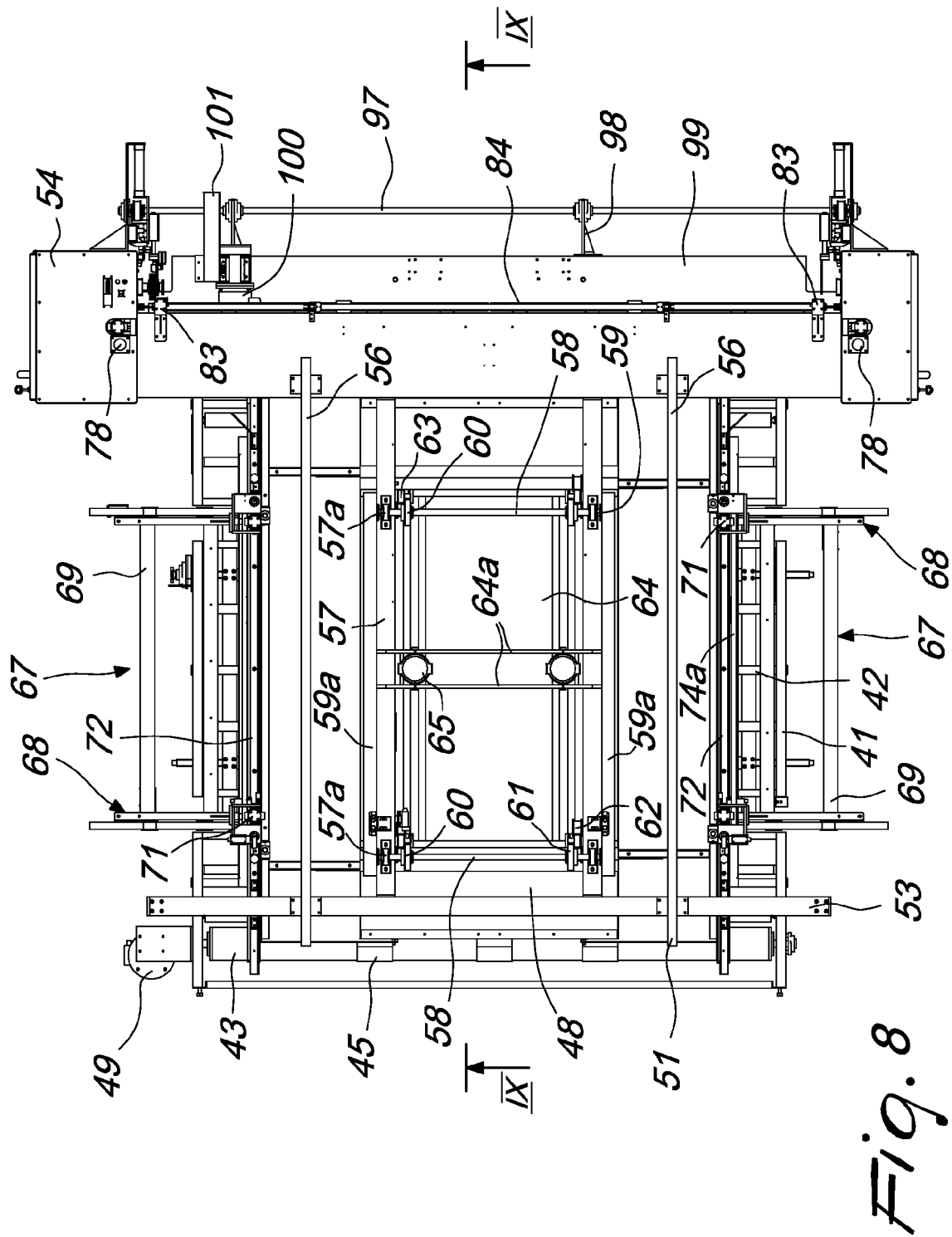


Fig. 7



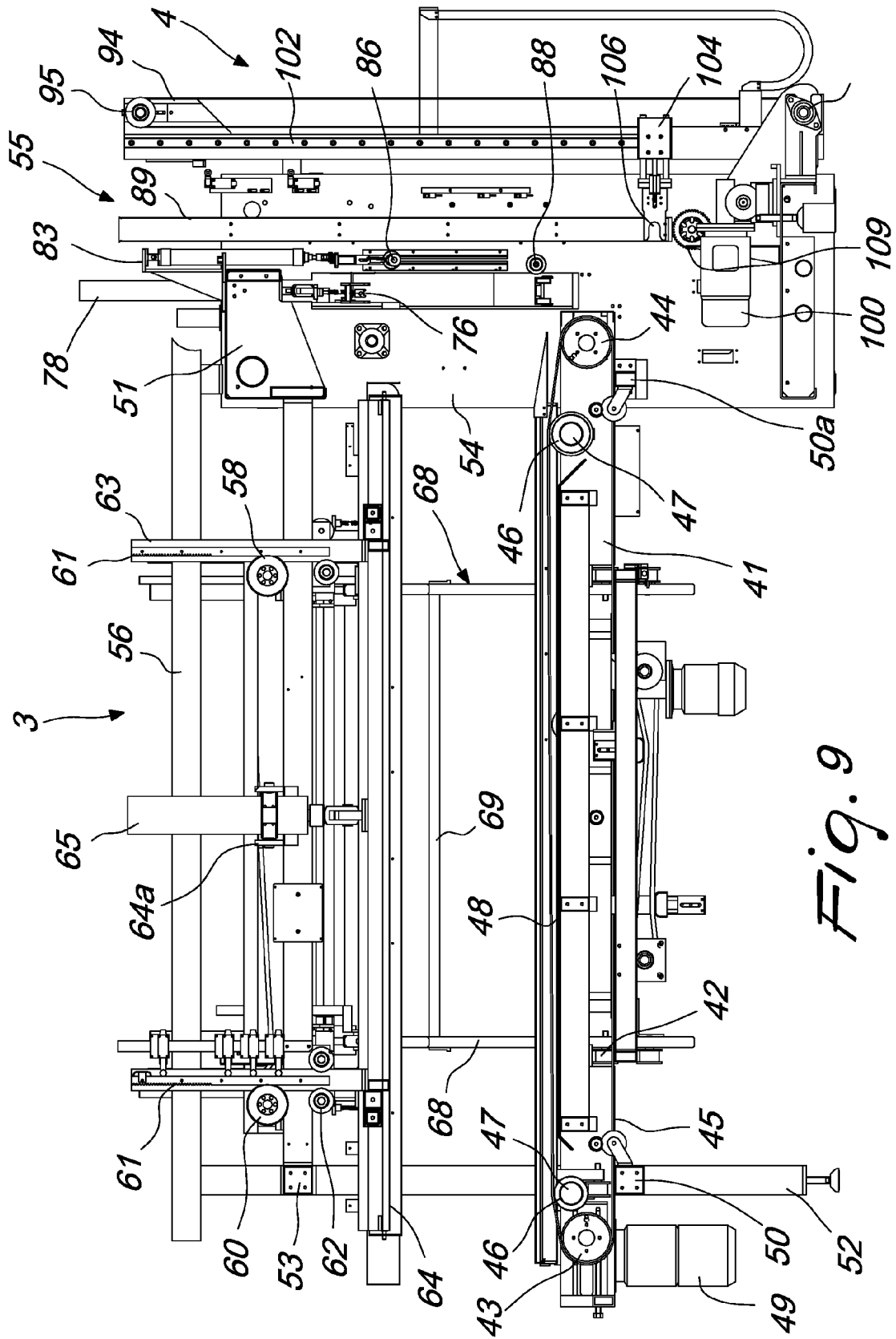


Fig. 9

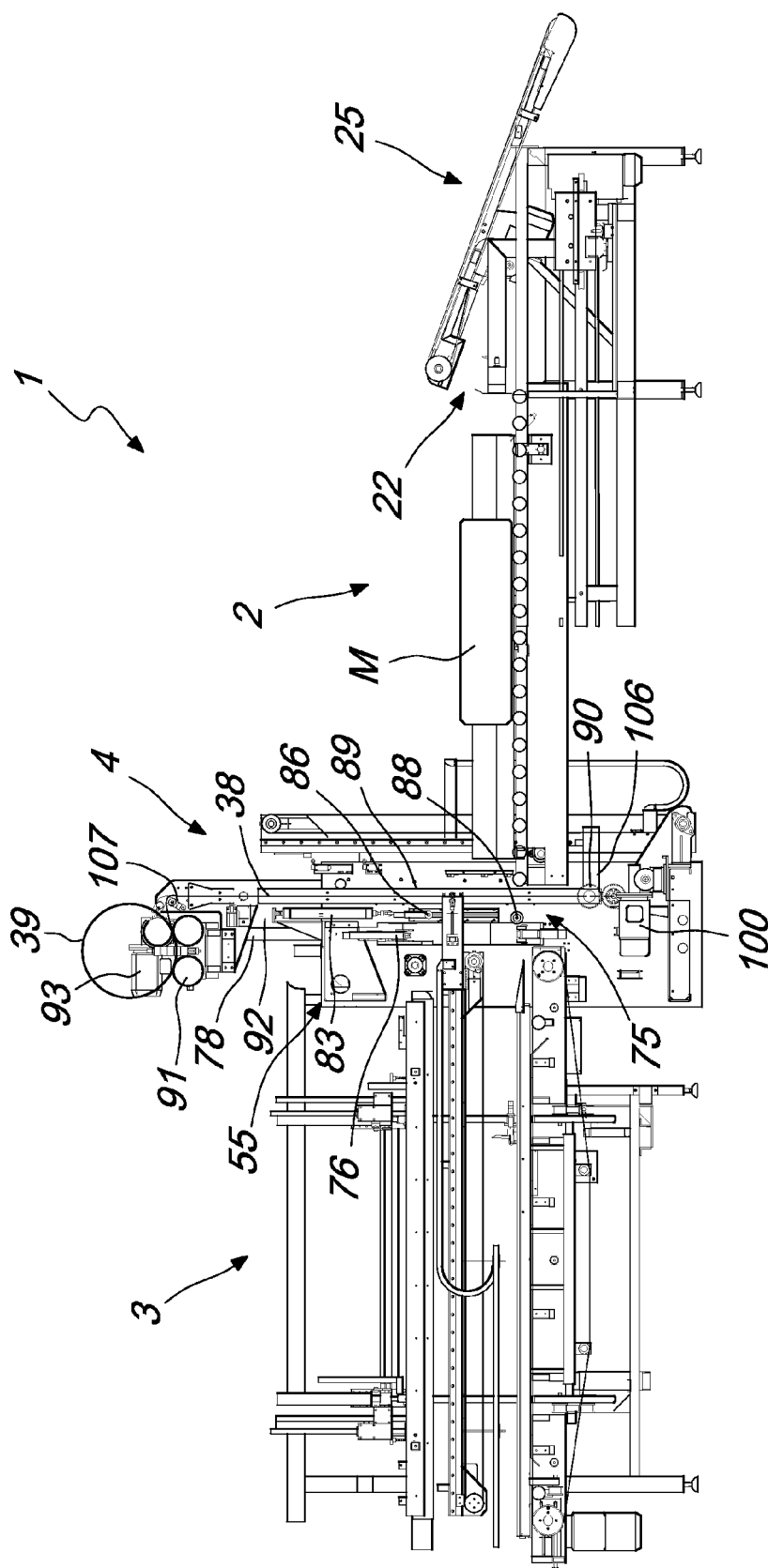


Fig. 10

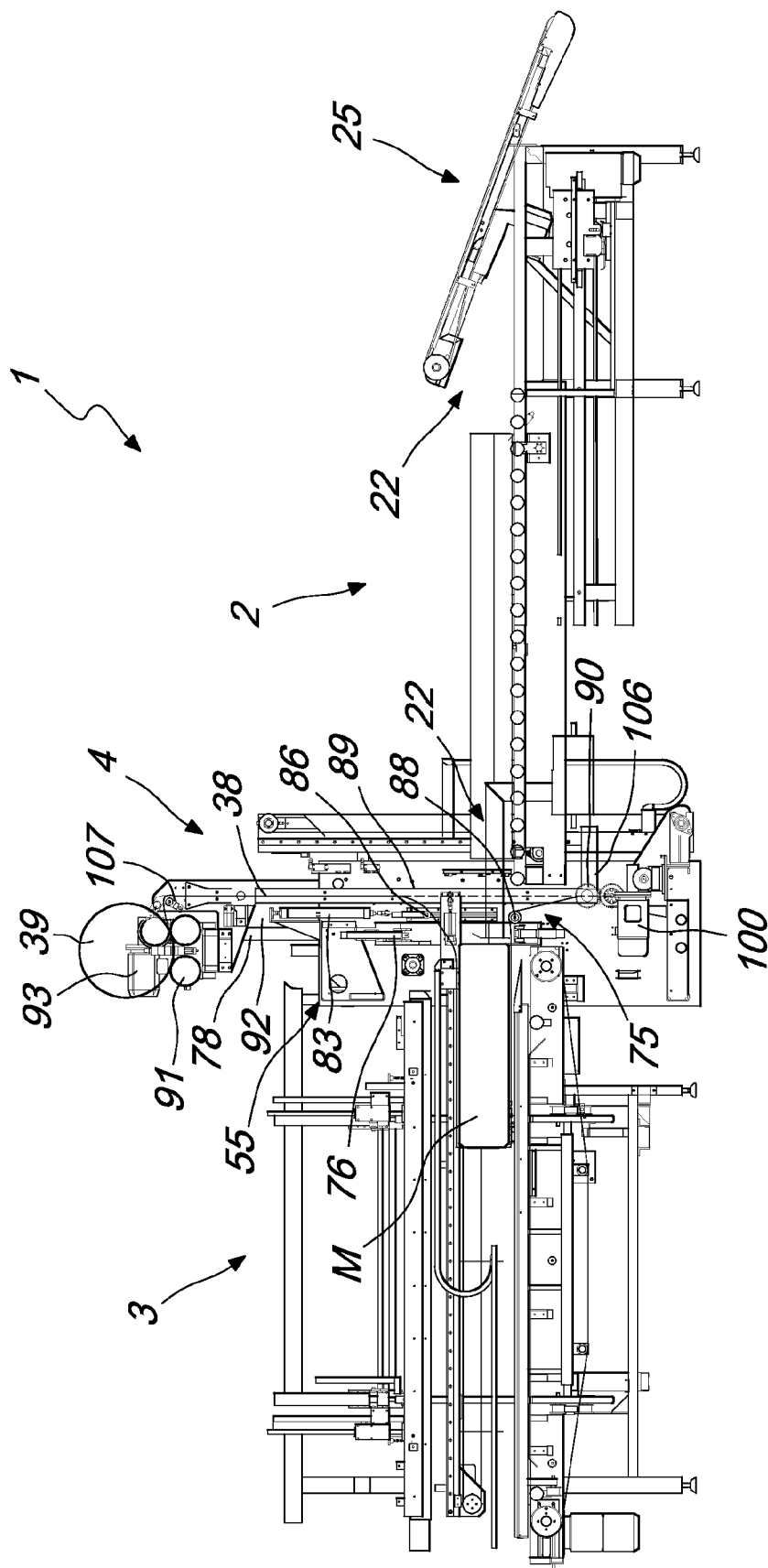


Fig. 11

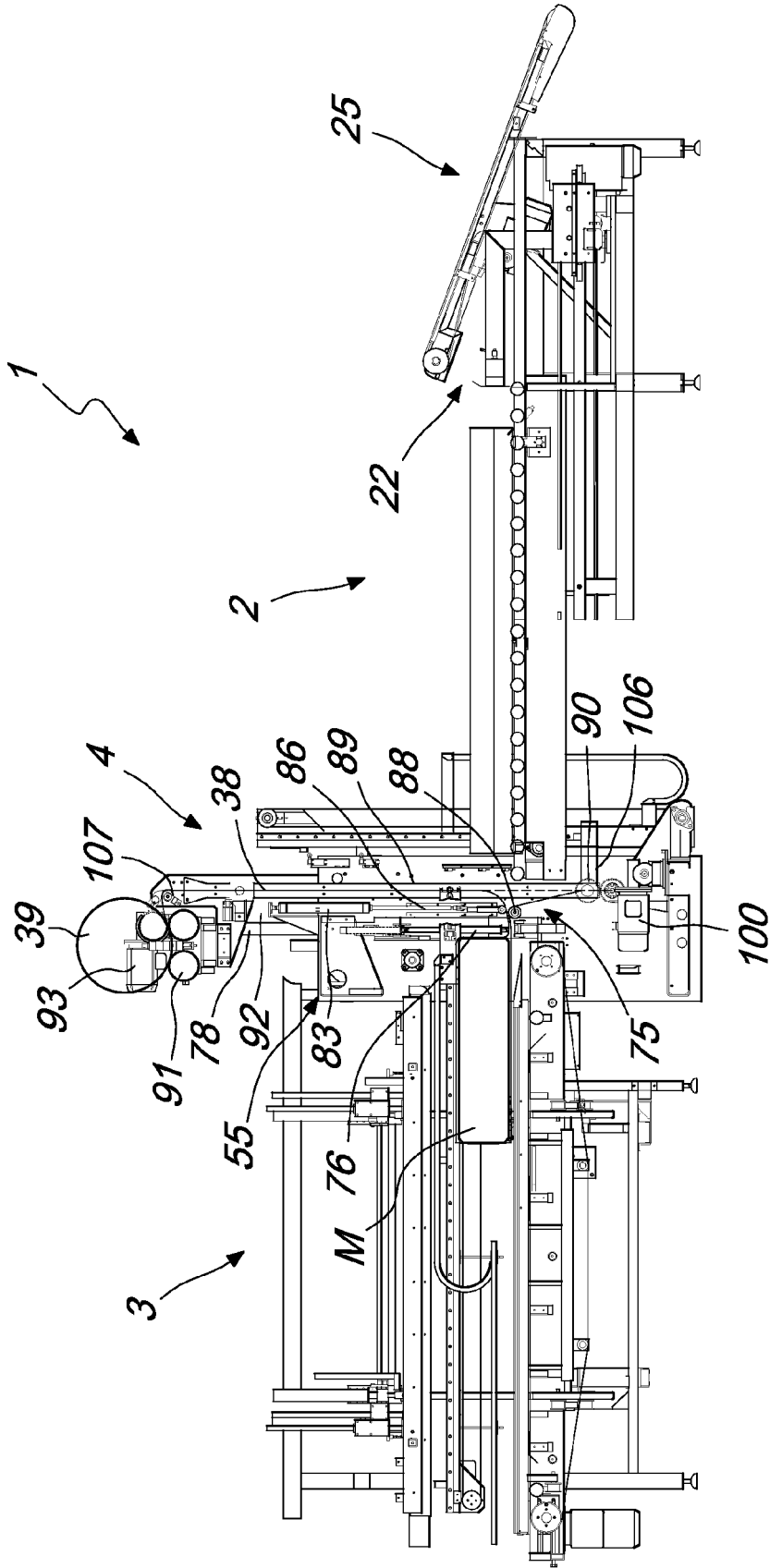


Fig. 12

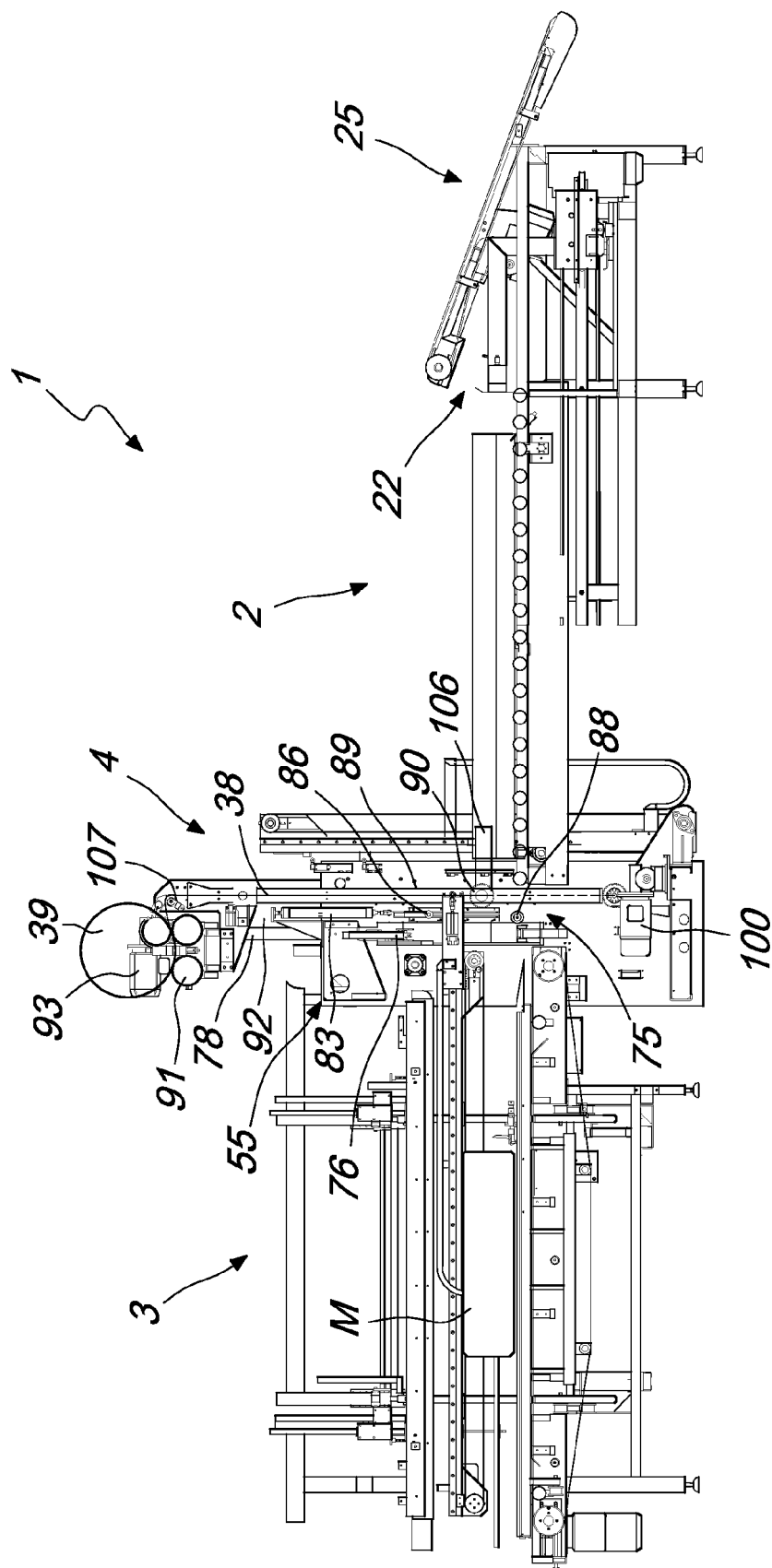


Fig. 13

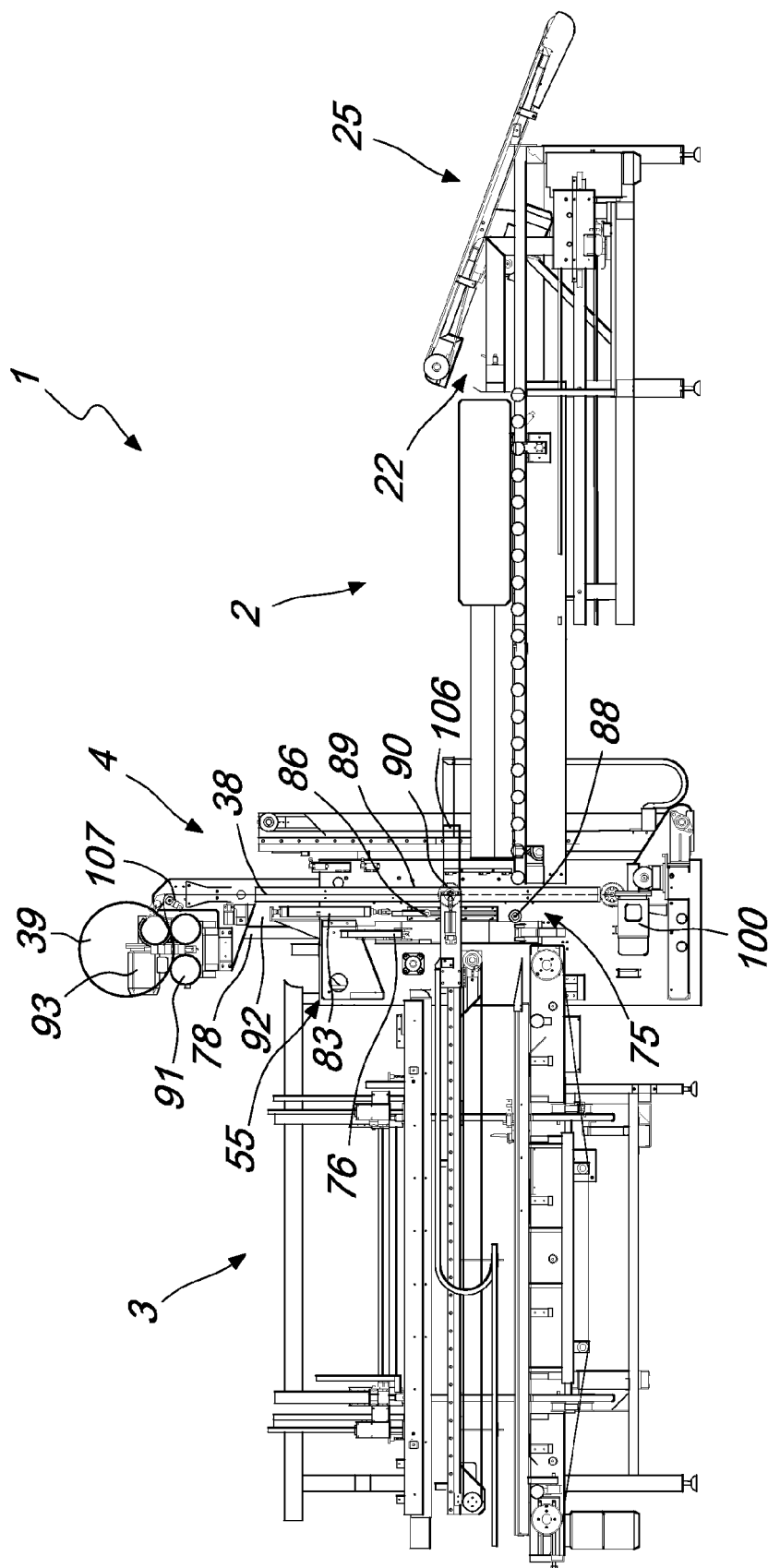


Fig. 14

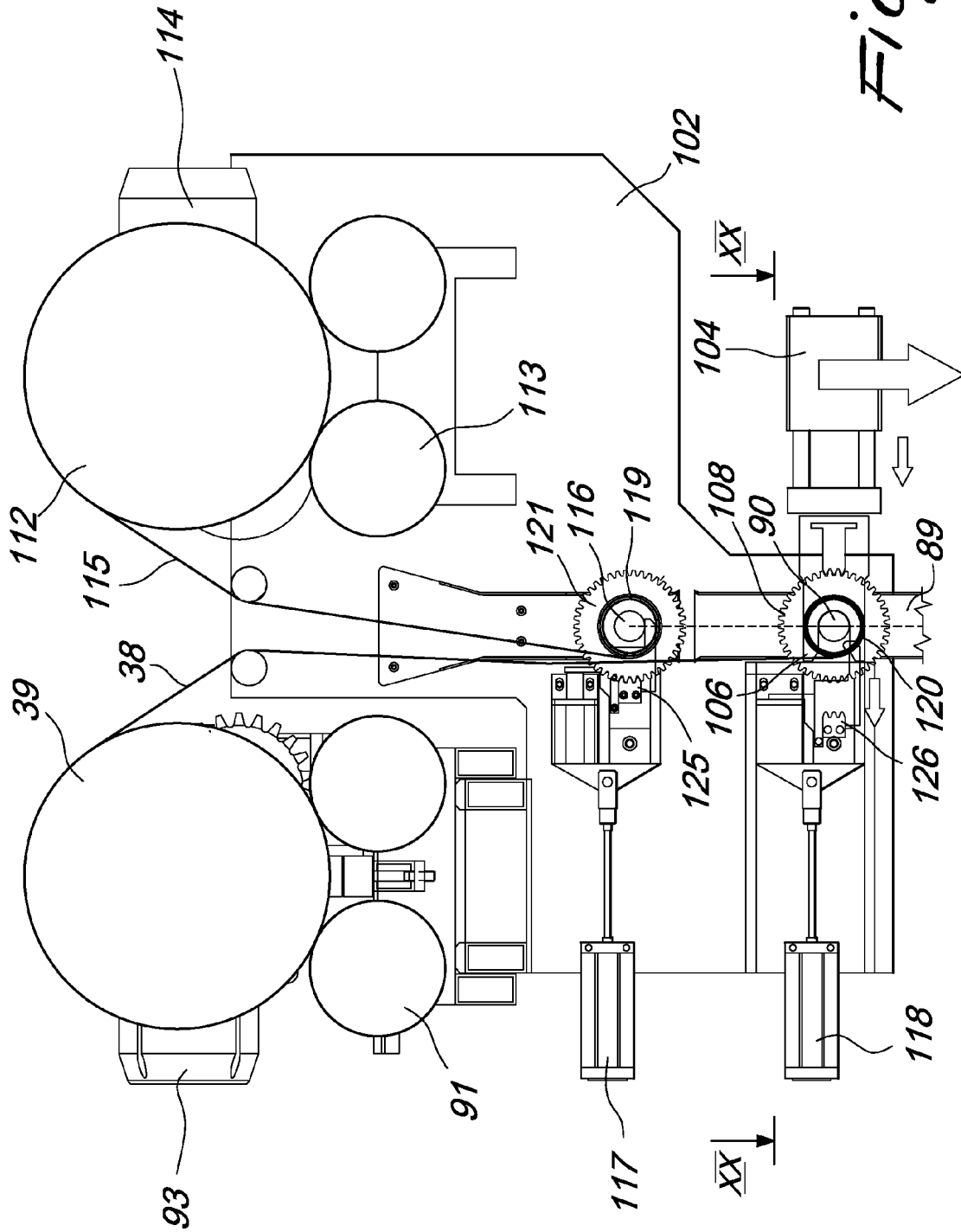
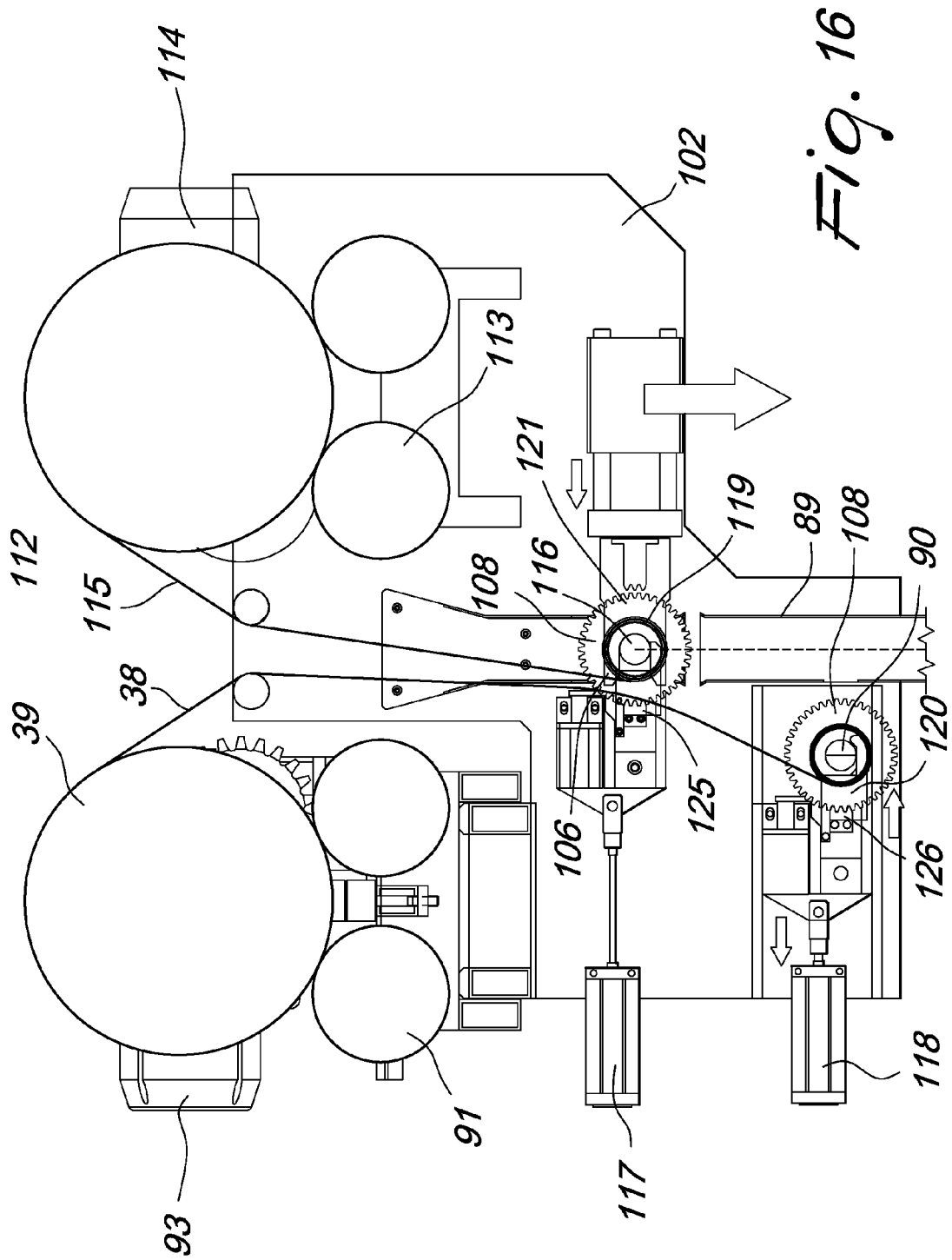


Fig. 15



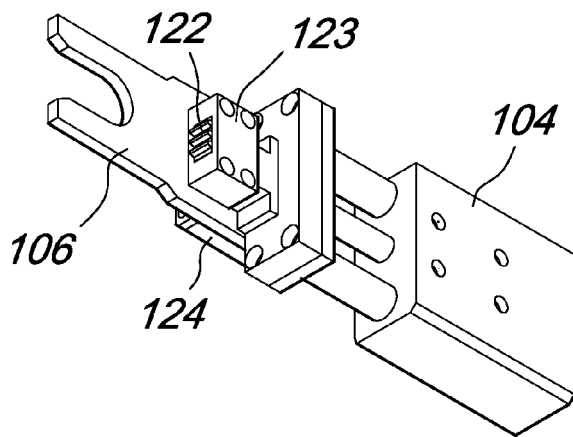


Fig. 17

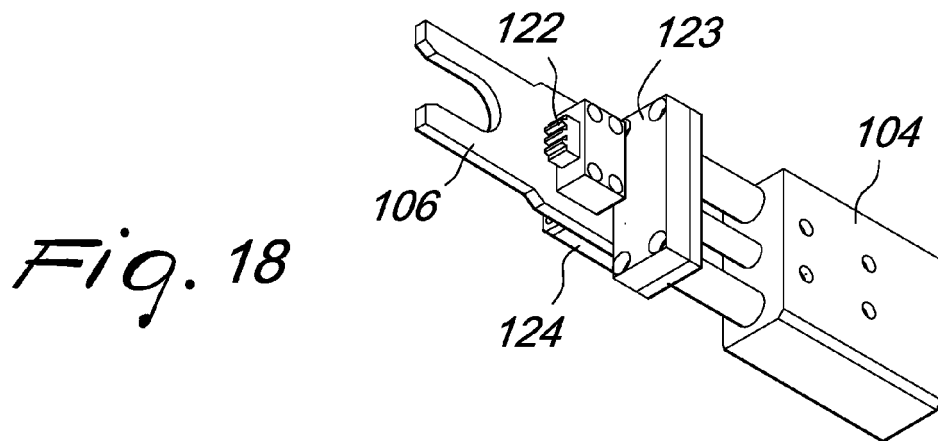


Fig. 18

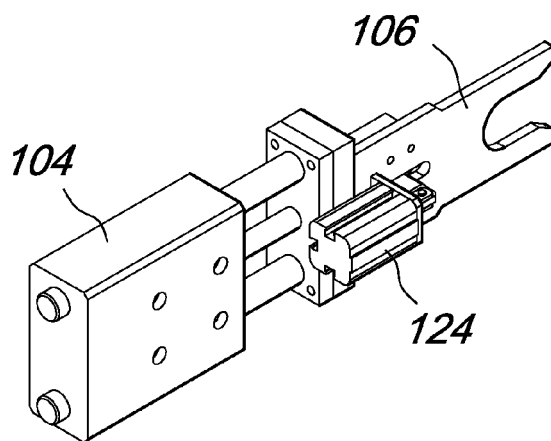


Fig. 19

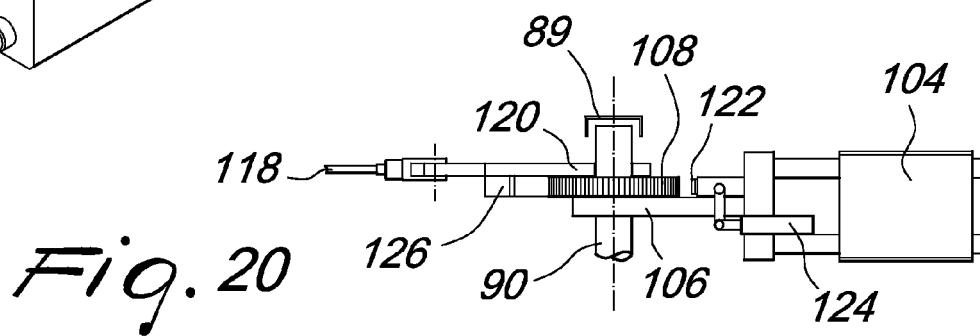


Fig. 20



EUROPEAN SEARCH REPORT

Application Number
EP 09 17 2295

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2 700 459 A (EDGAR ANSPACHER) 25 January 1955 (1955-01-25) * column 2, line 38 - column 4, line 26 * * figures 1-7 *	1-16	INV. B65B11/58
A	EP 1 136 359 A1 (RESTA SRL [IT]) 26 September 2001 (2001-09-26) * paragraph [0010] - paragraph [0041] * * figures 1-16 *	1-16	
A	DE 101 62 483 A1 (BLICKER SILVIA [DE]) 6 November 2003 (2003-11-06) * paragraph [0001] - paragraph [0016] * * figures 1-3 *	1-16	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 December 2009	Examiner Rodriguez Gombau, F
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 09 17 2295

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18-12-2009

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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