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(54) Feeder of stringers for machines for manufacturing covers of pallets made of wood or the like, with highly versatile use

(57) A feeder of stringers for machines for manufacturing covers of pallets made of wood or the like, with highly versatile use. The feeder (1) comprises guiding and advancement means (2), which define a first resting surface (3) for longitudinal stringers (4) which are mutually arranged side by side and parallel to an advancement orientation (5). The guiding and advancement means (2) can be actuated in order to actuate the advancement of the longitudinal stringers (4) along the advancement orientation (5) up to a mating station (8); the feeder (1) comprises at least three magazines (9, 10, 11), spaced along the advancement orientation (5) and each adapted to support a plurality of transverse stringers (12, 13, 14) which are mutually stacked; proximate to the last magazine (11) in the advancement direction of the stringers (4, 12, 13, 14) along the advancement orientation (5) there is a waiting station (15) and means (16) are provided for the individual extraction of the transverse stringers (12, 13, 14) from the corresponding magazine (9, 10, 11) for their deposition on a second resting surface (17), which is arranged above the first resting surface (3); first means (18) are also provided for the advancement of the transverse stringers (12, 13, 14) that arrive at least from the magazines (9, 10), along the second resting surface (17) up to the waiting station (15), and second advancement means (19), which can engage, in each instance, the transverse stringer (12, 13, 14) arranged at the waiting station (15) for its advancement from the waiting station (15) to the mating station (8) in which, in each instance, a transverse stringer (12, 13, 14) is superimposed on the longitudinal stringers (4); the magazines (9, 10, 11), the first advancement means (18) and the second advancement means (19) are arranged above the plane of arrangement of the longitudinal stringers (4) arranged on the first resting surface (3).

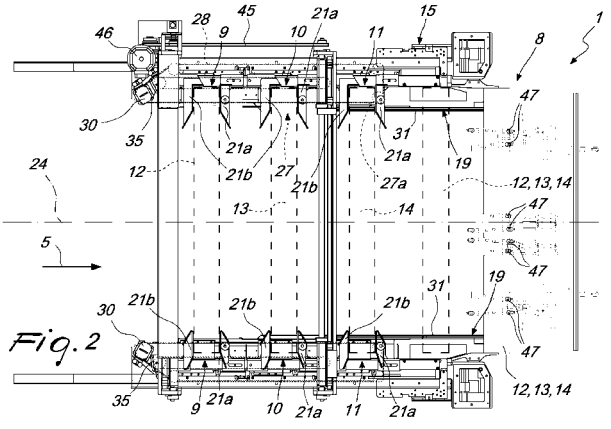

Fig. 2

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Description

[0001] The present invention relates to a feeder of stringers for machines for manufacturing covers of pallets made of wood or the like, with highly versatile use.

[0002] As is known, wood pallets are generally constituted by a loading surface, usually termed "cover", which is constituted by two layers of stringers arranged side by side and superimposed so that the stringers of one layer are parallel to each other and are perpendicular to the stringers of the other layer and by feet or blocks, which are fixed below the cover so as to keep it raised with respect to the resting surface. Usually three rows of blocks are provided and each one of the three rows is generally composed of three blocks, which are mutually spaced so that the pallet can be "straddled" by lifting devices on any of its four sides. Usually, the cover has a rectangular plan shape and the plugs of the three rows are mutually connected not only by the cover but also by three stringers which are arranged parallel to the longer sides of the cover and are nailed to the lower face of the plugs.

[0003] Wood pallets are assembled on nailing machines, which are fed with the cover, manufactured on another machine, and with the three rows of blocks.

[0004] Machines for manufacturing pallet covers are substantially composed of a feeder of stringers and a nailing station and perform nailing of the stringers of the upper layer to the stringers of the lower layer. The stringers are fed to the nailing station and mutually positioned by the feeder, which moves them along an advancement orientation. Such machines are divided in two types according to the orientation of the stringers of the upper layer with respect to the advancement orientation: a first type, in which the stringers of the upper layer are oriented parallel to the advancement orientation, and a second type, in which the stringers of the upper layer are oriented transversely to the advancement orientation.

[0005] The first type of machine has a high productivity, since in order to perform the assembly of a cover it requires a number of nailing strokes equal to the number of the stringers of the lower layer, generally equal to three and in any case lower than the number of stringers that compose the upper layer. On the other hand, this type of machine suffers the drawback of requiring long times when there are changes in production, i.e., when it is required to vary the type of cover to be manufactured, because it is necessary to modify the position of the nailing heads according to the variation in position of the upper layer stringers, which are more numerous than the stringers of the lower layer.

[0006] The second type of machine has a lower production capacity but is more flexible, since it requires shorter times at production changes. In fact, in this type of machine, in order to change the type of cover being manufactured, if the lower layer is composed, as usually occurs, of three stringers arranged parallel to the advancement orientation, it is sufficient to vary the position of the outer nailing heads, which work proximate to the ends of the stringers of the upper layer.

[0007] For these reasons, machines that belong to the second type described above are better suited to automated management of production change. However, in such machines, while the position of the nailing heads can be changed in a relatively simple manner, the operations for adjusting the elements, constituted generally by chain traction elements, that move the stringers along the advancement orientation remain complicated.

[0008] In order to overcome this difficulty, in recent years several types of feeder to be mounted on machines of the second type have been proposed.

[0009] A first type of feeder is provided with a double series of traction elements with independent controls. More particularly, this type of feeder comprises a first series of traction elements for moving the stringers of the lower layer, which are oriented parallel to the advancement orientation and are termed hereinafter "longitudinal stringers" for the sake of simplicity, and a second series of traction elements for moving the upper layer stringers, which are oriented transversely to the advancement orientation and are termed hereinafter "transverse stringers" for the sake of simplicity. The traction elements of the second series of traction elements are arranged at mutually fixed distances along the respective chains and move each individual stringer up to the nailing station.

[0010] These feeders solve the problem of the adjustment of the traction elements, but suffer the drawback that they cannot be used for manufacturing pallet covers of small size (with a side of less than 800 mm), because the chains for moving the transverse stringers are arranged between the guides that support the longitudinal stringers and therefore limit their possibility of mutual approach.

[0011] Another drawback of these feeders is that since the advancement of the longitudinal stringers is entrusted to a group of chains and since the advancement of the transverse stringers is entrusted to another group of chains, uneven elongations of the chains can occur, which lead to the formation of scarcely precise covers because the distances between the transverse stringers are mutually different.

[0012] A second type of feeders is composed of traction elements for moving the longitudinal stringers and a pusher with rack-type actuation for moving the transverse stringers. Such feeders are provided with two magazines of transverse stringers from which, in each instance, a transverse stringer is extracted and arranged in a position suitable for it to be taken by the rack-type pusher. Such feeders have the advantage of allowing the manufacture of covers of small size, because the magazines and the rack-type pusher do not limit the possibility to move mutually closer the guides along which the longitudinal stringers are pulled, but suffer the drawback that they can provide only two types of transverse stringer: one for each one of the two magazines. On the other hand, the addition of a magazine in order to be able to provide three

types of transverse stringer would require a considerable increase in the stroke of the rack-type pusher and accordingly a considerable increase in the dimensions of the machine and/or a substantial increase in the movement speed of the stringers, with problems regarding precision in stringer feeding.

[0013] A third type of feeder is composed of chain-type traction elements for the longitudinal stringers and chain-type traction elements for the transverse stringers with three magazines for the transverse stringers. The transverse stringers are fed, from the corresponding magazines, to the chain-type traction elements, which, after a first advancement portion, abandon the stringers, which are pushed into the nailing station by means of pushers arranged between the guides along which the longitudinal stringers are moved. Such feeders suffer the drawback of not being able to manufacture pallet covers of small size (with a side smaller than 800 mm) because the pushers limit the possibility to move mutually closer the guides of the longitudinal stringers.

[0014] The aim of the present invention is to solve the above mentioned problems, by providing a feeder of stringers for machines for manufacturing covers of pallets made of wood or the like, that enables to manufacture practically all the types of pallet covers currently in use and enables to switch rapidly from the manufacturing of one type of pallet to another type in a completely automated manner.

[0015] Within this aim, an object of the invention is to provide a stringer feeder that enables to manufacture, without problems, pallet covers with small dimensions, i.e., with a side of less than 800 mm.

[0016] Another object of the invention is to provide a feeder that can provide at least three types of stringer though having a modest space occupation along the advancement orientation of the stringers.

[0017] This aim and these and other objects that will become better apparent hereinafter are achieved by a feeder of stringers for machines for manufacturing covers of pallets made of wood or the like, comprising guiding and advancement means which define a first resting surface for longitudinal stringers which are arranged mutually side by side and parallel to an advancement orientation, said guiding and advancement means being actuatable in order to actuate the advancement of said longitudinal stringers along said advancement orientation at least to a mating station, characterized in that it comprises:

- at least three magazines, each adapted to support a plurality of transverse stringers which are mutually stacked along a substantially vertical orientation and are oriented transversely to said advancement orientation; said three magazines being mutually spaced along said advancement orientation;

- a waiting station, which is arranged at or directly downstream of the last magazine of said magazines according to the advancement orientation of the stringers along said advancement orientation;

- means for the individual extraction of said transverse stringers from the corresponding magazine and for their deposition on a second resting surface arranged above said first resting surface;

- first means for the advancement of the transverse stringers that arrive at least from the magazines arranged upstream of said last magazine along said second resting surface up to said waiting station;

- second advancement means, which can engage in each instance the transverse stringer that is arranged at said waiting station for its advancement along said advancement orientation from said waiting station to said mating station, in which, in each instance, a transverse stringer is superimposed on said longitudinal stringers;

said magazines, said first advancement means and said second advancement means being arranged above the plane of arrangement of said longitudinal stringers arranged on said first resting surface.

[0018] Further characteristics and advantages of the invention will become better apparent from the description of a preferred but not exclusive embodiment of the feeder according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a schematic perspective view of the feeder according to the invention mounted on a machine for manufacturing pallet covers, illustrated only partially for the sake of simplicity;

Figure 2 is a schematic top plan view of the feeder according to the invention mounted on a machine for manufacturing pallet covers, which is shown only partially;

Figure 3 is a schematic sectional view, taken along a central vertical plane parallel to the advancement orientation of the stringers, of the feeder according to the invention;

Figure 4 is an enlarged-scale view of a detail of Figure 3;

Figure 5 is a schematic perspective view of one of the magazines with the corresponding means for the individual extraction of the longitudinal stringers, with some elements removed for greater clarity;

Figure 6 is a schematic top plan view of a portion of the feeder according to the invention, showing two magazines with the corresponding means for the in-

dividual extraction of the longitudinal stringers, with some elements removed for greater clarity;

Figure 7 is a bottom plan view of a portion of the feeder according to the invention, highlighting the actuation of the first advancement means and of the second advancement means;

Figure 8 is a side elevation view of a detail of the second advancement means;

Figure 9 is a perspective view of the same detail of Figure 8;

Figure 10 is a side elevation view of a portion of the feeder according to the invention, taken from the opposite side with respect to the side visible in Figure 1, with some elements removed for greater clarity;

Figure 11 is a perspective view of a detail of Figure 10;

Figures 12 to 17 are schematic views, similar to Figure 3, of the operation of the feeder according to the invention, with some elements removed for the sake of simplicity.

[0019] With reference to the figures, the feeder according to the invention, generally designated by the reference numeral 1, comprises, in a per se known manner, guiding and advancement means 2, which define a first resting surface 3, which is preferably substantially horizontal, for longitudinal stringers 4, which are arranged mutually side by side and parallel to an advancement orientation, indicated by the arrow 5. The guiding and advancement means 2 comprise preferably, in a per se known manner, channels 6, which are arranged on a horizontal plane, are open upward and are oriented parallel to the advancement orientation 5. The longitudinal stringers 4 are arranged in the channels 6 and are made to advance inside the channels 6 along the advancement orientation 5, by means of first conveyors with chain-type traction elements 7 or other movement means of a known type, to a mating station 8. The guiding and advancement means 2, being well-known to persons skilled in the art, are not further described for the sake of simplicity.

[0020] The feeder 1 comprises at least three magazines 9, 10, 11, each adapted to support a corresponding plurality of transverse stringers 12, 13, 14, which are mutually stacked along a substantially vertical orientation inside the corresponding magazine 9 or 10 or 11 and are oriented transversely to the advancement orientation 5. The three magazines 9, 10, 11 are mutually spaced along the advancement orientation 5.

[0021] A waiting station 15 is arranged at or directly downstream of the last magazine 11 according to the direction of advancement of the stringers along the advancement orientation 5.

[0022] Each magazine 9, 10, 11 is provided with means 16 for the individual extraction of the transverse stringers 12, 13, 14, and the individual extraction means 16 can be actuated in order to actuate the extraction of a transverse stringer 12 or 13 or 14 from the corresponding magazine 9 or 10 or 11 and its arrangement on a second resting surface 17, which is arranged upward with respect to the first resting surface 3.

[0023] The feeder 1 according to the invention further comprises: first means 18 for the advancement of the transverse stringers 12, 13 that arrive at least from the magazines 9, 10 arranged upstream of the last magazine 11, along the second resting surface 17 up to the waiting station 15, and second advancement means 19, which can engage, in each instance, the transverse stringer 12 or 13 or 14 that is arranged at the waiting station 15 to actuate its advancement, along the advancement orientation 5, from the waiting station 15 to the mating station 8, in which, in each instance, a transverse stringer 12 or 13 or 14 is superimposed on the longitudinal stringers 4.

[0024] The magazines 9, 10, 11, the first advancement means 18 and the second advancement means 19 are arranged above the plane of arrangement of the longitudinal stringers 4 arranged on the first resting surface 3 so as to not limit the possibility of approach of the channels 6 of the guiding and advancement means 2 when it is necessary to manufacture pallet covers of small size, particularly pallet covers with a side of less than 800 mm.

[0025] Conveniently, the individual extraction means 16 can be actuated according to a preset program so as to provide, in each instance, a transverse stringer 12 or 13 or 14 to the first advancement means 18 according to the type of pallet cover to be manufactured.

[0026] In greater detail, each one of the magazines 9, 10, 11 comprises a substantially horizontal bottom 20, which lies on a plane that is raised with respect to the second resting surface 17, and side walls 21a, 21b, which rise from the bottom 20 and delimit a space that is adapted to contain a stack of transverse stringers 12 or 13 or 14. Each magazine 9, 10, 11 has, on one of the side walls 21a, 21b, an extraction opening 22, which is arranged directly above the bottom 20 and is oriented along the advancement direction of the stringers along the advancement orientation 5. The individual extraction means 16 comprise, for each one of the magazines 9, 10, 11, a plate 23, which is arranged on a substantially horizontal plane directly above the bottom 20 and can move with an alternating motion along the advancement orientation 5 in order to push, outside the corresponding magazine 9, 10, 11 the transverse stringer 12, 13, 14 that in each instance rests on the bottom 20 of the corresponding magazine 9, 10, 11. In practice, the plate 23 faces the extraction opening 22 and can be actuated in order to push a transverse stringer 12, 13, 14 to exit from the corresponding magazine 9, 10, 11 through the extraction opening 22.

[0027] Conveniently, the feeder 1 is provided in two halves which are arranged symmetrically with respect to

a vertical central plane, which is parallel to the advancement orientation 5. Each one of the two halves, which are substantially equal to each other, is dedicated to a portion of a corresponding longitudinal end of the transverse stringers 12, 13, 14. For the sake of simplicity, the description that follows will refer to one of these halves, it being understood that there is another twin half of the feeder 1 arranged on the opposite side with respect to the vertical central plane, designated in Figure 2 by the reference numeral 24. The two halves of the feeder 1 are designated by the same reference numerals.

[0028] Each plate 23, in order to perform the expulsion of a transverse stringer 12, 13, 14, is actuated by a corresponding fluid-operated cylinder 25, which is connected by means of its body to a supporting structure 26 to which the bottom 20 and the side walls 21a, 21b are fixed. Two of the fluid-operated cylinders 25 that actuate the plates 23 of the magazines 10 and 11 are shown in Figures 5, 6, 10 and 11.

[0029] The first advancement means 18 comprise, for each half of the feeder 1, a second conveyor with traction elements 27 that extends from the first magazine 9, according to the direction of advancement of the stringers along the advancement orientation 5, up to the waiting station 15.

[0030] The second conveyor with traction elements 27, as shown in particular in Figure 7, is constituted by a toothed belt 28, which is wound around pulleys 29 with a vertical axis, one of said pulleys being actuated by a motor 30. The toothed belt 28 is arranged directly below the second resting surface 17 and is provided, at regular space intervals, with pins 27a that protrude upward from the second resting surface 17 in order to engage, in each instance, with a transverse stringer 12, 13 and optionally 14 which is deposited on the second resting surface 17 in order to transport it to the waiting station 15.

[0031] In practice, in the feeder 1, the first advancement means 18 comprise a pair of second conveyors with traction elements 27, which are mutually spaced transversely to the advancement orientation 5 and can engage the transverse stringers 12, 13 and optionally 14 proximate to their longitudinal ends.

[0032] The second advancement means 19 comprise, for each half of the feeder 1, a pusher 31, which can move on command, with an alternating motion, along the advancement direction 5 from the waiting station 15 to the mating station 8.

[0033] In practice, in the feeder 1, the second advancement means 19 comprise a pair of pushers 31, which are mutually spaced transversely to the advancement orientation 5 and can engage, in each instance, a transverse stringer 12, 13, 14, which is arranged in the waiting station 15, proximate to the longitudinal ends of the transverse stringer 12, 13, 14.

[0034] As shown in particular in Figure 7, each pusher 31 is fixed, by means of a gripper 32, to an arm of a toothed belt 33 that meshes with two pulleys 34 with vertical axes. The two pulleys 34 are arranged so that the arm of the toothed belt 33 to which the gripper 32 is connected is parallel to the advancement orientation 5. One of the two pulleys 34 is connected to a motor 35, which can be actuated in order to cause the rotation of the pulleys 34 in one direction of rotation or in the opposite direction so as to obtain, for the pusher 31, an alternating motion parallel to the advancement orientation 5.

[0035] Each pusher 31, as shown particularly in Figures 8 and 9, has, in an intermediate portion of its extension parallel to the advancement orientation 5, an engagement element 36, which can engage the side of the transverse stringer 12, 13, 14 that is arranged in the waiting station 15 and is directed away from the mating station 8 upon the advancement of the pusher 31 toward the mating station 8. The engagement element 36 is elastically flexible in order to move past and below the transverse stringer 12, 13, 14 arranged in the waiting station 15 during the return motion of the pusher 31, i.e., when the pusher 31 moves from the mating station 8 toward the waiting station 15.

[0036] The engagement element 36, as shown, can be constituted by a tooth that is pivoted to the remaining portion of the pusher 31 about an axis 49 which is perpendicular to the advancement orientation 5 and is held by a spring 37 in an active position, in which it protrudes from the second resting surface 17 in order to engage the transverse stringer 12, 13, 14 that is arranged on the second resting surface 17 at the waiting station 15. The spring 37 allows the tooth to retract into the body of the pusher 31 when, during the return motion of the pusher 31, said tooth meets, with one of its sides shaped like an inclined plane, the side directed toward the mating station 8 of the transverse stringer 12, 13, 14 arranged in the waiting station 15. The degree of protrusion of the engagement element 36 above the body of the pusher 31 is limited by an abutment pin 38, which contrasts the action of the spring 37.

[0037] Conveniently, each pusher 31 defines with one of its portions, which extends from the engagement element 36 toward the mating station 8, an intermediate resting surface 39, which supports the transverse stringer 12, 13, 14, which is engaged by the engagement element 36 of the pushers 31 for at least one part in its motion from the waiting station 15 to the mating station 8. The intermediate resting surface 39 is conveniently inclined with respect to the horizontal so as to cause the gradual descent of the transverse stringer 12, 13, 14 onto a third resting surface 50, which is arranged between the second resting surface 17 and the first resting surface 3, when the pushers 31 move in the opposite direction with respect to the advancement direction, i.e., when they perform a translational motion from the mating station 8 to the waiting station 15.

[0038] The pushers 31, in their motion toward the mating station 8, can engage, by means of their end directed toward the mating station 8, the transverse stringer 12, 13, 14 previously deposited on the third resting surface 50 in order to perform the advancement of the transverse

stringer 12, 13, 14 toward the mating station 8.

[0039] Advantageously, means 40 are provided for adjusting the mutual distance of the conveyors with traction elements 27 of the pair of second conveyors with traction elements 27 and of the pushers 31 of the pair of pushers 31 according to the length of the transverse stringers 12, 13, 14 to be fed.

[0040] More specifically, each half of the feeder 1, which comprises a corresponding half of the magazines 9, 10, 11, as well as a second conveyor with traction elements 27 and a pusher 31, is mounted on a corresponding supporting structure 26 and therefore there is a pair of supporting structures 26 supported, so that they can slide, by sliding guides 41 which are fixed to a main fixed structure 42, which is fixed for example to the footing of the machine for manufacturing pallet covers. The sliding guides 41 are arranged horizontally and at right angles to the advancement orientation 5. Each supporting structure 26 is integral with one or more female threads 43, which are mated to one or more threaded shafts 44, which are oriented so that their axes are parallel to the sliding guides 41. In the illustrated case, in which there are two threaded shafts 44, said shafts are mutually connected kinematically by means of a chain or toothed belt 45 connected to the output shaft of a motor 46 that can be actuated in order to cause, as a consequence of the connection between the threaded shafts 44 and the female threads 43, the mutual approach or spacing of the two supporting structures 26 along the sliding guides 41 in order to adapt the dimensions of the feeder 1 to the length of the transverse stringers 12, 13, 14 to be fed.

[0041] At the mating station 8, in a per se known manner, nailing grippers 47 are provided that face upwardly the first resting surface 3.

[0042] Proximate to the mating station 8, the supporting structures 26 have mutually facing side walls with knurlings 48 in order to increase the adhesion to the longitudinal ends of the transverse stringers 12, 13, 14, so as to brake and retain the transverse stringers 12, 13, 14 at the mating station 8.

[0043] The individual extraction means 16, the first advancement means 18, the second advancement means 19 and the adjustment means 40 are connected to an actuation and control element of the programmable electronic type, not shown for the sake of simplicity, that supervises the operation of the machine for manufacturing pallet covers and controls such means according to preset programs as a function of the type of cover to be manufactured.

[0044] Operation of the feeder according to the invention is as follows.

[0045] The transverse stringers 12, 13, 14 to be used for manufacturing pallet covers are arranged, stacked, inside the magazines 9, 10, 11. If the pallet cover to be manufactured must be composed of three types of transverse stringer 12, 13, 14, the magazines 9, 10, 11 will each be loaded with a different type of transverse stringer 12, 13, 14, as shown in Figure 12.

[0046] In each instance, the actuation and control element of the electronic type that supervises the operation of the machine for manufacturing pallet covers actuates the fluid-operated cylinders 25 arranged in the magazine 9 or 10 or 11 that contains the type of transverse stringer to be fed to the mating station 8, so that the transverse stringer is pushed by the plate 23 so as to protrude from the corresponding magazine 9, 10, 11, through the extraction opening 22, as shown in Figure 13. The transverse stringer, once it has been extracted from the corresponding magazine 9 or 10 or 11, rests on the second resting surface 17, as shown in Figure 14. If the transverse stringer 12 or 13 or 14 to be fed is arranged in the last magazine 11, its extraction from the magazine 11 will also cause its arrangement in the waiting station 15, because, as mentioned above, the last magazine 11 is arranged proximate to the waiting station 15. If instead the transverse stringer to be fed is arranged in the first magazine 9 or in the second magazine 10, once it has been rested on the second resting surface 17, it will be engaged by the pins 27a of the pair of second conveyors with traction elements 27 and will be transported into the waiting station 15.

[0047] At this point the second advancement means 19, i.e., the pair of pushers 31, are actuated and engage, by means of the engagement element 36, the transverse stringer 12 or 13 or 14 arranged in the waiting station 15 and push it along the advancement orientation 5 toward the mating station 8. During this advancement, the transverse stringer 12 or 13 or 14 is disengaged from the second resting surface 17, because such surface ends and rests on the intermediate resting surface 39 of the pushers 31, as shown in Figure 15.

[0048] When the pair of pushers 31 has ended its stroke toward the mating station 8 and retracts again toward the waiting station 15, the transverse stringer 12 or 13 or 14, which was previously resting on the intermediate resting surface 39, is deposited onto the third resting surface 50, which is arranged below the second resting surface 17 but above the first resting surface 3.

[0049] In its return motion, the pair of pushers 31, thanks to the possibility of the engagement elements 36 to flex elastically downward, returns with the engagement elements 36 upstream of a transverse stringer 12 or 13 or 14 which in the meantime has been positioned, as described above, in the waiting station 15, as shown in Figure 16.

[0050] The subsequent advancement of the pair of pushers 31 toward the mating station 8 brings the transverse stringer 12 or 13 or 14 engaged by the engagement elements 36 onto the third resting surface 50. It should be noted that during this advancement the pushers 31 engage, by means of their end directed toward the mating station 8, the transverse stringer 12 or 13 or 14 previously deposited on the third resting surface 50, making it advance, on the third resting surface 50, toward the mating station 8, where the transverse stringer 12 or 13 or 14 is superimposed on the longitudinal stringers 4 arranged

on the first resting surface 3, as shown in Figure 17.

[0051] In practice, thanks to the combined actuation of the individual extraction means 16, of the first advancement means 18 and of the second advancement means 19 it is possible to bring into the mating station the desired combination of transverse stringers 12, 13, 14 in order to provide the upper layer of the pallet cover to be manufactured. In the illustrated preferred embodiment, the upper layer of the covers may be composed of three different types of transverse stringers.

[0052] In the mating station 8, the actuation of the nailing grippers 47 provides, in a per se known manner, the assembly of the transverse stringers 12, 13, 14 to the underlying longitudinal stringers 4.

[0053] When one wishes to change the type of pallet cover to be assembled, one selects the corresponding program according to which the actuation and control element operates. According to the new selected program, the actuation and control element feeds, by means of the actuation of the individual extraction means 16, of the first advancement means 18 and of the second advancement means 19, the transverse stringers 12, 13, 14 to the waiting station 15 and therefore to the mating station 8 according to the required sequence. If it is necessary to use transverse stringers 12, 13, 14 that have different lengths with respect to the ones with which the feeder 1 is loaded, the transverse stringers in use are removed and after the actuation and control element, by actuating the motor 46, has suitably varied the distance between the two halves that compose the feeder 1, the feeder is loaded with new transverse stringers.

[0054] In practice it has been found that the feeder according to the invention fully achieves the intended aim, since due to the fact that it is provided with at least three magazines for the transverse stringers and to the fact that the first advancement means and the second advancement means are arranged above the plane of arrangement of the longitudinal stringers arranged on the first resting surface, it makes it possible to manufacture, in practice, all the types of pallet covers currently in use, even with small dimensions, i.e., with a side of less than 800 mm. Moreover, the feeder according to the invention makes it possible to pass quickly from the manufacturing of one type of pallet cover to another type in a completely automated manner.

[0055] Although the use of three magazines is sufficient to meet completely current demands as regards the type of pallet to be provided, the feeder according to the invention can be provided with a larger number of magazines for the transverse stringers which are mutually spaced along the advancement orientation.

[0056] The feeder thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

[0057] In practice, the materials used, as well as the dimensions, may be any according to requirements and to the state of the art.

[0058] The disclosures in Italian Patent Application No. MI2010A001916 from which this application claims priority are incorporated herein by reference.

[0059] 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 example by such reference signs.

Claims

1. A feeder (1) of stringers for machines for manufacturing covers of pallets made of wood or the like, comprising guiding and advancement means (2) which define a first resting surface (3) for longitudinal stringers (4) which are mutually arranged side by side and parallel to an advancement orientation (5), said guiding and advancement means (2) being actuatable in order to actuate the advancement of said longitudinal stringers (4) along said advancement orientation (5) at least to a mating station (8), **characterized in that** it comprises:

   - at least three magazines (9, 10, 11), each adapted to support a plurality of transverse stringers (12, 13, 14) which are mutually stacked along a substantially vertical orientation and are oriented transversely to said advancement orientation (5); said three magazines (9, 10, 11) being mutually spaced along said advancement orientation (5);
   - a waiting station (15), which is arranged at or directly downstream of the last magazine (11) of said magazines (9, 10, 11) in the advancement direction of the stringers (4, 12, 13, 14) along said advancement orientation (5);
   - means (16) for the individual extraction of said transverse stringers (12, 13, 14) from the corresponding magazine (9, 10, 11) for their deposition on a second resting surface (17) arranged above said first resting surface (3);
   - first means (18) for the advancement of the transverse stringers (12, 13, 14) that arrive at least from the magazines (9, 10) arranged upstream of said last magazine (11) along said second resting surface (17) to said waiting station (15);
   - second advancement means (19), which can engage in each instance the transverse stringer (12, 13, 14) that is arranged at said waiting station (15) for its advancement along said advancement orientation (5) from said waiting station (15) to said mating station (8), in which, in each instance, a transverse stringer (12, 13, 14)

is superimposed on said longitudinal stringers (4);

said magazines (9, 10, 11), said first advancement means (18) and said second advancement means (19) being arranged above the plane of arrangement of said longitudinal stringers (4) arranged on said first resting surface (3).

2. The feeder (1) according to claim 1, **characterized in that** said individual extraction means (16) can be actuated according to a preset program in order to provide in each instance a transverse stringer (12, 13, 14) to said first advancement means (18) according to the type of pallet cover to be manufactured.

3. The feeder (1) according to claims 1 and 2, **characterized in that** each one of said magazines (9, 10, 11) comprises a substantially horizontal bottom (20), which lies on a plane that is raised with respect to said second resting surface (17), and side walls (21a, 21b), which rise from said bottom (20) and delimit a space that is adapted to contain a stack of said transverse stringers (12, 13, 14); each one of said magazines (9, 10, 11) having, on one of said side walls (21a, 21b), an extraction opening (22) which is arranged directly above said bottom (20) and is oriented along said advancement orientation; said individual extraction means (16) comprising, for each one of said magazines (9, 10, 11), a plate (23) which is arranged on a substantially horizontal plane directly above said bottom (20) and can move with an alternating motion along said advancement orientation (5) in order to push, outside the corresponding magazine (9, 10, 11), through said extraction opening (22), the transverse stringer (12, 13, 14) that in each instance rests on said bottom (20).

4. The feeder (1) according to one or more of the preceding claims, **characterized in that** said guiding and advancement means (2) comprise: channels (6), which are arranged on a substantially horizontal plane and are oriented parallel to said advancement orientation (5), and first conveyors with traction elements (7) which can engage the longitudinal stringers (4) arranged in said channels (6) for their advancement along said channels (6) according to said advancement orientation.

5. The feeder (1) according to one or more of the preceding claims, **characterized in that** said first advancement means (18) comprise at least one second conveyor with traction elements (27) that extends from the first magazine (9) of said magazines (9, 10, 11) in the direction of advancement of the stringers (4, 12, 13, 14) along said advancement orientation (5), to said waiting station (15).

6. The feeder (1) according to one or more of the preceding claims, **characterized in that** said first advancement means (18) comprise a pair of second conveyors with traction elements (27), which are mutually spaced transversely to said advancement orientation (5) and can engage the transverse stringers (12, 13, 14) proximate to their longitudinal ends.

7. The feeder (1) according to one or more of the preceding claims, **characterized in that** said second advancement means (19) comprise at least one pusher (31), which can move on command with an alternating motion along said advancement direction (5) from said waiting station (15) to said mating station (8) and vice versa.

8. The feeder (1) according to one or more of the preceding claims, **characterized in that** said second advancement means (19) comprise a pair of pushers (31), which are mutually spaced transversely to said advancement direction (5) and can engage in each instance a transverse stringer (12, 13, 14), which is arranged in said waiting station (15), proximate to its longitudinal ends.

9. The feeder (1) according to one or more of the preceding claims, **characterized in that** it comprises means (40) for adjusting the mutual distance of the second conveyors with traction elements (27) of said pair of second conveyors with traction elements (27) and of the pushers (31) of said pair of pushers (31) according to the length of said transverse stringers (12, 13, 14).

10. The feeder (1) according to one or more of the preceding claims, **characterized in that** each one of said magazines (9, 10, 11) is composed of two halves which are arranged on mutually opposite sides with respect to a vertical central plane (24), which is parallel to said advancement orientation (5); said two halves being movable toward or away from each other according to the length of said transverse stringers (12, 13, 14).

11. The feeder (1) according to one or more of the preceding claims, **characterized in that** said pushers (31) define an intermediate resting surface (39) which supports the transverse stringer (12, 13, 14), which is engaged by said pushers (31) for at least one part in its motion from said waiting station (15) to said mating station (8), said intermediate resting surface (39) being inclined with respect to the horizontal for the descent of the transverse stringer (12, 13, 14) toward a third resting surface (50), which is arranged between said second resting surface (17) and said first resting surface (3), upon the motion of said pushers (31) in the opposite direction with respect to said advancement direction.

12. The feeder (1) according to one or more of the preceding claims, **characterized in that** said pushers (31), in their motion toward said mating station (8), can engage, by means of their end directed toward said mating station (8), the transverse stringer (12, 13, 14) previously deposited on said third resting surface (50) for its advancement toward said mating station (8).

13. The feeder (1) according to one or more of the preceding claims, **characterized in that** said pushers (31) have an engagement element (36) that can engage the side of the transverse stringer (12, 13, 14) that is arranged in said waiting station (15) and is directed away from said mating station (8) upon the advancement of said pushers (31) toward said mating station (8); said engagement element (36) being flexible in order to move beyond the transverse stringer (12, 13, 14) arranged in said waiting station (15) upon the return motion of said pushers (31) from said mating station (8) to said waiting station (15).

14. The feeder (1) according to one or more of the preceding claims, **characterized in that** said individual extraction means (16), said first advancement means (18), said second advancement means (19) and said adjustment means (40) are functionally connected to an actuation and control element of the programmable electronic type, which is adapted to actuate said means (16, 18, 19, 40) according to preset programs according to the type of pallet cover to be manufactured.

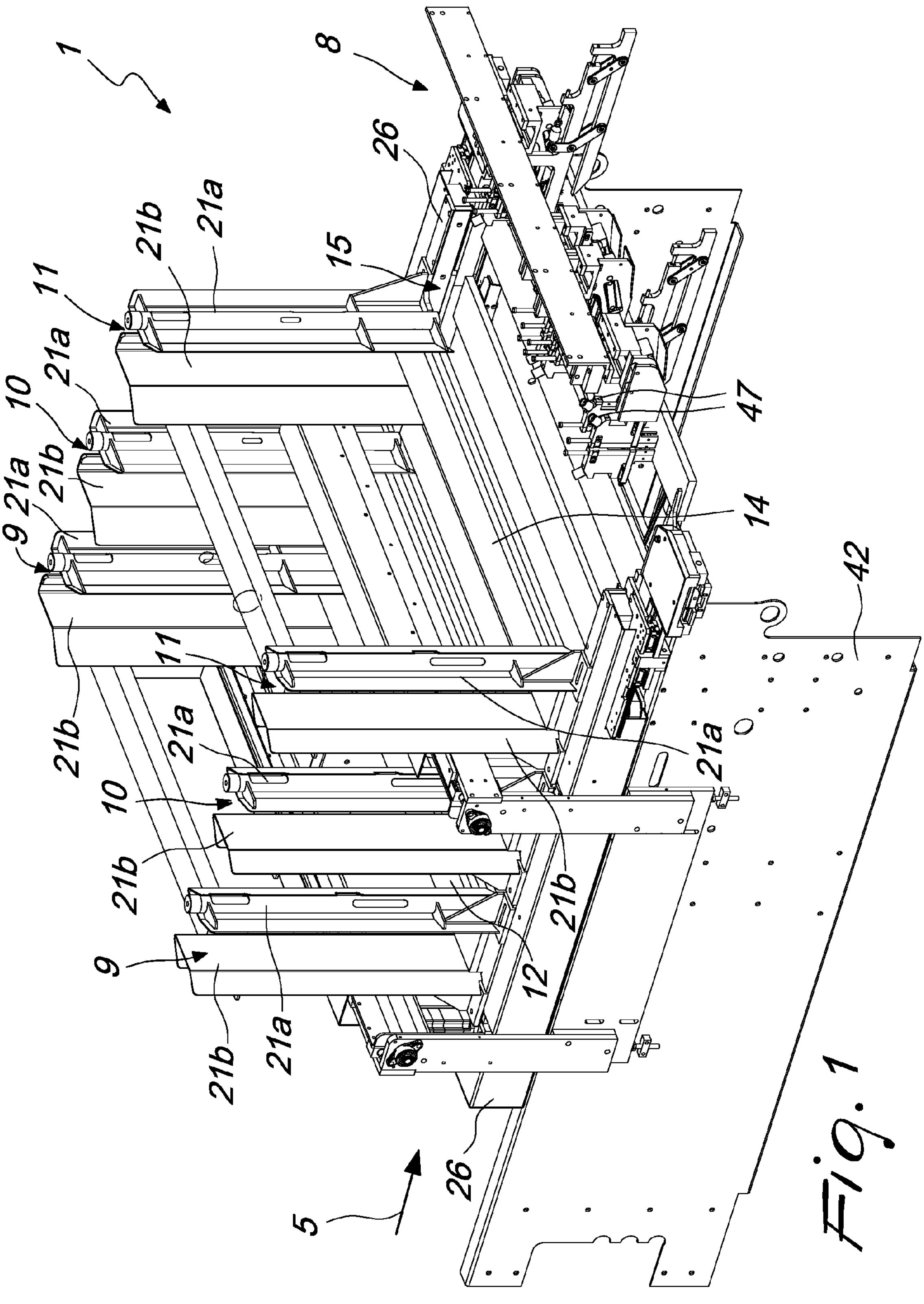
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Fig. 1

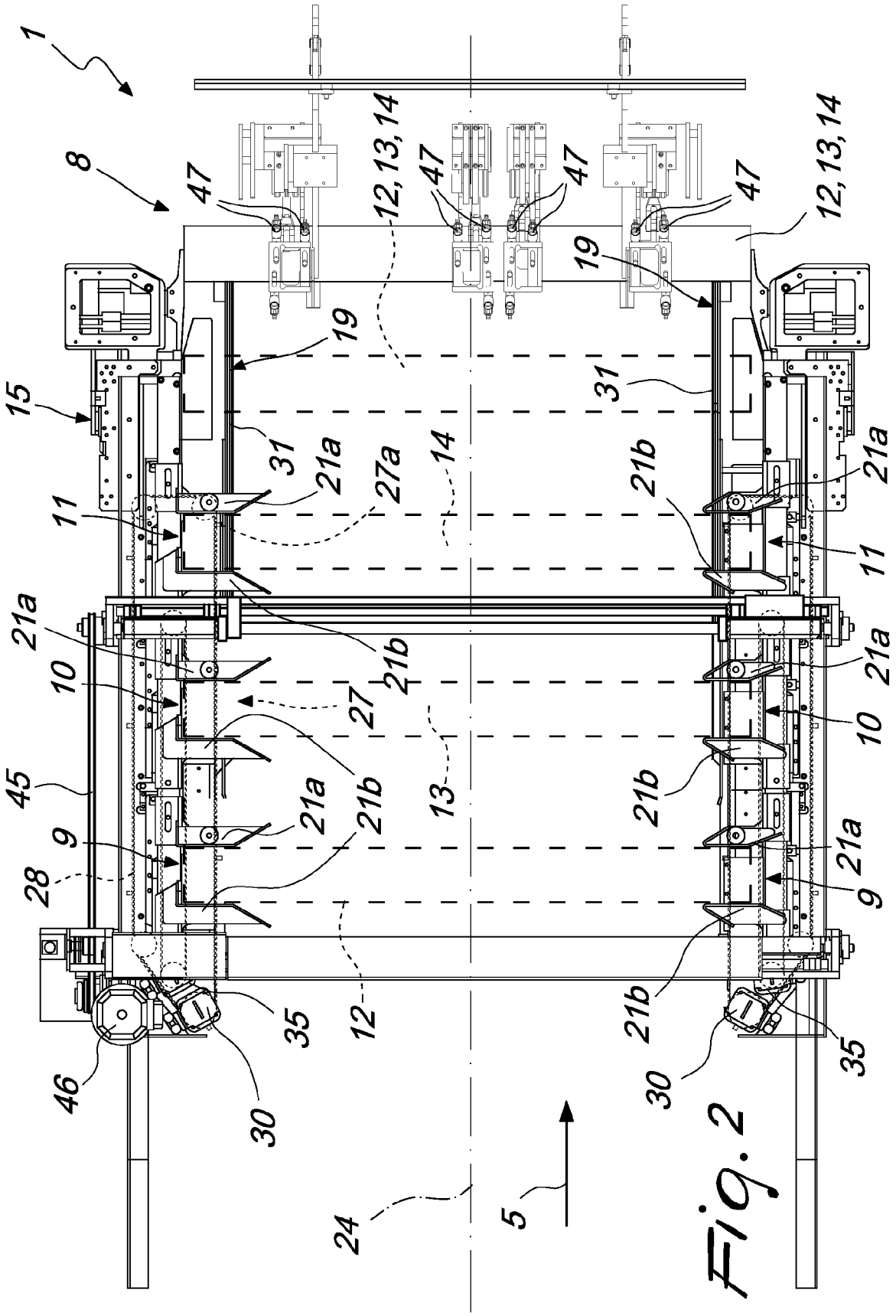
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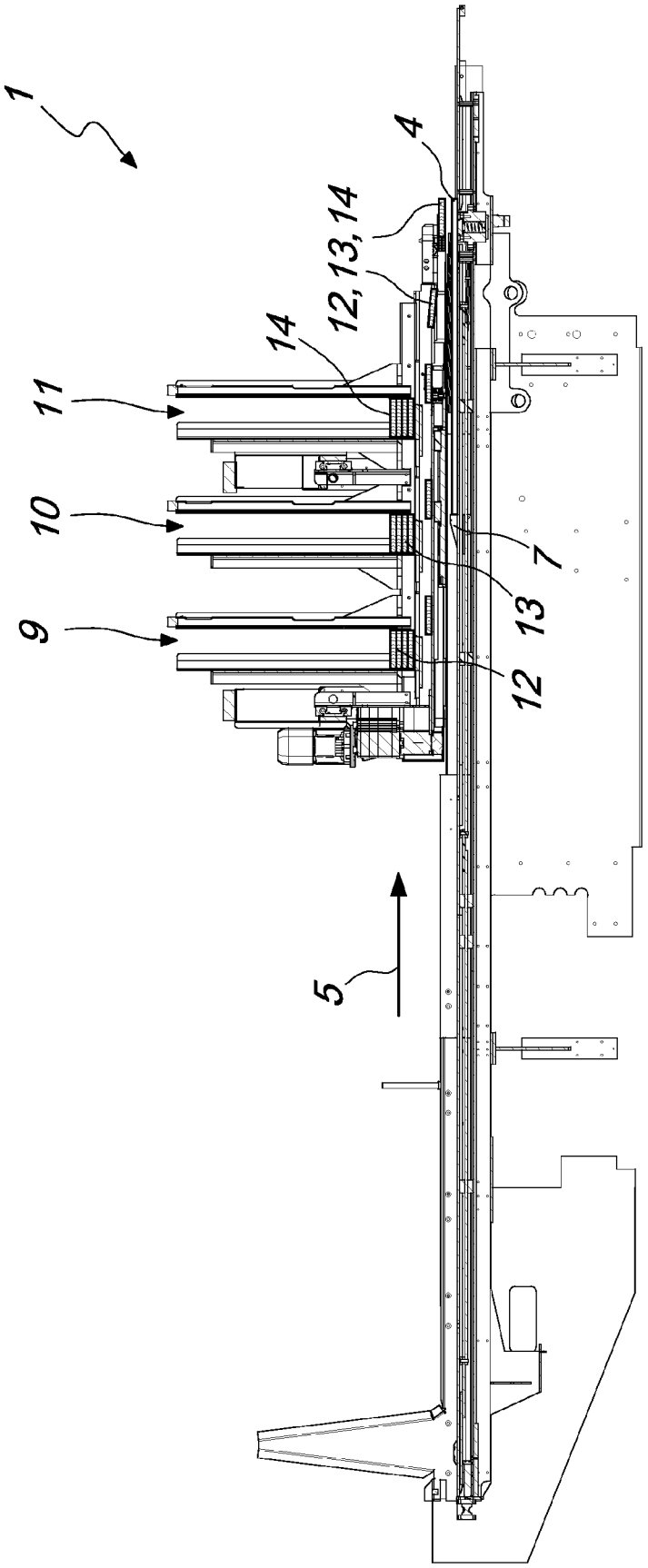
Fig. 2



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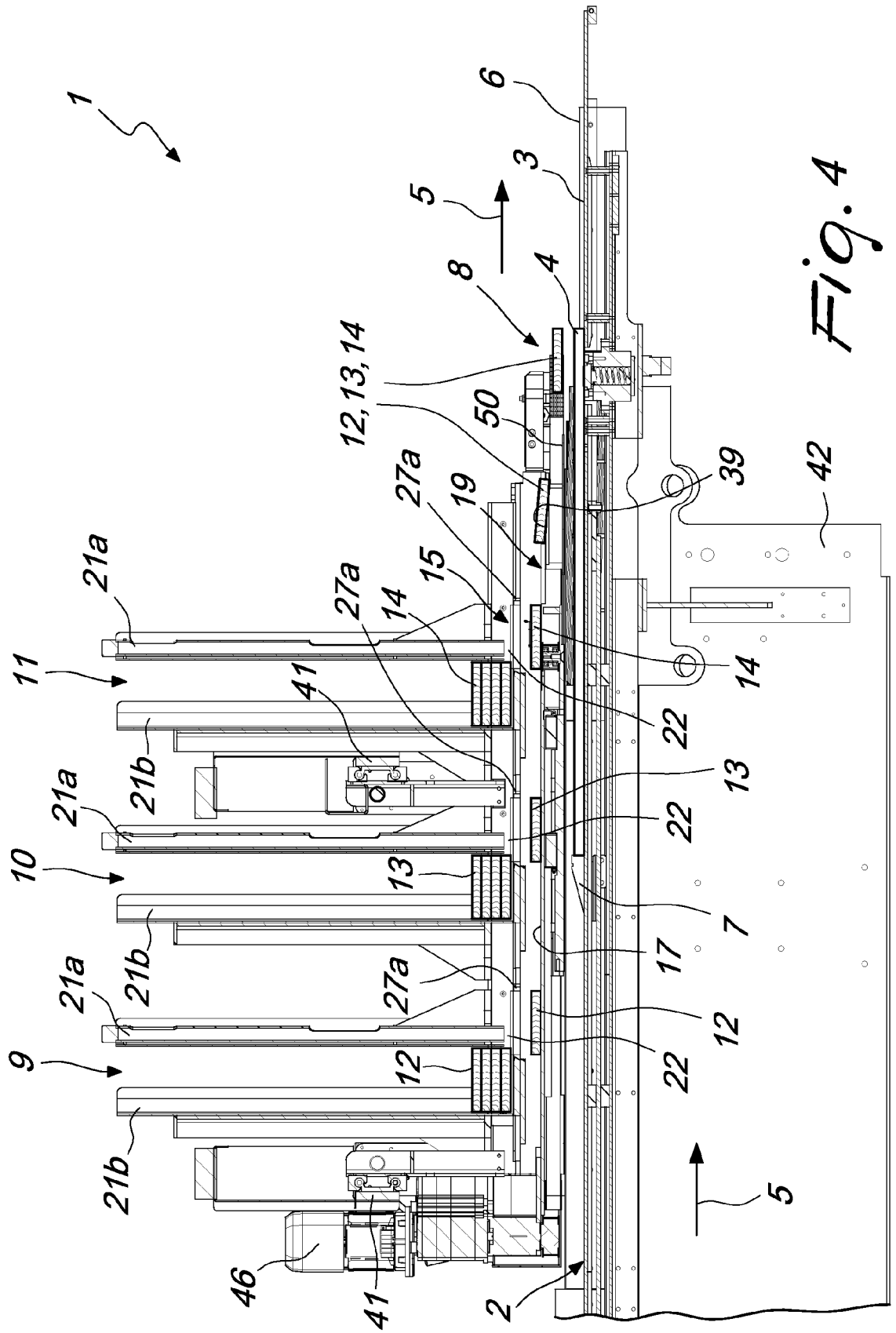
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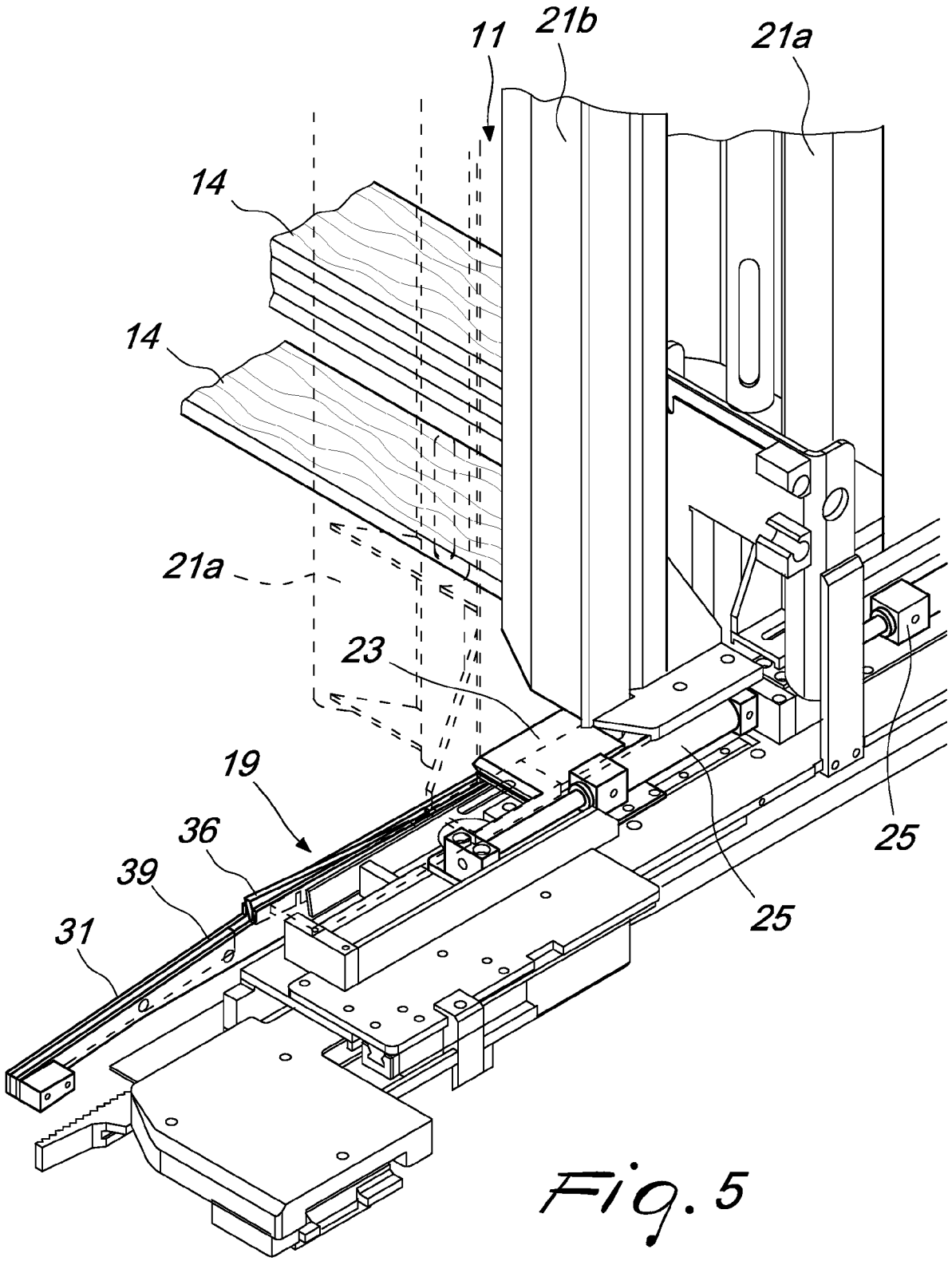
Fig. 4



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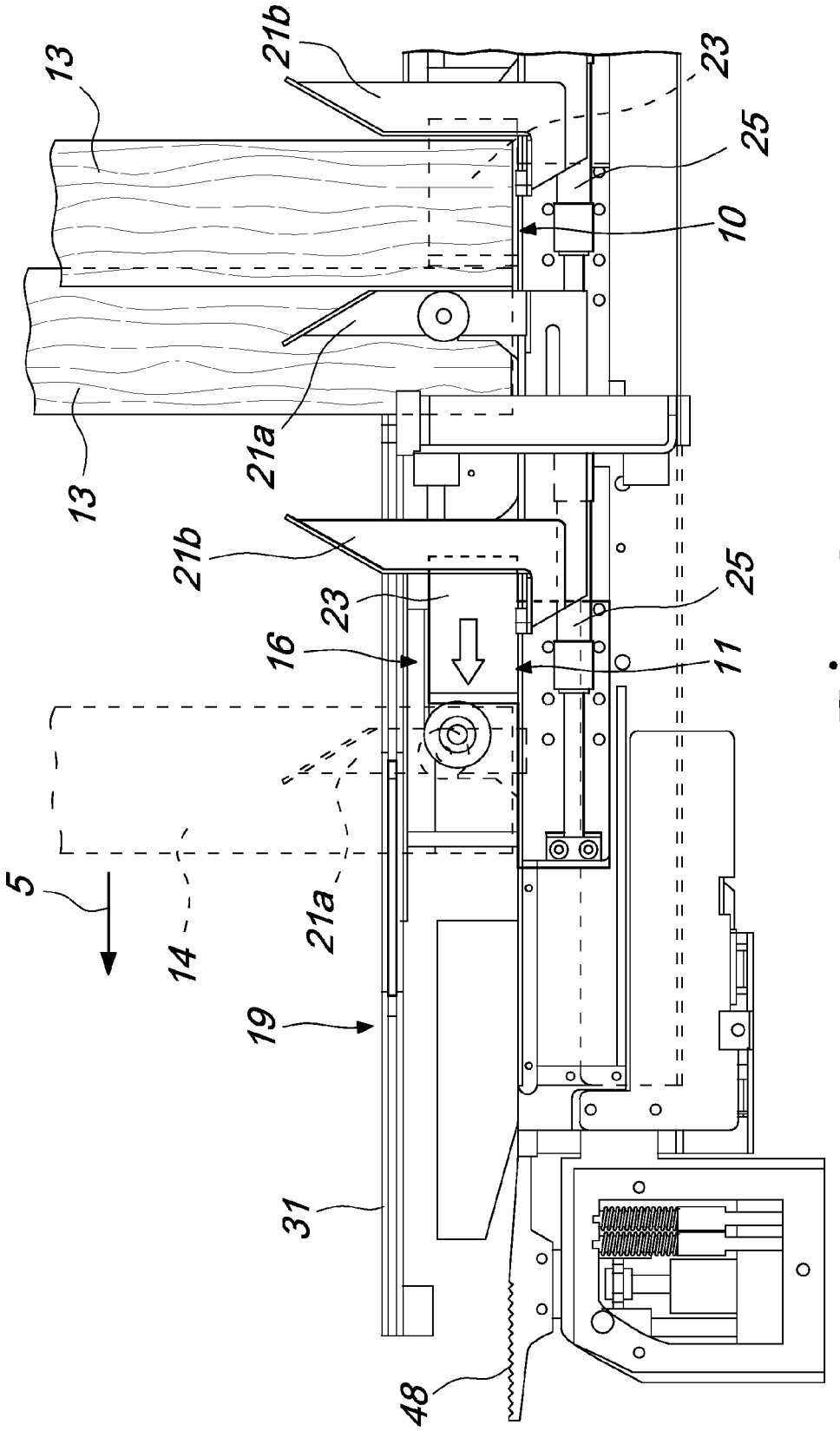

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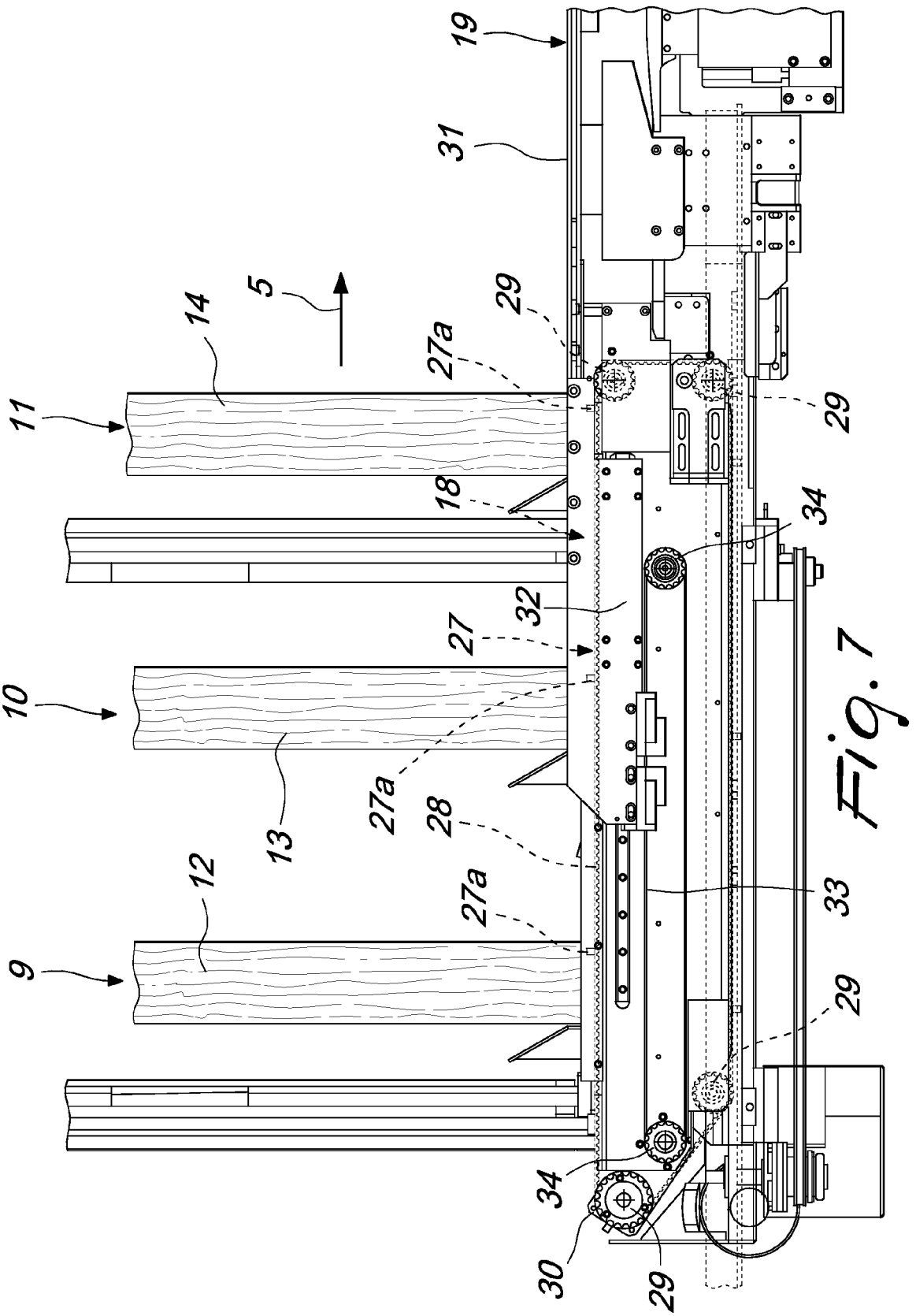

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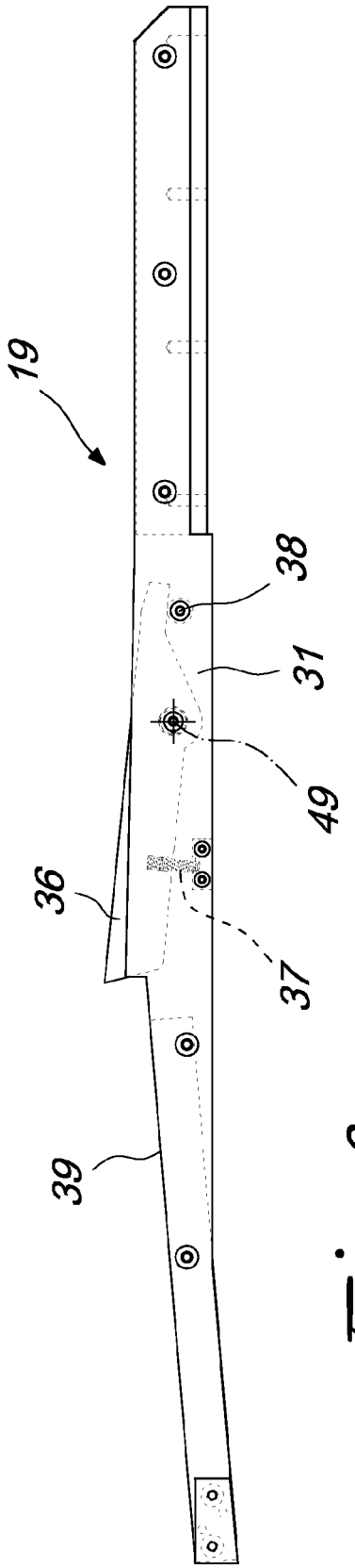

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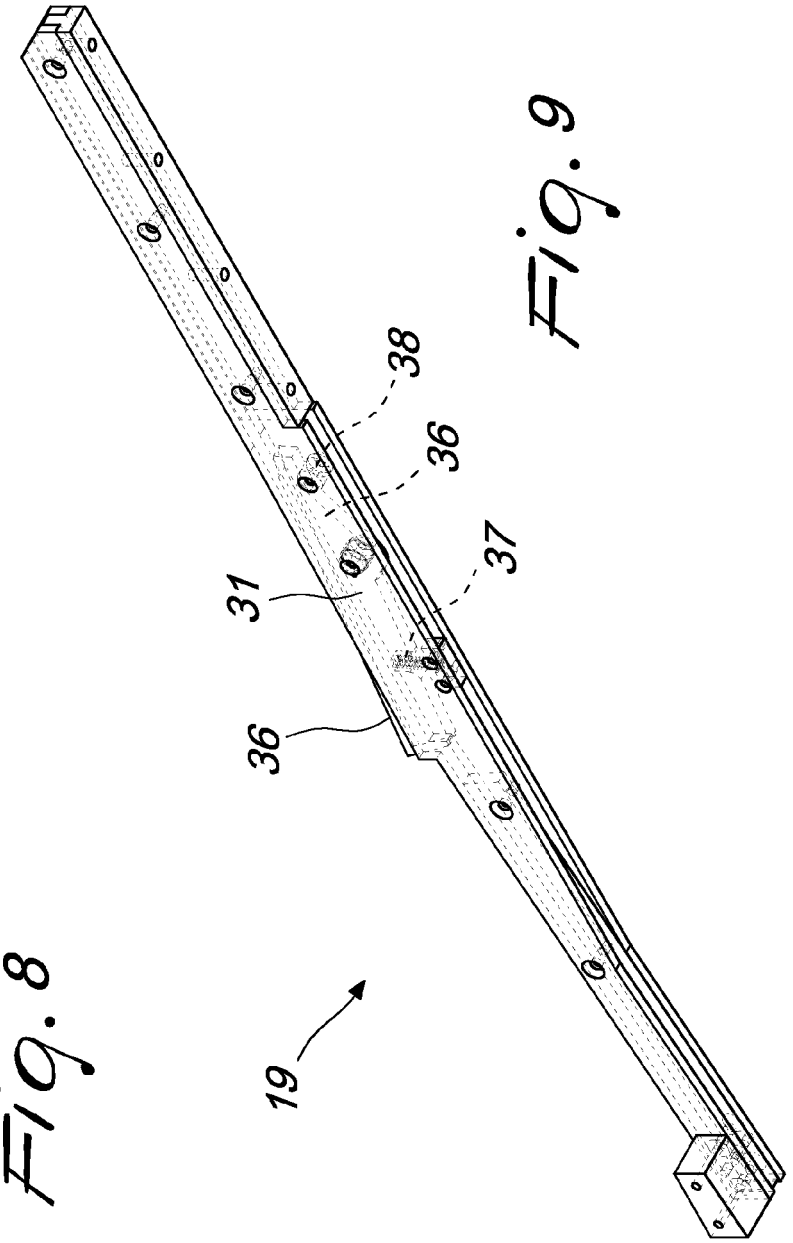

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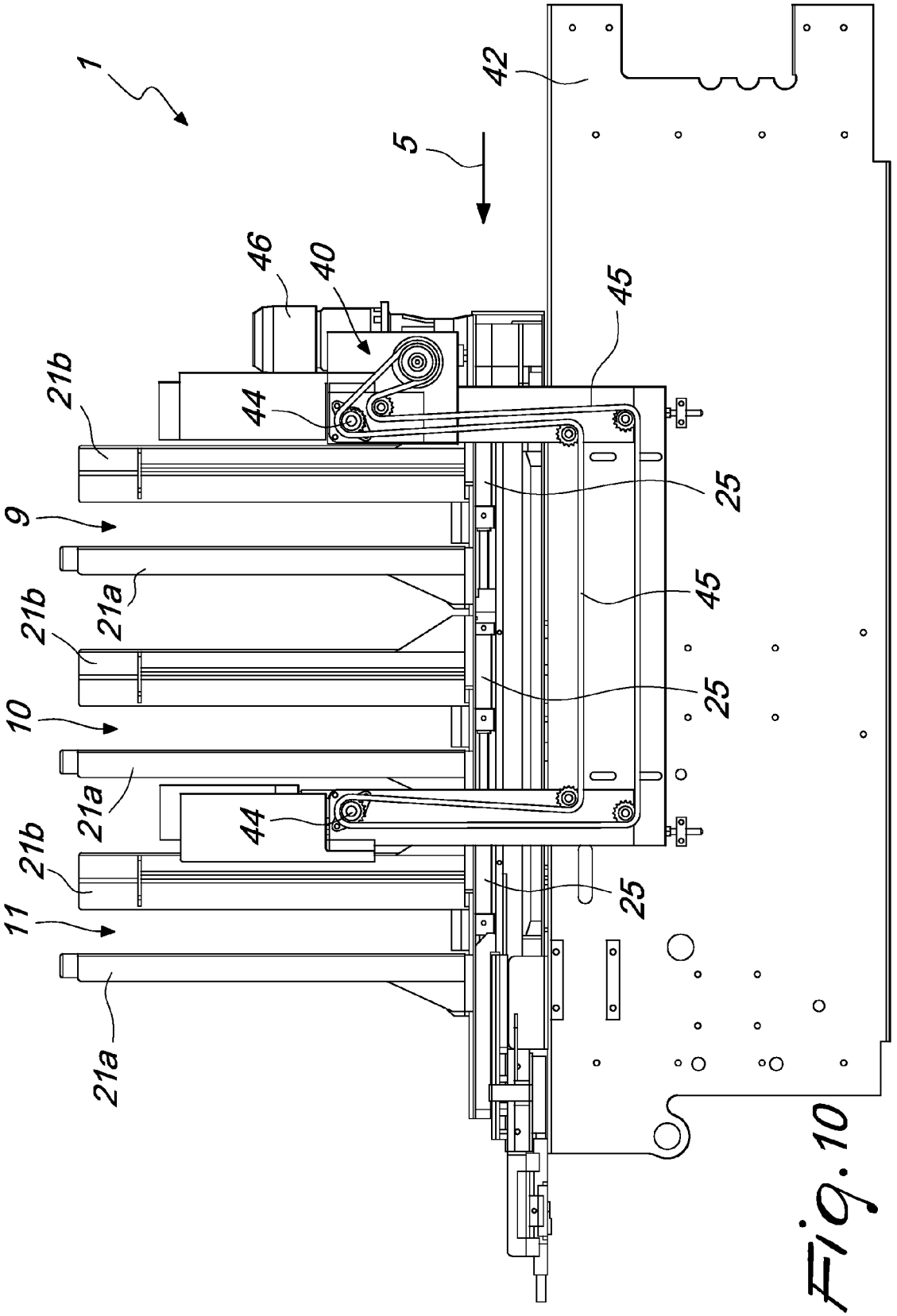

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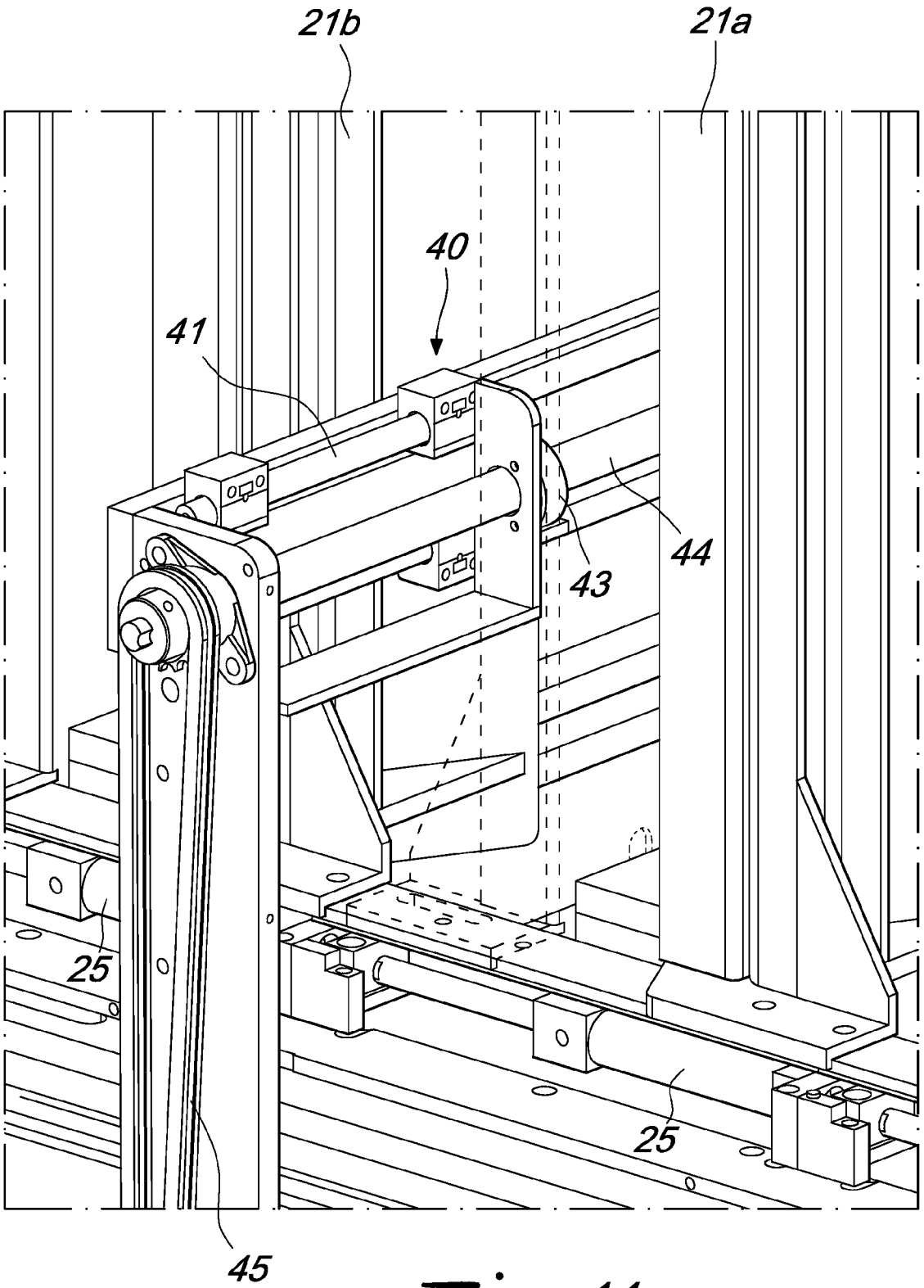

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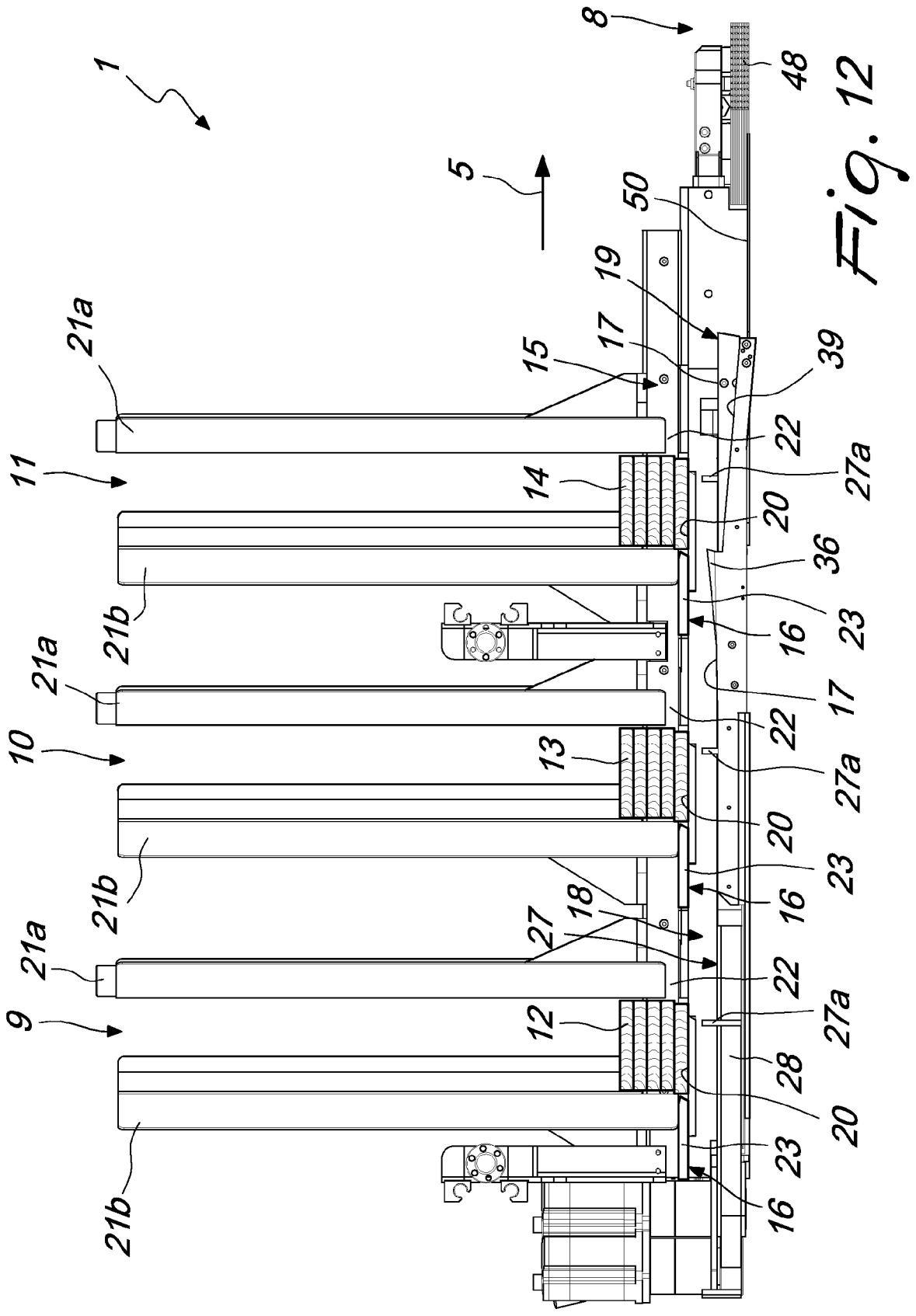
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Fig. 12

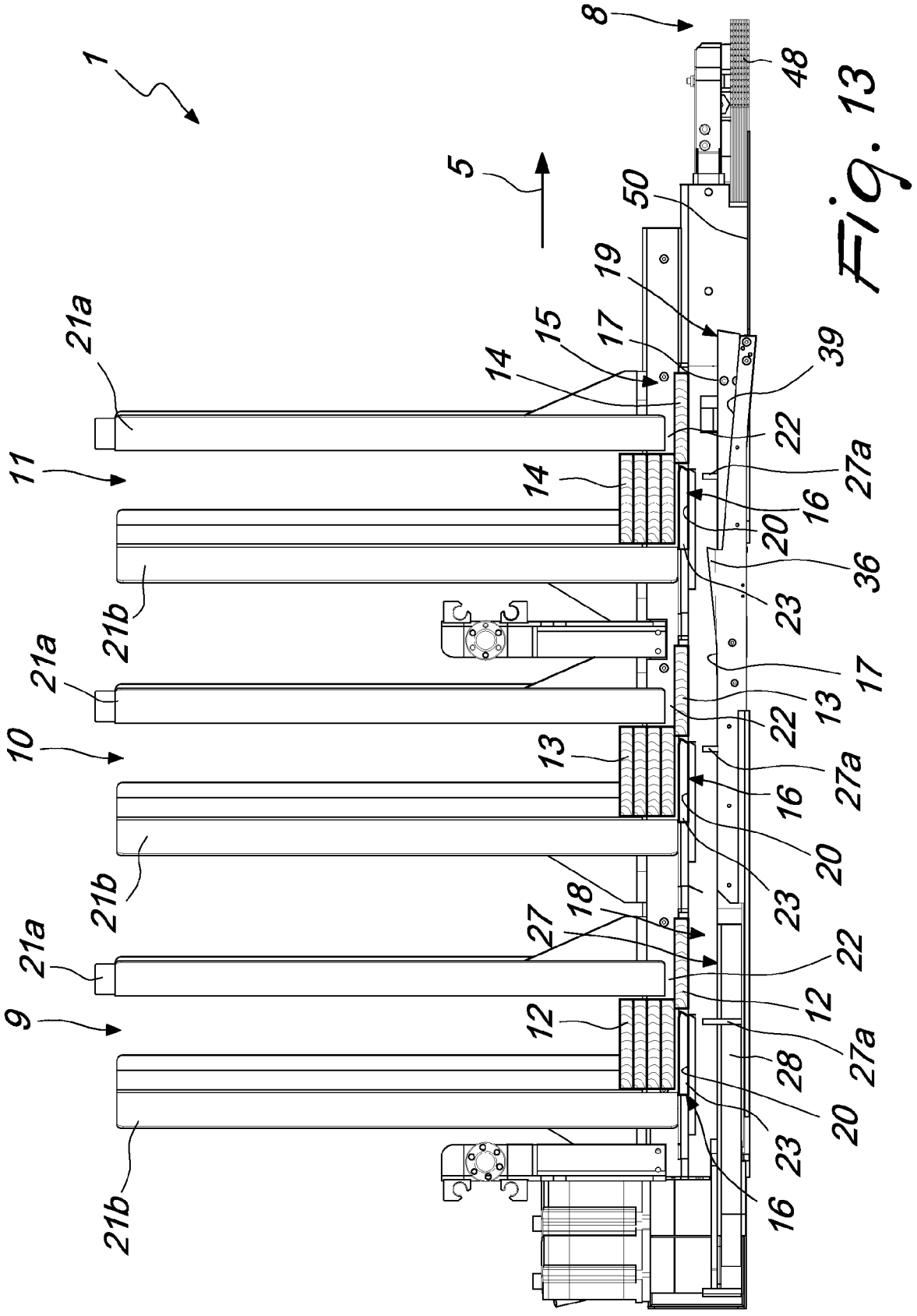
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Fig. 13

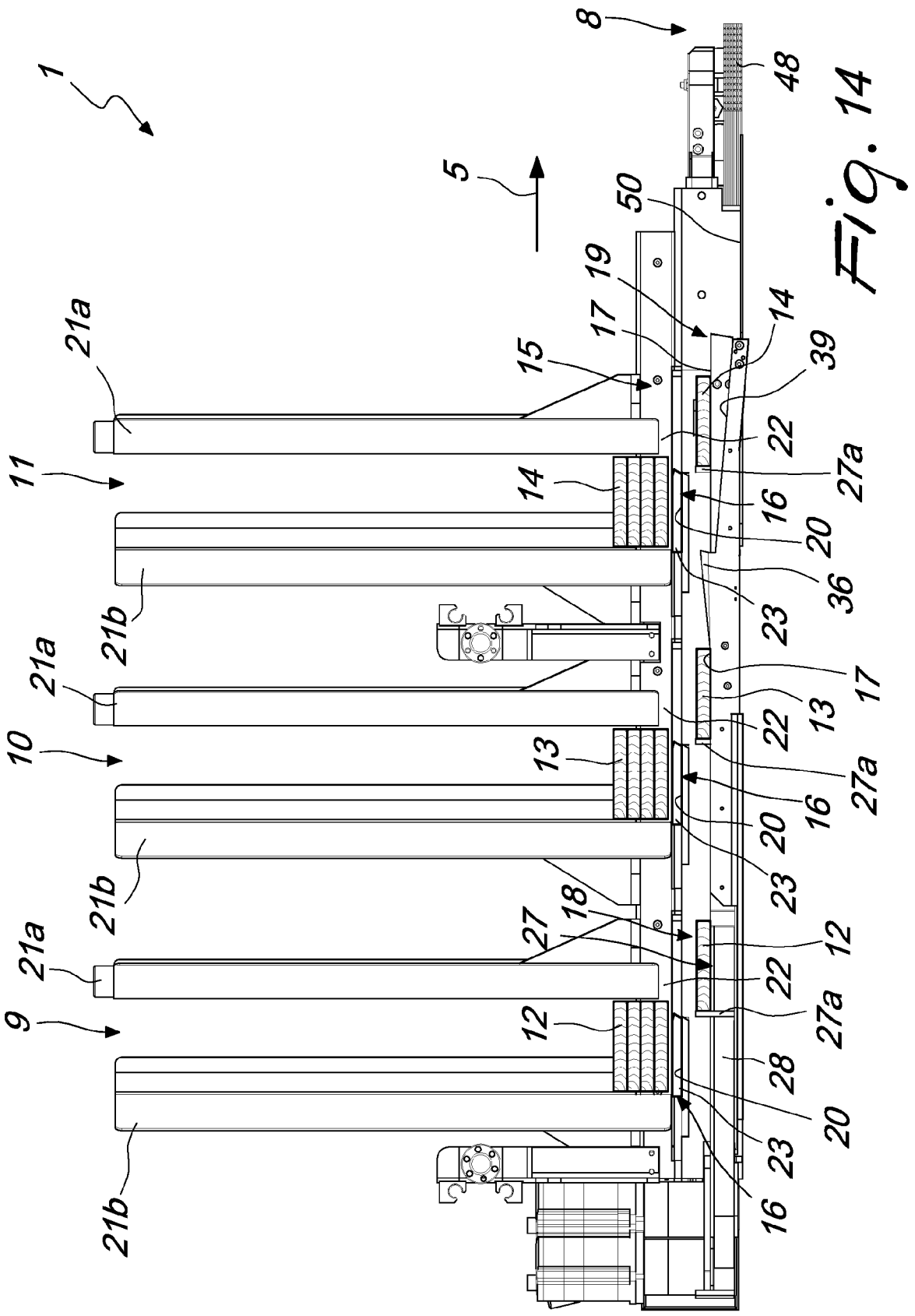
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Fig. 14

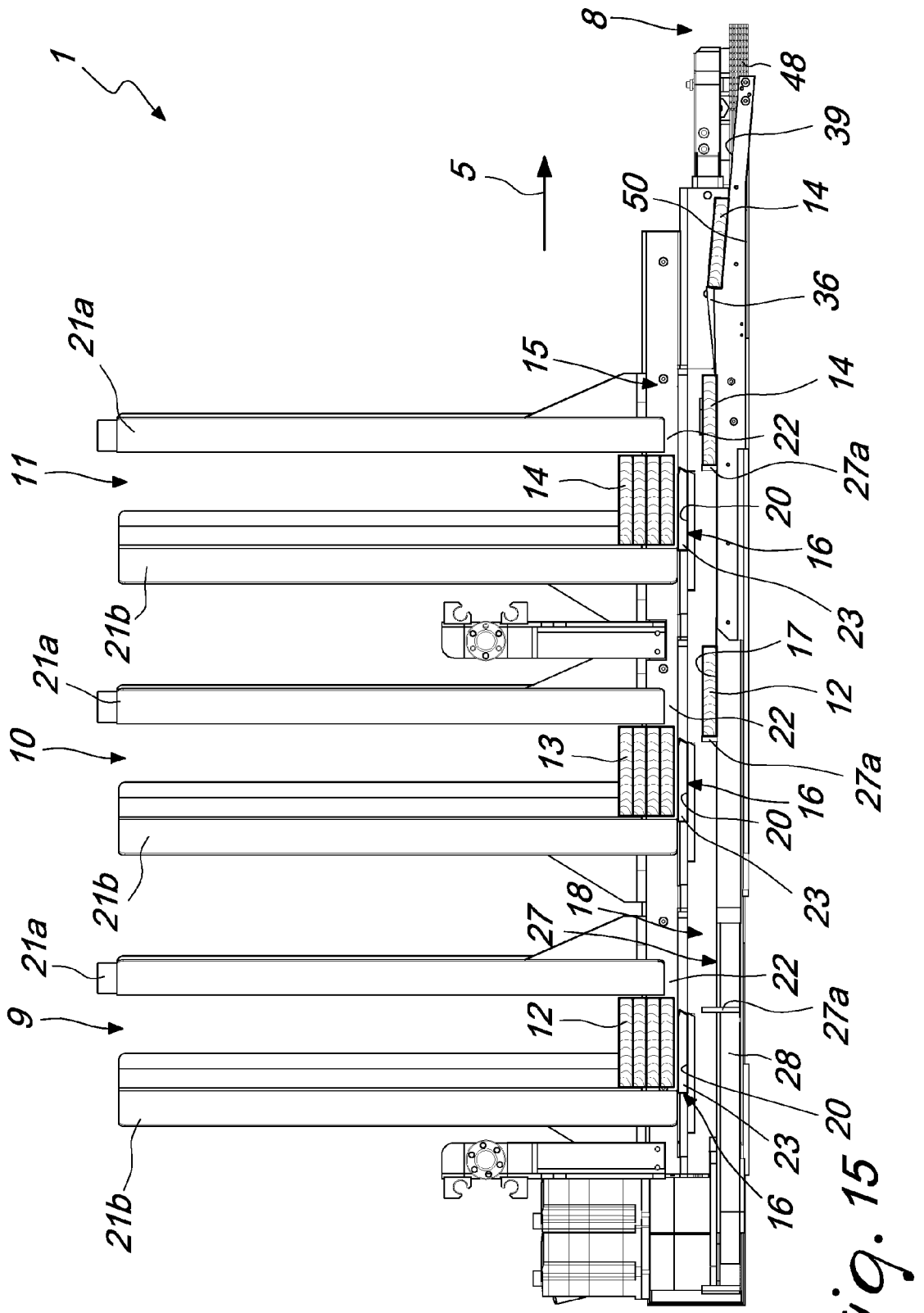
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Fig. 15

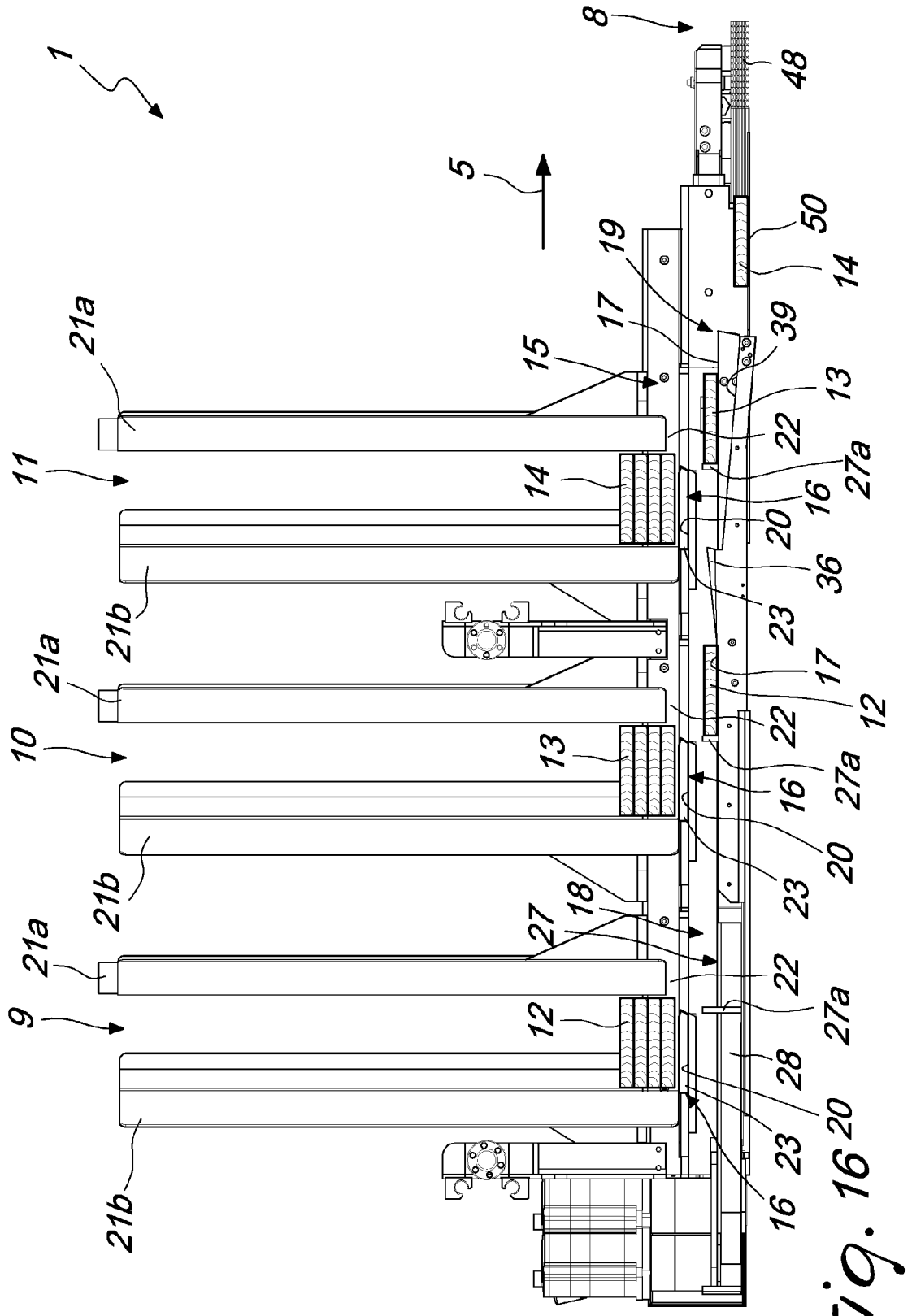
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Fig. 16

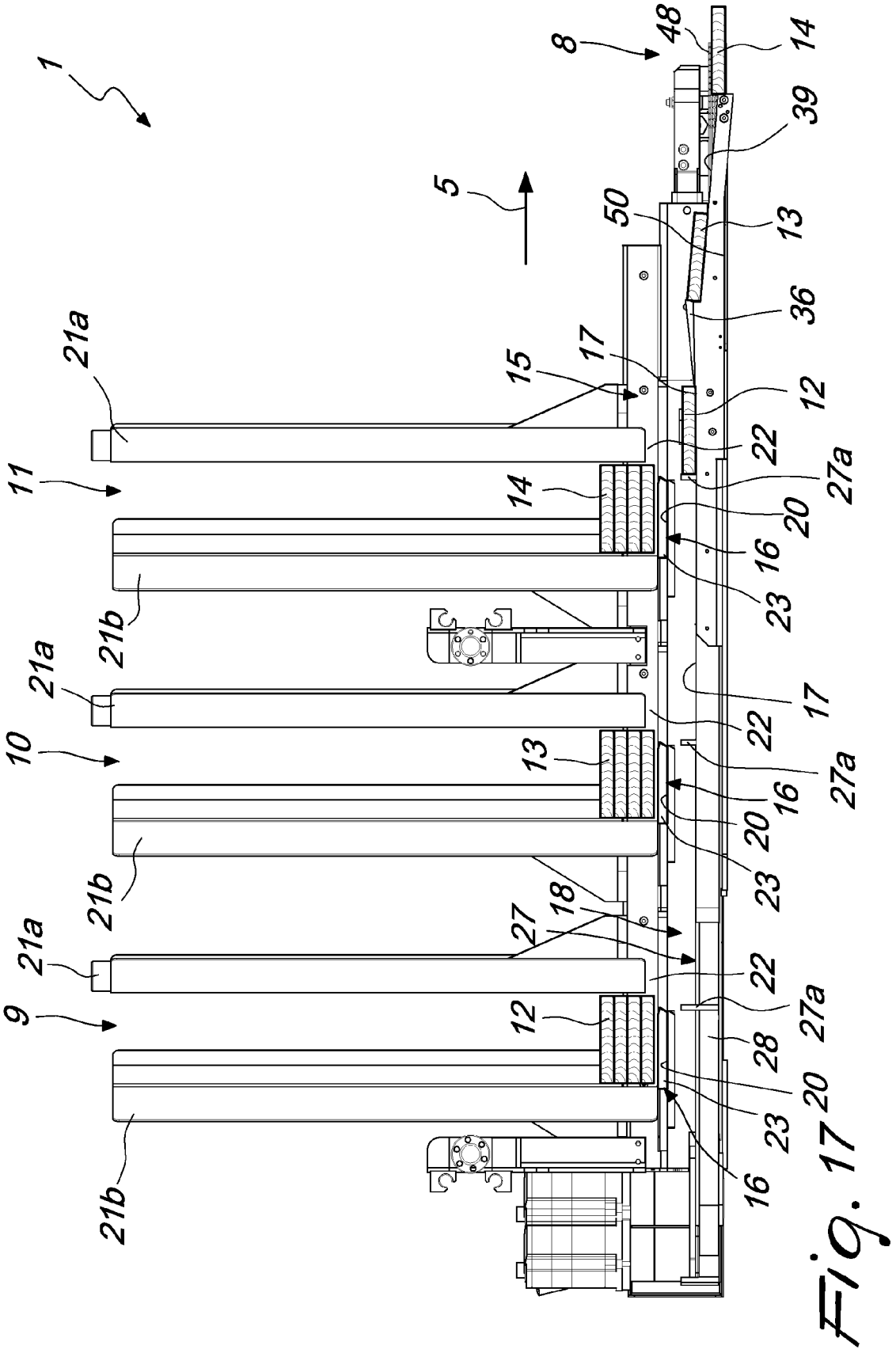
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Fig. 17

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European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 11 18 2441

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 6 058 601 A (DEKONING HUBERTUS C M [CA]) 9 May 2000 (2000-05-09) * abstract * * figures * * column 1, line 5 - line 13 * * column 4, line 27 - line 32 * -----	1	INV. B27M3/00 B27F7/00 B23Q7/00 B23Q7/10 B65G57/00
A	US 4 949 892 A (NEELY JOHN C [US] ET AL) 21 August 1990 (1990-08-21) * the whole document * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

B27M
B27F
B23Q
B65G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 January 2012	Hamel, Pascal

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26-01-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6058601 A	09-05-2000	CA 2261387 A1	27-01-2000
		US 6058601 A	09-05-2000
US 4949892 A	21-08-1990	NONE	

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

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