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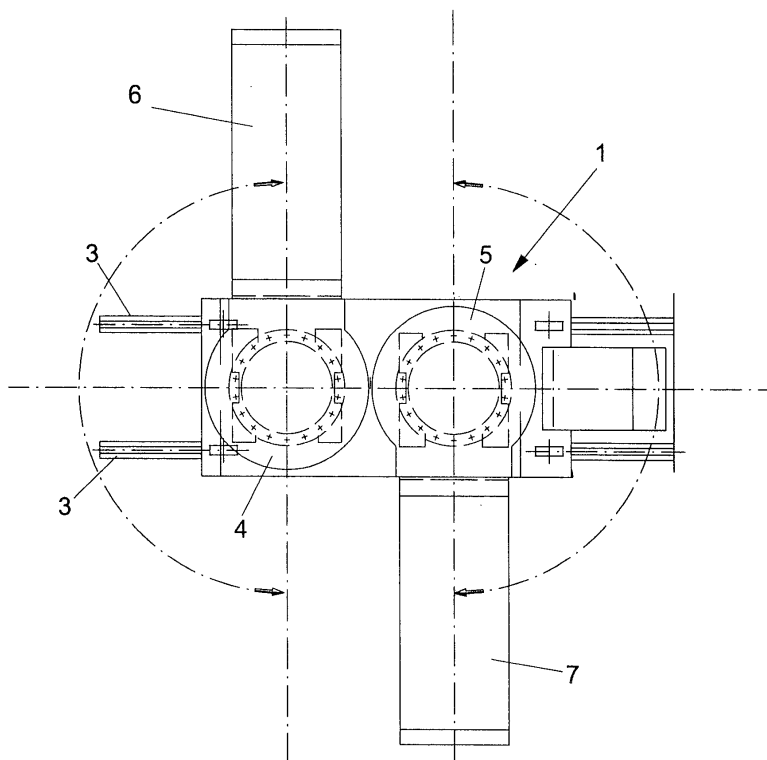
(54) Device and process for automatically picking up fibres from bales of fibres

(57) The invention concerns a device for automatically picking up fibres from bales of fibres, equipped with a trolley that translates interfacing a row made up of said bales of fibres, with a repeated back-and-forth movement between the ends of said row, means for picking up fibres being positioned on said trolley, which comprise two removal arms, which picking up fibres from said bales define a removal plane, each of said removal

arms being able to rotate by 180° about an axis perpendicular to said removal plane, from a position in which it is on one side of said trolley to a position in which it is on the opposite side of said trolley, so as to each be able to operate on a distinct side of the device or even both on the same side.

The invention also concerns a process for automatically picking up fibres, which foresees picking up from two different rows of bales of fibres.

Fig. 2



EP 1 571 244 A1

Description

[0001] The present invention concerns a process and a device for automatically picking up fibres from bales of fibres.

[0002] The invention refers to the automatic picking up of fibres, carried out through picking-up machines known as bale-opening machines and that, as known, constitutes the first step in the processing of textile fibres, with the task of picking up the fibres, in the form of flocks, from the bales in which they are manufactured and sending them for subsequent processing.

[0003] As known, the processes currently used in this field foresee the arrangement of the bales one next to the other, to form a row of bales. The picking up of fibres from bales is carried out in different steps, in each step just one surface layer of the fibres that constitute the upper surface of the row of bales being picked up, until the fibres have completely run out.

[0004] The picking up of the fibres can take place in different ways, which can involve both the support surface for the bales and the removal surfaces of the fibres from the bales. In particular, the row of bales can be rested upon a fixed support surface or on a mobile support surface, and said support surface can be horizontal or inclined in the longitudinal direction with respect to the row of bales. Moreover, the removal surface of the fibres can be horizontal or inclined, both in the longitudinal direction and in the transversal direction with respect to the row of bales.

[0005] Each of these different ways of operating foresees the use of a different picking-up device, the most advantageous of which allows the required level of performance to be obtained at a low cost.

[0006] In particular, the solution currently preferred foresees the use of an openable device of the feathering translating type, capable of moving longitudinally along the row of bales and that can operate, with suitable provisions, in the different cases in which the support and removal surfaces are horizontal or else inclined.

[0007] To better illustrate the technical problem, we shall refer, as a non-limiting example, to an openable device of the aforementioned type, comprising a trolley, or else a tower frame, which moves along a guide for the entire length of the row of bales and that carries a working arm canti-levered that extends transversally on the removal surface of the row of bales and can move in the vertical direction to adapt to the variations in height of the row itself.

[0008] The working arm is provided with picking-up means of fibres in flocks and in particular with

- a suction hood that conveys said fibres towards the actuation devices of the subsequent processing steps of the fibres;
- one or more high-speed rotating reels, arranged transversally to the direction of the relative displacement motion with respect to the row of bales and

equipped with teeth that come into contact with the fibres, pick them up from the removal surface of the bales and take them to said suction hood, preferably two rotating reels being foreseen, with staggered toothings so as to engage the entire removal surface;

- a series of support rods or pads, which constitute the support for the entire assembly of the working arm on the removal surface, said rods or pads being parallel to each other and arranged to alternate between the rotating members of the reels, without interfering with them, preferably equipped with means for adjusting the difference in level between the plane made up of them and the axes of the reels, and that have a portion not parallel with the direction of the relative displacement motion with respect to the row of bales, so as to engage the entire removal surface with the reels; and
- a pair of rotating shafts, arranged inside the extremities of said supports rods or pads, on which a series of wheels that are toothed or grooved in the direction of their rotation axis are arranged, which operate in the intervals left by said rods or said support pads, said rotation axis also being parallel to the rotation axis of said reels so that said toothed wheels are arranged to precede and follow said reels in the motion along the removal surface.

[0009] According to the prior art, the process for picking up flocks of fibres from the bales consists of the steps described hereafter.

[0010] As already stated, the bales are arranged in a row, on a fixed or mobile, horizontal or inclined support surface, to form an upper surface that is as continuous as possible, which constitutes the initial removal surface of the fibres. The working arm of the bale-opening device is rested upon the removal surface and the entire device is made to translate in such a way that the working arm carries out a series of passages on the row of bales, in each passage picking up a certain amount of fibres and, from time to time, displacing in the vertical direction to adapt to the decrease in height of the removal surface.

[0011] The first opening processing of the bales arranged the material for the subsequent cleaning and discarding operations of the impurities, which takes place by classification based upon the different specific weight. For such a purpose the suction hood is suitably profiled and the passage sections are sized to ensure a certain pneumatic transportation speed of the flocks of fibres picked up from the bales. The optimal operation of such a classification and impurity discarding system is ensured by a flow of fibres coming from the picking-up device that is as constant as possible.

[0012] Such constancy of the flow is affected both by the presence of the impurities inside the bale, and by the type of fibre processed and the fact that the most inner parts of a bale of fibres have different consistency

with respect to the surface parts of the bale itself.

[0013] Moreover, the constancy of the flow of fibres removed from the row of bales is also affected by drawbacks that inevitably occur in the initial and final removal steps of fibres from the row of bales. Indeed, at the start of the picking-up operations there are inevitably problems of levelling of the height of the various bales arranged along the row, whereas in conditions with picking-up almost finished there can be areas in which the consistency of the fibres present is insufficient to ensure the correct picking up.

[0014] Moreover, once the fibres of a row of bales has run out, it is necessary to prepare a new row of bales for picking up, such an operation requiring a complete interruption in picking-up.

[0015] Furthermore, between the inner layers and the surface layers of a bale of fibrous material differences are established not only in consistency, but also in thermohygroscopic character and, consequently, the flocks of fibres that are picked up at different heights of the row of bales and conveyed to the subsequent processing steps can be dishomogeneous also in terms of quality.

[0016] The technical problem has been illustrated with particular reference to a particular picking-up technology of fibres, but it is clear to the man skilled in the art that the same drawbacks also occur in the case in which, instead of removal arms that make use of reels, picking-up devices by pinching of flocks of fibres or else picking-up devices with just pneumatic action are taken into consideration.

[0017] A purpose of the present invention is therefore that of making a device and a process for automatically picking up fibres from bales ensuring a lower dishomogeneity in amount and in quality of the fibres conveyed to the subsequent processing steps and irrespectively of the specific picking-up technology of fibres from the removal surface.

[0018] A further purpose of the present invention is that of ensuring greater productivity of pick-up through a greater operating factor.

[0019] These purposes according to the present invention are accomplished by making a device for automatically picking up fibres from bales of fibres as outlined in claim 1 and a process for automatically picking up fibres from bales of fibres as outlined in claim 6.

[0020] Further characteristics are foreseen in the respective dependent claims.

[0021] The present invention shall now be described, for indicating but not limiting purposes, according to a preferred embodiment, with particular reference to the figures of the attached drawings, in which

- figure 1 shows a schematic front view of the device for picking up fibres according to the present invention, in which the removal arms are arranged on two opposite sides,
- figure 2 shows a schematic view from above of the device for picking up fibres of figure 1,

- figure 3 shows a schematic side view of the device for picking up fibres of figure 1,
- figure 4 shows a schematic side view of the device for picking up fibres of figure 1, in which the removal arms are arranged on the same side, and of a row of bales,
- figures 5-8 show a schematic view from above of the device for picking up fibres of figure 1, during different picking-up steps.

[0022] With reference to figure 1, a preferred embodiment of the device 1 for picking up fibres according to the present invention, which comprises a trolley 2, free to translate along a guide, consisting of rails 3. On said trolley 2 two frames 4 and 5 are positioned, which respectively carry two removal arms 6 and 7 cantilevered that indifferently can be made according to one of the known picking-up techniques of the state of the art. The servomechanisms 8 and 9 for adjusting the height of the arms 6 and 7 are also schematically illustrated.

[0023] On the two sides of the rails 3 the areas 10 for supporting the bales of fibres are foreseen, to form the rows of bales from which the picking-up is carried out.

[0024] With reference to figure 2, it is shown how the frames 4 and 5 for respectively supporting the removal arms 6 and 7 are arranged in succession along the trolley 2, so that they are respectively free to rotate about the axes 11 and 12, to pass from the position illustrated in the figures, with the two removal arms 6 and 7 on two opposite sides of the trolley 2, to a position in which both of the arms 6 and 7 are on the one side or on the other side of the trolley 2.

[0025] Figure 3 schematically shows the picking-up apparatuses of a removal arm 6, in particular a reel 13, a support pad 14 and two toothed wheels 15 and 16, respectively arranged on two rotating shafts 17 and 18.

[0026] Figure 4 schematically shows a detail of the device for picking up fibres from bales according to the present invention. During the processing steps in which both of the removal arms 6 and 7 work on the same side of the trolley 2, which displaces translating along the row of bales 19, one of the two arms precedes the other in the passage on the removal surface of the row of bales. The second removal arm 7, passing on the row of bales 19 immediately after the first removal arm 6 has carried out the picking-up, thus operates on a lower removal surface than the first. In the situation illustrated in figure 4, the device displaces from right to left and the removal arm 6, which precedes in the direction of movement of the device, is at a slightly greater height to that of the removal arm 7 that follows. Necessarily, the relative heights of the two arms invert in the subsequent passage of the device on the row of bales from left to right.

[0027] Figure 5 shows the device 1 for picking up fibres, during a picking-up step in which there is a first row of bales 19, already partially processed during previous passages of the removal arms 6 and 7, on one side of the rails 3, whilst on the other side the arrange-

ment of a second row of bales is in progress.

[0028] Both of the removal arms 6 and 7 work, carrying out one or more passages, on the removal surface of the same row of bales 19, in particular on the densest and previously flattened zones of said first row of bales 19. Consequently, the picking-up carried out is optimal.

[0029] Figure 6 shows the device 1 for picking up fibres, during a second step of the process for picking up fibres according to the present invention. In particular, once the arrangement of the second row of bales 20 is complete, the support frame 5 of the removal arm 7 has been made to rotate by 180° about the trolley 2, so that the removal arm 7 rests above said second row of bales 20 during the different passages of the trolley along the rows of bales 19 and 20.

[0030] In this step, the removal arms 6 and 7 work, carrying out one or more passages, on the removal surface of the two different rows of bales 19 and 20, but, whilst the removal arm 6 operates on the densest and previously flattened zones of said first row of bales 19, the removal arm 7 operates on the upper surface, not yet levelled, of said second row of bales 20. Consequently, the picking up carried out on said second row of bales 20 may not be constant.

[0031] In this step, the simultaneous picking-up on two different rows of bales 19 and 20, one of which in optimal picking-up conditions and the other in potentially inconstant picking-up conditions, allows the possible jumps in picking up of fibres due to surface dishomogeneity of the new row of bales 20 to be minimized through the mixing of said fibres with those picked up from the previously flattened row of bales 19.

[0032] Figure 7 shows the device for picking up fibres during a third step of the process for picking up fibres according to the present invention. In particular, with the surfaces layers of fibres of the bales of the second row of bales 20 having been removed, the removal arms 6 and 7 work, carrying out one or more passages, respectively on the removal surface of the two different rows of bales 19 and 20, both operating on the densest and previously flattened zones of said rows of bales 19 and 20. Consequently, the picking up carried out on said rows of bales 19 and 20 is optimal.

[0033] During a fourth step of the process for picking up fibres according to the present invention, the device for picking up fibres is still arranged as shown in figure 7. In particular, in this step the first row of bales 19 is now in a state of exhaustion.

[0034] In this step, the removal arms 6 and 7 work, carrying out one or more passages, respectively on the removal surface of the two different rows of bales 19 and 20, but, whilst the removal arm 7 operates on the densest and previously flattened zones of said second row of bales 20, the removal arm 6 operates on the end portion of said first row of bales 19. Consequently, the picking up carried out on said first row of bales 19 may not be constant.

[0035] Also in this step, the simultaneous picking up

on two different rows of bales 19 and 20, one of which in optimal picking-up conditions and the other in potentially inconstant picking-up conditions, allows the possible jumps in picking up of fibres due to surface dishomogeneity of the first row of bales 19 that is running out to be minimized through the mixing of said fibres with those picked up from the previously flattened second row of bales 20.

[0036] Figure 8 shows the device for picking up fibres during a further step of the process for picking up fibres according to the present invention, in a position mirroring the one shown in figure 5. In particular, with the first row of bales 19 having been exhausted, the removal arm 6 was made to rotate by 180° around the trolley 2, so as to rest over said second row of bales 20 during the different passages of the trolley along said second row of bales 20.

[0037] In this state, both of the removal arms 6 and 7 work, carrying out one or more passages, on the removal surface of the same row of bales 20, in particular on the densest and previously flattened zones of said second row of bales 20. Consequently, the picking up carried out is optimal.

[0038] As already stated, the position of the device shown in figure 8 perfectly mirrors the one shown in figure 5 and it is clear to the man skilled in the art that the device 1 shall cross subsequent cyclical steps of the process according to the present invention, which shall from time to time be mirror-like or identical to those shown with reference to figures 5-8.

[0039] The steps described in relation to the position of the device 1 for picking up fibres, as shown in figures 5-8, refer to the process for picking up fibres from bales of fibres, according to the present invention, in normal operating conditions. In the start-up step, the process foresees picking up fibres from the surface layers of a single row of bales, until the inner layers of the bales are reached. From this moment it is possible to proceed in normal operating conditions, according to the cyclical steps described with reference to figures 5-8.

[0040] The duration of the different processing steps can be varied by controlling the removal speed of the device for picking up fibres according to the present invention. This type of variations can be made by the operator even during the course of a processing step that has already begun, for example to prevent a row of bales finishing before a new row of bales has been arranged on the opposite side.

[0041] The present invention has been described for illustrative and not limiting purposes, according to its preferred embodiments, but it should be understood that variations and/or modifications can be made by men skilled in the art without for this reason departing from the relative scope of protection, as defined by the attached claims.

[0042] In particular, the invention should be understood to be applicable irrespective of the type of picking up means adopted, which make use of cutting or pres-

sure reels, pincer means of flocks of fibres or pneumatic picking up means.

Claims

1. Device for automatically picking up fibres from bales of fibres, equipped with a trolley that translates interfacing a row made up of said bales of fibres, with a repeated back-and-forth movement between the ends of said row, means for picking up fibres being positioned on said trolley, said device being **characterised in that** said means for picking up fibres comprise two removal arms, which picking up fibres from said bales define a removal plane, each of said removal arms being able to rotate by 180° about an axis perpendicular to said removal plane, from a position in which it is on one side of said trolley to a position in which it is on the opposite side of said trolley, so as to each be able to operate on a distinct side of the device or even both on the same side. 5 10 15 20
2. Device for automatically picking up fibres according to claim 1, **characterised in that** it comprises translation means of said removal arms along a direction perpendicular to said removal plane. 25
3. Device for automatically picking up fibres according to claim 2, **characterised in that** said translation means of said removal arms along a direction perpendicular to said removal plane comprise means for the relative displacement of one removal arm with respect to the other, so that, in the case in which both of the arms operate on the same side of said trolley, or rather on the same removal plane, the position of the removal arm that follows, in the movement on the removal surface along the row of bales, is lower than the position of the preceding removal arm. 30 35 40
4. Device for automatically picking up fibres according to any one of the previous claims, **characterised in that** said removal arms comprise means for adjusting the amount of fibres removed per unit time. 45
5. Device for automatically picking up fibres according to any one of the previous claims, **characterised in that** said removal arms are selected from cutting reel-holding arms, pressure reel-holding arms, pneumatic pick up arms and pinching arms of flocks. 50
6. Process for automatically picking up fibres from bales of fibres, **characterised in that** it foresees picking up from two different rows of bales and **in that** it comprises the following start-up steps: 55

- arrange a row of bales on a support plane, and

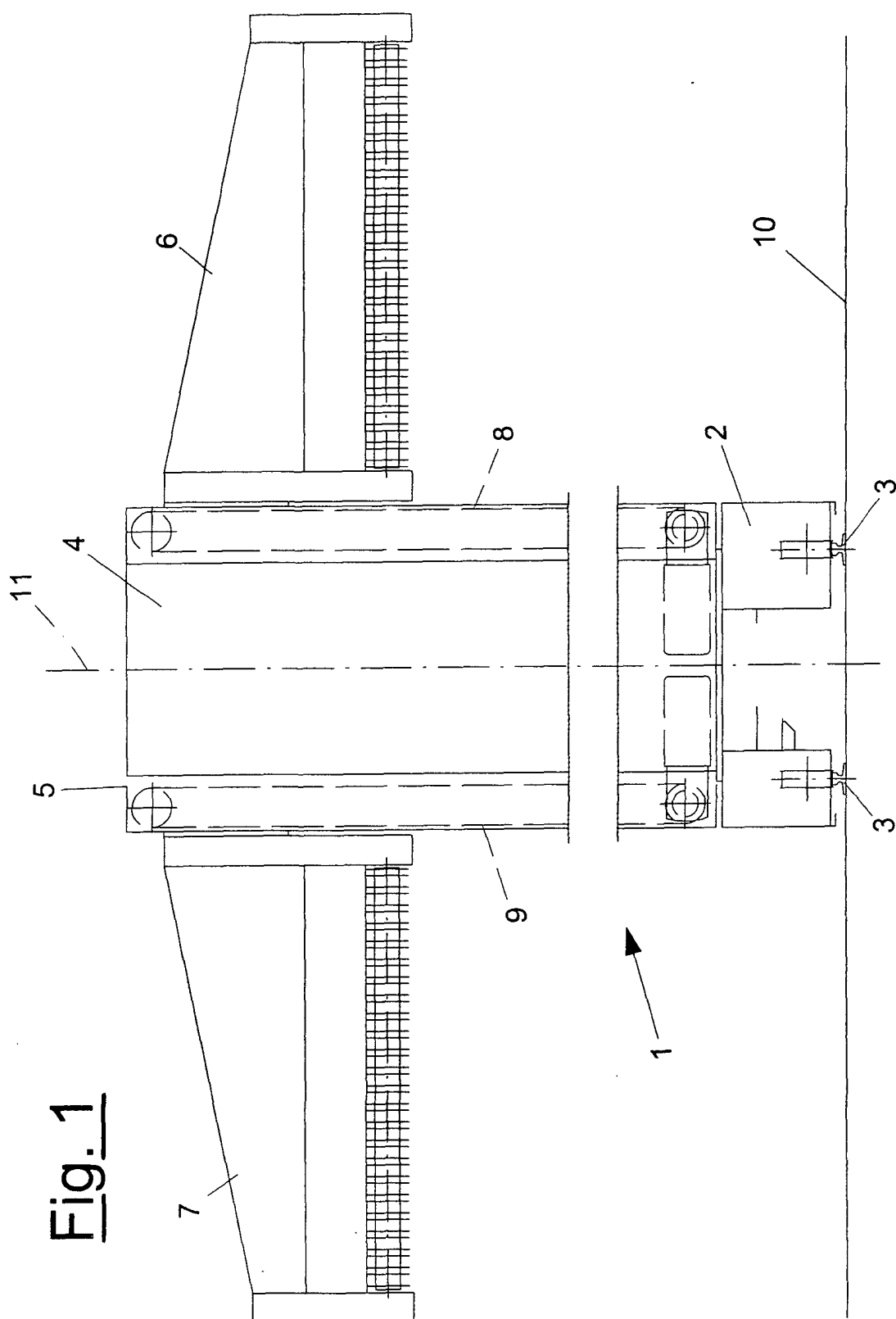
- pick up the fibres from the surface layer of the row of bales arranged previously,

and, in normal operating conditions, **in that** it comprises the following cyclical steps:

- arrange a row of bales whilst the fibres are picked up from the inner layers of the row of bales arranged during the previous cycle,
- begin to pick up the fibres from the surface layer of the row of bales whilst one continues to pick up the fibres from the inner layers of the row of bales arranged during the previous cycle,
- continue to pick up the fibres from the inner layers of both of the rows of bales,
- continue to pick up the fibres from the surface layers of the row of bales whilst the fibres begin to be picked up from the bottom layers of the row of bales arranged during the previous cycle,
- with the row of bales arranged during the previous cycle finished, repeat the cycle,

the overall amount of fibres picked up per unit time being adjusted so as to be substantially constant during the different steps.

7. Process for automatically picking up fibres from bales of fibres according to claim 5, **characterised in that** during the steps in which picking up is carried out from a single row of bales, the amount of fibres picked up per unit time from said row of bales is double than that which is picked up by the same row of bales during the steps in which picking up takes place from both of the rows of bales.
8. Process for automatically picking up fibres from bales of fibres according to any one of claims 6 and 7, **characterised in that** the duration of the cyclical steps is adjustable.



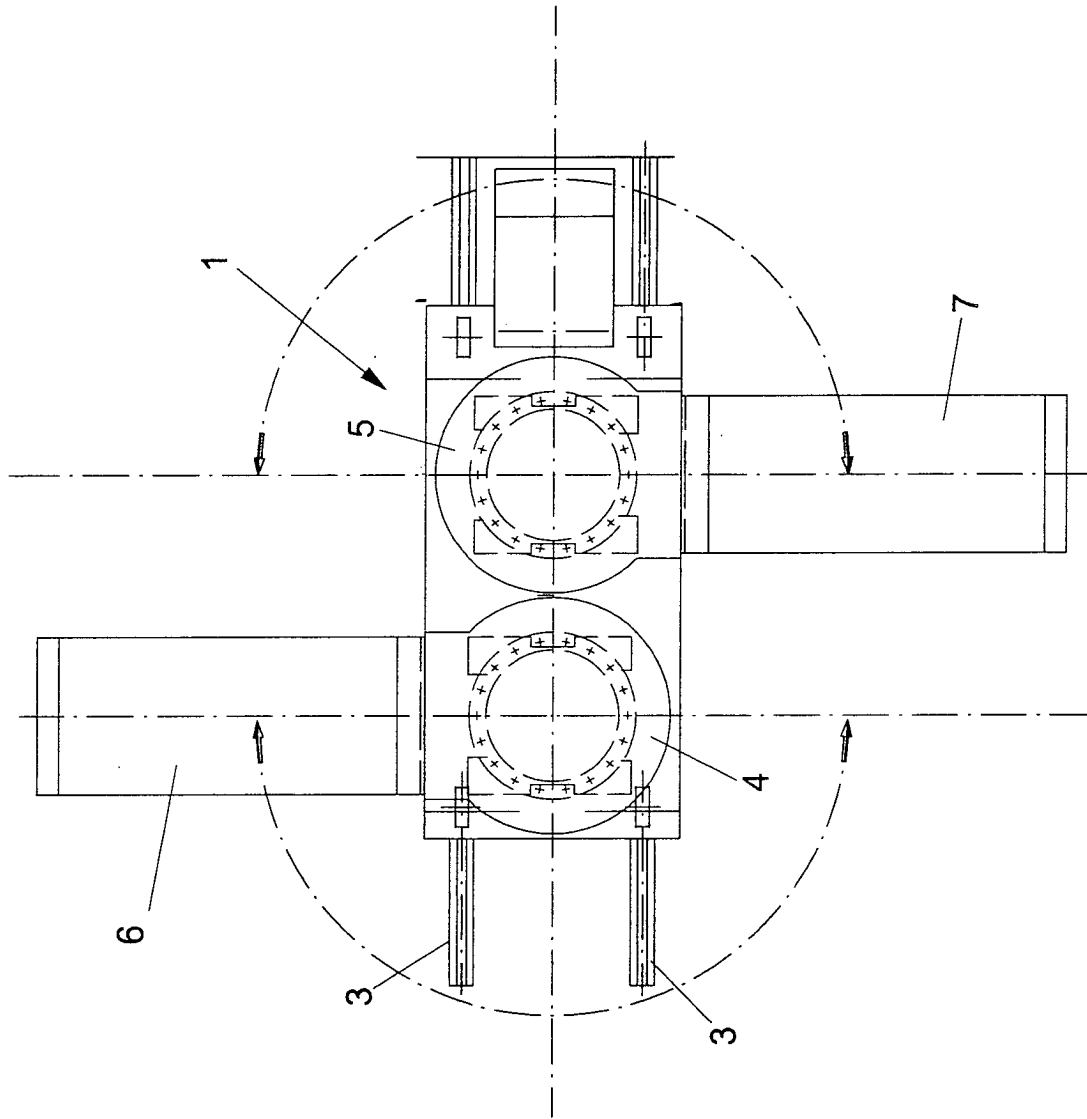
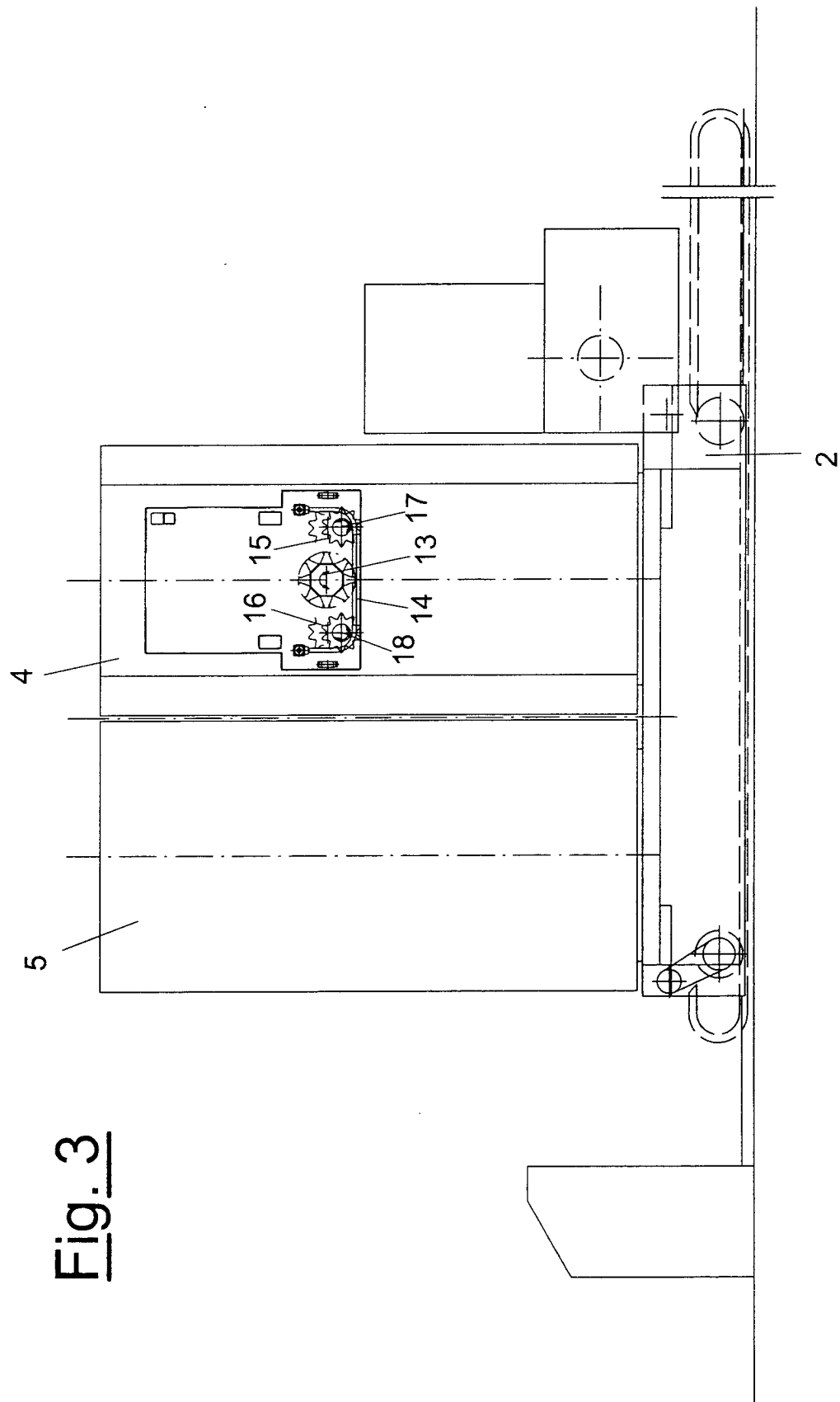


Fig. 2



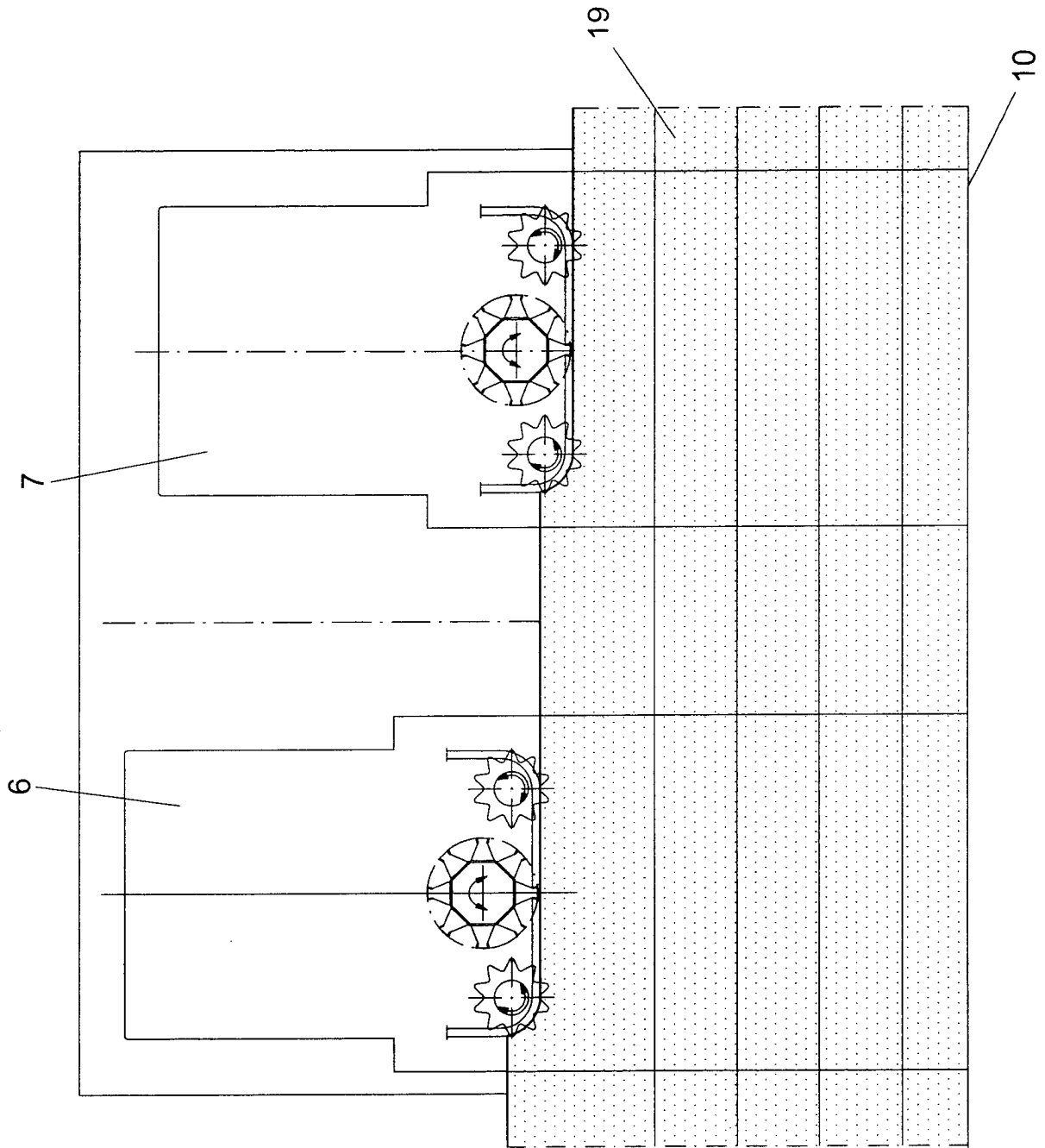


Fig. 4

Fig. 5

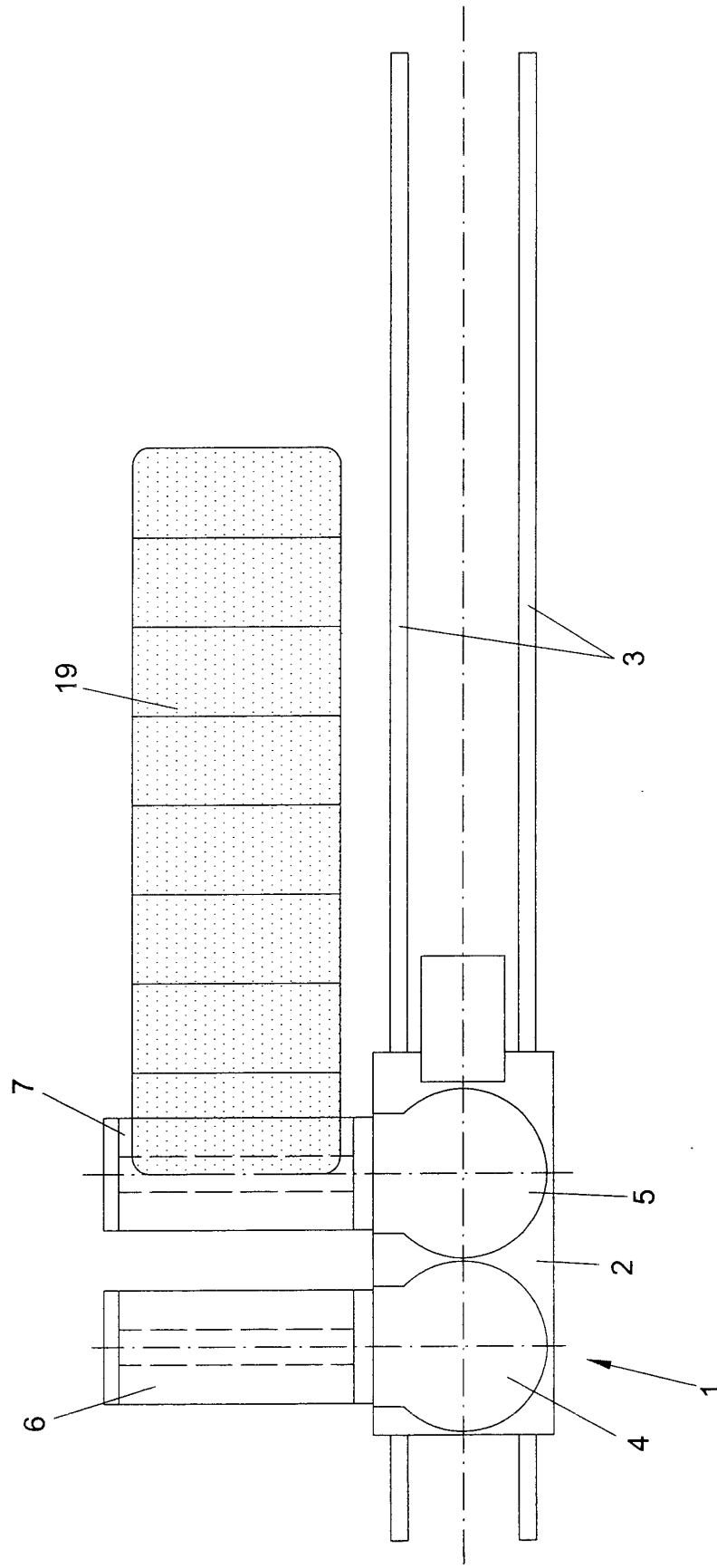


Fig. 6

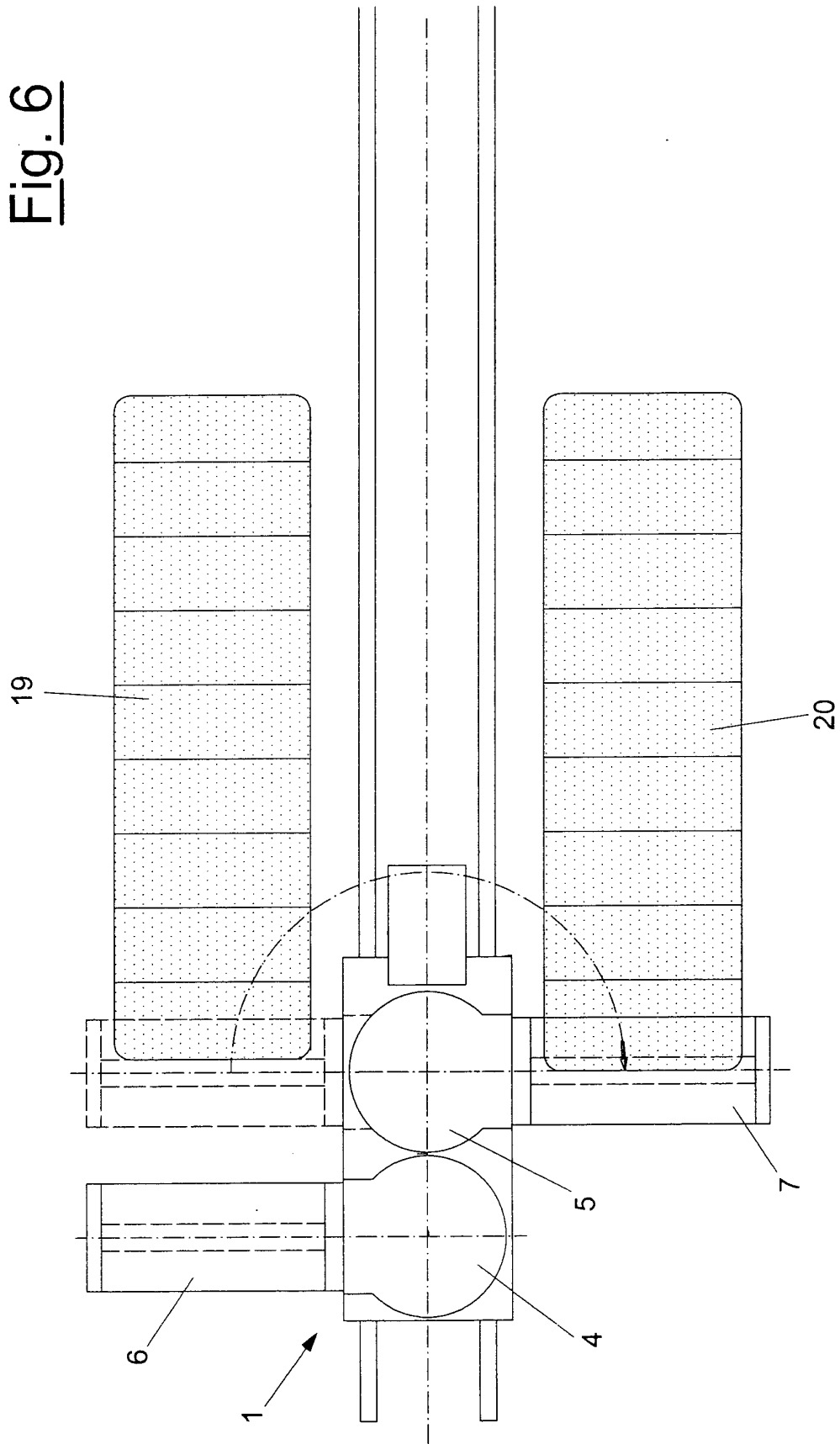


Fig. 7

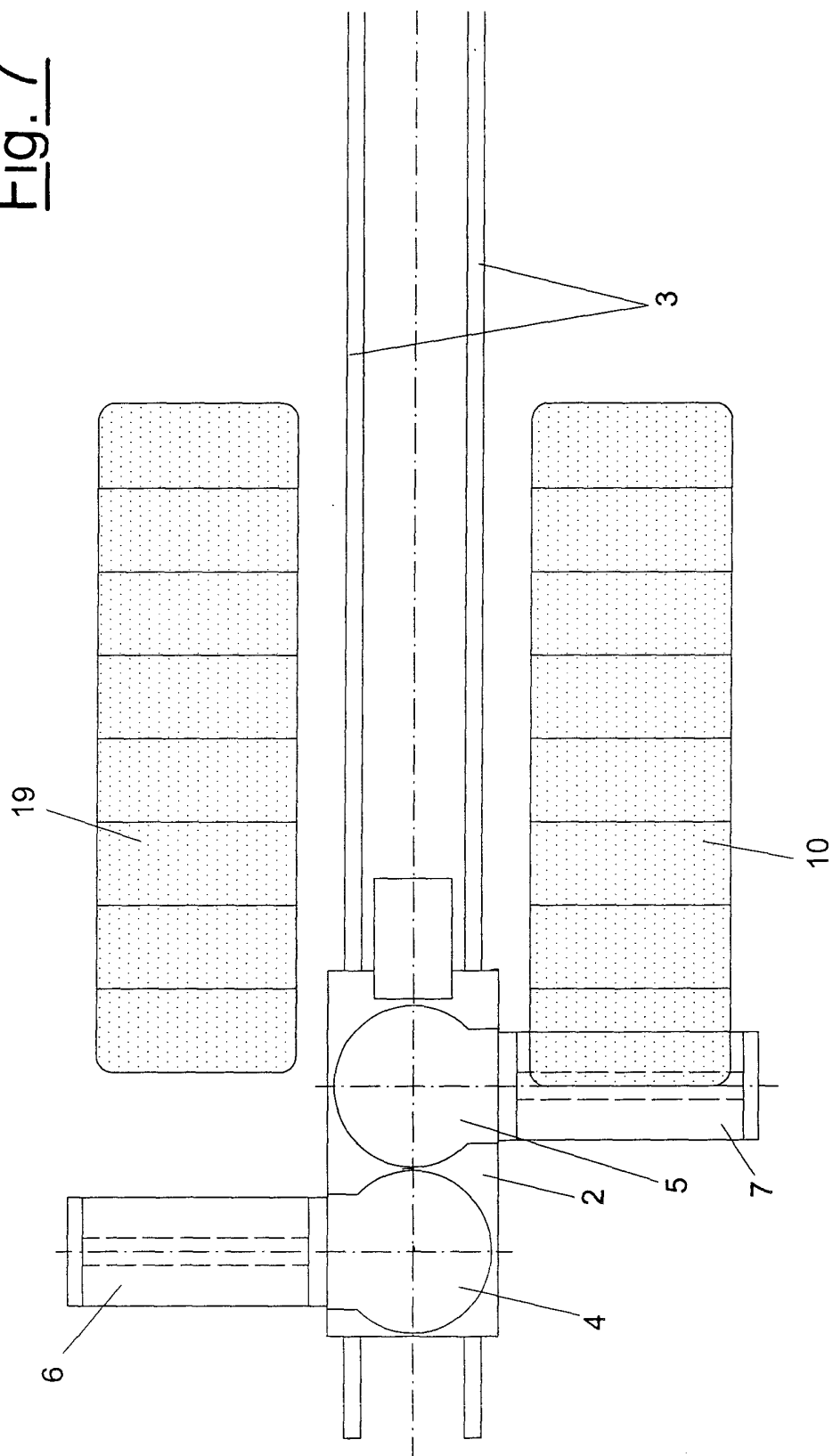
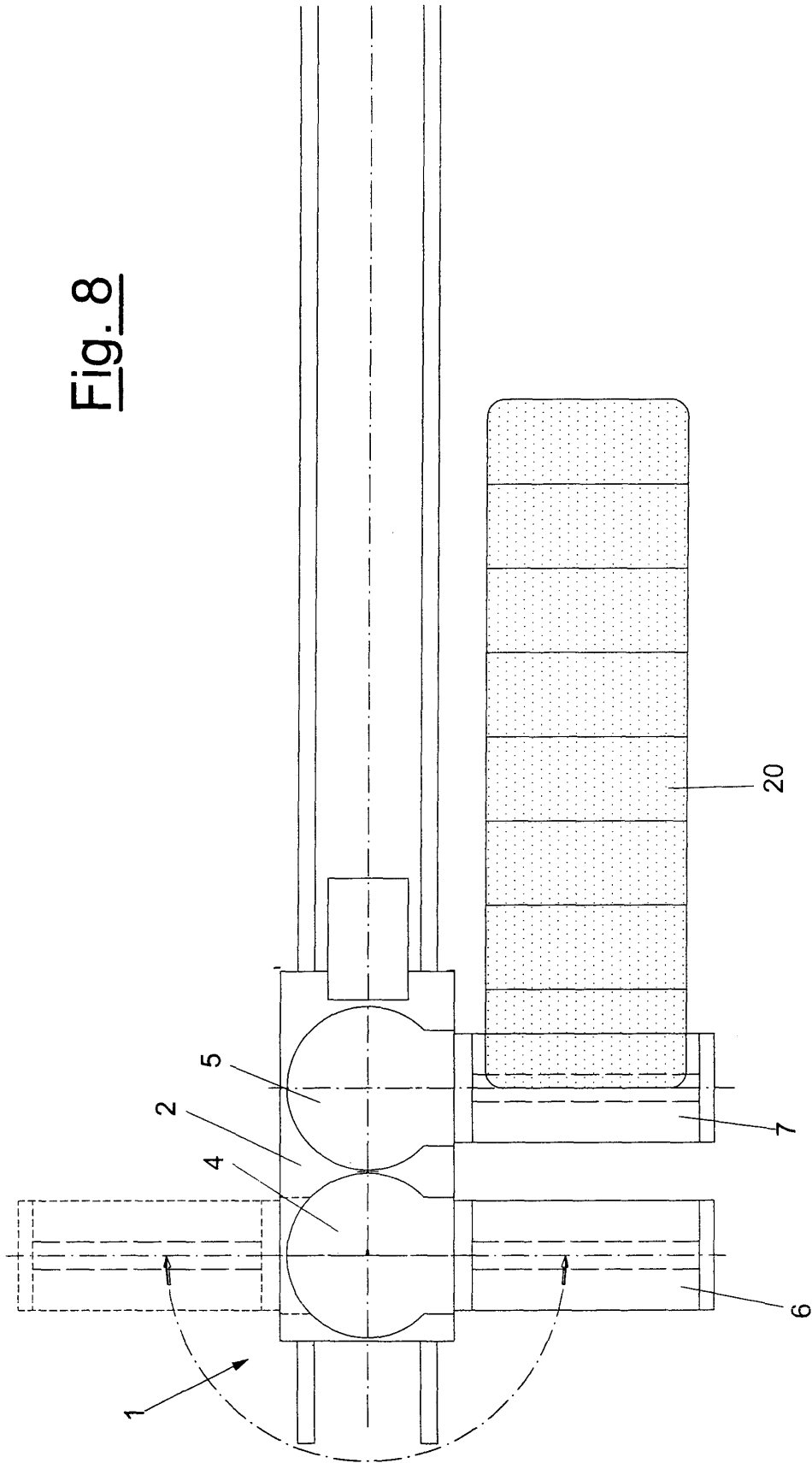


Fig. 8





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EUROPEAN SEARCH REPORT

Application Number
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A	* column 3, line 7 - line 32; claim 1; figures 1,2 *	1	
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A	----- US 5 175 909 A (PINTO ET AL) 5 January 1993 (1993-01-05) * claims 1,3; figure 1 *	6	
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		7 June 2005	D'Souza, J
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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