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(54) Device and method for unfolding foldable crates and method for emptying crates

(57) According to the invention a device for unfolding foldable crates is provided, which crates comprise a bottom with two longitudinal walls and two head walls, which can be placed in a folded position and an unfolded position, the device comprising a frame and means for engaging the crate, means to carry the crate along, means for placing the crate in reversed position

and means for bringing the crate in its unfolded position.

The invention also relates to a method for unfolding foldable crates with the help of the device according to the invention, and to a method for emptying crates with the help of the device according to the invention.

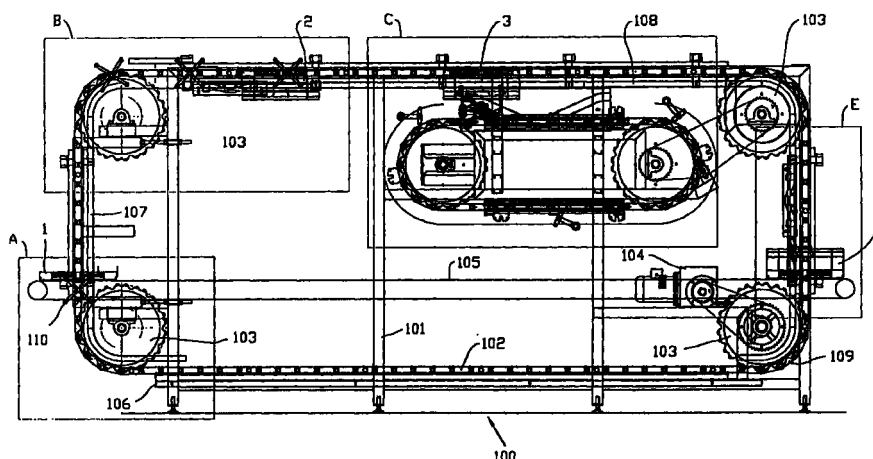


FIG. 1

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Description

[0001] The invention relates to a device for unfolding foldable crates and an accompanying method, and also to a method for emptying crates with the help of the device.

[0002] Foldable crates have a bottom with two hinged longitudinal walls and hinged head walls. When folding, first the head walls are folded to the inside and subsequently the longitudinal walls are folded over them. When unfolding, first the longitudinal walls are put straight up and subsequently the head walls are unfolded in between them, until with the help of a locking mechanism, they are fixed straight up between the longitudinal walls.

[0003] These foldable crates are used more and more, not only for domestic use, but also for professional purposes. After the crates have been emptied the crates are folded again, resulting in a large gain of space when transporting empty crates and the costs of transport being lower accordingly.

[0004] Foldable crates however have the drawback that before they can be used again they need to be unfolded again. When the crates have to be washed first before they can be used again, large numbers of crates per hour have to be supplied into a washing device. This unfolding is laborious and costly.

[0005] It is therefore an object of the invention to provide a device for unfolding foldable crates. It is another object of the invention to provide such a device which can process large numbers of crates per hour. Another object is to provide a reliable device to that end. It is also an object to provide an accompanying method.

[0006] According to a first aspect of the invention a device is provided for unfolding foldable crates, which crates comprise a bottom with two longitudinal walls and two head walls, which can be placed in a folded position and an unfolded position, the device comprising a frame and means for engaging the crate, means to carry the crate along, means for placing the crate in reversed position and means for bringing the crate in its unfolded position.

[0007] With the help of the engaging means the bottom of the crate is engaged, after which the engaging means are carried along by means for carrying along in order to convey the crate further. While it is carried along the crate is reversed with the help of reversing means. As a result the walls of the crate will unfold under the influence of gravity, the longitudinal walls then hanging down completely vertically and the head walls in between the longitudinal walls being partially unfolded. In this partially unfolded position of the crate subsequently the unfolding means will be able to easily engage onto the walls of the crate, and push the head walls into an entirely vertical position and click them fixed between the longitudinal walls. Subsequently the unfolded crate can be discharged.

[0008] Preferably the engaging means comprise two

grippers, which are able to engage the bottom of the crate on both sides of the crate, the grippers being shaped such that they are able to engage onto cams on the bottom of the crate and/or into recesses in the bottom of the crate. In this way the crate can be held firmly and completely determined as regards position.

[0009] According to a preferred embodiment the engaging means are connected to endless circulating first conveying means for carrying along an engaged crate. The first conveying means convey the engaged crate further, so that a crate supplied next can be engaged, and the engaged crate during conveying is carried along to the reversing means.

[0010] Preferably the first conveying means comprise two parallel chains, on which at mutual equal distances the grippers are arranged opposite each other and directed towards each other, so that the chains are able to convey the supplied crates with equal intermediate distances.

[0011] Preferably the reversing means comprise guiding means, which are attached to the engaging means, which guiding means can be guided along first guiding tracks on the frame. Thus a crate engaged by the engaging means is guided along the guiding tracks through the device with the help of the first guiding means, the first guiding tracks also determining the position of the engaging means and therefore the position of the crate as a result of the guiding they are offering the guiding means.

[0012] According to a preferred embodiment the first guiding tracks have a first path along which the guiding means pivot the engaging means over substantially 90°, and having a second path along which the guiding means pivot the engaging means over an additional 90°, as a result of which the crate is reversed in two steps.

[0013] Preferably the guiding means comprise a cross, at the ends of which rolls are attached which run along or in a first guiding track, so that the engaging means can always easily be rotated over 90°, after which a next roll is available for guiding through the first guiding tracks.

[0014] Preferably the first path is formed by a guiding track bent over an arc of approximately 90°, and preferably the second path is formed by a revolving curve, through which a roll on the cross of the guiding means runs, which revolving curve is formed such that when passing through the curve the cross rotates over approximately 90°. The cross is first moved upwards with two rolls along a vertical guiding track and after that along the arc to a horizontal guiding track, and thus rotated a quarter of a turn. Subsequently a roll of the cross runs like a cam through the revolving curve, the cross rotating another quarter of a turn. As a result the crate is completely reversed.

[0015] According to a preferred embodiment the unfolding means comprise pressing means, which are able to engage the head walls of a crate, which pressing

means can be moved between a rest position and a click position the crate then being placed in the unfolded position, so that the pressing means will press the partially unfolded walls of the crate into the entirely unfolded position.

[0016] Preferably the pressing means are attached to endless second conveying means, which are partially parallel to and moveable with equal speed as the means which carry along the crates, and preferably the second conveying means comprise two parallel chains, on which the pressing means are arranged at mutually equal distances. Thus the pressing means are moved with the same speed as the crate itself, parallel to the crate carried along, in order to entirely unfold the crate during moving along.

[0017] Preferably the pressing means are connected to a guiding means, which can be guided in a click curve, to move the pressing means to their click position. The guiding means is forced by the click curve to pass through a certain track, as a result of which the pressing means connected thereto are also forced to take certain positions. By passing through the click curve the pressing means, which have been inserted in the partially unfolded crate, are spread, as a result of which they push the head walls into the entirely unfolded position and click them fixed between the longitudinal walls. When the click curve is passed through further the pressing means are retracted again.

[0018] According to an advantageous embodiment the click curve has a curve track for long crates and a curve track for short crates, in which one of the two curve tracks can be closed off by means of a switch, so that it is possible to unfold crates of two different lengths with the device, and to be able to switch immediately from the one length to the other with the help of the switch. With shorter crates the click curve has to be shaped differently, because otherwise the pressing means would be spread too far.

[0019] Further advantageous embodiments of the device are described in the sub claims.

[0020] According to a second aspect of the invention a method is provided for unfolding foldable crates with the help of the device described above, the crates being supplied in folded position, after which the crates are engaged one by one by the engaging means, after which the crates are moved upwards and subsequently carried along in longitudinal direction, the crates tilting over approximately 90° at the transition from vertical to horizontal, and the crates being tilted additionally over approximately 90° during the horizontal conveyance, so that the crates take up a reversed position and the walls of each crate partially unfold under the influence of gravity, after which the crate unfolding means are inserted into the partially unfolded crate and urge the crate into a completely unfolded position, after which the unfolded crates are discharged.

[0021] With the help of this method crates are automatically brought from the folded position into the

unfolded position.

[0022] Preferably after they have taken up a reversed position, the crates are emptied to remove dirt and the like that may be present, from the crates. Loose dirt, such as leaves of vegetables previously stored in the crates, will not end up the washing device for the crates which is placed after the device according to the invention. By emptying with the help of emptying means in some cases washing the crates is not necessary any more.

[0023] Preferably the crates when being discharged are brought at supply level again, the crates then being discharged either reversed or straight up whatever is wanted, so that the user of the device according to the invention can decide for himself whether the unfolded crates leave the device straight up or reversed.

[0024] According to a third aspect of the invention a method is provided for cleansing the crates with the device described above, the crates being engaged with the help of the device and subsequently being reversed, after which the crates are emptied with the help of emptying means in order to remove dirt and the like that may be there, from the crates.

[0025] With the help of this method the device according to the invention can also be used to empty normal crates that cannot be unfolded. Nothing has to be changed to the device according to the invention to that end, although emptying means for the crates have to be provided of course. The crate unfolding means of the device do function, but of course have no influence on the crates that cannot be unfolded.

[0026] Preferably the crates after being emptied are either discharged reversed or straight up whatever is wanted. Possibly the device can also be used to only reverse the crates, without emptying them.

[0027] The invention will now be elucidated on the basis of an exemplary embodiment of the device, referring to the drawing.

Figure 1 shows a front view of the device according to the invention.

Figure 2 shows a partial left side view of figure 1 on a larger scale.

Figure 3A shows a side view of a gripper mechanism from the device of figure 1.

Figure 3B shows a front view of the gripper mechanism of figure 3A.

Figure 4 shows a part A from figure 1 on a larger scale.

Figure 5 shows a part B from figure 1 on a larger scale.

Figure 6 shows a part C from figure 1 on a larger

scale.

Figure 7 shows a part D from figure 6 on a larger scale.

Figure 8 shows a guiding plate from the figures 6 and 7.

Figure 9 shows a part E from figure 1 on a larger scale.

[0028] Figure 1 shows the device 100 according to the invention for unfolding foldable crates in front view. Certain parts A, B, C, E of the device will be elucidated separately below. The device 100 has a frame 101 with two chains 102 placed one after the other which are circulating about sprocket wheels 103, which sprocket wheels 103 are positioned in a rectangular. One sprocket wheel 103 is driven by a driving unit. The device 100 has an endless conveyor belt 105 which runs between the chains. To the frame 101 guide tracks 106, 107, 108 and 109 are arranged, which will be discussed below.

[0029] Folded crates 1 are supplied on the left-hand side of the device 100 with the help of conveying means that are not shown. The crates are engaged by the gripper mechanisms 110, which gripper mechanisms run along the guiding tracks 106 to 109 in order to place the crate in a certain position. In the positions 2 and 3 the crate is reversed. In the position 4 the crate is placed completely unfolded and straight up on the conveyor belt 105 to be discharged by means of discharging means that are not shown.

[0030] Figure 2 shows the device 100 according to the invention partially in side view with the left sprocket wheels 103, over which the chains 102 circulate. Each chain 102 is provided with a number of gripper mechanisms 110 which are always placed in pairs opposite each other, at mutual equal distances.

[0031] A gripper mechanism 110 is shown in the figures 3A and 3B and has a gripper 111, four rods 112 which are placed in the shape of a cross and provided at their ends with gripper rolls 113, a rod 114 which is slidable through a link of the chain 102 and slidable through sliding sleeves 116, the gripper 111 being adjustable at a certain distance from the chain 102 with the help of the adjusting nuts 117 and a push spring 115. The gripper 111 is shaped such that it is able to engage into a cam 9 of the crate 1 (see figure 4), which cam 9 is part of both the longitudinal side surfaces of the bottom of the crate 1, and which cam 9 is situated halfway the crate 1 between two recessed portions in the side surfaces of the bottom of the crate 1.

[0032] At the other end of the rod 114 of the gripper mechanism 110 ball bearings 118 are provided which when the chain is circulating along the gripper tensioning tracks 119 (see figure 2) are guided to pull the gripper to the outside, so that the gripper 111 can engage over a cam 9 of a crate 1 at the end of the gripper ten-

sioning track 119.

[0033] Figure 4 shows the lower left corner of the device 100 according to the invention in which the folded crate 1 with a cam 9 halfway the bottom of the crate, a part of the frame 101, a part of the chain 102, a sprocket wheel 103, a part of the conveyor belt 105, a part of the guiding track 106 and of the guiding track 107, and the cross of a gripper mechanism 110 are shown again. To the frame 101 a stop 6 is attached, so that the crate 1 is stopped exactly in the position in which the cam 9 is placed along the track of the chain 102. The stop 7 is present for shorter foldable crates. It can be seen that the guiding tracks 106 and 107 at circulation of the chain 102 will accurately guide two gripper rolls 113 of the gripper mechanism 110, so that the gripper mechanism 110 will always take up an accurately determined position.

[0034] Figure 5 shows the upper left portion of the device 100 according to the invention, which directly connects to the lower left portion according to figure 4. When the chain 102 moves on the gripper mechanism 110 from figure 4 is moved further upwards along the guiding track 107. In this position the gripper 111 is horizontal. When the chain 102 circulates about the sprocket wheel 103 the cross of the locking mechanism 110 is guided along a part of the track 107 with the shape of a quarter of circle, as a result of which the gripper 111 will be vertical. The vertical placement of the gripper 111 is indicated with the position 110A of the gripper mechanism.

[0035] When the gripper mechanism 110 is carried along further by the chain 102 to the position 110B the first of the bottom two gripper wheels of the gripper mechanism is guided into a revolving curve 121, which revolving curve 121 is arranged in a revolving plate 120, as a result of which the gripper roll 113A during passing through the revolving curve 121 rotates the cross and in that way the entire locking mechanism 110 a quarter of a turn, so that the gripper wheel 113A after passing through the revolving curve 121 is the last of the two bottom gripper wheels. The gripper 111 is in that way rotated an additional quarter of a turn and in that way with respect to the situation in figure 4 reversed. When two grippers 111 on the two chains carry along a folded crate 1 in between them, said crate will when passing through the path shown in figure 5 be reversed, as a result of which the longitudinal side walls of the crates unfold under the influence of gravity, and the head walls of the crate between the longitudinal side walls will partially unfold. The crate will then take the partially unfolded position 2 according to figure 5.

[0036] Figure 6 shows the part C of the device 100 according to figure 1. Figure 6 shows a conveying mechanism 130 for an unfolding mechanism 140 with which a partially unfolded crate can be completely unfolded.

[0037] The conveying mechanism 130 has two chains 131 of which only the front one can be seen, which each

run about two sprocket wheels 132. The right sprocket wheel 132 is driven by means of a driving chain 134, which in its turn is driven by one of the other sprocket wheels 103 of the device (see figure 1). Around the largest part of the chain track of the front chain 131 a guide-
 5 way 135 for the unfolding mechanism 140 is arranged. Above the chain 131, where said chain 131 is parallel to the chain 102, the guideway 135 is interrupted for a click plate 136 in which a click curve 137 for the unfolding mechanism 140 is arranged. On the chains 131 at
 10 mutual equal distances a number of unfolding mechanisms 140 are arranged (these are not all shown).

[0038] Figure 7 shows the unfolding mechanism in more detail. The unfolding mechanism 140 has a click roll 141 which is guided along the guideway 135 and through the click curve 137. The click curve 141 is connected to the click rod 142, which is connected to an axis of rotation 143 and a transverse rod 144, two swivel rods 145 being arranged at the ends of the transverse rod 144, which swivel rods are hingably connected to the pressing rods 146 which lie on a bearing about bearing axes 147 to the chain 131. The pressing rods 146 have pressure rods 148 extending upwards, which at their ends are provided with pressing cams 149.

[0039] When the click roll 141 is guided through the click curve 137, the click rod 142 swivels about axis of rotation 143, as a result of which the swivel axes 145 are pushed aside and the pressing rods 146 and the pressure 148 are pressed to the outside around the axes 147, as a result of which the pressing blocks 149 will press the incompletely unfolded head walls of the crate 3 to the outside until they click fixed between the ends of the longitudinal walls.

[0040] Figure 8 shows the click plate 136 as shown in figures 6 and 7 in more detail. The click plate 136 has two click curves 137A and 137B which with the help of a switch 138 respectively can be closed off. The click curve 137A is meant for guiding the click roll 141 when large crates have to be unfolded. The switch 138 then closes off the click curve 137B. The click curve 137B is meant for guiding the click roll 141 when small crates have to be unfolded. In this curve 137B the click rod 142 is not swivelled as far, as a result of which the pressure rods 148 are swivelled less far to the outside. In this way the head walls of the shorter crates can be clicked fixed in their unfolded position. In order to have the pressing blocks 149 engage well onto the head walls of the shorter crates separate surfaces 150 are provided (see figure 7) in the pressing blocks 149.

[0041] Figure 9 shows the lower right portion of the device 100 according to the invention as can be seen in figure 1. Between the guiding track 108 with the guiding track 109 yet another switching plate 160 with switching curve 170 is accommodated, analogous to the switching plate 120 with the switching curve 121 of figure 5, to rotate the cross of a gripper mechanism 110 a quarter of a turn. When passing through the guide track 108 in the upper right sprocket wheel 103 a gripper mecha-

nism 110 namely is rotated a quarter of a turn, just as was the case in the upper left sprocket wheel 103 from figure 5. A crate carried along between two gripper mechanisms 110 is therefore vertical when the chains leave the upper right sprocket wheel 103. With the help of the shown switching curve 170 the gripper mechanism is rotated yet another quarter of a turn, as a result of which it is finally placed straight up on the conveyor belt 105. Just before the crate 4 is placed on the conveyor belt 105, the bearings 118 of the gripper mechanism 110 are guided along the gripper tensioning plates (not shown), as a result of which the gripper mechanisms 110 let go of a crate, so that it can be discharged by means of discharging means that are not shown.

[0042] The switching plate 160 can also be arranged in a mirrored way, as a result of which the gripper mechanism when passing through the switching curve 170 is rotated a quarter of a turn back, so that the crate 4 is placed upside down on the conveyor belt 105. This is advantageous when the crated after unfolding for instance have to be supplied to a washing device.

[0043] The action of the device according to the invention is as follows. A folded crate 1 is supplied via supply means that are not shown to the conveyor belt 105 and are stopped by the stop 6. All following crates to be supplied are contiguous to this, so that the crates are automatically buffered in the horizontal plane. The crates are vertically carried along upwards one by one from this buffer, as will now be described. The two chains 102 carry along two gripper mechanisms 110 placed across each other, which are guided along the guide track 106 and after that along the guiding track 107. When the gripper mechanisms 110 are carried along upwards and approach the level of conveyor belt 105, the grippers 111 are pulled to the outside because the bearings 118 are guided along the gripper tensioning tracks 119. At the level of the crate 1 the gripper tensioning tracks 119 end and the push springs 115 of the gripper mechanism 110 push the grippers 111 to the crate 1, where the grippers 111 engage about the cams 9 of the crate 1. The crate 1 is engaged in that way by the gripper mechanisms 110 and the position of the crate is determined by the position of the gripper mechanisms.

[0044] The gripper mechanisms 110 carry the crate along further upwards along the guide track 107 and place the crate straight up rotated over approximately 90° after passing through the portion of the guide track 107 with the shape of a quarter of a circle near the upper left sprocket wheel 103.

[0045] When conveying the crate further by means of the circulating chains 102 the front gripper wheel 113A of the bottom two gripper wheels of the cross of the gripper mechanism 100 is carried through the switching curve 121, as a result of which the gripper mechanisms and in that way the crate rotate another 90° further, so that the crate is now in a reversed position. In this position the longitudinal walls of the crate will completely unfold and the head walls of the crate will partially

unfold under the influence of gravity.

[0046] The crate is subsequently conveyed further by means of chains and the gripper mechanisms, and at the same time an unfolding mechanism 140 is supplied by the conveying mechanism 130 and inserted into the partially unfolded crate. The crate and the unfolding mechanism 140 are subsequently further conveyed in a synchronous manner, the click roll 141 of the unfolding mechanism 140 passing through the click track 137, as a result of which the pressing blocks 139 which are in the partially unfolded crate are swivelled to the outside, so that pressing blocks 149 engage the head walls of the crate and press it into the completely unfolded position, the head walls of the crate then clicking fixed between the longitudinal walls.

[0047] The click roll 141 is subsequently carried along upwards again through the click curve 137, as a result of which the pressing blocks 149 swivel to each other again, and when passing through the right pressing sprocket wheel 132 the pressing mechanism 140 is removed from the now completely unfolded crate.

[0048] The crate between the gripper mechanisms then passes through the portion of the guide track 108 with the shape of a quarter of a circle and is in that way brought into a vertical position, after which the crate when passing through the switching curve 170 is either tilted 90° further or tilted 90° back, so that crate 4 is placed either straight up or reversed on the conveyor belt 105 and can subsequently be discharged.

[0049] The gripper mechanisms let go of the crate 4 because the bearings 118 are guided along the gripper tensioning plates, which are arranged just above the conveyor belt 105.

[0050] A further embodiment of the invention has a mechanism which taps the crate empty which is arranged directly after the revolving curve 121. This mechanism to tap the crate empty (which is not shown) will engage on the incompletely unfolded crate to remove material possibly present in the crate from the crate. Below the mechanism for tapping the crates empty a discharge mechanism for said material can be arranged.

[0051] The device 100 according to the invention which is provided with a mechanism for tapping the crates empty is also suitable for normal crates, which with the help of the device can be turned around and then with the help of mechanism for tapping the crates empty can be emptied.

[0052] With the help of the device according to the invention surely 2500 crates per hour can be processed.

[0053] The invention is not limited to the embodiments described above; the scope of protection is determined by the following claims.

Claims

1. Device for unfolding foldable crates, which crates comprise a bottom with two longitudinal walls and

two head walls, which can be placed in a folded position and an unfolded position, the device comprising a frame and means for engaging the crate, means to carry the crate along, means for placing the crate in reversed position and means for bringing the crate in its unfolded position.

2. Device according to claim 1, the engaging means comprising two grippers, which are able to engage the bottom of the crate on both sides of the crate.
3. Device according to claim 2, the grippers being shaped such that they are able to engage onto cams on the bottom of the crate and/or into recesses in the bottom of the crate.
4. Device according to claim 1, 2 or 3, the engaging means being connected to endless circulating first conveying means for carrying along an engaged crate.
5. Device according to claim 4, the first conveying means comprising two parallel chains, on which at mutual equal distances the grippers are arranged opposite each other and directed towards each other.
6. Device according to any one of the preceding claims, the reversing means comprising guiding means, which are attached to the engaging means, which guiding means can be guided along first guiding tracks on the frame.
7. Device according to claim 6, the first guiding tracks having a first path along which the guiding means pivot the engaging means over substantially 90°, and having a second path along which the guiding means pivot the engaging means over an additional 90°.
8. Device according to claim 7, the guiding means comprising a cross, at the ends of which rolls are attached which run along or in a first guiding track.
9. Device according to claim 8, the first path being formed by a guiding track bent over an arc of approximately 90°.
10. Device according to claim 8 or 9, the second path being formed by a revolving curve, through which a roll on the cross of the guiding means runs, which revolving curve is formed such that when passing through the curve the cross rotates over approximately 90°.
11. Device according to any one of the preceding claims, the unfolding means comprising pressing means, which are able to engage the head walls of

a crate, which pressing means can be moved between a rest position and a click position the crate then being placed in the unfolded position.

12. Device according to claim 11, the pressing means being attached to endless second conveying means, which are partially parallel to and moveable with equal speed as the means which carry along the crates. 5
13. Device according to claim 11 or 12, the second conveying means comprising two parallel chains, on which the pressing means are arranged at mutually equal distances. 10
14. Device according to claim 11, 12 or 13, the pressing means being connected to a guiding means, which can be guided in a click curve, to move the pressing means to their click position. 15
15. Device according to claim 14, the click curve having a curve track for long crates and a curve track for short crates, in which one of the two tracks can be closed off by means of a switch. 20
16. Device according to any one of the preceding claims, means being arranged between the crate reversal means and the crate unfolding means to place the crate horizontal. 25
17. Device according to any one of the preceding claims, means being arranged between the crate reversal means and the crate unfolding means for tapping the crate empty. 30
18. Device according to any one of the preceding claims, the device being provided with supply means for the crates, preferably a conveyor belt. 35
19. Device according to claim 18, the engaging means being provided with engaging means tensioners and a frame at the level of the supply means being provided with engaging means tensioner tracks to pull the engaging means to the side and have them engage a crate. 40
20. Device according to any one of the preceding claims, after the crate unfolding means the frame being provided with two guiding tracks to discharge the crate straight up or reversed whatever is wanted with the help of the guiding means. 45
21. Device according to any one of the preceding claims, detection means being arranged to detect whether a crate is present and/or is present in the correct position. 50
22. Method for unfolding crates that can be unfolded 55

with the help of a device according to any one of the preceding claims, the crates being supplied in folded position, after which the crates are engaged one by one by the engaging means, after which the crates are transported upwards and subsequently carried along in longitudinal direction, the crates tilting over approximately 90° at the transition from vertical to horizontal, and the crates being tilted additionally over approximately 90° during the horizontal conveyance, so that the crates take up a reversed position and the walls of each crate partially unfold under the influence of gravity, after which the crate unfolding means are inserted into the partially unfolded crate and urge the crate into a completely unfolded position, after which the unfolded crates are discharged.

23. Method according to claim 22, the crates after they have taken up a reversed position, being tapped empty to remove dirt and the like that may be present, from the crates.
24. Method according to claim 22 or 23, the crates when being discharged being brought at supply level again, the crates then being discharged either reversed or straight up whatever is wanted.
25. Method for cleansing crates with the help of the device according to any one of the claims 1-21, the crates being engaged with the help of the device and subsequently being reversed, after which the crates are tapped empty with the help of means to tap empty in order to remove dirt and the like that may be there, from the crates.
26. Method according to claim 25, the crates after being tapped empty either being discharged reversed or straight up whatever is wanted.
27. Device comprising one or more of the characterizing measures described in the description and/or shown in the drawings.
28. Method comprising one or more of the characterizing measures described in the description and/or shown in the drawings.

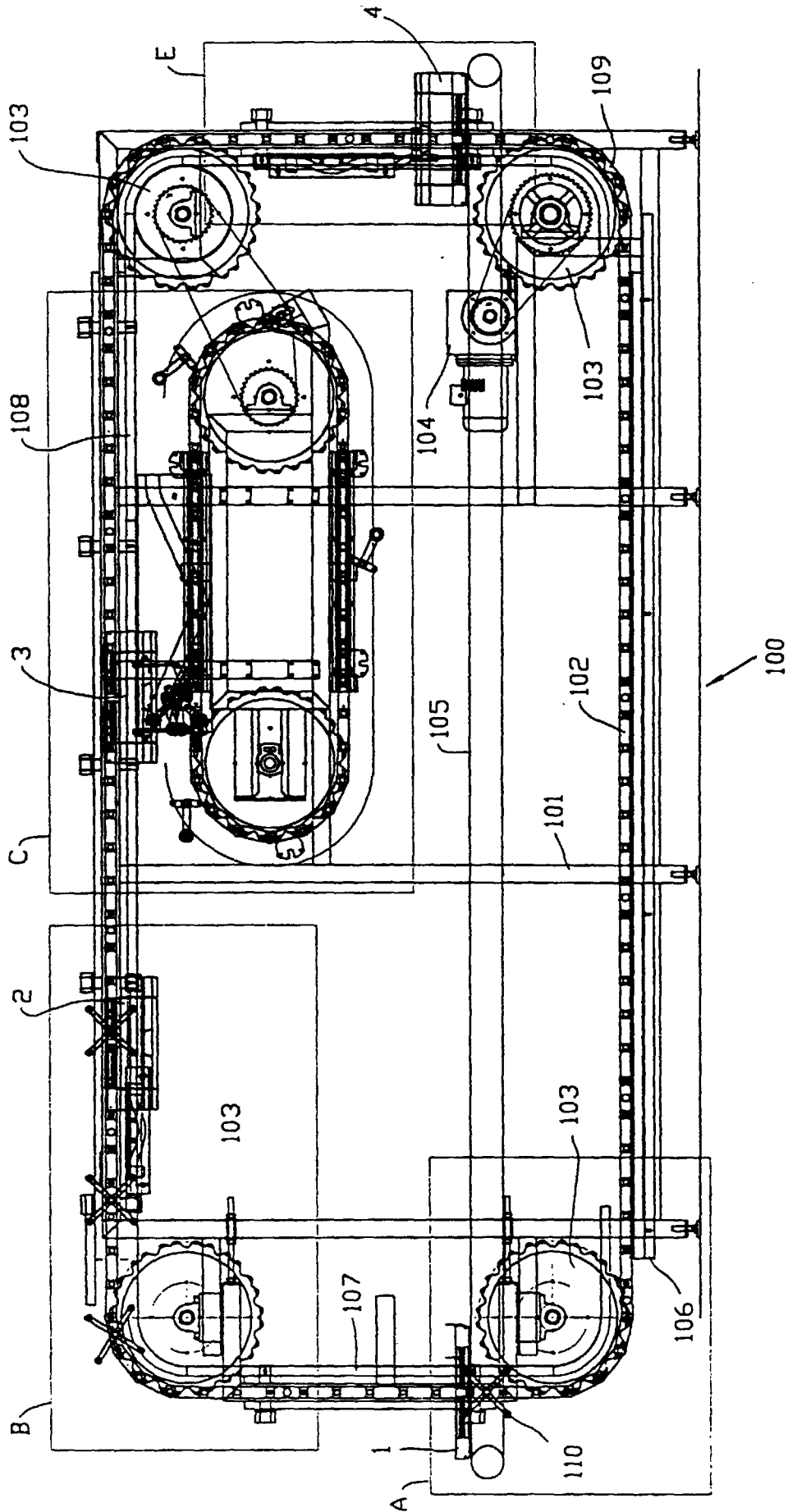


FIG. 1

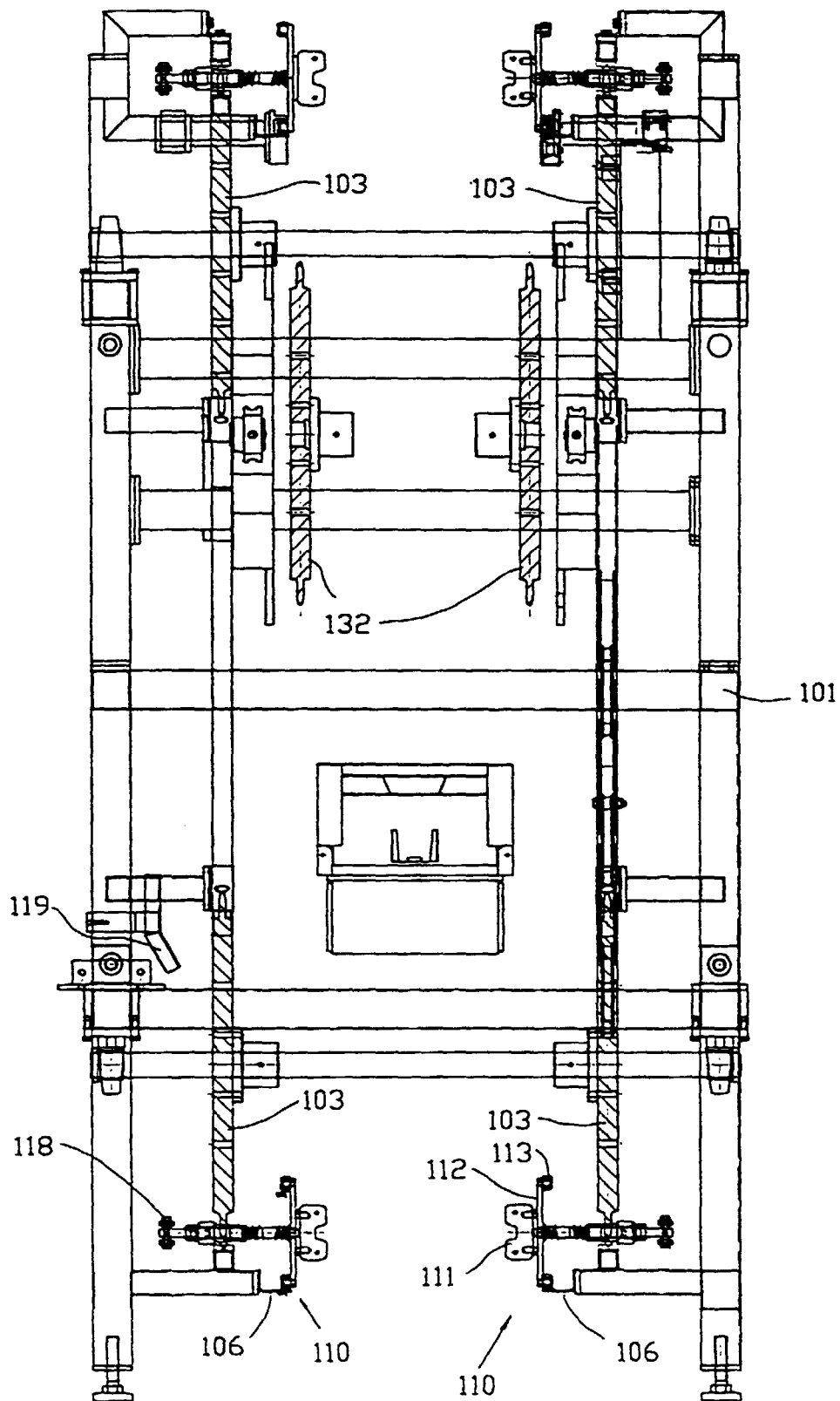


FIG. 2

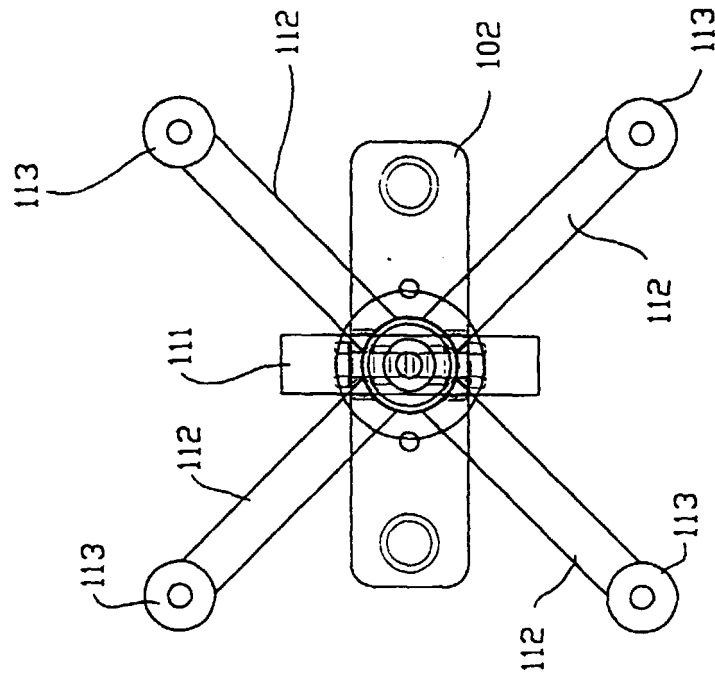


FIG. 3B

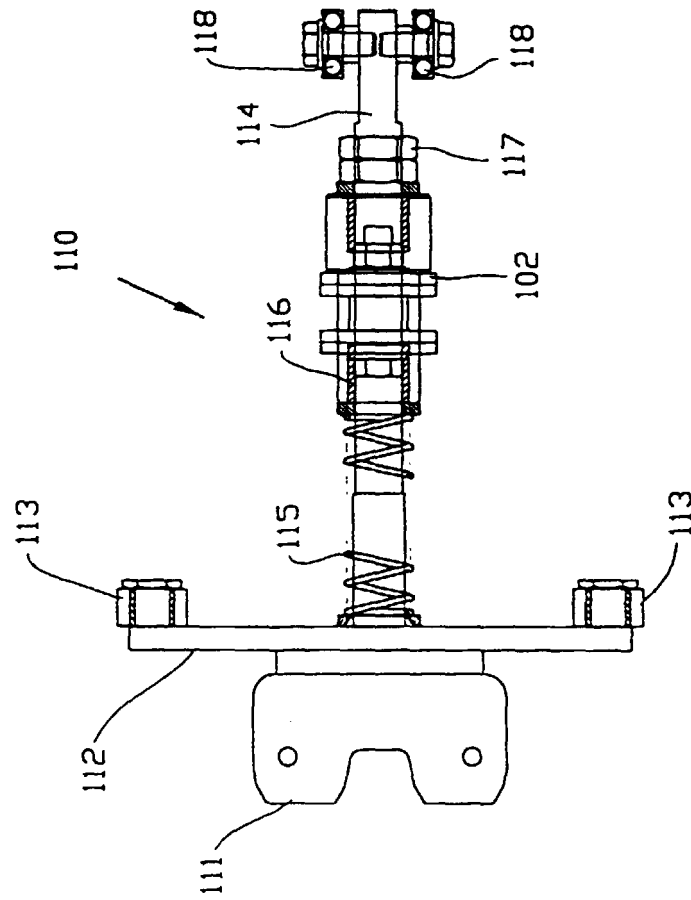


FIG. 3A

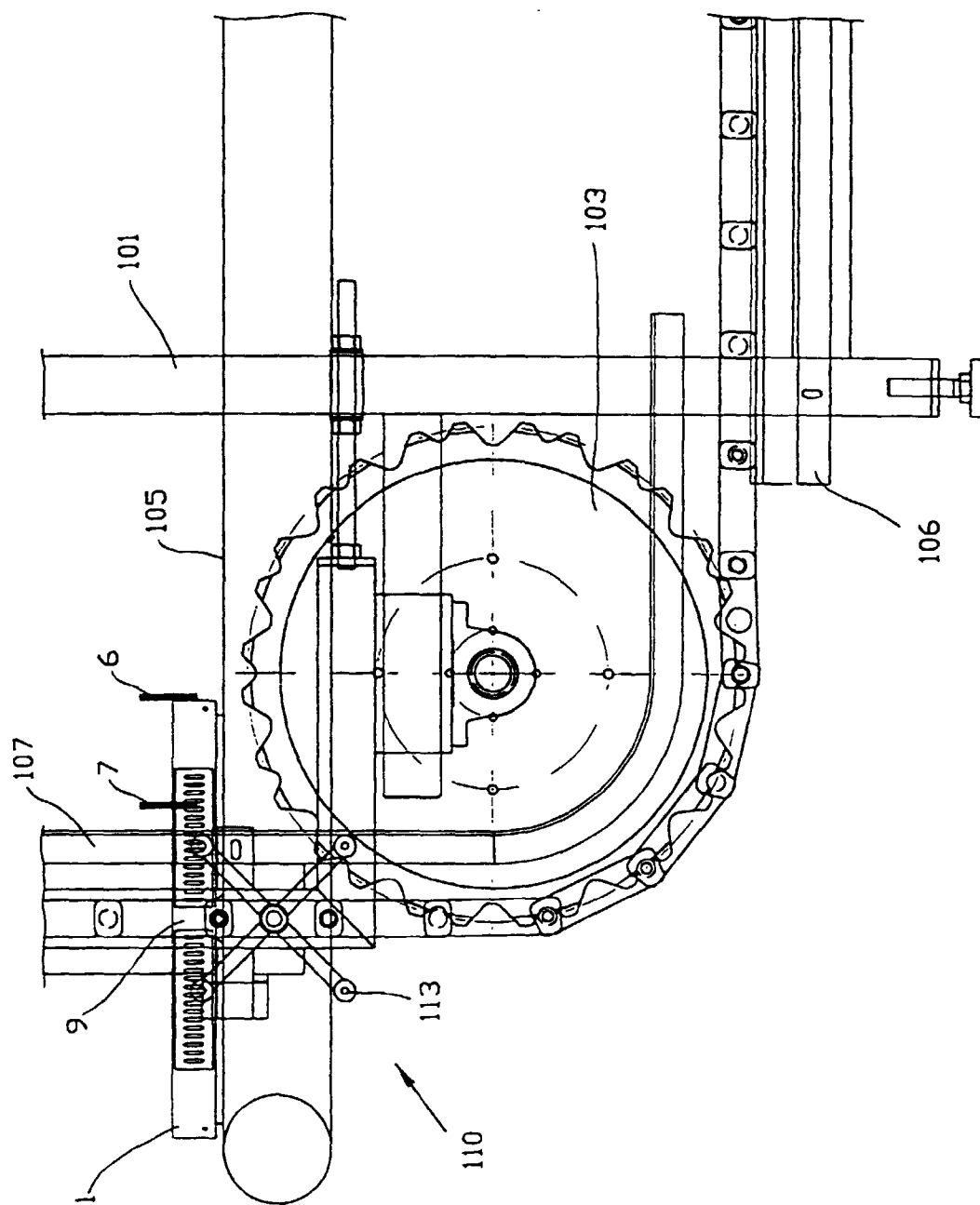
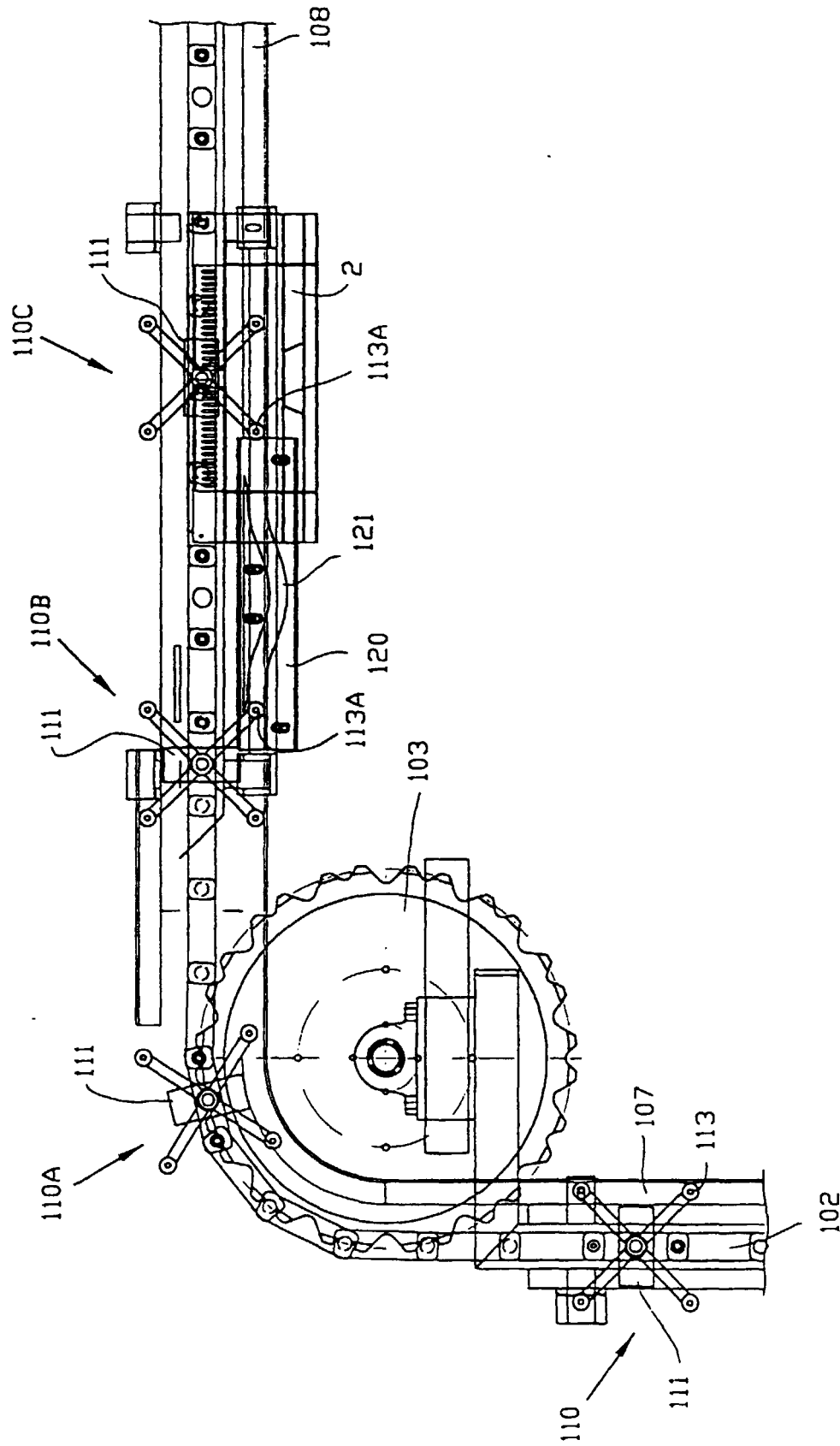


FIG. 4



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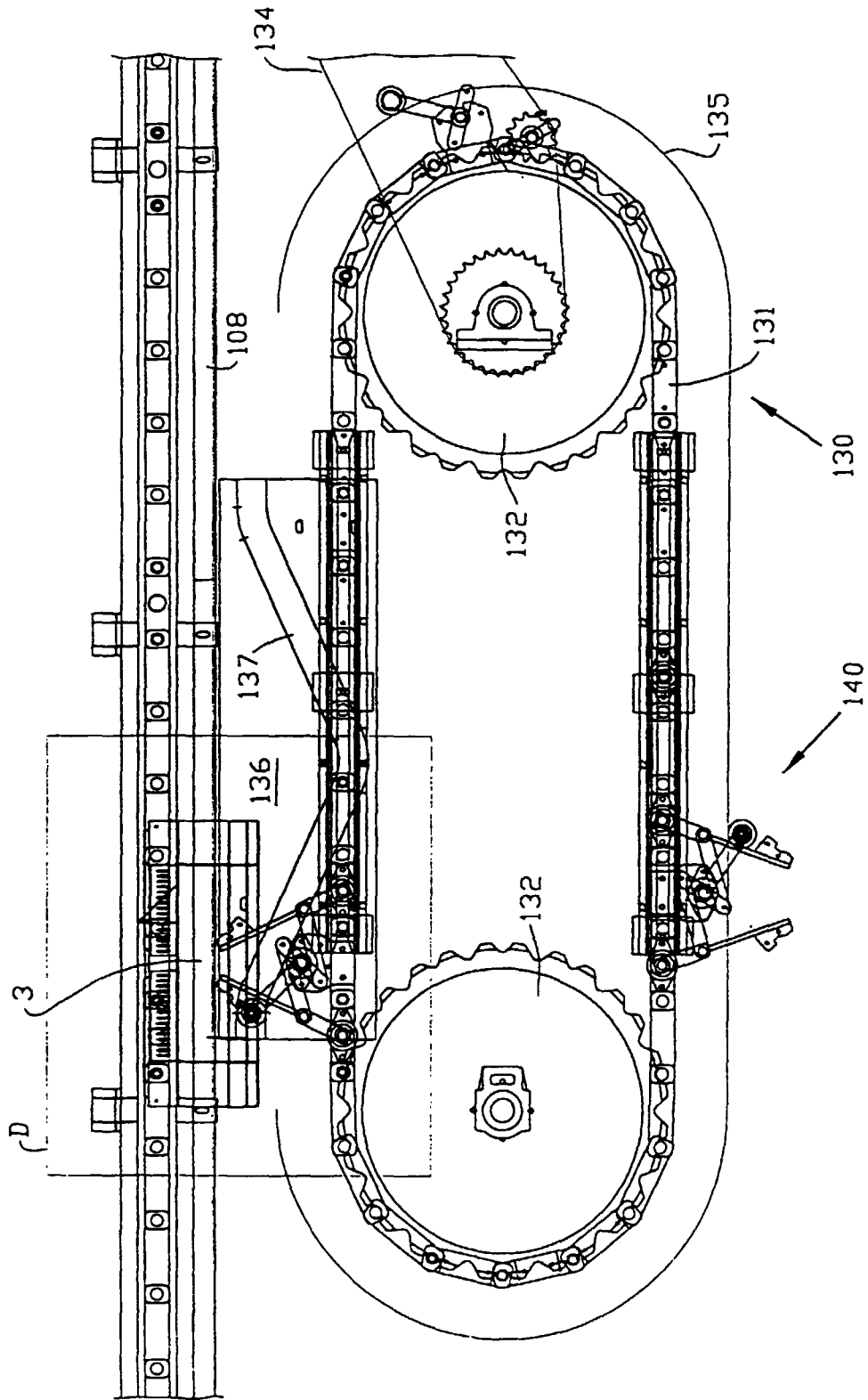


FIG. 6

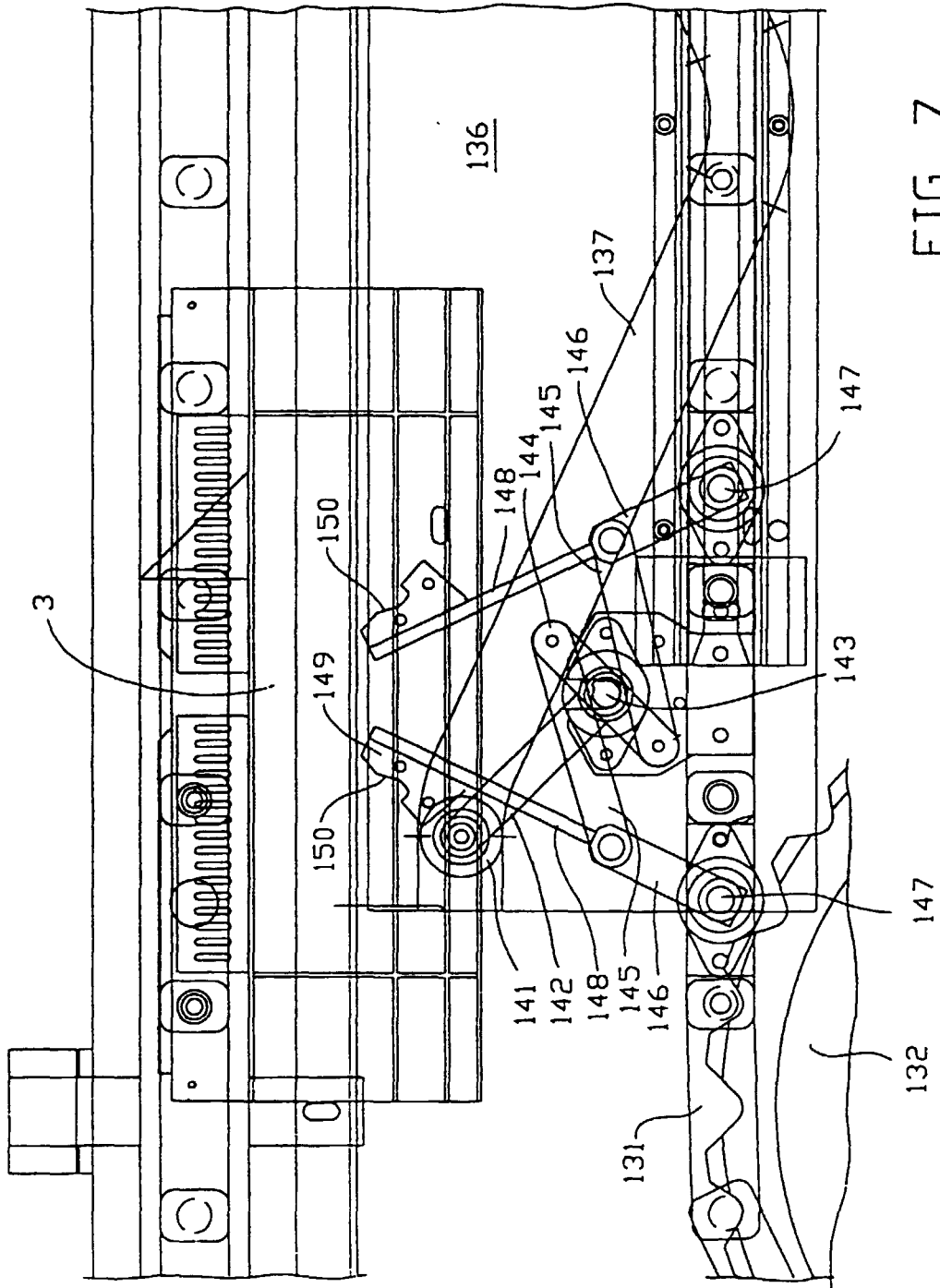


FIG. 7

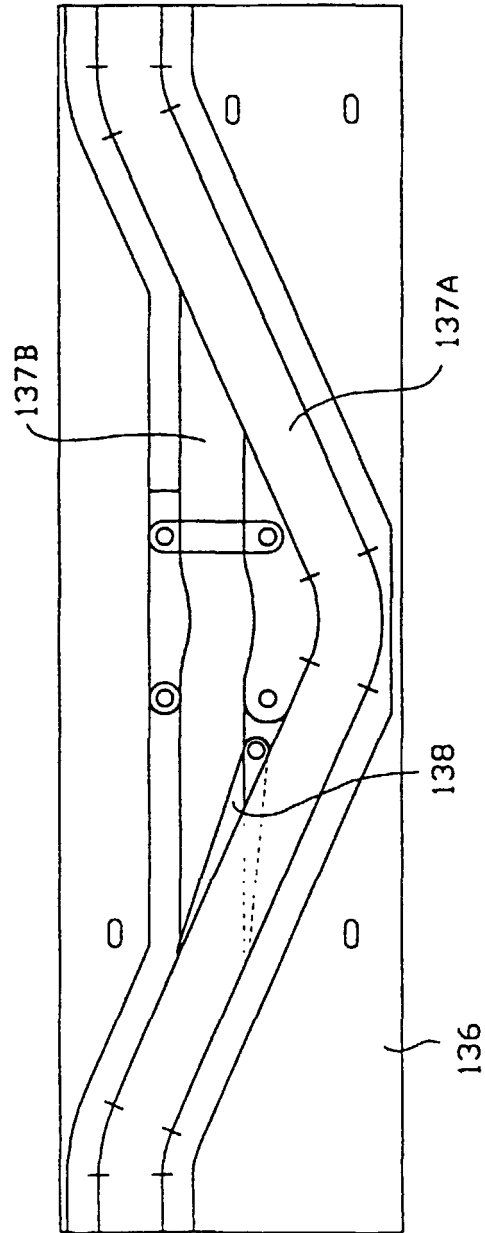


FIG. 8

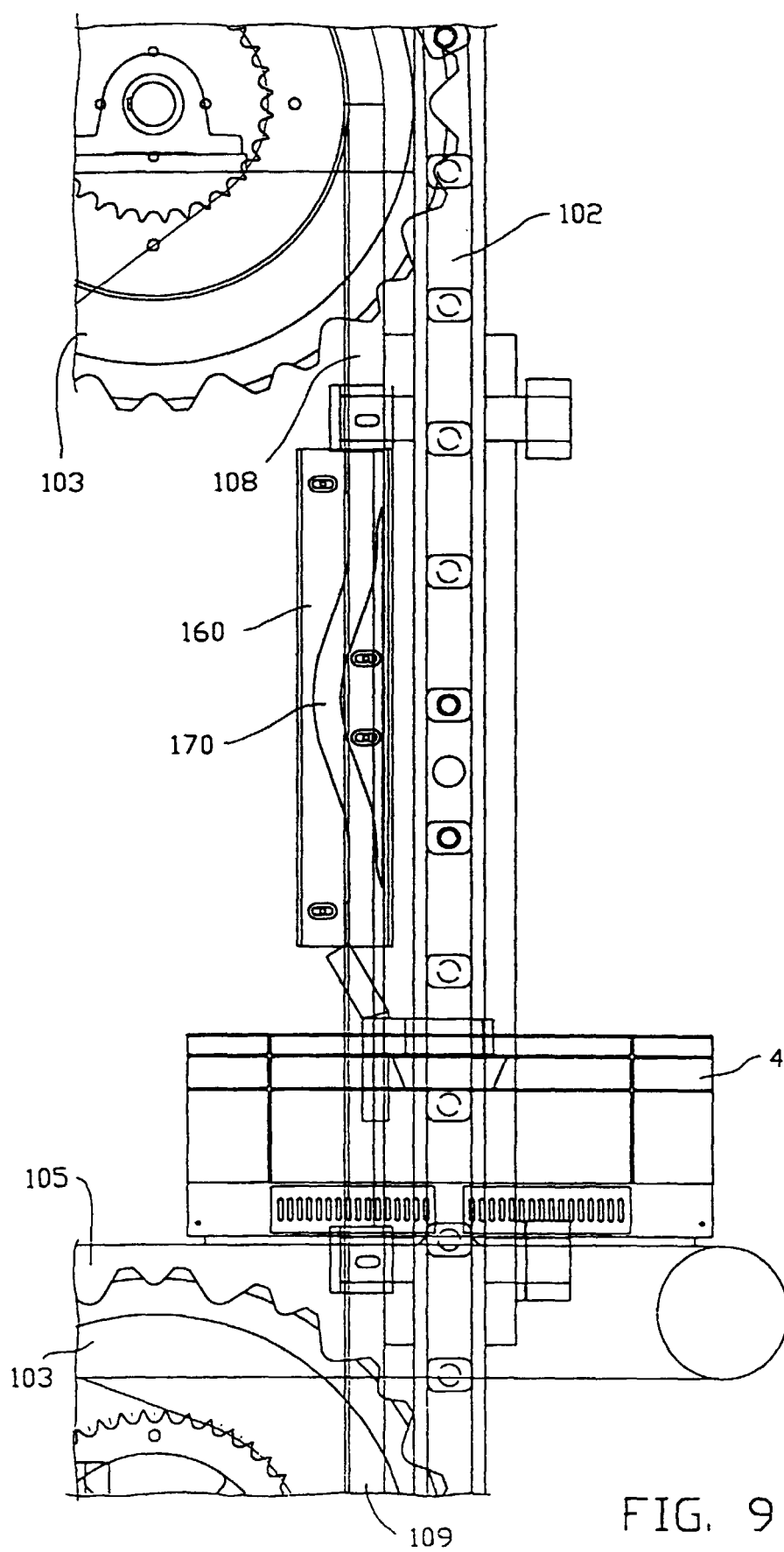


FIG. 9



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 20 2527

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