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(54) Folding-in device for folding crates

(57) Device for folding-in folding crates (1), wherein in two opposite first walls said folding crates (1) are provided with locking means to lock the unfolded position, in cooperation with connecting second walls, wherein the device comprises a conveyor (12) for moving the crates through the device according to a process path, as well as deactivation means to deactivate the locking means by engaging the locking means, and defining means to define a height dimension of the folding crates, wherein an engagement level of the deactivation means with respect to a reference plane, such as the conveyor, is adjustable in response to a height level defined by the defining means.

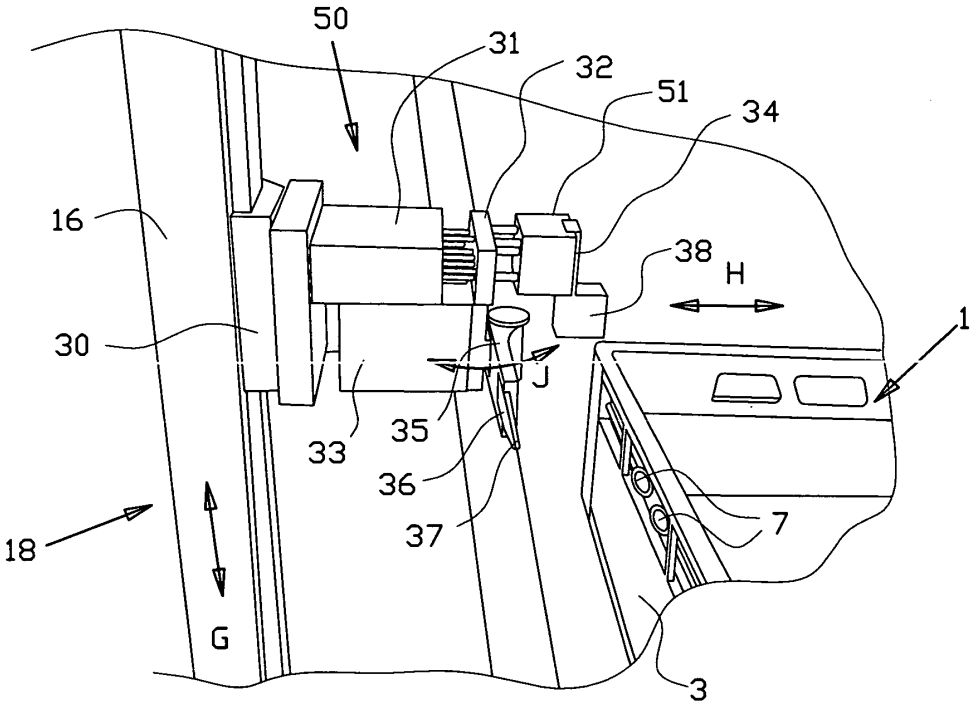

FIG. 4A

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Description

[0001] The present invention relates to a device for folding-in folding crates. Such folding crates can be embodied with a locking system. They may be folding crates of a system with multiple wall dimensions, wherein the locking means are arranged in two oppositely located walls. They may for instance be crates of the so-called Europool-system.

[0002] After being used or after cleaning such crates can be folded-in again so as to be stored and/or transported in a stacked manner. A known device for folding-in crates comprises a belt conveyor for conveying the folding crates through the device, and unlocking means which are arranged above the belt conveyor and which can travel along with the belt conveyor to unlock the locking means. During continuous conveyance of the folding crates the locking means are engaged from above to relieve the locking. The device is suitable for folding-in folding crates which all have the same crate height. For a different crate height the device has to be manually adjusted.

[0003] It is an object of the invention to provide a device for folding-in crates which is adapted to fold-in folding crates with mutually different crate heights.

[0004] It is another object of the invention to provide a reliably operating device for folding-in folding crates.

[0005] The invention provides a device for folding-in folding crates, wherein in two opposite first walls said folding crates are provided with locking means to lock the unfolded position, in cooperation with connecting second walls, wherein the device comprises a conveyor for moving the crates through the device according to a process path, as well as deactivation means to deactivate the locking means by engaging the locking means, and defining means to define a height dimension of folding crates, wherein an engagement level of the deactivation means with respect to a reference plane, such as the conveyor, is adjustable in response to a height level defined by the defining means. Because the engagement height is adjustable in response to the defined height dimension, the deactivation means can engage each individual crate at the correct engagement height. Thereby the device can fold-in crates with mutually different and/or varying crate heights.

[0006] According to a first development the deactivation means comprise first engagement means for engagement of the operating parts of the locking means.

[0007] Preferably the first engagement means comprise first fingers which are moveable with respect to each other between a first, receded spreaded position and a second, close gripping position in which with one end the fingers can engage the operating parts of the locking means for deactivation thereof. Like with manually folding-in a folding crate, the first fingers can extend into operating eyes of the folding crate to relieve the lock.

[0008] If the first fingers are moveable in a plane parallel to a support surface of the conveyor, then the fingers transversely engage an unfolded first wall and easily operate the operating parts located therein, which are moveable in a direction parallel to the bottom of a folding crate.

[0009] According to a second, further development the device comprises second engagement means for abutment against, or biasing by engagement, a locked first wall of a folding crate in the direction of the folded-in position. Because of the bias, for instance by elastically bending the first wall in the form of an arc, the first wall can vigorously fold in to its folded-in position after the lock has been relieved.

[0010] If an extreme position of the second engagement means in the direction of engagement is adjustable to adjust the bias of the first wall, then varying bending properties of the first wall can be taken into account in order to achieve the required bias. The bending properties can vary for instance as a consequence of a change in temperature of the crate, caused by washing the crate with heated water.

[0011] According to a reliably operating embodiment the engagement height of the second engagement means relative to the reference plane is adjustable in response to a height dimension defined by the defining means.

[0012] Preferably the second engagement means are adapted to engage near a free upper edge of a first wall of a folding crate, preferably in the centre of said wall. By engaging the free upper edge the first wall can be brought in an arched biased condition with little force.

[0013] Preferably the second engagement means comprise a second finger which is moveable between a first, receded position, and a second, protruding position in which with one end the second finger can engage a first wall of a folding crate.

[0014] In doing so the second finger is preferably moveable in a plane parallel to a bearing surface of the conveyor.

[0015] If the first engagement means and the second engagement means are connected with the same holder so as to travel along with the holder, wherein the distance between the first engagement means and the second engagement means in the direction of engagement is preferably attuned to the distance in the direction of engagement between a first wall and the locking means in the first wall of a folding crate, the first engagement means can be held automatically at the correct engagement position while the first wall is biased to the folded-in position.

[0016] Therewith the holder can be displaceable along a guide which is arranged transversely to the process path for positioning the engagement parts with respect to the reference plane. Alternatively the first engagement means and the second engagement means can each be connected with their own a holder.

[0017] Preferably the guide is a straight guide which is arranged transversely to the reference plane for positioning the engagement parts with respect to the reference plane.

[0018] By means of the guide the deactivation means can be displaced according to a straight line along the upright first walls of folding crates if the guide is a straight guide which is arranged perpendicularly to the reference plane.

[0019] Reaching the correct engagement height can be guaranteed even after a large number of height adjustments if the device comprises means for defining the absolute position, electronic control means and drive means for the displacement of the holder, wherein the electronic control means are adapted to displace the holder along the guide in response to the means for defining the absolute position and the means for defining the height level.

[0020] A correct engagement of the locking means can be enhanced if said device comprises a brake to detain a folding crate in a deactivation position and to position same on the conveyor.

[0021] According to a simply operating embodiment the defining means comprise a plurality of presence detectors for detection of the presence of a wall of a folding crate, wherein the presence detectors are arranged at various heights with respect to the reference plane, preferably at the heights which correspond with standard heights of folding crates.

[0022] In order to completely fold-in folding crates the device may comprise folding-in means to fold-in the second walls after folding-in the first walls.

[0023] If the device comprises checking means to check the folded-in position of the first and/or second walls, then a folding-in operation can be repeated if necessary to achieve the folded-in position.

[0024] Therewith the device can comprise ejection means for ejecting folding crates from the process path in response to the checking means. For instance an incompletely folded-in crate can be ejected prematurely from the continuous process path so that only completely folded-in crates leave the device at the end of the process path.

[0025] The first walls of folding crates which are supplied one after the other by the belt conveyor can be folded-in from the outside of the folding crates if the deactivation means are arranged at both sides of the process path to fold-in oppositely disposed first walls of a folding crate transversely to the direction of conveyance.

[0026] The device can fold-in crates with mutually different crate widths if the distance between the mutual deactivation means is adjustable according to the distance between the first walls transversely to the direction of conveyance.

[0027] According to a further aspect the invention provides a device for folding-in folding crates, wherein, in two opposite first walls, said folding crates are provided with locking means to lock the unfolded position, in cooperation with connecting second walls, wherein the device comprises holding means to hold the folding crate during folding-in, as well as deactivation means to deactivate the locking means by engagement of the locking means, said deactivation means comprising first engagement means to engage operating parts of the locking means, wherein the first engagement means comprise fingers or pins which are moveable with respect to each other between a first, receded spreaded position in which the fingers are disposed at a mutual distance which is larger than the mutual distance of the operating means, and a second, close engagement position, at which the fingers have arrived with one end at the location of operating parts.

[0028] According to an embodiment thereof the fingers are moveable further towards each other from the second position to a third position in which they exert a displacing force on the operating means of the locking means for deactivation thereof.

[0029] According to an efficient embodiment the fingers are moveable from the first to the third position in one continuous movement.

[0030] According to an embodiment the fingers are moveable in a plane parallel to the bottom of the crate.

[0031] According to an embodiment the fingers are arranged for movement by means of swivelling, in particular by rotation.

[0032] According to one embodiment the operating means comprise operating eyes or the like, into which the fingers can extend.

[0033] The fingers can be provided with engagement ends, which diverge with respect to each other in the third position. This enhances the engagement of the operating means, as well as moving same away from the fingers during the folding operation of the wall.

[0034] The engagement ends are arranged at an obtuse angle with respect to a connecting part of the respective finger. In the third position the connecting parts of the fingers can then extend parallel to each other.

[0035] The invention will be elucidated on the basis of a number of exemplary embodiments shown in the attached drawings, in which:

Figure 1A-D show an example of a folding crate to be treated with the folding-in device according to the invention;

Figure 2 is a perspective view of a folding-in device according to the invention;

Figure 3 is a plan view of the folding-in device according to figure 2, in an extended configuration, with the checking station;

Figure 4A-F show the successive steps when folding-in a longitudinal wall of a folding crate by means of the device

according to figures 2 and 3; and

Figures 5A and 5B show vertical views in two perpendicular planes of the checking station in the arrangement of figure 3.

[0036] The folding crate 1 as shown in figures 1A-D has a bottom 2, two longitudinal walls 3 and two transverse walls 4, which walls are pivotally connected with the bottom 2. The crate 1 as shown in this example is of the Europool-type, with a bottom size of 400 x 600 mm. The longitudinal walls 3 are provided with operable closing means 5, which can be pulled towards each other by pull eyes 7 in the direction A so as to relieve a lock between the upright edges of the encountering walls 3 and 4. The closing means 5 are adapted to become automatically active, by snapping, when said edges of the walls 2 and 3 have been correctly brought against each other. Europool-folding crates are available in different bottom sizes and various crate heights. The illustrated folding crate 1 has a crate height of 150 mm. The distance between the free upper end 6 and the pull eyes 7 of the longitudinal walls 3 is the same for all crate heights.

[0037] In fig. 1A the folding crate 1 is illustrated in folded-in condition, wherein the transverse walls 4 are disposed over the longitudinal walls 3. In figures 1B up to and including 1D the successive steps of folding-in the folding crate 1 are illustrated. In figure 1B the walls 3, 4 of the folding crate 1 are completely upright.

[0038] In figure 1C the longitudinal walls 3 are brought down in the direction B after the connection between the walls 3, 4 has been relieved. In figure 1D the transverse walls 4 are subsequently brought down in the direction C.

[0039] As illustrated in figures 2 and 3 the folding-in device 10 according to the invention comprises a metal frame 11 with a belt conveyor 12 to convey the folding crates 1 in the direction D through the folding-in device 10. At both sides of the belt conveyor 12 guides 17 are arranged to guide the folding crates 1. The guides 17 are mutually attuned transversely to the direction of conveyance D for abutment against the longitudinal sides 3 of folding crates 1. In the direction of conveyance D along the belt conveyor 12 are subsequently arranged a measuring station 13 for the crate height, a folding-in station 18 for the longitudinal wall, two first brakes 19, two second brakes 20, and a holder 21 for a curtain 22.

[0040] Downstream of the curtain 22 a checking station 70 is arranged, also provided with two third brakes 71. The checking station 70 is provided with a crate ejector 72 to remove incorrectly folded-in crates transversely to the belt conveyor 12.

[0041] At both sides of the belt conveyor 12 the measuring station 13 comprises an upright bearing rod 14. Height-adjustable holders 40 (four in this example) are attached to the bearing rods 14, in which various electronic photocells (presence detectors) are incorporated. The heights of the photocells differ mutually so as to determine the heights of folding crates 1 by detection of the side walls.

[0042] The folding-in station 18 for the longitudinal walls is set up with a metal portal 15 which extends along the belt conveyor 12 and which is attached to the frame 11. At both sides of the belt conveyor 12 upright servo-pneumatic positioning cylinders 16 are arranged between the upright parts of the portal 15 and the belt conveyor 12 for accurate height adjustment of two further elucidated unlocking grippers 50 (deactivation means) in the direction G for engagement of the pull eyes 7 in the longitudinal walls 3 of a folding crate 1. The positioning cylinders 16 each have an electronic absolute distance meter, which is not shown, to determine the position of the unlocking grippers 50 in the direction G along the positioning cylinder 16.

[0043] The first brakes 19 each have a first blocking plate 60 which is displaceable by a pneumatic cylinder 41 in the direction E transversely to the direction of conveyance D between a protruding position, in which the first blocking plate 60 can contact a leading side wall of a folding crate 1, and a (dotted) withdrawn position, in which a folding crate 1 can freely pass the first brakes 19. The distance in the direction of conveyance D between the first blocking plates 60 and the unlocking grippers 50 is attuned to the width of a folding crate 1, such that a folding crate 1, which is blocked by the first brakes 19, is positioned with its pull eyes 7, right across the unlocking grippers 50 when viewed from above.

[0044] Each of the second brakes 20 also comprises a second blocking plate 61 which is displaceable by means of a pneumatic cylinder 42 in the direction F transversely to the direction of conveyance D between a protruding position, in which the second blocking plate 61 above the belt conveyor 12 can contact a leading end of a folding crate 1, and a (dotted) retracted position, in which a folding crate 1 can freely pass the second brakes 20.

[0045] The distance between the first blocking plates 60 and the second blocking plates 61 is attuned in the direction of conveyance D, such that a folding crate can be enclosed with a small clearance between the first blocking plates 60 and the second blocking plates 61. The second brakes 20 provide a first positioning of an inters pace or gap 80 between two successive folding crates 1, so that after activation of the second brakes 20 the first blocking plates 60 can extend into the gap 62 via the curvatures of the corners of the folding crate 1. Thereby the folding crate 1 is accurately positioned with respect to the unlocking grippers 50 by the first brakes 19.

[0046] Figure 4A illustrates one of the two unlocking grippers 50 in more detail. The unlocking gripper 50 comprises a pneumatic cylinder 31 which at the rear side is attached to a slide 30 of the positioning cylinder 16. The piston rod of the pneumatic cylinder 31, together with the rods for straight guidance which are parallel thereto, is attached to a first

coupling part 32 to which in the centre an adjustable second coupling part 51 is attached. To the second coupling part 51 an adjustable engagement part 34 with a head piece 38 is attached which extends in the direction of the folding crates 1 on the belt conveyor 12.

[0047] A pneumatic gripper 33 is attached to the bottom side of the first coupling part 32, provided with two grippers arms 35 which may swivel in the direction J between the illustrated unfolded (first) position, an engagement position (second position) and a unlocking position (third position). To the gripper arms 35 pointed metal fingers 36 are attached, the form and size of the end 37 thereof being adapted to the inner diameter of pull eyes 7 of the folding crates 1. The fingers 36 are arranged and formed such that in the third position they diverge with respect to each other (figure 4F). The pneumatic gripper 33 itself, together with the head piece 38, is displaceable in the direction H transversely to the height direction G and the direction of conveyance D by operating the pneumatic cylinders 31.

[0048] The motor of the belt conveyor 12, the photocells 40, the positioning cylinders 16, the electronic absolute distance meters of the positioning cylinders 16, the pneumatic cylinders 31 of the unlocking grippers 50, the pneumatic grippers 33, the pneumatic cylinders 41, 42 of the first brakes 19 and of the second brakes 20 are connected with an electronic operating unit 100 to operate the folding-in device 10. The air pressure on the pneumatic cylinders 31 of the unlocking grippers 50 is adjustable.

[0049] The checking station 70, illustrated in figures 3, 5A and 5B (not illustrated in figure 2) comprises third brakes 71, the construction of which can be compared with the first brakes 19 and the second brakes 20. The checking station 70 comprises a portal 72 which is not completely illustrated, with an upper girder 74 which is attached to the frame 11 in a manner which has not been further illustrated. The upper girder 74 is provided with a drive for a slide 73, which is guided on guide bars 75. A frame 76 is suspended from the slide 73, to at bottom end of which a pusher plate 77 is attached. The slide 73 is displaceable in the directions M transversely along the conveyor belt 12.

[0050] Figure 3 schematically illustrates the location of a photocell 80 which, transversely to the conveyor belt 12, is directed to a reflector 81 which is located at the other side. It furthermore illustrates a photocell 78, which is directed towards a reflector 79 obliquely along a set-up location.

[0051] Near the corners of the set-up location for a crate, which set-up location is defined by the brakes 71, cylinders 82 are arranged, with a cylinder casing 82a and a piston rod 82b, at the end of which a plunger 83 is arranged. As illustrated in figures 5A and 5B the cylinders 82 are oblique at an angle alpha with respect to the horizontal. The photocells 78 and 80 are operatively connected with a checking unit (not illustrated), which activates the cylinders 82 dependent upon the signal of the photocell 78. The checking unit furthermore activates the driving of the slide 73 dependent upon the signal of photocell 80.

[0052] The operation of the fold-in member 10 is as follows. A folding crate 1 is placed at the beginning of the continuous belt conveyor 12 in unfolded condition, wherein the longitudinal walls 3 will be disposed along the guides 17. The folding crate 1 is passed in the direction D along the measuring eyes 40 of the measuring station 13, so that the height of a folding crate 1 is electronically established.

[0053] Subsequently the first brakes 19 are activated by which the first folding crate 1 with the leading transverse wall 4 runs against the first blocking plates 60. The belt conveyor 12 itself will continue to slip under the folding crate 1. During transport of the folding crate 1 up to the first blocking plates 60 the unlocking grippers 50 are brought from the start position according to figure 4A in the direction G to the correct engagement height in accordance with the measured height. The metal fingers 37 of the opened pneumatic gripper 33 then arrive in a plane parallel to the plane of the belt conveyor 12 in line with the pull eyes 7 of the folding crate 1. This situation is illustrated in figures 4B and 4C.

[0054] As illustrated in figure 4D, subsequently the pneumatic cylinders 31 of the unlocking grippers 50 are activated, by which the head piece 38 presses in the direction H against the upper edge 6 of the longitudinal wall 3 of the folding crate 1. By this the upper edge 6 is biased to a desired extent towards the interior of the crate, according to an arched line K. In this position the pneumatic cylinders 31 have not yet reached the end of their stroke.

Subsequently, as illustrated in figure 4E, the pneumatic gripper 33 is activated, by which the metal fingers 36/37 swivel from the first position van figure 4D to a second position, figure 4E, in which they extend into the pull eyes 7. Upon continued swivel movement the fingers 36/37 move towards the third position as illustrated in figure 4F, wherein they also force the pull eyes 7 towards each other by which the lock between the longitudinal wall 3 and the transverse walls 4 is relieved. Also due to the biasing in the longitudinal wall 3 said longitudinal wall 3 folds to its folded-in position, as is also illustrated in figure 4F. The diverging shape of the two fingers 36/37 facilitates a shearing of the pull eyes 7 from said fingers. In the third position they can exert a biasing force on the longitudinal wall 3, in addition to or as an alternative on the head piece 38. After the lock has been relieved the cylinders 31 can travel along with the downwardly directed longitudinal wall 3 up to the end of their stroke.

After folding-in the longitudinal walls 3 the pneumatic gripper 33 together with the head piece 38 is withdrawn in the direction H and the pneumatic gripper is opened again in the direction J. After that the first brakes 19 are deactivated by which the next, following folding crate 1 can be folded-in in the folding station 18 for the longitudinal wall.

The leading transverse wall 4 of the first folding crate 1 which is folded-in halfway, is folded-in by passing under the

curtain 22, the trailing transverse wall 4 can be folded down in the direction of conveyance D by means of a pneumatic cylinder, not illustrated, which is placed obliquely along the belt conveyor.

In this example the station 13 which measures the crate height is provided with various photocells 40. As an alternative a distance meter may also be placed above the belt conveyor 12 which defines the distance with respect to the upper edge 6 of the folding crates 1.

In this example the belt conveyor 12 is bounded by fixed guides 17 along the belt conveyor 12. As an alternative also a part of the guides, the photocells 40, the positioning cylinders 41 with unlocking grippers 50, the first brakes 19 and the second brakes 20 may also be mounted on a sub frame which is displaceable transversely to the direction of conveyance D with respect to the belt conveyor 12 so as to adjust the device 10 to various crate widths.

In this example the station 18 for folding-in the longitudinal wall comprises two servo-pneumatic positioning cylinders 16 for the accurate height adjustment of the unlocking grippers. As an alternative linear electro motors can be arranged as well.

In this example the longitudinal wall 3 is biased by the head piece 38, but the abutment of the head piece 38 against the longitudinal wall 3 may suffice for correct engagement of the metal fingers 37 onto the pull eyes 7. The head piece 38 may be superfluous for providing the correct engagement when the operation of the pneumatic cylinders 31 of the unlocking grippers 50 is driven by control means which are suitable for that purpose.

After the folding crates have passed through the curtain 22 they arrive at the location of the checking station 70. There the brakes 71 are activated in order to keep the crate at the correct location or set-up location in the checking station 70.

By means of the photocell 80 it is established whether the walls 3 have been folded-in flat. For that purpose the height of the photocell 80 is somewhat higher than the upper surface of the walls 3 in folded down condition of said walls. If the photocell 80 does notice the walls 3, the control unit activates the driving for the slide 73. Then the slide 73 together with the pusher plate 77 moves the respective crate in the direction M away from the surface of the belt conveyor 12.

If the photocell 80 does not notice a wall 3, and thus both walls 3 have been folded down correctly, it may be that the rest of the crate is not folded-in correctly, and that the sensor 78 notices one wall 4. Said signal is transmitted to the control unit, which thereupon activates the cylinders (for instance pneumatic cylinders) 82, by which the piston rods 82b extend in the directions N and the plungers 83 arrive against the respective wall 4. In this example all cylinders 82 are activated simultaneously, also in case only one wall 4 would not have been folded down correctly. Because of the obliquely downward movement of the plunger 83 folding down of the respective wall 4, which may have been oblique at the start, is enhanced. The movement of the plunger 83 ends just above the level h1 of the upper surface of the walls 4 if they would have been folded down correctly.

After the operation of the plungers 83 the photocell 78 will no longer notice a wall 4. Then the control unit relieves the operation of the brakes 71 and the crate is conveyed further on the belt conveyor 12.

Claims

1. Device for folding-in folding crates, wherein in two opposite first walls said folding crates are provided with locking means to lock the unfolded position, in cooperation with connecting second walls, wherein the device comprises a conveyor for moving the crates through the device according to a process path, as well as deactivation means to deactivate the locking means by engaging the locking means, and defining means to define a height dimension of the folding crates, wherein an engagement level of the deactivation means with respect to a reference plane, such as the conveyor, is adjustable in response to a height level defined by the defining means.

2. Device according to claim 1, wherein the deactivation means comprise first engagement means for engagement of the operating parts of the locking means, wherein the first engagement means preferably comprise first fingers or pins which are moveable with respect to each other between a first, receded spreaded position and a second, close gripping position in which with one end the fingers can engage the operating parts of the locking means for deactivation thereof, wherein the first fingers are preferably moveable in a plane parallel to a support surface of the conveyor.

3. Device according claim 1 or 2, comprising second engagement means for abutment against, or biasing by engagement, a locked first wall of a folding crate in the direction of the folded-in position, wherein an extreme position of the second engagement means in the direction of engagement is preferably adjustable to adjust the bias of the first wall, wherein the engagement height of the second engagement means relative to the reference plane is preferably adjustable in response to a height dimension defined by the defining means.

4. Device according to claim 3, wherein the second engagement means are preferably adapted to engage near a free

upper edge of a first wall of a folding crate, wherein the second engagement means preferably comprise a second finger or pin which is moveable between a first, receded position, and a second, protruding position in which with one end the second finger can engage a first wall of a folding crate, wherein the second finger is preferably moveable in a plane parallel to a bearing surface of the conveyor.

5. Device according to any of the claims 1-2 and any of the claims 3-4, wherein the first engagement means and the second engagement means are connected with the same holder so as to travel along with the holder, wherein preferably the distance between the first engagement means and the second engagement means in the direction of engagement is attuned to the distance in the direction of engagement between a first wall and the locking means in the first wall of a folding crate, wherein the holder is preferably displaceable along a guide which is arranged transversely to the process path for positioning the engagement parts with respect to the reference plane, wherein the guide is preferably a straight guide which is arranged perpendicularly to the reference plane, and wherein the device preferably comprises means for defining the absolute position, electronic control means and drive means for the displacement of the holder, wherein the electronic control means are adapted to displace the holder along the guide in response to the means for defining the absolute position and the means for defining the height level.

6. Device according to any of the preceding claims, comprising a brake to detain a folding crate in a deactivation position and to position same on the conveyor.

7. Device according to any of the preceding claims, wherein the defining means comprise a plurality of presence detectors for detection of the presence of a wall of a folding crate, wherein the presence detectors are arranged at various heights with respect to the reference plane, preferably at the heights which correspond with standard heights of folding crates.

8. Device according to any of the preceding claims, comprising folding-in means to fold-in the second walls after folding-in the first walls.

9. Device according to any of the preceding claims, comprising checking means to check the folded-in position of the first and/or second walls, wherein the device preferably comprises ejection means for ejecting folding crates from the process path in response to the checking means, and wherein the device preferably comprises means to push over a wall of the folding crates which may not have been folded in, which push-over means comprise a wall engagement member and are connected to the checking means for activation in response to an incorrect position of the respective wall which has been established by the checking means, wherein the push-over means are preferably arranged for following a path with a downwardly directional component during the push-over action of the wall engagement member, wherein the push-over means are preferably adapted to move the wall engagement member to a height which corresponds with the height of a folded-in crate.

10. Device according to any of the preceding claims wherein the deactivation means are arranged at both sides of the process path to fold-in oppositely disposed first walls of a folding crate transversely to the direction of conveyance, wherein the distance between the mutual deactivation means is prefrably adjustable according to the distance between the first walls transversely to the direction of conveyance.

11. Device for folding-in folding crates, wherein, in two opposite first walls, the folding crates are provided with locking means to lock the unfolded position, in cooperation with connecting second walls, wherein the device comprises holding means to hold the folding crate during folding-in, as well as deactivation means to deactivate the locking means by engagement onto the locking means, said deactivation means comprising first engagement means to engage operating parts of the locking means, wherein the first engagement means comprise fingers or pins which are moveable with respect to each other between a first, receded spreaded position in which the fingers are disposed at a mutual distance which is larger than the mutual distance of the operating means, and a second, close engagement position, at which the fingers have arrived with one end at the location of operating parts.

12. Device according to claim 11, wherein the fingers are moveable further towards each other from the second position to a third position in which they exert a displacing force on the operating means of the locking means for deactivation thereof, wherein the fingers are preferably moveable from the first to the third position in one continuous movement.

13. Device according to claim 11 or 12, wherein the fingers are moveable in a plane parallel to the bottom of the crate.

14. Device according to one of the claims 11-13, wherein the fingers are arranged for movement by means of swivelling,

in particular by rotation.

15. Device according to one of the claims 11-14, wherein the operating means comprise operating eyes or the like, into which the fingers can extend.

16. Device according to one of the claims 11-15, wherein the fingers are provided with engagement ends, which diverge with respect to each other in the third position, wherein the engagement ends are preferably arranged at an obtuse angle with respect to a connecting part of the respective finger, wherein in the third position the connecting parts of the fingers preferably extend parallel to each other.

17. Device according to any of the claims 11-16, comprising second engagement means, connected with the first engagement means for abutment against or biasing by engagement a locked first wall of a folding crate in the direction of the folded-in position and thereby positioning the first engagement means with respect to the operating parts, wherein an extreme position of the second engagement means in the direction of engagement is preferably adjustable for adjusting the bias of the first wall.

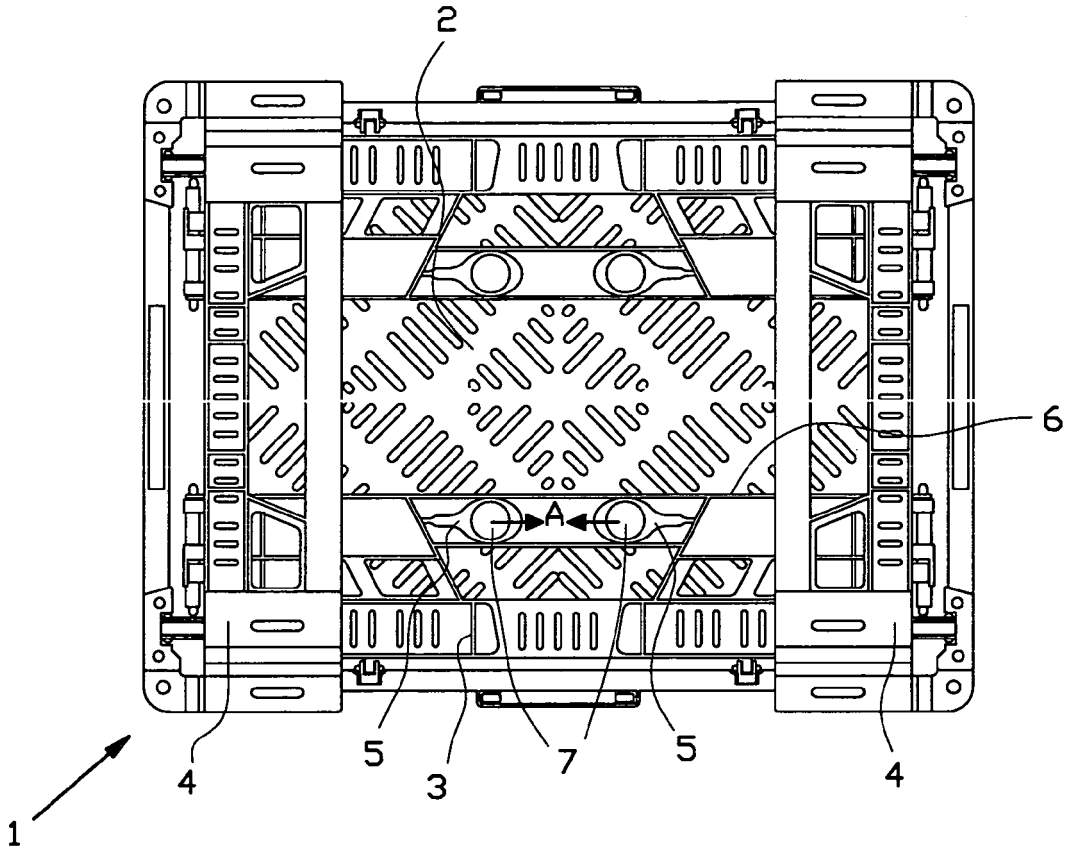

FIG. 1A

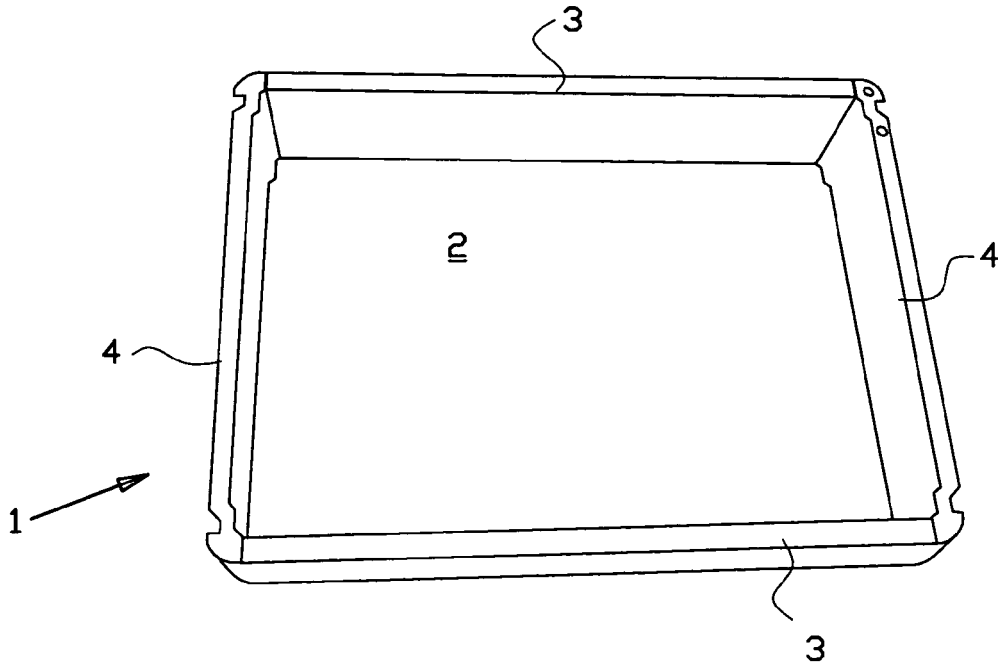

FIG. 1B

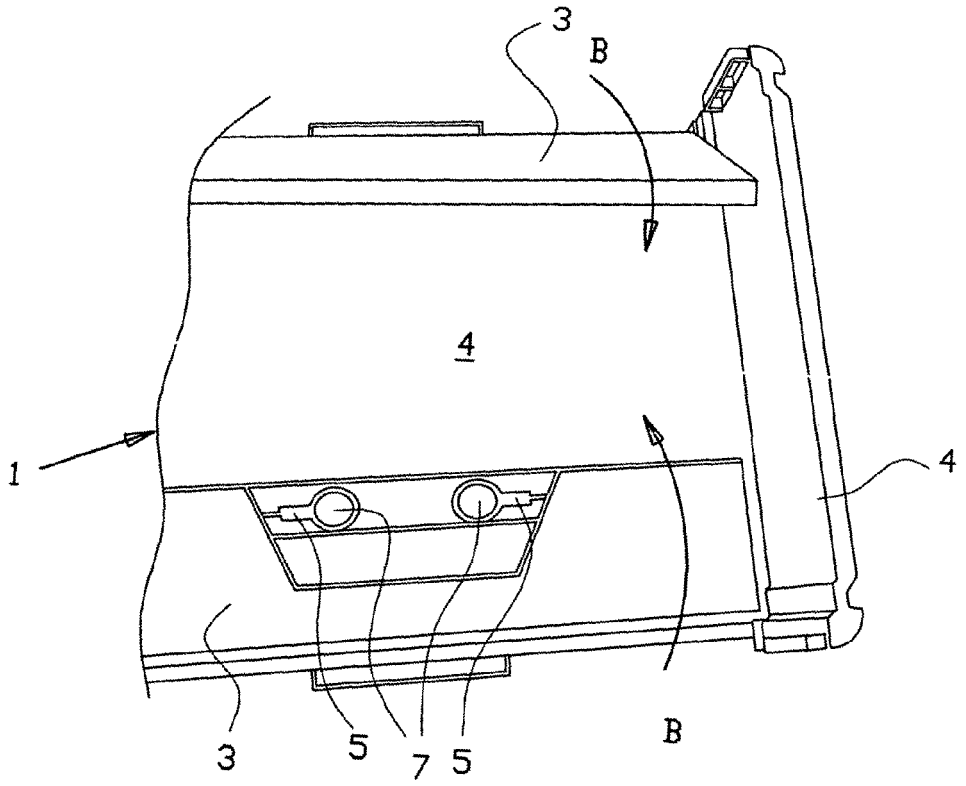

FIG. 1C

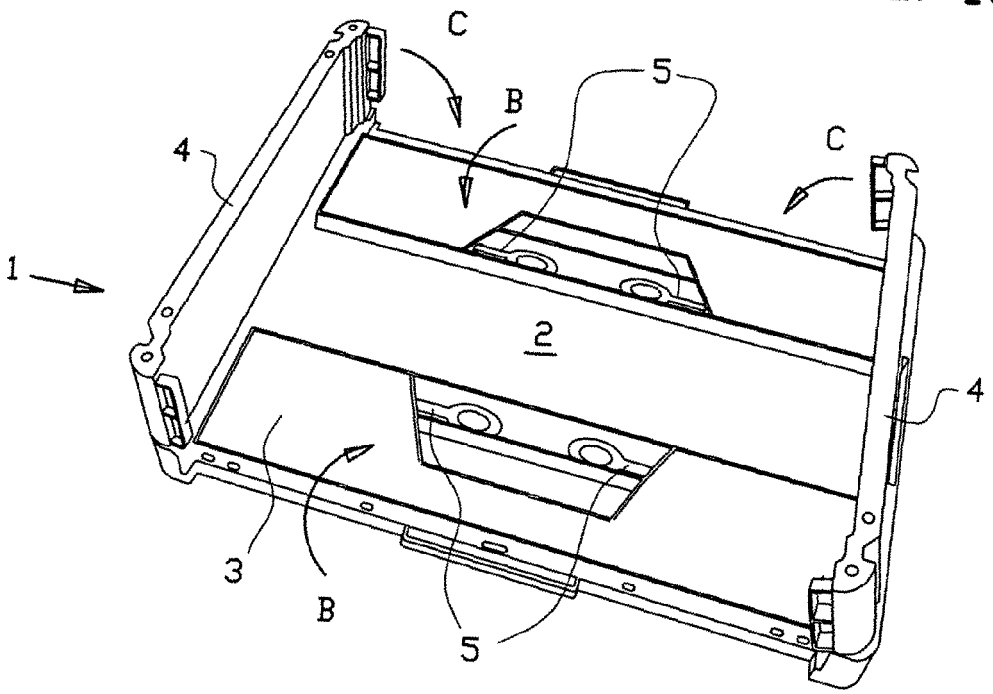

FIG. 1D

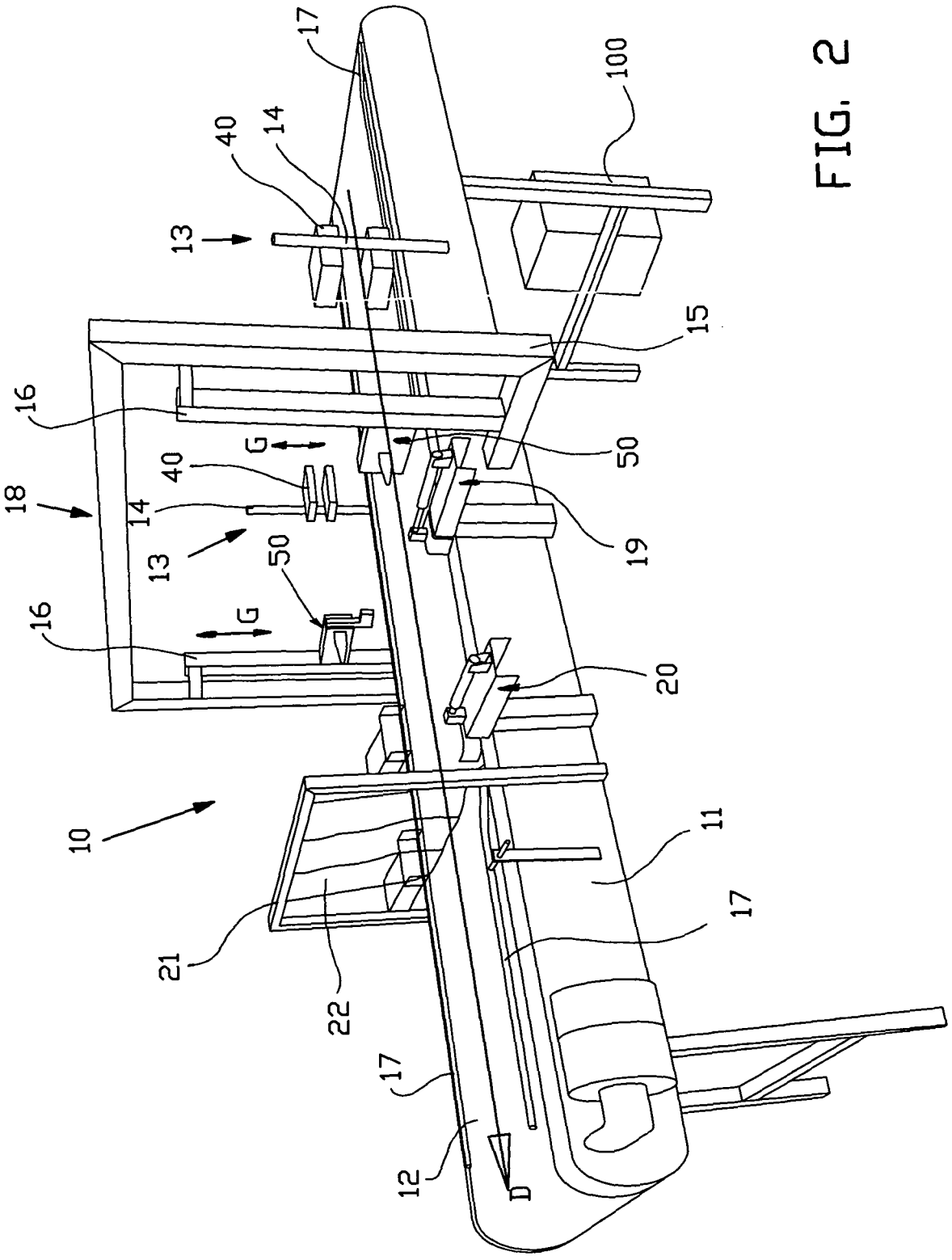
17
100
40
14
13
15
16
G
50
40
18
14
19
13
50
16
G
20
10
11
17
21
22
17
12
D

FIG. 2

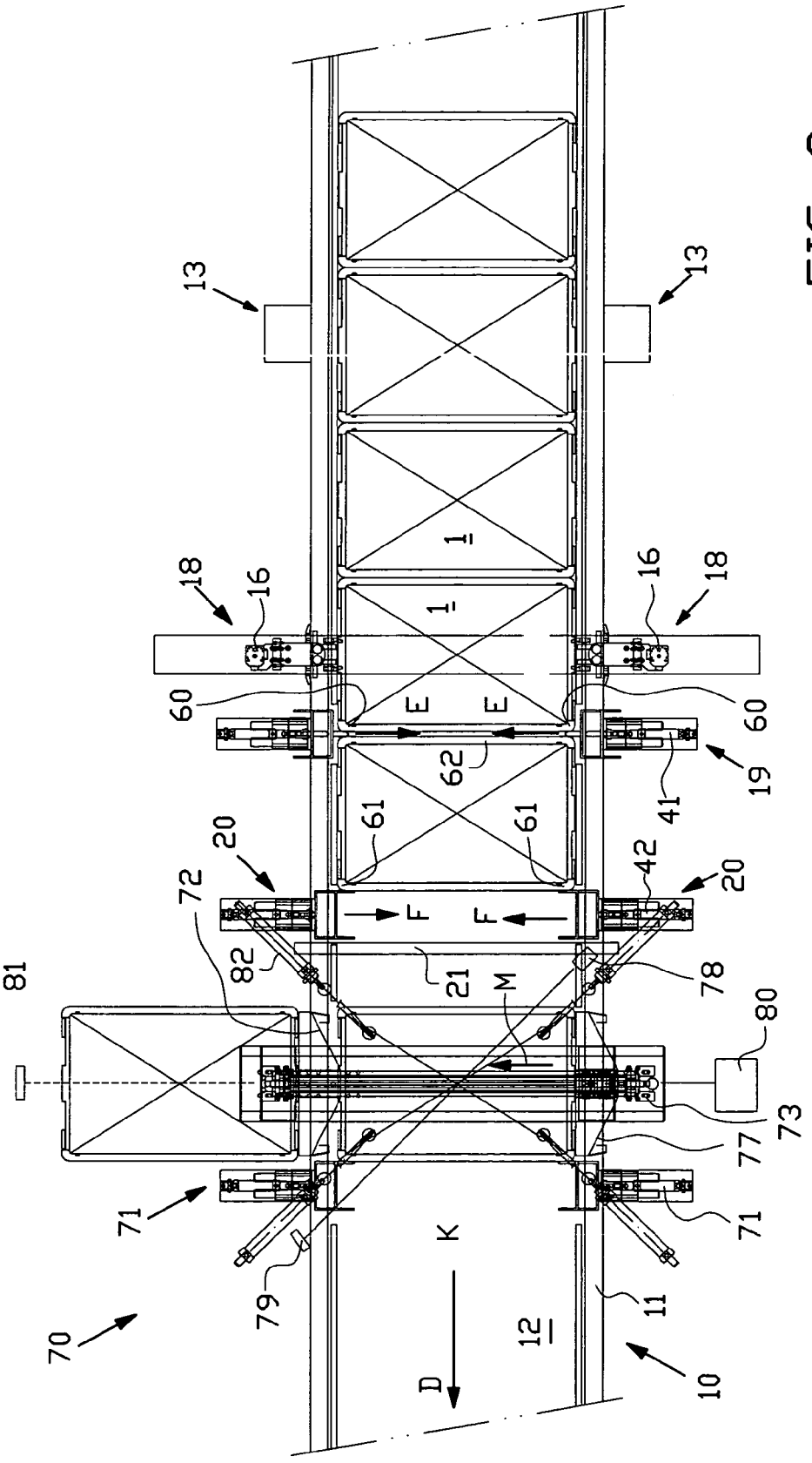
13
13
18
16
16
18
1
1
60
60
E
E
62
19
41
61
61
20
42
20
72
F
F
82
21
M
78
81
80
73
77
71
71
K
79
11
12
70
D
10

FIG. 3

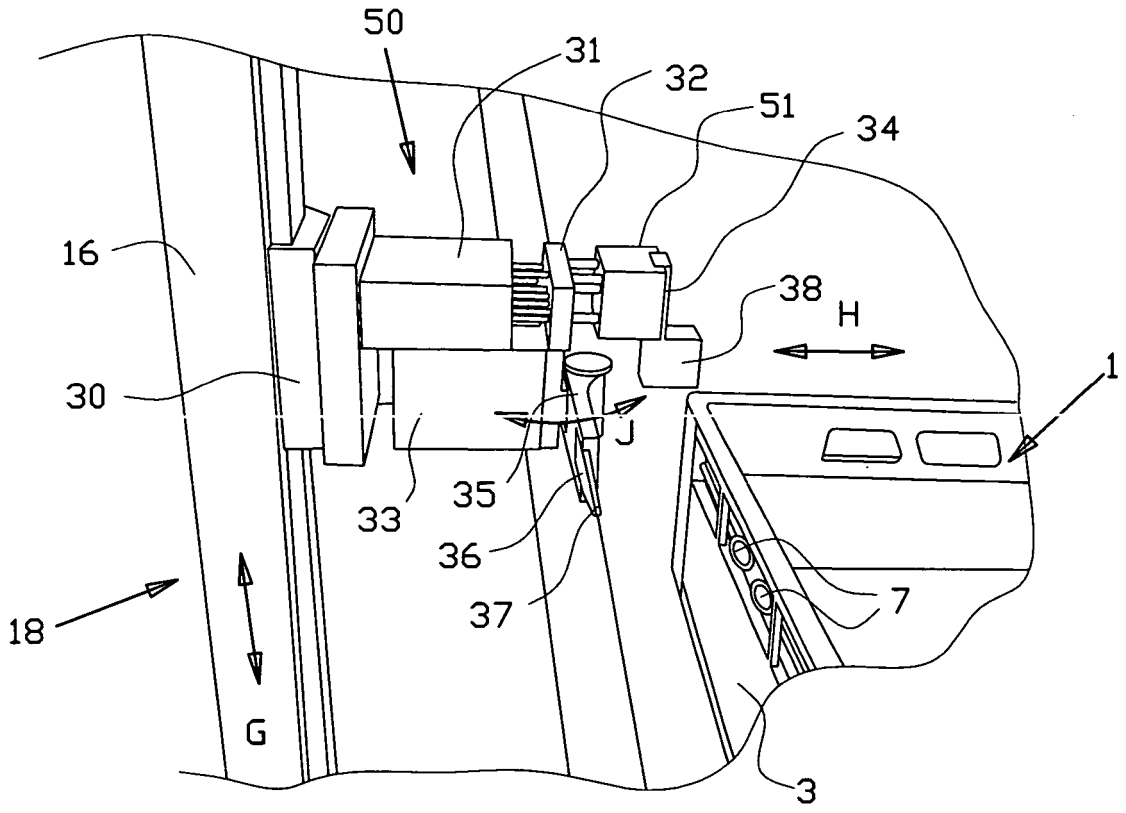
50
31
32
51
34
16
38
H
30
1
J
35
33
36
37
7
18
G
3

FIG. 4A

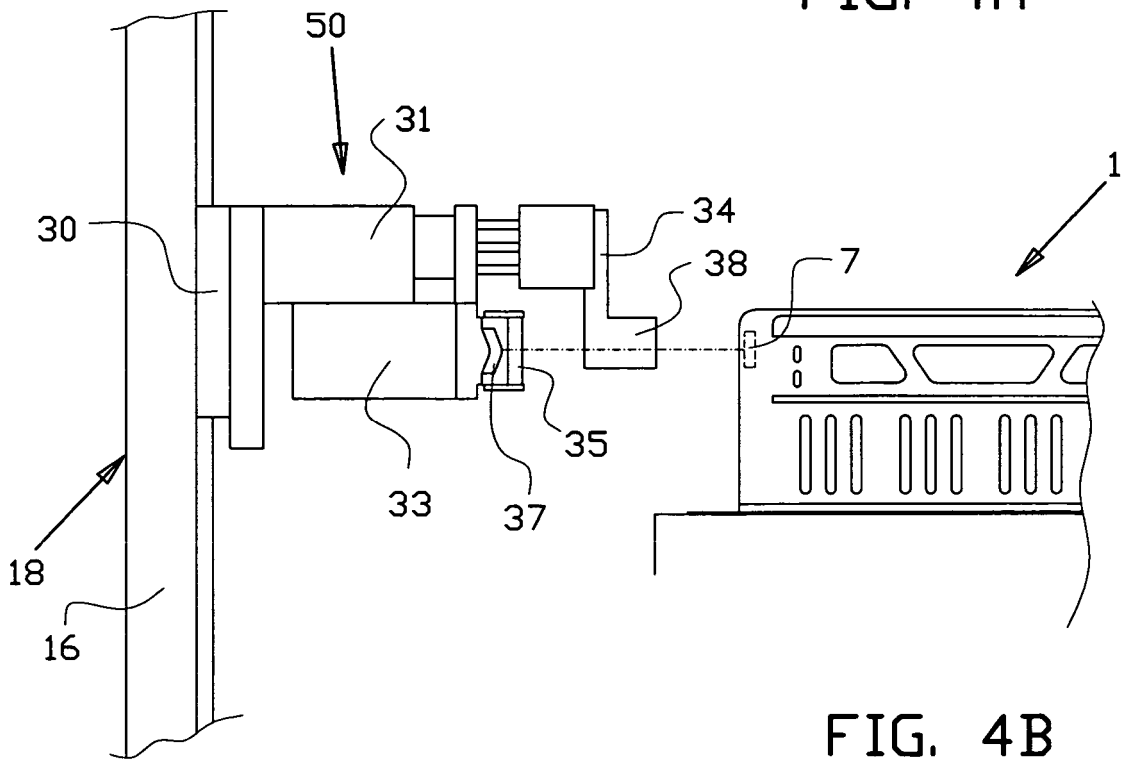
50
31
1
34
30
38
7
35
33
37
18
16

FIG. 4B

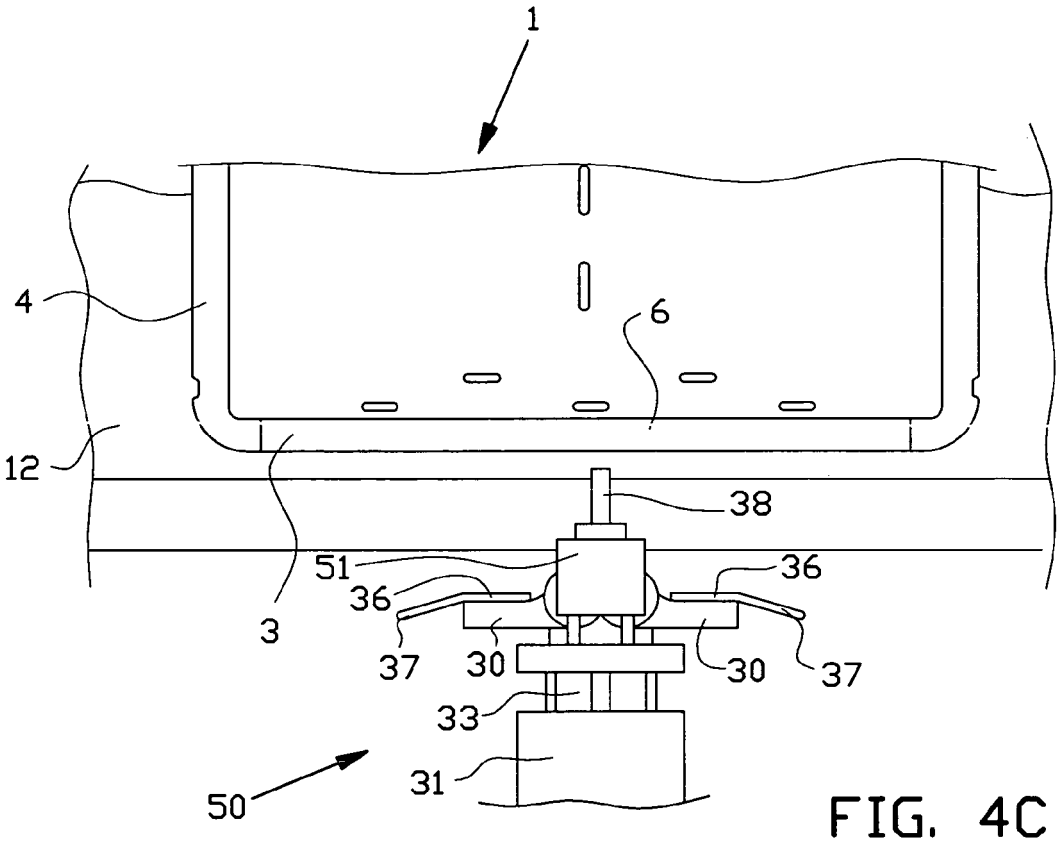
1
4
6
12
38
51
36
36
3
37
30
30
37
33
31
50

FIG. 4C

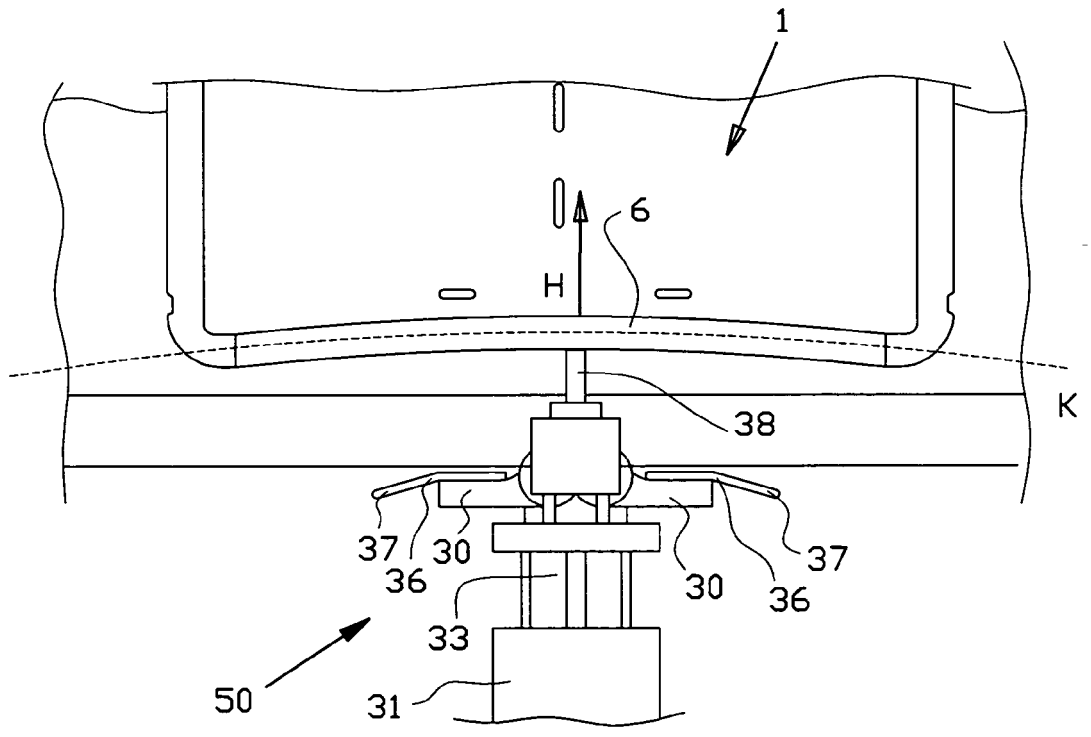
1
6
H
K
38
37
30
36
30
37
36
33
50
31

FIG. 4D

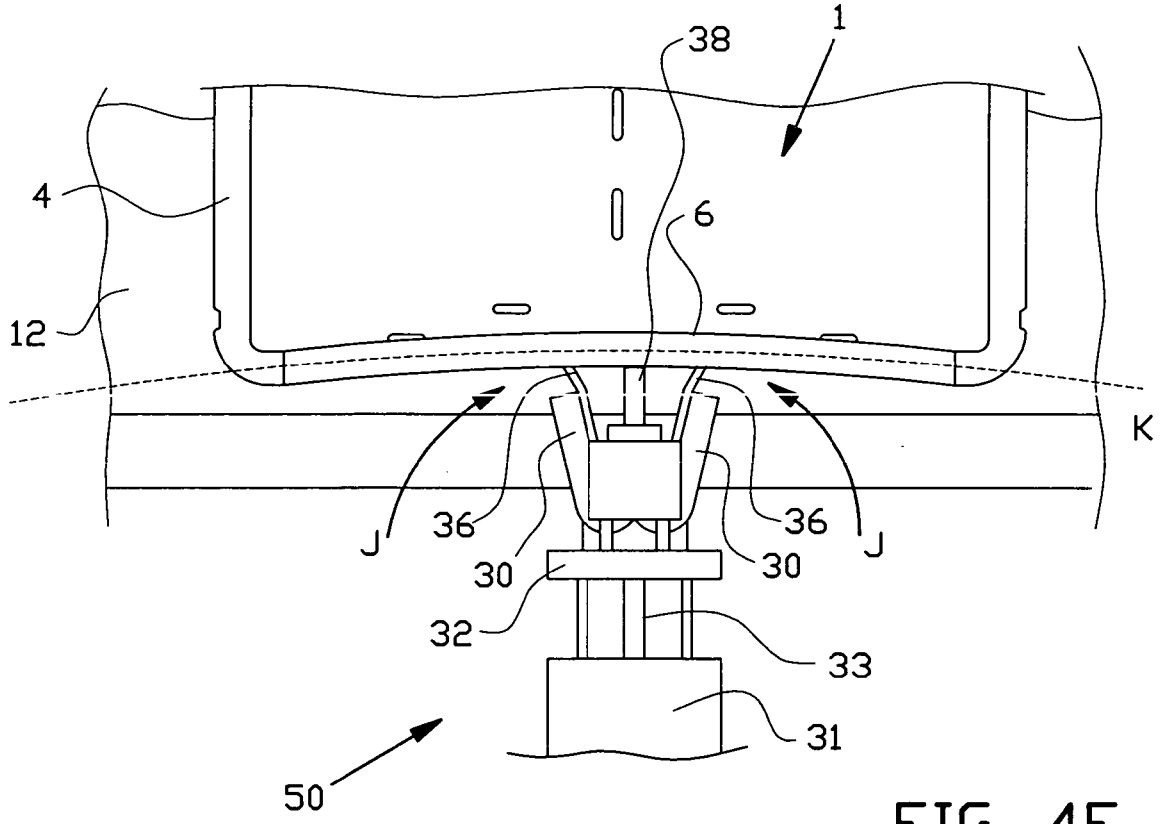
1
38
4
6
12
K
J
36
30
36
30
J
32
33
31
50

FIG. 4E

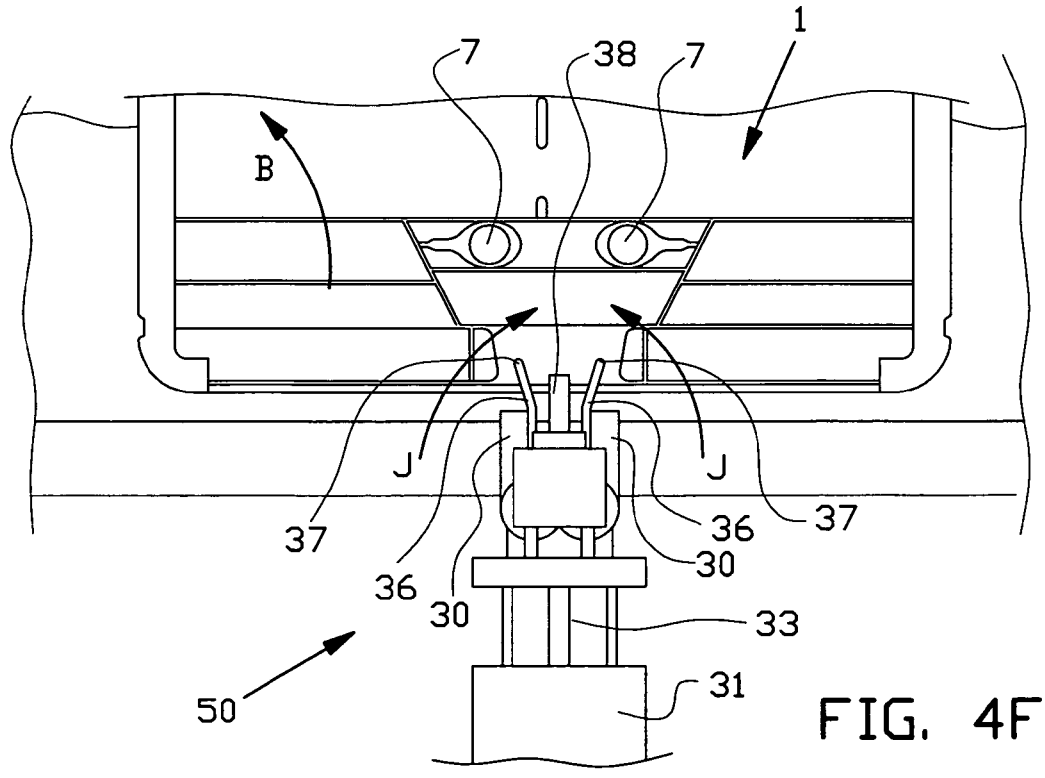
1
7
38
7
B
J
J
37
36
37
30
36
30
33
31
50

FIG. 4F

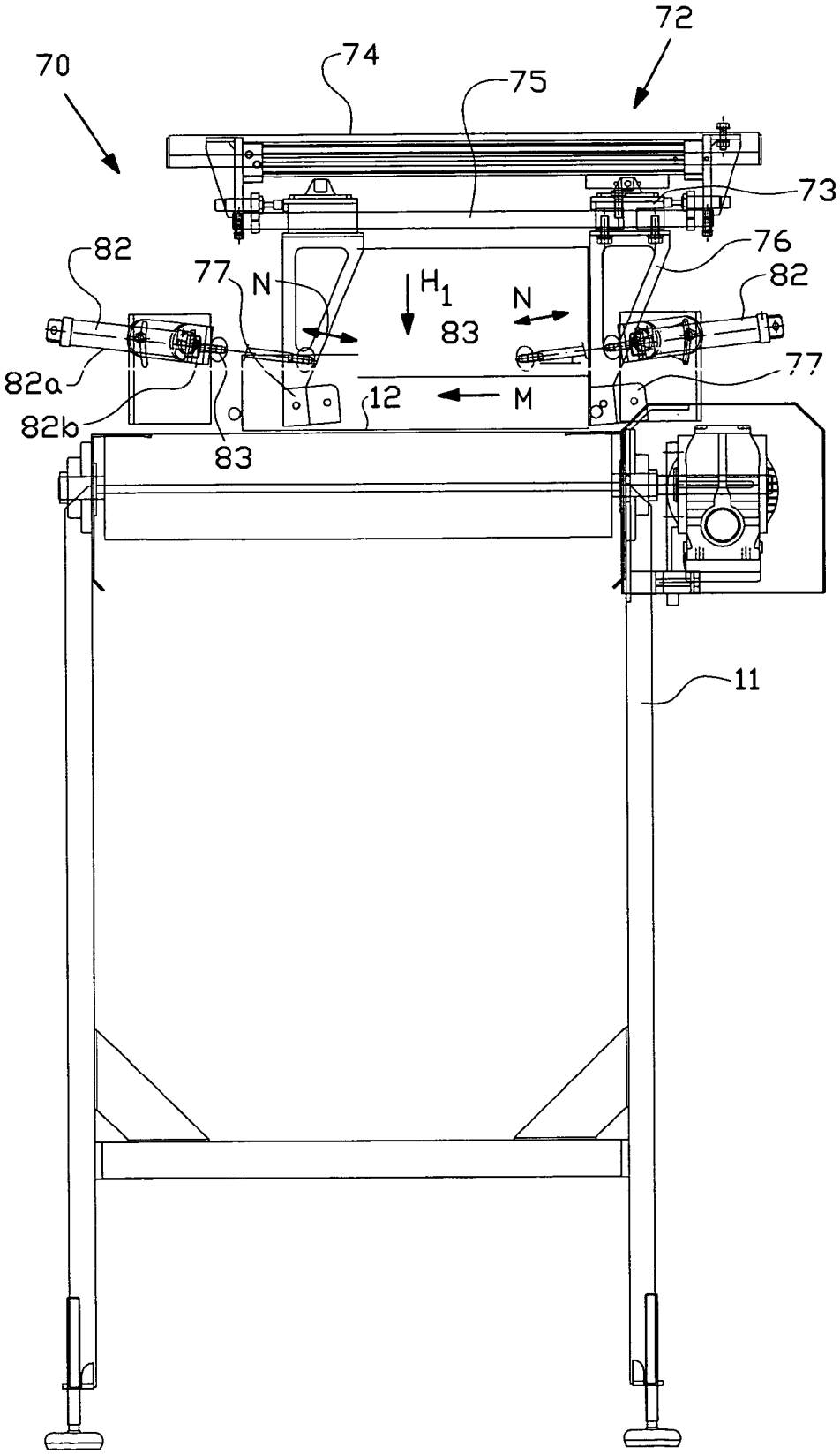

FIG. 5A

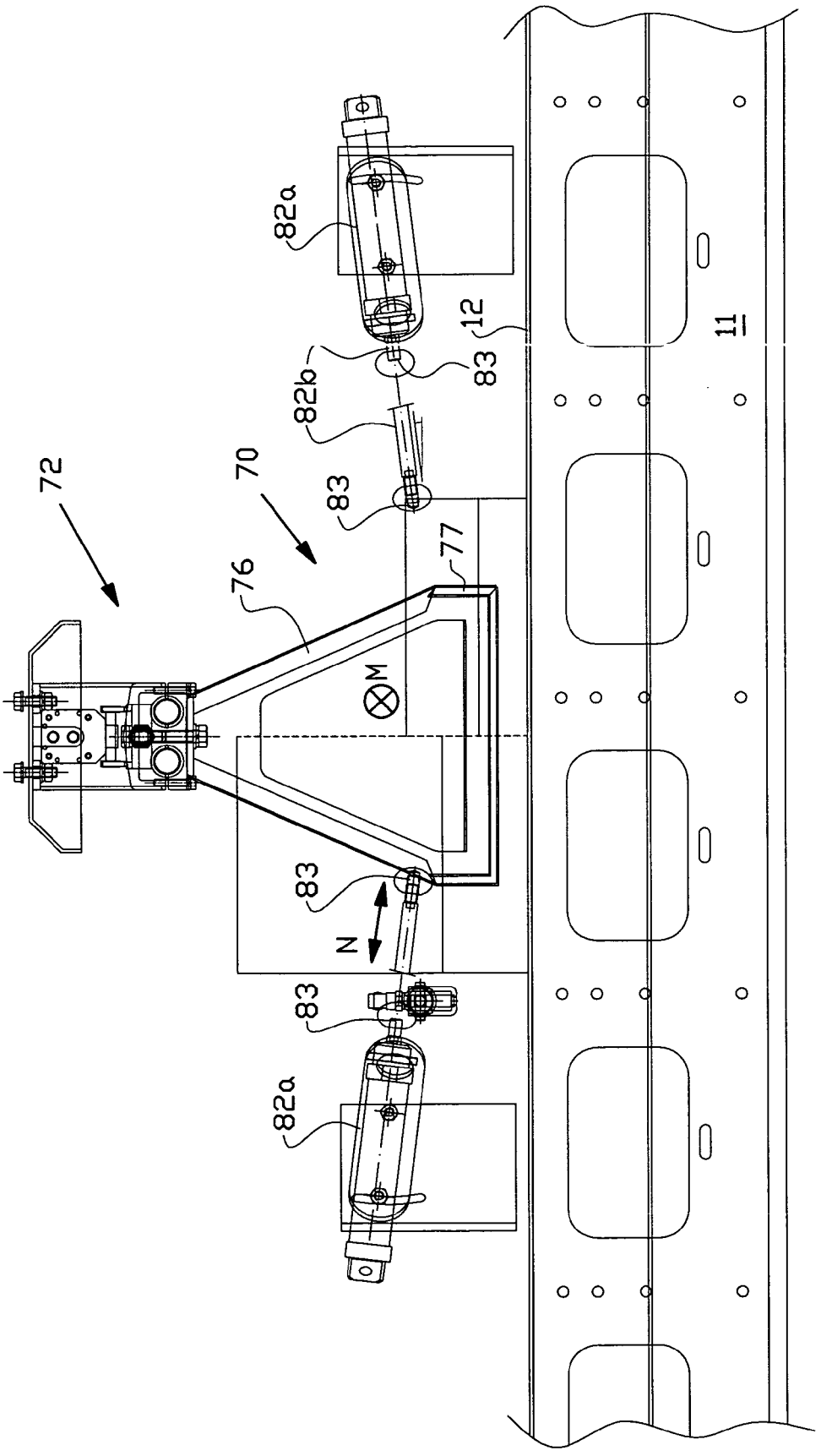

FIG. 5B