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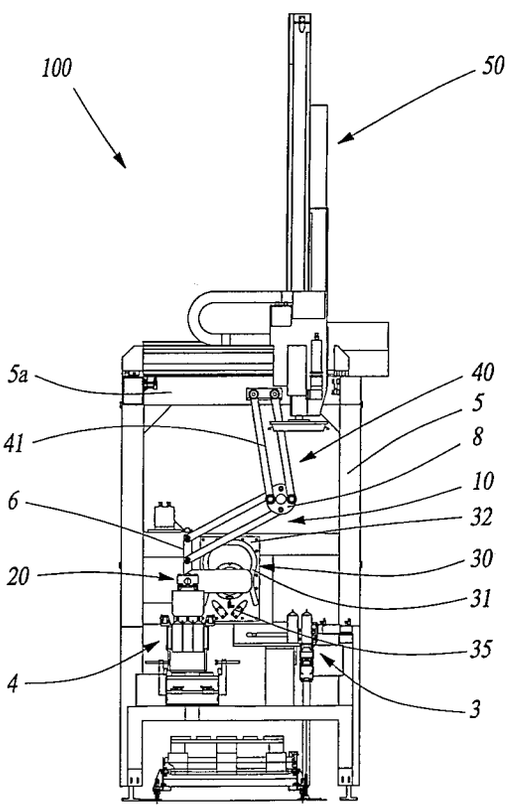
(54) Pick and place device for containers into packages

(57) A pick and place device for containers (1) into packages or boxes (2) comprises: a frame (5); feeding conveyor means (3) for the containers (1); feeding transport means (4) for said packages (2); reciprocating means (10) comprising a first arm (11) routably pivoted to the frame (5) and a second arm (12) slidingly supported by said first arm (11); picking means (20) of the containers (1) routably supported by an end of the second arm (12); cam means (30) fastened to the frame (5) and having at least one cam (31) for guiding the cam follower (13) fastened to the second arm (12) fit to reciprocally rotate between a picking condition (P) where the picking means (20) hook a plurality of the containers (1) supported by the feeding conveyor means (3) and a releasing condition (R) of the containers (1) in which these latter are released grouped inside the related package (2) supported by the feeding transport means (4).

The cam (31) has a quite reversed U shape so as to allow the picking means (20) to translate along the same vertical line in correspondence of the picking (P) condition and releasing (R) condition so picking and placing respectively the containers (1) at different or equal heights.

FIG.1



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Description

[0001] The present invention relates to plants for packaging inside boxes of grouped containers, in particular it refers to a pick and place device for grouped liquid containers into packages, such as cardboard, plastic or metal boxes, or plastic holders, or cardboard or plastic trays. In the following the name "boxes" will be used in order to identify such containers.

[0002] The known packaging plants for liquid containers, for example the ones called "rex" for milk, requires the use of packaging machine fit to take said row aligned containers from a first grouping and aligning transporting line and to place them, at the same height, into a correspondent box on a second packaging line.

[0003] In other words, said machines comprise a reciprocating device fit for picking from a feeding line for example three rows each including five containers and to place them into a box supported by a feeding line coplanar with the package feeding line but situated at the opposite side of the rotation axis of the reciprocating device as regards the feeding line.

[0004] The free end of the reciprocating device carries the picking pliers and makes a 180 degree rotation with a to and fro movement, so that the picking pliers of the reciprocating device makes a semicircular path between the container feeding line and the feeding packaging conveyor.

[0005] The main drawback of the known devices is that it is possible to pick and place containers located only at the same level because only with a 180 degree rotation the containers are picked and placed at the same place because the arm of the reciprocating device has the same length as regards the vertical axis of the hinge pin both in picking and placing condition. Indeed if the picking and placing is at different heights, the reciprocating arm length is different as regards to the vertical pivoting axis because the support fulcrum of the picking pliers describes a circular path, due to the reciprocating device rotation of more or less than 180 degrees allowing to lift or lower it as regards to the picking height of the containers laying on the container or package feeding line.

[0006] Further drawback is that it is impossible to pick or place different height containers, for example half, one or two litre containers, without positioning the container or package feeding lines to adjust their distance from the vertical hinging axis of the reciprocating device.

[0007] Another drawback is that the known devices do not allow to pick containers at a certain height and to release them at different heights in connection with the container displacement inside the packaging boxes, for example when two or more layers of containers must be superimposed into the same package.

[0008] The main object of this invention is to propose a pick and place device for containers into packages fit for picking containers at a certain height and for realising them at different height or vice versa, without necessarily adjusting the container disposition on the container or package feeding line.

[0009] Further object is to propose a device with a pliers fit to pick containers with different capacity, therefore with different heights, and to place them into packages even at superimposed layers.

[0010] Other object is to propose a cheap device easy to make, to install and to upkeep.

[0011] The invention features are highlighted in the following in particular referring to the enclosed drawing tables, in which:

- Figure 1 shows a frontal view of the device, object of the invention;
- Figure 2 shows a side view of the device as in figure 1;
- Figure 3 shows a top view of the device as in figure 1;
- Figures 4A and 4B show two frontal views of the device according to figure 1, respectively in a container picking position and in a container placing position;
- Figure 5 shows a enlarged top view of the pick and place device as in figure 1, in which some parts have been eliminated to better highlight other ones.
- Figure 6 shows a schematic view of the operative cycles of the plant in which the device as in figure 1 is used.

[0012] Referring to the figures from 1 to 6, numeral 100 indicates a pick and place device for the containers 1 into packages or boxes 2.

[0013] Said device essentially comprises a frame 5, feeding conveyor means 3 for the containers 1 and feeding transport means 4 for the packages 2, reciprocating means 10, picking means 20, cam means 30 and pantograph means 40.

[0014] The reciprocating means 10 are essentially constituted by a motor 14, fixed to the frame 5, having an operation pinion engaged by a timing belt 15 engaging a gear keyed on the input shaft of a reduction gear 16 supported by the frame 5 and on the output shaft is keyed a first arm 11, near to one of its ends.

[0015] A couple of supports 18 is externally fixed near the free end of the first arm 11 and each support 18 is provided with a longitudinal groove wherein a protruding guide 17 of a second arm 12 is slidingly inserted. The second arm 12 is provided with a cam follower pin engaging the cam means 30 and it is located beside the first arm 11 without interfering with it during its movement.

[0016] The picking means 20 of the containers 1 are supported in a rotating way by means of a pin 7 at an end of the second arm 12 and they comprise a plurality of mechanical or pneumatic handling picking means, known and not illustrated, fit to be activated for picking removably the container heads.

[0017] The pantograph means 40 are pivoted to an

end of a upper horizontal beam 5a of the frame 5 and, to the free end of a bar 6 integral with the pin end 7 opposite to the end to which picking means are fixed as regards to the second arm 12. Obviously the pin 7 is pivotally supported by the second arm by means of a known and not described bearing.

[0018] In particular the pantograph means 40 are constituted by a double couple of rods 41 where each couple is constituted by parallel rods in which two end are pivoted to the bar 6, four ends to a disc joint 8 and the remaining two ends to the upper beam 5a of the frame 5.

[0019] The cam means 30 essentially comprise a plate 32 vertically fixed to the frame 5 where a cam 31 is obtained, reversed "U" shaped, symmetric to the vertical middle line of the plate 32 and each symmetric part thereof has a first inferior section outside divergent near the free inferior end, a second middle curved section and a third superior quite straight section near the joining between the two symmetric parts.

[0020] This cam 31 is almost disposed around the rotation fulcrum of the reciprocating means 10 that is the outer shaft of the reduction gear 16, and moreover it is engaged by the free end of the cam follower pin 13 protruding from the second arm 12.

[0021] A pair of fixed stops 35 is fixed to the plate 32 and defining the limit stop of the second arm 12 and of the first arm 11 during the alternate rotation.

[0022] The feeding conveyor means 3 are essentially constituted by a conveyor belt 3a overhung by a pair of guides 3b where the containers 1 are aligned in a single row. These feeding conveyor means 3 are located under the reciprocating means 10 and in correspondence with these latter, they have a transversal conveyor fit to displace possibly three rows containing five containers 1 per each exactly under the picking means 20. It is important to highlight that the containers 1 can be disposed in two, three and four rows containing two, three and five containers each.

[0023] The package feeding transport means 4 are constituted by a pair of conveyor belt 4a fit to support and move the packages 2 and having an end located under the reciprocating means 10.

[0024] The packaging machine, comprising the device 100, also includes known members such as the picking means 50 of the packages 2 from the conveyor means 4a and the placing means of pallets 9 to conveyor line 55.

[0025] The operation of the device 100 is easy and efficacious because it is slaved to an electronic unit 60 activating the motor 14 in phase relationship with the feeding conveyor means 3, the feeding transport means 4 and the picking means 50.

[0026] The electronic unit activation 60 involves the reciprocal movement of the reciprocating means 10 with a rotation go-back movement and in particular the movement of the firs arm 11 that slidingly carries the second arm 12, guided by the cam 31 during its side excursion as regards the middle vertical line of the same cam.

[0027] So the second arm 12 is obliged to reciprocally rotate between a picking condition P, in which the picking means 20 hook a plurality of containers 1 supported by the feeding conveyor means 3, and a releasing condition R of the containers 1 in which these latter are released grouped into the respective package 2 supported by the feeding transport means 4.

[0028] When the package 2 is completely filled, the picking means 50 hook, move and release the package, piling it on a respective pallet 9.

[0029] The particular "reverse U" shaped conformation of the cam 31 allows said picking means 20 to vertical translate in correspondence of the picking condition P and the releasing condition R in order to pick and release the containers 1 at the same or different heights.

[0030] In other words the second arm 12 is slidingly movable as regards to the first arm 11 so that it goes along a path imposed by the sliding of the cam follower pin 13 inside the cam 31 that, in correspondence of the extreme picking P and releasing R condition, is horizontally straight, although the first arm 11 goes along a circular path, so that the bar 6 vertically slides on the same axis.

[0031] It is important to note that the alternative rotation of the reciprocating means 10 can be more than 180° degrees, depending on the height in which the containers 1 are picked and on the height in which the containers 1 are released into the related package 2. For example, in case of half-litter containers, the picking occurs at a certain height that depends on the height from the ground of the conveyor belt 3a, while the releasing occurs alternatively at the same height of the conveyor belt 4a and at a superior height equivalent to the container height because they are superimposed in at least two layers inside each relative package 2.

[0032] The keeping of the bar vertical stroke and then of the picking means 20 in correspondence of the picking P and realising R positions is guaranteed by pantograph means 40 provided with the disc joint 8.

[0033] So, in correspondence with the bar vertical excursion near the picking P and releasing R conditions, the cam 31 contour is so that it determines the axial movement of the second arm 12 as regards to the first arm 11 for more or less than 180° degrees rotation of the reciprocating means 10.

[0034] The fixed stops 35 limit the first arm 11 and second arm 12 rotation, till a prefixed maximum value of the angular deviation in correspondence of the picking P and releasing R conditions.

[0035] It is important to note that the device 100 allows the container picking at different heights from the releasing heights due to the program settings in the electronic unit 60 that suitably provide to regulate the reciprocating means rotation 10 since the vertical movement of the picking means 20 is guaranteed when they are above the feeding conveyor means 3 and the feeding transport means 4.

[0036] It is also important to note that the device 100 allows the movement of different height containers and also the releasing at different heights with regard to the transport planes due to the vertical movement of the picking means 20 and without any reciprocal horizontal regulation of the feeding conveyor means 3 and feeding transport means 4.

[0037] The main advantage of the present invention is to provide a pick and place device for containers into packages fit to pick the containers at a certain height and to place them at different heights and vice versa without regulating the mutual reciprocal horizontal position of the containers on the feeding conveyor and transportation means.

[0038] Further advantage is to provide a device with a picking means able to pick containers of both different capacity and different height and to place them into packages also in superimposed layers.

[0039] Other advantage is to provide a simple realization, installation and maintenance device.

Claims

1. Pick and place device for containers (1) into packages (2) comprising feeding conveyor means (3) for said containers (1) and feeding transport means (4) for said packages (2), with said device (100) characterized in that it includes:

   - reciprocating means (10) comprising a first arm (11) routably pivoted to a frame (5) of said device (100) and a second arm (12) slidingly supported by said first arm (11);
   - picking means (20) of said containers (1) routably supported by an end of said second arm (12);
   - cam means (30) fastened to said frame (5) and with at least one cam (31) for guiding the cam follower (13) fastened to said second arm (12) fit to reciprocally rotate between a picking condition (P) where said picking means (20) hook a plurality of said containers (1) supported by said feeding conveyor means (3) and a releasing condition (R) of said containers (1) in which these latter are released grouped inside said related package (2) supported by said feeding transport means (4), said cam (31) having a quite reversed U shape so as to allow said picking means (20) to translate along the same vertical line in correspondence of said picking (P) condition and releasing (R) condition so picking and placing respectively said containers (1) at different or equal heights.

2. Device according to claim 1 characterized in that further includes pantograph means (40) having an end pivoted to said frame (5) and the free end pivoted to said picking means (20), said pantograph means (40) being fit to vertically keep these latter passing from said picking condition (P) to said releasing condition (R), and vice-versa.

3. Device according to claim 1 characterized in that said reciprocating means (10) further include a motor member (14) kinematically connected by means of a timing belt (15) to a reduction gear (16) on which output shaft is keyed said first arm (11).

4. Device according to claim 1 characterized inù that said picking means (20) include a plurality of handling means fit for picking removably the container heads.

5. Device according to claim 1 characterized in that said cam (31) is fixed to a plate (32) laying on a vertical plane and is symmetric with respect to a middle vertical line and for each symmetric part has a first inferior outside divergent section near the free end, a second middle curved section and a third quite straight section near to the joining between the two symmetric parts.

6. Device according to claim 1 and claim 5 characterized in that further includes fixed stops (35) fixed to said plate (32) and fit for limiting the rotation till a prefixed maximum value of the angular deviation of said reciprocating means (10) in correspondence of said picking (P) condition and releasing (R) condition.

7. Device according to claim 1 characterized in that said second arm (12) has a protruding guide (17) toward said first arm (11) and sliding inside the groove of at least support (18) fixed to said first arm (11) on the outer surface faced to said second arm (12).

FIG.1

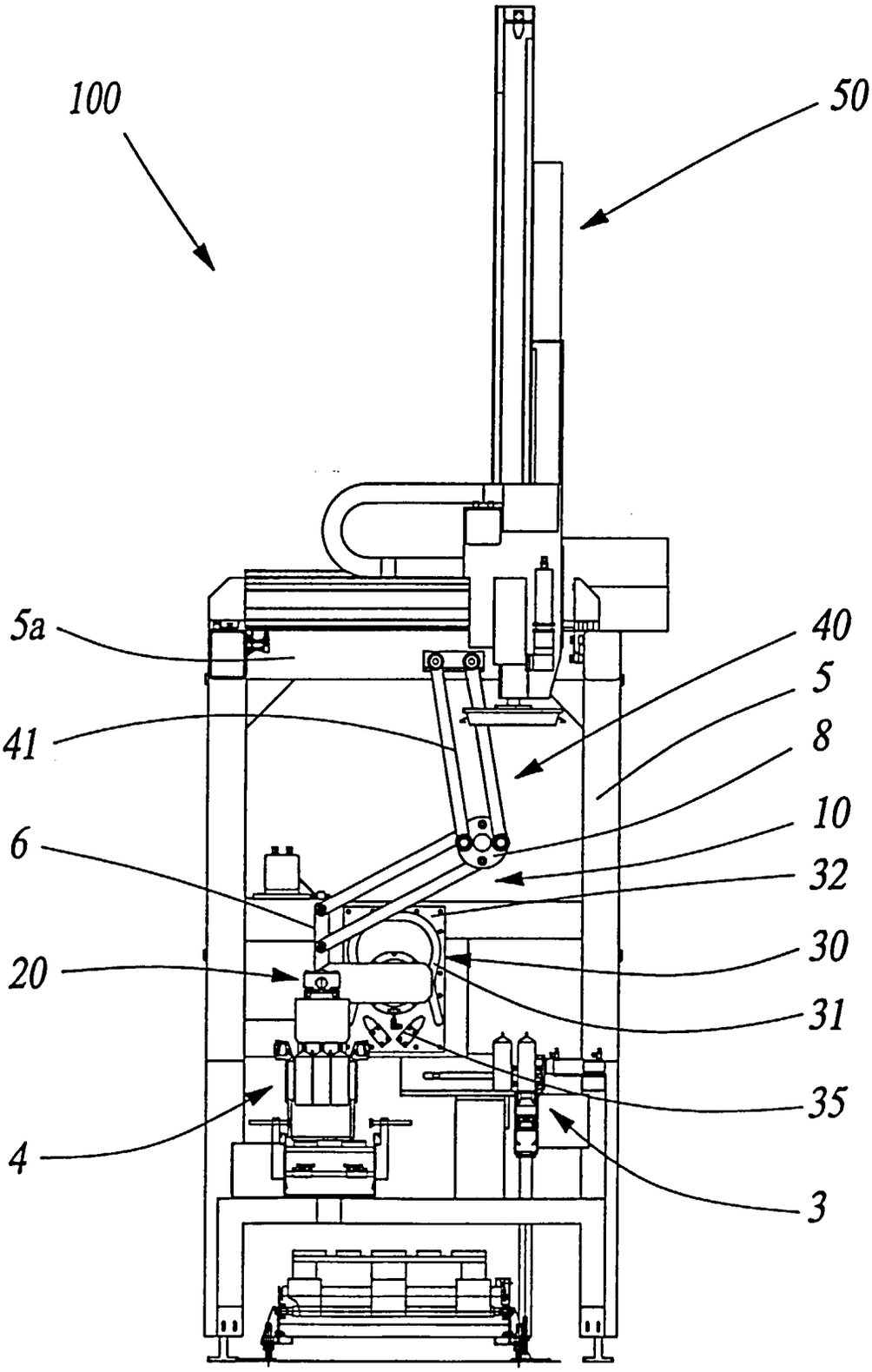
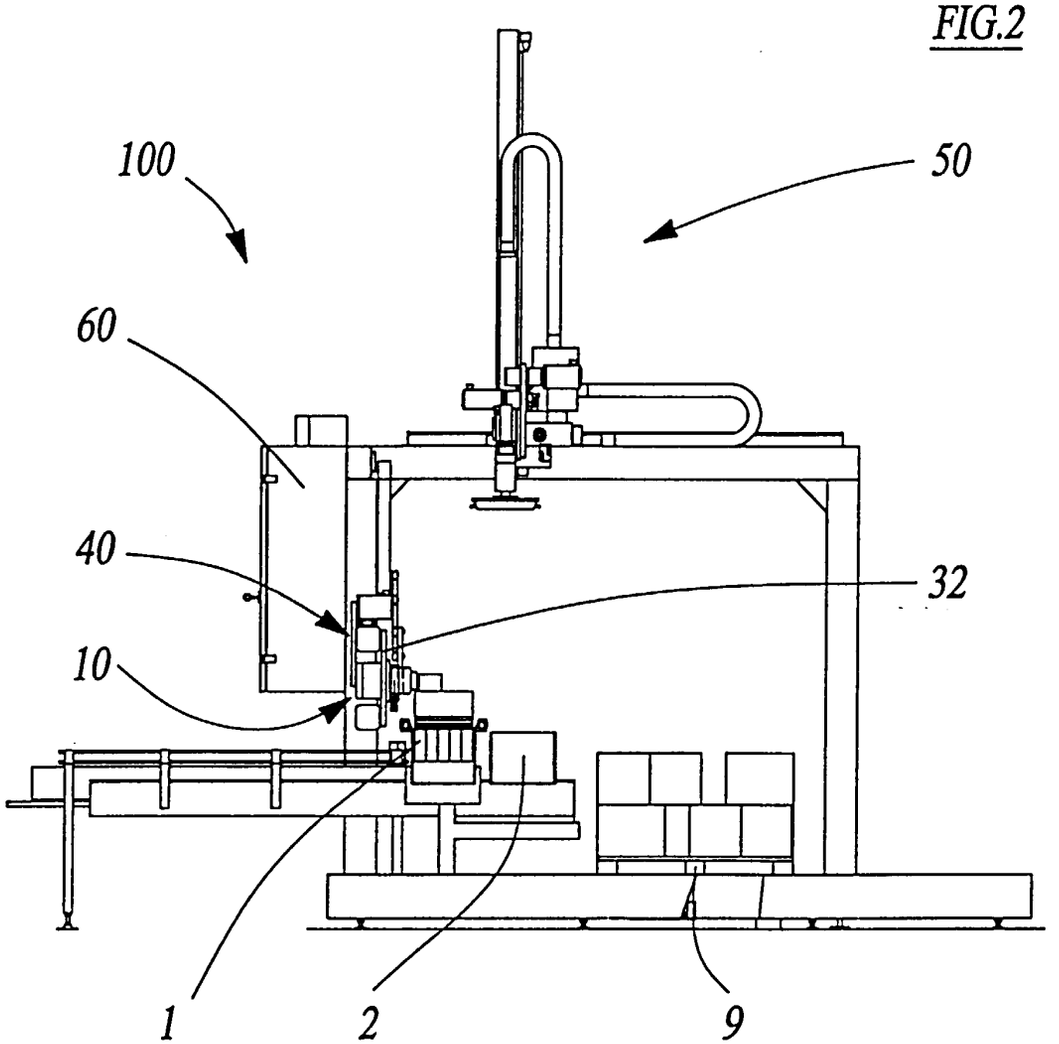


FIG.2



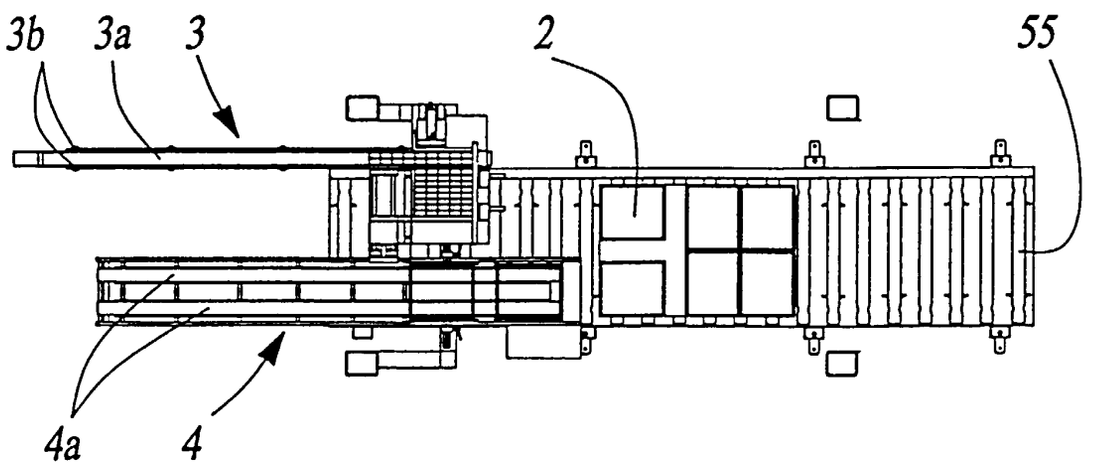
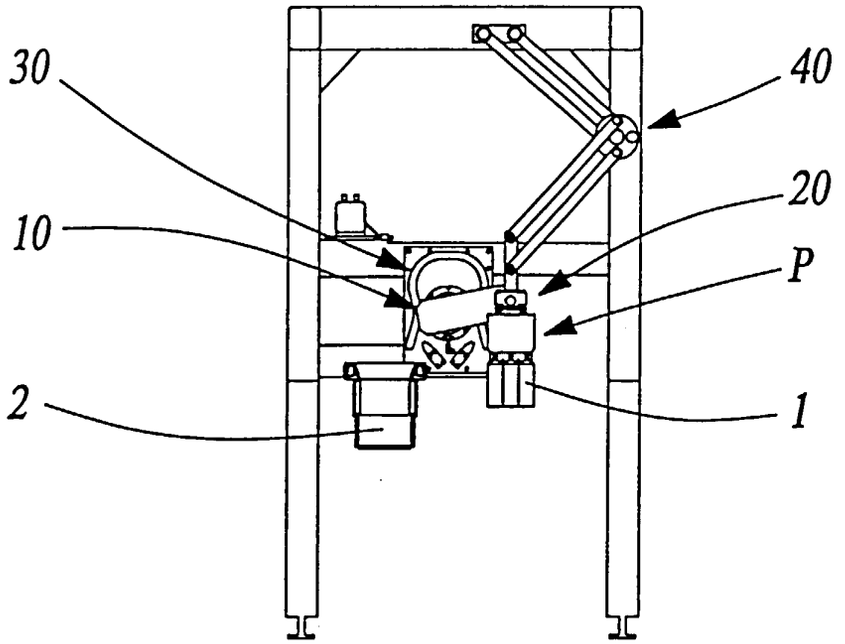


FIG.3

FIG.4A



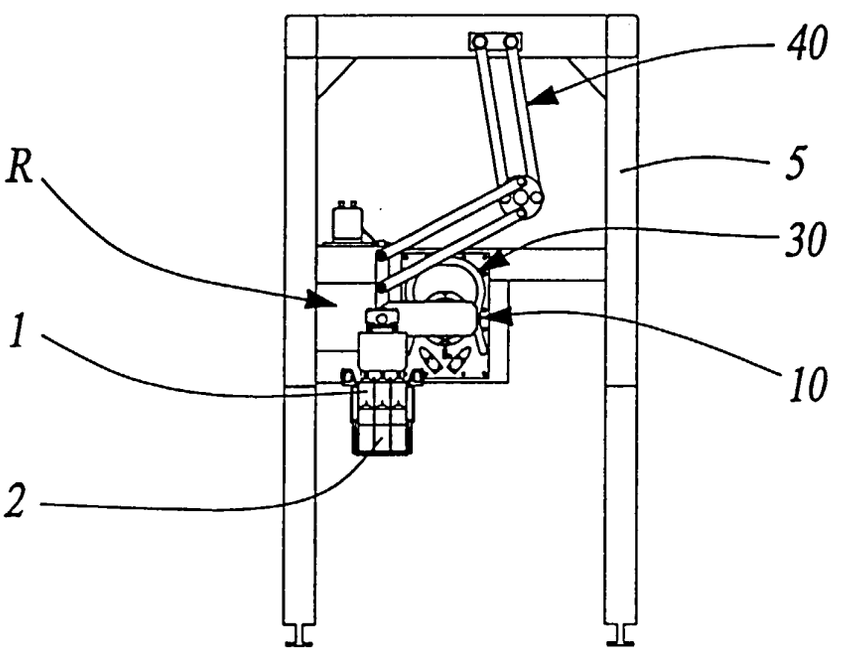


FIG.4B

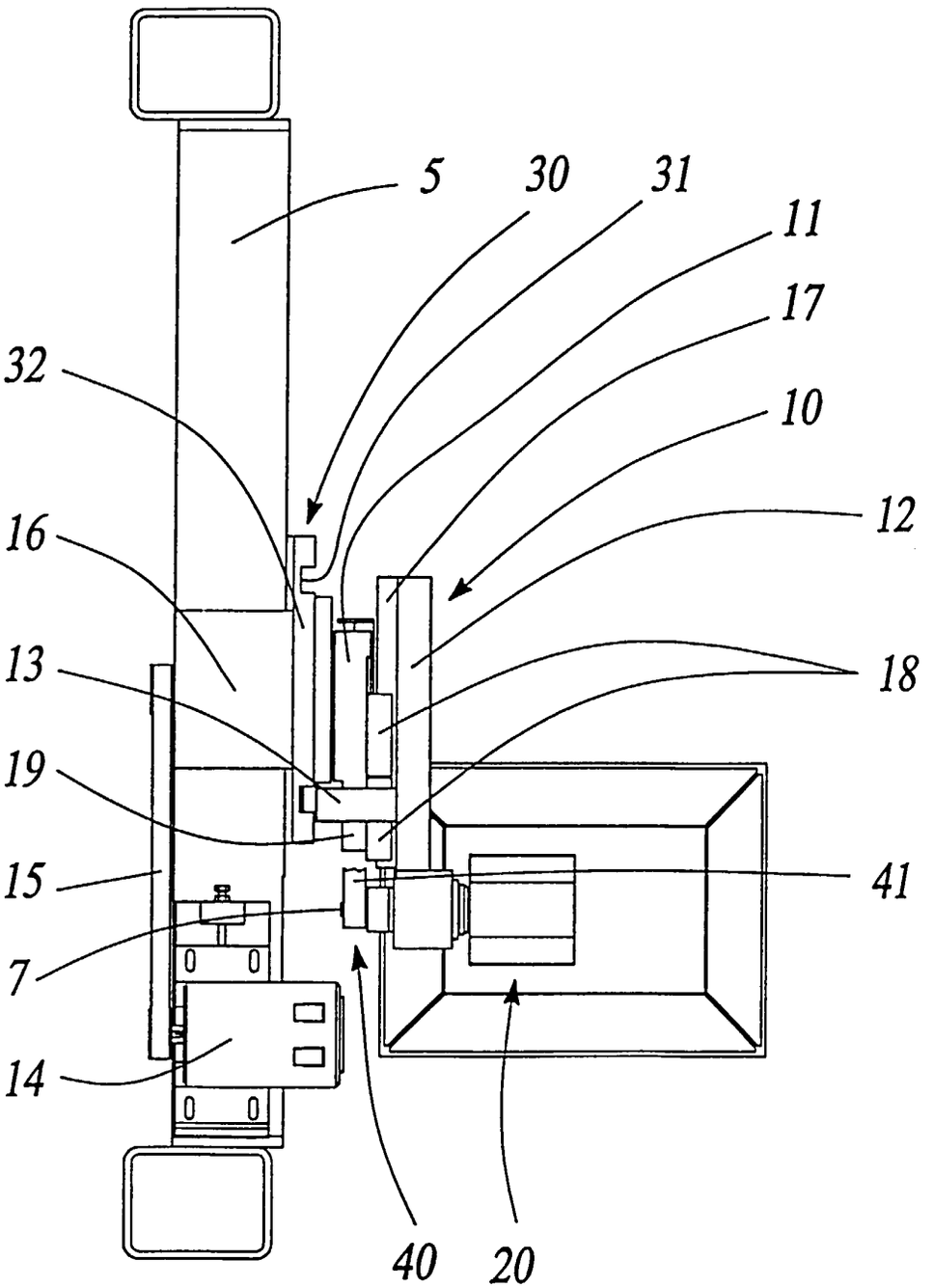


FIG.5

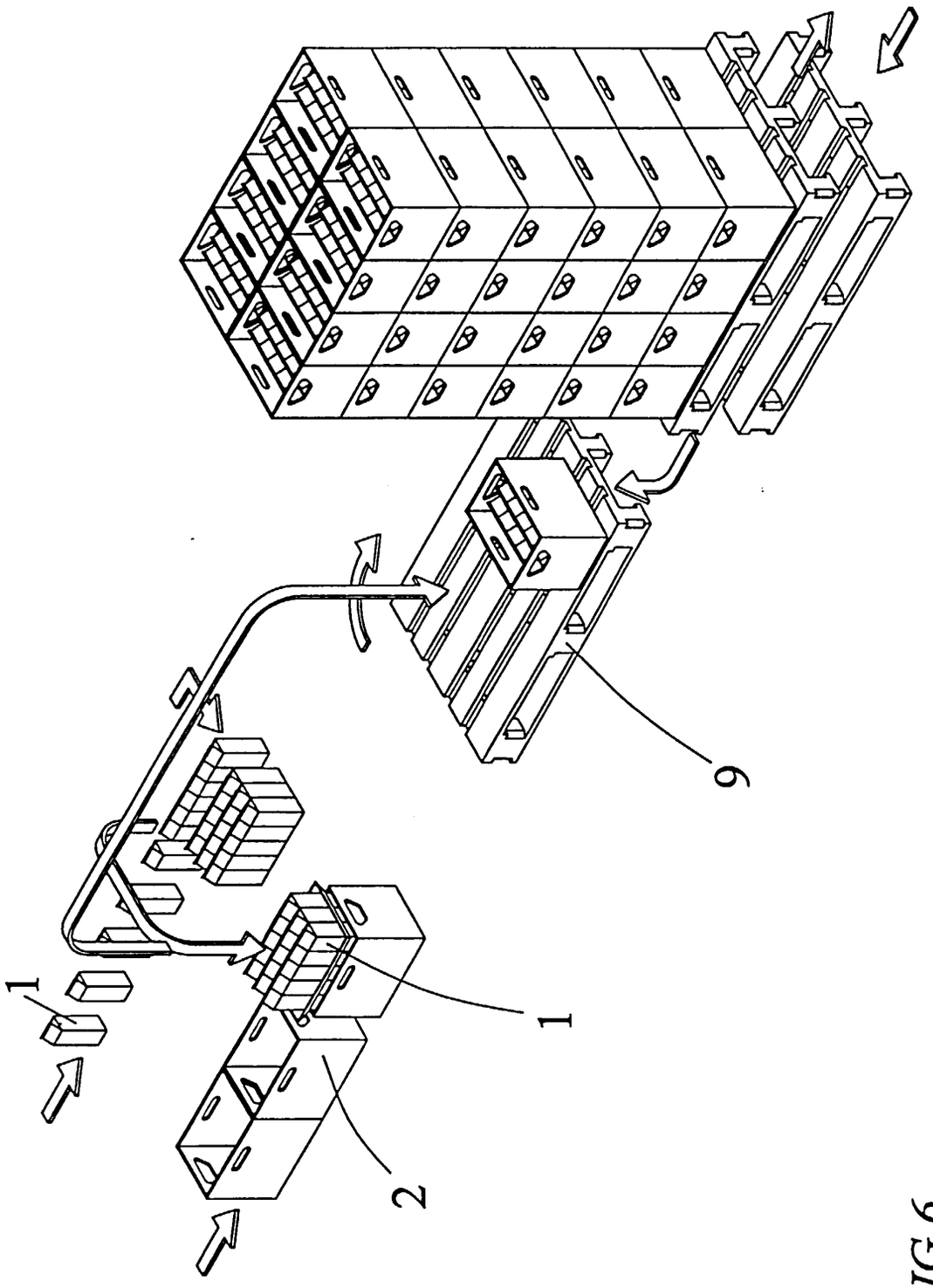


FIG.6