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## (54) Device and method of filling a container with product for storage and/or transport thereof

(57) The invention relates to a device for filling a container (1) for storage and/or transport with product, in particular crops, for instance potatoes (2), comprising supply means and a filling location where an empty container (1) can be positioned for filling purposes, wherein the supply means carry the products to the container, and wherein a buffer bin (4) with a closable outflow opening (10) is arranged between the supply means and the filling location for receiving a determined quantity of product before the container is filled. The invention also relates to a method.

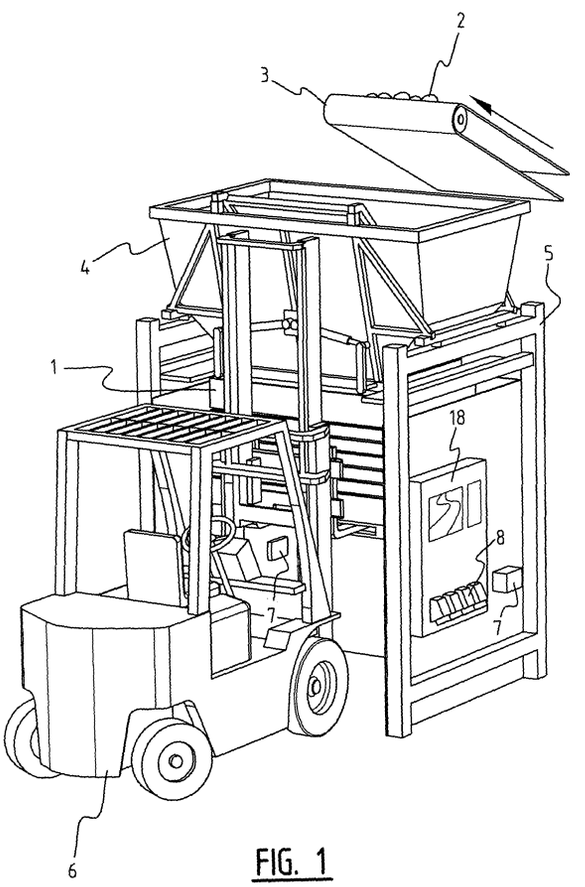


FIG. 1

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## Description

**[0001]** The present invention relates to a device and method for filling a container for storage and/or transport with product, in particular crops, for instance potatoes. The device comprises supply means and a filling location where an empty container can be positioned for filling, wherein the supply means carry the products to the container. The method comprises the steps of a) supplying product in the direction of the container, and b) dropping the product into the container from a minimal drop height.

**[0002]** Many crates are filled every year with agricultural products such as potatoes, onions, chicory root, carrots, flower bulbs and so on. During filling of the crate it is important to place the product in the crate without damage. In addition, the crate must be properly filled. If a crate is too full, the product is then damaged when a subsequent crate is placed thereon, and there is a chance of spillage. If a crate is not full enough, this signifies a less than optimal utilization of the available space.

**[0003]** Different devices and methods for filling crates with for instance potatoes are known from the prior art. A first prior art crate filler is provided with a horizontal adjustable feed belt, wherein a filling location for a crate is situated at each end surface thereof. The end surfaces of the horizontal feed belt can be tilted into the crate, so that the reversing end of the belt reaches close to the bottom of the crate. The crates are filled in turn with potatoes. During filling the downward tilted end of the feed belt is returned slowly to the horizontal position and the horizontal feed belt is displaced in the direction of the empty crate placed opposite in order to lower the other end into the crate.

**[0004]** In a second crate filler known from the prior art, vertically adjustable filling belts with finger-like carrier members are provided on the ends of the horizontal adjustable feed belt, which carrier members are lowered into the crate and drop the product layer by layer into the crate from a minimal drop height.

**[0005]** Although these known crate fillers place the product in the crate without damage, they have the following drawbacks. Firstly, the known crate fillers take up a lot of space due to the configuration of two filling locations the size of a crate and the feed belt with drive construction situated therebetween. In addition, these crate fillers are subject to malfunction and wear as a result of the moving construction components. Although it appears to be a dual system, doubling of the capacity relative to a single crate filler is not achieved since the second crate is only filled once the first crate has been completely filled. The filled crate is collected by a forklift truck driver who, as a result of protruding machine components, must be alert when removing a full crate and placing an empty crate. A final drawback is that the driver has different routes to cover, which can cause a delay in the filling process.

**[0006]** Known from the Netherlands patent application 9201646 is a filling device wherein materials are carried on a conveyor belt into a buffer bin or filling holder, which is arranged between the conveyor belt and a crate in which the products must be received. The filling holder has a bottom formed by pivoting flaps. The side of the filling holder directed toward the conveyor belt is closed by a screening wall. The filling holder is moved downward in each case during filling thereof. The filling holder is moved into a crate situated thereunder. During pouring the filling holder is moved upward. The known construction is however rather complicated.

**[0007]** The object of the present invention is to provide a device wherein the above stated drawbacks are obviated.

**[0008]** According to a first aspect of the invention, there is provided for this purpose a device for filling a container for storage and/or transport with product, in particular crops, for instance potatoes, comprising:

- supply means for supplying the product to a filling location where an empty container can be positioned for filling purposes;
- a frame;
- a stationary buffer bin, positioned between the supply means and the filling location and arranged on the frame, for receiving a determined quantity of product before the container is filled;

wherein the supply means are adapted to introduce the product from above into the buffer bin, and the buffer bin is provided with a closable outflow opening via which a container placed thereunder can be filled.

**[0009]** The device according to the invention has a buffer bin which is arranged between the supply means and the filling location and which has a closable outflow opening for receiving a determined quantity of product before the container is filled. Because a buffer bin is used, a more compact device is obtained compared to the prior art, while this is not to the detriment of the filling capacity of the device.

**[0010]** In a preferred embodiment lifting means are provided at the filling location for lifting the bottom of the container to a position close to the outflow opening and for lowering the bottom during filling of the container. The lifting means can for instance be formed by a forklift truck or by a lifting mechanism designed especially for the device. Because the buffer bin remains stationary and the container is displaced up and downward, it is possible to suffice with a relatively simple construction. The device can moreover be modified quickly and easily for application of different types (dimensions, form, material, etc.) of containers.

**[0011]** The buffer bin is preferably provided with at least one pivoting flap for closing the outflow opening. Opening and closing of the pivoting flap can take place automatically or on command using suitable means.

**[0012]** In an advantageous embodiment the outflow

opening is arranged in or close to the bottom of the buffer bin. The filling location is in that case situated under the buffer bin, whereby a further space saving is achieved compared to the prior art.

**[0013]** The container for storage and/or transport is preferably a crate or a big-bag.

**[0014]** In order to enable proper filling of a crate, there is preferably arranged a transverse partition dividing the outflow opening in two. Filled crates are often stacked on top of each other. On the underside the crates have a supporting beam in the centre which can damage the product when a crate is overfilled. Because the outflow opening is now divided in two, the product from the buffer bin is placed in the crate such that two peaks of product are created at the top of the crate, with space between the peaks for the cross beam on the underside of the crate for stacking thereon.

**[0015]** In order to collect the dirt still present in the product and not allow the outflow opening to become blocked, a blocking member is arranged in the buffer bin at a distance from the transverse partition.

**[0016]** The device is further provided with weighing means for weighing the content of the buffer bin. At a command from the weighing means the pivoting flap or flaps is or are opened. It is hereby possible to fill the containers precisely with a preset weight so that it is known how many kilograms of product in total are stored or delivered.

**[0017]** One or more fall breakers are further arranged in the buffer bin in order to also transfer the product from the supply means to the buffer bin without damage.

**[0018]** The supply means can be formed by a feed belt. According to another embodiment, the supply means comprise a crate tipper arranged above the buffer bin. It is hereby possible to also use the device for transferring product.

**[0019]** Finally, a sack can be arranged in the buffer bin, the end of which sack is situated in the outflow opening of the buffer bin. The trunk-like outer end of the sack then serves as the actual outflow opening of the buffer bin. The pivoting flap(s) serve(s) to regulate the size of the outflow opening, or a piece of string can be tied round the trunk.

**[0020]** With the device according to the invention a container can be filled very quickly and without disruption, and without damaging product herein.

**[0021]** In addition, the invention has for its object to provide an improved method for filling a container for storage and/or transport with product as according to the type described in the introduction. According to the invention there is provided for this purpose a method for filling a container for storage and/or transport with product, in particular crops, for instance potatoes, comprising the steps of:

a) supplying product in the direction of the container, and

b) dropping the product into the container from a minimal drop height, wherein during step a) and before step b) the following steps take place of:

c) arranging product in a buffer bin from above until the buffer bin is filled with a determined quantity of product,

d) subsequently emptying the content of the buffer bin in one operation into the container, wherein the bottom of the container is moved an increasingly greater distance from the outflow opening of the buffer bin during step d).

**[0022]** The preferably empty container is herein positioned at the filling location such that a closable outflow opening of the buffer bin is placed close to the bottom of the empty container. It is hereby possible to have the product drop into the container from a minimal drop height without herein damaging the product.

**[0023]** During emptying of the buffer bin into the container the bottom of the container is moved an increasingly larger distance from the outflow opening of the buffer bin. In this manner the content of the buffer bin is transferred to the container quickly and without damaging the product.

**[0024]** During filling of the buffer bin the content thereof is preferably weighed and, when a preset weight is reached, the supply of product is interrupted in order to then empty the content of the buffer bin into the container in one operation by opening the closable outflow opening, wherein the product falls into the container from a minimal drop height.

**[0025]** A crate or a big-bag can be chosen as container for storage and/or transport.

**[0026]** Step a) can further be carried out using a feed belt or a crate tipper, which is placed above the buffer bin for filling purposes. Product can be transferred in simple manner with a crate tipper.

**[0027]** Finally, a sack can be arranged in the buffer bin for filling purposes, the end of which sack is situated in the outflow opening of the buffer bin. The trunk-like end of the sack then serves as the actual outflow opening of the buffer bin. The size of the outflow opening can be readily modified to the desired outflow of product.

**[0028]** The invention will be elucidated with reference to the annexed drawings. In the drawings:

Figure 1 shows a perspective view of the device according to the invention,

Figure 2 shows a perspective view with partly cutaway parts of the device of figure 1, wherein the flaps are closed,

Figure 3 shows a perspective view with partly cutaway parts of the device of figure 1, wherein the flaps are opened,

Figures 4A-4G show a schematic representation of the filling of a crate according to the method of the invention,

Figures 5A and 5B show a schematic representation of the removal of dirt from an outflow opening

of a buffer bin,

Figure 6 is a perspective view of a device according to the invention provided with a crate tipper,

Figure 7 is a partly cut-away perspective detail view of the buffer bin,

Figure 8 shows a device according to the present invention deployed as big-bag filler, and

Figure 9 shows a schematic representation of another application of the device according to the present invention.

**[0029]** Figure 1 shows a perspective view of a device for filling crates 1 with for instance potatoes 2. The device comprises a feed belt 3 which debouches on the top side of a buffer bin 4. Buffer bin 4 is mounted on a frame 5 such that space is created under buffer bin 4 for positioning an empty crate 1 that has to be filled. The positioning of an empty crate 1 and discharge of the filled crate 1 take place by means of a fork-lift truck 6. Sensors 7 and connectors 8 are mounted on frame 5 for the purpose, among others, of controlling feed belt 3.

**[0030]** The partly cut-away detail view of figure 2 shows that fall breakers 9 are provided in buffer bin 4. These fall breakers 9 break the fall of the potatoes as they are transferred from feed belt 3 to buffer bin 4. On the underside the buffer bin 4 is provided with an outflow opening which can be closed by means of two pivoting flaps 10. Each pivoting flap 10 pivots about a pivot shaft 11, which is connected via a pivot arm 12 to a cylinder 13. On the underside of buffer bin 4 is further arranged a transverse partition 14 dividing the outflow opening in two. Transverse partition 14 is a reverse V-shaped beam to which the free ends of pivoting flaps 10 connect for the purpose of closing the outflow opening of buffer bin 4.

**[0031]** With reference to figure 3 it can be clearly seen that above and at a distance from transverse partition 14 a blocking member 15 is arranged in buffer bin 4. This blocking member 15 prevents foliage and the like present between potatoes 2 from remaining on the upper side of transverse partition 14 and impeding closing of pivoting flaps 10. Blocking member 15 can optionally be rotated through one turn when flaps 10 open, so that the foliage falls into crate 1 along with potatoes 2. In figure 3 it is further just possible to see a stop sensor 16 which is mounted on frame 5 at the position of pivot shaft 11 of flap 10. A similar stop sensor (not shown in the drawing) is situated on the other side of buffer bin 4. Stop sensors 16 detect when an empty crate 1 is in position for receiving potatoes 2 from buffer bin 4.

**[0032]** Buffer bin 4 is arranged on either side on weighing beams 17 in order to weigh the content of buffer bin 4. The signals from weighing beams 17 are converted in control unit 18 into control signals for feed belt 3 and cylinders 13.

**[0033]** The method according to the invention will be elucidated hereinbelow with reference to figures 4A-4G.

**[0034]** Before the supply of potatoes 2 can be started, weighing beams 17 are set to 0 kg, whereafter filling of buffer bin 4 can begin. Feed belt 3 supplies potatoes 2 above buffer bin 4. Potatoes 2 enter the buffer bin 4 via fall breakers 9 without being damaged (figure 4A). A fork-lift truck driver drives beneath buffer bin 4 with an empty crate 1 and lifts crate 1 upward so that buffer bin 4 lowers into crate 1 and the outflow opening of buffer bin 4 is situated close to the bottom of crate 1 (figures 4A and 4B). When crate 1 has been moved far enough upward, it comes into contact with stop sensors 16. The sensors generate a signal to control unit 18 as an indication that an empty crate 1 lies ready to be filled. As soon as the content of buffer bin 4 reaches the preset weight, feed belt 3 is immediately stopped and the two pivoting flaps 10 are immediately opened using cylinders 13 (figure 4C). At the moment the two pivoting flaps 10 open, the potatoes 2 fall into crate 1, wherein the drop height is minimal so that no damage occurs (figure 4D). The fork-lift truck driver quickly lowers crate 1 so that crate 1 is rapidly filled with potatoes 2 (figures 4D and 4E). As soon as crate 1 is at the bottom, the fork-lift truck driver can drive away therewith to the storage area. When crate 1 is at the bottom, contact is made with sensors 7 which generate a signal to control unit 18, which in turn gives the command to close the two pivoting flaps 10 and to drive feed belt 3 (figure 4F). While the fork-lift truck driver places the full crate 1 in storage and returns with an empty crate 1, buffer bin 4 is filled once again with potatoes 2 (figure 4G) until the preset weight is reached, so that the content of buffer bin 4 can be discharged rapidly into crate 1.

**[0035]** Due to the transverse partition 14 two peaks of product are created at the top of crate 1 during filling (see figure 4E), and since the crates have on the underside a cross beam in the centre a crate can now be placed on top of the filled crate without therein damaging product.

**[0036]** Figures 5A and 5B show how flaps 10 close. Owing to the closing position of flaps 10 not being the same (figure 5B), dirt such as foliage which has come to lie on transverse partition 14 is easily removed. When no blocking member 15 (figure 3) is provided in the buffer bin, the foliage and the like falls directly onto transverse partition 14. By now closing the flaps 10 to the dissimilar closing position shown in figure 5C after emptying of the buffer bin, and from a position of open flaps 10 (figure 5A), the foliage will automatically drop downward when flaps 10 are opened again.

**[0037]** Figure 6 shows a device according to the invention with crate tipper 19. The crate tipper is a per se known device for tipping and emptying crates. The crate tipper 19 comprises a basic frame 20 and a tilting frame 21 tiltable relative to basic frame 20. A motor 22 is provided for tilting the tilting frame 21. Tilting frame 21 comprises a fixed bottom 23 and a partly pivotable cover 24. Using a fork-lift truck a filled crate can be placed via the front side into crate tipper 19, between bottom 23 and cover 24. Using motor 22 the tilting frame 21 is then tilted

rearward relative to basic frame 20. The crate is rotated through more than 90° so that the top side of the crate is then directed downward in the direction of buffer bin 4, and the partly pivoting cover 24 opens. The content of the crate is hereby gradually tipped over into buffer bin 4. Once the desired quantity of product has been tipped into buffer bin 4, tilting frame 22 is returned to its starting position.

**[0038]** In the device of figure 6 two flaps 27 are further mounted on the underside of buffer bin 4. Flaps 27 are attached to chains 25 which are fixed to the extended pivot arms 12. When flaps 10 are opened, flaps 27 will be lowered and descend into the container to ensure that no product falls out of the container during the downward movement of the container.

**[0039]** In the device of figure 6 is also shown that frame 5 is height-adjustable using a pin/hole connection 17 arranged in each leg.

**[0040]** The configuration shown in figure 6 can be used for tipping product from a crate into a crate of different or the same type. In the case of onion sets, potatoes, grass seed and such products, which are placed in front of a drying wall in wet conditions, it is sometimes suitable to transfer the product. The drying time is sometimes hereby shortened by as much as 60 to 70%.

**[0041]** Figure 7 shows a partly cut-away perspective detail view of buffer bin 4. Corresponding components are designated with the same reference numerals.

**[0042]** Figure 8 shows a device according to the present invention applied as big-bag filler. The big-bag filler is substantially identical to the crate filler, with the difference that transverse partition 14 and blocking member 15 have been omitted, that parts 26 of the outflow opening are folded away, and that a sack 30 is optionally arranged in buffer bin 4, the end 31 of which sack is situated in the outflow opening of buffer bin 4. The end 31 of sack 30 is held closed by the two pivoting flaps 10 and extends downward beyond these flaps 10. A trunk-like outflow opening is hereby obtained, the diameter of which, and therefore the quantity of product dispended thereby per unit of time, can be regulated by means of flaps 10. An empty big-bag 32 is suspended from the forks 33 of the fork-lift truck. A lifting platform 34 places the bottom of the big-bag a short distance from the outflow opening in order to reduce the drop height of the products during filling of the big-bag. During filling of the big-bag the lifting platform will move downward under the increasing weight. It is also possible to fill big-bags without making use of sack 30.

**[0043]** Big-bags are used increasingly more often to package agricultural products, and in particular planting material. A drawback of big-bags is that they take up a lot of floor space, since the filled big-bags can hardly be stacked. If the potatoes will not be removed immediately after sorting, it is then possible to store the potatoes in the correct quantities, preferably depending on the weight, in crates which can be stacked. When the potatoes are collected, the crates can be tipped into big-bags quickly and easily for transport using the device of figure 8 extended with the crate tipper 19 of figure 6.

**[0044]** Figure 9 shows a variant of the configuration shown in figure 8. The trunk-like outflow opening 31 is used here as dispensing means for dosed delivery of product. Instead of flaps 10, a piece of string tied round the trunk-like end 31 can also serve as regulating means for regulating the size of the outflow opening. Under the outflow opening can be placed a conveyor belt 35 with speed control which discharges the products to a truck, sorting machine, clod separator, cutting machine or the like. The device then in fact functions as dispensing bunker for the following truck or machine. The device of figure 9 can also be combined with a crate tipper 19 (figure 6).

**[0045]** Using the device and method according to the invention it is possible to know precisely how many kilograms of product are in storage. This can be particularly important for the buyer of the product. Everything can be planned better in advance so that no surpluses or shortages result. In addition, it is possible to deliver a batch of product to the exact kilogram, as the buyer desires.

**[0046]** The speed of the device is high, sixty tons per hour being readily feasible, and the device is also only 2 to 2.5 metres wide. Compared to traditional crate fillers, the device according to the present invention has much fewer rotating structural parts, whereby fewer malfunctions occur as well as less maintenance being necessary.

**[0047]** The invention is not limited to the embodiment shown in the accompanying drawings.

## Claims

1. Device for filling a container for storage and/or transport with product, in particular crops, for instance potatoes, comprising:

   - supply means for supplying the product to a filling location where an empty container can be positioned for filling purposes;
   - a frame;
   - a stationary buffer bin, positioned between the supply means and the filling location and arranged on the frame, for receiving a determined quantity of product before the container is filled;

   wherein the supply means are adapted to introduce the product from above into the buffer bin, and the buffer bin is provided with a closable outflow opening via which a container placed thereunder can be filled.

2. Device as claimed in claim 1, wherein lifting means are provided at the filling location for lifting the bottom of the container to a position close to the outflow

opening and for lowering the bottom during filling of the container.

**3.** Device as claimed in claim 1 or 2, wherein the buffer bin comprises one or more standing walls with which a stationary filling cavity is defined.

**4.** Device as claimed in claim 1, wherein the buffer bin is provided with at least one pivoting flap for closing the outflow opening.

**5.** Device as claimed in claim 2, wherein the outflow opening is arranged in or close to the bottom of the buffer bin.

**6.** Device as claimed in any of the claims 1-3, wherein the container for storage and/or transport is a crate or a big-bag.

**7.** Device as claimed in claim 4, wherein a transverse partition is arranged which divides the outflow opening in two.

**8.** Device as claimed in claim 5, wherein a blocking member is arranged in the buffer bin at a distance from the transverse partition.

**9.** Device as claimed in any of the claims 1-6, wherein the device further comprises weighing means for weighing the content of the buffer bin.

**10.** Device as claimed in any of the claims 1-7, wherein one or more fall breakers are arranged in the buffer bin.

**11.** Device as claimed in any of the claims 1-8, wherein the supply means comprise a crate tipper arranged above the buffer bin.

**12.** Device as claimed in any of the claims 1-9, wherein a sack is arranged in the buffer bin, the end of which sack is situated in the outflow opening of the buffer bin.

**13.** Method for filling a container for storage and/or transport with product, in particular crops, for instance potatoes, comprising the steps of:

a) supplying product in the direction of the container, and
b) dropping the product into the container from a minimal drop height, wherein during step a) and before step b) the following steps take place of:
c) arranging product from above in a buffer bin until the buffer bin is filled with a determined quantity of product,
d) subsequently emptying the content of the buffer bin in one operation into the container, wherein during step d) the bottom of the container is moved an increasingly greater distance from the outflow opening of the buffer bin.

**14.** Method as claimed in claim 11, wherein prior to step d) an empty container is positioned at the filling location such that a closable outflow opening of the buffer bin is located close to the bottom of the empty container.

**15.** Method as claimed in any of the claims 11-13, wherein during step c) the content of the buffer bin is weighed and, when a preset weight is reached, step a) is interrupted and step d) and b) then take place by opening the closable outflow opening.

**16.** Method as claimed in any of the claims 11-14, wherein a crate or a big-bag is chosen as container for storage and/or transport.

**17.** Method as claimed in any of the claims 11-15, wherein step a) is carried out using a crate tipper, which is placed above the buffer bin for filling purposes.

**18.** Method as claimed in any of the claims 11-16, wherein a sack is arranged in the buffer bin for filling purposes, the end of which sack is situated in the outflow opening of the buffer bin.

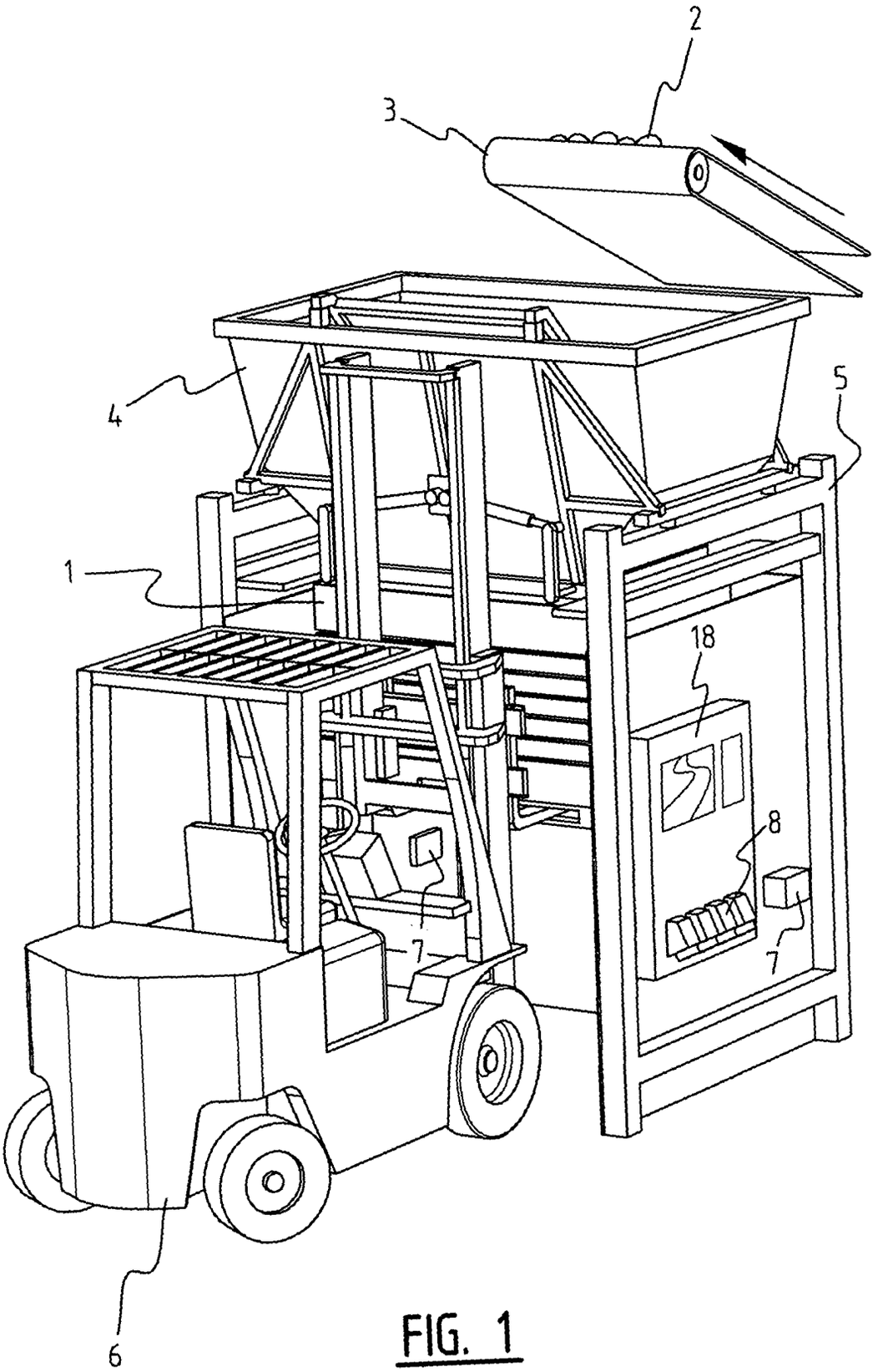


FIG. 1

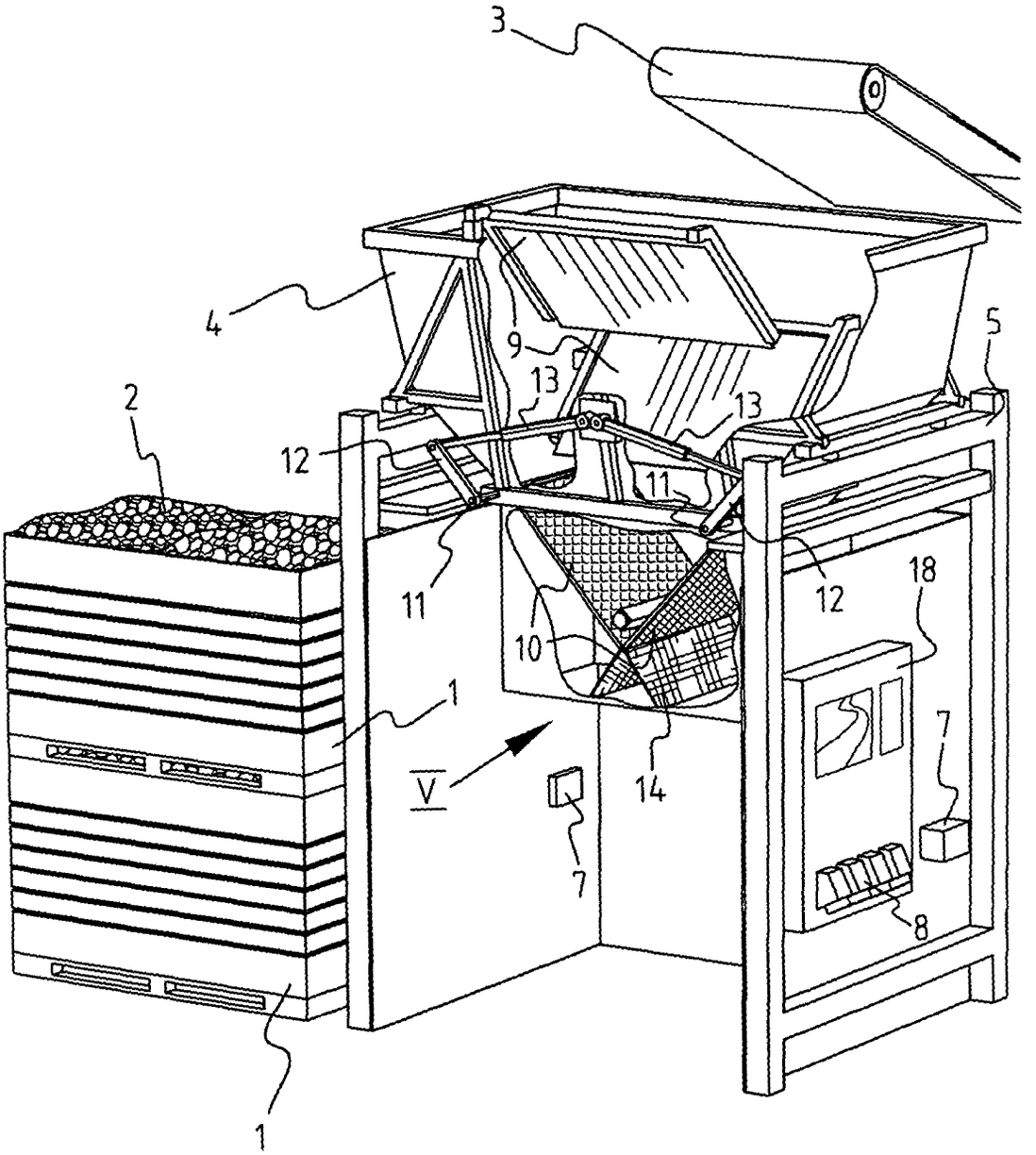


FIG. 2

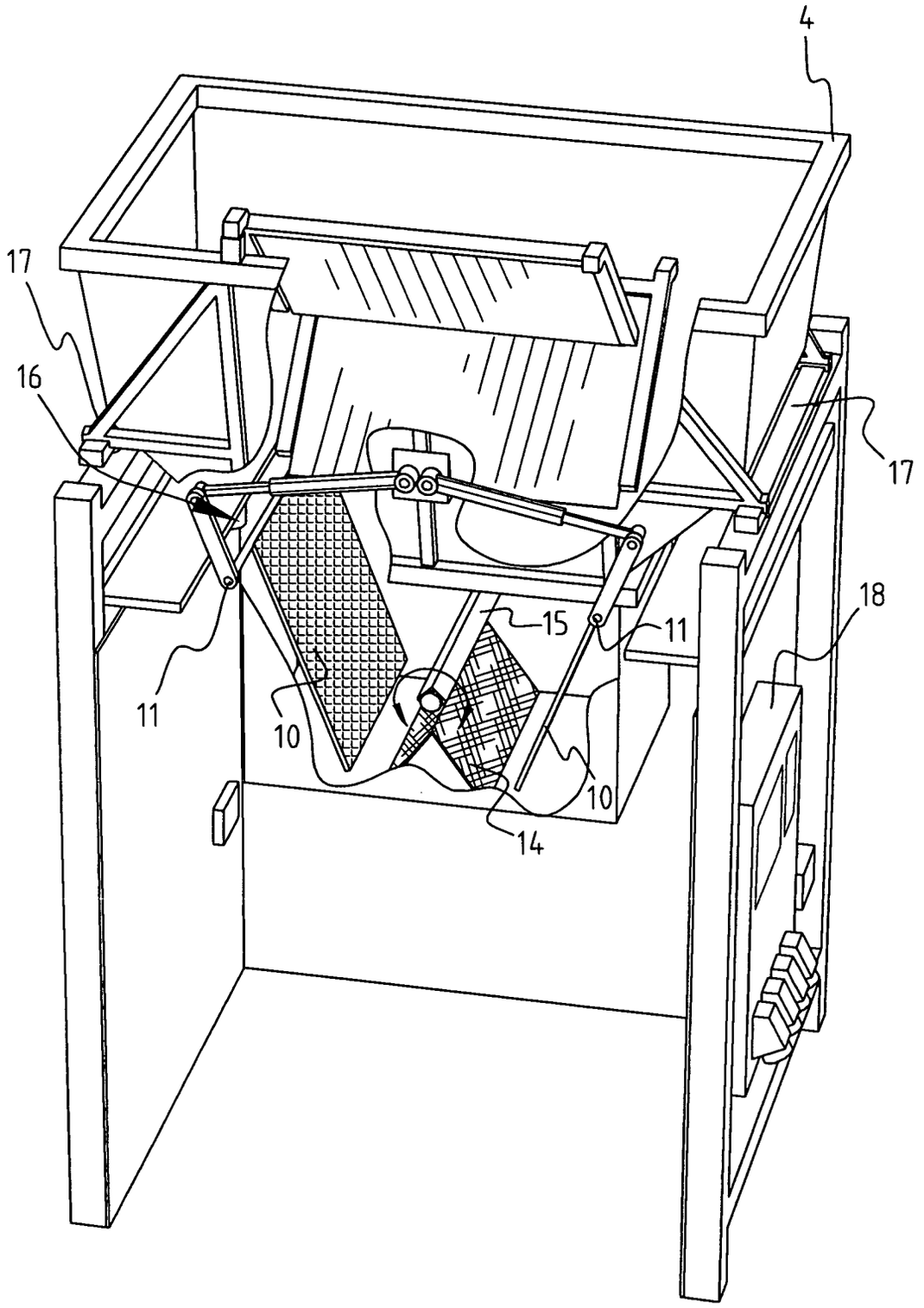


FIG. 3

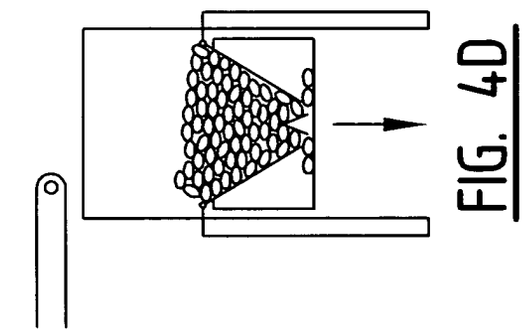

FIG. 4D

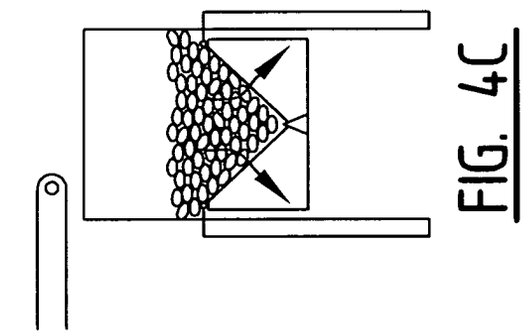

FIG. 4C

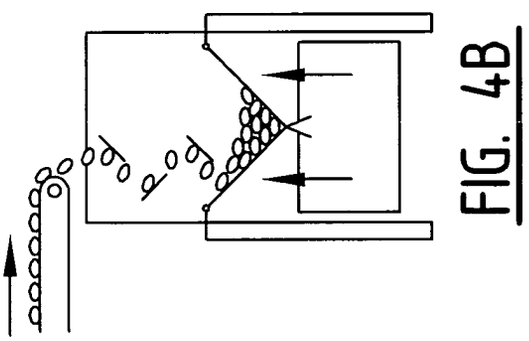

FIG. 4B

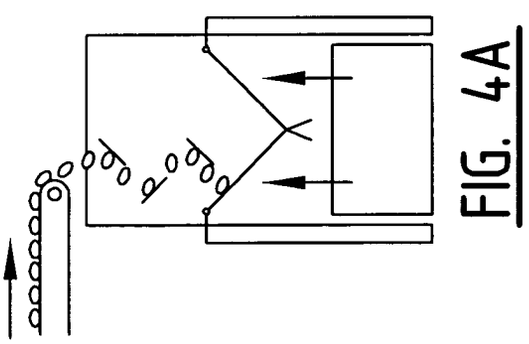

FIG. 4A

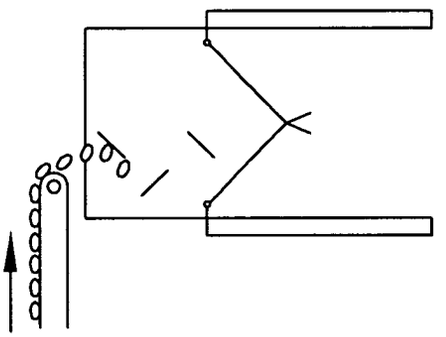

FIG. 4G

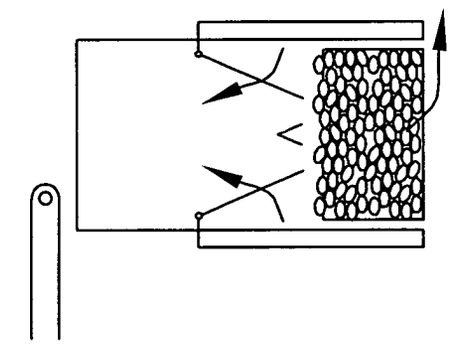

FIG. 4F

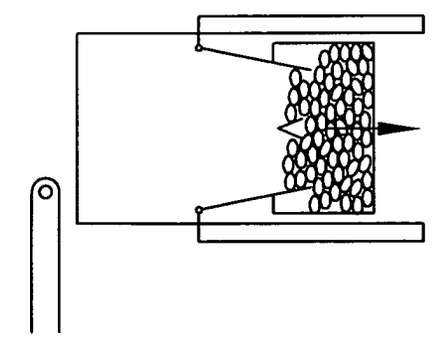

FIG. 4E

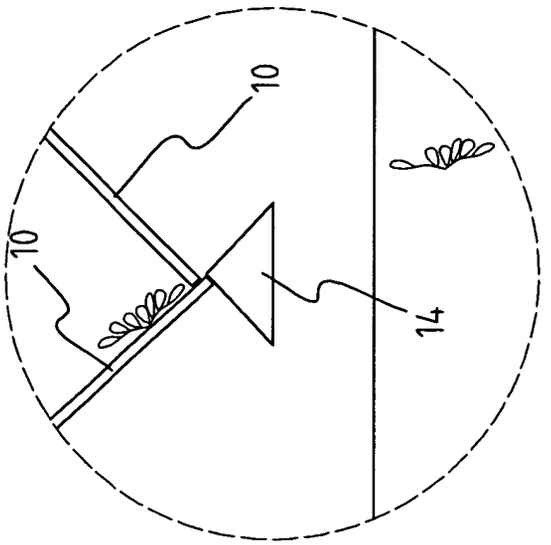


FIG. 5B

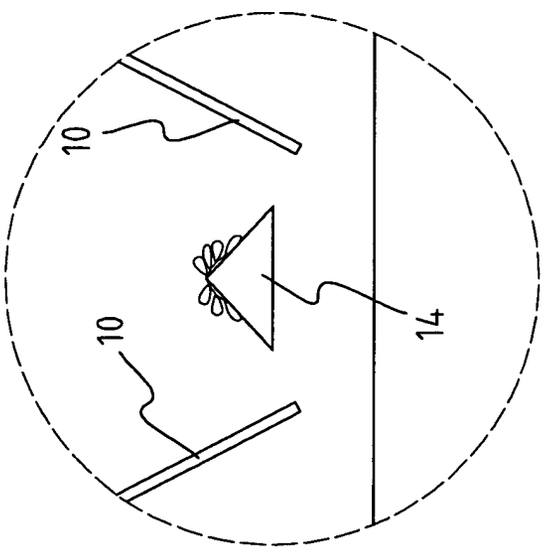


FIG. 5A

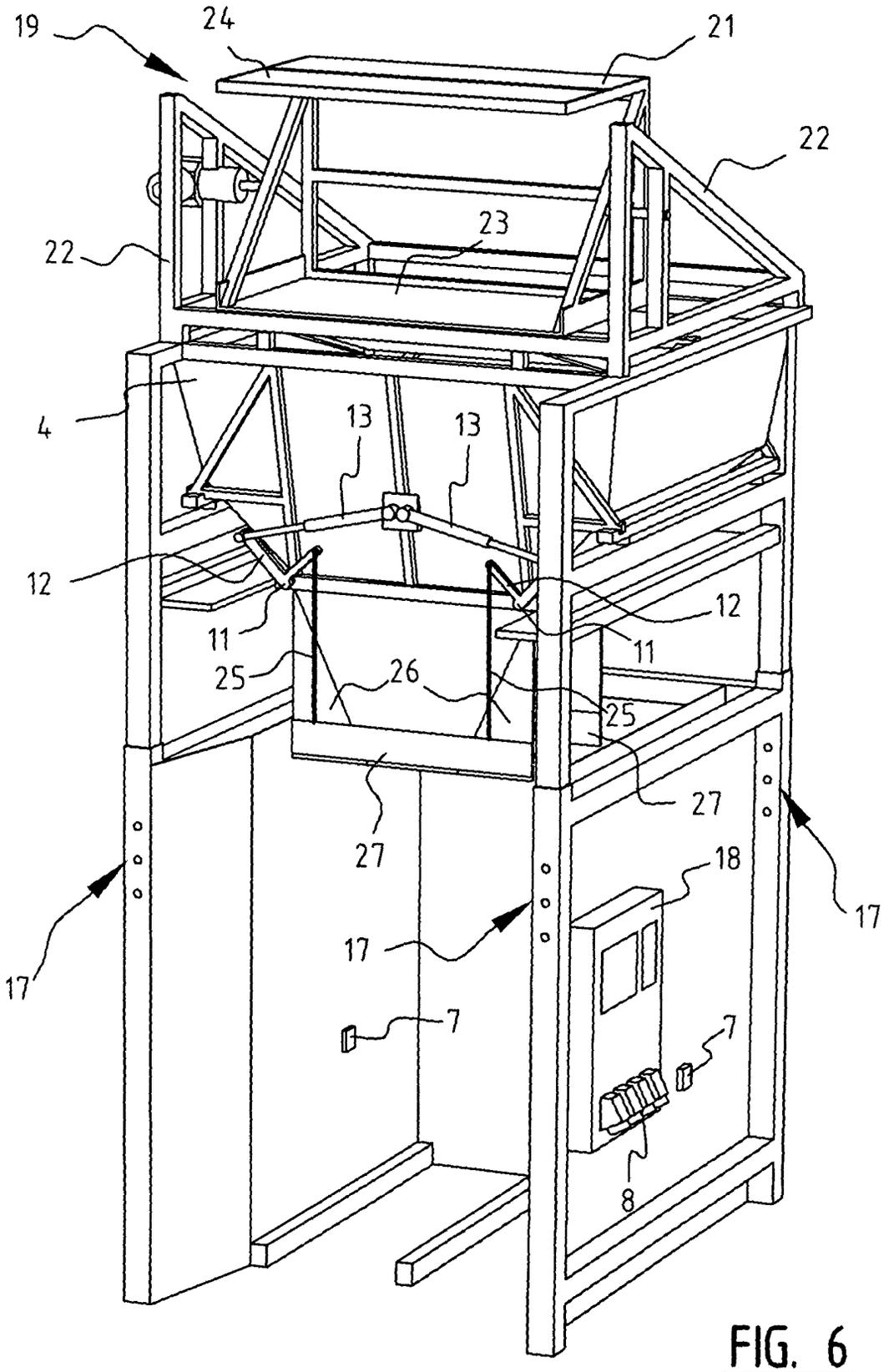


FIG. 6

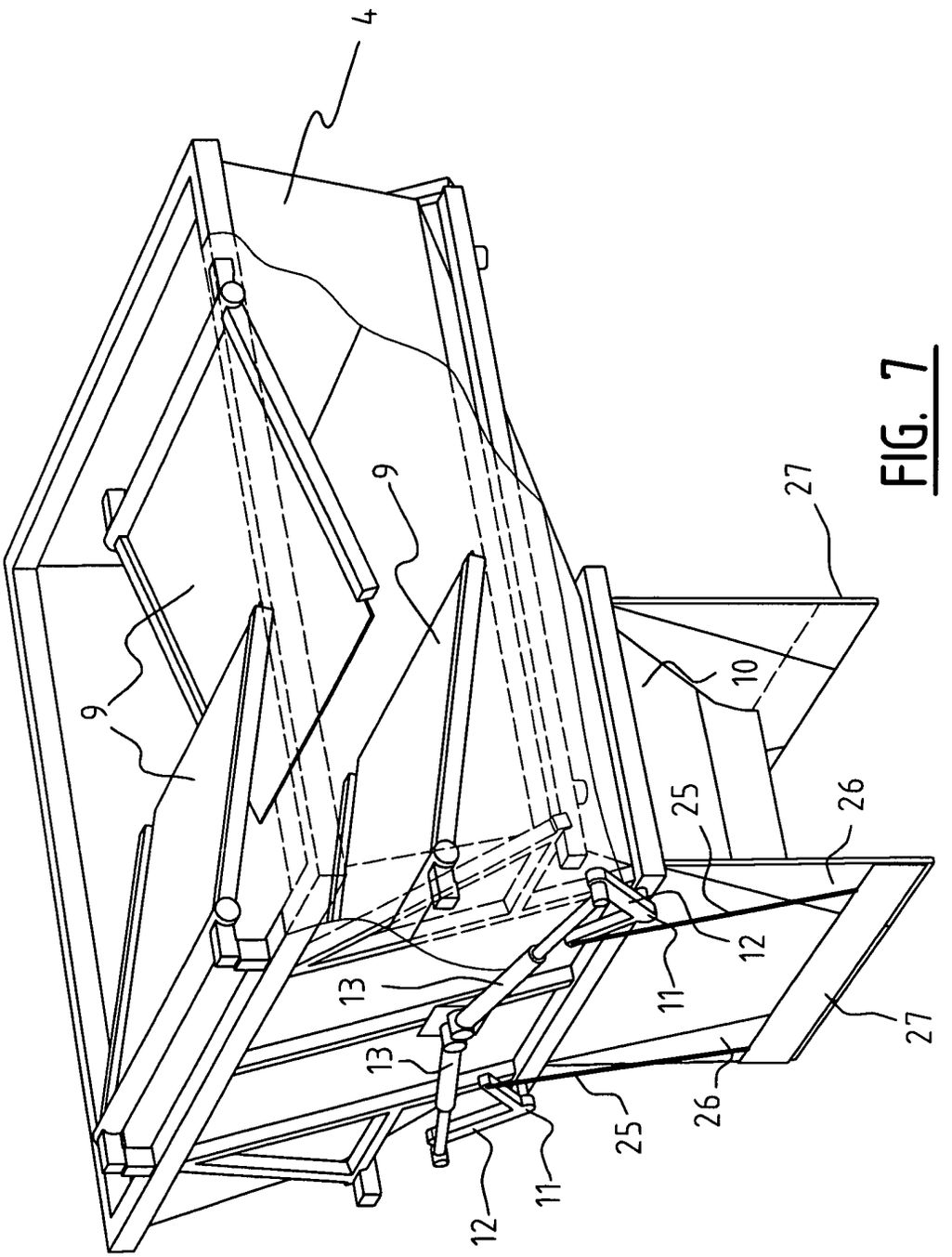


FIG. 7

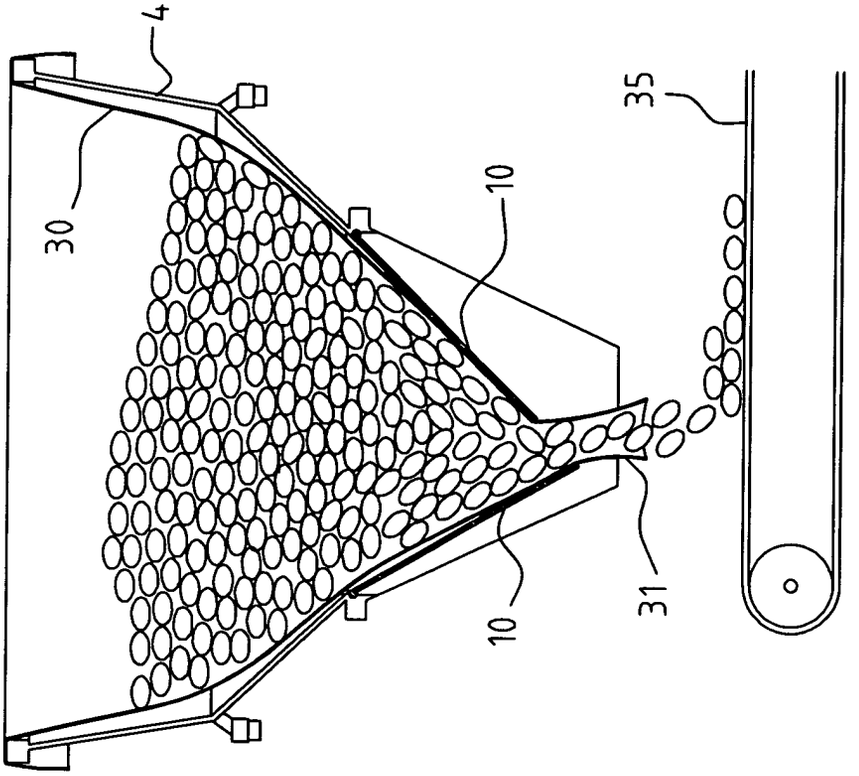


FIG. 9

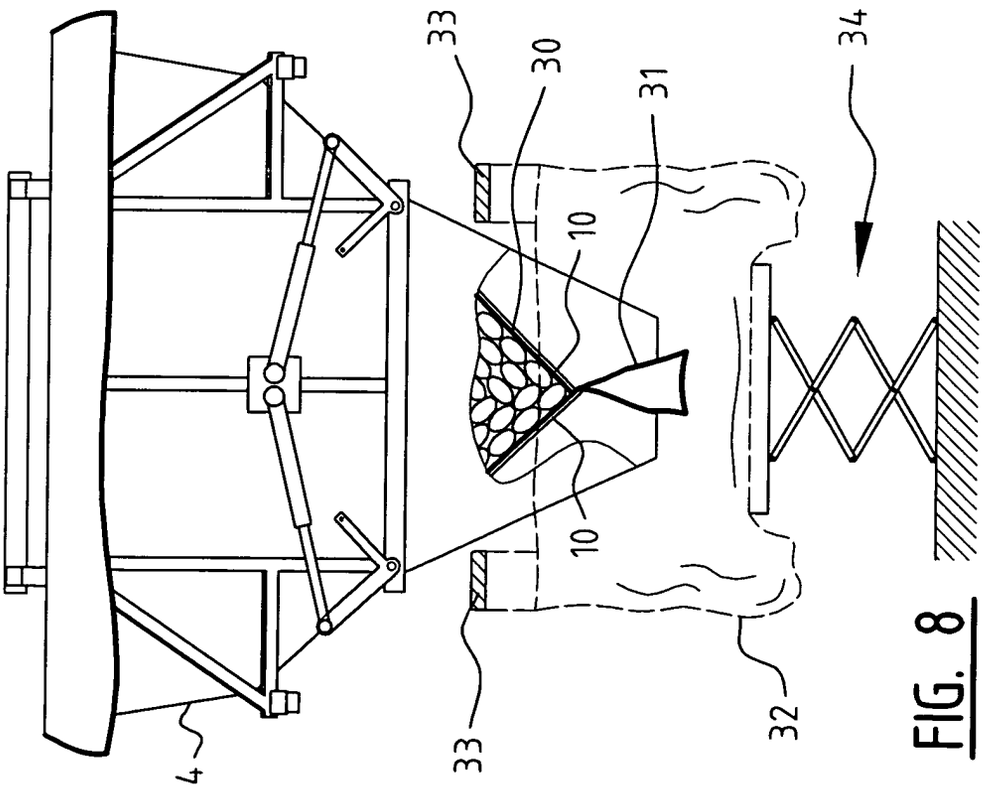


FIG. 8

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# EUROPEAN SEARCH REPORT

Application Number
EP 04 07 8047

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