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(54) **Waste handling method and apparatus**

(57) A waste handling method where waste bags (27) are collected at the source by a waste collecting truck (11) and brought to a transfer station (10) where the waste bags (27) are transferred into a transport container (20). The waste bags (27) are first emptied from the waste collecting truck (11) into an intermediate con-

tainer (17) or an intermediate storage (14, 24, 25), at which the free fall of the waste bags (27) remains low. The intermediate storage (14, 24, 25) can include a hopper (14) with inclined side walls or belt conveyors (24, 25), the intermediate container (17) can include as well a belt conveyor (18)



FIG. 8

## Description

**[0001]** The object of the invention is a waste handling method.

**[0002]** According to a known waste collecting method, wastes are collected from the source with a waste collecting truck and transported to a transfer station. There the waste is transferred into a larger container, i.e. a transfer container, in which the waste is transported to a landfill site for example. The current Waste Management Act, however, requires sorting and recovery of waste, and therefore also the households have to sort different wastes into different waste bags.

**[0003]** According to a waste collecting system the biological waste of the households is collected into black waste bags and the unsorted municipal waste into white waste bags. However, the same collection truck collects all bags in spite of the colour of the bags. At the transfer station the bags can be sorted or transferred into transfer containers or into transport containers for transporting to a sorting station. The problem in this case, however, is that the bags break easily during these handling procedures. However, they should not break, at least not before they are sorted.

**[0004]** The purpose of this invention is to create a new waste handling method, which does not have the disadvantages, mentioned above. It is characteristic of the waste handling method according to the invention, that the waste bags are first emptied from the waste collecting truck into an intermediate container, from which the waste bags are transferred into a transfer container or into a transport container.

**[0005]** In the waste handling method according to the invention, the intermediate container can be placed very close to the outlet hatch of the collecting truck, so that the free fall of the waste bags remains low. It can further be arranged such, that the free fall of the waste bags from the intermediate container to the transport container also remains low. Then the waste bags will not at any phase need to fall from a height and thus the waste bags will better remain intact during all handling phases all the way to the sorting station.

**[0006]** Another object of the invention is a waste handling equipment. It is characteristic of a waste handling equipment according to the invention that a transfer station is provided with an intermediate container, which is placed between the container that is to be unloaded and the container that is to be loaded. According to an advantageous embodiment of the invention, the intermediate container is located between the waste collecting truck and the transfer truck.

**[0007]** In the following, the invention is described, using examples, with reference to the accompanying drawings, in which

Figure 1 shows a side view of a transfer station according to the invention.

Figure 2 shows the transfer station in Figure 1 seen

from above.

Figure 3 corresponds to Figure 1 and shows the second embodiment of the transfer station.

Figure 4 shows the transfer station of Figure 3 seen from the other side.

Figure 5 corresponds to Figure 1 and shows the third embodiment of the transfer station.

Figure 6 shows the transfer station of Figure 5 seen from above.

Figure 7 corresponds to Figure 1 and shows the fourth embodiment of the transfer station.

Figure 8 shows a partly cross sectional view of a detail of the transfer station of Figure 3 seen from the side.

Figure 9 shows a detail of a transfer container according to the invention.

**[0008]** Figure 1 shows a side view of the transfer station 10 with a waste collecting truck 11 and a transfer truck 12. In the situation shown in Figure 1, the transfer truck 12 has brought the transport container 20 in a horizontal position to the transfer station. After that, the tilting mechanism 13 of the transfer station turns the transport container 20 to a vertical position, a hopper 14 that works as an intermediate container 20 is brought above the transport container 20 and the hatch 21 of the transport container 20 is opened. Now, the waste collecting truck 11 can tip the waste bags through the hopper 14 into the transport container 20. This embodiment handles lightweight wastes.

**[0009]** According to the invention the hopper 14 may be formed in such a way, that the falling movement of the waste bags is slowed down in the hopper 14. Since the waste bags are relatively light, the bags can be dropped without breaking from the hopper 14 straight to the bottom of the transport container 20. When the transport container 20 is full, the hatch 21 is closed and the transport container 20 is again turned into a horizontal position. After that the transport container 20 is pulled on the transfer truck 12 and transported by the transfer truck 12 to, for instance, a sorting station that is not shown in the figure.

**[0010]** The hatch 21 of the transport container 20, shown in Figure 1, works as the cover of the container when the transfer container is in a vertical position. At the same time the hatch in the transport container 20 is also the rear door, which is opened when the transport container 20 is tipped for emptying. Since the equipment shown in Figure 1 is meant for lightweight waste bags, the transport container 20 may be filled all the way to the top edge. If needed, the transport container 20 may, however, be equipped with a pressure sensor to determine the weight of the load and to prevent overloading.

**[0011]** In Figure 2, the transfer station 10 of Figure 1 is shown from above. It is provided with six transport containers 20, but with only three hoppers 14. In other words, every hopper 14 is meant to be used with two transport containers 20 located next to each other. That

is why every hopper 14 is attached by a hinge to a point between two hoppers 20a and 20b next to each other. In this way, the hopper 14 can be turned around the hinge 15 above the opening of whichever of the two transport containers 20a or 20b next to each other.

**[0012]** Figure 3 shows another embodiment of the transfer station 10, that is provided with an intermediate container 17 movable on the guide rails 16 above the transport container 20. This intermediate container 17 is most advantageously so large, that the waste collecting truck 11 can, if necessary, empty there the entire load. In the normal unloading situation, the intermediate container 17 does not, however, become full very easily, since the bottom of the intermediate container is provided with a conveyor belt 18, which during unloading all the time transfers the waste bags forward. On the conveyor belt 18 the waste bags are transferred above the opening of the transport container 20 and dropped into the container. Therefore, the intermediate container 17 does not fill up as long as the conveyor belt 18 is operating.

**[0013]** The conveyor belt 18 will, however, be stopped in case that the transport container 20, adjacent to intermediate container 17 becomes full. In that case, it is not necessary to interrupt unloading of the waste collecting truck 11, since the entire load fits into the intermediate container 17. When the waste collecting truck 11 has been emptied, the intermediate container 17 is moved along the rails 16 of the transverse track above the adjacent empty transport container 20. At the time when the second transport container is being filled, the waste bags in the first, already filled container can be compressed using a compactor 19 located next to the intermediate container 17, in order to get the hatch 21 of the transport container 20 closed.

**[0014]** Figure 4 shows a side view of the transfer station of Figure 3. As seen in the figure, this embodiment of the transfer station 10 is provided with six transport containers 20 next to each other and with one intermediate container 17. The intermediate container 17 is placed on a guide rail 16 of the track above the transport containers 20, the guide rail being so long that the intermediate container 17 can be moved to every transport container 20. The rail 16 is even a little longer, so that the waste bags of any of the transport containers 20 can be compressed by one or two compactors 19a and 19b attached to the intermediate container 17. On the guide rail 16 of the track there may also be located several intermediate containers 17.

**[0015]** in Figure 4 can be seen that the wall 22 of the intermediate container 17 is low at the area where the waste bags are tipped from the waste collecting truck into the intermediate container 17. On the other hand the side walls 23 are higher, preventing the tipped waste bags from falling over the side wall at this area. At the bottom of the intermediate container 17 there is seen a conveyor belt 18 that is therefore relatively close to the unloading opening of the waste collecting truck and also

close to the inlet opening of the intermediate container 17. The low free fall of the waste bags in both of these transfer phases efficiently prevents the waste bags from breaking.

**[0016]** Figure 5 shows an embodiment of the transfer station 10, which is intended for heavier waste. There the waste bags are brought above the opening of the transport container 20 by using two conveyors 24 and 25. Since the waste bags are heavier, they will be dropped against the inner side wall of the transfer container 20, the transfer container 20 being tilted at, for example, the angle of 30° - 40° relative to the vertical position. Hence the falling speed of the falling waste bags is reduced so that the breaking of the waste bags is prevented.

**[0017]** The tilting angle of the transport container 20 also has another meaning. It controls also the filling of the container. When the waste bags fall against the side wall of the transfer container 20, the transfer container 20 will be filled along the whole length of its one side. Since concerning heavyweight waste, it is important that the bags to be loaded will be evenly distributed over the whole length of the container. If, instead, the transport container 20 were filled in a vertical position with heavyweight waste bags, the highest allowed weight of the container would easily be achieved before the transfer container 20 was full. Hence, the waste bags accumulated only at the one end of the transport container would burden the front axle of the transfer truck, so that the front axle weight of the transfer truck would exceed the allowed limit. To prevent overload, the transfer containers can be equipped with pressure sensors.

**[0018]** In Figure 5 the embodiment of the transfer station 10 is provided with a second conveyor 25, which is an extension of the first conveyor, that is transfer conveyor 24, the second conveyor 25 being transverse or perpendicular to the first conveyor 24. The second conveyor 25, which works as an intermediate storage for the waste bags, is very close to the opening of the transfer container 20. Hence, the free fall and the falling speed of the waste bags will be as low as possible. Even though the gap between the transfer container 20 and the transverse conveyor 25 is small, the hatch 21 of the transfer container 20 is so constructed that it can still be opened. This is because the opening path of the hatch 21 or the rear door of the transport container 20 is low. In Figure 5 it is presented by a dashed line 26.

**[0019]** Figure 6 shows the transfer station 10 of Figure 5 seen from above. In this embodiment there are has two transport containers 20a and 20b next to each other, where the waste bags coming from the belt conveyor 24 are transferred by the transverse conveyor 25. The first transport container 20a is filled first by operating the transverse conveyor 25 into this direction. When the first transport container 20a has become full, the direction of the transverse conveyor 25 is turned into the opposite direction and the second transfer container 20b will be filled.

**[0020]** In the embodiment of the transfer station shown in Figure 7, the transport container 20 is also in a tilted position, since also there the heavyweight waste bags are handled. The waste bags tipped from the waste collecting truck 11 are first dropped into the hopper 14 and from that further into the transport container 20 against its inner side. These both falling phases are arranged in such a way that the falling speed of the waste bags is minimised. When the transport container 20 is full, the hopper 14 can be lifted up by turning it around the hinge 15.

**[0021]** Figure 8 shows a cross-section of a detail of the transfer station 10 in Figure 3. In the figure, a waste collecting truck 11 tips the waste bags 27 into the intermediate container 17, where the conveyor belt 18 at the bottom of the container transfers the waste bags above the opening of the transport container 20. This embodiment handles lightweight waste bags, which can be dropped without breaking straight to the bottom of the transfer container 20. In the equipment, however, the intermediate container 17 is necessary, because the breaking of the waste bags 27 could not be prevented if the waste bags were tipped straight into the transfer container 20 from the waste collecting truck 11.

**[0022]** In Figure 9 is presented the mechanism of the hatch 21 or the rear door of the transfer container 20 with the hatch 21 half-open. The opening mechanism of the hatch 21 is constructed in such a way, that it requires very little space to open the hatch 21. This goal is achieved by dividing the hatch 21 in two parts 21a and 21b which have been joined together with a hinge 28. The hatch 21 is opened with a hydraulic cylinder, whose first end is attached to the frame of the transport container 20 and other end is attached to the supporting arms 30 of the first part 21a of the hatch 21. When opening the hatch 21 the first part 21 a, pushed by the hydraulic cylinder 29, pulls open, by the aid of the hinge 28, also the second part 21b of the hatch 21. To the opposite edge 21b of the second part of the hatch 21 is attached a support roll 32, which moves along the guide rails 31 at the edge of the opening of the transport container 20. This kind of opening mechanism for the hatch 21 needs only very little space to open. Due to the small use of space, the intermediate container 17 for the waste bags can be placed very close to the opening of the transport container 20. Because of this, the free fall of the waste bags to the bottom of the transport container 20 remains as low as possible, which prevents the bags from braking.

## Claims

1. A waste handling method, according to which the wastes (27) are collected at the source by a waste collecting truck (11) or similar and taken to a transfer station (10), where the waste is transferred to a transfer container or to a transport container (20),

**characterised** in that at the transfer station (10) the waste bags (27) are emptied from the waste collecting truck (11) first into an intermediate container (17) or into an intermediate storage (14, 24, 25), from which they are transferred further to a transfer container or to a transport container (20).

2. A waste handling method as claimed in claim 1, **characterised** in

- that the transport container (20) is brought by a transfer truck (12) to the transfer station (10) in a horizontal position, after which the tilting mechanism (13) of the transfer station turns the transport container to a vertical position or to a tilted position,
- that an intermediate container (17) or intermediate storage (14, 24, 25) is brought above the transport container or adjacent to the upper end of the transfer container,
- that a waste collecting (11) truck tips the waste bags (27), most advantageously filled with lightweight waste, into an intermediate container or into an intermediate storage, from which the waste bags are further transferred to a transport container,
- and that the hatch (21) of the transport container is closed and the transport container is again turned to a horizontal position, after which the transport container is pulled on a transfer truck (12) and transferred to a sorting station, for example.

3. A waste handling method as claimed in claim 1 or 2, **characterised** in that at the transfer station (10) an intermediate container (17) or an intermediate storage (14, 24, 25) is brought above the transport container (20) or adjacent to the upper end of the transport container to such a position, that the distances from the waste collecting truck (11) to the intermediate container or to the intermediate storage and from there to the transport container are as short as possible.

4. A waste handling method as claimed in claim 1, 2 or 3, **characterised** in that at the transfer station (10) the waste bags (27) are emptied from the waste collecting truck (11) into an intermediate container (17) or into an intermediate storage (14, 24, 25), from which the waste bags are dropped against the tilted side wall of a transfer container or a transport container (20).

5. A waste handling method as claimed in any of the claims 1-4, **characterised** in that the waste bags (27) are emptied from the waste collecting truck (11) against the tilted wall of hopper (14) of the intermediate storage.

6. A waste handling equipment, which comprises a transfer station (10), where the wastes (27) are brought from the source by a waste collecting truck (11) or similar, and located at the transfer station a transfer container or transport container (20), where the waste is transferred, **characterised** in that at the transfer station (10) is provided with an intermediate container (17) or an intermediate storage (14, 24, 25) located between the waste collecting truck (11) or similar and the transfer container or transport container (20), into which intermediate container or intermediate storage the waste bags (27) are emptied from the waste collecting truck (11) or similar.
7. A waste handling equipment as claimed in claim 6, **characterised** in that the intermediate container (17) or the intermediate storage comprises at least one belt conveyor (18, 24, 25).
8. A waste handling equipment as claimed in claim 6 or 7, **characterised** in that on the bottom of the intermediate container (17) there is a conveyor belt (18), for transferring the waste bags (27), tipped into the intermediate container, from the intermediate container further to a transfer container or transport container (20).
9. A waste handling equipment as claimed in claim 6 or 7, **characterised** in that the intermediate storage comprises a transfer belt conveyor (24) and another belt conveyor (25) that is transversely or perpendicularly positioned relative to the transfer belt conveyor.
10. A waste handling equipment as claimed in claim 6, **characterised** in that the intermediate storage is a hopper (14) with tilted side walls.

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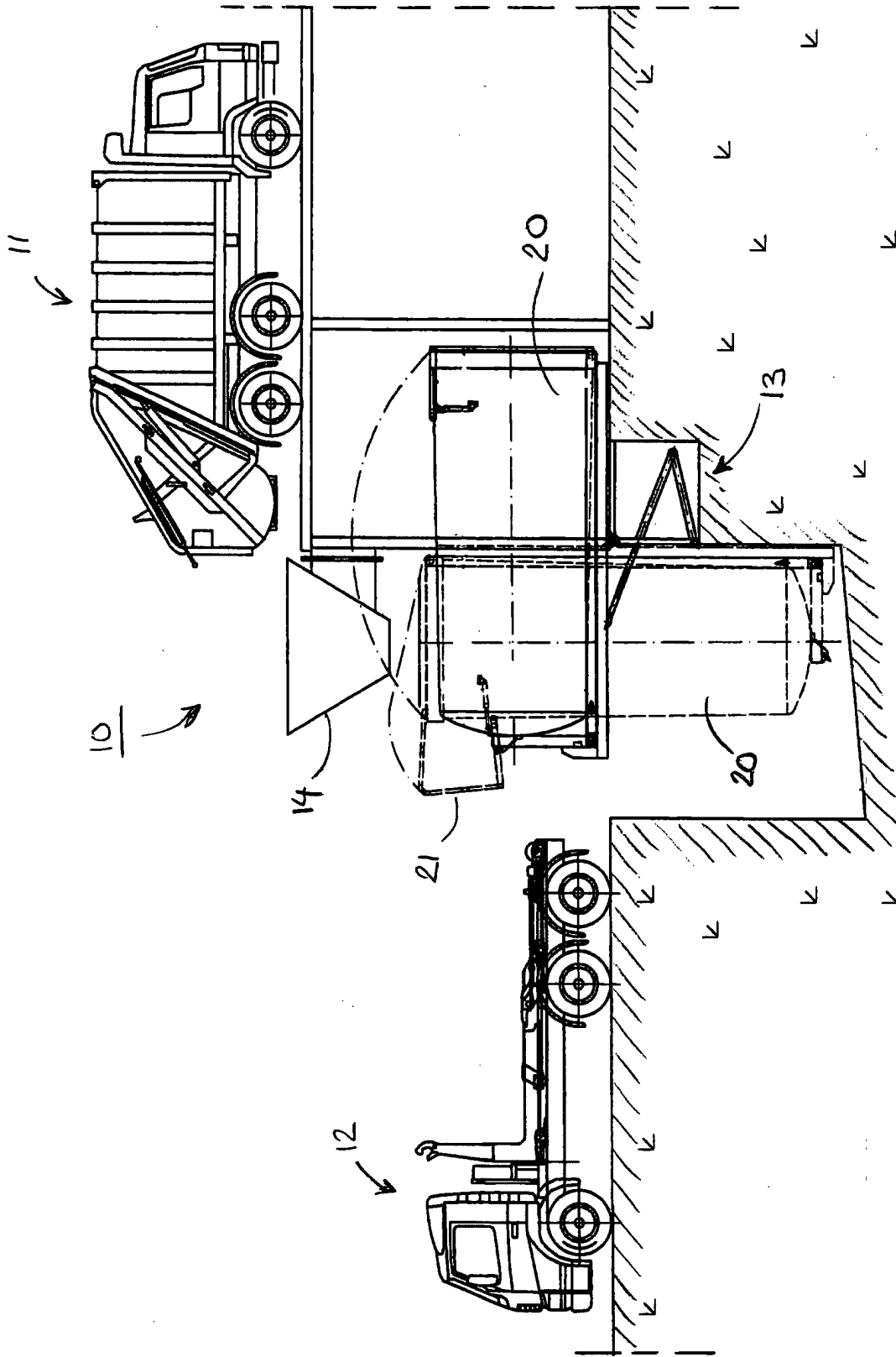


FIG. 1

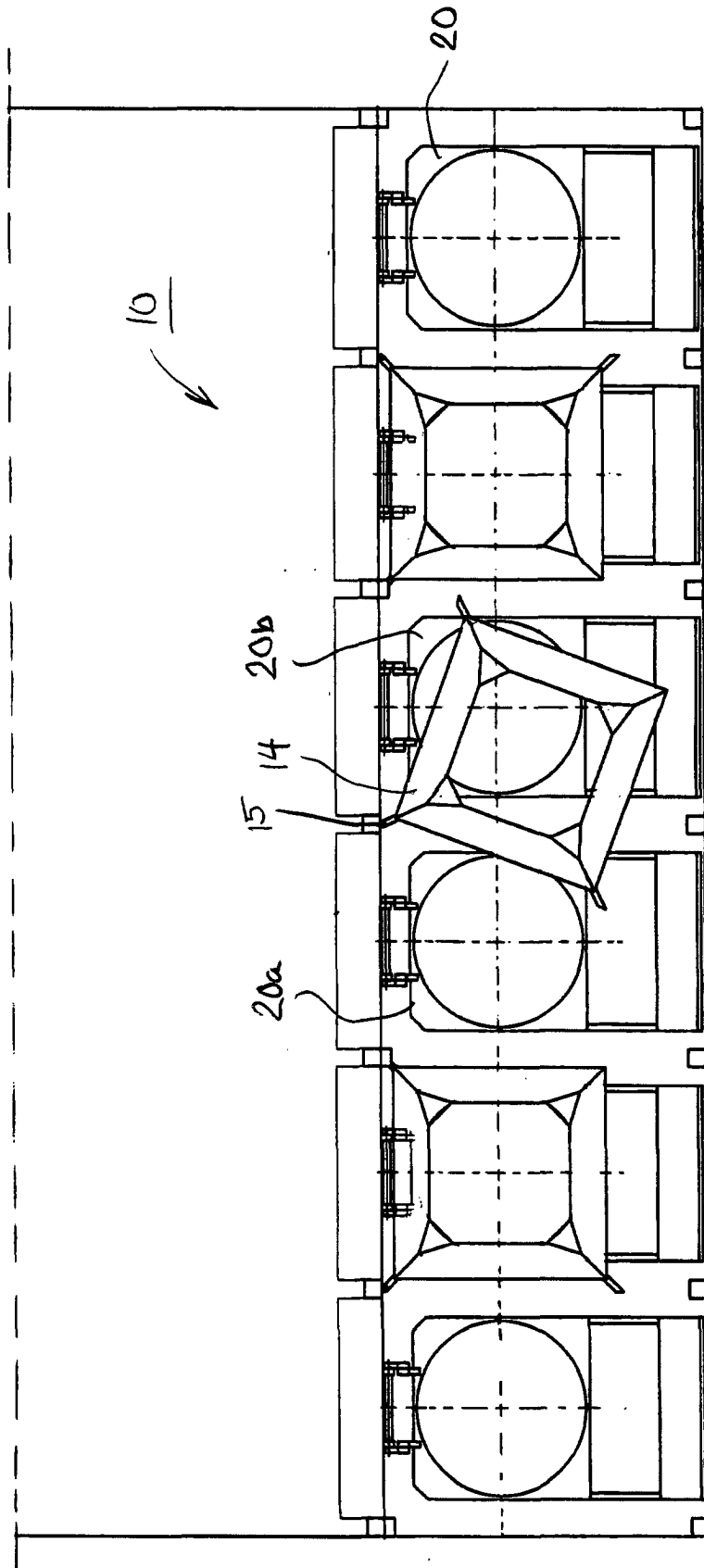


FIG. 2

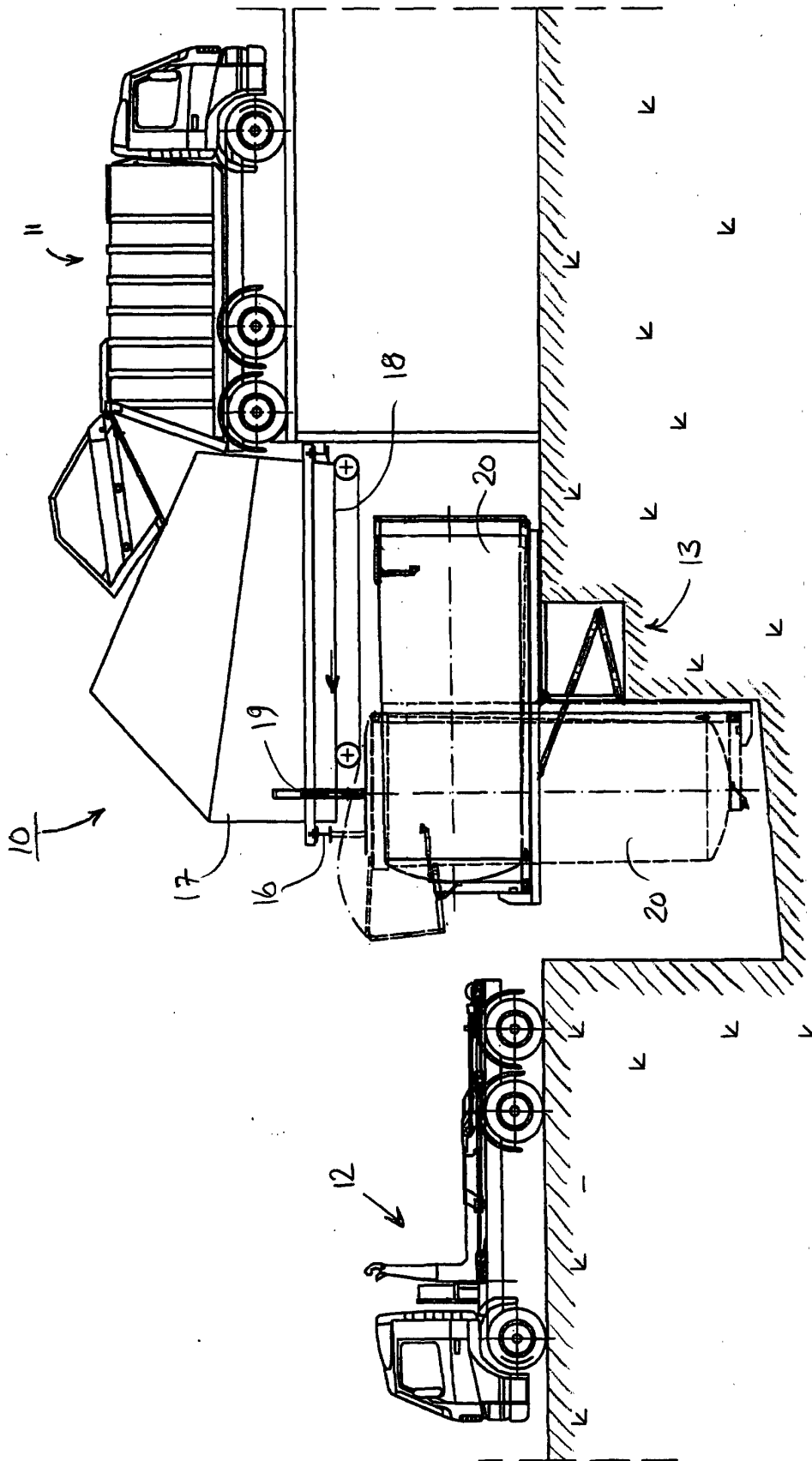


FIG. 3

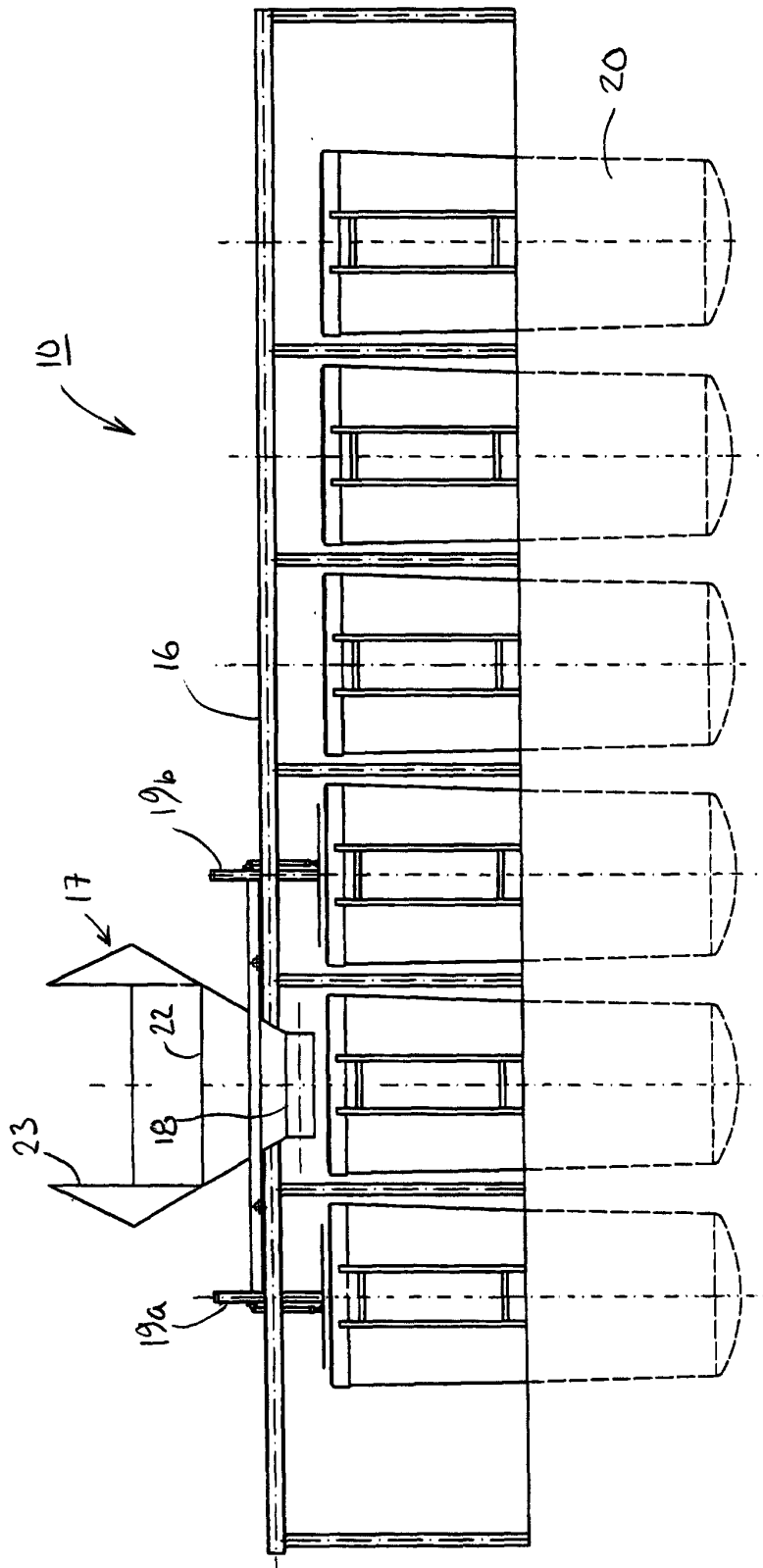


FIG. 4



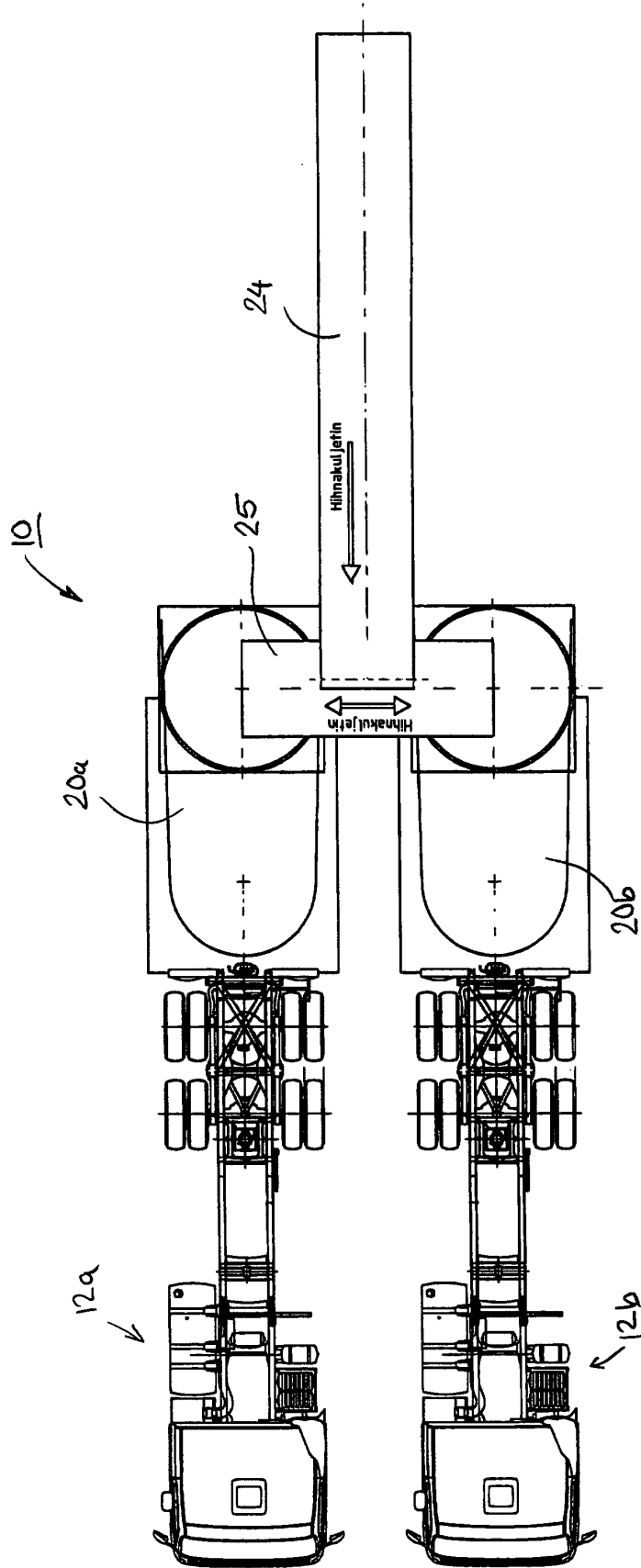


FIG. 6

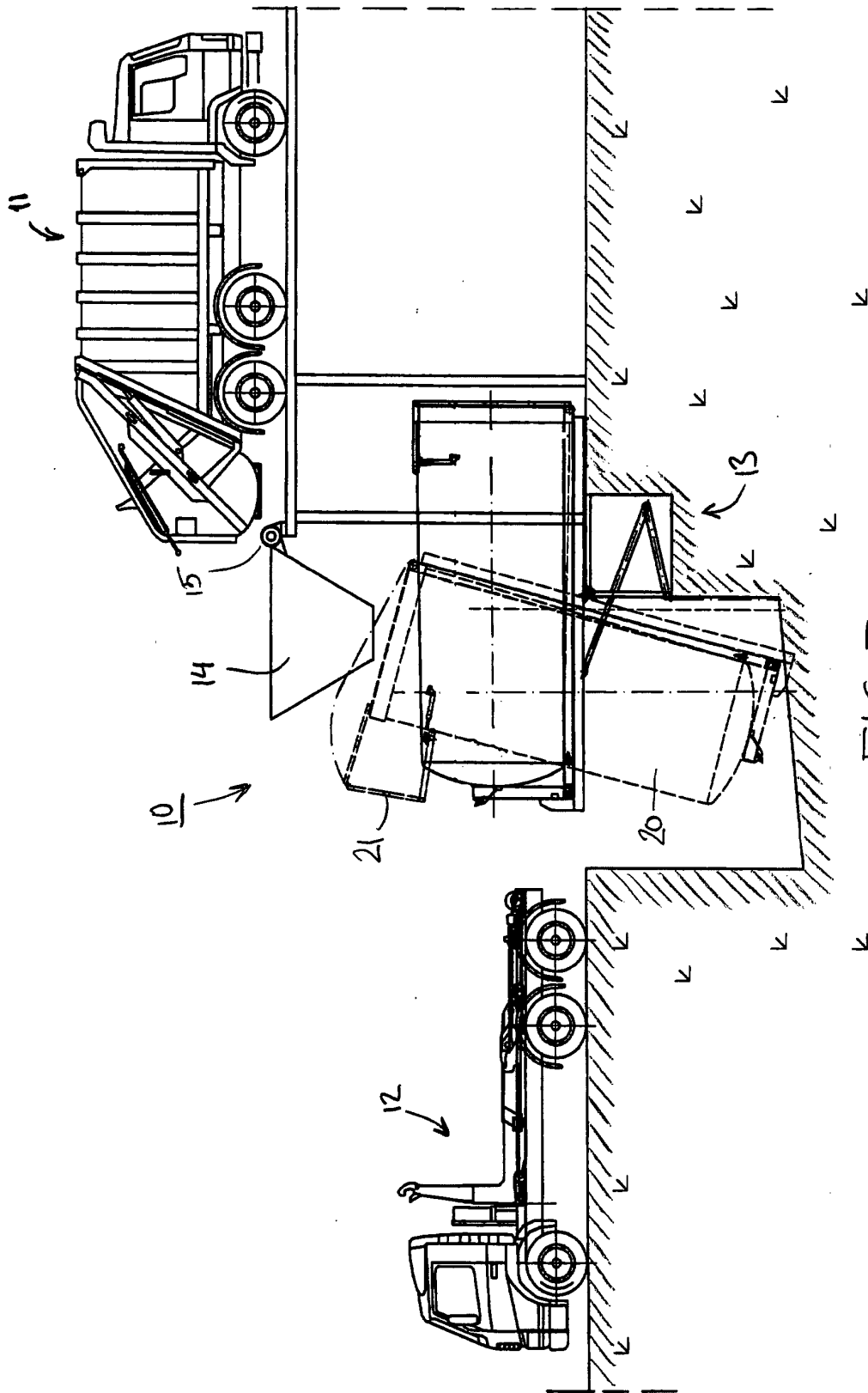
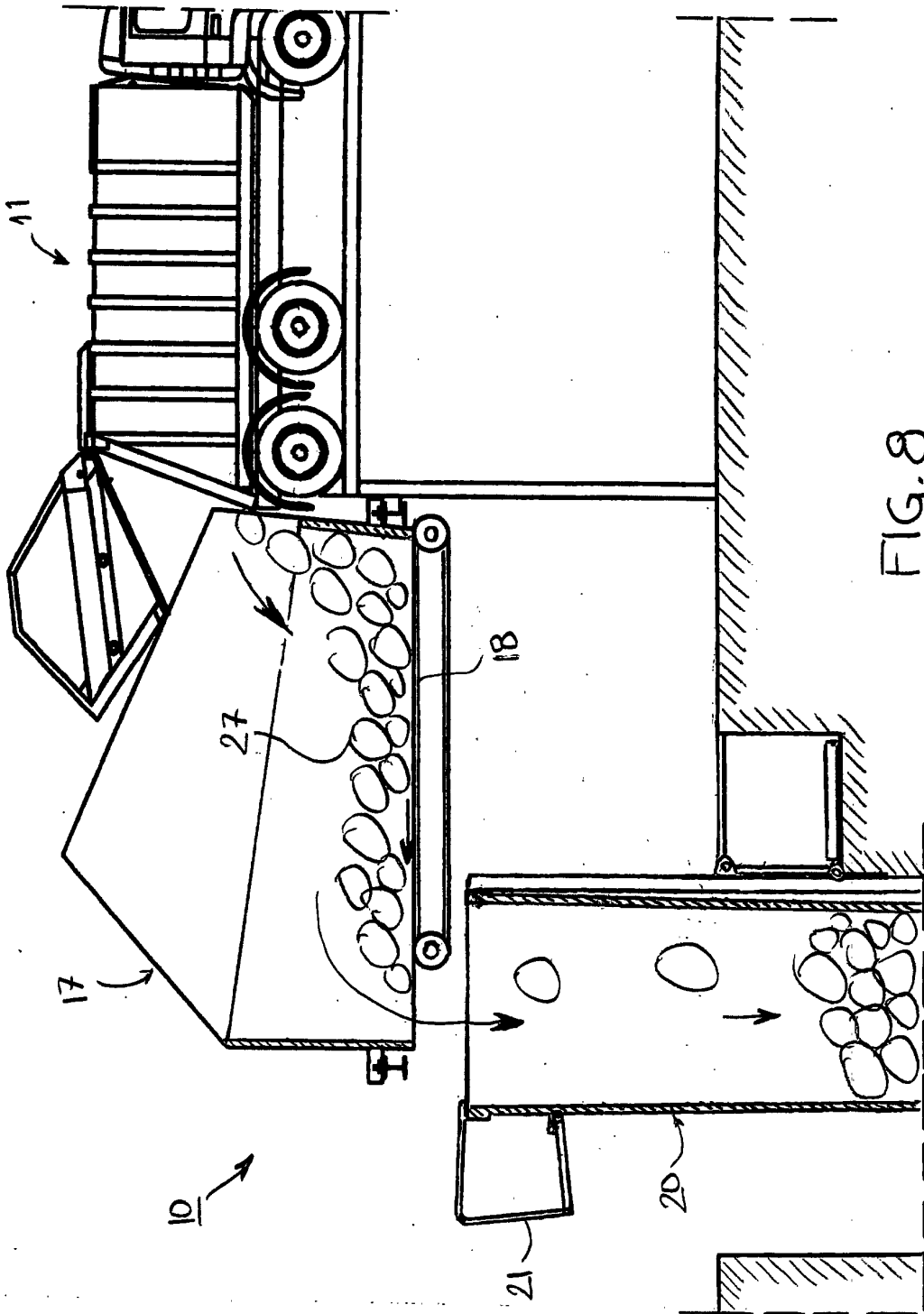


FIG. 7



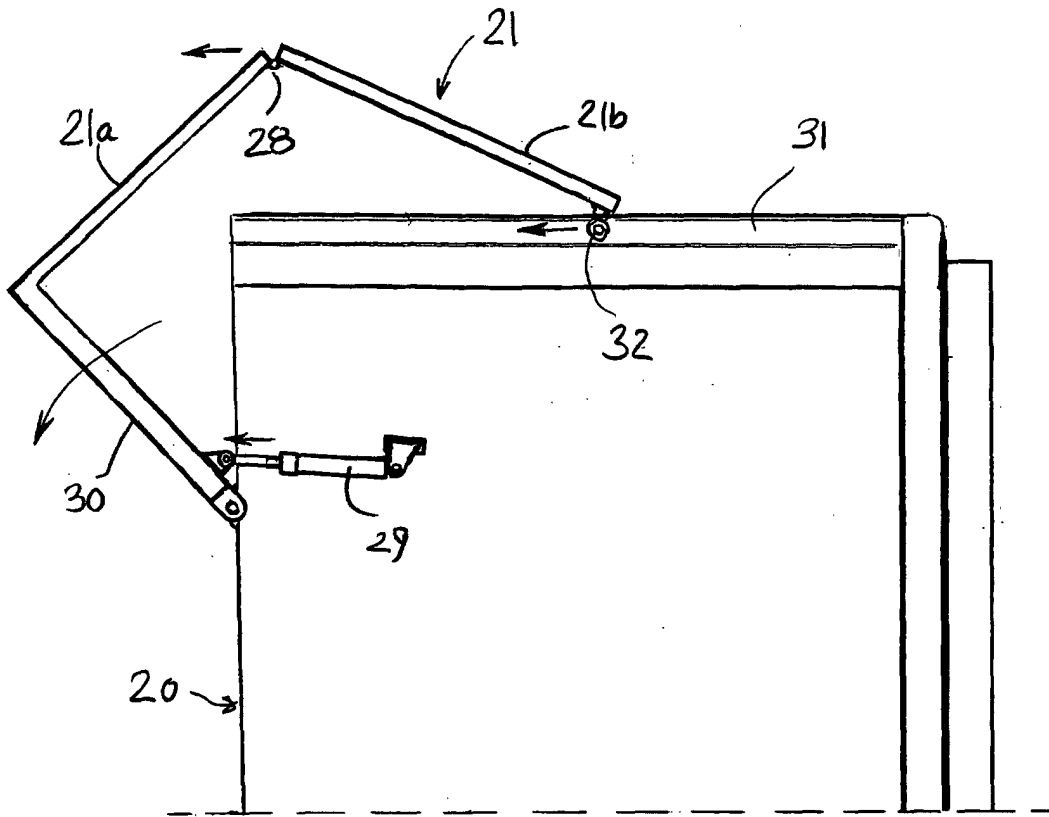


FIG. 9



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Application Number  
EP 01 66 0015

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Place of search	Date of completion of the search	Examiner	
THE HAGUE	23 April 2001	Smolders, R	
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EPC FORM 1503/03 82 (04/001)

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