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(54) **Refuse collection system**

(57) The invention relates to a system for collecting waste, comprising: diverse containers (6) for disposing at least partly in the ground at a distance from each other; a vehicle (1) with a loading space (2) for receiving therein the refuse from the container; and lifting and tilting means (8) which are connected to the vehicle and provided with engaging means (13) for engaging and

lifting the container in the vicinity of the vehicle and tilting the container at an opening (4) in the loading space in order to empty the content thereof into the loading space. Between the vehicle and the engaging means there is arranged a positioning mechanism (8) with which the engaging means can be positioned in accordance with at least the position of the container relative to the vehicle.

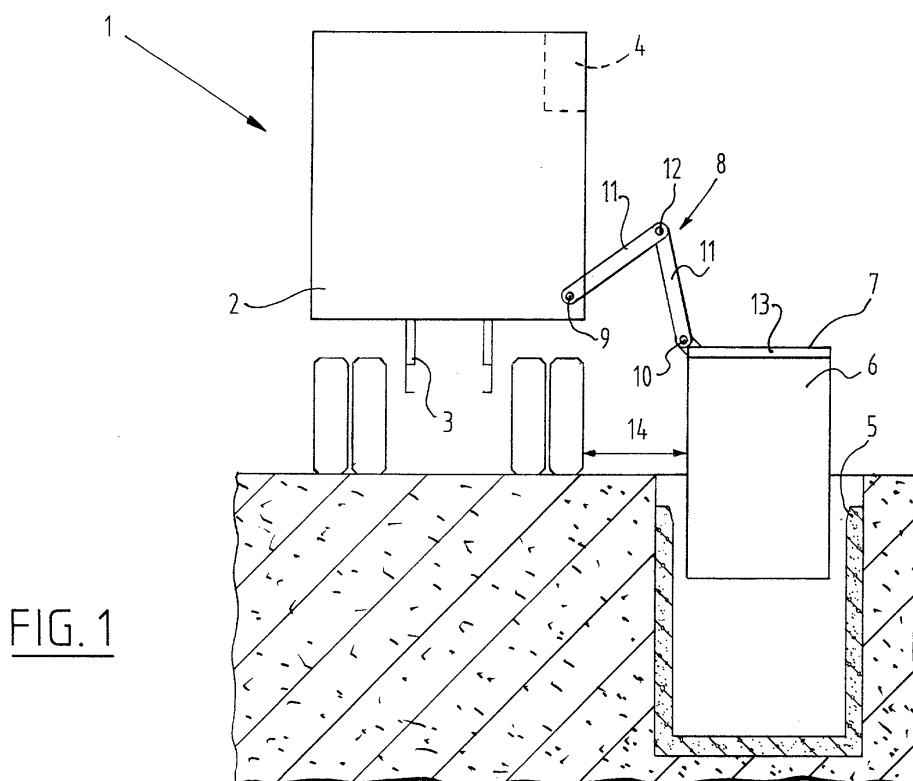


FIG. 1

Description

[0001] The present invention relates to a system for collecting waste. In the system a number of containers can be disposed at least partly in the ground at a distance from each other. Users can throw their refuse into these. The system further comprises a vehicle with a loading space for receiving therein the refuse from the container. Connected to the vehicle for this purpose are lifting and tilting means which are provided with engaging means for engaging and lifting the container in the vicinity of the vehicle and tilting the container at an opening in the loading space in order to empty the content thereof into the loading space.

[0002] Such a system is known from the Netherlands patent 1.002.778, where a rail system is arranged on the side of the loading space. The intention is that the engaging means are coupled to a sunken container and are then carried upward with the container thereon along the rail and tilted at the highest point of the rail construction, so that the container also tilts and in overturned position is emptied into the opening of the loading space, which is therefore situated close to the highest point of the rail system.

[0003] The use of lifting and tilting means, which are designed as a rail along which the container is carried upward, has a number of drawbacks which make it impossible in practice to travel with the vehicle on a route along which containers are sunk for instance into the road surface, and to automatically engage the containers in question and empty them in overturned position.

[0004] One of the main problems is the positioning of the truck relative to the container. A sunken container is stationary and the truck must travel toward the container and stop at exactly the right position, if it is to be possible to couple the container to the engaging means. Exactly the right position is understood to mean the position of the truck in relation to the shape of the container as well as the distance of the truck from the container etc. A rail system is stationary relative to the vehicle, so that the vehicle must be positioned exactly relative to the container to allow successful engaging of the container.

[0005] There are however further complicating factors. The container and the vehicle can have a different position relative to the horizontal. As a result of the use of a rail, the engaging means are then also too rigid to be able to still engage the container successfully.

[0006] Owing to the use of a rail as embodiment of the lifting and tilting means, the known system therefore has the following shortcomings. The driver must stop at precisely the right moment in the direction of travel. The vehicle may not herein stand in an angular position in the horizontal plane relative to the shape of the upper surface of the container. Furthermore, the vehicle and the container may not herein have a differing angular position in vertical direction. If these conditions are met, which is practically impossible, the container can be engaged with the engaging means and emptied.

[0007] The present invention has for its object to at least alleviate and preferably even obviate the above stated problems. For this purpose a system according to the present invention is distinguished from known systems in that between the vehicle and the engaging means there is arranged a positioning mechanism with which the engaging means can be positioned in accordance with at least the position of the container relative to the vehicle. The engaging means can hereby be carried close to the container, of course within a limited range, without the vehicle having to be positioned very precisely for this purpose. The engaging means are preferably also positioned in accordance with the orientation or angular position of the container relative to the vehicle. It is thus possible to compensate for an angular position of the vehicle relative to the container in for instance the travel direction, and also for different angular positions of the container and vehicle in vertical direction.

[0008] The system is preferably implemented in fully automated manner. For this purpose the system can comprise an imaging device and an actuable control for the positioning mechanism, whereby the positioning mechanism can be driven by a user with this control on the basis of watching the imaging device. The system is thus automated in the sense that the user can remain in the cab of the vehicle if the imaging device is placed there.

[0009] In such an embodiment the system is however not yet fully automated, i.e. it does not yet function without the intervention of the user. In order to now obtain a fully automated system, the positioning mechanism can comprise a detector for automatically determining the position of the container (and preferably also the orientation and angular position) relative to the vehicle, in addition to a control which can be set into operation selectively and which is connected to the detector to drive the positioning mechanism on the basis of a position (and preferably also angular position and orientation) determined with the detector. In such an embodiment the system can be implemented in fully automated manner, i.e. without any intervention by a user. The user is then only needed to drive the vehicle along the diverse containers of the system. It is possible according to the present invention not only to span a distance between the vehicle and the container not known exactly beforehand, but also to arrange the lifting and tilting means on the vehicle for movement in the travel direction. Thus is prevented, within a limited range, that the container cannot be engaged if braking takes place too soon or too late.

[0010] The lifting and tilting means can comprise a folding arm with which the positioning means can be simultaneously realized.

[0011] Because the tilting means and the positioning means thus form a unit, a very simple embodiment is provided in favourable manner.

[0012] In a somewhat more complex embodiment a

large number of positioning devices are made possible, wherein an additional folding arm is applied. Both folding arms extend between the vehicle and the engaging means and, through separate control of each of the folding arms, any desired adjustment is possible within a limited range. As alternative to one or more folding arms, use can be made of a telescopic arm arranged pivotally in at least two directions on the vehicle. The telescopic arm is then preferably arranged on the vehicle for three-dimensional tilting, and the engaging means are again arranged for driven tilting on the free end of the telescopic arm.

[0013] It will be evident to the skilled person that the invention also includes a vehicle separately, without the containers.

[0014] Several embodiments of systems according to the present invention will be described hereinbelow with reference to the annexed drawings, in which:

- fig. 1 shows a schematic rear view of a system according to the present invention;
- fig. 2A-2F shows schematic rear views of the system of fig. 1 in operation;
- fig. 3 is a perspective view of a second embodiment of a system according to the present invention;
- fig. 4-7 show schematically diverse situations in practice which can be dealt with using a system as according to fig. 3;
- fig. 8 shows a third embodiment of a system according to the present invention; and
- fig. 9 shows a fourth embodiment of a system according to the present invention.

[0015] In fig. 1 is shown a schematic rear view of a system according to the present invention. The system comprises a vehicle in the form of a refuse collection vehicle 1 having a loading space 2 on the frame 3 thereof. Loading space 2 has a filling opening 4 close to the top side thereof.

[0016] Sunk into a pit 5 is a container 6 which can be engaged on the upper edge 7. Container 6 has to be emptied into the loading space 2 via filling opening 4 of refuse collection vehicle 1. A lifting and tilting mechanism is provided for this purpose to remove container 6 out of the pit and to tip it into overturned position at the filling opening 4.

[0017] The lifting and tilting mechanism is formed by a folding arm 8 which is connected on one side via hinge 9 to refuse collection vehicle 1 and connected on the other side via hinge 10 to engaging means 13 for engaging the upper edge of container 6. Folding arm 8 further comprises two arms 11 which are each connected to one of the hinges 9, 10 and are mutually connected via a hinge 12. Engaging means 13 are random and designed for instance as those known from the above mentioned Netherlands patent 1.002.778.

[0018] Owing to the configuration of folding arm 8 the distance 14 between pit 5 and refuse collection vehicle

1 is not a specific requirement when refuse collection vehicle 1 is parked at pit 5, because within a limited range of distances 14 the folding arm 8 is able to engage the upper edge 7 of a container 6 with engaging means 13.

[0019] It is desirable here that the inner dimensions of pit 5 and the outer dimensions of container 6 correspond as closely as possible. This is to avoid considerable investment having to be made to make a pit into which the container 6 does not fit properly, as would be the case for instance if the content of container 6 were to be emptied into the opening 4 of loading space 2 with a purely pivoting movement on a pivot arm.

[0020] The operation of the configuration according to the present invention shown in fig. 1 is shown in figures 2A-2F.

[0021] Fig. 2A shows the situation in which the truck 1 arrives at the pit 5. Folding arm 8 is positioned with arms 11 mutually in line against a side wall of loading space 2 and the engaging means lie on the roof of loading space 2 or extend into opening 4. Fig. 2B shows that folding arm 8 is folded out, wherein engaging means 13 are oriented horizontally for coupling to upper edge 7 of container 6. Through appropriate driving of folding arms 8 as shown in fig. 2C, container 6 is lifted in upright position out of pit 5 in the direction of arrow A. When container 6 is thus moved upward out of pit 5 so far that lower edge 24 of container 6 is also clear, the container is carried into the vicinity of filling opening 4. There then begins a pivoting or tilting movement about the hinge 10 forming the connection between folding arm 8 and engaging means 13, so that container 6 is pivoted into overturned position and emptied into filling opening 4, as shown in fig. 2F.

[0022] As will be apparent to the skilled person, folding arm 8 forms a positioning mechanism for the engaging means for the purpose of positioning the engaging means relative to container 6 from refuse collection vehicle 1. This is shown particularly clearly in fig. 2B. Shown in this figure is that engaging means 13 are displaced at the same height, i.e. a height corresponding with the upper edge 7 of container 6, with the folding arm from a position adjacently of the wheels of the refuse collection vehicle to a position in which the two arms 11 of folding arm 8 lie mutually in line. In this thus limited range of folding arm 8 the container 6 can be coupled to the engaging means for emptying thereof. Folding arm 8 thus forms a positioning mechanism because the container can be engaged with engaging means 13 within this indeed limited range, but with a considerably greater measure of freedom in the parking of refuse collection vehicle 1 than in the known art.

[0023] Fig. 3 shows a second embodiment of a system according to the present invention. It is noted that in the diverse embodiments of a system according to the present invention as presented here, the same reference numerals are used for the same or similar components.

[0024] Fig. 3 shows a configuration with a first folding arm 8, such as also shown for instance in fig. 1, although this system is provided with an additional folding arm 15. Both folding arms 8, 15 are further mounted on a carriage 16 which is displaceable along a rail 17 on refuse collection vehicle 1. Rail 17 is for instance a gear rack along which the schematically shown carriage is displaceable within a limited range. Owing to the configuration of the carriage displaceable along rail 17 and having thereon the lifting and tilting means in the form of folding arms 8, 15, engaging means 13 can couple to upper edge 7 of container 6 by displacing carriage 16 along rail 17 and a subsequent operation as shown in fig. 2A-2F. The displaceability of carriage 16 in the direction of arrow B along rail 17 makes the exact position where the refuse collection vehicle 1 comes to a halt much less critical than in the known art. The upper edge 7 of container 6 can be successfully engaged when vehicle 1 stops at a position where container 6 lies within the length of rail 17. Fig. 4 is a schematic top view in which the foregoing is clearly shown.

[0025] Fig. 5 is a schematic top view of a situation in practice which shows clearly the advantage of a folding arm 8 and an additional folding arm 15. When refuse collection vehicle 1 comes to a halt in a position wherein the length direction of vehicle 1 is at an angle relative to a side edge of container 6, it is possible to compensate for this as shown in fig. 5. To still be able to engage the upper edge 7 of container 6 horizontally with the engaging means in the manner shown here, in the angular position of vehicle 1 in the horizontal plane relative to container 6, it is not a problem to still be able to engage container 6 without having to reposition refuse collection vehicle 1.

[0026] Fig. 6 shows another situation in practice wherein the ground surface adjacently of the road 18 over which the refuse collection vehicle 1 is travelling slopes upward. Depending on the height of container 6 or the depth thereof, this situation, which cannot be resolved with the known art, can also be dealt with in the manner shown in fig. 6.

[0027] Fig. 7 further shows a schematic rear view of the situation in practice wherein refuse collection vehicle 1 and the container have relative angular positions in vertical direction. In fig. 7 refuse collection vehicle 1 stands horizontally but container 6 slants upward in the travel direction of vehicle 1.

[0028] In this situation too, despite the tight fit of container 6 in pit 5, container 6 can be lifted and emptied into opening 4 reliably and with certainty.

[0029] Referring back to fig. 3, it is noted that a camera 19 is arranged on refuse collection vehicle 1. This is connected to imaging means, for instance computer 20, which in addition to a monitor also comprises a so-called joystick 22. The images recorded by camera 19 are displayed on monitor 21 of computer 20. Computer 20 is arranged for instance in the cab of refuse collection vehicle 1. Making use of joystick 22, the driver of the

refuse collection vehicle can influence control of folding arm 8 and additional folding arm 15 such that engaging means 13 are aligned with the upper edge of container 6, or at least with points of engagement on this upper edge, or possibly thereunder. Preferably however, computer 20 is able to align the engaging means 13 without the intervention of the driver using for instance joystick 22, whereby a fully automated process is realized. The driver of the refuse collection vehicle has only to drive to the various containers 6 along a route and to stop in the vicinity of such a container 6 within the limited range of the thus designed lifting and tilting means with a positioning mechanism in the form of folding arms 8, 15.

[0030] Fig. 8 shows in particularly schematic manner a third embodiment of a system according to the present invention which is also provided with a folding arm 8 and an additional folding arm 15, but where use is made, instead of the carriage 16 displaceable along a rail 17, of an extra hinge function designated with arrow C, wherein folding arms 8, 15 can pivot in the length direction, i.e. in the travel direction of refuse collection vehicle 1, and not just forward and backward from and to loading space 2.

[0031] Finally, fig. 9 shows a totally different fourth embodiment of a system according to the present invention. No use is made here of a folding arm 8 or 15 but of a telescopic arm 23. This latter is connected for instance via a carriage and a rail to loading space 2 of refuse collection vehicle 1, although alternatively an extra hinge function can also be realized as shown in fig. 8. Engaging means 13 are arranged pivotally on the free outer end of telescopic arm 23.

[0032] To remove container 6 from pit 5 in upright position, an upward pivoting movement of telescopic arm 23 is accompanied by an extending thereof from the position thereof shown in broken lines, or by shortening telescopic arm 23 until the position thereof shown with broken lines reached.

[0033] In similar manner as shown in fig. 4, 5, 6 and 7, an additional telescopic arm can also be provided in order to achieve the same functionalities as those shown in the said figures.

[0034] It will be apparent to all, and in particular the skilled person, that within the scope of the present invention many alternative and additional embodiments are possible without departing from the scope of the invention. By providing the positioning mechanism, whether or not as unit with the lifting and tilting means, the engaging means can be positioned relative to the refuse collection vehicle so that a precisely accurate positioning of the whole truck is not necessary to achieve the same for the engaging means.

[0035] Hardly any attention has been paid in the foregoing to control and driving of the positioning mechanism, the folding arms or the telescopic arm or telescopic arms, since the realization thereof, after examination of the foregoing, lies well within the capabilities of the person with ordinary skill in the art.

Claims

1. System for collecting waste, comprising: diverse containers for disposing at least partly in the ground at a distance from each other; a vehicle with a loading space for receiving therein the refuse from the container; and lifting and tilting means which are connected to the vehicle and provided with engaging means for engaging and lifting the container in the vicinity of the vehicle and tilting the container at an opening in the loading space in order to empty the content thereof into the loading space, wherein between the vehicle and the engaging means there is arranged a positioning mechanism with which the engaging means can be positioned in accordance with at least the position of the container relative to the vehicle.

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2. System as claimed in claim 1, wherein the engaging means can further be positioned with the positioning mechanism in accordance with the orientation or angular position of the container relative to the vehicle.

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3. System as claimed in claim 1 or 2, further comprising an imaging device and an actuable control for the positioning mechanism, whereby the positioning mechanism can be driven by a user with the control on the basis of watching the imaging device.

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4. System as claimed in claim 3, wherein the imaging device is placed in a cab of the vehicle.

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5. System as claimed in claim 1 or 2, wherein the positioning mechanism comprises a detector for automatically determining the position of the container relative to the vehicle, and a control which can be set into operation selectively and which is connected to the detector to drive the positioning mechanism on the basis of a position determined with the detector.

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6. System as claimed in any of the foregoing claims, wherein the positioning mechanism is adapted to displace the engaging means in the direction of travel.

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7. System as claimed in claim 6, wherein a rail extending in the direction of travel is arranged on the vehicle, along which rail the lifting and tilting means are displaceable.

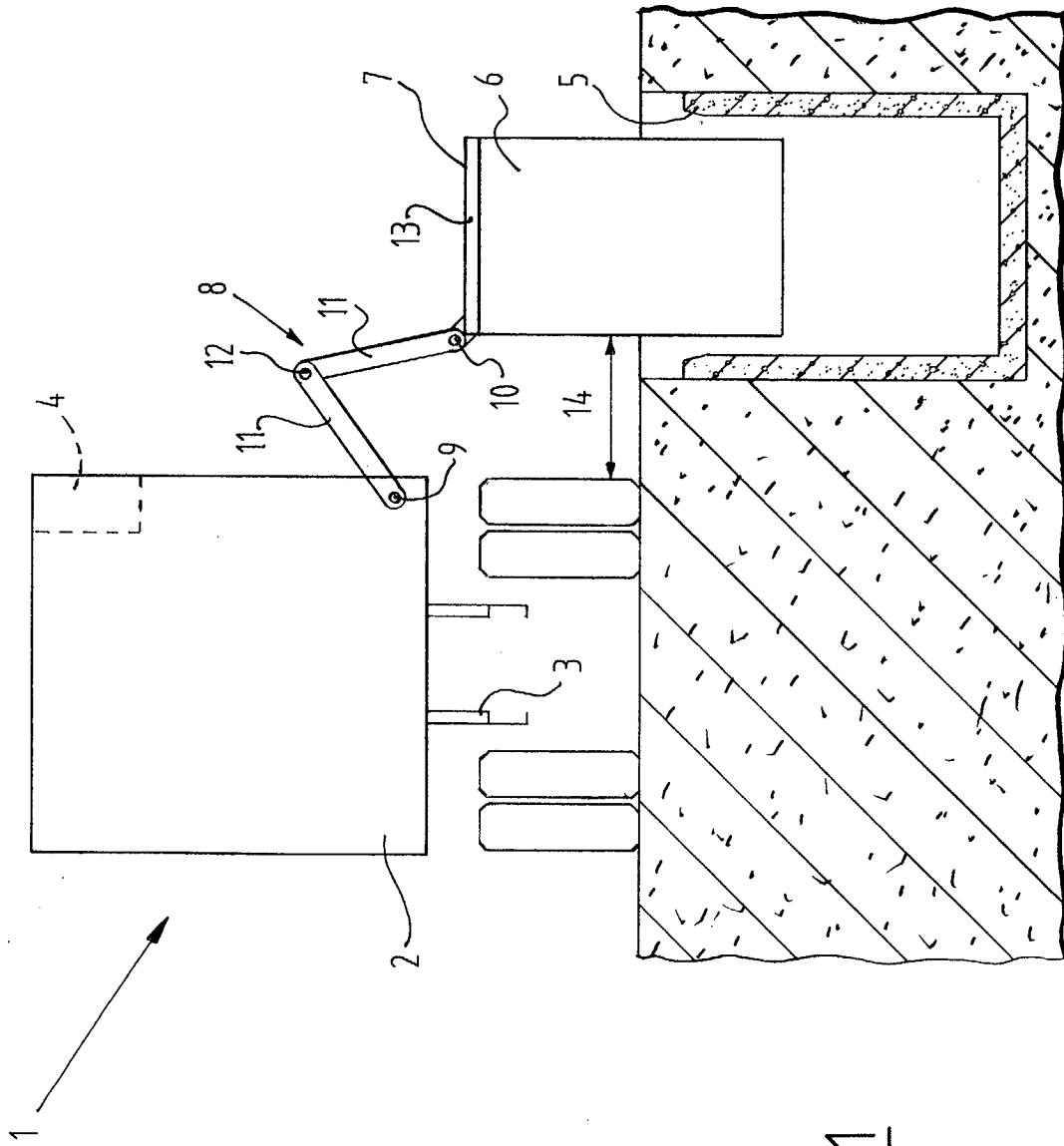
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8. System as claimed in any of the foregoing claims, wherein the lifting and tilting means, and simultaneously the positioning means, comprise a folding arm which is connected pivotally to the vehicle on one side and connected pivotally to the engaging means on the other.

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9. System as claimed in claim 8, further comprising an additional folding arm which is connected at a distance from the folding arm to the vehicle and the engaging means.

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10. System as claimed in any of the foregoing claims, wherein the lifting and tilting means comprise at least one telescopic arm which is arranged pivotally on the vehicle and which is connected to the vehicle on one side and to the engaging means on the other.

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11. Vehicle in a system as claimed in any of the foregoing claims.

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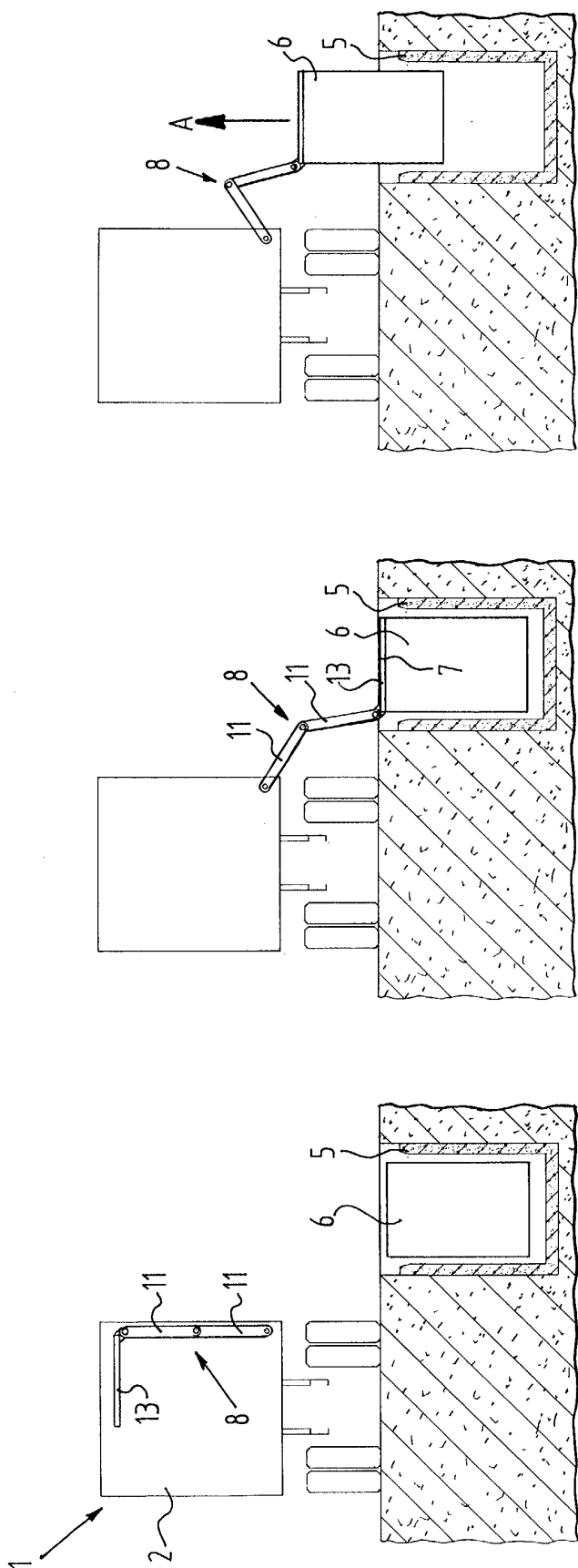


FIG. 2C

FIG. 2B

FIG. 2A

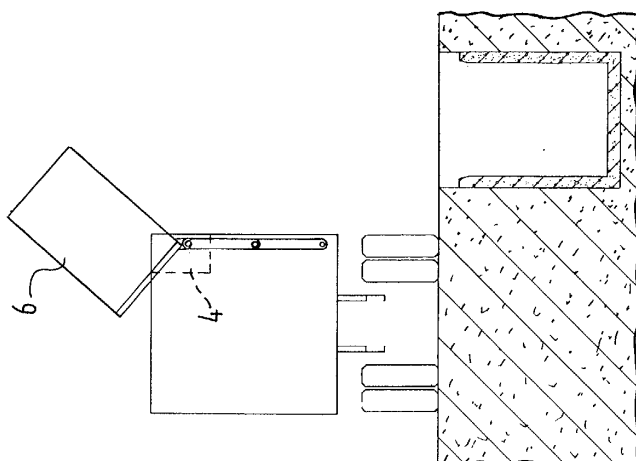


FIG. 2F

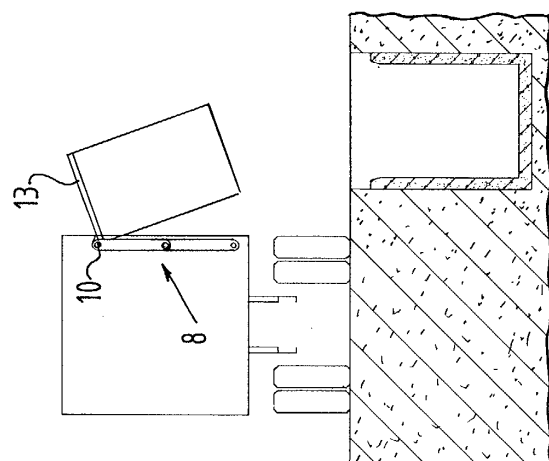


FIG. 2E

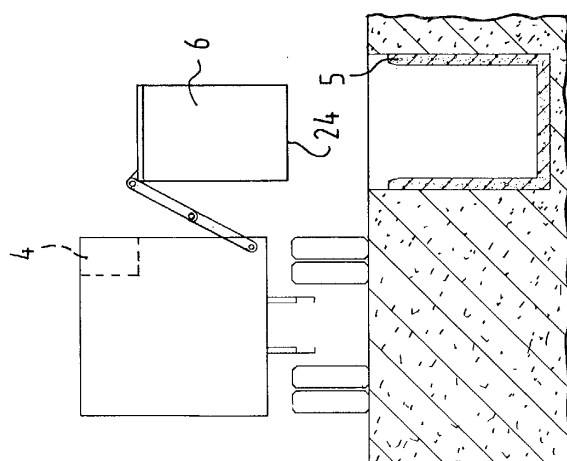


FIG. 2D

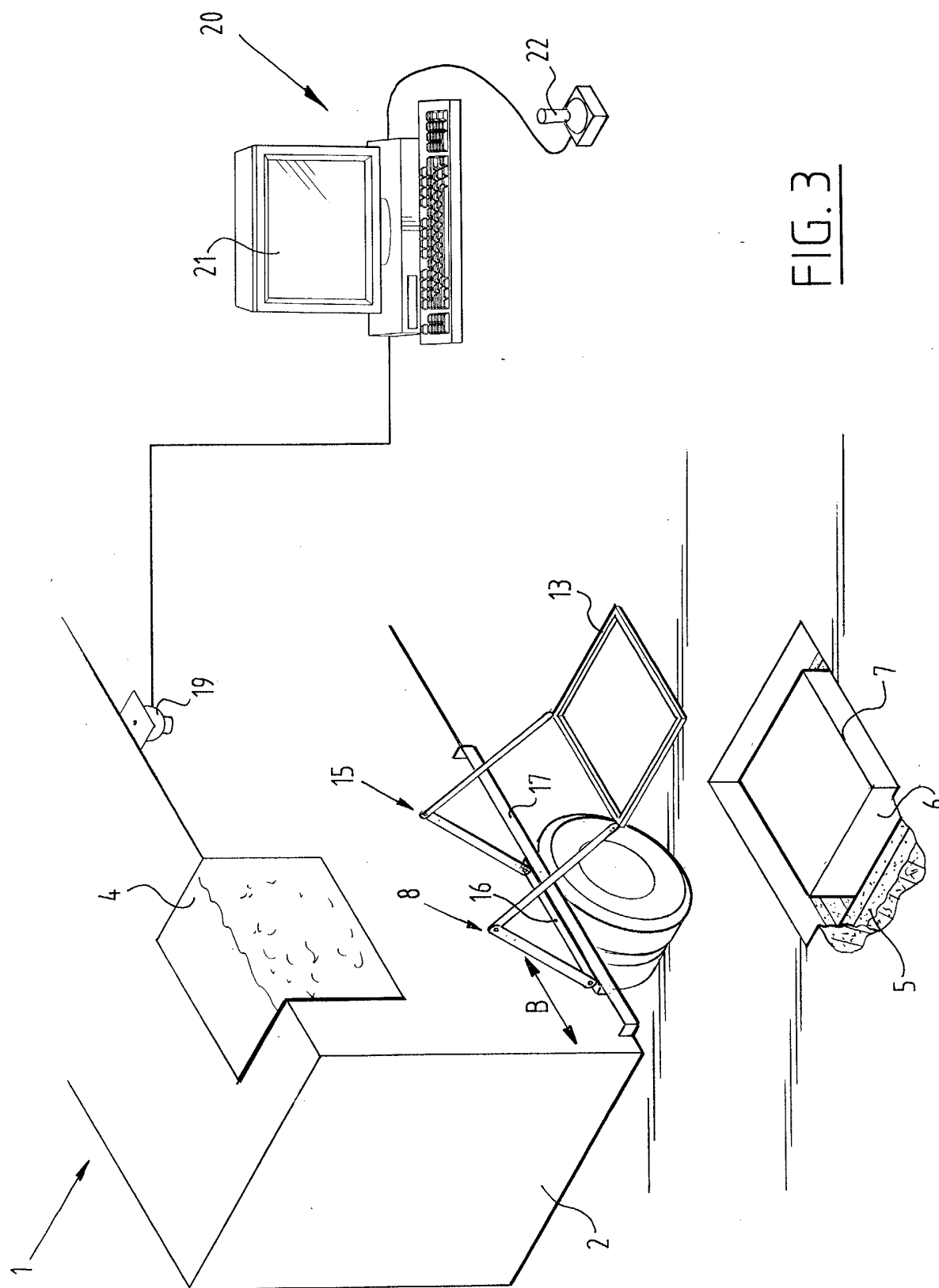


FIG. 3

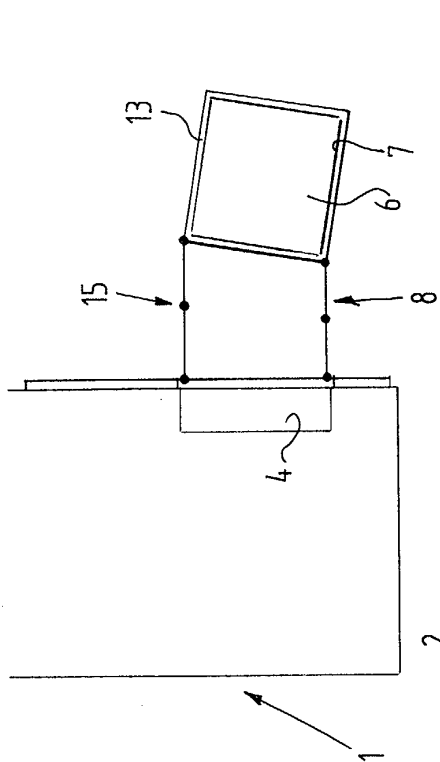


FIG. 5

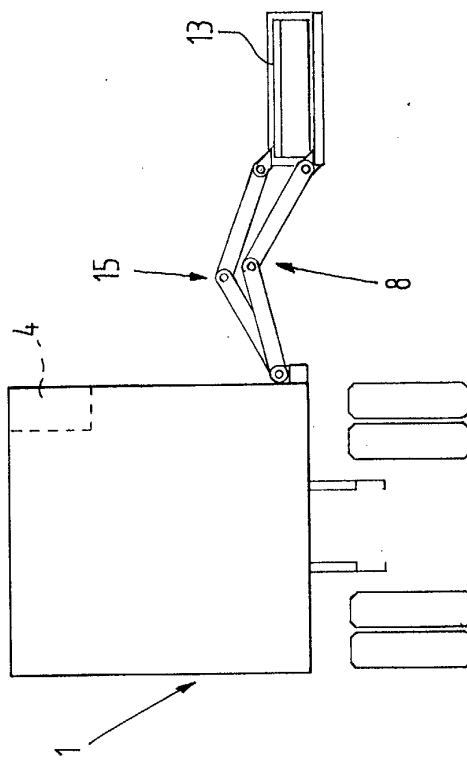


FIG. 7

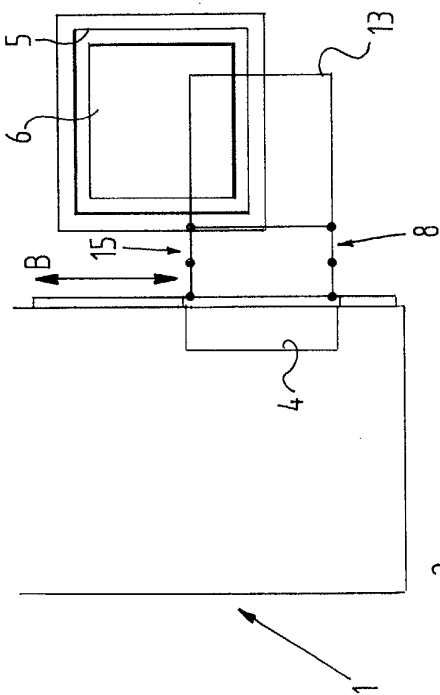


FIG. 4

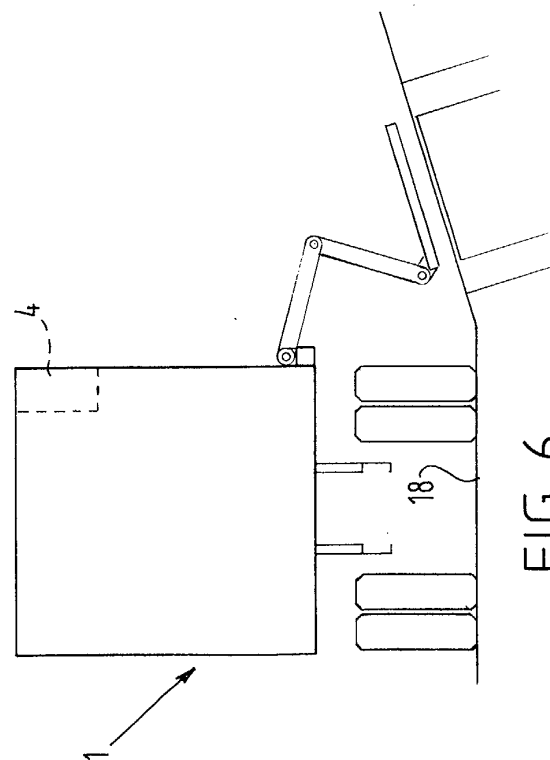


FIG. 6

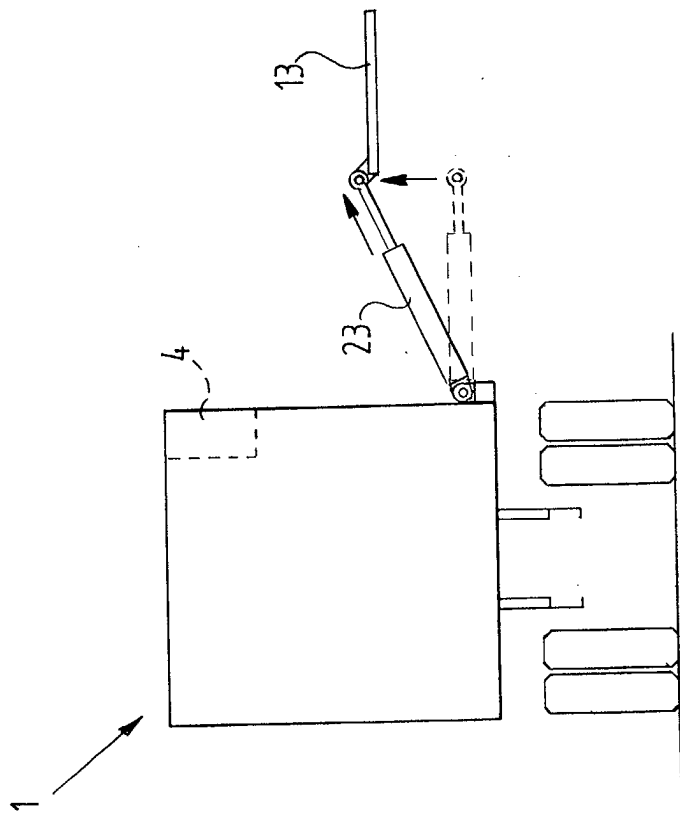


FIG. 9

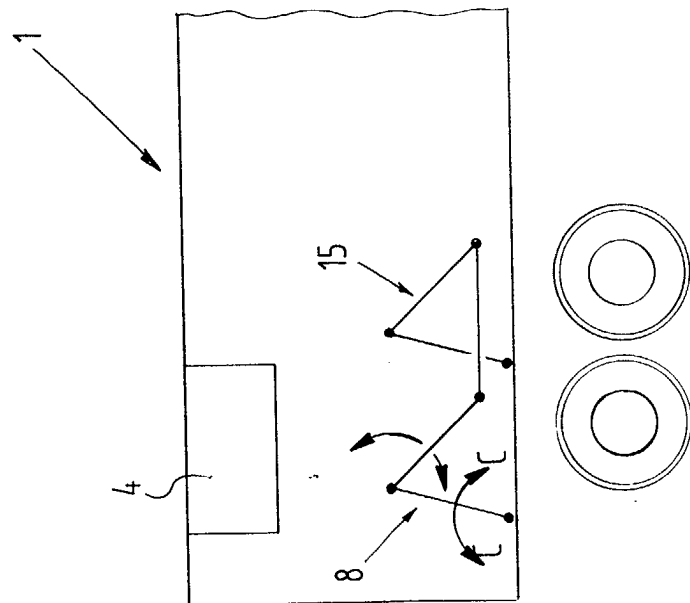


FIG. 8



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EUROPEAN SEARCH REPORT

Application Number
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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 20 February 2003	Examiner Smolders, R
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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