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## (54) Collection vehicle and method of emptying bin.

(57) A bin hoist (15) on a collection vehicle includes a bin carrier (20) connected with a support (31) by a linkage (34, 37). The support is connected with a body (12) of the vehicle by a second linkage (40, 41). Separate motors (36, 42) are provided for operating the linkages.

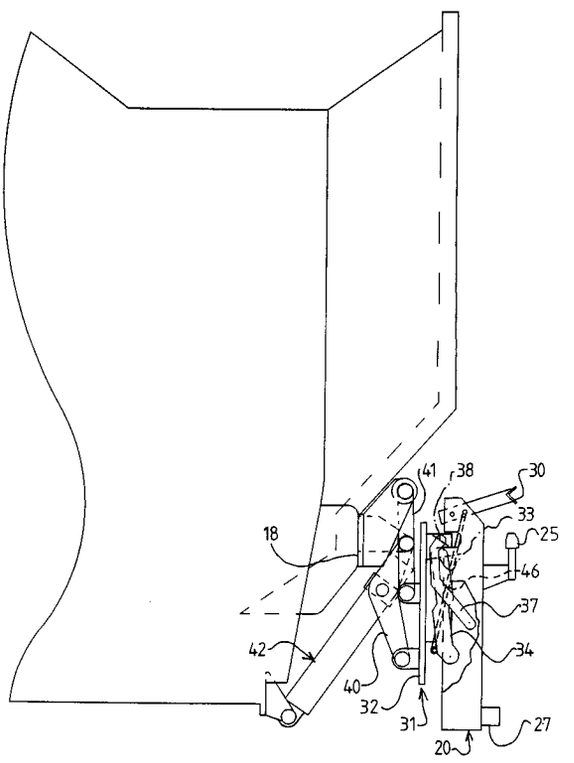


FIG 2

EP 0 512 469 A1

## Description of Invention

From one aspect, the present invention relates to a collection vehicle having a body defining a chamber for receiving a load and defining a loading opening through which refuse or other material can be loaded into the chamber, the vehicle further comprising a bin hoist for raising a bin from the ground and tipping the bin through the loading opening to discharge contents of the bin into the chamber wherein the bin hoist includes a bin carrier, a support, a linkage for connecting the bin carrier with the support and a tipping motor for moving the bin carrier relative to the support. In known collection vehicles of the kind described, the linkage generally includes a first member connected with the support for pivoting relative thereto about a first axis which is fixed with respect to the support and connected with the bin carrier for pivoting relative thereto about a second axis which is parallel to the first axis.

An example of a collection vehicle of the kind described is disclosed in EP 0358046A. The bin hoist disclosed in this published specification includes a rotary actuator which defines the first axis, about which the support pivots relative to the vehicle body. The rotary actuator is necessarily mounted on the vehicle body in a position such that the first axis is at a relatively high level. When the bin carrier is in a lowered position, the linkage extends downwards from the first axis and partly obstructs the loading opening. Access to the loading opening is further obstructed by the bin carrier and refuse cannot conveniently be loaded into the chamber by hand.

According to a first aspect of the present invention, the bin hoist of a collection vehicle of the kind described is characterised by a further linkage connecting the support with the body for movement relative thereto to raise and lower the first axis and by a lift motor for moving the support relative to the body.

The arrangement may be such that the first axis can be lowered to a position where it lies below the level of a lower boundary of the opening. It is then unnecessary for parts of the hoist to obstruct the loading opening, when the bin carrier is in a fully lowered position.

According to a second aspect of the invention, there is provided a method of emptying the contents of the bin into a chamber defined by a collector vehicle body and comprising the steps of moving the bin carrier and a support therefore relative to the body from a fully lowered position to a raised position, maintaining the attitude of the bin carrier relative to the body substantially constant during movement from the fully lowered position to the raised position, engaging the carrier with a bin during movement from the fully lowered position to the raised position in a manner to carry the bin upwards from the ground and then raising and tipping the bin carrier and the bin relative to the support whilst the support remains in the fully raised position.

An example of a vehicle embodying the invention will now be described, with reference to the accompanying drawings, wherein:

**FIGURE 1** shows a perspective view of a rear portion of the vehicle, together with a bin,

**FIGURE 2** shows certain parts of Figure 1, a viewed in a direction from one side of the vehicle to the other, and with a bin carrier of the vehicle in a fully lowered position,

**FIGURE 3** is a view similar to Figure 2 but showing the bin carrier in a raised position and

**FIGURE 4** is a view similar to Figures 2 and 3 but showing the bin carrier in a tipped position.

The vehicle illustrated in the accompanying drawings is a collection vehicle suitable for collecting refuse or other material. The vehicle has a wheeled chassis 10 supporting a driver's cab (not shown) and having an internal combustion engine (also not shown) for driving road-wheels of the vehicle, one of which is shown at 11. On the chassis, there is mounted a body 12 defining a chamber for receiving collected material. At the rear of the vehicle, the body defines a loading opening 13 through which the material to be collected can be loaded into the chamber defined by the body. In the body, there is provided known means for compacting the load in the chamber and known means for ejecting the load from the chamber. The compacting means may be incorporated in a pivoted tailgate 14 which defines the loading opening 13. The arrangement of the body 12 and of parts within the body may be the same as in known collection vehicles and will not be described further.

Two bin hoists 15, 16 are mounted on the body 12 at the rear of the body, in the example illustrated, on the tailgate 14. The lower boundary of the loading opening 13 is defined by a rave rail 17 which is horizontal when the vehicle is standing on horizontal ground. A base 18 of the hoist 15 is rigidly attached to the body and is spaced downwardly from the lower boundary of the loading opening by a substantial distance. Preferably, the base 18 does not project rearwards relative to the rave rail 17. In the preferred vehicle, the base 18 is bolted or otherwise secured directly to a lower rail 19 which is spaced downwardly from and forwards from the rave rail 17. The surface of the vehicle to which the base 18 is secured is spaced forwards from the rearmost surface of the rave rail 17 by a substantial distance so that the hoist 15, when in the fully lowered position illustrated in Figure 2, lies

partly beneath the rave rail 17 and projects rearwards beyond the rave rail only a modest distance. As can be seen from Figures 1 and 2, the hoists do not significantly obstruct access to the loading opening 13 for manual loading of refuse when the hoists are in their fully lowered positions.

It will also be noted from Figure 1 that the hoists 15 and 16 are mounted adjacent to a longitudinal centreline of the vehicle. Each hoist extends a part of the way from that centreline towards a corresponding side of the vehicle body 12 but does not extend to the side of the vehicle. Between the hoist 15 and a corresponding side of the vehicle, there is a space adjacent to the rave rail 17 which is not significantly obstructed by parts of the hoist and further facilitates access to the loading opening 13. As shown, control means for controlling operation of the hoist 15 may be mounted on the vehicle body 12 at a position between the hoist 15 and the corresponding side of the vehicle. In the example illustrated, the control means is shown mounted on the lower rail 19 adjacent to an end of that rail. Because the lower rail 19 is positioned somewhat forwards of the rave rail 17, the presence of control means of modest bulk on the lower rail does not obstruct access by an operator of the vehicle to the loading opening 13.

It will be noted that, when the hoists 15 and 16 are in their fully lowered positions, no part of either hoist extends upwards beyond the rave rail 17. In the example illustrated, all parts of the hoist lie below the level of the rave rail 17.

The hoist 15 comprises a bin carrier 20 which includes a hollow housing 21 which is of rectangular form, as viewed from the rear when in the fully lowered position. The housing includes a substantially flat rear wall 22, side walls, one of which is shown at 23, which are perpendicular to the rear wall 22 and a top wall 24 which is inclined to the rear wall. The bin carrier further comprises a row of fingers 25 which are spaced rearwards from the housing 21 and rigidly connected therewith by a bracket 26. The bracket projects rearwards from the rear wall 22 at a position between upper and lower margins of that wall. A bin rest 27 projects rearwards from a lower marginal portion of the rear wall 22. A rearmost face of the rest 27 is substantially aligned with rearmost faces of the fingers 25. The fingers can be received beneath a lip 28 provided on a known bin 29 to support the bin on the carrier 20. When the bin is raised from the ground by the carrier, it bears on the bin rest 27 and the lip 28 is held on the fingers 25 by means of a bin clamp 30.

The bin hoist 15 further comprises a support 31 for the bin carrier 20. The support includes a substantially flat plate 32 and a first bearing defining a first pivot axis 33 which is parallel to the length of the rave rail 17. The bin carrier 20 is connected with the support 31 by a linkage which includes a first arm 34 connected adjacent to one of its ends for pivoting relative to the support about the first axis 33 and connected near to its opposite end with the bin carrier 20 for movement relative thereto about an axis 35 parallel to the axis 33. For pivoting the arm 34 relative to the support 31, there is provided a tipping motor in the form of an hydraulic rotary actuator 36 which is mounted on the plate 32. The rotary actuator incorporates a bearing which defines the first pivot axis 33.

For controlling the attitude of the bin carrier 20 relative to the support 31, there is provided a second arm 37 pivotally connected adjacent to one of its ends to the support for movement relative thereto about a third pivot axis 38. The arm 37 is connected with the bin carrier for pivoting relative thereto about a fourth pivot axis 39. The pivot axes 33, 35, 38 and 39 are mutually parallel and are so positioned that the angular relation of the bin carrier to the support changes during pivoting of the arm 34 relative to the support. As shown in Figure 2, when the rotary actuator 36 is at one limit of its travel, the rear wall 22 of the bin carrier is substantially parallel to the plate 32 of the support and the arms 34 and 37 are disposed inside the housing 21. The arm 34 extends downwards from the pivot axis 33 and the arm 37 extends downwards from the pivot axis 38. During upward pivoting of the arm 34 though 180°, the housing 21 tips relative to the support 31 so that the fingers 25 move forwards relative to the bin rest 27 and the bin rest eventually moves upwards relative to the fingers so that a bin carried on the bin carrier 20 is partly inverted through the loading opening 13.

The support 31 is connected with the base 18 by a linkage comprising third and fourth arms 40 and 41. These arms are pivotally connected adjacent to respective ends with brackets provided on the base 18 and on the support plate 32. It will be noted that the latter brackets are mounted on that face of the support plate opposite to the face at which the rotary actuator 36 lies. The arms 40 and 41 extend forwards from the support plate 32 to the brackets which project rearwards from the base 18. The support plate 32, arms 40 and 41 and the base 18 collectively constitute a parallelogram linkage which maintains the attitude of the support plate 32 relative to the base 18 substantially constant.

A lift motor 42 is provided for moving the support 31 relative to the base 18. In the example illustrated, the lift motor is an hydraulic ram, an upper end portion of which is connected with the arm 40 and a lower end portion of which is pivotally connected with the vehicle body at a position below the rail 19. It will be appreciated that other arrangements of motor for pivoting the arm 40 and

the arm 41 relative to the base may be provided.

It will be noted that each of the arms 34, 37, 40 and 41 is duplicated so that the linkage connecting the bin carrier 20 with the support 31 comprises a first pair of arms adjacent to one side wall of the housing 21 and a second pair of arms adjacent to the other side wall of the housing. Similarly, the linkage connecting the support 31 with the base 18 comprises a first pair of arms adjacent to one lateral margin of the support plate 32 and a second pair of arms adjacent to the other lateral margin of the support plate.

Hydraulic fluid under pressure for operating the lift motor 42 and the tipping motor 36 is provided by an hydraulic pump (not shown) associated with the vehicle engine in a known manner. For controlling operation of the lift motor and of the tipping motor, there is provided hydraulic control means including a valve assembly 43 having an operating handle which is accessible to an operator at the rear of the vehicle. The control means comprises a further valve 44 mounted on the support 31 for controlling the admission of hydraulic fluid to the tipping motor 36. The valve 44 is biased to a normally closed position and can be opened by engagement of an abutment 45 on the arm 40 with an operating element of the valve to move the valve to an open condition when the support 31 reaches the raised position illustrated in Figure 3.

Further control means (not shown) for controlling operation of the hoist 16 is provided, this control means being constructed and arranged in a manner corresponding to that in which the control means for the hoist 15 is arranged.

The hoist 16 is generally constructed and arranged in a manner corresponding to that in which the hoist 15 is constructed and arranged. The hoists can be operated independently by means of their respective control means. Alternatively, the hoists can be operated together to lift a relatively large bin and tip the contents of that bin into the chamber defined by the vehicle body 12. Control of the valve assembly 43 and of the corresponding valve assembly associated with the hoist 16 may be operated by solenoids, energisation of which is controlled by the control handles. Provision may be made for concurrent energisation of both valve assemblies by movement of a single control handle so that an operator standing at the rear of the vehicle and adjacent to one side of the vehicle can initiate operation of both hoists.

During an initial stage of movement of the bin carrier 20 from the fully lowered position towards the raised position illustrated in Figure 3, the bin carrier moves upwardly and rearwards relative to the vehicle body 12. Accordingly, the fingers 25 will engage a bin placed at the rear of the vehicle and sufficiently close to the hoist and the fingers 25 can engage beneath the lip of a bin, irrespective of the height of that lip above the ground, within a certain range. The hoist can operate to lift different sizes of bin having respective lips at different heights.

Means is provided for applying the bin clamp 30 to the lip of a bin on the carrier 20 either when the bin carrier reaches the raised position illustrated in Figure 3 or during movement of the bin carrier from the position illustrated in Figure 3 towards the position illustrated in Figure 4. The means for applying the bin clamp may be a cam which is operated during pivoting of the first arm 34 relative to the housing 21. Alternatively, the means for applying the bin clamp may comprise an hydraulic piston and cylinder unit which is operated when the valve 44 is opened. In the example illustrated, the bin clamp is operated by a rod 46 connected with the arm 34. The means for applying the bin clamp also raises the bin clamp from the lip of the bin as the carrier approaches the position illustrated in Figure 3 or after the carrier has reached that position.

It will be noted that the front of the housing 21 is almost closed by the support plate 32 when the bin carrier 20 is in the fully lowered position. The tipping motor 36 and the arms of the linkage which connect the bin carrier with the support are all disposed inside the almost closed housing. This provides a neat appearance of the hoist and provides some degree of protection against contamination of the bearings. It will be noted that the sole connection between the hoist 15 and the vehicle body 12 is attachment of the base 18 to the lower rail 19 and connection of the lift motor 42 to the body. The connections between the vehicle body and the hoist 15 are all well below the loading opening 13 and spaced somewhat forwards from the rearmost extremity of the loading opening.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

## Claims

1. A collection vehicle having a body (12) defining a chamber for receiving a load and a loading opening (13) through which the load can be introduced into the chamber, the vehicle further comprising a bin hoist (15) for raising a bin from the ground and tipping the bin through the loading opening to discharge contents of the bin into the chamber, wherein

the hoist includes a bin carrier (20), a support (31), a linkage (34,37) for connecting the bin carrier with the support and a tipping motor (36) for moving the bin carrier relative to the support, the linkage including a first member (34) connected with the support for pivoting relative thereto about a first axis which is fixed with respect to the support and connected with the bin carrier for pivoting relative thereto about a second axis which is parallel to the first axis, the hoist of the vehicle being characterised by a further linkage (40, 41) connecting the support with the body of the vehicle for movement relative thereto to raise and lower the first axis and by a lift motor (42) for moving the support relative to the body.

**2.** A vehicle according to Claim 1 wherein the further linkage (40, 41) is substantially a parallelogram linkage which maintains the attitude of the support (31) relative to the body (12) substantially constant during movement of the support relative to the body.

**3.** A vehicle according to Claim 1 or Claim 2 comprising control means (44) for preventing operation of the tipping motor (36) until the first axis has been raised to a predetermined level relative to the body.

**4.** A vehicle according to any preceding claim wherein, when the bin carrier (20) is in a fully lowered position, the hoist lies substantially entirely below the level of a lower boundary of the loading opening (13).

**5.** A method of emptying the contents of a bin into a chamber defined by a collector vehicle body (12) comprising the steps of moving a bin carrier (20) and a support (31) therefor relative to the body from a fully lowered position to a raised position, maintaining the attitude of the bin carrier relative to the body substantially constant during movement from the fully lowered position to the raised position, engaging the carrier with the bin during movement of the carrier from the fully lowered position to the raised position in a manner to carry the bin upwards from the ground and then raising and tipping the bin carrier and the bin relative to the support, whilst the support remains in the fully raised position.

**6.** A method according to Claim 5 wherein, during movement of the carrier (20) from the fully lowered position to the raised position, the position of the carrier relative to the support (31) remains unchanged.

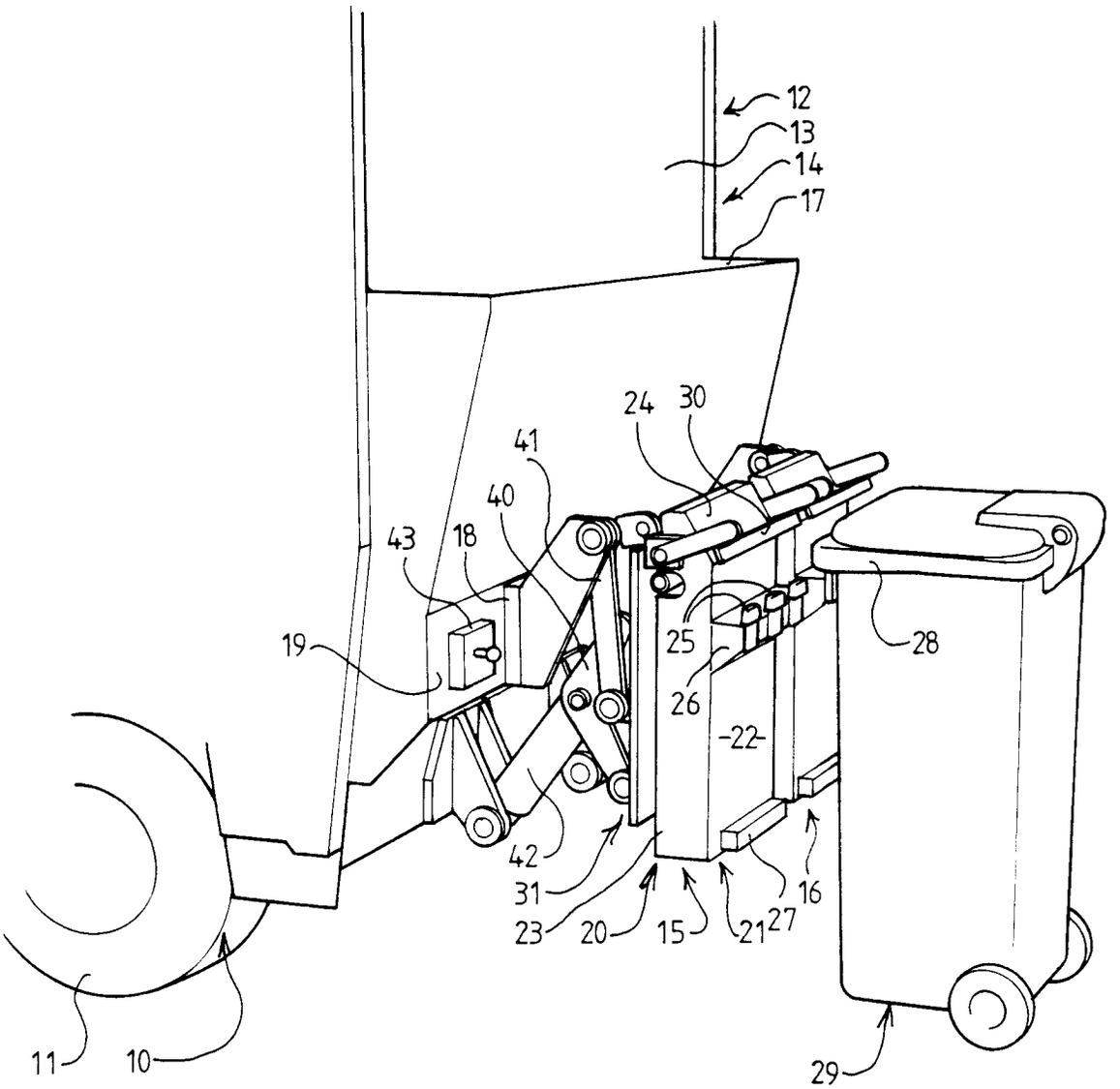
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FIG 1

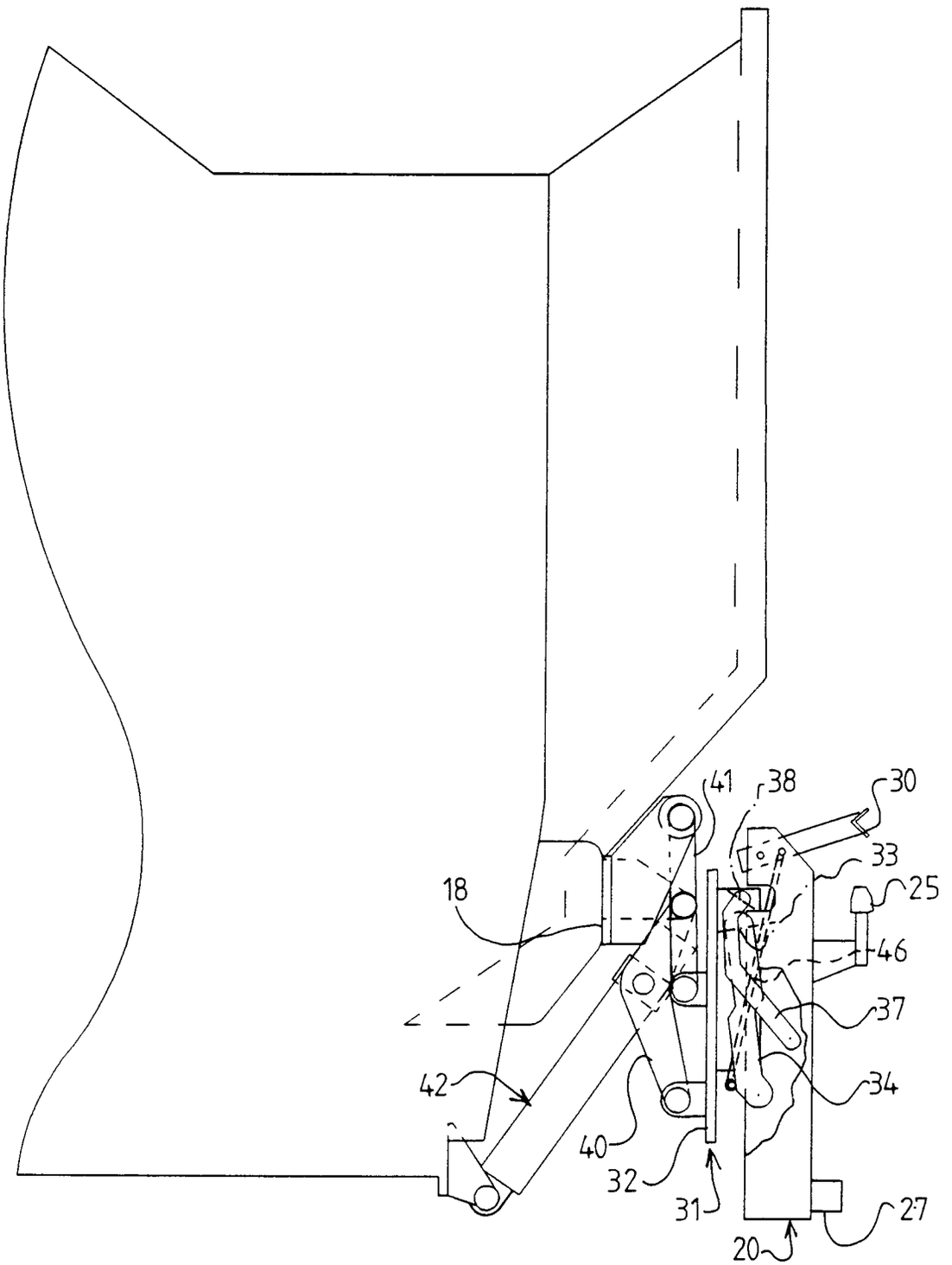


FIG 2

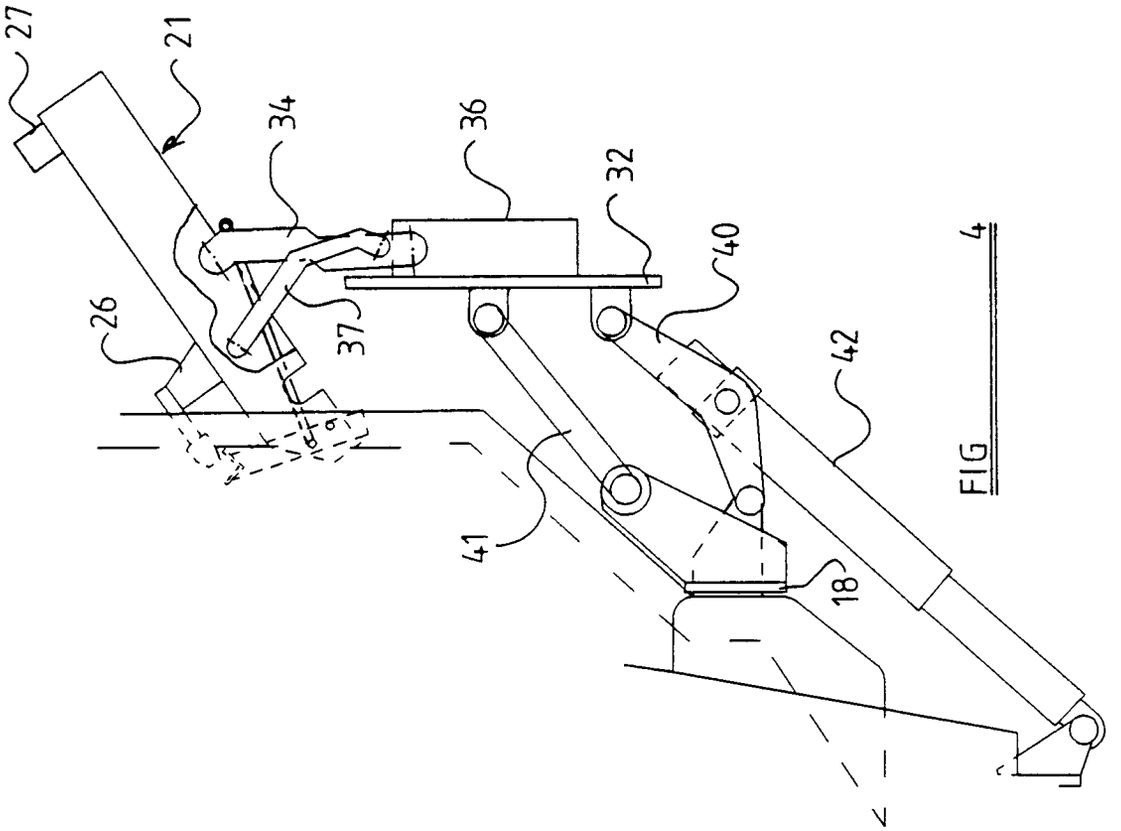
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FIG 4

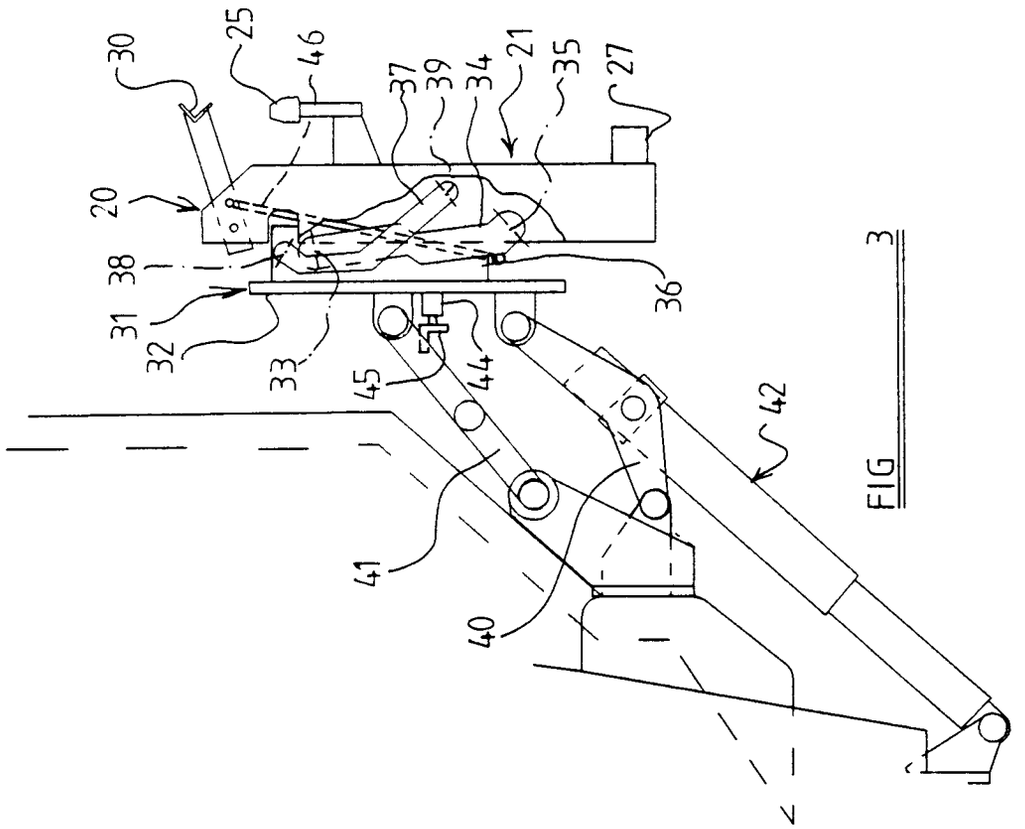
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FIG 3

European Patent Office

# EUROPEAN SEARCH REPORT

Application Number

EP 92 10 7538

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl.5) |
|---|---|---|---|
| X | US-A-4 422 814 (BORDERS)<br>* column 2, line 28 - column 3, line 22; figures 1,2,6,7 * | 1,3,5,6 | B65F3/04 |
| Y | | 2,4 | |
| Y | FR-A-2 461 667 (DEMENAIS)<br>* figures 1,3-5 * | 2,4 | |
| D,A | EP-A-0 358 046 (NAAB) | | |
| A | GB-A-2 224 261 (GREEN) | | |

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B65F

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 06 AUGUST 1992 | DEUTSCH J.P.M. |

CATEGORY OF CITED DOCUMENTS

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