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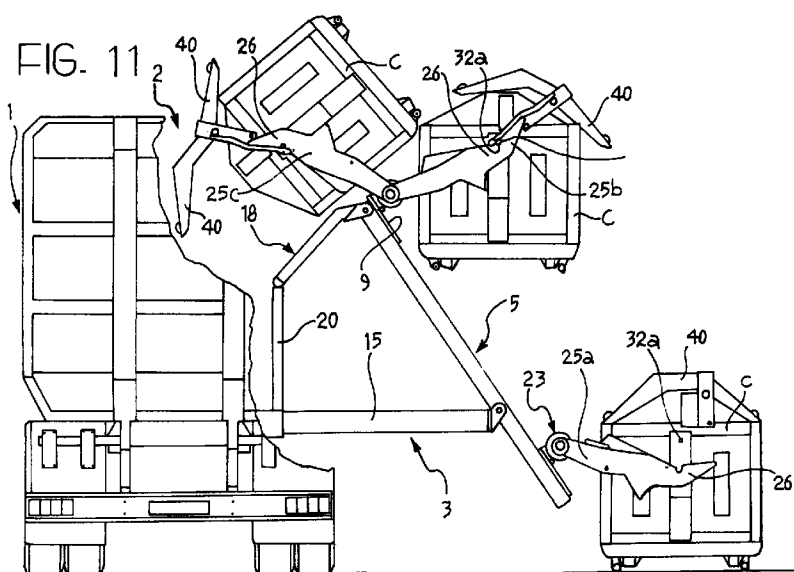
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(54) A device for tipping a refuse container into the body of a refuse-collection vehicle

(57) A device for tipping a refuse container over the body (2) of a refuse-collection vehicle (1) includes a guide structure (5) which can move between a position substantially parallel to a side wall (2a) of the vehicle (1) and a position inclined thereto. A carriage (9) is slidable along the guide structure (5) between a lowered position and a raised position upon actuation of first actuator means (13). A pair of arms (25) for picking up the container (C) are adapted to rotate relative to the carriage on actuation of second actuator means (23) which control the rotation of the arms (25) between a position in

which they engage the container (C) and a position in which it is raised. A swingable member (18) is interposed between the guide structure (5) and the vehicle and articulated to the vehicle (1) and to the guide structure (5), a support rod (15) which can slide relative to the vehicle (1) in such a way that it can project in a direction transverse the side wall (2a) of the vehicle (1) is also articulated to the lower part of the guide structure (5).



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Description

The present invention concerns a device for tipping a refuse container over the body of a refuse-collection vehicle, comprising:

a guide structure associated to a side wall of the vehicle in such a way as to be swingable between a position substantially parallel to the wall and a position inclined thereto;

a carriage which can move along the guide structure between a lowered position and a raised position following the actuation of first actuator means associated to the guide structure and to the carriage; and

pick-up means for picking up the container comprising a pair of arms which can rotate simultaneously relative to the carriage about an axis transverse the guide structure following the actuation of second actuator means for controlling the rotation of the arms between a position in which they engage the container and a raised position in which the container is above the position of engagement.

A device of the type indicated above is known in which the guide structure is articulated directly at its upper end to a side of the refuse-collection vehicle. A hydraulic cylinder is also articulated close to the lower part of this side and, by its extension, is intended to control the inclination of the guide structure with respect to the side of the vehicle. However, in order to enable containers also far from the vehicle to be picked up, the device must be provided with very long pick-up arms so that they can compensate, by their length, for the large inclination of the guide structure needed in these conditions. Naturally, such long arms considerably increase the weight bearing on the carriage which supports the arms directly so that it is necessary to increase the size of the actuators which control the movement of the carriage. In addition, the length of the arms, particularly when they have engaged the container, gives rise to large moments of force due to the distance between the load which is cantilevered from the carriage and the axis of rotation of the arms such that the entire device must have a relatively complex structure in order to withstand them.

The primary object of the present invention is to propose a device of the aforesaid type which allows refuse containers to be picked up whether they are close to or far from the vehicle, but which has shorter arms so as not to be subject to the disadvantages mentioned above with respect to the prior art.

This object is achieved by virtue of the fact that a swingable member is interposed between the guide structure and the vehicle, being articulated to the vehicle and to the guide structure, and by the fact that the lower part of guide structure is also articulated to a support rod which is slidable relative to the vehicle in such

a way that it can project in a direction substantially transverse the said wall of the vehicle.

The device which is the subject of the present invention is therefore particularly simple and light in comparison with similar known devices, the resulting decreased production costs and reliability in use being particularly advantageous. Its structure also enables the time taken for each cycle of engaging, tipping and repositioning of the refuse containers to be reduced considerably. In addition, it is possible to use pick-up arms of a restricted length so as to allow refuse containers situated very close to the vehicle to be engaged as well as containers located relatively far away from it.

The prior-art device described above is also provided with a movable carriage which supports an auxiliary structure which can be tipped relative thereto and to which the pick-up arms are directly connected. In particular, when the carriage reaches the raised position close to the upper end of the guide structure, the auxiliary structure of the carriage must be turned upside down relative to the carriage itself to pour the contents of the container into the vehicle body. Naturally the carriage provided with this tippable auxiliary structure is complex in that it requires actuators for controlling the movement of the auxiliary structure, and is therefore expensive to produce.

A further object of the present invention is to provide a device of the type indicated above in which the carriage is of extremely simple construction.

This further object is achieved by virtue of the fact that the said second actuator means enable the arms to be moved between a rest position which is lower than the position of engagement of the container and a position of tipping of the container annularly spaced from the raised position of the container in the opposite sense from the engagement position.

In this way, the second actuator means alone can move the arms between all of their operative positions without needing moving carriage parts to contribute to the movement of the arms.

The second actuator means preferably include an actuator of the helical type.

Further characteristics and advantages of the present invention will become clearer from the following detailed description, made with reference to the accompanying drawings and given purely by way of non-limitative example, in which:

Figure 1 is a side elevational view of a refuse-collection vehicle including a tipping device according to the invention;

Figure 2 is a front elevational view of the device according to the invention;

Figure 3 is a side elevational view taken in the direction of the arrow III in Figure 2, which illustrates the positions that the device according to the invention can assume in use in a full line and a broken line respectively;

Figure 4 is a sectional view on an enlarged scale of a detail indicated by the arrow IV in Figure 2;

Figure 5 shows half of a transverse section taken on the line V-V of Figure 4, the half not shown being symmetrical to that which is illustrated;

Figure 6 is a similar view to that of Figure 5 and shows half of a transverse section taken on the line VI-VI of Figure 4;

Figure 7 is a transverse section taken on the line VII-VII of Figure 4;

Figures 8 and 9 are similar views which show, on an enlarged scale, a detail indicated by the arrow VIII in Figure 3 in two different operative positions; and Figures 10 and 11 are rear elevational views of a refuse-collection vehicle provided with the device according to the invention during the steps of handling a refuse container in which the container is close to or far from the vehicle respectively.

With reference initially to Figures 1 to 9, reference numeral 1 indicates a refuse-collection vehicle having a body 2 into which are tipped the contents of refuse containers C which are handled by a device 3 attached to a side wall 2a of the vehicle 1.

Although reference is made in the present description to a side of the vehicle 1, such as the side wall to which the device 3 is attached, the device could also be attached to a different wall of the vehicle 1, for example a rear wall or even a front wall.

The device 3 includes a guide structure 5 comprising a pair of uprights 7 with upper ends 7a and lower ends 7b, each of which can, for example, be made from a channel shaped profiled section. A carriage 9 is movable along the uprights 7 and preferably has two pairs of rollers (not shown in the drawings), each of which engages one of the uprights 7.

One end of each of a pair of chains 11 is fixed to the carriage 9, the opposite ends being anchored to the guide structure 5. A hydraulic cylinder 13 connected to the structure 5 supports a pair of idle wheels 13a, in known way, over which the chains 11 pass in such a way that, on extension of the cylinder 13, the chains 11 cause the carriage 9 to move along the guide structure 5 between a lowered position and a lifted position with respect to the structure.

In a position on the uprights 7 intermediate the ends 7a and 7b but closer to the end 7b, a support rod 15 is articulated to the structure 5 at 7c by means of a pair of lugs 15a. The rod 15, which is advantageously made from a square-profiled piece, is slidable in a guide piece fixed to the vehicle body 1 and having a section corresponding to that of the rod 15, with the interposition of slide members (not visible in the drawings) interposed in such a way that the rod and the profiled guide piece are held together by a prismatic coupling. The sliding of the rod 15 along the guide element is driven by an actuator, for example of the linear fluid type (not visible in the drawings).

Each end 7a of the uprights 7 is articulated to one end 18a of a swingable member 18 whose opposite end 18b is articulated on the vehicle 1, for example on elongate elements 20 fixed to the side wall 2a of the vehicle 1. This swingable member 18 can be made from a plurality of bars extending parallel to the guide structure 5 and rigidly attached to a sheet 19 of, for example, corrugated metal.

The carriage 9 provides rigid support for the body 27 of a hydraulic actuator 23 intended to control the simultaneous rotation of a pair of pick-up arms 25 about an axis of the actuator 23 disposed transverse the direction of movement of the carriage 9 and, therefore, the guide structure 5.

In particular, the actuator 23 enables the arms 25 to pivot between a lowered rest position, in which they are substantially parallel to the guide structure 5 (see Figure 2 and the part drawn in continuous line in Figure 3), a container-engagement, or pick-up position, in which the arms 25 assume a substantially horizontal position (see the broken line part of Figure 3, and Figures 8, 10 and 11), a position in which the container C is lifted which is slightly higher than the pick-up position (see Figures 9, 10 and 11) and a position in which the container C is tipped over the body 2 of the vehicle 1, in which the arms are angularly spaced from the container-lifting position in the opposite sense from the engagement position (Figures 8 and 9).

The actuator 23 therefore allows the arms 25 to pivot through approximately 270° from the extreme lowered rest position to the opposite extreme position in which the container C is tipped over.

In particular the actuator 23, which is, to advantage, of the double-acting helical type, comprises an annular chamber 29 within a cylindrical body 27 in which an annular piston 31 is slidable. The piston 31 preferably has three helical grooves 33 in its radially outer surface, each of which is engaged by a helical projecting slide member 35 mounted on a pivot pin fixed to the body 27.

A pair of ducts 38 allow pressurised fluid to be supplied to the opposite ends of the chamber 29 in order to drive the sliding of the piston 31 within the chamber 29.

The piston 31 also has a plurality of axial grooves 43a in its radially inner surface, preferably three, each of which is engaged by a respective projection 43 of corresponding shape which extends radially from a central portion 28 within the actuator 23, which is also positioned within the piston 31 and free to rotate with it relative to the body 27.

Coaxially, within the annular piston 31 there is a pair of aligned cylindrical bodies 37 each of which forms one of the external walls of a pair of cylindrical chambers 39 of a pair of associated double-acting, linear hydraulic actuators 41, as well as portions of the internal wall of the chamber 29, both of these bodies 37 being fixed by axially opposite ends to the central portion 28. These actuators 41 are therefore aligned with each other and are coaxial with the axis of the actuator 23.

Each actuator 41 includes a respective piston 47 which can slide in the associated chamber 39 and which is attached rigidly to an associated arm 25 of the device 3 by means of a hollow shaft 49.

Pressurised fluid is supplied through a pair of ducts 44, 45 respectively to the opposite ends of each chamber 39 of the actuators 41, the duct 44 being formed in the central portion 28 and communicating at one end with a duct outside the actuator 23 by means of holes passing through the piston 31 and, at the other end, with both of the chambers 39.

An axially-splined guide rod 51 is slidable axially in the hollow shafts 49. This rod 51 engages in specific central holes having a shape corresponding to both of the pistons 47, and its central part is fixed to the central portion 28. In this way the pistons 47 are fixed firmly for rotation about the axis of the actuator 23 with the arms 25. By controlling the actuators 41, it is possible to vary the mutual spacing of the pick-up arms 25 telescopically in such a way as to adapt the device 3 as necessary for handling containers C of different sizes.

The arms 25, illustrated in greater detail in Figures 8 and 9, each include a pick-up end 26 which has a heel-like support portion 28 extending from its lower part for bearing against a vertical abutment rib 28a of the container C when the container C is lifted by the arms 25.

The upper part of the end 26 of each arm 25 has a pair of oppositely inclined surfaces 30 which converge towards a seat 32 intended to house a cylindrical appendage 32a projecting laterally from the rib 28a of the container C.

A bar 34 is articulated on each of the arms 25 close to the seat 32, the bar having an associated fluid actuator 36 for driving its pivotal movement between an inactive rest position (Figure 10) and an active position (Figure 11) in which the bar 34 retains one of the appendages 32a in the associated seat 32. When the bar 34 moves from its inactive rest position to its active position, it engages part of the pivoted cover 40 of the container C so as to open it.

During operation of the device, and with reference particularly to Figures 10 and 11, the vehicle 1 is located alongside a refuse container C to be tipped over its body 2. The vehicle 1 will, to advantage, have known sensor devices for indicating its correct positioning with respect to the container C, for example of the telecamera, photocell or sonic type.

The vehicle 1 can be close to the container C as illustrated in Figure 10, or further away from it as in Figure 11. The support rod 15 will however be caused to move transverse the vehicle 1 so as to bring the lower end of the guide structure 5 close to the container C to be handled.

By virtue of the device which is the subject of the present invention, refuse containers C located at distances which may vary between approximately 0.3 m and 2.7 m from the vehicle 1 can be handled efficiently.

The carriage 9 is driven to move from a rest position, which is generally an intermediate position with respect to the guide structure 5, in which the arms 25 are also in a rest position adjacent the wall 2a and appropriate for the phases in which the vehicle 1 moves (see the position of the arms 25 illustrated by the solid line in Figure 3), to a position close to the lower end 7b of the uprights 7. The arms 25 then assume a substantially horizontal position (illustrated by the broken line in Figure 3 and with the reference numeral 25a in Figures 10 and 11) as a result of a first rotation about the axis of the actuator 23 until the cylindrical projections 32a of the container C engage the inclined surfaces 30 of the ends 26 of the arms 25. A slight further rotation of the arms 25 causes the projections 32a to slide along the surfaces 30 until they engage in their respective seats 32. In this position the arms pick up the container C and start to lift it.

The carriage 9 is then caused to move from its lowered position to its raised position relative to the guide structure 5 as a result of the actuation of the cylinder 13 and, simultaneously, the arms 25 are rotated further so as to reach the raised position indicated by the reference numeral 25b in Figures 10 and 11.

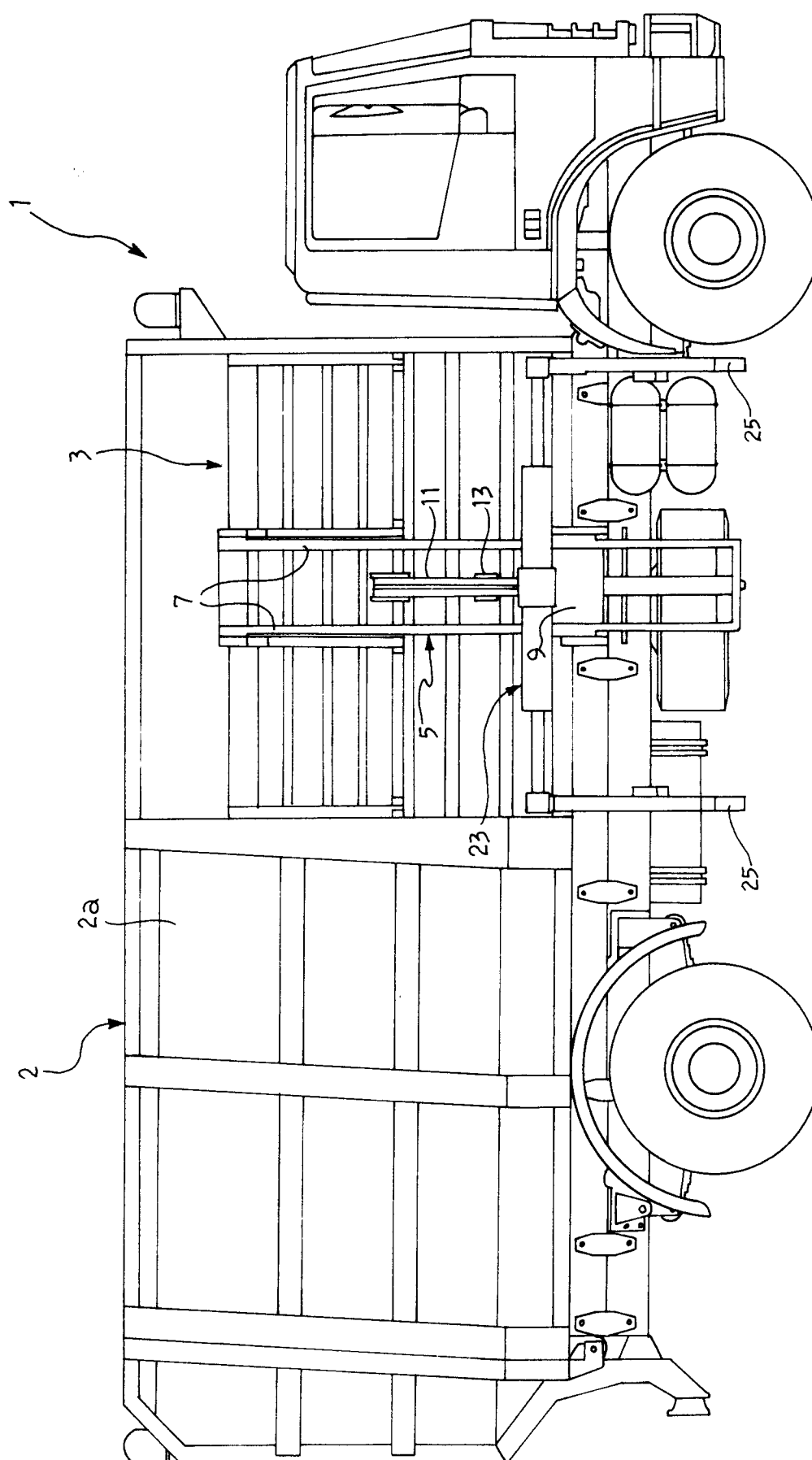
When the arms 25 move from the container-engagement position to the raised position the actuators 36 are controlled in such a way as to cause the bars 34 to rotate simultaneously so as to retain the projections 32a in the seats 32 and open the cover 40 of the container C.

When the carriage 9 reaches the raised position at the upper ends 7a of the uprights 7, the actuator 23 causes the arms 25 to rotate further to the position indicated by the reference numeral 25c which corresponds to the position in which the container C is tipped over the body 2 of the vehicle 1. The container C is therefore emptied, after which it is returned to its initial position on the ground by reversal of the sequence movements used to lift and tip over the container.

Claims

1. A device for tipping a refuse container over the body (2) of a refuse-collection vehicle (1) comprising:
 - a guide structure (5) associated to a side wall (2a) of the vehicle (1) in such a way to be swingable between a position substantially parallel to the wall (2a) and a position inclined thereto;
 - a carriage (9) which can move along the guide structure (5) between a lowered position and a raised position following the actuation of first actuator means (13) associated to the guide structure (5) and to the carriage (9); and
 - pick-up means (25) for picking up the container (C) comprising a pair of arms (25) which can rotate simultaneously relative to the carriage

- (9) about an axis transverse the guide structure (5) following the actuation of second actuator means (23) for controlling the rotation of the arms (25) between a position in which they engage the container (C) and a raised position in which the container (C) is above the position of engagement, characterised in that a swingable member (18) is interposed between the guide structure (5) and the vehicle (1), being articulated to the vehicle (1) and to the guide structure (5), and in that the lower part of the guide structure (5) is also articulated to a support rod (15) which is slidable relative to the vehicle (1) in such a way that it can project in a direction substantially transverse the said wall (2a) of the vehicle (1).
2. A device according to Claim 1, characterised in that the said second actuator means (23) enable the arms (25) to be moved between a rest position which is lower than the position of engagement of the container (C) and a position of tipping of the container (C) which is angularly spaced from the raised position of the container in the opposite sense from the engagement position.
3. A device according to Claim 2, characterised in that the said second actuator means (23) comprise an actuator of the helical type.
4. A device according to Claim 3, characterised in that the helical actuator (23) includes an annular piston (31) slidable in a correspondingly shaped chamber (29), the radially outer surface of the annular piston (31) having at least one helical groove (33) engaged by an associated projecting slide member (35) fixed to the body (27) of the helical actuator (23), the radially inner surface of the annular piston (31) having at least one axial groove (43a) engaged by a projection (43) fixed to the arms (25) and free to rotate with the annular piston (31) relative to the body (27) of the helical actuator (23).
5. A device according to Claim 4, characterised in that the said helical actuator (23) has at least one associated linear actuator (41) for varying the mutual spacing of the arms (25).
6. A device according to Claim 5, characterised in that the helical actuator (23) includes a pair of separate, axially-aligned cylindrical chambers (39) within the annular piston (31), an associated piston (47) connected to a respective arm (25) being slidable in each of the cylindrical chambers (39).
7. A device according to Claim 6, characterised in that each of the pistons (47) slidable in the cylindrical chambers (39) engages a splined guide rod (51) whereby the pistons (47) are fixed for rotation therewith.
8. A device according to any one of Claims 1 to 7, characterised in that the arms (25) have a pick-up end (26) with a support heel (28) for bearing against a shoulder (28a) of the container (C), and lead-in means including a pair of opposing inclined surfaces (30) which converge towards a seat (32) for housing a respective cylindrical appendage (32a) projecting from a side of the container (C).
9. A device according to Claim 8, characterised in that each arm (25) has a bar (34) articulated thereto and movable between an inactive rest position and an active position in which it retains the appendage (32a) of the container (C) in the respective seat (32), the bar (34) also being able to open a pivoting cover (40) of the container (C) in its movement between the inactive position and the active position.
10. A device according to any one of Claims 1 to 7, characterised in that the first actuator means include a hydraulic cylinder (13) associated with rotatable reversing means (13a) over which pass flexible transmission means having opposite ends anchored to the carriage (9) and to the guide structure (5) respectively.



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FIG. 2

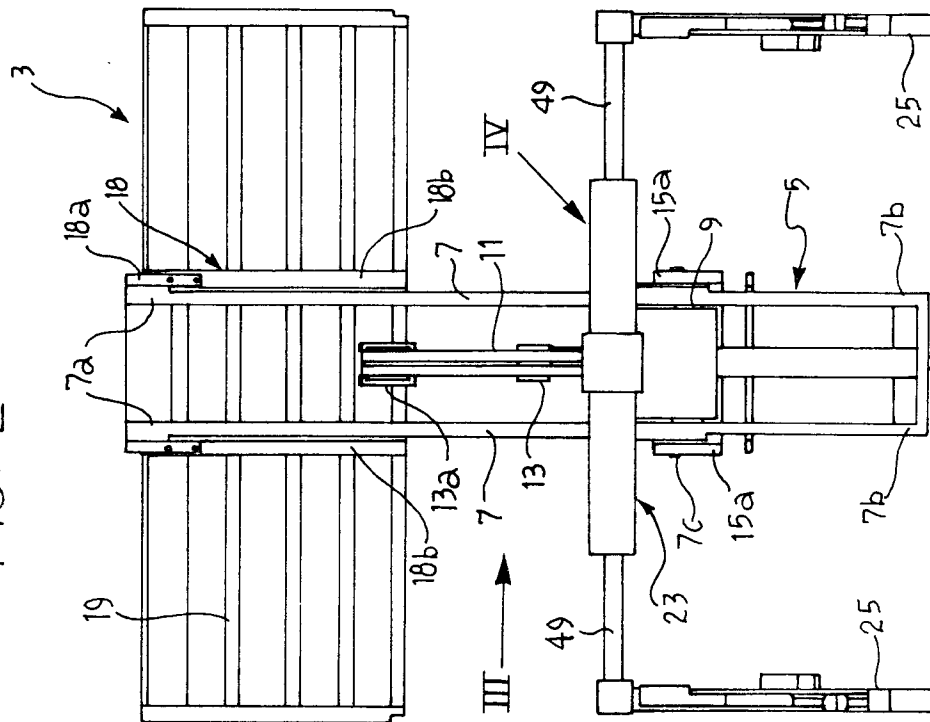


FIG. 3

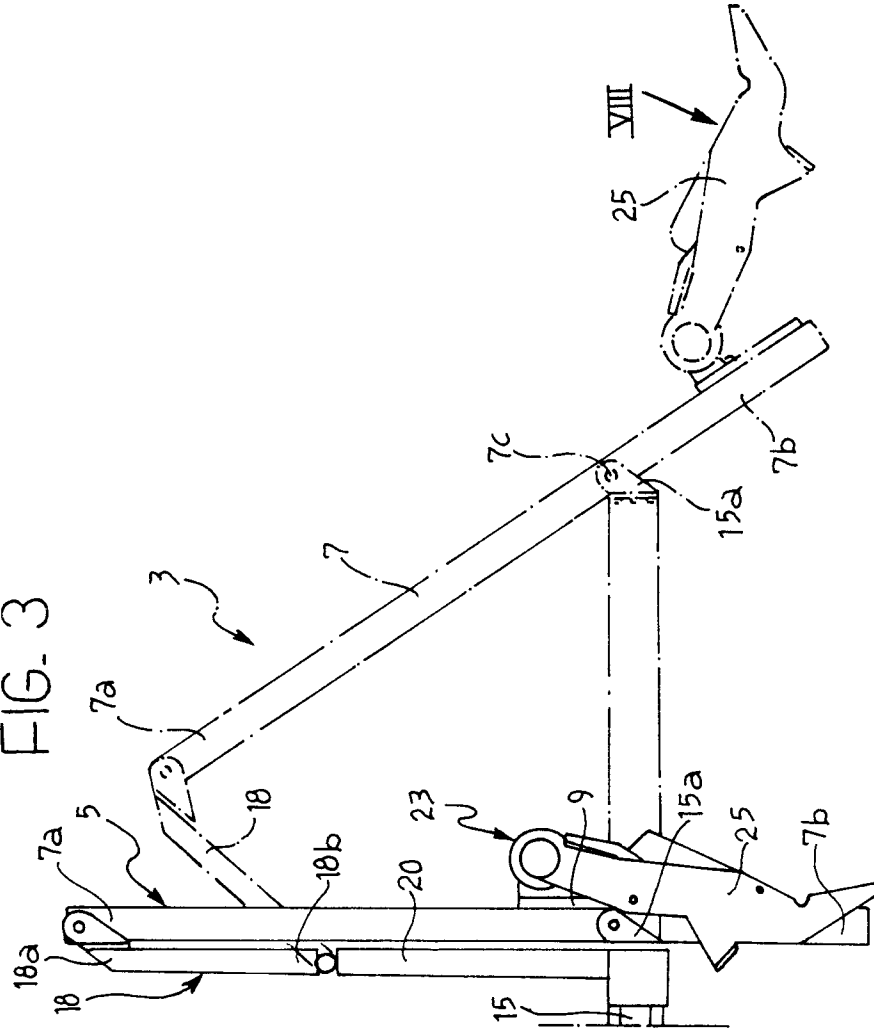


FIG. 4

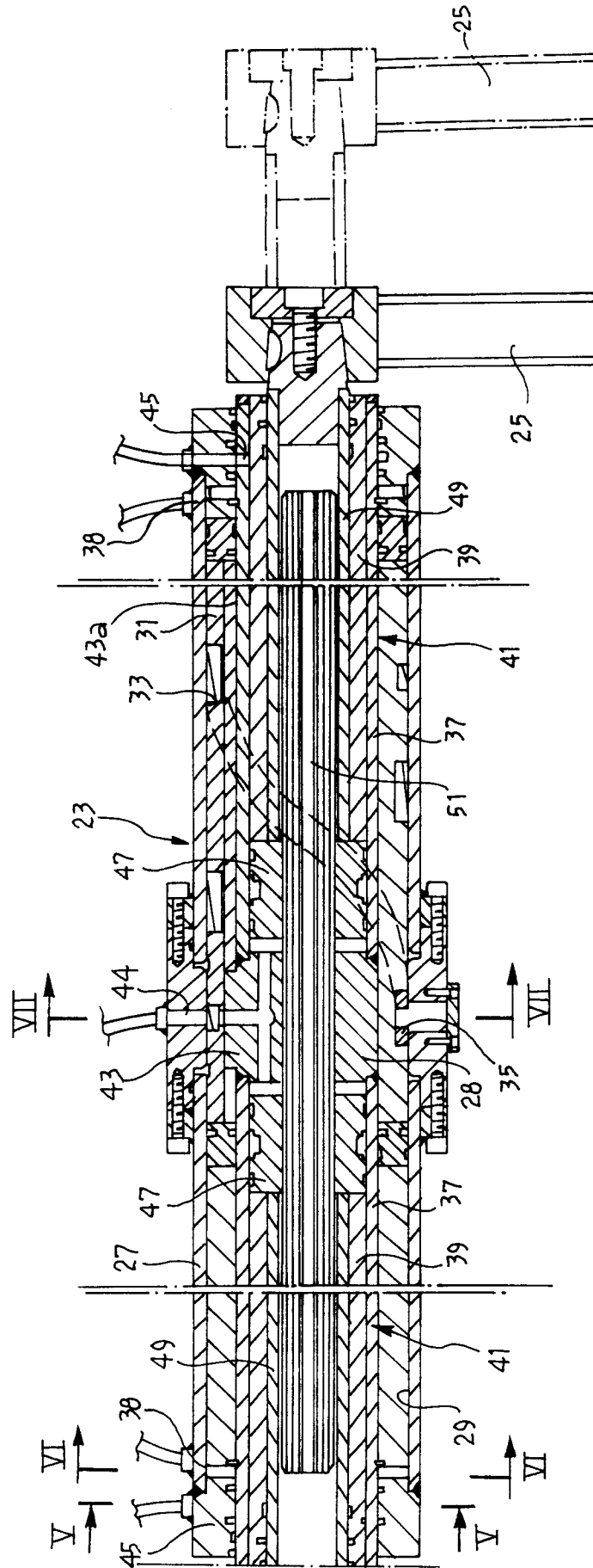


FIG. 5

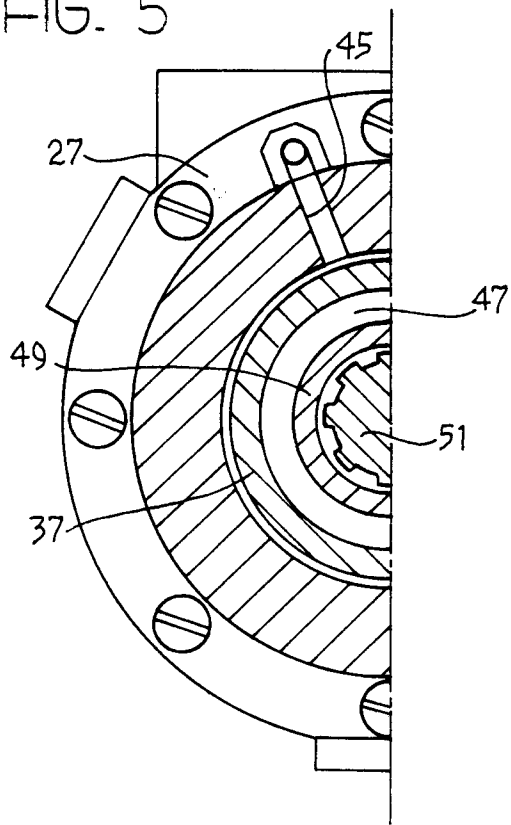


FIG. 6

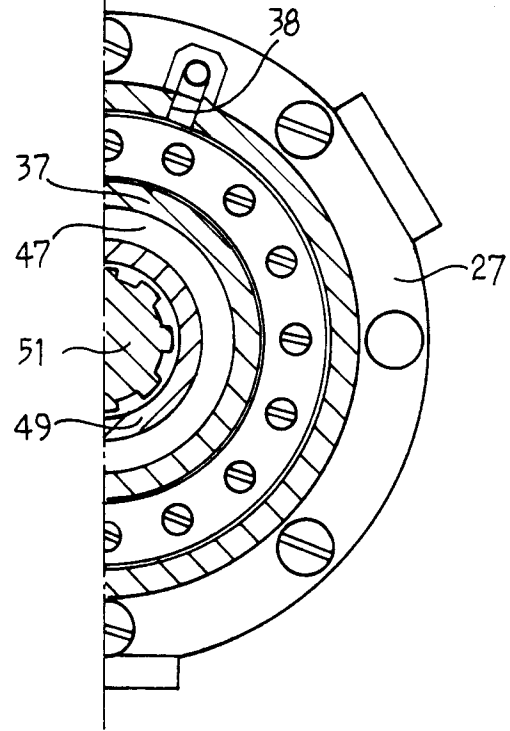


FIG. 7

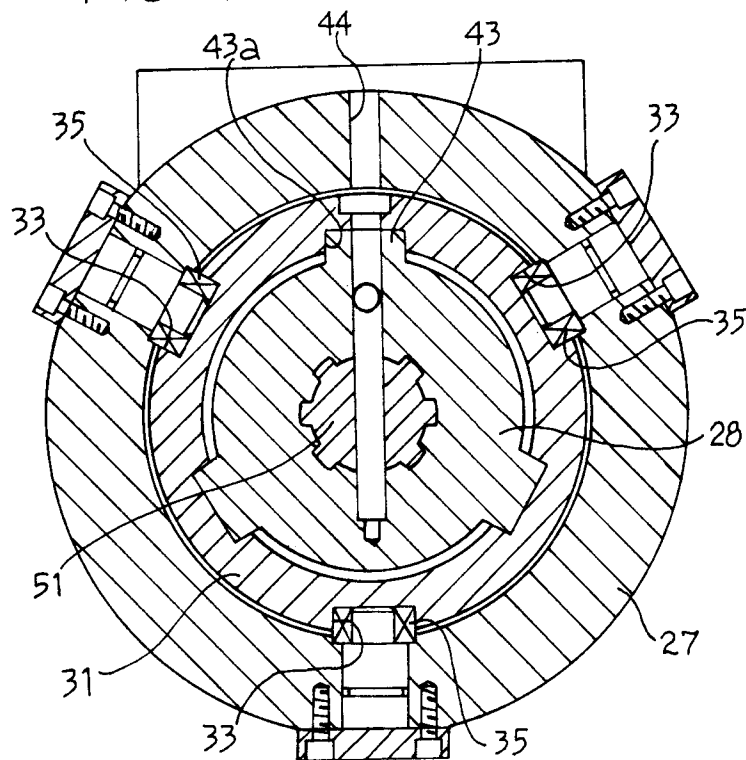


FIG. 8

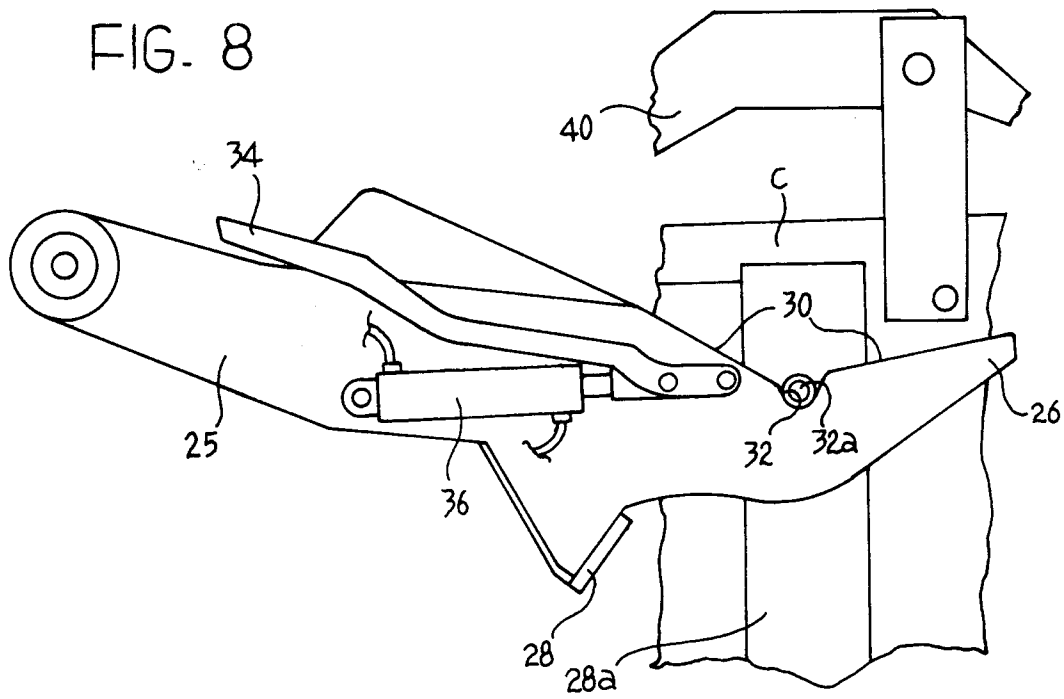


FIG. 9

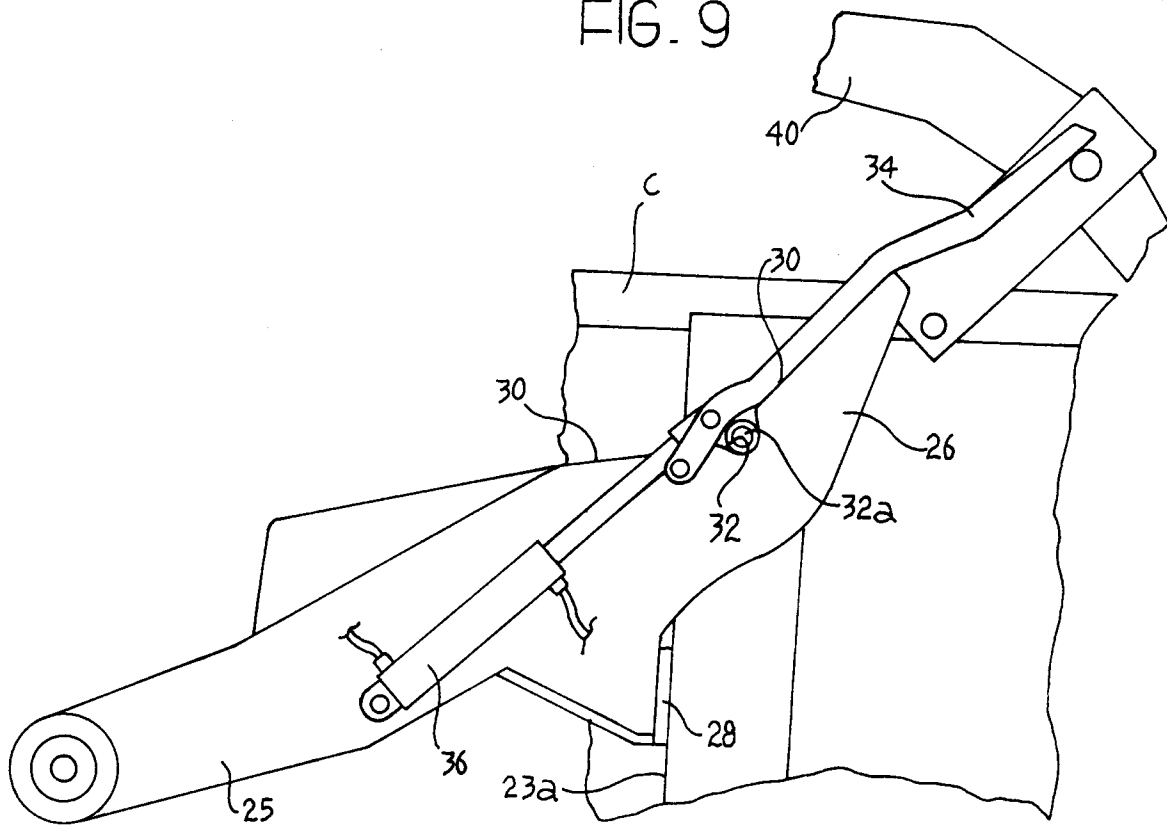
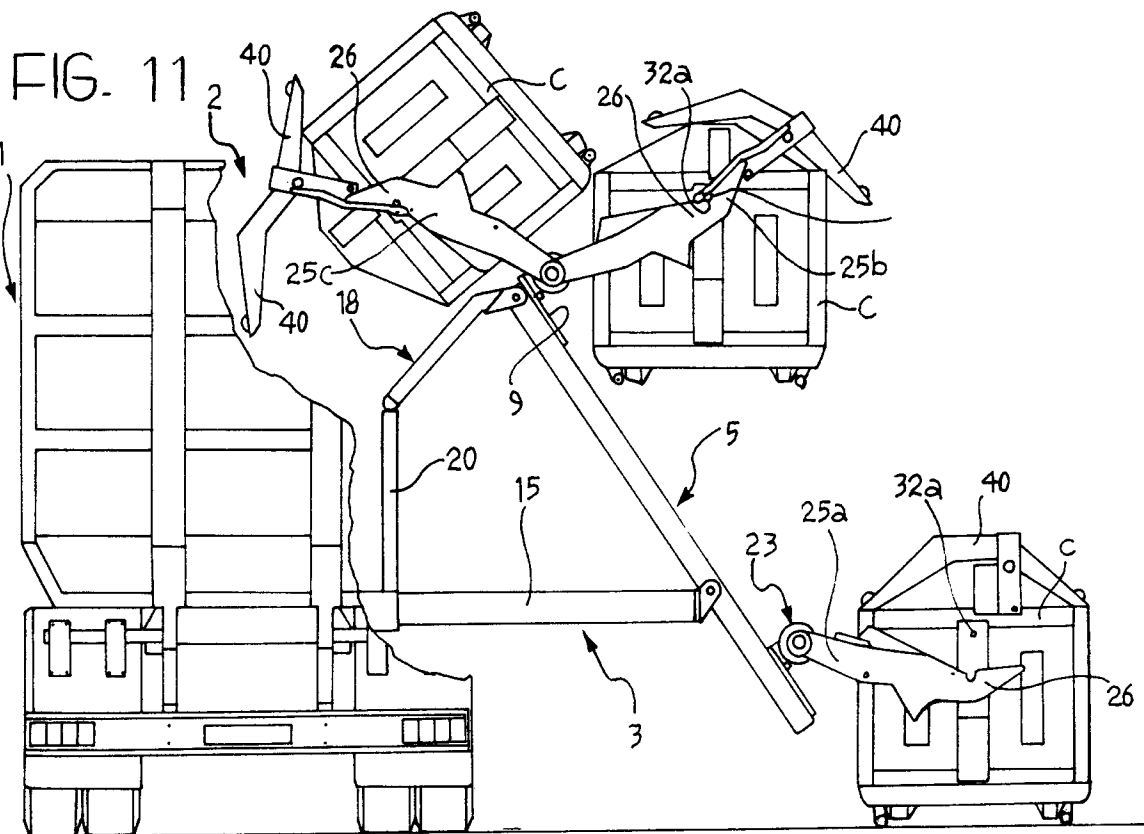
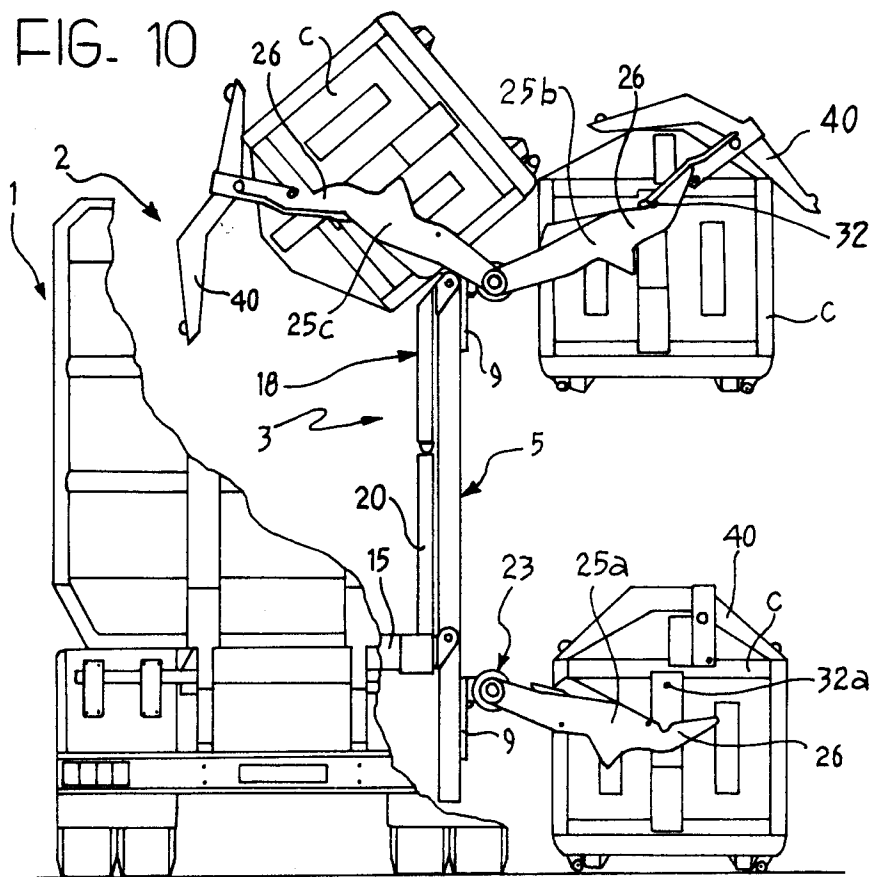


FIG. 10





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EUROPEAN SEARCH REPORT

Application Number
EP 96 10 8692

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.6)
A	US-A-4 872 801 (K. YEAZEL ET AL.) * column 2, line 56 - column 3, line 36 * * column 5, line 44 - line 58 * * figures 1-6,13,14 * ---	1,2	B65F3/08
A	GB-A-2 080 757 (V.I.B. S.R.L.) * page 2, line 38 - page 3, line 41 * * figures 1,2 * ---	1,8,10	
A	US-A-3 217 913 (H. ALDREDGE ET AL.) * column 2, line 46 - column 5, line 48 * * figures 1,2 * ---	1,9	
A	EP-A-0 514 347 (V. ARMANDO ET AL.) * column 2, line 36 - column 3, line 34 * * figures 1-3 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B65F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 23 August 1996	Examiner Smolders, R
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