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(54) Garbage truck provided with a fixed rear dump trough and means for lifting and emptying garbage bins.

(57) Garbage truck consisting of a truck body (1) provided at the rear with a fixed dump trough (3) and equipped with a compactor (6) sliding on inclined guides (13, 14) which can be totally or partially raised and rotate on an upper shaft (15) trasnverse to the truck body (1) to permit lifting of the compactor (6) while the body (1) is emptied with the shovel (4) equipped with an upwards moving flat section (21) to empty the fixed dump trough (3). The system for lifting and emptying of the road garbage bins (24) is located on the outer surface of the side frames of the truck body (1) and is controlled by a hydraulic fluid power unit with fixed rod (32) and mobile cylinder (37) fitted with a rackwork (44) acting on a gear wheel (31) connected to the control levers (28, 29) operating the fork (25) by which the road bin (24) is hooked up.

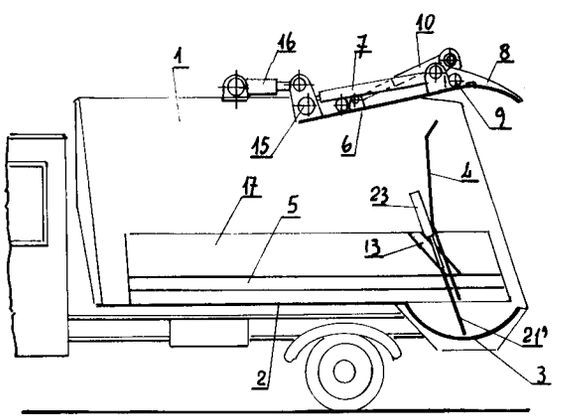

Fig. 3

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They commonly are referred to as garbage trucks for solid urban refuse (S.U.R.) consisting of a truck body provided as the rear with a transverse dump trough in which the garbage is collected and with a garbage compactor in upward-downward reciprocating motion moving along sloping guides. This mobile compactor is equipped, at its lower end, with a scoop or shovel swinging on a cross shaft to remove the garbage from the dump trough and compact it in the front part of the truck body where the emptying shovel is located.

These already known garbage trucks have, however, a serious drawback which lies in the fact that the sloping side guides of the swinging compactor are fixed to the side walls of the truck body and that this compacting equipment must be fitted on a rear charging mouth which can be lifted to allow for movement of the emptying shovel which otherwise would be prevented from performing its operation because of the compactor.

The above mentioned charging mouth includes the dump trough and clearing devices for road garbage bins. It is thus obvious that this dump trough and the clearing equipment are lifted together with the compactor and the rear charging mouth.

Therefore these garbage trucks for solid urban refuse that are provided with upwards moving charging mouth are very complicated and expensive.

Garbage trucks are usually provided with devices to hook, lift, reverse and empty the road garbage bins into a box where solid urban refuse is collected and compacted. When the dump trough is full it is emptied by means of a proper scoop according many known ways.

Various systems have been devised for lifting and emptying of road garbage bins such as systems provided with hooking forks which clasp the garbage bin sideways and are hooked onto the bin by pegs fastened on the sides of the road garbage bin. The forks are suitably hinged on the sides of the truck body and are lifted/lowered by operating devices for each side of the road garbage bins.

The control devices to lift and lower the forks and the garbage bin to which they are hooked are generally operated by a leverage system and hydraulic fluid powered pistons fitted on the sides, consisting of a known, fixed cylindrical body and a movable arm connected to swinging levers bearing the forks. When operated, the pistons can lift the road bin, reverse and empty it and vice versa.

This system to handle road garbage bins, commonly known as hydraulic fluid powered system, has some drawbacks. The first is due to the fact that perfect balanced operation of both pistons is difficult because the weight of the garbage in the road bin may be unbalanced. The second drawback is that the piston and namely the movable arm are rather long and thus require overdimensioning.

This invention has the aim to provide for a garbage truck equipped with a dump trough without rear charging mouth so that the scoop or shovel emptying the garbage will slide without hurting against the mobile compactor.

According to the invention, this objective is attained by allowing the compactor to be raised above the upper edge of the scoop. For this purpose, the upper part or the whole sloping guides along which the compactor sliders are moving upwards and downwards, can be lifted since the guides are hinged onto an upper cross shaft, around which they can be moved upwards by a single/double acting hydraulic piston. The length of the upper part of the guides is such as to block the sliders of the compactor in their upper position. According to this description, the lower part of the sloping guides, which are not involved in the sliders when the compactor is in its upper position, can be secured to the sides of the road bin.

Obviously the upper part of the lowered guides will match with the lower part of fixed guides and pins driven by the double acting hydraulic pistons so as to cause the guides to be continuous or interrupted so that the compactor can move upwards or downwards or can stay lifted.

According to this solution the transverse dump trough located transverse to the garbage truck for solid urban refuse and the equipment for emptying the road garbage bins are fixed to the truck body. The dump trough is cleaned when the truck body is emptied by a flat section located transverse to the truck, adjacent and parallel to the lower edge of the shovel, moving along side guides esternally secured to the shovel and driven by single acting low-pressure hydraulic pistons to push this sliding plate forward in the dump trough according its longitudinal profile .

Therefore, according to this solution the rear charging mouth is no longer needed, thus considerably reducing the equipment while lowering the costs of the garbage truck for solid urban refuse.

According to this invention, lifting and emptying of the road garbage bins is controlled by a special hydraulic fluid powered piston consisting of a central arm fastened at both ends and provided with a fixed plunger on which the piston cylinder, provided on one side with a rackwork, is sliding.

This rackwork is linearly acting on a gear fitted on each side of the truck body and rigidly connected to the lifting lever of the fork hook. This control device consisting of a fixed rod and mobile cylinder is mounted on each side of the garbage truck body.

Thus an exact and perfectly balanced handling of the road garbage bins is ensured; the manufacturing costs of this control equipment are extremely low because its components are simple and the loads are supported by the rod, both ends of which are fastened on body sides of the truck body.

This control device consisting of a piston with a fixed arm and a mobile cylinder can be used for any kind of truck for solid urban refuse and is particularly suitable for trucks provided with a rear dump trough in which the garbage from the road bin is collected and is fitted with a compactor which can be lifted to allow for fast emptying the dump trough.

The invention in question is illustrated in a practical exemplifying implementation in the attached drawings, in which:

Fig. 1 shows the longitudinal central section of the truck body with the compactor in its lowest working position

Fig. 2 shows a top view of the truck body referred to in Fig. 1

Fig. 3 shows the section of the truck body referred to in Fig. 1 with the lifted compactor in its emptying phase.

Fig. 4 shows the magnified detail of the device used to clean the dump trough.

Fig. 5 shows the magnified detail of the compactor slider guides.

Fig. 6 shows a longitudinal side view of the rear end of the truck body provided with the lifting device for road garbage bins subject matter of this invention..

Fig. 7 shows the X-X section according to Fig. 1

Fig. 8 shows a lengthwise and partial sectional view of the piston provided with fixed arm and mobile cylinder which allows to lift and empty the road garbage bins.

With reference to these figures, the bottom 2 of the garbage truck body 1 features at its rear end a transverse dump trough 3. The emptying shovel 4 of the truck body is longitudinally sliding on guides 5 actuated by a known hydraulic fluid powered system (not shown in the drawings). The compactor 6 is moving along sloping guides and is drived by double acting hydraulic pistons 7.

The compactor 6 is equipped at its lower end with a cross scoop 8 rotating on a shaft 9 by double acting hydraulic pistons 10.

The above mentioned equipment is well known on trucks provided with a dump trough 3.

The upward/downward moving compactor 6 (arrow A in Fig. 1) pushes and pulls the transverse scoop 8 into and from the dump trough (3), so that its rotating movements (arrow B in Fig. 1) will remove the garbage from the dump trough and push it into the truck body 1.

According the invention, the slider guides 12 of the compactor are in two parts: the lower part 13 being secured to the sides of the truck body 1 while the upper part is swiveling on an upper transverse shaft 15, the oscillation being caused by a - usually double acting - hydraulic fluid powered piston 16.

The lower part 13 of the guide is usually recessed in the lateral reinforcement 17 of the truck body in which also the guide 5 of the emptying shovel 4 is lodged, while the upper components 14 of the guide consist of channels the legs of which are bent towards the center.

Besides the upper guide components 14, the compactor retracted in its top position, with its sliders 12 lodged in the upper guide components 14, is also integral with the cross shaft 15.. Thus when the piston 16 is actuated, the compactor is raised in its top position and the related upper components 14 of the guides are lifted as shown in Fig. 3 or lowered as shown in Fig. 1

In their lower position - according Fig. 1 - the upper components 14 of the guides are coinciding with the lower components 13 so that the compactor can move upwards and downwards according to the Arrow "A" driven by the pistons 7 while at the same time, the swinging scoop 8 can clear the dump trough 3 and compact the garbage into the truck body 1 by means of the pistons 10.

When the compactor is lowered and the lower 13 and upper 14 components are lengthwise matching together, a locking device will ensure the continuity of these guide components 13 and 14 or will permit their separation so that the upper guide components can move upwards . As shown in Fig. 5, this locking device consists of a pin 18 entering the corresponding hole 19 in the lower end of the channel section forming the upper part 14 of the guide. This pin 18 is connected to the mobile rod of an external double acting hydraulic piston 20 located on each side of the truck body 1.

As already explained, the invention provides for an emptying shovel 4 which, from its front rest position, can be moved along the whole length of the truck body, to the rear end of the truck body. This emptying shovel 4 cannot empty and clear the dump trough 3, since this was unnecessary in previous known solutions, because the dump trough was lifted together with the rear charging mouth.

According to this invention, a sliding plate 21 is provided to empty the dump trough 3; the flat is located near and ahead of the emptying shovel 4. This flat section 21 can slide upwards and downwards along opposed side guides (22) being fastened to the emptying shovel 4 and is operated by means of single acting low-pressure hydraulic pistons 23.

While the shovel 4 is emptying the dump trough in its to and for movement, the flat section 21 moves downwards under the low pressure of the pistons 23, to scrape the bottom 2 of the truck body and along the longitudinal section of the dump trough where it is lowered and moved according to the dump trough profile to provide for its emptying and cleaning.

Therefore the garbage truck for solid urban refuse, provided with rear dump trough 3 fixed to the truck body, according to this invention is much simpler and effective than similar trucks in which the dump trough is fastened to the upwards moving charging mouth. The described solution according to which the compactor 6 can be lifted together with the upper part 14 of the lateral guides, while its lower part 13 is fixed may also be devised so that both guide components 13 and 14 can be lifted together while the whole system remains efficient.

According to such alternative, the locking device 18, 19, 20 between both guide components is no longer necessary.

With reference to Figures 6 through 8, 1 indicates the body of the garbage truck for solid urban refuse. Each side of the truck body 1 is fitted with a system for lifting and emptying of the road garbage bins 24 fitted, as is known, - with a fork 25 hooked around a lateral pin 26 of the road garbage bin 24 and a head 27 resting on the bin 24.

The fork 25 is fastened to the end of a horizontally articulated arm 28, so that the forks 25 can clasp the garbage bin and easily hook up around the pins 26.

The fork 25 as well as the resting head 27 are rigidly connected to a lever arm 29 rotating with its upper end around a fixed pivot 30. A gear wheel 31 is rigidly connected to the upper end of the lever 29.

This gear wheel 31 is driven by a hydraulic piston as shown in fig.8. This hydraulic piston, according to this invention, consists of a fixed rod 32, both ends of which 33 and 34 are secured to the truck body sides. A plunger 35 fitted with peripheral seals 36 is rigidly and centrally mounted on this fixed rod 32.

A mobile cylinder 37, fitted at both ends with closing and sealing heads 38 and 39, is enclosing both the fixed rod 32 and the plunger 35, thus forming two chambers 40 and 41 inside the cylinder 37 and its heads 38, 39 but ouside the the fixed rod 32. These chambers 40 and 41 are separated by the fixed plunger 35 and may receive and discharge the control fluid through the openings 42 and 43, connected through flexible hoses to the hydraulic fluid control and distribution system.

A rackwork 44 is mounted outside the cylinder 37 opposite to the orifices 42, 43 and lengthwise to the cylinder. This rack engages with the gear wheel 31 of the road bin lifting system 24.

Charging or discharging of the chambers 40, 41 through the orifices 42, 43 will thus move the cylinder 37 and the rackwork 44 in a straight line in either direction (arrow A or arrow B), while the rackwork 44 will move the gear wheel 31 in either direction on its fixed pin 30. Rotation of the gear wheel 31 causes the lever 29 to revolve and hence lifting or lowering of the members 25, 27, 28 which are hooking up the road bin 24 which in turn is raised, emptied and then once more lowered to earth.

The device, subject matter of this invention may be used on any type of garbage truck and is particularly suited for medium capacity vehicles equipped with a fixed dump trough in which the road bins are emptied and with a compactor that can be lifted for fast emptying of the truck body, this compactor being schematically outlined, for exemplification purposes, by the short dashes line in fig.6. This compactor is inclined or vertically sliding in lateral guides and can be lifted together with part or all of the guides to permit free movement of the shovel which is to empty the truck body.

Claims

1. Garbage truck for solid urban refuse equipped with:

- a truck body (1) in which the garbage is collected;
- a dump trough (3) transverse and at at the rear of the truck body (1) in which the road bins (24) are dumped;
- a garbage compactor (6) inside the truck body (1) moving upwards and downwards along sloping guides (13, 14) mounted in the side frames of the truck and provided with a lower shovel (8) rotating on a shaft (9) transverse to the truck to clear the dump trough (3);
- a shovel (4) to empty the truck body (1) moving on lateral guides (5) located lengthwise to the truck, mounted in the side frames of the truck (1);
- a device to lift and empty the road garbage bins (24) consisting of two forks (25) fitted on each side of the truck (1) and supported by levers (28, 29) actuated by a control system, **characterized in that**:
- the dump trough (3) is fixed inside the truck body (1) in extension of its bottom (2);
- the lateral sloping guides in which the sliders (12) of the compactor (6) are

moving, are in two parts, i.e. a lower fixed component (13) located on the side frames of the truck body (1) and an upper component (14) oscillating on an upper shaft (15) transverse to the truck by means of a double acting hydraulic piston (16);

- a device for locking and unlocking of the two guide components (13, 14);
- a compactor (6) oscillating together with its mobile upper guides (14) on the shaft (15);
- the emptying shovel (4) has a flat profile (21) transverse to the truck and is positioned in parallel in front of the lower end of the emptying shovel (4), sliding at the top and bottom in fixed guides (22) opposed to the shovel (4) by means of single acting low pressure hydraulic pistons (23);
- an operating system located externally on the side frames of the truck body (1) to lift and empty the road bins (24) consisting of a rod (32) fastened at both ends to the side frame and provided with an almost central plunger (35) and a mobile cylinder (37) externally fitted with a rackwork (44) acting on a gearwheel (31) secured to the levers (28, 29) that are lifting and emptying the road bins (24).

2. Garbage truck as described in claim 1, **characterized** in that the lower parts (13) of the slider guides (12) of the compactor (6) are recessed in lateral reinforcements (17) of the side walls of the truck body (1) and are also provided with guides (5) in which the ejector plate (4) is moving.

3. Garbage truck as described in claim 1, **characterized** in that the upper guide components (14) are shaped in opposed channel sections in which the sliders (12) of the compactor (6) are moving.

4. Garbage truck as described in claim 1, **characterized** in that each locking and unlocking device of the two components (13, 14) of the slider guides (12) of the compactor (6) has a pin (18) actuated by a hydraulic fluid powered double acting piston (20) mounted on the outer surface of the truck body (1) engaging in a hole (19) at the base of the lower end of the upper guide component (14).

5. Garbage truck as described in claim 1, **characterized** in that the system to lift and empty the road bins (24) in the truck body (1) mounted externally on the side frames of the body (1) is consisting of a fork (25) to be hooked around the pins (26) on the sides of the road bins (24) and a supporting head (27) on the bin; this fork being positioned at the end of a horizontally articulated arm (28), while this fork (25) and the supporting head (27) are rigidly connected to a lever (29) the upper end of which is revolving on a fixed center pin (30), **characterized** in that the lever (29) is moved upwards and downwards on vertical longitudinal truck planes, by:

- a gear wheel (31) rigidly connected to the lever end (29) supported by its fixed center pin (30),
- a fixed rod (32) both ends (33, 34) of which are secured to the outer side frames of the truck body (1),
- a plunger (35) almost centrally fixed on the rod (32) and provided with peripheral seals (36),
- a mobile cylinder (37) enclosing the fixed rod (32) and plunger (35) fitted with closing and sealing heads (38, 39) at both ends;
- a longitudinal rackwork (44) mounted on the outer surface of the mobile cylinder (37) and meshing with the gear wheel (31) connected to the lever (29);
- two chambers (40, 41) externally formed by the fixed rod (32) inside the mobile cylinder (37) and by the related heads (38, 39) but separated by the fixed plunger (35) charged and discharged through the orifices (42, 43) connected by flexible hoses to the hydraulic power distribution and control unit.

6. System as described in claim 5, **characterized** by its arrangement on the outer surface of the side frames of the truck body (1) in opposite symmetrical positions.

7. System as described in claim 5, **characterized** in that it may be installed on any body type (1) of garbage trucks equipped with any compacting and emptying system, with or without rear dump trough (3).

8. Garbage truck as described in claim 1, **characterized** in that the lateral guides (13, 14) are enbloc and can be lifted around the shaft (15) by means of a hydraulic piston (16).

9. Operation mode of the garbage truck as described in claim 1, **characterized** by the following functions:

- when the components (13, 14) of the aligned guides are locked by the pins (18), the compactor (6) can clear the dump trough (3) with the aid of the oscillating shovel (8) and can compact the garbage in the truck body (1);
- to empty the truck body (1) when full, the compactor (6) is moved upwards so that the sliders (12) are located in the upper part (14) of the guides;
- the hydraulic pistons (16) and shaft (15) are then rotating the compactor in its top position thus clearing the truck body (1);
- the emptying plate (4) now empties the truck body while cleaning the trough (3) with the flat scraper section (21);
- after the truck body (1) has been emptied, the emptying plate (4) and scraper section (21) are retracted, the compactor (6) is lowered together with the upper guide components (14) and pin clutch (18), so that the truck is ready for another load.

10. Operation mode of the garbage truck as described in claim 1 and 5, **characterized** in that the above mentioned mobile cylinder (37), when activated linearly in either direction (A) or (B), moves the rackwork (44), the gearwheel (31) and lifts or lowers the lifting, emptying and lowering gear of the road dumper bin (24).

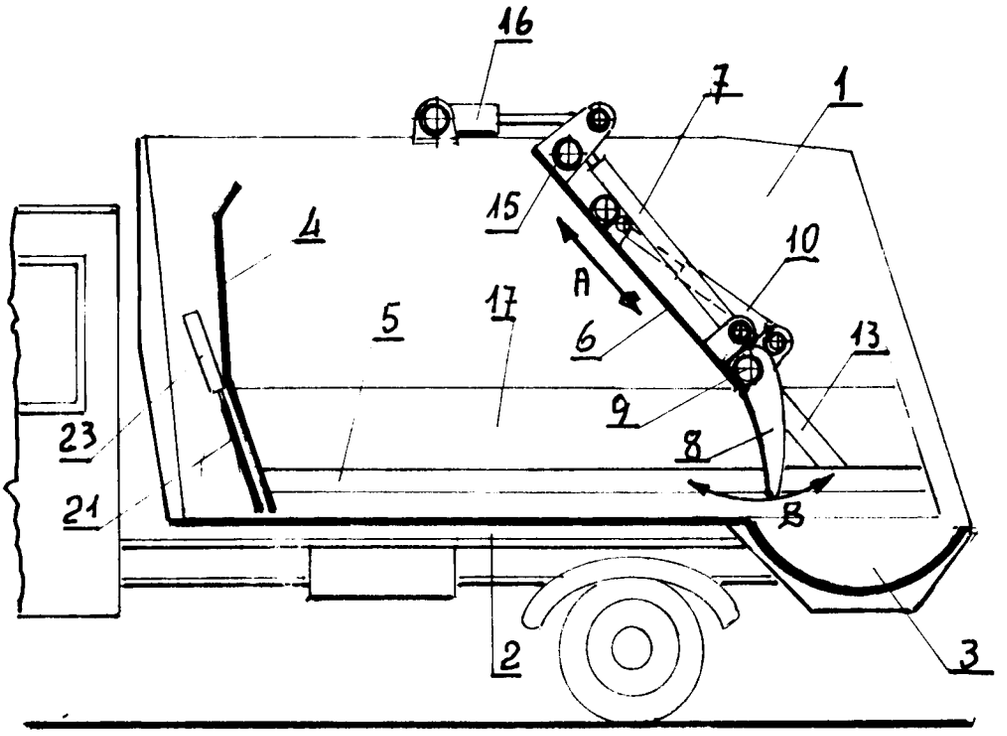

Fig. 1

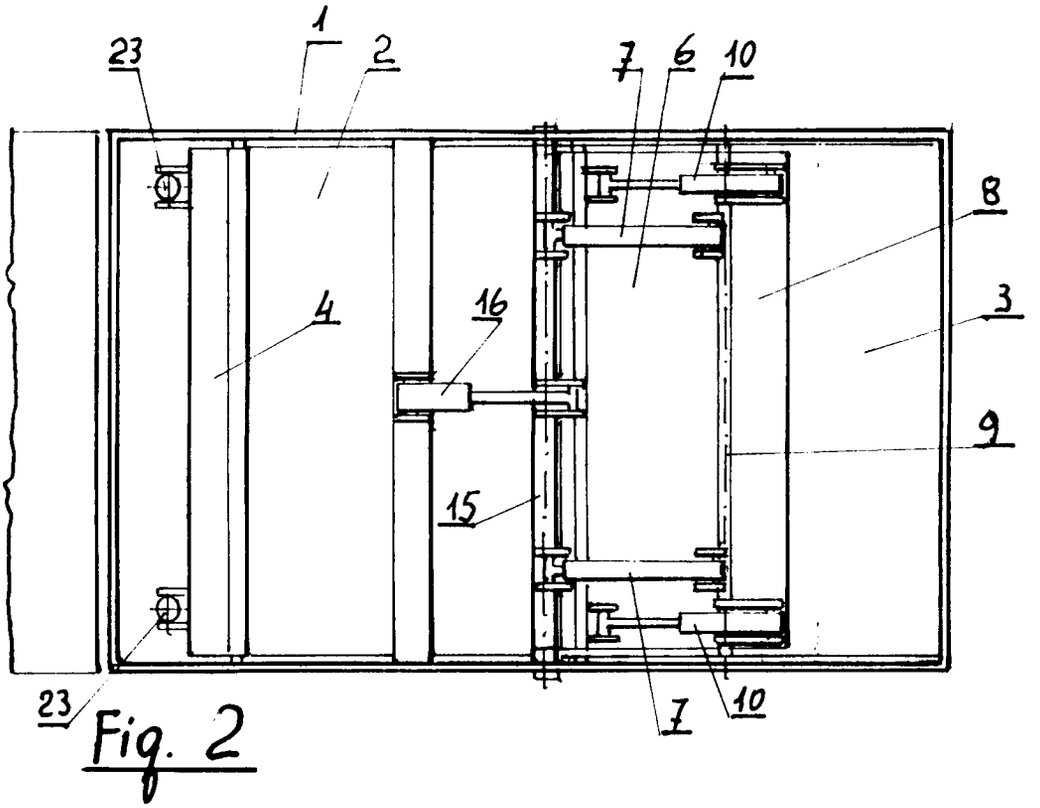

Fig. 2

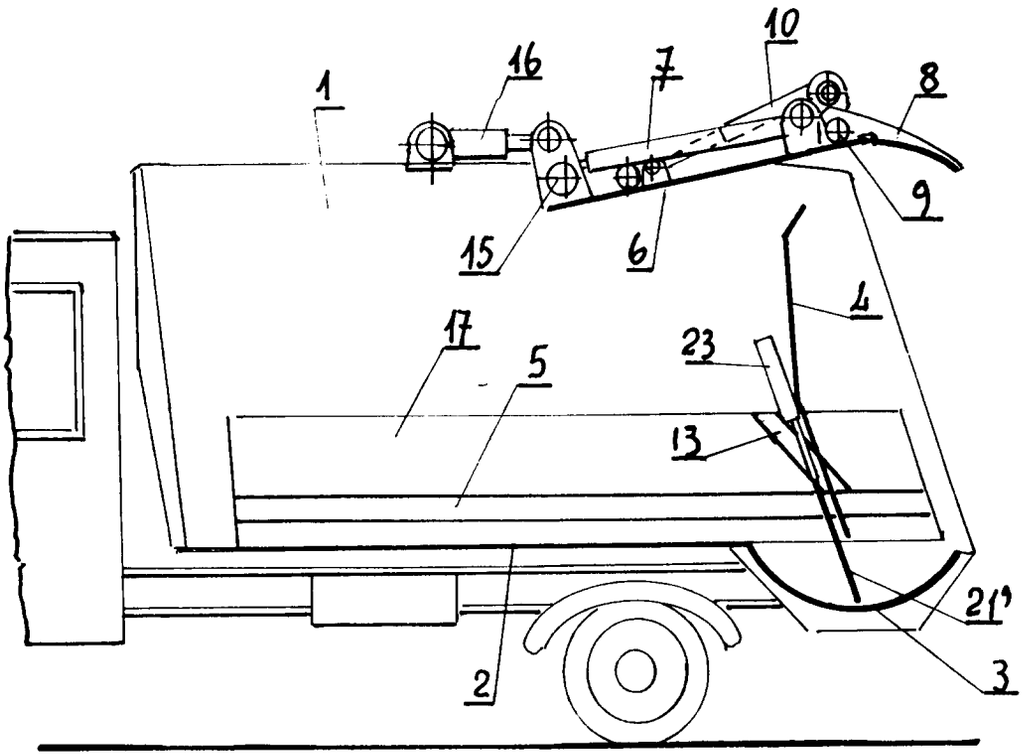

Fig. 3

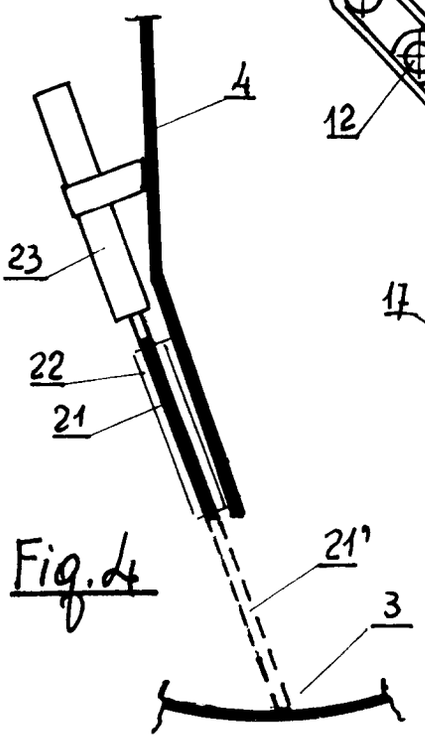

Fig. 4

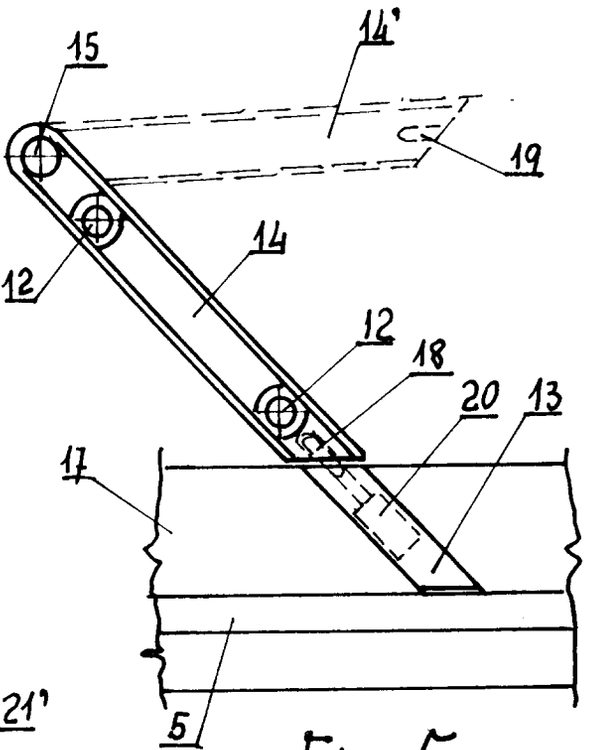

Fig. 5

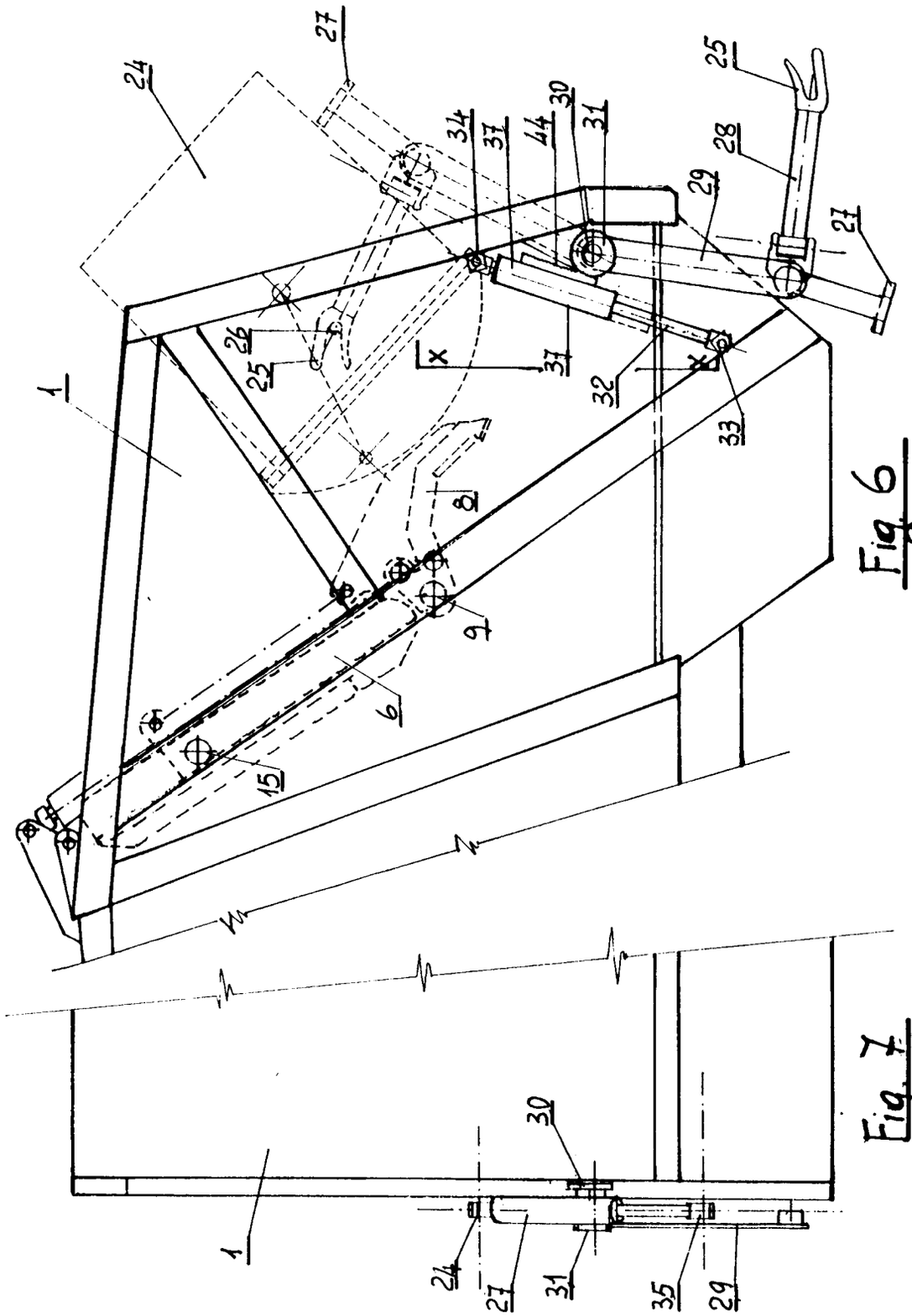
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Fig. 6

Fig. 7

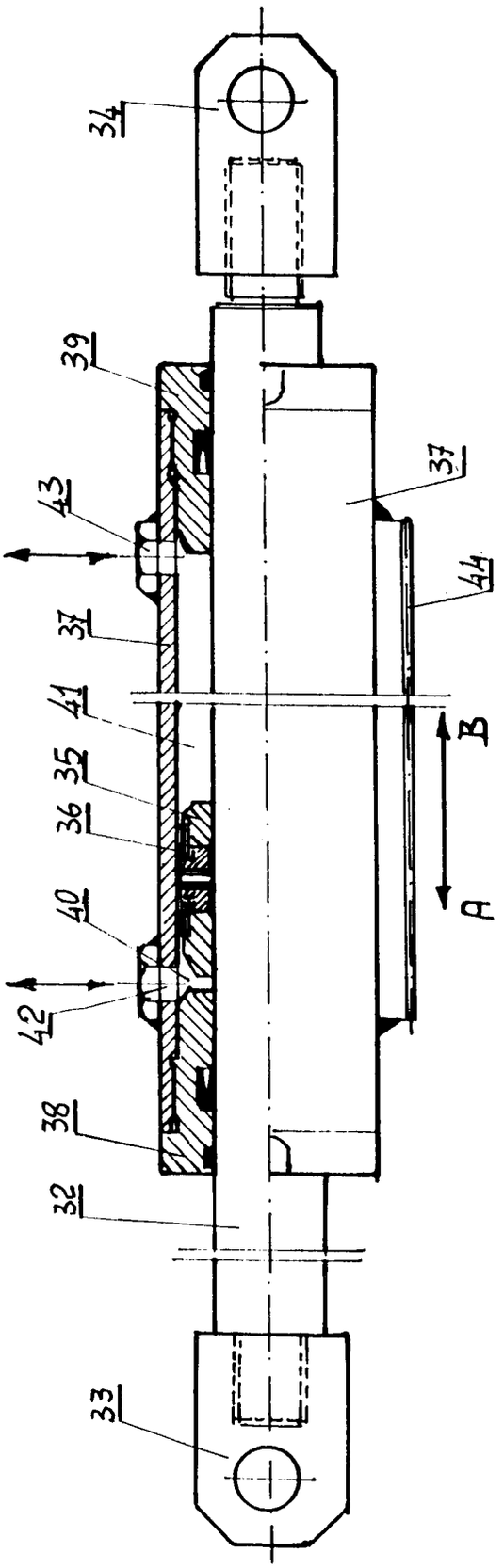

Fig. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 94 11 1684

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	EP-A-0 085 216 (JACK ALLEN (MOTOR BODIES) LIMITED) * page 3, line 9 - line 18; figures 2-5 *	1	B65F3/20 B65F3/28 B65F3/04
A	EP-A-0 514 355 (FARID S.P.A.) * column 3, line 8 - line 21 * * column 4, line 5 - line 22 * * figures *	1	
A	NL-A-8 202 938 (FARID S.P.A.) * figures 1,2 *	1	
A	CH-A-236 955 (BALLERT ET AL.) * page 2, line 78 - line 89; figure 2 *	1	
A	DE-C-932 413 (ZÖLLER) * figure 1 *	1	
A	US-A-3 799 376 (HERPICH ET AL.)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
B65F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 October 1994	Martínez Navarro, A.

CATEGORY OF CITED DOCUMENTS

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