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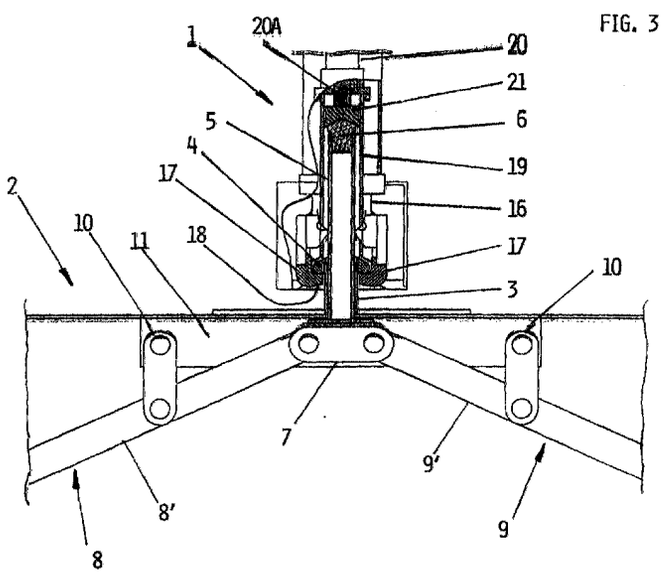
(54) Device and method for handling and emptying containers destined for the waste collection

(57) This document describes a device for handling and emptying the contents of containers for waste collection, in particular for differentiated refuse collection, comprising a coupling device (1) of a waste container (2;2A;2B;2C) that must be handled by means of the said coupling device (1), where the said coupling device (1) presents a body (16) to which are connected the first coupling means (17,18,22,24,25) of the said container (2;2A;2B;2C), and where the said container (2;2A;2B;2C) presents second means (3,4) for coupling the said coupling device (1), third means (5;5';5") sliding in the said second means (3,4) and fourth means (7,8,9,10,12,12A,13,13A, 12',12'A,13',13'A;27,28,30,31;38,39) connected to the said third means (5;5';5") for opening and/or closing at least one door (14,15) of the said container (2;2A;2B;2C), characterised in that the said coupling device (1) comprises fifth means (19,20,21) connected to the said body (16) to check the movement of the said third means (5;5';5") of the said container (2;2A;2B;2C), and that the said fourth means (7,8,9,10,12,12A,13,13A,12',12'A,13',13'A;27,28,30,31;38,39) are made in such a way as to widen the movement of the said third means (5;5';5").

FIG. 3



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Description

[0001] The present invention concerns a device for handling and emptying the contents of containers for waste collection, in particular for differentiated refuse collection, and a container for said device.

[0002] The containers for waste collection, in particular for differentiated refuse collection, for example glass, paper, plastics, etc. are manufactured with the loading openings substantially in the upper part while the emptying is carried out through an opening provided in the lower part.

[0003] They are generally manufactured in a bell-shaped or with a substantially quadrangular and/or rectangular section.

[0004] The motor vehicles used for handling and emptying the contents of these containers are provided with a body to contain the waste and a multi-axis articulated and revolving mechanical arm, hydraulically-controlled, placed between the body and the vehicle's cabin to which is connected a device for coupling the container and for placing it above the body in order to empty the waste contained in it.

[0005] The US 5 014 870 patent discloses a container that presents, centrally and on its upper part, some appropriate means for coupling it through an appropriate device for lifting and displacing it for the next emptying of the contents present inside it.

[0006] These coupling means provide a first coupling element that consists in a bushing fixed centrally and securely to the upper part of the container and that presents a flange on its top.

[0007] A square section bar slides inside the bushing; its upper end, protruding from the container, presents a flange while the other end, inside the container, is connected to the tie rods that are fixed to the opened bottom of the container. These tie rods are manufactured with flexible elements, for example steel ropes that are released, i.e. loose, when the container is resting on the ground.

[0008] The bar has a square section to avoid circular movements that could make the ropes overlap, with ensuing problems when the bottom of the container must be closed and/or opened.

[0009] The sliding bar presents a ring placed immediately under the flange present at its upper end; the ring has the function to stop the entry of the bar in the container and to allow the coupling of the sliding bar, when the container is resting on the ground, preventing the flange of the bar to rest on the flange of the bushing of the container.

[0010] The bottom of the container is generally divided in two equal and symmetric parts that open outward as to the container.

[0011] A coupling device is associated to this container connected to the articulated arm of a vehicle. The device presents at least two symmetrically opposite levers each with a hook at an end. The levers, controlled by hydraulic actuators, can oscillate and, with the hook present at their end, couple under the flange present on the bushing fixed to the container. This coupling allows the handling of the container.

[0012] The device also comprises, in middle and vertically position, a hydraulic actuator that is fixed with one end to the upper part of the coupling device. The other end of the hydraulic actuator, the sliding one, presents a beam to which are articulated in a symmetrically opposite position at least two levers each with a hook at one end. The levers, controlled by hydraulic actuators, can oscillate and, with the hook present at their end, couple under the flange present on the upper end of the sliding bar. This coupling allows the handling of the sliding bar for closing and/or opening the lower part of the container.

[0013] The handling and emptying of the contents of the container occur in the following way.

[0014] After placing the coupling device on the container, with the beam integral with the middle actuator resting on the flange of the sliding bar, the actuators are activated for the levers present on the beam in such a way that they couple the flange of the sliding bar with their hook. The actuators for the movement of the levers connected to the body of the coupling device are also activated in such a way that they couple the flange of the bushing fixed to the container.

[0015] Then the middle actuator is activated: in this way the sliding bar translates upwards in such a way that the tie rods inside the container are pulled and kept in this position in order not to allow the lower part of the container to open during the lifting.

[0016] Now the container can lift and placed above the body of the vehicle ready for emptying its contents.

[0017] Then the middle hydraulic actuator is activated to translate downwards the sliding bar in order to release the tie rods and open the lower part of the container for emptying.

[0018] After emptying the container, the reverse must be carried out: activate the internal actuator in order to translate upwards the sliding bar and close the bottom of the container, place the container back on the road, activate the middle actuator to translate the sliding bar downwards so that it does not protrude excessively from the container when the coupling device is removed, activate the actuators to release the levers from the bushing flange fixed to the container as well as from the flange of the sliding bar, lift the coupling device, move the vehicle to the next container to be emptied.

[0019] As can be seen, this container and this device require a variety of operations for coupling, emptying and releasing the container and precisely:

- coupling the container and the sliding bar;
- upward translation of the sliding bar,
- displacement of the container,
- downward displacement of the sliding bar in order to open the container,

- upward displacement of the sliding bar in order to close the container,
- downward displacement of the sliding bar with the container placed back on the road,
- releasing the coupling levers of the container and sliding bar and lifting the coupling device.

[0020] Therefore this system requires quite a relevant time to complete all the operations, and more the operation lasts, less are the number of containers that can be emptied during the working day.

[0021] Moreover, this device presents a complex realisation both from the operational point of view and as it is manufacture, see for example the number of the hydraulic actuators and of the coupling levers that increase its dimension and costs.

[0022] Moreover, the vertical movement of the sliding bar in order to put the tie rods in traction and keep the bottom of the container closed when the latter is lifted from the ground, requires that the sliding bar executes a path greater than the one made if the tie rods were normally in traction and therefore as a result has also a greater length.

[0023] A longer path of the sliding bar requires therefore that also the hydraulic actuator in charge of its movement is fit for the amplitude of this path, with an increase of the realisation costs.

[0024] It is the object of the present invention to solve one or more of the above drawbacks and to indicate how to provide a device for handling and emptying the contents of containers destined for the waste collection, in particular for differentiated refuse collection, and a container for said device, which does not have the drawbacks of the present state of the art, but on the contrary has advantages in terms of performance and easy assembly and user-friendly.

[0025] A first aim of the present invention is to indicate a coupling device, which reduces the time of the complete emptying operation of a waste container.

[0026] A further aim of the present invention is to indicate a coupling device that may be manufactured with less mechanical components and small size than the known art.

[0027] A further aim of the present invention is to indicate a container for waste collection, for which the coupling device may be used with advantages for what concerns functions and user-friendly.

[0028] A further aim of the present invention is to indicate a container for waste collection in which coupling means are not necessary for closing the bottom when lifting.

[0029] A further aim of the present invention is to indicate a container for waste collection that allows to open and close the bottom of the container with a movement that is smaller than that of the coupling device with respect to the known containers.

[0030] These and other objectives are achieved, according to the present invention, by a device for handling and emptying the contents of containers for the waste collection, in particular for differentiated refuse collection, and by a container for waste collection, incorporating the features of the annexed claims, which form an integral part of the description herein.

[0031] Further objects, features and advantages of the present invention will become apparent from the following detailed description and annexed drawings, which are supplied by way of non limiting example, wherein:

- Fig. 1 shows schematically a cross-section of a handling device and a container for said device, obtained according to the principles of the invention, in the first coupling position for lifting the container;
- Fig. 2 shows schematically a cross-section of a handling device and a container for said device, obtained according to the principles of the invention, in the second coupling position for emptying the container;
- Fig. 3 shows schematically a partial cross-section in an oversized scale of the handling device in the second coupling position of Fig. 2, according to the invention;
- Fig. 4 shows schematically a partial cross-section in an oversized scale of the device in the first coupling position of the container for said device of Fig. 1, according to the invention;
- Fig. 5 shows schematically a partial cross-section in an oversized scale of the device in a releasing/coupling position of the of the container for said device, according to the invention;
- Fig. 6 shows schematically a side cross-section of the device according to the invention;
- Fig. 7 and 8 shows schematically a cross-section of a variant embodiment of the waste container, in closing and opening position respectively of the lower part of the container, according to the invention;
- Fig. 9 and 10 shows schematically a cross-section of a second variant embodiment of the waste container, in closing and opening position respectively of the lower part of the container, according to the invention;
- Fig. 11 and 12 shows schematically a cross-section of a third variant embodiment of the waste container, in closing and opening position respectively of the lower part of the container, according to the invention;

Fig. 1-4 show schematically a cross-section of a handling device and a container for said device, in the first coupling position for lifting the container and in the second coupling position for emptying the container, a partial cross-section in an oversized scale of the device in the first and second coupling position of the container for said device, where number 1 indicates the coupling device and number 2 indicates a container resting on

the ground and fit for working together with the device 1.

[0032] The container 2 presents in the middle of its upper part a cylindrical bushing 3 with one end fixed securely to the container and to the other end is fixed a ring 4. The ring 4 presents the lower surface flat and the upper surface in a truncated cone shape; the ring 4 presents also a greater diameter than the cylindrical bushing 3 in order to obtain a coupling step with the bushing itself.

[0033] Number 5 indicates a tubular rod passing and sliding inside the bushing 3; on the upper end of the rod 5 a pin 6 is hammered; the pin 6 presents a round head shaped protruding from the rod 5 and whose diameter is essentially the same as that of the rod.

[0034] The lower end of the rod 5, which is inside the container 2, presents a securely connected bracket 7, whose ends are articulated with two levers indicated with 8 and 9 respectively.

[0035] Each lever 8 and 9, is articulated with a bracket indicated with 10; these brackets are articulated in a vertical position with a plate 11 fixed on the internal part of the upper wall of the container 2, in such a way as to execute an angular movement around their articulation axis.

[0036] Each levers 8 and 9 presents two straight parts indicated with 8', 8", 9' and 9" respectively; the 8" and 9" straight parts are tilted about of 20° with respect to the corresponding 8' and 9'straight parts.

[0037] The end of each 8" and 9" straight part is articulated with a pair of tie rods indicated with 12, 12A and 13, 13A respectively, which are articulated with one of the two doors 14 and 15 closing the bottom of the container 2; Fig. 1 and 2 show only the tie rods 12 and 13 and the door 14, because the tie rods 12A and 13A and the door 15 are placed symmetrically to the tie rods 12 and 13 and to the door 14 in the part of the container 2 not visible in its cross-section represented in Fig. 1 and 2 (see Fig. 12 as an example).

[0038] The point of articulation of the levers 8 and 9 with the bracket 10 is such that a downward or upward movement of the levers 8 and 9 by means of the bracket 7, through the tubular rod 5, corresponds to an opposite movement having a greater amplitude than the ends of the straight parts 8" and 9"; the difference between the width of the movement of the tubular rod 5 and that of the ends of the straight parts 8" and 9" is given by the ratio existing between the point of articulation to the bracket 10 of the levers 8 and 9 and their two ends.

[0039] In other words, if the distance between the point of articulation of the levers 8 and 9 with the relative bracket 10 and their point of articulation with bracket 7 is half of the distance between the point of articulation of the levers 8 and 9 with the corresponding tie rods 12 and 13, an upward or downward movement of the bracket 7 corresponds to twice the upward or downward movement of the tie rods.

[0040] Therefore, by changing the ratio between the length of the sections of the levers 8 and 9 before and after the articulation with the bracket 10, the amplitude of the tie rod movement may be changed.

[0041] In this way a smaller vertical movement of the tubular rod 5 with respect to the vertical movement of the tie rods 12, 12A, 13 and 13A is enough to open and/or close the lower doors of the container 2; therefore this movement reduction allows to reduce the length of the tubular rod 5.

[0042] The container 2 presents also an opening, not shown, placed usually in the upper part, for inserting waste inside the container, which can differ in shape, for example round for containers for bottles, tins and similar, or rectangular or square, with or without lid.

[0043] The coupling device 1 presents a body 16, to the lower part of body 16 are pivoted of the levers 17 that present a small tooth 18 for coupling the ring 4 of the container 2 for its displacement for dumping.

[0044] The lower surface of the body 16 presents a complementary shape to the ring 4 on which it is coupled during the coupling phase of the container 2 as described later.

[0045] A tubular element 19, whose end is fixed to a hydraulic actuator 20, is present inside the body 16. The other end of the hydraulic actuator 20 is fixed to the upper part of the body 16.

[0046] A piston 21 is fixed to rod 20A of the hydraulic actuator 20, the external diameter of this piston is substantially equal to the internal diameter of the tubular element 19 and within which it can slide under the action of the hydraulic actuator 20.

[0047] The lower base of the piston 21 presents a shape complementary to that of the end of pin 6 with which it is coupled.

[0048] The levers 17 present, with views from the top according to Fig. 6, substantially a "C" shape, and they are mounted symmetrically between them with the upper and lower portions of "C", indicated with 17A and 17B respectively, which face each other and couple sideways to the body 16.

[0049] A mechanical actuator 22 is placed vertically between the two portions 17A and 17B of the levers 17 facing each other; this mechanical actuator 22 presents two bases 23A and 23B joined by a cylindrical pin 24 having a diameter smaller than the two bases. The lower base 23B of the mechanical actuator 22 is fixed to the rod of a second hydraulic actuator 25.

[0050] Between the two bases 23A and 23B of the mechanical actuator 22 is inserted a section of the end of the portion 17A of a lever 17 and of the portion 17B of the other lever 17, divided between them by the cylindrical pin 24.

[0051] The movement deriving from the second hydraulic actuator 25 works it, by means of the mechanical actuator 22, so that the levers 17 make an angular movement passing from a first position (Fig. 4) to a second position (Fig. 5) in which the small teeth 18 are coupled and released from the ring 4 of container 2 respectively.

[0052] With the levers 17 in the first position it is possible to lift the container 2 in order to place it above the vehicle and its support for emptying the contents.

[0053] With the levers in the second position it is possible to release and/or couple the container 2 to the coupling device 1, at the end and/or at the beginning of the handling and emptying operations of the container respectively.

[0054] The coupling of the container 2 and the corresponding opening for emptying occurs in the following way.

[0055] The coupling device 1 is inserted centrally on the container 2 so that the lower part of the body 16 couples with the upper part of the ring 4, which, as said previously, has a complementary shape.

[0056] The second hydraulic actuator 25 is activated: this actuator, by means of the mechanical actuator 22, rotates the levers 17 in such a way that the relative small tooth 18 moves up under the edge of ring 4. The hydraulic actuator 20 is activated in such a way that the piston 21 rests on the head of the pin 6, and at the same time moves the body 16 upwards in such a way as to eliminate the clearance existing between the small teeth 18 and the edge of ring 4, a necessary clearance to place the small teeth 18 under the edge of the ring 4 in the phase of coupling.

[0057] The container, coupled to the edge of the ring 4 by means of the small teeth 18 of the levers 17, can be lifted by means of the device 1 and placed above the vehicle for emptying its contents.

[0058] The positioning of the piston 21 on the head of the pin 6 works it so that when lifting the container 2 the lower doors 14 and 15 remain closed also due to the weight of the waste contained in the container because the required downward movement of the tie rods 12, 12A and 13, 13A for opening the lower doors 14 and 15, and as a result the upward movement of the sliding bar 5 given by levers 8 and 9, is prevented by the actuator 20 that through the piston 21 presses on the head of the pin 6.

[0059] Therefore it is not necessary to move the bar 5 to put the tie rods in traction and keep closed the bottom of the container during its handling, as in the known art.

[0060] For emptying the container 2, when it is placed above the vehicle, it is just need to disable the actuator 20 in such a way that the sliding bar 5, not countered any more by the strength exercised by the piston 21, can slide upwards under the thrust exercised by the levers 8 and 9 ensuing the downward movement of the tie rods 12, 12A and 13, 13A for opening the doors 14 and 15, given by the weight of the waste present in the container.

[0061] After emptying the container, the reverse must be carried out: activate the actuator 20 so that the sliding bar 5, under the thrust of the piston 21, returns in the container 2 and by means of the levers 8 and 9 activates the closing of the doors 14 and 15. After the closing of the doors 14 and 15 the container is put back on the ground and repositioned back in its place.

[0062] The hydraulic actuator 20 is disarmed in such a way that the body 16 can lower and release the small teeth 18, and at the same time the second hydraulic actuator 25 is activated: the latter, by means of the mechanical actuator 22 rotates the levers 17 in such a way that the corresponding small tooth 18 is released from the edge of the ring 4. Now, the coupling device 1 can lift from the container and place the articulated arm to which the coupling device is connected, at rest on the vehicle in order to empty the next container.

[0063] All the operation of positioning the vehicle with respect to the container, coupling, shifting and emptying the container, occurs automatically by means of a computerised system mounted inside the cab of the vehicle.

[0064] This system detects the positioning parameters of the vehicle in the direction with respect to the container, the distance between the vehicle and the container and the positioning of the coupling device in the container.

[0065] The driver, after placing the vehicle near the container, with respect to the direction, must simply start the computerised system and the operation is carried out automatically.

[0066] The positioning of the vehicle with respect to the container to be emptied, in the direction of the vehicle, occurs by means of a miniaturised camera placed on the vehicle.

[0067] The said camera is used to transmit to a monitor placed inside the cab and therefore to the driver, the picture of a reference sign placed on the container; when this sign lines up with that of the camera, the vehicle is in the best position for executing the loading and emptying.

[0068] For what concerns the detection of the distance of the container from the vehicle, it is obtained by means of ultrasound sensors, in such a way that the computerised system can establish how much to extend the articulated arm so that the vertical axis of the coupling device 1 is on the vertical axis of the container.

[0069] A proximity sensor is used for detecting how much to lower the articulated arm, and consequently the coupling device 1, in order to have the position for coupling the container.

[0070] The computerised system is not described since it is known.

[0071] As deduced from the description, the device for coupling, emptying the contents and releasing the container is obtained in a simple and fast way.

[0072] The characteristics of the device for handling and emptying the contents of containers for waste collection, in particular for differentiated refuse collection, and a container for said device, are clear from the description made and from the annexed drawings.

[0073] From the above description are also clear the advantages of the device for handling and emptying the contents of containers for waste collection, in particular

for differentiated refuse collection, and a container for said device, according to the present invention.

[0074] In particular they consist in the fact that:

- the device is obtained easily and economical,
- the device presents a reduced number of mechanical components
- the device presents a reduced number of hydraulic actuators,
- the device requires a reduced number of operations for coupling and/or releasing and emptying a container,
- the device does not require coupling means for closing the bottom of the container when lifting,
- the device allows the opening and/or closing the bottom of the container with movements smaller in size with respect to those executed by the bottom of the container.

[0075] It is obvious that many changes and applications are possible for the man skilled in the art to the device for handling and emptying the contents of containers for waste collection, in particular for differentiated refuse collection, and a container for said device, described as an example, without departing from the novelty spirit of the inventive idea.

[0076] For example, the opening and/or closing of the bottom of the container can be realised with other means, for example as shown in the Fig. 7 to 12.

[0077] The figures do not show the coupling device since it is not different from the one described before, from the operational point of view and as it is manufacture.

[0078] The description will use the same references for the details equal to the solution described previously.

[0079] With reference to the Fig. 7 and 8, which shows schematically a cross-section of a variant of the waste container, in closing and opening position respectively of the lower part of the container, according to the invention, number 2A indicates a container.

[0080] The container 2A presents in the middle of its upper part the cylindrical bushing 3 with one end fixed securely to the container and to the other end is fixed the ring 4.

[0081] Number 5' indicates a tubular rod passing and sliding inside the bushing 3; on the upper end of the rod 5' there is hammered the pin 6 described previously.

[0082] To the lower end of rod 5', which is placed inside the container 2A, is connected a first pulley 27, with 28 is indicated a second pulley fixed to the inner upper wall of the container 2A by means of known type brackets, which presents an orientation rotated by 180° with respect to the first pulley 27.

[0083] Number 29 indicates a cylindrical envelope closed at one end and fixed with the other end to the inner upper wall of the container 2A.

[0084] Number 30 indicates a rope that is fixed at one end to the inner upper wall of the container 2A, while the other end is fixed to a tubular element 31. The rope 30, before being fixed to the tubular element 31, passes around the first pulley 27 and then around the second pulley 28.

[0085] To the other end of the tubular element 31 are articulated of the tie rods 12' and 13'; each tie rods is articulated with one of the two doors 14 and 15 closing the bottom of the container 2A.

[0086] The tubular element 31 can slide within a cylindrical bushing 32 present inside the envelope 29 to which is fixed vertically to its lower wall. The cylindrical bushing 32 has the function to guide the tubular element 31.

[0087] The vertical downward movement of the tubular rod 5' works it so that the pulley 27, connected to it, makes the same movement; the movement of the pulley 27 pushes downwards the rope 30, which, by means of the pulley 28 fixed to the container, drives upward the tubular element 31. The upward movement of the tubular element 31, to which are connected the tie rods 12' and 13', determine the closing of the doors 14 and 15.

[0088] It is implicit that an opposite movement of the tubular rod 5' determines the opening of the doors 14 and 15.

[0089] The coupling, lifting and emptying of the container 2A occurs as described above, i.e. with the device 1 placed on the container 2A to which it is coupled by means of the small teeth 18 of the levers 17.

[0090] The piston 21, controlled by the hydraulic actuator 20, is placed on the pin 6 of the tubular rod 5', which is kept locked in the container 2A. In this position the pulley 27 connected to the tubular rod 5', is placed downwards in such a way as to push the rope 30 downwards, which, by means of the pulley 28 drives the tubular element 31 upwards. This upward movement of the tubular element 31, to which are connected the tie rods 12' and 13', determines and keeps the doors 14 and 15 closed.

[0091] When the container 2A is positioned on the vehicle for emptying its contents, the hydraulic actuator 20 is disabled in such a way that the sliding rod 5', not opposed any more by the force exerted by the piston 21, can slide upwards under the thrust exerted by the rope 30 on the pulley 27, by means of the pulley 28, ensuing the downward movement of the tubular element 31 given by the tie rods 12' and 13' after the opening of the doors 14 and 15 under the weight of the waste present in the container 2A.

[0092] Also in this variant the amplitude of the movement of the tubular element is twice the amplitude of the movement of the rod 5'; this difference derives, as known, from the system of transmission of the movement by means of two pulleys of which one is fixed.

[0093] With reference to Fig. 9 and 10, which shows schematically a cross-section of a second variant of the waste container, in closing position and in opening position of the lower part of the container, respectively, according to the invention, 2B indicates a waste container

of the type embedded in the ground.

[0094] Number 33 indicates a protruding part of the container 2B, which is internally divided in two parts indicated with 34 and 35, respectively. The part 34 presents an opening 36 for inserting the waste in the container 2B.

[0095] The part 35 presents externally the cylindrical bushing 3, with one end fixed securely to the protruding part 33 of the container, while to the other end is fixed the ring 4.

[0096] The same pulley device, represented and described with reference to Fig. 7 and 8, is present inside the part 35.

[0097] It goes without saying that some differences in the dimensions of some details may occur between the two devices due to the different positioning of the container, without affecting the operation.

[0098] With reference to the Fig. 11 and 12, which shows schematically a cross-section of a third variant of the waste container, in closing and opening position respectively of the lower part of the container, according to the invention, number 2C indicates a waste container.

[0099] The container 2C presents in the middle of its upper part the cylindrical bushing 3 with one end fixed securely to the container, while to the other end is fixed the ring 4.

[0100] Number 5" indicates a tubular rod passing and sliding inside the bushing 3; on the upper end of the rod 5" is hammered the pin 6.

[0101] The lower part of the rod 5", which is inside the container 2C, presents a section with two series of transversal openings 37 placed symmetrically opposed.

[0102] Number 38 indicates two brackets presenting a horizontal section fixed securely to the internal part of the upper wall of container 2C, and a vertical section protruding inside the container. The vertical sections of the two brackets 38 are parallel in such a way as to allow the passage of the sliding bar 5" and the housing of two equal levers indicated with 39.

[0103] The levers 39 present a profile with a substantially semi-cylindrical portion 39' connected to a straight portion 39". The levers 39 are pivoted between the brackets 38 in the geometric point of the generatrix of the semi-cylindrical portion 39'. The semi-cylindrical portion 39' presents on the edge a toothing 40 that enters in the openings 37 of the tubular rod 5".

[0104] The end of the straight part 39" of each lever 39 is articulated a couple of equal tie rods indicated with 12', 12'A and 13', 13'A respectively, which are articulated with one of the two doors 14 and 15 for closing the bottom of the container 2C.

[0105] The point of articulation of the levers 39 to the brackets 38 is such that a downward or upward movement of the levers 39 by means of the tubular rod 5" to which they are connected by the toothing 40, corresponds to the same movement of the ends of the straight parts 39" having a greater amplitude equal to the ratio existing between the point of articulation to the brackets 38 of the levers 39 and their ends, as previously described.

[0106] In other words, if the distance between the point of articulation of the levers 39 to the brackets 38 and their point of articulation with the tubular rod 5" is half of the distance between the point of articulation of the levers 39 to the tie rods 12' and 13', an upward or downward movement of the tubular rod 5" corresponds to the upward or downward double movement of the tie rods.

[0107] In this way a smaller vertical movement of the tubular rod 5" as to the vertical movement of the tie rods 12', 12'A, 13' and 13'A is enough to open and/or close the lower doors of container 2C; therefore this movement reduction allows to reduce the length of the tubular rod 5".

[0108] It is obvious that many other changes and applications are possible for the man skilled in the art to the device for handling and emptying the contents of containers for waste collection, in particular for differentiated refuse collection, and a container for said device, described as an example, without departing from the spirit of the present invention, as it is also clear that in practical actuation of the invention the components may be different in form and size from the ones described and be replaced with technical equivalent elements.

Claims

1. Device for handling and emptying the contents of containers for waste collection, in particular for differentiated refuse collection, comprising

   - a coupling device (1) of a waste container (2; 2A;2B;2C)
   - a waste container (2;2A;2B;2C) apt to be handled by the said coupling device (1) where said coupling device (1) presents a body (16) to which are related first coupling means (17,18,22,24,25) of said container (2;2A;2B; 2C),

   and where said container (2;2A;2B;2C) presents second means (3,4) for coupling said coupling device (1), third means (5;5';5") sliding in said second means (3,4) and fourth means (7,8,9,10,12,12A, 13,13A,12',12'A,13',13'A; 27,28,30,31;38,39) related to said third means (5;5';5") for opening and/or closing at least one door (14,15) of said container (2;2A;2B;2C)
   characterised in that

   - said coupling device (1) comprises fifth means (19,20,21) related to the said body (16) for the control of the vertical movement of said third means (5;5';5") of said container (2;2A;2B;2C),
   - said fourth means (7,8,9,10,12,12A,13,13A,

12',12'A,13',13'A; 27,28,30,31;38,39) are made in such a way as to widen the movement of said third means (5;5';5").

2. Device, according to claim 1, **characterised in that** said first coupling means (17,18,22,24,25) comprise at least one lever (17) capable of angular movement for passing from a first rest position to a second working position for the coupling of said first coupling means (17,18,22,24,25) to said second means (3,4).

3. Device, according to claims 1 and 2, **characterised in that** said first coupling means (17,18,22,24,25) comprise at least one mechanical actuator (22) capable of passing from the said first to the said second position of said lever (17) and vice versa.

4. Device, according to claims 1 and 3, **characterised in that** said first coupling means (17,18,22,24,25) comprise at least a first hydraulic actuator (25) capable of starting of said mechanical actuator (22).

5. Device, according to claims 1 and 2, **characterised in that** said first coupling means (17,18,22,24,25) comprise at least a small coupling tooth (18) capable of connecting with said second means (3,4).

6. Device, according to claim 1, **characterised in that** said second means (3,4) comprise at least a bushing (3), in particular said bushing (3) is securely fixed to the upper part of said container (2;2A;2B; 2C).

7. Device, according to claims 1 and 6, **characterised in that** said second means (3,4) comprise a ring (4), in particular said ring (4) is securely fixed to said bushing (3) and capable of coupling with said small coupling tooth (18) for handling said container (2; 2A;2B;2C).

8. Device, according to claims 1 and 6, **characterised in that** said third means (5;5';5") comprise at least a rod (5;5';5"), in particular said rod (5;5';5") being slides in said bushing (3).

9. Device, according to claim 8, **characterised in that** said rod (5;5';5") presents a first end closed by a pin (6), in particular said pin (6) presents a round-shaped head protruding from said rod (5;5';5") and with a diameter substantially equal to the diameter of said rod.

10. Device, according to claim 1, **characterised in that** said fifth means (19,20,21) comprise a second hydraulic actuator (20) connected to said body (16) apt to realise a lock of a vertical movement of said rod (5;5';5").

11. Device, according to the previous claim, **characterised in that** said hydraulic actuator is capable of producing a vertical displacement of said rod (5;5'; 5") for opening and/or closing of said door (14,15).

12. Device, according to claim 1, **characterised in that** said fifth means (19,20,21) comprise a piston (21) connected to said second hydraulic actuator (20).

13. Device, according to claim 1, **characterised in that** said fifth means (19,20,21) comprise a tubular element (19) in which slides said piston (21).

14. Device, according to at least one of the previous claims, **characterised in that** a surface of said piston (21) presents a complementary shape of the head of said pin (6) for their joint coupling.

15. Device, according to claims 1 and 8, **characterised in that** said fourth means (7,8,9,10,12,12A,13,13A, 12',12'A,13',13'A; 27,28,30, 31;38,39) comprise at least a first bracket (7), in particular said first bracket (7) is integral to said rod (5;5';5").

16. Device, according to claim 1, **characterized in that** said fourth means (7,8,9,10,12,12A,13,13A,12', 12'A,13',13'A; 27,28,30,31; 38,39) comprise at least two levers (8,9;39).

17. Device, according to claim 1, **characterised in that** said fourth means (7,8,9,10,12,12A,13,13A,12', 12'A,13',13'A; 27,28,30, 31;38,39) comprise at least a second bracket (10), in particular said second bracket (10) is articulated with a third bracket (11) integral to said container (2;2A;2B;2C).

18. Device, according to the previous claim, **characterised in that** said second bracket (10) is angularly movable around the articulation axis to said third bracket (11).

19. Device, according to at least one of the previous claims, **characterised in that** a first end of said levers (8,9;39) is articulated with said first bracket (7).

20. Device, according to at least one of the previous claims, **characterised in that** said levers (8,9;39) present two straight parts (8,8';9,9') inclined one with respect to the other.

21. Device, according to at least one of the previous claims, **characterised in that** at least one of said straight parts (8,8';9,9') is articulated with said second bracket (10).

22. Device, according to claim 1, **characterised in that** said fourth means (7,8,9,10,12,12A,13,13A,12', 12'A,13',13'A;27,28,30,31;38,39) comprise at least

one tie rod (12,12A,13,13A,12',12'A,13',13'A) which is articulated with a first end to said door (14,15) of said container (2;2A;2B;2C).

23. Device, according to the previous claim, **characterised in that** a second end of said tie rod (12,12A, 13,13A,12',12'A,13',13'A) is articulated with a second end of said levers (8,9;39).

24. Device, according to one or more of the previous claims, **characterised in that** said levers (8,9;39) are capable of transmitting the movement of said rod (5;5';5") to said tie rod (12,12A,13,13A, 12', 12'A,13',13'A) for opening and/or closing of said door (14,15).

25. Device, according to claim 1, **characterised in that** said fourth means (7,8,9,10,12,12A,13,13A,12', 12'A,13',13'A;27,28,30,31;38,39) comprise at least a first pulley (27) connected to said rod (5;5';5").

26. Device, according to claim 1, **characterised in that** said fourth means (7,8,9,10,12,12A,13,13A,12', 12'A,13',13'A;27,28,30,31;38,39) comprise at least a second pulley (28) connected to said container (2; 2A,2B;2C).

27. Device, according to claim 1, **characterised in that** said fourth means (7,8,9,10,12,12A,13,13A,12', 12'A,13',13'A;27,28,30,31;38,39) comprise at least a rope (30) connected to said first (27) and said second pulley (28).

28. Device, according to claim 1, **characterised in that** said fourth means (7,8,9,10,12,12A,13,13A,12', 12'A,13',13'A;27,28,30,31;38,39) comprise at least a tubular element (31).

29. Device, according to claim 27, **characterised in that** an end of said rope (30) is fixed to the inner upper wall of said container (2;2A;2B;2C).

30. Device, according to claims 27 and 28, **characterised in that** a second end of said rope (30) is fixed to a first end of said tubular element (31).

31. Device, according to one or more of the previous claims, **characterised in that** a second end of said tie rod (12,12A,13,13A,12',12'A,13',13'A) is articulated to a second end of said tubular element (31).

32. Device, according to one or more of the previous claims, **characterised in that** said first (27) and said second pulley (28) are capable of transmitting the movement of said rod (5;5';5") to said tie rod (12,12A,13,13A, 12',12'A,13',13'A) for opening and/or closing of said door (14,15).

33. Device, according to claim 8, **characterised in that** the lower part of said rod (5;5';5") presents two series of transversal openings (37) placed symmetrically opposed to each other.

34. Device, according to claim 1, **characterised in that** said fourth means (7,8,9,10,12,12A,13,13A,12', 12'A,13',13'A;27,28,30,31;38,39) comprise at least a third bracket (38), in particular said third bracket (38) is integral with the inner upper wall of said container (2;2A;2B;2C).

35. Device, according to at least one of the previous claims, **characterised in that** said levers (8,9;39) present a profile having a substantially semi-cylindrical portion (39') connected to a straight portion (39").

36. Device, according to at least one of the previous claims, **characterised in that** said levers (8,9;39) are articulated to said third bracket (38), in particular in the geometric point of the generatrix of said semi-cylindrical portion (39').

37. Device, according to at least one of the previous claims, **characterised in that** said semi-cylindrical portion (39') presents on the edge a toothing (40) capable of entering in said openings (37) of said rod (5;5';5").

38. Device, according to one or more of the previous claims, **characterised in that** the amplitude of the vertical movement of said tie rod (12,12A,13,13A, 12',12'A,13',13'A) is greater than the amplitude of the movement of said rod (5;5';5").

39. Device, according to one or more of the previous claims, **characterised in that** a downward and/or upward movement of said rod (5;5';5") corresponds to a greater opposite movement of said tie rod (12,12A,13,13A,12',12'A,13',13'A) for opening and/or closing of said door (14,15).

40. Device, according to one or more previous claims, **characterized in that** said fifth means (19,20,21) are capable of locking and/or allowing the movement of said third means (5;5';5").

41. Device for handling and emptying the contents of containers for waste collection, in particular for differentiated refuse collection, comprising

- a coupling and actuation device (1) of the opening of a container (2;2A;2B;2C)
- a connection and actuating device (3,4,5;5';5") being part of the said container,
- means (7,8,9,10,12,12A,13,13A,12',12'A,13', 13'A;27,28,30,31;38,39) for opening of said

container connected to the coupling and actuating device (3,4,5;5';5")

characterised in that
said means (7,8,9,10,12,12A,13,13A,12',12'A,13', 13'A;27,28,30,31; 38,39) for opening of said container are obtained with a kinematic mechanism that widens the result of the actuation produced by the said coupling and actuation mechanism (1).

42. Method for handling and emptying the contents of containers for waste collection, in particular for differentiated refuse collection according to one or more previous claims.

43. Method for handling and emptying the contents of containers for waste collection, in particular for differentiated refuse collection, **characterized in that** it comprises the following phases:

- placing a coupling device (1) above a container (2;2A;2B;2C) to be emptied,
- enabling the coupling means (17,18,20,25) for the said container (2;2A;2B;2C),
- lifting and placing the said container (2;2A;2B; 2C) above the vehicle,
- enabling a kinematic mechanism (7,8,9,10,12, 12A,13,13A,12',12'A,13',13'A;27,28,30,31;38, 39) that widens the movement of an actuator (5;5';5") for opening the bottom of the container (2;2A;2B;2C) for the emptying its contents,
- closing the bottom of the container (2;2A;2B; 2C) by means of an opposite movement of said actuator (5;5';5"),
- placing the container back on the ground in the same initial position,
- releasing the coupling means (17,18,20,25) of the container (2;2A;2B;2C),
- moving the vehicle towards the next container to be emptied.

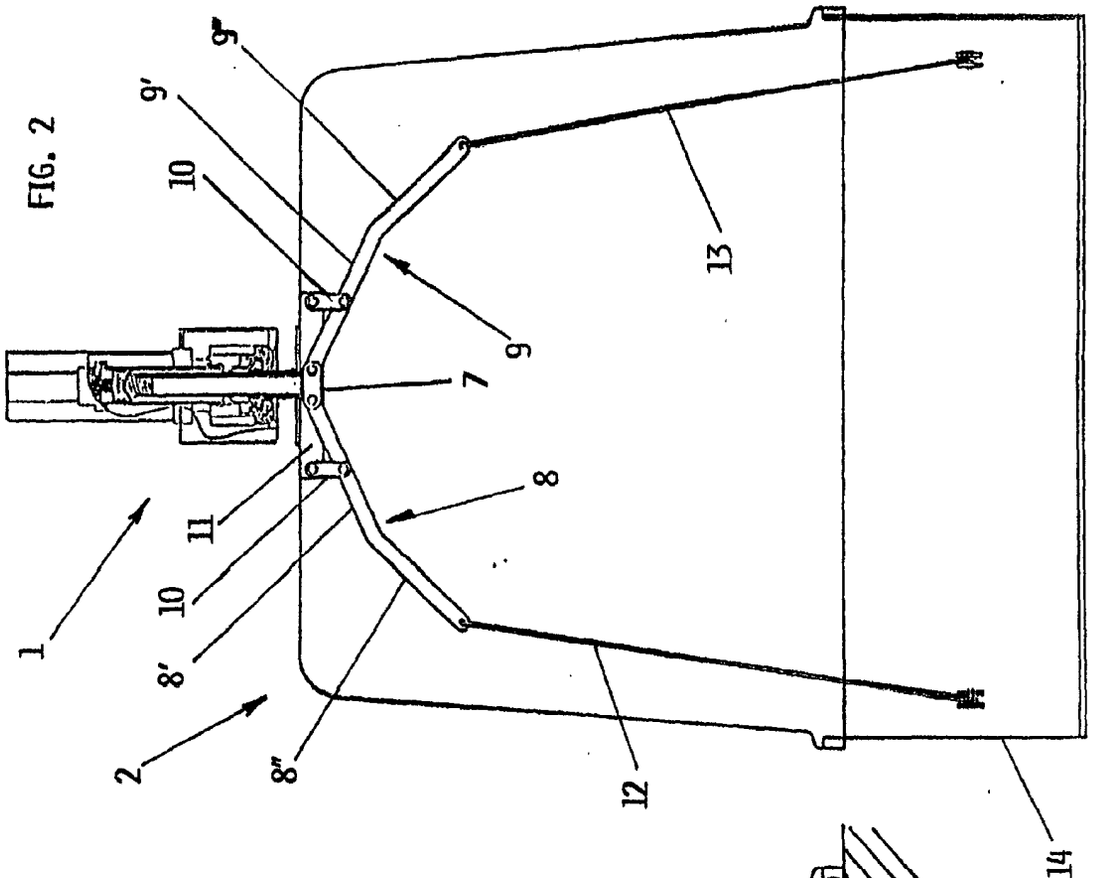


FIG. 2

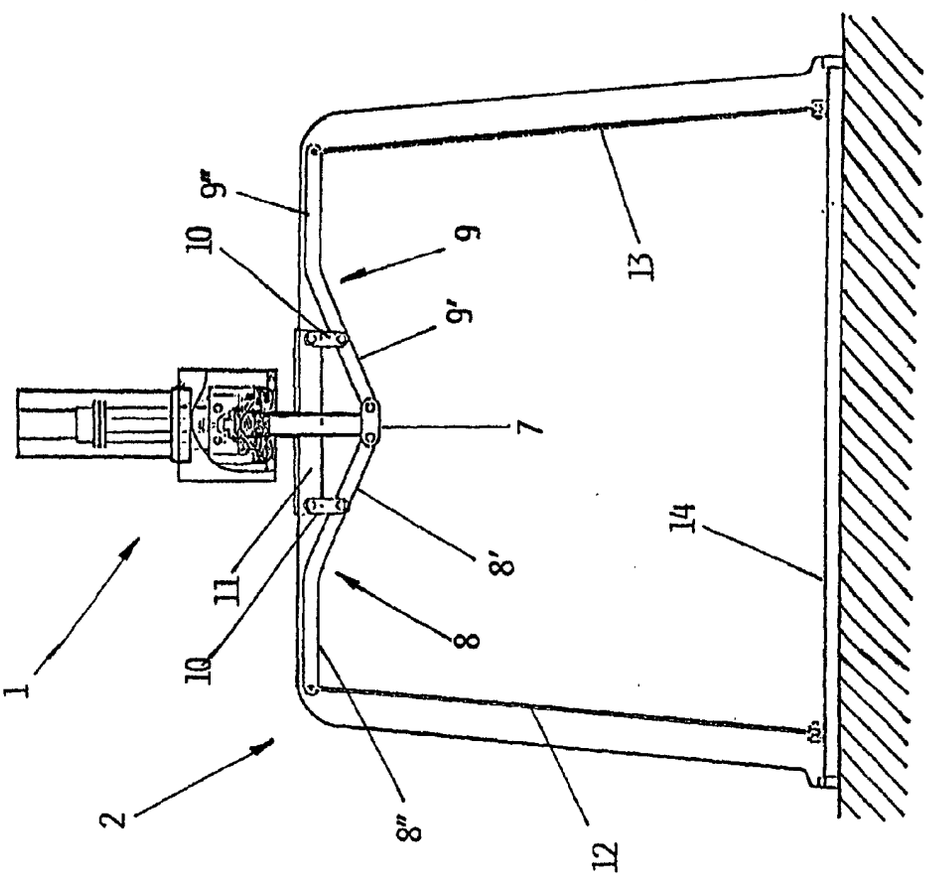


FIG. 1

FIG. 3

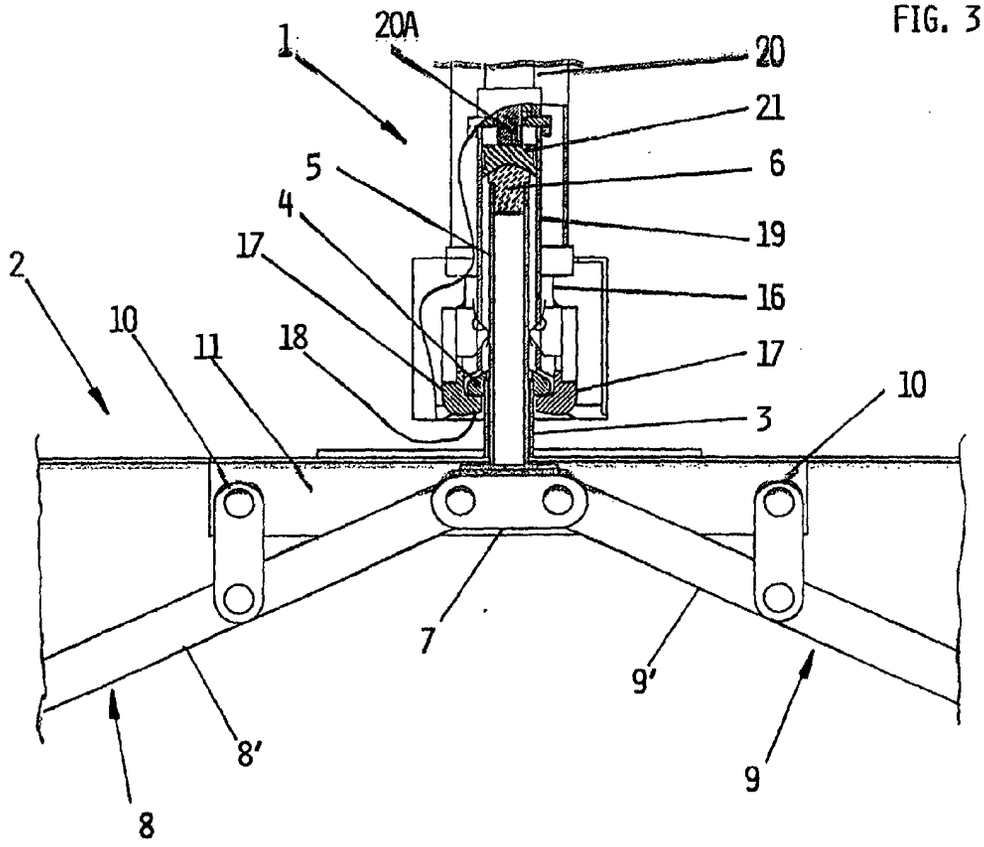

1
20A
20
21
6
5
19
4
17
16
2
10
11
18
17
10
3
7
9'
8'
9
8

FIG. 4

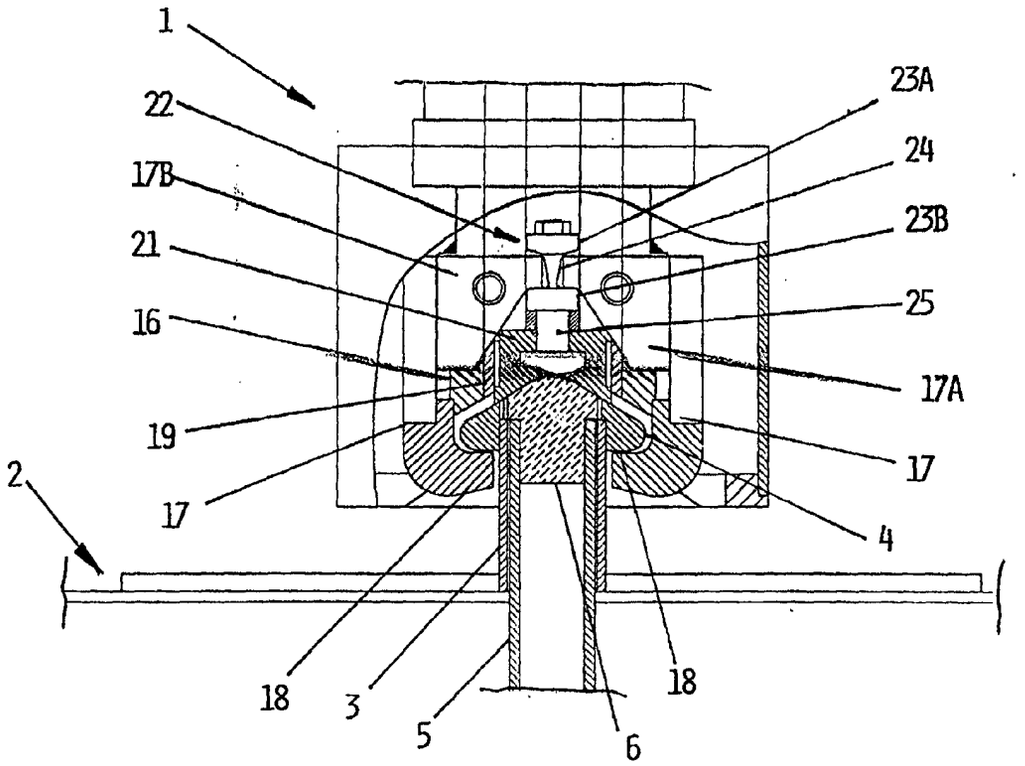

1
23A
22
24
17B
23B
21
25
16
17A
19
17
2
17
4
18
3
18
5
6

FIG. 5

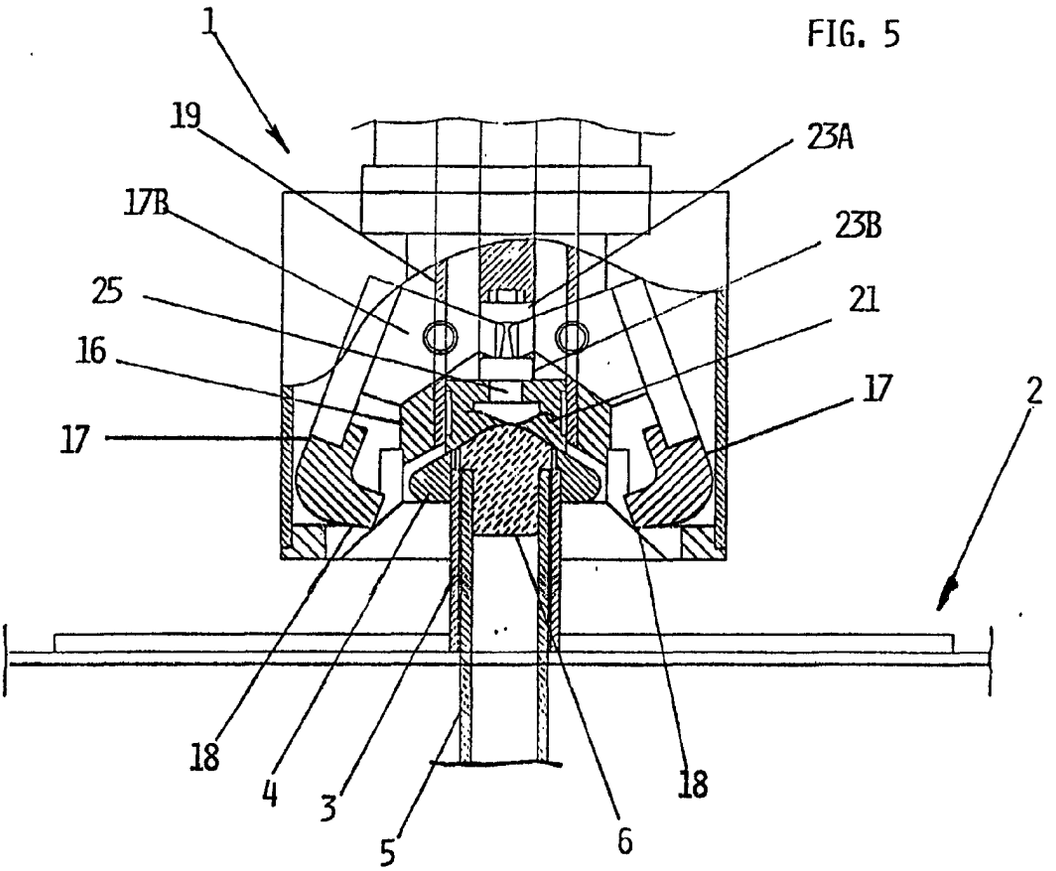

1
19
17B
25
16
17
23A
23B
21
17
2
18
4
3
5
6
18

FIG. 6

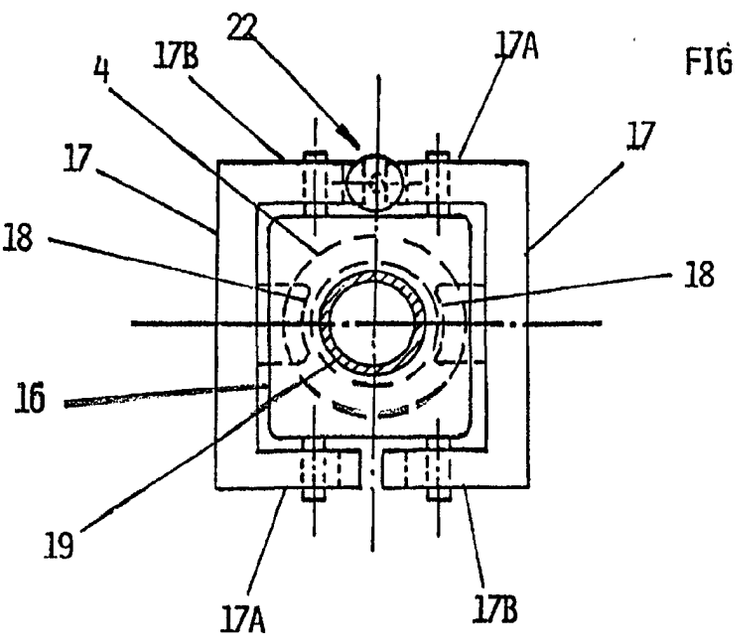
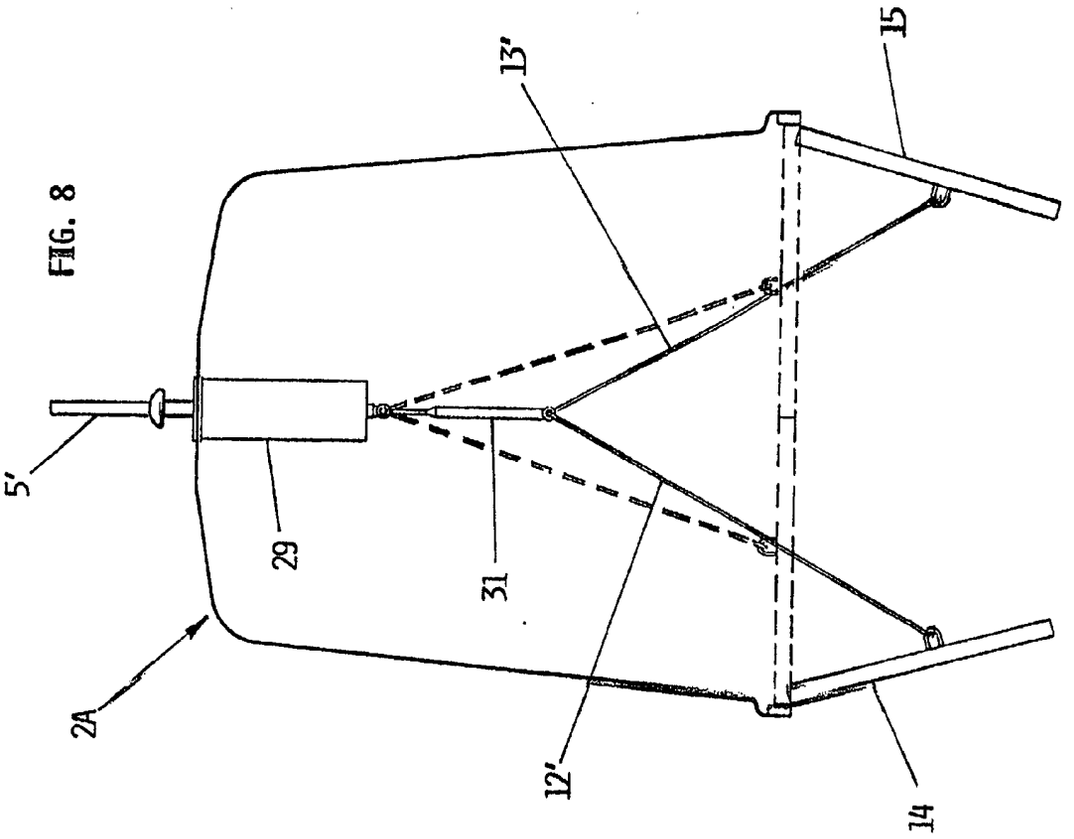

22
17A
4
17B
17
17
18
18
16
19
17A
17B

FIG. 8



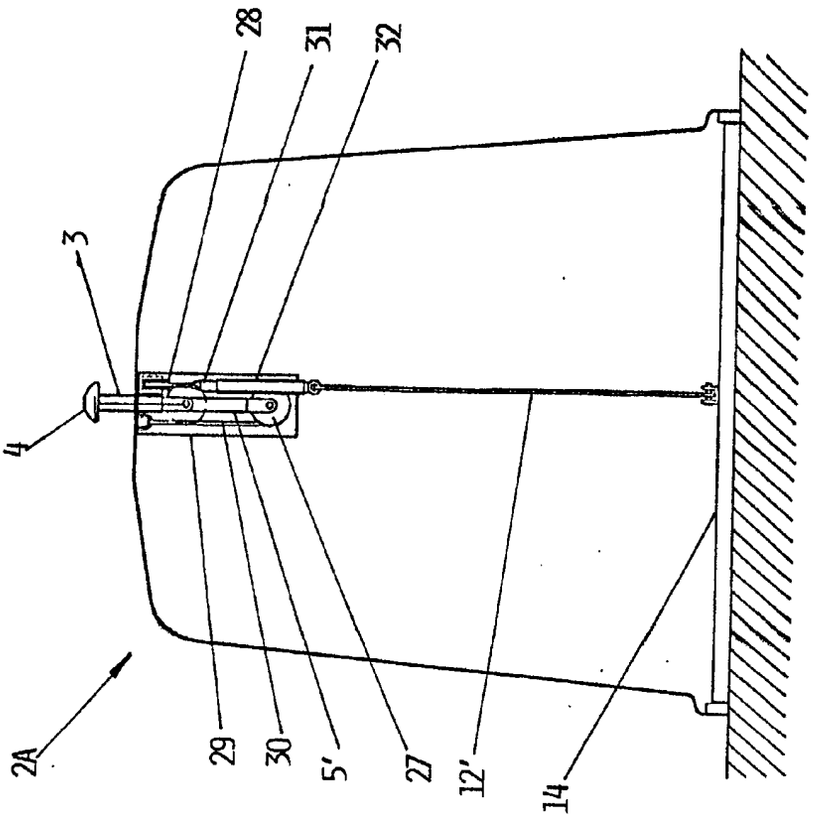
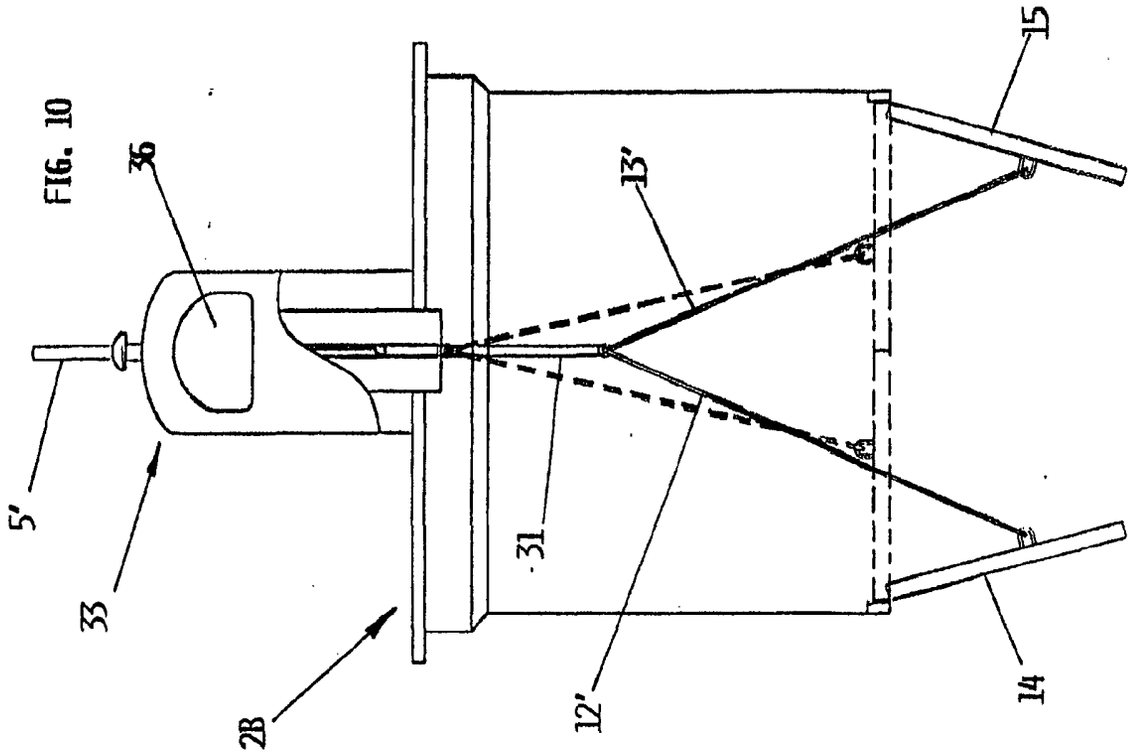


FIG. 7

FIG. 10



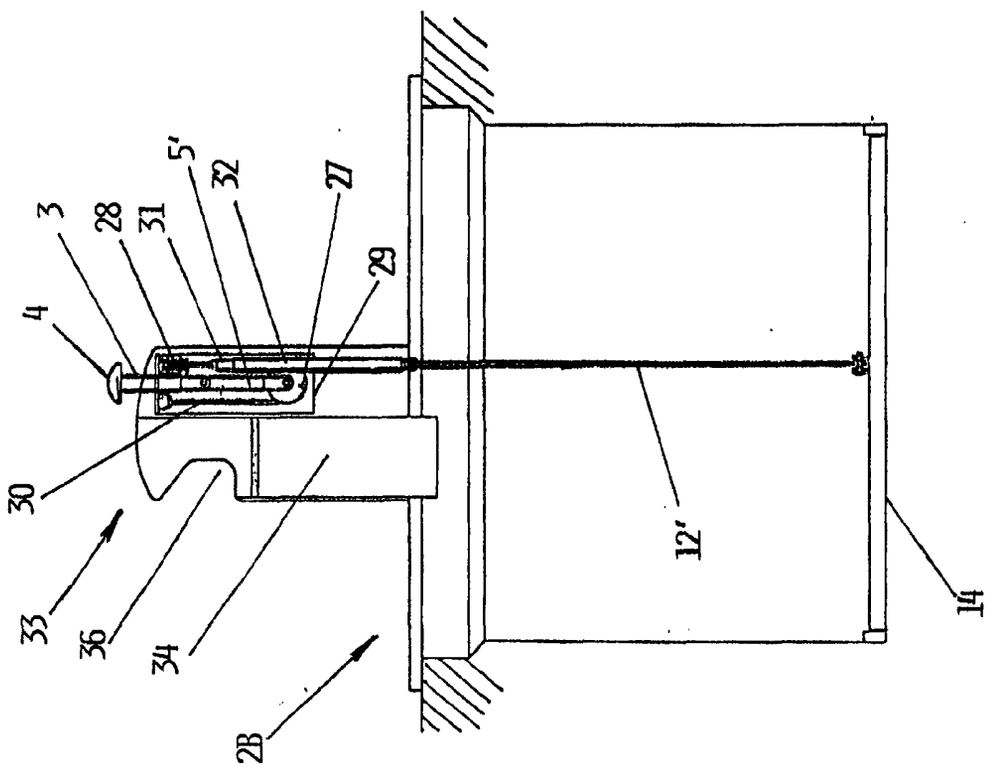


FIG. 9

FIG. 12

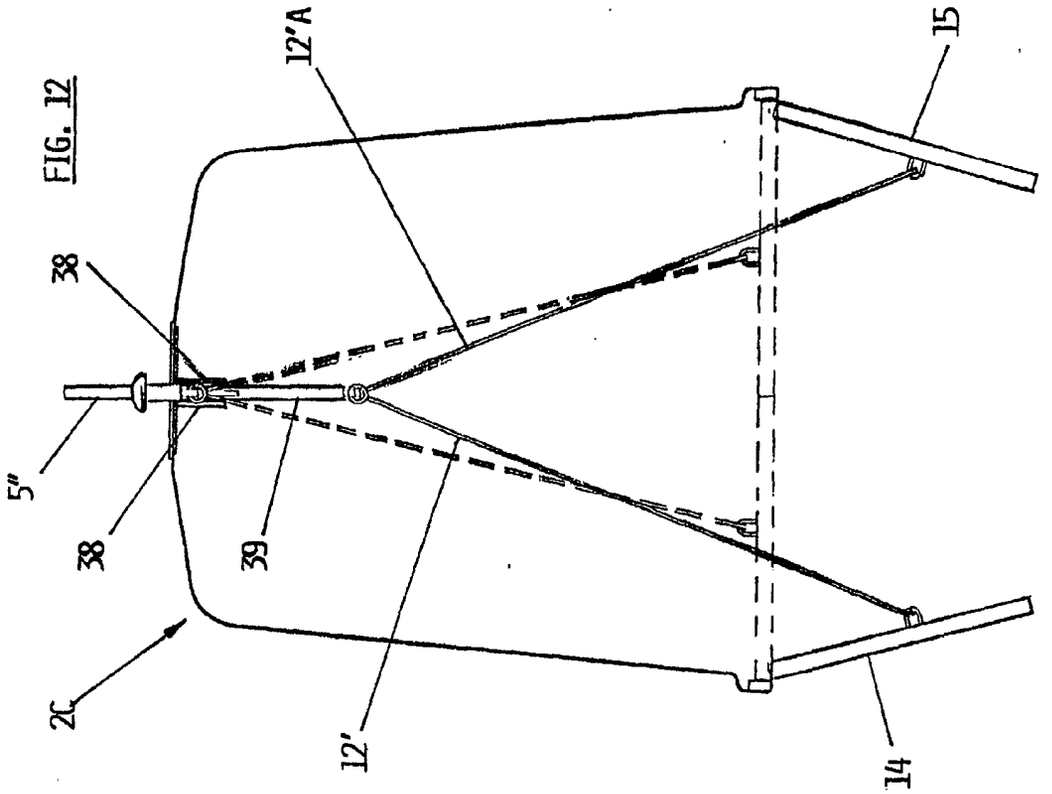
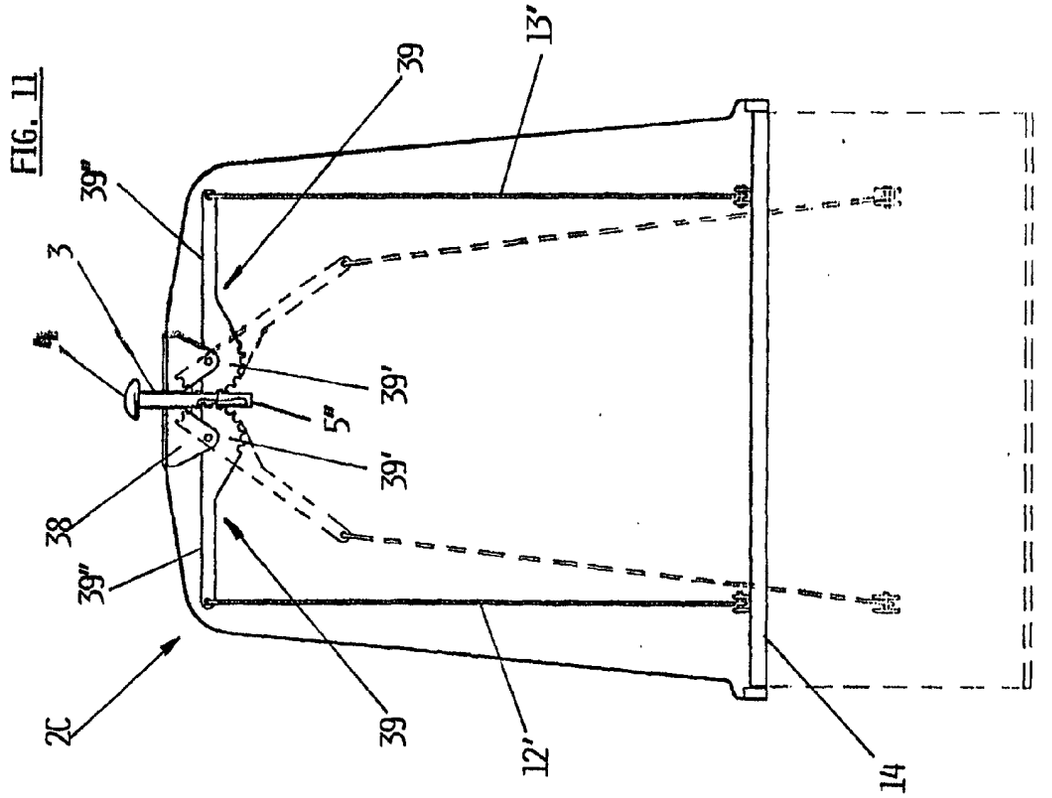


FIG. 11



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Application Number
EP 01 11 6183

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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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B65F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	5 October 2001	Deutsch, J.-P.

CATEGORY OF CITED DOCUMENTS

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