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Remarks:

Amended claims in accordance with Rule 137(2) EPC.

(54) **Device for handling and emptying waste collection containers**

(57) The present invention relates to a device for handling and emptying waste collection containers comprising a first holding member (10) suitable for being coupled to a handle (1) fixed on a container (3), a second holding member (20) suitable for holding a gate operator (2) arranged in the container and linked to gates (4), said second holding member (20) being installed in a moving carriage (51) vertically movable between gate closing and opening positions, characterized in that said first and second holding members comprise moving elements operated by means of a holding activation device (40) for moving between holding and release positions. Retaining elements (52) contact with stops (21) of the second holding member preventing the movement thereof towards said release position when the latter is in the holding position and said moving carriage is in the gate closing position.

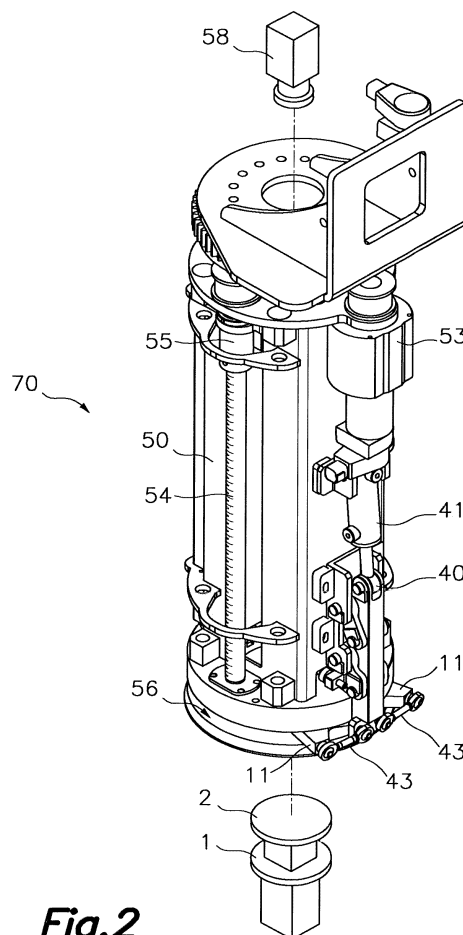


Fig.2

Description

Technical Field

[0001] The present invention relates to the field of devices for handling and emptying waste collection containers, and more particularly to the field of devices for handling and emptying containers that are attached to a manipulator arm installed in a collection truck, and that are envisaged for being coupled to a handle of a waste container, to hold and lift up the container and to operate a gate operator element for opening and closing lower gates of the container while the container is hoisted up.

State of the Art

[0002] Waste collection containers are known to comprise a hollow body provided with a loading mouth, lower gates, a handle fixed on an outer surface of the hollow body for holding the container, and a gate operator element mechanically linked to said lower gates. The handle comprises a fixed vertical rod ending in a perimetral flange, a ring or another gripping element than be held, and the gate operator element comprises a moving vertical rod arranged adjacent and/or concentric to the handle and ending in a perimetral flange, a ring or another gripping element that can be held. Generally, when the handle and the gate operator element are arranged adjacent to one another, they both end in respective rings or other gripping elements that can be held, and when the handle and the gate operator element are arranged in a concentric or telescopic manner, they both end in respective perimetral flanges.

[0003] Document DE 29905551 U1 discloses a device for handling and emptying waste collection containers of the type described above, including a coupling head comprising a head structure bearing a first holding member suitable for being coupled to the handle of a container, a second holding member suitable for holding the gate operator element, which in this case is arranged concentric to the handle, and operating means suitable for linearly shifting by means of a moving carriage said second holding member when same is held to said gate operator element of the container, thus opening and closing the lower gates through said mechanical link of the gate operator element with the lower gates of the container.

[0004] One drawback of said document DE 29905551 U1 is that the first and second holding members are configured as forks provided with fixed branches positioned in a horizontal manner towards one side of the coupling head, and as a result for coupling the head to the handle and to the gate operator element of the container, said head must perform a series of relatively complex movements to first locate the coupling head on the side of the handle and of the gate operator element of the container at a specific height in relation to same, to then position the forks in relation to the handle and the gate operator element of the container, and finally to laterally couple

the forks to the handle and to the gate operator element of the container. This series of movements, which must be carried out by means of the manipulator arm, are difficult to control manually, even with the help of machine vision means, and they are difficult to automate.

Brief Description of the Invention

[0005] The present invention contributes to mitigating the foregoing and other drawbacks by providing a device for handling and emptying waste collection containers, which includes a coupling head comprising a head structure. This head structure bears a first holding member suitable for being coupled to a handle fixed on an outer surface of a container for holding up said container, and a second holding member suitable for holding a gate operator element arranged in the container, adjacent and/or concentric to said handle and mechanically linked to lower gates of the container for opening and closing same. This second holding member is installed in a moving carriage vertically movable along said head structure. The head structure also bears operating means suitable for shifting said moving carriage between gate closing and opening positions, in which the gate operator element of the container, held by said second holding member, performs the closure and allows the opening of said lower gates of the container, respectively.

[0006] Said first holding member comprises one or more moving elements operated by a holding activation device for moving between holding and release positions which determine the holding and the release of said handle, respectively. Similarly, said second holding member comprises one or more moving elements operated by a holding activation device for moving between holding and release positions which determine the holding and the release of said gate operator element, respectively.

[0007] The head structure has retaining elements which contact with stops of the one or more moving elements of the second holding member preventing the movement thereof towards said release position when said one or more moving elements of the second holding member are in said holding position and said moving carriage is in said gate closing position or in any intermediate position between said gate opening position and the gate closing position. As a result, the one or more moving elements of the second holding member can only move towards the release position when the moving carriage is in the gate closing position, in which said stops of the one or more moving elements of the second holding member are free of interference with said retaining elements.

[0008] In a preferred embodiment, the one or more moving elements of the first holding member comprise a first pair of moving jaws movable between said holding and release positions by means of at least one articulation, acting as a first clamp. The jaws of this first pair of moving jaws of the first holding member have respective upper planar faces which, in said holding position and in

a loading situation, contact with a lower surface of a perimetral flange of the handle of the container, receiving vertical loads from said flange, and lower planar faces which, in the holding position and in a loading situation, transmit said vertical loads to and rest on a complementary planar surface of said head structure. Therefore, the vertical load of the container is primarily borne by the head structure and does not substantially affect the jaws of the first pair of jaws or the articulation thereof.

[0009] In this preferred embodiment, the one or more moving elements of the second holding member comprise a second pair of moving jaws movable between said holding and release positions by means of at least one articulation, acting as a second clamp, and the mentioned stops are attached to the jaws of said second pair of moving jaws. The jaws of the second pair of moving jaws of the second holding member have respective upper planar faces which, in said holding position and in a loading situation, contact with a lower surface of a perimetral flange of the gate operator element of the container, receiving vertical loads from said flange, and lower planar faces which, in the holding position and in said loading situation, transmit said vertical loads to and rest on a complementary planar surface of the moving carriage. Therefore, the vertical load of the gates of the container, which bear the load of the content of the container when they are in a closed position, is primarily borne by the moving carriage and does not substantially affect the jaws of the second pair of jaws or the articulation thereof.

[0010] It must be pointed out that instead of the pairs of jaws like the one or more moving elements of the first holding member and like the one or more moving elements of the second holding member, in other alternative embodiments of the present invention, moving pins, moving forks or other elements suitable for holding rings or other gripping elements that can be held, are provided, fixed to the handle and to the gate operator element, both when they are arranged adjacent to another and when they are arranged in a concentric or telescopic manner.

[0011] The mentioned holding activation device operating the second holding member is preferably arranged outside the moving carriage such that it does not move together with same. In one embodiment, the first and second holding members are operated simultaneously by means of a single holding activation device shared by both members. For example, this single shared holding activation device comprises a first actuator moving a mechanism between jaw closing and opening positions. Said mechanism is kinematically connected to lever arms attached to the jaws of the first pair of moving jaws of the first holding member and to moving rams arranged in the head structure facing zones free of interference with said retaining elements corresponding to the gate opening position of the moving carriage which, in this embodiment, is the lower position of travel.

[0012] When the mechanism of the holding activation device is moved to the jaw closing position, the mechanism moves by means of respective levers the jaws of

the first pair of jaws towards the holding position and at the same time moves the moving rams such that they push said stops of the jaws of the second pair of moving jaws of the second holding member when the moving carriage is in the gate opening position.

[0013] Therefore, when the moving carriage starts its movement from the gate opening position towards the gate closing position, which in this embodiment is the upper position of travel, the stops of the jaws of the second pair of jaws lose contact with the moving rams but immediately begin interfering with the retaining elements, which keeps the jaws of the second pair of jaws in the holding position while the stops slide along the retaining elements and the jaws of the second pair of jaws drive the gate operator element of the container to the gate closing position, or upper position of travel.

[0014] The jaws of the second pair of moving jaws of the second holding member are permanently pushed towards the release position by an elastic element, such as a spring, installed in contact with both jaws. Therefore, when the moving carriage is moved from the gate closing position to the gate opening position again, which is located in said zone free of interference with the retaining elements, the stops no longer contact with the retaining elements and contact again with the rams of the holding activation device, and the jaws of the second pair of jaws remain in the holding position. Only when the mechanism of the holding activation device is moved to the jaw opening position will the moving rams be withdrawn and said elastic element be allowed to bring the jaws of the second pair of moving jaws back to the release position, releasing the gate operator element of the container.

[0015] In one embodiment, the operating means shifting the moving carriage comprise a second actuator, such as an electric motor or a hydraulic motor, causing the rotation of one or more vertical spindles coupled to one or more nut elements fixed to the moving carriage. Therefore, when this second actuator is activated, it causes the rotation of the one or more spindles in a first direction for raising the moving carriage towards the gate closing position and in a second direction for lowering the moving carriage towards the gate opening position.

[0016] The head of the device for handling and emptying containers of the present invention is envisaged to be attached to a manipulator arm installed in a collection truck, and a worker controls the operation of said manipulator arm by means of suitable controls for coupling the head to the handle of a waste container, to lift the container, hold it up, and operate the gate operator element for opening and closing lower gates of the container while the container is hoisted up.

[0017] To aid the operations of coupling the head to the handle and to the gate operator element of the container, in an upper region of the head structure there is installed an image capturing camera the line of sight of which is directed downwards between the jaws of the first pair of moving jaws of the first holding member when they are in the release position, between the jaws of said

second pair of moving jaws of the second holding member when they are in the release position, and through an opening of the moving carriage and through a lower opening of the head structure. Images provided by said image capturing camera are, for example, shown on a display and are used by the worker to position the head structure in relation to the handle of the container.

[0018] When the head is correctly positioned in relation to the handle of the container, the head is lowered and the handle and the gate operator element of the container are inserted through said lower opening of the head structure and said opening of the moving carriage. The head structure has at least one stop surface contacting with an upper surface of said perimetral flange of the handle of the container determining a limit position of insertion for the head structure. In this limit position of insertion, said upper planar faces of the jaws of the first pair of moving jaws of the first holding member are located at a level lower than said lower surface of said perimetral flange of the handle of the container, and said upper planar faces of the second pair of moving jaws of the second holding member are located at a level lower than said lower surface of said perimetral flange of the gate operator element of the container.

[0019] This limit position of insertion is detected by a first detector element arranged in the head structure. This first detector element is movable between a standby position and a detection position, and is pushed by an elastic element towards said standby position. When the head structure reaches the limit position of insertion, the first detector element is pushed to said detection position by the perimetral flange of the handle of the container and is detected in the detection position by a first sensor arranged in the head structure.

[0020] There is installed in the moving carriage a second detector element movable between upper, intermediate and lower positions and an elastic element pushing said detector element towards said lower position, where it is kept as long as the gate operator element of the container is not inserted into the head. The second detector element is pushed to said upper position by the gate operator element of the container when the head structure reaches the limit position of insertion and the moving carriage is in the gate opening position, i.e., the lower position of travel, and it is kept in said intermediate position by the gate operator element of the container when the moving carriage is moved towards the gate closing position, i.e., the upper position of travel.

[0021] A second sensor and a third sensor are arranged in the moving carriage. Said second sensor detects the second detector element when it is in any of the intermediate and upper positions, whereas the third sensor detects the second detector element only when it is in the upper position. None of the second and third sensors detect the second detector element when it is in the lower position.

Brief Description of the Drawings

[0022] The foregoing and other advantages and features will be more clearly understood based on the following detailed description of an embodiment in reference to the attached drawings which must be interpreted in an illustrative and non-limiting manner, in which:

Figure 1 is a side view of a device for handling and emptying waste collection containers according to an embodiment of the present invention attached to a manipulator arm installed in a collection truck stopped adjacent to a container;

Figure 2 is a perspective view of several elements of a coupling head which is part of the device of Figure 1 facing a handle and a gate operator element of the container, and showing the position of an image capturing camera vertically extracted from its position;

Figure 3 is a perspective view of first and second holding members and a mechanism of a corresponding holding activation device of the coupling head, facing a handle and a gate operator element of the container;

Figure 4 is a perspective view of the first and second holding members and a mechanism of a corresponding holding activation device, shown in relation to a moving carriage and retaining elements of the coupling head, said first holding member and said mechanism of the holding activation device being extracted from their position of assembly for better understanding;

Figure 5a is a partial horizontal section through a plane coinciding with the second holding members, also showing the moving carriage and the retaining elements, the first and second holding members being in a release position and the moving carriage being in a gate opening position corresponding to a lower position of travel;

Figure 6a is a side elevational view of the first and second holding members and mechanism in the position corresponding to Figure 5a;

Figure 5b is a partial horizontal section through a plane coinciding with the second holding members, also showing the moving carriage and the retaining elements, the first and second holding members being in a holding position and the moving carriage being in the gate opening position corresponding to the lower position of travel;

Figure 6b is a side elevational view of the first and second holding members and mechanism in the position corresponding to Figure 5b;

Figure 5c is a partial horizontal section through a plane coinciding with the second holding members, also showing the moving carriage and the retaining elements, the first and second holding members being in a holding position and the moving carriage being in a gate closing position corresponding to an

upper position of travel;

Figure 6c is a side elevational view of the first and second holding members and mechanism in the position corresponding to Figure 5c;

Figure 7a is a vertical cross-section of a lower portion of the head facing the handle and the gate operator element of the container and separated from same, showing on the right side a plan depiction of the first and second holding members in a release position corresponding to such situation;

Figure 7b is a vertical cross-section of a lower portion of the head with the handle and the gate operator element of the container inserted in a limit position of insertion, and with the moving carriage in the gate opening position, showing on the right side a plan depiction of the first and second holding members in a release position corresponding to such situation;

Figure 7c is a vertical cross-section of the lower portion of the head with the handle and the gate operator element of the container inserted therein, in a stand-by situation and with the moving carriage in the gate closing position, showing on the right side a plan depiction of the first and second holding members in a holding position corresponding to such situation; Figure 7d is a vertical cross-section of the lower portion of the head with the handle and the gate operator element of the container inserted therein, in a loading situation and with the moving carriage in the gate closing position, showing on the right side a plan depiction of the first and second holding members in a holding position corresponding to such situation; and

Figure 7e is a vertical cross-section of the lower portion of the head with the handle and the gate operator element of the container inserted therein, in a loading situation and with the moving carriage in the gate opening position, showing on the right side a plan depiction of the first and second holding members in a holding position corresponding to such situation;

Detailed Description of an Embodiment

[0023] Figure 1 shows a device for handling and emptying waste collection containers according to an embodiment of the present invention, which comprises a coupling head 70 attached to a free end of a manipulator arm 71 installed in a collection truck 72 provided with a cab 73 carrying a worker, and a collection body 74. In the cab 73 or in another part of the collection truck 72, there are controls whereby the worker can control the necessary movements of the manipulator arm 71 to couple the coupling head 70 to a handle 1 fixed on an outer upper surface of a container 3 and to a gate operator element 2 arranged in the container 3 concentric to said handle 1 and mechanically linked to lower gates 4 of the container 3 for opening and closing the container.

[0024] Figure 2 shows a head structure 50 of the coupling head 70. A first holding member 10 suitable for be-

ing coupled to the handle 1 of the container 3 and a second holding member 20 suitable for holding the gate operator element 2 of the container 3 are installed in said head structure 50. This second holding member 20 is installed in a moving carriage 51 vertically movable along said head structure 50. Operating means described in detail below shift said moving carriage 51 between a gate closing position, corresponding to the upper position of travel, in which the gate operator element 2 of the container 3, held by said second holding member 20, performs the closure of the lower gates 4 of the container 3, and a gate opening position, corresponding to the lower position of travel, in which the gate operator element 2 of the container 3, held by said second holding member 20, allows the opening of the lower gates 4 of the container 3 by gravity.

[0025] As shown in Figures 3 and 4, said first holding member 10 comprises a first pair of moving jaws 10a, 10b movable about a first articulation acting as a first clamp, and the second holding member 20 comprises a second pair of moving jaws 20a, 20b movable about a second articulation acting as a second clamp. The handle 1 of the container 3 comprises a hollow rod having a square cross-section, and the jaws of said first pair of moving jaws 10a, 10b have gripping surfaces configured such that they are externally coupled to said hollow rod having a square cross-section preventing the container 3 from rotating with respect to the head 70 when the handle 1 is gripped by the first holding member 10.

[0026] The jaws of the first pair of moving jaws 10a, 10b have lever arms 11 projecting from their rear portion, and the jaws of said second pair of moving jaws 20a, 20b have stops 21 projecting from their rear portion.

[0027] The second pair of moving jaws 20a and 20b installed in the moving carriage has an elastic element 24 (shown in Figure 5a, 5b and 5c) permanently pushing the second holding member 20 towards the release position. In the shown embodiment, said elastic element 24 is a metal torsion spring, although alternatively there can be more than one elastic element 24 comprising one or more torsion or compression coil springs, or one or more bodies made of an elastomeric material, etc.

[0028] Retaining elements 52 arranged adjacent to the moving carriage 51 along almost the entire travel thereof geometrically interfere with the stops 21 of the second pair of moving jaws 20a and 20b, keeping them in the jaw closing position, and preventing the release of the gate operator 2 held by said jaws. Said retaining elements 52 do not interfere with said stops 21, and the elastic element 24 can open the second pair of moving jaws 20a and 20b only when the moving carriage 51 is in the release position and in this position alone. In this embodiment, the retaining elements 52 consist of vertical walls guiding the vertical shift of the moving carriage 51, and as can be seen in Figure 4, they have an opening at their lower end, coinciding with the position of the stops 21, the moving carriage 51 being in the release position for releasing the gate operator 2.

[0029] The opening and closure of the jaws are operated by means of a holding activation device 40, shown in Figures 3 and 4, which simultaneously moves the first pair of moving jaws 10a and 10b about a first articulation between jaw closing and opening positions which determine the holding and the release of the handle 1 of the container 3 and the second pair of moving jaws 20a, 20b about a second articulation between jaw closing and opening positions which determine the holding and the release of the gate operator element 2 of the container 3.

[0030] In the present embodiment, said holding activation device 40 consists of an articulated quadrangle formed by a vertical bar 44 articulated with respect to the head structure 50 by means of connecting rods 45, and one of said connecting rods 45 having moving rams 42 arranged for pushing said stops 21 of the jaws of the second pair of moving jaws 20a, 20b when the moving carriage 51 is in the release position for releasing the gate operator 2, that being a zone which is free of interference with the retaining elements 52.

[0031] The upper end of the vertical bar 44 is attached to the first actuator 41 which in the present embodiment is a piston, and its lower end is kinematically connected to lever arms 11 of the jaws of the first pair of moving jaws 10a, 10b of the first holding member 10. The activation of the first actuator 41 shifts the vertical bar 44, moving the lever arms 11 of the first pair of moving jaws 10a, 10b closer to or away from one another, causing the opening or closure of the first holding member 10, while at the same time pushing the moving rams 42 against or withdrawing them away from the stops 21 of the second pair of moving jaws 20a and 20b, causing the opening or closure of the second holding member 20.

[0032] Said kinematic attachment between the vertical bar 44 and the first pair of moving jaws 10a and 10b is by means of articulated arms 43 having spherical articulations at their two ends for converting a lateral vertical shift of the vertical bar 44 into a horizontal movement of the lever arms 11 of the first pair of moving jaws 10a and 10b.

[0033] Figures 5a and 6a show the second pair of moving jaws 20a and 20b in the release position for releasing the gate operator 2, the moving carriage 51 being in the gate opening position 4. In this position, the holding activator 40 keeps the first pair of moving jaws 10a and 10b open, and the moving rams 42 withdrawn.

[0034] Figures 5b and 6b show the second pair of moving jaws 20a and 20b in the holding position for holding the gate operator 2, the moving carriage 51 being in the gate opening position 4. In this position, the holding activator 40 keeps the first pair of moving jaws 10a and 10b closed, and the moving rams 42 in the pushing position.

[0035] Figures 5c and 6c show the second pair of moving jaws 20a and 20b in the holding position for holding the gate operator 2, the moving carriage 51 being in the gate closing position 4. In this position, the holding activator 40 keeps the first pair of moving jaws 10a and 10b closed, and the moving rams 42 in the pushing position,

and the retaining elements 52 keep said second pair of moving jaws 20a and 20b in the holding position for holding the gate operator 2.

[0036] Figures 5a to 7e show how the first pair of moving jaws 10a and 10b have an upper face 12 complementary to a lower surface of a perimetral flange 1a of the handle 1, and a lower face 13 complementary to a complementary planar surface 56 of the head structure 50. With said first pair of moving jaws 10a and 10b being closed around said handle 1, and the container 3 being hoisted from said handle 1, the vertical load of the container is transmitted from the handle 1 to the head structure 50 by means of the contact of these planar surfaces.

[0037] The same drawings also show how, according to the shown embodiment, the second pair of moving jaws 20a and 20b have an upper face 22 complementary to a lower surface of a perimetral flange 2a of the gate operator element 2, and a lower face 23 complementary to a complementary planar surface 57 of the moving carriage 51. With said second pair of moving jaws 20a and 20b being closed around said gate operator 2, and the container 3 being hoisted, the vertical load of the waste, borne by the gates 4 of the container 3, is transmitted from the gate operator 2 to the moving carriage by means of the contact between these planar surfaces.

[0038] Figures 7a, 7b, 7c, 7d and 7e show steps of the process of collecting, lifting and emptying a waste container 3. The first drawing shows how the coupling head 70 has been vertically aligned on the handle 1 with the help of an image capturing camera 58 (Figure 2), the first and second holding members 10 and 20 being open.

[0039] Figure 7b shows how the coupling head 70 is lowered, inserting said handle 1 and gate operator 2 into a lower opening made on said head. When the handle 1 contacts with a stop surface 60 located inside the coupling head 70, a first detector element 61 is operated by said contact, shifting it against an elastic element 63, and said shift being detected by a first sensor 31. The gate operator 2 also contacts with a second detector element 62, shifting it against an elastic element 64, this movement being detected at two different points of travel by a second sensor 32 and by a third sensor 33. The positive detection of the three mentioned sensors indicates that the handle 1 and the gate operator 2 have correctly reached the limit position of insertion inside the coupling head 70, and are in a position suitable for being held. After conducting this check, the first and second holding members 10 and 20 are closed, holding the handle 1 and the gate operator 2, respectively.

[0040] Figure 7c shows how, while the container is still on the ground, a second actuator 53 which causes the rotation of vertical spindles 54 is operated causing the vertical shift of a nut element 55 fixed to the moving carriage 51 (Figure 2), causing the vertical drive thereof. This movement of the moving carriage 51 drives the second holding member 20, and thereby the gate operator 2, thus assuring the closure of the gates 4 of the container 3 before lifting the container. After performing this vertical

shift, the gate operator 2 moves down until the lower surface of its perimetral flange 2a contacts with the upper face 22 of the second holding member 20 due to the existing clearance. As it moves down, the second detector element 62 also moves down pushed by the elastic element 64, causing the third sensor 33 to no longer detect it, but the second sensor to continue detecting it, thus indicating the correct closure of the gates.

[0041] Figure 7d shows how, upon lifting the container 3 from the ground, the handle 1 moves down until the lower surface of a perimetral flange 1a of the handle 1 contacts with the upper face 12 of the first holding member 10 and transmits the vertical load. As it performs this downward movement, the first detector element 61 is shifted pushed by the elastic element 63, causing the first sensor 31 to no longer detect its presence. The correct lifting of the container is confirmed when only the second sensor 32 provides a positive reading.

[0042] Finally, Figure 7e shows how, with the container 3 being lifted, and therefore without having a positive reading from the first or from the third sensor 31 and 33 but with a positive reading from the second sensor 32, the second actuator 53 (Figure 2) is operated to cause the rotation of the spindles 54, lowering the moving carriage 51, and thereby the second holding member 20, which drives the gate operator 2 and allows the opening of said gates 4 for emptying the container 3.

Claims

1. A device for handling and emptying waste collection containers, comprising a coupling head comprising a head structure (50) bearing:

- a first holding member (10) suitable for being coupled to a handle (1) fixed on an outer surface of a container (3) for holding said container (3);
- a second holding member (20) suitable for holding a gate operator element (2) arranged in the container (3), adjacent and/or concentric to said handle (1) and mechanically linked to lower gates (4) of the container (3) for opening and closing same, said second holding member (20) being installed in a moving carriage (51) movable along said head structure (50); and
- operating means suitable for shifting said moving carriage (51) between gate closing and opening positions, in which the gate operator element (2) of the container (3), held by said second holding member (20), performs the closure and allows the opening of said lower gates (4) of the container (3), respectively;

characterized in that:

- said first holding member (10) comprises one or more moving elements operated by a holding activation device (40) for moving between holding and release positions which determine the

holding and the release of said handle (1);

- said second holding member (20) comprises one or more moving elements operated by a holding activation device (40) for moving between holding and release positions which determine the holding and the release of said gate operator element (2); and

- the head structure (50) integrates retaining elements (52) which contact with stops (21) of the one or more moving elements of the second holding member (20) preventing the movement thereof towards said release position, being in said holding situation and said moving carriage (51) being in any position of travel except in a position in which the held gate operator (2) is in a standby situation.

2. The device according to claim 1, **characterized in that** the one or more moving elements of the first holding member (10) comprise a first pair of moving jaws (10a, 10b) acting as a first clamp and the one or more moving elements of the second holding member (20) comprise a second pair of moving jaws (20a, 20b) acting as a second clamp, the jaws of said second pair of moving jaws (20a, 20b) having said stops (21).
3. The device according to claim 2, **characterized in that** the jaws of said first pair of moving jaws (10a, 10b) of the first holding member (10) have respective upper planar faces (12) which, in said holding position and in a loading situation, contact with a lower surface of a perimetral flange (1a) of the handle (1) of the container (3) receiving vertical loads from said flange, and lower planar faces (13) which, in the holding position and in a loading situation, transmit said vertical loads to and rest on a complementary planar surface (56) of said head structure (50).
4. The device according to claim 2 or 3, **characterized in that** the jaws of said second pair of moving jaws (20a, 20b) of the second holding member (20) have respective upper planar faces (22) which, in said holding position and in a loading situation, contact with a lower surface of a perimetral flange (2a) of the gate operator element (2) of the container (3) receiving vertical loads from said flange, and lower planar faces (23) which, in the holding position and in a loading situation, transmit said vertical loads to and rest on a complementary planar surface (57) of the moving carriage (51).
5. The device according to any one of the preceding claims, **characterized in that** said holding activation device (40) operating the second holding member (20) is arranged outside the moving carriage (51) and does not shift together with it.

6. The device according to any one of the preceding claims, **characterized in that** the first and second holding members (10, 20) are simultaneously operated by means of a single shared holding activation device (40). 5
7. The device according to claim 6, **characterized in that** the first and second holding members (10, 20) are simultaneously operated by means of a single holding activation device (40) comprising a first actuator (41) moving a mechanism kinematically connected to lever arms (11) of the jaws of the first pair of moving jaws (10a, 10b) of the first holding member (10) and to moving rams (42) arranged in zones free of interference with said retaining elements (52) for pushing said stops (21) of the jaws of the second pair of moving jaws (20a, 20b) of the second holding member (20) when the moving carriage (51) is in the gate opening position. 10
8. The device according to claim 7, **characterized in that** each of the jaws of the second pair of moving jaws (20a, 20b) of the second holding member (20) are permanently pushed towards the release position by an elastic element (24). 15
9. The device according to any one of the preceding claims, **characterized in that** said operating means suitable for shifting the moving carriage (51) comprise a second actuator (53) causing the rotation of at least one vertical spindle (54) coupled to at least one nut element (55) fixed to the moving carriage (51). 20
10. The device according to any one of claims 2 to 8, **characterized in that** in the head structure (50) there is installed an image capturing camera (58) the line of sight of which is directed downwards between the jaws of said first pair of moving jaws (10a, 10b) of the first holding member (10) when they are in the release position, between the jaws of said second pair of moving jaws (20a, 20b) of the second holding member (20) when they are in the release position, and through an opening (59) of the moving carriage (51), and said image capturing camera (58) provides images which are used for positioning the head structure (50) in relation to the handle (1) of the container (3). 25
11. The device according to claim 4, **characterized in that** the head structure (50) has at least one stop surface (60) contacting with an upper surface of said perimetral flange (1a) of the handle (1) of the container (3) determining a limit position of insertion of the head structure (50), in which said upper planar faces (12) of the jaws of the first pair of moving jaws (10a, 10b) of the first holding member (10) are located at a level lower than said lower surface of said perimetral flange (1a) of the handle (1) of the container (3) and said upper planar faces (22) of the second pair of moving jaws (20a, 20b) of the second holding member (20) are located at a level lower than said lower surface of said perimetral flange (2a) of the gate operator element (2) of the container (3). 30
12. The device according to claim 11, **characterized in that** in the head structure (50) there is arranged a first detector element (61) movable between a standby position and a detection position, and an elastic element (63) pushing said first detector element (61) towards said standby position, the first detector element (61) being pushed to said detection position by the perimetral flange (1a) of the handle (1) of the container (3) when the head structure (50) is in said limit position of insertion. 35
13. The device according to claim 12, **characterized in that** a first sensor (31) detecting the first detector element (61) when it is in the detection position is arranged in the head structure (50). 40
14. The device according to claim 11, 12 or 13, **characterized in that** there is installed in the moving carriage (51) a second detector element (62) movable between upper, intermediate and lower positions, and an elastic element (64) pushes said detector element (61) towards said lower position, the second detector element (62) being pushed to said upper and intermediate positions by the gate operator element (2) of the container (3) when the head structure (50) is in the limit position of insertion and when the moving carriage is moved towards the close gate position, respectively. 45
15. The device according to claim 14, **characterized in that** a second sensor (32) only detecting the second detector element (62) when it is in any of the intermediate and upper positions and a third sensor (33) only detecting the second detector element (62) when it is in the upper position are arranged in the moving carriage (51). 50
16. The device according to claim 3, **characterized in that** the jaws of said first pair of moving jaws (10a, 10b) of the first holding member (10) have gripping surfaces configured for being externally coupled to a hollow rod having a square cross-section which is part of the handle (1) of the container (3) preventing the container (3) from rotating with respect to the head when the handle (1) is gripped by the first holding member (10). 55

Amended claims in accordance with Rule 137(2) EPC.

1. A device for handling and emptying waste collection containers, comprising a coupling head comprising a head structure (50) bearing:

- a first holding member (10) suitable for being coupled to a handle (1) fixed on an outer surface of a container (3) for holding said container (3);
 - a second holding member (20) suitable for holding a gate operator element (2) arranged in the container (3), adjacent and/or concentric to said handle (1) and mechanically linked to lower gates (4) of the container (3) for opening and closing same, said second holding member (20) being installed in a moving carriage (51) movable along said head structure (50); and
 - operating means suitable for shifting said moving carriage (51) between gate closing and opening positions, in which the gate operator element (2) of the container (3), held by said second holding member (20), performs the closure and allows the opening of said lower gates (4) of the container (3), respectively;
- characterized in that:**

- said first holding member (10) comprises a first pair of moving jaws (10a, 10b) acting as a first clamp operated by a holding activation device (40) for moving between holding and release positions which determine the holding and the release of said handle (1);
- said second holding member (20) comprises a second pair of moving jaws (20a, 20b) acting as a second clamp operated by a holding activation device (40) for moving between holding and release positions which determine the holding and the release of said gate operator element (2); and
- the head structure (50) integrates retaining elements (52) which contact with stops (21) of the second pair of moving jaws (20a, 20b) preventing the movement thereof towards said release position, being in said holding situation and said moving carriage (51) being in any position of travel except in a position in which the held gate operator (2) is in a standby situation;
- the jaws of said first pair of moving jaws (10a, 10b) have respective upper planar faces (12) which, in said holding position and in a loading situation, contact with a lower surface of a perimetral flange (1a) of the handle (1) of the container (3) receiving vertical loads from said flange, and lower planar faces (13) which, in the holding position

and in a loading situation, transmit said vertical loads to and rest on a complementary planar surface (56) of said head structure (50).

2. The device according to claim 1, **characterized in that** the jaws of said second pair of moving jaws (20a, 20b) of the second holding member (20) have respective upper planar faces (22) which, in said holding position and in a loading situation, contact with a lower surface of a perimetral flange (2a) of the gate operator element (2) of the container (3) receiving vertical loads from said flange, and lower planar faces (23) which, in the holding position and in a loading situation, transmit said vertical loads to and rest on a complementary planar surface (57) of the moving carriage (51).
3. The device according to any one of the preceding claims, **characterized in that** said holding activation device (40) operating the second holding member (20) is arranged outside the moving carriage (51) and does not shift together with it.
4. The device according to any one of the preceding claims, **characterized in that** the first and second holding members (10, 20) are simultaneously operated by means of a single shared holding activation device (40).
5. The device according to claim 4, **characterized in that** the first and second holding members (10, 20) are simultaneously operated by means of a single holding activation device (40) comprising a first actuator (41) moving a mechanism kinematically connected to lever arms (11) of the jaws of the first pair of moving jaws (10a, 10b) of the first holding member (10) and to moving rams (42) arranged in zones free of interference with said retaining elements (52) for pushing said stops (21) of the jaws of the second pair of moving jaws (20a, 20b) of the second holding member (20) when the moving carriage (51) is in the gate opening position.
6. The device according to claim 5, **characterized in that** each of the jaws of the second pair of moving jaws (20a, 20b) of the second holding member (20) are permanently pushed towards the release position by an elastic element (24).
7. The device according to any one of the preceding claims, **characterized in that** said operating means suitable for shifting the moving carriage (51) comprise a second actuator (53) causing the rotation of at least one vertical spindle (54) coupled to at least one nut element (55) fixed to the moving carriage (51).

8. The device according to any one of the preceding claims, **characterized in that** in the head structure (50) there is installed an image capturing camera (58) the line of sight of which is directed downwards between the jaws of said first pair of moving jaws (10a, 10b) of the first holding member (10) when they are in the release position, between the jaws of said second pair of moving jaws (20a, 20b) of the second holding member (20) when they are in the release position, and through an opening (59) of the moving carriage (51), and said image capturing camera (58) provides images which are used for positioning the head structure (50) in relation to the handle (1) of the container (3). 5 10
9. The device according to claim 2, **characterized in that** the head structure (50) has at least one stop surface (60) contacting with an upper surface of said perimetral flange (1a) of the handle (1) of the container (3) determining a limit position of insertion of the head structure (50), in which said upper planar faces (12) of the jaws of the first pair of moving jaws (10a, 10b) of the first holding member (10) are located at a level lower than said lower surface of said perimetral flange (1a) of the handle (1) of the container (3) and said upper planar faces (22) of the second pair of moving jaws (20a, 20b) of the second holding member (20) are located at a level lower than said lower surface of said perimetral flange (2a) of the gate operator element (2) of the container (3). 15 20 25 30
10. The device according to claim 9, **characterized in that** in the head structure (50) there is arranged a first detector element (61) movable between a standby position and a detection position, and an elastic element (63) pushing said first detector element (61) towards said standby position, the first detector element (61) being pushed to said detection position by the perimetral flange (1a) of the handle (1) of the container (3) when the head structure (50) is in said limit position of insertion. 35 40
11. The device according to claim 10, **characterized in that** a first sensor (31) detecting the first detector element (61) when it is in the detection position is arranged in the head structure (50). 45
12. The device according to claim 9, 10 or 11, **characterized in that** there is installed in the moving carriage (51) a second detector element (62) movable between upper, intermediate and lower positions, and an elastic element (64) pushes said detector element (61) towards said lower position, the second detector element (62) being pushed to said upper and intermediate positions by the gate operator element (2) of the container (3) when the head structure (50) is in the limit position of insertion and when the moving carriage is moved towards the close gate 50 55

position, respectively.

13. The device according to claim 12, **characterized in that** a second sensor (32) only detecting the second detector element (62) when it is in any of the intermediate and upper positions and a third sensor (33) only detecting the second detector element (62) when it is in the upper position are arranged in the moving carriage (51).
14. The device according to claim 1, **characterized in that** the jaws of said first pair of moving jaws (10a, 10b) of the first holding member (10) have gripping surfaces configured for being externally coupled to a hollow rod having a square cross-section which is part of the handle (1) of the container (3) preventing the container (3) from rotating with respect to the head when the handle (1) is gripped by the first holding member (10).

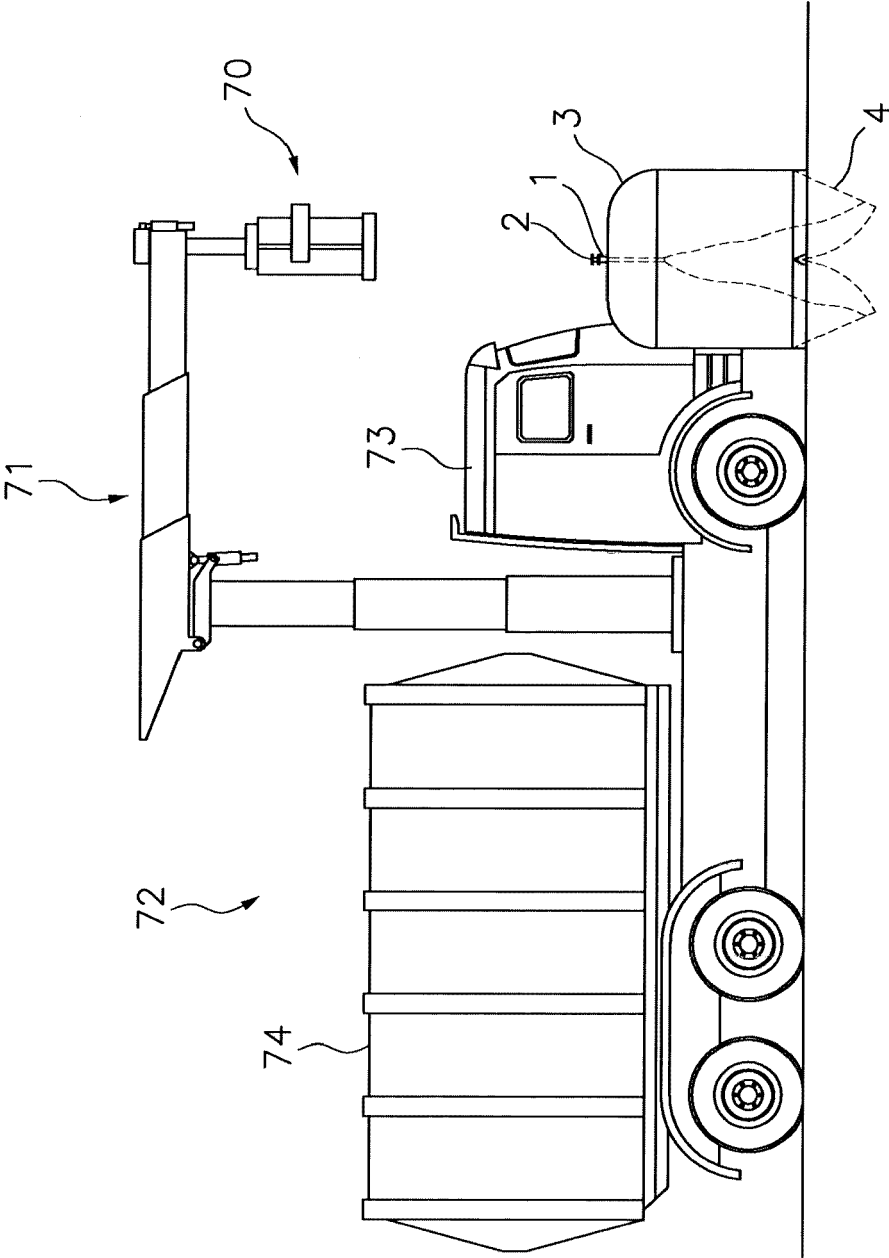


Fig. 1

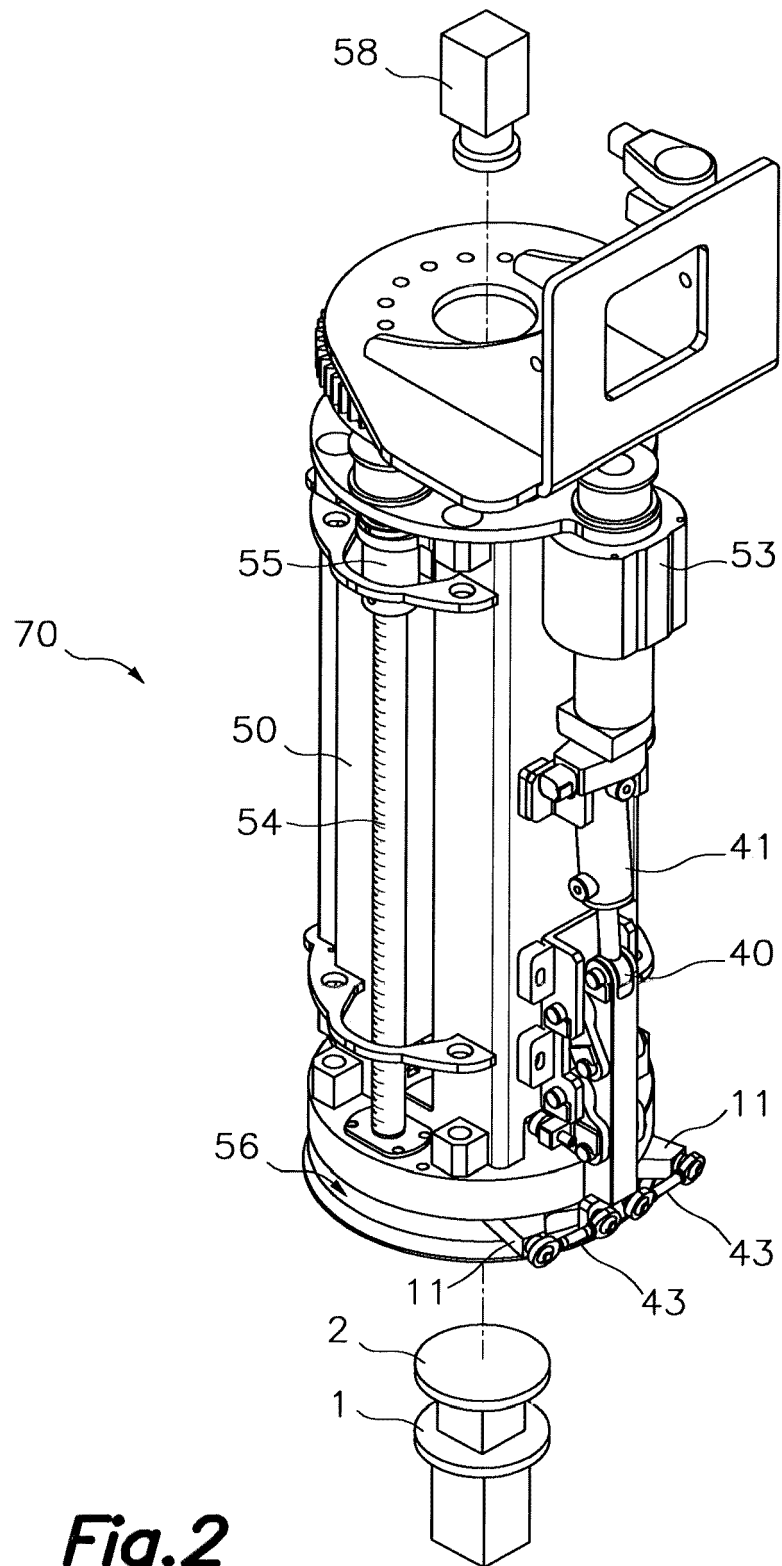


Fig.2

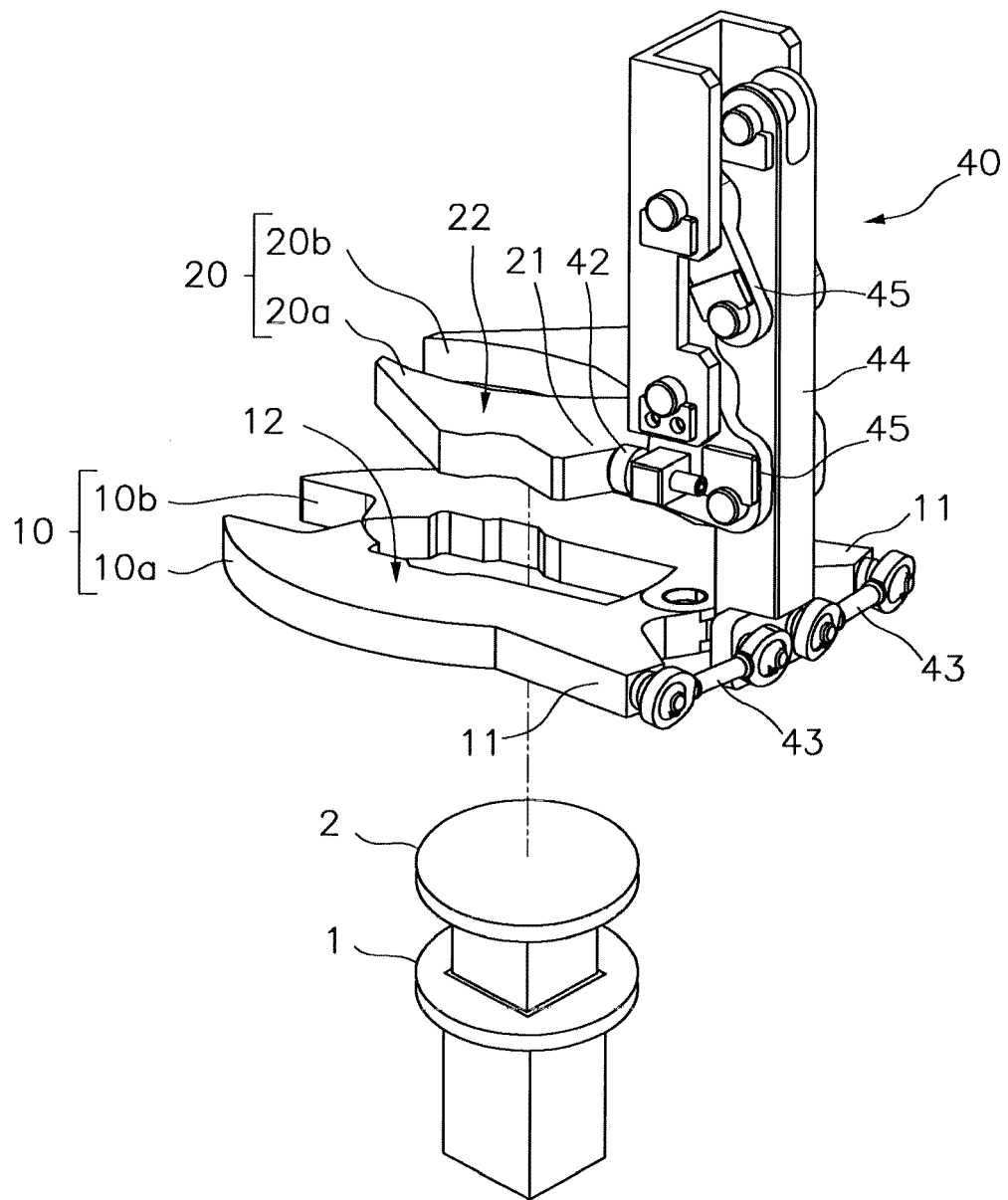


Fig.3

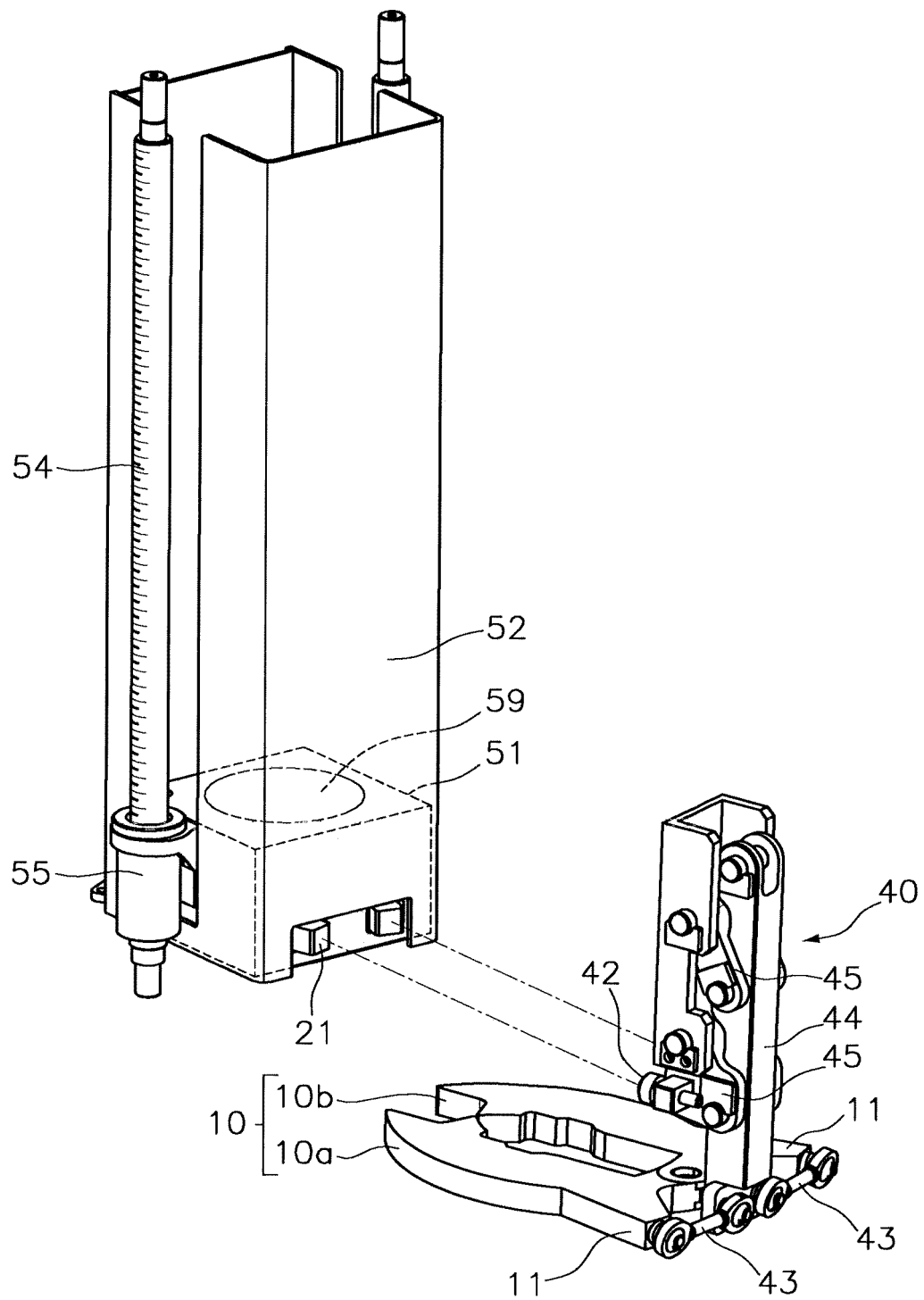


Fig. 4

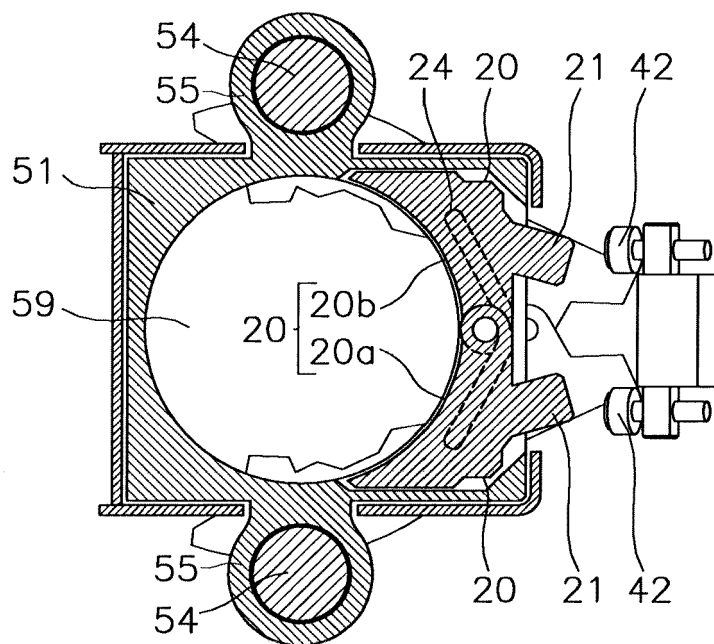


Fig.5a

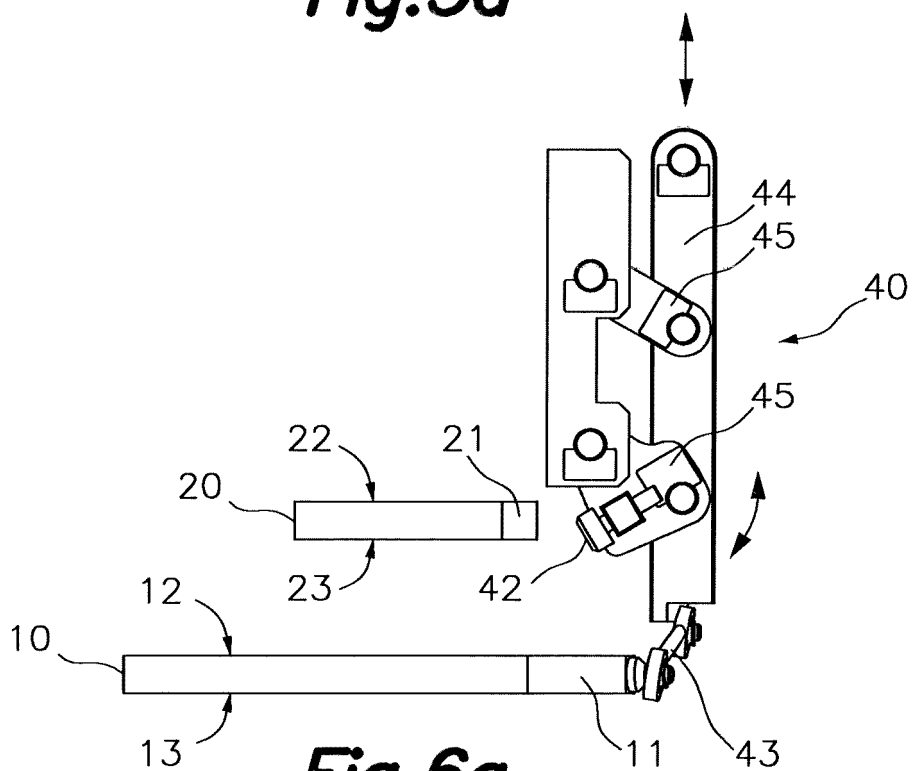


Fig. 6a

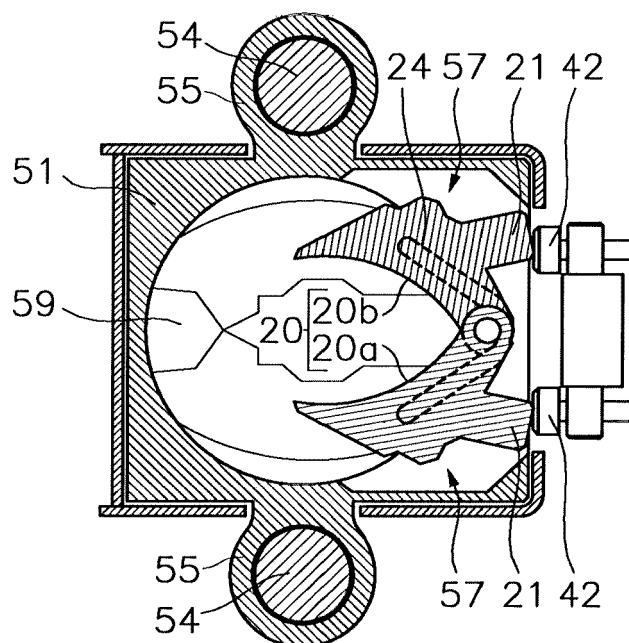


Fig. 5b

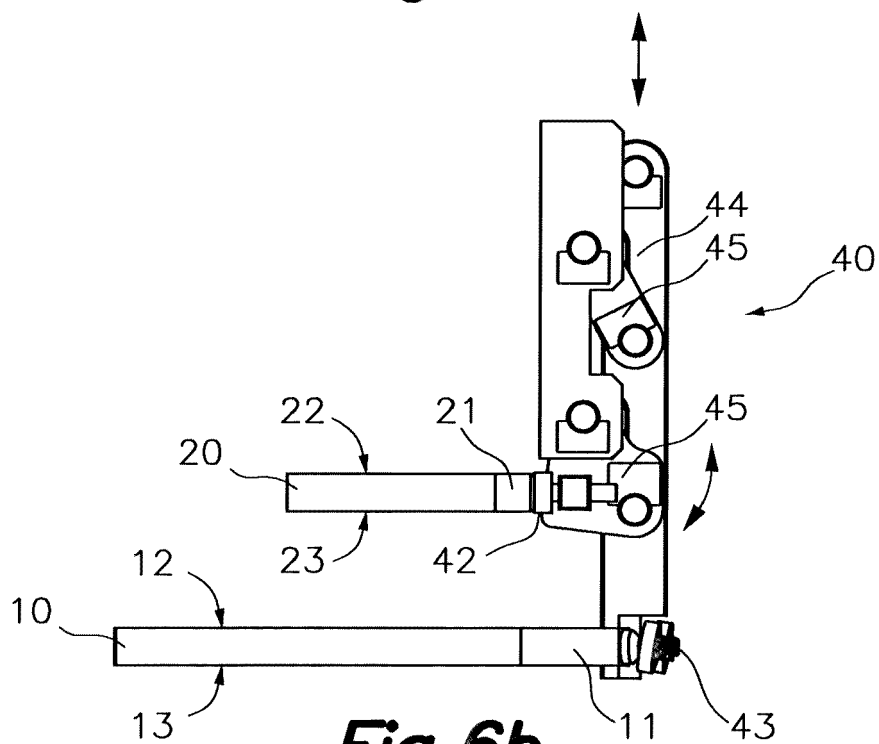


Fig. 6b

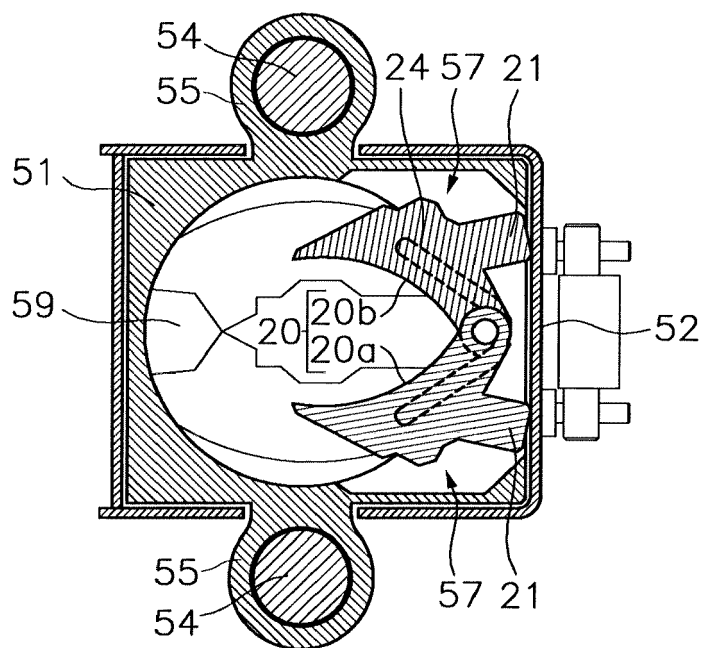


Fig. 5c

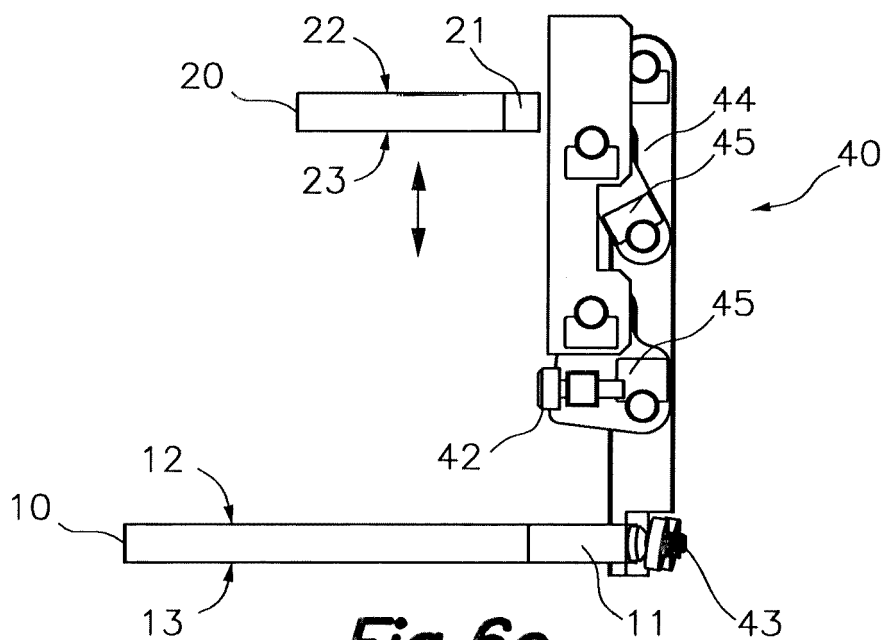


Fig. 6c

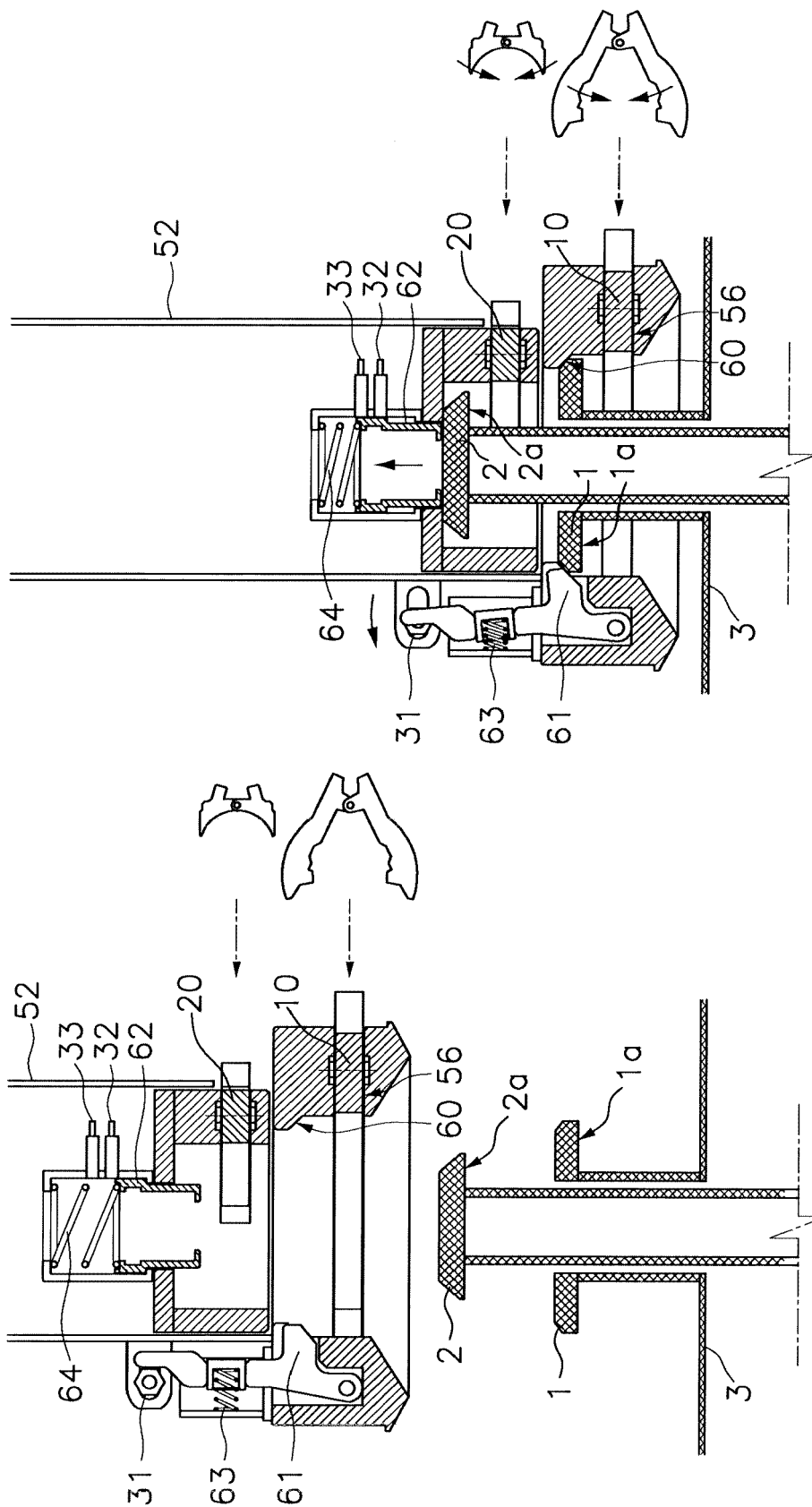


Fig. 7b

Fig. 7a

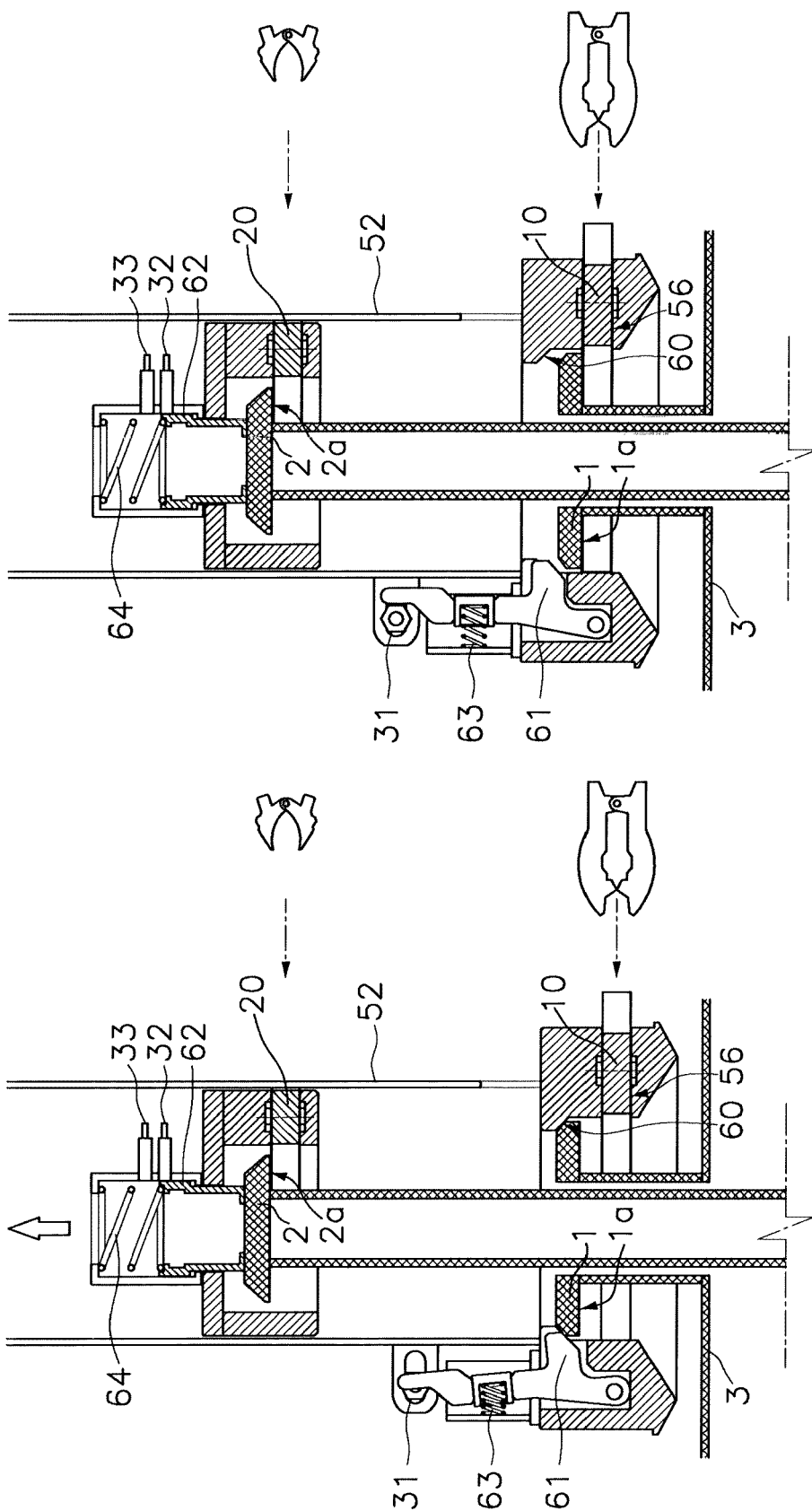


Fig. 7d

Fig. 7c

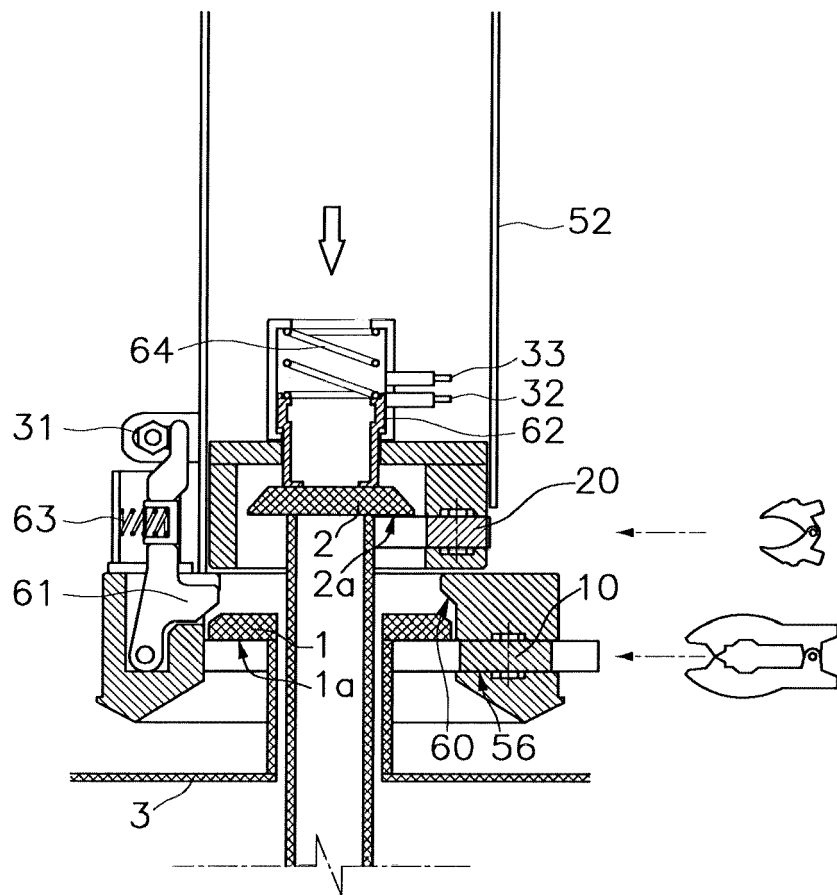


Fig. 7e



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EP 13 38 0051

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A,D	DE 299 05 551 U1 (SINTERPLAST S P A [IT]) 29 July 1999 (1999-07-29) * figures 1-3 * * page 3, line 8 - page 7, line 5 *	1	
A	EP 1 916 218 A1 (BAKKER HARM [NL]) 30 April 2008 (2008-04-30) * figures 1-6 * * paragraphs [0021] - [0033] *	1	
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 18 March 2014	Examiner Pardo, Ignacio
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