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(54) **METHOD AND DEVICE FOR HANDLING WASTE COLLECTION CONTAINERS**

(57) The present invention discloses a device for handling waste collection containers comprising a coupling head (1) comprising a head structure (10) arranged to be attached to a crane arm and comprising: a first holding member (20) having first movable elements (21) being movable between a handle gripping position and a handle release position and for being coupled to a container; and wherein the first movable elements are rotatable around a longitudinal axis of the head structure; the device further comprising a rotation device having an engaged position wherein the rotation device rotates the first movable elements around said longitudinal axis, and a disengaged position, wherein the first movable elements freely rotate around said longitudinal axis; a control unit being configured to set the rotation device at its disengaged position while the first movable elements move to the handle gripping position. It is also disclosed a method for handling waste collection containers.

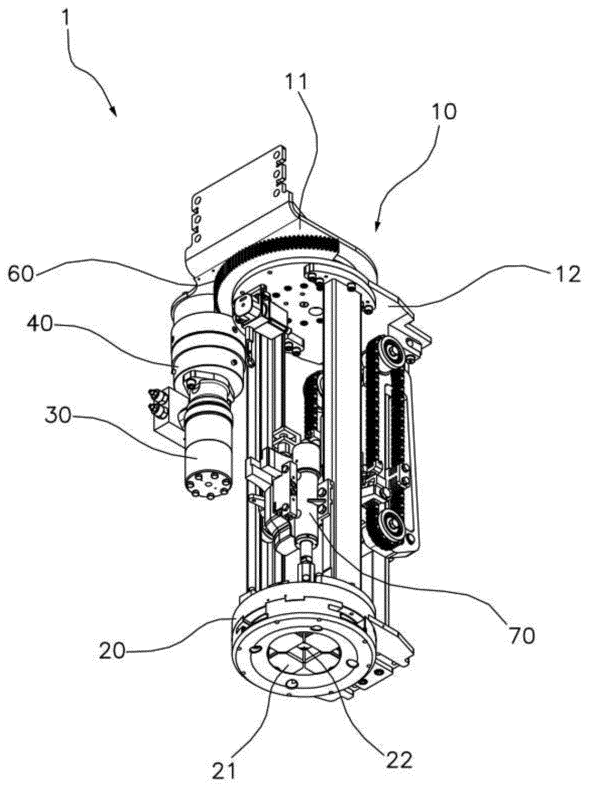

Fig.2

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Description

Technical field

[0001] The present invention relates to the field of devices for handling waste collection containers, and to methods for performing said operations. In particular, the present invention relates to a device for handling waste collection containers, and to a method for performing said operation, by means of a coupling head attached to a crane arm of a waste collection vehicle, said coupling head allowing holding a container and lifting it. Particular embodiments of the device and method of the present invention also allow emptying the container into a container discharge area.

State of the Art

[0002] Devices for handling waste collection containers capable of being coupled to a handle of the container are known in the state of the art. In the state of the art are also known devices for handling and emptying waste collection containers which besides being capable of being coupled to a handle of the container, are also capable of interacting with a gate operator of the container for causing the opening and/or closing of the gates of the container.

[0003] For example, patent document EP 3115317 A1 discloses a device and a method for handling and emptying waste collection containers. In the device disclosed in EP 3115317 A1 a holding member comprises a central opening for the insertion of the handle of the container and a plurality of jaws, which move in a radial and coordinated manner to close the same around the handle of the container.

[0004] Waste collection containers, or simply containers, and their handles have an angular positioned when laying on the floor. Due to various reasons, the angular position of the containers and their handles is usually not optimal in order to be coupled to a device for handling containers. In the prior art are known devices for handling containers which can rotate their gripping means in order to orientate them in such a way that they can be coupled to the handle of the container. Typically, this is done by an operator that can be aid with a video camera. However, such a solution is complex and prone to errors.

[0005] There is a need to provide a simpler solution and that does not require the supervision of an operator in order to adapt the angular position of the gripping means of a device for handling containers to the angular position of said containers, and in particular, to their handles.

Brief description of the invention

[0006] The present invention is directed towards a device for handling waste collection containers.

[0007] The present invention solves the problem of adapting the angular position of the gripping means of a device for handling waste collection containers to the angular position of the handle of the containers by providing a device for handling waste collection containers whose gripping means self-align to the angular position of the container handle without needing complex sensors, cameras or any kind of artificial intelligence.

[0008] The present invention provides the above by disclosing a device for handling waste collection containers, the device comprising a coupling head which comprises a head structure arranged to be attached to the distal end of a crane arm comprised in a waste collection vehicle, said head structure comprising: a first holding member having first movable elements operated by means of first operating means, said first movable elements being movable between a handle gripping position and a handle release position and for being coupled to a mushroom-shaped handle fixed on an outer surface of a container for holding up said container through said handle, said handle having a first angular position, each of said movable elements having a flat surface adapted for being placed in contact with a corresponding flat surface of the mushroom-shaped handle in their handle gripping position; said first operating means being controlled by means of a control unit; and wherein the first movable elements are rotatable around a longitudinal axis of the head structure; the device for handling waste collection containers further comprising a rotation device having an engaged position wherein the rotation device rotates at least the first movable elements around said longitudinal axis, and a disengaged position, wherein at least the first movable elements freely rotate around said longitudinal axis; the control unit being configured to set the rotation device at its disengaged position while the first movable elements move to the handle gripping position, so that at least the first movable elements freely rotate adapting the angular position thereof to the first angular position of the container handle.

[0009] According to the present invention, it is understood that a mushroom-shaped handle is a handle having a tubular section and a head protruding transversally with respect to said handle. Said head is preferably shaped like a semi ellipsoid or a semi sphere, although it can have any other suitable shape. Said tubular section is preferably of a polygonal cross-section, the sides of said polygon defining the angular position of the container handle.

[0010] According to the present invention, the control unit may be configured to set the rotation device at its engaged position when the first movable elements reach their handle gripping position.

[0011] According to the present invention, the rotation device may be configured to move the first movable elements to a second angular position for discharging the container to a discharge area.

[0012] According to the present invention, the device for handling waste collection containers may further comprise an angular position sensor for detecting the angular

position of the first movable elements, and the control unit may be configured to store therein the first angular position and the second angular position.

[0013] According to the present invention, the rotation device may be configured to return the first movable elements to the first angular position after discharging the container to the discharge area.

[0014] According to the present invention, the first holding member may be rotatably attached to the head structure, that is to say, the head structure can have a fixed angular position and the first holding member can rotate in order to adapt to the first angular position of the container handle.

[0015] According to the present invention, the head structure may comprise a fixed part and a rotatable part that is rotatably attached to said fixed part and comprises the first holding member, the rotatable part being actuated by the rotation device, that is to say, the first holding member rotates together with part of the head structure.

[0016] According to the present invention, the rotation device may comprise a motor, a clutch operatively connected to the motor and to a pinion, said pinion intermeshing with a driven gear driving the rotatable part of the head structure.

[0017] According to the present invention, said head structure may further comprise a second holding member having second movable elements arranged to be operated by means of second operating means, said second movable elements being movable between a gate operator release position and a position of interaction with the gate operator and allowing said movable elements to come into geometric interference with the gate operator, preventing its free movement, the first holding member being adapted to be attached to the handle and the second holding members being adapted to be arranged in the position of interaction, and the gate operator being arranged in the container in a position adjacent and/or concentric to said handle and mechanically linked to the lower gates of the container for controlling their opening and closing; a displacing mechanism arranged to be operated by a third operating means envisaged for axially moving said second holding member with respect to said first holding member between gate closing and gate opening positions, by means of the relative axial movement between the handle and the gate operator of the mentioned container linked to the first and second holding members, causing the closing and/or opening of said lower gates of the container mechanically linked to the gate operator; the second movable elements being movable between the gate operator release position and the position of interaction with the gate operator; and the first, second and third operating means are controlled by means of the control unit. Devices according to the present invention comprising these features, besides handling waste collection containers, are also capable of emptying the waste collection containers by operating a gate operator comprised in the container handle.

[0018] According to the present invention, the control unit may be provided with at least a first and second handling configuration, which are adapted, respectively, for handling a container containing a gate operator of a first type and for handling a container containing a gate operator of the second type, the first and second configurations differing at least in the predetermined handle gripping and release positions, and/or in the operator release and interaction positions; and/or in the gate opening and closing positions.

[0019] According to the present invention, the displacing mechanism for axially moving the second holding member with respect to the first holding member, may comprise at least a guide arranged in an axial direction of the coupling head and the third operating means may comprise at least a roller chain.

[0020] According to the present invention, the third operating means may further comprise a hydraulic cylinder.

[0021] According to the present invention, each first movable element may comprise two lateral faces perpendicular to its flat surface, and chamfered edges between the flat surface and the lateral faces.

[0022] According to the present invention, the first holding member may comprise at least a pair of movable elements facing each other.

[0023] According to the present invention, the first holding member may comprise four first movable elements arranged in a cross shaped manner.

[0024] According to a second aspect of the present invention, it is also disclosed a method for handling waste collection containers by means of a device for handling waste collection containers according to the present invention, comprising the following steps: placing the coupling head in a position such that the first holding member is located adjacent to, aligned with and at least partially around the handle of a container, the second holding member being adjacent to and aligned with the gate operator; operating the movement of the first movable elements to the handle gripping position, firmly securing the handle; wherein the step of operating the movement of the first movable elements to the handle gripping position, firmly securing the handle comprises the following steps: set the rotation device to the disengaged position, wherein at least the first movable elements freely rotate; operate the movement of the first movable elements to the handle gripping position with the rotation device in the disengaged position so that at least the first movable elements adapt the angular position thereof to the first angular position of the container handle; firmly secure the container handle with the first movable elements having its flat surface in contact with a corresponding flat surface of the mushroom-shaped handle.

[0025] According to the second aspect of the present invention, the step of operating the movement of the first movable elements may further comprise the step of setting the rotation device to the engaged position.

[0026] According to the second aspect of the present invention, the step of setting the rotation device to the disengaged position may comprise the step of disengag-

ing the clutch operatively connected to the motor and to the pinion that intermeshes with the gear that drives the rotatable part of the head structure, so that said pinion, gear and rotatable part freely rotate.

[0027] According to the second aspect of the present invention, the method may further comprise the steps of operating the movement of the second movable elements to the position of interaction with the operator; moving the second holding member to the gate closing position by means of the displacing mechanism, allowing the second movable elements to support a vertical load produced by the weight of the waste located on the gates of the container and transmitted through the gate operator; lifting the container, placing it such that it is superposed on a discharge area and operating the displacing mechanism until placing the second holding member in the gate opening position, causing the movement of the second holding member and the gate operator, causing the opening of the gates mechanically linked to said gate operator; operating the displacing mechanism again until placing the second holding member in the gate closing position, causing the closing of said gates, putting the container back in its original location and releasing the first and second holding members.

[0028] According to the second aspect of the present invention, the step of lifting the container, placing it such that it is superposed on a discharge area may comprise the following steps: lifting the container; optionally rotating the container handle to the second angular position for discharging the container to the discharge area, if the first angular position of the container handle does not coincide with its second angular position; placing the container such that it is superposed on the discharge area.

[0029] According to the second aspect of the present invention, the step of lifting the container, placing it such that it is superposed on a discharge area may comprise the following steps: lifting the container; placing the container such that it is superposed on the discharge area; optionally rotating the container handle to the second angular position for discharging the container to the discharge area, if the first angular position of the container handle does not coincide with its second angular position.

[0030] According to the second aspect of the present invention, the step of putting the container back in its original location may comprise the following steps: rotating the container handle to the first angular position; putting the container back in its original location.

[0031] According to the second aspect of the present invention, the first, second and third operating means may be controlled by means of a programmable control unit provided with at least a first and a second handling configuration, which are adapted, respectively, for handling a container containing a gate operator of a first type and for handling a container containing a gate operator of a second type, the first and second configurations differing at least in the predetermined handle gripping and release positions, and/or in the gate opening and closing positions; and wherein the programmable control unit may implement the following steps: determining if the container to be handled integrates a gate operator of a first type or a gate operator of the second type based on the information obtained by means of sensors or by means of information entered by an operator through an interface; applying a first handling configuration if the container to be handled integrates a gate operator of the first type or a second handling configuration if the container to be handled integrates a gate operator of the second type.

[0032] According to the second aspect of the present invention, a camera and/or a lidar sensor may be integrated in the coupling head for providing information of the handle and the gate operator, and in that the programmable control unit uses said information of the handle and the gate operator to guide the coupling head to the handle and the gate operator and/or to determine if the gate operator is of the first type or of the second type.

[0033] It will be understood that references to geometric position, such as parallel, perpendicular, tangent, etc. allow deviations up to $\pm$ 5° from the theoretical position defined by this nomenclature.

[0034] It will also be understood that any range of values given may not be optimal in extreme values and may require adaptations of the invention to these extreme values are applicable, such adaptations being within reach of a skilled person.

[0035] Other features of the invention appear from the following detailed description of an embodiment.

Brief description of the Figures

[0036] The foregoing and other advantages and features will be fully understood from the following detailed description of an embodiment with reference to the accompanying drawings, to be taken in an illustrative and non-limitative manner, in which:

FIG. 1 shows a top perspective view of an exemplary embodiment of a device for handling waste collection containers according to the present invention.

FIG. 2 shows a bottom perspective view of the exemplary embodiment of a device for handling waste collection containers shown in FIG. 1.

FIG. 3 shows a schematic front view of two different handles of waste collection containers.

FIG. 4 shows a front view of the exemplary embodiment of a device for handling waste collection containers shown in FIGS. 1 and 2.

FIG. 5 shows a section view of the exemplary embodiment of a device for handling waste collection containers shown in FIG. 4 along the cut line V-V.

Detailed description of an embodiment

[0037] The foregoing and other advantages and features will be fully understood from the following detailed description of an embodiment with reference to the accompanying drawings, to be taken in an illustrative and not limitative way.

[0038] FIGS. 1 and 2 show a top and a bottom perspective view, respectively, of an exemplary embodiment of a device for handling waste collection containers according to the present invention. The device comprises a coupling head 1 which comprises a head structure 10 arranged to be attached at a distal end of a crane arm in a waste collection vehicle (not shown). Said head structure 10 further comprises a first holding member 20 having first movable elements 21 operated by first operating means.

[0039] In the exemplary embodiment shown, the head structure 10 comprises a fixed part 11 and a rotatable part 12 that is rotatably attached to said fixed part 11, which is configured for being attached to the distal end of a crane arm comprised in a wate collection vehicle (not shown).

[0040] The device of the exemplary embodiment shown further comprises a rotation device which comprises a motor 30, a clutch 40, a pinion 50 (hidden in these figures, see FIG. 5), and a gear 60. The rotation device drives the rotatable part 12.

[0041] In this exemplary embodiment, the first holding member 20 defines a circular opening 22 for the passage therethrough of the handle 2, 2' of a waste collection container 3 (see FIG. 3) to be handled by the device object of the present invention.

[0042] As can be seen, the exemplary embodiment shown comprises four first movable elements 21 arranged in a cross shaped manner. However, other embodiments can have a different number of first movable elements 21, for example, a pair of them facing each other.

[0043] In the exemplary embodiment shown, each first movable element 21 comprises two lateral faces perpendicular to its flat surface, which is intended for being placed in contact with a corresponding flat surface of the container handle, and chamfered edges between the flat surface and the lateral faces.

[0044] FIG. 3 shows a schematic front view of two different handles 2, 2' of a waste collection container 3.

[0045] The device object of the present invention can be used for handling containers 3 having gates on its lower face, filling openings in its upper half, a handle 2, 2' firmly attached to the container 3 on its upper face, which allows holding the entire container and its waste load through said handle 2, 2'. Certain containers 3 can have a handle 2, 2' comprising a gate operator 201, 201' arranged in a position adjacent or concentric to said handle 2, 2', which is mechanically linked to the gates of the container 3, for example, by means of an articulated bar mechanism or a cable and pulley mechanism. Said mechanical link allows the axial movement of the gate operator 201, 201' to cause the opening and closing of said gates and to cause at least a part of the weight of the waste deposited on the lower gates of the container 3 to be transmitted through the mentioned mechanical link to the gate operator while lifting the container. In embodiments of the device of the present invention comprising a second holding member having second movable elements, said transmitted loads are supported by said second holding member.

[0046] As can be seen, both handles 2, 2' comprise a tubular section 202 and a head 200 protruding from said tubular sections 202. In both handles 2, 2' shown, the tubular section 202 has a squared cross-section, although other handles 2,'2 can have tubular sections having different cross-sections.

[0047] In the gate operator 201 of the first type, the gate closing position will be the position in which said operator 201 is completely inserted into the handle 2, without projecting above the same, whereas the gate opening position will be the position in which said gate operator 201 of the first type projects a predetermined distance from the handle 1. In FIG. 3 the gate operator 201 of the first type is shown in the gate opening position.

[0048] However, in other embodiments, the gate opening position can be the position in which the gate operator is completely inserted into the handle, without projecting above the same, whereas the gate closing position can be the position in which said gate operator projects a predetermined distance from the handle.

[0049] In the gate operator 201' of the second type, said gate operator 201' comprises a flange and the gate opening position will be the position in which said gate operator 201' is in the lower point of its vertical travel, the mentioned flange being close to and superposed to the handle. This one will also be the resting position of the gate operator 201' of the second type, the container 3 being supported on the ground, and the opening of the lower gates therefore being prevented as they are supported on the ground. In the case shown in FIG. 3, although the gate operator 201' of the second type is in the gate opening position, the gates will remain closed as they are supported on the ground, which means that the mechanical link between the gate operator 201' of the second type and the gate must allow that position, for example, by integrating cables or chains that can stay loose in this resting position.

[0050] The gate closing position of the gate operator 201' of the second type will be the position in which the flange of the gate operator 201' of the second type is arranged at a predetermined distance from the head 200 greater than the distance existing in the gate opening position, in the upper limit of its vertical travel.

[0051] The two types of handles 2, 2' depicted in FIG. 3 have been shown for illustrative purposes, as other types of handles 2, 2' of waste collection containers 3 can also be used with the device of the present invention.

[0052] FIG. 4 shows a front view of the exemplary em-

bodiment of a device for handling waste collection containers shown in FIGS. 1 and 2. In the exemplary embodiment shown, the head structure 10, and in particular, its fixed part 11 comprises a motor 30, a clutch 40 operatively connected to said motor 30 and to a pinion 50, which in this figure is hidden under a protective cover (see FIG. 5). Said pinion 50 intermeshes with a gear 60 fixed to the rotatable part 12 of the head structure 10.

[0053] The clutch 40 has an engaged position wherein the rotation device, that is to say, the motor 30, pinion 30 and gear 60, rotate the rotatable part 12 of the head structure 10 around a longitudinal axis of said head structure 10, thus rotating the first movable elements 21 comprised in the first holding member 20. The clutch 40 also has a disengaged position wherein the rotatable structure 12 freely rotates driven by the first movable elements 21 while moving to its handle gripping position from the handle release position. The first movable elements 21 are operated by means of first operating means, which in the embodiment shown comprise the actuator 70. In this way, the first movable elements 21 adapt their angular position to the angular position of the handle 2, 2' of the container 3 by freely rotating while advancing to their handle gripping position, when said container 3 is resting on the floor. This solution does not require complex sensors, neither advanced algorithms or artificial intelligence, to detect the angular position of the handle 2, 2' of the container 3 and actively rotate the gripping members until they reach a suitable angular position for gripping or holding said handle 2, 2'.

[0054] FIG. 4 also depicts the cut line V-V.

[0055] FIG. 5 shows a section view of the exemplary embodiment of a device for handling waste collection containers shown in FIG. 4 along the cut line V-V. This section view clearly shows the pinion 50, which in the previous figures is hidden under a protective cover, and the gear 60 that intermeshes with said pinion and drives the rotatable part 12 of the head structure 10 (see, for example, FIGS. 1 and 2).

[0056] As stated above, in this exemplary embodiment shown, when the clutch 40 is in its disengaged position, the rotatable part 12 of the head structure 10 freely rotates adapting its angular position to the one of the first movable elements 21 which self-align or self-orientate, due to the movement of said first movable elements 21 when moving from the handle release position to the handle gripping position. As the clutch 40 is in its disengaged position, the rotatable part 12 drives the pinion 50, which freely rotates, by means of the gear 60.

[0057] When the first movable elements 21 reach their handle gripping position, the control unit of the device may be configured to set the clutch 40 to its engaged position so that the rotation device can drive and rotate the rotatable part 12.

[0058] Once the clutch 40 is in its engaged position, the motor 30 can rotate the rotatable part 12 of the head structure 10 until a second angular position is reached in which the container 3 can be discharged in a discharge area, which can be inside or outside a waste collection vehicle. Said second angular position may be the same as the first one, in which case the rotation device does not rotate the handle 2, 2' and its container 3.

[0059] Differences between the first and the second angular positions may be due to the placement of the container 3 on the ground, the configuration of the discharge area, misuse of the container 3, vandalism, etc.

[0060] Certain embodiments of the device according to the present invention can comprise a second holding member having second movable elements arranged to be operated by means of second operating means, said second movable elements being movable between a gate operator release position and a position of interaction with the gate operator 201, 201' and allowing said movable elements to come into geometric interference with the gate operator 201, 201', preventing its free movement, the first holding member being adapted to be attached to the handle 2, 2' and the second holding members being adapted to be arranged in the position of interaction. Said embodiments according to the present invention also comprise a displacing mechanism arranged to be operated by third operating means envisaged for axially moving said second holding member with respect to said first holding member between gate closing and gate opening positions, by means of the relative axial movement between the handle 2, 2' and the gate operator 201, 201' of the mentioned container 3, causing the closing and/or opening of the lower gates of the container 3. That is to say, said embodiments besides handling the waste collection container 3, can also empty their content in a discharge area. In embodiments lacking such features, the containers 3 can be emptied, for example, by an operator manually activating a discharge mechanism of the containers 3. Embodiments of the device according to the present invention which are able to discharge the content of the container 3 are preferred, but as previously stated, are not necessary.

[0061] Although in the embodiment shown in FIGS. 1 to 5 the head structure comprises a rotatable part that rotates the components that it bears, in other embodiments, this may differ. For example, in other embodiments only the first holding member 20 with its first movable elements 21 may be rotatable, the head structure having a fixed angular position. Another possibility is that only the first movable elements 21 are rotatable around a longitudinal axis of the head structure 10, with the head structure and the first holding member having a fixed angular position.

[0062] It will be understood that various parts of one embodiment of the invention can be freely combined with parts described in other embodiments, even being said combination not explicitly described, provided that such combination is within the scope of the claims and that there is no harm in such combination.

Claims

1. Device for handling waste collection containers, the device comprising a coupling head (1) which comprises a head structure (10) arranged to be attached to the distal end of a crane arm comprised in a waste collection vehicle, said head structure comprising:

   a first holding member (20) having first movable elements (21) operated by means of first operating means, said first movable elements (21) being movable between a handle gripping position and a handle release position and for being coupled to a mushroom-shaped handle (2, 2') fixed on an outer surface of a container (3) for holding up said container (3) through said handle (2, 2'), said handle (2, 2') having a first angular position, each of said first movable elements (21) having a flat surface adapted for being placed in contact with a corresponding flat surface of the mushroom-shaped handle (2, 2') in their handle gripping position;
   said first operating means being controlled by means of a control unit;
   characterized in that the first movable elements (21) are rotatable around a longitudinal axis of the head structure (10);
   and **in that** the device for handling waste collection containers further comprises a rotation device having an engaged position wherein the rotation device rotates at least the first movable elements (21) around said longitudinal axis, and a disengaged position, wherein at least the first movable elements (21) freely rotate around said longitudinal axis;
   the control unit being configured to set the rotation device at its disengaged position while the first movable elements (21) move to the handle gripping position, so that at least the first movable elements (21) freely rotate adapting the angular position thereof to the first angular position of the container handle (2, 2').

2. Device, according to claim 1, wherein the control unit is configured to set the rotation device at its engaged position when the first movable elements reach their handle gripping position.

3. Device, according to claim 2, wherein the rotation device is configured to move the first movable elements (21) to a second angular position for discharging the container (3) to a discharge area.

4. Device, according to claim 3, wherein it further comprises an angular position sensor for detecting the angular position of the first movable elements (21), and the control unit is configured to store therein the first angular position and the second angular position.

5. Device, according to claim 4, wherein the rotation device is configured to return the first movable elements (21) to the first angular position after discharging the container (3) to the discharge area.

6. Device, according to any one of the preceding claims, wherein the head structure (10) comprises a fixed part (11) and a rotatable part (12) that is rotatably attached to said fixed part (11) and comprises the first holding member (20), the rotatable part being actuated by the rotation device.

7. Device, according to claim 6, wherein the rotation device comprises a motor (30), a clutch (40) operatively connected to the motor (30) and to a pinion (50), said pinion intermeshing with a driven gear (60) driving the rotatable part (12) of the head structure (10).

8. Device, according to any one of the preceding claims, wherein said head structure (10) further comprises:

   - a second holding member having second movable elements arranged to be operated by means of second operating means, said second movable elements being movable between a gate operator release position and a position of interaction with the gate operator (201, 201') and allowing said movable elements to come into geometric interference with the gate operator (201, 201'), preventing its free movement, the first holding member being adapted to be attached to the handle (2, 2') and the second holding members being adapted to be arranged in the position of interaction, and the gate operator (201, 201') being arranged in the container (3) in a position adjacent and/or concentric to said handle (2, 2') and mechanically linked to lower gates of the container (3) for controlling their opening and closing;
   - a displacing mechanism arranged to be operated by third operating means envisaged for axially moving said second holding member with respect to said first holding member between gate closing and gate opening positions, by means of the relative axial movement between the handle (2, 2') and the gate operator (201, 201') of the mentioned container (3) linked to the first and second holding members, causing the closing and/or opening of said lower gates of the container (3) mechanically linked to the gate operator (201, 201'); and

   wherein the second movable elements are movable between the gate operator release position and the

position of interaction with the gate operator (201, 201'); and the first, second and third operating means are controlled by means of the control unit.

9. Method for handling waste collection containers by means of a device for handling waste collection containers according to claims 1 to 8, comprising the following steps:

- placing the coupling head in a position such that the first holding member is located adjacent to, aligned with and at least partially around the handle (2, 2') of a container (3), the second holding member being adjacent to and aligned with the gate operator (201, 201');
- operating the movement of the first movable elements (21) to the handle gripping position, firmly securing the handle (2, 2');

characterized in that the step of operating the movement of the first movable elements (21) to the handle gripping position, firmly securing the handle comprises the following steps:

- set the rotation device to the disengaged position, wherein at least the first movable elements (21) freely rotate;
- operate the movement of the first movable elements (21) to the handle gripping position with the rotation device in the disengaged position so that at least the first movable elements (21) adapt the angular position thereof to the first angular position of the container handle (2, 2');
- firmly secure the container handle (2, 2') with the first movable elements (21) having its flat surface in contact with a corresponding flat surface of the mushroom-shaped handle (2, 2').

10. Method, according to claim 9, wherein the step of operating the movement of the first movable elements (21) further comprises the step of setting the rotation device to the engaged position.

11. Method, according to claim 10, wherein the step of setting the rotation device to the disengaged position comprises the step of disengaging the clutch operatively connected to the motor and to the pinion that intermeshes with the gear that drives the rotatable part of the head structure, so that said pinion, gear and rotatable part freely rotate.

12. Method, according to any one of claims 9 to 11, further comprising the steps of:

- operating the movement of the second movable elements to the position of interaction with the operator (201, 201');
- moving the second holding member to the gate closing position by means of the displacing mechanism, allowing the second movable elements to support a vertical load produced by the weight of the waste located on the gates of the container (3) and transmitted through the gate operator (201, 201');
- lifting the container (3), placing it such that it is superposed on a discharge area and operating the displacing mechanism until placing the second holding member in the gate opening position, causing the movement of the second holding member and the gate operator (201, 201'), causing the opening of the gates mechanically linked to said gate operator (201, 201');
- operating the displacing mechanism again until placing the second holding member in the gate closing position, causing the closing of said gates, putting the container (3) back in its original location and releasing the first and second holding members.

13. Method, according to claim 12, wherein the step of lifting the container (3), placing it such that it is superposed on a discharge area comprises the following steps:

- lifting the container (3);
- optionally rotating the container handle (2, 2') to the second angular position for discharging the container (3) to the discharge area, if the first angular position of the container handle (2, 2') does not coincide with its second angular position;
- placing the container (3) such that it is superposed on the discharge area.

14. Method, according to claim 12, wherein the step of lifting the container, placing it such that it is superposed on a discharge area comprises the following steps:

- lifting the container (3);
- placing the container (3) such that it is superposed on the discharge area;
- optionally rotating the container handle (2, 2') to the second angular position for discharging the container (3) to the discharge area, if the first angular position of the container handle (2, 2') does not coincide with its second angular position.

15. Method, according to any one of claims 12 or 14, wherein the step of putting the container (3) back in its original location comprises the following steps:

- rotating the container handle (2, 2') to the first angular position;
- putting the container (3) back in its original lo-

cation.

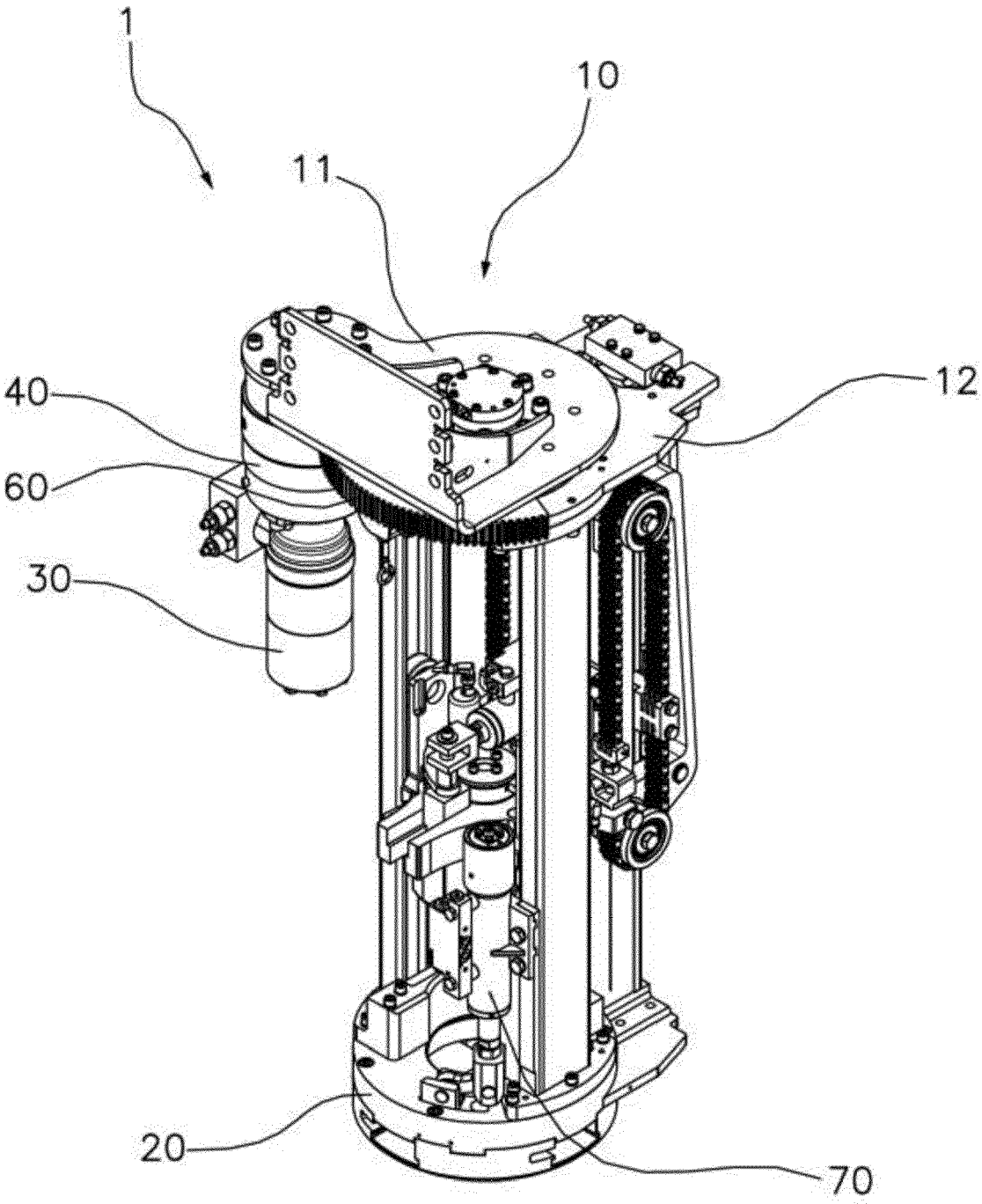

Fig. 1

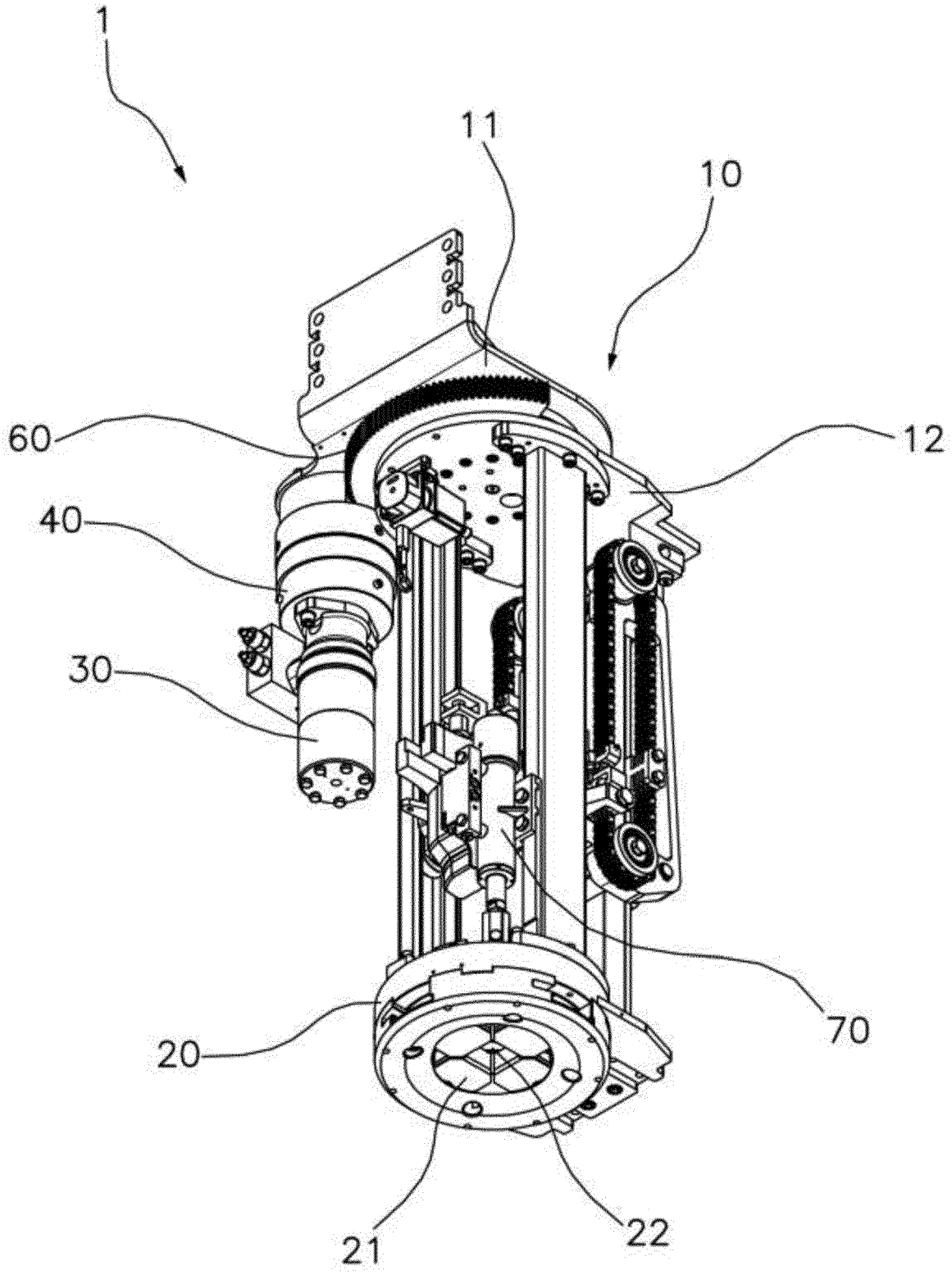

Fig.2

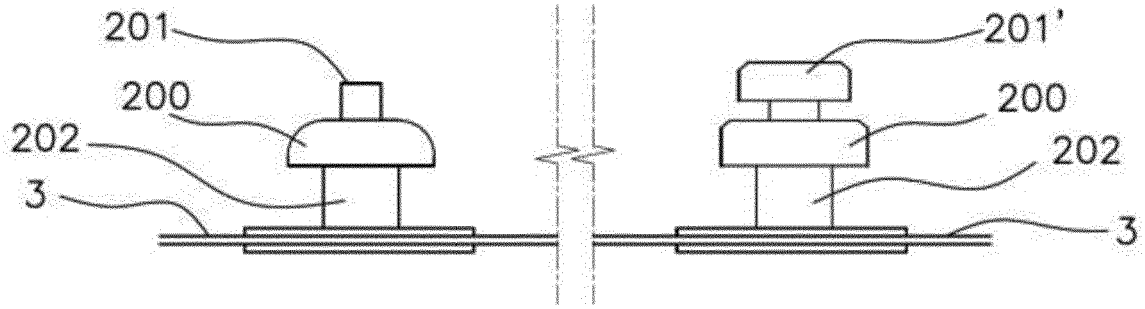

Fig.3

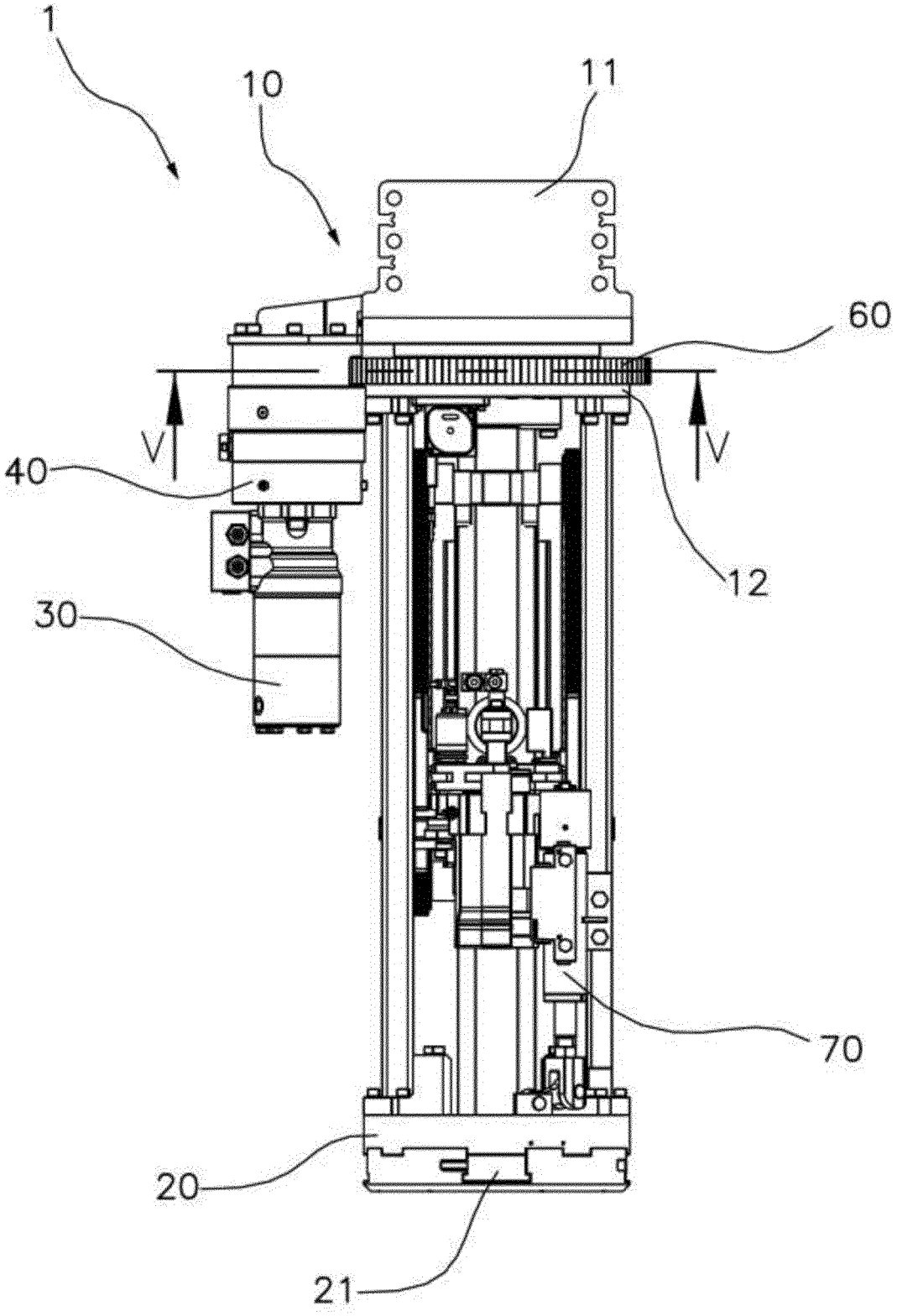

Fig.4

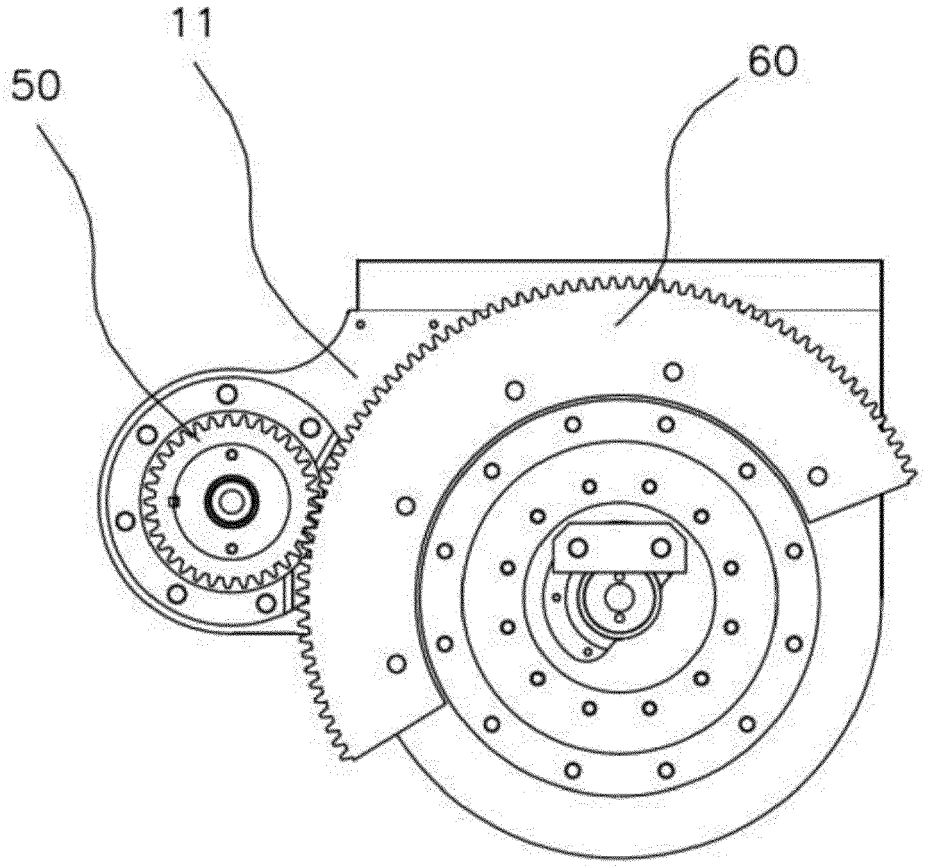

Fig.5

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EUROPEAN SEARCH REPORT

Application Number
EP 21 38 2599

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 2 754 624 A1 (MECAGIL LEBON SA [FR]; SALEUR RECYCLAGE SAS [FR]) 16 July 2014 (2014-07-16) * paragraph [0031]; figures 1, 2 *	1-15	INV. B65F3/02
A	WO 2019/081794 A1 (PEREZ VERA AQUILINO [ES]) 2 May 2019 (2019-05-02) * page 24, line 25 - page 25, line 4 * * page 27, line 2 - line 5 * * figures 1, 2, 38, 39 *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)
B65F

1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	20 December 2021	Luepke, Erik

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