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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, the device comprising a coupling head (1) which comprises a head structure (30) comprising a first holding member (10) having first movable elements (14) 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 handle (2, 2') fixed on an outer surface of a container (3); and wherein the first movable elements, between the handle gripping position and the handle release position, are also movable to an overload position wherein the movable elements are into geometric interference with the handle, and wherein the first operating means comprise resilient elements (15) configured to move a first movable element from the handle gripping position to the overload position when a force exerted by the container handle exceeds a threshold. It is also disclosed a method for handling waste collection containers.

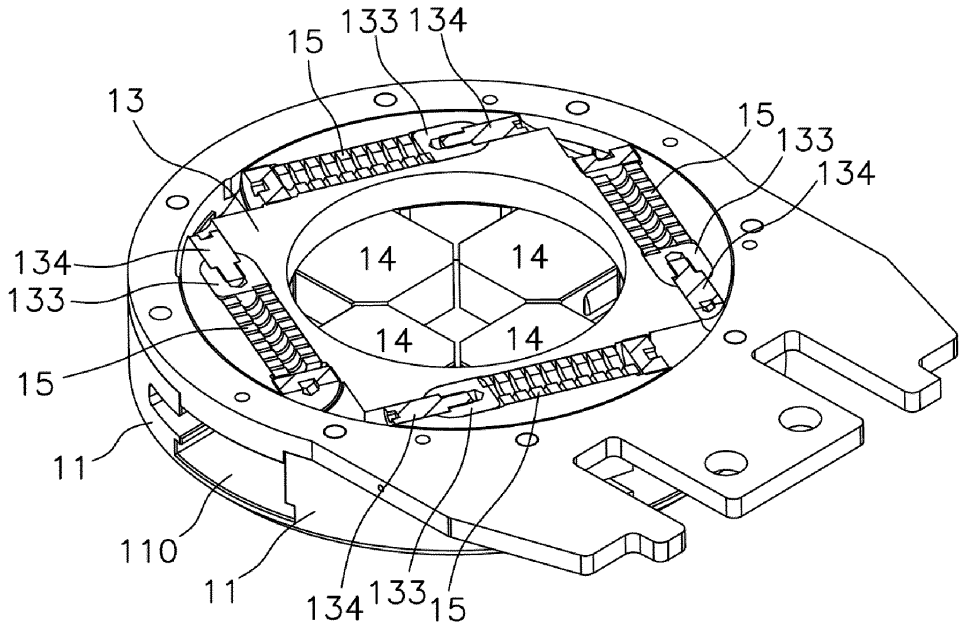

Fig. 7

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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. Although said holding member provides a firm and secure attachment of the device to the container, it can be damaged if the container and/or its handle are not properly placed or aligned, in which case the misalignment of the handle and/or its container can cause an overload to one or more of the jaws that can damage them as the device lacks a mechanism to avoid overloads in the jaws.

[0004] It is important to mention that a fully loaded waste collection container can be considerably heavy and, thus, the forces that a device for handling containers has to withstand are considerably high.

[0005] Other devices for handling waste collection containers known in the art, as for example, the ones disclosed in patent documents DE29905551U1, EP 1916218 A1 and EP 1172308 A1, also lack means to avoid overloads in the jaws that could damage, or even break, them.

[0006] None of the known prior art documents disclose a device for handling waste collection containers comprising means to avoid overloading the jaws that secure the container.

Brief description of the invention

[0007] The present invention is directed towards a device for handling waste collection containers.

[0008] In order to provide a device for handling waste collection containers which comprises means to avoid damaging or even breaking the gripping means of the container due to overloads caused by, for example, a misalignment or misplacement of the container handle in said gripping means, it is disclosed 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 and for holding up said container through said handle, each of said first 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, between the handle gripping position and the handle release position, are also movable to an overload position wherein the first movable elements are into geometric interference with the mushroom-shaped handle, and wherein the first operating means comprise resilient elements configured to move a first movable element from the handle gripping position to the overload position when a force exerted by the container handle exceeds a threshold.

[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.

[0010] According to the present invention, as the overload position is located between the handle gripping position and the handle release position, in said overload position the flat surface of the first movable element is not in contact with a corresponding flat surface of the mushroom-shaped handle of the container. However, as stated above, in said overload position the first movable element still interferes with the mushroom-shaped handle, and in particular, the first movable element still interferes with the protruding head of the handle.

[0011] According to the present invention, the first operating means may comprise a spring for each first movable element, each spring having a first end operatively connected to the corresponding first movable element and a second end operatively fixed to the first holding member. In the present invention, each first movable el-

ement is preferably independent from the other movable elements, that is to say, each first movable element can move to its overload position irrespective of the position of the other first movable elements.

[0012] According to the present invention, the first end of the spring may be connected to a link member that may be operatively connected to the corresponding first movable element.

[0013] According to the present invention, the link member may be shaped as a circular arc.

[0014] According to the present invention, at least part of the link members may slide along a groove matching the shape of the link. For example, if the link is shaped as a circular arc, the groove is also shaped as a circular arc.

[0015] According to the present invention, the first holding member may comprise a lower plate for housing the first movable elements, and an intermediate plate for simultaneously actuating the first movable elements, said intermediate plate being arranged between the lower plate and an upper plate for being attached to the head structure.

[0016] According to the present invention, the second end of the spring may be housed in a respective recess in the intermediate plate.

[0017] According to the present invention, the first operating means may comprise an actuator and the intermediate plate may comprise a protruding part for being operatively connected to said actuator.

[0018] According to the present invention, said protruding part may protrude from the first holding member through an aperture in the upper plate.

[0019] According to the present invention, the actuator may be configured to rotate the intermediate plate relative to the head structure.

[0020] According to the present invention, said actuator may be 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 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 second 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 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; and the second movable elements may be movable between the gate operator release position and the position of interaction with the gate operator; and the first, second and third operating means may be controlled by means of the control unit. Embodiments of the present invention comprising these features can also empty the waste container.

[0025] 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.

[0026] 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.

[0027] According to the present invention, the third operating means may further comprise a hydraulic cylinder.

[0028] 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; lifting the container, placing it such that it is superposed on a discharge area; moving at least one movable element to its overload position when a force exerted by the container handle exceeds a threshold; returning the at least one movable element to its handle gripping position from its overload position when the force exerted by the container handle is inferior to the threshold.

[0029] 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; 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; and 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.

[0030] 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.

[0031] 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.

[0032] It will be understood that references to geometric position, such as parallel, perpendicular, tangent, etc. allow deviations up to ± 5° from the theoretical position defined by this nomenclature.

[0033] 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.

[0034] Other features of the invention appear from the following detailed description of an embodiment.

Brief description of the Figures

[0035] 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 perspective view of the first holding member of the exemplary embodiment of a device for handling waste collection containers shown in FIGS. 1 and 2.

FIG. 5 shows an exploded perspective view of the first holding member shown in FIG. 4.

FIG. 6 shows a front view of the first holding member shown in FIG. 4 without its upper plate.

FIG. 7 shows a perspective view of the first holding member shown in FIG. 6 with a cut-off along the cut line VII-VII.

FIG. 8 shows a front view of the first holding member shown in FIG. 4.

FIG. 9 shows a section view of the first holding member shown in FIG. 8 along the cut line IX-IX.

FIG. 10 shows an exploded perspective view of the intermediate plate of the first holding member shown in FIG. 5.

FIG. 11 shows a top view of the intermediate plate shown in FIG. 10.

FIG. 12 shows a section view of the intermediate plate shown in FIG. 10 along the cut line XII-XII.

Detailed description of an embodiment

[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 not limitative way.

[0037] FIGS. 1 and 2 show a top and a bottom per-

spective 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 30 arranged to be attached at a distal end of a crane arm in a waste collection vehicle (not shown). Said head structure 30 further comprises a first holding member 10 having first movable elements 14 operated by first operating means.

[0038] In the exemplary embodiment shown, the first holding member 10 comprises a lower plate 11 for housing the first movable elements 14 and an upper plate 12 attached to the head structure 30. Between said upper and lower plates 12, 11, the first holding member 10 comprises an intermediate plate 13 (in these views is hidden, see for example, FIG. 5). Said intermediate plate 13 is driven by an actuator 20, which in the exemplary embodiment shown is a hydraulic cylinder, which rotates said intermediate plate 13 around a longitudinal axis of the head structure 30.

[0039] In this exemplary embodiment, the lower plate 11 defines a circular opening 112 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.

[0040] As can be seen, the exemplary embodiment shown comprises four first movable elements 14 arranged in a cross shaped manner. However, other embodiments can have a different number of first movable elements 14, for example, a pair of them facing each other.

[0041] FIG. 3 shows a schematic front view of two different handles 2, 2' of a waste collection container 3.

[0042] 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 201, 201' while lifting the container 3. 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.

[0043] 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.

[0044] 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 2. In FIG. 3 the gate operator 201 of the first type is shown in the gate opening position. However, in other embodiments, the gate opening position can be the position in which the 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.

[0045] 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.

[0046] 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.

[0047] 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.

[0048] FIG. 4 shows a perspective view of the first holding member 10 of the exemplary embodiment of a device for handling waste collection containers shown in FIGS. 1 and 2. In this view can be seen a channel 110 that houses and guides a corresponding first movable element 14, which slides or moves along said channel 110. Sliding or moving along their corresponding channel 110, the first movable elements 14 move in a radial manner from the handle release position to the handle gripping position, and vice versa. In the handle release position, the first movable elements 14 are placed so that they do not interfere with the container handle 2, 2' of the container 3 (see FIG. 3) and the device of the present invention can be uncoupled from the container 3. In the handle gripping position, a flat or planar surface of the first mov-

able elements 14 is placed in contact with a corresponding flat surface of the container handle 2,2', and in particular, with a corresponding flat surface of the tubular section 202 of the container handle 2, 2', firmly securing the container handle 2, 2' to the device of the present invention. In said handle gripping position the first movable elements 14 interfere geometrically with the head 200 of the container handle 2, 2', thus providing a more secure coupling between the container handle 2, 2' and the device for handling waste container of the present invention.

[0049] According to the present invention, said first movable elements 14 can also move to an overload position when a force applied to the first movable elements 14 exceeds a certain threshold that could damage, or even break, them. In said overload position, the movable element 14 is located between its handle gripping position and its handle release position. In the overload position 14 the flat surface of the first movable element 14 is no longer in contact with the corresponding flat surface of the container handle 2, 2', but the first movable element 14 is still in geometric interference with the head 200 of the handle 2, 2' so that still contributes to the attachment of the device of the present invention to the container 3, and in particular, to its handle 2, 2'.

[0050] This figure clearly depicts the protruding part 132 of the intermediate plate 13 (see FIG. 5) protruding from the upper plate 12 through the aperture 120. Although in the embodiment shown the aperture 120 is in the upper face of the upper plate 12, in other embodiments, said aperture can be in the side face of said upper plate 12, as the protruding part 132 in other embodiments can also protrude radially instead of longitudinally with respect to a longitudinal axis of the head structure 30 (see FIGS. 1 and 2).

[0051] FIG. 5 shows an exploded perspective view of the first holding member 10 show in FIG. 4, so that the elements that are usually, partially or completely, hidden can also be seen. As stated above, the first holding member 10 comprises an upper plate 12 attached to the head structure 30 (see FIGS. 1 and 2), a lower plate 11 housing the first movable elements 14 and an intermediate plate 13 arranged between the upper and the lower plates 11, 12. In this exemplary embodiment, the intermediate plate 13 acts as part of the first operating means and is configured for simultaneously actuating the first movable elements 14 housed in the lower plate 11, and in particular, housed in the corresponding channels 110. Said intermediate plate 13 houses a plurality of resilient elements, which in this embodiment are springs 15 (see FIG. 7), that allow the first movable element 14 to move to their overload position when a force applied to them exceeds a certain threshold. In the present case, the intermediate plate comprises openings 130 on its upper side and openings 131 on its lateral side to allow access to the springs 15 housed therein, to ease the maintenance and installation of the springs 15 in the intermediate plate 13, among other possible benefits.

[0052] In the exemplary embodiment shown, the intermediate plate 13 further comprises a plurality of pins 133, each of said pins 133 being operatively connected to the corresponding spring 15 (see FIG. 7) and to the corresponding link member 141. Said pins 133 also act as a stop of the corresponding spring 15 (see FIG. 12).

[0053] In the exemplary embodiment shown, the intermediate plate 13 is at least partly guide by a corresponding circular groove or housing in the lower plate 11 and in the upper plate 12.

[0054] In this exemplary embodiment, each first movable element 14 is operatively connected to a link member 141 that is also operatively connected to a first end of the corresponding spring 15. A second end of said spring is housed in the intermediate plate 13. The connection between the first movable element 14, the link member 141 and the spring 15 is preferably done using non-permanent attachment means, such as, bolts and nuts, screws, etc. This particular embodiment also comprises a plate 142 for each first movable element 14, placed between the lower plate 11 and the intermediate plate 13 that can, among other benefits, ease the movement, and in particular, ease the rotation of the intermediate plate 13 relative to the head structure 30 and the first holding member 10 by easing the sliding of the intermediate plate 13 relative to the upper and lower plates 12, 11 that are fixed.

[0055] In the embodiment shown, the upper plate 12 is attached to the lower plate 11 using threaded fasteners 121, however other types of fastening means can also be used.

[0056] FIG. 6 shows a front view of the first holding member 10 shown in FIG. 4 without its upper plate 12. This view shows the lower plate 11 with one of its first movable elements 14 and the intermediate plate 13 with its protrusion 132 and one of its lateral openings 131.

[0057] The cut line VII-VII is also depicted in FIG. 6.

[0058] FIG. 7 shows a perspective view of the first holding member shown in FIG. 6 with a cut-off along the cut line VII-VII. With this view is possible to appreciate the arrangement of the springs 15, acting as resilient elements, housed in the intermediate plate 13. Said intermediate plate 13, which is driven by the actuator 20, drives and controls the linear displacement of the first movable elements 14 along its corresponding channel 110. In this exemplary embodiment, the linear travel of the first movable elements 14 along their corresponding channel 110 is limited by the actuator 20, and in particular, by the rotation that the actuator 20 imparts to the intermediate plate 13 by the protruding part 132.

[0059] When a force is applied to one or more first movable elements 14 that exceeds a predetermined threshold, generally due to a misalignment or misplacement of the container 3 and its handle 2, 2', the affected first movable element 14 compresses the spring 15 and moves to its overload position. When said excess force disappears, i.e., the force that the first movable element receives comes back to the normal or regular values, the

spring 15 pushes the first movable element 14 back to the handle gripping position.

[0060] FIG. 8 shows a front view of the first holding member 10 shown in FIG. 4. This figure shows the protruding part 132 protruding from the upper plate 12. As stated above, said protruding part 132 is operatively connected to the actuator 20, which drives the intermediate plate 13. By rotating the intermediate plate 13, the first movable elements 14 move from the handle release position to the handle gripping position, and vice versa. The connection of the first movable elements 14 to their corresponding link 141 can be seen in the section view of FIG. 9, which shows a section view the first holding member 10 along the cut line IX-IX shown in FIG. 8. This section views shows the arrangement of the first movable elements 14 in their corresponding channel 10 of the lower plate 11 and their connection to their corresponding link member 141.

[0061] In the exemplary embodiment shown, in order to allow a tilting motion of the link member 141 with respect to its corresponding first movable element 14, each first movable element 14 comprises an indentation 143. The groove 111 aids in allowing and guiding the movement of the first movable element 14 by guiding the pin 133 that slides along a corresponding groove 111.

[0062] FIG. 10 shows an exploded perspective view of the intermediate plate 13 of the first holding member 10 shown in FIG. 5. This view shows how, in this exemplary embodiment, the spring 15 is inserted into the intermediate plate 13 through the opening 131 on the lateral side of the intermediate plate 13. In order to limit the movement of the spring 15 inside the intermediate plate 13, said plate 13 comprises a stop 135, which can be operated through the opening 131, and the pin 133, which on its upper portion comprises a body that acts as a stop of one of the ends of the spring 15. Said pin 133 is held in its position by the locking pin 134, which in the exemplary embodiment shown, is coaxial with a longitudinal axis defined by the spring 15.

[0063] As stated above, the pins 133 slide along a corresponding groove 111 in the lower plate 11 that guides their movement and, correspondingly, also guide the movement of the intermediate plate 13. In this exemplary embodiment, each link member 141 is operatively connected to an end of the corresponding spring 15 by means of the corresponding pin 133.

[0064] FIG. 11 shows a top view of the intermediate plate 13 shown in FIG. 10. This top view clearly shows the openings 130 on the upper side of the intermediate plate 13.

[0065] The cut line XII-XII is also depicted in FIG. 11.

[0066] FIG. 12 shows a section view of the intermediate plate 13 shown in FIGS. 10 and 11 along the cut line XII-XII, clearly showing the arrangement of the previously described components of the intermediate plate 13 when they are in their working position. In particular, FIG. 12 shows the spring 15 with the stop 135 limiting the movement of said spring 15 at one of its ends and the body of the pin 133 limiting the movement of said spring 15 at the opposite end. In this exemplary embodiment, the pin 133 is held in place by the locking pin 134.

[0067] 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.

[0068] In the exemplary embodiment shown, each first movable element 14 comprises two lateral faces perpendicular to its flat surface and chamfered edges between the flat surface and the lateral faces. However, in other embodiments the first movable elements 14 can have a different shape than the one described.

[0069] 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 (30) 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 (10) having first movable elements (14) operated by means of first operating means, said first movable elements (14)

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) and for holding up said container (3) through said handle (2, 2'), each of said first movable elements (14) 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 (14), between the handle gripping position and the handle release position, are also movable to an overload position wherein the first movable elements (14) are into geometric interference with the mushroom-shaped handle (2, 2'),
and **in that** the first operating means comprise resilient elements configured to move a first movable element (14) from the handle gripping position to the overload position when a force exerted by the container handle (2, 2') exceeds a threshold.

2. Device, according to claim 1, wherein the first operating means comprise a spring (15) for each first movable element (14), each spring (15) having a first end operatively connected to the corresponding first movable element (14) and a second end operatively fixed to the first holding member (10).

3. Device, according to claim 2, wherein the first end of the spring (15) is connected to a link member (141) that is operatively connected to the corresponding first movable element (14).

4. Device, according to any one of claims 2 to 4, wherein at least part of the link member (141) slides along a groove (111) matching the shape of the link.

5. Device, according to any one of the preceding claims, wherein the first holding member (10) comprises a lower plate (11) for housing the first movable elements (14), and an intermediate plate (13) for simultaneously actuating the first movable elements (14), said intermediate plate (13) being arranged between the lower plate (11) and an upper plate (12) attached to the head structure (30).

6. Device, according to claims 2 and 6, wherein the second end of the spring (15) is housed in a respective recess in the intermediate plate.

7. Device, according to claim 6 or 7, wherein the first operating means comprise an actuator (20) and wherein the intermediate plate (13) comprises a protruding part (132) for being operatively connected to said actuator (20).

8. Device, according to claim 8, wherein said protruding part (132) protrudes from the first holding member (10) through an aperture (120) in the upper plate (12).

9. Device, according to claim 8 or 9, wherein the actuator (20) is configured to rotate the intermediate plate (13) relative to the head structure (30).

10. Device, according to any one of the preceding claims, wherein each first movable element (14) comprises two lateral faces perpendicular to its flat surface, and chamfered edges between the flat surface and the lateral faces.

11. Device, according to any one of the preceding claims, wherein the first holding member (10) comprises at least a pair of movable elements (14) facing each other.

12. Device, according to claim 11, wherein the first holding member (10) comprises four first movable elements (14) arranged in a cross shaped manner.

13. Device, according to any one of the preceding claims, wherein said head structure (30) 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 (201, 201') release position and a position of interaction with the gate operator (201, 201') and allowing said second 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 (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 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 (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 mechanically linked to the gate operator (201, 201'); and

wherein the second movable elements are movable between the gate operator (201, 201') 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.

14. Method for handling waste collection containers by means of a device for handling waste collection containers according to any one of claims 1 to 14, comprising the following steps:

- placing the coupling head (1) in a position such that the first holding member (10) is located adjacent to, aligned with and at least partially around the handle (2, 2') of a container (3);
- operating the movement of the first movable elements (14) to the handle gripping position, firmly securing the handle (2, 2');
- lifting the container (3), placing it such that it is superposed on a discharge area;
- moving at least one movable element (14) to its overload position when a force exerted by the container handle (2, 2') exceeds a threshold;
- returning the at least one movable element (14) to its handle gripping position from its overload position when the force exerted by the container handle (2, 2') is inferior to the threshold.

15. Method, according to claim 14, 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');
- 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'); and
- 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.

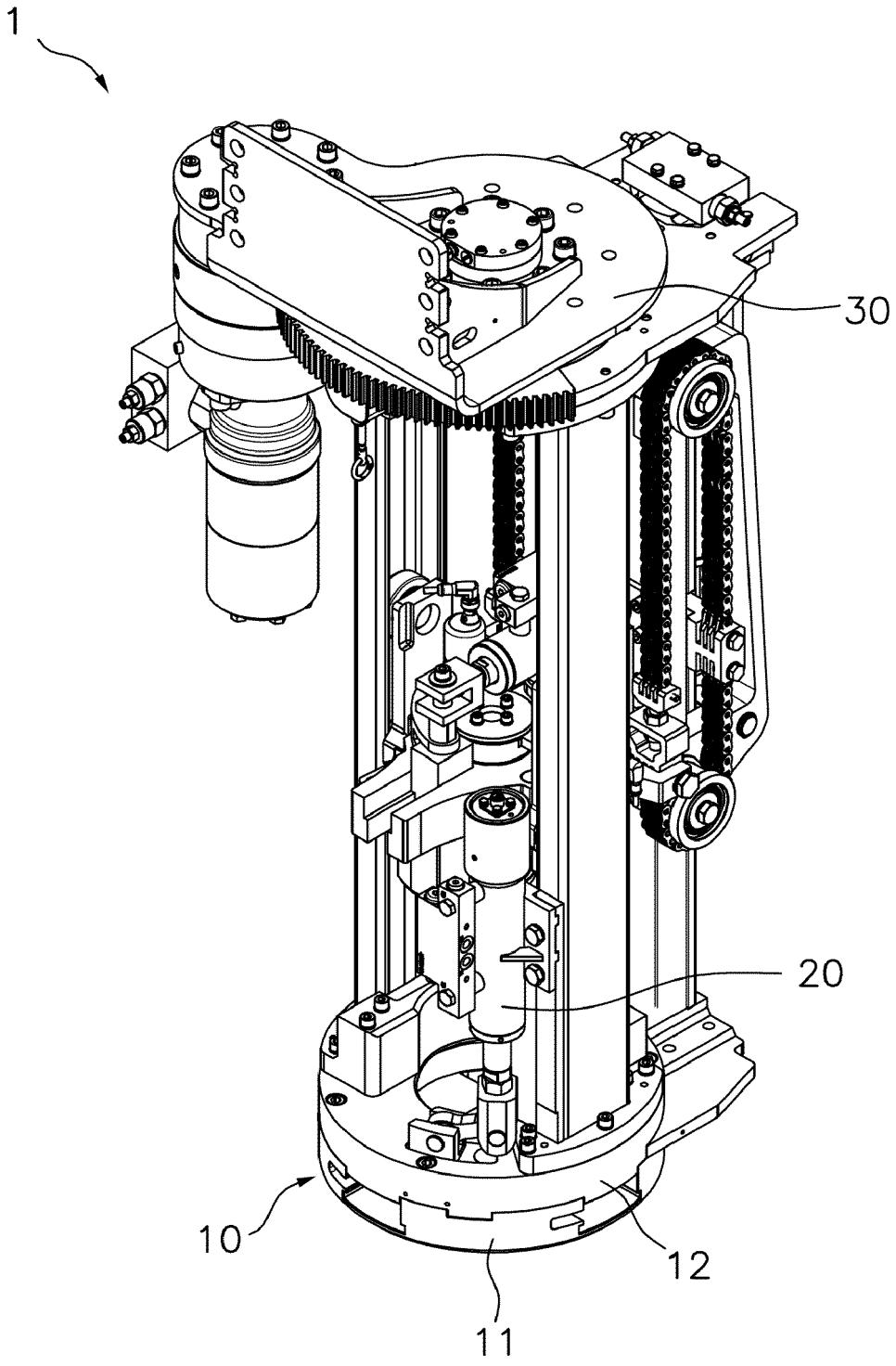

Fig. 1

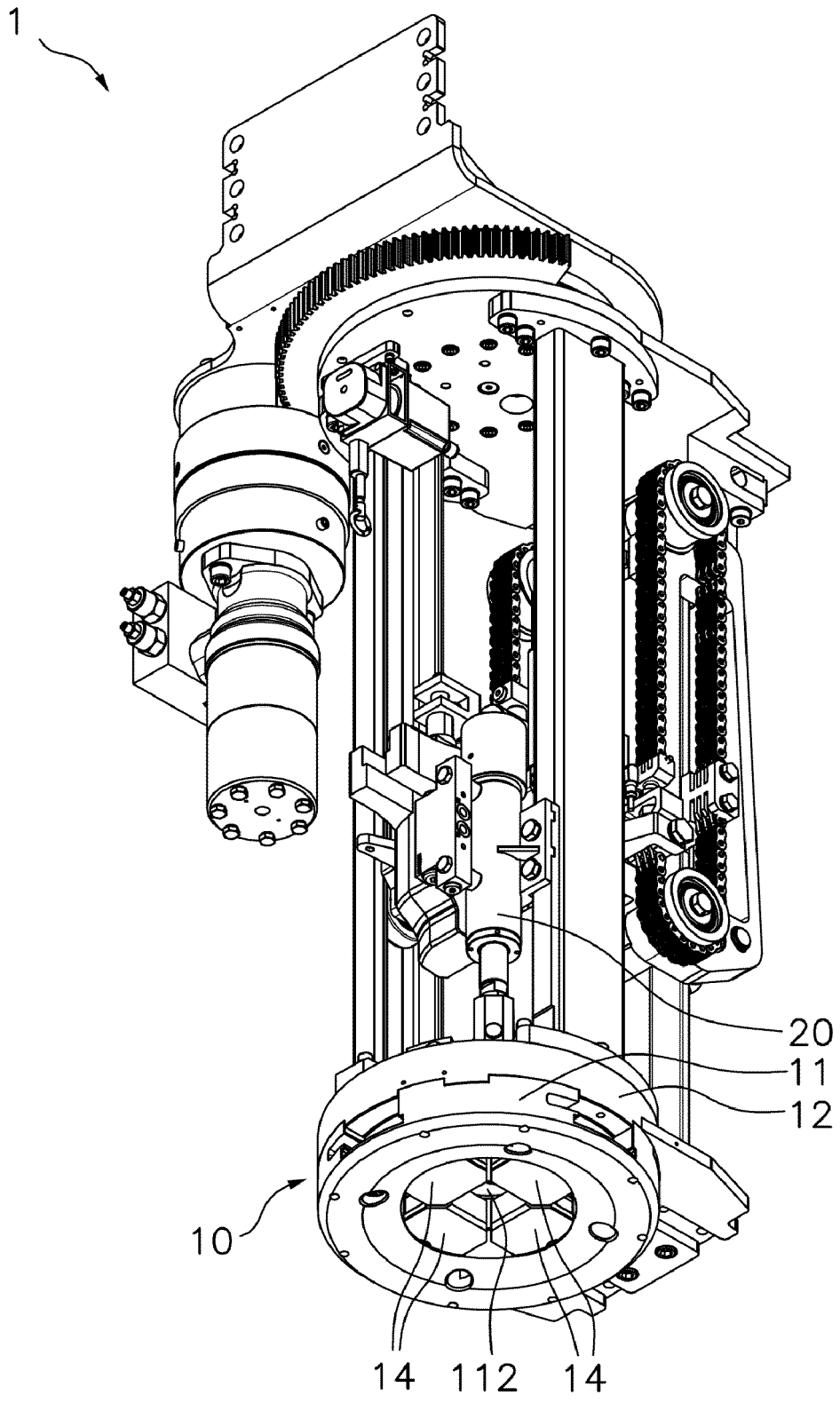

Fig.2

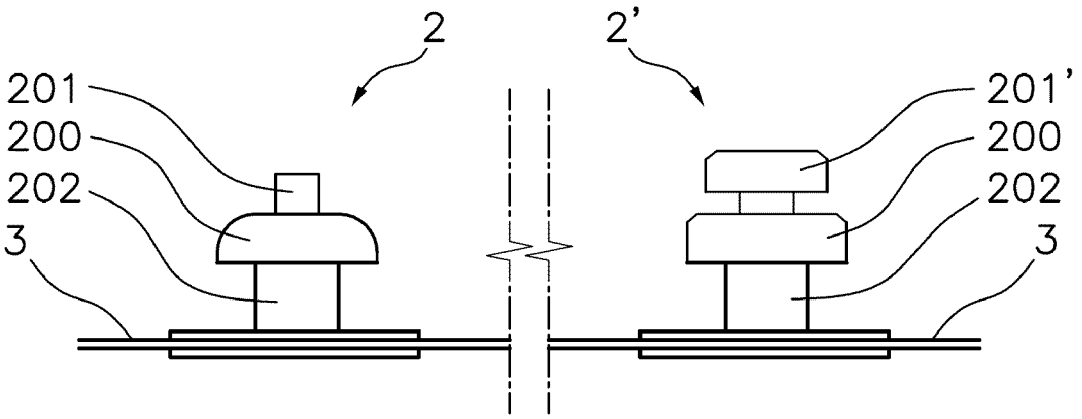

Fig.3

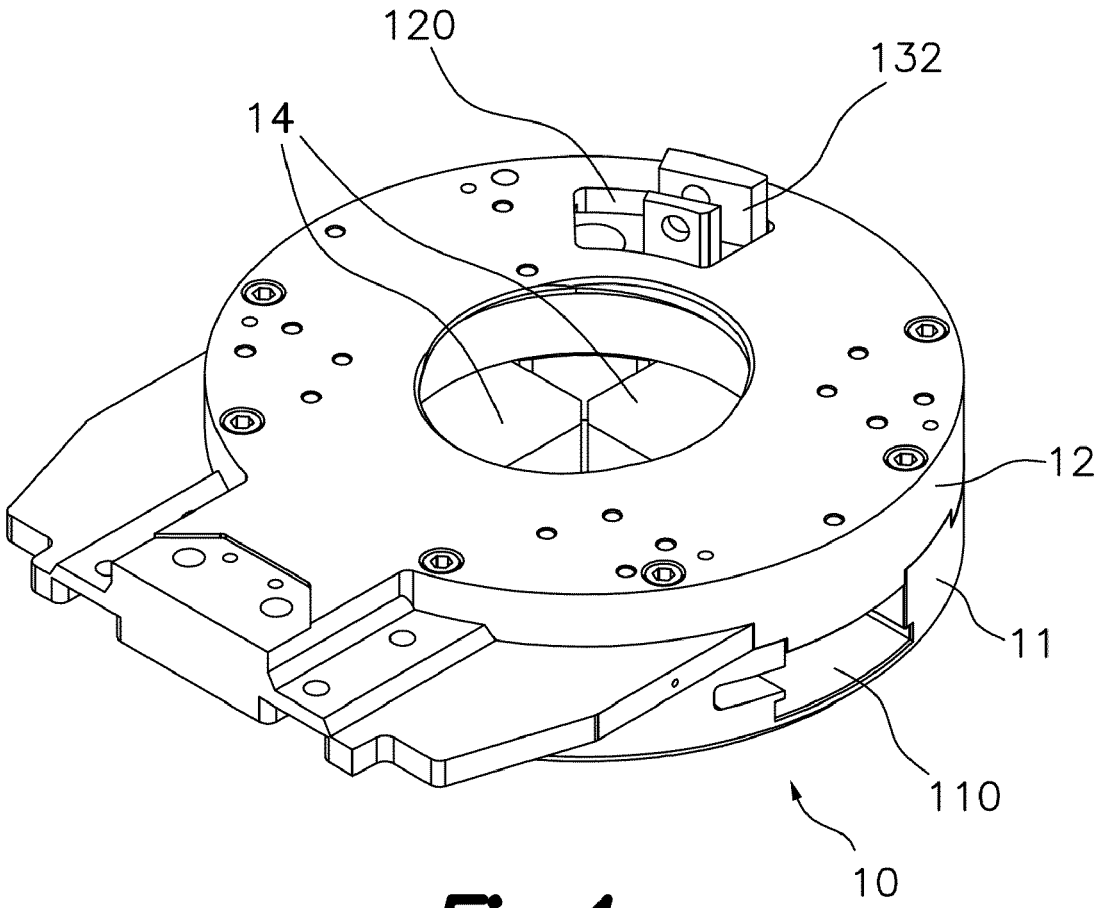

Fig.4

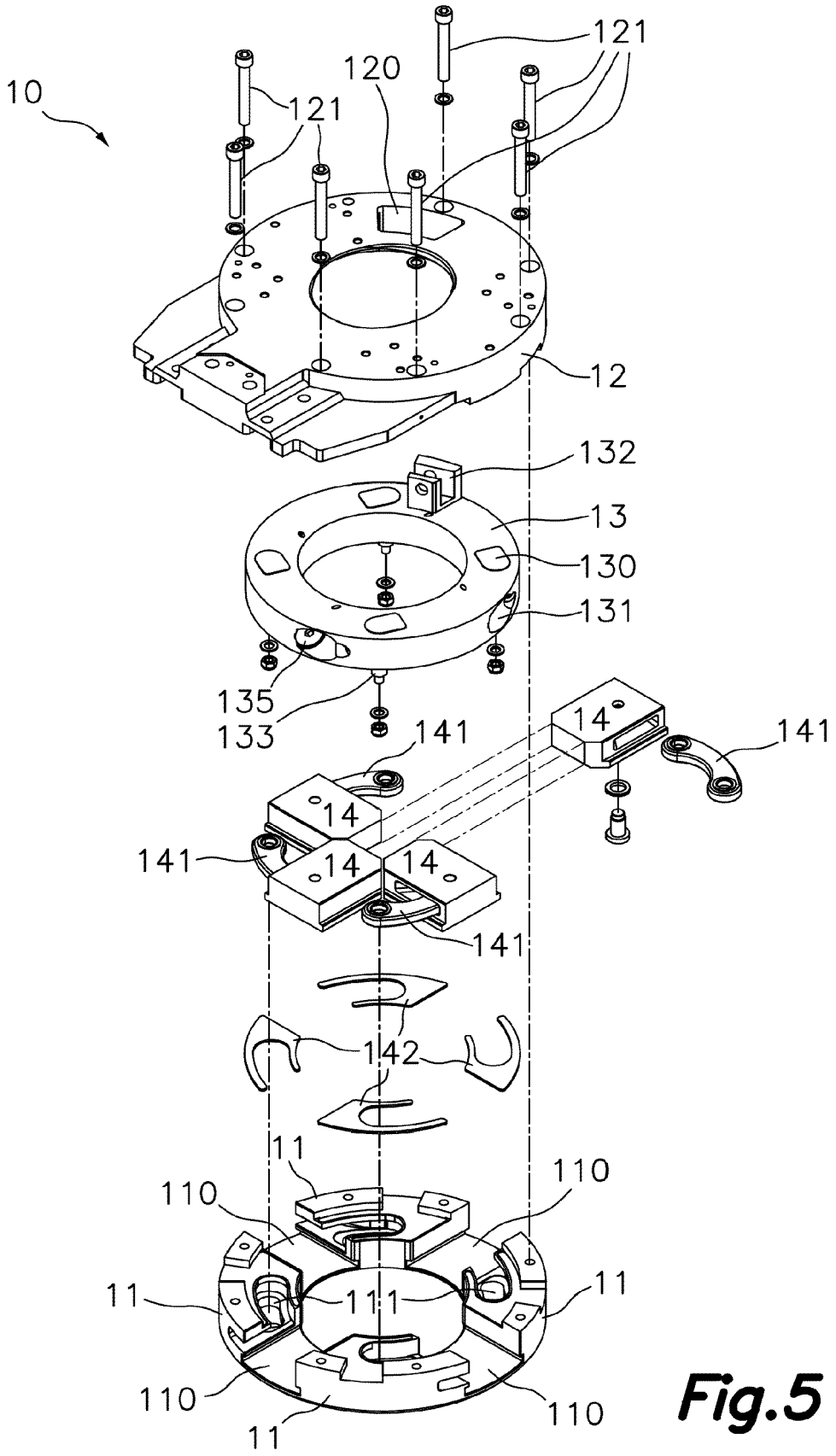
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Fig.5

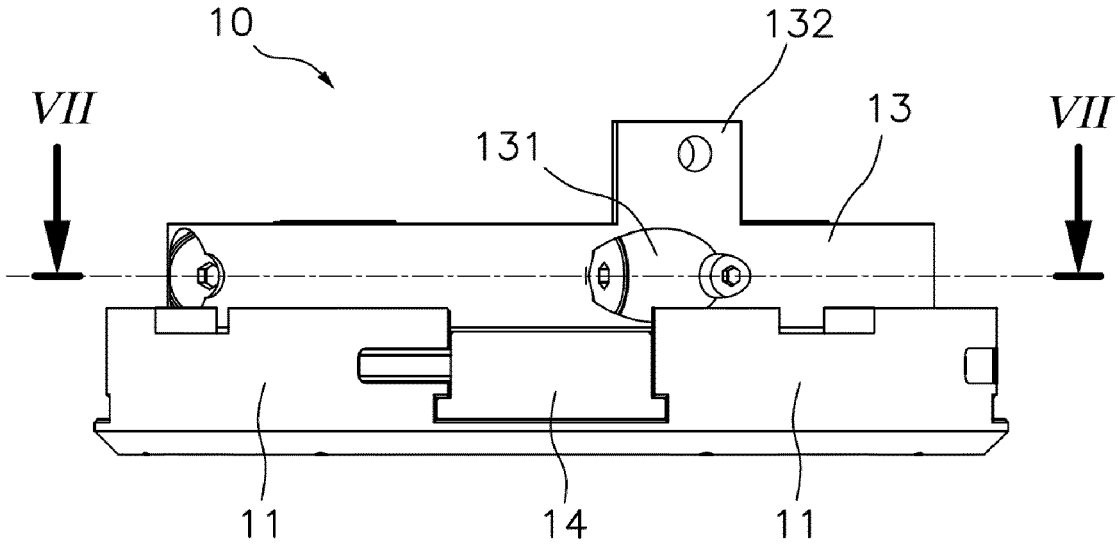
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Fig.6

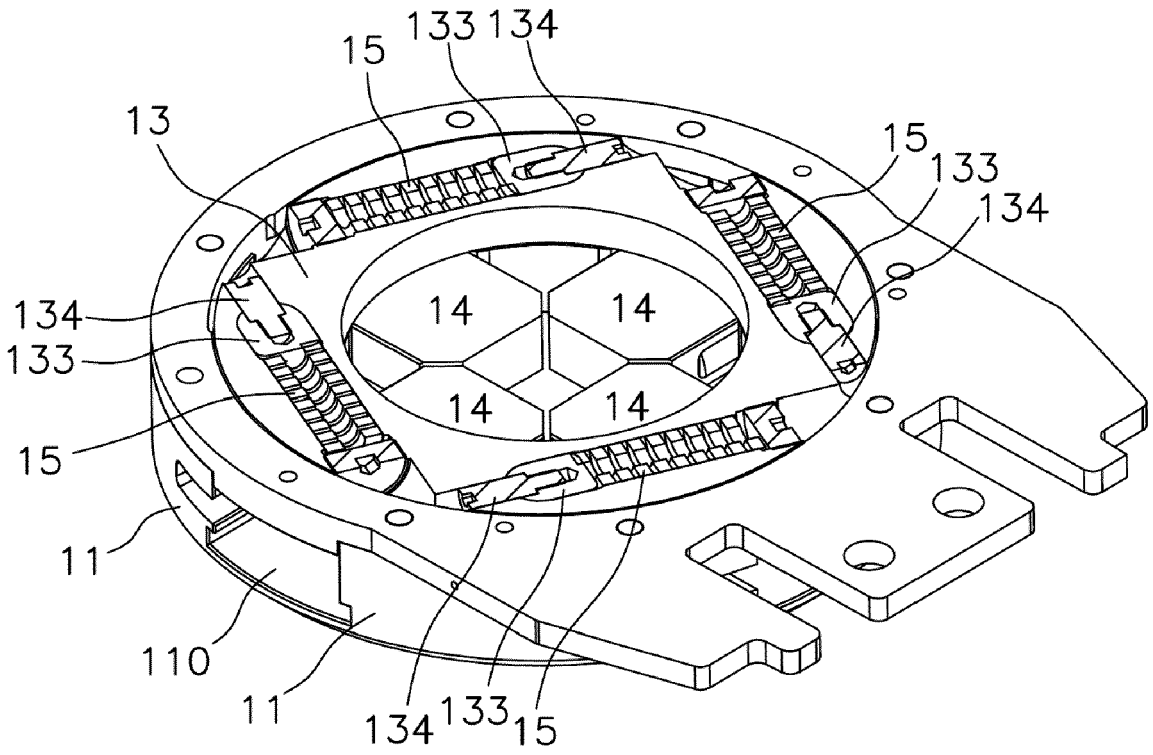
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Fig.7

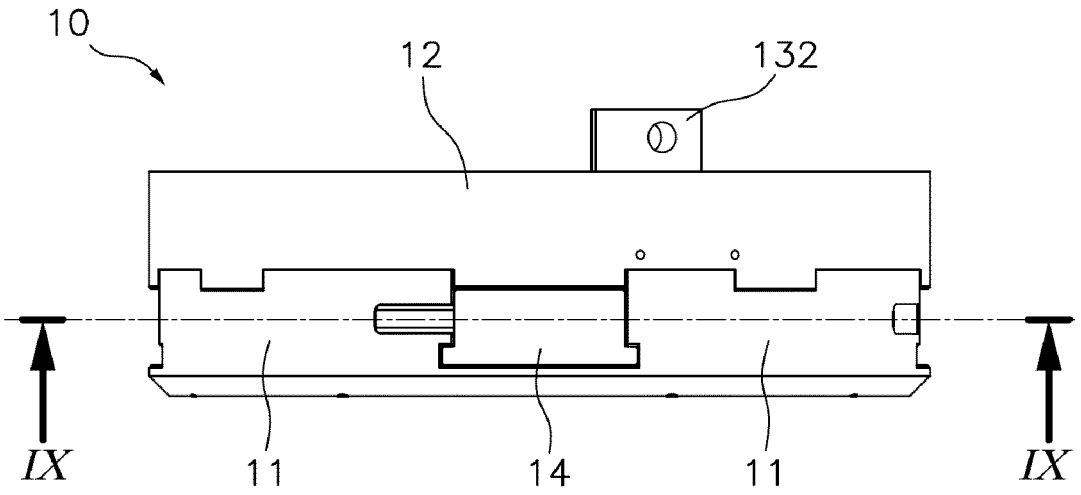
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Fig.8

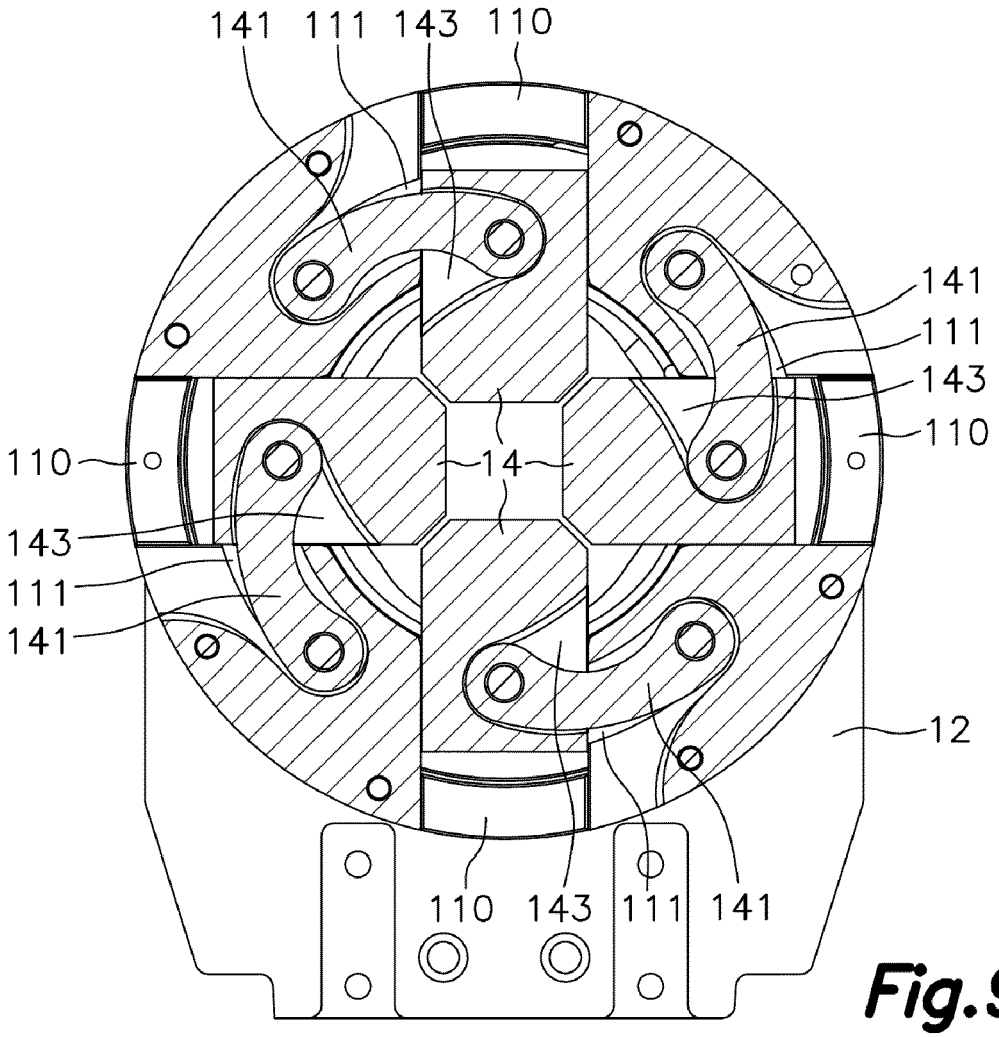
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Fig.9

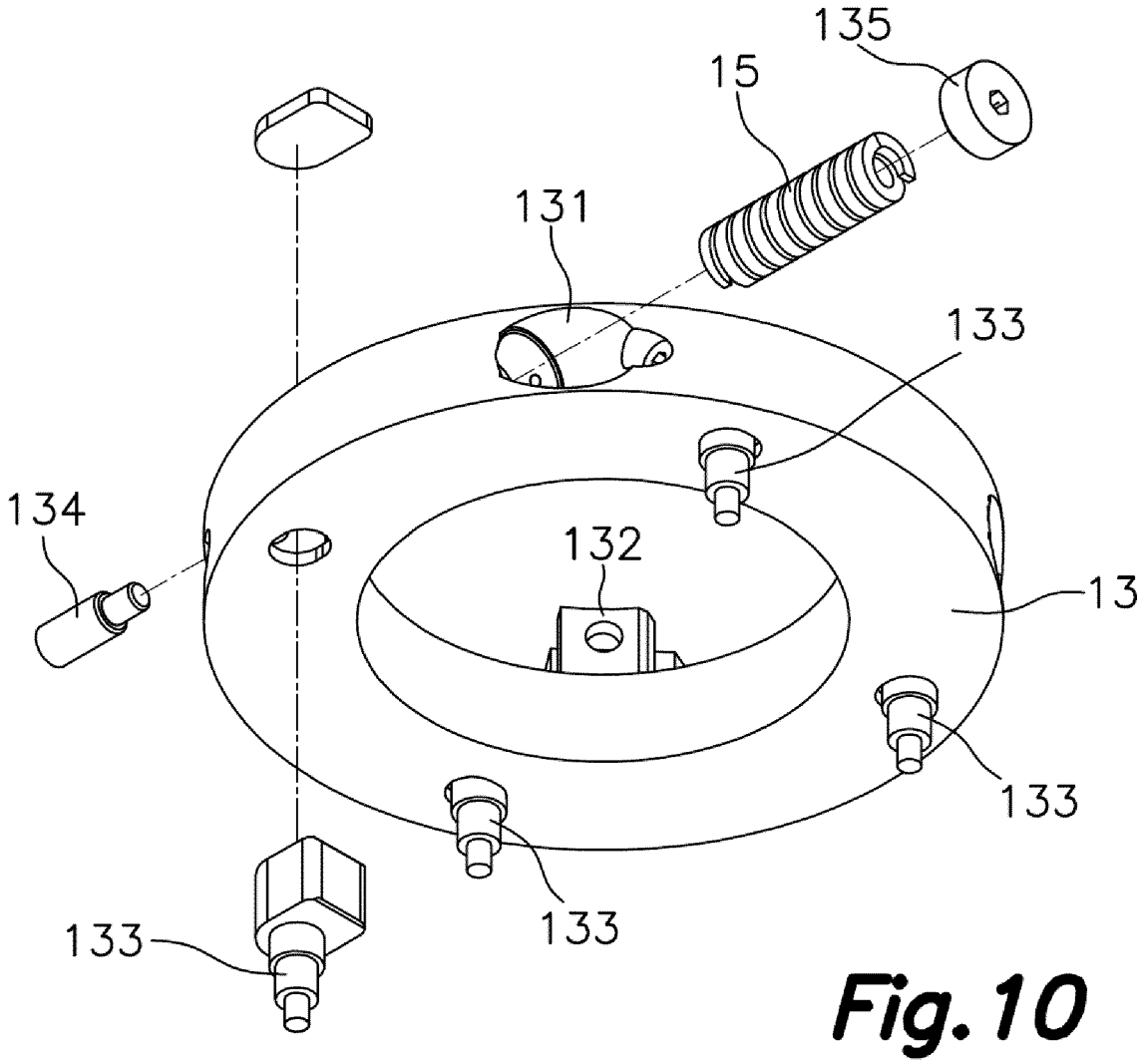

Fig. 10

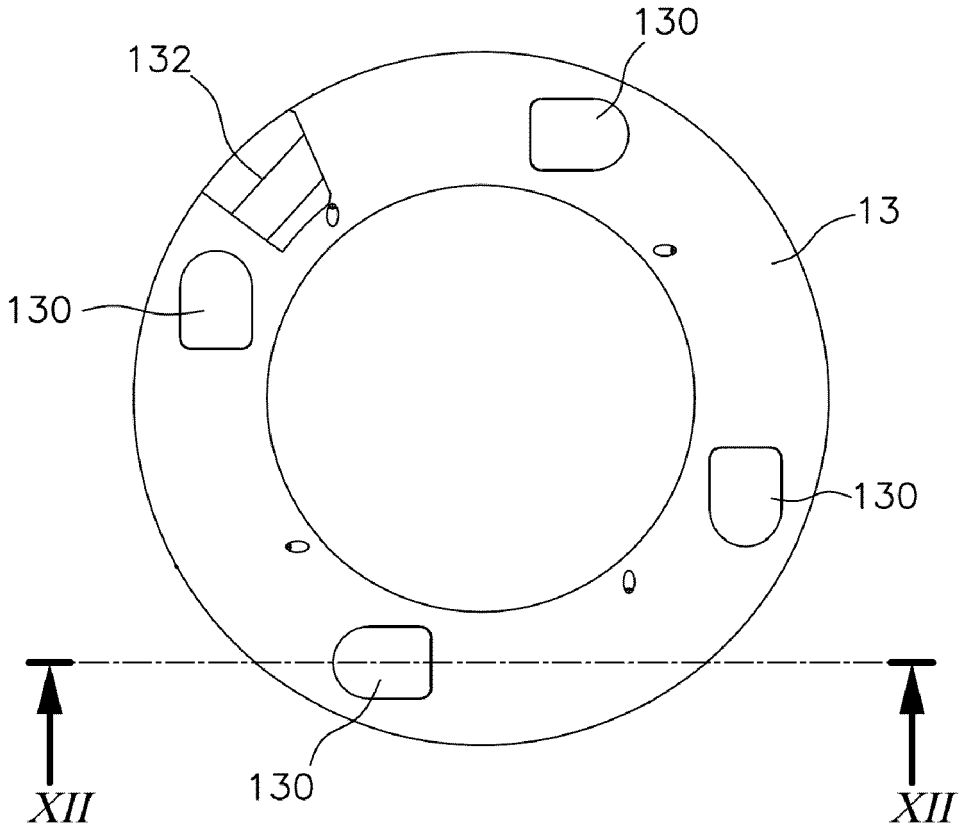

Fig. 11

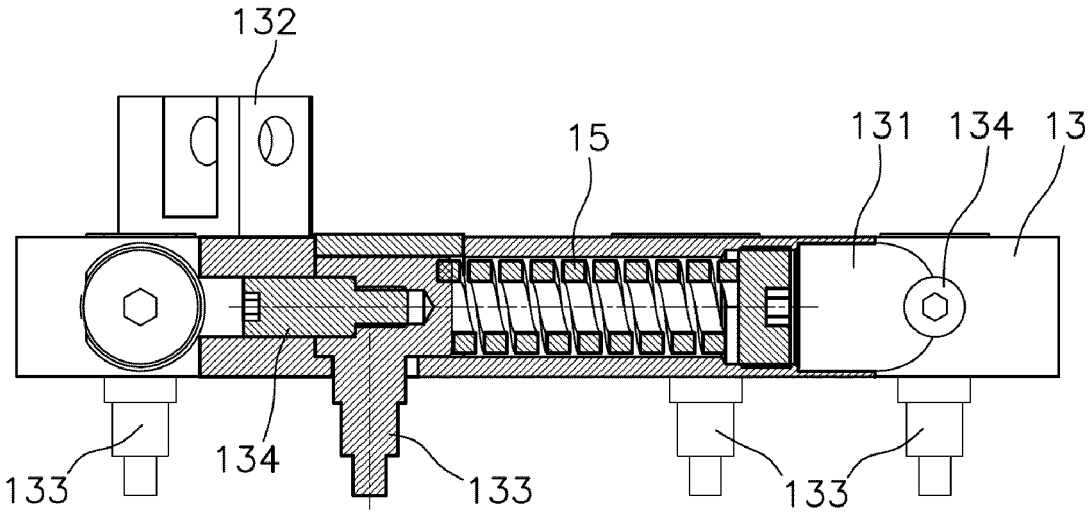

Fig. 12

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EUROPEAN SEARCH REPORT

Application Number
EP 21 38 2600

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	WO 2015/136127 A1 (EXPLIN IRIS SL) 17 September 2015 (2015-09-17) * page 4, paragraph 3 * * page 6, paragraph 6 * * figures 1, 2, 5, 6 *	1-15	INV. B65F3/02
A	WO 2019/081794 A1 (PEREZ VERA AQUILINO [ES]) 2 May 2019 (2019-05-02) * page 23, line 29 - page 24, line 3 * * page 27, line 2 - line 5 * * figures 1, 2, 33-35, 38-39 *	1-15	
A	CN 111 284 971 B (HUNAN TUOPU INTELLIGENT TECH CO LTD) 4 August 2020 (2020-08-04) * paragraph [0046]; figures 14, 17 *	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	21 December 2021	Luepke, Erik

CATEGORY OF CITED DOCUMENTS

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21-12-2021

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- EP 1172308 A1 **[0005]**