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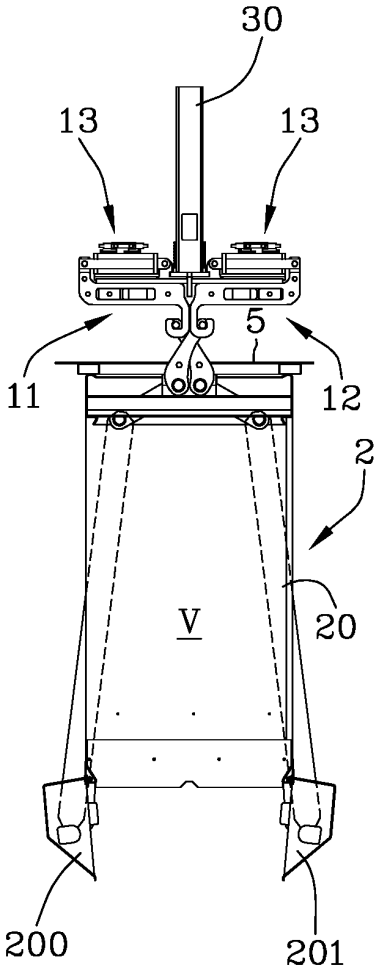
(54) **A SYSTEM FOR COLLECTING WASTE**

(57) An apparatus (1) for handling and unloading containers intended for collecting waste comprises a gripping device (10, 10') which is suitable for hooking a container (2, 2'), which in turn comprises two gripping elements (11, 12, 11', 12') movable between a gripping and displacement position of the container (2 2') and an unloading position, wherein waste is unloaded from the container (2, 2').

The container (2 2') for collecting waste comprises coupling means (21, 22, 21', 22') suitable to be engaged by a gripping device (10, 10') and a containment tank (20) provided with a bottom (200, 201) which is openable upon actuation of the coupling means (21, 22, 21', 22').

The coupling means (21, 22, 21', 22') comprises two coupling elements (21, 22, 21', 22'), movable between a closing position of said bottom (200, 201) and an opening position of the bottom (200, 201).

Fig.5



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Description

[0001] The invention has for object a system for collecting waste, particularly for differentiated and buried waste collection.

[0002] Systems are known for differentiated and buried waste collection which provide one or more waste containers (such as dumpsters), which are accommodated in a storage pit being superiorly closed by a walkable platform.

[0003] The emptying of the containers occurs by means of a vehicle provided with a tipping container as well as with a coupling device (or simply "hook"), which is capable of gripping and handling the container, in addition to unloading waste into the tipping container of the vehicle itself.

[0004] Some systems provide use of a walkable platform, which is hinged to a frame embedded in ground level and opening means for opening the platform, thereby allowing the hook to retrieve the container from the storage pit.

[0005] However this type of systems requires a considerable space, which is detrimental to the efficient exploitation of the road surface that could be instead destined for example to parking areas or for helping a better flow of traffic.

[0006] For this reason, systems have been devised based on which each container is surmounted by, and joined to its own platform, which platform constitutes a portion of the overall platform that closes the storage pit superiorly, thus defining the upper walkable surface.

[0007] In this manner a plurality of containers may be housed within the same storage pit, which containers are disposed adjacent to one another, for example in a row, and whose platforms define a walkable surface of limited extension according to the number of buried containers.

[0008] Above its own platform, each container comprises a waste disposal mouth, which is afforded in a turret rising from the ground level and provided with coupling means, for example metal rings, suitable for being gripped by the motor vehicle hook.

[0009] To these coupling means there are connected opening and closing kinematic mechanisms of the bottom of the container, in order that waste are unloaded into the vehicle tipping container.

[0010] Although this system proves to be effective in practice, a need for an improvement is felt for a long time, which is aimed at attaining a better effectiveness, with particular reference to the coupling between the hook previously mentioned and the container coupling and handling means; said amelioration being intended to improve active and passive safety, durability, and precision of the coupling system, wherein the wear of the kinematic mechanisms is reduced, which results from possible contact with the waste.

[0011] In this context, the technical task underlying the present invention is to provide an apparatus for handling and unloading waste collection containers and a waste collection container which meet the requirement mentioned above.

[0012] The technical task mentioned is achieved by the apparatus realized in accordance with claim 1 and by the container realized in accordance with claim 7.

[0013] Further characteristics and advantages of the present invention will become more apparent from the indicative and therefore non-limiting description of preferred but non-exclusive embodiments of the apparatus and container herein provided as illustrated in the appended drawings in which:

- Figure 1 is an axonometric view of a first embodiment of the apparatus of the invention;
- Figures 2 - 5 are vertical sectional views of a gripping device of the apparatus and/or waste container according to the respective first embodiment, in different operating configurations which together define the proposed system;
- Figure 6 is an axonometric view of a container containment tank according to the first embodiment of the invention;
- Figures 7 and 8 are axonometric views of a side portion of the container according to the first embodiment;
- Figures 9 - 12 are axonometric views of the gripping device and/or of the waste container of the invention according to the respective first embodiments in different operating configurations which together define the proposed system;
- Figure 13 is an axonometric view of the apparatus gripping device in accordance with a second embodiment of the invention; and
- Figure 14 is a schematic view, in vertical section, of a gripping device of the apparatus and of the waste container in accordance with the respective second embodiments.

[0014] With reference to the attached figures, by 1 it is indicated an apparatus for handling and unloading containers for waste collection according to the invention.

[0015] By the numerals 2, 2' reference is made to two embodiments of the container for waste collection according to the invention, particularly designed to be used with the proposed apparatus.

[0016] The handling apparatus 1 of the invention is intended to be mounted on a motor vehicle provided with a tipping container and destined to collect urban solid waste.

[0017] The container 2, 2' herein provided, is notably intended to be used for differentiated waste collection and is preferably of the buried type, which means that it is devised to be arranged within a storage pit obtained below street level.

[0018] The handling apparatus 1 and one or more containers 2, 2' according to the invention, may co-operate functionally within a system 1, 2, 2' intended for waste collection which is free from the drawbacks of the prior

art as better detailed hereinafter.

[0019] The handling apparatus 1 includes a gripping device 10, 10' capable of hooking a container 2, 2' for the purposes of lifting, moving and unloading the waste contained therein.

[0020] The handling apparatus 1 may include an articulated arm 3, preferably a swivel arm, which is intended to be mounted onto the motor vehicle.

[0021] In turn, the articulated arm 3 mounts the gripping device 10, 10' preferably at its distal end (see Figure 1).

[0022] According to an important aspect of the invention, the gripping device 10, 10' comprises two gripping elements 11, 12, 11', 12 ' movable between a gripping and displacement position of the container 2, 2' and an unloading position of the waste from the container 2.

[0023] The container 2, 2' proposed, includes coupling means 21, 22, 21', 22 which are suitable to be gripped by a gripping device 10, 10' as well as a waste containment tank 20 having a substantially prismatic shape and provided with a bottom 200, 201 that can be opened on actuation of the coupling means 21, 22, 21', 22'.

[0024] The coupling means comprises two coupling elements 21, 22, 21', 22' movable between a closed position of the bottom 200, 201, wherein escape of the waste from the tank 20 is prevented, and an opening position of the bottom 200, 201 aimed at allowing the discharge of waste.

[0025] The functional interrelation between the apparatus 1 and the container 2, 2' proposed will be better detailed in a later section, i.e. when discussing on how the invention operates; here below, the structure of the gripping device 10, 10' and that of the container 2, 2' are being disclosed.

[0026] In the two particular embodiments of the invention, not exhaustive of its implementation possibility and shown in the accompanying figures, the gripping elements 11, 12, 11', 12' of the gripping device 10, 10' are able to move between the gripping position and the unloading position with a translatory movement, which is subject for example to hydraulic linear actuators 13 or to other means of implementation suitable for the purpose.

[0027] In particular, the two gripping elements 11, 12, 11', 12' may be adapted to move independently of each other; in this case, each element can be subject to a respective actuator 13.

[0028] In detail, the gripping elements 11, 12, 11', 12' may be suitable to move away from each other, while moving towards the unloading position, wherein they come therefore to be spaced apart from one another.

[0029] In this case the gripping elements 11, 12, 11', 12' may be suitable to move towards to one another as they move into the gripping position, wherein they are preferably adjacent to one another.

[0030] In particular, the gripping device 10, 10' may comprise a support frame 14, preferably connected to said articulated arm 3 via a connecting segment 30.

[0031] To the support frame 14 the gripping elements 11, 12, 11, 12' are slidably coupled.

[0032] The above mentioned actuators 13 may be fixed onboard the frame 14, which frame 14, in use, is intended to be arranged horizontally.

[0033] In this case the frame 14 may have a longitudinal extension transverse to said connecting segment 30, thereby defining with the latter an inverted T (see again figure 1).

[0034] The frame 14 may be provided with one or more linear guides 15, in order that the translation motion of the gripping elements 11, 12, 11', 12' can be constrained.

[0035] Even more in detail, the frame 14 may have a generally parallelepiped box-like shape, within which the gripping elements 11, 12, 11 ', 12' are running.

[0036] In this case the above-mentioned guides may include rectilinear slots 15 which are afforded in the larger side walls of the frame 14, which slots slidingly engage respective guide bolts 16 with which each gripping element 11, 12, 11', 12' is provided.

[0037] In a first embodiment of the apparatus 1 of the invention, illustrated in Figures 1, 2, 3, 4, 5, 10, 11 and 12 the gripping elements 11, 12 are preferably coplanar and plate-shaped and may be symmetrical with respect to a central transverse plane that separates in two the frame 14, said plane passing preferably through the axis of the connecting segment 30 above mentioned.

[0038] In detail, the gripping elements 11, 12, in use, are arranged in the same vertical plane.

[0039] According to a preferred aspect, each gripping element 11, 12 forms a concave seat for receiving a coupling pin provided in the container 2. In particular, each gripping element 11, 12 may comprise a shaped or curved portion 110, 120, in the form of a hook-or a clasp protruding downwards with respect to the rest of the coupling device.

[0040] The shaped portion 110, 120 protrudes downwards from the frame 14 and may have an U-shaped free distal end (see in particular figure 1). Therefore, while oscillating from their respective gripping and unloading positions, the two shaped portions 110, 120 are subject to mutual backward and forward movements in the underlying area to the frame 14, along the same lying plane.

[0041] The apparatus 1 in accordance with a second particular embodiment of the invention is differing from that of the first embodiment due to the fact that its gripping device 10' exhibits a different type of gripping elements 11', 12'.

[0042] As shown in Figures 13 and 14, the gripping elements 11', 12' of this second embodiment differ from those of the first embodiment by the fact that they provide two gripping pins 111', 121', preferably arranged transverse to the their direction of movement, between the gripping and the unloading positions referred to previously.

[0043] In detail, also the gripping elements 11', 12' of this second embodiment may be symmetrical with respect to a central transverse plane that separates in two the frame 14 and which is preferably passing through the

axis of the connecting segment 30.

[0044] The gripping elements 11', 12' may comprise respective top members 112', 122' preferably plate-shaped and preferably coplanar.

[0045] Such top members may be subject to the actuators 13 and engaged to the above guides 15.

[0046] Each gripping element 11', 12' may include a bracket 113', 123' which is fixed to the respective member 112', 122', to which bracket 113', 123' the gripping pins 111', 121' already mentioned are in turn fastened.

[0047] The brackets 113', 123' may be U-inverted-shaped.

[0048] Even more in detail, the gripping pins 111', 121' may include a central thinning 114', 124', thereby allowing a more stable engagement with the coupling elements of the containers 2'; in this manner, these coupling elements are prevented indeed from sliding along the coupling pins themselves, thus causing the container to oscillate during transport.

[0049] Let us now go through the detailed description of the container 2, 2' of the invention.

[0050] The coupling elements 21, 22, 21', 22' are preferably rotatable about a respective axis of rotation for the purposes of being actuatable between the closing position and the opening position.

[0051] In detail, the coupling elements 21, 22, 21', 22' may be capable of spreading apart when moving towards the closed position and able to come closer to one another when moving towards the open position.

[0052] The coupling elements 21, 22, 21', 22' can be elongated and curved. In the preferred embodiment of the invention, the coupling elements 21, 22, 21', 22' are placed in a central position, in the upper side of the tank 20.

[0053] According to a first embodiment of the container 2 of the invention, each coupling element 21, 22 comprises an attachable pin 210, 220 which is suitable for being gripped by the gripping device 10 for lifting and moving the container 2.

[0054] To be precise, the pins 210, 220 of the coupling elements 21, 22 may be so shaped as to fit into the previously mentioned concave seats of the gripping elements 11, 12 of the gripping device 10 according to the first embodiment; for example, the coupling pins 210, 220 may be cylindrical-shaped and exhibit a diameter suitable for being received within the respective concave seat.

[0055] Even more in detail, the pins 210, 220, together with the rest of the coupling means 21, 22, are able to support the weight of the rest of the container 2, together with that of the waste contained in the tank 20, so that the full container 2 can be lifted out of the storage pit which is afforded under the ground level, wherein the tank 20 is housed.

[0056] In moving between the above mentioned opening and closing positions, the coupling elements 21, 22 taken as a whole, preferably perform a scissors-like movement.

[0057] According to a preferred aspect of the invention, clearly shown in Figure 6, each gripping element 21, 22 comprises a pair of connecting rods which are joined by the respective attachable pin 210, 220 at the free end thereof and, at the opposite end, by a respective rod 41, 42 whereon the connecting rods are keyed.

[0058] The container 2' realized according to a second embodiment, provides coupling elements 21', 22' which are other than those of the container 2 in accordance with the first embodiment.

[0059] In detail, as shown in Figure 14, these coupling elements comprise plate-like elements 21', 22' preferably coplanar, which may be symmetrical with respect to a central transverse plane separating the container into two. In detail, the coupling elements 21', 22', in use, are arranged with the respective pin 111', 121' in the same horizontal plane.

[0060] According to a preferred aspect, each coupling element 21', 22' forms a concave seat aimed at receiving a gripping pin 111', 121' of the apparatus 1 of the second particular embodiment disclosed above.

[0061] In particular, each coupling element 21', 22' may comprise a shaped and curved portion in the form of a hook-or a clasp which protrudes superiorly from the container 2'.

[0062] In both the embodiments herein disclosed, or in other embodiments falling within the same inventive concept, the coupling means 21, 22, 21 ', 22' are placed on an upper side of the tank 20, thereby protruding upwardly therefrom (see again figure 6), so that the coupling means 21, 22, 21', 22' are accessible to the gripping device 10.

[0063] The above-mentioned upper side, as shown in Figures 7 and 8, can be closed by a walkable top platform 5, wherefrom the coupling means 21, 22 are protruding upwardly.

[0064] Above the platform 5 a waste disposal mouth (not shown) may be provided, which is obtained in a turret rising from the platform 5 itself and communicating with the interior of the tank 20.

[0065] In detail, in the platform 5 a passage may be afforded which movably houses the coupling elements 21, 22, 21', 22'.

[0066] Preferably, the container 2, 2' may comprise a kinematic mechanism 41, 42, 43, 44, 45 actuated by the coupling means 21, 22, 21', 22' and able to open /close the bottom 200, 201 of the tank 20.

[0067] The bottom can particularly comprise one or two hinged doors or wing doors 200, 201, openable outwards and, by way of example, in the form of a bucket or a spoon, thus defining a sort of waste discharge hatch.

[0068] The kinematic mechanism 41, 42, 43, 44, 45 is separated from a volume V being configured for receiving the waste and defined within the tank 20.

[0069] For the sake of accuracy, the kinematic mechanism 41, 42, 43, 44, 45 extends preferably in the plane of the upper side of the tank 20, just below the platform 5 and along the side walls of the tank 20, in front of the respective outer surface.

[0070] Further details of the opening/closing mechanisms of the bottom 200, 201 will be detailed later, after illustrating the operation of the invention with the aid of Figures 2 - 5, 7, 8, 9 - 12; for the sake of simplicity, this operation shall be explained with reference to the first embodiments of the apparatus 1 and the container 2, although what is being disclosed herein below also applies to second embodiments.

[0071] To the side of the carriageway of a road accessible by a waste collection vehicle, there is formed a storage pit for housing a plurality of containers 2 according to the invention.

[0072] For example, the pit is realized in such a manner as to allow arrangement in a row of the different containers 2 which are destined for different types of waste in the context of the differentiated waste collection.

[0073] The respective platforms 5 of the different containers 2, which are disposed alongside and flush to one another, come to define in their entirety a walkable plane at the street level, thus allowing to users to approach the different waste disposal mouths and proceed with the waste discharge into the tanks 20.

[0074] For the purposes of collection, the vehicle is stopped at the side of the row of containers 2, and the driver operates the articulated arm 3 such that the gripping device 10 is positioned at one of the containers 2, in superposition to the coupling means 21, 22.

[0075] In this step, the gripping elements 11, 12 are in the unloading position above mentioned, which corresponds to the rest position of the gripping device 10, whereas the coupling elements 21, 22 of the container 2 are in the closed position, which coincides with the respective rest position.

[0076] At this point, the gripping device 10 is made to lower until the adjacent gripping elements 11, 12 become inserted between the coupling elements 21, 22, which are wide apart (see Figures 3 and 10).

[0077] Even more in detail, the gripping elements 11, 12, which in the closed or rest position, are in their minimum side dimensions configuration, come to be arranged between the two different coupling elements 21, 22 which are spread apart when in the closed position thereof, so that the gripping elements 11, 12 can be accommodated.

[0078] In this step, in the case where the apparatus 1 and the container 2 are those of the corresponding first embodiment, the gripping elements 11, 12 are placed in the plane, whereon the pins 210, 220 are lying, which plane is interposed between the lying planes of the connecting rods of the coupling elements 21, 22.

[0079] Therefore, advantageously, the two connecting rods pairs inferiorly offer to their respective pins 210, 220, the space for insertion of the U-shaped ends 110, 120 of the two gripping elements 11, 12.

[0080] At this point, the gripping elements 11, 12 are spread apart until reaching the gripping position, wherein they are contained laterally by respective connecting rods of the coupling means 21, 22.

[0081] After that, the gripping device 10 is raised in such a way as to lift the container 2, so that the latter is withdrawn from the storage pit with a vertical translation.

[0082] In this step, i.e. while the gripping device 10 is being raised, the pins 210, 220 of the coupling elements 21, 22 are engaged in aforementioned concave seat of the gripping elements 11, 12, thereby defining the firm grip of the container 2 by the device of the invention (see figures 4 and 11).

[0083] Note that the step of spreading apart and gripping occur in the same way also in the case of the apparatus 1 and the container 2' of the second embodiment, except for a different way based on which the coupling elements 21', 22' and the gripping elements 11', 12' become engaged.

[0084] Note that, during lifting and transport of the container 2, the bottom 200, 201 of the tank 20 is kept closed by the pressure exerted by the gripping elements 11, 12 on respective coupling elements 21, 22 of the container 2 itself.

[0085] At this point, the container 2 is brought above the vehicle tipping container and the waste discharge step may take place.

[0086] To this end, the gripping elements 11, 12, which engage the coupling elements 21, 22 of the container 2, are moved forward, up to their unloading position, thereby giving rise to a rotation of the coupling elements 21, 22 which are dragged or left free to move one toward the other in their opening position (see figures 5 and 12).

[0087] In so doing, the kinematic mechanism 41, 42, 43, 44, 45 mentioned above allows opening of the bottom 200, 201 of the tank 20, resulting in waste escape therefrom by gravity which waste then fall into the vehicle tipping container; in this regard, see also Figures 7 and 8.

[0088] Then, the sequence of steps described above is performed in reverse order, and thereafter, the process is repeated for each container 2 loaded with waste.

[0089] In other words, the coupling elements 21, 22 of the container 2 and the gripping elements 11, 12 of the gripping device 10 are configured for being paired and for co-operating functionally, acting as a lock, i.e., as the key with the lock, to the benefit of a firm gripping and efficient waste management in terms of handling and unloading thereof.

[0090] Furthermore, since the coupling means 21, 22 are embedded in the tank 20 instead of being provided on top of the waste disposal mouth, there are ensured a less swing of the container 2 during transport, a lower mechanical stress on the components of the container 2 and consequently a lower wear of the elements in addition to greater security of the system as a whole.

[0091] As shown in Figures 6, 7 and 8, in particular in the first embodiment of the invention, the above mentioned pairs of connecting rods of one of the coupling elements 21, 22 of the container 2, are contained, in a freely movable manner, in the pair of connecting rods of the other coupling element 21, 22, thereby allowing the scissor-like movement referred to above.

[0092] In any case, in both embodiments, each coupling element 21, 22, 21', 22' is keyed, on one side, to the rods 41, 42 previously mentioned and, on the other side, to the C-shaped rotatable connecting means 43, 44, both arranged at the upper side of the tank 20 (see in particular figure 6).

[0093] The C-shaped means 43, 44 are mounted with their concave parts facing to one another, thus defining a free inlet space for the waste, which goes from the waste disposal mouth up to the previously mentioned receiving volume V.

[0094] The rods and the C-shaped means are connected to articulated means 45, being in turn connected to the side walls 200, 201 of the bottom of the tank 20 and able to allow closing and opening thereof after that the coupling means 21, 22, 21', 22' have been rotatingly actuated.

[0095] As mentioned above, the articulated means 45 are advantageously arranged outside the tank 20, thus preventing the waste contained in the tank 20 from becoming caught in the opening and closing kinematic mechanism 41, 42, 43, 44, 45, with the risk for the latter to become entangled, which would make the periodic cleaning of the containers 2, 2' complicated and costly.

Claims

1. An apparatus (1) for handling and unloading containers intended for collecting waste, comprising a gripping device (10, 10') suitable for hooking a container (2, 2'), **characterized in that** said gripping device (10, 10') comprises at least two gripping elements (11, 12, 11', 12') which are movable between a gripping and displacement position of the container (2, 2') and an unloading position, wherein waste is unloaded from the container (2 2').

2. An apparatus (1) according to the preceding claim, wherein the gripping elements (11, 12, 11', 12') are suitable for being moved between the gripping position and the unloading position.

3. An apparatus (1) according to at least any preceding claim, wherein the gripping elements (11, 12, 11', 12') are moving away from one another, while advancing towards the unloading position.

4. An apparatus (1) according to at least any preceding claim, wherein each gripping element (11, 12) is forming a concave seat for receiving a coupling pin (210, 220) of a container (2).

5. An apparatus (1) according to at least any preceding claim, in which each gripping element (11',12') comprises a gripping pin (111', 121') in order that a coupling element (21', 22') of a container (2') is engaged.

6. An apparatus (1) according to at least any one of claims 1 to 5, comprising at least one articulated swivel arm (3), which mounts the gripping device (10, 10').

7. A container (2, 2') for collecting waste comprising coupling means (21, 22, 21', 22') suitable to be engaged by a gripping device (10, 10') and at least one containment tank (20) provided with at least one bottom (200, 201) which is openable upon actuation of said coupling means (21, 22, 21', 22'), **characterized in that** the coupling means (21, 22, 21', 22') comprises at least two coupling elements (21, 22, 21', 22') which are movable between a closing position of said bottom (200, 201) and an opening position of the bottom (200, 201).

8. A container (2, 2') according to the preceding claim, in which the coupling elements (21, 22, 21', 22') are rotatable about a respective axis of rotation.

9. A container (2, 2') according to claim 7 or claim 8, wherein the coupling elements (21, 22, 21', 22') are capable of spreading apart while moving towards the closed position and are capable of advancing one towards the other while moving towards the open position.

10. A container (2) according to at least any one of claims 7 to 9, wherein each coupling element (21, 22) comprises a coupling pin (210, 220) suitable to be gripped by a gripping device (10) in order that the container (2) is lifted and moved.

11. A container (2') according to at least any one of claims 7 to 10, wherein each coupling element (21', 22') comprises a concave seat for receiving a gripping pin (111', 121 ') of a gripping device (10) in order that the container (2) is lifted and moved.

12. A container (2, 2') according to at least any one of claims 7 to 11, wherein said coupling means (21, 22, 21', 22') are placed on an upper side of the tank (20).

13. A container (2, 2') according to the preceding claim, in which said upper side is closed by a top platform (5) wherefrom the coupling means (21, 22, 21', 22') are protruding.

14. A container (2, 2') according to claim 12 or claim 13, comprising a kinematic mechanism (41, 42, 43, 44, 45) actuated by the coupling means (21, 22, 21', 22') and able to open/close the bottom (200, 201) of the tank (20), said kinematic mechanism (41, 42, 43, 44, 45) being separated by a volume (V) being configured for receiving the waste, which volume (V) is defined within the tank (20).

15. A waste collecting system, comprising at least one container (2, 2') according to at least any one of claims 7 to 14 and at least one apparatus (1) according to at least any one of claims 1 to 6.

Fig.1

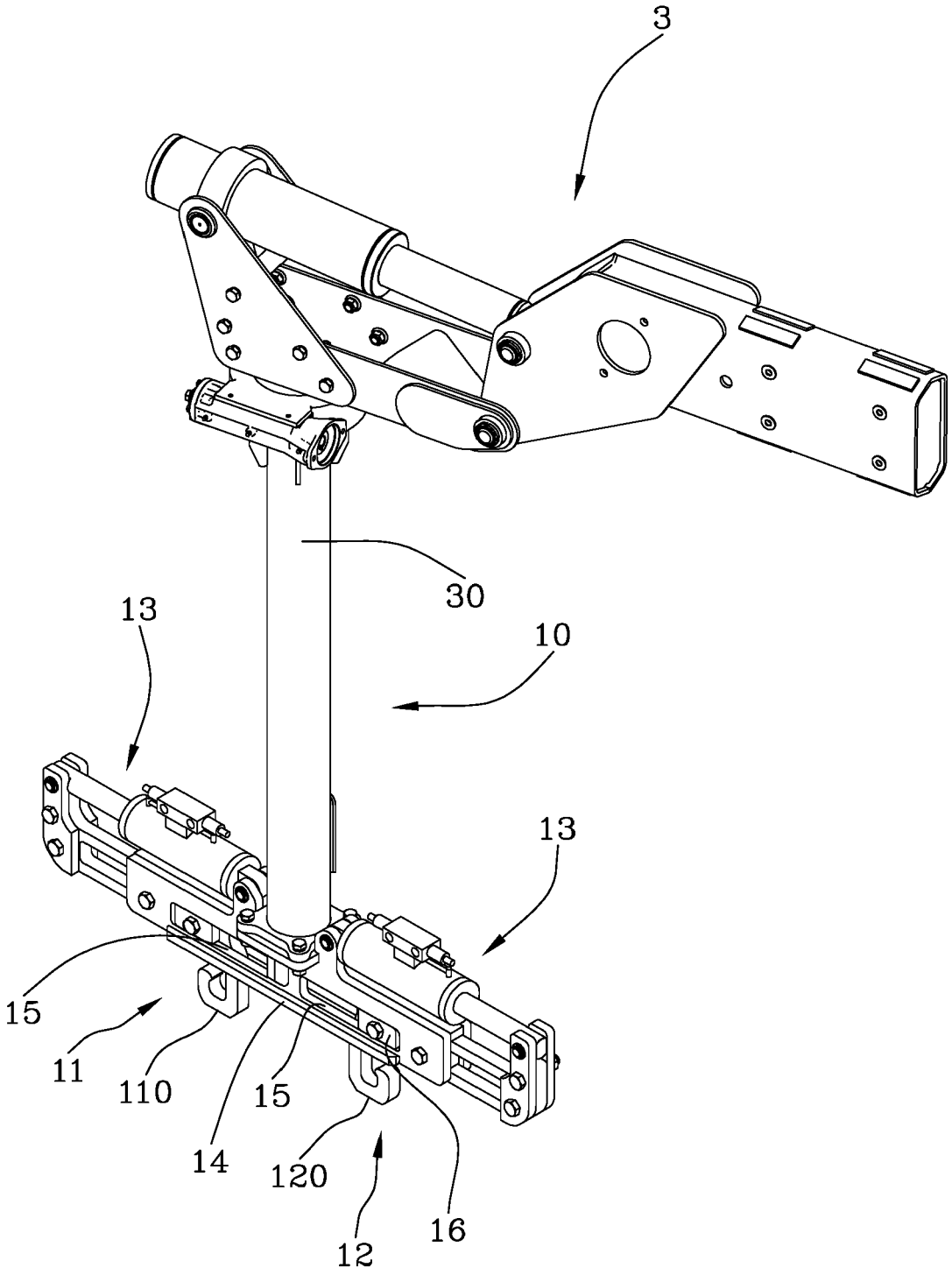


Fig.5

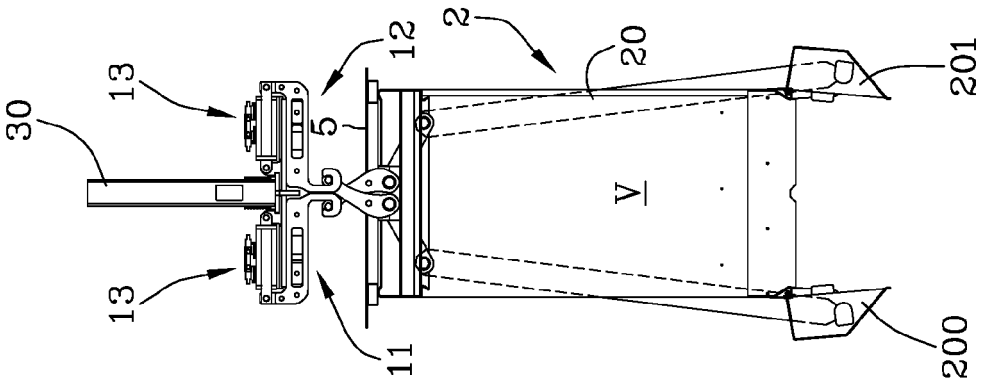


Fig.4

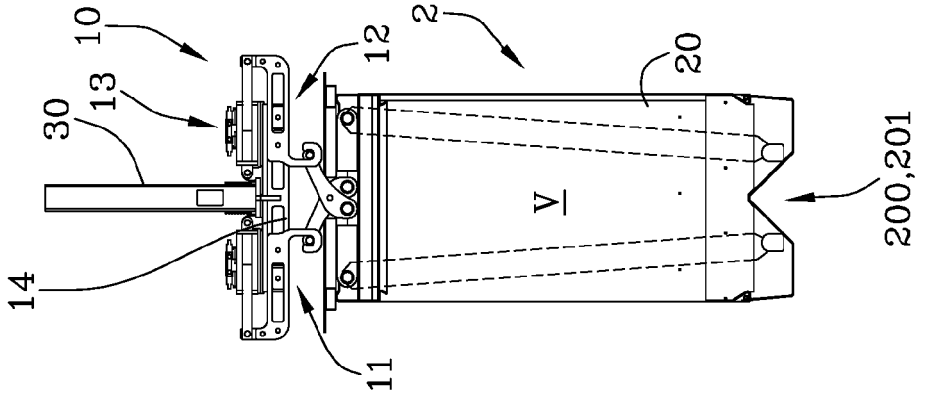


Fig.3

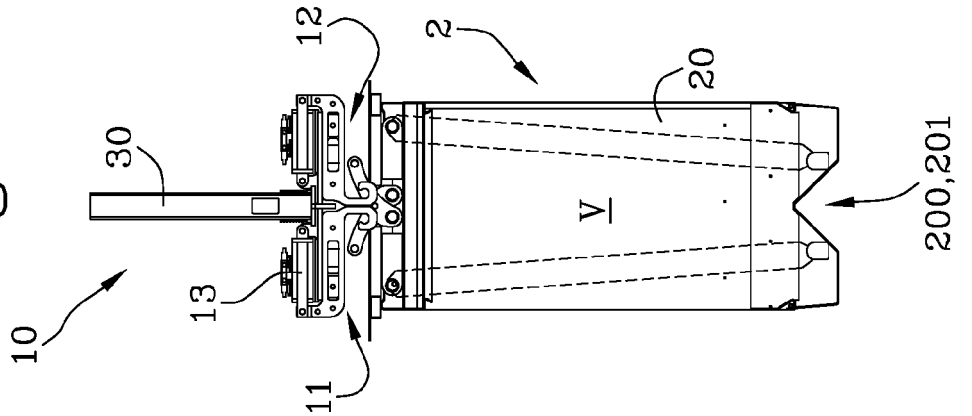


Fig2

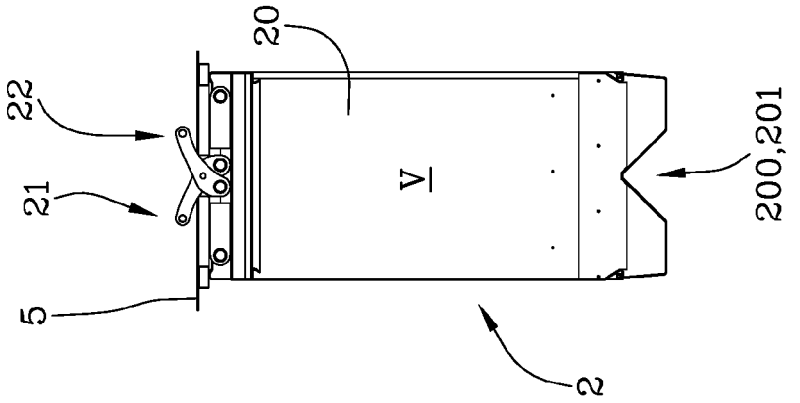


Fig.6

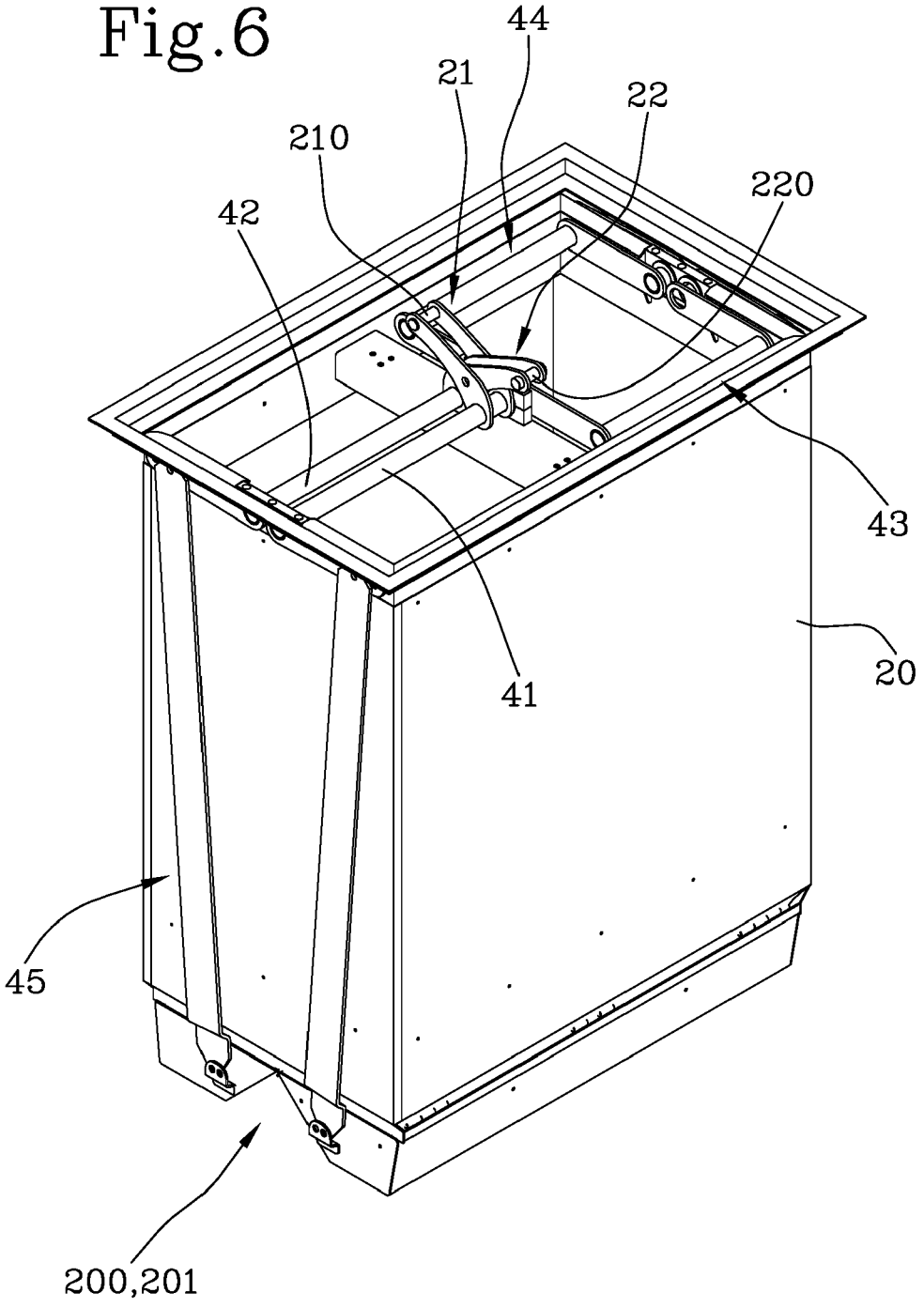


Fig.7

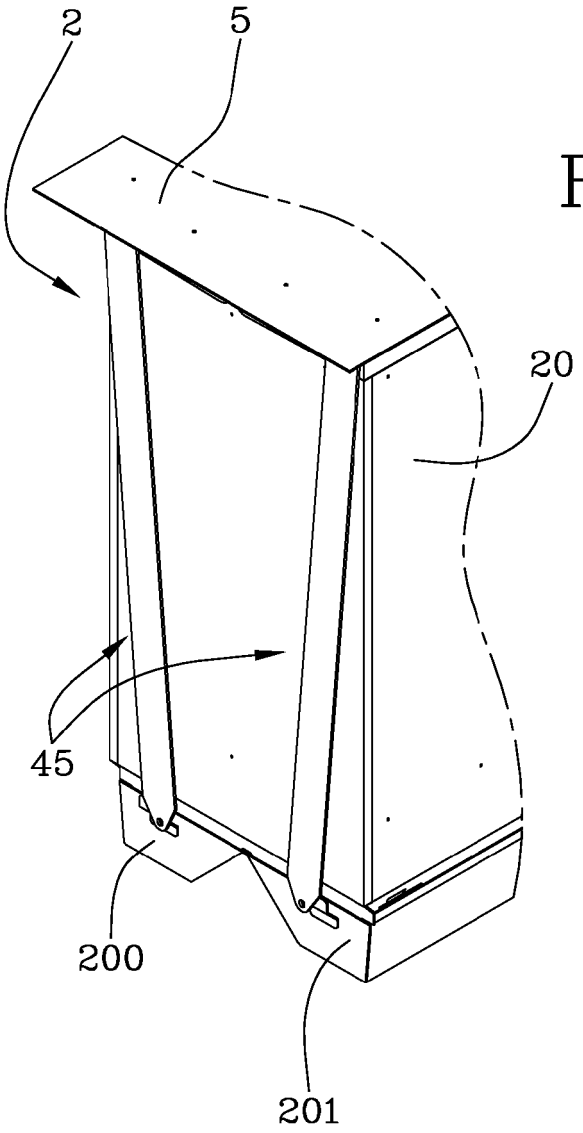


Fig.8

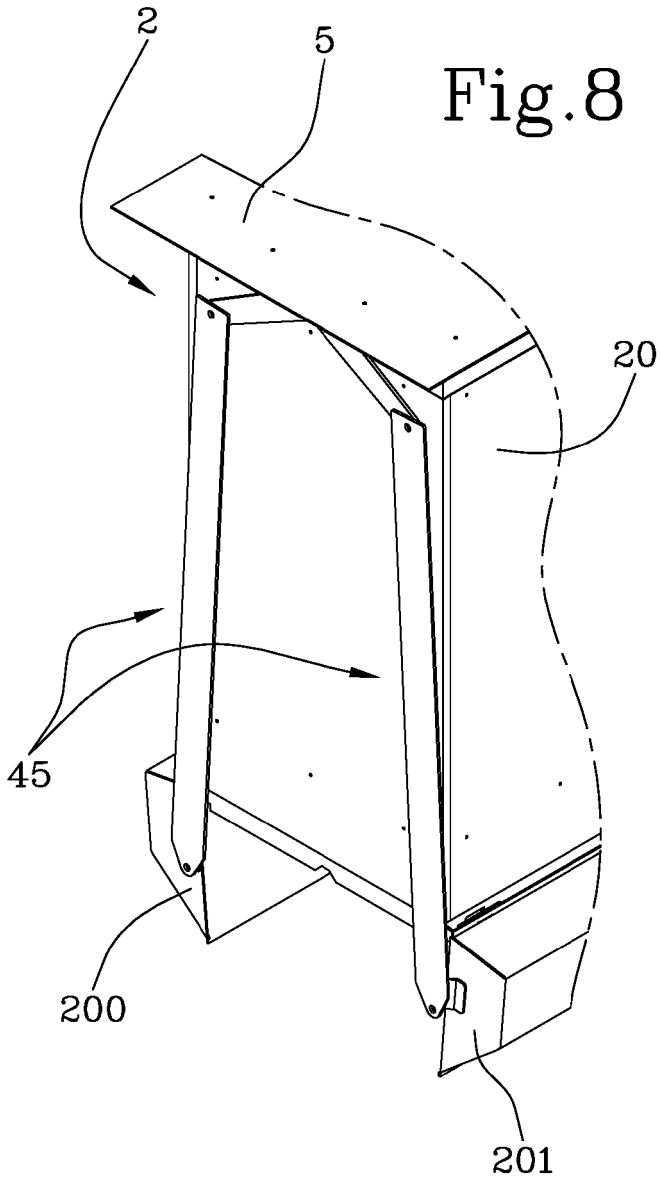


Fig.9

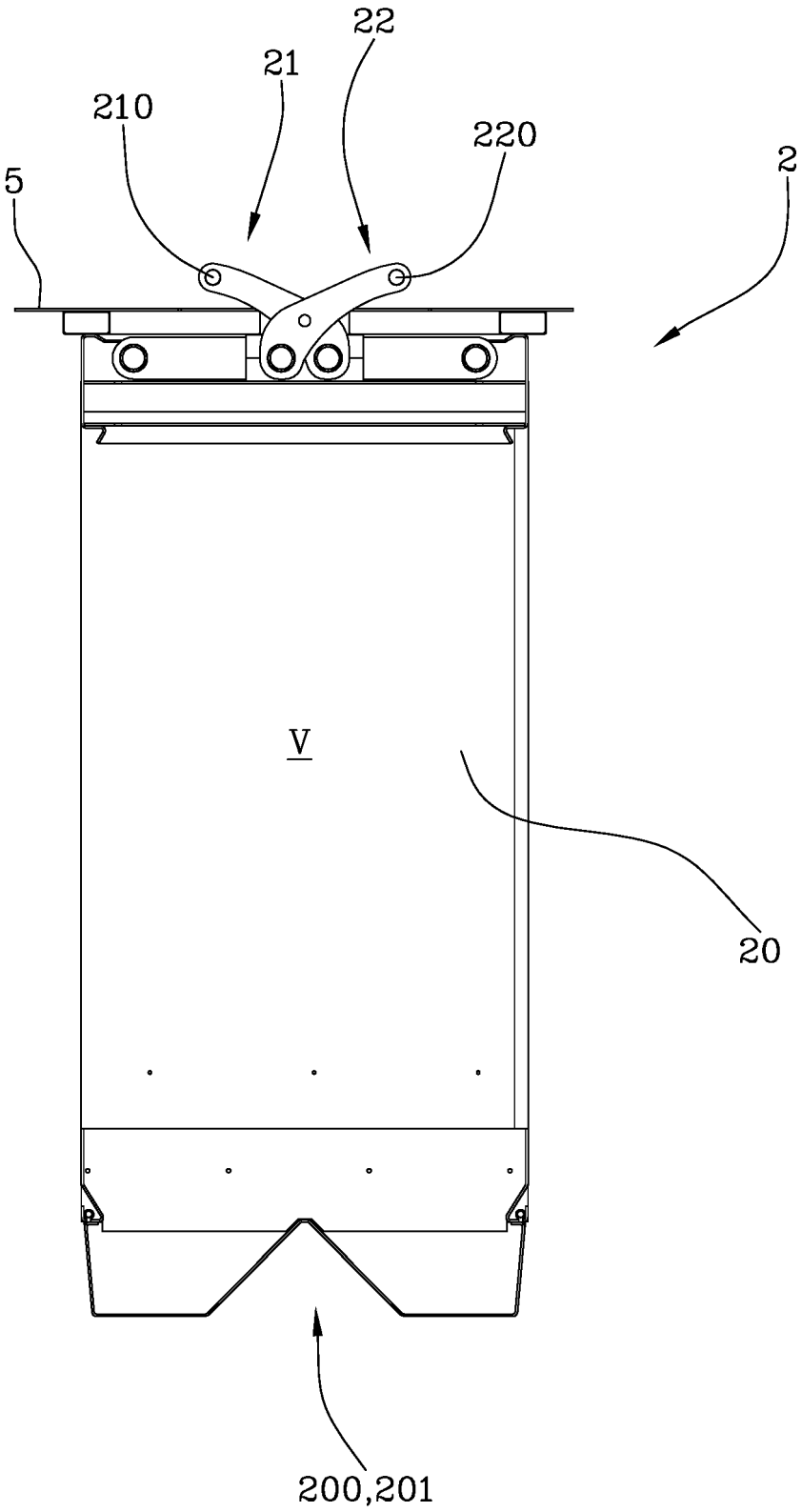


Fig.10

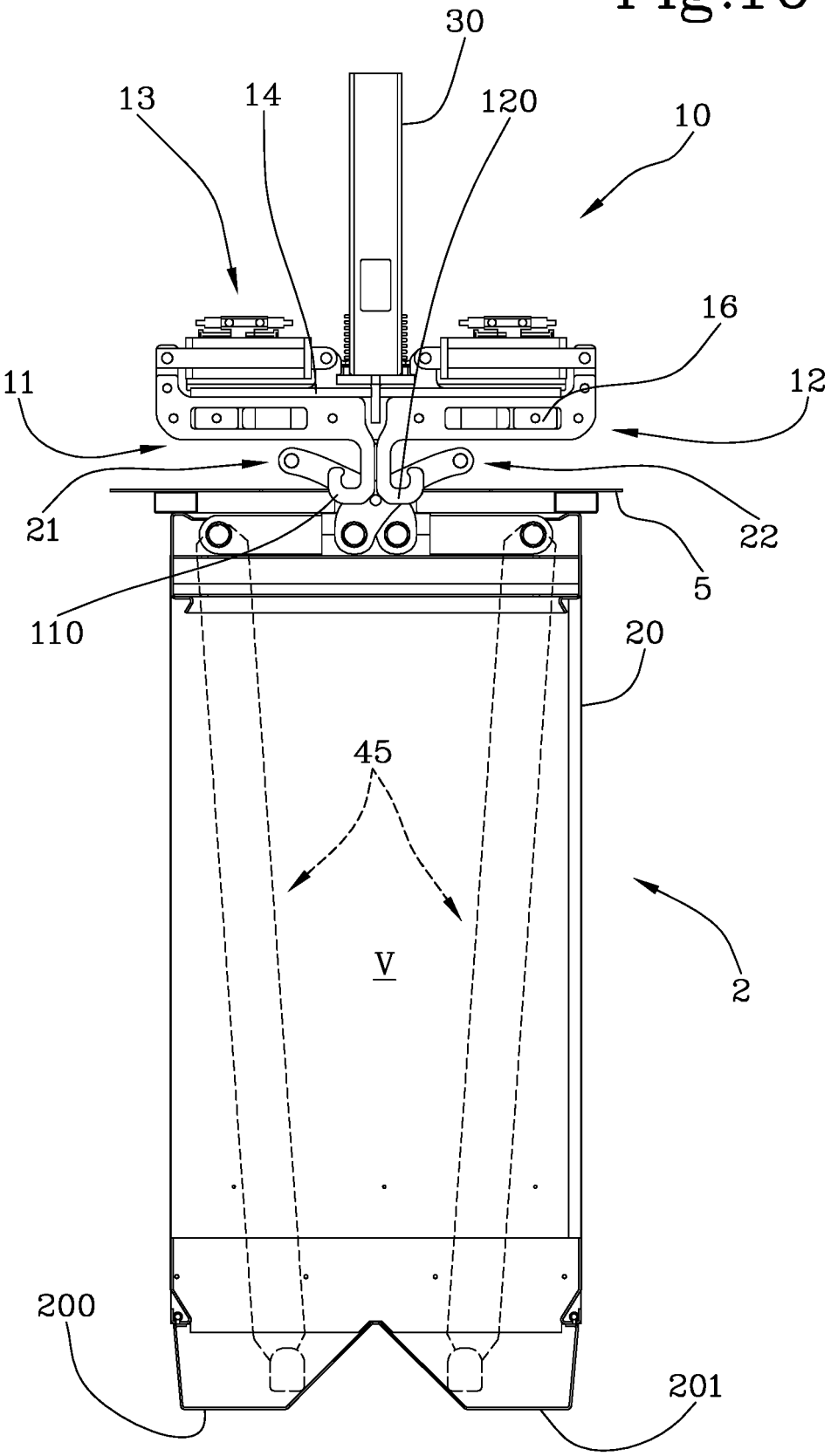


Fig.11

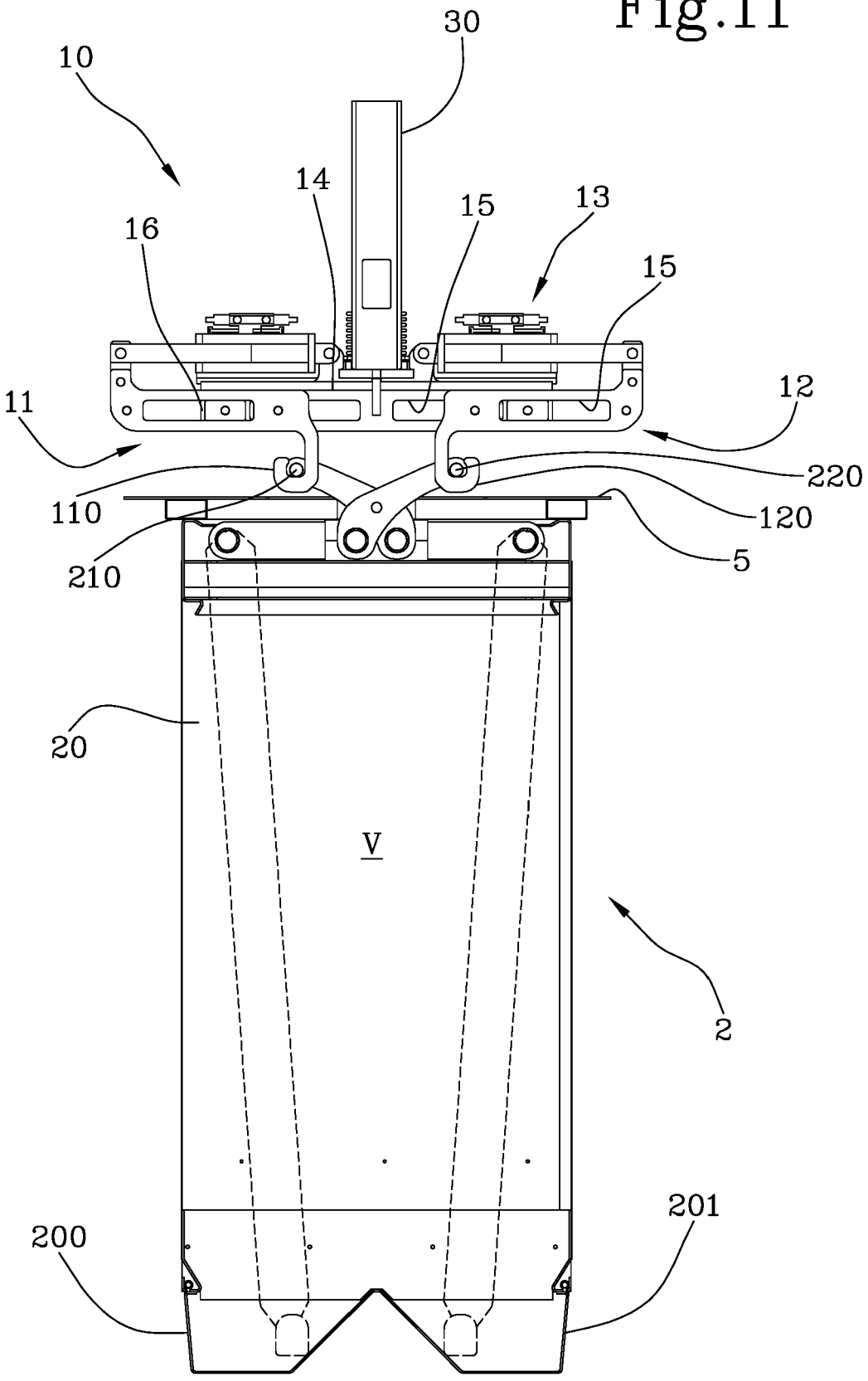


Fig.12

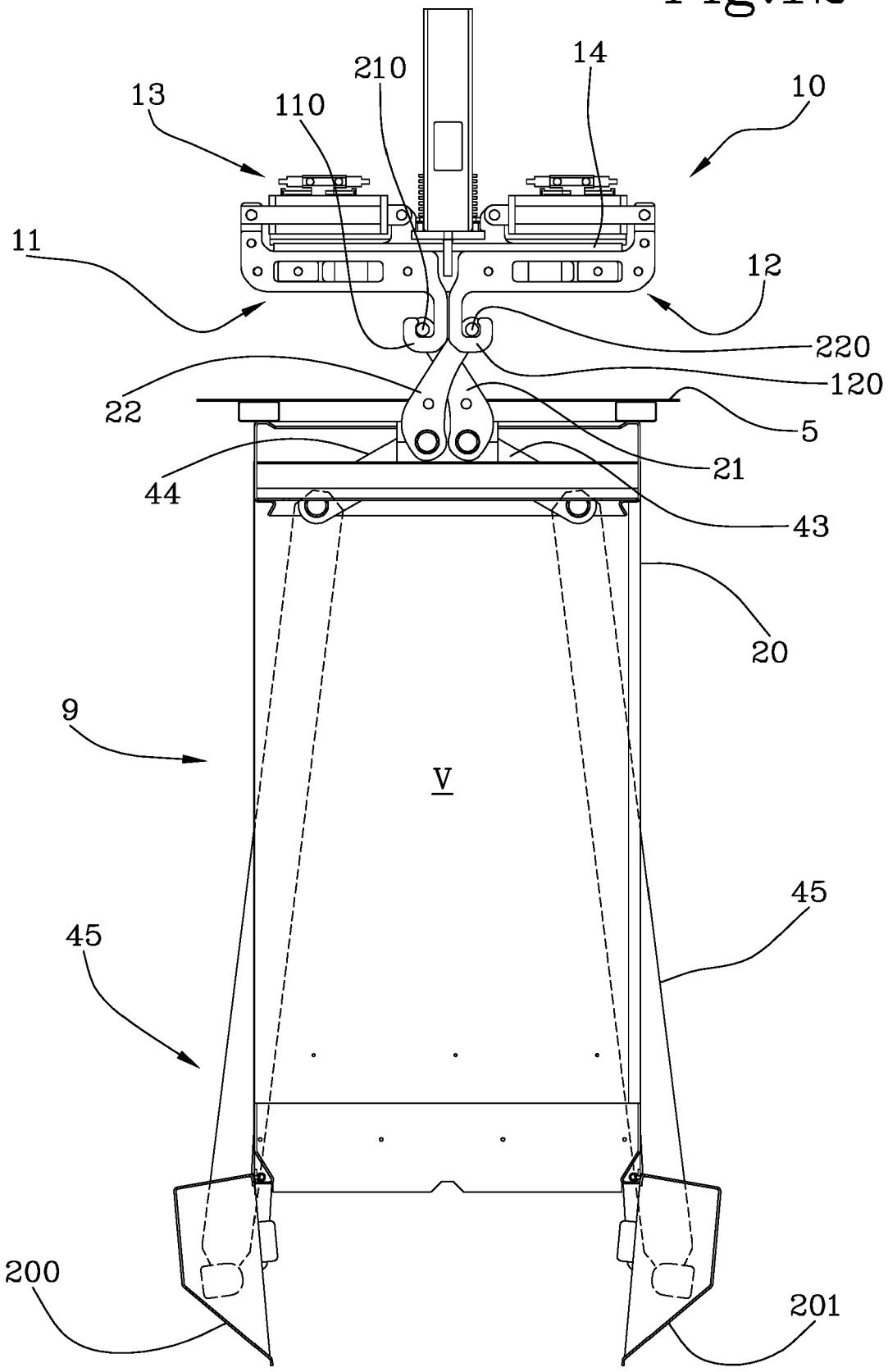


Fig.13

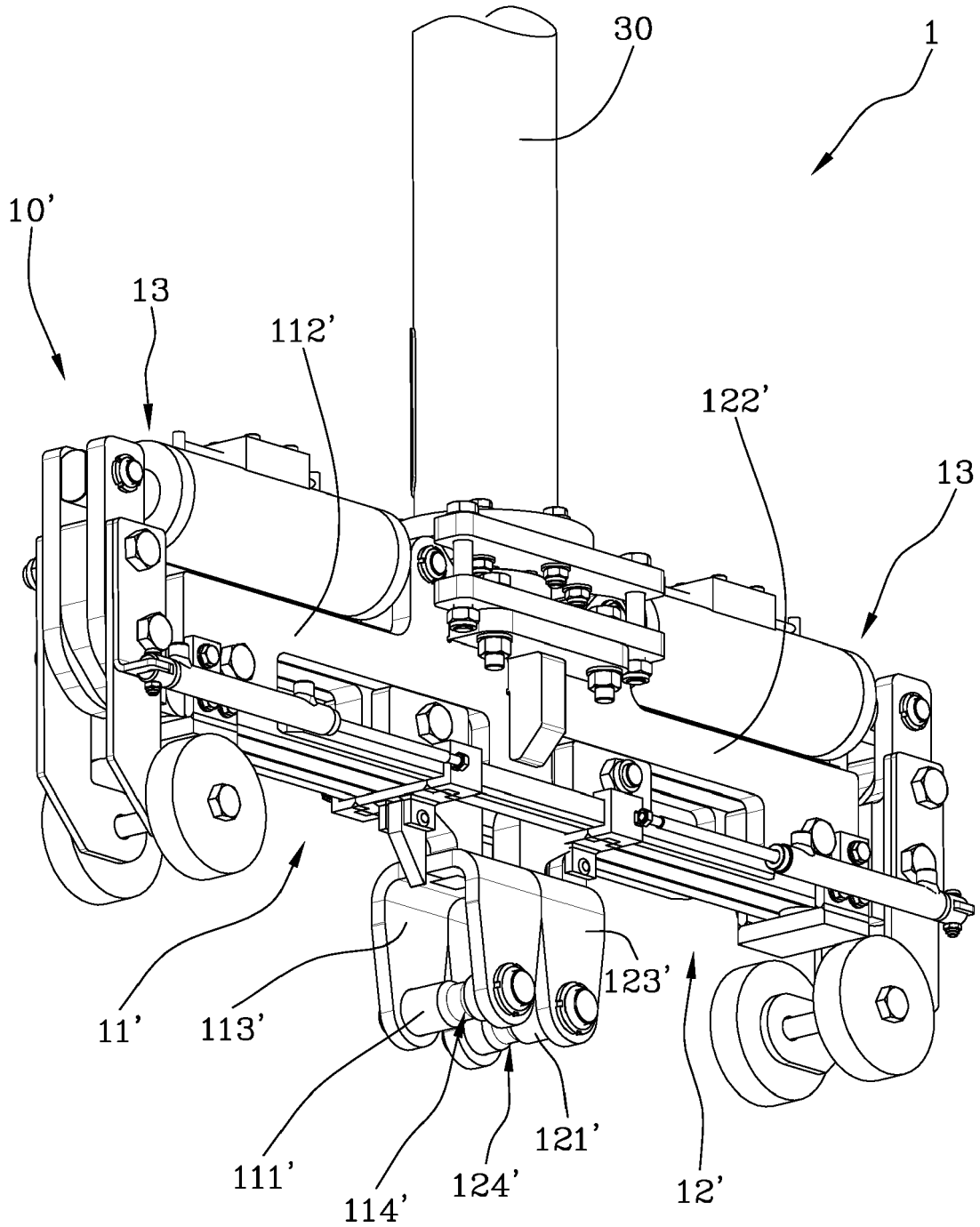
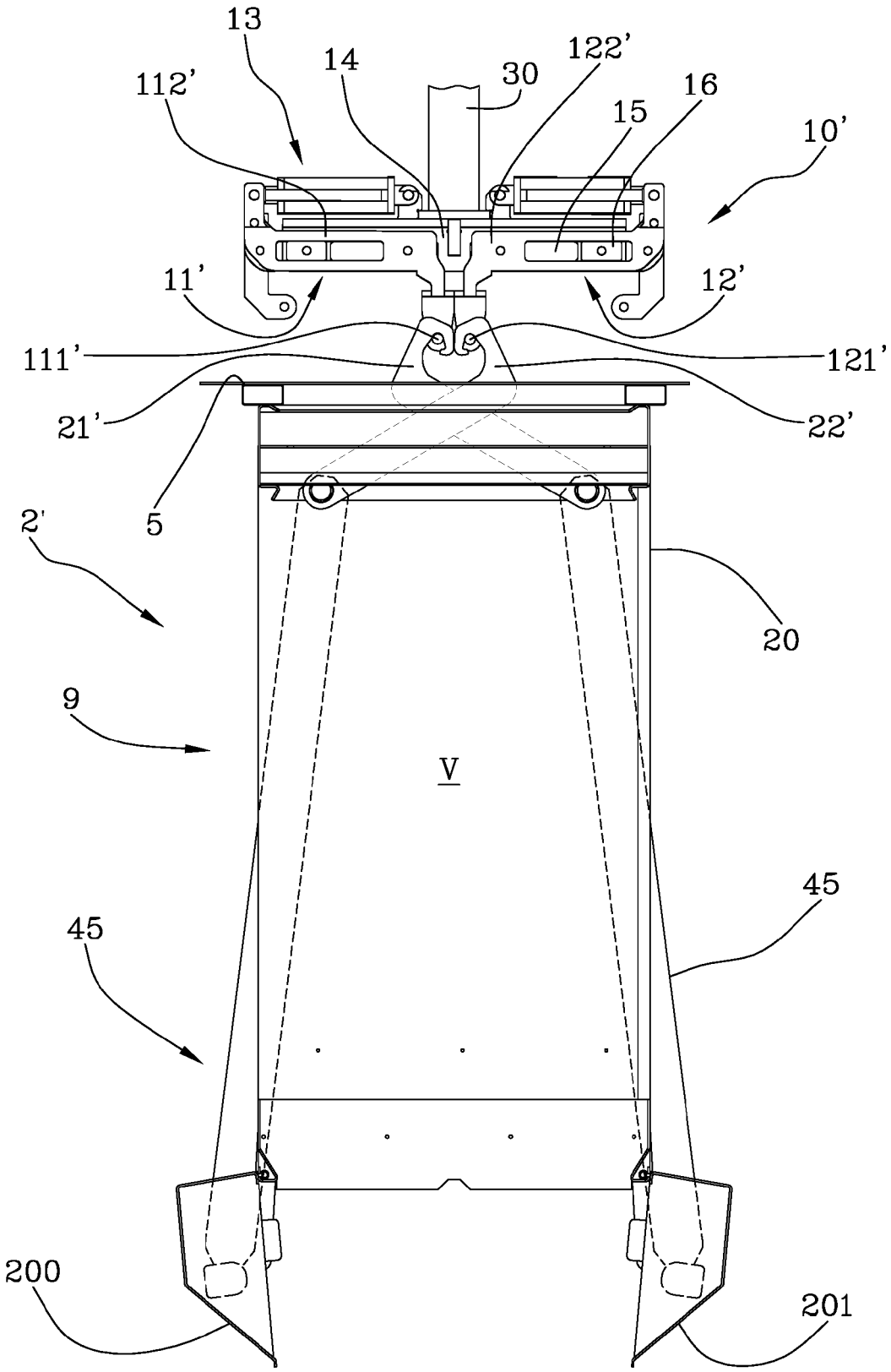


Fig.14



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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15 June 2016	Pardo Torre, Ignacio

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