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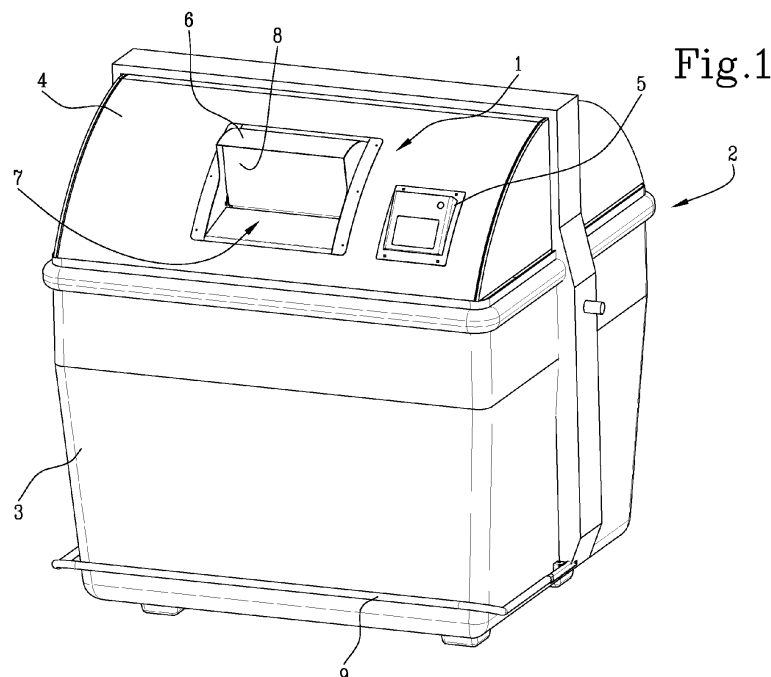
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(54) CONTROLLED WASTE CONFERMENT DEVICE

(57) A locking mechanism (12) comprises a mechanical stop (13) and a coupling assembly (14) respectively fixed to a fixed part (6) and to a movable part (8). A coupling element (17) is movable between a work position in which it interferes with the mechanical stop (13) to inhibit the translation of the movable part (8), and a release position in which it does not interfere with the mechanical stop (13). A locking member (27) oscillatingly carried by the coupling element (17) is movable between an activation position in which it interferes with an auxil-

iary stop (29) to inhibit the translation of the coupling element (17), and an unlocked position in which it frees the translation of the coupling element (17). An actuator (26) operates on a cam element (25) to move it between a rest condition in which the locking member (27) is retained in the activation position and an operating condition in which the locking member (27) is in the unlocked position and the coupling element (17) is in the release position.

**Fig.1****EP 3 943 413 A1**

Description

[0001] The present invention relates to a device for controlled waste conferment. It is also an object of the invention a waste container integrating the aforesaid device.

[0002] As is known, waste collection in urban areas is normally carried out with the aid of special containers, for example bins, suitably located in the urban territory and accessible by citizens for the conferment of waste. The containers are periodically emptied by suitably equipped vehicles, which provide for the transport of waste to the respective treatment sites. For the purpose of waste collection in urban environments, where separate collection is required, the containers are each conveniently configured for the conferment of a specific type of waste by the user.

[0003] To allow a control and monitoring of the waste conferment by the user, solutions have been proposed which enable and possibly record the conferment of waste after the identification of the user.

[0004] These solutions include a locking system which prevents the direct conferment of the waste, making it possible only after unlocking a hatch or other access system by means of an electromechanical device. The electromechanical device is automatically activated following the identification of the user, usually by means of an electronic interface reading a code stored or storable on a badge or other type of optical, magnetic, RFID medium, and/or on smartphones or the like.

[0005] One of the drawbacks found with the use of the current control devices is their relative vulnerability to tampering.

[0006] In particular, it has been possible to verify that the current systems lend themselves to being tampered with by ill-intentioned users who, with a certain dexterity, manage to introduce cards or other flexible laminar elements into the gaps present between respectively movable parts near the conferment opening, until reaching and unlocking the unlocking mechanism so as to carry out a conferment in the absence of identification, for example to anonymously introduce materials other than those required by separate collection, or to circumvent tariff charge systems which are based on the number of conferments made and/or the amount of waste conferred by the user.

[0007] Another problem which emerges in the current state of the art consists of malfunctions which occur when a user tries to operate the opening mechanism of the conferment mouth, controlled by a lever and/or a pedal, when he has not yet completed the identification operation. In this case, it can easily occur that the mechanical components subjected to the stress transmitted by the user through the lever or the pedal are unable to move to determine the unlocking of the conferment mouth when the electronic interface, upon recognition of the code transmitted by the user, enables the conferment operation.

[0008] In many cases the user interprets the failure to unlock as a malfunction of the system, and feels entitled to deposit his waste outside the bin. Another problem which is increasingly being felt in the sector is the demand for devices which can operate efficiently without the need for a connection to an electrical power supply network. These requirements are typically met using autonomous battery power units, which can be recharged by means of photovoltaic panels. However, the use of these autonomous power supply units makes it important to reduce the energy consumption of the IT and automation equipment of the containers as much as possible, and in particular of the electromechanical locking systems used for locking and unlocking the access mouth.

[0009] The object of the present invention is to improve the state of the art, proposing a device which lends itself to effectively inhibiting any tampering actions aimed at causing the unlocking of the access mouth in a fraudulent manner.

[0010] A further object of the invention is to propose a device which lends itself to operating in an efficient and reliable manner, even if an inexperienced user acts clumsily on the lever or on the pedal trying to open the access mouth when the identification operation is not yet completed.

[0011] A further object of the invention is to provide a device which lends itself to minimizing the energy expenditure required to activate the unlocking.

[0012] In a first aspect, the invention relates to a device for the conferment of urban waste, comprising a fixed part integral with a waste container at an access mouth, a movable part with respect to the fixed part, and control devices for moving the movable part between a closed position in which it inhibits the conferment of waste to the access mouth and an open position in which the access mouth is accessible for the conferment of waste. Preferably, between the fixed part and the movable part a locking mechanism operates comprising a mechanical stop and a coupling assembly configured to cooperate with the mechanical stop. The mechanical stop and the coupling assembly are respectively fixed to the fixed part and to the movable part of the conferment device, or vice versa; The coupling assembly further comprises a coupling element movable between a work position in which it interferes with the mechanical stop to inhibit the translation of the movable part from the closed position, and a release position in which it does not interfere with the mechanical stop, freeing the movement of the movable part towards the open position.

[0013] A locking member is oscillatingly carried by the coupling element and movable with respect to the latter between an activation position in which the locking member mechanically interferes with an auxiliary stop to inhibit the translation of the coupling element from the working position, and an unlocked position in which it frees translation of the coupling element towards the release position.

[0014] A cam element operates on the locking member

and on the coupling member, and an actuator is activatable on the cam element to move it between a rest condition in which the locking member is retained in the activation position and an operating condition in which the locking member is in the unlocked position and the coupling element is in the release position.

[0015] In a further aspect, the invention relates to a waste container equipped with the aforesaid device.

[0016] According to the Applicant, the simultaneous action of the cam element on the locking member and on the coupling element allows greater security in relation to tampering attempts, and offers the possibility of determining the activation of the device with a reduced energy expenditure.

[0017] In at least one of the above aspects, one or more of the following preferred features are further included.

[0018] Preferably, the movable part is rotatably engaged with respect to the fixed part around a rotation axis.

[0019] Preferably, the fixed part and the movable part each have an axially delimited retaining wall between respective side walls, the mechanical stop and the coupling assembly each being mounted on one of said side walls, mutually facing each other, belonging to the fixed part and the movable part respectively.

[0020] Preferably, each of the side walls has an outer peripheral edge extending along a circumferential sector around the rotation axis of the movable part with respect to the fixed part.

[0021] Preferably, at least the containment wall of the fixed part extends as a cylindrical sector concentrically to the rotation axis of the movable part with respect to the fixed part.

[0022] Preferably, at least the retaining wall of the movable part comprises two flat portions arranged according to a V-shaped configuration with a vertex arranged near the rotation axis of the movable part with respect to the fixed part.

[0023] Preferably, the mechanical stop is fixed to the movable part of the conferment device.

[0024] Preferably, the coupling assembly is mounted on a fixed part of the conferment device.

[0025] This simplifies the installation of wiring and mechanical connections to the coupling assembly.

[0026] Preferably, the coupling assembly comprises a support structure oscillatably engaging the coupling element.

[0027] Preferably, the coupling element is oscillatably engaged about a rotational oscillation axis.

[0028] Preferably, the coupling assembly further comprises elastic members which counteract the movement of the cam element towards the operating condition.

[0029] Preferably, the coupling assembly further comprises recall members operating on the coupling element to elastically retain it towards the release position.

[0030] Preferably, at least in some configurations, the function of the return members can be fulfilled by the force of gravity.

[0031] Therefore, a possible locking of the coupling el-

ement in the work position does not preclude the mobility of the cam element towards the respective operating condition, which occurs by loading the recall members. The recall members will therefore be able to bring the coupling element into the release position as soon as the locking action on the coupling element itself ceases.

[0032] Preferably, the coupling element comprises a terminal body and an intermediate body mutually rotatable about the rotational oscillation axis. Preferably, the terminal body carries a gripping portion interacting with the mechanical latch.

[0033] Preferably, the cam element operates on the intermediate body.

[0034] Preferably, the intermediate body carries a stop seat acting against an abutment carried by the terminal body, on the opposite side with respect to the gripping portion, to stop the rotation of the terminal body with respect to the intermediate body.

[0035] The intermediate body will therefore be free to move with respect to the terminal body during the movement of the cam element towards the operating condition if the terminal body remains locked in the work position.

[0036] Preferably, the locking member is oscillatably carried by the intermediate body.

[0037] Preferably, the return members comprise an auxiliary spring operating on the terminal body to elastically retain the abutment against the stop seat. Preferably, the auxiliary spring operates between the intermediate body and the terminal body.

[0038] Preferably, the elastic members comprise a primary spring operating on the intermediate body to counteract the translation of the coupling element towards the release position.

[0039] Preferably, the primary spring operates between the intermediate body and the support structure.

[0040] Preferably, the locking member comprises a pin slidably guided with respect to the coupling element and movable in opposition to the action of a contrast spring.

[0041] Preferably, the contrast spring pushes the locking member towards the unlocking position.

[0042] Preferably, the auxiliary stop is integral with respect to the support structure.

[0043] Preferably, the cam member is rotatable about a constraint axis parallel to the rotational oscillation axis of the coupling element.

[0044] Preferably, the cam element has a first active edge operating on the locking member and a second active edge operating on the coupling element.

[0045] Preferably, the first active edge and the second active edge converge towards a distal end of the cam element.

[0046] Preferably, in the operating condition the coupling element exerts on the cam element a thrust action along a direction intersecting the constraint axis of the cam element.

[0047] The cam element can therefore maintain a stable positioning in the operating condition without substantial energy expenditure by the actuator. Preferably,

the actuator is operable upon command of an identification and control unit upon identification of an authorized user through an access code.

[0048] Further features and advantages will become more apparent from the detailed description of a preferred, but not exclusive, embodiment of a controlled conferment device of urban waste, and a container equipped with said device, in accordance with the present invention. Such description will be set forth hereinafter with reference to the accompanying drawings given only for illustrative and, therefore, non-limiting purpose, in which:

- figure 1 shows a perspective view of a waste collection container integrating a controlled conferment device in accordance with the present invention;
- figure 2 shows a perspective view of the conferment device in the closing condition;
- figure 3 shows an enlarged detail highlighting the coupling assembly in the condition of figure 2;
- figure 4 highlights the detail of figure 3 in a different perspective angle;
- figure 5 shows a perspective view of the conferment device in the opening condition;
- figure 6 shows an enlarged detail highlighting the coupling assembly in the condition of figure 5;
- figure 7 highlights the detail of figure 5 in a different perspective angle;
- figure 8 laterally shows the locking mechanism in an operating condition in which a coupling element is in the work position to lock a movable part of the conferment device in the closed position;
- figure 9 laterally shows the locking mechanism in an operating condition where a locking member of the coupling assembly is in an unlocking position;
- figure 10 laterally shows the locking mechanism in an operating condition in which the coupling element is in the release position to enable movement of the movable part of the conferment device towards an opening position;
- figure 11 laterally shows the locking mechanism on the opposite side in the operating condition of figure 10;
- figure 12 shows, laterally on the opposite side with respect to figure 10, the locking mechanism in a condition in which the coupling element is retained in the work position while the cam element is in the operating condition.

[0049] With reference to figure 1, the number 1 globally indicates a device for controlled waste conferment, according to the present invention. The device 1 is installed on a container for the collection of waste, in the illustrated example of the side-loading bin type, globally indicated with 2 in figure 1. The device in question can be conveniently installed in any other type of container, for example stationary or movable containers, which can be emptied by means of rear, side, bilateral loading vehicles and also for underground containers, which can be emptied by

tipping or by unloading from below.

[0050] The container 2 comprises a vessel 3 to which, in a manner known per se, a covering element 4 can be associated above, which can be opened to allow the emptying of the container by means of a tipping action.

[0051] An electronic identification and control unit 5 can be installed on the covering element 4 which, in a manner known per se, is suitable to enable the operation of the device 1 for the purpose of waste conferment following the identification of an authorized user, by reading an access code reported for example on a magnetic card, RFID badge, or other. In possible embodiments not shown, the electronic unit 5 can have different locations, for example on the vessel 3 of the container 2 or, for example in underground applications, on a tower associated with the container itself.

[0052] The conferment device 1 essentially comprises a fixed part 6 integral with the covering element 4 or another part of the container 2, to define an access mouth 7 for the introduction of waste into the container itself. The fixed part 6 is operatively associated with a movable part 8 on the action of mechanical control devices 9, comprising for example a lever or a pedal. Preferably, the movable part 8 is rotatably engaged with respect to the fixed part 6 about a rotation axis X-X.

[0053] The action of the user on the pedal 9 commands a translation of the movable part 8 between a closing position in which, as in figure 1 and 2, it inhibits the conferment of waste to the access mouth 7, and an opening position in which, as in figure 5, the access mouth 7 is accessible for the conferment of waste.

[0054] The fixed part 6 and the movable part 8 are configurable according to various known embodiments, for example a saddle with a diaphragm, as well as a half-cylinder, single or double type shell. In the further example illustrated here, the fixed part 6 and the movable part 8 are of the so-called "drawer" or "single saddle" type, and each have a retaining wall 10a, 10b axially delimited between respective side walls 11a, 11b. Each of the side walls 11a, 11b has an outer peripheral edge extending along a circumferential sector around the rotation axis X-X. At least the retaining wall 10 of the fixed part 6 extends as a cylindrical sector concentrically to the rotation axis X-X of the movable part 8 with respect to the fixed part 6. The retaining wall 10b of the movable part 8 can in turn be composed of two flat portions arranged according to a V-shaped configuration, with a vertex arranged near the movable part with respect to the fixed part.

[0055] A locking mechanism 12 operates between the fixed part 6 and the movable part 8, the locking mechanism essentially comprising a mechanical stop 13 and a coupling assembly configured to cooperate with the mechanical stop 13. In the illustrated example, the mechanical stop 13 and the coupling assembly 14 are each mounted on one of said mutually facing side walls 11a, 11b, belonging respectively to the fixed part 6 and to the movable part 8. In at least one embodiment, the positions of the mechanical stop 13 and the coupling assembly 14

can however be reciprocally reversed.

[0056] The mechanical stop 13 can comprise a stop element 15 projecting from a plate 16 fixed to the respective side wall 10b of the movable part 8.

[0057] The coupling assembly 14 can in turn comprise a coupling element 17 oscillatably engaged about a rotational oscillation axis Y-Y on a support structure 18 having a plate-shaped base fixed at an opening 18a formed in the corresponding side wall 10a of the fixed part 6.

[0058] The coupling element 17 is movable between a work position in which, as better seen for example in figure 8, it interferes with the mechanical stop 13 to inhibit the translation of the movable part 8 from the closed position, and a release position in which it does not interfere with the mechanical stop 13, so as to free the movement of the movable part 8 towards the open position.

[0059] Preferably, the coupling element 17 is essentially composed of a terminal body 19 and an intermediate body 20, 21, mutually rotatable about the rotational oscillation axis Y-Y. The terminal body 19, substantially plate-shaped, carries a gripping portion 22 configured to interact with the mechanical stop 13. The intermediate body 20, 21 has a first plate 20 and a second plate 21 arranged orthogonally to each other. The first plate 20 can be arranged so as to orthogonally intersect the rotational oscillation axis Y-Y and rotatably constrained thereto, while the second plate 21 is preferably parallel and spaced with respect to the latter. The terminal body 19 carries, preferably on the second plate 21, a stop seat 23 acting against an abutment 24 carried by the terminal body 19, on the opposite side with respect to the gripping portion 22. The interference of the abutment 24 against the stop seat 23 stops the rotation of the terminal body 19 with respect to the intermediate body 20, 21.

[0060] A cam element 25 operates on the coupling element 17, preferably at the second plate 21 of the intermediate body, to determine the angular rotation about the rotational oscillation axis Y-Y. The cam element 25 is rotatable about a constraint axis Z-Z spaced parallel from the rotational oscillation axis Y-Y of the coupling element 17, upon the command of at least one actuator 26, preferably an electrically operated servomotor.

[0061] The actuator 26 is selectively activatable, upon user identification on command of the identification and control unit 5, to move the cam element 25 to an operating condition in which the coupling element 17 is in the release position.

[0062] A locking member 27 is oscillatably carried by the coupling element 17, preferably at the intermediate body 20, 21. In the illustrated example, the locking member 27 is made in the form of a cylindrical pin slidably guided with respect to the coupling element 17, preferably in a tubular guide 28 integral with the intermediate body 20, 21. The locking member 27 is movable with respect to the coupling element 17, between an activation position and an unlocking position. In the activation position, the locking member 27 lends itself to mechanically interfering with an auxiliary stop 29 integral with respect

to the support structure 18 to inhibit the translation of the coupling element 17 towards the release position, as better seen in figure 8. In the release position, better visible in figures 9 and 10, the locking member 27 is disengaged from the auxiliary stop 29 so as to free the translation of the coupling element 17 towards the release position. The movement of the locking member 27 implemented following the rotation of the cam element 25. Preferably, the movement of the locking member 27 towards the activation position by the cam element 25 occurs in opposition to the action of a contrast spring 30, for example a helical compression spring operating between an end of the tubular guide 28 and a shoulder carried by the locking member 27, to push the latter towards the unlocking position, which is then actuated in conjunction with the rotation of the cam element 25 towards the operating condition.

[0063] The cam element 25 can conveniently have a tapered shape towards its distal end 31 with respect to its constraint axis Z-Z. In fact, towards the distal end 31 converge a first active edge 32 operating on the locking member 27, for example at a pin 33 transversely carried by the same, and a second active edge 34 operating on the coupling element 17, against the second plate 21 of the intermediate body 20, 21.

[0064] The first active edge 32 therefore lends itself to pushing the locking member 27 towards the activation position when, on command of the actuator 26, the cam element 25 is rotated away from the operating position, until reaching a rest condition in which the locking member itself is retained in the activation position to inhibit the translation of the coupling element 17 from the work position.

[0065] When the movable part 8 is locked in the closing position, the movement of the coupling element 17 from the work position is thus effectively hindered as a result of fraudulent actions aimed at disengaging the coupling element itself from the mechanical stop 13, for example by inserting flexible laminar elements between the side walls 11a, 11b of the fixed 6 and movable parts 8 of the conferment device 1.

[0066] Further elastic members 35 operate on the coupling element 17 to retain and/or elastically pull it towards a release position, counteracting the movement of the cam element 25 towards the operating condition. In the illustrated example, such elastic members 35 comprise a primary helical traction spring 35, preferably operating between the intermediate body 20, 21 and the support structure 18.

[0067] As better seen in figure 10, when the cam element 25 is in the operating condition, the second plate 21 of the intermediate body 20, 21 acts against the distal end 31 by means of its surface oriented perpendicularly with respect to a direction passing through the constraint axis Z-Z and a point of contact with the distal end itself. In this circumstance, under the effect of the primary spring 35, the coupling element 17 exerts a thrust action on the cam element 25 along a direction intersecting the

constraint axis Z-Z of the cam element 25, which is thus in a substantially balanced situation, minimizing or cancelling the energy expenditure required by the actuator 26 to keep the cam element 25 in the operating position.

[0068] Recall members operate on the coupling element 17 to retain it towards the release position. In the illustrated example, the return members comprise at least one auxiliary spring 36 operating between the intermediate body 20, 21 and the terminal body 19, so as to elastically push the abutment 24 against the stop seat 23. Possible embodiment variants can include the use of gravitationally operating return members. The auxiliary spring 36 has a preload such as to induce the terminal body 19 to follow the rotation imposed on the intermediate body 20, 21 when the cam element 25 is brought into the operating position. In the case where, for example due to an incorrect manoeuvre by the user on the pedal 9, a mechanical impingement is determined between the mechanical stop 13 and the coupling element 17 as depicted in figure 12, the elastic elongation of the auxiliary spring 36 can support the movement of the intermediate body 20, 21 without requiring excessive effort and energy expenditure from the actuator 26. When the action on the pedal 9 and the consequent impingement phenomenon cease, the elastic action of the auxiliary spring 36 immediately recalls the terminal body 19 in the release position, enabling the rotation of the movable part 8 for the purpose of waste conferment.

Claims

1. Controlled waste conferment device, comprising:

a fixed part (6) integral with a waste container (2) at an access mouth (7),
a movable part (8), movable with respect to the fixed part (6),
control devices (9) for moving the movable part (8) between a closed position in which it inhibits the conferment of waste to the access mouth (7) and an open position in which the access mouth (7) is accessible for the conferment of waste,
a locking mechanism (12) operating between the fixed part (6) and the movable part (8) and comprising:

a mechanical stop (13);
a coupling assembly (14) configured to cooperate with the mechanical stop (13);
the mechanical stop (13) and the coupling assembly (14) being respectively fixed to the fixed part (6) and to the movable part (8) of the conferment device, or vice versa;
wherein the coupling assembly (14) comprises:

a coupling element (17) movable be-

tween a working position in which it interferes with the mechanical stop (13) to inhibit the translation of the movable part (8) from the closed position, and a release position in which it does not interfere with the mechanical stop (13), freeing the movement of the movable part (8) towards the open position;
a locking member (27) oscillatingly carried by the coupling element (17) and movable with respect to the latter between an activation position in which the locking member (27) mechanically interferes with an auxiliary stop (29) to inhibit the translation of the coupling element (17) from the working position, and an unlocked position in which it frees translation of the coupling element (17) towards the release position;
a cam element (25) operating on the locking member (27) and the coupling element (17);
an actuator (26) activatable on the cam element (25) to move it between a rest condition in which the locking member (27) is retained in the activation position and an operating condition in which the locking member (27) is in the unlocked position and the coupling element (17) is in the release position.

2. Device according to claim 1, wherein the coupling element (17) is oscillatingly engaged about a rotational oscillation axis (Y-Y).

3. Device according to claim 1 or 2, wherein the coupling assembly (14) further comprises elastic members (35) which counteract the movement of the cam element (25) towards the operating condition.

4. Device according to one or more of the preceding claims, wherein the coupling assembly (14) further comprises return members (36) operating on the coupling element (17) to elastically retain it towards the release position.

5. Device according to one or more of the preceding claims, wherein the coupling element (17) comprises a terminal body (19) and an intermediate body (20,21) reciprocally rotatable around the rotational oscillation axis (Y-Y).

6. Device according to claim 5, wherein the cam element (25) operates on the intermediate body (20,21).

7. Device according to claim 5 or 6, wherein the intermediate body (20,21) carries a stop seat (23) acting against an abutment (24) carried by the terminal

body (19), to stop the rotation of the terminal body (19) with respect to the intermediate body (20,21).

8. Device according to one or more of claims 5 to 7, wherein the locking member (27) is oscillatingly carried by the intermediate body (20,21). 5
9. Device according to one or more of claims 5 to 8 when dependent on claim 4, wherein the return members comprise an auxiliary spring (36) operating on the terminal body (19) to elastically retain the abutment (24) against the stop seat (23). 10
10. Device according to one or more of claims 5 to 9 when dependent on claim 3, wherein the elastic members (35) comprise a primary spring (35) operating on the intermediate body (20,21) to counteract the translation of the coupling element (17) towards the release position. 15
11. Device according to one or more of claims 2 to 10, wherein the cam element (25) is rotatable around a constraint axis (Z-Z) parallel to the rotational oscillation axis (Y-Y) of the coupling element (17). 20
12. Device according to one or more of the preceding claims, wherein the cam element (25) has a first active edge (32) operating on the locking member (27) and a second active edge (34) operating on the coupling element (17). 25
13. Device according to claim 11 or 12, wherein in the operating condition the coupling element (17) exerts on the cam element (25) a thrust action along a direction intersecting the constraint axis (Z-Z) of the cam element (25). 30
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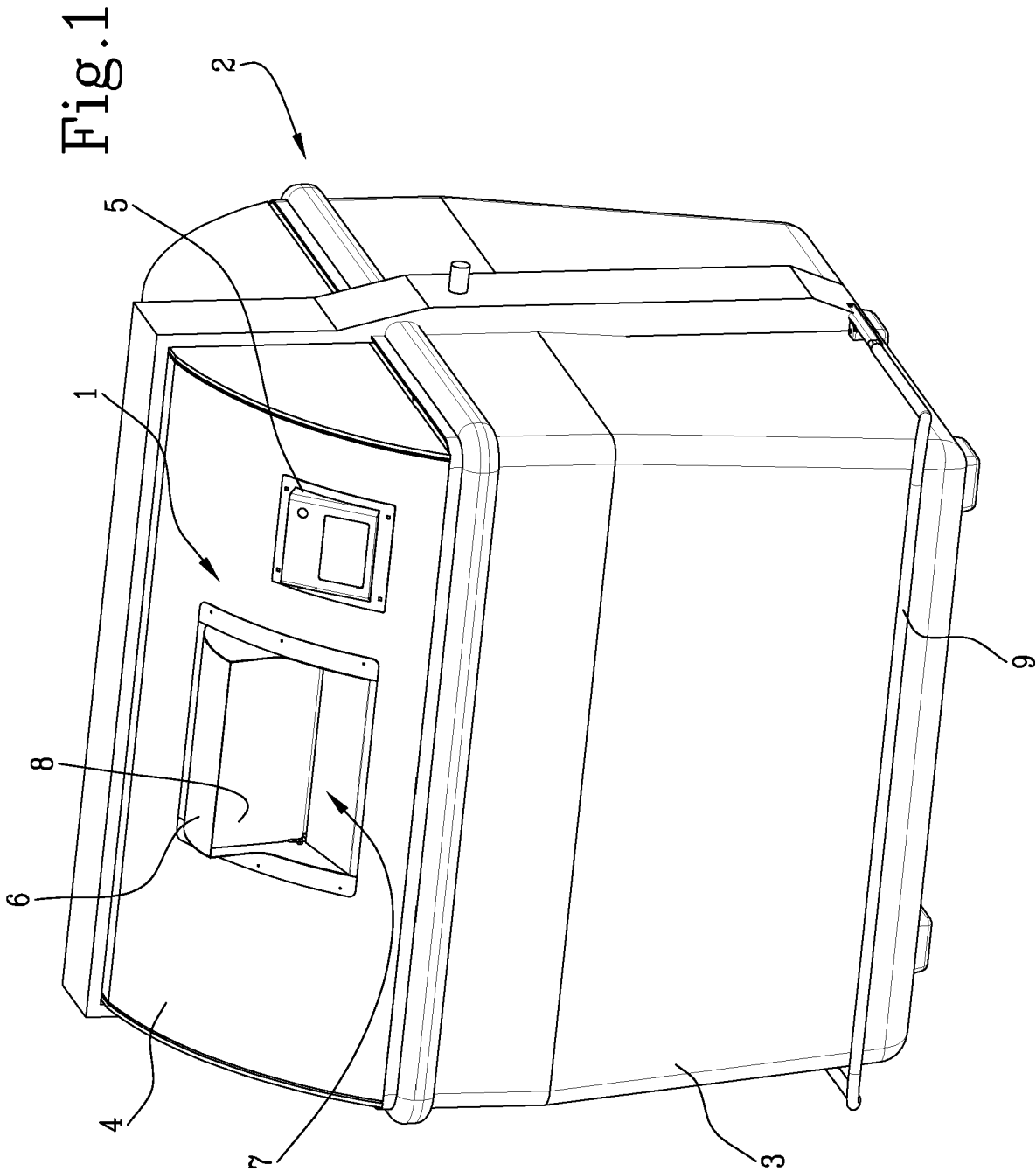
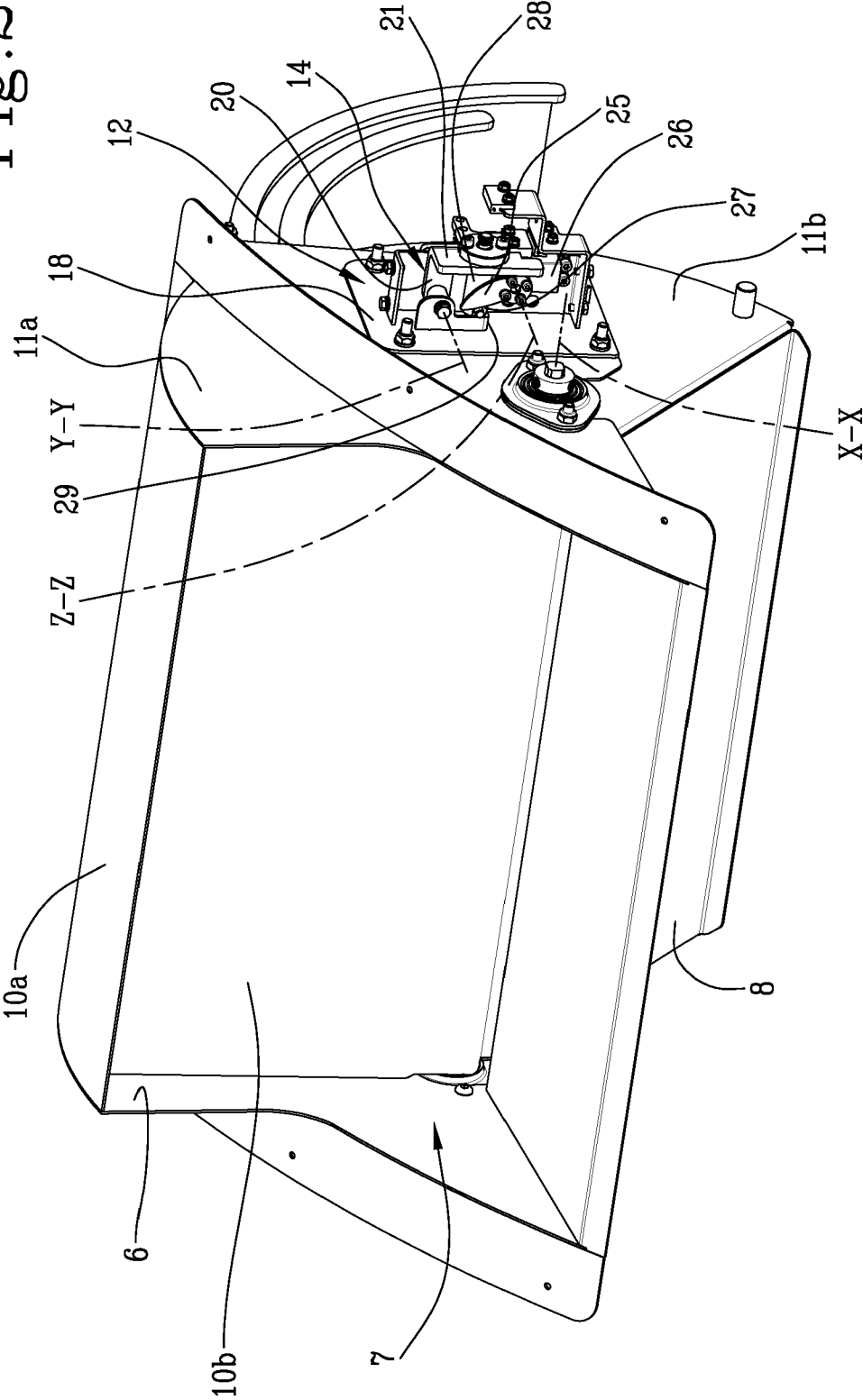
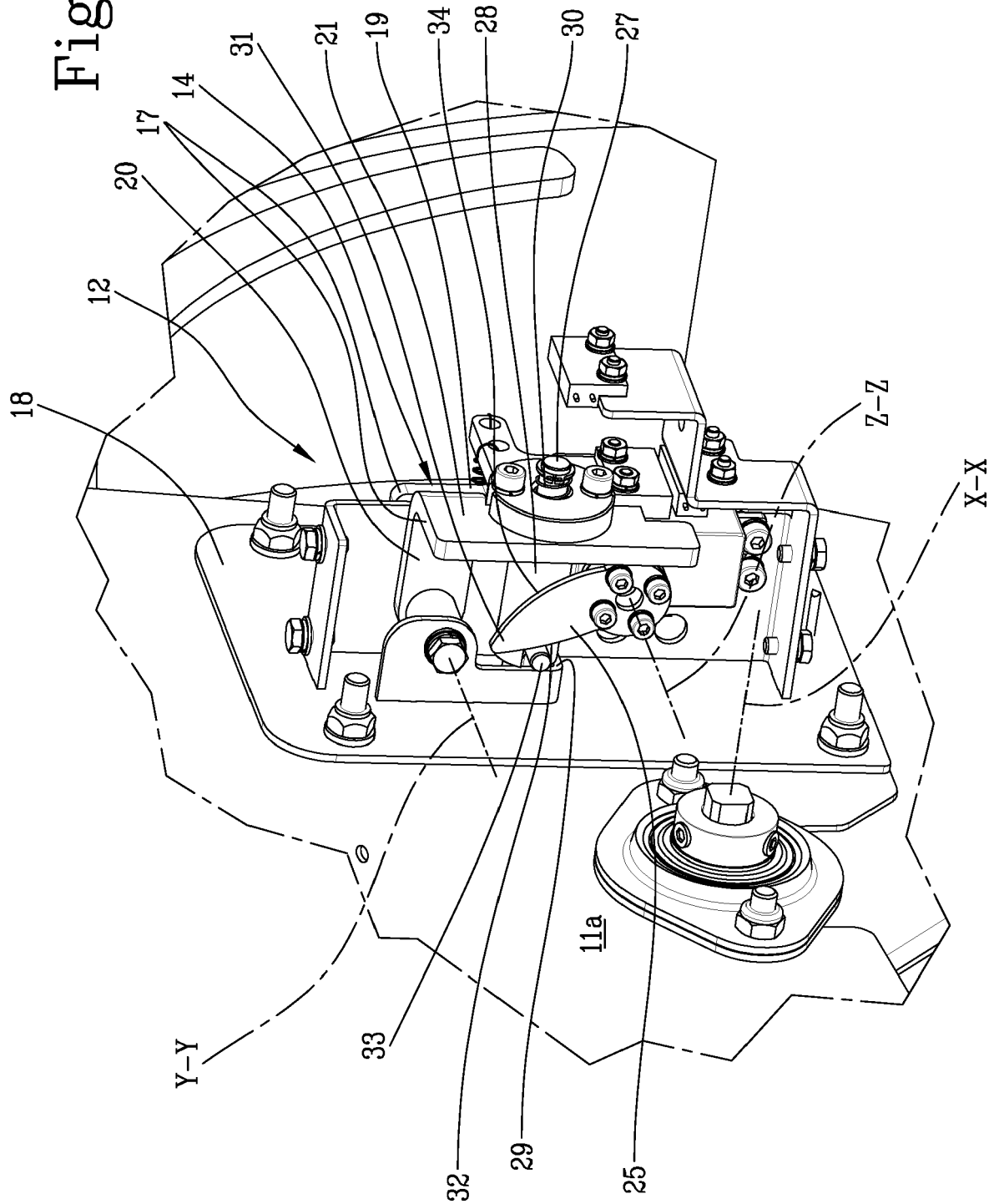


Fig.2



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Fi.



Fi. 4.

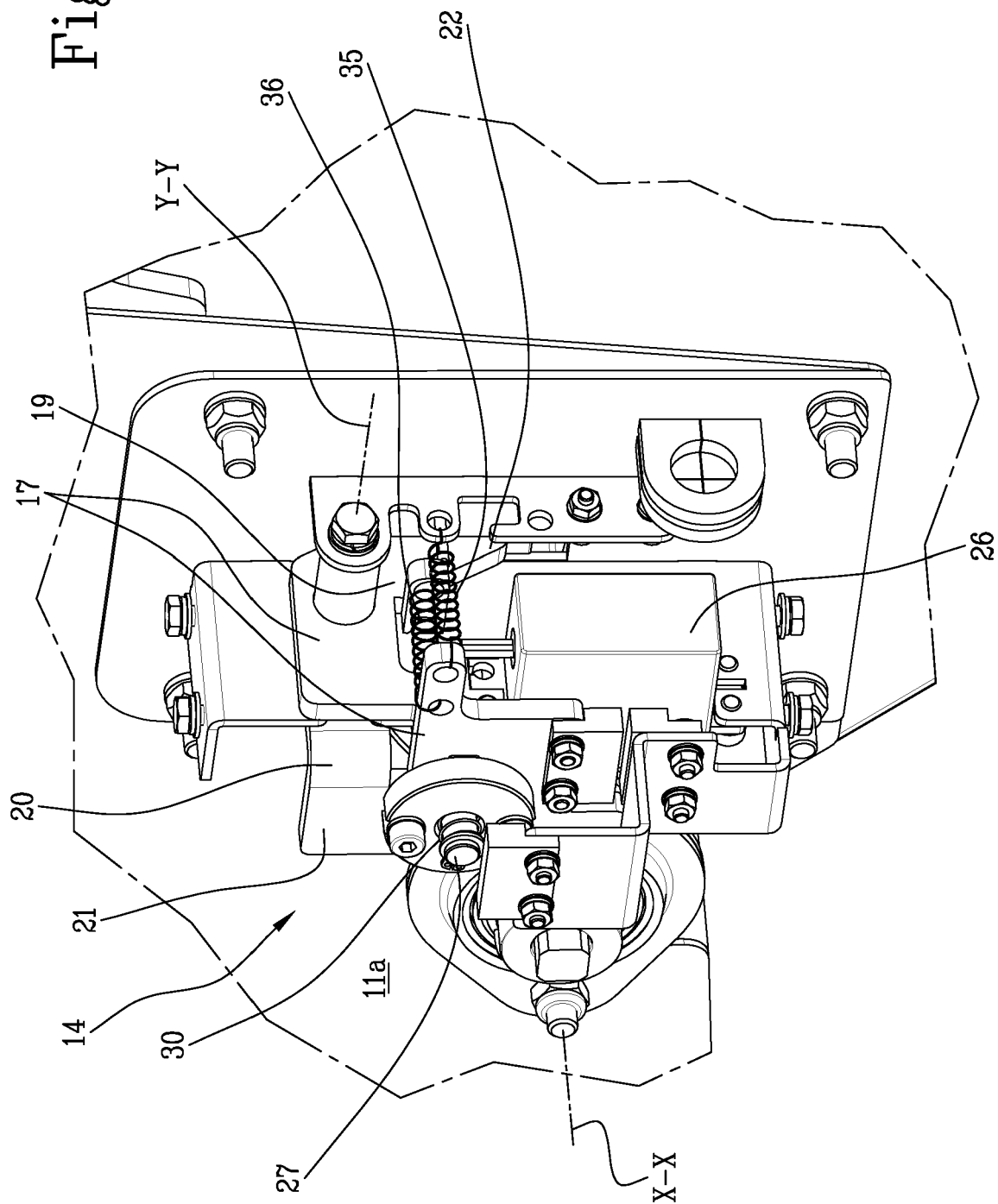
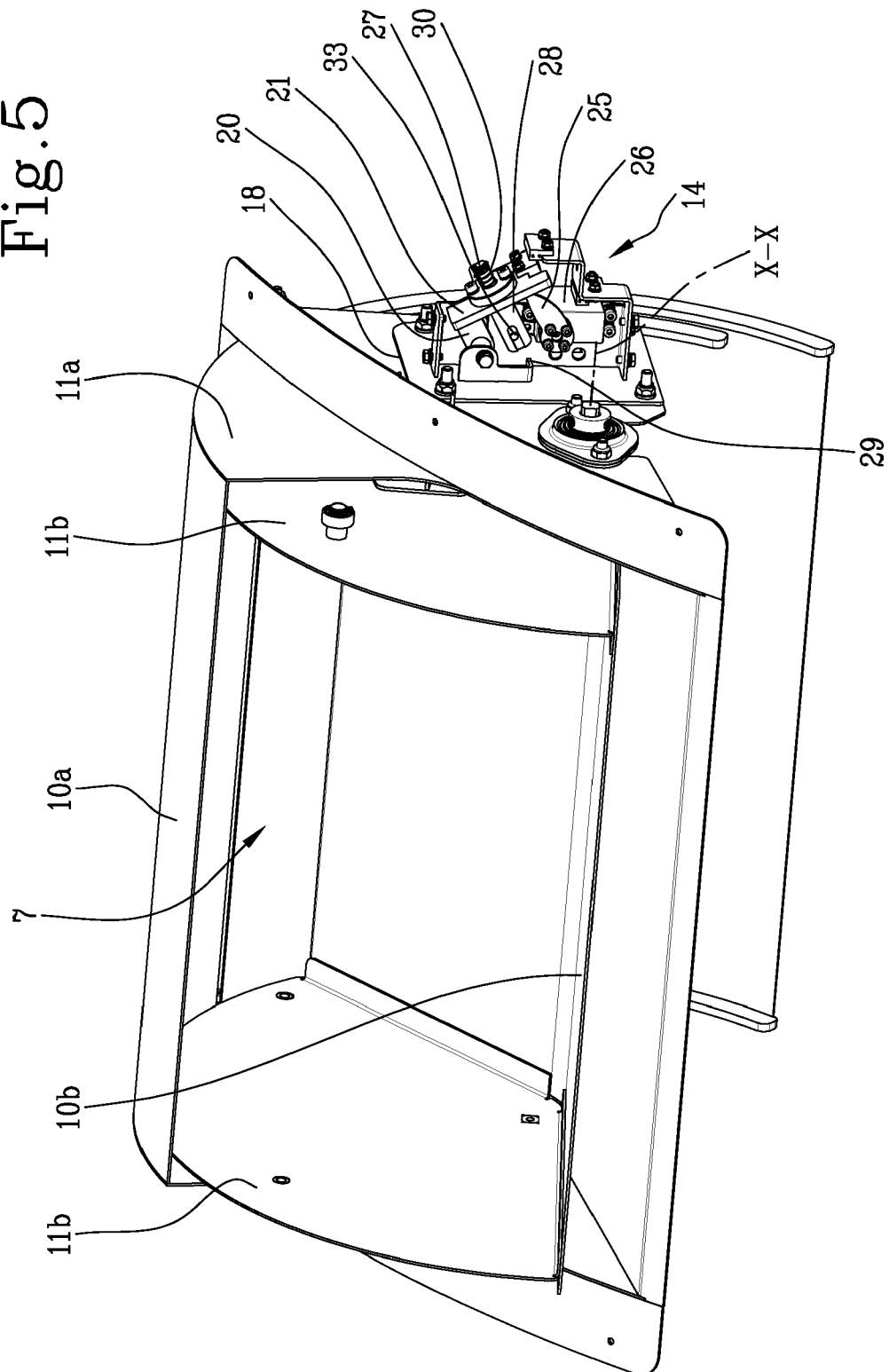


Fig.5



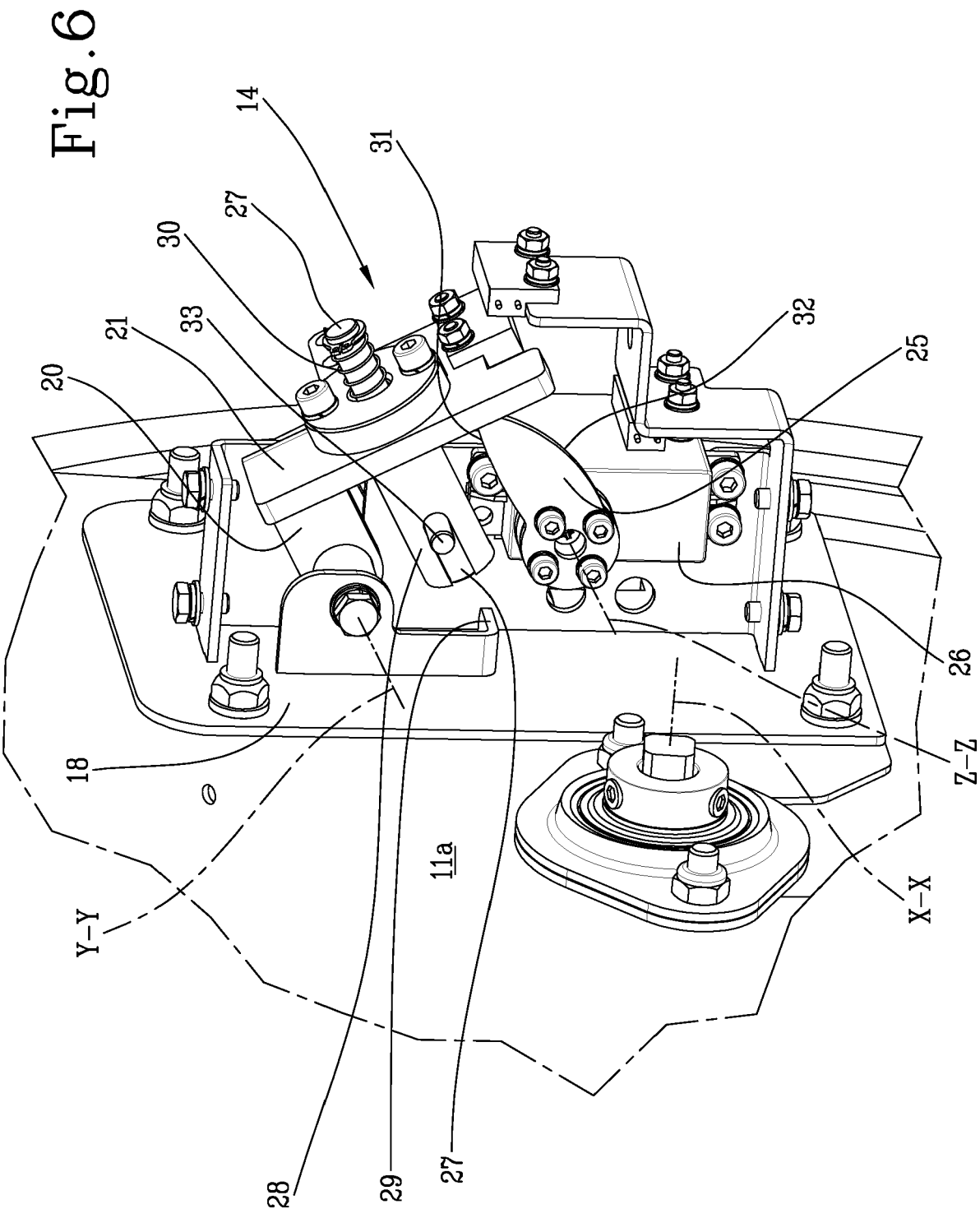
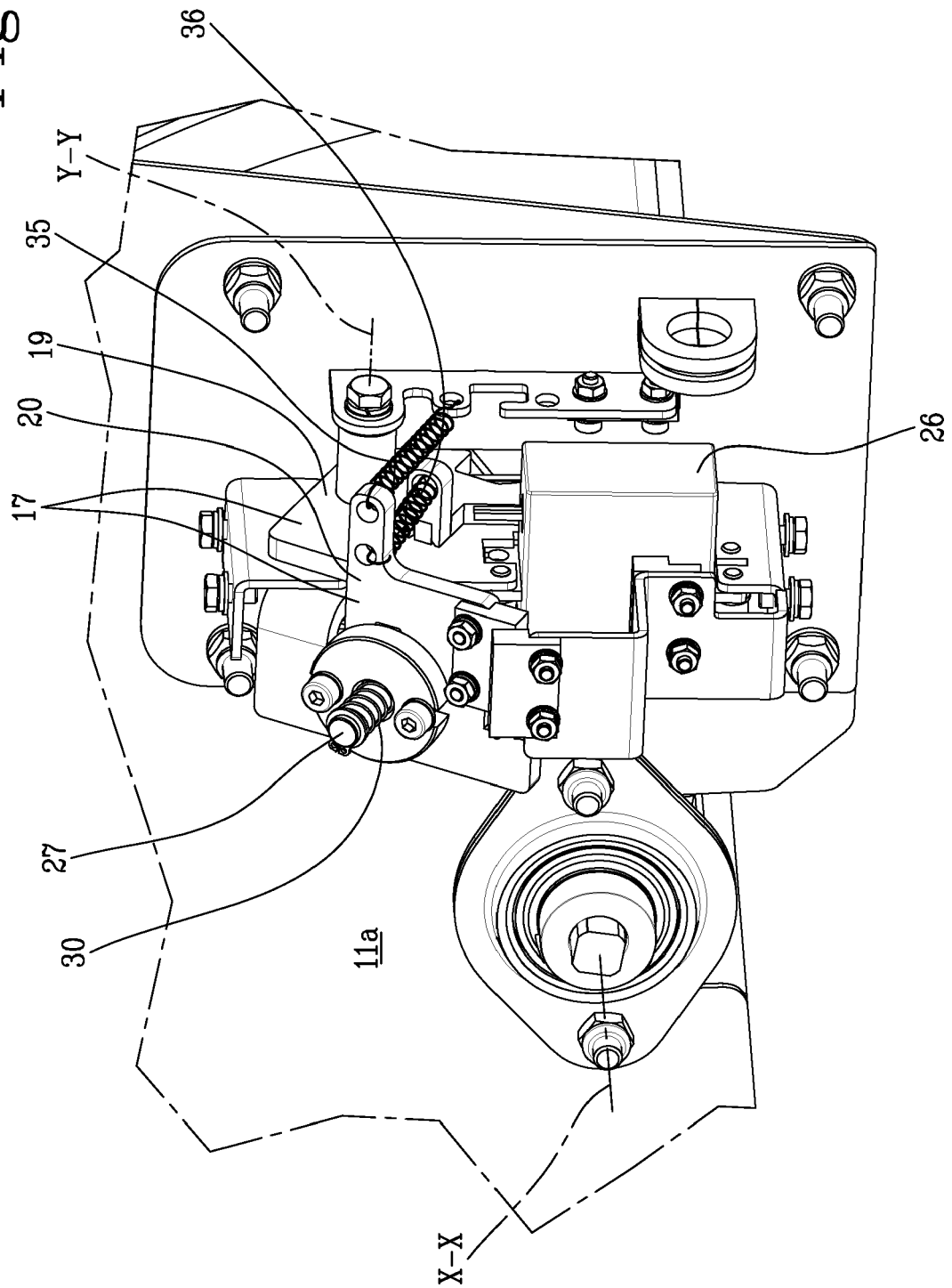


Fig. 7



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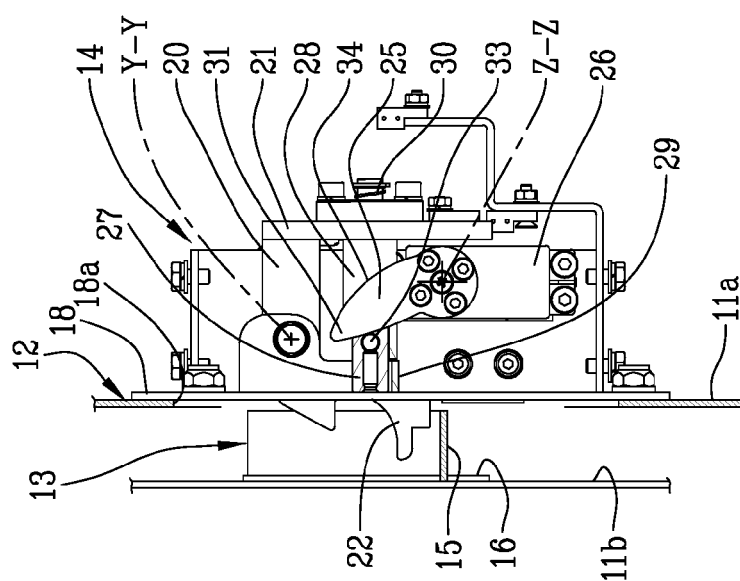


Fig. 9.

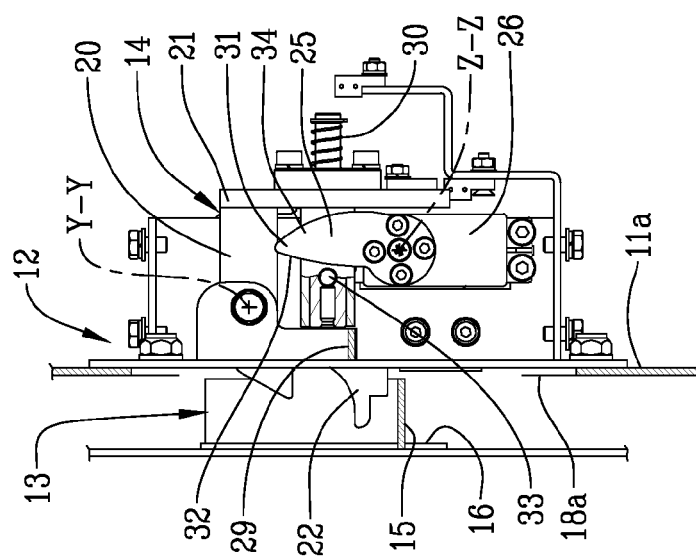


Fig. 10

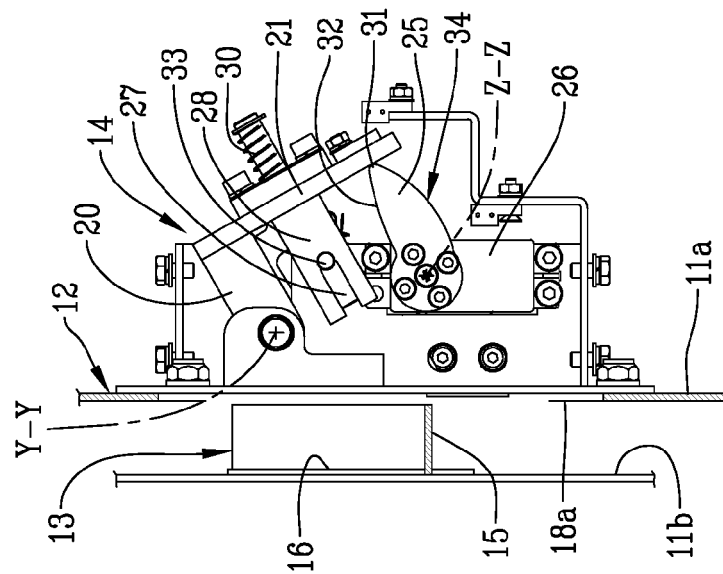


Fig.12

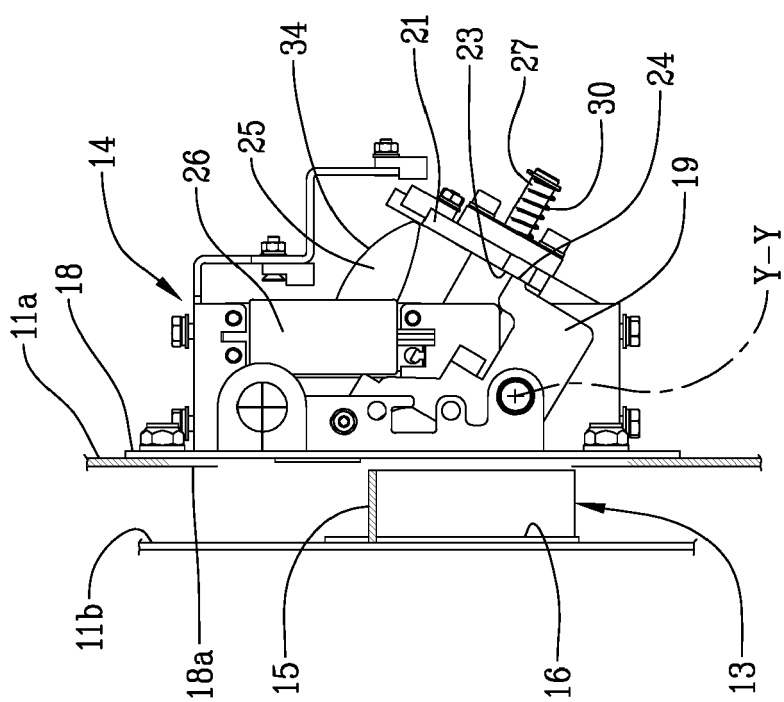
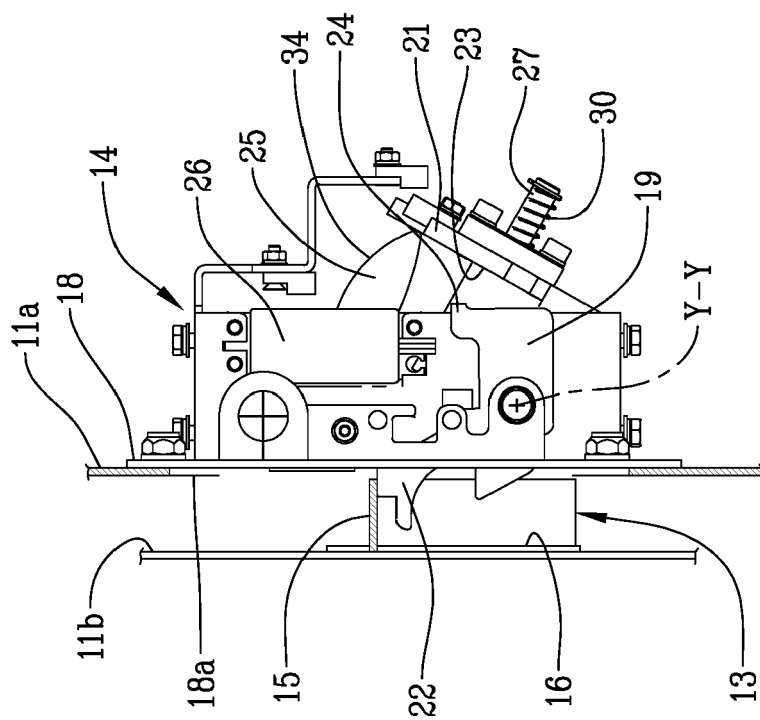


Fig.11





EUROPEAN SEARCH REPORT

Application Number
EP 21 18 5363

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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 97/05044 A1 (INGBUERO PETERS [DE]; PETERS KLAUS [DE]) 13 February 1997 (1997-02-13) * page 4, line 14 - page 12, last line * -----	1-13	INV. B65F1/10
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