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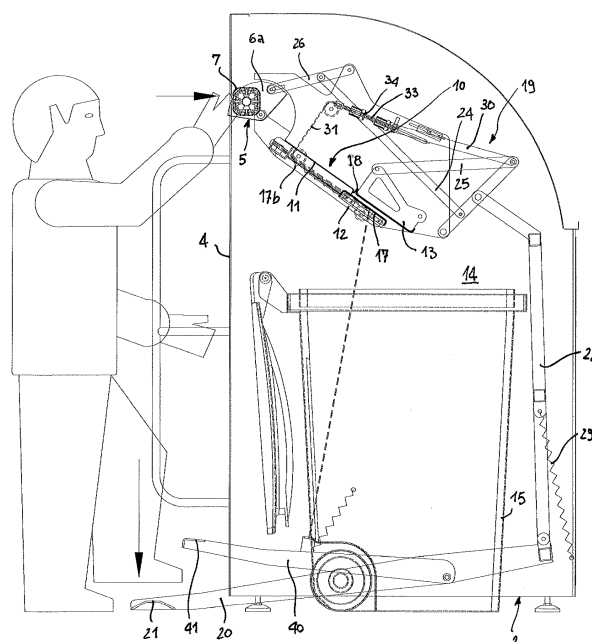
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(54) **COMPACTOR DEVICE FOR WASTE COLLECTION**

(57) A compactor device for waste collection, comprises a containment structure (2) having an introducing mouth (3) at its top. A loading tank (5) is arranged to close the introducing mouth (3) and movable between a receiving position of at least one waste (7) and a closure position. A transfer chute (10) has an upper portion (11) arranged to receive the waste (7) from the loading tank (5) and a lower portion (12) disposed above a fall compartment (14). A presser (13) is movable towards a lower

portion (12) of the transfer chute (10). A control mechanism (19) determines, by translating the actuation lever (20), a translation of the loading tank (5) from the closure position to the receiving position to allow the introduction of a waste (7) into the loading tank (5), and a movement of the presser (13) toward the transfer chute (10), so as to cause a crushing of the waste (7) previously transferred from the loading tank (5) to the transfer chute (10).

Fig.3



Description

[0001] The present invention relates to a compactor device for separate waste collection.

[0002] The device under consideration is particularly suitable for being installed in crowded public places, such as supermarkets, shopping malls, parks, trade shows, to promote and/or increase the efficiency of the separate collection of certain waste types.

[0003] The separate collection of municipal waste is usually carried out with the aid of special containers, each configured for the disposal of a certain waste type by users.

[0004] In order to regulate and/or promote the correct use of containers, it may be provided that they are equipped with user identification devices by entering a code assigned thereto, to enable the waste disposal only for authorized users and/or record the disposals made for statistical purposes and/or for the purpose of awarding credits.

[0005] In order to improve the efficiency of the separate collection of bottles and/or plastic and/or paper wrappers, metal cans, or other kinds of containers, it is often provided that the waste inserted into the introducing mouth of the container is brought to an electromechanically operated compaction assembly, which exerts a pressing action on the waste to reduce its size before conveying it into a fall compartment.

[0006] The object of the present invention is to provide an improved compactor device compared to the prior art in terms of simplicity of operation and/or use, and/or in terms of installation versatility.

[0007] In particular, the aim is to offer a compactor device which is suitable for carrying out the waste pressing by exploiting a thrust action required by the user himself in order to introduce the waste into the access compartment to the container.

[0008] The aim is also to offer a compactor device which ensures a high level of safety. In particular, for example, the aim is to prevent the introduction of waste into the access compartment from causing the user to bring his hands or other parts of his body close to the movable members intended for carrying out the pressing.

[0009] More specifically, the object of the present invention is a compactor device for the waste collection, as defined in claim 1.

[0010] Since no power supply is needed for carrying out the pressing, the device under consideration turns out to be more reliable in terms of safety.

[0011] Moreover, the device under consideration can thus be easily installed even in outdoor locations and/or in areas where a power supply line is not provided, nor easily available.

[0012] The mechanical action exerted by the user allows to get the crushing of a waste which has been previously introduced, possibly by a different user, simultaneously with the opening of the loading tank to enable the introduction of a new waste.

[0013] The invention may further comprise one or more of the following preferred features.

[0014] Preferably, the presser is configured to intercept the waste throughout the transfer chute.

5 **[0015]** Preferably, the presser is placed above the lower portion of the transfer chute.

[0016] Preferably, the presser is movable towards said lower portion starting from a rest position in which it has a thrust surface facing the transfer chute according to a tilted orientation, to stop on the lower portion the waste descending along the transfer chute.

10 **[0017]** Preferably, the lower portion of said transfer chute comprises a partition that is movable with respect to the upper portion between a first position in which it cooperates with the presser for compressing the waste, and a second position in which it is placed away from the presser to release the fall of the waste into the fall compartment.

15 **[0018]** Preferably, in the first position, the partition has a contrast surface at its top, facing towards the presser and operating against the waste during crushing.

20 **[0019]** Preferably, the partition is slidably guided with respect to the upper portion of the chute, and movable parallel to the latter.

25 **[0020]** Preferably, in the first position the movable partition extends essentially on the continuation of the upper portion of the transfer chute, away from the loading tank.

30 **[0021]** Preferably, in the second position, the contrast surface of the partition is placed parallel alongside to the upper portion, in an underlying position with respect to the latter.

35 **[0022]** Preferably, the partition is movable by the action of the control mechanism. Preferably, the control mechanism further comprises: a first tie rod mechanically connected to the actuation lever; a second tie rod mechanically connected to the partition; first and second grasping members carried by the first and second tie rods, respectively.

40 **[0023]** Preferably, the first tie rod is movable towards the second tie rod in consequence of a translation of the actuation lever towards the actuating position.

[0024] Preferably, the first and second grasping members are removably engageable with each other following the approaching of the first tie rod to the second tie rod, and mutually detachable following the translation of the actuation lever towards the release position, to allow a reciprocal moving away of the first and second tie rods.

45 **[0025]** Preferably, at least an auxiliary drive lever is provided for controlling the translation of the partition towards the second position.

[0026] Preferably, return members, which elastically counteract the translation of the actuation lever towards the actuating position, are also provided.

50 **[0027]** Preferably, relocation members configured to counteract the translation of the partition towards the second position are also provided. Preferably, said fall compartment is formed in a lower portion of the containment structure.

[0028] Preferably, a discharge port is defined between the presser in the rest position and the lower portion of the transfer chute.

[0029] Preferably, said discharge port is defined between the presser and the partition in the first position.

[0030] Preferably, there is also provided a release mechanism which can be activated by the user to determine the sliding of the partition towards the second position independently of the actuation of the presser and/or other members of the compactor device.

[0031] Preferably, the release mechanism comprises an auxiliary lever which can be activated by means of a respective release pedal, for controlling the movement of the partition by means of at least one respective auxiliary tie rod.

[0032] Further characteristics and advantages will become more apparent from the detailed description of a preferred, yet not limiting, embodiment of a compactor device for waste collection, according to the present invention.

[0033] Such description will be set forth hereinafter with reference to the accompanying drawings given only for illustrative and, therefore, nonlimiting purpose, wherein:

- figure 1 shows a perspective view of a compactor device for waste collection, according to the present invention;
- figure 2 shows the compactor device of figure 1 in a side sectional view;
- figure 2a shows an interrupted perspective view of a detail of the compactor device in the condition of figure 2;
- figure 3 shows a side sectional view of the compactor device during the waste loading by a user;
- figure 3a shows an interrupted perspective view of a detail of the compactor device in the condition of figure 3;
- figure 4 shows a side sectional view of the compactor device during the release of the actuation lever by a user;
- figure 5 shows the compactor device in a rest position in which the previously introduced waste has stopped near the area of action of a presser;
- figure 6 shows the compactor device during the loading of an additional waste by a user and the simultaneous crushing of the previously introduced waste;
- figure 7 shows the compactor device during the release of the actuation lever by a user, wherein the compacted waste falls into a fall compartment;
- figure 8 shows an emergency intervention phase by the user to determine the discharge of a waste into the underlying fall compartment.

[0034] With reference to the mentioned figures, the number 1 globally indicates a compactor device for the collection of waste 7, according to the present invention.

[0035] The compactor device 1 comprises a substan-

tially box-shaped containment structure 2, made e.g., of metallic material, having an introducing mouth 3 at its top. More specifically, the introducing mouth 3 is preferably formed in the upper part of a front wall 4 of the containment structure 2. The front wall 4, or at least the part thereof bearing the introducing mouth 3, preferably extends on a substantially vertical plane or with a slight tilt with respect to the vertical.

[0036] A loading tank 5, arranged so as to occlude the introducing mouth 3, is oscillatably secured to the containment structure 2. In other words, the loading tank 5 prevents a user from introducing his hands and/or objects directly into the containment structure 2 through the introducing mouth 3.

[0037] The loading tank 5 may be substantially shaped like a cylindrical sector, with a containment wall 6 thereof defining a concavity 6a suitable for receiving at least one waste 7, e.g., a plastic bottle, to be disposed of into the compactor device 1. The concavity 6a is preferably delimited between a pair of side walls 8 arranged at the opposite end edges of the containment wall 6. The loading tank 5 can be rotatably hinged to one or more supports 9 integral with respect to the containment structure 2, e.g., near its side walls 8, preferably around a substantially horizontal rotation axis X.

[0038] The loading tank 5 is movable about its rotation axis X between a receiving position (figures 3 and 6), in which it has its concavity 6a facing the outside of the containment structure 2 for receiving at least one waste 7, and a closure position (figures 2 and 5), in which said concavity 6a faces the containment structure 2 internally.

[0039] Near the loading tank 5, inside the containment structure 2, a transfer chute 10 is arranged, extending according to a tilted course away from the loading tank 5 itself. The transfer chute 10 has an upper portion 11 arranged to receive waste 7 from the loading tank 5, on a sliding surface 11a facing upwards. On the continuation of the upper portion 11, the transfer chute 10 also has a lower portion 12 arranged to cooperate with a presser 13 placed above the lower portion 12 itself and movable towards the latter.

[0040] The lower portion 12 is preferably arranged above a fall compartment 14 located in the lower part of the containment structure 2. In the fall compartment 14 a collection container 15 for the waste 7 disposed of into the compactor device 1 can be removably housed. An opening door 16 arranged in a rear wall of the containment structure 2, on the opposite side of the front wall 4, can facilitate the introduction and removal of the collection container 15.

[0041] In a possible alternative embodiment, not shown, the fall compartment 14 directly receives the waste in the absence of additional containers, and the containment structure 2 has a bottom which can be opened to allow the waste to be emptied in the dumpster of a motor vehicle, above which the entire device 1 is hoisted and kept suspended by a grasping, lifting and ground repositioning system, installed on the same ve-

hicle used to collect waste. In a manner known *per se*, the opening and closing movements of the opening bottom may be mechanically controlled by means of the same gripping, lifting and ground repositioning system.

[0042] Preferably, the lower portion 12 of the transfer chute 10 comprises a partition 17 slidably guided with respect to the upper portion 11 of the chute itself, and movable parallel to the latter.

[0043] The partition 17 is movable between a first position, in which it substantially extends on the continuation of the upper portion 11 of the chute, away from the loading tank 5, and a second position, in which the partition 17 is retracted towards the loading tank 5, below the upper portion 11. More particularly, in the first position the partition 17 has, at its top, its own contrast surface 17a facing upwards and overlooking a thrust surface 13a belonging to the bottom of the presser 13. The partition 17 is thus suitable for operating against the waste 7 during crushing, cooperating with the presser 13 itself to compress the waste 7.

[0044] The contrast surface 17a is preferably out of alignment with respect to the sliding surface 11a of the upper portion 11 of the transfer chute 10. A step 18 is preferably defined in the transition zone between the upper portion 11 and the lower portion 12 of the transfer chute 10.

[0045] In the second position, the contrast surface 17a of the partition 17 is placed parallel alongside to the upper portion 11, in an underlying position with respect to the latter. The partition 17 thus turns out to be away from the presser 13 to release the fall of the waste 7 in the fall compartment 14.

[0046] Preferably, the translation of the partition 17 towards the second position is opposed by return springs 17b, counterweights or other suitable repositioning members, operating for example between the partition itself and a fixed portion with respect to the upper portion 11 of the transfer chute 10.

[0047] At least one control mechanism 19, preferably housed above the fall compartment 14, is mechanically connected to an actuation lever 20 protruding out of the containment structure 2. In the illustrated example there is provided a pair of actuation levers 20 interconnected with each other by a pedal 21 extending horizontally near a lower area of the front wall 4.

[0048] Each actuation lever 20 is rotatably constrained to a side wall of the containment structure 2 for actuating, with its opposite end to the pedal 21, a thrust strut 22 operating on the control mechanism 19.

[0049] The control mechanism 19 preferably presents, next to each of the side walls 8 of the containment structure 2, a primary lever 23 having a first end 23a rotatably constrained with respect to the containment structure 2. A first connecting rod 24 and a second connecting rod 25 are constrained to the primary lever 23.

[0050] The first connecting rod 24 controls, on the opposite side of the primary lever 23, a secondary lever 26 operatively connected to the loading tank 5.

[0051] Preferably, the secondary lever 26 has a proximal end 26a constrained with respect to the containment structure 2, and a distal end 26b bearing a slot 27 crossed by a constraining pin 28 integral with one of the side walls 8 of the loading tank 5.

[0052] The second connecting rod 25 is, in turn, constrained to the presser 13, to control its rotation around its own hinging axis Y with respect to the containment structure 2.

[0053] The activation of the compactor device 1 provides that the actuation levers 20 translate between a rest position and an actuating position by a thrust action exerted by the user on the pedal 21. Preferably, at least one traction spring 29 or equivalent return members elastically counteract the translation of the actuation levers 20 towards the actuating position.

[0054] In the rest position (figures 2 and 5), the secondary lever 26 retains the loading tank 5 in its closure position. At the same time, the second connecting rod 25 holds the presser 13 in a respective rest position in which the thrust surface 13a faces the transfer chute 10, according to a tilted orientation with respect to the latter. In this case, the thrust surface 13a of the presser 13 is suitable for intercepting the descent of the waste 7 along the transfer chute 10, to stop it at the partition 17 of the lower portion 12 (figure 5).

[0055] In the activation position, *i.e.* with the pedal 21 lowered (figures 3 and 6), the secondary lever 26 causes a translation of the loading tank 5 from the closure position to the receiving position to allow the introduction of a waste 7 into the loading tank 5. At the same time, the second connecting rod 25 causes a translation of the presser 13 towards the transfer chute 10 to cause a crushing of a waste 7, if any, previously transferred from the loading tank 5 to the transfer chute 10.

[0056] Preferably, the control mechanism 19 is also configured to determine the movement of the partition 17 in order to facilitate the fall of the waste 7 into the fall compartment 14, preferably at the time when the presser 13 returns in the rest position.

[0057] For this purpose, it may be provided, for example, that the control mechanism 19 comprises at least one first tie rod 30 mechanically connected to the actuation lever 20. In the illustrated example there is provided a pair of first tie rods 30 in the form of rods spaced parallel to each other. Each first tie rod 30 is preferably connected to a second end 23b of the primary lever 23, *e.g.*, in a common hinge point C with the second connecting rod 25.

[0058] At least one second tie rod 31, *e.g.*, comprising one or more cables guided through respective return pulleys 32, is mechanically connected to the partition 17 of the transfer chute 10.

[0059] First and second grasping members 33, 34, which are removably engageable with each other, are respectively connected to the first and second tie rods 30, 31, preferably by means of a first and a second movable crosspiece 35, 36. In a possible embodiment, the

first and second grasping members 33, 34 may, for example, comprise hooking elements 33, e.g., in the form of arms which may elastically oscillate around respective hinge pivots 37 (figure 3a), which may be engaged and disengaged with respective engagement seats 34 carried by the second movable crosspiece 36, overcoming the resilient strength of contrast springs (not shown). Alternatively, the first and second grasping members 33, 34 may be magnetically coupled together.

[0060] The first tie rods 30 are movable towards the second tie rods 31 as a result of the translation of the actuation levers 20 towards the actuating position due to a thrust exerted on the pedal 21, so as to bring the first grasping members 33 into engagement with the second grasping members 34, as better shown in figure 3a.

[0061] Once the actuating position has been reached by the operating levers 20, the waste 7 is pressed against the partition 17 and the loading tank 5 turns the concavity 6a outwards from the containment structure in order to allow the introduction of a new waste. The action exerted by the user on the pedal 21 leads to the crushing of the waste previously introduced at the time when the loading tank has been opened for introducing the new waste 7.

[0062] When the pedal 21 is released, the action of the traction spring(s) 29 leads to the translation of the actuation levers 20 towards the release position, with the simultaneous translation of the presser 13 towards the rest position. The mutual engagement of the first and second grasping members 33, 34 causes the partition 17 to be translated by the action of the second tie rods 32 away from the presser 13, sliding below the upper portion 11 of the chute 10. After reaching the second position of the partition 17, the first grasping members 33 interfere on respective fixed cams 38 (figure 3a), which cause their disengagement from the second grasping members 34.

[0063] Thus, the movable crosspieces 35, 36, as well as the first and second tie rods 30, 31 end up drifting apart, at the time when the partition 17 is repositioned in the first position by the return springs 17b.

[0064] Figures 2, 3, 4, 5, 6 and 7 show the operating sequence of the compactor device 1 during the execution of two consecutive work cycles, starting from a hypothetical initial condition in which the device has never been used so far.

[0065] This initial condition is shown in Figure 2, in which the actuation levers 20 are in the rest position and keep the pedal 21 in the elevated position. The loading tank 5 is in the closure position, while the partition 17 is in the respective first position, below the presser 13 kept, in the rest position, elevated at a certain distance from the partition itself. No object is interposed between the presser 13 and the partition 17.

[0066] Figure 3 shows an operating step in which a user accesses the compactor device 1 by pressing the pedal 21 downwards. The stroke made by the actuation levers 20 leads to the actuation of the primary lever 23 of the control mechanism 19. Consequently, the secondary lever 26, controlled by the first connecting rod 24,

leads to the rotation of the loading tank 5 in the receiving position, so as to allow the introduction of a waste 7 inside the concavity 6a, through the introducing mouth 3 available on the front wall 4.

[0067] Simultaneously with the rotation of the loading tank 5, the second connecting rod 25 causes the presser 13 to be lowered towards the partition 17. At the same time, the movement of the primary lever 23 imposes, through the first tie rods 30, an approaching of the first movable crosspiece 35 to the second movable crosspiece 36, determining the mutual engagement of the first and second grasping members 33, 34.

[0068] Figure 4 shows the compactor device 1 during the ascent of the control pedal 21 following its release by the user. The traction springs 29 bring the actuation levers 20 back to the rest position, while the loading tank 5 is returned to the closure position by means of the control mechanism 19. Simultaneously, the primary lever 23 brings the first tie rods 30 back to the initial position and, due to the mutual engagement between the first and second grasping members 33, 34, the translation of the partition 17 towards the second position, below the first portion 11, is determined by means of the second tie rods 31.

[0069] Just as the partition 17 reaches the second position, the action of the fixed cams 38 determines the mutual disengagement of the first and second grasping members 33, 34 with the resultant returning of the partition 17 in the first position as shown in figure 5.

[0070] The rotation of the loading tank 5 towards the closure position drops the waste 7 onto the first portion 11 of the transfer chute 10. The waste 7 descends along the chute 10 but, before having completely passed the first portion 11, the partition 17 has already repositioned in the first position. The fall of the waste 7 into the collection compartment 14 is consequently intercepted by the presser 13, which in the meantime has returned to its rest position. Therefore, the waste 7 is still engaged between the partition 17 and the presser 13.

[0071] Figure 6 shows the compactor device 1 when a user activates the pedal 21 again to introduce a new waste 7 into the loading tank 5. When the pedal 21 is actuated again, the lowering of the presser 13 towards the operating position causes the previously introduced waste 7 to be pressed against the partition 17. The step 18 arranged between the upper portion 11 and the lower portion 12 of the transfer chute 10 facilitates the effective retention of the waste 7, preventing it from rising up along the transfer slide 10 during the crushing step.

[0072] As can be seen in figure 6, when the pedal 21 released by the user goes back to the elevated position, the resultant translation of the partition 17 towards the second position facilitates the fall of the crushed waste 7 into the collection container 15. At the same time, the repositioning of the loading tank 5 in the closure position releases the new waste 7 onto the upper portion 11 of the transfer chute 10.

[0073] The new waste 7 descends along the transfer chute 10 and will be stopped between the presser 13

relocated in the operative position and the partition 17 relocated in the first position, again arranging the compactor device 1 in the condition of figure 5 for the execution of further operating cycles.

[0074] In the illustrated example, the compactor device 1 is designed for the collection of plastic bottles, and the sizes of its components are studied for the purpose of the treatment of this waste type.

[0075] In order to avoid jams due to the introduction of relatively small foreign bodies, it can advantageously be provided that between the presser 13 in the rest position and the lower part 12 of the transfer chute 10, *i.e.*, between the presser 13 and the partition 17 in the first position, a discharge port L is defined. The discharge port L has a greater amplitude than the minimum size detectable on the waste 7 to be disposed into the compactor device 1. It is thereby prevented that the non-crushed waste 7 may fall into the collection compartment 14. However, the discharge port L is large enough to permit the passage of smaller bodies, such as pieces of wood, stones or other objects other than those whose collection the compactor device 1 is designed for.

[0076] In order to avoid permanent jams of the compactor device due to the introduction of full and closed bottles, and/or foreign bodies of sizes comparable to those of waste 7, an unlocking mechanism 39 which can be activated by the user is also preferably provided, to determine the sliding of the partition 17 towards the second position independently of the actuation of the presser 13 and/or other members of the compactor device 1. Preferably, the release mechanism 39 comprises an auxiliary lever 40 which can be activated by means of a respective release pedal 41, for controlling the movement of the partition 17 by means of at least one respective auxiliary tie rod 42.

[0077] In the illustrated example, an auxiliary opening 43 is arranged on the front wall 4 for introducing caps or other closure elements previously removed from the bottles 7 to facilitate their crushing. Downstream of the auxiliary opening 43, the caps may be conveyed to an auxiliary container, not shown.

[0078] The compactor device 1 may also be provided with a user identification system by reading IRFD cards or other type of code, *e.g.*, through a special reader 44 and a printing unit housed in the containment structure to issue through a slit 45 receipts attesting the use of the compactor device 1. The reader 44 and the printer may be powered by batteries which may be recharged, if needed, using photovoltaic panels, without no need of connections to power supply networks.

Claims

1. A compactor device for waste collection (7), comprising:
a containment structure (2) having an introducing mouth (3) above:

a loading tank (5) arranged to close the introducing mouth (3) and movable between a receiving position in which it exhibits a concavity (6a) facing externally to the containment structure (2) to receive at least one waste (7), and a closure position in which said concavity (6a) faces internally to the containment structure (2);
a transfer chute (10) having an upper portion (11) arranged to receive the waste (7) from the loading tank (5) and a lower portion (12) disposed above a fall compartment (14);
a presser (13) movable towards a lower portion (12) of the transfer chute (10);
an actuation lever (20) protruding externally to the containment structure (2);
a control mechanism (19) mechanically connected to the actuation lever (20) to determine, upon translation of the actuation lever (20) from a release position to an actuating position, a movement of the loading tank (5) from the closure position to the receiving position to allow introduction of said waste (7) into the loading tank (5), and a movement of the presser (13) toward the transfer chute (10) so as to cause a crushing of the waste (7) previously transferred from the loading tank (5) to the transfer chute (10).

2. A device according to claim 1, wherein the presser (13) is configured to intercept the waste (7) along the transfer chute (10).
3. A device according to claim 1 or 2, wherein the presser (13) is positioned above the lower portion (12) of the transfer chute (10).
4. A device according to one or more of the preceding claims, wherein the presser (13) is movable towards said lower portion (12) starting from a rest position in which it has a thrust surface (13a) facing the transfer chute (10) according to an inclined orientation, to stop on the lower portion (12) the waste (7) descending along the transfer chute (10).
5. A device according to one or more of the preceding claims, wherein the lower portion (12) of said transfer chute (10) comprises a partition (17) that is movable with respect to the upper portion (11) between a first position in which it cooperates with the presser (13) for compressing the waste (7), and a second position in which it is placed away from the presser (13) to release fall of the waste (7) into the fall compartment (14).
6. A device according to claim 5, wherein the partition (17) is slidably guided with respect to the upper portion (11) of the slide, and movable parallel to the latter.

7. A device according to claim 5 or 6, wherein in the first position the movable partition (17) extends essentially on the continuation of the upper portion (11) of the transfer chute (10), away from the loading tank (5). 5
8. A device according to one or more of claims 5 to 7, wherein in the second position the partition (17) is placed parallel alongside to the upper portion (11) in an underlying position with respect to the latter. 10
9. A device according to one or more of the claims from 5 to 8, wherein the partition (17) is movable on the action of the control mechanism (19). 15
10. A device according to one or more of the claims from 5 to 9, wherein the control mechanism (19) further comprises:
- a first tie rod (30) mechanically connected to the actuation lever (20); 20
 - a second tie rod (31) mechanically connected to the partition (17);
 - first and second grasping members (33, 34) carried respectively by the first and second tie rods (30, 31). 25
11. A device according to claim 10, wherein:
- the first tie rod (30) is movable towards the second tie rod (31) in consequence of a translation of the actuation lever (20) towards the actuating position; and 30
 - the first and second grasping members (33, 34) are removably engageable with each other following approaching of the first tie rod (30) to the second tie rod (31), and mutually detachable following the movement of the actuation lever (20) towards the release position, to allow a reciprocal moving away of the first and second tie rods (30, 31). 35 40
12. A device according to one or more of claims 5 to 11, further comprising at least one auxiliary drive lever (40) for controlling displacement of the partition (17) to the second position. 45
13. Device according to one or more of the preceding claims, wherein a discharge port (L) is defined between the presser (13) in the rest position and the lower portion (12) of the transfer chute (10). 50

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Fig.1

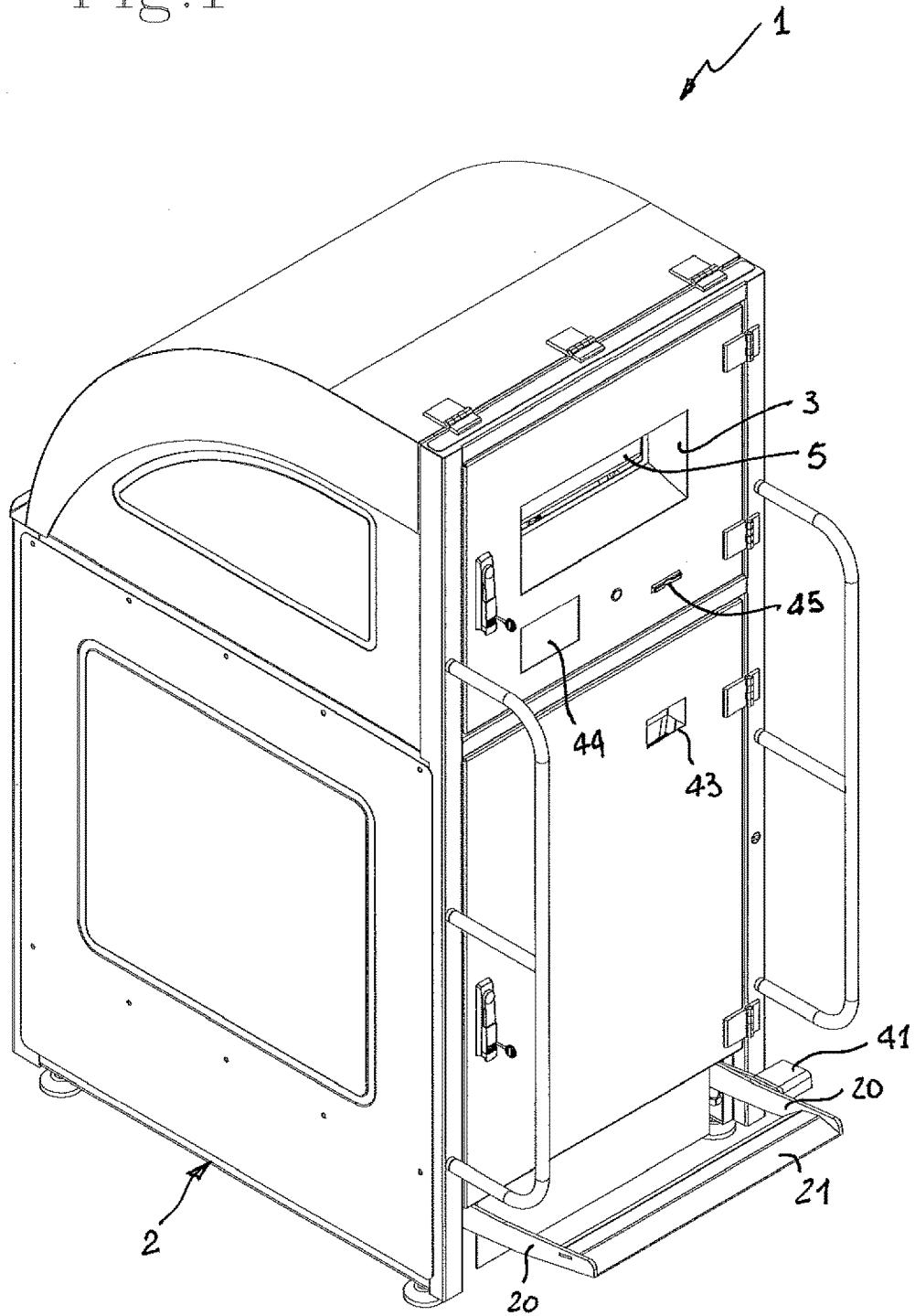
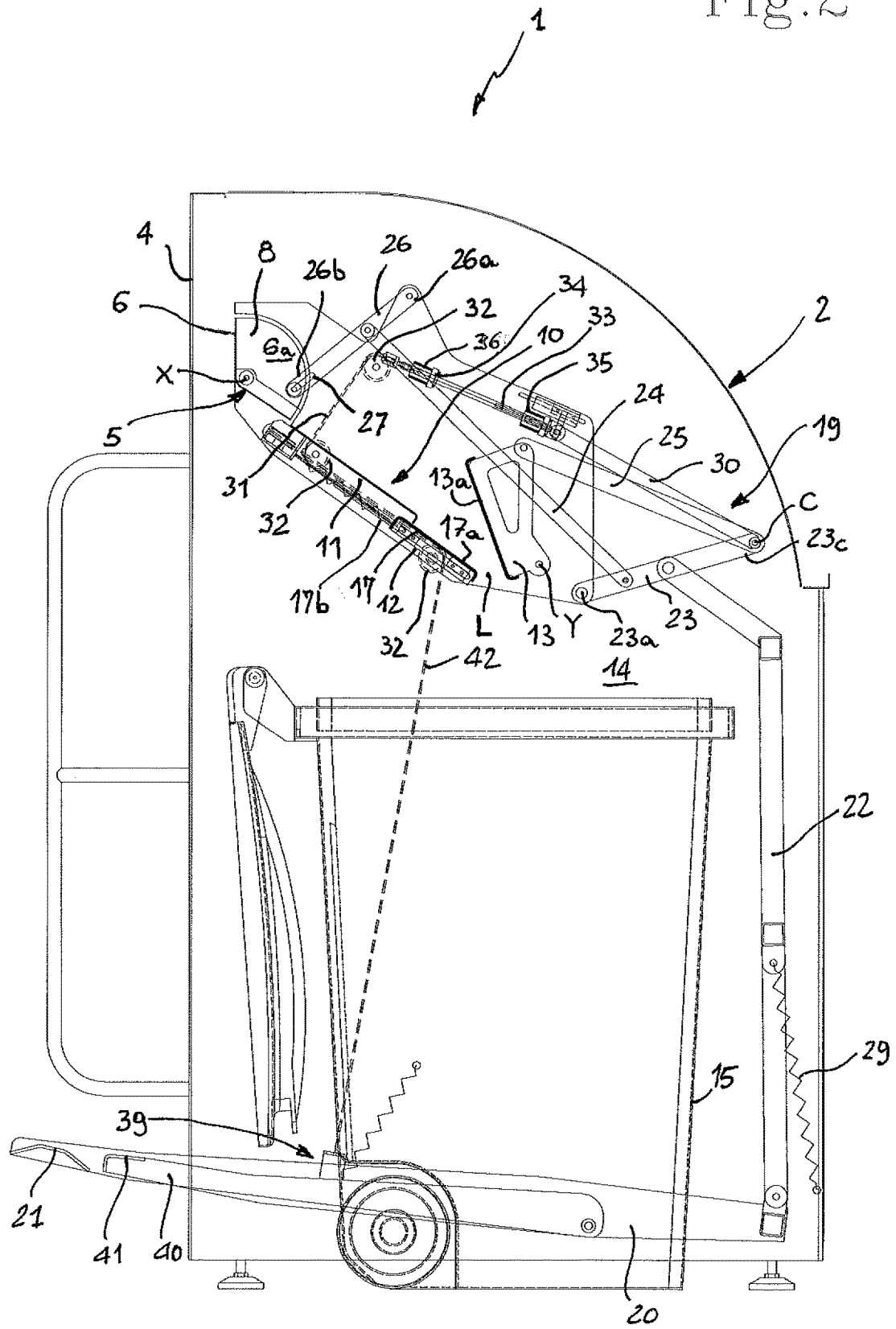


Fig.2



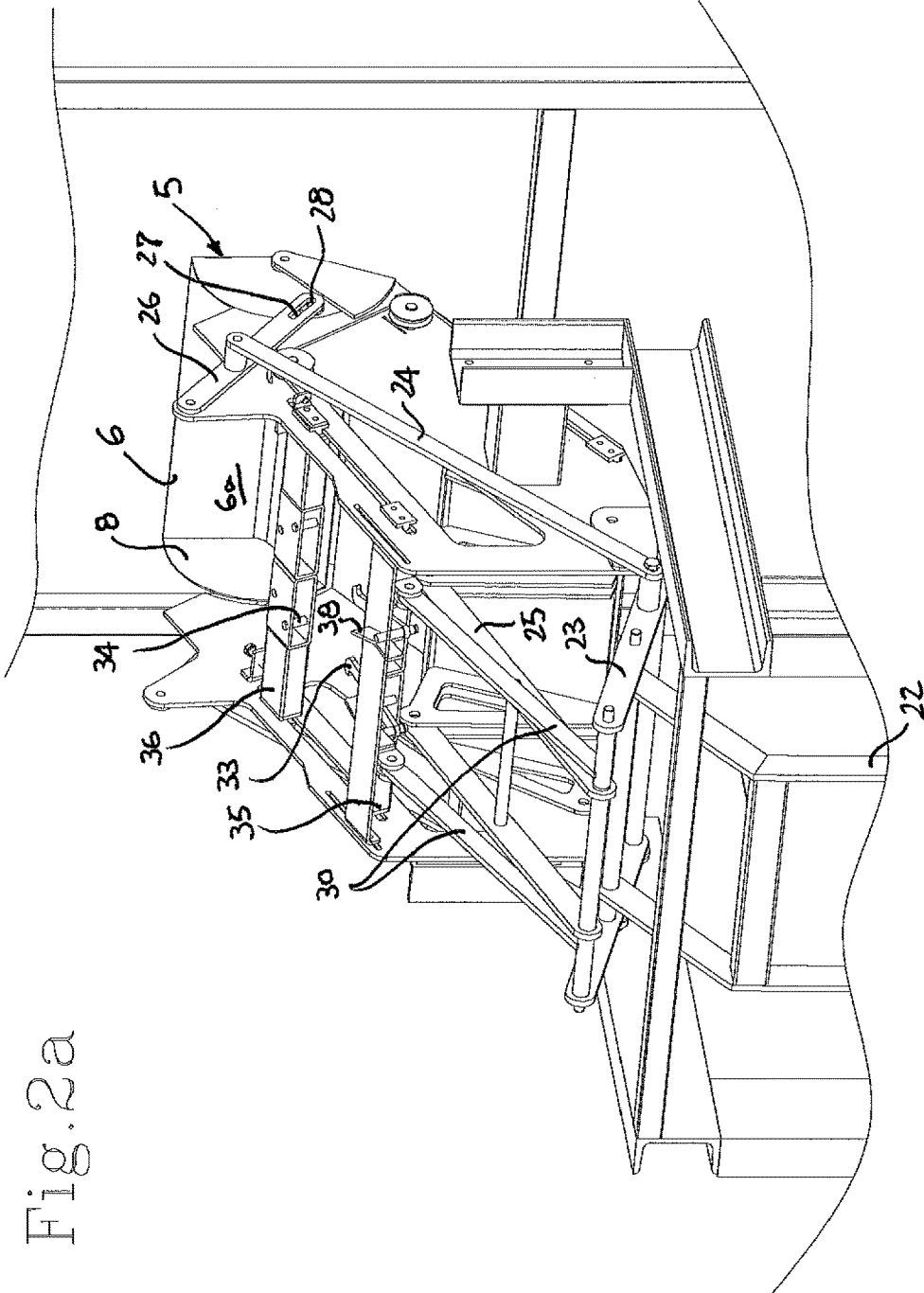
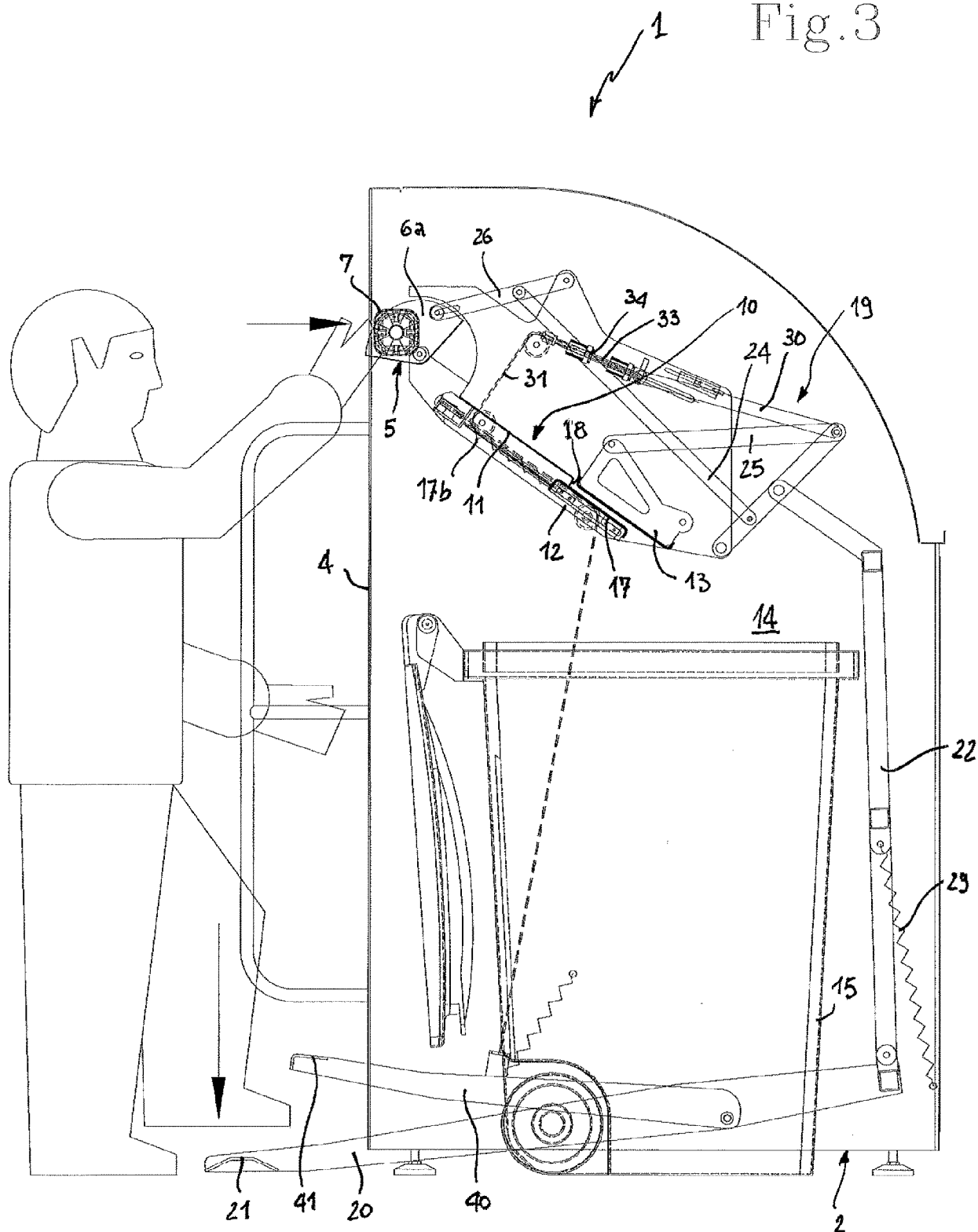
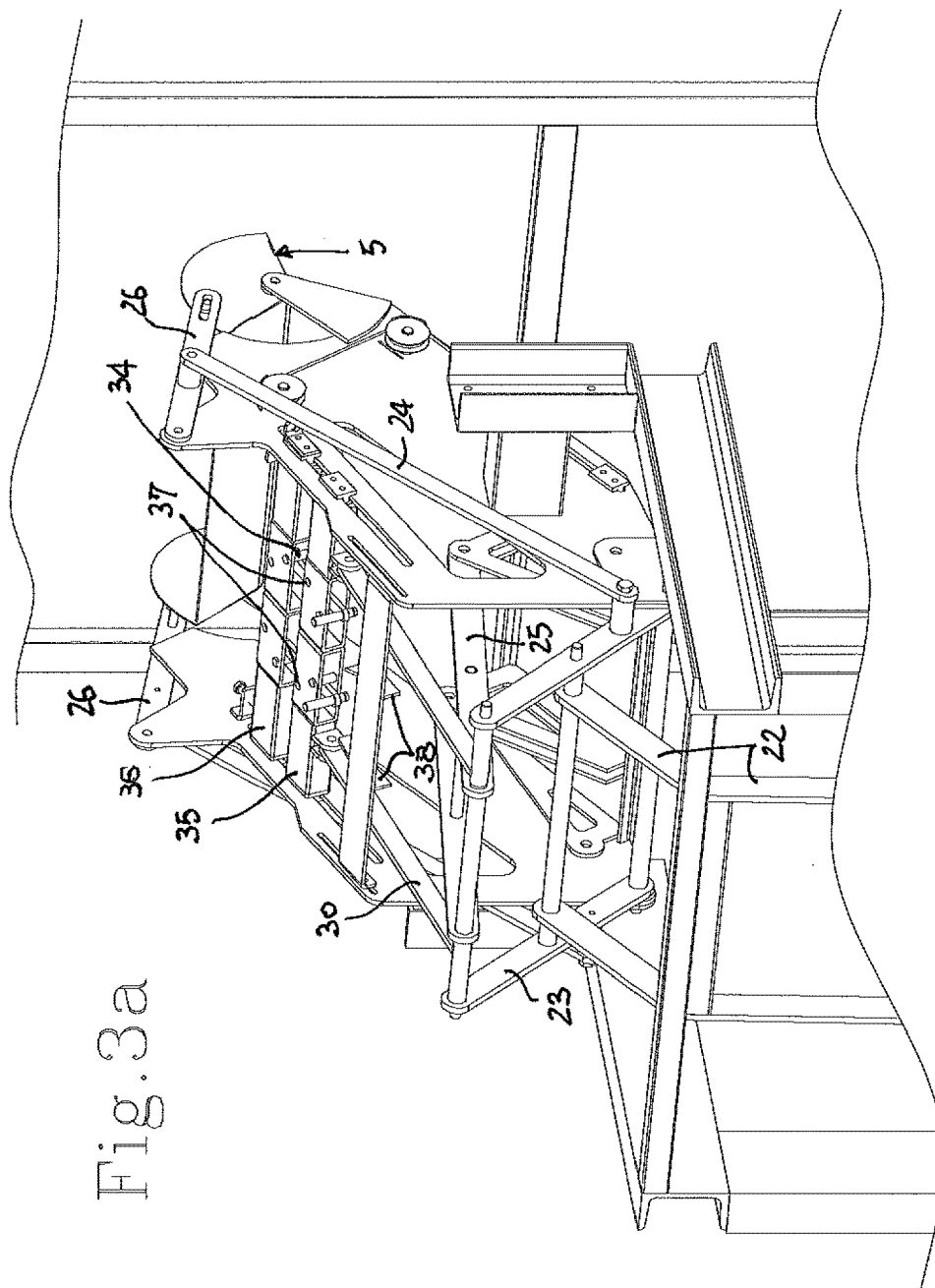


Fig. 2a

Fig.3





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Fig.4

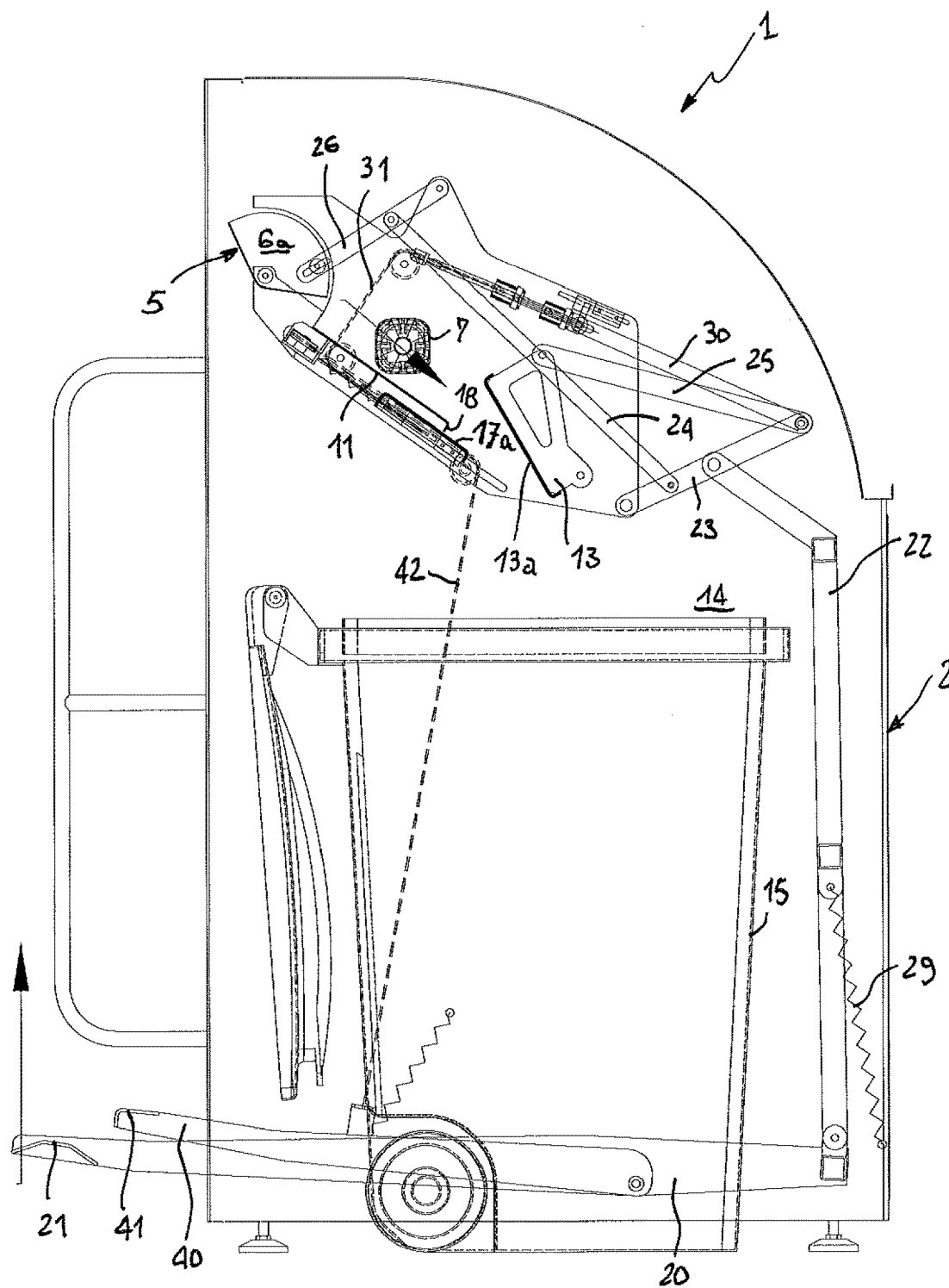


Fig.5

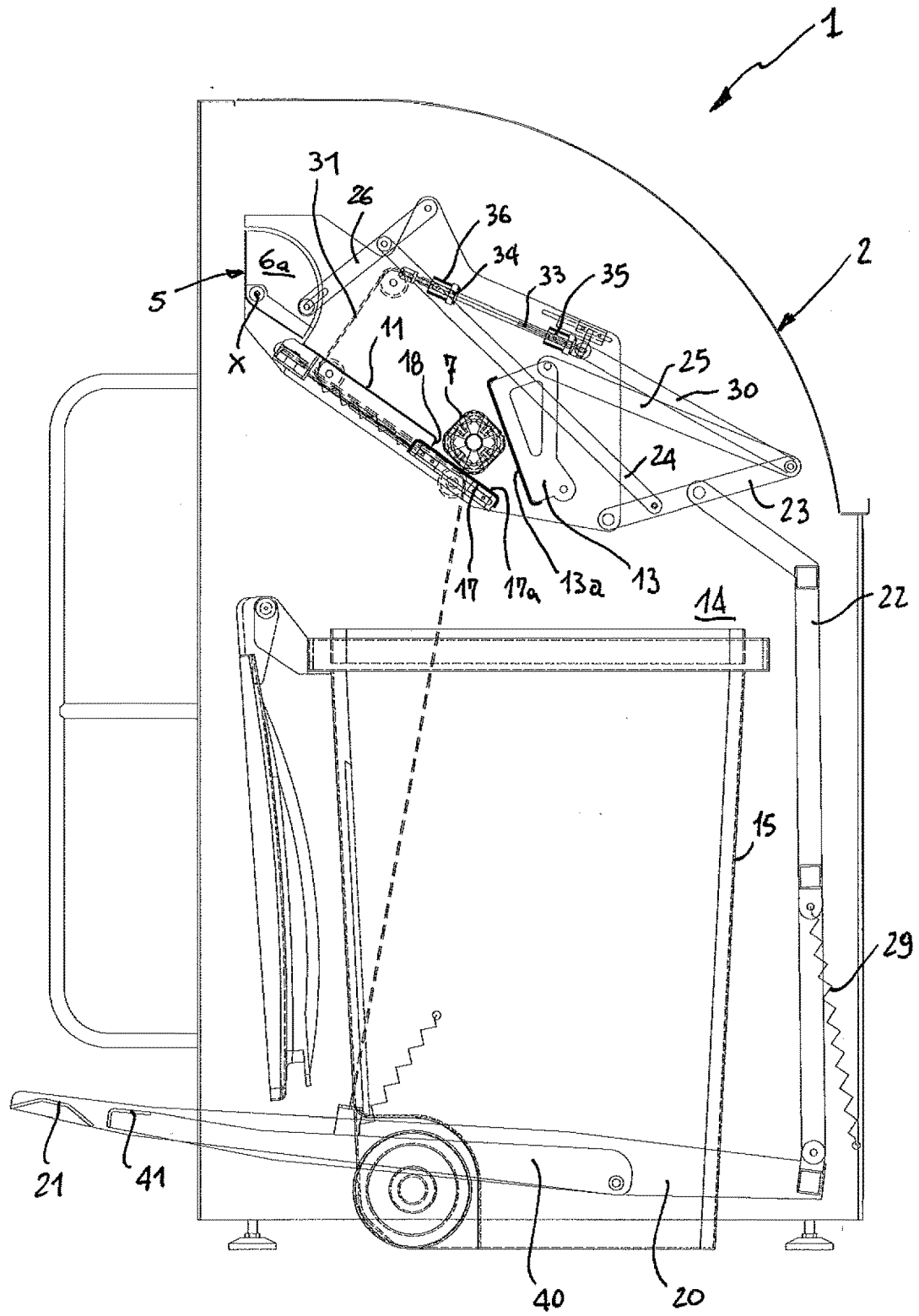


Fig.6

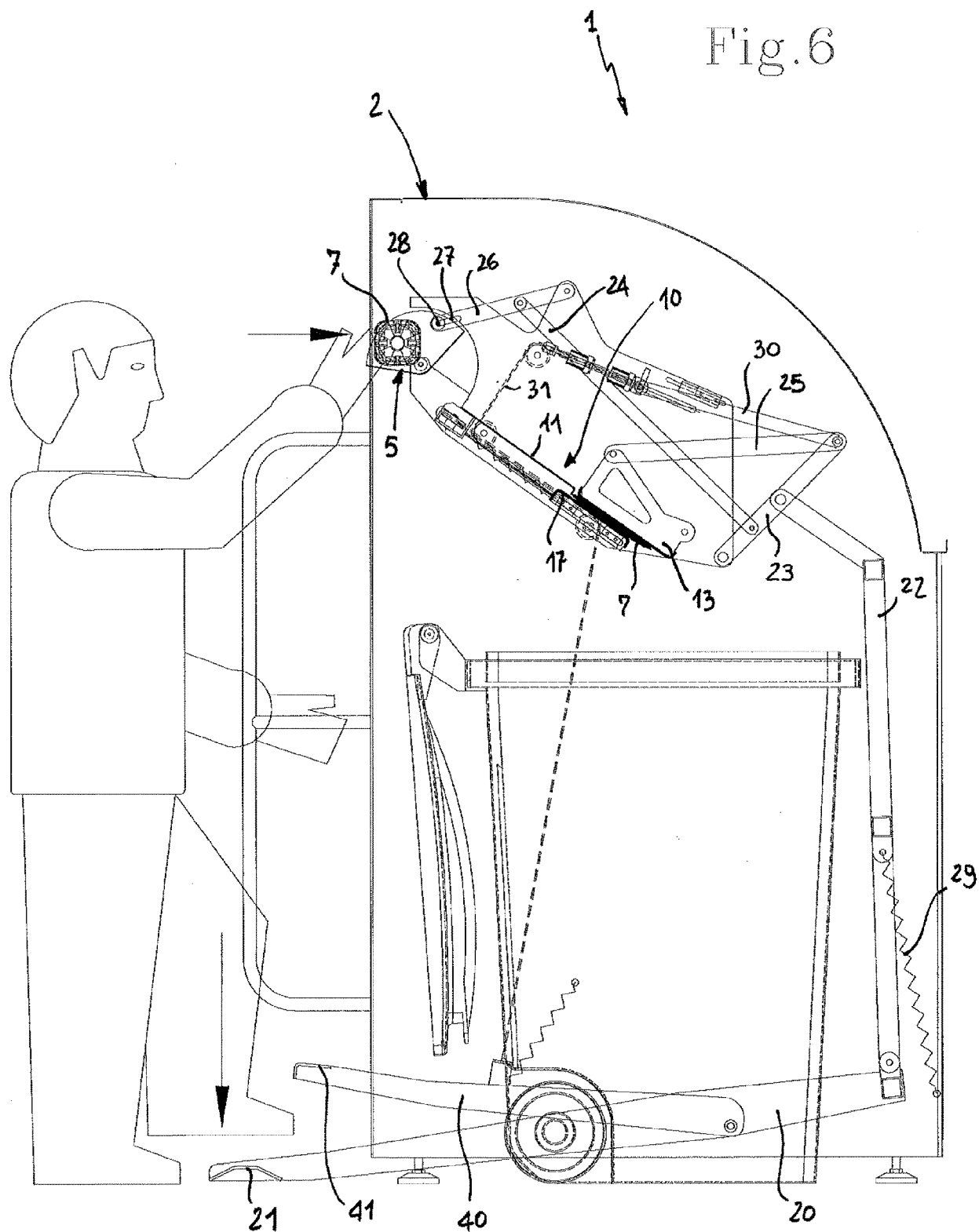


Fig. 7

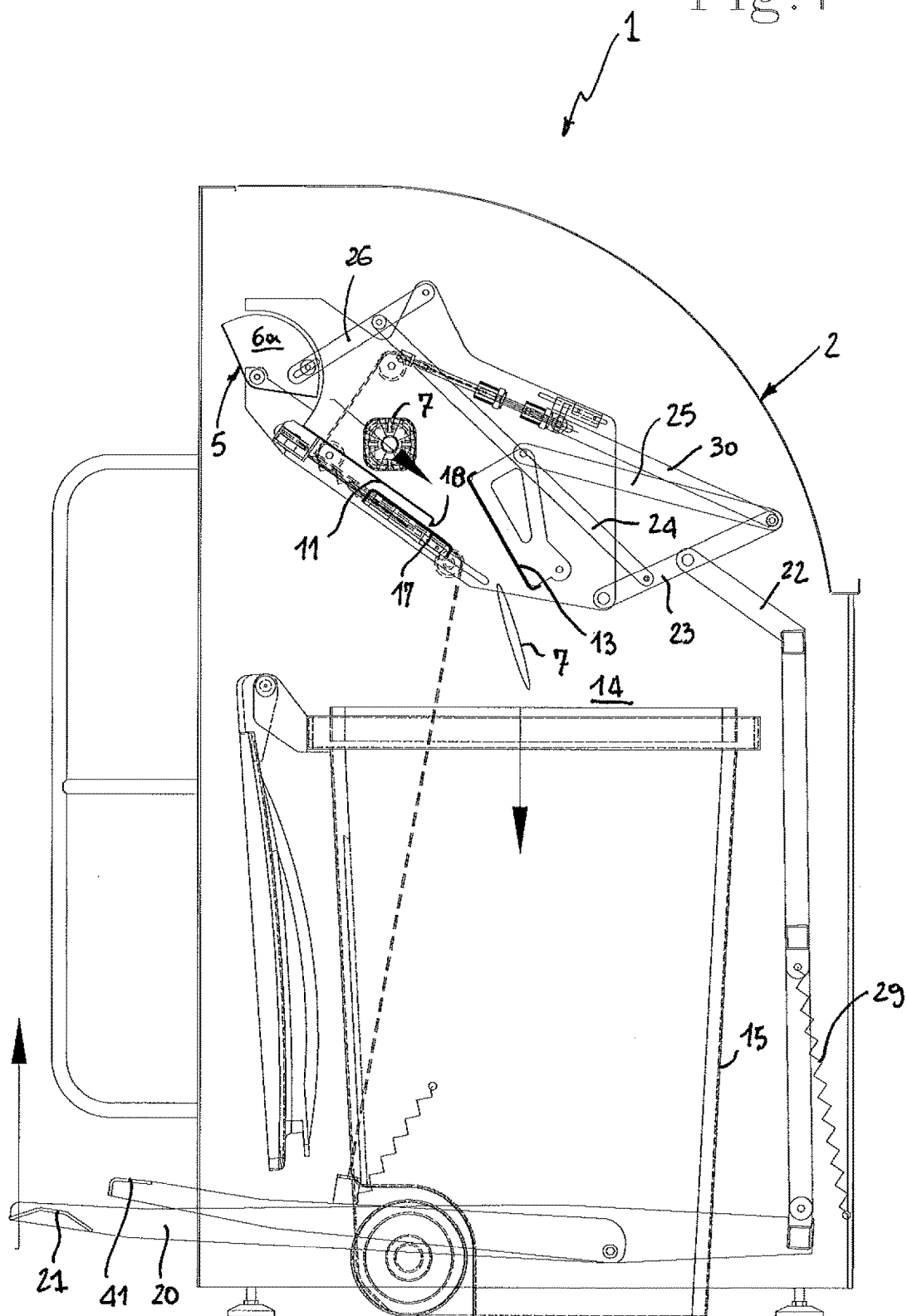
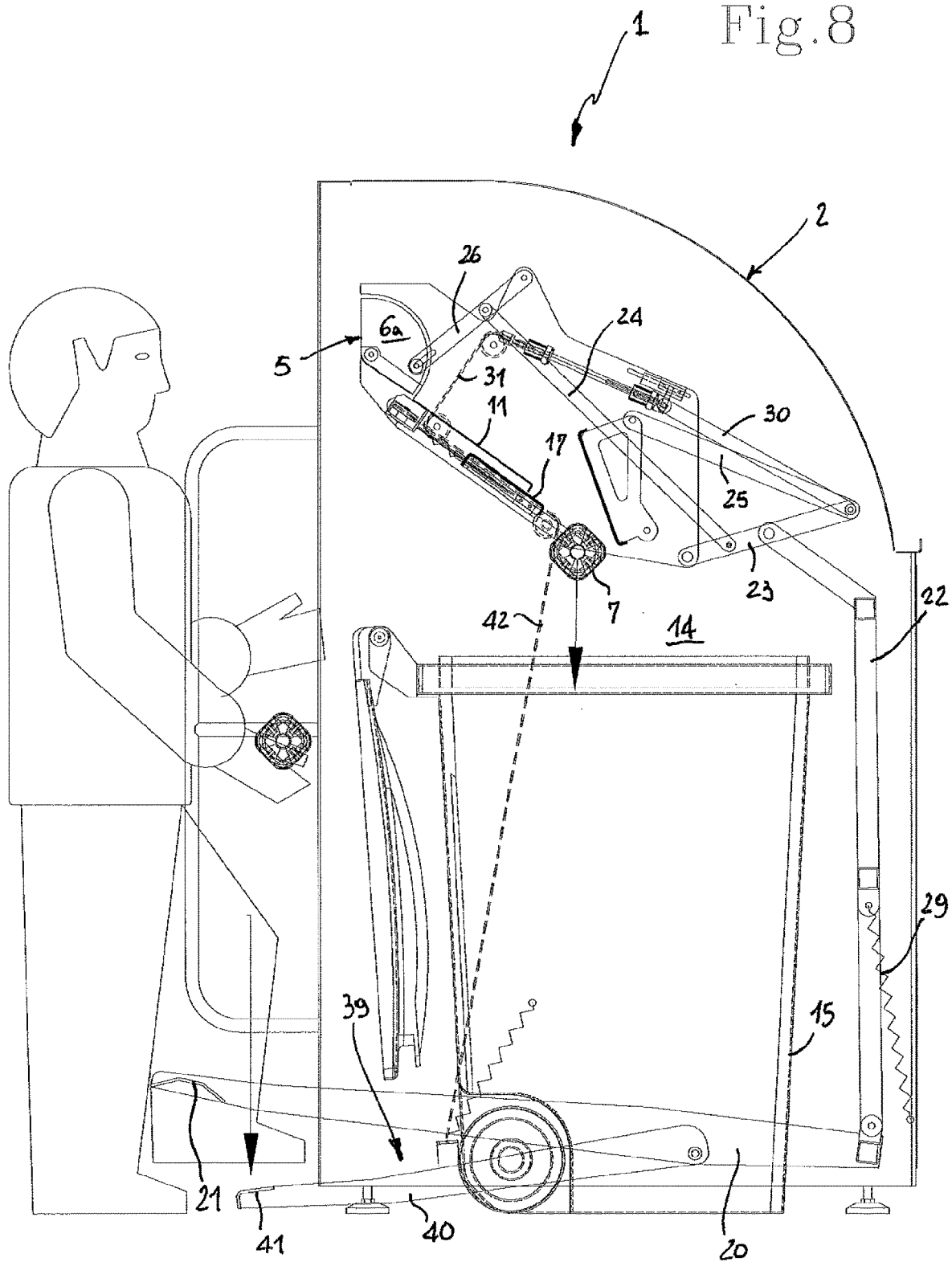


Fig. 8





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