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(54) EQUIPMENT FOR EMPTYING BINS INTO WASTE CONTAINERS

(57) The equipment (1) comprises a lifting arm (9) having an upper end portion (9a) rotatably engaged to a support structure (6) about a horizontal overturning axis (X1), between a lowered position and an emptying position wherein it extends in an upward inclined direction. The lifting arm (9) provides at the bottom a base coupling (15) configured to engage a lower edge (22) of a bin (3). The upper end portion (9a) provides an upper coupling (23) for the engagement of a coupling eyelet (25) provided at the top of the bin (3). To prevent accidental falling of the bin (3) to the benefit of safety, upper locking devices (38) lock the upper coupling (23) during tipping, while lower locking devices (50) comprising a harpoon (52) cooperating with a matching seat (51) lock the base coupling (15) to the lifting arm (9).

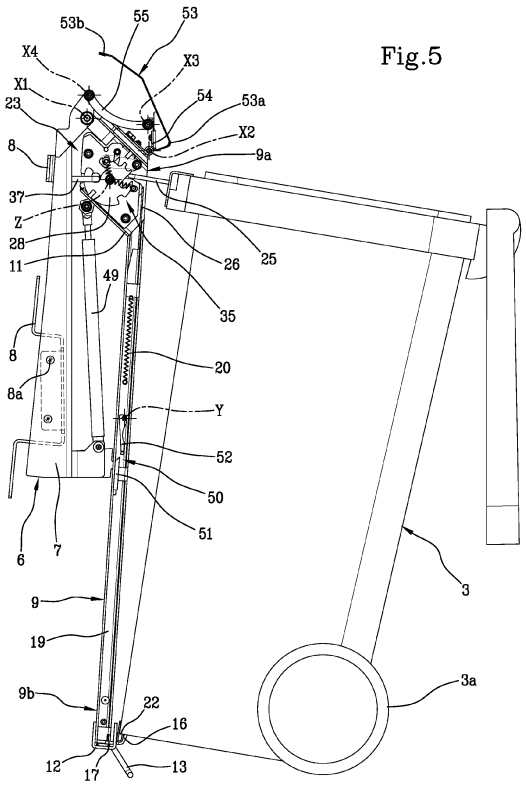

Fig.5

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Description

[0001] The present invention relates to equipment for emptying bins in waste containers. In particular, the invention is conveniently used to facilitate the handling of waste bins of such a size and weight that they cannot be easily handled for the purpose of emptying into larger waste containers, e.g. of the dumpster type.

[0002] As is well known, the organised collection of municipal waste in many cases involves the use of special containers, e.g. of the "bell" shaped or dumpster type, appropriately located in different areas of urban land - usually on a pavement and/or by the roadside - to enable citizens to dispose of waste.

[0003] The containers are periodically emptied into suitably equipped vehicles, which transport the waste to the respective treatment sites.

[0004] The use of these containers by citizens involves the regular delivery of waste in relatively small quantities, such that they can be easily transported and handled by a person.

[0005] However, for certain types of users, e.g. bars, restaurants, shops or the like, where waste production is typically higher than in households, transferring waste to dumpsters can be more problematic. In fact, in these circumstances, delivery operations involve the transfer of far greater quantities of waste than those associated with a normal household. In such circumstances, the waste may be temporarily accumulated in special bins, typically wheeled bins of the type prescribed in UNI-EN 380 with a capacity of between 120 and 360 litres, to be transferred to the container for public use at the end of the shift or working day.

[0006] In order to facilitate the emptying of the bins into the containers, equipment with a lifting arm hinged to a support structure that is attached to one of the side walls of the container for public use has been proposed. The lifting arm has a base coupling onto which the lower edge of the bin is hooked, and an upper coupling that incorporates a coupling mechanism configured to retain a coupling eyelet protruding from an upper edge of the bin. To protect the coupling mechanism against the entry of foreign objects and/or tampering, the base coupling has a gripping element attached to a movable rod inside the lifting arm. Engaging the bin at the base coupling causes the gripping element to lower and consequently the rod to slide, which in turn causes the opening of an inlet opening provided in the lifting arm at the height of the upper coupling. Pushing the bin towards the lifting arm causes the insertion of the coupling eyelet of the inlet opening and the engagement thereof by the upper coupling. At this point, the lifting arm can be rotated about its hinging axis on the support structure, so that the waste is tipped into the container.

[0007] The applicant has noted that the known equipment described above has certain limitations and drawbacks.

[0008] First of all, the mobility of the base coupling is a source of potential danger in that the gripping element, e.g. because it is inadvertently touched during the tipping manoeuvre or for other reasons, can undergo uncontrolled displacement and cause the base coupling to disengage from the bin while the latter is suspended in an upside-down position and still loaded with waste. Such circumstances represent an obvious safety limitation, as disengaging the bottom edge of the bin in an inverted condition can easily result in the bin falling over and/or serious structural damage at the top coupling. This situation is aggravated by the fact that the engagement of the coupling eyelet by the coupling mechanism is rather unstable, and unsuitable for firmly holding the bin at its upper edge.

[0009] A further limitation of the state of the art stems from the fact that the known equipment is designed to be associated with bell-shaped containers, which are equipped with a movable bottom for emptying purposes, and have upward sloping outer side walls. In this type of container, the inclination of the side walls and the typical positioning of the waste delivery openings make it easier to spill the contents of the bin inside the container. The applicant has, however, found that the known equipment is unsuitable for installation on containers other than bell-type ones, e.g. on dumpster containers where the side walls have downwardfacing outer surfaces and where it is difficult to properly convey waste spilled from the bin into the container.

[0010] The object of the present invention is substantially to overcome the problems encountered in the prior art.

[0011] In particular, the aim is to propose equipment for emptying bins with improved reliability of use, both in relation to safety for the user and in relation to safeguarding mechanical components from unwanted damage. A further aim of the invention is to propose a piece of equipment that can be easily and effectively adapted to operate on any container, be it a bell-shaped type, a dumpster type, or the like.

[0012] These purposes and others, which will better appear in the course of the following description, are substantially achieved by equipment for emptying bins into waste containers, comprising: a support structure rigidly engageable to a waste container; a lifting arm having an upper end portion rotatably engaged to the support structure about a horizontal overturning axis, and movable between a lowered or rest position wherein it extends in a substantially vertical direction, and an emptying or raised position wherein it extends in an upward inclined direction away from the overturning axis; a base coupling arranged at a lower end portion of the lifting arm opposite the upper end portion, and configured to engage a lower edge of a bin; an upper coupling arranged close to the upper end portion of the lifting arm and arranged to engage a coupling eyelet provided at the top of the bin, and upper locking devices to lock the upper coupling to the lifting arm at least when the lifting arm is moved away from the lowered position towards the emptying position.

[0013] Preferably, lower locking devices are also provided to lock the base coupling to the lifting arm at least when the lifting arm is moved away from the lowered position.

[0014] The combined action of the lower and upper locking devices promotes a stable and secure engagement of the bin during emptying.

[0015] In at least one convenient embodiment, the equipment may also have one or more of the hereinafter characteristics.

[0016] Preferably, the base coupling comprises a gripping element slidably engaged to said lower end portion and movable parallel to a longitudinal extension of the lifting arm between a waiting position wherein it is moved towards the upper end portion and a working position wherein it is moved away from the upper end portion and elastic return elements operating between the lifting arm and the gripping element to push it towards the waiting position.

[0017] Preferably, the lower locking devices are selectively activatable following a lifting of the lifting arm towards the empty or raised position, in order to lock the base coupling relative to the lifting arm.

[0018] Preferably, the lower locking devices are deactivated when the lift arm is in the lowered position, in order to unlock the base coupling relative to the lifting arm.

[0019] Preferably, the lower locking devices comprise: a matching seat provided by the lifting arm; a tilting harpoon rotatably engaged relative to the gripping element, rotatably free about a tilting axis parallel to the overturning axis and movable by gravity following the movement of the lifting arm, between an inserted position wherein it engages the matching seat to inhibit the movement of the gripping element towards the working position, and a released position in which it disengages the matching seat. Preferably, the lifting arm has an inlet opening accessible at the bin coupling eyelet, and wherein the base coupling is integral with a rod slidably engaged along the lifting arm and providing, on the opposite side to the base coupling, a shutter movable jointly with the base coupling between a closed position in which it closes an inlet opening and an opening position in which it disengages the inlet opening to free access to the coupling eyelet.

[0020] Preferably, the harpoon is tiltably provided by said rod.

[0021] Preferably, the lifting arm has a handle protruding towards the longitudinal extension of the lifting arm away from the base coupling.

[0022] Preferably, the upper coupling comprises a coupling element that is angularly rotatable about a rotation axis, selectively between a closed position wherein it is intended to retain the coupling eyelet of the bin, and an open position wherein it disengages the coupling eyelet.

[0023] Preferably, the upper locking devices are selectively activatable after moving the lifting arm away from the lowered or rest position, in order to lock the upper coupling relative to the lifting arm.

[0024] Preferably, the upper locking devices are configured to enable disengagement of the coupling eyelet by the upper coupling when the lifting arm is in the lowered or rest position.

[0025] Preferably, the upper locking devices comprise: a tilting pawl rotatably engaged relative to the lifting arm, that is movable between an inserted position wherein it engages an insertion seat integral with the coupling element to inhibit its rotation towards the open position, and a released position wherein it disengages the insertion seat to release the rotation of the coupling element; a first elastic return element to elastically push the tilting pawl towards the inserted position; a matching fin integral with the tilting pawl and engageable against a matching element fixed to the support structure to bring the tilting pawl into the inserted position when the lifting arm moves away from the lowered position.

[0026] Preferably, the coupling element is obtained on a discoidal cam element perimetrically having a first and a second stop seat interspersed with a radial relief, and alternatively engageable by a cam follower probe to selectively retain the coupling element in the closed position and in the open position.

[0027] Preferably, the cam element also carries a perimeter locking seat that can be operationally engaged by a latch that is elastically retained in a gripping position and manually movable to a release position to unlock the movement of the coupling element from the closed position.

[0028] Preferably, the latch has two side expansions, laterally protruding from the lifting arm at opposite sides respectively.

[0029] Preferably, there are also devices for locking the lifting arm in the lowered position, which can be selectively deactivated following engagement of the coupling eyelet by the upper coupling.

[0030] Preferably, the locking devices comprise an auxiliary coupling element provided by the cam element and operatively engaged, following movement of the coupling element to the open position, with an auxiliary coupling eyelet provided by the support structure.

[0031] Preferably, there should also be at least two stabilising matching elements protruding from the lifting arm, spaced parallel to the overturning axis and configured to act against a wall of the bin at positions laterally opposite to the upper coupling.

[0032] Preferably, the support structure comprises: an upright; at least one coupling plate configured to be fixed to a side wall of a waste container; fixing members for fixing said at least one coupling plate to the upright.

[0033] Preferably, there is also a conveyor chute configured to convey into the waste container material spilled from the bin in the emptying position, and constrained to the upper end portion of the lifting arm and to the support structure by means of an articulated quadrilateral lever system.

[0034] Preferably, the articulated quadrilateral lever system comprises the overturning axis.

[0035] Preferably, the articulated quadrilateral lever

system is configured to impose on the conveyor chute an overall angular excursion greater than the rotation made by the lifting arm about the overturning axis.

[0036] Further features and advantages will better appear from the detailed description of a preferred but not exclusive embodiment of equipment for emptying bins into waste containers, according to the present invention. Such description will be set forth herein below with reference to the accompanying drawings, provided for merely indicative and therefore nonlimiting purposes, wherein:

figure 1 shows a perspective view of a waste container provided with equipment according to the present invention, in a rest condition with a bin positioned nearby;
figure 2 shows the container of figure 1 with a bin in engagement with the equipment being emptied into the container itself;
figure 3 shows an upper end portion of the lifting arm, in a lowered position and with the cover shell in transparency;
figure 4 shows a lower end portion of the lifting arm, without the cover shell;
figure 5 shows a lateral view of the lifting arm without the cover shell and at an early stage of the bin engagement, with the base coupling in the working position and the upper coupling element in the open position;
figure 6 shows a perspective view of a detail close the upper end portion of the lifting arm, with the upper coupling element in the open position:
figure 7 shows the detail of figure 6 in a laterally opposite perspective view:

figure 8 is a similar representation to figure 6, with the upper coupling element in the closed position;
figure 9 is a similar representation to figure 7, with the upper coupling element in the closed position;
figure 10 is an interrupted side view of the equipment with a bin engaged and the lifting arm in the overturning position.

[0037] With reference to the above-mentioned figures, 1 denotes equipment for emptying bins into waste containers, according to the present invention. The equipment 1 is suitable for installation on a waste container, collectively indicated with 2, to facilitate the emptying of bins 3 into the container itself. The attached figures show, by way of example, a bin 3 fitted with wheels 3a, of the type conforming to UNI-EN 380.

[0038] Again by way of example, the waste container 2 is of the dumpster type, presenting a containment tank 4 having a substantially parallelepiped tapered conformation with side walls 4a diverging upwards, equipped at the top with a cover element having one or more openable access doors 5.

[0039] The equipment 1 comprises a support structure 6 rigidly engageable to the waste container 2. As can best be seen in figure 10, the support structure 6 preferably comprises an upright 7 extending in a substantially vertical direction and providing at the rear, i.e. on the side facing the waste container 2, one or more coupling plates 8 configured for fixing to one of the side walls 4a of the containment tank 4. The coupling plates 8 and the upright 7 are preferably made separately from each other, e.g. of punched and bent sheet metal, and mutually joined by means of rivets 8a, threaded elements, welding or other suitable fixing members. This facilitates the adaptation of the equipment 1 to any type of waste container 2 by selecting the type of coupling plate 8 suitable for the waste container 2 on which the equipment is to be installed.

[0040] The equipment 1 further comprises a lifting arm 9 having its own upper end portion 9a rotatably engaged to the support structure 6 about a horizontal overturning axis X1, positioned at a height close to an upper edge 4b of the containment tank 4. The lifting arm 9 is movable about the overturning axis X1, between a lowered position wherein it extends in a substantially vertical direction as visible in figures 1, and 3 to 9, and an emptying position wherein, as figures 2 and 10 show, it extends in an upward inclined direction away from the overturning axis X1. The angular excursion made by the lifting arm 9 between the lowered position and the emptying position is indicatively comprised between 90° and 180°, preferably comprised between 120° and 165°, e.g. approximately 150°. In the example shown, the lifting arm 9 has an inner strut 10 coupled to an upper terminal 11 with a closed tubular section. The upper terminal 11 is constrained to an upper end of the support structure 6 at the overturning axis X1. At one end of the inner strut 10 opposite the upper terminal 11, a lower end 12 is fixed, providing a handle 13, which protrudes substantially in the direction and continuation of the longitudinal extension of the arm itself. The inner strut 10 and the upper terminal 11 are preferably enclosed in a cover shell 14, which is rigidly fastened thereto, e.g. by rivets or other suitable fixing means, so as to stabilise their mutual positioning.

[0041] A base coupling 15 is arranged at a lower end portion 12 of the lifting arm 9, which is slidably engaged relative to said lower end portion 12. The base coupling 15 has a plate-like gripping element 16, arranged in parallel at a short distance from the lifting arm 9, at the bottom provided with a base bridge 17 (figure 5) projecting horizontally through a slot 18 defined in the lower end 12 of the lifting arm 9.

[0042] The base bridge 17 is integral to a lower end of a rod 19 slidably guided along the inner strut 10, internally to the lifting arm 9. Consequently, the entire base coupling 15 is movable parallel to a longitudinal extension of the lifting arm 9 between a waiting position wherein it is moved towards the upper end portion 9a and a working position wherein it is moved away from the upper end

portion 9a. One or more return springs 20 or equivalent spring elements of another type (figures 3 and 5) operate between the inner strut 10 and the rod 19, or other parts belonging respectively to the lifting arm 9 and the base coupling 15, to constantly draw the latter back to the waiting position.

[0043] An upward-opening recess 21 is defined between the gripping element 16 and the lifting arm 9 (figure 4), which lends itself to accommodating a lower edge 22 of the bin 3, protruding inferiorly from one of its back walls.

[0044] For the purposes of the initial engagement with the lifting arm 9 in the lowered position, the bin 3 is tilted about the axis of rotation of its wheels 3a so as to raise its lower edge 22, and then brought closer to the lifting arm 9, until the lower edge 22 is above the recess 21. A slight rotation of the bin 3 causes a lowering of the lower edge 22 and its consequent insertion into the recess 21, until it meets the base bridge 17 and lowers the base coupling 15 towards the working position, overcoming the action of the return springs 20.

[0045] Close to the upper end portion 9a of the lifting arm 9, internally thereto, an upper coupling 23 is housed, accessible through an inlet opening 24 formed in the cover shell 14 and configured to operatively engage a coupling eyelet 25 protruding horizontally from an upper edge of the bin 3.

[0046] In the absence of engagement between the bin 3 and the lifting arm 9, the inlet opening 24 is conveniently closed by a shutter 26 defined at one end of the rod 19, on the opposite side to the base coupling 15. The longitudinal displacement of the rod 19, caused by the lowering of the base coupling 15 pressed by the lower edge 22 of the bin 3 during engagement, causes the shutter 26 to slide from a closed position in which it closes the inlet opening 24, to an open position in which it disengages the inlet opening 24 to free access to the coupling eyelet 25.

[0047] The upper coupling 23 comprises a coupling element 27, preferably formed on a discoidal cam element 28 rotatably engaged between a pair of retaining cheeks 29 rigidly fixed relative to the lifting arm 9, preferably within the upper terminal 11. The cam element 28 is angularly rotatable about a rotation axis Z, preferably parallel to the overturning axis X1. As a result of alternating angular rotations of the cam element 28, the coupling element 27 is selectively positionable between a closed position in which it lends itself to retaining the coupling eyelet 25 of the bin 3 inserted through the inlet opening 24, and an open position in which it disengages the coupling eyelet 25. A first stop seat 30a and a second stop seat 30b are defined along a perimeter edge of the cam member 28 interspersed with a radial relief 31. The first and second stop seats 30a, 30b are alternatively engageable by a cam follower probe 32, provided by an arm 33 (depicted in transparency in figures 6 and 8) tiltably hinged to one of the retaining cheeks 29. A contrast spring 34 elastically pushes the cam follower probe 32 towards the perimeter edge of the cam element 28, to elastically retain the coupling element 27 selectively in the closed position when the cam follower probe 32 is in the first stop seat 30a, and in the open position when the cam follower probe 32 is in the second stop seat 30b. In other words, the cam element 28 is subjected to a bistable kinematic motion, brought about by the cooperation between the stop seats 30a, 30b, the radial relief 31 and the cam follower probe 32, under the action of the contrast spring 34.

[0048] The upper coupling 23 is also associated with locking devices 35 of the lifting arm 9 in the lowered position, which can be selectively deactivated following engagement of the coupling eyelet 25 with the upper coupling itself. The locking devices 35 preferably comprise an auxiliary coupling element 36 provided by the cam element 28, substantially diametrically opposed to the coupling element 27. The auxiliary coupling element 36 is operatively engageable, following movement of the coupling element 27 to the open position, with an auxiliary coupling eyelet 37 provided by the support structure 6. More particularly, the alternating angular rotation of the cam element 28 brings the auxiliary coupling element 36 between an engaged position (figures 6 and 7) in which it engages the auxiliary coupling eyelet 37, and an uncoupled position (figures 8 and 9) in which the auxiliary coupling eyelet 37 is disengaged from the auxiliary coupling element 36.

[0049] The coupling position of the auxiliary coupling element 36 corresponds to the opening position of the coupling element 27. The lifting arm 9 is therefore locked in the lowered position when bin 3 is disengaged from the upper coupling 23. The closed position of the coupling element 27 corresponds in turn to the uncoupling position of the auxiliary coupling element 36, so that the lifting arm 9 is free to rotate to the emptying position when the bin 3 is engaged at the upper coupling 23.

[0050] Upper locking devices 38 are also provided to lock the upper coupling 23 to the lifting arm 9, at least when the latter is moved away from the lowered position towards the emptying position. The upper locking devices 38 preferably comprise a tilting pawl 39, integral with a matching fin 40 rotatably engaged to one of the retaining cheeks 29, preferably opposite to that bearing the arm 33 of the cam follower probe 32. Alternating angular rotations of the matching fin 40 cause the pawl 39 to move from and towards the perimeter edge of the cam element 28, between an engaged and an disengaged position. In the engaged position, the pawl 39 engages an insertion seat 41 provided by the cam element 28, and thus integral with the coupling element 27, to inhibit rotation of the latter towards the open position. In the disengaged position, the pawl 39 disengages the insertion seat 41 to release the mobility of the coupling element 27 towards the respective open position.

[0051] A first spring or other elastic return element 42 operating between the matching fin 40 and one of the retaining cheeks 29, or other fixed part relative to the lifting arm 9, elastically pushes the pawl 39 towards the

engaged position. The matching fin 40 has an end projection 43 which can be engaged against the auxiliary coupling eyelet 37, or other fixed matching element against the support structure 6, to overcome the resistance of the first return spring 42 and bring the pawl 39 into the released position as the lifting arm 9 reaches the lowered position. When the lifting arm 9 moves away from the lowered position, the first return spring 42 pushes the tilting pawl 39 into the inserted position, locking the coupling element 27 in the closed position.

[0052] The upper locking devices 38 may further comprise a latch 44 provided by an auxiliary arm 45 tiltably engaged to at least one of the retaining cheeks 29, or other fixed part in relation to the lifting arm 9. The latch 44 has at least one, preferably two, side expansions 45a, 45b, laterally protruding from respectively opposite sides of the lifting arm 9, so as to be easily accessible to an operator from either side of the lifting arm 9 itself.

[0053] A second return spring 46 acts on the latch 44 to keep it elastically in contact against the perimeter edge of the cam element 28, close to the coupling element 27.

[0054] When the coupling element 27 is in the closed position, the latch 44 lends itself to being elastically pushed by the second return spring 46 into a gripping position, in which it engages a perimeter locking seat 47 provided along the perimeter edge of the cam element 28. In this way, a stable engagement of the bin 3 by the upper coupling 23 is ensured, preventing accidental disengagement thereof, for example, should the lifting arm 9 fall back to the lowered position under the effect of the weight of the full bin.

[0055] When the equipment 1 is in the waiting condition to receive a bin 3 to be emptied, the lifting arm 9 is placed in the lowered position while the cam element 28 of the upper coupling 23 is retained by the cam follower probe 32 in the first stop seat 30a, so as to keep the coupling element 27 in the open position. At the same time, the auxiliary coupling element 36 remains in the coupling position so that the lifting arm 9 cannot be lifted. After the bin 3 to be emptied has been engaged with its lower edge 22 at the base coupling 15 causing the lowering of the rod 19 and the consequent opening of the inlet opening 24, the bin 3 lends itself to being pushed towards the lifting arm 9, so that the coupling eyelet 25 engages with the inlet opening 24 to engage with the coupling element 27 of the upper coupling 23. By engaging the coupling member 27, the coupling eyelet 25 transmits a thrust action on the cam member 28 causing it to rotate angularly anti-clockwise relative to figures 5 and 6, so as to cause the disengagement of the first stop seat 30a from the cam follower probe 32 and the engagement of the latter in the second stop seat 30b, after climbing over the radial relief 31. This angular rotation of the cam element 28 causes the coupling element 27 to move into the closed position, resulting in the retaining of the bin 3 at the coupling eyelet 25, and the simultaneous release of the lifting arm 9 by translation of the auxiliary coupling element 36 into the respective release position. The snapping of the latch 44 into its perimeter locking seat 47 helps to retain the coupling element 27 in the closed position.

[0056] The bin 3 is therefore firmly retained in at least two points respectively distant from each other, i.e. at its lower edge 22 by the gripping element 16 of the base coupling 15, and at the coupling eyelet 25 by the upper coupling 23.

[0057] To promote the stability of the bin 3 engaged to the lifting arm 9, a pair of stabilising matching elements 48 can be conveniently provided, protruding from the lifting arm 9, spaced parallel to the overturning axis X1 and configured to act against a front wall of the bin 3, in positions laterally opposite to the upper coupling 23, to inhibit undesirable tilting of the bin 3 about its vertical extension.

[0058] After opening the access door 5 provided on the waste container 2, the lifting arm 9 can then be gripped at the handle 13 and rotated about the overturning axis X1, in order to determine the emptying of the contents of the bin 3 into the containment tank 4. This operation can be facilitated by one or more pneumatic springs 49 or other elastic devices operating between the support structure 6 and the lifting arm 9 to assist the lifting of the bin 3 during overturning. Since the handle 13 protrudes on the longitudinal continuation of the lifting arm 9, moving away from the base coupling 15, the risk of accidental interference of the user's hands against the gripping element 16 during the overturning action, and the consequent risk of causing accidental disengagement of the lower edge 22 of the bin 3, is conveniently reduced.

[0059] To further improve the safe engagement of the bin 3 by the base coupling 15, there are also lower locking devices 50 suitable for locking the base coupling 15 against the lifting arm 9, at least when the lifting arm 9 is moved away from the lowered position. In a preferred embodiment, the lower locking devices 50 provide that on the lifting arm 9, e.g. along the inner strut 10, a matching seat 51 is provided which can be operationally engaged by a tilting harpoon 52 rotatably engaged relative to the gripping element 16. More in particular, the harpoon 52 is preferably engaged along the rod 19, rotatably free about a tilting axis Y parallel to the overturning axis X1 and movable by gravity in consequence of the movement of the lifting arm 9, between an inserted position wherein it engages the matching seat 51 to inhibit the movement of the gripping element 16 towards the working position, and a released position in which it disengages the matching seat 51. When the lifting arm 9 is in the lowered position, the harpoon 52 retains its released position so that the rod 19 slides downwards during the engagement of the bin 3. Therefore, the lower locking devices 50 are deactivated when the lifting arm 9 is in the lowered position, so that the base coupling 15 is unlocked relative to the lifting arm 9.

[0060] The lower locking devices 50 are selectively activated following a lifting of the lifting arm 9 to the emptying or raised position, in order to lock the base coupling 15

relative to the lifting arm 9. More specifically, following the lifting of the lifting arm 9 to the emptying or raised position, the harpoon 52 rotates by gravity about its hinge axis Y into the working position, due to the engagement of the matching seat 51. Undesirable displacements of the gripping element 16 in engagement relation with the lower edge 22 of the container are thus inhibited during the operation of overturning the bin 3.

[0061] In a possible embodiment variant, where mobility of the gripping element 16 is not required to control the sliding of the rod 19, the lower locking devices 50 may more simply provide fixing elements (e.g. screws, rivets, welds) to realise a fixed mounting of the gripping element 16 itself relative to the lifting arm 9.

[0062] The upper locking devices 38 are selectively activated after moving the lifting arm 9 away from the lowered or rest position to lock the upper coupling 23 relative to the lifting arm itself. In fact, the movement of the lifting arm 9 away from the lowered or rest position also causes the detachment of the end projection 43 from the auxiliary coupling eyelet 37, and the consequent rotation of the matching fin 40 by the first return spring 42. Accordingly, the pawl 39 is brought into the inserted position with the respective insertion seat 41 provided in the cam element 28. This further improves the safety of use by limiting the risk of the container becoming undesirably disengaged from the upper coupling 23, e.g. as a result of displacement of the latch 44 due to shocks or accidental interference with the user's hands during the overturning step.

[0063] The lifting of the lifting arm 9 to the emptying position causes the substantial overturning of the bin 3 and the exit of the waste contained therein and its transfer to the containment tank 4. In order to facilitate the proper conveying of waste into the containment tank 4, a conveying chute 53 may be provided configured close to the upper end portion 9a of the lifting arm 9, configured to convey the material spilled from the bin 3 into the waste container 2.

[0064] The conveyor chute 53 has a front edge 53a constrained to the upper end portion 9a of the lifting arm 9 itself, e.g. by means of a hinge 54 fixed to the upper terminal 11 and defining a second constraint axis X2 parallel to the overturning axis X1. Starting from its own front edge 53a, the conveyor chute 53 extends above the upper end portion 9a of the lifting arm 9 to its own rear edge 53b, facing rearwards on the opposite side to the front edge 53a, i.e. towards the waste container 2, and overhanging the support structure 6.

[0065] Also hinged to the conveyor chute 53, about a third constraint axis X3 spaced parallel to the second constraint axis X2, is at least one deflection lever 55, two in the illustrated example, hinged to the support structure 6 according to a fourth constraint axis X4 spaced parallel to the overturning axis X1, away from the upper end portion 9a. In other words, the conveyor chute 53 is constrained to the lifting arm 9 and to the support structure 6 by means of an articulated quadrilateral lever system, the vertices of which are represented respectively by the second, third and fourth constraint axis X2, X3, X4 and the overturning axis X1. Through a careful choice of positioning and reciprocal distances between the axes X1, X2, X3 and X4, this articulated quadrilateral is geometrically configured in such a way as to impose on the conveyor chute 53 a rototranslatory movement during the angular rotation performed by the lifting arm 9 about the overturning axis X1, between the lowered position and the emptying position. In an initial step of the movement from the lowered position, the conveyor chute 53 performs a rotation with a smaller angular excursion than that performed by the lifting arm 9, in order to maintain a substantially upward orientation from its front edge 53a and to easily climb over the upper edge 4b of the containment tank 4. In a terminal step of the movement towards the emptying position, the conveyor chute 53 makes an angular excursion greater than that made by the lifting arm 9, so as to assume an orientation directed downwards from its front edge 53a, in order to fit easily inside the containment tank 4 beyond the upper edge 4b and facilitate the conveying of the material falling from the bin 3.

[0066] When emptying is complete, the lifting arm 9 can be easily returned to its lowered rest position by manual action on handle 13. The upper locking devices 38 are configured to enable disengagement of the coupling eyelet 25 by the upper coupling 23 when the lifting arm 9 is in the lowered position. In fact, when the lowered or rest position is reached, the end projection 43 encounters the auxiliary coupling eyelet 37 causing a new rotation of the matching fin 40 and the consequent displacement of the pawl 39 into the released position from the respective insertion seat 41. With a manual displacement of the latch 44 and a simultaneous pulling action exerted on the bin 3, it is therefore possible to impose on the cam element 28 a rotation such as to reposition the first stop seat 30a in engagement relation with the cam follower probe 32, enabling the disengagement of the coupling eyelet 25 from the upper coupling 23. The emptied bin 3 can then be easily removed from the equipment 1, with the disengagement of the lower edge 22 of the bin itself from the gripping element 16 of the base coupling 15, recalled by the return spring 20 to the waiting position.

Claims

1. Equipment for emptying bins into waste containers, comprising:

   a support structure (6) rigidly engageable to a waste container (2);
   a lifting arm (9) having an upper end portion (9a) rotatably engaged to the support structure (6) about a horizontal overturning axis (X1), and movable between a lowered position wherein it extends in a substantially vertical direction, and

an emptying position wherein it extends in an upward inclined direction away from the overturning axis (X1);
a base coupling (15) arranged at a lower end portion (12) of the lifting arm (9) opposite the upper end portion (9a), and configured to engage a lower edge (22) of a bin (3);
an upper coupling (23) arranged close to the upper end portion (9a) of the lifting arm (9) and arranged to engage a coupling eyelet (25) provided at the top of the bin (3);
further comprising:

lower locking devices (50) to lock the base coupling (15) to the lifting arm (9) at least when the lifting arm (9) is moved away from the lowered position;
upper locking devices (38) to lock the upper coupling (23) to the lifting arm (9) at least when the lifting arm (9) is moved away from the lowered position towards the emptying position.

2. Equipment according to claim 1, wherein the base coupling (15) comprises a gripping element (16) slidably engaged to said lower end portion (12) and movable parallel to a longitudinal extension of the lifting arm (9) between a waiting position wherein it is moved towards the upper end portion (9a) and a working position wherein it is moved away from the upper end portion (9a);
elastic return elements (20) operating between the lifting arm (9) and the gripping element (16) to push it towards the waiting position.

3. Equipment according to claim 2, wherein the lower locking devices (50) comprise:

a matching seat (51) provided by the lifting arm (9); and
a tilting harpoon (52) rotatably engaged relative to the gripping element (16), rotatably free about a tilting axis parallel to the overturning axis (X1) and movable by gravity in consequence of the movement of the lifting arm (9), between an inserted position wherein it engages the matching seat (51) to inhibit the movement of the gripping element (16) towards the working position, and a released position in which it disengages the matching seat (51).

4. Equipment according to one or more of the preceding claims, wherein the lifting arm (9) has a handle (13) protruding towards the longitudinal extension of the lifting arm (9) away from the base coupling (15).

5. Equipment according to one or more of the preceding claims, wherein the upper coupling (23) comprises a coupling element (27) that is angularly rotatable about a rotation axis (Z), selectively between a closed position wherein it is able to retain the coupling eyelet (25) of the bin (3), and an open position wherein it disengages the coupling eyelet (25);
wherein the upper locking devices (38) comprise:

a tilting pawl (39) rotatably engaged relative to the lifting arm (9), that is movable between an inserted position in which it engages an insertion seat (41) integral with the coupling element (27) to inhibit its rotation towards the open position, and a released position wherein it disengages the insertion seat (41) to release the rotation of the coupling element (27);
a first elastic return element (42) to elastically push the tilting pawl (39) towards the inserted position;
a matching fin (40) integral with the tilting pawl (39) and engageable against a matching element (25) fixed to the support structure (6) to bring the tilting pawl (39) into the inserted position when the lifting arm (9) moves away from the lowered position.

6. Equipment according to one or more of the preceding claims, wherein the coupling element (27) is obtained on a discoidal cam element (28) perimetrically having a first and a second stop seat (30b) interspersed with a radial relief (31), and alternatively engageable by a cam follower probe (32) to selectively retain the coupling element (27) in the closed position and in the open position.

7. Equipment according to claim 6, wherein the cam element (28) further provides a perimeter locking seat (47) operatively engageable by a latch (44) elastically retained in a gripping position and manually movable to a release position to unlock the movement of the coupling element (27) from the closed position, and wherein the latch (44) preferably has two side expansions (45a), (45b) laterally protruding from the lifting arm (9) at opposite sides respectively.

8. Equipment according to one or more of the preceding claims, further comprising locking devices (35) for locking the lifting arm (9) in the lowered position, selectively deactivatable following the engagement of the coupling eyelet (25) by the upper coupling element (23), said locking devices (35) preferably comprising an auxiliary coupling element (36) provided by the cam element (28) and operatively engageable, following the movement of the coupling element (27) in the open position, with an auxiliary coupling eyelet (37) provided by the support structure (6).

9. Equipment according to one or more of the preceding claims, further comprising at least two stabilising

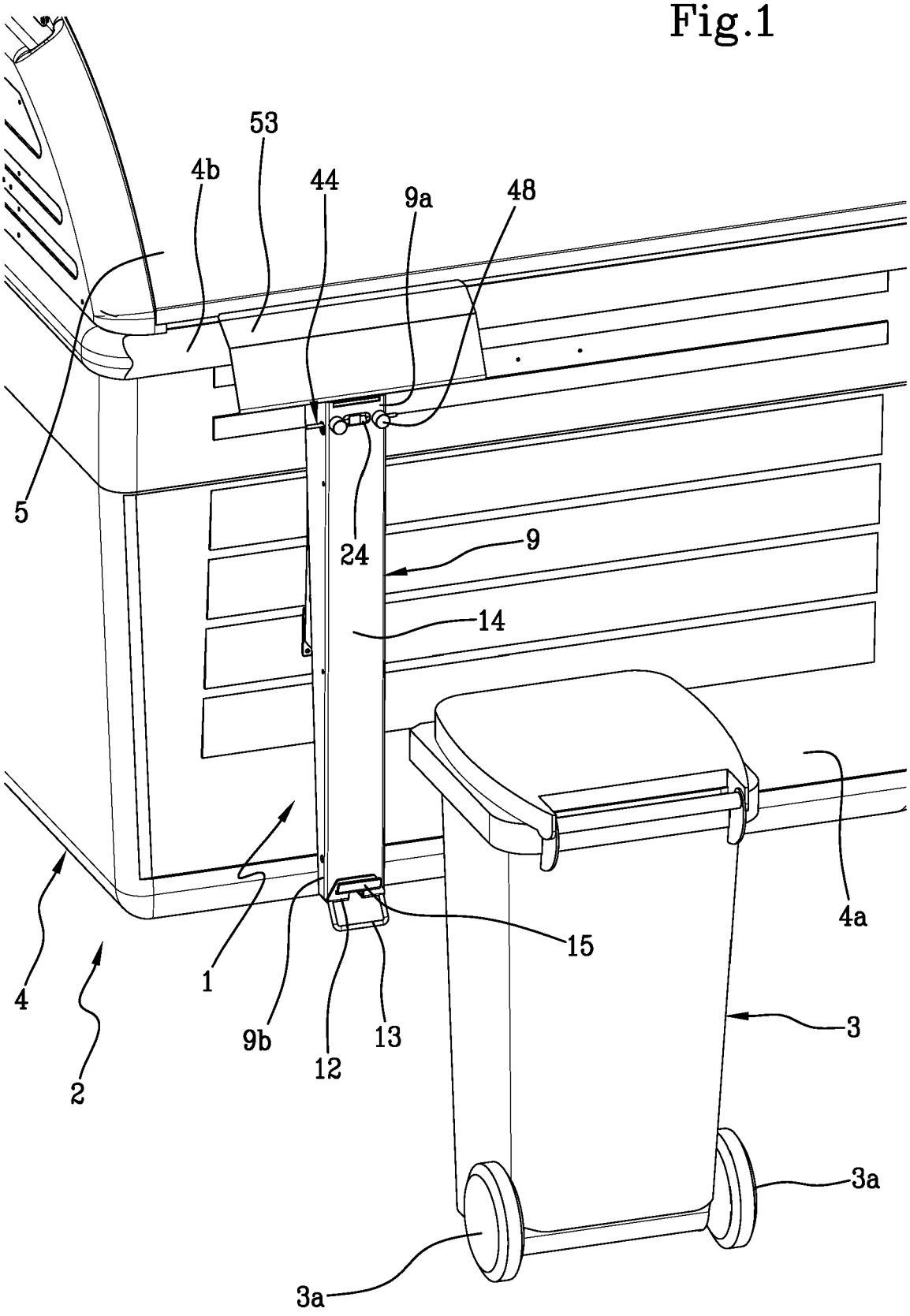
matching elements (48) protruding from the lifting arm (9), spaced parallel to the overturning axis (X1) and configured to act against a wall of the bin (3) at positions laterally opposite to the upper coupling (23).

10. Equipment according to one or more of the preceding claims, wherein the support structure (6) comprises:

an upright (7);
at least one coupling plate (8) configured to be fixed to a side wall of a waste container (2);
fixing members (8a) for fixing said at least one coupling plate to the upright (7).

11. Equipment according to one or more of the preceding claims, further comprising a conveyor chute (53) configured to convey into the waste container (2) material spilled from the bin (3) in the emptying position, and constrained to the upper end portion (9a) of the lifting arm (9) and to the support structure (6) by means of an articulated quadrilateral lever system.

Fig.1



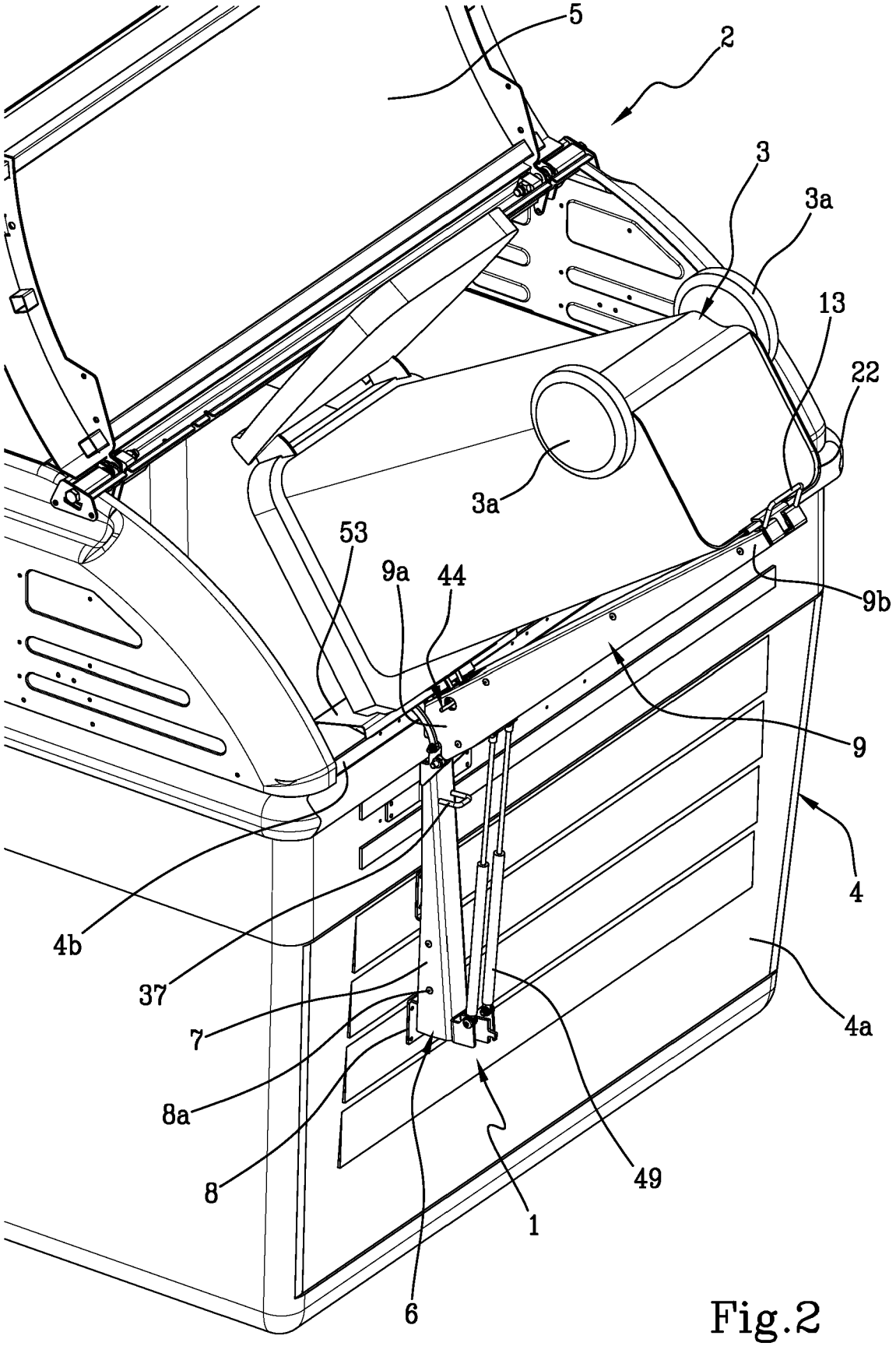


Fig.2

Fig.3

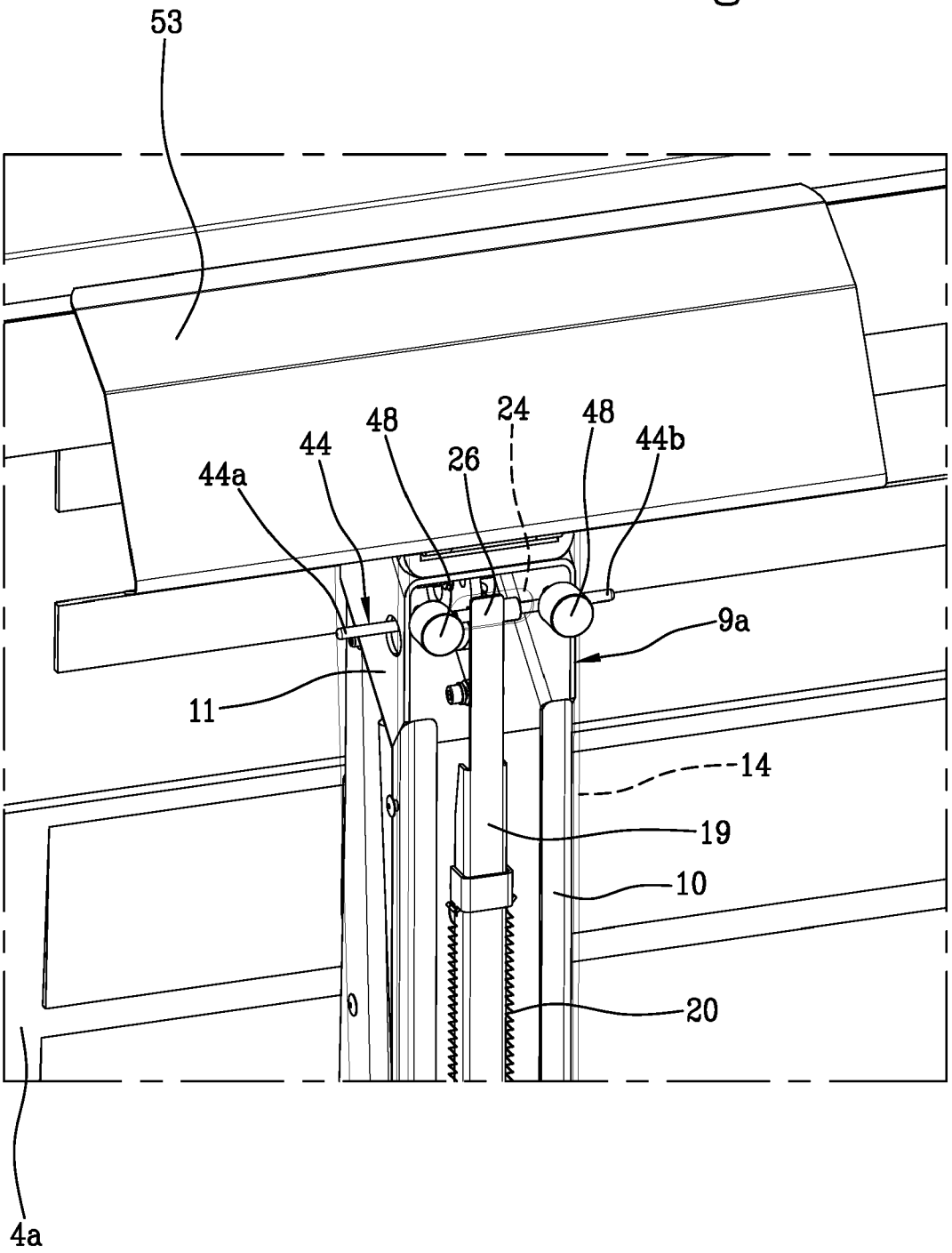


Fig.4

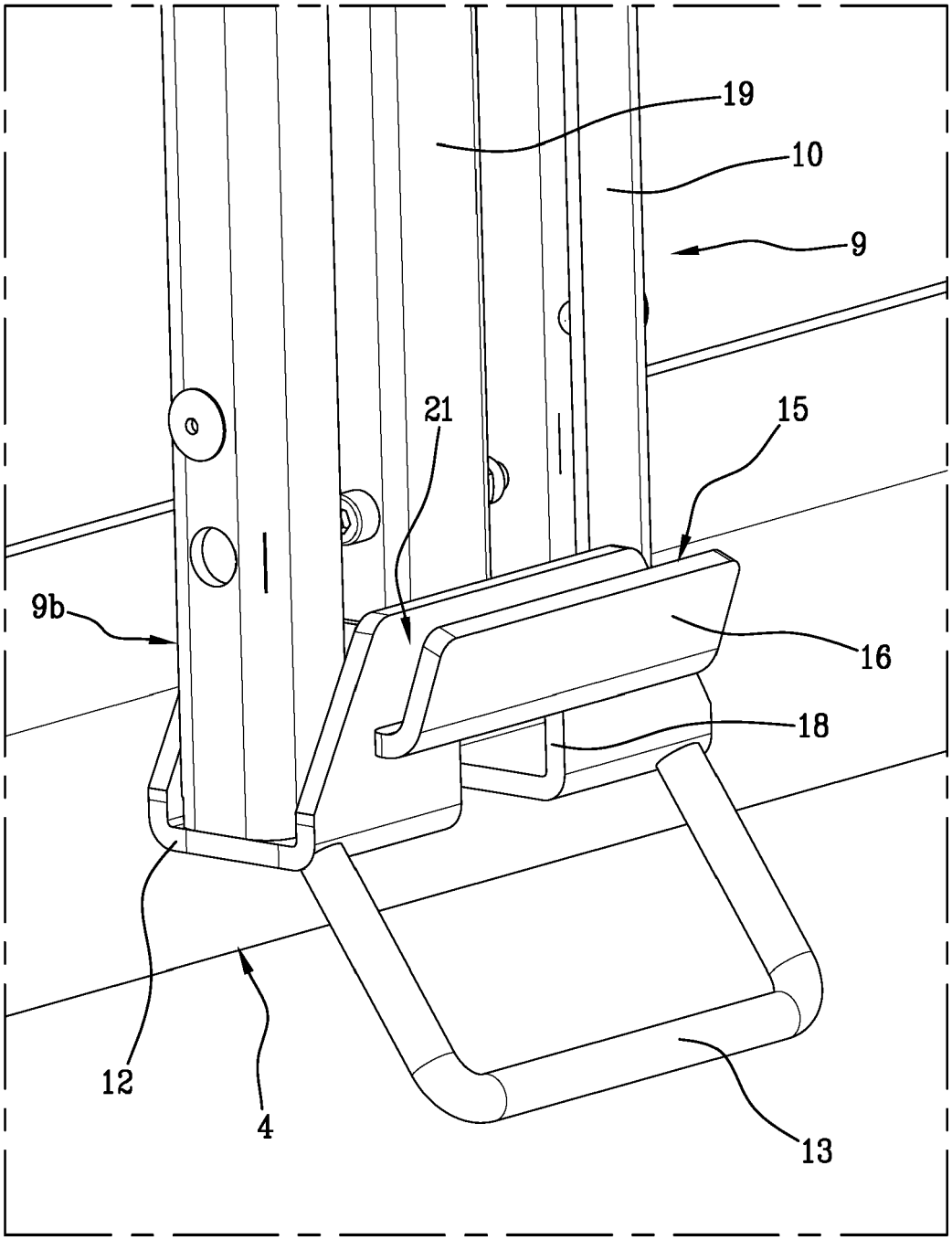
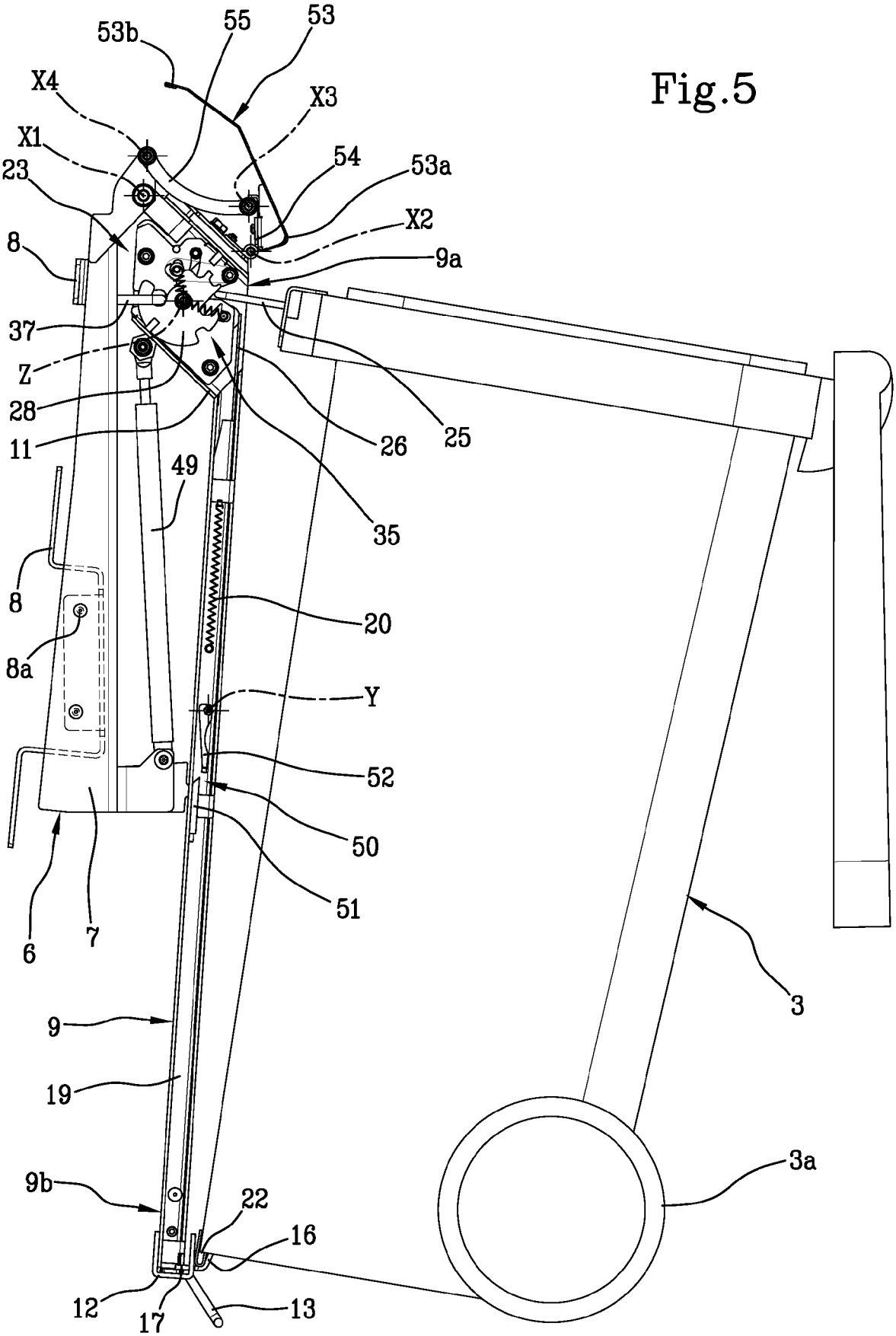


Fig.5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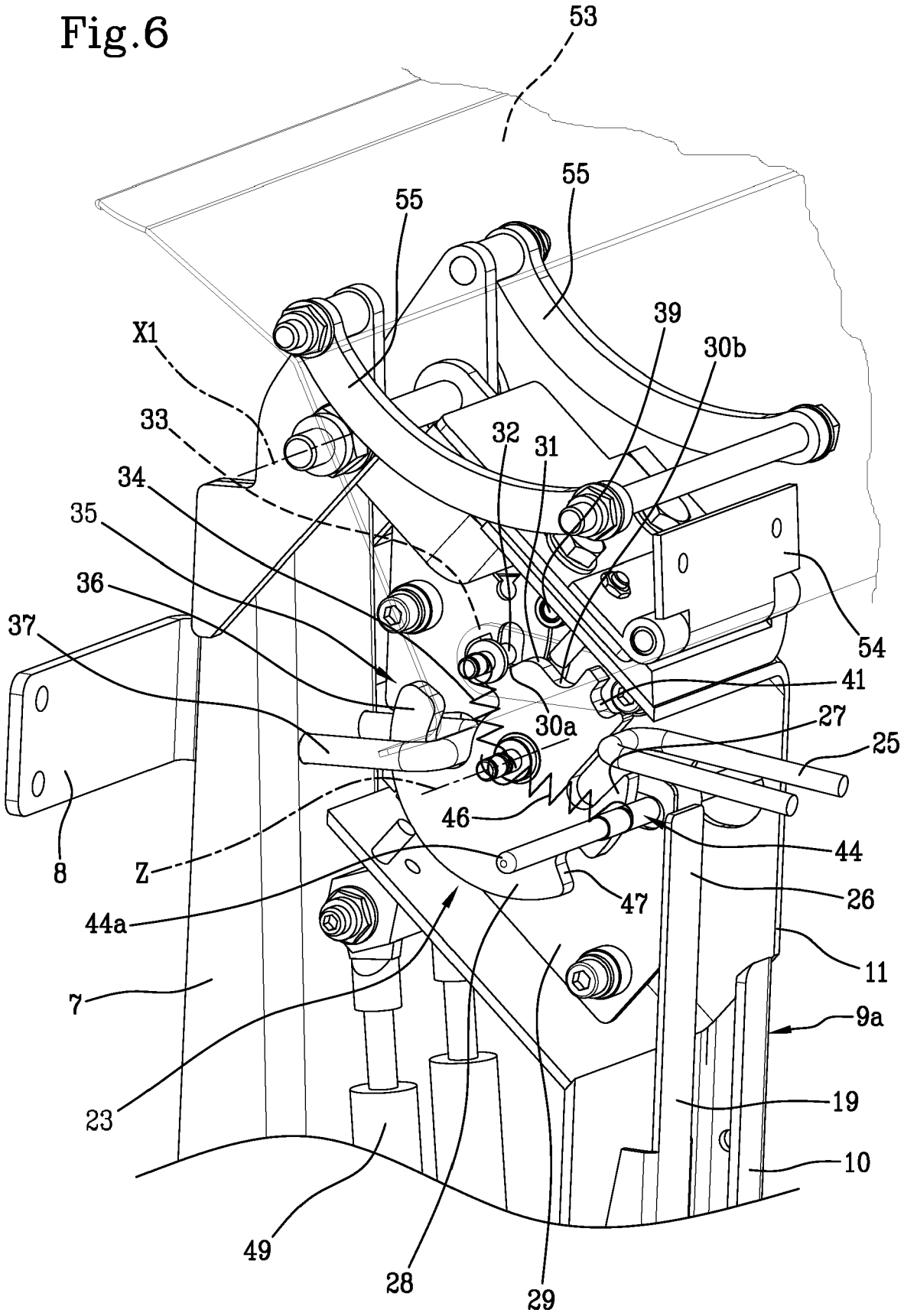
55
53
X4
X3
X1
54
53a
23
X2
8
9a
37
Z
28
11
26
25
49
35
8
20
8a
Y
52
50
51
6
7
3
9
19
3a
9b
22
16
12
17
13

Fig.6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30b
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Z
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44a
11
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9a
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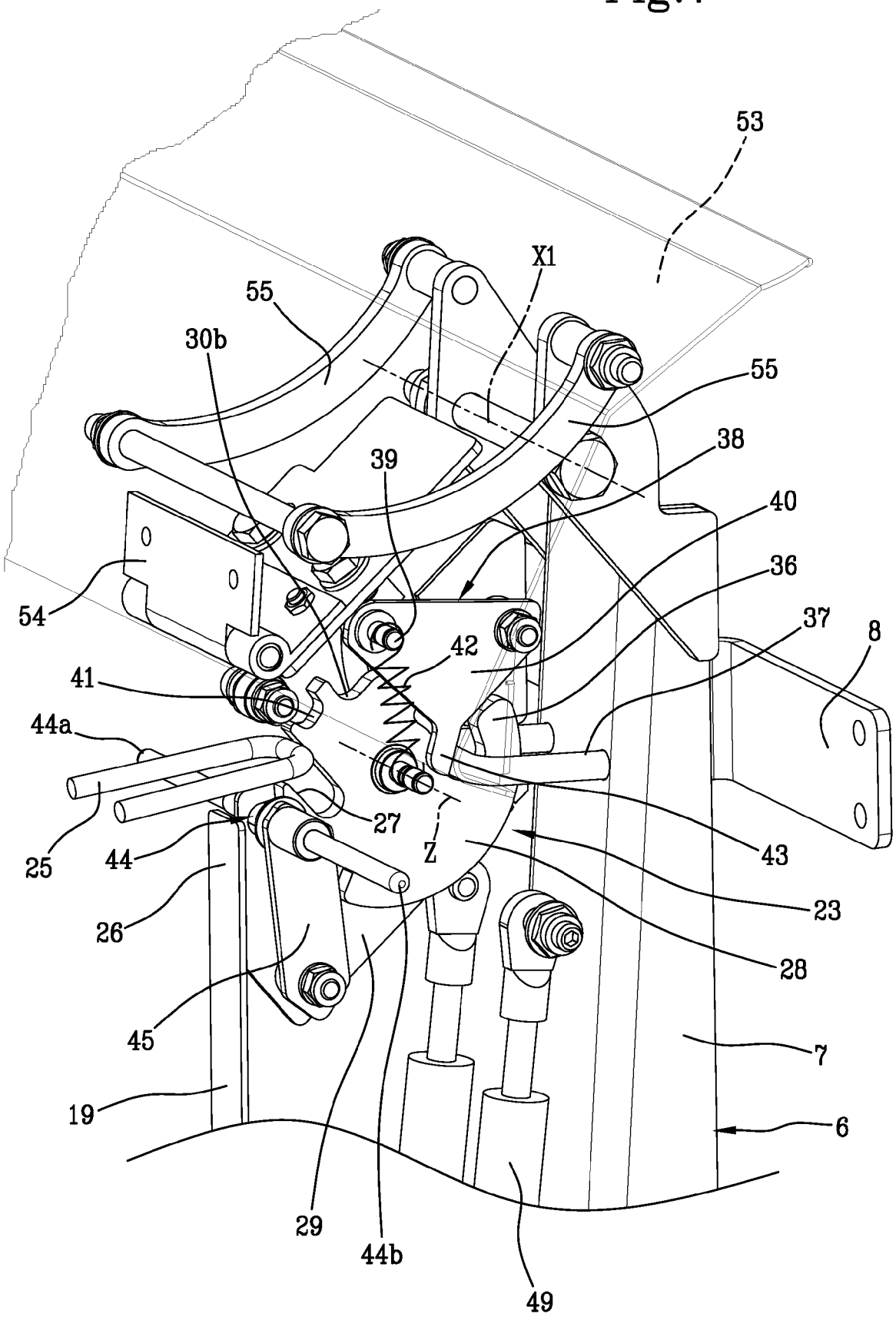
Fig.7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30b
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44b
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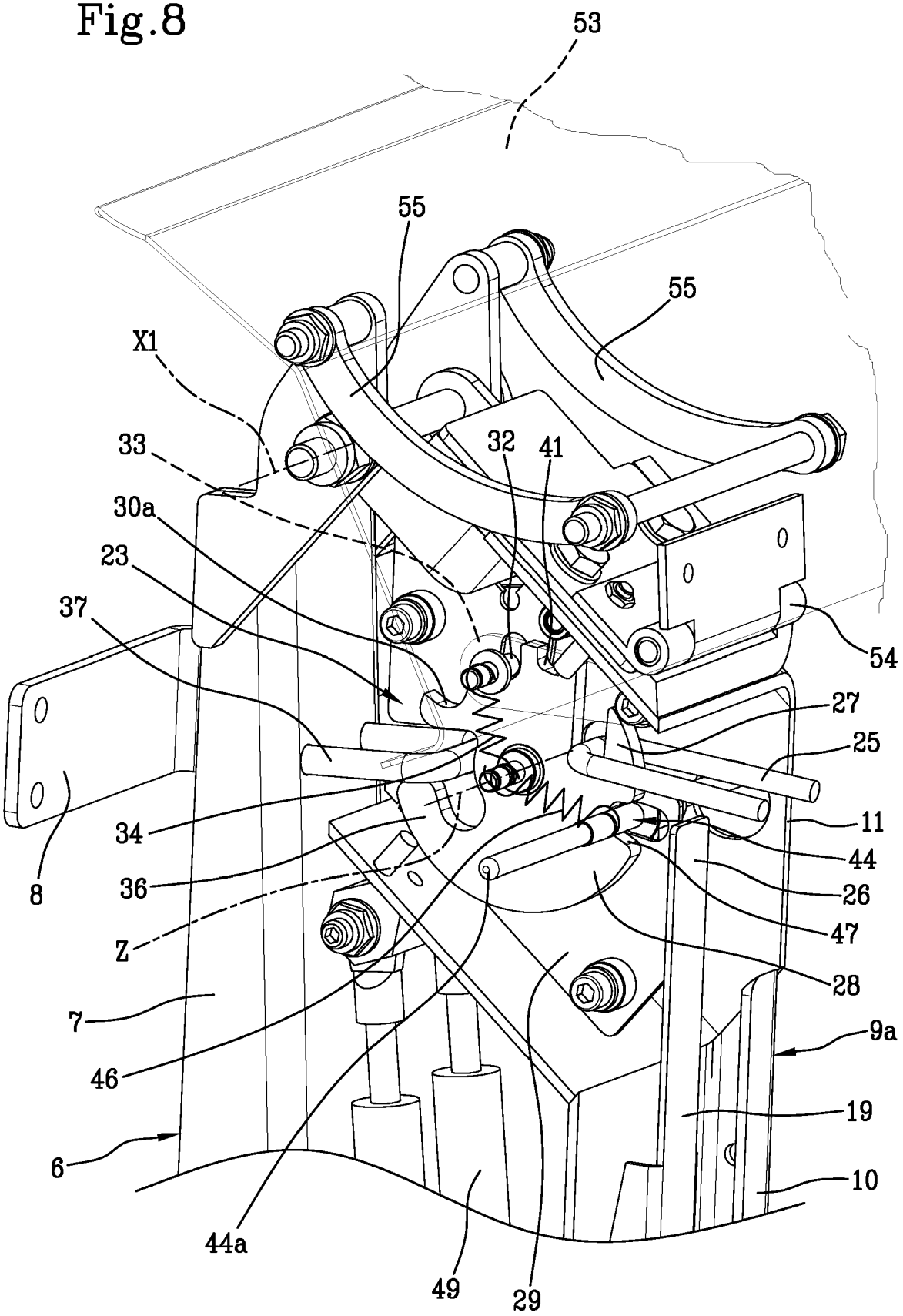
Fig.8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9a
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44a
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Fig.9

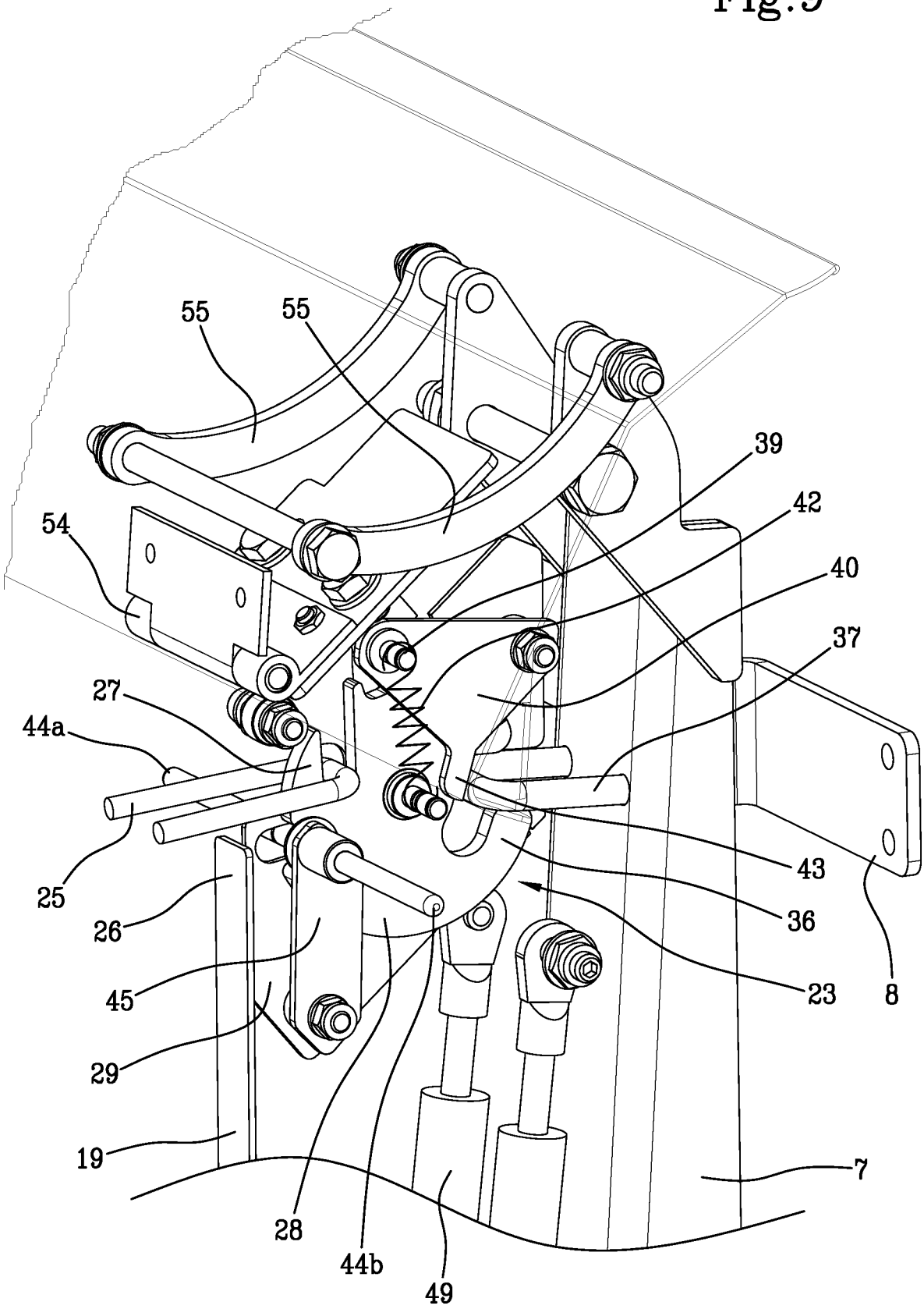
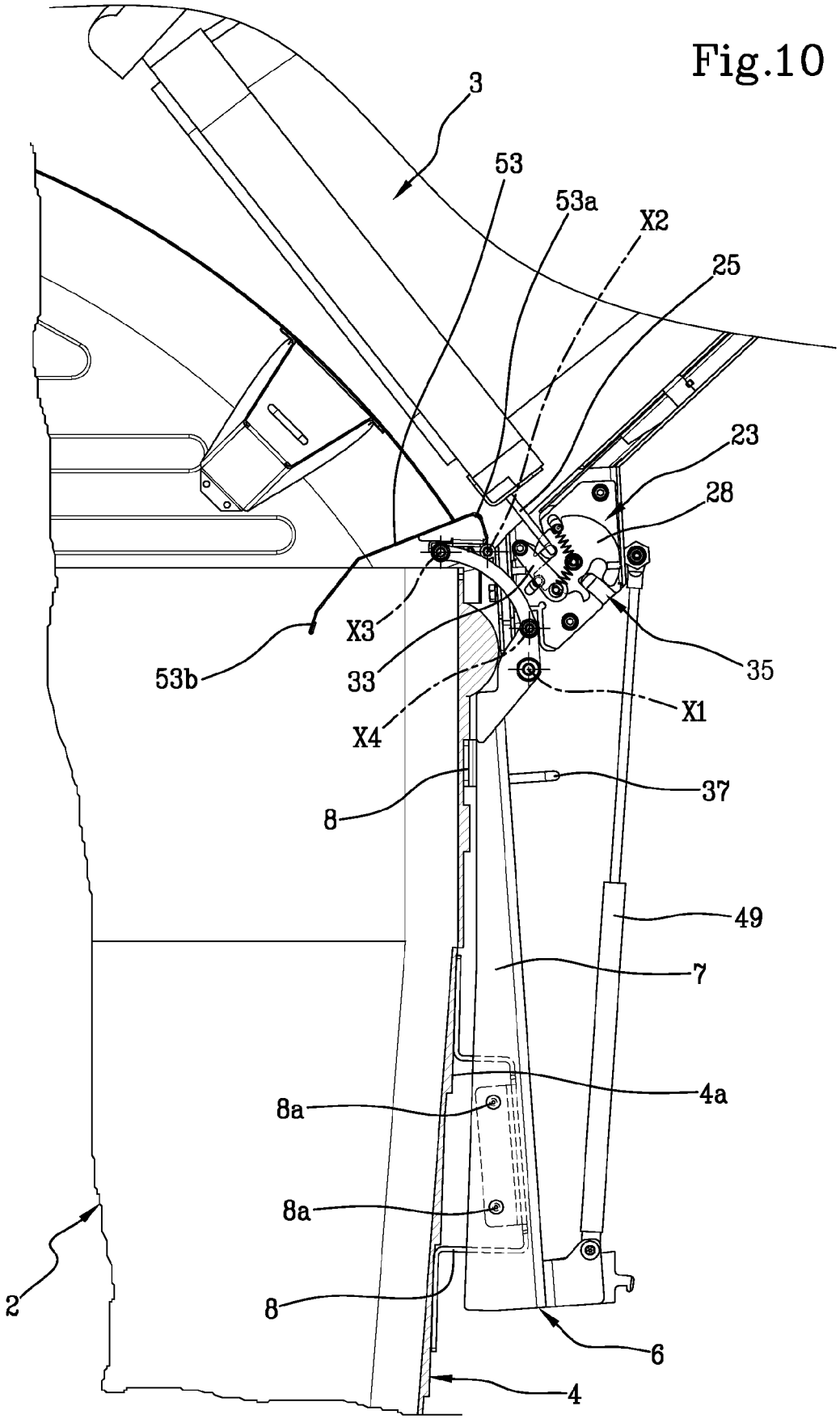


Fig.10



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EUROPEAN SEARCH REPORT

Application Number
EP 23 20 0192

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B65F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	20 December 2023	de Miscault, Xavier

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