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(54) Waste compacting unit

(57) Waste compacting unit (10) to be connected with a waste collecting vehicle, comprising:
- a collecting tank (94) to be fixed on a vehicle and comprising at least two sidewalls (99),
- a frame (12) fixed on the collecting tank (94),
- a pressing shovel (18) comprising at least a spoon (24, 28) and shovel moving means for the displacement of said spoon (24, 28), said shovel moving means (22) being fixed on the frame (12),
- an ejecting plate (16) comprising at least a main plane body (76) and plate moving means for the displacement of said main plane body (76), said plate moving means (20) being fixed on the frame (12).

The frame (12) is fixed on the upper part of the collecting tank (94) so that the plate moving means are fixed on the upper part of the collecting tank (94) and said plate moving means do not come in touch of any waste contained in the collecting tank (94).

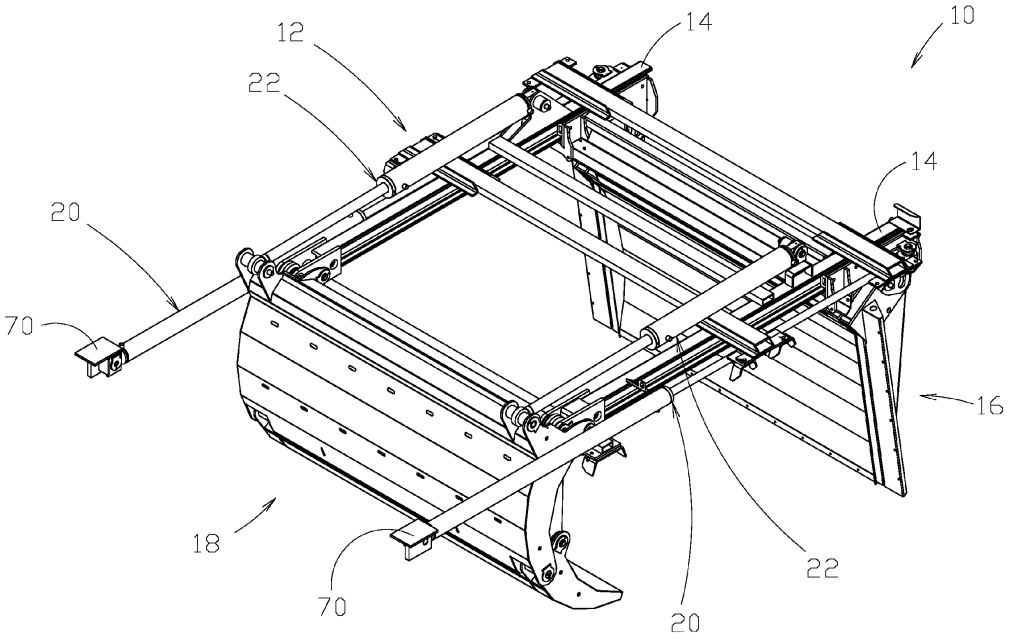

Fig. 1

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Description

[0001] The present invention refers, in general, to a waste compacting unit, adapted to be mounted on urban hygiene apparatuses, equipped with a collecting tank. More particularly, this waste compacting unit is to improve the filling of the collecting tank and to extend the life of the unit elements.

[0002] As is known, several typologies of waste compacting units are provided in the sector of urban hygiene to perform an automatic compaction of the waste, loaded in the inside of a collecting tank.

[0003] A typology of compacting units are provided to compact by means of a compacting shovel a quantity of waste after the loading of said quantity of waste in a collecting tank.

[0004] The compacting shovel is guided by motor means, usually hydraulic means, according to a translating motion which is originated from the front wall of the collecting tank. From here, the shovel begins its lifted run to reach the loading opening. In this position, the shovel is lowered so as to reach the quantity of waste. Then, the shovel is approached again to the front wall of the collecting tank in such a way as to drag and compact the waste that has just been loaded together with the waste that was already contained in the collecting tank.

[0005] The movement of the shovel needs the presence of a system of guides on the upper part of the collecting tank, which makes it necessary to provide the collecting tank with an upper opening. However, the so-obtained structure is not very rigid and during the phase of compaction, the side walls could be overloaded and the collecting tank could be deformed.

[0006] In addition, when on the one side, the compacting units are provided with an only compacting shovel, guided through slides, so as to carry out a completely closed collecting tank, on the other side whenever a further quantity of waste has to be loaded in the collecting tank, the compacting shovel must be translated from the position of compaction near the front wall of the tank to the loading opening in order to be lifted and let the opening free for the further quantity of waste to be loaded in the collecting tank. Consequently, this system makes the loading of waste in the collecting tank slow and not very practical since it is necessary to await till the shovel has been shifted from an end to the other end of its run.

[0007] In addition, the mass of waste is compacted and released more times in the inside of the tank and this fact involves a comparatively low ratio of compaction.

[0008] A further problem in the compacting units with one compacting shovel occurs in the unloading phases of the tank. In fact, when the tank must be emptied, after a complete lifting of the shovel, the tank is inclined so that the waste is discharged on falling down owing to gravity. This unloading operation can not be controlled completely because the waste, above all the damp waste, could slip down roughly as an only block, which could involve problems as to the safety and the practicalness in the treatment of the discharged waste.

[0009] In order to facilitate the emptying of the collecting tank and the compaction of the waste in the inside of the tank, some compacting units comprise an ejecting plate that can be translated from the front wall of the tank to the loading opening in the discharge phase so as to control and facilitate the going out of the mass of waste.

[0010] Besides, in the initial waste loading phases, when the tank is still empty or begins to be filled, the ejecting plate is brought towards the loading opening and accompanies the loading and the compacting of the waste on going back gradually towards the front wall of the tank.

[0011] The ejecting plate is compelled to move along guides which are mounted on the sidewalls of the tank near the bottom. A telescopic cylinder is positioned between the tank and the ejecting plate and allows the ejecting plate to advance and return.

[0012] If on the one side, the ejecting plate improves the compaction ratio and hasten the phases of compaction without translating the compacting shovel from an end to the other end of the tank, on the other side, the ejecting plate creates an empty chamber between the ejecting plate itself and the front wall, in which chamber the waste is introduced. In this kind of waste compacting units, it is necessary to provide one or more openings in the tank in order to have access to those sectors in which the waste could amass in an unwished manner. Thus, the waste collecting tank is not completely sealed.

[0013] According to the known art, the guides and the telescopic cylinder are in proximity to the tank bottom and therefore, they come into contact with the waste. Consequently, both the guides and the telescopic cylinder could be damaged by the humidity and other factors owing to their contact with the waste. This typology of apparatuses often is subjected to maintenance operations in order to avoid a malfunction.

[0014] An aim of the invention is to improve the constructive features of a waste compacting unit for urban waste.

[0015] A further aim of the invention is to carry out a versatile waste compacting unit for urban waste in order to improve the filling of the waste collecting tank and to extend the life of the tank components.

[0016] A further aim of the invention is to carry out a waste compacting unit allowing a practical, safe discharge of waste from the waste collecting tank.

[0017] All the above aims and other ones are achieved according to the invention through a waste compacting unit to be connected with a waste collecting vehicle, comprising a collecting tank, a frame fixed on the collecting tank, a pressing shovel and an ejecting plate, the colleting tank being fixed on a vehicle and comprising at least two sidewalls, the pressing shovel comprising at least a spoon and shovel moving means for the displacement of said spoon, said shovel moving means being fixed on the frame, the ejecting plate comprising at least a main plane body and plate moving means for the displacement

of said main plane body, said plate moving means being fixed on the frame. The waste compacting unit is characterized in that the frame is fixed on the upper part of the collecting tank so that the plate moving means are fixed on the upper part of the collecting tank and said plate moving means do not come in touch of any waste contained in the collecting tank. In this way, the moving and guiding mechanisms for the ejecting plate are not damaged by the waste or other agents and the maintenance operations for the compacting unit are reduced.

[0018] Advantageously, the main plane body is connected with the upper part of the plate moving means so as to swing and tilt in relation to the collecting tank. In this way, when the tank is inclined for the discharge operation, the ejecting plate inclines in respect to the tank so that even the waste that has amassed between the plate and the front wall of the tank goes out. Consequently, it is no more necessary to make openings in the tank to clean the sectors that are difficult to reach. Thus, the tank is carried out without any doors and is completely hermetic.

[0019] Besides, the plate moving means comprise at least a guide fixed on the frame and with which at least a sliding block is connected so as to translate, said at least a sliding block being connected with the main plane body through connecting means. The ejecting plate, namely, its main body, translates along the tank and facilitates, in the advancing phase, the ejection of the compacted waste and facilitates, in the returning phase, the collection of waste that is compacted on the tank by the pressing shovel.

[0020] Advantageously, the connecting means comprise a first pin and a second pin; in particular, the first pin is fixed on the main plane body and rotates in a hole which is obtained in the at least a sliding block so that the main plane body can swing in relation to the at least a sliding block; the second pin is fixed on the main plane body and moves in a slot which is obtained in the at least a sliding block in order to limit the rotation of the main plane body in relation to the at least a sliding block. In this way, the main plane body inclines in respect to the tank only with an angle that is sufficient to allow the going out of the waste that is arranged involuntarily on the front wall of the tank. Advantageously, the pressing shovel comprises a first spoon and a second spoon which are connected with each other at their ends so as to swing and adjust the angle between said first spoon and said second spoon.

[0021] Besides, at an end, the first spoon is pivoted on the frame and at the other end, the first spoon is connected with the second spoon so as to swing, the second spoon being connected through a connecting rod with the frame; an end of said connecting rod being connected with the frame so as to swing and the other end being connected with the second spoon so as to swing next to the connection between the first spoon and the second spoon, the first spoon being connected with actuating and moving means for the lifting of the first spoon and consequently, the second spoon is lifted and opens wide from the first spoon simultaneously. In this configuration, it is sufficient to lift the first spoon not only to lift the second spoon but also to remove it from the first spoon in order to obtain an easier access to the tank for its filling or discharge.

[0022] Advantageously, the frame comprises at least a crossbar the ends of which are fixed to a sidewall of the tank, respectively. In this way, it is possible to obtain a more rigid and strong tank that perfectly cope with the stresses caused by the compaction of the waste in the inside of the tank.

[0023] Further features and details of the invention will be better understood from the following specification which is given as a non limiting example as well as from the accompanying drawings wherein:

Fig. 1 is an axonometric view of a waste compacting unit according to the invention, without the tank;
Fig. 2 is an exploded view of the waste compacting unit in Figure 1 ;
Figures 3, 4, 5 are details of the exploded view in Figure 2;
Figures 6 - 13 are section views of a waste compacting unit according to the invention, which is represented in a respective phase of utilization.

[0024] With reference to the accompanying drawings, in particular with reference to Figures 1 and 2, number 10 denotes a waste compacting unit comprising a frame 12 equipped with guides 14 along which an ejection plate 16 slides. A pressing shovel 18 is connected at the ends of the guides 14 so as to rotate. The waste compacting unit 10 comprises a first pair of hydraulic pistons 20 to move the ejecting plate 16 as well as a second pair of hydraulic pistons 22 to move the pressing shovel 18.

[0025] As it appears from Figure 3, the pressing shovel 18 comprises a first spoon 24 and a second spoon 28 which is connected through a pair of connecting rods 26 with the first spoon 24 so as to rotate.

[0026] The following is a description of the connections among the first spoon 24, the second spoon 28 and the pair of connecting rods 26 of a half of the pressing shovel 18 since the remaining half is symmetric to the other one. The second spoon 28 comprises a main body 30 on the sides of which two plates are fixed, a first pin 32 and a second pin 34 being fixed between said two plates.

[0027] In turn, the first spoon 24 comprises a main body 36 on the side ends of which two plates are attached, a third pin 38 and a fourth pin 40 being fixed between them on the upper part, a holed seat 42 being obtained on the lower part.

[0028] Likewise, the pair of connecting rods 26 comprises a main body 44 on the ends of which a first through-hole 46 and a second through-hole 48 are obtained.

[0029] As it appears from Figure 4, the frame 12 comprises four crossbars 50 which show a hollow rectangular section and are fixed orthogonally to both guides 14.

[0030] A pin 56 is fixed at one end of both guides 14 and two coaxial through-holes 54 are obtained next to it. A second pair of hinges comprising a pin 58 is connected near the opposite end of the two guides 14.

[0031] The second pair of hydraulic pistons 22 comprises a cylinder 60 in the free end of which a connecting hole 62 is obtained as well as a rod 64 in the free end of which a connecting hole 66 is obtained.

[0032] As represented in Figures 3 and 4, each hydraulic piston 22 is fixed on an end of the respective guide 14 by inserting the pin 58 in the connecting hole 62 while the free end of the rod 64 is connected with the first spoon 24 so as to rotate by inserting the third pin 38 in the connecting hole 66 of the same rod 64.

[0033] The first spoon 24 is connected with the guides 14 so as to rotate by fixing each of the fourth pins 40 in the coaxial holes 54. The second spoon 28 is connected with the first spoon 24 so as to rotate by fixing each of the second pins 34 of the second spoon 28 in the holed seat 42 of the first spoon 24. Besides, as it appears from Figure 4, the second spoon 28 is connected with guides 14 through connecting rods 26, the first hole 46 of which is interested by the pin 54 of the guides 14 while the second hole 48 is interested by the second pin 34.

[0034] With reference to Figures 4 and 5, the first pair of hydraulic pistons 20 comprises a cylinder 68 with a connecting plate 70 at its free end and a rod 72 with a connecting through-hole 74 at its free end.

[0035] The ejecting plate 16 comprises a main body 76 and a pair of sliding blocks-supports 78 comprising a pair of sliding blocks 88 which are connected with the guides 14 so as to slide. The main body 76 comprises a first pair of pins 80 which are inserted in a respective hole 82 which is obtained in the pair of sliding blocks-supports so as to connect the main body 76 and the pair of supports-sliding blocks 78 with each other so as to rotate. The relative rotation between them is limited by the possibility of movement of a second pair of pins 84 which are included in the main body 76 in the inside of a seat 86 which is obtained in the pair of sliding-bocks-supports 78, and by a stroke end which is formed by the contact between the profile 92 of the main body 76 and the lower part of the pair of sliding blocks 78.

[0036] A connecting pin 90 is fixed on each sliding block support 78, in which pin the connecting through-hole 74 of the hydraulic piston 20 is inserted. The connecting plate 70 of the first pair of hydraulic pistons 20 is fixed on a collecting tank 94 which comprises a bottom 96, a front wall 98, two sidewalls 99 and an inclined wall 100. The ends of the crossbars 50 of the waste compacting unit 10 are fixed on the upper part on the sidewalls 99 of the collecting tank 94.

[0037] The following is a description of the working of the compacting unit for urban waste.

[0038] As it appears from Figure 6, the pressing shovel 18 of the waste compacting unit 10 is maintained lifted from the second pair of hydraulic cylinders 22. The ejecting plate 16 is maintained separated from the front wall 98 of the collecting tank 94 through the first pair of hydraulic cylinders 20, their rods being completely retracted.

[0039] In this configuration, the ejecting plate 16 subdivides essentially the volume of the collecting tank 94 into two halves.

[0040] When a quantity of waste B is inserted in the waste collecting tank 94, the waste rests on the bottom 96 and the inclined wall 100 and is in touch with the ejecting plate 16 and the sidewalls 99.

[0041] When the second pair of hydraulic pistons 22 is actuated, the rod 64 goes out and the pressing shovel 18 is lowered and presses the waste to form a compact waste C which is pressed between the pressing shovel 18 and the ejecting plate, as visible in Figure 7.

[0042] After loading further quantities of waste in the collecting tank 94, the subsequent compaction is done by lowering the pressing shovel 18, which involves an increase of the volume of the compacted waste C. as it is visible in Figure 8, the more voluminous compacted waste C pushes the ejecting plate 16 towards the front wall 98 on causing the going out of the rod 72 of the first pair of hydraulic pistons 20. In fact, the first pair of hydraulic pistons 20 can maintain its extension fixed till when a determined threshold of force, applied on the ejecting plate 16, is overcome so that it is possible for the ejecting plate 16 to advance towards the front wall 98.

[0043] As it appears from Figure 9, the second pair of hydraulic pistons 22 lift the pressing shovel 18 again to allow the loading of a further quantity of waste B in the collecting tank 94.

[0044] At it appears from Figure 10, the subsequent lowering of the pressing shovel 18 permits to obtain a compacted volume of waste C which brings the ejecting plate 16 in proximity to the front wall 98 of the collecting tank 94 so that it is possible to take advantage of the whole available volume of the collecting tank 94.

[0045] In this way, the pressing shovel 18 accomplishes only one rotation and without translating, the shovel compacts a further quantity of waste which is charged in the collecting tank 94 in each loading cycle, in addition to the present compacted volume of waste C.

[0046] Obviously, the whole available volume of the collecting tank 94 is utilizable and it is possible to compact the waste with the pressing shovel 18 till when the compacted volume of waste C does not allow the entering of the pressing shovel 18 in the collecting tank 94 any longer and stops the lowering of the pressing shovel 18 above the level of the first pair of hydraulic pistons 20.

[0047] As visible in Figure 11, the emptying of the collecting tank 94 is accomplished by rotating the tank itself about a hinge 102 since the hinge 102 constrains the tank to a support D so as to rotate.

[0048] The pressing shovel 18 is completely lifted from the second pair of hydraulic pistons 22 to allow the compacted waste C to fall down from the collecting tank 94 owing to the gravity.

[0049] Then, as visible in Figure 12, the first pair of

hydraulic pistons 20 is actuated to advance the ejecting plate 16 towards the inclined wall 100 and to push the compacted waste C out of the tank.

[0050] As visible in Figure 13, the ejecting plate 16 is rotated relative to the pair of sliding blocks 78 to allow the discharge of any waste that could penetrate the room between the ejecting plate 16 and the front wall 98 of the collecting tank 94 during the loading operations or during the compaction of the mass of waste with the pressing shovel 18, in particular liquid waste.

[0051] The particular construction of the pressing shovel 18 and the movement thereof through the second pair of hydraulic pistons 22 according to the present invention allow to limit the movement of the pressing shovel 18 to only one rotation while unlike the known compacting units no translation occurs since such a translation would compel the pressing shovel 18 to accomplish a translating forward and backward movement for each compaction.

[0052] This constructive feature allows to obtain a more rigid collecting tank 94 since the frame 12 of the waste compacting unit 10 closes the upper part of the tank and prevents the sidewalls 99 from breaking owing to the pressure of the compacted waste.

[0053] On the contrary, on the upper part of the collecting tank, the waste compacting units of the known art are provided with guides for the run of the pressing shovel, such guides being no more necessary in the waste compacting unit 10 according to the present invention.

[0054] In the known waste compacting units, the guides for the ejecting plate are subjected to problems due to the contact with the mass of waste because such guides are positioned near the bottom of the collecting tank while in the waste compacting unit 10 according to the present invention, such guides are positioned in the pair supports-sliding blocks 78, far from the bottom 96.

[0055] The particular conformation of the main body 76 and the upper positioning of the guides 14 for the ejecting plate 16 allow the ejecting plate 16 to tilt only in the unloading phase in order to completely remove the waste from the collecting tank 94, contrary to the waste compacting units of the known art in which the guide system and the moving system (usually a telescopic cylinder) for the ejecting plate are positioned near the bottom of the tank.

[0056] According to another version of the invention, a waste compacting unit could have a hydraulic motor and a rack instead of the first and second pair of hydraulic pistons 20, 22, or an endless screw.

[0057] In addition, further versions and modifications are possible, which are to be considered as included in the scope of protection as described in the following claims.

Claims

1. Waste compacting unit (10) to be connected with a waste collecting vehicle, comprising:

- a collecting tank (94) to be fixed on a vehicle and comprising at least two sidewalls (99),
- a frame (12) fixed on the collecting tank (94),
- a pressing shovel (18) comprising at least a spoon (24, 28) and shovel moving means for the displacement of said spoon (24, 28), said shovel moving means being fixed on the frame (12),
- an ejecting plate (16) comprising at least a main plane body (76) and plate moving means for the displacement of said main plane body (76), said plate moving means (20) being fixed on the frame (12),

characterized in that the frame (12) is fixed on the upper part of the collecting tank (94) so that the plate moving means are fixed on the upper part of the collecting tank (94) and said plate moving means do not come in touch of any waste contained in the collecting tank (94).

2. Waste compacting unit (10) according to claim 1, wherein said main plane body (76) is connected with the upper part of the plate moving means so as to swing and tilt in relation to the collecting tank (94).

3. Waste compacting unit (10) according to claim 1 or 2, wherein said plate moving means comprise at least a guide (14) fixed on the frame (12) and with which at least a sliding block (78, 88) is connected so as to translate, said at least a sliding block (78, 88) being connected with the main plane body (76) through connecting means (82, 84, 86).

4. Waste compacting unit (10) according to claim 3, wherein said connecting means comprise:

- a first pin (80) which is fixed on the main plane body (76) and rotates in a hole (82) which is obtained in the at least a sliding block (78, 88) so that the main plane body (76) can swing in relation to the at least a sliding block (78, 88),
- a second pin (84) which is fixed on the main plane body (76) and moves in a slot (86) which is obtained in the at least a sliding block (78, 88) in order to limit the rotation of the main plane body (76) in relation to the at least a sliding block (78, 88).

5. Waste compacting unit (10) according to claim 3 or 4, wherein the shovel moving means comprise actuating means (22) fixed on the at least a sliding block and frame (12) so as to translate the main plane body (76) in relation to the tank (94).

6. Waste compacting unit (10) according to any of the preceding claims, wherein the pressing shovel (18)

comprises a first spoon (24) and a second spoon (28) which are connected with each other at their ends so as to swing and adjust the angle between said first spoon (24) and said second spoon (28).

7. Waste compacting unit (10) according to claim 6, wherein at an end, the first spoon is pivoted on the frame (12) and at the other end, the first spoon is connected with the second spoon (28) so as to swing, the second spoon (28) being connected through a connecting rod (26) with the frame (12), an end of said connecting rod (26) being connected with the frame (12) so as to swing and the other end being connected with the second spoon (28) so as to swing next to the connection between the first spoon (24) and the second spoon (28), the first spoon (24) being connected with actuating and moving means (22) for the lifting of the first spoon (24); consequently, the second spoon (28) is lifted and opens wide from the first spoon (28) simultaneously.

8. Waste compacting unit (10) according to any of the preceding claims, wherein the frame (12) comprises at least a crossbar (50) the ends of which are fixed to a sidewall (99) of the tank (96), respectively.

9. Waste compacting unit (10) according to any of the preceding claims, wherein the tank (96) is hermetic.

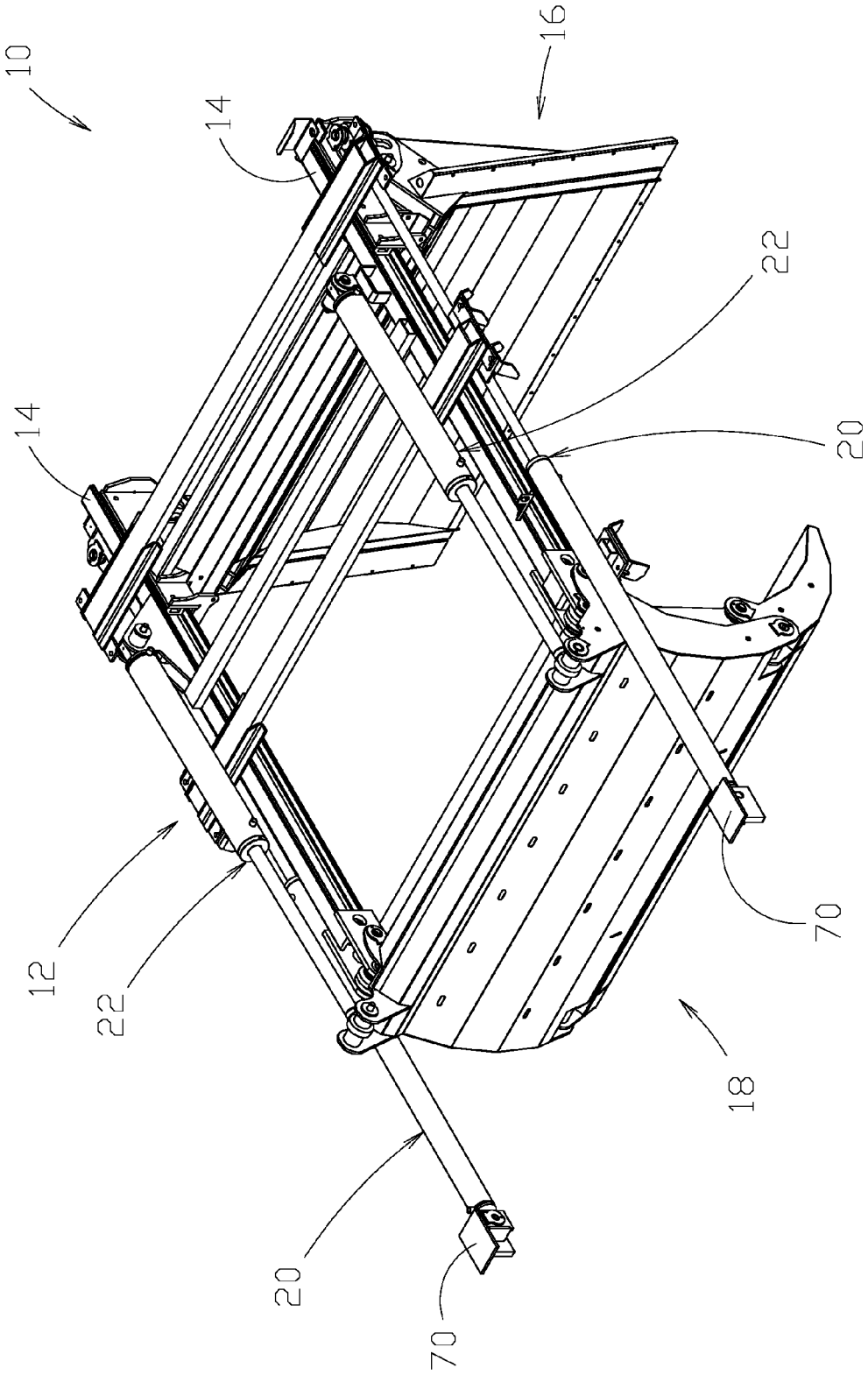

Fig. 1

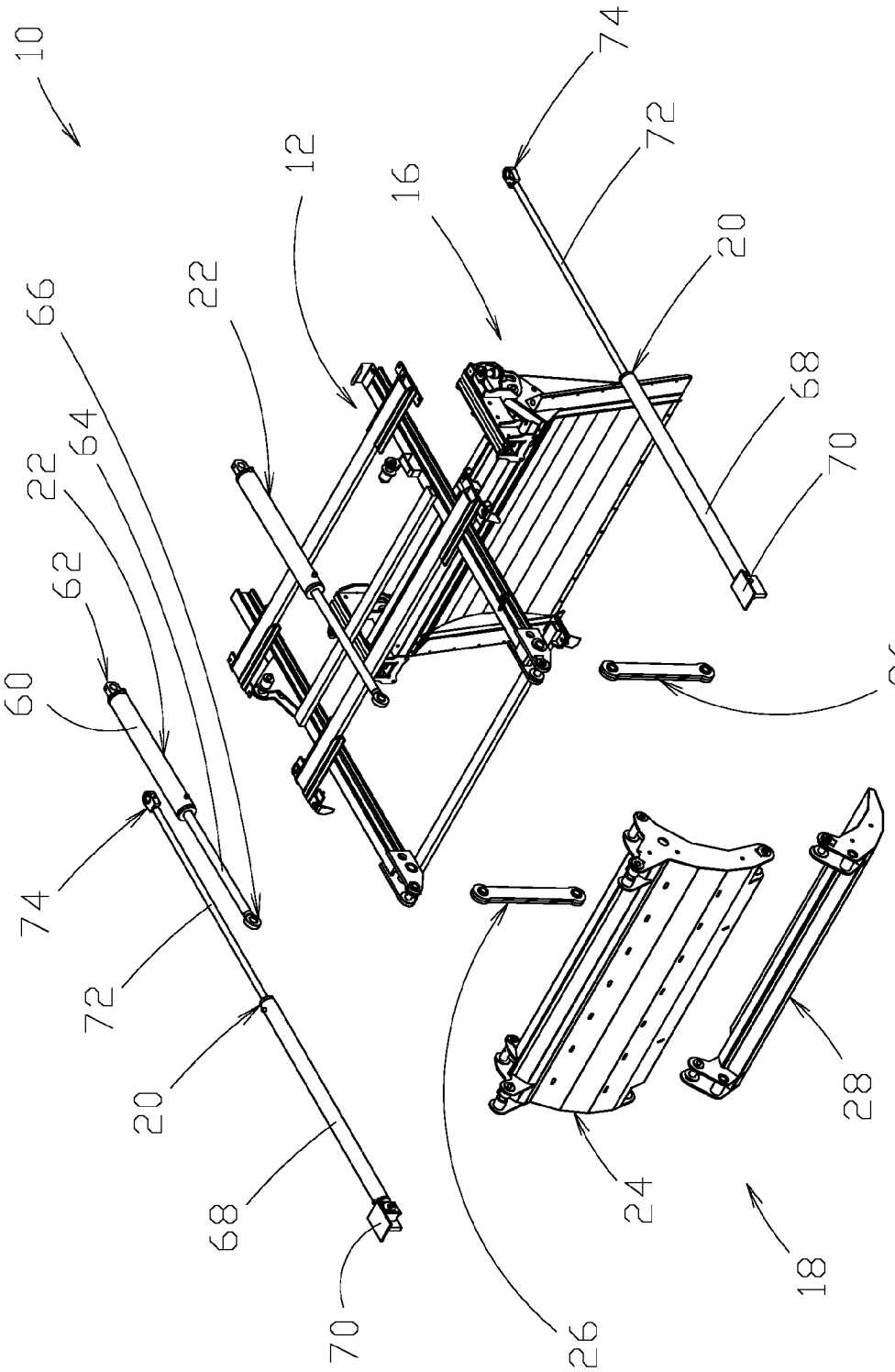

Fig. 2

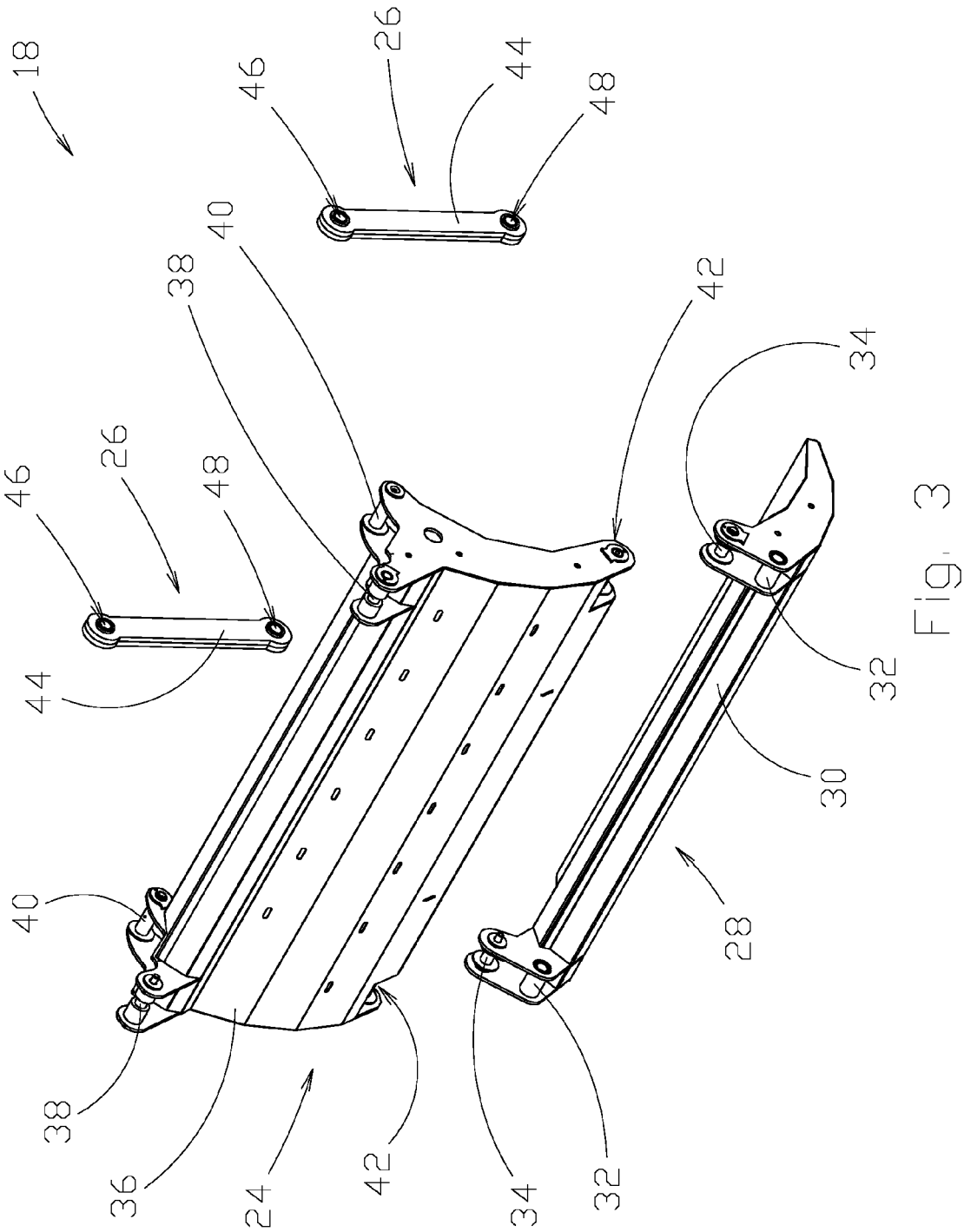

Fig. 3

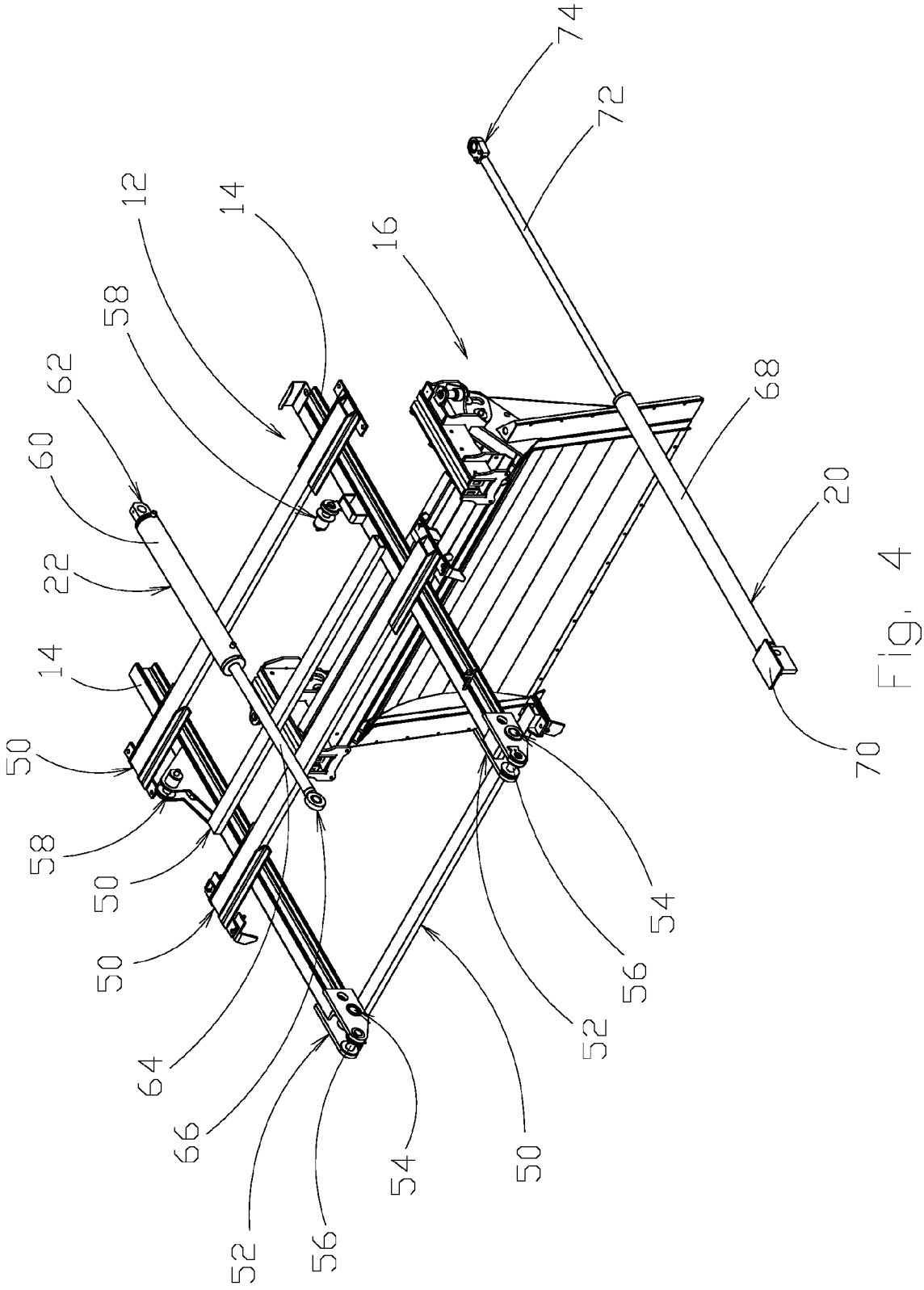
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Fig. 4

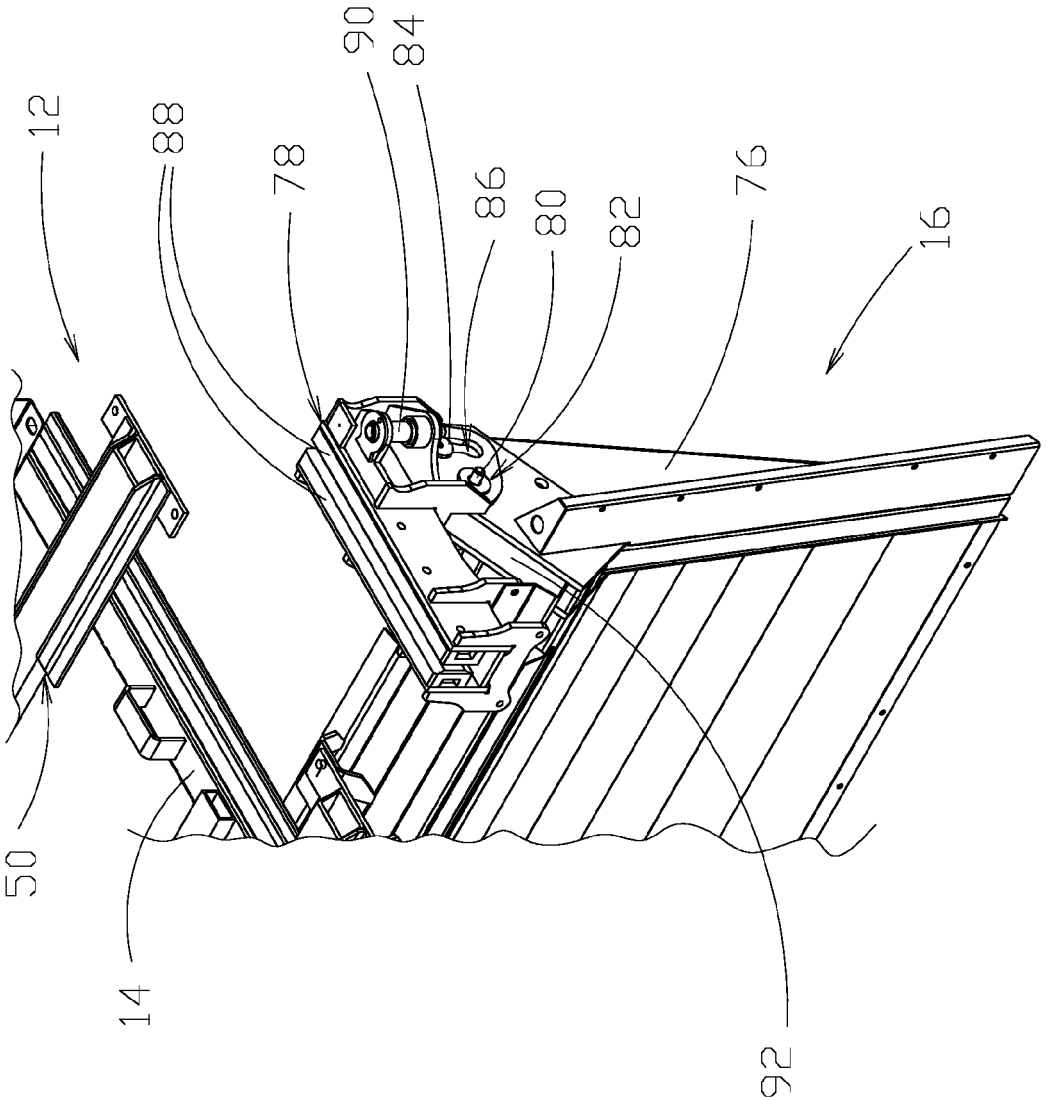

Fig. 5

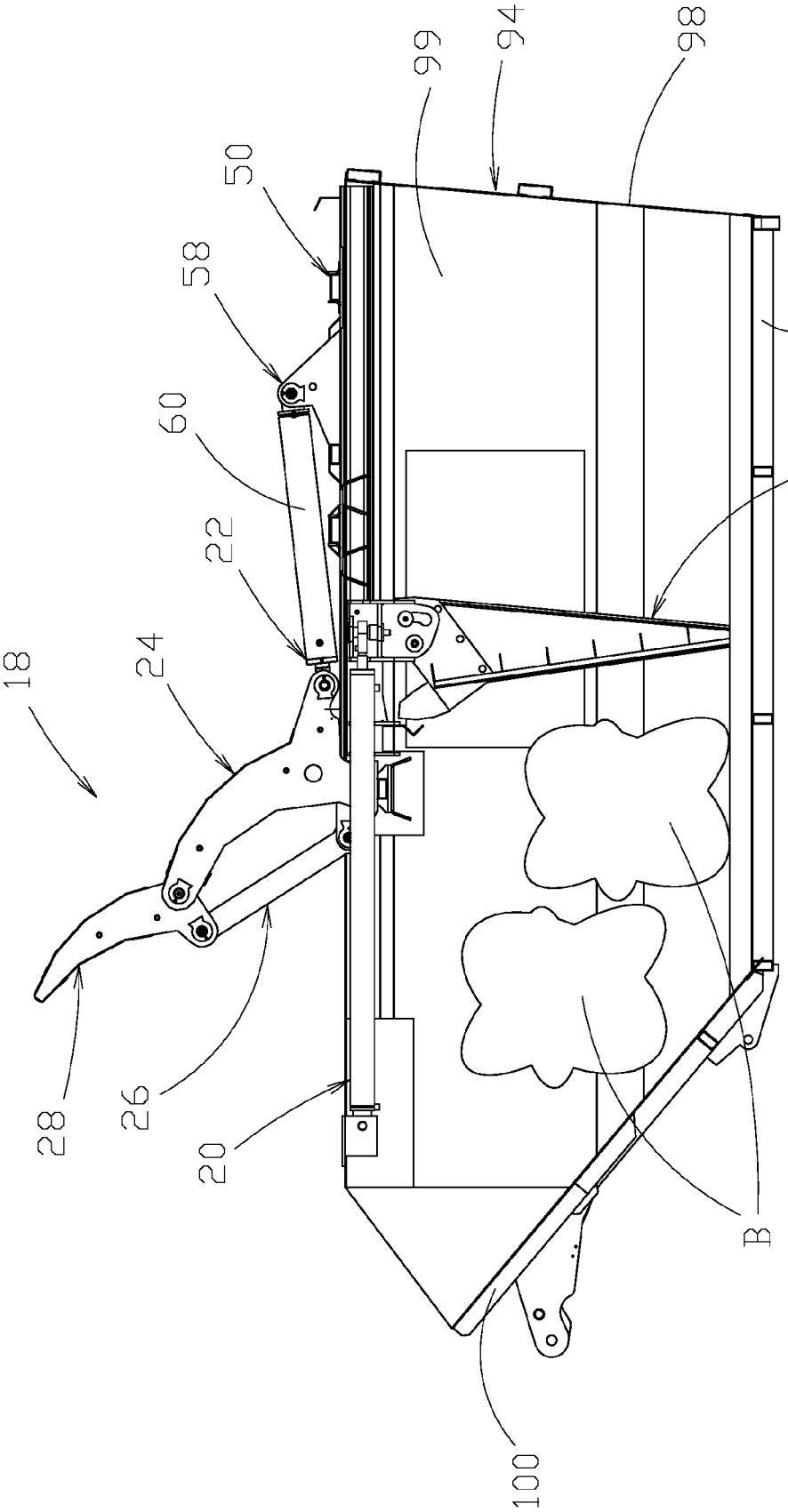

Fig. 6

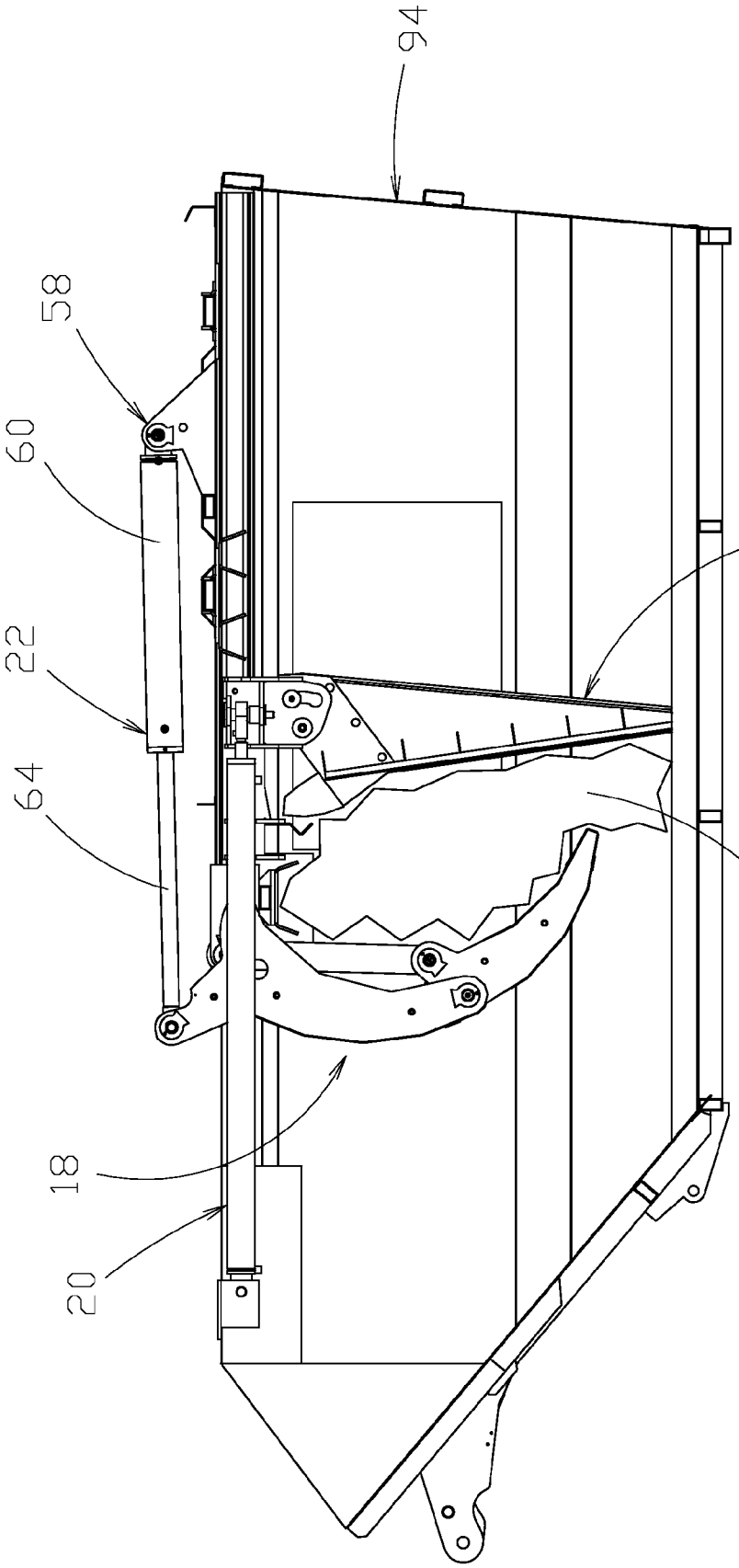

Fig. 7

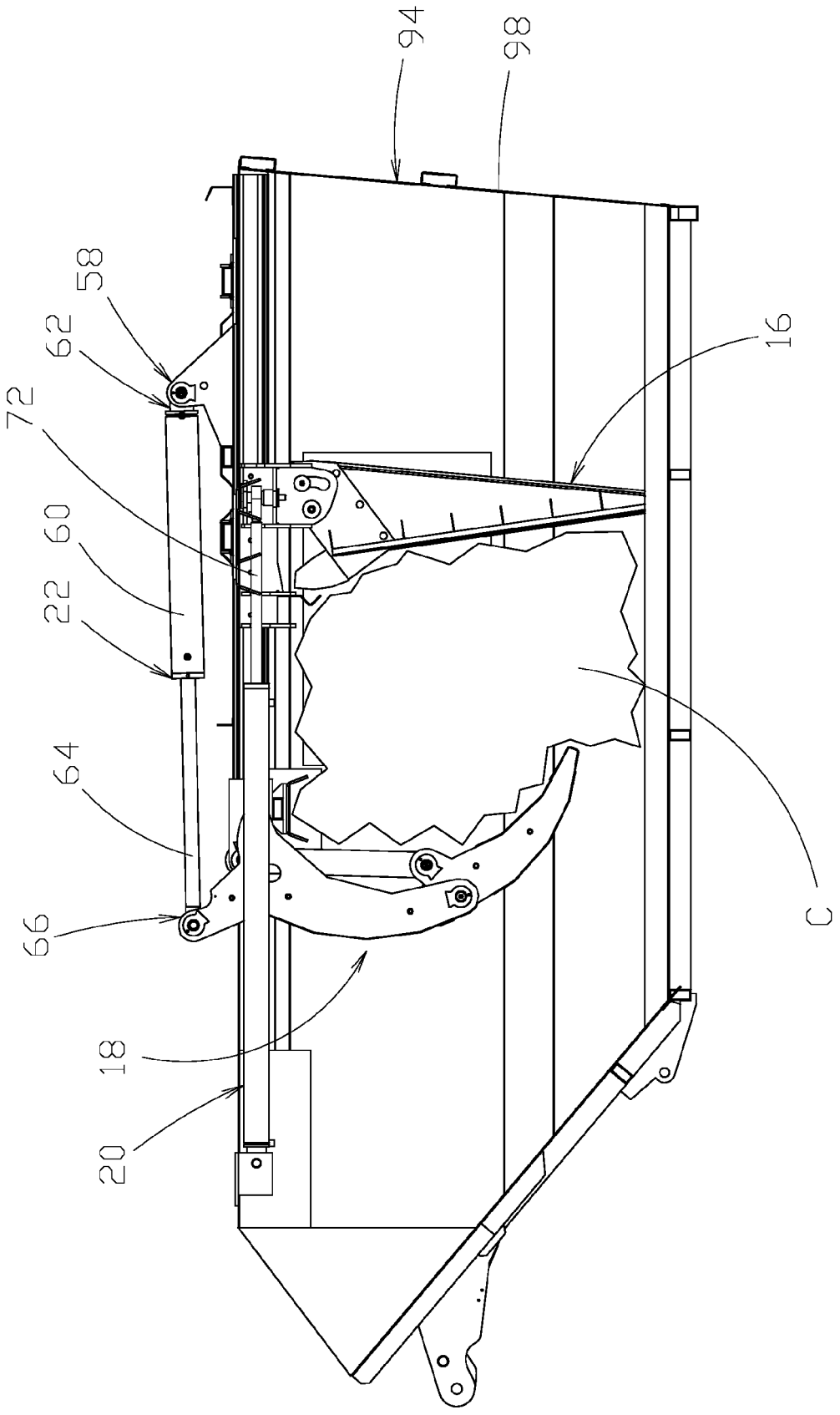

Fig. 8

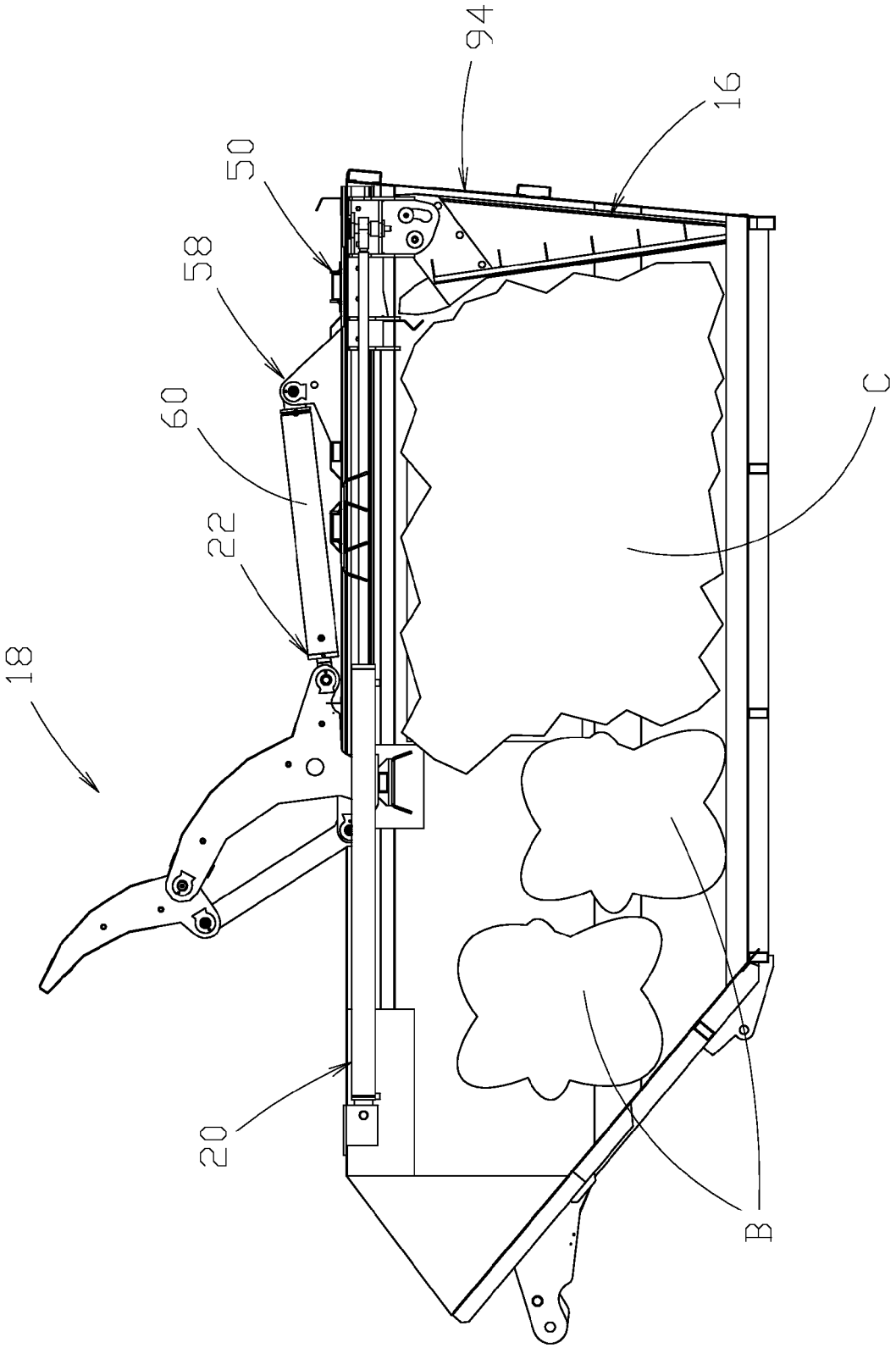

Fig. 9

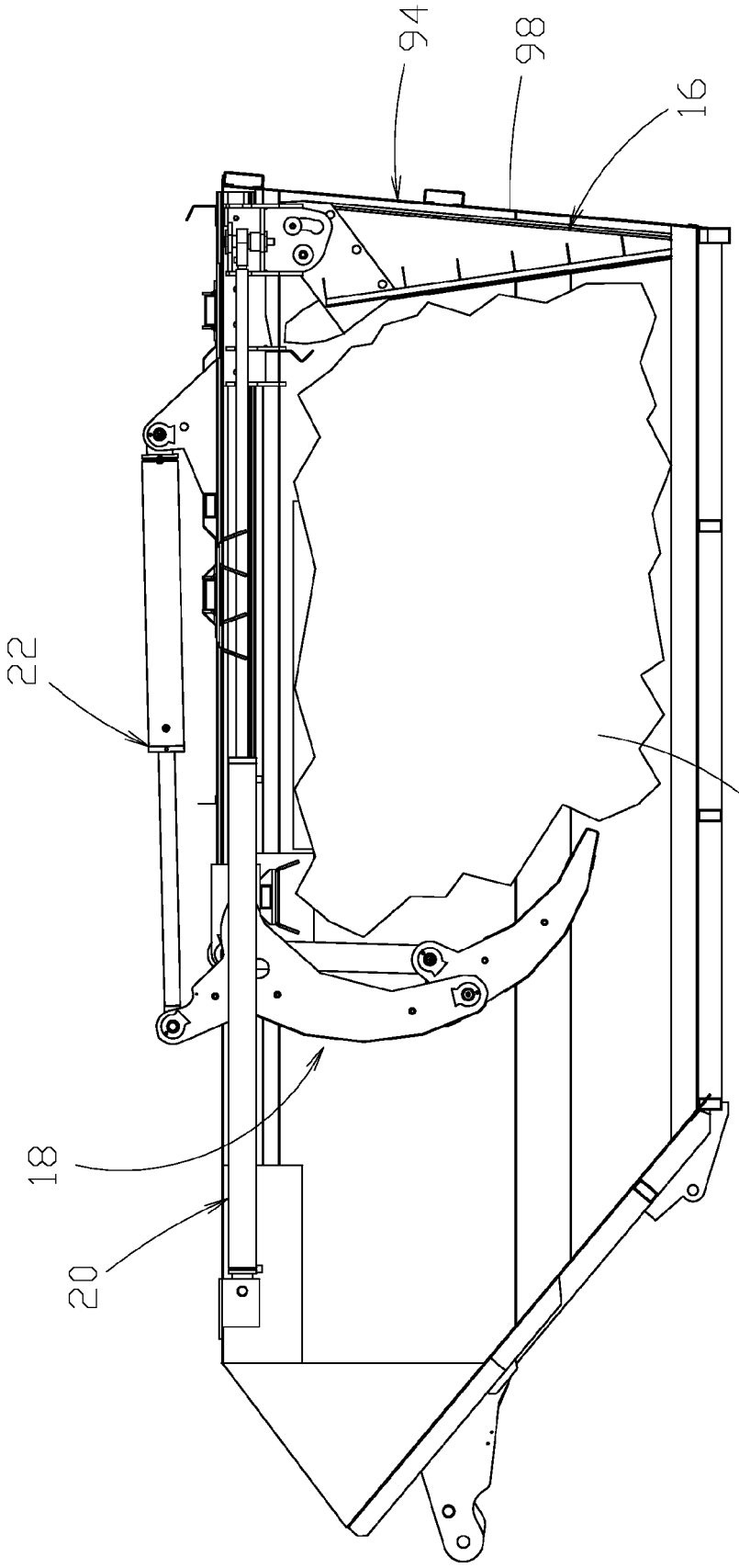

Fig. 10

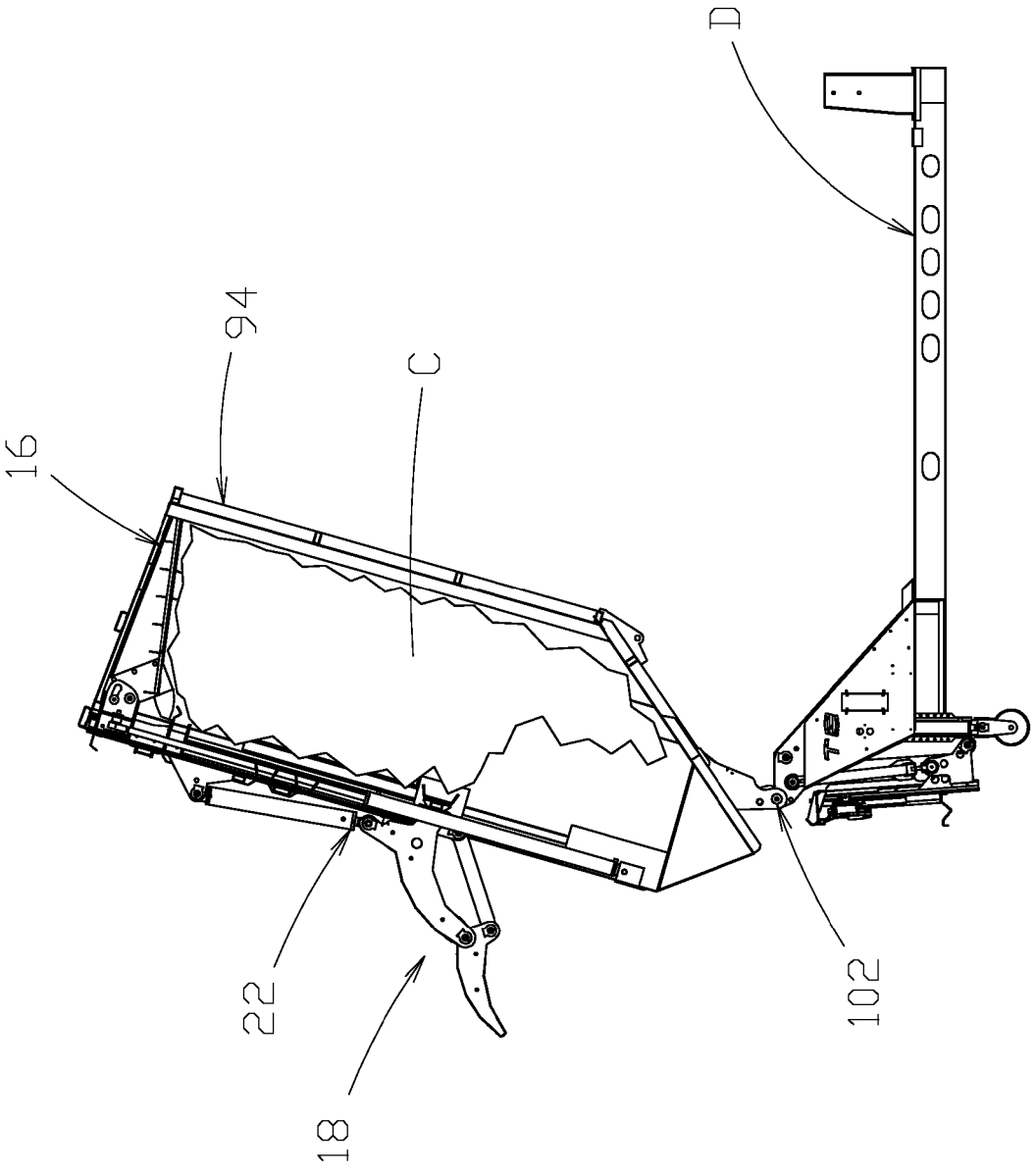

Fig. 11

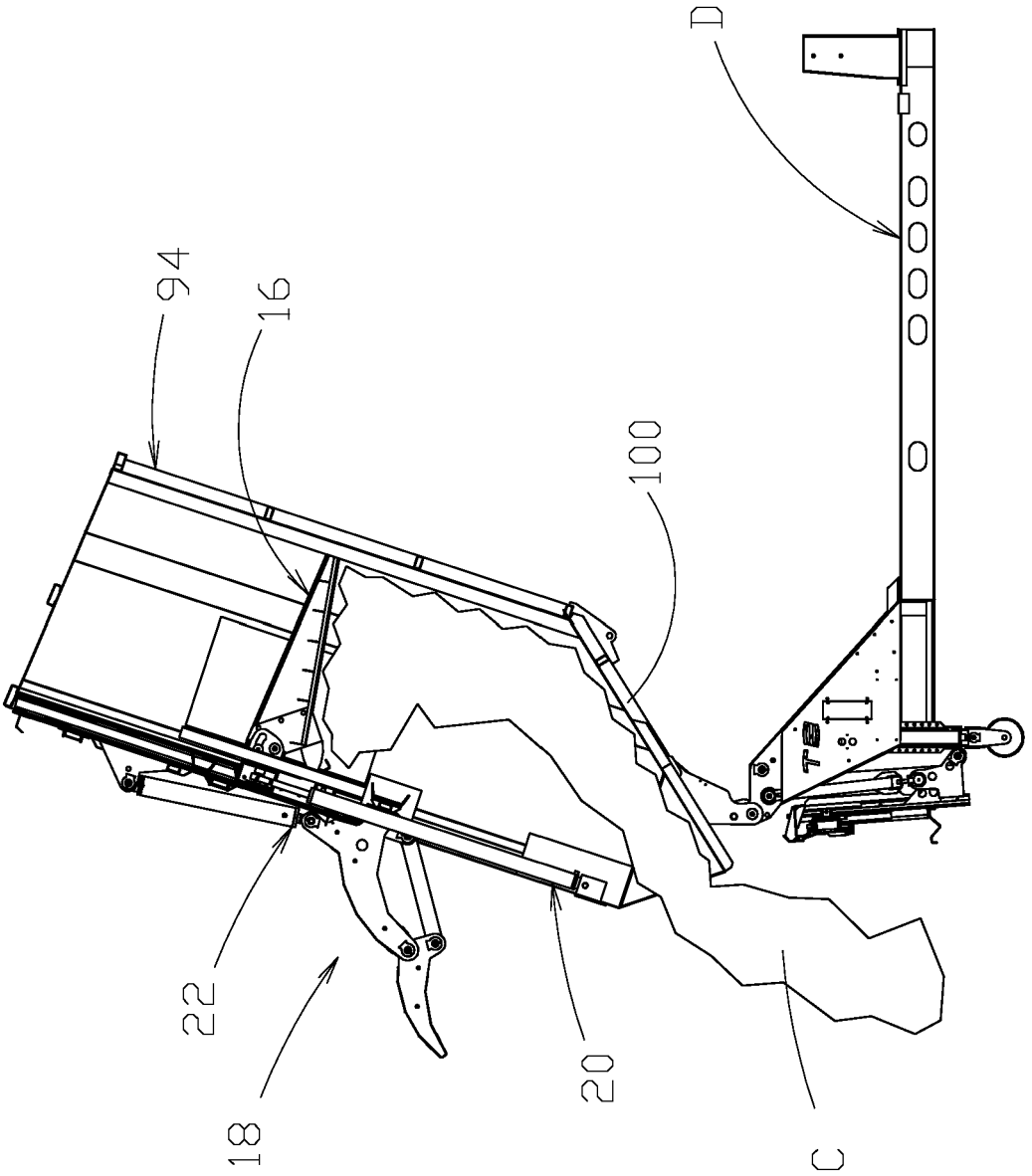

Fig. 12

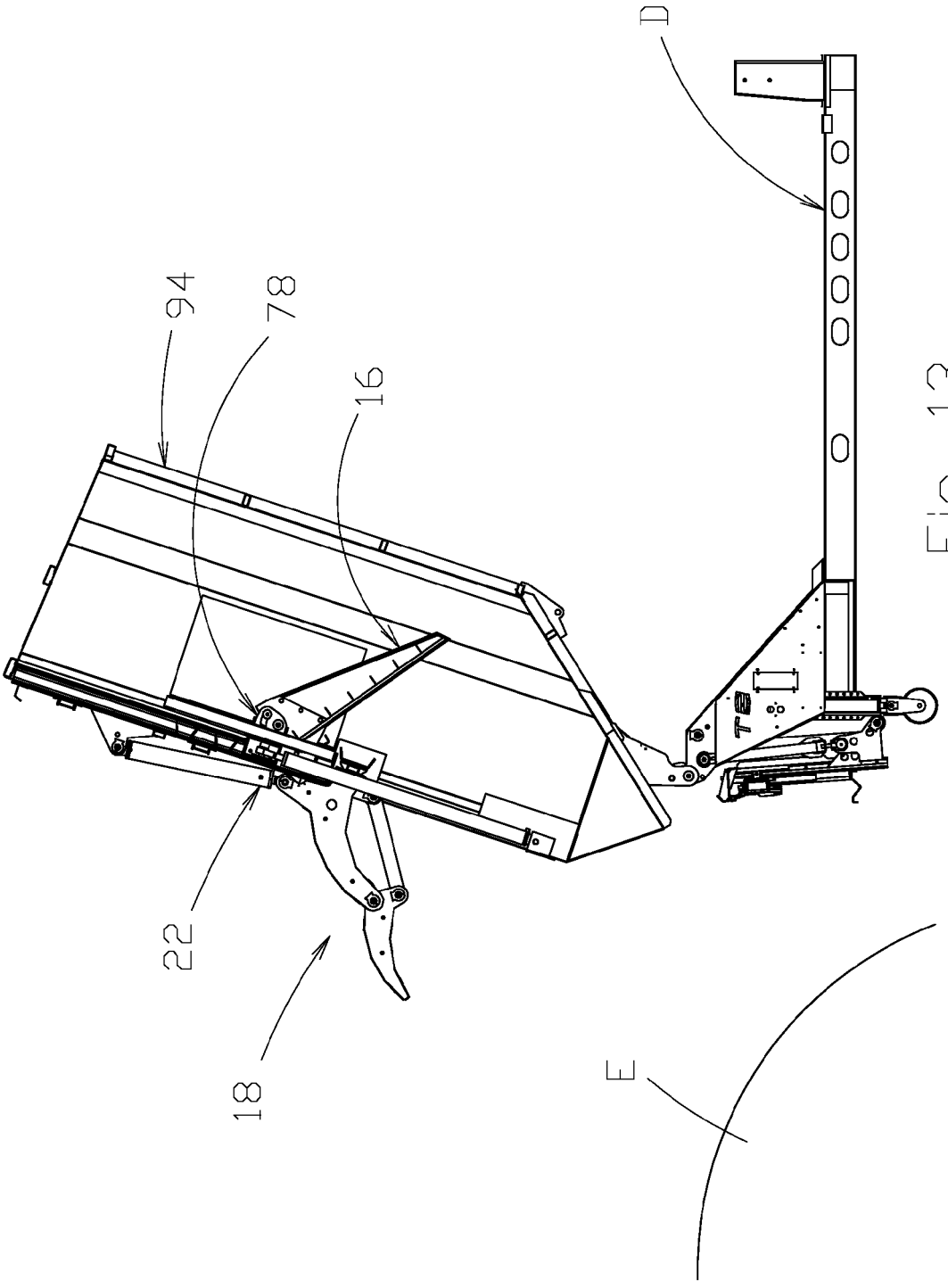

Fig. 13

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EUROPEAN SEARCH REPORT

Application Number
EP 11 15 8414

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	EP 0 514 355 A1 (FARID S.P.A.) 19 November 1992 (1992-11-19) * column 2, line 27 - column 4, line 31 * * figures 1-3 *	1-3,9 4-8	INV. B65F3/20 B65F3/28 B65F3/26
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	5 July 2011	Smolders, Rob

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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