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(54) SYSTEM FOR THE HANDLING OF DUMPSTERS IN SIDE LOADING VEHICLES

(57) System for the handling of dumpsters in side loading vehicles, which comprises a pair of arms associated with a structure which brings them closer to the dumpster so that it can be grasped, and the structure of which, after moving closer to the side of the vehicle, lifts it again and carries the dumpster until it is tipped for unloading into the hopper of the collection vehicle. It comprises means for 3D scanning (3) of the different types of dumpsters and a control unit for processing, together with a central control unit (6) to which information is sent from the control unit associated with the 3D scanning means, in order to determine each type of dumpster and the positioning of the grasping bolts (8), sending the corresponding orders to devices for bringing the dumpsters closer, which include means for rotation and regulation of the pair of arms (9) for holding the dumpsters, to lifting means (2), and to means for anchoring the bolts on the dumpsters and opening the lid of the dumpsters.

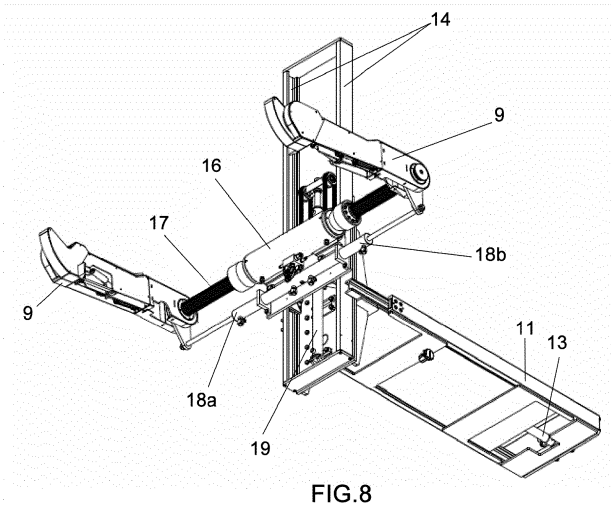

FIG.8

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Description

OBJECT OF THE INVENTION

[0001] The following invention, as expressed in the title of this descriptive report, refers to a system for the handling of dumpsters in side loading vehicles, the first objective of which is the automatic detection of the type of dumpster to be handled, determining the positioning of the grasping bolts for handling.

[0002] A second objective of the system is, once the type of dumpster to be handled has been detected, to regulate independently the exact position of the dumpster collection arms so that, once it has been unloaded, it can be put back in the same position from which it was collected.

[0003] In this way, even though the vehicle may not be completely centred with regard to the dumpster to be collected, the system itself, having detected the exact position of the dumpster, will adapt precisely the independent opening of the pair of arms which pick up the dumpster, allowing it to be grasped correctly, with a small degree of tolerance, thus avoiding any dragging movement of the dumpster on the ground which might damage it.

[0004] In addition, the aforementioned detection system acts as a means of detecting obstacles which might get in the way of the operation for loading/unloading of the corresponding dumpster.

FIELD OF APPLICATION

[0005] This report describes a system for the handling of dumpsters in side loading vehicles, which can be installed on either side of the waste collection vehicle, allowing it to work on either the right or the left with regard to the vehicle's direction of travel.

BACKGROUND OF THE INVENTION

[0006] As is known in the field of waste collection, the dumpsters are tipped into the vehicle from the rear in such a way that, in principle, the dumpsters are handled manually by operatives collecting them and tipping the contents into the hopper, and then leaving the dumpsters in a suitable position, while the refuse accumulated in the hopper is compacted to allow collection of the largest possible quantity.

[0007] This operation required considerable physical exertion on the part of the operatives, who were also at risk of suffering accidents, for example falls, because they were required to stand on small platforms at the rear of the vehicle, to speed up the collection process.

[0008] Over time, waste collection has evolved, to incorporate automatic means at the rear of the vehicle, allowing the operatives to place the dumpsters in a position to be collected and tipped by these means into the hopper, leaving the dumpster, once emptied of its contents, for the operatives to return it to its original position; this way, the effort required by the operatives is reduced considerably, as they only have to move the dumpsters from one place to another.

[0009] Meanwhile, the operation continues to evolve, by incorporating in the waste collection vehicles means which allow the dumpsters to be collected and tipped from the side of the vehicle, making this a more flexible operation which can be carried out by the vehicle's driver, with no requirement for operatives to handle the dumpsters. The capacity of the dumpsters can also be greater.

[0010] Using this system, the driver of the vehicle positions the vehicle with the collection means facing the dumpster, so that they pick up the dumpster automatically and tip the contents into the hopper, and then replace the dumpster; depending on the skill of the driver, the handling means for the dumpster will be more or less centred.

[0011] With this operation, if the collection means are not perfectly aligned, it is common for the dumpster to be dragged across the ground, causing damage to them, and for them to be returned to a position different from the initial position once they have been emptied.

[0012] The aforementioned handling means for dumpster are based, essentially, on a pair of fixed parallel arms which are moved to pick up the dumpster, lift them from ground level and, once grasped, move them closer to the vehicle so that they can be lifted up and tipped. The reverse operation returns them to their position on the ground.

[0013] In this way, we can consider different cases such as ES 1 056 843, which describes a *"device for the collection of dumpsters, applicable to waste collection trucks",* in which the device is based on a cross-beam with the pair of dumpster collection arms, with the arms coupled to a sliding assembly on the cross-beam.

[0014] In addition, we can consider the patent documents ES 2 094 632; ES 2 118 525, ES 2 221 253 and ES 2 286 053, which describe respective devices for handling dumpsters, adapted to one side of the corresponding waste collection truck.

DESCRIPTION OF THE INVENTION

[0015] This report describes a system for the handling of dumpsters in side loading vehicles, in which the system comprises a pair of arms associated with a structure which brings them closer to the dumpster to pick it up and the structure of which, after moving closer to the side of the vehicle, lifts it again, carrying the dumpster, until it is tipped to be unloaded in the collection truck hopper, in such a way that the system comprises:

- a 3D scanning device, based on a laser sensor, a servomotor and a control unit, for the different types of dumpsters;
- a central control unit, to which the information processed by the scanning device control unit is sent,

with the central control unit associated with a database for storing the different types of dumpsters;

- a computer unit, associated with the central control unit, for interaction between the driver and the collection system;
- a means for bringing the pair of arms for holding the grasping bolts on the dumpsters closer for handling;
- a means for rotating and regulating the pair of holding arms for the dumpster grasping bolts;
- a means for lifting the dumpsters held by the pair of arms, and;
- means for anchoring the dumpster grasping bolts to the pair of holding arms, and for opening the lid of the dumpster, when they are being tipped.

[0016] In this way, the 3D scanning device for the different types of dumpsters is defined by a laser sensor coupled to a servomotor which scans the dumpsters in real time, and information from which is processed by the control unit associated with it, sending the results to the central control unit.

[0017] The central control unit has a database which stores the data relating to different types of dumpsters, in order to compare the information sent by the control unit associated with the 3D scanning device, to determine the type of dumpster to be handled and the relative position of the grasping bolts, with the central control unit ordering and controlling all the movements in the system from said detection.

[0018] Meanwhile, the means for moving the pair of arms for holding and handling the dumpsters is defined by a plate which is moved by means of a first hydraulic cylinder, and attached to which is a pair of parallel vertical guides between which there is a carriage for assembly of the means for rotating and regulating the pair of arms for holding the dumpster grasping bolts.

[0019] The moveable plate associated with the carriage on which the means for rotating and regulating the pair of arms for holding the dumpster grasping bolts are mounted can be moved in relation to a frame arranged horizontally and crosswise on the chassis of the collecting vehicle, under the refuse tipping hopper.

[0020] The means for rotating the pair of arms for holding the dumpster grasping bolts are defined by a hydraulic actuator, to the shaft of which is attached a grooved shaft on which the pair of arms is mounted using respective tubular pieces.

[0021] In addition, the means for regulation of the pair of arms for holding the dumpster grasping bolts are defined by a pair of independently-acting hydraulic cylinders, which move the pair of arms along the grooved mounting shaft, by means of the tubular pieces, allowing them to be adapted to the measurements of the different types of dumpster, and to the relative position in which the collection vehicle is placed with regard to the dumpsters.

[0022] The tubular pieces which are used to mount the pair of arms on the grooved shaft have, in an external central position, a recess in which the U-shaped end of a flat bar fits; the other end of this bar is attached to the corresponding piston of a hydraulic cylinder from the pair of hydraulic cylinders, allowing each of them to be operated independently.

[0023] The means for lifting the dumpsters held by the pair of handling arms are defined by a second hydraulic cylinder which moves the carriage, associated with the pair of arms, between the pair of parallel vertical mounting guides.

[0024] Meanwhile, the second hydraulic cylinder, in relation to the carriage lifting means, works in conjunction with a pair of chains which are firmly attached at one end to the fixed structure of the moveable plate in the means for bringing the dumpsters closer, and at the other end are firmly attached to the carriage, and are associated with respective intermediate pulleys mounted on a bar firmly attached to the piston of the aforementioned second hydraulic cylinder.

[0025] The means for anchoring the grasping bolts on the dumpsters to the pair of arms for holding and opening the lid of the dumpsters are defined by a tilting body, associated with the arm itself, which, when deployed, fulfils the dual function of anchoring the grasping bolts and opening the lid of the dumpster.

[0026] For this purpose, the tilting body, in relation to the means for anchoring the grasping bolts and opening the lid, has an oval-shaped side protrusion which, when tilted, closes on the corresponding grasping bolt for the dumpster and anchors it, while also acting on the lid to open it.

[0027] In this way, with the dumpster in its highest position, the hydraulic actuator is activated, rotating the grooved shaft and with it the pair of arms holding the dumpster, at the same time as the grasping bolts have been anchored, the lid of the dumpster opened and, where relevant, means for holding the dumpster operated.

[0028] The means for holding the dumpsters while being tipped are defined by a fourth hydraulic cylinder and a pair of flat bars which tilt in the direction of the pair of arms and a roller which tilts in a crosswise direction to the latter.

[0029] The cabin computer system, associated with the central control unit, may load files onto an external server so that they can be accessed from other authorised computers.

[0030] To complement the description which will be given below, and to make it easier to better understand the characteristics of the invention, this descriptive report is accompanied by a set of plans with figures representing the most characteristic details of the invention; these are provided for illustrative purposes and are nonlimiting.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031]

Figure 1 shows a schematic view of a waste collection vehicle with the means for monitoring and managing the unloading of the dumpsters and their return to their original position.

Figure 2 shows a front view of a waste collection vehicle with the system for handling the dumpsters shown in its resting position on the corresponding loading side, next to a dumpster to be collected.

Figure 3 shows a front view of the waste collection vehicle with the system for handling the dumpsters displaced from its rest position and with the arms for attaching the dumpsters set up to move closer to the dumpster and pick it up.

Figure 4 shows a front view of the waste collection vehicle in the previous figure with the system for handling the dumpsters raised to its elevated position, prior to tilting the dumpster to empty it.

Figure 5 shows a side view of the waste collection vehicle in the previous figures, showing how the system for handling the dumpsters is arranged on one side.

Figure 6 shows a perspective view of the means for bringing the pair of arms for handling the dumpsters closer, which is defined by a frame arranged on the chassis of the vehicle, in a crosswise direction, under the hopper for tipping the refuse; a plate moves in relation to the frame, in a horizontal direction, by means of a first hydraulic cylinder, with this plate attached to a pair of vertical guides to which is attached the carriage on which the means for rotating and regulating the pair of arms for handling the dumpsters is mounted. Also shown is the means for lifting the dumpsters, based on a second hydraulic cylinder, which moves the carriage on which the means for rotating and regulating the pair of arms is mounted along the pair of guides, between which it is mounted, with the cooperation of a pair of chains, a detail of which is also shown.

Figure 7 shows a perspective view of the means for bringing the pair of arms closer, defined by a frame which is arranged on the vehicle chassis, in a crosswise direction, below the refuse tipping hopper and in relation to which a plate moves by means of a first cylinder, so that the pair of vertical guides along which the carriage which carries the means for rotating and regulating the pair of arms is fixed to said plate. The diagram shows the means in the deployed position.

Figure 8 shows a perspective view from below of the means for regulating the pair of arms for handling the dumpsters, and also shows the pair of cylinders which act independently on these means. Also shown is the second hydraulic cylinder which moves the carriage carrying the means for rotating and regulating the pair of arms which handle the dumpsters.

Figure 9 shows a perspective view of the means for regulating the pair of arms for handling the dumpsters, with one of the arms removed, showing how the pair of arms are mounted using an intermediate tubular piece with an external central recess in which one end of a U-shaped bar is coupled, in such a way that the other end is attached to the corresponding hydraulic cylinder for regulating said pair of arms; a detail of said tubular piece and bar is also shown.

Figure 10 shows a front view of the previous figure with the means for regulating the pair of arms for handling the dumpsters, with one of the arms removed, showing how the pair of arms are mounted using an intermediate tubular piece with an external central recess in which one end of a U-shaped bar is coupled, with the other end attached to the corresponding hydraulic cylinder for regulating said pair of arms; a detail of the tubular piece and the bar is also shown.

Figure 11 shows a view of the previous figure with an axial cut made in the grooved shaft for mounting the arms for handling the dumpsters in relation to the intermediate tubular piece and the bar with a U-shaped end, and a detail thereof.

Figure 12 shows a front view of figure 7 with an axial cut in the grooved shaft for mounting the pair of arms for handling the dumpsters in relation to the connection between the shaft of the hydraulic actuator and the grooved shaft for mounting the pair of arms, and a detail thereof.

Figure 13 shows a perspective view of a dumpster being held by the pair of handling arms, showing how the grasping bolt on the dumpsters fits into a concave recess in the arms and, subsequently, the arms are anchored by the tilting body which opens the lid of the bin; a detail of the positioning of said bolt can also be seen.

Figure 14 shows a perspective view of the previous figure with the means for anchoring the bolts on the dumpster to the pair of arms; these means also open the lid of the dumpster and are defined by a tilting body associated with the arms themselves. A detail thereof is also shown.

Figure 15 shows a perspective view of figure 11, in which the means for anchoring the grasping bolts on the dumpsters to the pair of arms have acted, and shows how the tilting body, by means of a small oval-

shaped protrusion, closes on the bolt and, simultaneously, opens the lid; a detail thereof is also shown.

Figure 16 shows a perspective view of a variant for practical execution in which the pair of arms for handling the dumpsters comprise a means for holding the dumpsters during the tipping operation, showing how said means tilts in parallel to the arm and, simultaneously, a roller deploys in an orthogonal direction towards the front face of the dumpster, in such a way that the details thereof can be seen.

Figure 17 shows a perspective view of the previous figure in which it can be seen how the body for opening the lid of the dumpster deploys, as indicated above, to act simultaneously with the means for holding the dumpsters; a detail thereof is also shown.

Figure 18 shows a perspective view of the previous figure in which it can be seen how the body for opening the lid of the dumpster has continued tilting until the lid opens, as indicated above, to act simultaneously with the means for holding the dumpsters; a detail thereof is also shown.

Figures 19a, 19b and 19c show side elevation views of the set of levers, hidden in the end of the pair of arms for handling the dumpsters, and operated by a cylinder, which causes the dumpster grasping bolts to become anchored and the lid of the dumpster to open.

Figures 20a and 20b show perspective views of an arm with the means for anchoring the dumpster grasping bolts to the pair of arms for holding and opening the lid of the dumpsters, in its rest position, together with the means for holding the dumpster, where the latter are in their rest and working positions, respectively.

Figures 21 a 21 b, 21 c and 21 d show respective perspective views of the means for holding the dumpster from its rest position to its working position, and also show how, when the piston of the fourth hydraulic cylinder associated with said holding means is retracted, a pair of flat bars tilts, in relation to a different rotating axis, with one of them acting on a third flat bar which holds a roller which tilts in an orthogonal direction to that of the pair of flat bars.

DESCRIPTION OF A PREFERRED EMBODIMENT

[0032] In light of the abovementioned figures and in accordance with the numbering adopted, figure 2 of the drawings shows how, in the rest position, the system is flat against the structure of the collection vehicle 1, and in figure 3 it can be seen how, in operations to collect dumpsters 2, it is moved outwards by acting on the means for bringing the dumpsters closer. Figure 5 shows how the system is mounted on a side of the collection vehicle 1.

[0033] Thus, when the refuse collection vehicle 1 is next to the dumpster 2 to be collected, firstly, the 3D scanning means 3 will operate, based on a laser sensor attached to a servomotor and a control unit, carrying out a 180° sweep of the corresponding dumpster in real time, processing the information obtained and sending it to a central control unit 6.

[0034] Meanwhile, the central control unit 6 is associated with a database 7 which stores the data relating to different types of dumpsters 2 to be handled so that, in order to compare the information sent by the scanning means, the control unit 6 will determine the type of dumpster to be handled and the exact position of the grasping bolts 8, with the central control unit 6 ordering and controlling all the movements in the system from said detection.

[0035] In addition, the central control unit 6 is connected to a computer unit 4 with a screen set up, for example, in the vehicle cabin, on which the driver 5 of the vehicle interacts.

[0036] This way, once the type of dumpster to be collected has been defined and the relative positioning of the grasping bolts 8 identified, the central control unit 6 will be responsible for communicating the appropriate orders to the system to carry out the whole unloading manoeuvre and the reverse operation, and also to the means in the compacting hopper. It is also responsible for safety management.

[0037] Thus, in the first place, the means for bringing closer the pair of arms 9 for holding the grasping bolts 8 to handle the dumpster are activated; said means are defined by a plate 10 which is moveable in a horizontal direction with regard to a frame 11 arranged on the collection vehicle chassis 1, in a crosswise position, under the refuse tipping hopper 12.

[0038] The moveable plate 10, in relation to the means for bringing the device closer, is operated by a first hydraulic cylinder 13 and the fixed structure of the aforementioned plate 10 has had a pair of parallel vertical guides 14 attached, with a carriage 15 mounted between them and which moves along them.

[0039] Mounted on the carriage 15 are means for rotating and regulating the pair of arms 9 for holding the grasping bolts 8, in which the rotating means are defined by a hydraulic actuator 16 associated with which, on both sides, is a grooved shaft 17 on which the pair of arms 9 is mounted; the regulation means are defined by a pair of hydraulic cylinders 18a and 18b which act independently on each of the arms 9.

[0040] The carriage 15 with the means for rotating and regulating the pair of arms 9 for handling the dumpsters 2 mounted on it moves along the pair of guides 14 by means of a second hydraulic cylinder 19 with the help of a pair of belts or chains 20, one end of which is attached to the plate 10 structure and the other end attached to

the structure of the carriage 15. To do so, as can be seen in different figures, such as figure 6, said pair of belts or chains 20 pass around the corresponding pulley or pinion 21 mounted on a bar firmly attached to the piston of said second hydraulic cylinder 19, so that a displacement "X" of the piston of the second hydraulic cylinder 19 corresponds to a displacement "X/2" of the carriage 15.

[0041] As we have said, the pair of arms 9 is mounted on a grooved shaft 17 by means of a tubular piece 22 associated with a bar 23 fixed to the end of the piston on the corresponding hydraulic cylinder of said pair of hydraulic cylinders 18a and 18b, so that, when the pair of hydraulic cylinders act, independently, the pair of arms 9 is positioned to pick up the corresponding dumpster 2 by the grasping bolts 8.

[0042] In this way, the tubular piece 22, which is grooved on the inside, has a central recess 24 on the outside in which a U-shaped end of the bar 23 fits; the other end of the bar is attached to the piston of the corresponding hydraulic cylinder of the pair of hydraulic cylinders 18a and 18b, so that the action of the corresponding hydraulic cylinder 18a or 18b causes it to move, and the corresponding arm 9 with it.

[0043] Thus, even if the collection vehicle 1 is not perfectly centred in relation to the dumpster 2 to be collected, on the basis of the information managed by the central control unit 6, one or both cylinders can be activated in relation to the pair of hydraulic cylinders 18a - 18b to regulate the position of the pair of arms 9 so that they are perfectly positioned in relation to the grasping bolts 8 of the dumpster, allowing it to be picked up with precision, avoiding any lateral dragging of the dumpster, which might damage the dumpster itself or the collection system.

[0044] Also, this sideways adjustment of the pair of arms 9 ensures that, once the dumpster is emptied, it will be put back in the same position it occupied before being unloaded onto the tipping and compacting hopper 12.

[0045] Figure 12 of the drawings shows how the grooved shaft 17 is attached to the hydraulic actuator 16 which transmits movement to it via an adapter 25 which is threaded on the inside, on one side to the shaft of the hydraulic actuator 16 and on the other to the grooved shaft 17, although any other equivalent means could be used.

[0046] Figures 13, 14 and 15, with their corresponding details, show how, once the pair of arms 9 have positioned the grasping bolts 8 of the corresponding dumpster 2, the means for anchoring and opening the dumpster lids operate; these are defined by a tilting body 26 associated with the arm 9, which is activated by a third hydraulic cylinder 27 via a first set of levers 28.

[0047] The aforementioned tilting body 26, in its rest position, rests on the upper part of the corresponding arm 9 and has an oval-shaped protrusion 29 so that, when it tilts, it closes around the corresponding attaching bolt 8 of the dumpster 2 to be collected, anchors it and, simultaneously, opens the lid of the dumpster 2.

[0048] Said figures show how the aforementioned oval-shaped protrusion 29 protrudes through a window 34 in the concave depression for positioning the grasping bolt 8, closes on it and anchors it.

[0049] In a variant of practical execution of the invention, depending on the type of dumpsters to be handled, in order to hold them in position during the unloading operation and prevent any possible tilting in relation to the grasping bolts 8 which prevent it tipping, the means for anchoring the grasping bolts 8 and opening the lid are assisted by means for holding the dumpster, also associated with the corresponding arm 9, which are defined by a fourth hydraulic cylinder 30 which acts on a second set of levers 31.

[0050] Thus, when the fourth hydraulic cylinder is activated, it causes deployment of an element 32 in the same direction as the arm 9 and simultaneously causes deployment of a crosswise roller 33, which is positioned on the internal face of the dumpster.

[0051] Figures 16, 17 and 18 show how the means for holding the dumpster have been deployed and how the means for anchoring the grasping bolts 8 and opening the lid are deployed.

[0052] Figures 19a, 19b and 19c show how, from the rest position, the third hydraulic cylinder 27 is used to deploy the means for anchoring the grasping bolts 8 of the dumpsters and opening the lid, in other words the tilting body 26, to its maximum tilting position, via the first set of levers 28.

[0053] It can thus be seen how, when the piston of the third hydraulic cylinder 27 expands, it acts on the first set of levers 28 formed of two flat bars connected to each other, by one of their ends, so that the piston operates one of them, with its other rotating end fixed, and the other one, at its free end, is guided through a rounded channel designed for the purpose.

[0054] Figures 20a and 20b show how, from the rest position, the fourth hydraulic cylinder 30 is used to deploy the means for holding the dumpster, based on a pair of flat bars 32a and 32b which tilts in the direction of the pair of arms 9 and on a roller 33 which tilts in a crosswise direction to the latter and which is pressed up against the front face of the dumpster, as can be seen in figures 16 to 18.

[0055] Figures 21 a, 21 b, 21 c and 21 d show how the means for holding the dumpster are deployed from their rest position to their working position so that, when the piston of the fourth hydraulic cylinder 30 is retracted, the pair of flat bars 32a and 32b are tilted, in relation to different rotating axes, while the flat bar 32b acts on a third flat bar 35 which carries a roller 33, and where the third flat bar 35 is joined in a rotating manner to the opposite end of the pair of flat bars 32a and 32b, causing it to tilt in an orthogonal direction to them.

[0056] The central control unit 6 is associated with a geo-positioning system 36 and a recording database 37, which tracks the route taken by the vehicles 1, the collection points and the amount of waste collected, provid-

ing information which can be used to obtain information on the collection service and, depending on the conclusions drawn, act accordingly.

[0057] In addition, the cabin computer system 4 associated with the central control unit 6 may load files onto an external server 38 so that they can be accessed from other authorised computers 39.

[0058] From the structure described, the method of operation is as follows: the waste collection vehicle 1 is positioned, with the system in its rest position, alongside the corresponding dumpster 2 to be unloaded facing the side collection system; the driver, who is also the system operator, uses a cabin monitoring computer unit 4 to interact with the collection system, stopping it in as central a position as possible so that, subsequently, scanning means 3, based on a laser sensor, a servomotor and a control unit, performs a 180° sweep of the corresponding dumpster in real time, and processes the information obtained and sends it to a central control unit 6 for processing; the type of dumpster in question can then be identified, by comparing it with the database 7, together with the position of the dumpster's grasping bolts 8.

[0059] The central control unit 6 uses this information to manage and control the optimum sequence of movements for collection, emptying and return of the dumpster to its exact collection point.

[0060] To do so, first of all, it will act on the means for bringing closer, rotating and regulating the width of the pair of arms 9 , in order to position the grasping bolts 8 of the dumpster 2 in the exact position, having corrected any error in centring the dumpster in relation to the collection system.

[0061] This way, the first hydraulic cylinder 13 has displaced the plate 10 which is attached to the pair of guides 14 between which is mounted the carriage 15 carrying the means for rotating and regulating the pair of arms 9, while the hydraulic actuator 16 has rotated the grooved shaft 17 and consequently the pair of arms 9, and the pair of hydraulic cylinders 18a and 18b have adjusted the width thereof, in order to pick up the dumpster without dragging it in any way.

[0062] The means for anchoring the grasping bolts 8 of the dumpster 2 and opening the lid are also activated, so that the dumpster 2 can be released in the subsequent manoeuvres. As mentioned previously, said anchoring means are based on a tilting body 26 which is operated by a third hydraulic cylinder 27 via a first set of levers 28. Once the dumpster has been secured 2, if required, the means for bringing it closer will act by bringing the dumpster 2 closer to the side of the collection vehicle 1 and raising it to be emptied; this manoeuvre reduces the effort required and, logically, makes the emptying operation easier.

[0063] The dumpster held by the pair of arms 9 can be lifted by the action of the second hydraulic cylinder 19, which moves the carriage 15, which carries the means for rotating and regulating the pair of arms 9, to the elevated position; in this position, when the hydraulic actuator 16 operates, it causes the grooved shaft 17 and, consequently, the pair of arms 9 to rotate. In said tipping operation, the tilting body 26 will cause the lid of the dumpster 2 to open.

[0064] Once the dumpster 2 has been emptied, it will be returned to its initial position, and the system will return to its rest position, so that the vehicle can continue its route to the next dumpster to be emptied.

Claims

1. A system for the handling of dumpsters in side loading vehicles, which comprises a pair of arms associated with a structure which brings them closer to the dumpster to pick it up and the structure of which, after moving closer to the side of the vehicle, lifts it again, carrying the dumpster, until it is tipped to be unloaded in the collection truck hopper, **characterised in that** the system comprises:

   - a 3D scanning device (3), based on a laser sensor, a servomotor and a control unit, for the different types of dumpsters;
   - a central control unit (6), to which the information processed in the scanning device (3) is sent, associated with a database (7) for storing the different types of dumpsters (2);
   - a computer unit (4), associated with the central control unit (6), for interaction between the driver and the collection system;
   - a means for bringing the pair of arms (9) for holding the grasping bolts (8) on the dumpsters (2) closer for handling;
   - a means for rotating and regulating the pair of holding arms (9) for the dumpster (2) grasping bolts (8);
   - a means for lifting the dumpster (2) held by the pair of arms (9), and;
   - means for anchoring the dumpster (2) grasping bolts (8) to the pair of holding arms (9), and for opening the lid of the dumpsters, when they are being tipped.

2. A system for the handling of dumpsters in side loading vehicles, according to claim 1, **characterised in that** the 3D scanning means (3) for the different types of dumpster based on a laser sensor, a servomotor and a control unit, scans the different dumpsters (2) in real time, with the information being processed and sent to the central control unit (6).

3. A system for the handling of dumpsters in side loading vehicles, according to claim 1, **characterised in that** the central control unit (6) is associated with a database (7) which stores the data relating to the different types of dumpsters (2), so that the information sent by the scanning means (3) to the central

control unit (6) can be compared, to determine the type of dumpster to be handled and the relative position of the grasping bolts (8), using this detection to order and control all the movements in the system.

4. A system for the handling of dumpsters in side loading vehicles, according to claim 1, **characterised in that** the means for moving the pair of arms (9) for holding and handling the dumpsters (2) is defined by a plate (10) which is moved by means of a first hydraulic cylinder (13), and attached to which is a pair of parallel vertical guides (14) between which there is a carriage (15) for mounting the means for rotating and regulating the pair of arms (9) for holding the dumpster (2) grasping bolts (8).

5. A system for the handling of dumpsters in side loading vehicles, according to claim 4, **characterised in that** the moveable plate (10) associated with the carriage (15) for mounting the means for rotating and regulating the pair of arms (9) for holding the dumpster (2) grasping bolts (8), can be moved in relation to a frame (11) arranged on the chassis of the collection vehicle (1), in a crosswise direction, under the refuse tipping hopper (12).

6. A system for the handling of dumpsters in side loading vehicles, according to claim 1, **characterised in that** the means for rotating and regulating the pair of arms (9) for holding the dumpster (2) grasping bolts (8) is defined by a hydraulic actuator (16), attached to the shaft of which is a grooved shaft (17) for mounting the pair of arms (9) using respective tubular pieces (22).

7. A system for the handling of dumpsters in side loading vehicles, according to claim 1, **characterised in that** the means for rotating and regulating the pair of arms (9) for holding the dumpster (2) grasping bolts (8) is defined by a pair of independently acting hydraulic cylinders (18a and 18b), which move the pair of arms (9) along the grooved shaft (17) by means of the tubular pieces (22).

8. A system for the handling of dumpsters in side loading vehicles, according to claims 6 and 7, **characterised in that** the tubular pieces (22) which are used to mount the pair of arms (9) on the grooved shaft (17) have in a central position on the outside a recess (24) in which a U-shaped end of a flat bar (23) fits; the other end of the flat bar (23) is attached to the corresponding piston of a hydraulic cylinder from the pair of hydraulic cylinders (18a and 18b).

9. A system for the handling of dumpsters in side loading vehicles, according to claim 1, **characterised in that** the means for lifting the dumpsters (2) held by the pair of handling arms (9) is defined by a second hydraulic cylinder (19) which moves the carriage (15), associated with the pair of arms (9), between the pair of parallel vertical guides (14) for mounting.

10. A system for the handling of dumpsters in side loading vehicles, according to claim 9, **characterised in that**, the second hydraulic cylinder (19), in relation to the means for lifting the carriage (15), is assisted by a pair of chains (20) which at one end are firmly attached to the fixed structure of the plate (10) and at the other end are firmly attached to the carriage (15) and geared to respective intermediate pulleys (21).

11. A system for the handling of dumpsters in side loading vehicles, according to claim 1, **characterised in that** the means for anchoring the grasping bolts (8) of the dumpster (2) to the pair of arms (9) for holding and opening the lid of the dumpster (2) is defined by a tilting body (26), associated with the arms (9) themselves, and operated by a third hydraulic cylinder (27) and a first set of levers (28) which, when deployed, anchors the grasping bolts (8) and opens the lid of the dumpster.

12. A system for the handling of dumpsters in side loading vehicles, according to claim 11, **characterised in that** the tilting body (26) has an oval-shaped side protrusion (29) which, when tipped, closes on the corresponding attaching bolt (8) of the dumpster (2) and anchors it.

13. A system for the handling of dumpsters in side loading vehicles, according to claim 1, **characterised in that** with the dumpster (2) in its highest position the hydraulic actuator (16) is activated, rotating the grooved shaft (17) and with it the pair of arms (9) holding the dumpster (2), at the same time as the grasping bolts (8) have been anchored, the dumpster lid opened and, if appropriate, the means for holding the dumpster in operation.

14. A system for the handling of dumpsters in side loading vehicles, according to claim 1, **characterised in that** the pair of arms (9) also incorporate means for holding the dumpster (2) when they are tipped, in which these means are defined by a fourth hydraulic cylinder (30) and a pair of flat bars (32a and 32b) which tilts in the direction of the pair of arms (9), and a roller (33) which tilts in a crosswise direction to the latter.

15. A system for the handling of dumpsters in side loading vehicles, according to claim 1, **characterised in that** the cabin computer unit (4), associated with the central control unit (6), may load files onto an external server (38) so that they can be accessed from other authorised computers (39).

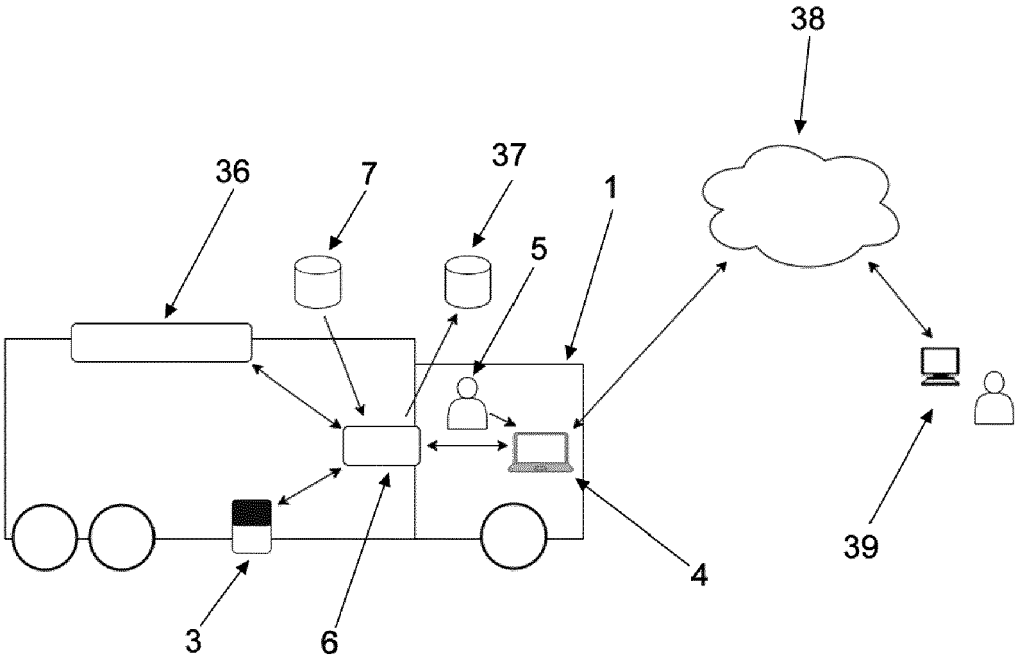

FIG.1

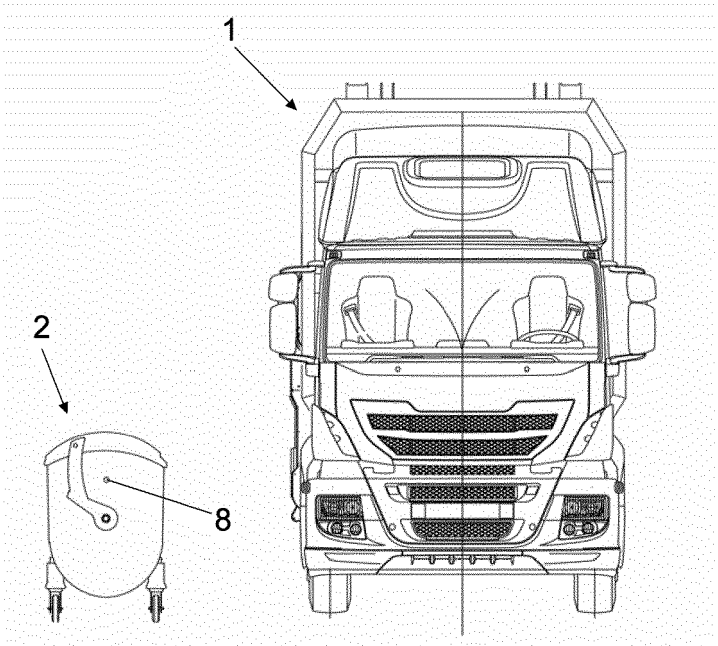

FIG.2

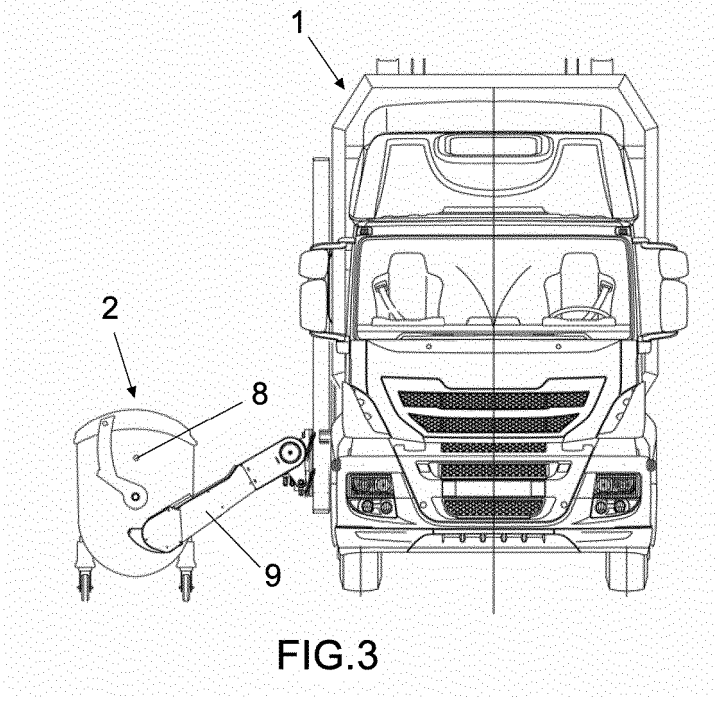

FIG.3

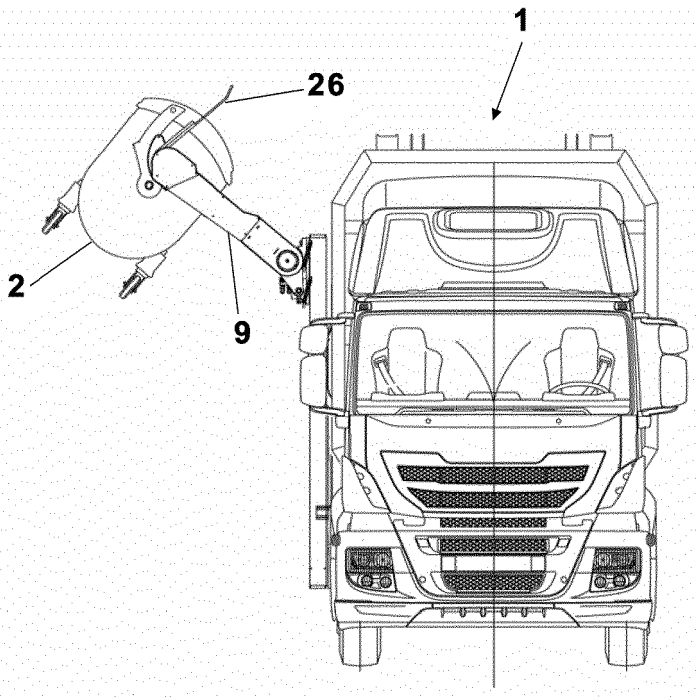

FIG.4

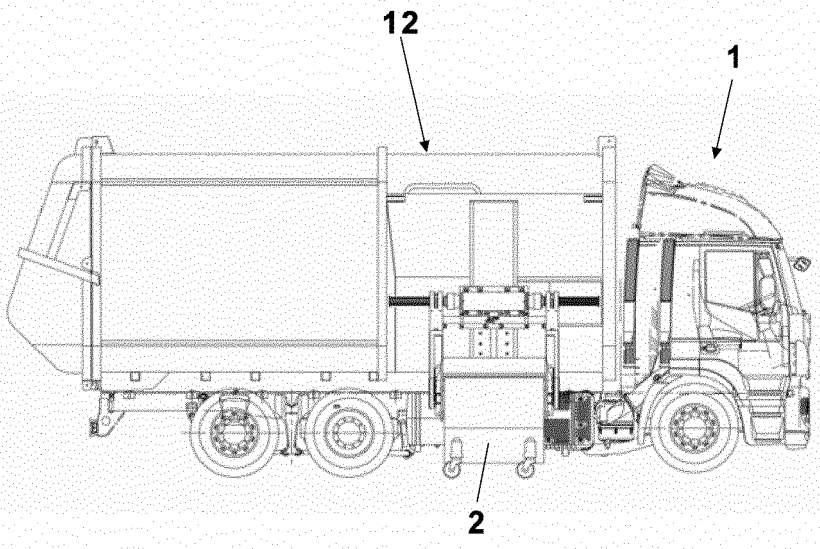

FIG.5

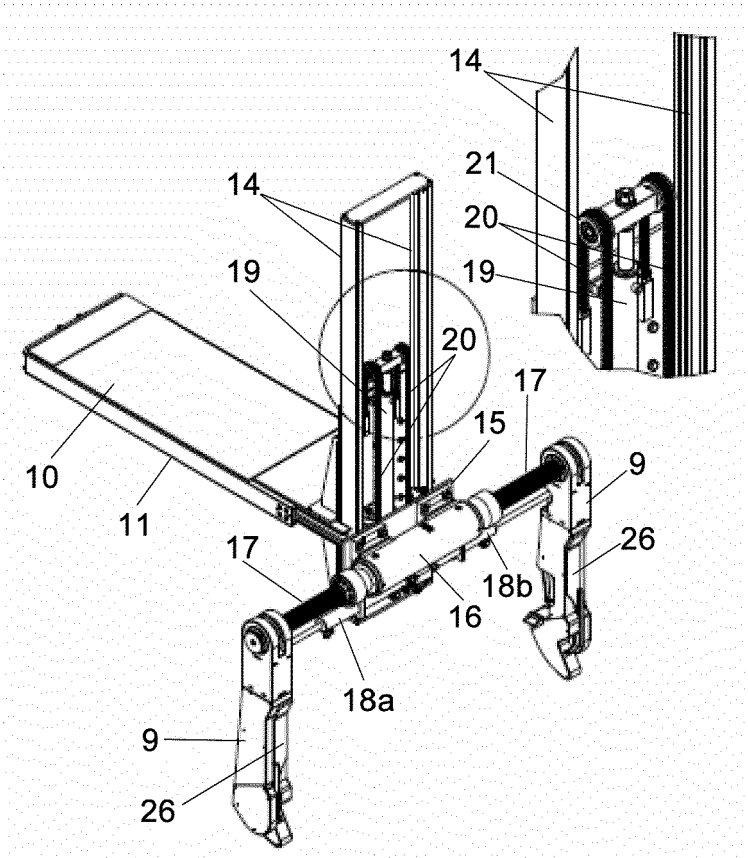

FIG.6

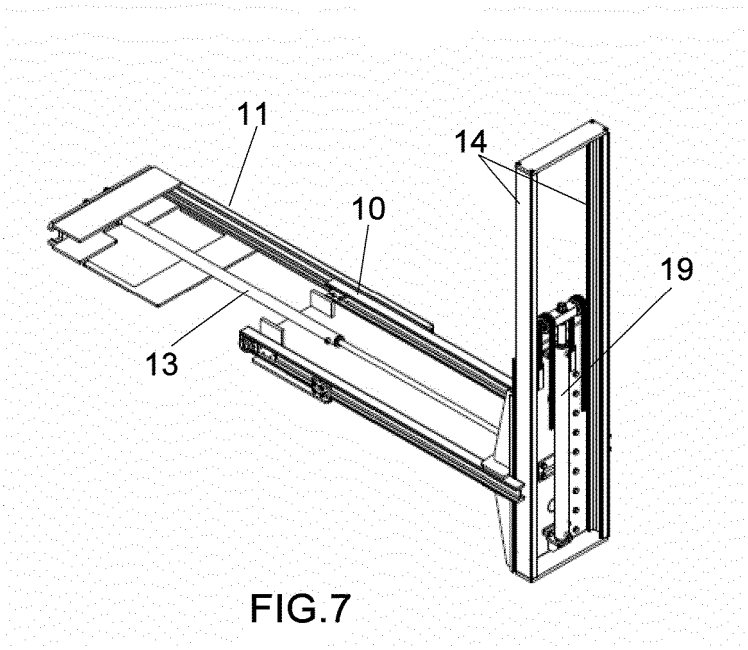

FIG.7

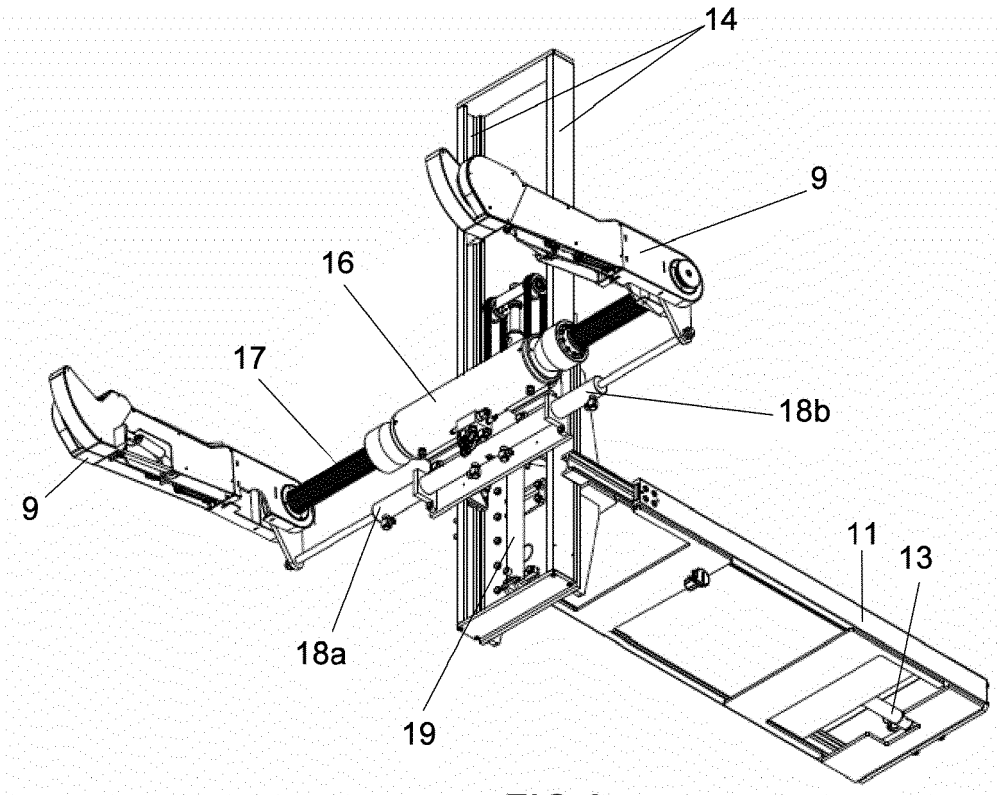

FIG.8

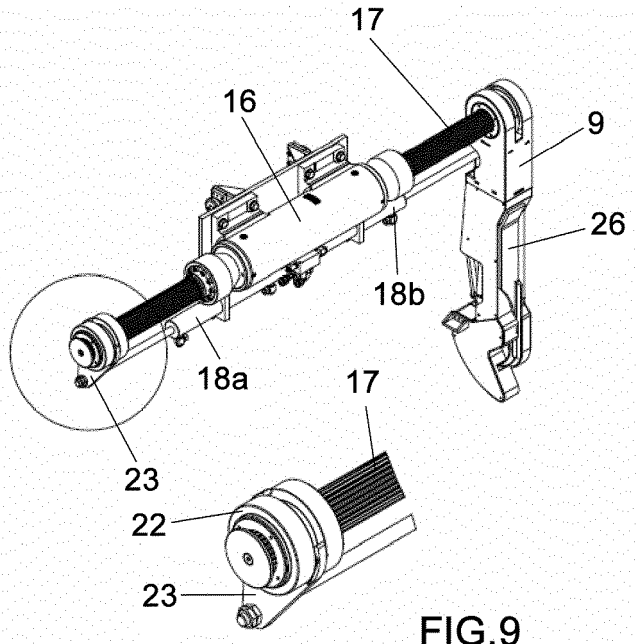

FIG.9

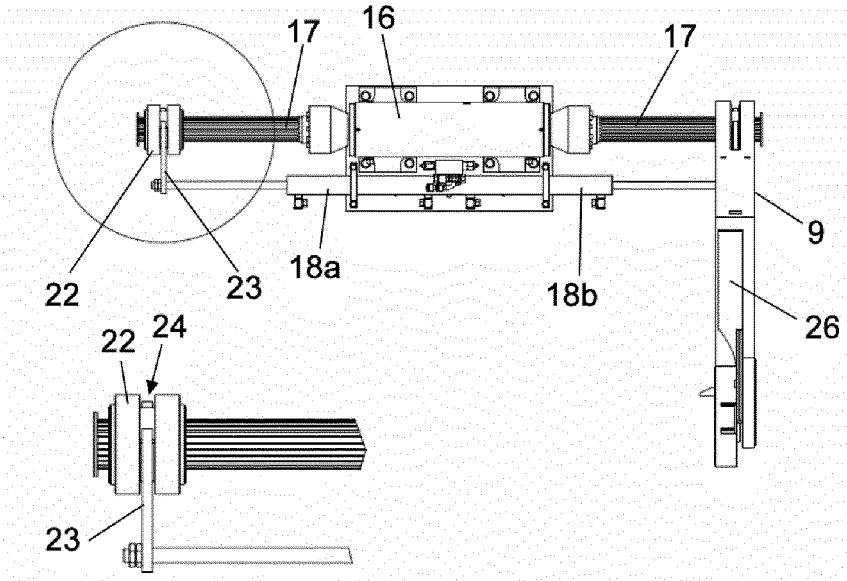
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FIG.10

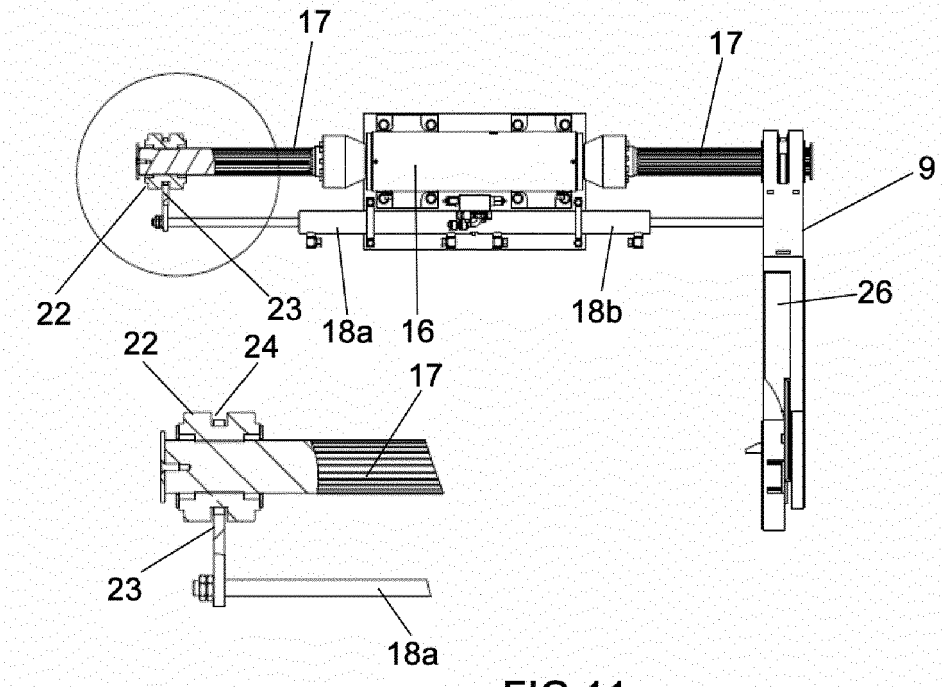
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FIG.11

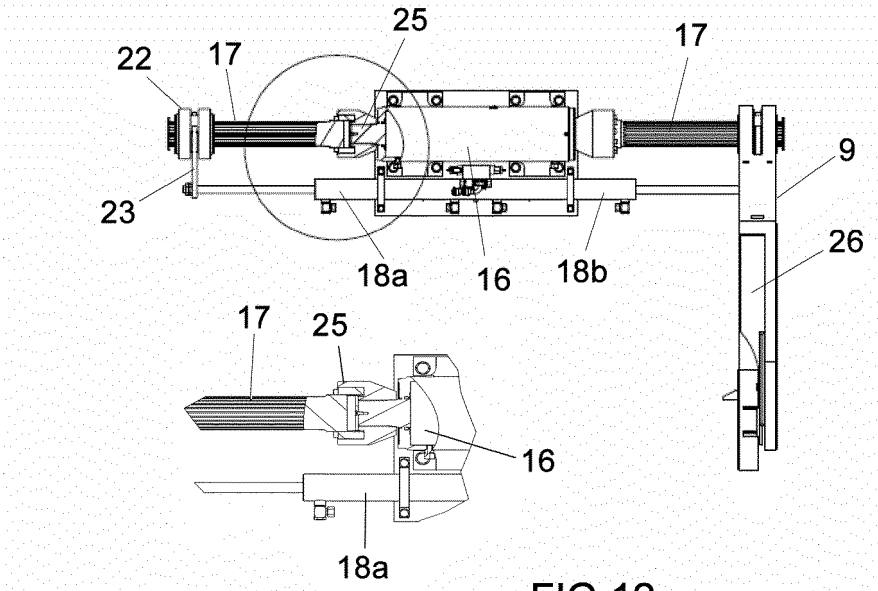
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FIG.12

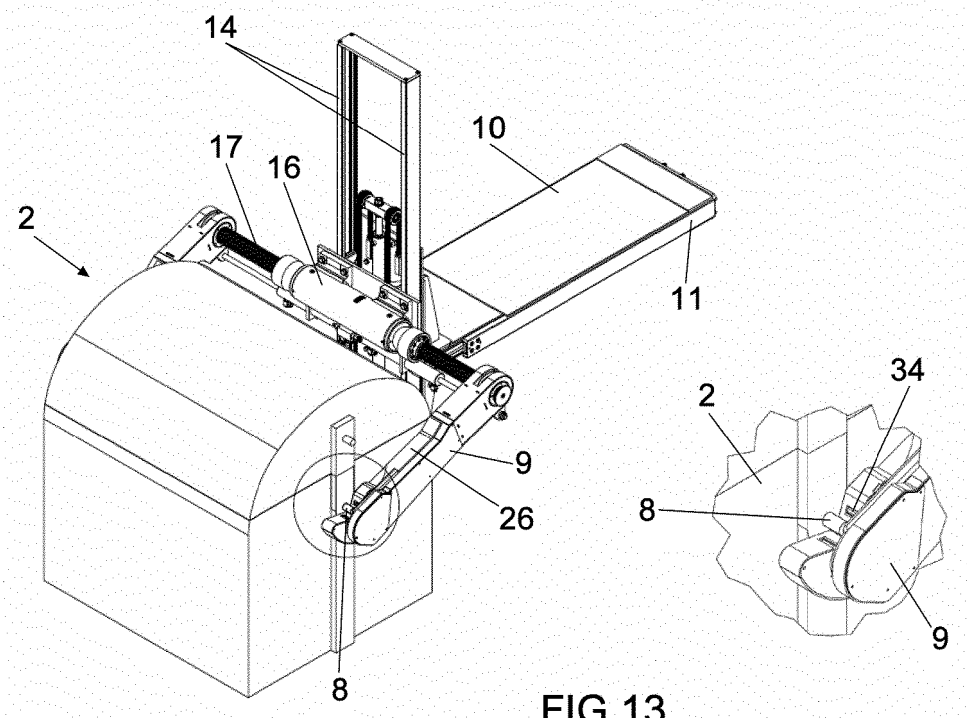
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FIG.13

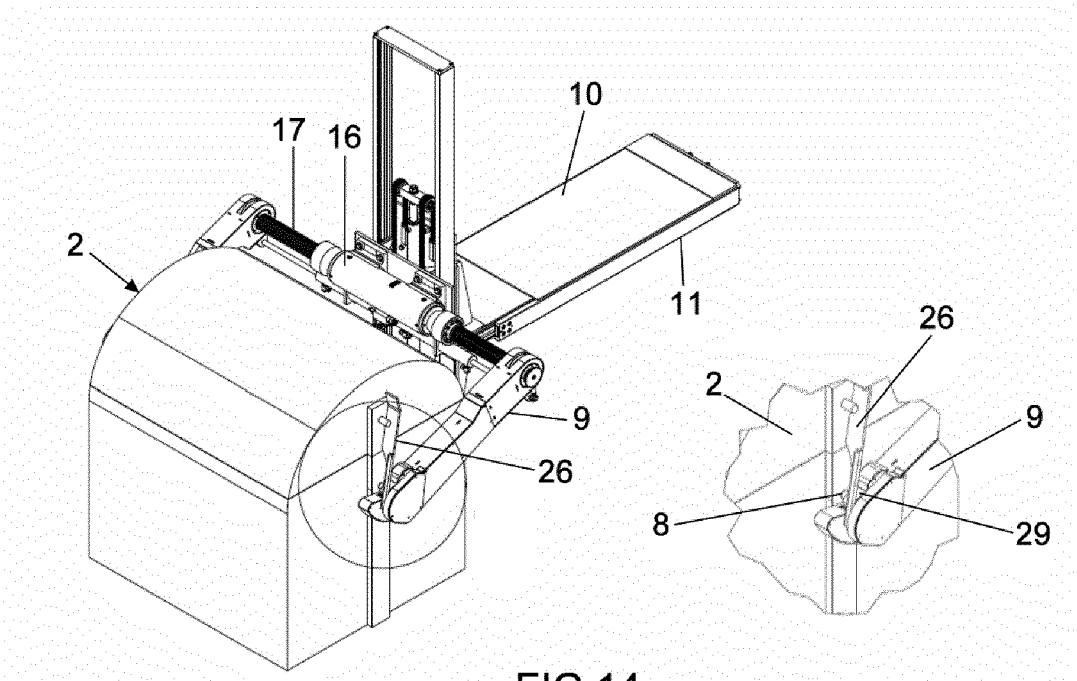

FIG.14

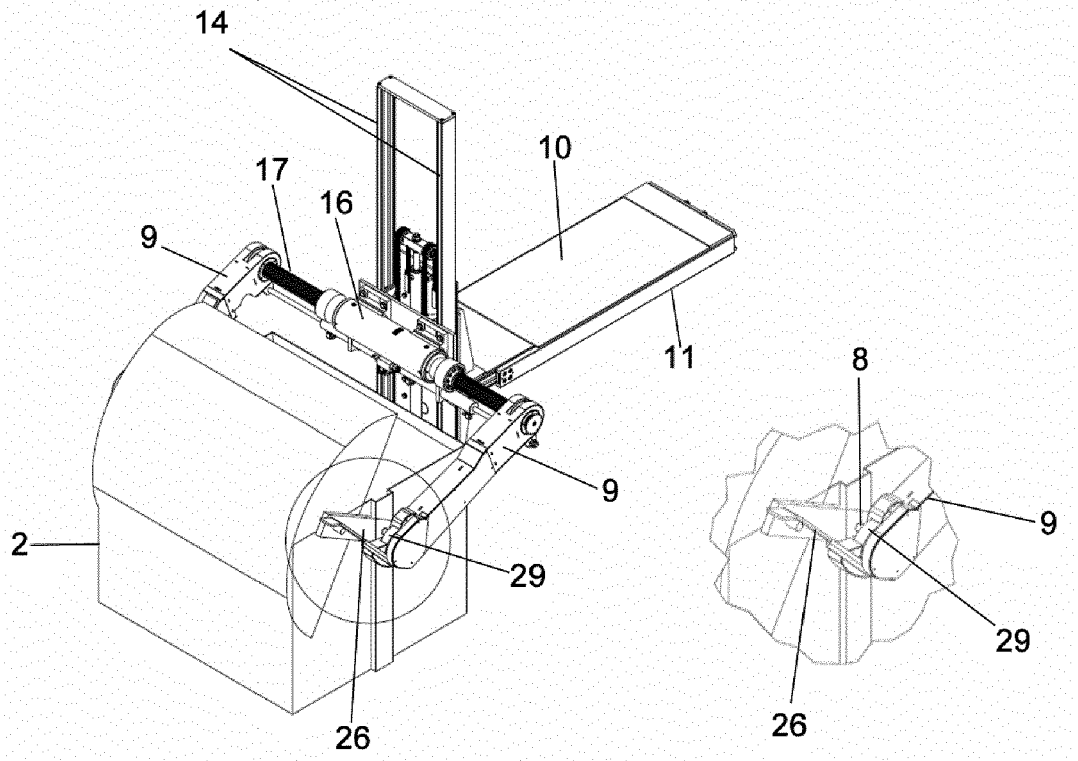

FIG.15

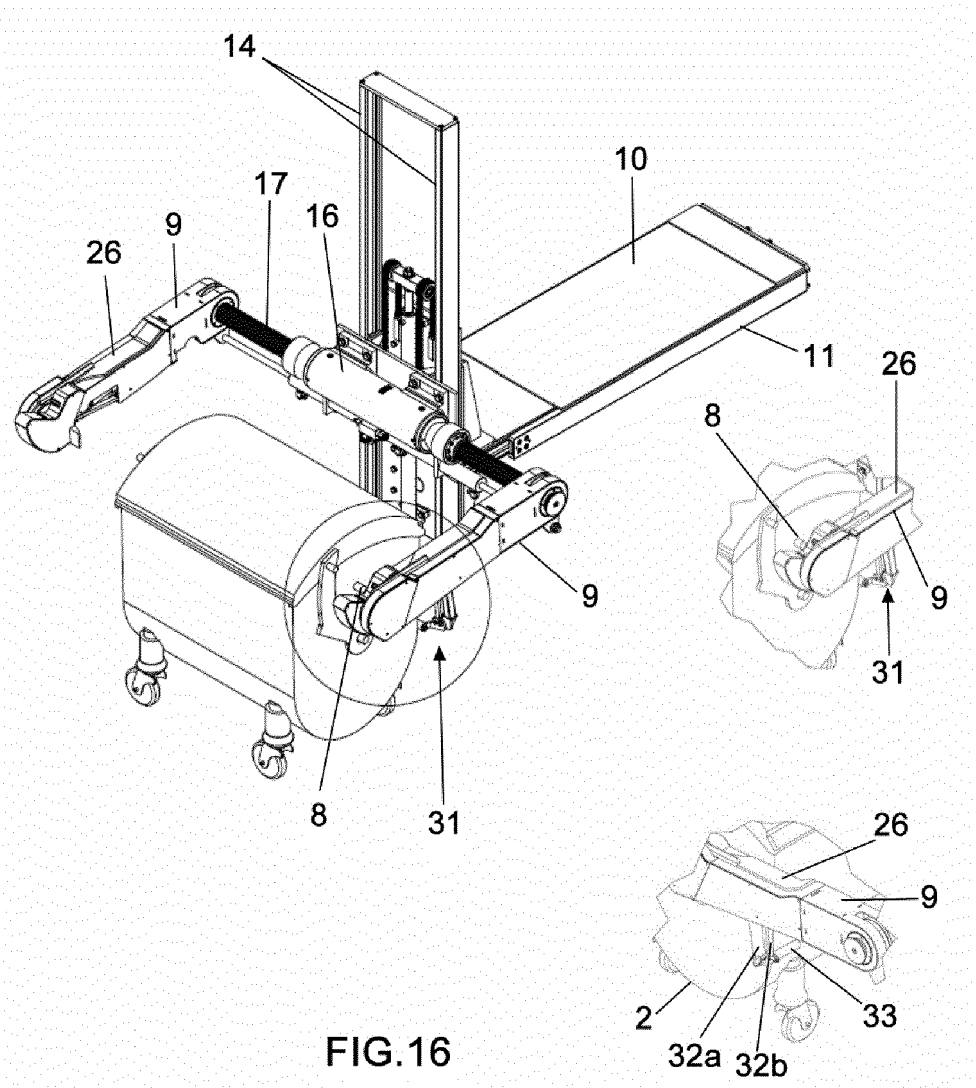

FIG.16

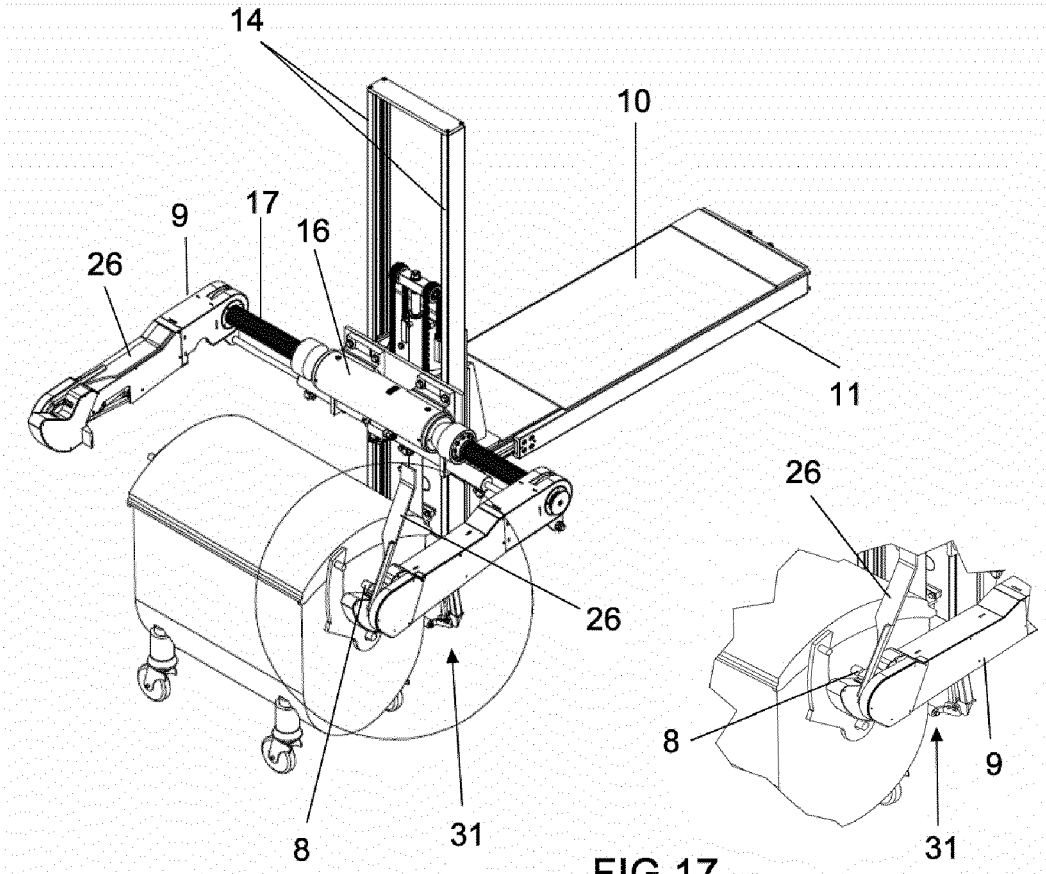

FIG.17

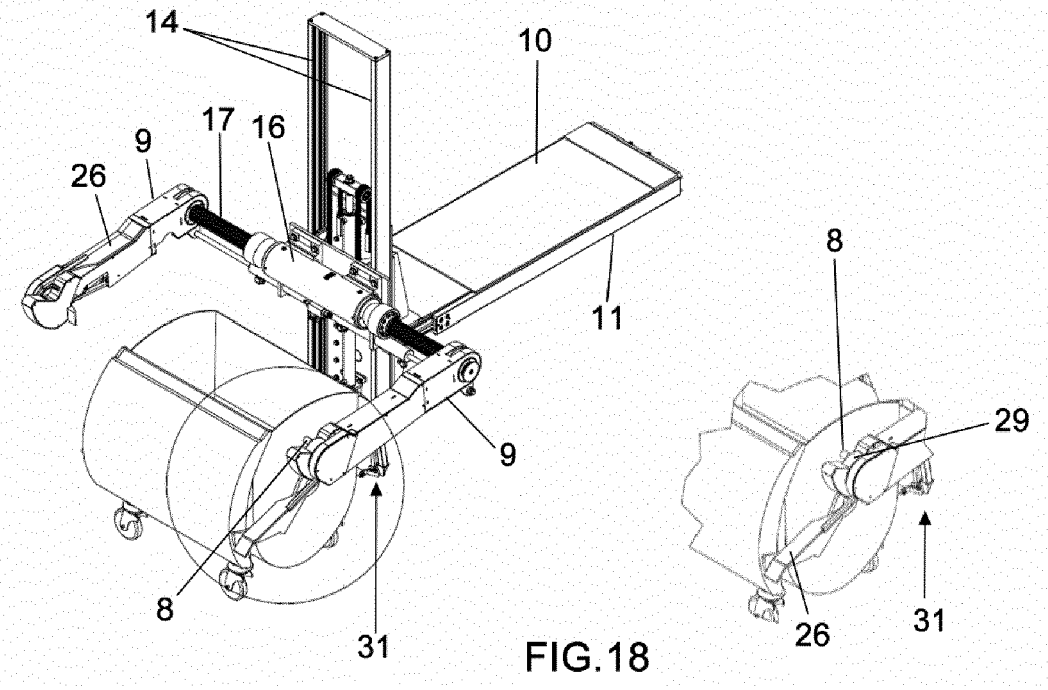

FIG.18

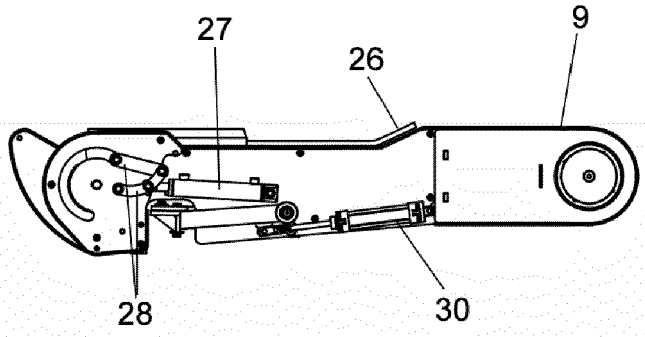

FIG.19a

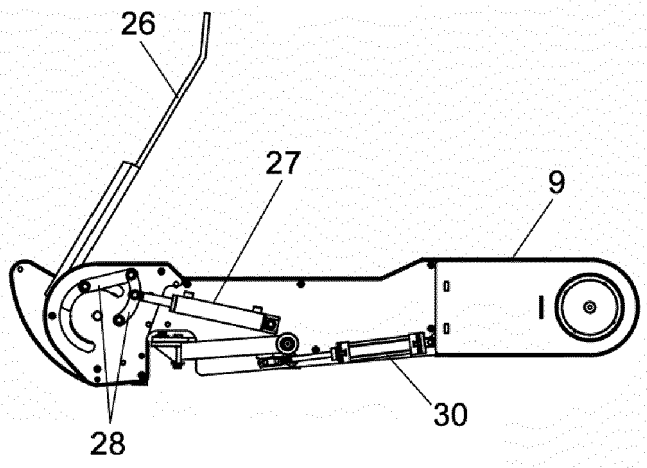

FIG.19b

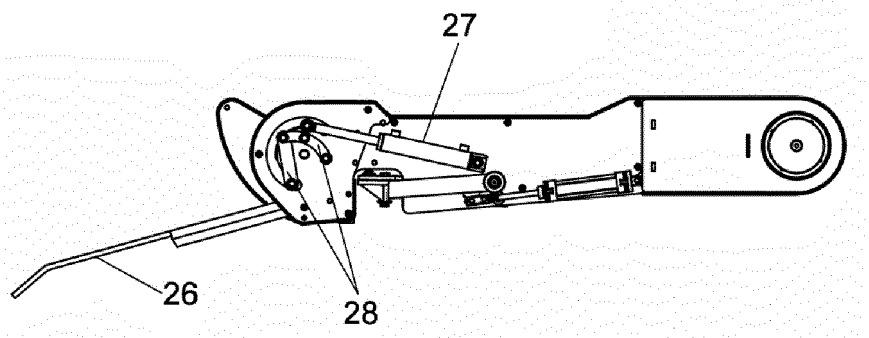

FIG.19c

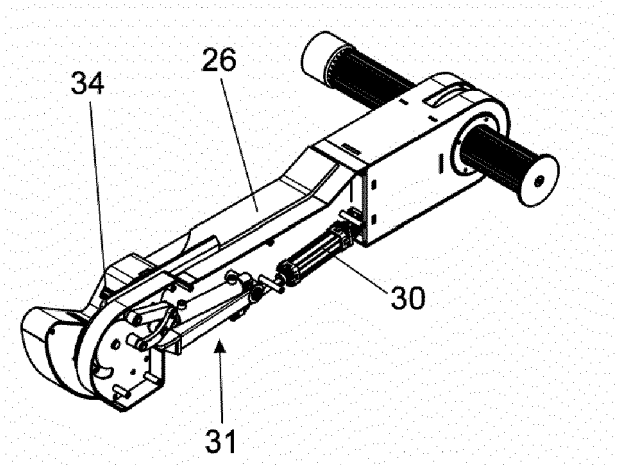

FIG.20a

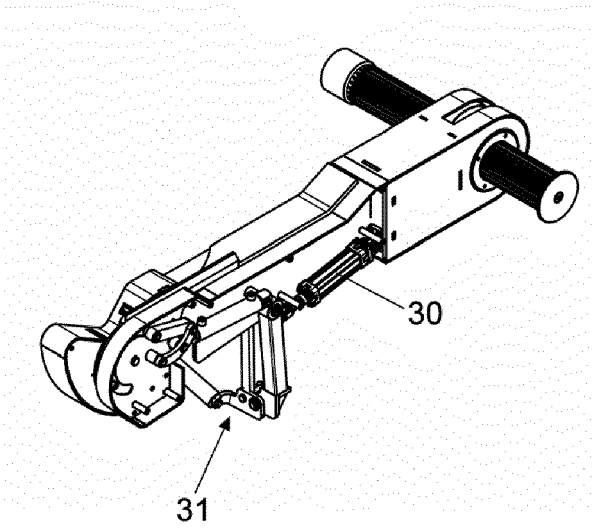

FIG.20b

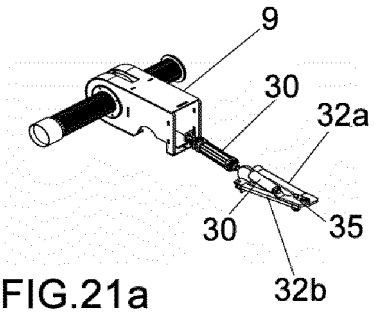

FIG.21a

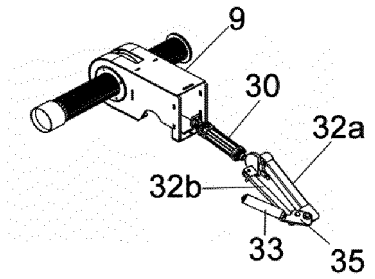

FIG.21b

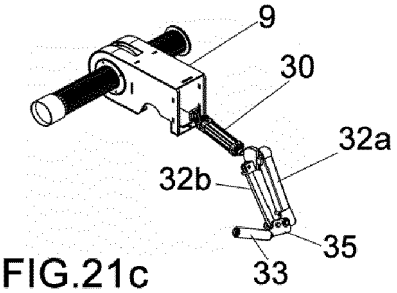

FIG.21c

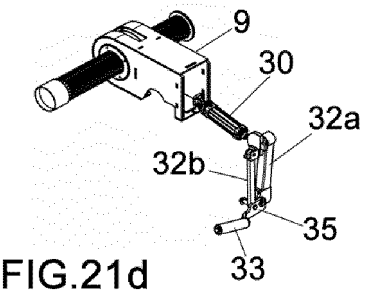

FIG.21d

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EUROPEAN SEARCH REPORT

Application Number
EP 16 16 1144

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 Y	DE 10 2012 006538 A1 (SKRYPZAK ROLAND [DE]) 2 October 2013 (2013-10-02) * paragraphs [0027], [0029], [0031], [0034], [0035], [0038] - [0041]; figures 1-3 *	1-5,9-15 6-8	INV. B65F3/04
Y	NL 2 005 788 C (OMB NEDERLAND B V [NL]) 31 May 2012 (2012-05-31) * page 4, line 18 - line 29 * * page 6, line 3 - line 11 * * figures 2a, 2b *	6-8	
X	EP 1 020 375 A1 (GEESINK BV [NL]) 19 July 2000 (2000-07-19) * paragraphs [0009], [0010], [0014], [0015], [0017], [0025], [0028], [0030], [0034]; figure 1 *	1-5,9-15	
A	DE 25 10 655 A1 (HALLER GMBH FAHRZEUGBAU) 23 September 1976 (1976-09-23) * page 6, paragraph 2 - page 7, paragraph 1; figures 1, 2 *	1-15	TECHNICAL FIELDS SEARCHED (IPC) B65F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	2 February 2017	Luepke, Erik

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02-02-2017

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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- ES 2094632 **[0014]**
- ES 2118525 **[0014]**
- ES 2221253 **[0014]**
- ES 2286053 **[0014]**