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(54) **LOADING SYSTEM FOR EMPTYING A CONTAINER, VEHICLE PROVIDED THEREWITH, AND METHOD THEREFOR**

(57) The loading system (6) comprises a lifting and tilting mechanism (32) provided with a carrier (40), a lifting arm (34), a drive (46, 72) and a closing mechanism (33) operatively connected to the lifting and tilting mechanism (32) for enclosing a container (66) and provided with a clamping arm (52) embodied to enclose the container (66) together with the carrier (40) in a closed situation, wherein the clamping arm (52) is connected with a clamping pivot (54) to the carrier (40), a closing arm (58), wherein a first outer end is connected via a first pivot (60) to the loading system (6) and a second outer end is connected via a second pivot (62) to the clamping arm (52), wherein the distance (D) between a pivot shaft of the second pivot (62) and a tilting pivot shaft of the tilting pivot (38) is reduced during the lifting movement, and the loading system (6) further comprising a spring mechanism (64), wherein the spring mechanism (64) comprises a bias.

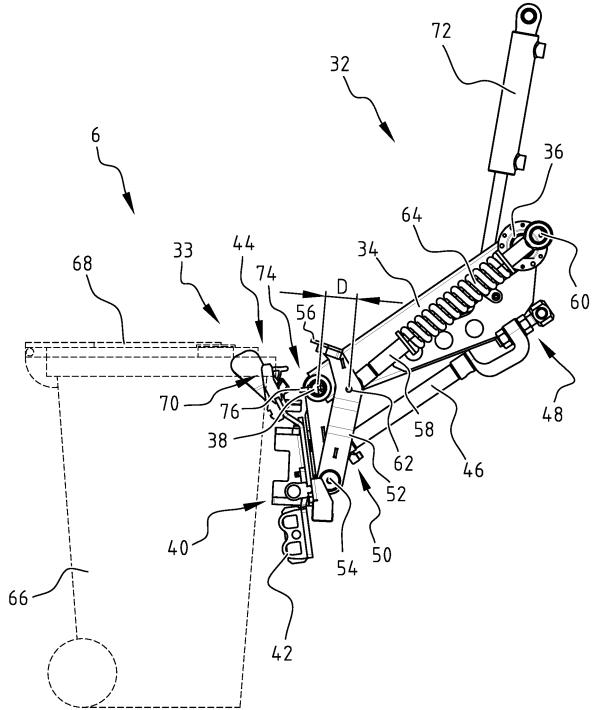


FIG. 2

## Description

**[0001]** The present invention relates to a loading system for emptying a container, such as a refuse bin, into a collector. This relates particularly to a vehicle such as a refuse truck, whereby the contents of containers/bins are collected.

**[0002]** In practice containers such as refuse bins or waste bins are emptied using a loading system. The bins are here raised using a loading seat and then tilted into an opening of a collector. In practice such loading systems are usually provided on the rear side of a refuse truck. A lifting and tilting mechanism provides for the gripping of a loading system on the container and the subsequent movement of the container for the purpose of emptying thereof. An operational range is passed through here during movement of the container.

**[0003]** Known in practice are diverse pick-up frames which are used in vehicles such as refuse trucks. Use is made here of a number of connecting arms which are connected on a first side to a loading system and can grip a container on a second side. At least part of the lifting-tilting movement for the container is performed using these arms. Such conventional mechanisms are relatively complex and comprise a reasonably large number of parts, which requires frequent maintenance of the pick-up frame.

**[0004]** The present invention has for its object to provide a loading system whereby the above stated problems are obviated or at least reduced, such that a container can be emptied into a collector in effective manner.

**[0005]** This object is achieved with the loading system according to claim 1 for emptying a container into a collector.

**[0006]** Providing a carrier enables a container, particularly a bin, to be taken up for performing a tilting movement for the purpose of emptying the container. The carrier is preferably provided for this purpose with a pick up comb or other gripping means which grips the container, for instance directly beneath an edge of such a container. It hereby becomes possible to raise the container using the lifting and tilting mechanism. The lifting and tilting mechanism is at least provided for this purpose with at least one lifting arm. This at least one lifting arm is connected at a first outer end to the loading system and is connected on a second side to the carrier by means of a tilting pivot with a tilting pivot shaft. The lifting arm particularly enables the raising of the container during the lifting movement.

**[0007]** The lifting and tilting mechanism is further provided with a drive which, in addition to enabling the lifting movement using the lifting arm, enables a tilting movement. Such a tilting movement is preferably performed after the lifting or raising movement. During the lifting movement the container is raised to a position above an opening of the collector. During the tilting movement the container is tilted such that the contents of the container are carried into the collector. The drive can take a me-

chanical, hydraulic and/or electrical form. The drive can further be a combined drive for the lifting movement and the tilting movement, as well as a separate drive. In a currently preferred embodiment the lifting movement is realized using a first hydraulic drive cylinder and the tilting movement is realized by a second hydraulic drive cylinder.

**[0008]** In order to prevent the container shooting out of the loading system or undergoing another uncontrolled movement during the tilting movement, a closing mechanism which is operatively connected to the lifting and tilting mechanism is provided according to the invention. This closing mechanism is provided as a clamping arm, preferably as a clamping plate, which in closed situation grips the container and together with, preferably, the pick up comb clamps or encloses for instance an edge of such a container. A safe movement of the container can hereby be realized in effective manner. According to the invention, the clamping arm is here connected via a clamping pivot to the carrier. A relative movement between clamping arm and guide, with the pick up comb preferably connect thereto, is enabled using the clamping pivot.

**[0009]** The closing mechanism according to the invention further comprises a closing arm, wherein a first outer end is connected via a pivot to the loading system and wherein a second outer end is connected via a second pivot with pivot shaft to the clamping arm. The clamping arm is moved relative to the carrier using the closing arm. According to the invention, the movement of the closing arm during the lifting movement is such that the clamping arm undergoes a relative movement relative to the carrier, preferably by means of a rotation around a clamping pivot, and encloses therein a bin during the lifting movement.

**[0010]** According to the invention, the loading system is embodied such that the distance between the pivot shaft of the second pivot and the tilting pivot shaft of the tilting pivot is reduced during the lifting movement.

**[0011]** According to an advantageous embodiment of the invention, the second pivot comes to lie substantially in line with the tilting pivot during said lifting movement. This means that a pivot shaft of the second pivot comes to lie substantially in line with a pivot shaft of the tilting pivot.

**[0012]** Bringing the pivot shaft and the tilting pivot shaft closer together during the lifting movement or, in a possible embodiment, even substantially wholly aligning them achieves on the one hand that an effective enclosure or clamping of the container is realized such that the container can be tilted during the tilting movement, and achieves on the other hand that the forces during the tilting movement can be absorbed in effective manner by the loading system, and particularly the lifting and tilting mechanism thereof. Occurring loads are limited hereby, so that a simpler loading system design can be applied and/or maintenance costs are minimized.

**[0013]** According to the present invention, a substantially mechanical clamping for a container is realized with

the closing mechanism. The closing arm is provided for the preferably solely mechanical movement of the clamping arm relative to the carrier. This makes the control of the closing mechanism relatively simple and extremely robust. This has the additional advantage that maintenance, including preventive maintenance, is minimal.

**[0014]** The improved distribution of forces in the loading system according to the invention can in practice significantly reduce the number of repairs and the preventive maintenance required. The clamping of the container which is provided by the closing mechanism according to the invention further avoids the container being able to perform an uncontrolled movement during the particular tilting movement. This particularly avoids the container being able to shoot out of the clamping or enclosure. This increases the safety of working with the loading system.

**[0015]** During the tilting movement the pivot shafts of the second pivot and the tilting pivot remain at the same mutual distance or, in a possible embodiment, even remain in line. This avoids a relative movement being performed and great forces for instance being exerted on the closing arm.

**[0016]** According to the present invention, the loading system further comprises a spring mechanism. Play and wear can be obviated with the spring mechanism.

**[0017]** In a currently preferred embodiment the spring mechanism is preferably provided at or on the closing arm. This achieves that a situation can be prevented in which a container is positioned incorrectly and/or some of the contents of the container protrude, for instance when the container is too full. The spring mechanism then functions as a safeguard. No spring action is preferably required in normal use.

**[0018]** According to the invention, the spring mechanism comprises a bias. Providing a bias on the spring mechanism, preferably arranged on or at the closing arm, enables play and/or wear which occurs over time during use to be obviated. An enhanced utility of the loading system according to the invention is hereby obtained, wherein less (preventive) maintenance need be performed. In a currently preferred embodiment the spring mechanism comprises a compression spring. The bias is preferably increased further during the tilting movement with the loading system.

**[0019]** In a currently preferred embodiment the spring mechanism, for instance embodied as a spring, is provided such that a deflection/stroke or a spring elongation of about 5 mm is possible. It has been found that above stated desired effects can hereby be achieved in effective manner. A great loading of the spring mechanism is further avoided by the limited deflection, so that the lifespan of such a spring mechanism is extended. This increases the overall robustness of the loading system, and particularly the spring mechanism.

**[0020]** By holding the second pivot and the tilting pivot preferably substantially at the same mutual distance or, in a possible embodiment, even in line during the tilting

movement, a possibly required spring action is additionally avoided during this part of the movement. Loads occurring on the spring element are hereby avoided or at least reduced, which further extends the lifespan of the spring element.

**[0021]** In a further advantageous preferred embodiment according to the present invention the loading system comprises an adjusting mechanism configured to adjust the degree of alignment, i.e. the degree to which the mutual distance between a second pivot and a tilting pivot is reduced.

**[0022]** Providing an adjusting mechanism achieves that the degree of alignment of the second pivot and the tilting pivot can be adjusted. This can obviate for instance production tolerances, wear, play or other deformation over time. This further extends the lifespan of the loading system.

**[0023]** In a currently preferred embodiment the adjusting mechanism comprises an adjusting bolt whereby the relative position of the two pivots can be adjusted to some extent. The adjusting bolt preferably engages directly or indirectly on the tilting pivot. This can achieve an adjustment between the two pivot shafts in effective manner.

**[0024]** In a further advantageous preferred embodiment according to the present invention the drive is provided with a single-action tilting cylinder.

**[0025]** By providing a tilting cylinder the tilting movement can be performed in effective manner. The lifting and tilting mechanism preferably comprises here a separate lifting cylinder for performing the lifting movement. Providing a single-action tilting cylinder achieves that, in a rest position, i.e. when the carrier is provided at a lower position, it can move rearward and/or upward to some extent if an obstacle is hit. Such an obstacle comprises for instance a speed bump, a kerb or other element. Giving the tilting cylinder a single-action form enables the carrier to as it were yield and move upward and/or rearward to some extent, such that damage is avoided. This prevents damage to the loading system in effective manner.

**[0026]** The invention further also relates to a vehicle provided with a loading system as described above.

**[0027]** Such a vehicle provides the same effects and advantages as described for the loading system. The vehicle relates particularly to a refuse truck provided on the rear side with a loading system according to the invention. Making use of a loading system according to the invention gives the refuse truck a longer lifespan, particularly a longer operating time, wherein a longer maintenance interval can be applied. Costs for maintenance, including preventive maintenance, are hereby reduced relative to conventional systems.

**[0028]** The invention further also relates to a method for emptying a container into a collector using a loading system, comprising of providing a loading system and/or vehicle as described above.

**[0029]** Such a method provides the same effects and advantages as stated for the loading system and/or the

vehicle. During the lifting movement the loading system is aimed at bringing the pivot shaft of the second pivot and the tilting pivot shaft of the tilting pivot closer together or, in a possible embodiment, even substantially in line, and therein substantially maintaining this relative position during the tilting movement. This achieves an effective distribution of forces, such that a robust method for emptying a container into a collector is provided.

**[0030]** In an advantageous embodiment the method comprises the additional step of obviating play and/or wear by applying a bias to a spring element. The spring element is preferably provided here on or at a closing arm of the closing mechanism.

**[0031]** The spring tension is preferably increased further during the tilting movement. The spring mechanism used preferably comprises a compression spring. An additional advantage of such an increase of the spring tension is that the lowering speed of the loading seat of the loading system is not unnecessarily slow.

**[0032]** Further features, advantages and details of the invention are described in preferred embodiments thereof, wherein reference is made to the accompanying drawings, in which:

- figure 1 shows a view of a refuse truck provided with the loading system according to the invention;
- figures 2-4 show views of the loading system in different stages of the movement for emptying a container into a collector;
- figure 5 shows a further view of the loading system according to the invention;
- figure 6 shows a view of the enclosure or clamping of the loading system according to the invention;
- figure 7 shows a view of the position of the carrier with the loading system during emptying; and
- figures 8A-F show views of an alternative embodiment of the loading system according to the invention.

**[0033]** Refuse truck 2 (figure 1) is provided with a collector 4 with loading system 6. Loading system 6 is provided in the shown embodiment with two loading seats 8. Per loading seat a container can be emptied into opening 10 of collector 4. With a combined operation of the two loading seats 8 together it is optionally possible to empty a container with a differing size into opening 10 of collector 4.

**[0034]** In the shown embodiment loading system 6 is provided with a monitoring system 12 using a number of sensors, including for instance a sensor 14 co-displacing with loading seat 8, sensor 16 arranged in a lateral guard 18, sensor 20 arranged on the upper side on collector 4 and/or a camera 22 arranged on the upper side. It will be apparent that a different configuration of sensors is also possible.

**[0035]** Control of loading system 6 is carried out using control box or control panel 24, which is operatively connected to control 26. Control 26 is for instance arranged

in or close to control panel 24 and preferably operatively connected to alarm 28, for instance in the form of a sound signal, light signal or other type of alert.

**[0036]** During emptying of container 66 it undergoes a movement in operational range 30 on the rear side of vehicle 2. Loading system 6 is provided for this purpose with lifting and tilting mechanism 32 (figure 2) and closing mechanism 33. Lifting and tilting mechanism 32 comprises a lifting arm 34 provided at a first outer end with lifting pivot 36 and provided at a second outer end with tilting pivot 38. Situated on tilting pivot 38 is carrier 40 with (rubber) support 42 and pick up comb 44. Mechanism 32 is further provided with tilting arm 46 which is connected at a first outer end 48 to loading system 6 and is connected with a second outer end 50 to carrier 40. Tilting arm or, in the shown embodiment, tilting cylinder 46 is given an extending form in order to thereby enable the tilting movement of carrier 40.

**[0037]** Closing mechanism 33 is provided in the shown embodiment with clamping arm or clamping plate 52, which is arranged rotatably relative to carrier 40 via a clamping pivot 54. At the other outer end clamping arm 52 is provided with clamping edge 56. Closing mechanism 33 further comprises closing arm 58 which is provided at a first outer end on loading system 6 using first pivot 60 and is provided at the other outer end of closing arm 58 on clamping arm 52 using second pivot 62. In the shown embodiment closing arm 58 is provided with spring 64, for instance a compression spring. Using closing mechanism 33 loading system 6 can be used to empty container 66 provided with cover 68 and edge 70. In the shown embodiment edge 70 is used to provide the desired clamping or enclosure with comb 44 and/or edge 56.

**[0038]** Adjusting mechanism 74 is provided to enable adjustment of the relative position of second pivot 62 relative to tilting pivot 38 (figure 2). In the shown embodiment adjusting mechanism 74 is provided with bolt 76 which engages directly on tilting pivot 38.

**[0039]** During emptying of container 66, container 66 undergoes a movement from the ground position (figure 2) via a lifted position (figure 3) and to a tilted position (figure 4) in which the container is emptied. During the lifting movement pivot shafts of second pivot 62 and tilting pivot 38 come to lie in line (figure 3) or, in alternative embodiments, preferably at least closer together. This relative position is maintained during the subsequent tilting movement (figure 4). Distance D (figure 2) between pivot shafts of second pivot 62 and tilting pivot 38 is reduced during this movement, or preferably even eliminated in the case of alignment of pivot shafts of second pivot 62 and tilting pivot 38 (figure 3).

**[0040]** By activating lifting cylinder 72 (figure 2) container 66 is raised using pick up comb 44. Lifting arm 34 performs here a movement whereby the carrier 40 connected thereto likewise undergoes a movement. Container 66 is hereby carried to the lifted position (figure 3). During this lifting movement closing arm 58 rotates around first pivot 60 such that clamping arm 52 changes

position relative to carrier 40. This relative change in position is such that the pivot shaft of second pivot 62 is substantially aligned with the pivot shaft of tilting pivot 38 at the moment that container 66 has reached the lifted position (figure 3). From the lifted position, a tilting movement is started using single-action tilting cylinder 46, which extends and herein tilts carrier 40 around tilting pivot 38. It is noted here that second pivot 62 remains in line with tilting pivot 38 here (figure 4), or in any case preferably at the same mutual distance D. After emptying of container 66, loading system 6 performs a reverse movement for setting down container 66.

**[0041]** In the shown embodiment spring 64 of closing arm 58 (figure 5) is provided with a stroke A. In the shown embodiment this stroke is preferably about 0.5 cm. It will be apparent that other embodiments and configurations are likewise possible.

**[0042]** Pick up comb 44 and clamping edge 56 (figure 6) preferably enclose edge 70 of container 66. Because of the correct clamping, container 66 will not move relative to carrier 40 during the tilting movement. The tilting movement is achieved by single-action cylinder 46, which functions as a drive for the tilting movement (figure 7). If a speed bump is for instance hit during travel with vehicle 2 with carrier 40, application of the shown single-action cylinder 48 will enable carrier 40 to move rearward over some distance. This prevents damage to carrier 40. It will be apparent that other drives and/or engagements are likewise possible.

**[0043]** Loading system 6 is suitable for handling diverse types of container 66 with different volumes, for instance 120 litres and 360 litres. Monitoring system 12 (figure 1) can be activated here as soon as a container 66 is lifted off the ground with one or more loading seats 8. This can achieve an additional safeguard.

**[0044]** Alternative loading system 106 (figures 8A-F) shows a variant according to the invention, wherein the mutual distance D between second pivot shaft 162 and tilting pivot shaft 138 is reduced during the lifting movement. Distance D preferably remains substantially constant during the tilting movement. In the shown embodiment many parts of loading system 106 are the same or substantially the same as the parts of loading system 6, and therefore require no further elucidation. In the shown embodiment spring 164 is a so-called compression spring. The spring tension of spring 164 is built up further during the tilting movement.

**[0045]** During emptying of a container 66 loading system 106 undergoes a lifting movement and a tilting movement. Distance D is reduced during the lifting movement. The bias of spring 164 is built up further during the tilting movement.

**[0046]** The present invention is by no means limited to the above described preferred embodiments thereof. The rights sought are defined by the following claims, within the scope of which many modifications can be envisaged.

## Claims

1. Loading system for emptying a container into a collector, the loading system comprising:
  - a lifting and tilting mechanism embodied to perform a lifting movement and a tilting movement, provided with:
    - a carrier for carrying the container during the tilting movement;
    - a lifting arm, wherein a first outer end is connected to the loading system and a second outer end is connected to the carrier by means of a tilting pivot provided with a tilting pivot shaft;
    - a drive embodied to perform the lifting movement and the tilting movement;
  - a closing mechanism which is operatively connected to the lifting and tilting mechanism for enclosing the container, provided with:
    - a clamping arm embodied to enclose the container together with the carrier in a closed situation, wherein the clamping arm is connected with a clamping pivot to the carrier;
    - a closing arm, wherein a first outer end is connected via a first pivot to the loading system and a second outer end is connected via a second pivot, provided with a pivot shaft, to the clamping arm,
2. Loading system as claimed in claim 1, wherein the distance between the pivot shaft of the second pivot and the tilting pivot shaft of the tilting pivot is reduced during the lifting movement, and the loading system further comprising a spring mechanism, wherein the spring mechanism comprises a bias.
3. Loading system as claimed in claim 1 or 2, wherein the pivot shaft of the second pivot comes to lie substantially in line with the tilting pivot shaft of the tilting pivot during the lifting movement.
4. Loading system as claimed in one or more of the foregoing claims, further comprising an adjusting mechanism configured to adjust the degree of alignment of the second pivot and the tilting pivot.
5. Loading system as claimed in claim 4, wherein the adjusting mechanism comprises an adjusting bolt.

6. Loading system as claimed in claim 5, wherein the adjusting bolt engages on the tilting pivot.
7. Loading system as claimed in one or more of the foregoing claims, wherein the drive comprises a single-action tilting cylinder. 5
8. Vehicle provided with a loading system as claimed in one or more of the foregoing claims. 10
9. Method for emptying a container into a collector using a loading system, comprising of providing a loading system and/or vehicle as claimed in one or more of the foregoing claims. 15
10. Method as claimed in claim 9, further comprising of bringing the pivot shaft of the second pivot and the tilting pivot shaft of the tilting pivot closer together during the lifting movement, and substantially maintaining the relative position during the tilting movement. 20
11. Method as claimed in claim 9 or 10, further comprising of obviating play and/or wear by applying a bias to a spring element. 25
12. Method as claimed in claim 9, 10 or 11, wherein the spring tension of the spring mechanism is increased during the tilting movement. 30

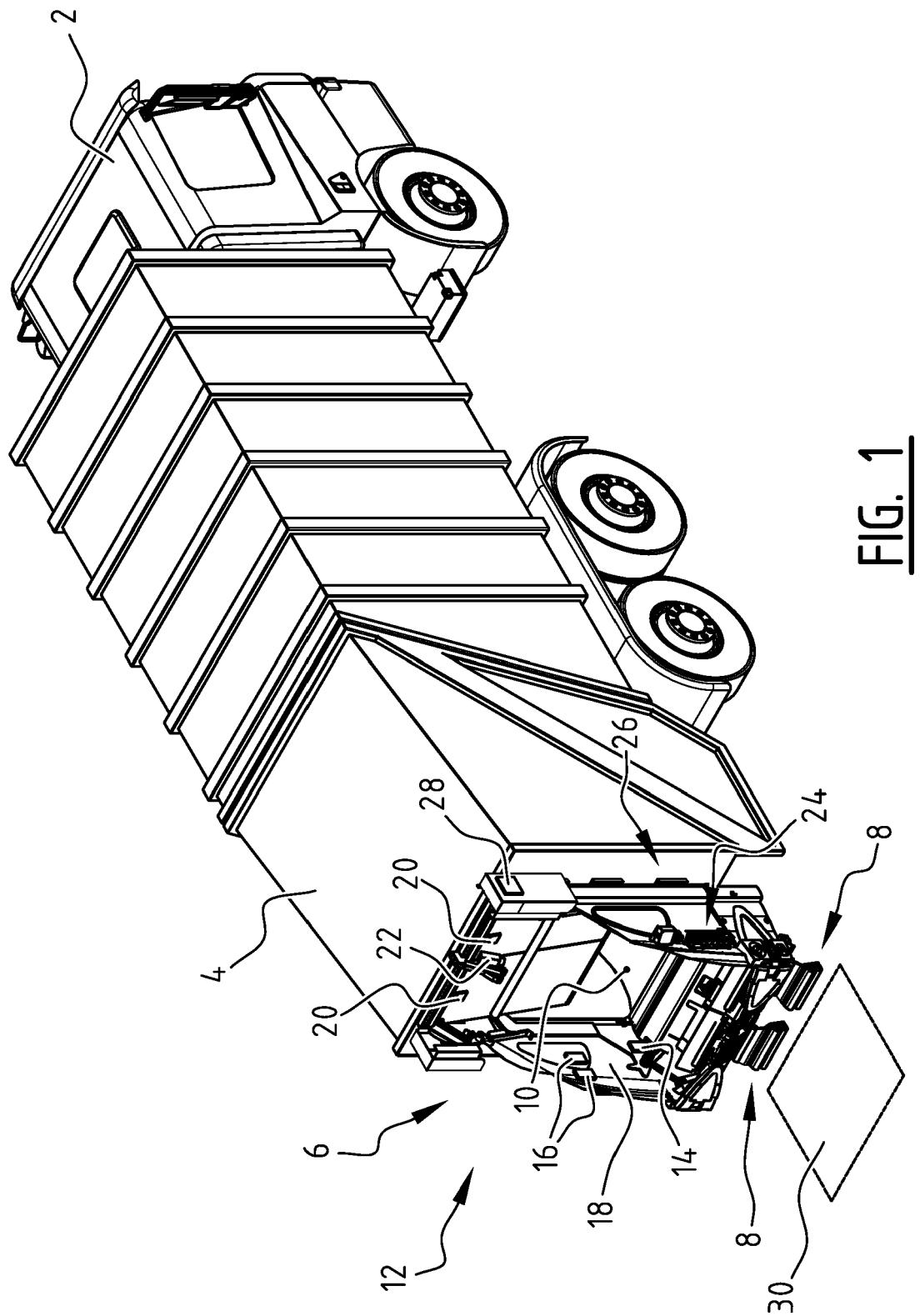
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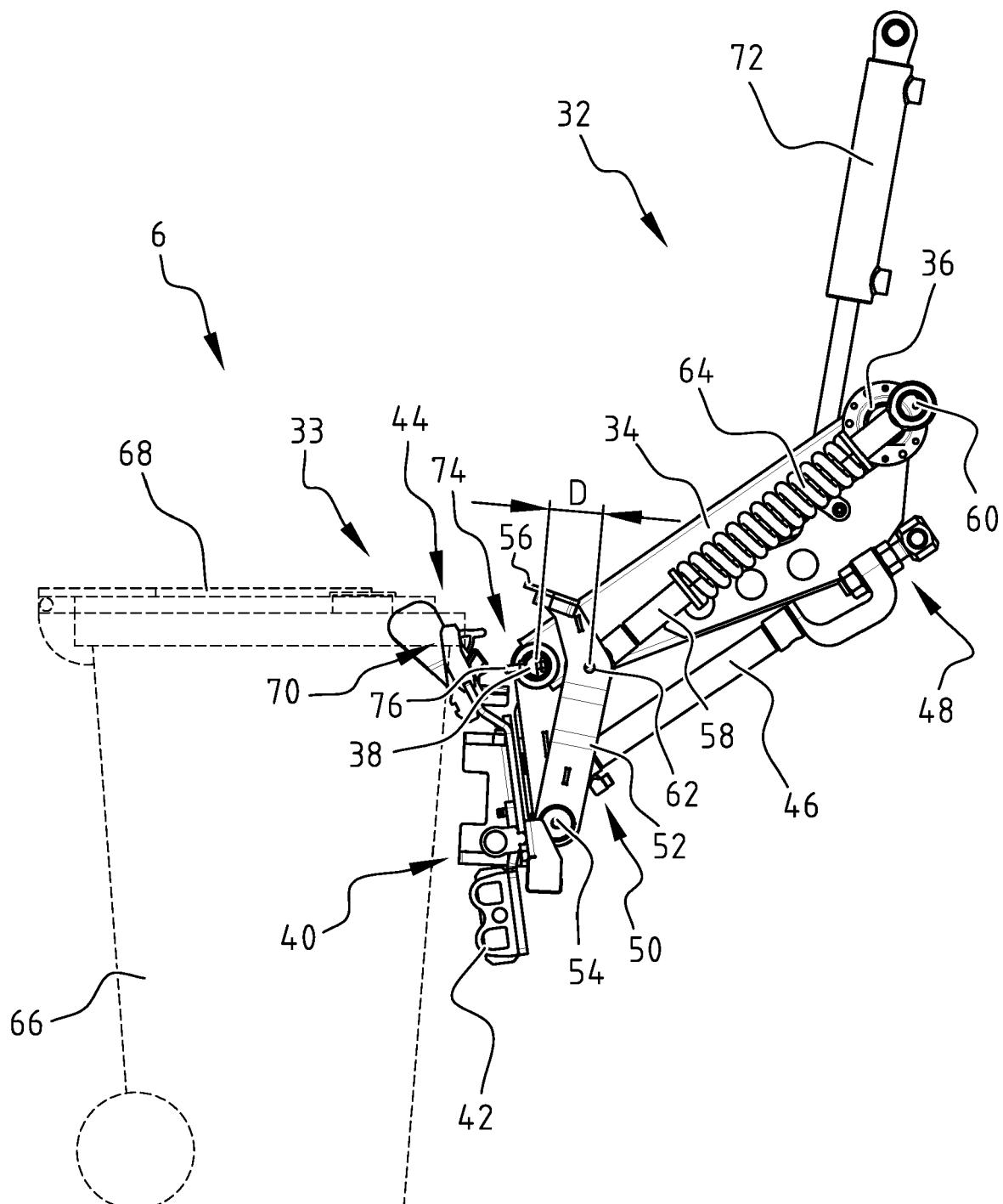


FIG. 2

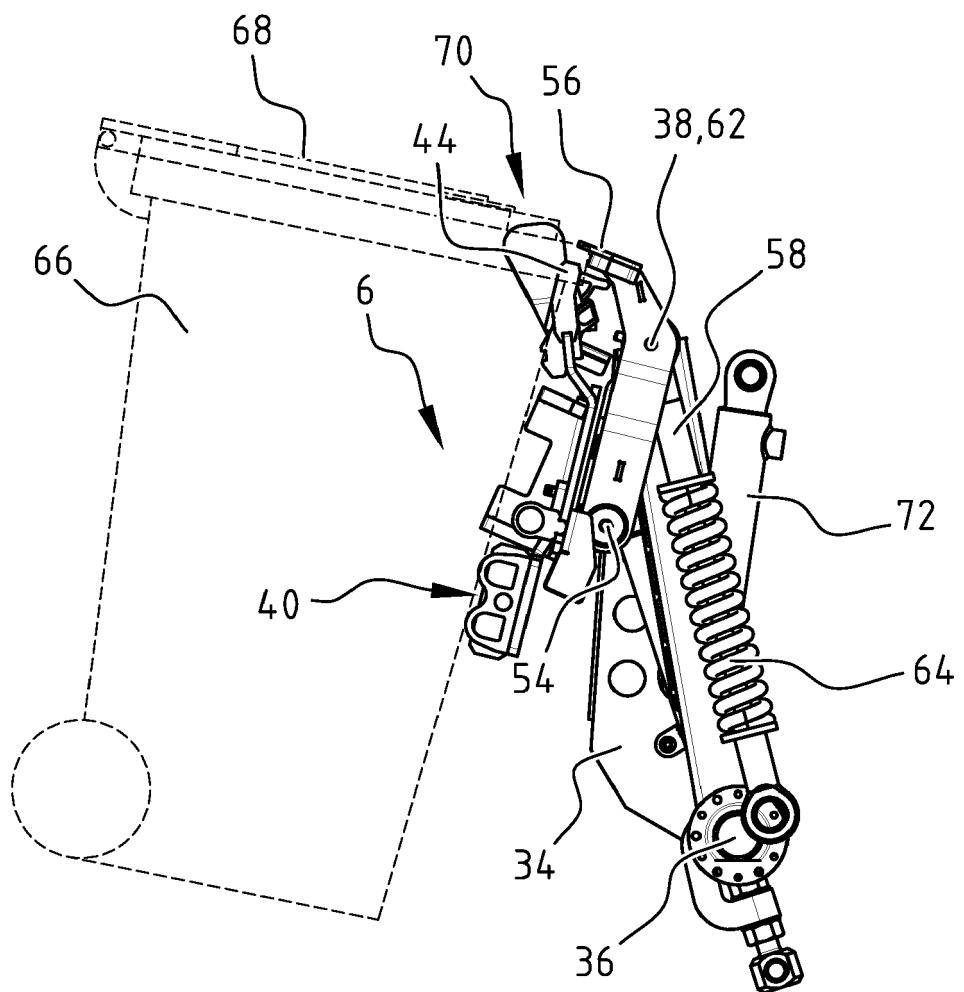


FIG. 3

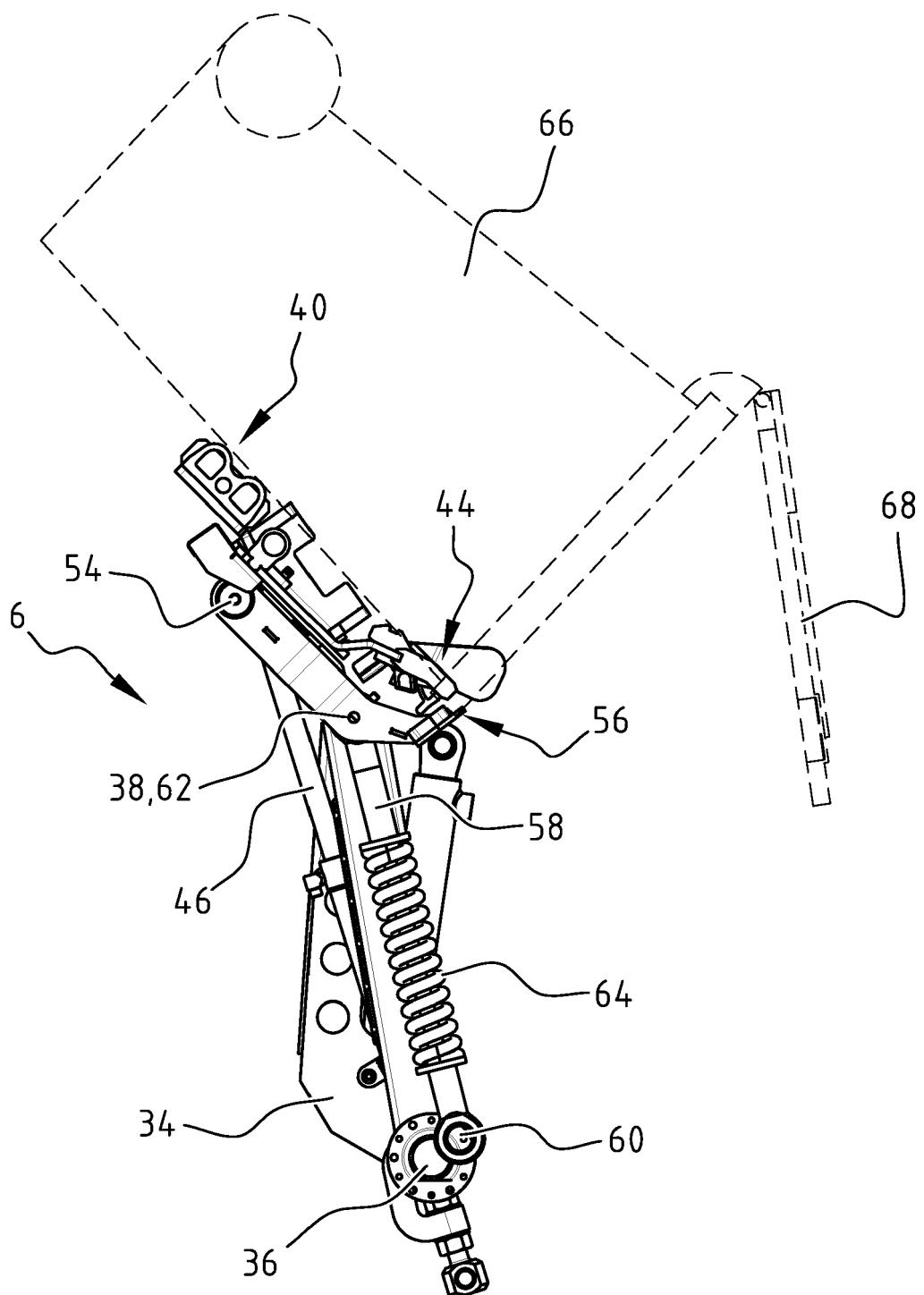


FIG. 4

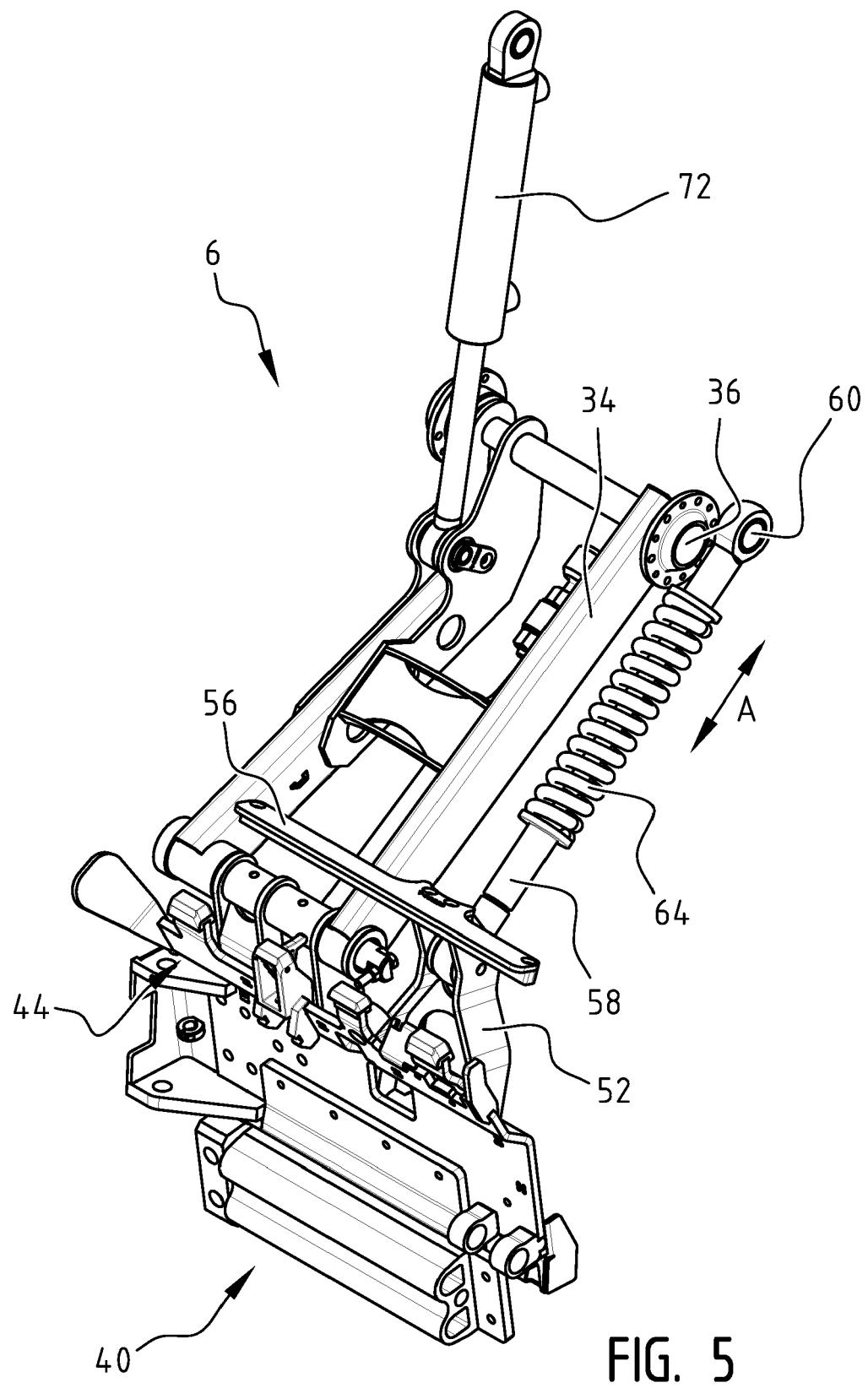


FIG. 5

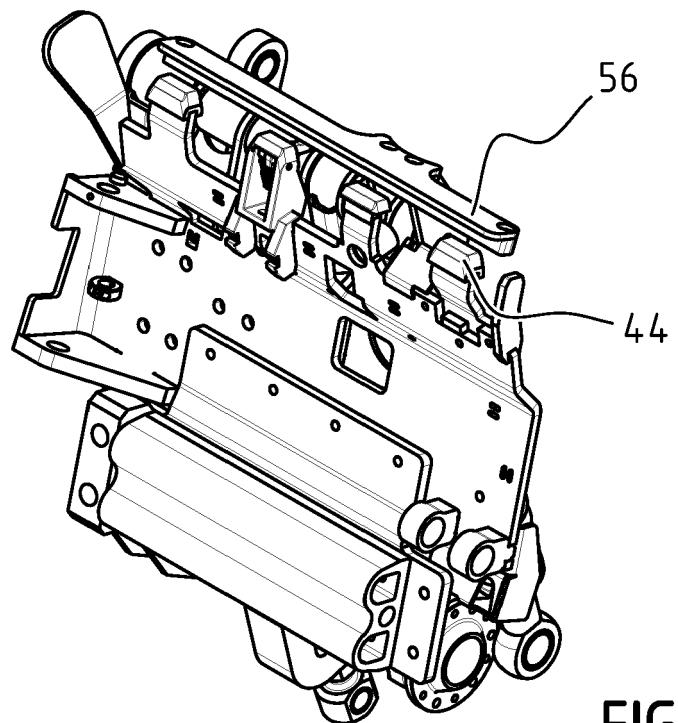


FIG. 6

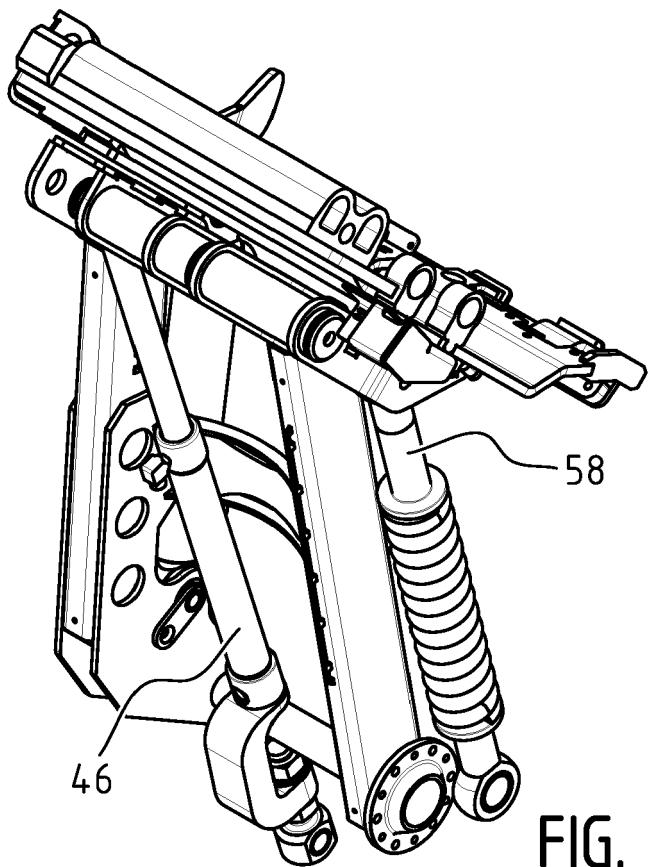
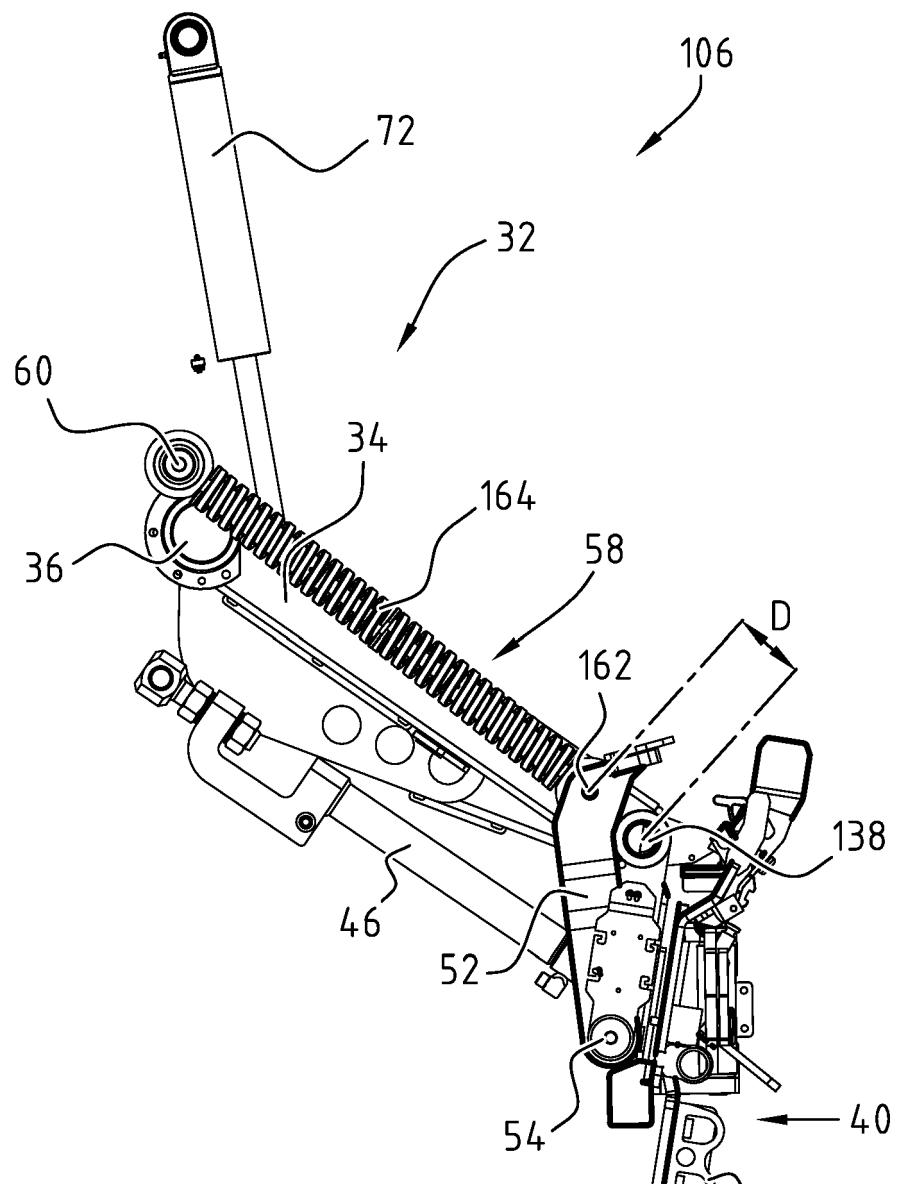


FIG. 7



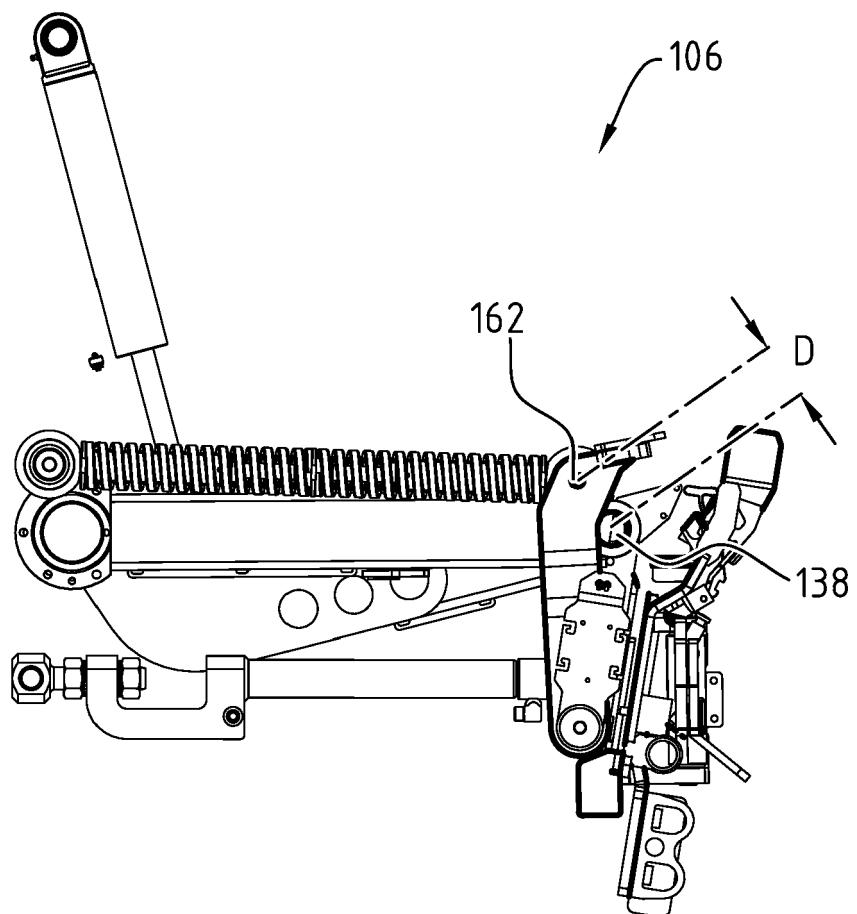


FIG. 8B

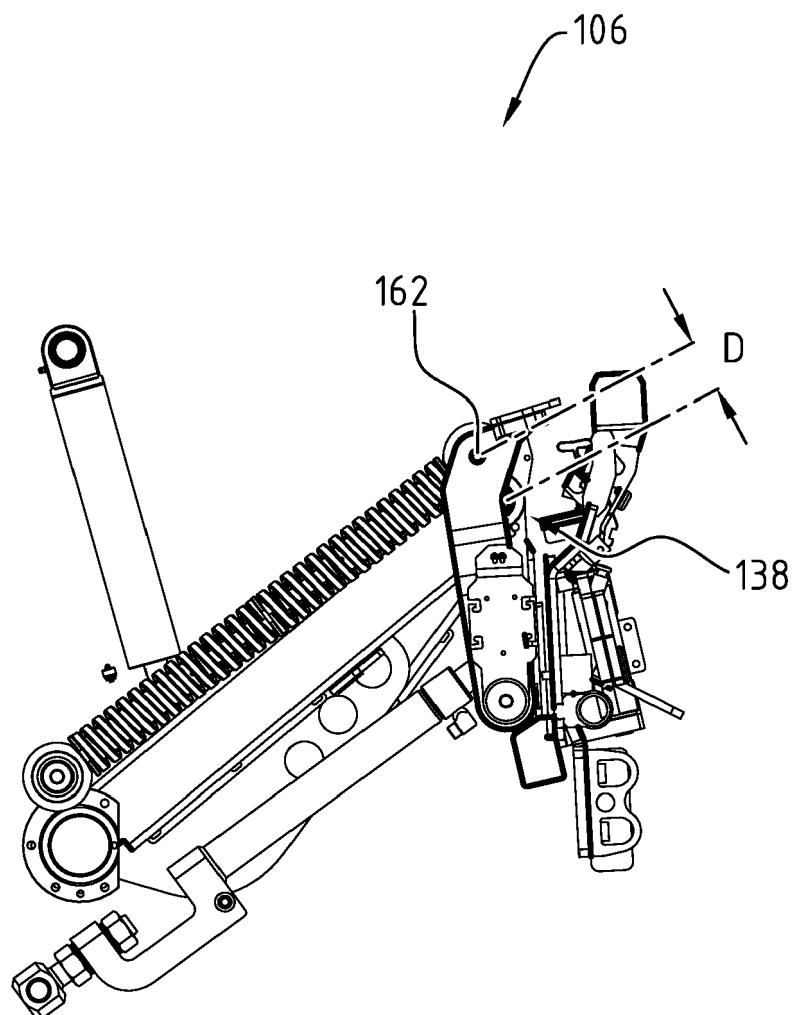


FIG. 8C

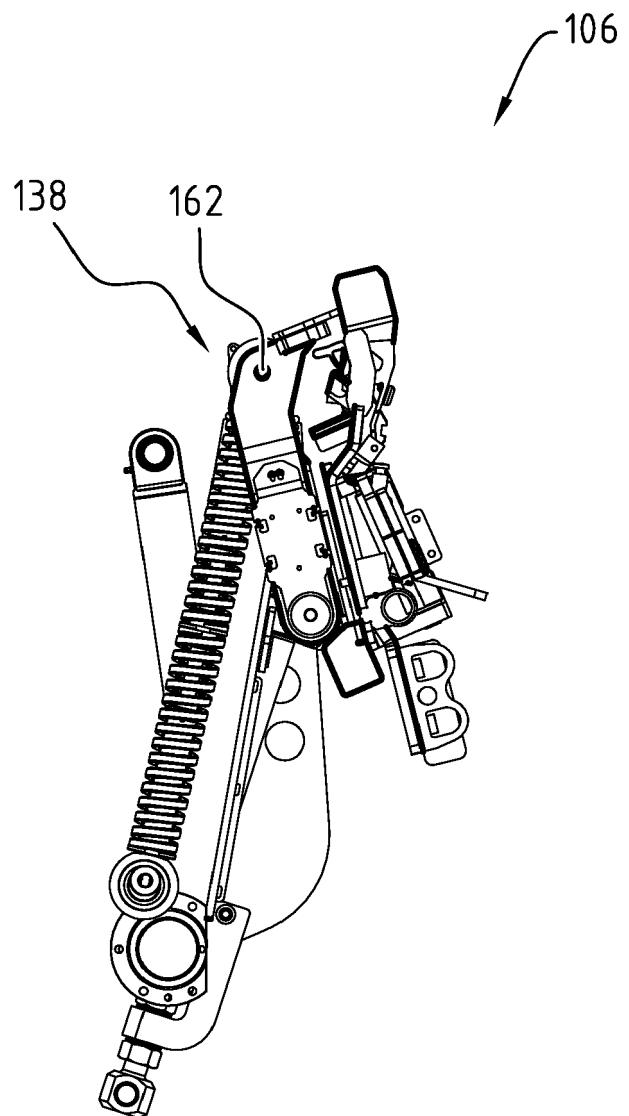


FIG. 8D

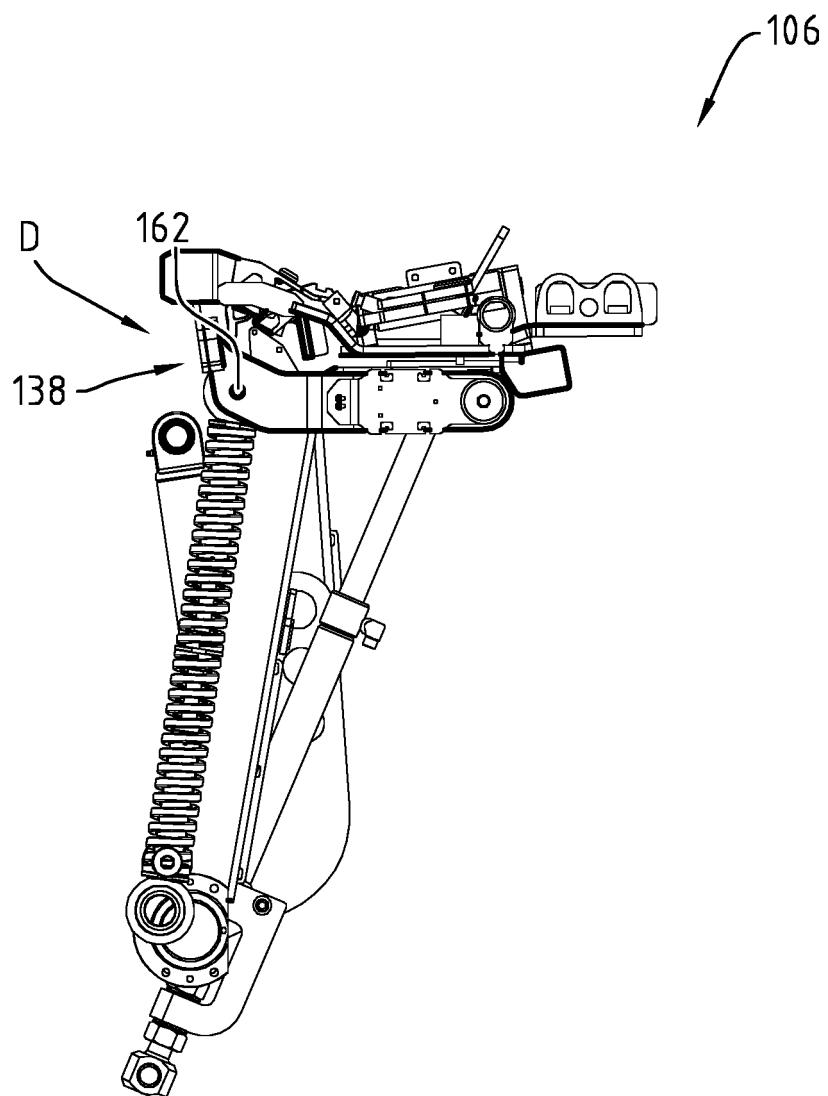


FIG. 8E

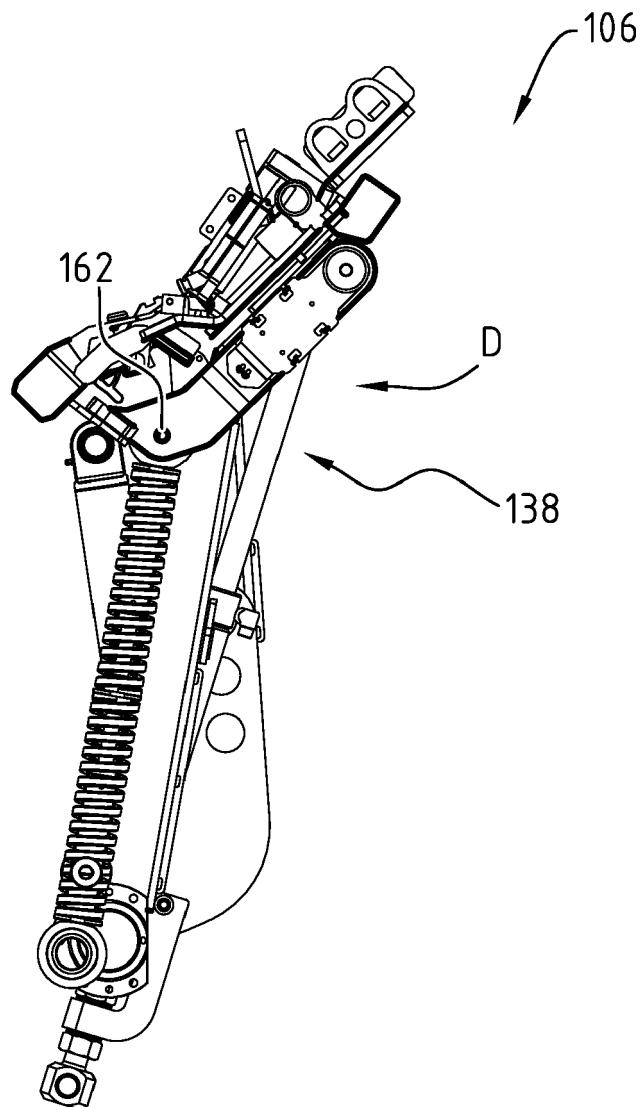


FIG. 8F



## EUROPEAN SEARCH REPORT

Application Number  
EP 16 20 5985

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| DOCUMENTS CONSIDERED TO BE RELEVANT  |  |   |   |
|--|--|---|---|
| Category   | Citation of document with indication, where appropriate, of relevant passages  | Relevant to claim   | CLASSIFICATION OF THE APPLICATION (IPC) |
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| 15 A   | DE 35 14 306 A1 (T. SCHMITZ)<br>23 October 1986 (1986-10-23)<br>* column 5, line 4 - line 45 *<br>* figures 3,4 *  | 1,7-10  |   |
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| 30   | -----  |   | TECHNICAL FIELDS<br>SEARCHED (IPC)      |
|  |  |   | B65F                                    |
| 35   |  |   |   |
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| 50 1   | The present search report has been drawn up for all claims   |   |   |
| 55   | Place of search<br>The Hague   | Date of completion of the search<br>10 April 2017   | Examiner<br>Smolders, Rob               |
| CATEGORY OF CITED DOCUMENTS  |  | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or<br>after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding<br>document |   |
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

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