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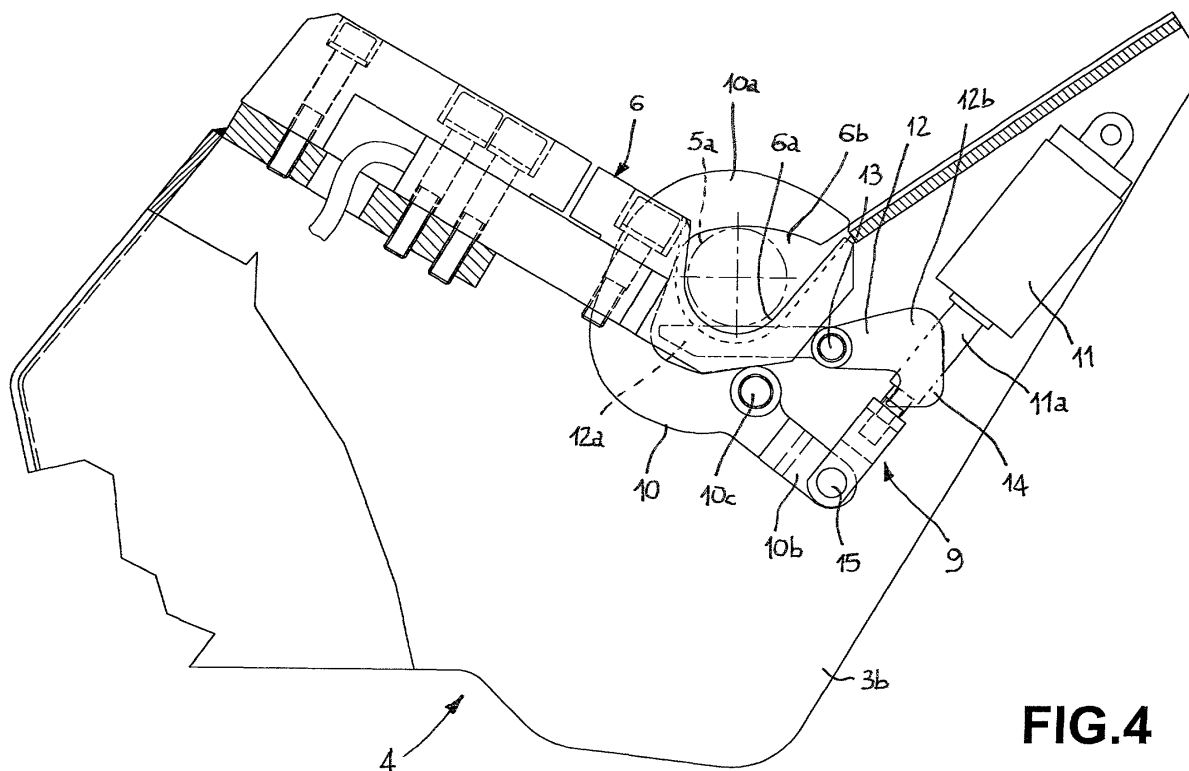
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(54) **Device for safely gripping of rubbish-collecting bins**

(57) The disclosed device comprises a pair of lifting arms (3) each carrying a gripping and handling member (4) comprising a hooking element (6) for engagement of a bin (5) to be emptied. The hooking element (6) has a rest seating (6a) with an arched profile arranged to receive a lifting pin (5a) of the bin (5), through a radial access

clearance (7b). A closure member (10) is movable to a closed position of the radial access clearance, to prevent the lifting pin (5a) from accidentally coming out of the rest seating (6b). A feeler element (12) is moved to an operating position following introduction of the lifting pin (5a) into the rest seating (6b), to enable movement of the closure member (10) to the closed position.



**FIG.4**

## Description

**[0001]** The present invention relates to a device for automatic emptying of rubbish-collecting bins, comprising: at least one lifting arm having a first end oscillatably in engagement with a bearing structure; at least one hooking element carried by a second end of the lifting arm and having a rest seating extending with an arched profile to engage a lifting pin carried by a bin and a radial clearance for access of the lifting pin to the rest seating; at least one closure member movable between an open position in which it is laterally moved away from the radial access clearance and a closed position in which it substantially extends through the access clearance to hinder disengagement of the lifting pin from the rest seating; drive means to cause movement of the closure member between the open and closed positions.

**[0002]** It is known that modern rubbish-collecting systems involve use of appropriate bins suitably distributed on the urban ground, that are periodically emptied by automatic devices provided on motor-vehicles designed for collection and transportation of the waste material to the rubbish dumps or other disposal places.

**[0003]** Such an automatic gripping and emptying device for rubbish bins is described in the European Patent EP 776835 in the name of the same Applicant. This device essentially comprises a pair of lifting arms parallel to each other, each having a first end rotatably linked to a bearing structure, and a second end carrying a gripping member arranged to engage a bin at a lifting pin laterally projecting from said bin. Appropriate actuating means activated by fluid-operated cylinders carries out the simultaneous displacement of the lifting arms between a rest condition in which they are substantially oriented downwardly and contained in the overall dimensions of the vehicle, and an overturned position in which they are substantially oriented upwardly. Identified between the rest position and the overturned position is a grip position in which the arms bring the respective gripping members completely level with the lifting pins of the bin to enable the bins to be picked up from the ground and lifted to the overturned condition in which the bin is turned upside down over a loading hopper associated with the motor-vehicle.

**[0004]** More particularly, engagement of the bin takes place at a pair of lifting pins laterally projecting from the bin itself, each of which is fitted in a rest seating with an arched profile carried by the gripping member and accessible through a radial access clearance.

**[0005]** In order to avoid the risk that the bin shall be accidentally disengaged from the gripping and handling members during the lifting and overturning steps, a closure member is provided to be arranged, in known manner, at the rest seating in each lifting arm, said closure member being movable to a closed position in which it extends through the radial clearance for access to the rest seating, starting from an open position in which it is disengaged from the radial access clearance itself.

When the closure member has reached the closed position, the lifting pin of the bin is completely enclosed between the arched extension of the rest seating and the closure member itself, so that any possibility of disengagement from the hooking member is prevented.

**[0006]** Movement of the closure member to the closed position is controlled by a fluid-operated actuator, which is programmed for intervention during a predetermined step of the emptying cycle, subsequent to picking up of the bin from the ground by the lifting arms.

**[0007]** The Applicant has however found that reliability of known embodiments can be improved to a certain amount if correct operation of the closure member is subordinated to a correct engagement of the pin carried by the bin in the rest seating. In more detail, it should be pointed out that at the present state of the art the closure member is moved to the closed position also in the absence of the pin within the rest seating. This circumstance can give rise to risk conditions because the bin-emptying cycle would be carried out even if, for any reason, one or both of the lifting pins of the bin were not correctly engaged by the respective gripping members. In accordance with the present invention, it has been found that this problem can be overcome by associating a feeler element set to enable displacement of the respective closure member to the closed position only following a correct fitting of the lifting pin of the bin into the rest seating.

**[0008]** Accordingly, it is an object of the present invention to provide an automatic emptying device for rubbish-collecting bins, characterized in that it further comprises: at least one feeler element oscillatably connected to the hooking element and movable between a rest position in which it is at least partly contained in the profile of the rest seating to interfere with the lifting pin introduced into the rest seating itself, and an activation position in which it is moved outwardly of the profile of the rest seating upon the action of the lifting pin; said drive means being able to be set in operation following movement of the feeler element to the activation position, to cause movement of the closure member to the work position.

**[0009]** Further features and advantages will become more apparent from the detailed description of a preferred but not exclusive embodiment of an automatic emptying device for rubbish-collecting bins, in accordance with the present invention. This description will be set out hereinafter with reference to the accompanying drawings given by way of non-limiting example in which:

- Fig. 1 is a front view of an emptying device in accordance with the present invention;
- Fig. 2 is a side view of the emptying device shown in Fig. 1;
- Fig. 3 shows an enlarged detail of Fig. 2 seen in a partly interrupted section;
- Fig. 4 shows the detail in Fig. 3 in an engagement condition of a bin.

**[0010]** With reference to the drawings, a device for automatic emptying of rubbish-collecting bins in accordance with the present invention has been generally identified by reference numeral 1.

**[0011]** In known manner, device 1 lends itself to be mounted on a side of a truck (not shown) or other motor-vehicle used for rubbish collection and transportation to the rubbish dumps or other disposal places. To this aim, device 1 has a bearing framework 2 in engagement on the motor-vehicle side.

**[0012]** Associated with the bearing structure 2 is a pair of lifting arms 3 each having a first end 3a oscillatably connected with the bearing structure itself and a second end 3b carrying a gripping and handling member 4 for a bin 5 diagrammatically and only partly shown.

**[0013]** In known manner, the bearing structure 2 is movable away from the motor-vehicle side to enable the lifting arms 3 to take a position alongside opposite sides of the bin 5 to be emptied. The lifting arms 3 are in turn movable close to each other to come near the side walls of bin 5 and enable the respective gripping and handling members 4 to operatively engage the bin itself. In more detail, for the purpose each gripping and handling member 4 is provided to be equipped with a hooking element 6 having a rest seating 6a with an arched profile the shape of which substantially matches that of a lifting pin 5a projecting from the side wall of bin 5.

**[0014]** As shown in Fig. 3, the extension of the arched profile of the rest seating 6a is interrupted, at the upper part thereof, by a radial access clearance 6b through which the rest seating 6a lends itself to receive the lifting pin 5a to cause engagement of bin 5 and allow lifting of same by arms 3 above a loading hopper set on said motor-vehicle.

**[0015]** With each gripping and handling member 4, auxiliary devices can be also associated such as an overturning lever 7 driven by a first actuator 7a to cause overturning of bin 5 over the hopper, and an auxiliary lever system 8 driven by a second actuator 8a to cause opening of the bin lid upon overturning of said bin 5. The overturning lever 7 and auxiliary lever system 8 are diagrammatically shown and are not further described because they are not important to the aims of the present invention.

**[0016]** Further associated with each gripping and handling member 4 is a safety device 9 to prevent accidental disengagement of the lifting pin 5a from the rest seating 6a during lifting and overturning of bin 5.

**[0017]** The safety device advantageously comprises a closure member 10, rotatably linked to the second end 3b of the lifting arm 3. In a preferential embodiment, the closure member 10 is essentially defined by a plate-like element having a closing portion 10a substantially of a C-shaped conformation and a drive tailpiece 10b, disposed on opposite sides respectively of an engagement pin 10c. The closure member 10 is movable between an open position in which, as shown in Fig. 3, it is laterally moved away from the radial access clearance 6b to en-

able entry and exit of the lifting pin 5a, and a closed position in which, as shown in Fig. 4, its closing portion 10a substantially extends through the access clearance 6b to hinder disengagement of the lifting pin 5a from the rest seating 6a.

**[0018]** Drive means 11 comprising a third fluid-operated actuator for example, which is housed in the second end 3b of the lifting arm 3, causes movement of the closure member 10 between the open position and closed position. To this aim, the third fluid-operated actuator 11 has its rod 11a connected by a connecting pin 15 to the drive tailpiece 10b carried at the end of the closure member 10.

**[0019]** Also associated with each gripping and handling member 4 is at least one feeler element 12, preferably embodied by a plate-like rocking lever having a first and a second portions 12a, 12b extending on opposite sides relative to a hinging pin 13.

**[0020]** The feeler element 12 is normally maintained in a rest condition by effect of the weight of the second portion 12b which is heavier than the weight of the first portion 12a, in which condition, as shown in Fig. 3, it is at least partly contained within the arched profile of the rest seating 6a, at its first portion 12a. More specifically, in the rest position the first portion 12a of the feeler element 12 extends in a trajectory cutting the projection of the arched profile of the rest seating 6a. In this circumstance, the feeler element 12 lends itself to interfere with the lifting pin 5a of bin 5 upon insertion of the latter in the rest seating 6a.

**[0021]** It is also provided that, in a rest condition, the feeler element 12 should inhibit movement of the closure member 10 to the closed position. For the purpose, the second portion 12b of the feeler element 12 preferably has a locking tailpiece 14 adapted to operatively interfere with the closure member 10. More specifically, this locking tailpiece 14 engages for the purpose with the connecting pin 15 joining the end of the rod 11a of the third actuator 11 with the drive tailpiece 10b of the closure member itself, as shown in Fig. 3. In this circumstance, the locking tailpiece 14 interferes with the connecting pin 15 so as to restrain the closure member 10 from rotation and bring it from the open position to the closed position.

**[0022]** Upon engagement of the lifting pin 5a of bin 5, movement of the pin itself to the rest seating 6a gives rise to displacement of the feeler element 12 to an activation position in which, as shown in Fig. 4, it appears with its first portion 12a moved outwardly of the profile of the rest seating 6a. More particularly, in this condition, the first portion 12a of the feeler element 12 takes a position substantially tangential to the projection of the arched profile of the rest seating 6a, as viewed from Fig. 4.

**[0023]** In the activation position, the second portion 12b of the feeler element 12 disengages the connecting pin 15 of the closure member 10. The closure member 10 can therefore be freely brought to the closed position

upon command of the third fluid-operated actuator 11.

**[0024]** Preferably, at least one pin presence-ascertaining sensor is provided, which sensor is set to detect reaching of the closed position by the closure member 10. This sensor, not shown as it can be made in any convenient manner, can for example consist of a proximity sensor or a micro-switch operated by the drive tailpiece 10b on reaching of the closed position, or associated with the third actuator 11 to detect reaching of the stop condition corresponding to the closed position.

**[0025]** When activated, the pin presence-ascertaining sensor emits a signal that can be utilised to enable prosecution of the emptying cycle of bin 5, involving raising and overturing of same over the loading hopper arranged on the vehicle.

**[0026]** Alternatively or additionally to said pin-presence sensor, a pin absence-ascertaining sensor can be arranged in association with the closure member 10 and/or the fluid-operated actuator 11 to detect reaching of the open position of the closure member itself. The signal emitted by the pin absence-ascertaining sensor can be utilised to disable prosecution of the emptying cycle in the absence of the lifting pin 5a in the rest seating 6a.

**[0027]** The present invention achieves the intended purposes.

**[0028]** In fact, the concerned device is able to ensure complete accomplishment of the emptying cycle under a condition of full safety, in connection with a correct engagement of the bin by the gripping members 4.

**[0029]** In fact, in the absence of a correct engagement of the lifting pins 5a in the respective rest seatings 6a displacement of the closure members 10 to the closed position and therefore prosecution of the emptying cycle is made impossible.

**[0030]** This situation did not occur in the known art in which displacement of the closure members could take place also in the absence of the lifting pin in the rest seating. Therefore it could happen that the bin were accidentally raised from the ground also when its lifting pins did not stay correctly in engagement with the gripping members, which involved serious risks of falling.

## Claims

1. A device for automatic emptying of rubbish-collecting bins comprising:

- at least one lifting arm (3) having a first end (3a) oscillatably in engagement with a bearing structure (2);
- at least one hooking element (6) carried by a second end (3b) of the lifting arm (3) and having a rest seating (6a) extending with an arched profile to engage a lifting pin (5a) carried by a bin (5) and a radial clearance (6b) for access of the lifting pin (5a) to the rest seating (6a);

- one closure member (10) movable between an open position in which it is laterally moved away from the radial access clearance (6b) and a closed position in which it substantially extends through the access clearance (6b) to hinder disengagement of the lifting pin (5a) from the rest seating (6a);
- drive means to cause movement of the closure member (10) between the open and closed positions;

characterized in that it further comprises:

- one feeler element (12) oscillatably connected to the hooking element (6) and movable between a rest position in which it is at least partly contained in the profile of the rest seating (6a) to interfere with the lifting pin (5a) introduced into the rest seating itself, and an activation position in which it is moved outwardly of the profile of the rest seating (6a) upon the action of the lifting pin (5a);
  - said drive means (11) being able to be set in operation following movement of the feeler element (12) to the activation position, to cause movement of the closure member (10) to the work position.
2. A device as claimed in claim 1, wherein said feeler element (12) comprises a rocking lever having a first and a second portions (12a, 12b) disposed on opposite sides relative to a hinging pin (13); said second portion (12b) having a heavier weight than the first portion (12a) to give the feeler element (12) a tendency to take its rest position.
  3. A device as claimed in claim 1, wherein the feeler element (12) has a locking tailpiece (14) that, in its rest position, interferes with the closure member (10) to inhibit displacement thereof to the closed position.
  4. A device as claimed in claims 2 and 3, wherein said locking tailpiece is formed in the second portion of the feeler element.
  5. A device as claimed in claim 1, further comprising at least one pin presence-ascertaining sensor to detect reaching of the closed position by the closure member (10).
  6. A device as claimed in claim 1, further comprising at least one pin absence-ascertaining sensor to detect reaching of the open position by the closure member (10).
  7. A device as claimed in claim 1, wherein said drive means (11) comprises a fluid-operated actuator in

engagement with the second end (3b) of the lifting arm (3) and operating on said closure member (10).

8. A device as claimed in claim 1, wherein said hooking element (6) is associated with a gripping and handling member (4) further comprising an overturning device (7) for the bin (5) which is controlled by a first actuator (7a) and an opening device (8) for a lid of the bin (5) which is controlled by a second actuator (8a).

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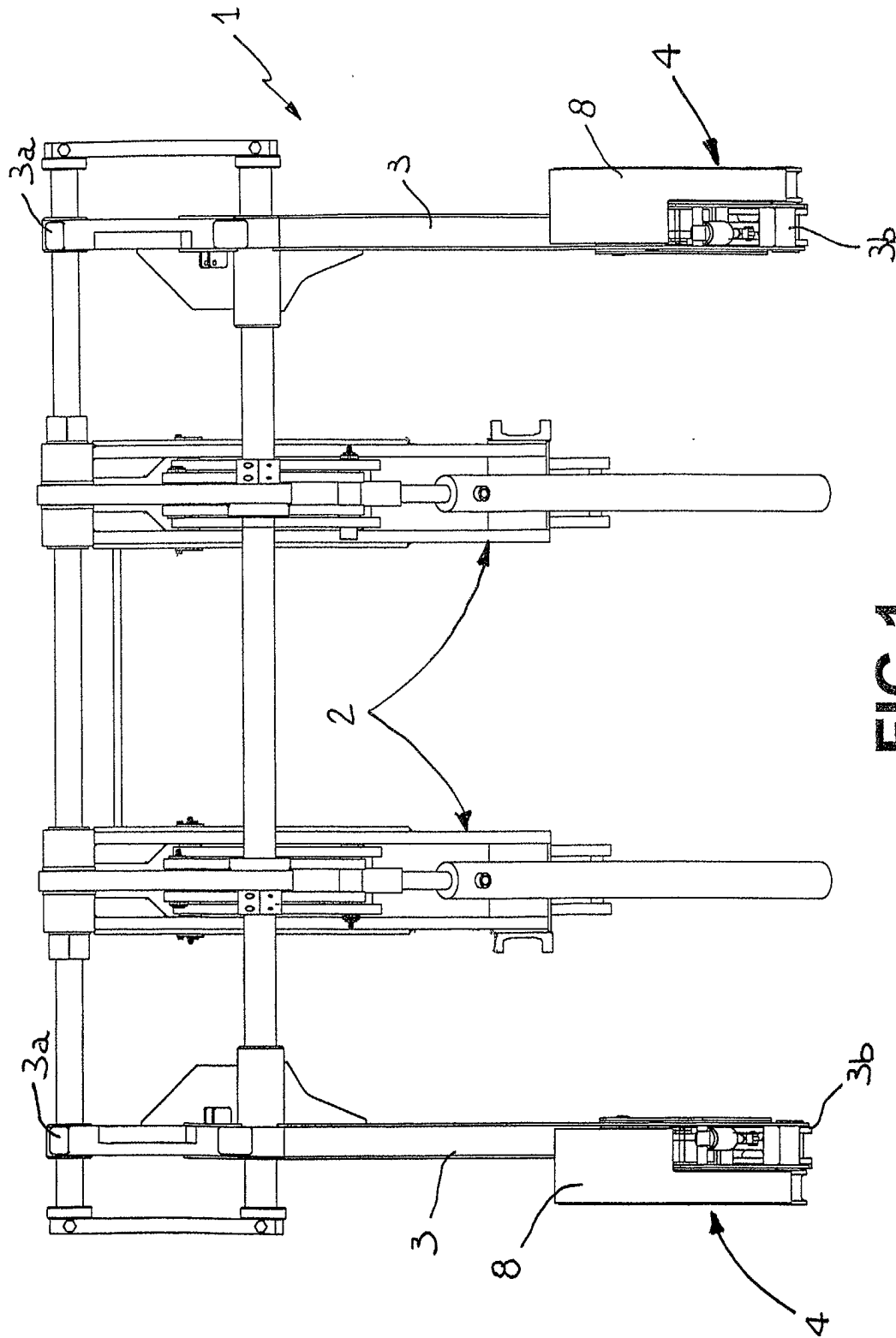
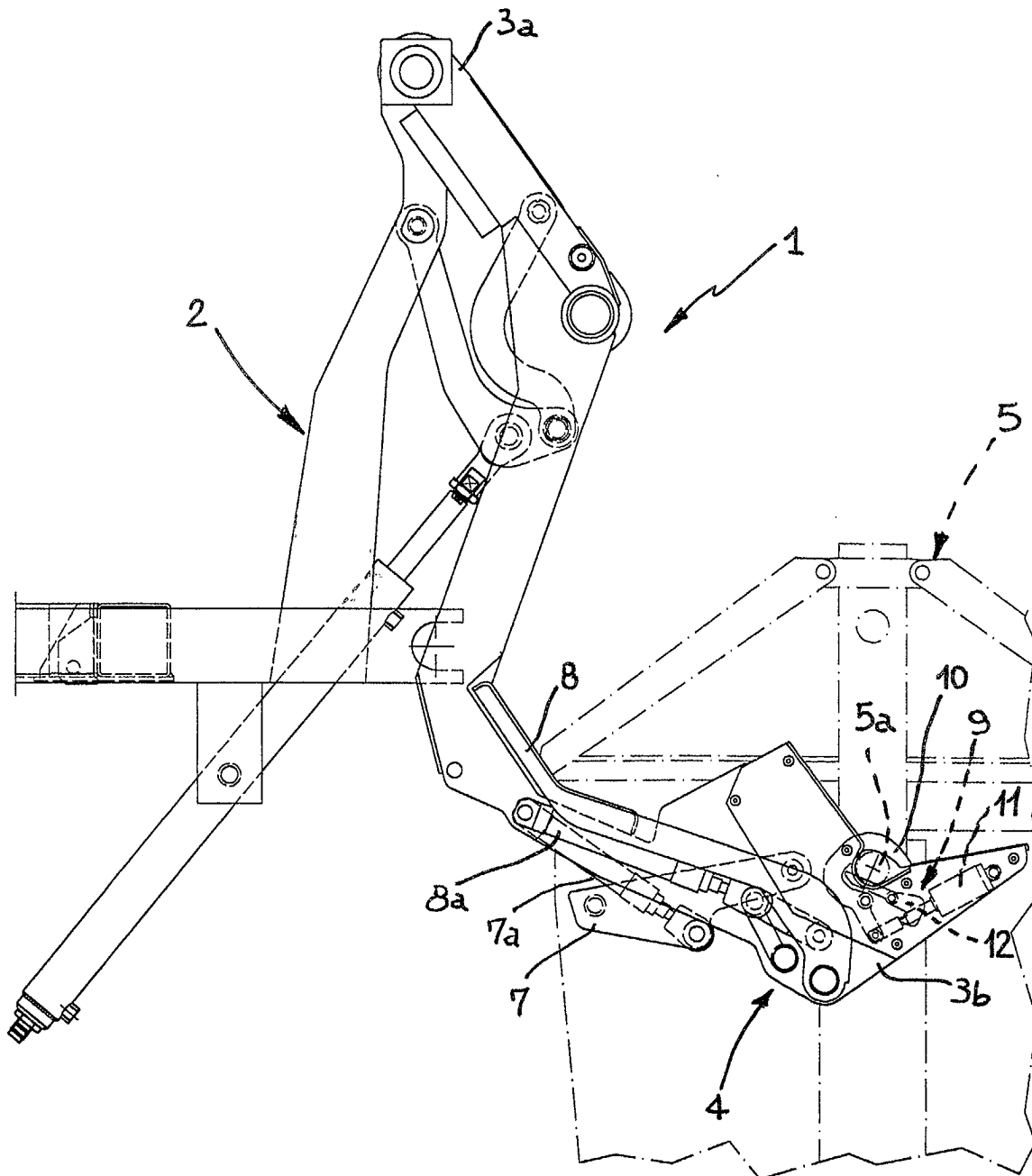


FIG.2



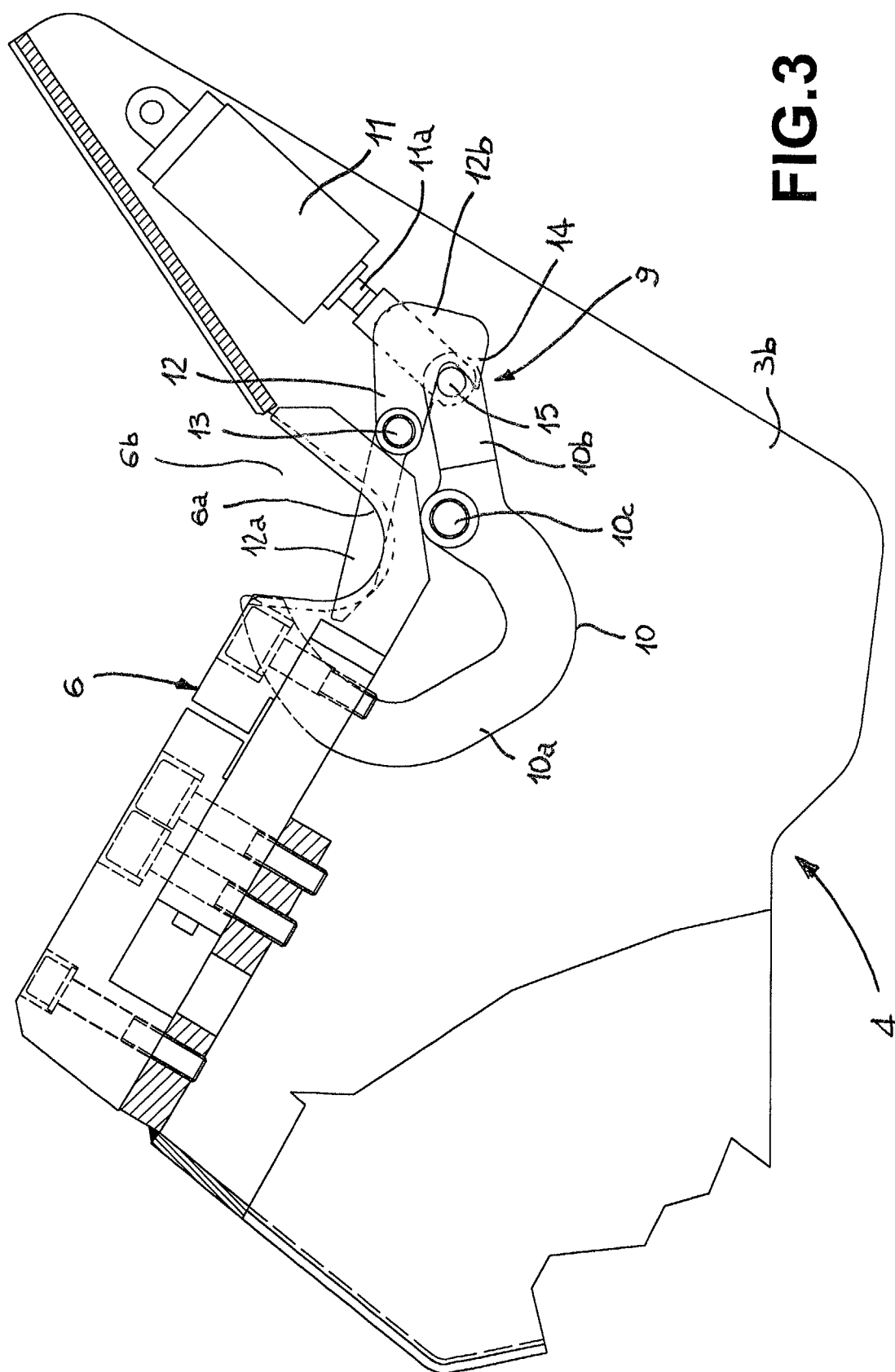


FIG.3



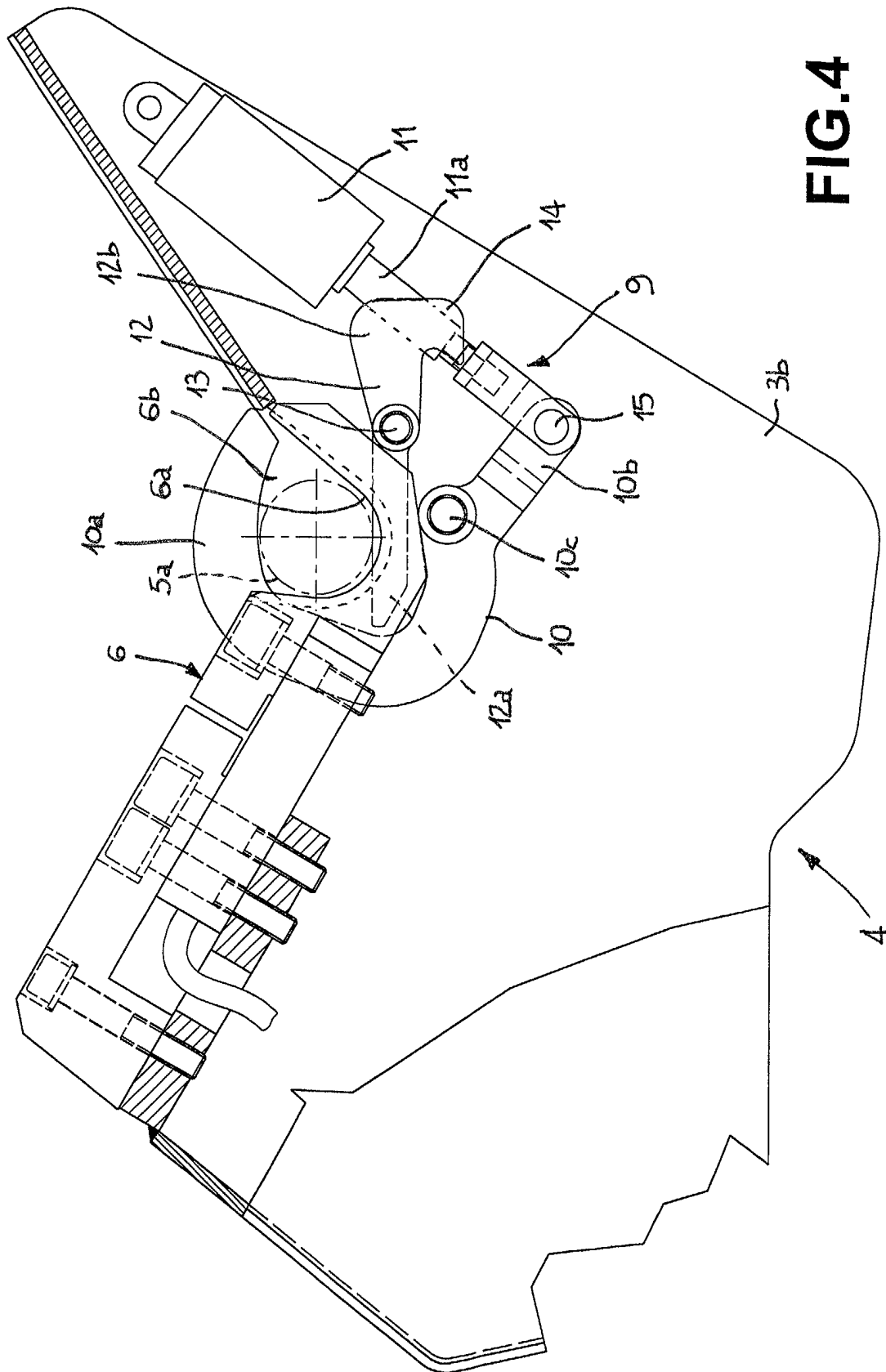


FIG. 4



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 01 83 0604

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Place of search		Date of completion of the search	Examiner
THE HAGUE		8 February 2002	Smolders, R
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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