

Description

This invention relates to a truck-associated device for gripping and automatically lifting a refuse collection bin, of the type described in the pre-characterising part of the main claim.

Devices of the aforesaid type have been known for some time (see for example Italian patent application 22400A/87 in the name of Bergomi SpA). These devices are able to lift a bin from the ground, empty it into a compacting hopper or an aperture in a body part of the truck, and then return it to its initial position. The known devices comprise relatively complicated operating means, able to move the gripping arms both horizontally with respect to the truck body so as to bring them into contact with the bin, and rotationally so as to lift it, empty it and return it to its original position.

The complexity of the movements which the known operating means have to undergo requires the use of numerous levers, actuator means and control means. In addition to making known devices very heavy, this results in assembly, adjustment and maintenance times which considerably affect the production and operating costs of the device.

In addition the relatively complicated movements undergone by the known operating means mean that the time involved in gripping, lifting and emptying the bin are not always acceptable.

An object of the present invention is to provide a bin gripping and lifting device in which the gripper arm operating means have a limited number of components and undergo simpler movements than known means, so resulting in a lower production, assembly and adjustment cost and time for the device, and in a shorter time required for gripping, lifting and emptying the bin.

This and further objects which will be apparent to an expert of the art are attained by a device in accordance with the accompanying claims.

The present invention will be more apparent from the accompanying drawings, which are provided by way of non-limiting example and in which:

Figure 1 is a schematic front view of a device according to the invention associated with a truck (shown partially), the device being represented in its initial rest state;

Figures 2, 3, 4 and 5 are simplified schematic side views taken on the line A/A of Figure 1, showing the device of the invention in various stages of its operation;

Figure 6 is a schematic side view of the lifting means of the device, in two different operating positions;

Figure 7 is an enlarged schematic front view of the lower part of the device according to the invention;

Figure 8 is an enlarged schematic front view of a modified embodiment thereof;

Figure 9 is a section through the modified embodiment of Figure 8 taken on the line 9/9 thereof.

With reference to said figures, a device according to the invention comprises a pair of gripper arms 1 connected to the lifting means, which are indicated overall by 3 and comprise two pairs of slides 4 to which an end portion 1B of the arms 1 is connected, and guides 5A, B along which the slides 4 can slide and which are connected to a cross-member 5 at the lower end 7 of a support structure 8, which is hinged at its upper end 9, opposite its lower end, to supports 10 rigidly fixed to the frame of the body 11 of a truck 16 (shown partially). For operating the device there are provided a pair of first cylinders 12 for rotating the arms 1, a second cylinder 13 for moving the slides along the cross-member (represented schematically by dashed lines in Figure 7) and a third cylinder 14 for rotating the structure 8, the cylinders being all for example of hydraulic type.

More specifically, the arms 1, substantially of conventional type, have an elongate structure comprising at its free end a usual gripper head 1A for coupling to conventional gripping elements 17 provided on the sides 18A of a refuse collection bin 18 and comprising conventional members (not shown) for locking the head to said gripping elements 17 to prevent the bin being able to escape from the head when overturned (Figures 4, 5).

In a manner conventional to the expert of the art, the arms 1 internally house usual members 118 (shown schematically in Figure 5) for overturning the bin 18. The arm end portions 1B hinged to the slides 4, and also the heads 1A, are advantageously inclined to a central portion 1C of the arms, ie to the longitudinal axis B' (Figure 2) of the arm.

The slides 4 are rigidly connected to the end 1B of the arms and slide along two guide bars 5A, B connected at their ends to two sidepieces 5C. An end portion 5D of the guide 5B projects from that sidepiece 5C closer to the central structure 2. One end of the cylinder 12 engages said projecting portion 5D.

As shown in Figure 3, preferably one of the two slides 4 and the relative guide bar 5A are positioned on the terminal part of the end 1B of the arms 1 whereas the other slide and the other guide bar 5B are located on the straight portion of the arms.

The cross-member 5 is rigidly fixed to the inner sidepieces 5' which support the guides 5A, 5B. Advantageously the cross-member is connected to the sidepieces coaxially to the guide 5A. The cross-member 5 is connected to the lower end 7 of the support structure 8 in a manner able to rotate with respect to the structure, with its axis of rotation parallel to said end 7, but unable to translate horizontally. Bearings 6 are provided in the lower end 7 of the structure 8 to facilitate rotation of the cross-member 5.

In Figures 2-5 the cross-member 5, the slides 4 and the sidepieces 5C are not shown for reasons of simplicity and clarity. Each of the two cylinders 12 (Figure 3) which operate the arms 1 is connected to the central structure 8, preferably on the axis on which the structure is hinged to the supports 10.

In the illustrated embodiment the central structure is essentially of inverted U-shape with its end portion 8C (Figure 6) advantageously hinged in conventional manner at 15 (Figure 1) to the supports 10, this end portion and the end portion 8B (Figure 6) being inclined to the flat central part 8A of the structure 8 to face each other (Figure 6).

Because of the inclination of the end portions 8B, 8C of the structure 8, this can be advantageously housed in a recess 20 provided in a side wall 11A (Figure 2) or rear wall of the truck body 11, so that the outer face of the structure 8 when in its rest position (Figure 1 and Figure 2, position indicated by the arrow B) is substantially flush with said outer wall 11A of the truck body.

It should be noted that a similar consideration also applies to the arms 1, which also have their ends 1A, 1B inclined in the described manner, so as to be substantially flush with the wall 11A of the truck body when in their rest position.

As shown in Figure 6, the cylinder 14 for rotating the structure 8 has one end connected to a support 21 on the vehicle frame, positioned below the hinging support 10 for the structure, and its other end connected to the central piece 22A of a toggle arrangement 22, the ends 22B, C of which are connected to a support 23 on the truck body 11 and to the central structure respectively.

Preferably the end 22C of the toggle arrangement 22 is connected to the central structure 8 at the upper end portion 8C of this latter.

Finally, the device comprises an operating and control unit for the cylinders 12, 13 and 14 which actuate the arms 1 and the structure 8. The operating and control unit is of a type conventional to the expert of the art and will therefore not be described in detail hereinafter. It should be noted that the operating and control unit is connected in the usual manner to usual position sensors, and in particular to usual sensors, such as encoders, for measuring the angle of rotation A1 (Figure 3) of the structure 8 to the truck body 11 and the angle A2 (Figure 3) between the arms 1 and the structure, and usual sensors, such as photoelectric cells, provided on the head 1A of the arms 1 in order to sense when the heads 1A reach the sides of the bin.

The device of the invention operates as follows: the arms 1 are lowered from their rest position (Figure 2, position indicated by the arrow B), in which the device is substantially coplanar with the wall 11A of the truck body, to a position in which they are able to interfere with the bin (Figure 2, position indicated by the arrow C). This first movement is obtained by operating the cylinders 12, to cause the cross-member 5 to rotate on the bearings 6 and consequently rotate the arms 1. The structure 8 is then rotated to cause the arms 1 to approach the bin.

The structure movement is interrupted when the sensors provided on the heads 1A sense the presence of the bin (Figure 3, position indicated by the arrow D). It should be noted that advantageously, simultaneously with the said rotation of the structure 8, the arms 1 are also rotated downwards so that the heads 1A always maintain a predetermined distance from the ground.

These movements are controlled by the control unit on the basis of the information originating from the position sensors on the structure 8 and the arms 1. The control unit could for example have memorized, for each angular movement of the structure 1 relative to the bin, a corresponding angular value which the arms 1 are to assume relative to the structure. In this manner the control unit can move the arms until these values are attained. The movement involved in the approach of the device to the bin (18) is therefore the combination of only two rotary movements, namely a rotary movement of the structure 8 relative to the truck body 11 and a simultaneous rotary movement of the arms 1 relative to the structure 8. When the sensors provided on the heads 1A sense the presence of a bin, the cylinder 13 causes the heads to approach the sides of the bin so that they can then be raised through a determined angle to engage the gripping elements 17. The control unit advantageously memorizes the angular position of the structure 8 corresponding to this gripping of the bin. This information is subsequently used to return the bin 18 to the same initial position after it has been emptied. At this point the arms are made to further rotate through a predetermined angle A3 to lift the bin from the ground (Figure 4, position indicated by the arrow E).

The structure 8 is then rotated to its position of maximum rotation while maintaining the angle A3 between the structure and the arms 1 constant. When in this position the bin lies above a compacting hopper (not shown) or an aperture in the truck body 11 (Figures 4 and 6, position indicated by the arrow F). With the aid of the members 118 the bin is further rotated to empty it completely (Figure 5). The bin is returned to its original position by repeating the aforescribed movements in the reverse direction.

It should be noted that the bin is moved as a result of the combination of only two rotary movements, ie the rotation of the structure 8 and of the arms 1 connected to it, without the need for horizontal movements by the device.

In this manner, certain movements which in known devices lead to idle times in the gripping cycle are eliminated, hence reducing the time required for completing the gripping and emptying of a bin.

Finally it should be noted that the aforescribed embodiment is provided by way of example and that numerous modifications are possible, all falling within the same inventive concept. For example the central structure 8 could comprise two separate support elements each connected to one of the arms 1 and to its own actuator cylinder, or the lever arrangement 22 connecting the structure 8 to the cylinder 14 could be of a type different

from that shown. The cross-member 5 could be of different form from that described, and could for example be of the type indicated in Figures 8 and 9 by 115. In this latter modification the cross-member is again connected to the lower end 7 of the central structure 8 (partially shown in Figure 8) in the already described manner, ie such as to rotate on bearings 6.

In this modification the cross-member 115 is of the telescopic type comprising two rods 117 arranged to slide at least partially within the cross-member. The lower ends 1B of the arms 1 are connected to the free ends of these rods.

The cross-member 115 is hollow and comprises in its interior two grooved shafts 116 coaxial to the cross-member and arranged to act as a guide for the rods 117 and to prevent them rotating about the cross-member axis. For this purpose the rods internally comprise elements 128 (Figure 9) which engage the grooves 119 of the shafts 116. The end 117A of the rods 117, which is movable within the cross-member 115, is shaped in such a manner as to divide the cavity 115A defined by the cross-member into two separate sealed regions 120A, 120B. For this purpose that wall of the end 117A in contact with the inner wall of the cross-member comprises a seat for the insertion of a seal ring 122. In each of the regions 120A, B there is provided a port 121A, 121B for the passage of hydraulic oil or a similar fluid for moving the rod 117.

Into the exit mouth 115B of the cross-member there is inserted an element 123 for supporting the rod 117 and for sealing the region 120A of the cross-member. A seal ring 123A and bearings 123B are for example provided for this purpose.

Finally, the cross-member 115 externally comprises elements 125 for connection to the actuator cylinders 12 (not shown in Figure 8).

Claims

1. A truck-associated device for gripping and automatically lifting a refuse collection bin, of the type comprising bin lifting means to which bin gripper arms are connected, characterised in that the lifting means (2) comprise at least one elongate support structure (8) hinged at its upper end (9) to supports (10) rigidly fixed to the frame of the truck body (11), and connected to the gripper arms (1) at its lower end (7), which is substantially parallel to its upper end, said arms being able to rotate relative to the central structure, the movement of approach and withdrawal (Figure 3) of the device to and from the bin (18) being achieved by the combination of only two rotary movements, namely a rotary movement of said structure (8) relative to the truck body (11) and a rotary movement of the arms (1) relative to the structure (8).
2. A device as claimed in claim 1, characterised in that the lifting means (2) comprise at least one first actuator member (12) connected to the central structure (8) and to said arms (1) or connection elements (5, 5B; 115, 125), and a second actuator member (14) connected to a support (21) rigidly fixed to the truck body and to the support structure (8).
3. A device as claimed in claim 2, characterised in that the first actuator member (12) is connected to the support structure (8) at the upper end (9) of this latter.
4. A device as claimed in claim 2, characterised in that the support (21) for the second actuator member (14) is fixed to the truck body in a lower position than that of the support (10) on which the structure (8) is hinged, said second member (14) being connected to the structure via a lever arrangement 22.
5. A device as claimed in claim 4, characterised in that the lever arrangement (22) is of the toggle type comprising a first end element (22C) connected to the structure (8) at an upper end portion (8C) of this latter, and a second end element (22B) connected to a support (23) rigidly fixed to the truck frame in a position intermediate between that of the support (10) on which the structure (8) is hinged and that of the support (21) on which said second member (14) is connected to the truck, and a central element (22A) connected to said second member (14).
6. A device as claimed in claim 1, characterised by being housed in a recess (20) in the lateral or rear wall of the truck body (11).
7. A device as claimed in claim 1, characterised in that the structure (8) and the arms (1) are configured such that when the device is in its rest position (B, Figure 2), these are substantially coplanar with that wall (11A) of the truck body (11) into which a recess (20) housing the device opens.
8. A device as claimed in claim 1, characterised in that the structure (8) and the arms (1) have their end portions (1A, 1B; 8B, 8C) inclined to their central portions (1C, 8A) to hence limit the overall size of the device when in its rest position.
9. A device as claimed in claim 1, characterised in that when in the rest position, the axis on which the structure (8) is hinged to the supports (10) on the truck body (11) and the hinging axis of the arms (1) lie in one and the same plane substantially parallel to that wall (11A) of the truck body with which the device is associated.
10. A device as claimed in claim 1, characterised in that the gripper arms (1) are connected to the lower end (7) of the central structure (8) by a cross-member (5; 115) to which they are rigidly connected, said cross-

member being able to rotate relative to said lower end.

11. A device as claimed in claim 10, characterised in that said cross-member (115) comprises two rods (117) 5 arranged to translate telescopically within the cross-member, the free ends of said rods being fixed to one end (1B) of said arms (1), the rods (117) and the cross-member (115) comprising guide elements (116) and counter-elements (128) which enable the 10 rods to translate axially but not to rotate.

15

20

25

30

35

40

45

50

55

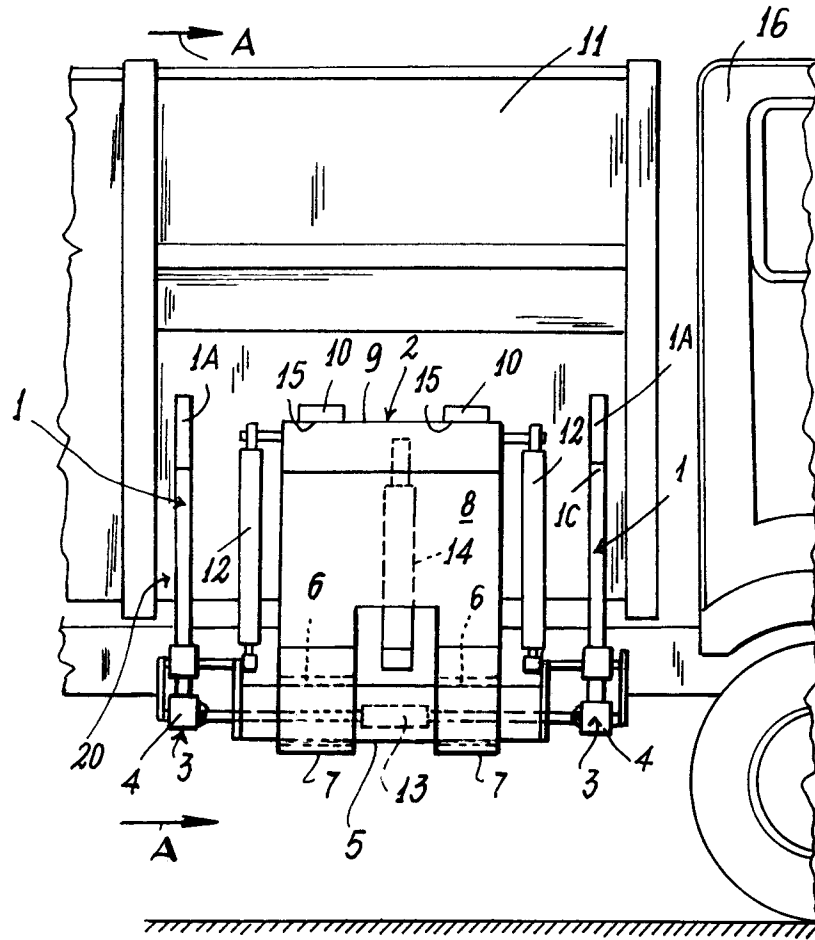


Fig. 1

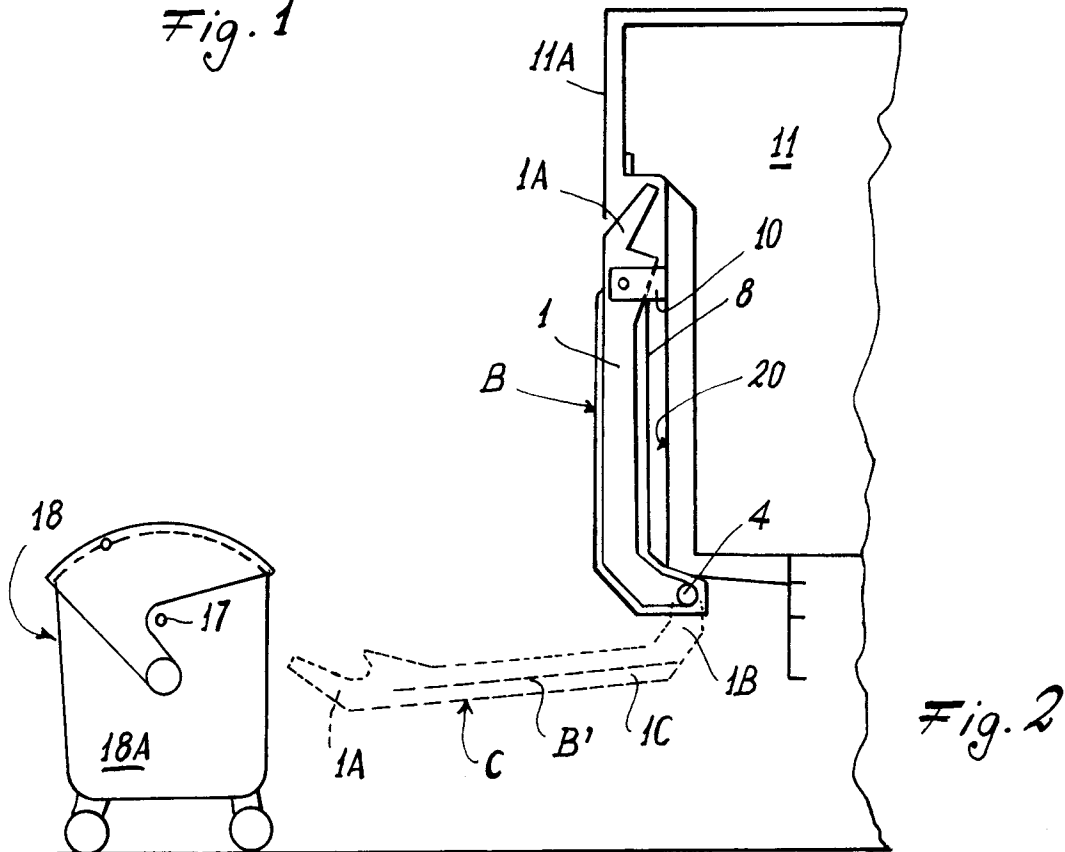


Fig. 2

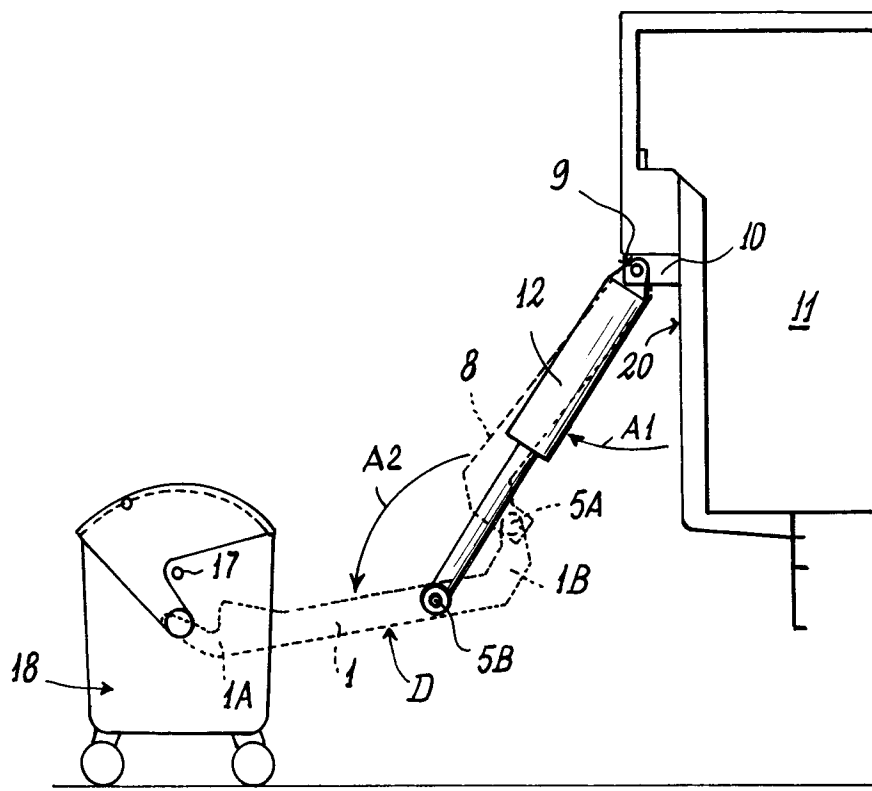


Fig. 3

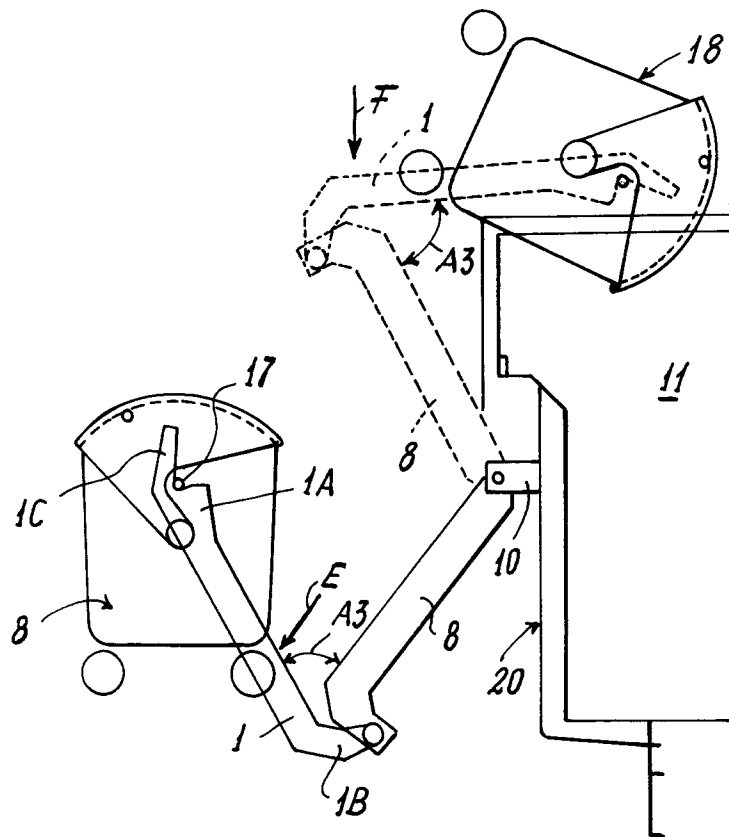
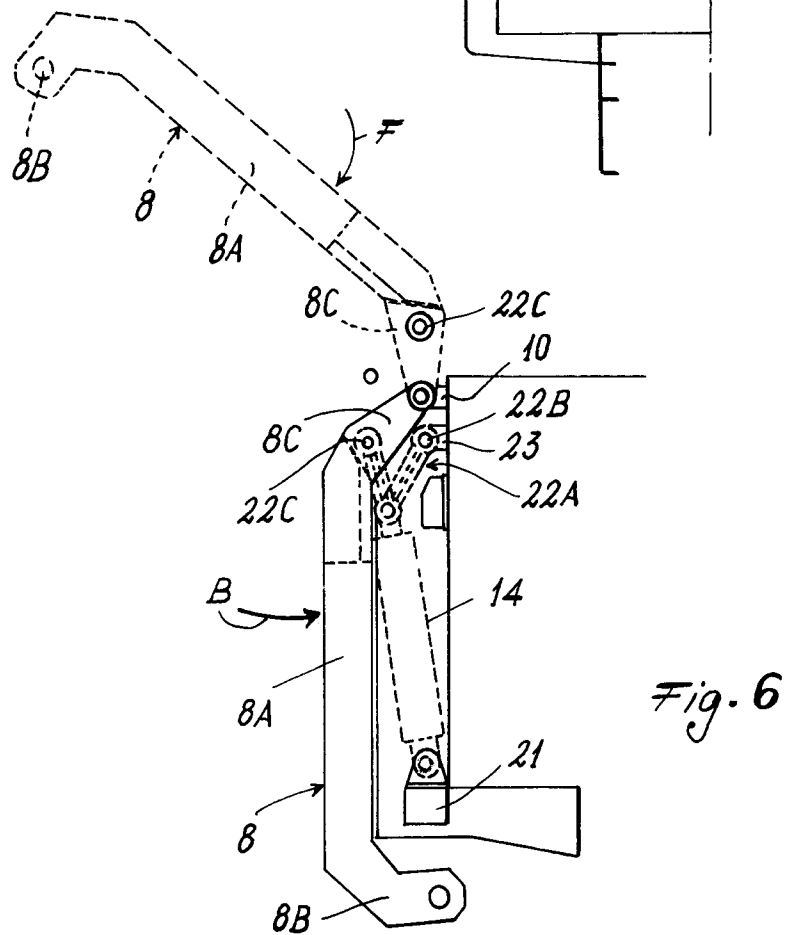
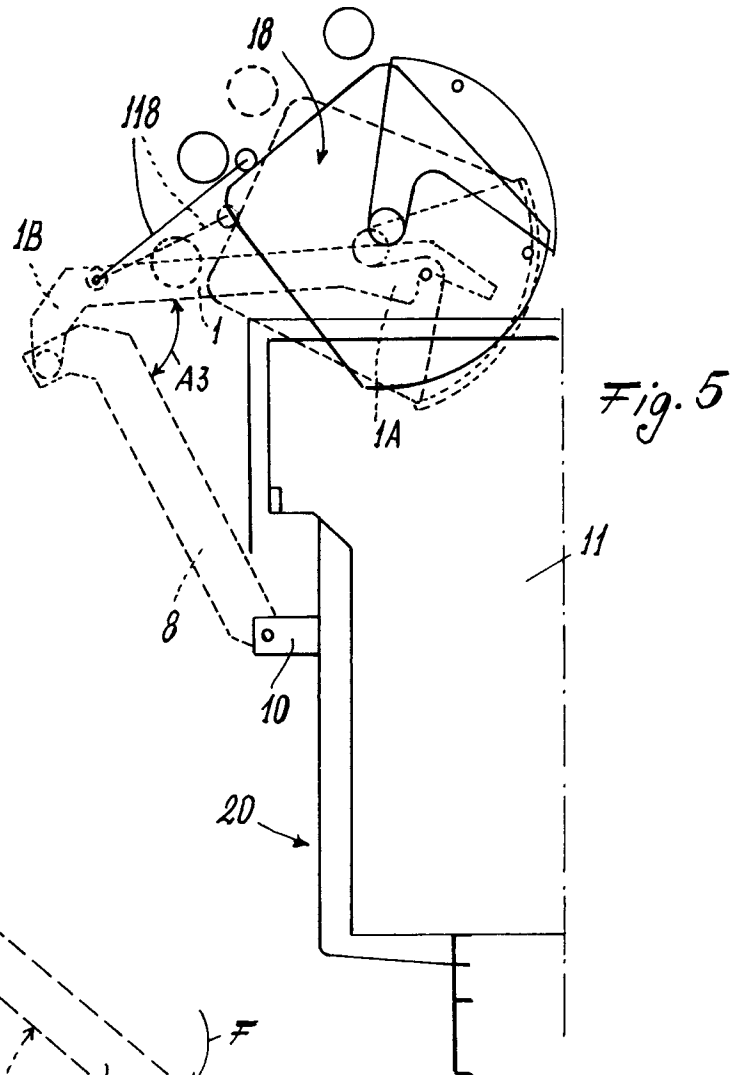
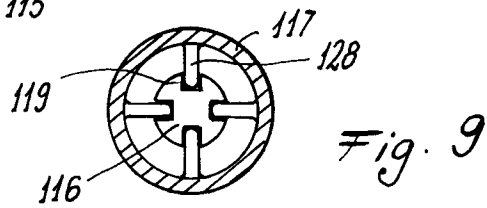
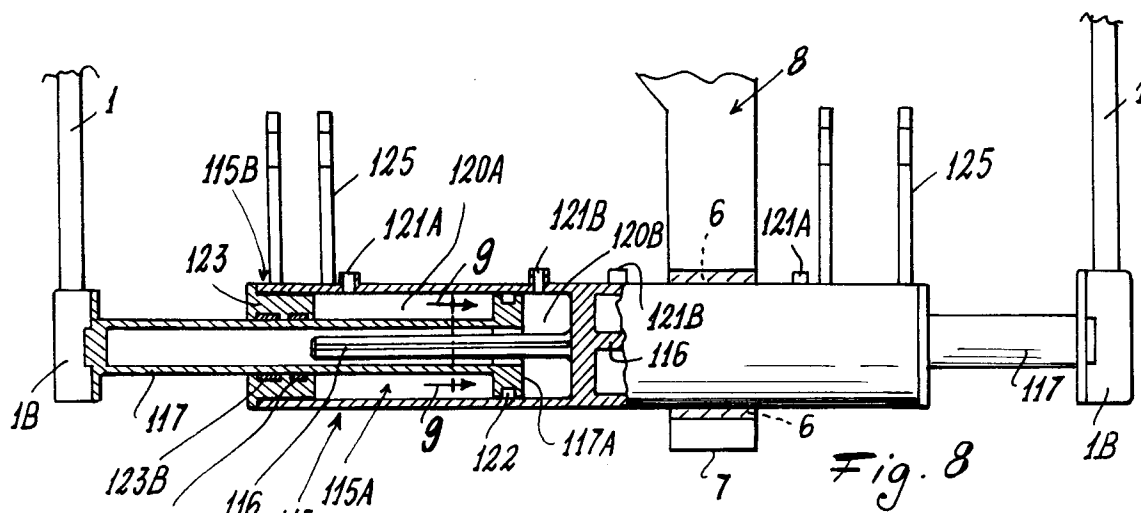
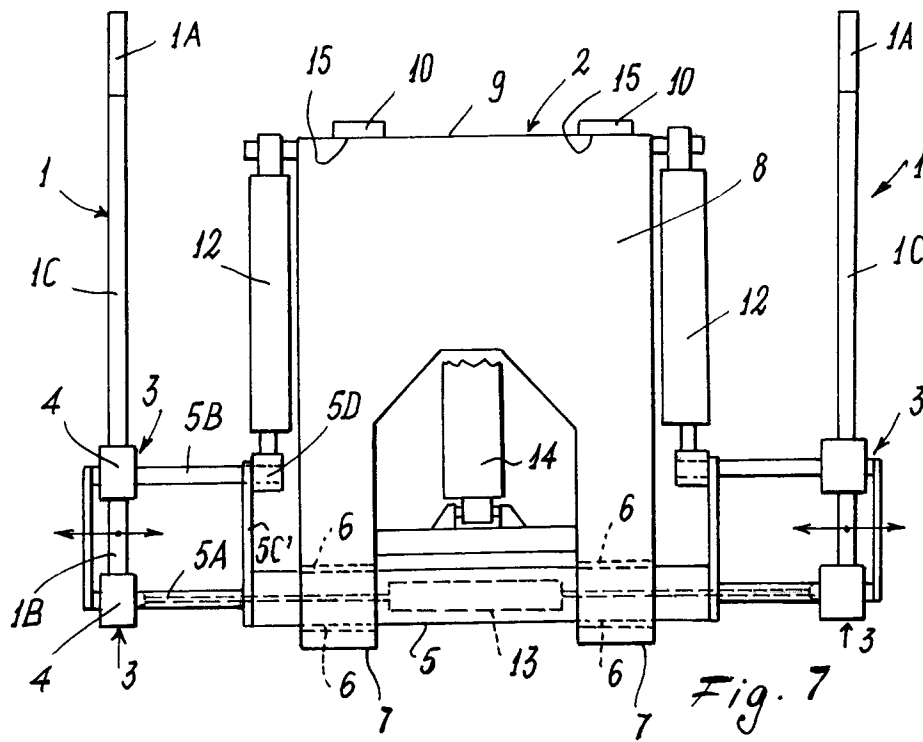


Fig. 4







European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 11 5609

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X Y	DE-U-88 11 472 (ALUSTAHL BEHALTERBAU GMBH) * page 8, line 8 - page 10, line 8 * * figures 1-4 *	1-3,10 4-7,9	B65F3/04
D,Y A	EP-A-0 312 900 (BERGOMI S.P.A.) * column 2, line 54 - column 3, line 23 * * column 3, line 36 - column 5, line 23 * * figures 1-7 *	4-7,9 8,10,11	
X	EP-A-0 577 566 (O.M.B. BRESCIA S.R.L.) * column 2, line 32 - line 37 * * figures 3-5 *	1,2	
A	EP-A-0 201 314 (DEMPSTER SYSTEMS INC.) * page 5, line 11 - page 7, line 6 * * figures 1-4 *	1,2	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6) B65F
Place of search THE HAGUE		Date of completion of the search 2 February 1996	Examiner Smolders, R
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)