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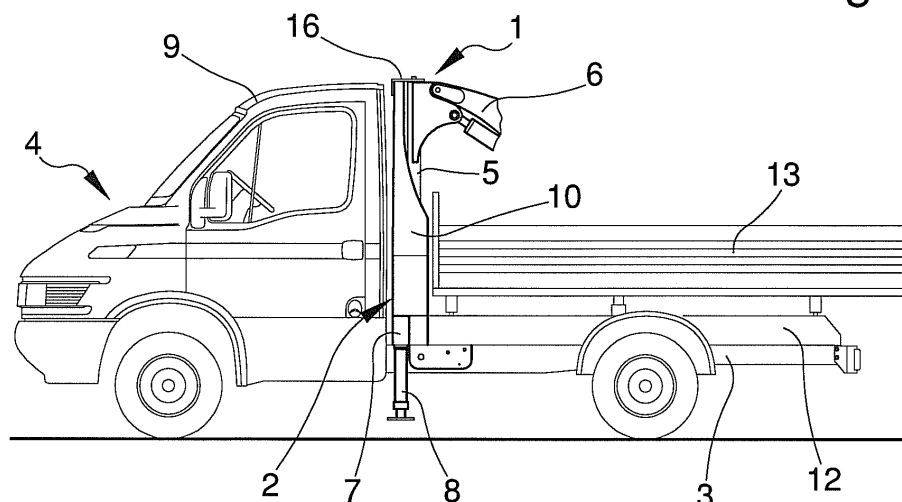
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(54) **Equipment for lifting loads on land vehicles, particularly trucks, tractors, agricultural prime movers, trailers and the like**

(57) The equipment for lifting loads on land vehicles, particularly trucks, tractors, agricultural prime movers, trailers and the like comprises at least a base frame (2) associable with the chassis (3) of a vehicle (4), at least a crane-carrying column (5), substantially vertical, associated with the base frame (2) in a way rotating around its own axis, at least a crane (6) for lifting loads associated with the column (5), at least a hinging system (16) for hinging the column (5) to the base frame (2) substantially arranged at the upper extremity of the column (5) and means for operating in rotation (15) the column (5) around its own axis which comprise at least a first actuator (17)

arranged substantially horizontal and associated with first transformation means (18) for transforming the movement of the first actuator (17) into the rotary movement of the column (5), and at least a second actuator (19) arranged substantially horizontal and associated with second transformation means (20) for transforming the movement of the second actuator (19) into the rotary movement of the column (5), the first actuator (17) and the second actuator (19) being arranged substantially parallel one above the other and at least one of such actuators (17, 19) being of the rack and pinion or worm-screw type.

**Fig. 1**



## Description

**[0001]** The present invention relates to an equipment for lifting loads on land vehicles, particularly trucks, tractors, agricultural prime movers, trailers and the like.

**[0002]** With particular reference to the truck sector but, similarly, also to that of other industrial, agricultural and forestry land vehicles, it is known that in the post-production phase these vehicles are equipped with a body for containing goods to be transported and with a lifting crane that allows loading and unloading the goods onto and from the body.

**[0003]** Most vehicle manufacturers, in practice, introduce onto the market various models of vehicles without either body or crane, which are only fitted subsequently according to the requests and the requirements of the buyer.

**[0004]** The fitting of the body and of the crane is done by specialised fitters who, before delivering the complete vehicle, carry out all the tests necessary to issue the registration document, indicate compliance with required directives and ensure conformity with applicable laws.

**[0005]** Vehicle cranes normally consist of a hydraulically-operated articulated arm which is fitted in the space between the vehicle control cab and the body.

**[0006]** The articulated arm is normally supported by a vertical column that can be operated rotating around its own axis to allow the crane to turn by 180° or more and to reach all the loading and unloading areas on the body or near it.

**[0007]** In a particular type of vehicle crane, the rotating column is fitted inside a base designed to be fixed to the chassis of the vehicle by means of tie-rods.

**[0008]** The upper extremity of the column protrudes overhanging from the base and supports the joints of the crane articulated arm driven by hydraulic jacks.

**[0009]** Such type of crane however has various drawbacks including the fact that the base must necessarily be of considerable strength and sturdiness because, in view of the fact that the crane column is fitted overhanging, in the load lifting phase all the forces are discharged on the base, which represents the only anchoring point of the column.

**[0010]** Such base, therefore, is of considerable weight and dimensions and this considerably reduces the capacity of the body loading area.

**[0011]** Because of the weight and the overall dimensions of the crane and its base, in fact, the working capacity of the vehicle is considerably reduced, making the vehicle not always suitable for satisfying the practical needs of the end user.

**[0012]** To overcome such drawback, other lifting equipment is known in which the top of the column that carries the crane is hinged to a fixed frame so as to more uniformly distribute the forces that discharge on the structure during load lifting.

**[0013]** This type of equipment also has a number of drawbacks however relating in particular to the difficulty

in rotating the column around its own axis.

**[0014]** For such purpose in fact a hydraulic cylinder is usually used arranged horizontally behind the vehicle cab and suitable for operating a rack that engages a pinion associated with the column.

**[0015]** To guarantee however the application of the force required to cause the column to rotate, the hydraulic cylinder is of considerable size and this makes the equipment as a whole very cumbersome with the concrete risk of inconveniently reducing the working capacity of the body.

**[0016]** As an alternative to the use of just one large hydraulic cylinder, the use is known of two hydraulic cylinders of smaller size arranged on diametrically opposite sides of the same pinion and which can be operated in opposite directions to cause the column to rotate.

**[0017]** This solution does not however overcome the drawback of the overall size of the equipment inasmuch as the arrangement of the two cylinders side by side on opposite sides of the pinion results in any case in considerable overall width dimensions which excessively restricts the size and capacity of the body.

**[0018]** The main aim of the present invention is to provide an equipment for lifting loads on land vehicles, particularly trucks, tractors, agricultural prime movers, trailers and the like, that can be fitted on a truck or on a similar industrial, agricultural and forestry land vehicle in a practical and functional way, and at the same time has a particularly low weight and overall dimensions such as to allow exploiting to the full the space on board the vehicle without considerably restricting the capacity of the body.

**[0019]** Another object of the present invention is to provide an equipment for lifting loads on land vehicles, particularly trucks, tractors, agricultural prime movers, trailers and the like, that allows to overcome the mentioned drawbacks of the background art in the ambit of a simple, rational, easy, effective to use and low cost solution.

**[0020]** The above objects are achieved by this equipment for lifting loads on land vehicles, particularly trucks, tractors, agricultural prime movers, trailers and the like, comprising at least a base frame associable with the chassis of a vehicle, at least a crane-carrying column, substantially vertical, associated with said base frame in a way rotating around its own axis, at least a crane for lifting loads associated with said column, means for operating in rotation said column around its own axis, and at least a hinging system for hinging said column to said base frame substantially arranged at the upper extremity of said column, characterized by the fact that said means for operating in rotation comprise at least a first actuator arranged substantially horizontal and associated with first transformation means for transforming the movement of said first actuator in the rotary movement of said column, and at least a second actuator arranged substantially horizontal and associated with second transformation means for transforming the movement of said second actuator in the rotary movement of said column, said first actuator and said second actuator being ar-

ranged substantially parallel one above the other and at least one of said actuators being of the rack and pinion or wormscrew type.

**[0021]** Other characteristics and advantages of the present invention will become more evident from the description of a preferred, but not sole, embodiment of an equipment for lifting loads on land vehicles, particularly trucks, tractors, agricultural prime movers, trailers and the like, illustrated purely as an example but not limited to the annexed drawings in which:

figure 1 is a side view of a truck with a particular embodiment of the equipment according to the invention;

figure 2 is a rear view of the truck of figure 1;

figure 3 is a plan view of a portion of the equipment of figure 1;

figure 4 is an axonometric, partially exploded view of the means for operating in rotation envisaged by the equipment of figure 1;

figure 5 is a section view of the means for operating in rotation envisaged by the equipment of figure 1;

figure 6 is a rear, schematic and partial view of a truck with a first alternative embodiment of the equipment according to the invention;

figure 7 is a rear perspective view of a truck with a second alternative embodiment of the equipment according to the invention;

figure 8 is a perspective view of the detail of the base frame of the equipment of figure 7.

**[0022]** With particular reference to such figures, globally indicated by 1 is an equipment for lifting loads on land vehicles, particularly trucks, tractors, agricultural prime movers, trailers and the like.

**[0023]** The equipment 1 comprises a base frame 2 suitable for being fitted and fixed to the chassis 3 of a land vehicle 4 and for supporting a substantially vertical crane-carrying column 5, supporting a crane 6 for lifting loads.

**[0024]** In the particular embodiments of the invention shown in the illustrations, the land vehicle 4 consists of a truck; alternative embodiments cannot however be ruled out in which the equipment 1 is fitted on a different type of land vehicle 4, such as, e.g., a tractor, an agricultural prime mover, a trailer or the like.

**[0025]** The base frame 2 has a base 7 with an elongated shape at the extremities of which are associated hydraulically operating stabiliser rods 8 of any type, shape and operation, both fixed and removable.

**[0026]** In the assembly configuration on the vehicle 4, the base 7 is meant to be arranged along a substantially horizontal and transversal direction behind the driver's cab 9 of the vehicle 4.

**[0027]** In this respect, it is underlined that in the present treatise, the terms transversal and longitudinal are used as reference to the longitudinal direction of the vehicle 4.

**[0028]** In the embodiments represented in the figures 2 and 6, from the base 7 extends upwards a supporting

casing 10, 11 having a first upright 10 and a second upright 11 substantially vertical, which are arranged on opposite sides of the column 5 and are connected together at the top.

**[0029]** Furthermore, the base 7 is welded to a mock frame 12 composed, e.g., of substantially longitudinal members that can be coupled with the chassis 3 of the vehicle 4 and which are suitable for supporting a body 13 for containing the loads to be transported.

**[0030]** The body 13 can be both of the fixed type or of the dump type.

**[0031]** Between the base 7 and the longitudinal members 12, and between one member 12 and the other, a plurality of reinforcement crosspieces 14 are provided that help strengthen the base frame 2 and distribute the bending moment of the loads lifted by the crane 6 both on the base 7 and on the members 12.

**[0032]** The column 5 is associated with the base frame 2 in a way rotating around its own axis.

**[0033]** For this purpose, the lower extremity of the column 5 is associated with means for operating in rotation 15, while at the upper extremity of the column 5 a hinging system 16 is provided for hinging the column 5 to the base frame 2, which is supported at the top of the uprights 10, 11.

**[0034]** In detail, the crane 6, which is partially shown in the figures 1 and 2 and completely in figure 7, is welded to the column 5 substantially close to its upper extremity and is placed below the hinging system 16.

**[0035]** This way, the column 5 does not protrude overhanging as in some types of traditional cranes and the bending moment of the loads lifted by the crane 6 is distributed both on the base 7 and on the supporting casing 10, 11.

**[0036]** In the alternative embodiment of the base frame 2, shown in the figures 7 and 8, from the base 7 extends upwards a supporting casing 10, 11, 22 having a connection upright 22, with a substantially upturned U-shape, from which the first and the second uprights 10 and 11 branch out and extend as far as the base 7.

**[0037]** In this particular embodiment, the supporting casing 10, 11, 22 has a supporting table 23, placed in between the connection upright 22 and the uprights 10 and 11, suitable for supporting the means for operating in rotation 15. As is easily visible in the figures 7 and 8, the supporting table 23 is arranged higher up than the base 7, thus defining a recess 24 underneath it suitable for accommodating the free portion of the crane 6 in its idle position.

**[0038]** At the upper extremity of the supporting casing 10, 11, 22 the hinging system 16 is arranged.

**[0039]** More specifically, as shown in detail in the figure 8 and similarly to the embodiments of figure 1 and figure 6, the hinging system 16 comprises a housing seat 25, defined at the upper extremity of the connection upright 22, suitable for supporting in rotation the upper extremity of the column 5.

**[0040]** Advantageously, the hinging of the top of the

column 5 to the supporting casing of the base frame 2 allows a more uniform distribution of the forces that discharge onto the structure during load lifting.

[0041] Usefully, the means for operating in rotation 15 comprise a first actuator 17 which is arranged substantially horizontal and transversal to the longitudinal direction of the vehicle 4 and is associated with first transformation means 18 for transforming the movement of the first actuator 17 into the rotary movement of the column 5.

[0042] The means for operating in rotation 15 further comprise a second actuator 19 which is arranged substantially horizontal and transversal to the longitudinal direction of the vehicle 4 and is associated with second transformation means 20 for transforming the movement of the second actuator 19 into the rotary movement of the column 5.

[0043] The first actuator 17 and the second actuator 19 are arranged substantially parallel one above the other and at least one of them is of the rack and pinion or wormscrew type.

[0044] In the particular embodiments of the invention shown in the illustrations, the actuators 17, 19 are of the double-acting hydraulic cylinder type and the transformation means 18, 20 are suitable for transforming the rectilinear reciprocating movement of the actuators 17, 19 into the rotary movement of the column 5.

[0045] In the case of the actuators 17, 19 being of the wormscrew type, these also comprise respective operating motors which are preferably of the hydraulic type or, alternatively, of the electrical type, though the use of different types of operating motors known to the technician in the field cannot be ruled out.

[0046] Neither can alternative embodiments of the present invention be ruled out in which three or more actuators are provided, always arranged one on top of the other.

[0047] In the embodiments shown in the illustrations, both the linear actuators 17, 19 are of the rack and pinion type and comprise an outer liner 17a, 19a inside which is sliding a pair of pistons 17b, 19b associated at the extremities of a rack element 17c, 19c.

[0048] The rack elements 17c, 19c are engaged with two corresponding pinions for the start of rotation of the column 5 which, in practice, make up the transformation means 18, 20.

[0049] In detail, the pinions 18, 20 are obtained on a shaft 21 arranged substantially vertical and coaxially associable with the column 5, e.g. by welding.

[0050] Alternative embodiments of the present invention cannot however be ruled out in which the shaft 21 and the column 5 are made monolithic.

[0051] The two liners 17a, 19a of the linear actuators 17, 19 are obtained in a single body to form a monobloc suitable for containing the pistons 17b, 19b, the rack elements 17c, 19c and the shaft 21.

[0052] In the embodiments shown in the figures from 1 to 5 and in figure 8, the monobloc of the two liners 17a, 19a is substantially housed to measure between the up-

rights 10, 11 and 10, 11, 22 of the base frame 2 respectively.

[0053] Alternative embodiments are however possible such as that shown schematically in figure 6, in which the liners 17a, 19a are integrated with the uprights 10, 11 and protrude at the side from these.

[0054] It has in fact been ascertained how the described invention achieves the proposed objects.

[0055] In this respect, the fact is underlined that the particular solution of providing two or more linear actuators arranged one on top of the other for operating in rotation the crane-carrying column allows considerably reducing the overall dimensions of the equipment arranged between the vehicle cab and the rear body, making it possible to fully exploit the space on board the vehicle and the load capacity of the body.

## Claims

1. Equipment (1) for lifting loads on land vehicles, particularly trucks, tractors, agricultural prime movers, trailers and the like, comprising at least a base frame (2) associable with the chassis (3) of a vehicle (4), at least a crane-carrying column (5), substantially vertical, associated with said base frame (2) in a way rotating around its own axis, at least a crane (6) for lifting loads associated with said column (5), means for operating in rotation (15) said column (5) around its own axis, and at least a hinging system (16) for hinging said column (5) to said base frame (2) substantially arranged at the upper extremity of said column (5), **characterized by** the fact that said means for operating in rotation (15) comprise at least a first actuator (17) arranged substantially horizontal and associated with first transformation means (18) for transforming the movement of said first actuator (17) into the rotary movement of said column (5), and at least a second actuator (19) arranged substantially horizontal and associated with second transformation means (20) for transforming the movement of said second actuator (19) into the rotary movement of said column (5), said first actuator (17) and said second actuator (19) being arranged substantially parallel one above the other and at least one of said actuators (17, 19) being of the rack and pinion or wormscrew type.
2. Equipment (1) according to claim 1, **characterized by** the fact that at least one of said actuators (17, 19) is of the linear type.
3. Equipment (1) according to claim 2, **characterized by** the fact that at least one of said linear actuators (17, 19) is of the double-acting type.
4. Equipment (1) according to one or more of the previous claims, **characterized by** the fact that at least

one of said linear actuators (17, 19) comprises at least an outer liner (17a, 19a) inside which runs a piston (17b, 19b) associated with a rack element (17c, 19c) engageable with a pinion (18, 20) for starting the rotation of said column (5).

5. Equipment (1) according to one or more of the previous claims, **characterized by** the fact that the liners (17a, 19a) of said linear actuators (17, 19) are obtained in a single body piece. 5 10
6. Equipment (1) according to one or more of the previous claims, **characterized by** the fact that said means for operating in rotation (15) are arranged substantially by the lower extremity of said column (5). 15
7. Equipment (1) according to one or more of the previous claims, **characterized by** the fact that said pinion (18, 20) is obtained on a shaft associable coaxially with said column (5). 20
8. Equipment (1) according to one or more of the previous claims, **characterized by** the fact that said lifting crane (6) is associated with said column (5) substantially close to said upper extremity and below said hinging system (16). 25
9. Equipment (1) according to one or more of the previous claims, **characterized by** the fact that said base frame (2) comprises at least a base (7) for fixing to said chassis (3) of the vehicle (4) and at least a supporting casing (10, 11) for supporting said hinging system (16) which is associated with said base (7). 30 35
10. Equipment (1) according to one or more of the previous claims, **characterized by** the fact that said supporting casing (10, 11) comprises at least a first upright (10) and a second upright (11) substantially vertical, arranged on opposite sides of said column (5) and connected together by said hinging system (16). 40
11. Equipment (1) according to one or more of the previous claims, **characterized by** the fact that said base (7) is substantially transversal. 45
12. Equipment (1) according to one or more of the previous claims, **characterized by** the fact that said base (7) is associated with stabiliser rods (8). 50
13. Equipment (1) according to one or more of the previous claims, **characterized by** the fact that said base (7) is associated with at least a mock frame (12) substantially longitudinal which can be coupled with said chassis (3) of the vehicle (4) and which is suitable for supporting at least a body (13) for con-

taining loads.

14. Equipment (1) according to one or more of the previous claims, **characterized by** the fact that it comprises reinforcement crosspieces (14) for reinforcing at least one between said mock frame (12) and said base (7).

Fig. 1

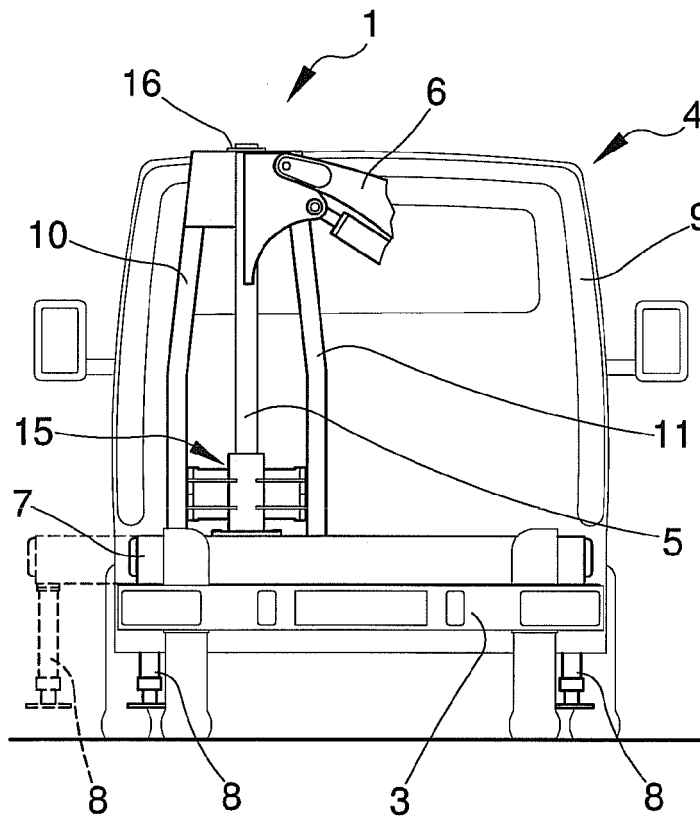
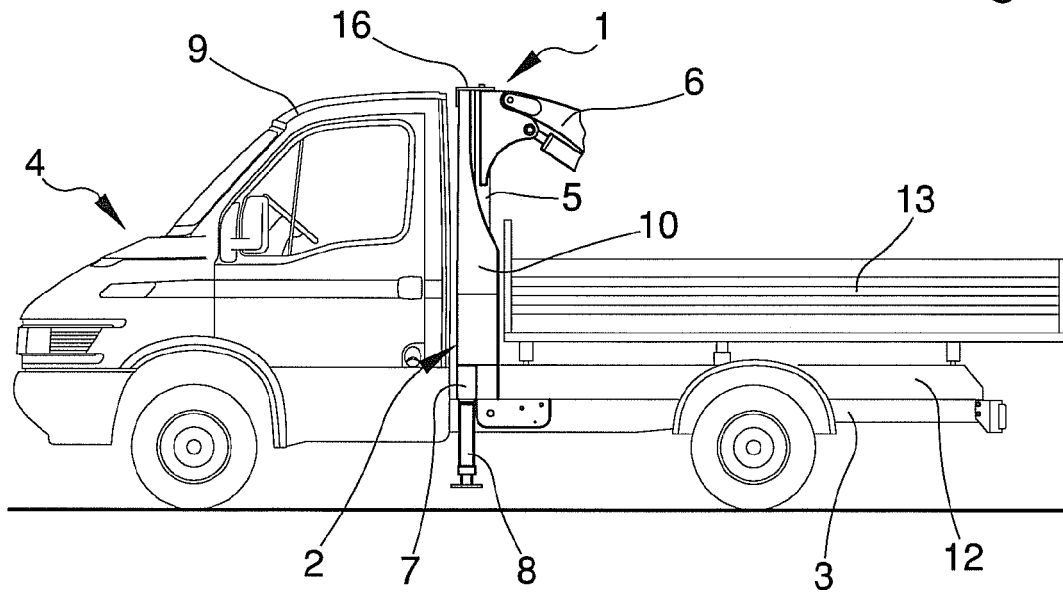


Fig. 2

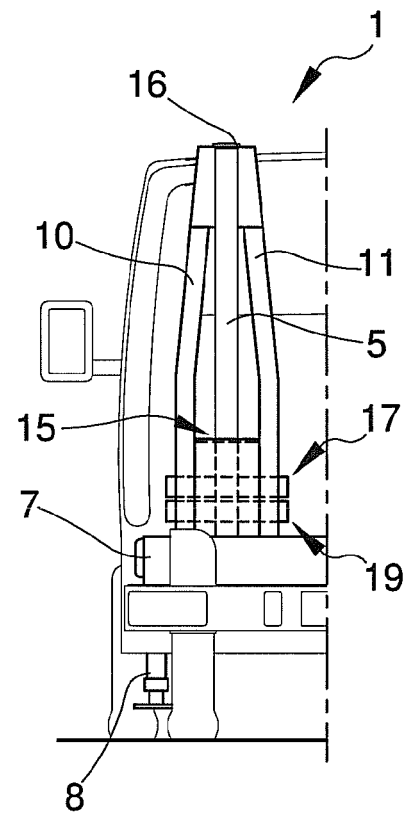


Fig. 6

Fig. 3

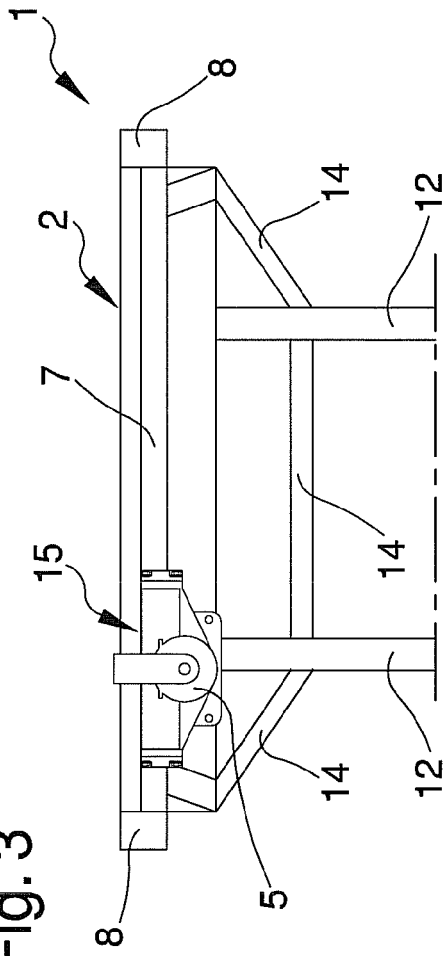


Fig. 4

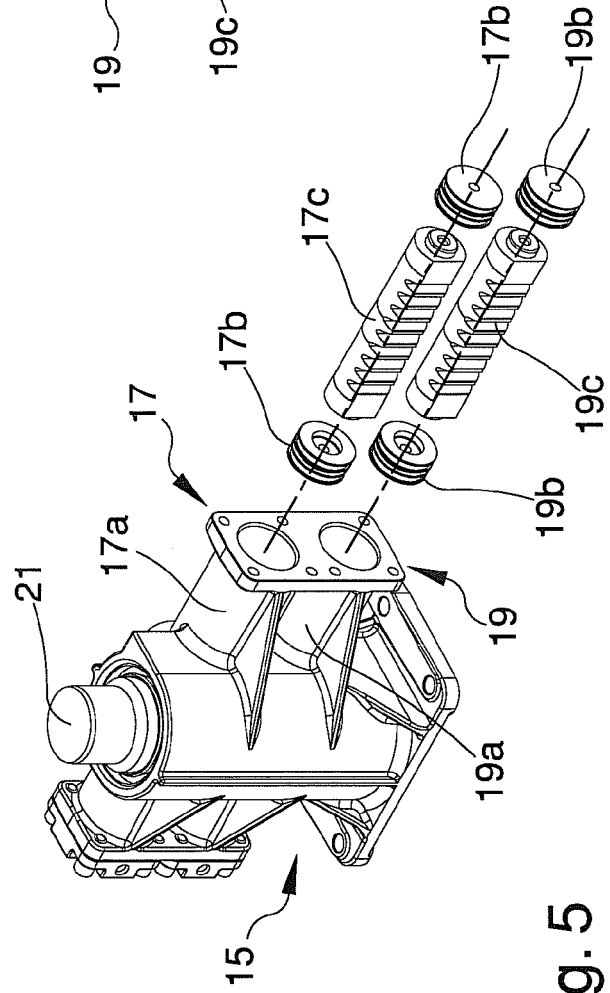
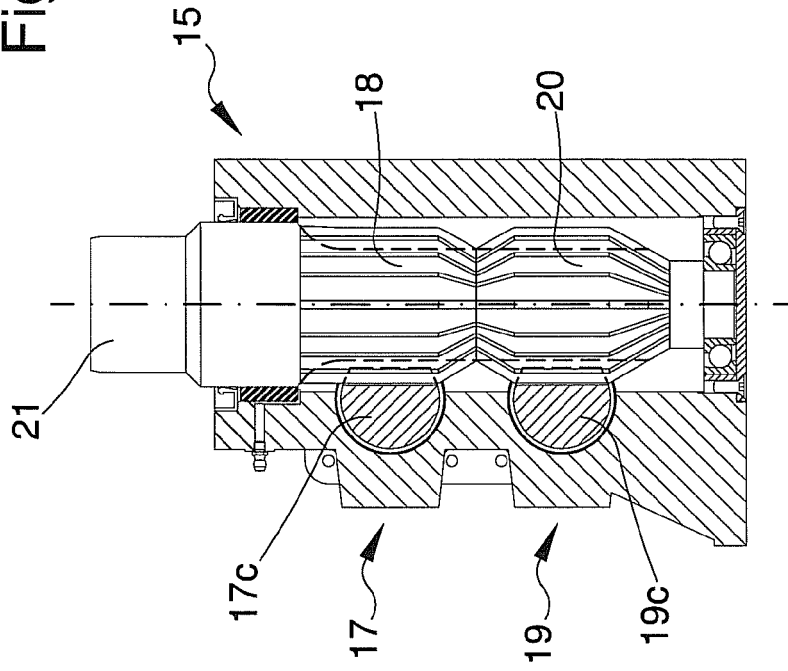


Fig. 5

Fig. 7

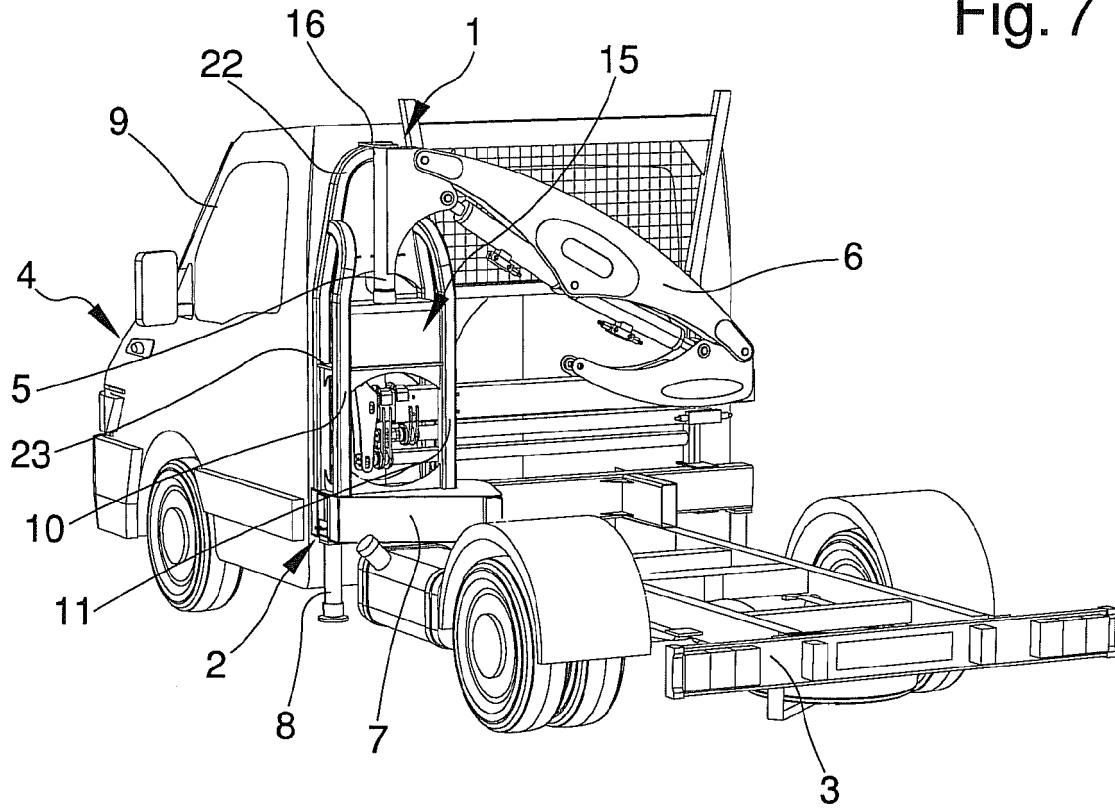
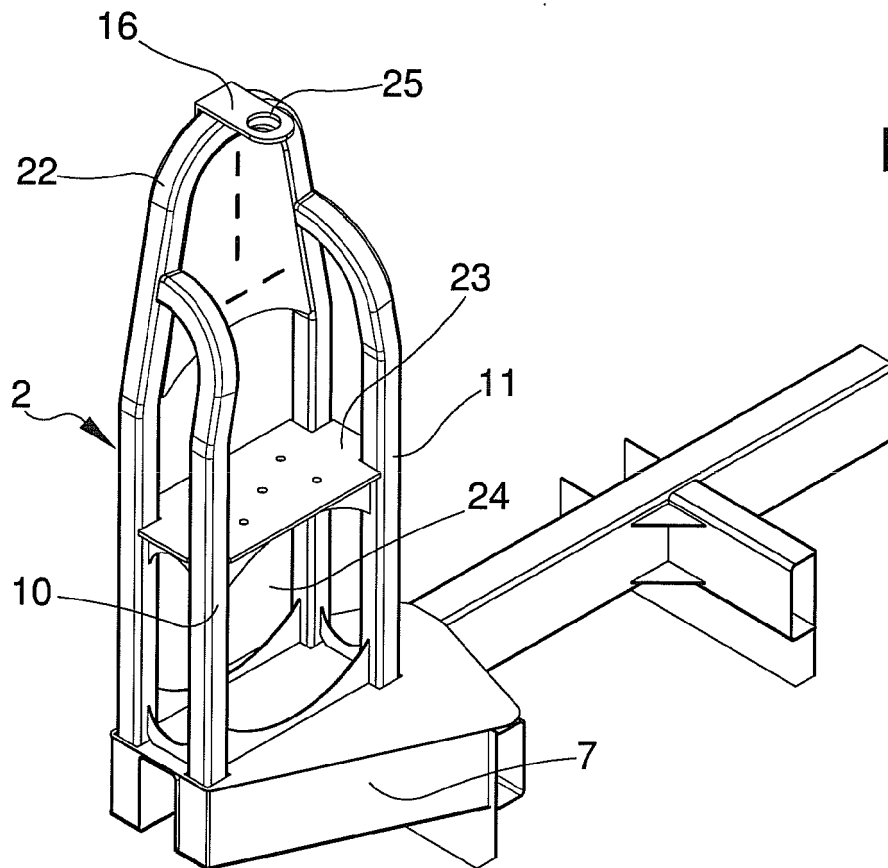


Fig. 8





## EUROPEAN SEARCH REPORT

Application Number  
EP 09 17 0587

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 3 533 515 A (MILNER EDWIN EARL JR) 13 October 1970 (1970-10-13) * column 3 - column 9 * * figures 1,4,5,7,10,13 * -----	1-15	INV. B66C23/16
Y	US 2 796 998 A (OLOV SUNDIN ERIC) 25 June 1957 (1957-06-25) * abstract * * figures 1-6 * -----	1-15	
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 26 January 2010	Examiner Rupcic, Zoran
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			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 17 0587

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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26-01-2010

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