

(19)



(11)

EP 2 107 034 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

07.10.2009 Bulletin 2009/41

(51) Int Cl.:

B66C 23/78 (2006.01)

B66C 23/80 (2006.01)

(21) Application number: **09004797.8**

(22) Date of filing: **01.04.2009**

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL
PT RO SE SI SK TR**

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(30) Priority: **04.04.2008 IT MO20080099**

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(54) **Stabilizing apparatus for vehicles**

(57) The stabilizer apparatus for vehicles (1) comprises a leg for resting on the ground which has a first support end turned towards the ground (T) and an opposite second coupling end supported at one side of a frame

(2) of a vehicle (1), said leg being divided in at least a first segment (11) and a second segment (12) which are mutually articulated at an articulation point (14) positioned between said first end and said second end.

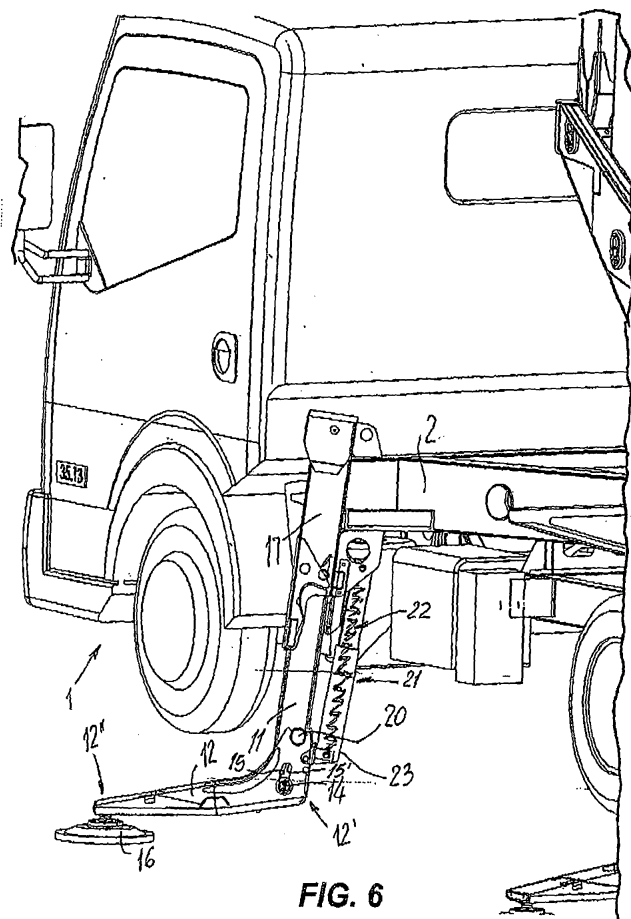


FIG. 6

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Description

TECHNICAL FIELD OF THE INVENTION

[0001] This invention relates to a stabilizer apparatus for vehicles, in particular for vehicles with liftable platforms for carrying out overhead works.

BACKGROUND ART

[0002] In vehicles with cranes for lifting goods or liftable platforms for carrying out overhead works, as is known, at least four stabilizer apparatus are provided which are mounted at the four corners of the frame of the vehicle which supports a crane or a platform on which a lifting apparatus is mounted.

[0003] As is known, both the crane and the lifting apparatus are usually composed of a series of articulated jibs which may be extended or retracted by means of hydraulic actuators, and on the free end of the last of which a fastening member is mounted, in the case of a crane, or a platform holding one or more operators to carry out the work, in the case of lifting apparatus.

[0004] The known stabilizer apparatus each comprises an extendible telescopic leg, which is held in a retracted and lifted position off the ground when the vehicle is travelling along the roads, and is instead extended onto the ground when the vehicle is stopped and positioned in a working area.

[0005] In this way the end of the leg, which is normally fitted with a foot resting on the ground, comes into contact with the ground and distributes its share of the weight of the vehicle.

[0006] The four feet are mounted on the vehicle at an angle, in such a way that, when they are extended towards the ground, the lower ends thereof fitted with feet move away from the centre of gravity of the vehicle by a pre-set distance to create a point of support away from the vehicle by a height which generates sufficient torque arm to contrast any tipping force of the vehicle which is caused by the raising of the centre of gravity of the vehicle when, e.g., the jibs which support a working platform are raised from their idle position to move an operator to the required working height.

[0007] For this reason, as said above, the legs which are mounted on the frame of the vehicles at an angle, stay in this position also when they are not in use, that is, when in order to allow the vehicle to move they are raised completely off the ground and retracted.

[0008] The known stabilizer apparatus have some drawbacks.

[0009] A first drawback is caused by the angled mounting arrangement of the known stabilizer apparatus, when the support feet they are fitted with touch the ground, and the hydraulic or pneumatic actuators which control them push on them to lift the vehicle off the ground, reactive forces are caused on the support feet which have transversal components, that is substantially parallel to the

surface of the ground and which cause the feet to slide away from the vehicle.

[0010] This forces the users to use resting plates which must be inserted between the feet and the ground and which are arranged in order to prevent or at least limit this slipping which, if excessive, may cause problems of stability for the vehicle during work.

[0011] A further drawback is caused by the length of the legs which are required to reach a resting position on the ground even when it is at an angle, the known stabilizer apparatus, when in the raised position, take up considerable space on the vehicles also on the upper part of the vehicle frame, as they extend upwards beyond the frame.

[0012] These extensions may cause a hazard by interfering with the lifting devices, during movements thereof which also require rotation around an axis which is perpendicular to the frame of the vehicle.

[0013] Another drawback is that their angled mounting position on the frame of the vehicles increases the plan dimensions thereof, and for this reason requires specific type-approvals in order to be able to transit on roads.

[0014] A further drawback is that when the legs of the known stabilizer apparatus are in the resting configuration on the ground, they constitute an obstacle since they extend off the ground and therefore persons, bicycles, motorcycles and other vehicles may knock against the legs thereof, damaging them or compromising the stability of the lifting apparatus and of the vehicle to which they are fitted, during the working phases.

[0015] This situation constitutes a hazard for both persons who may be injured if they accidentally knock against the legs, and for the operators inside the working platforms who are carrying out work at a height.

OBJECTS OF THE INVENTION

[0016] One object of this invention is to improve the background art.

[0017] A further object of the invention is to provide a stabilizer apparatus for vehicles which prevents the support foot from slipping when it is in contact with the ground.

[0018] A further object of the invention is to provide a stabilizer apparatus for vehicles which is very compact, especially when it is in the idle position, in order to reduce the overall sizes without occupying any space in the upper area of the frame.

[0019] A further object of the invention is to provide a lifting apparatus for vehicles which avoids the risk of accidental knocking.

[0020] A further object of the invention is to provide a stabilizer apparatus for vehicles which, if necessary, increases the distance of the support points on the ground compared to the centre of gravity of the vehicle, without proportionally increasing its size.

[0021] According to one aspect of the invention, a stabilizer apparatus for vehicles is provided comprising a support leg on the ground which has a first support end facing the ground and an opposite second coupling end supported on one side of the frame of a vehicle, **characterised in that** said leg is divided into at least a first segment and a second segment which are mutually articulated at an articulation point positioned between said first end and said second end.

[0022] The stabilizer apparatus for vehicles therefore:

prevents the slipping of the support foot on the ground;
drastically reduces the overall size when it is in an idle position in order to allow the vehicle to transit on the roads;
prevents accidents caused by the angled position of the legs when they are in a resting configuration on the ground;
fully adapts to the conformation of the ground, even when this is not completely level;
may be mounted on any kind of vehicle without any substantial modification to the plan dimensions.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] Other characteristics and advantages of the present invention will become more evident from the detailed description of a form of preferred, but not sole, embodiment, of a stabilizer apparatus for vehicles, illustrated purely as an example but not limited to the annexed drawings in which:

Figure 1 is a side view of a vehicle with a platform for carrying out overhead works, on which stabilizer apparatus for vehicles are mounted according to the invention;
Figure 2 is a front view of the vehicle of Figure 1;
Figure 3 is a detailed view and on an enlarged scale of a stabilizer apparatus according to the invention, in an idle configuration;
Figure 4 is a detailed side view and on an enlarged scale of the stabilizer apparatus of Figure 3, in an intermediate configuration for a resting preparation on the ground;
Figure 5 is a detailed side view and on an enlarged scale of the stabilizer apparatus of Figures 3 and 4 in a resting position on the ground;
Figure 6 is a detailed side view and on an enlarged scale of the stabilizer apparatus of Figures 3, 4, 5 in a resting configuration on the ground;
Figures 7a and 7b are schematic views of a stabilizer apparatus for vehicles of the known type and of a stabilizer apparatus for vehicles respectively according to the invention.

EMBODIMENTS OF THE INVENTION

[0024] With particular reference to the Figures, 1 is used to indicate a vehicle, in this specific case a truck, which comprises a longitudinal frame 2 which supports a driving cab 3 and a support bed 4.

[0025] On this support bed 4 is installed a lifting device indicated generally as 5, which comprises three articulated jibs joined together and indicated respectively as 6, 7, 8.

[0026] At the free end of the jib 8 a working platform 9 is mounted, on which one or more operators may stand when carrying out overhead works.

[0027] On the frame 2 four stabilizer apparatus 10 are mounted, arranged to maintain the stability of the vehicle on a resting surface, normally the ground "T", when the jibs 6, 7, 8, and the platform 9 are lifted.

[0028] The four stabilizer apparatus 10 are substantially positioned on the four corners of the support bed 4.

[0029] Each stabilizer apparatus comprises a first segment 11 and a second segment 12 which is hinged to the first segment 11 at a hinge articulation point, indicated generally as 13.

[0030] The articulation point is made by the coupling of an articulation pin 14, which is transversally supported on the lower end of the first segment 11, and which is engaged sliding along a slot 15, which defines a first end 15' and an opposite second end 15'', and which is obtained near an end 12' of the second segment 12, while, the opposite end 12'' of the latter, i.e. the end intended to rest on the ground "T", has a support foot 16.

[0031] The first segment 11 is supported telescopically in a sleeve 17 which is made integral to the frame 2 and which is therefore fixed against the latter.

[0032] Between the sleeve 17 and the first segment 11 is interposed a linear, fluid-dynamic actuator 18, shown in dotted lines in Figure 4, which has the function of pushing the first segment 11 out of the sleeve 17 or drawing it back inside.

[0033] The fluid-dynamic actuator 18 has an end which is hinged to the frame 2 while the opposite end of the leg is hinged to the articulation pin 14, making it slide in the slot 15 as is better described below.

[0034] As can be seen in Figures 3 and 4, the second segment 12 has a cavity 19, with a semi-circumferential profile, which is obtained in an area of the end 12' which, when the second segment 12 is in the resting position on the ground "T", as shown in Figure 4, is aligned with the first segment 11.

[0035] The latter has a further engaging pin 20 which, in the illustrated configuration, is intended to engage into the cavity 19, pushed by the first segment 11 sliding towards the ground "T".

[0036] This condition of engagement can be seen in Figure 5, in which it can also be seen that the articulation pin 14 is in a position in the slot 15 opposite to the one which can be seen in Figure 4.

[0037] Therefore, the engaging pin 20, when inserted

in the cavity 19, prevents the second segment 12 from rotating.

[0038] With reference to Figures 3, 4, 5 it can also be seen that between the frame 2 and the second segment 12, and more precisely, between the frame 2 and the end 12' of the latter, an elastic connection element 21 is interposed which may be loaded in traction and which, when loaded, is intended to cause the rotation of the second segment 12 between an idle configuration, illustrated in Figure 3, and a configuration ready for resting on the ground "T", as illustrated in Figure 4.

[0039] The connection element 21 comprises a helical spring 22, shown in dotted lines in Figure 4, which is contained in a box-shaped protective casing 23, with a cylindrical shape.

[0040] The second segment 12, when it is arranged in the configuration resting on the ground, may be covered, as shown in Figure 4, with an overlapping element 25, shown in dotted lines, which may be walked over or driven over.

[0041] In practice, this overlapping element 25 comprises a cover 26 which may be rested on the ground "T" and may be fixed to the ground using known means, such as e.g. nails or pegs.

[0042] This cover 26 has an upper surface which may be walked or driven over which has a substantially rounded profile to allow pedestrians or vehicle wheels to pass over it without the risk of tripping.

[0043] In this way, even if a bicycle or motor vehicle or pedestrian passes very close to the vehicle 1 when work is being done, all risk of knocking against the second segment 12 resting on the ground "T" is avoided.

[0044] The stabilizer for vehicles works as follows:

When it is in the idle configuration (see Figure 3) to allow the vehicle 1 on which it is mounted to transit on the roads, the second segment 12 rotates upwards and is arranged alongside the first segment 11, to maintain the transversal dimensions within the width of the vehicle 1.

In this configuration, as can be seen in Figure 3, the articulation pin 14 rests on the first end 15' of the slot 15 and is held in this position by the linear actuator 18 which is in the retracted configuration.

The spring 22 is substantially idle and offers no resistance to the rotated configuration of the second segment 12.

The engaging pin 20 is raised off the cavity 19, as this is also integral to the leg of the linear actuator 18 which is in the retracted configuration.

When the vehicle 1 is positioned in an area where overhead works must be carried out, the four stabilizer apparatus 10 which are fitted on the vehicle 1 are activated to rest on the ground "T" and stabilise the position of the vehicle 1: This configuration can be seen in Figure 4.

In each stabilizer apparatus 10 the linear actuator 18 is activated which stretches out, making its own

leg 18' exit towards the ground "T", on the free end of which the articulation pin 14 is fastened.

The second segment 12 is pushed towards the ground "T" thanks to the action of the linear actuator 18, while the articulation pin 14 is still resting against the first end 15' of the slot 15.

At the same time, the downwards movement of the first segment 11 and of the second segment 12 progressively loads in traction the helical spring 22 contained in the connection element 21 and when the traction force reaches a pre-set value, the spring 22 causes the second segment 12 to rotate towards the ground "T", placing the support foot 16 in contact with the latter.

The linear actuator 18 continues to stretch out and, as the second segment 12 has come into contact with the ground, the articulation pin 14 runs along the slot 15, and rests on the second end 15" thereof. At the same time, also the engaging pin 20 is inserted in the cavity 19 which, due to the rotation of the second segment 12, is arranged facing towards it.

When both the articulation pin 14 and the engaging pin 20 have been pushed into their respective resting positions, the second segment 12 is locked into the resting position on the ground "T" without being able to rotate.

If the linear actuator of each stabilizer apparatus 10 continues to stretch out, the vehicle 1 is lifted off the ground and rests exclusively on the four support feet 16 which are spaced apart from the vehicle by a sufficient lever arm to create a resisting moment to stop the vehicle 1 from tipping over when the jibs 6, 7, 8 of the lifting device 5 are raised upwards to move one or more operators upwards, also shifting the overall centre of gravity of the vehicle 1 upwards.

In the resting configuration to prevent that the second segment 12 from constituting a dangerous obstacle for pedestrians and vehicles transiting around the vehicle 1, it is possible to cover the segment 12 with the covering element 25 which, with rounded profiles and being trafficable, is easily overcome without the risk of knocking the second segment 12.

It is important to note also that the rotation of the second segment 12 and the following positioning on the ground "T" of the support foot 16 generates a reactive force which has a substantially perpendicular direction to the support feet, with no noteworthy components of transversal force.

This condition prevents any lateral slipping of the support foot 16 when the linear actuator 18 is fully and substantially stretched out and pushes on the latter to lift the vehicle 1 from the ground "T".

When the stabilizer apparatus 10 is returned to the idle configuration illustrated in Figure 3, the linear actuator 18 is activated and withdraws the leg 18' into itself.

As the leg 18' slides upwards it drags with it both the articulation pin 14 and the engaging pin 20: the first

slides along the slot 15 moving from the second end 15" to the first end 15' and the second is extracted from the cavity 19.

In this way, the second segment 12 is once again free to rotate.

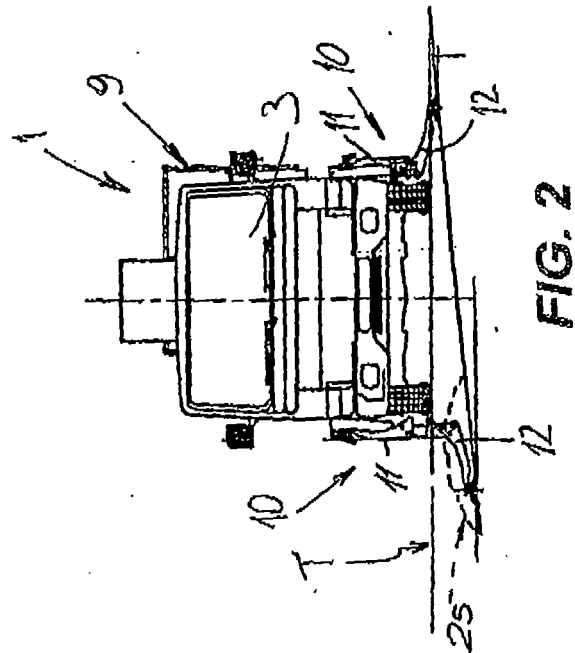
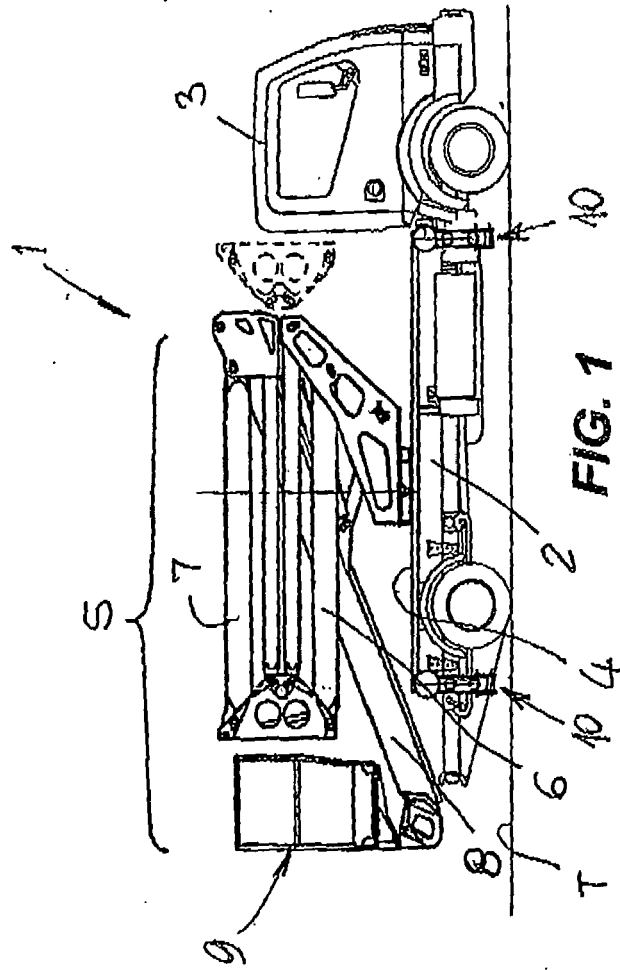
The linear actuator 18 continues to withdraw its own leg 18' and the articulation pin 14 ends up resting on the first end 15' of the slot 15 and exerts a traction force on the second segment 12 which progressively rotates around this articulation pin 14, returning to the position which is parallel to the first segment 11. The first segment 11 slides inside the sleeve 17 until the stabilizer apparatus 10 is fully raised.

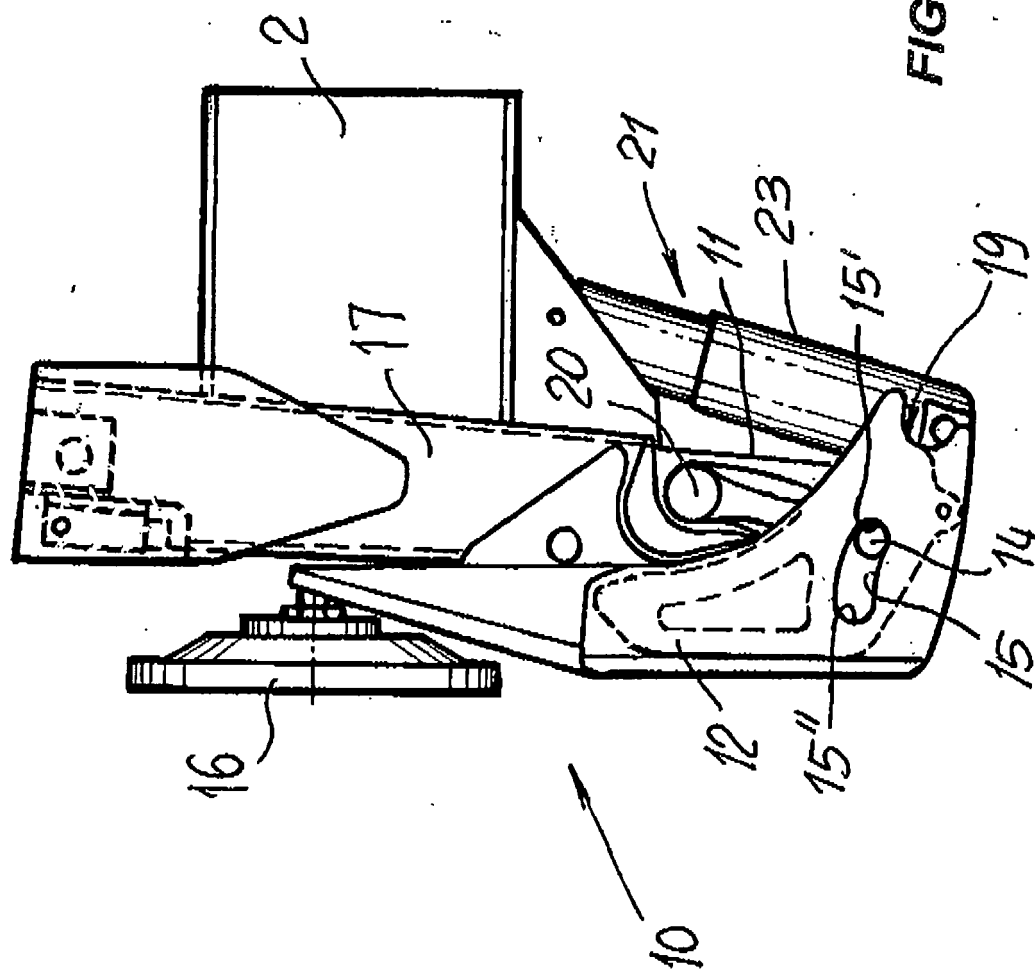
Claims

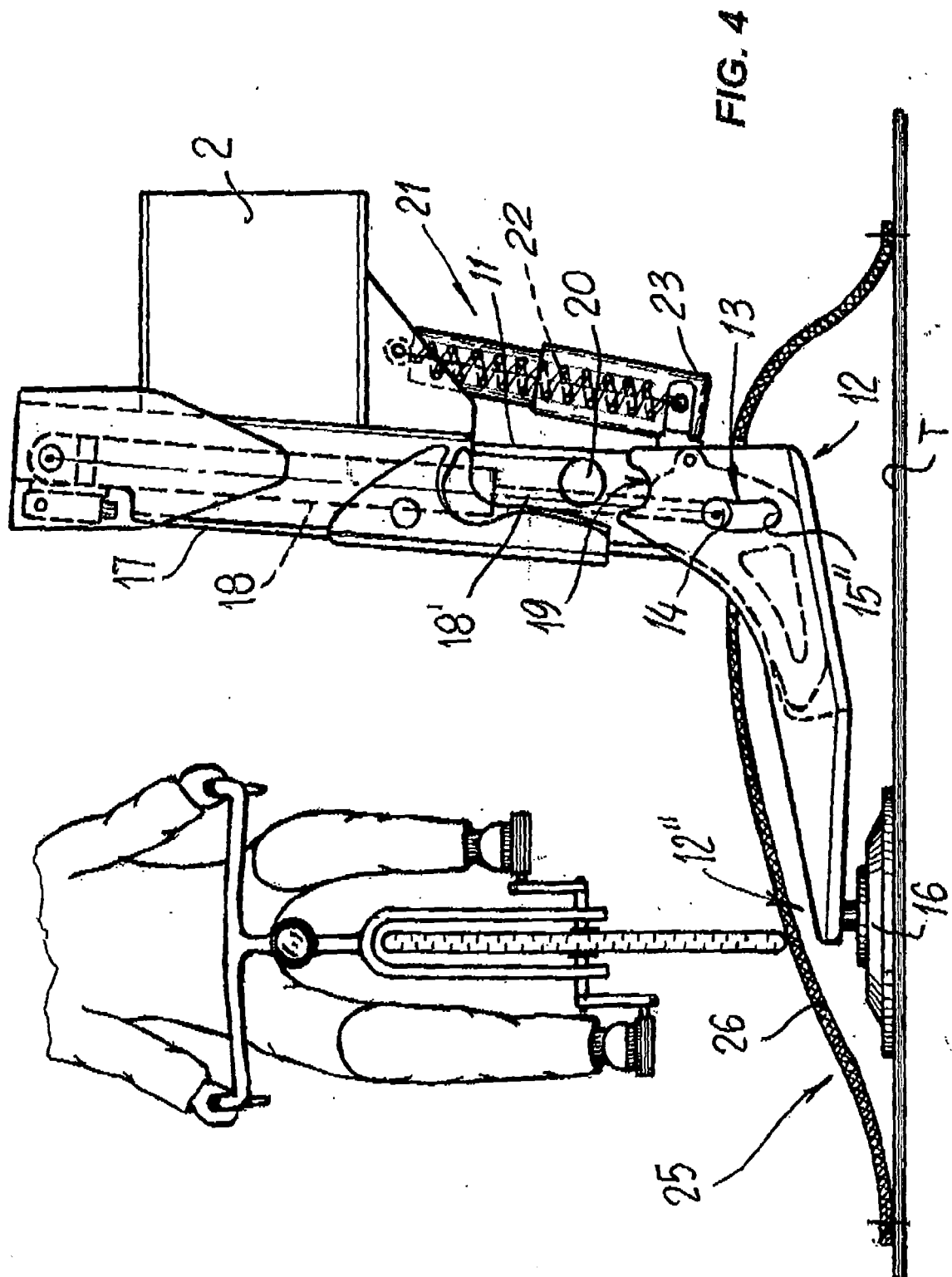
1. Stabilizer apparatus for vehicles (1) comprising a leg for resting on the ground which has a first support end turned towards the ground (T) and an opposite second coupling end supported at one side of a frame (2) of a vehicle (1), **characterised in that** said leg is divided in at least a first segment (11) and a second segment (12) which are mutually articulated at an articulation point (14) positioned between said first end and said second end.
2. Apparatus according to the claim 1, wherein said first segment (11) is supported mobile to said frame (2) along a direction substantially parallel to said side of said frame (2).
3. Apparatus according to the claim 1, wherein said second segment (12) is articulated mobile in rotation with respect to said first segment (11) around said articulation point (14), between an idle configuration raised off the ground (T) and a resting configuration on the ground (T), and vice versa.
4. Apparatus according to the claim 3, wherein in said idle configuration said second segment (12) is turned towards said side of said frame (2) in a position substantially parallel to said first segment (11).
5. Apparatus according to any of the claims from 1 to 4, wherein between said first segment (11) and second segment (12) actuator means (21, 22) are interposed to start in rotation said second segment (12) with respect to said first segment (11) from said idle configuration to said resting configuration.
6. Apparatus according to the claim 5, wherein said actuator means comprise an elastic element (22) which may be loaded in traction and interposed between said side of said frame (2) and said second segment (12) so as to generate a rotation moment to rotate said second segment (12) with respect to said first segment (11) between said idle configuration and

said resting configuration.

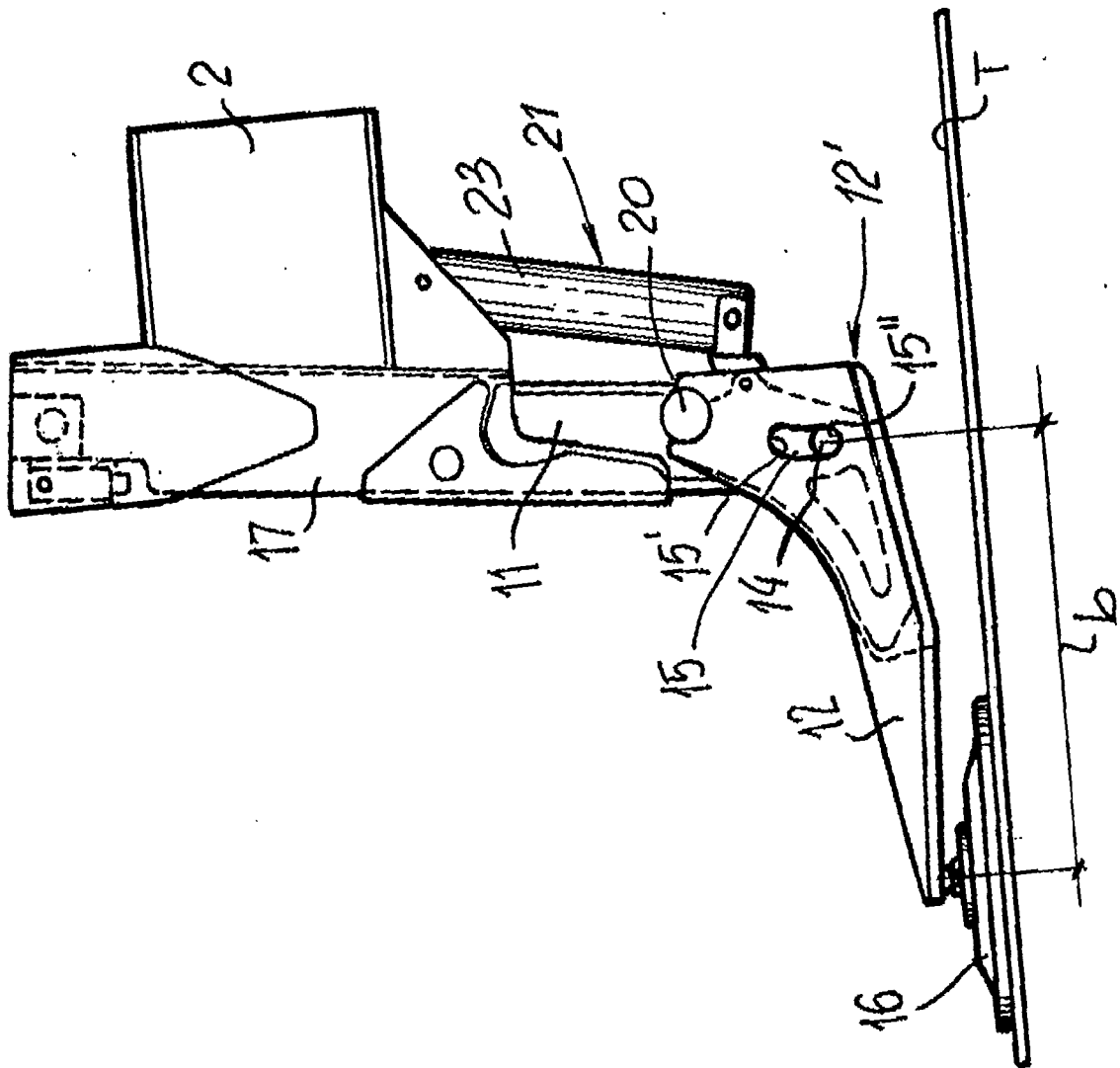
7. Apparatus according to the claim 1, wherein said articulation point comprises a hinge pin (14) supported crossways in said first segment (11) with an axis substantially parallel to a longitudinal direction of said side of said frame (2), said pin (14) being engaged in a corresponding slot (15) obtained in said second segment (12).
8. Apparatus according to the claim 7, wherein said slot (15) has an arc profile defining two opposite ends (15', 15") against which said pin (14) may stop.
9. Apparatus according to the claim 1, wherein between said side of said frame (2) and said first segment (11) operating means (18) are interposed to lift or lower said first segment (11) with respect to said side of said frame (2).
10. Apparatus according to the claim 7 or 9, wherein said operating means comprise at least a linear fluid-dynamic actuator (18) placed in between said side of said frame (2) and said pin (14).
11. Apparatus according to any of the claims from 1 to 10, wherein between said first segment (11) and second segment (12) are interposed locking means (19, 20) for locking the rotation of said second segment (12) in said resting configuration.
12. Apparatus according to the claim 11, wherein said locking means comprise:
 - a cavity (19) defined at one end of said second segment (12) turned towards said first segment (11);
 - an engaging pin (20) supported crosswise on said first segment (11), parallel to said hinge pin (14), aligned with and engageable in said cavity (19) when said second segment (12) is in said resting configuration.
13. Apparatus according to any of the claims from 1 to 12, wherein said second segment (12) may be covered with a removable cover element (25).
14. Apparatus according to the claim 13, wherein said cover element (25) is trafficable.
15. Apparatus according to the claim 13 or 14, wherein said cover element comprises a convex outer surface (25) having a connection profile with the ground.
16. Vehicle, **characterised in that** it comprises a stabilizer apparatus (10) for vehicles (1) according to one or more of the claims from 1 to 15.







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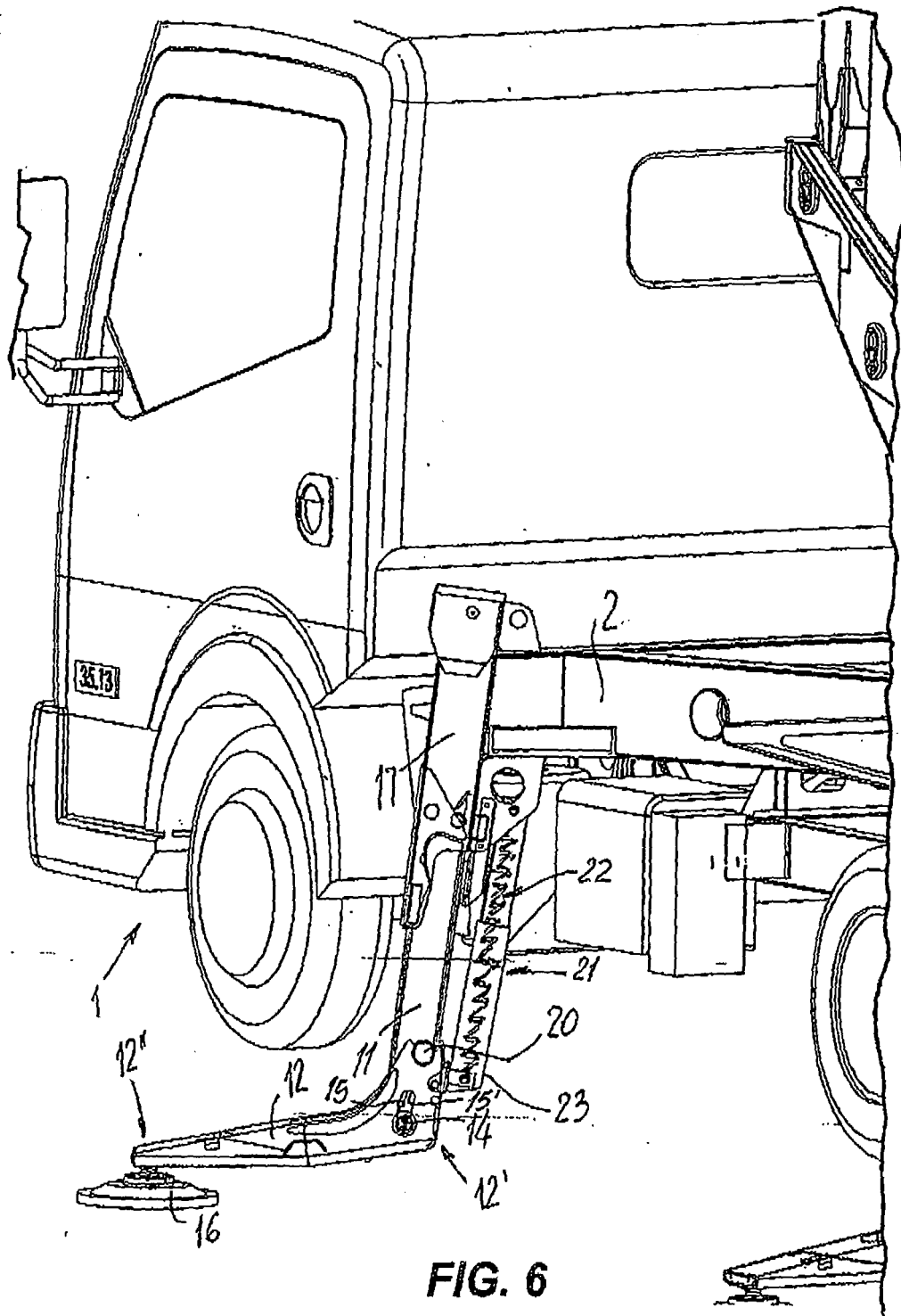
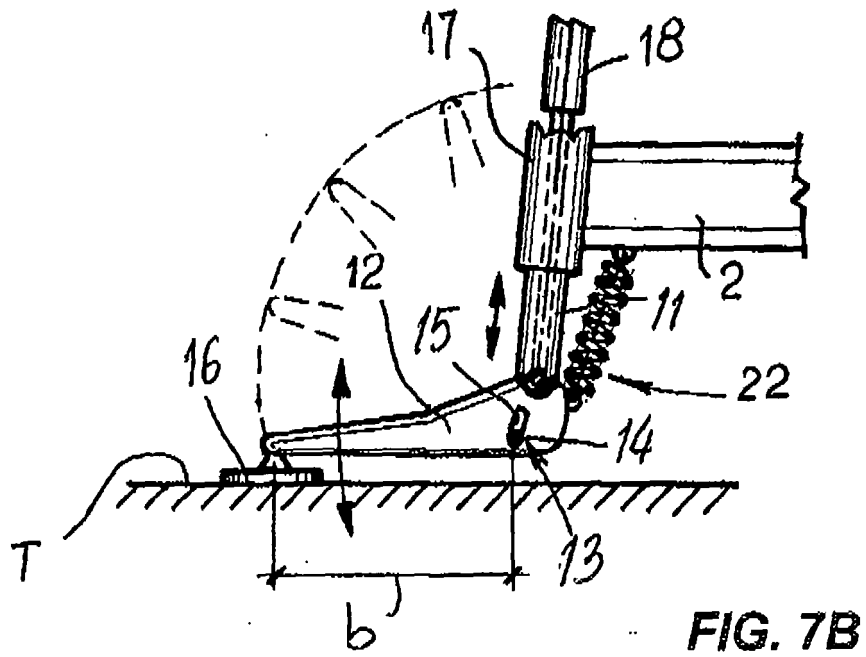
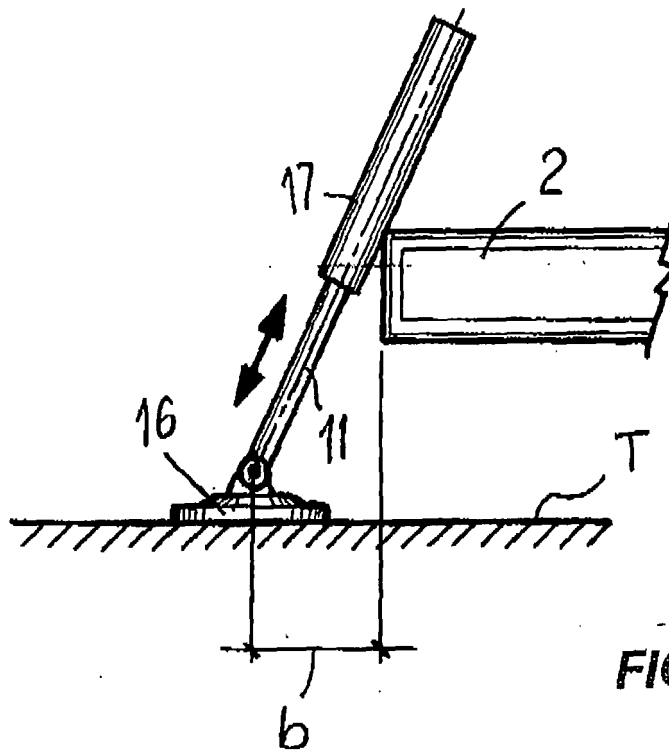


FIG. 6





EUROPEAN SEARCH REPORT

Application Number
EP 09 00 4797

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2001/002086 A1 (WEBB STERLING E [US]) 31 May 2001 (2001-05-31) * figures 8,9 *	1-4,7, 9-12	INV. B66C23/78 B66C23/80
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X	US 4 711 428 A (CARPENTER WILLIS M [US]) 8 December 1987 (1987-12-08) * figure 5 *	1-3	
Y	----- WO 99/20505 A (HIAB AB [SE]; STOLPE JENS [SE]) 29 April 1999 (1999-04-29) * abstract; figure 4 *	5,6	
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	-----		TECHNICAL FIELDS SEARCHED (IPC)
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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 17 June 2009	Examiner Serôdio, Renato
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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