(12) PATENT ABRIDGMENT (11) Document No. AU-B-18796/88
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 608024

(54) Title
VEHICLE-MOUNTED LOAD HOISTING DEVICE

International Patent Classification(s)
(51)[4] B60P 001/48

(21) Application No. : 18796/88 (22) Application Date : 07.07.88

(30) Priority Data

(31) Number (32) Date (33) Country
3723604 17.07.87 DE FEDERAL REPUBLIC OF GERMANY

(43) Publication Date : 19.01.89

(44) Publication Date of Accepted Application : 21.03.91

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(56) Prior Art Documents
AU 34833/68 59.9
AU 277482 39741/64 59.3 59.9
AU 241319 57356/60 59.9 84.2

(57) Claim

1. A vehicle-mounted load hoisting device for loading and unloading a load from a vehicle, including

a pivot frame having first and second ends; said pivot frame being mounted on the vehicle at said first end for pivotal motion about a first axis extending horizontally and transversely to a longitudinal direction of the vehicle;

a stop face provided on said pivot frame;

a cantilever arm having first and second ends; said cantilever arm being connected at the first end thereof to the second end of said pivot frame for pivotal motion relative to said pivot frame about a second axis extending spaced from and parallel to said first axis;

a power means supported on the vehicle and being

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articulated to said cantilever arm for pivoting said cantilever arm about said second axis into contact with said stop face;

and further
~~the improvement~~ comprising

(a) a pivot arm having first and second ends; said pivot arm being articulated at the first end thereof to the second end of said cantilever arm for pivotal motion relative to said cantilever arm about a third axis oriented parallel to said first and second axes and being spaced therefrom;

(b) a pulley mounted at the second end of said pivot arm;

(c) a winch;

(d) an elongated, flexible hoisting means wound on the winch and trained about said pulley and being adapted to extend from said pulley for attachment to the load; and

(e) locking means for locking said cantilever arm and said pivot frame together to form a rigid unit pivotal about said first axis; in said rigid unit said cantilever arm being in contact with said stop face and extending as a longitudinally aligned continuation of said cantilever arm.

COMMONWEALTH OF AUSTRALIA

Patent Act 1952

COMPLETE SPECIFICATION

(ORIGINAL)

608024

Class Int. Class

Application Number :

Lodged :

Complete Specification Lodged :

Accepted :

Published :

This document contains the amendments made under Section 49 and is correct for printing.

Priority : 17 July 1987

Related Art :

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Complete Specification for the invention entitled:

VEHICLE-MOUNTED LOAD HOISTING DEVICE

The following statement is a full description of this invention including the best method of performing it known to us/~~me~~:-

BACKGROUND OF THE INVENTION

The present invention relates to a device for loading and unloading a load from a vehicle having a pivot frame mounted at one end of the vehicle so as to be pivotal about a horizontal axis oriented perpendicularly to the direction of vehicle length. A cantilever arm is pivotally connected to the other end of the pivot frame for pivotal motion about an axis parallel to the horizontal axis. The cantilever arm is angled upwardly from the vehicle (when viewed in the loaded position) and is swingable by a power device (such as hydraulic power cylinders) to a position where the cantilever arm engages an abutment of the pivot frame.

Such a device is known and is disclosed in German Offenlegungsschrift (non-examined published application) 2,325,866. This prior art device includes a hook at the free end of an angled cantilever arm, which engages the load and, by pivoting the cantilever arm over the rear end of the vehicle, can set down or hoist the load. Although the prior art device has favorable lever ratios which reduce the load acting on the hydraulic power cylinders, it is suitable only for the manipulation of certain large, box-like containers which can be emptied in a manner similar to that of a sliding dump truck body.

SUMMARY OF THE INVENTION

In one broad form the present invention provides a vehicle-mounted load hoisting device including a pivot frame mounted on the vehicle for pivotal motion about a first horizontal axis extending transversely to the vehicle length; a cantilever arm connected to the pivot frame for pivotal motion about a second horizontal axis extending parallel to the first axis; a pivot arm articulated to the cantilever arm for pivotal motion about a third axis oriented parallel to the first and second axes; a pulley mounted at an end of the pivot arm for supporting a cable or the like wound on a winch and attachable to the load; and an arrangement for locking the cantilever arm and the pivot frame together to form a rigid

unit pivotal about the first axis. When forming the rigid unit, the cantilever arm is in contact with a stop face on the pivot frame and extends as a longitudinally aligned continuation of the cantilever arm.

It is an advantage of the invention that the requirement for simplification and greater uniformity in transportation as it is encountered, in particular, in current pioneering equipment, is met to the greatest possible extent. Additionally, the device according to the invention also overcomes the drawbacks encountered in the prior art devices for manipulating pontoons in that, when picking up the pontoon, the lifting cable need not be relocated from an upper engagement zone to a lower engagement zone.

The device of the invention can be employed with any vehicle (including tracked vehicles) that can be equipped with a flat bed and at most requires, for adaptation to different shapes of loads, easily and quickly performed conversion measures.

Additional features according to the present invention make it possible to omit the use of push boats when foldable pontoons are picked up out of the water. When picking-up

pontoons (foldable in a W-shape) by prior art devices, the two outer flotation bodies would not fold automatically against the inner flotation bodies but had to be additionally pressed in by push boats. A sudden downward pivoting of the pivot arm, according to the invention, from a raised position simultaneously lowers the attached pontoon. The forces generated when the pontoon impacts on the water are sufficient to press the outer flotation bodies to the inner flotation bodies and simultaneously lock them together.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic side elevational view of a vehicle equipped with a preferred embodiment of the invention, with a pontoon load placed thereon.

Figure 2 is a schematic side elevational view of the preferred embodiment, removed from the vehicle and drawn on an enlarged scale.

Figure 3 is a schematic side elevational view of a vehicle equipped with the preferred embodiment, shown in the position before the pontoon is hoisted from the water.

Figure 4 is a view similar to Figure 3, showing the vehicle during the hoisting of the pontoon.

Figure 5 is a schematic perspective view of a portion of the preferred embodiment, including components for performing conversion measures for the manipulation of various containers.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning to Figure 1, a base frame 3 is fastened to the truck bed 1 and a pivot frame 4 is mounted thereon which is pivotal at one end about a horizontal axis 5 which extends transversely to the longitudinal direction of the truck 2 and which is situated at the rear end thereof. A cantilever arm 7 is hinged to the other end of the pivot frame 4 by an axis 6 which is parallel to the axis 5. The cantilever arm 7 has an integral terminal part 8 which is oriented at a right angle to the arm 7 and which, in the illustrated position, extends in an upward direction from the bed 1. A pivot arm 9 is articulated to the free end of the terminal part 8. The pivot frame 4 and the cantilever arm 7 are positioned in the longitudinal direction of the vehicle and, in the illustrated loaded state, lie horizontally and parallel on the base frame 3. At the free end of the pivot arm 9 a roller 10 is

provided to guide a hoisting cable 11 connected to an upper location 13 of a load 12 and wound on a winch 14. The cable 11 is guided over a roller 15 which is coaxial with the pivot axis of pivot arm 9. The winch 14 is disposed on the terminal part 8 of the cantilever arm 7 on the side facing away from the load 12, that is, facing away from the axis 6 and thus oriented toward the driver's cab 16 of the vehicle 2. On the same side of the terminal part 8, at a higher level, a projection 17 is provided for supporting a hydraulic cylinder 18. The piston rod of the hydraulic cylinder 18 engages the pivot arm 9 at fulcrum 19.

The load 12 is guided on both sides along its lower outer edges 20 by three pairs of rollers 21, 22 and 23, each provided with wheel flanges on their exterior faces. The rollers of each pair are coaxial. Two centering cones 24 are rotatably mounted to the rear end of the vehicle 2 so as to engage the two lower edges 20 of the load 12 and prevent it from running off to the sides.

Turning now to Figure 2 in which rollers 21, 22 and 23 have been omitted for the sake of clarity, the piston rods of two hydraulic cylinders 26 (only one is visible) are

articulated to the cantilever arm 7 at an axis 25 which is spaced at a predetermined distance from and above the axis 6 where the cantilever arm 7 is pivoted to the pivot frame 4. The other ends of the piston rods are mounted at an axis 27 to the base frame 3. A pneumatic cylinder 28 is disposed on the cantilever arm 7 in the longitudinal direction of vehicle 2, with its piston rod 29 engaging a hook 30 which passes around a catch 31 which forms an extension of the pivot frame 4 beyond axis 6, in order to lock the pivot frame 4 to cantilever arm 7. In the locked state, the pivot frame 4 and the cantilever arm 7 are in a mutually flush position and form a rigid unit pivotal about axis 5 by hydraulic cylinders 26. In the unlocked state, the cantilever arm 7 is able to initially pivot about axis 6 until its frontal face 32 abuts a counterface 33 of a stop cam 34 forming part of the pivot frame 4. In the loading position, faces 32 and 33 are disposed approximately at a right angle to one another so that the cantilever arm 7 may pivot approximately 90°.

Figures 3 and 4 show the launching and hoisting of a pontoon 12, constituting a load. To launch (setting down) the pontoon 12, the cantilever arm 7 is lifted in its state locked to the pivot frame 4 as shown in Figure 4. Rollers 21, 22 and 23 aid in the unloading of the pontoon as it is put into the water, and the cable 11 is released from pontoon

12 after it has been unloaded. Also, two bolt pin-type locks 35 (one visible in Figure 1) which serve to prevent lateral displacement of the pontoon 12 during transport, are released before launching. Then, in a known manner, pontoon 12 rocks over the end of the vehicle which itself may have been driven partially into the water, as may be observed in Figures 3 and 4. The pontoon 12 then unfolds automatically.

For hoisting the pontoon 12 from the water, cable 11 is attached at the point of attachment 13, which is disposed at the frontal portion of the pontoon at the lower end in the plane of symmetry and the pontoon is lifted by the pivotal arm 9 which forms a continuation of the cantilever arm 7. During this occurrence the two inner or center flotation bodies of pontoon 12 thus come to contact one another and are automatically locked to one another. Pontoon 12 is then lifted out of the water by pivoting pivot arm 9 into its end position shown by the dashed lines in Figure 3, which is also visible in Figures 1 and 2, and is lowered suddenly due to a sudden depressurization of the hydraulic cylinder 18. This causes the inner sides of the outer flotation bodies of the pontoon to suddenly impact on the surface of the water, thus bringing the outer flotation bodies in contact with the already juxtaposed inner flotation bodies and automatically locking them at the same time. Then by the actuation of the

winch 14 and the hydraulic cylinders 26 the pontoon 12 is again raised and pulled up over the rear end of vehicle 2, as shown in Figure 4. Thus, the pontoon 12 can be pulled onto the vehicle without putting it down and without changing the position of the cable 11. While the pontoon 12 is being lifted out of the water, cantilever arm 7 is raised by hydraulic cylinders 26 to an angled, unlocked position with respect to the likewise raised pivot frame 4. The free end of the cantilever arm 7 projects beyond the end of vehicle 2 as shown in Figure 3.

The sudden downward pivoting of pivot arm 9 from the raised position shown in Figure 3 can be effected by means of a suitable hydraulic circuit. For this purpose, it is expedient to provide an appropriately dimensioned shutoff valve, with the circumvention of the valve block, directly in the suction conduit connected to a pressurized fluid reservoir.

In the pulled-up loaded state, as shown in Figure 1, the frontal face of pontoon 12 facing the driver's cabin 16 lies against end stops 36 (only one shown) and is held in this position by bolt locks 35, and by tying down cable 11 by means of the winch 14.

Figure 5 is a schematic representation illustrating the conversion of the device to accommodate standard containers

according to ISO or DIN standards which are provided with two parallel longitudinal tracks along their undersides. For this purpose, a front guide wheel 37 is disposed on each side of cantilever arm 7, while a fork-like projection 38 is disposed at the rear end of the pivot frame 4. The projection is equipped with a tubular axle 39 which extends from both sides of projection 38 with respect to the base frame 3. A pair of rear guide wheels 40 can be placed onto axle 39. The axle 39 and two further axles 41 and 42 which are parallel to axle 39 are equipped with the guide rollers 23, 22 and 21 at their ends for hoisting a pontoon 12, as shown in Figure 1. These guide rollers are removed during conversion. Two catch hooks 43 are provided at axle 41 in the region of the rails of the standard container. These hooks must be removed when transporting a pontoon or they may be folded down to such an extent that they no longer project over the loading plane.

The present disclosure relates to the subject matter disclosed in Federal Republic of Germany Application No. P 37 23 604.0 filed July 17th, 1987, the entire specification of which is incorporated herein by reference.

It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations, and the same are intended to be

comprehended within the meaning and range of equivalents of the appended claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A vehicle-mounted load hoisting device for loading and unloading a load from a vehicle, including

a pivot frame having first and second ends; said pivot frame being mounted on the vehicle at said first end for pivotal motion about a first axis extending horizontally and transversely to a longitudinal direction of the vehicle;

a stop face provided on said pivot frame;

a cantilever arm having first and second ends; said cantilever arm being connected at the first end thereof to the second end of said pivot frame for pivotal motion relative to said pivot frame about a second axis extending spaced from and parallel to said first axis;

a power means supported on the vehicle and being articulated to said cantilever arm for pivoting said cantilever arm about said second axis into contact with said stop face;

and further
~~the improvement~~ comprising

(a) a pivot arm having first and second ends; said pivot arm being articulated at the first end thereof to the second end of said cantilever arm for pivotal motion relative to said cantilever arm about a third axis oriented

parallel to said first and second axes and being spaced therefrom;

(b) a pulley mounted at the second end of said pivot arm;

(c) a winch;

(d) an elongated, flexible hoisting means wound on the winch and trained about said pulley and being adapted to extend from said pulley for attachment to the load; and

(e) locking means for locking said cantilever arm and said pivot frame together to form a rigid unit pivotal about said first axis; in said rigid unit said cantilever arm being in contact with said stop face and extending as a longitudinally aligned continuation of said cantilever arm.

2. A device as defined in claim 1, further comprising an additional power means for operating said locking means.

3. A device as defined in claim 1, further comprising a pair of catch hooks for standard pallets and standard containers; said catch hooks are pivotal out of the way.

4. A device as defined in claim 1, further comprising a pair of catch hooks for standard pallets and standard containers; said catch hooks are removable.

5. A device as defined in claim 1, further comprising two centering cones rotatably mounted on the pivot frame for rollingly engaging two lower edges of the load.

6. A device as defined in claim 1, wherein the vehicle is a truck equipped with a flat bed and said lifting means is a hydraulic lifting assembly, said load being loaded and unloaded from a rear end of said truck.

7. A device as defined in claim 1, wherein the pivotal range of said pivot arm is at least 30° and at the most 120°.

8. A device as defined in claim 7, wherein the pivotal range of said pivot arm is at least 45° and at the most 90°.

9. A device as defined in claim 1, further comprising an additional power means supported on said cantilever arm

and articulated to said pivot arm for rotating said pivot arm about said third axis.

10. A device as defined in claim 9, wherein said additional power means comprises a hydraulic power cylinder.

11. A device as defined in claim 9, wherein said cantilever arm has a projection extending in a direction away from said second and third axes; said additional power means being articulated to and supported by said projection.

12. A device as defined in claim 1, wherein said cantilever arm has a transporting position in which it is oriented generally horizontally for supporting the load located on the vehicle; and further wherein said cantilever arm has a terminal length portion, including said second end of said cantilever arm; said terminal length portion extending generally vertically upwardly when said cantilever arm is in its said transporting position.

13. A device as defined in claim 12, wherein said pivot frame has a first length measured perpendicularly to said first axis and said cantilever arm has a second length, excluding said terminal length portion, measured perpen-

dicularly to said second axis; said second length dimension being greater than said first length dimension.

14. A device as defined in claim 12, wherein said winch is attached to said terminal length portion and is oriented in a direction away from said second axis; further comprising an additional pulley mounted at said second end of said cantilever arm coaxially with said third axis; said elongated, flexible hoisting means being guided by said additional pulley to said pulley mounted at the second end of said pivot arm.

15. A device as defined in claim 14, wherein said elongated, flexible hoisting means is a cable and said winch is a cable winch.

16. A device as defined in claim 12, further comprising load-engaging rollers mounted on said pivot frame and said cantilever arm for rollingly supporting the load in the transporting position of said cantilever arm.

17. A device as defined in claim 9, wherein said additional power means is formed for causing and permitting sudden downward pivoting of said pivot arm.

18. A device as defined in claim 17, wherein said additional power means is a hydraulic power cylinder which is provided with a greater sized suction conduit which is directly connectable to a pressurized fluid reservoir.

19. A device as defined in claim 16, wherein said load-engaging rollers include wheel flanges arranged to pass around lower edges of the load.

20. A device as defined in claim 19, wherein the load-engaging rollers are arranged in pairs; the rollers of each pair being aligned in a direction parallel to said axes.

21. A device as defined in claim 20, further comprising adjusting means for varying the distance between rollers forming the pairs to adapt the rollers to loads of diverse widths.

22. A vehicle-mounted load hoisting device as hereinbefore described with reference to and as shown in the accompanying drawings.

DATED this 14 day of December 1990

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Applicant:

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FIG.1

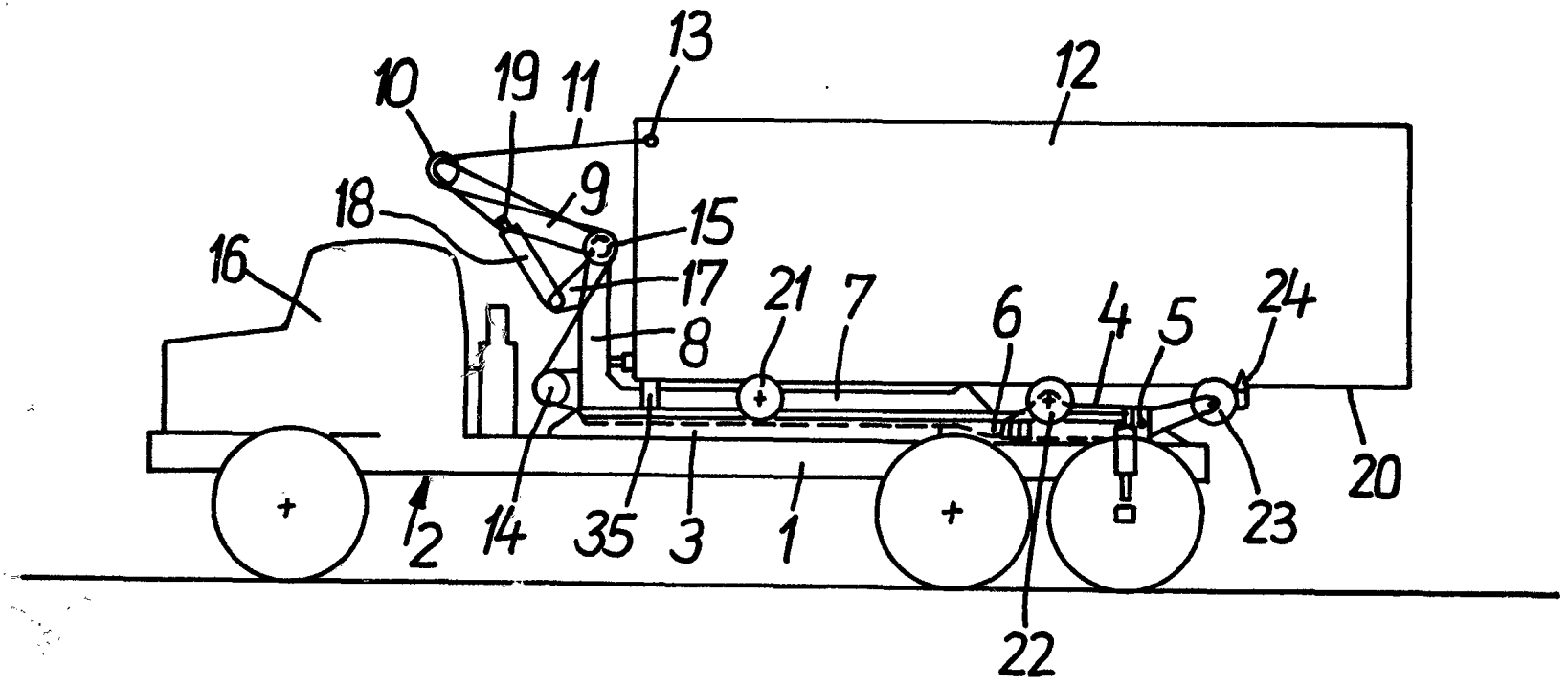

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FIG. 2

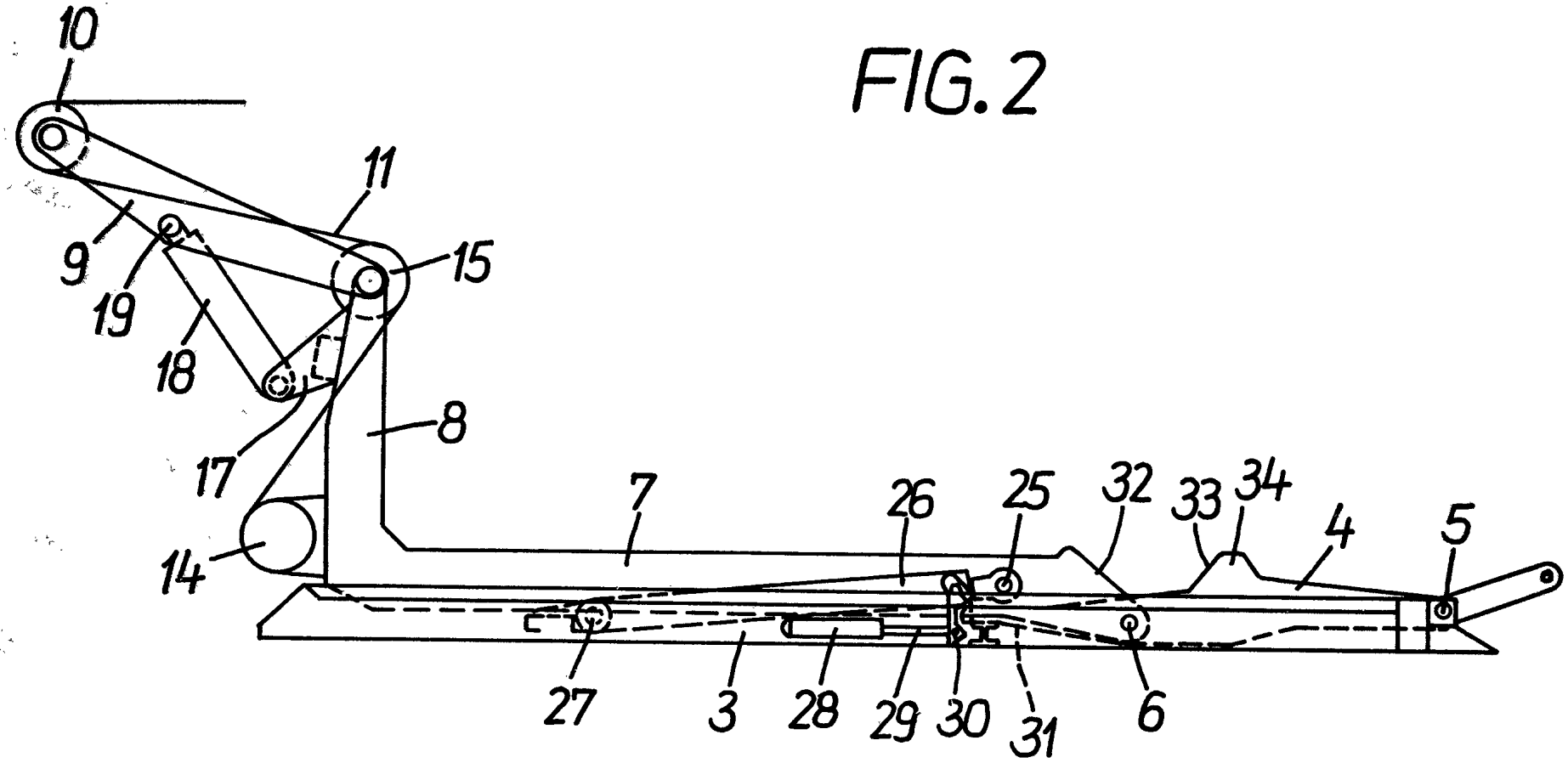

FIG. 3

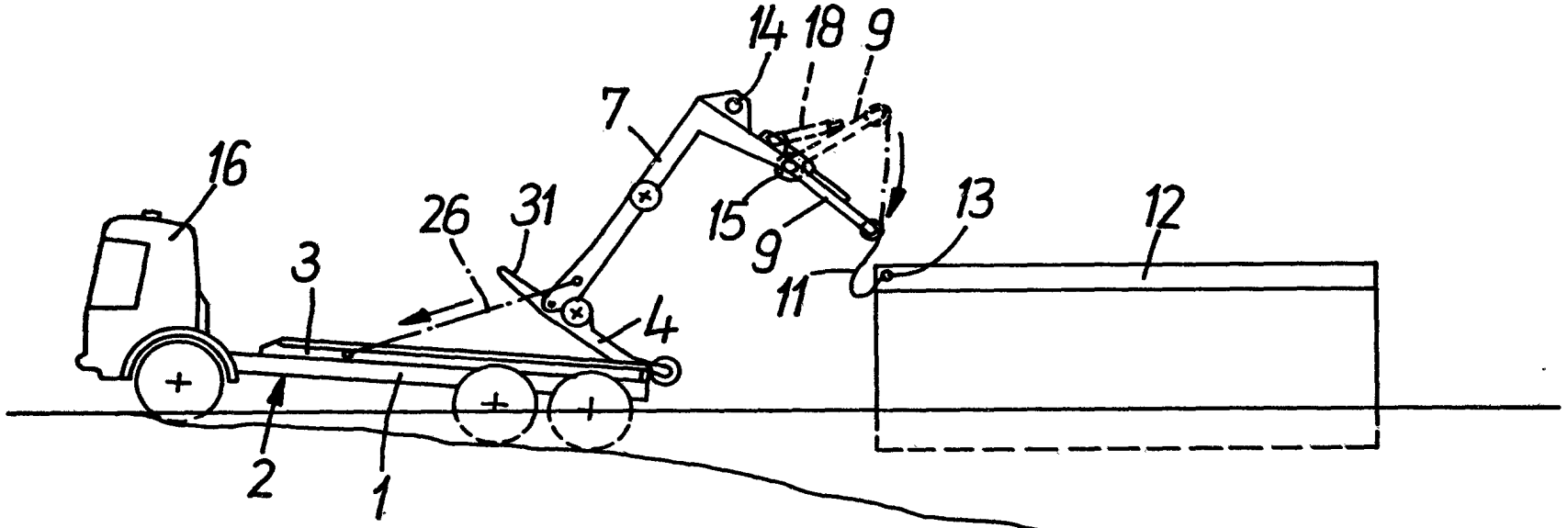

FIG. 4

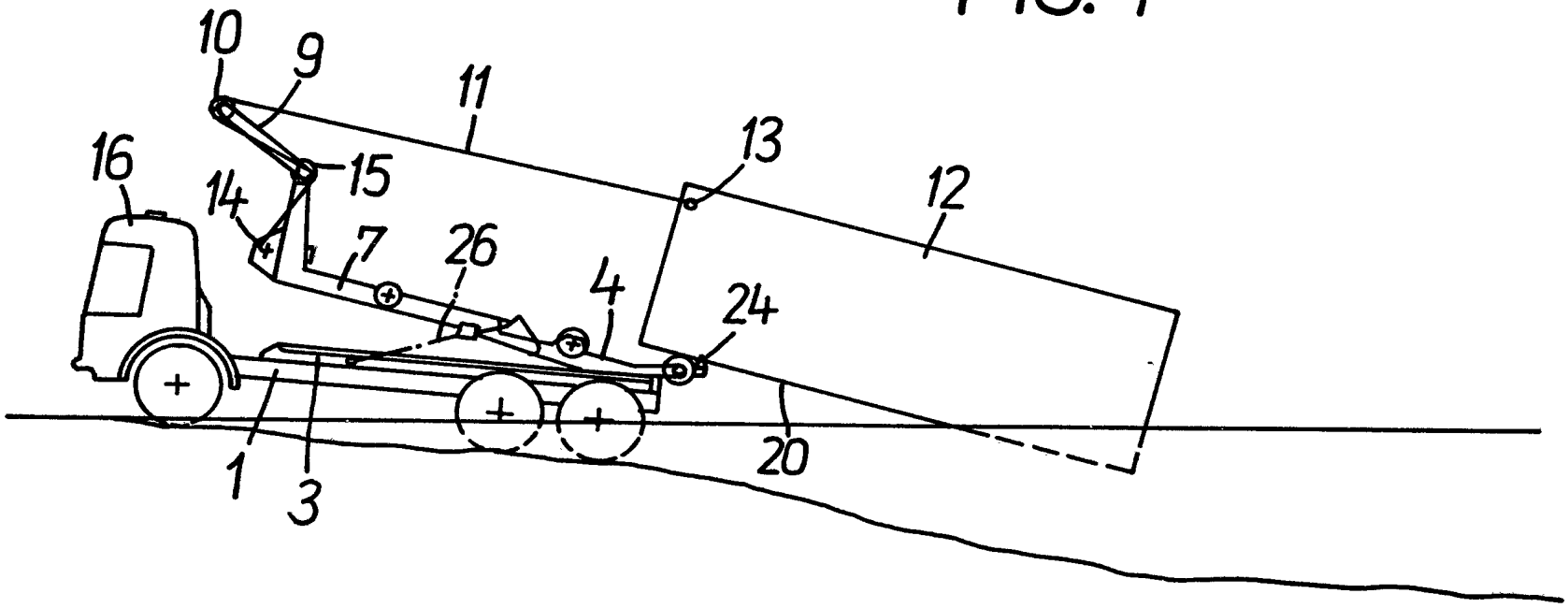

FIG.5