PATENT SPECIFICATION (11) 1 579 540

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(21) Application No. 27289/77 (22) Filed 29 June 1977 (19)
(31) Convention Application No. 449 749 (32) Filed 10 July 1976 in
(33) Spain (ES)
(44) Complete Specification published 19 Nov. 1980
(51) INT. CL.³ B60P 1/28 B65G 63/00
(52) Index at acceptance
B8E 23C
B8B 45A 45B
B8Q 2D1

(54) A TRAILER LOADING AND UNLOADING SYSTEM

(71) I, JOSE MANUEL ABASCAL ZULOAGA, a Spanish citizen of Arrieta 3-3-º Pamplona Spain, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

Trailers which are today available on the market may be of single axle or twin axle design, according to their purpose and load carrying capacity, but in general they have features which make it a laborious procedure for them to be loaded and unloaded, there being several solutions which have been adopted to qvercome this problem. Among these solutions, those that stand out as being the most practical include the one where the trailer body is attached to the chassis but in such a manner that it can be tipped and also the one which employs containers which are independent of the trailer itself. However, even with these solutions, there are still difficulties encountered loading and unloading, and it is the pincipal object of the present invention to overcome these difficulties.

Accordingly, the present invention consists in an apparatus comprising a trailer having a chassis supported on a set of wheels; means operable to displace said wheels forwardly or rearwardly with respect to the centre of gravity of said chassis including any load thereupon, whereby said chassis and any load thereon are urged by gravity to tilt rearwardly or forwardly, respectively; a tow-head rigidly attached to the front end of said chassis; a rigid tow bar pivotally attached at a first end thereof to a first point on said tow-head; a double-acting shock absorber for retarding motion and pivotally attached at a first end thereof to a second point on said tow-head; said first and second points being vertically spaced apart with the second point higher than the first point; said shock absorber being extensible and operative to restrain the rate of tilting of said chassis whereby a sudden fall of the rear of said trailer is avoided; and said shock absorber fixing the maximum forward tilt of said trailer.

Said apparatus may include hauling means for hauling a load onto said trailer when said chassis is tilted rearwardly. Said hauling means preferably is a winch connected at the forward end of said chassis and a cable from said winch for attachment to and hauling of said load.

The means operable to displace said wheels may be a double-acting cylinder having first and second ends of which the first end is connected to said chassis and the second end is connected to said set of wheels; at least a first sheave so mounted as to be displaced with said set of wheels; at least second and third sheaves attached to said chassis; a rope extending around said sheaves and having a first end thereof attached to said wheels and the second end thereof being free and having means for attachment to said load; the extension of said rope around said sheaves being operative to permit the second end of said rope to be moved along the trailer towards the rear of the trailer when the wheels are displaced towards their forward position and also operative to draw the second end of said rope along the trailer towards the front of the trailer when said wheels are displaced toward their rearward position; and the paying out and drawing in of the second end of said rope being in the ratio of at least three times the displacement of said wheels. The sheaves are preferably so placed relatively to one another that the second end of said rope is drawn in to a position which places said load in its final forward position on said chassis when said wheels are in their extreme rearward position.

Alternatively, said hauling means comprises a reel on a shaft; a double-acting hydraulic cylinder, two ratchets on said shaft; said two ratchets being connected to said hydraulic cylinder and being operative to urge said reel in a single direction alternately with the alternate motion of said double-acting hydraulic cylinder: a rope member on said reel, said reel being adapted to wind said rope

member upon it; and said rope being adapted for connection by one end thereof to said load.

The present invention will now be more particularly described with reference to the accompanying diagrammatic drawings, in which:—

Figure 1 shows an apparatus according to the present invention and connected at one end to a towing tractor and also connected to a container which is about to be loaded onto said apparatus;

Figure 2 shows the container hauled up into position on the tilted apparatus;

Figure 3 shows the apparatus of Figure 2 in position ready for travelling;

Figure 4 shows a second embodiment of an apparatus according to the present invention;

Figure 5 depicts an elevational view of a winch used in said three embodiments;

Figure 6 is a plan view of said winch;

Figure 7 is a section on the line 7–7 in Figure 5;

Figure 8 is a section on the line 8–8 in Figure 7; and

Figures 9 to 11 illustrate a third embodiment of an apparatus according to the invention in use and at various stages during its use.

Referring to Figures 1, 2 and 3, a trailer comprises a chassis 8 and a set of wheels 14, said wheels being mounted upon a suspension rocker arm 9 which in turn is connected to the chassis 8 by means of a trunnion 4 which is so arranged as to be able to travel along the length of said chassis 8 upon appropriate operation of a cylinder 10.

At the front end of said chassis 8 there is securely mounted a tow-head 11 by means of which attachment to a structure 7 on a towing tractor 13 is made by means of a tow bar 12, and by means of an arm 6 which preferably comprises a double-acting shock-absorbing cylinder. The tow-bar 12 may be extensible in an adjustable manner so that the required distance between the tractor 13 and the trailer can be set.

With the arrangement so far described, the wheels 14 are moved forwards (i.e. towards the tractor 13) by means of operation of the cylinder 10, whereupon the chassis 8 tips about the rocker arm 9 and the rear end of said chassis comes into contact with the ground and rests there. During this tipping motion the cylinder 6 acts as a shock-absorber and prevents any sudden blow against the ground as a result of an uncontrolled descending motion.

The trailer is equipped with a winch 5 which is placed at its forward end and whose rope 2 enables said winch to perform a pulling motion and to draw towards the chassis 8 any load deposited on the ground (see Figure 1). When the load has been winched onto the tipped chassis 8, the various elements will be in the relative positions thereof which are illustrated in Figure 2. Thereafter, the cylinder 10 is appropriately operated to displace the trunnion 4 along the chassis 8 in a rearwards direction (i.e. away from the tractor 13) with the result that the various elements will be in the relative positions thereof which are illustrated in Figure 3 which shows the loaded trailer ready to be towed by the tractor 13. It will be appreciated that such system may be used for any kinds of loads, but it preferably handles a container 1 holding the load to be carried.

Referring to Figure 4, another embodiment comprises the chassis 8 supporting a framework 17 which can be tilted by appropriate operation of a cylinder 15. This assists the unloading of the container 1 because of the angle of inclination which, when the rope is paid off the winch 5, will cause said container to slide onto the ground.

Figures 5 to 8 illustrate the winch 5 which is used in the embodiments of Figures 1 to 4 and which comprises a reel 21 carrying a rope (not illustrated) for attachment to the loads to be moved, said reel being mounted in such a way that it is freely rotatable upon a shaft 22. Between the reel and the shaft there is a tapered clutch with two end bushes 23, 24 with their respective ball bearings 25, said clutch being capable of being operated by hand to release or to engage the reel. Moreover, said clutch may alternatively be remotely or hydraulically controlled.

A ratchet body 26 is additionally mounted on the shaft 22 and rotates integrally with it, there being two separate sleeves 27, 28 affixed to said body each provided with pawls 29 which, through pressure exerted by their respective springs 30, engage and mesh with the ratchet body 26.

Said ratchet sleeves 27, 28 are pivotally attached to a piston rod of a double-acting hydraulic cylinder 31, the ratchet 27 being directly joined to the piston rod whereas the ratchet 28 is joined to one end of a rod 33. One end of a rod 32 is joined to one end of the piston rod of the cylinder 31 and to the sleeve 27. The opposite ends of said rods 33, 32 are linked with one another by means of a disc 34 to which they are pivotally connected, the arrangement being such that the ratchet sleeve 27 becomes operative when the piston in the cylinder travels on its forward stroke whereas the ratchet sleeve 28 becomes operative when the piston travels on its return stroke.

These ratchet wheels 27, 28, however, are assembled so that they operate in opposition to one another, and hence, although they are each driven in opposite directions of rotation they both transmit said motion in the same direction to the body 26 so that the shaft 22 receives a continuous rotational motion.

With this arrangement, and when pressurised hydraulic fluid is being fed to the cylinder 31, the piston is made to travel at a constant rate in one direction or the other,

due to the presence of a distributor 35 which is mechanically or hydraulically controlled; thus, the reciprocating motion of the piston in the cylinder 31 is transmitted in the respective direction to the ratchet sleeves 27, 28 and these transmit continuous rotational motion to the shaft 22.

When the shaft 22 is rotating, it is then only necessary to engage the tapered clutch 23, 24 in order to rotate the reel 21 which thereupon exerts a pull on the rope in order to shift the load which requires to be moved.

Unloading is performed in a similar fashion, with the wheels 14 being displaced forwards (in the embodiments illustrated in Figures 1 to 4) to the extent that the rear end of the chassis 8 comes into contact with the ground and then, once the container 1 has been released from the safety catches (not illustrated) which secure it to the trailer, it will slide down towards the ground, and become deposited there when the tractor 13 is shifted forwards.

Referring to Figures 9 to 11, a draw rope 46 is provided which is looped over a sheave 47 attached to a trunnion and which is looped over a further two sheaves 48, 49 which are arranged on the front end of the chassis 8. One end of the rope 46 is firmly secured to a point 50 on the trunnion and the free end 51 of said rope is illustrated as being attached to the load or container 1. In this manner, when the trailer has been suitable positioned in front of the load or container 1 and has been tipped into the inclined position with the end 51 of the rope secured to said load or container 1, if the hydraulic cylinder 10 is actuated in order to make the wheels 14 move relatively to the chassis 8 to their normal position which is necessary when the trailer is in tow, the sheave 47 will be moved from the position thereof illustrated in Figure 9 through the position thereof illustrated in Figure 10 to the position thereof illustrated in Figure 11. This movement of the sheave 47 away from the sheaves 48, 49 results in the container being moved onto the chassis 8 simultaneously with the restoration of the chassis 8 to its horizontal attitude. In order for the trailer to be unloaded, it is simply necessary for the cylinder 10 to be actuated to cause the trailer to move into the tipped position thereof, whereupon the container 1 will slide rearwards under its own weight until it touches the ground, and it is then fully freed from the trailer when this is drawn forwards by the tractor which tows it. Throughout this unloading operation the rope 46 acts as a restraint and prevents the container 1 from dropping suddenly. The distance moved by the free end of the rope 46 in moving from the Figure 9 to the Figure 11 position thereof is three times the distance through which the wheels 14 are moved.

In the case of use in forestry, the trailer can be used with the same features as mentioned above but, in a preferred form, it is intended that the "container" employed should comprise two longitudinal stringers each having the same length as that of the chassis 8 of the trailer. At the forward ends of said stringers, there is a fixed upright board whereas at their rear ends there is a hinged and removeable tail-board so that in this way the timber or trees to be loaded may be arranged as in a bale upon the two stringers lying on the ground and the tailboard then raised, so as thus to allow the loading operation to be performed in the same manner as has already been described.

Whatever arrangement may be used for the parts comprising the construction, the system covered by this invention is applicable both to trailers having a single axle as well as to those having more than one, with the wheels arranged either in one or in several sets, and likewise mechanical, pneumatic or other actuating means may be used instead of the hydraulic means as are referred to in the above description.

WHAT I CLAIM IS:—

1. An apparatus comprising a trailer having a chassis supported on a set of wheels; means operable to displace said wheels forwardly or rearwardly with respect to the centre of gravity of said chassis including any load thereupon, whereby said chassis and any load thereon are urged by gravity to tilt rearwardly or forwardly, respectively; a tow-head rigidly attached to the front end of said chassis; a rigid tow bar pivotally attached at a first end thereof to a first point on said tow-head; a double-acting shock absorber for retarding motion and pivotally attached at a first end thereof to a second point on said tow-head; said first and second points being vertically spaced apart with the second point higher than the first point; said shock absorber being extensible and operative to restrain the rate of tilting of said chassis whereby a sudden fall of the rear of said trailer is avoided; and said shock absorber fixing the maximum forward tilt of said trailer.

2. An apparatus as claimed in Claim 1, including hauling means for hauling a load onto said trailer when said chassis is tilted rearwardly.

3. An apparatus as claimed in Claim 2, wherein said hauling means is a winch connected at the forward end of said chassis and a cable from said winch for attachment to and hauling of said load.

4. An apparatus as claimed in Claim 1, wherein said means operable to displace said wheels is a double-acting cylinder having first and second ends of which the first end is connected to said chassis and the second end is connected to said set of wheels; at least a first sheave so mounted as to be displaced with

said set of wheels; at least second and third sheaves attached to said chassis: a rope extending around said sheaves and having a first end thereof attached to said wheels and the second end thereof being free and having means for attachment to said load; the extension of said rope around said sheaves being operative to permit the second end of said rope to be moved along the trailer towards the rear of the trailer when the wheels are displaced towards their forward position and also operative to draw the second end of said rope along the trailer towards the front of the trailer when said wheels are displaced toward their rearward position; and the paying out and drawing in of the second end of said rope being in the ratio of at least three times the displacement of said wheels.

5. An apparatus as claimed in Claim 4, wherein the sheaves are so placed relatively to one another that the second end of said rope is drawn in to a position which places said load in its final forward position on said chassis when said wheels are in their extreme rearward position.

6. An apparatus as claimed in Claim 2 wherein said hauling means comprises a reel on a shaft; a double-acting hydraulic cylinder; two ratchets on said shaft; said two ratchets being connected to said hydraulic cylinder and being operative to urge said reel in a single direction alternately with the alternate motion of said double-acting hydraulic cylinder; a rope member on said reel, said reel being adapted to wind said rope member upon it; and said rope being adapted for connection by one end thereof to said load.

7. An apparatus constructed, arranged and operable substantially as hereinbefore described with reference to and as illustrated in Figures 1 to 3 or Figure 4 or Figures 9 to 11 of the accompanying diagrammatic drawings.

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Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1980.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.

1579540 COMPLETE SPECIFICATION

6 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

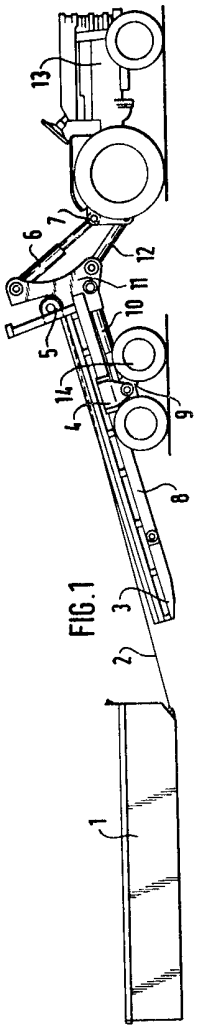

FIG.1

1579540 COMPLETE SPECIFICATION
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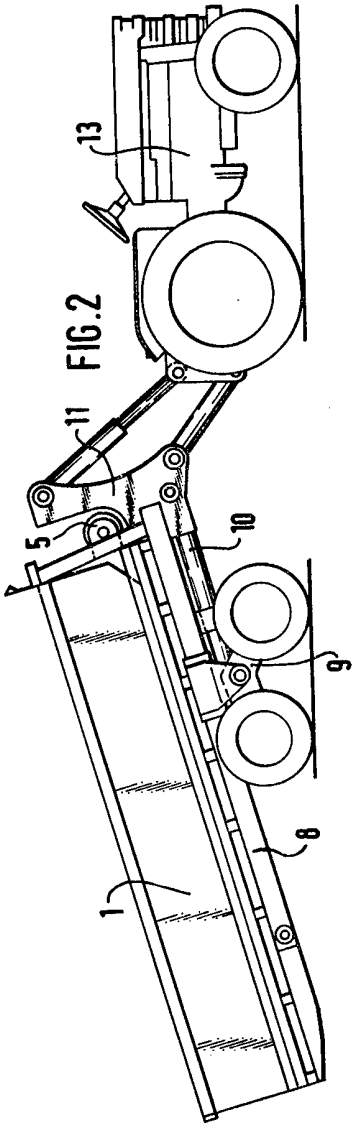

FIG.2

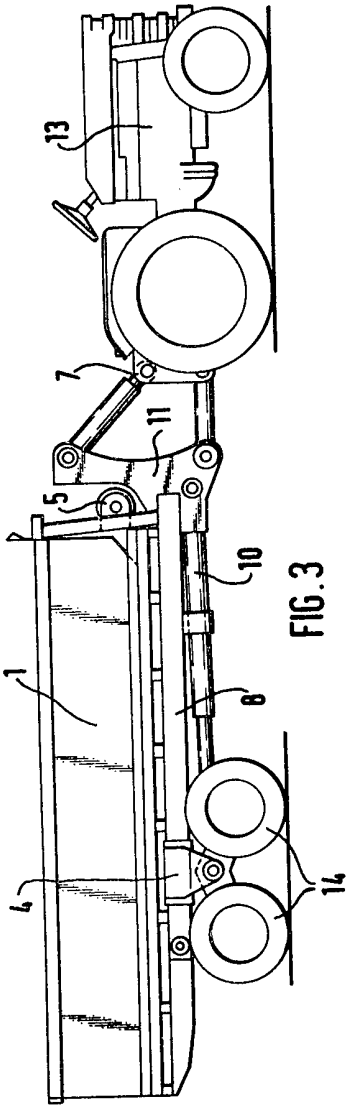

FIG.3

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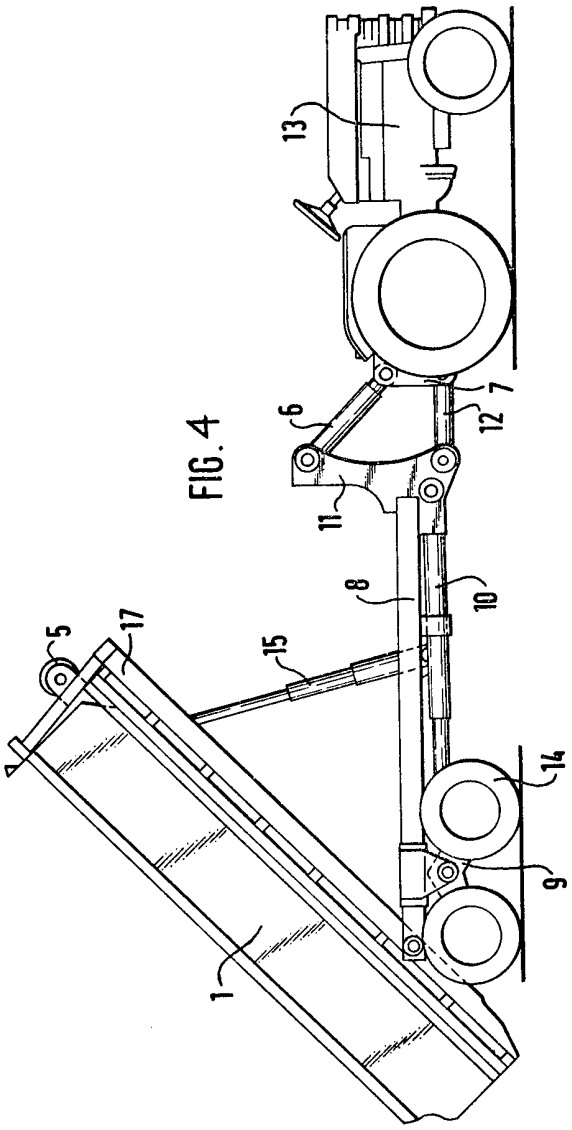

FIG. 4

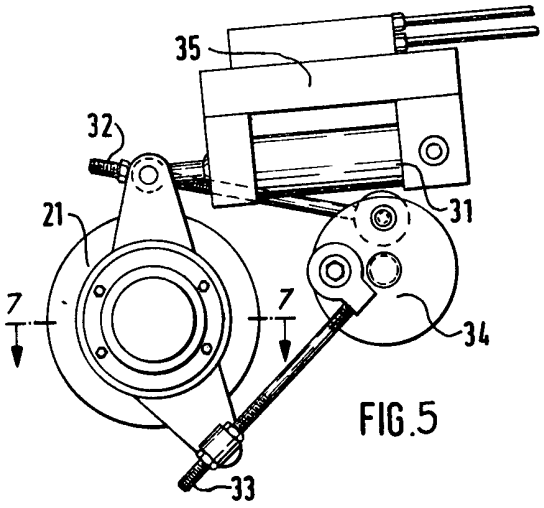

FIG.5

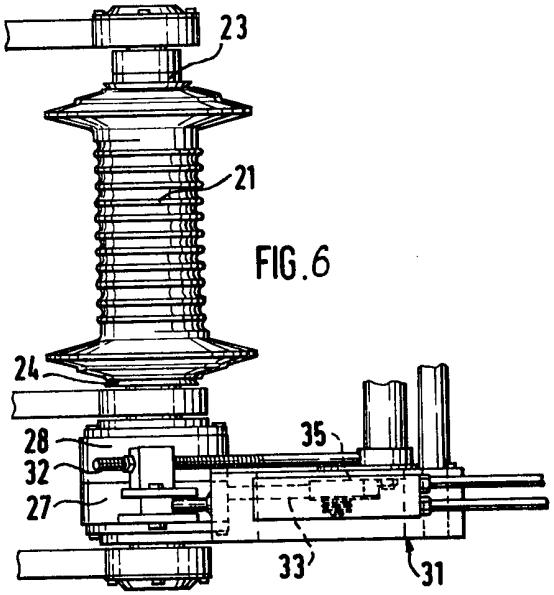

FIG.6

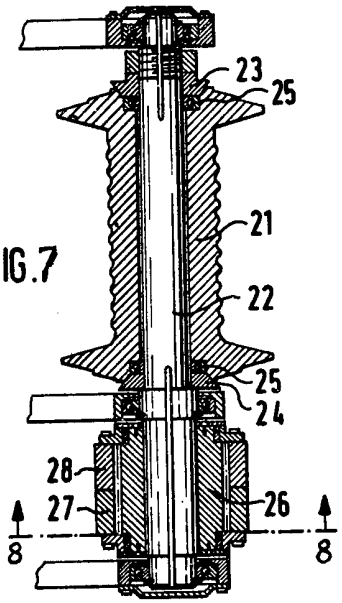

FIG.7

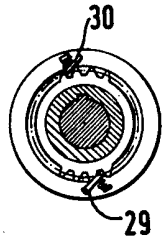

FIG.8

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Sheet 6