APPARATUS CONNECTABLE TO A TRAILER

The invention relates to an apparatus connectable to a trailer, by means of which apparatus the rear end of the trailer is shifted sideways. The trailer comprises a raising and lowering device for raising and lowering the rear end of the trailer, and a transmission device for shifting the rear bogie of the trailer from the rear end of the trailer to the front end thereof and back. The apparatus comprises a gear wheel assembly (5) and a hauling device (6), which gear wheel assembly (5) is arranged transversally at the rear end of the trailer (2), and to the support of which gear wheel assembly (5) the rear end of the trailer can be brought by means of the hauling device (6) in order to perform the transversal shift. According to the invention, the gear wheel assembly (5) comprises two wheels (5a, 5b) located at a distance from each other, and in the immediate vicinity of the wheels (5a, 5b) of the gear wheel assembly there is provided a hydraulic motor (9; 9a, 9b) which serves as a power unit for carrying out the transversal shift.

* See back of page
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APPARATUS CONNECTABLE TO A TRAILER

The present invention relates to an apparatus, defined in the introductory section of patent claim 1, which is connectable to a trailer.

In the prior art there are known, from the patent publications FI 57718 and US 3,303,950, arrangements for transporting loads, particularly containers. In these arrangements, the trailer comprises a raising and lowering device for raising and lowering the rear end of the trailer, and shifting equipment for shifting the rear bogie of the trailer from the rear end of the trailer to the front end and back.

While loading a container or corresponding load, the rear end of the trailer is supported, by means of a raising and lowering device, against the ground, and the rear bogie of the trailer is shifted from the rear end to the front end of the trailer, whereafter the rear end of the trailer is lowered, by means of the raising and lowering device, to the ground level, and the load is pulled to the support of the trailer. When the load is supported by the trailer, the rear end of the trailer is again lifted, by means of the raising and lowering device, to the upper position, and the rear bogie is shifted from the front end of the trailer back to the rear end and locked into place. When the raising and lowering device is brought to the rest position, the trailer and the connected the tractor are ready for transport. The unloading of the trailer is carried out in a corresponding fashion, in reversed order.

The problem with the above mentioned devices is that the trailer and the container or corresponding load must be placed successively and in an at least roughly parallel direction while the container is being loaded on the trailer. Thus the driver of the tractor-trailer combination must be a highly skilled profes-
sional. Still the manoeuvring of the vehicle combination in narrow spaces may cause problems.

Yet another problem with the known arrangements is that while loading a container or other similar load on a trailer, the rear end of the said trailer must be placed exactly at the front end of the container, in order to fasten the container without trouble to the hauling apparatus of the trailer winch, which hauling apparatus pulls the container to the support of the trailer. The arrangements described in the above mentioned publications do not include specification of any kind of auxiliary means for carrying out this transversal shift.

In the prior art there is known, from the Finnish patent publication 77,187, an apparatus for load-carrying vehicles, particularly for semi-trailers, where the transversal shift for the trailer is arranged by means of supporting jacks.

The problem with this apparatus is that the jacks have a special structure. They are provided with horizontal hydraulic cylinders in order to perform the transversal shift.

Another problem is that the transversal movement is limited; the rear end of the trailer can be shifted in the transversal direction only as much as the jacks allow.

Yet another problem is that the double-function jacks, whereby both the raising and lowering operations, as well as the sideways shift are carried out, are fairly complex in structure and expensive to manufacture.

Yet another problem is that the horizontal parts of the jacks are subjected to bending strain. Consequently the structure of the horizontal parts must be made extremely solid, which increases the weight of the jacks.

Another further problem is that while unload-
ing, the sideways shift cannot be used; the bending strain directed to the jacks would in that case be very strong, and this would require an extremely sturdy and heavy jack structure.

The object of the present invention is to eliminate the above mentioned drawbacks.

The apparatus of the present invention is characterized by the novel features enlisted in the patent claim 1.

The apparatus of the present invention, connectable to a trailer, by means of which apparatus the rear end of the trailer is shifted sideways, the said trailer comprising a raising and lowering device for raising and lowering the rear end of the trailer, and shifting equipment for shifting the rear bogie of the trailer from the rear end of the trailer to the front end thereof and back, comprises a gear wheel assembly and a hauling device, which gear wheel assembly is adjusted transversally at the rear end of the trailer, and to the support of which gear wheel assembly the rear end of the trailer can be brought by means of the hauling device in order to carry out the transversal shift. According to the invention, the gear wheel assembly comprises at least two wheels, rollers or similar members at a distance from each other; and that in the immediate vicinity of at least one wheel or like member of the gear wheel assembly there is provided a hydraulic motor which serves as the first power unit for carrying out the sideways shift.

Here the gear wheel arrangement means one or several devices comprising an endless circular outer member and an axis or inner member, around which the outer member can be rotated. The transversal adjustment of the gear wheel arrangement means that the rotating direction of the gear wheel arrangement is arranged vertically or at least roughly vertically to the longitudinal direction of the trailer, and generally to
the normal transport direction (forward, backward) of the trailer.

The hauling device of the apparatus of the invention may be for instance a hydraulic, pneumatic or mechanical device, which is adjusted in between the trailer chassis and the gear wheel assembly, in order to move the gear wheel assembly mainly in the vertical direction.

In a preferred embodiment of the apparatus, around the drive shaft of the hydraulic motor, there is fitted an annular member forming a wheel of the gear wheel assembly. Thus the hydraulic motor and the wheel of the gear wheel assembly form a uniform structure.

In another preferred embodiment of the apparatus, the hauling device includes a lever arm, whereinto the wheels or like members of the gear wheel assembly, as well as the hydraulic motor, are fastened, and which lever arm is turnably fastened to the rear end of the trailer, and a second power unit whereby the lever arm is manipulated in order to raise the rear end of the trailer to the support of the gear wheel arrangement, for performing the shift.

In yet another preferred embodiment of the apparatus, the second power unit is at least one pressure fluid cylinder, which is attached in between the rear end of the trailer and the lever arm, and to the lever arm, at a point which is located at a distance from the lever arm, above the turning axis of the lever arm.

In another preferred embodiment of the apparatus, the gear wheel arrangement is fitted in the bevelled part of the rear end of the trailer.

In another preferred embodiment of the apparatus the wheels, rollers or similar parts are interconnected by means of a shifting member, such as a caterpillar band or similar arrangement.

An advantage of the invention is that the
apparatus is simple, takes up little space and is easy to operate.

Another advantage of the invention is that the apparatus can be placed at the very end of the trailer, in which case the adjusting of the rear end of the trailer becomes even easier.

Furthermore, owing to the invention the sideways shift can be carried out irrespective of the raising and lowering device; the rear end of the trailer is raised to the support of the gear wheel arrangement when it is desired to shift the rear end of the trailer transversally.

Furthermore, the invention allows for the shifting of the rear end of the trailer both empty and loaded; thus the apparatus can be utilized both while loading and unloading the trailer.

Yet another advantage of the invention is that the range of the sideways shift is not limited; the rear end of the trailer can be shifted around the support point of the front end in a relatively large angle.

Moreover, owing to the invention the apparatus can be controlled and operated from the rear end of the trailer, in which case the adjusting of the trailer and the load in the sideways direction during the loading step is simple.

In the following the invention is explained in more detail with reference to the appended drawings, where

figure 1 illustrates a partial cross-section of the rear end of the trailer, where the apparatus of the invention is attached;

figure 2 is a top-view illustration of the rear end of the trailer of figure 1;

figure 3 is a schematical and enlarged side--view illustration of the apparatus of the invention; and

figure 4 is a schematical top-view illustration
of the apparatus of the invention.

In figures 1 and 2, the apparatus 1 of the invention is arranged in connection with a trailer 2. It is placed behind the bogie 3 of the trailer 2 at the rear end of the trailer, in this case in the bevelled part 2a of the rear end. The trailer 2 comprises a raising and lowering device 4 for raising and lowering the rear end of the trailer 2. Moreover, the trailer 2 comprises transmission means (not illustrated in the drawings) for shifting the rear bogie 3 of the trailer from the rear end of the trailer 2 to its front end and back. The shifting equipment is formed for instance of a hydraulic motor and conductors provided in the trailer chassis, by means of which conductors the bogie 3 can be shifted.

The raising and lowering devices for trailers as well as the shifting equipment are introduced for instance in the patent publications FI 57,718 and US 3,303,950.

In the embodiment of the drawings, the apparatus of the invention comprises a gear wheel assembly 5, which is arranged transversally at the rear end of the trailer, in this case in the bevelled part 2a thereof. The rotating direction of the gear wheel arrangement 5 is mainly vertical to the lengthwise direction of the trailer and to the central axis A-A. The hauling device 6 is connected to the gear wheel assembly 5. The hauling device 6 includes a lever arm 7 and a hydraulic cylinder 8.

In this case the gear wheel assembly 5 comprises two wheels located at intervals from each other, or two rollers or other similar members 5a, 5b. They are placed symmetrically at the rear end of the trailer, on both sides of the central axis A-A thereof. The wheels or like members 5a, 5b can, when necessary, be connected to each other by means of a shifting device 18 (marked in dotted lines in figure 4), such as a
caterpillar chain or other such member.

Both wheels of the gear wheel assembly or the roller 5a, 5b are in this case formed by means of the hydraulic motor 9; 9a, 9b. Around the drive shaft of the hydraulic motor 9, there is fitted an annular member 10; 10a, 10b, which serves as a casing and as a bearing member of the gear wheel assembly. The hydraulic motors 9; 9a, 9b serve as the first power unit for rotating the gear wheel assembly 5.

The lever arm 7 of the hauling device 6 is formed of first support members 7a, 7b, an axis 7c and of a second support member 7d. The hydraulic motors 9 and the annular members 10 are fastened to the axis 7c by means of the support members 7a, 7b. The axis 7c in turn is turnably attached to the trailer chassis, in this case in between the frame beams 2b, 2c. The second support member 7d is fastened to the axis 7c, in between the first support members 7a, 7b. The second power unit, i.e. the hydraulic cylinder 8, is attached in between the second support member 7d and the trailer, in this case in between the second support member 7d and the bracket 12 of the transversal beam 11.

Most advantageously the hydraulic cylinder 8 is attached in between the trailer beam 11 and the lever arm 6 so that the fastening point 13 of the second support member 7d of the lever arm 7 of the hydraulic cylinder 8 is located at the distance a, above the turning axis 7c of the lever arm 7. The distance a is shorter than the length b of the lever arm which is formed by the second support member 7d and the gear wheel arrangement 5. Advantageously a:b is 1:2 or smaller. By choosing the distance a suitably, the length of the cylinder 8 and the working length and trajectory of the piston thereof remain relatively small and are thus easy to control. In this arrangement, the lever arm formed by the fastening point 13 and the turning axis 7c affects by maximum torque the gear wheel
assembly 5 while lifting the rear end of the trailer off the ground, to the support of the gear wheel assembly 5.

The operation of the apparatus of the invention is explained as follows. Let us presume that a container is desired to load to the support of the trailer 2. In that case the trailer is backed to in front of the container, so that the rear end of the trailer, in this case its bevelled part 2a, is as near as possible to the shorter side of the container, and the trailer and the container are in a position as parallel as possible. Thereafter the strut members 14 (figure 2) of the raising and lowering device 4 located at the rear end of the trailer 2 are lowered down to the ground by means of the hydraulic cylinders 15 provided in the strut members. When the rear end of the trailer has been brought to the support of the strut members 14, the bogie 3 of the trailer is shifted, by means of the transmission device, to the front end of the trailer, wherein the rear end of the trailer can be further lowered, by means of the said raising and lowering device 4, to rest against the ground. Now the rear end of the trailer is near to the bottom edge of the shorter side of the container. However, at this stage it is often found out that the rear end of the trailer is not transversally at exactly the same spot as the shorter side of the container. Thus the rear end of the trailer must be moved sideways so that the edges of the trailer and container meet. This is necessary in cases where separate loading or winch arrangements are used in the trailer in order to bring the container to the support of the trailer. One such loading or winch arrangement is introduced in the patent publication FI 60,829.

The transversal shifting of the trailer is carried out by means of the apparatus of the invention so that pressure fluid is conducted to the hydraulic cylinder 8, in which case the cylinder piston moves out
and turns the lever arrangement 7 by means of the second support member 7d from the pont 13 to the direction B, figure 3, in which case the axis 7c of the lever arm is
turned and turns, by intermediation of the support members 7a, 7b, the gear wheel assembly 5 downwards to the direction C, so that the wheels 5a, 5b meet the
ground level 17 below the rear end of the trailer and
lift the rear end of the trailer to the support of the
gear wheel assembly 5. Thereafter the power units of
the gear wheel assembly 5 are switched on, the said
power units in this case being the hydraulic motors 9;
9a, 9b, which are made to rotate so that the rear end of
the trailer moves in the desired direction, for instance
D, until the desired position of the rear end is achieved,
and the hydraulic motors are switched off and the
gear wheel assembly 5 is lifted up. Thereafter the
locking member of the loading or winch device is fastened
to the bottom edge of the shorter side of the container,
and the loading operation proper can begin. As for the
operation and use of the loading and winch arrangement,
for instance the patent publication FI 60,829 is referred to.

By means of the loading and winch arrangement,
the container is generally hauled to the support of the
trailer 2 so that the rear end of the container remains
still, but the front end is lifted up while the rear
end of the trailer is pushed under the container. This
is continued until the whole trailer has in a way been
backed away under the container.

If during the loading operation it is found
out that the container is inclined with respect to the
trailer chassis, the position of the container can be
straightened by means of the apparatus of the invention,
by lowering the gear wheel assembly 5 by means of
the hauling device 6 to against the ground, and by then
manipulating the gear wheel assembly so that it is
shifted to the desired direction in order to straighten
the load and the trailer so that they become parallel.

In similar fashion, the apparatus of the present invention can also be used while unloading. When the rear end of the trailer is lowered against the ground, and it is for example observed that the load must be shifted sideways in order to bring it to the desired spot, the gear wheel assembly 5 can again be lowered, by means of the hauling device 6, against the ground, and the rear end of the trailer can be shifted.

It is pointed out that if it is necessary to shift the trailer sideways, this can be carried out by means of the tractor, in the support of the bogies 16 provided in connection with the strut members 14 of the raising and hauling device 4.

The invention is not limited to the above described preferred embodiments exclusively, but many modifications therein are possible within the inventional idea defined in the appended patent claims.
PATENT CLAIMS

1. An apparatus connectable to a trailer, by means of which apparatus the rear end of a trailer is shifted sideways, which trailer (2) comprises a raising and lowering device (4) for raising and lowering the rear end of the trailer, and shifting equipment for shifting the rear bogie (3) of the trailer from the rear end of the trailer to the front end thereof and back, which apparatus (1) comprises a gear wheel assembly (5) and hauling device (6), which gear wheel assembly (5) is adjusted transversally at the rear end of the trailer (2), and to the support of which gear wheel assembly (5) the rear end of the trailer (2) can be brought by means of the hauling apparatus (6) in order to carry out the sideways shift, characterized in that the gear wheel assembly (5) includes at least two wheels, rollers or similar members (5a, 5b) located at a distance from each other; and that in the immediate vicinity of at least one wheel or like member (5a, 5b) of the gear wheel assembly, there is a hydraulic motor (9; 9a, 9b) serving as the first power unit in order to carry out the sideways shift.

2. The apparatus of claim 1, characterized in that around the drive shaft of the hydraulic motor (9; 9a, 9b) there is fitted an annular member (10; 10a, 10b), which forms a wheel (5a, 5b) of the gear wheel assembly.

3. The apparatus of claim 1 or 2, characterized in that the hauling device (6) comprises a lever arm (7), whereby the wheels or like members (5a, 5b) of the gear wheel assembly (5) and the hydraulic motor (9; 9a, 9b) are attached, and which lever arm (7) is turnably fastened at the rear end of the trailer (2), and a second power unit whereby the lever arm (7) is manipulated in order raise the rear end of the trailer (2) to the support of the gear wheel
assembly (5) in order to carry out the shift.

4. The apparatus of claim 3, characterized in that the second power unit is at least one pressure fluid cylinder (8), which is attached between the rear end of the trailer and the lever arm (7) and to the lever arm (7) at a point (13) located at a distance (a) above the drive shaft (7c) of the lever arm (7).

5. The apparatus of claim 3 or 4, characterized in that the gear wheel arrangement (5) is arranged in the bevelled part (2a) of the trailer (2).

6. The apparatus of claim 1 or 2, characterized in that the wheels, rollers or like members of the gear wheel assembly (5) are interconnected by means of a shifting device (18) such as caterpillar band or other similar member.
**INTERNATIONAL SEARCH REPORT**

**International Application No** PCT/FI 90/00139

**I. CLASSIFICATION OF SUBJECT MATTER**

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: B 60 P 1/43, 1/64, B 60 S 9/215

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**SE, DK, FI, NO classes as above**

**III. DOCUMENTS CONSIDERED TO BE RELEVANT**

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**IV. CERTIFICATION**

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Ake Carlsson
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