March 1, 1966 G. HEIGL 3,237,781

OUTRIGGER COUNTERBALANCE FOR CRANES

Filed April 23, 1964 3 Sheets-Sheet 1

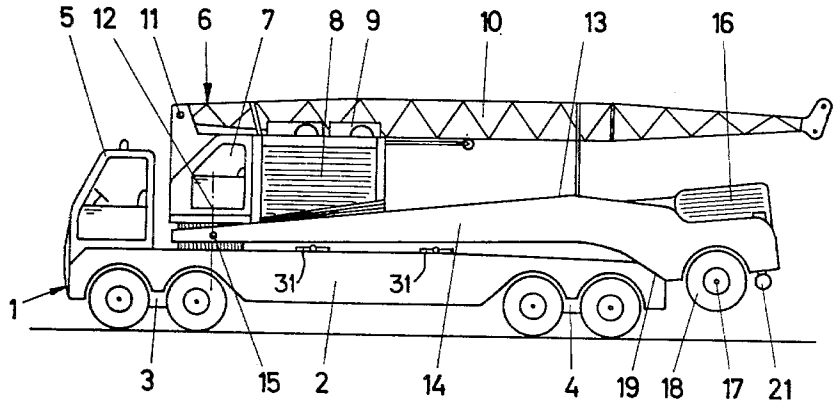


Fig. 1

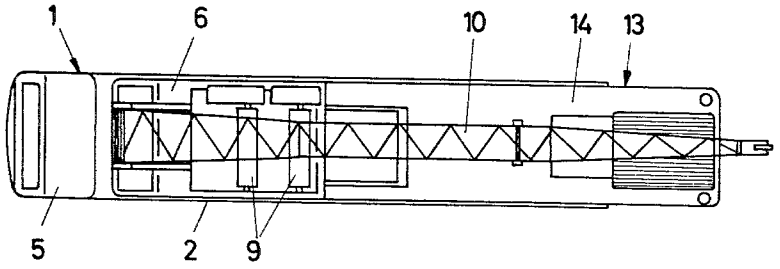


Fig. 2

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Fig. 3

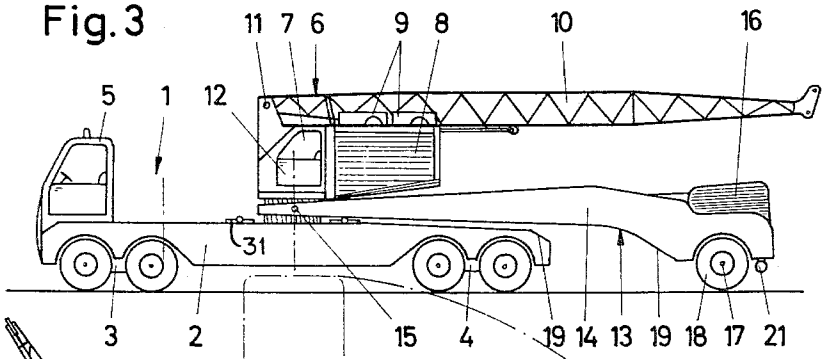
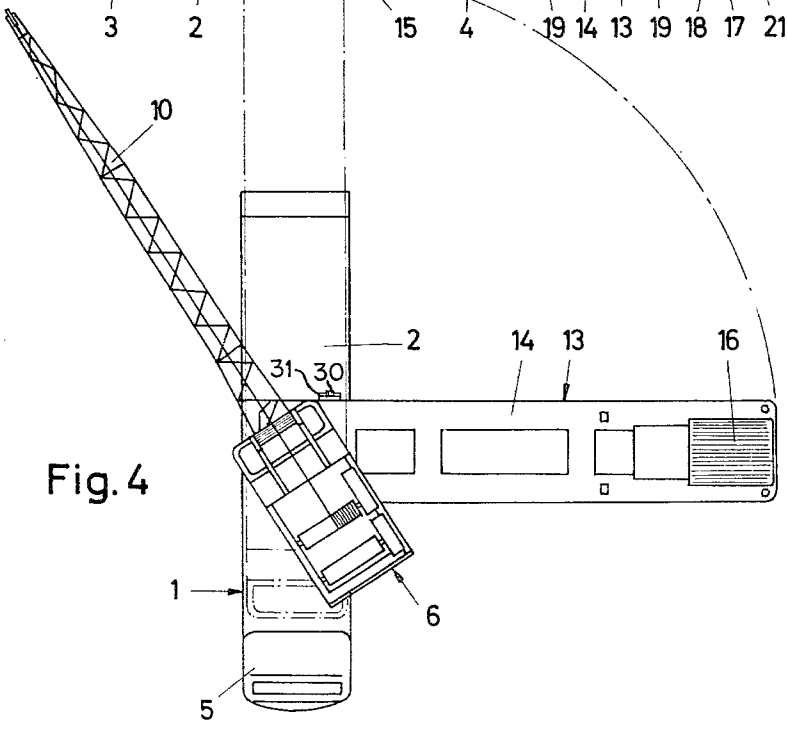


Fig. 4



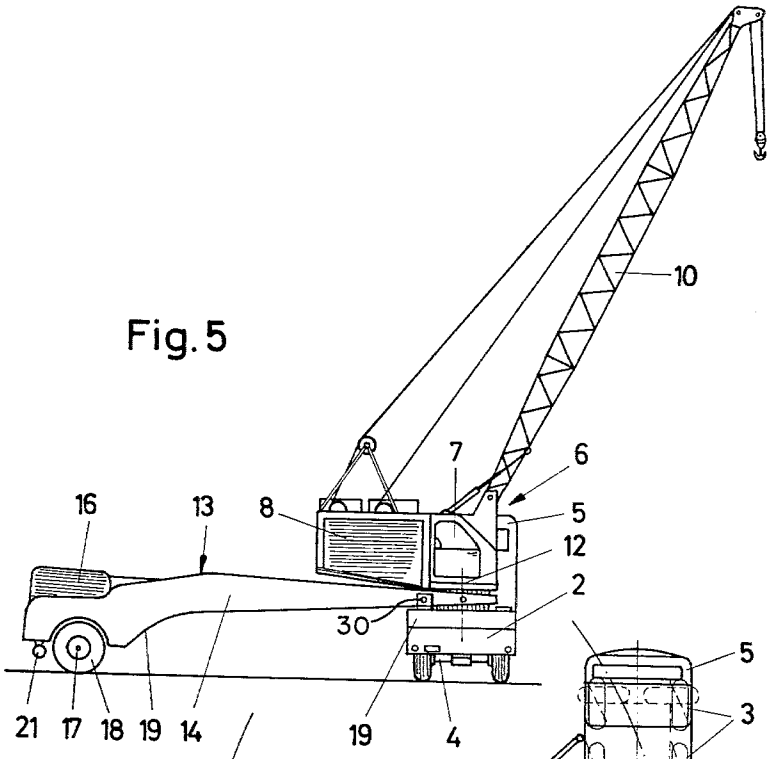
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Fig. 5



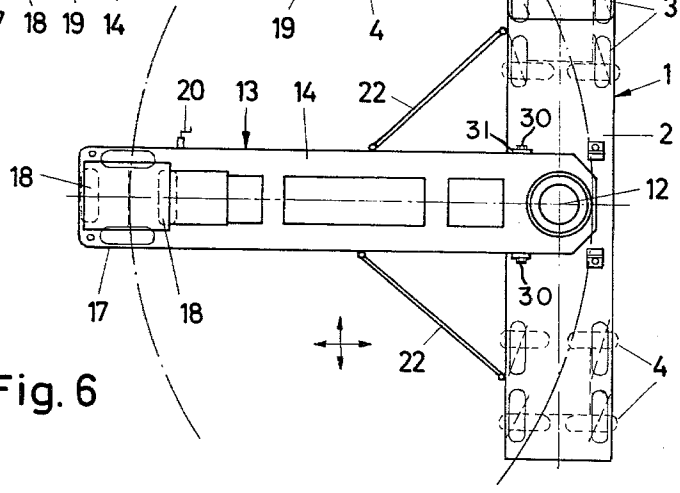


Fig. 6

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OUTRIGGER COUNTERBALANCE FOR CRANES

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8 Claims. (Cl. 212—49)

This invention relates to a vehicle crane having a crane base that is located revolvably on the load platform of a vehicle, particularly a self-propelled one including front and rear axle assemblies, to which base is joined a crane tower and/or crane boom. The invention more particularly relates to a vehicle crane of the type described including a counterweight arm which is retracted during transportation and which in work position extends transversely from the load platform and also is secured against a displacement in a vertical direction relative to the load platform, with its outer end bearing a counterweight.

The efficiency of such, a vehicle crane, i.e., its lifting power at a certain maximal extension, is limited by its stability. The counterweight on the counterweight arm is supposed to compensate, at least to some extent, for the toppling moment originating with the load and transferred by the boom and thus increase the stability. The counter force attainable with the counterweight depends on the length of the counterweight arm.

In a known vehicle crane of the above-described kind, the counterweight arm is comprised of telescoping parts and located on the crane base. The counterweight is attached to the extended counterweight arm by means of an auxiliary crane. The maximal length of the counterweight arm is only approximately half the length of the vehicle frame, so that the attainable counter force remains small. A longer construction is out of the question for the reason that the telescoping parts would have too great a diameter. In addition, it is not possible to attain a longer construction with telescoping parts because of the danger of jamming the individual telescoping parts. Another disadvantage of this known vehicle crane lies in the necessity of providing an auxiliary crane, since the counterweight can no longer remain on the counterweight arm after it is retracted. The counterweight arm of the known vehicle crane, when in work position, constitutes a crane supporter which continuously transfers a counterforce of constant size to the vehicle. The magnitude of the usable counterweight is also limited by the fact that in the case of a toppling moment being reduced to zero the counter moment should not be too great. At any rate, it is necessary to provide in addition adjustable supporting brackets which support the vehicle when in work position, so that a movement of the vehicle is impossible in these conditions.

A portable crane is also known where the crane itself is constructed as a one-axle trailer which is supported against the ground by telescope-like supporting legs. The crane is equipped with an arm which at its free end is connected with an also one-axle saddle tractor by means of a revolvable bed. When the vehicle is to be transported, the legs are pulled in so that the crane and the tractor represent an ordinary two-axle tractor-trailer arrangement. In the work position of the crane, the supporting legs are extended to the point where the tractor is lifted up and suspended from the arm of the crane to constitute a counterweight. In this known crane, the counterweight formed by the tractor must be so constituted that the unengaged crane cannot topple under the weight of the counterweight. This limits the size of the counterweight. Also the crane cannot be moved when in work position

because of the supporting legs resting on the ground. Finally, the stability of this crane is in the last analysis determined by the length of the arms to which the telescope supporting legs are attached. Because of the permissible width of the street vehicle, these arms cannot be too wide. The above-described crane is furthermore of a complicated and expensive special kind of construction.

A crane vehicle is also known where the crane base resting revolvably on the load platform is extended beyond the load platform. The extended section is supported against the ground by an adjustable wheel arrangement and contains a counterweight. The length of the lever arm on which the counterweight operates is here relatively small. The decisive disadvantage of this type of vehicle consists of the fact that the part carrying the counterweight is joined to the crane base and thus must participate in its movements. This means that the swivel angle of the crane base will be restricted, because the extended part of the crane base cannot be swung over the load platform, because the downwardly projecting wheel arrangement would interfere with the load platform. In addition, there is a considerable increase in the total length of the vehicle during the transport by virtue of the sector of the crane base projecting toward the rear.

In another known vehicle crane, a non-revolving gallows-like crane tower rises from the rear end of the load platform. Joined around a horizontal axis at the front end of the vehicle is a pivotable counterweight which is connected with the top of the crane tower by means of cables and is supported against the ground by a wheel arrangement when idle. In its working position, the counterweight is lifted from the ground. This vehicle crane does not have a revolving crane base, which means that it can be used substantially only for dragging-off operations. If the load is not sufficient to lift the counterweight, the latter influences the handling of the vehicle unfavorably, because it can be swung merely around a horizontal axis, but cannot be steered in the manner of a pulling-pole-vehicle. Also, such a counterweight projecting forwardly from the vehicle can be very disturbing because of the great length of the vehicle and because it affects the view toward the front very unfavorably.

A revolving railroad crane is also known. This portable crane, when in transport position, pulls a counterweight in form of a one-axle trailer after it. In work position, the counterweight trailer is flapped up and joined solidly with the crane base. In this case, the length of the counter arm is extraordinarily small. Also, the counterweight constantly creates a counter moment which should not be too great. Supporting brackets are provided for the railroad crane also, which in work position are extended and prevent any movement of the crane.

Finally, in all kinds of cranes, supporting arms are provided which can be extended from the load platform transversely to the longitudinal axis of the vehicle. These arms are equipped at their free ends with support legs which in work position rest on the ground. These arms can be made no longer than the load platform is wide. Also, the disadvantage that the crane cannot be moved when under load is again present.

Lastly, a vehicle crane is known having a frame to which it is possible to attach additional bridge segments which extend sideways therefrom. Such segments act as counterweights and form additional supports for the crane base. However, the distance of the centers of gravity of these segments from the vehicle frame is relatively small. Also, these segments must be transported separately from the remainder of the vehicle crane.

In the case of cranes movable on tracks, it is also possible to make the crane base longitudinally movable with respect to the vehicle frame.

It is the purpose of the present invention to equip a vehicle crane of the type described with a long counterweight arm which makes possible a great increase in crane load capacity. The invention accomplishes this by constructing the counterweight arm as a pull bar vehicle or trailer whose bar rests in transport position in longitudinal alignment with and over a considerable part of the load platform and is pivotably connected to the load platform for movement about a vertical axis therethrough. In work position, the portion of the arm including the counterweight rests on the ground by means of a known wheel arrangement.

The counterweight arm may be made of considerable length since the length of the trailer is limited only by the length of the load platform. Actually it would be possible to make the trailer even longer than the length of the load platform. The length of the trailer would be limited only by the length limitation for vehicles in street traffic. In the work position of the vehicle crane, the trailer extends transversely from the load platform and rests with its outboard end on the ground. Thus, on the one hand a great counter moment can be attained, but on the other hand there is no danger that the counter moment is greater than the toppling moment in the case of lack of load. When the load is moved to that side of the vehicle turned toward the trailer, the latter forms a support against the ground, with its wheel assembly together with the two-axle assemblies of the vehicles constituting a stable three-point arrangement. This means that special support arms which if present would prevent the vehicle from being moved while in work position are no longer necessary.

According to additional construction details of the present invention, the trailer can be bedded on the load platform in such a manner that the wheels of the trailer in transport position do not touch the ground. Also, the means fixing the pivot end of the trailer to the vehicle may be set to allow pivotal movement of the trailer about a horizontal axis.

In this construction the trailer can be pulled completely onto the load platform so that the maneuverability of the vehicle crane is not handicapped in any manner.

The crane base is furthermore resting in a known manner on the load platform and can be moved in longitudinally of the vehicle, i.e., from a transport position, where the center of gravity of the crane base lies closer to the front axle assembly than to the rear axle assembly, into a work position, where the center of gravity is approximately in the middle between the two axle assemblies of the vehicle, and vice versa, and the pivoted end of the trailer is connected with the crane base.

Thus, in a preferred embodiment of the invention, when the construction is in transport position, the center of gravity of the crane base is closer to the front axle assembly, so that said front axle assembly bears a greater part of the crane weight than the rear axle assembly. However, since the trailer simultaneously rests with the counterweight on the load platform and since the counterweight is behind the rear axle assembly, an approximately uniform distribution of axle loading results. In the work position, when the counterweight does not bear down upon the axle assemblies of the vehicle, the crane base will be approximately in the middle between the axle assemblies, so that said axle assemblies are again subjected to an approximately uniform load. The shiftability of the crane base also has the advantage that in spite of a relatively long load platform which guarantees a good stability under load, the total length of the vehicle in transport position is not too great.

The wheel assembly of the trailer can be steered and driven in a known manner. Furthermore, the vehicle front and the rear axle assemblies, respectively, can also be driven or steered in a familiar manner. Thus the trailer as well as the crane vehicle can easily be maneuvered into position with regard to each other. In addition, it will be possible to move the crane while in work position and under load as may be desirable.

So that the counterweight is not formed by dead ballast, it is contemplated that it constitute a generator for producing current to power the crane.

The drawings show a preferred embodiment of the invention.

In the drawings:

FIGURE 1 is a side elevational view of the vehicle crane according to the present invention in transport position.

FIGURE 2 is a top view of a vehicle crane according to FIGURE 1.

FIGURE 3 is a side elevational view of the vehicle crane in an intermediate position between transport and work positions.

FIGURE 4 is a top view of the crane in work position.

FIGURE 5 is a rear elevational view of the vehicle crane in work position.

FIGURE 6 is a top view of the vehicle crane of FIGURE 5.

In the particular embodiment shown in the drawings, **1** constitutes a self-propelled vehicle with load platform **2**. Platform **2** rests upon front axle assembly **3** and rear axle assembly **4**. The number of axles may vary. Both axle assemblies may be steerable and driveable. The cab of vehicle **1** is indicated as **5**. Resting upon load platform **2** is a crane base **6** of the usual kind, which in the example includes crane operator cab **7**, ballast **8** and pulleys **9**. Joined to the crane base, swivelable around horizontal axis **11**, is crane boom **10**. Instead of a boom, a crane tower with or without boom or a boom with one or several auxiliary booms could be provided. It is not of importance for the invention how the crane base, the crane tower or crane boom, respectively, are constructed. With respect to load platform **2**, the crane base can be turned around vertical axis **12**, perhaps by means of a ball turn connection not shown. In addition, a counterweight arm is provided which according to the present invention is constructed as trailer **13**. Trailer **13** is equipped with a bar **14** which is very stiff with regard to bending and torsion and whose length preferably approximately corresponds to the length of load platform **2**. Bar **14** is connected with the vehicle by means of horizontal swivel axis **15**. In the example illustrated axis **15** passes through the crane axis and therefore is rotatable around vertical axis **12**. At its free end, the trailer **13** carries a counterweight **16** which could function as a generator producing current to power the crane. Also, trailer **13** is equipped at its free end with an axle assembly **17** which bears wheels **18**.

In the transport position shown in FIGURES 1 and 2, the entire trailer **12** rests on load platform **2**. Axle assembly **17** of the trailer is raised so high the wheels **18** thereof do not touch the ground. The raising of the trailer **12** to load platform **2** can be eased by slanted slide surfaces **19** at the rear edge of vehicle platform **2**. These surfaces may be equipped with any convenient friction-reducing means not shown.

In the particular embodiment shown, crane base **6** can be shifted from its transport position according to FIGURES 1 and 2 into a work position according to FIGURES 3, 4 and 5, for which purpose it can be arranged on a carriage movable, for example, hydraulically or by cable pull along load platform **2**. In order to put the vehicle crane into a work position, the crane base **6** is shifted from its transport position close to the operator cab **5** towards the rear, with its center of gravity in the work position lying about in the center between the axle assemblies **3** and **4**. In the course of this shift, the trailer **13** connected with crane base **6** by means of horizontal swivel axis **15** is also shifted toward the rear, so that its wheels **18** touch the ground. This position is visible in FIGURE 3. Now vehicle **1** is maneuvered in

such a manner that load platform **2** extends perpendicular to trailer **13**. This position is visible in FIGURES 4 and 5. Maneuvering is especially easy if, as suggested in FIGURE 6, the wheels of the front and rear axle assemblies are steerable. Maneuvering can furthermore be facilitated by having axle assembly **17** of trailer **13** steerable. This can be done, for instance, by connecting axle assembly **17** with a pivot mounting which can be turned by hand crank **20** (FIGURE 6), if the trailer **13** is supported on spur wheel **21**.

Before boom **10** is put into work position and before loads are carried by it, bar **14** is rigidly connected to load platform **2** by bolts **30** which extend through brackets **31** which are hingedly mounted on said platform so that neither swivelling around horizontal axis **15** nor any axis perpendicular thereto is possible. A swiveling of bar **14** around vertical axis **12** may also be prevented by for example attaching bars **22**. The vehicle crane is now in work position.

FIGURE 6, where for reasons of clarity the crane base **6** has been omitted, indicates that upon turning axle assembly **17** into a position where wheels **18** are located as shown by the broken lines, a turning of the vehicle in the direction of the dot-line arcs is possible. The vehicle can also be moved longitudinally.

The crane according to the present invention can lift great loads at great distance because of the very long counterweight arm. Since the arm protrudes on only one side, the other side is completely free for working. This is completely satisfactory for ordinary crane operations.

The invention is based on the general idea to employ a counterweight arm which in a transport position stretches almost over the entire length of the vehicle and in a working position rests on the ground with that end which is away from the vehicle. Thus it is simultaneously a carrier of the counterweight and a support arm.

All features derived from the description and the drawings, including their construction details, and in desired combinations, can be essential for the invention.

What is claimed is:

1. A vehicle crane, comprising a crane base pivotally mounted on the load platform of a vehicle having front and rear axle assemblies, particularly a motor-driven vehicle, to which base is joined a crane tower and/or crane boom, and with a counterweight arm which in a transport position is generally parallel to the lengthwise extent of said load platform and in a work position extends transversely to said load platform, and which is then secured against movements in a vertical direction with respect to said load platform and at its outer end bears a counterweight, said counterweight arm comprising:

trailer means having a pull-bar pivotable around a vertical axis adjacent the inner end thereof, which trailer means in transport position rests upon and extends over the load platform to a considerable extent, said trailer means including a wheel assembly in the area of the counterweight which in the work position rests on the ground.

2. The vehicle crane defined in claim **1**, wherein said trailer means in its transport position completely rests upon said load platform in such a manner that the wheels of the trailer means do not touch the ground and including pivot means having a substantially horizontal axis affixed between said inner end of said trailer means and said load platform whereby said trailer means is pivotable about a horizontal axis with respect to the vehicle.

3. The vehicle crane defined in claim **1**, wherein the crane base is mounted on the load platform for movement longitudinally therealong between a transport position whereat the center of gravity thereof is closer to the front axle assembly than to the rear axle assembly and a working position whereat the center of gravity thereof is approximately equidistant between the front and rear axle assemblies, and that said inner end of the trailer means is connected with the crane base.

4. The vehicle crane defined in claim **1**, including means by which the wheel assembly of the trailer means can be steered.

5. The vehicle crane defined in claim **1**, including means by which the wheel assembly of the trailer means can be driven.

6. The vehicle crane defined in claim **1**, wherein the front and rear axle assemblies of the vehicle can be at least one of steered and driven.

7. The vehicle crane defined in claim **1**, wherein the counterweight is a generator for producing current to power the crane.

8. A crane construction, comprising:

a vehicle having ground-engaging members and an elongated load platform;

an upstanding crane base mounted on said load platform for pivotal movement with respect thereto about a vertical axis;

a crane structure mounted on said crane base and positioned above said load platform;

an elongated trailer and means pivotally connecting one end of said trailer to said crane base for pivotal movement about a horizontal axis, said trailer being positioned between said crane structure and said load platform and being adapted to extend generally parallel with the lengthwise extent of said load platform for support thereon during movement of said vehicle, said trailer having a counterweight adjacent its other end and ground-engaging members mounted on the underside of said trailer adjacent said other end whereby said ground-engaging members of said trailer can engage the ground when the trailer is moved to a position in which it extends transverse to said load platform.

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