

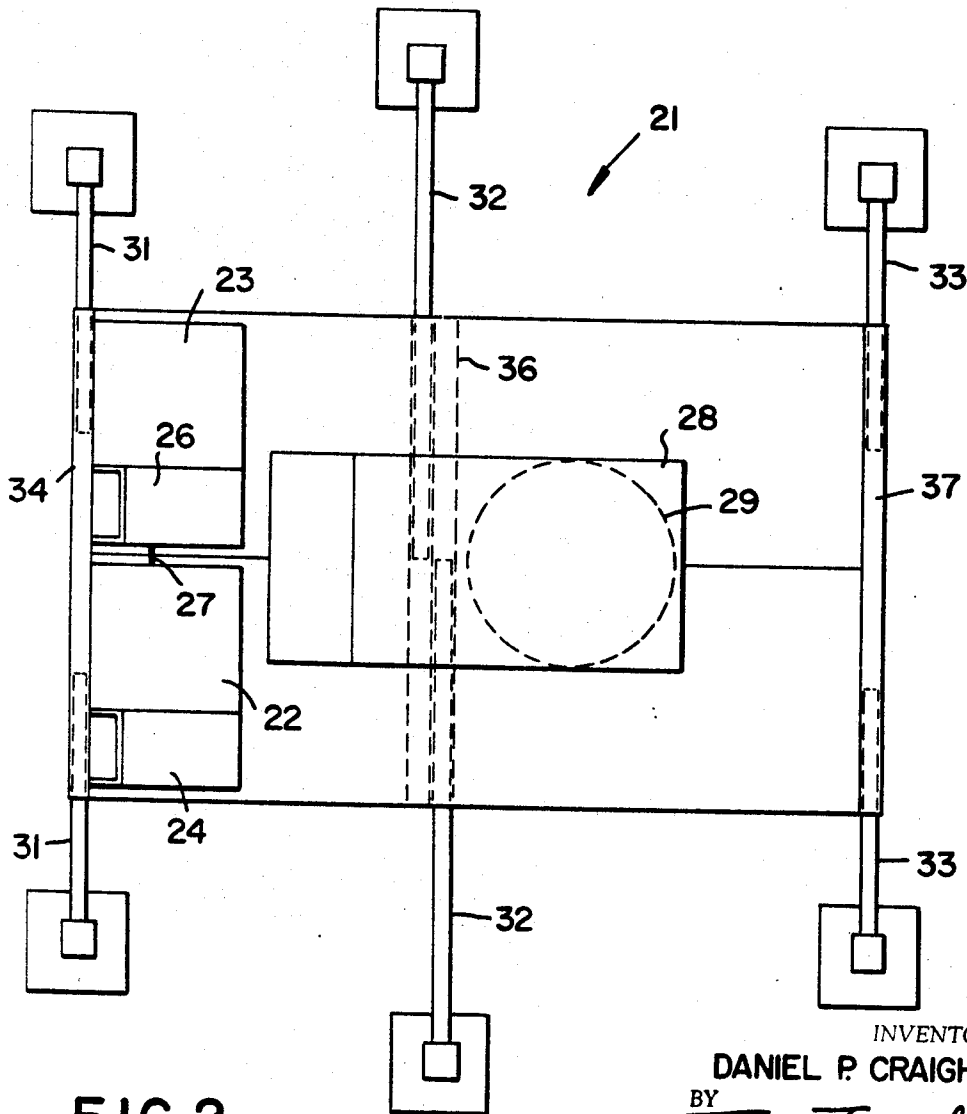
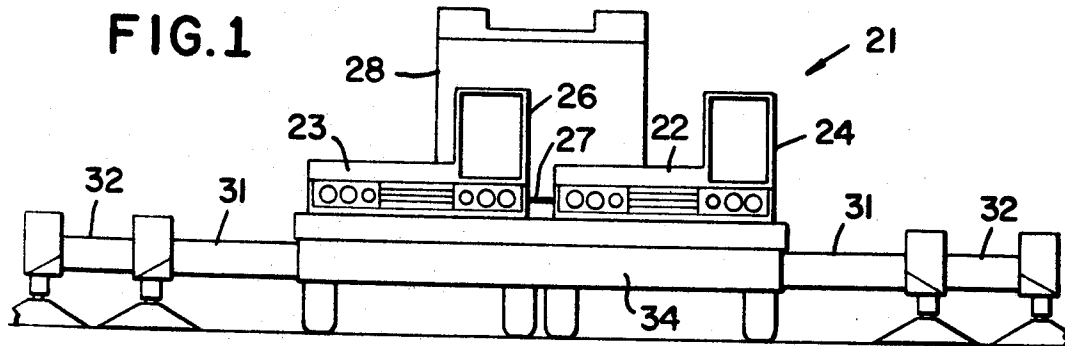
July 23, 1968

D. P. CRAIGHEAD
METHOD AND APPARATUS FOR CONSTRUCTING A LARGE
CAPACITY MOBILE CRANE

3,393,810

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3 Sheets-Sheet 1



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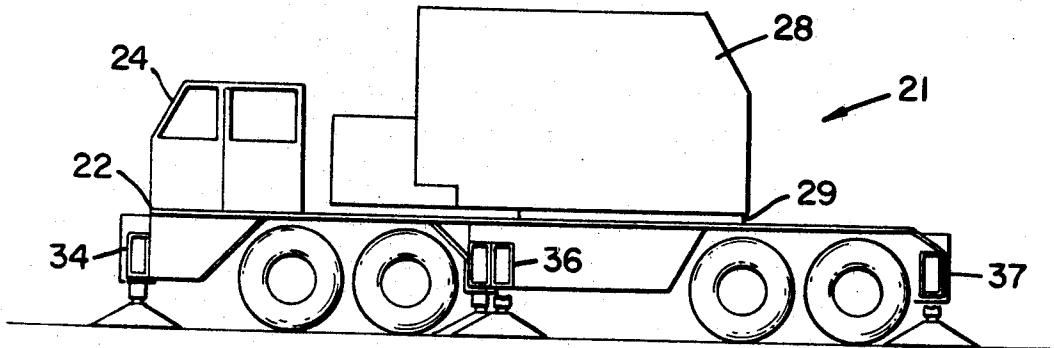


FIG. 3

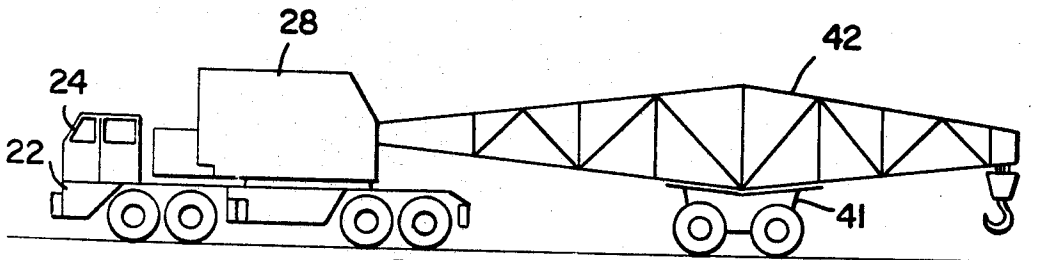


FIG. 4A

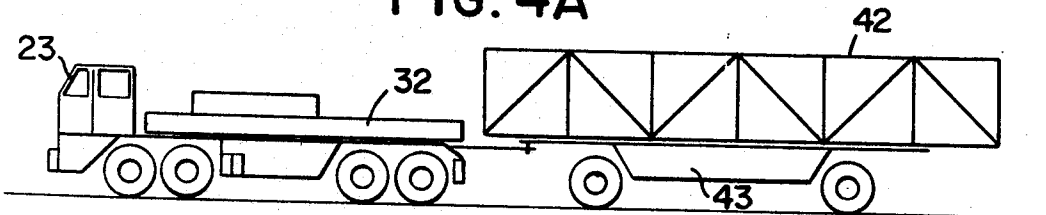


FIG. 4B

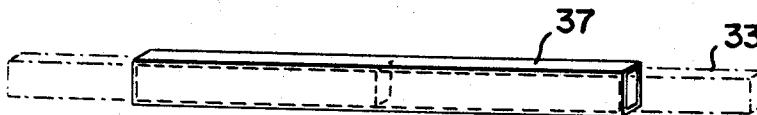


FIG. 5A

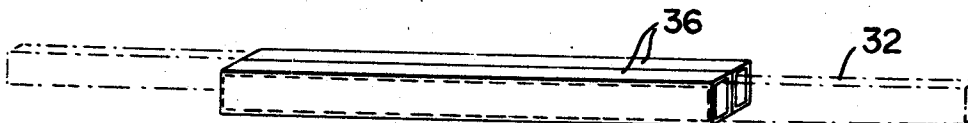


FIG. 5B

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METHOD AND APPARATUS FOR CONSTRUCTING A LARGE
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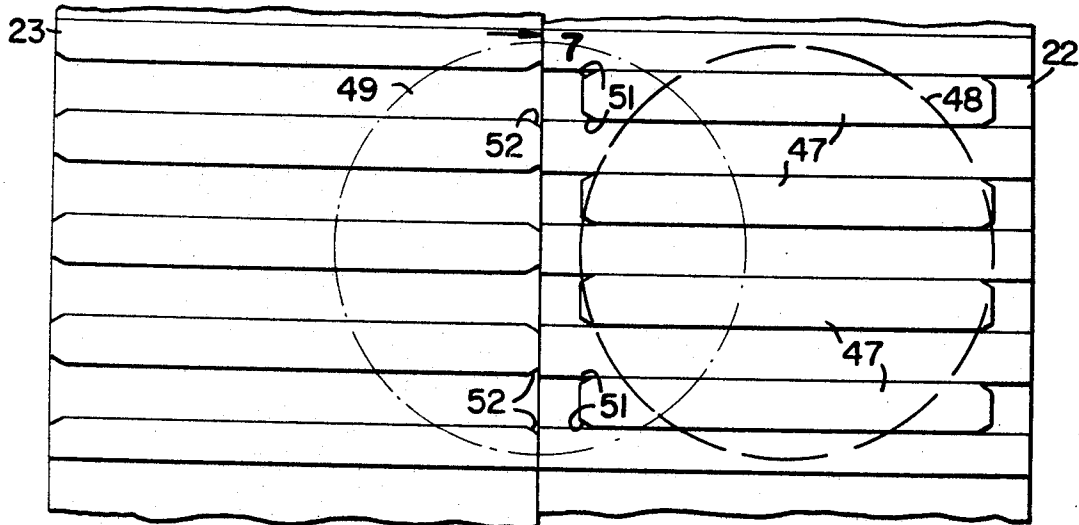


FIG. 7

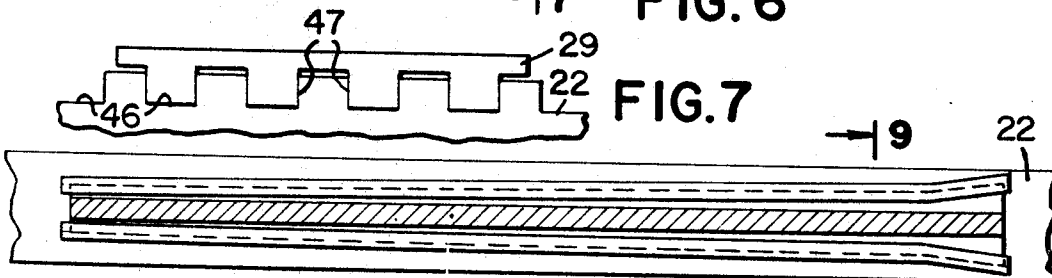


FIG.10

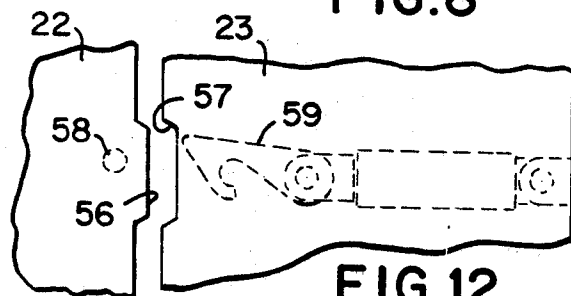


FIG.12

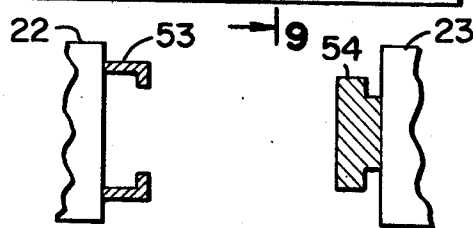


FIG.11

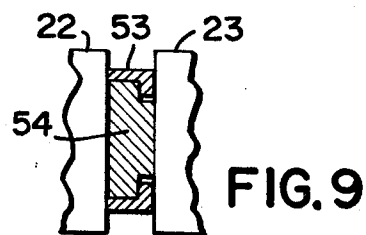


FIG. 9

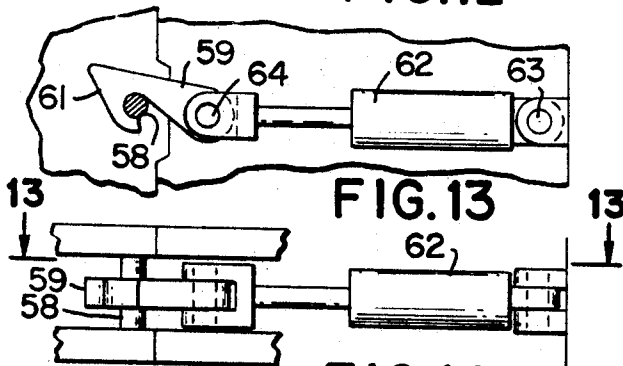


FIG.14

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3,393,810

METHOD AND APPARATUS FOR CONSTRUCTING A LARGE CAPACITY MOBILE CRANE

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ABSTRACT OF THE DISCLOSURE

A mobile crane uses two wheeled transport vehicles connected side-by-side to form a large base for operations at a job site. A complete crane mechanism (turntable, engine, control cab, drawworks and boom) is mounted on the beds of the transport vehicles in a manner such that the crane can be shifted laterally across the beds between a first position in which the crane is carried entirely by one of the transport vehicles and a second position in which the crane is carried by both of the transport vehicles. In the first position, the transport vehicles can be separated and the mobile crane can be transported over the roads between job sites with a reduced overall width. In this first position, the mobile crane can also be operated from the single transport vehicle as a smaller capacity mobile crane. When the transport vehicles are connected together and the crane is shifted to the second position, the larger base provided by the two transport vehicles permits the mobile crane to be operated as a large capacity crane.

This invention relates to a mobile crane. This invention relates specifically to structure and a mode of operation for increasing the capacity of a mobile crane.

The current development of mobile cranes mounted on wheeled transport vehicles is increasingly becoming subjected to two counteracting factors, a desire for greater load capacity and legal restrictions on vehicle width. The users of the mobile cranes want and can use larger cranes with greater load capacity; but legal restrictions on the width of vehicles that can be operated on the roads put a severe limitation on the size of the vehicle which can serve as a mobile base for the crane. The size of the base limits the size of the load that can be handled by the crane. If the load is too great, the crane may tip over. This problem is most acute when the mobile crane is operated with the transport vehicle as a mobile base. However, it is also present when the crane is operated from the fixed base provided by the outriggers of the transport vehicle.

The crane itself, in many cases, could handle larger loads. The problem is presented in most cases by the limitations on the size of the base. In any event, the boom and related components of the crane can easily be designed to handle larger loads if the problem of instability and tip-over because of the small base can be overcome.

As a result of these factors, the largest capacity mobile cranes at the present time are mounted on crawler tracks; and mobile crane manufacturers are looking for ways to make large capacity wheeled cranes roadable.

It is a primary object of the present invention to form an enlarged base at a job site for operations of a mobile crane at the job site. It is a related object to form this enlarged base by joining two individual transport vehicles (each of which is narrow enough to meet all size restrictions for operation on the road) side-by-side. The crane itself is shifted from one transport vehicle onto the enlarged base or platform provided by the connected vehicles. The crane can then be operated with the connected vehicles as a mobile base, or outriggers can be extended from the connected vehicles and the crane can be operated

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from a fixed base. After the operations at a particular job site have been completed, the crane can be shifted back to the first, or basic, transport vehicle; the vehicles can be disconnected; and the two separate transport vehicles can then be driven on the road to another job site. This ability to divide the large capacity mobile crane into separate units which are individually roadable is a specific object of the present invention.

When the crane is carried entirely by one of the transport vehicles, the crane and that transport vehicle can be used as a smaller capacity mobile crane for jobs that do not require the base or platform size provided by the joined transport vehicles. The other transport vehicle can, in this case, be used either to help carry outrigger and counterweight components of the overall mobile crane unit, or a second crane can be mounted on the bed of the transport vehicle so that this second transport vehicle and additional crane can also function as a smaller capacity mobile crane until such time as the second transport vehicle is again needed to form the enlarged base required to operate the first crane at greater capacity. A mobile crane construction which permits these modes of operation is a further specific object of the present invention.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show preferred embodiments of the present invention and the principles thereof and what are now considered to be the best modes contemplated for applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

FIG. 1 is an end elevation view of a large capacity mobile crane constructed in accordance with one embodiment of the present invention;

FIG. 2 is a top plan view of the mobile crane shown in FIG. 1;

FIG. 3 is a side elevation view of the mobile crane shown in FIG. 1;

FIG. 4A is a side elevation view showing the manner in which one transport vehicle carries the crane on the road between job sites;

FIG. 4B is a side elevation view showing how the other transport vehicle can be used to vary outrigger and counterweight components and can also be used to tow a trailer carrying boom components on the road between job sites;

FIG. 5A is a perspective view showing one outrigger construction that can be used with the crane shown in FIG. 1;

FIG. 5B is a perspective view of another outrigger construction that can be used with the crane shown in FIG. 1;

FIG. 6 is a fragmentary plan view showing a skid-rail and slot arrangement for guiding lateral shifting of the crane shown in FIG. 1;

FIG. 7 is a fragmentary side elevation view taken along the line and in the direction indicated by the arrows 7—7 in FIG. 6;

FIG. 8 is a fragmentary side elevation view, partly in cross-section, of guide structure which can be associated with the adjoining sides of the transport vehicle of the mobile crane shown in FIG. 1 to facilitate alignment of the vehicles when one vehicle is drawn up parallel alongside the other vehicle to form the enlarged base;

FIG. 9 is an end elevation view of the guide structure shown in FIG. 8 and is taken along the line and in the direction indicated by the arrows 9—9 in FIG. 8;

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FIGS. 10 and 11 are views like FIG. 9, but showing the individual guide elements on the individual transport vehicles;

FIG. 12 is a fragmentary top plan view of a portion of the beds of the two transport vehicles and shows a key and complementary keyway that can be formed on the engageable sides of the transport vehicles to facilitate locking of the beds of the transport vehicles together;

FIG. 13 is a fragmentary plan view like FIG. 12, but taken along the line and in the direction indicated by arrows 13-13 in FIG. 14, and shows a pin and power operated hook arrangement for locking the transport vehicles together; and

FIG. 14 is a fragmentary end elevation view of the structure shown in FIG. 13.

In FIGS. 1, 2 and 3, a large capacity mobile crane constructed in accordance with one embodiment of the present invention is indicated generally by the reference numeral 21.

The mobile crane 21 includes two transport vehicles, or carriers, 22 and 23. Each transport vehicle is a self-contained, self-propelled vehicle, complete with its own engine, drive components and operating controls. Thus, as shown in FIGS. 1 and 2, each transport has its own control cab 24 and 26. However, as will be described in greater detail below in the description of the operation of the mobile crane 21, the control cabs 24 and 26 can also be connected for operation as a unit from only one of the cabs by means of a control connector 27.

A crane 28 is mounted in position near the center of the base or platform provided by the adjoining beds of the transport vehicles 22 and 23. The crane 28 is of conventional construction, and includes an engine, control cab, drawworks, boom and a turntable 29. The boom, drawworks, engine and controls of the crane are not illustrated in FIG. 1, 2 or 3, since the present invention is not concerned with these particular crane components and to illustrate them would only complicate the illustration of the structure and mode of operation of the present invention.

The mobile crane 21 is shown set up for operation as a fixed base unit in FIGS. 1, 2 and 3. The mobile crane 21 includes outriggers 31, 32 and 33 at the front, middle and rear of the mobile crane. The outriggers extend from and retract within outrigger frames 34, 36 and 37. The outrigger frames may be continuous frames which extend the full width of the mobile crane 21, as illustrated in FIGS. 1 and 2. The full width frames serve as connecting means for locking the two transport vehicles 22 and 23 together. However, the full width frames must be removed before the individual transport vehicles 22 and 23 can be disassembled for movement of the mobile crane 21 on the road to another job site. In some cases, therefore, it may be preferable to form some or all of the frames 34, 36 and 37 as two-part frames with each part limited to the width of an individual transport vehicle 22 and 23.

As best illustrated in FIG. 2, each outrigger may also be designed to have a length best suited to a particular use of the mobile crane. As shown in FIG. 2, the middle outriggers 32 are as long as the frame 36, while the outriggers 31 and 33 are only half as long as the frames 34 and 37. The middle outriggers 32 have the greatest extension, because these outriggers are nearest to the axis of rotation of the turntable 29. However, as in the case of the outrigger frames, the length of the outriggers 31, 32 and 33 may be varied from that shown in FIG. 2. For example, all of the outriggers could be made the same length as the outriggers 32.

As best shown in FIGS. 5A and 5B, a number of outrigger and outrigger frame combinations are available. Two normal length outriggers (about 11 feet) can be used with a full width outrigger frame 37. As noted above, the outrigger frame 37 can also be made from two separate parts so that the separate parts can be permanently mounted on the individual transport vehicles 22 and 23.

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As shown in FIG. 5B, a pair of full-width outrigger frames 36 can be used at one outrigger location, and extra long outriggers 32 (for example outriggers about 22 feet long) can then be used with these longer outrigger frames 36 to provide a very large fixed base for this mobile crane.

FIGS. 4A and 4B illustrate the manner in which the mobile crane 21 shown in FIGS. 1-3 can be disassembled into individual transport vehicles for movement over roads to a new job site.

As shown in FIG. 4A, the crane 28 is carried entirely by the basic transport vehicle 22. A boom dolly 41 trails the transport vehicle or crane carrier 22 and supports the boom 42. The boom 42 is shown with part of the boom sections removed. However, the boom dolly 41 can carry the boom 42 with all sections in place.

It is a very important feature of the present invention that a basic transport vehicle 22 and crane 28 combination shown in FIG. 4A forms a complete mobile crane, and can be operated as a mobile crane unit without the supplementary transport vehicle 23. Thus, the mobile crane unit shown in FIG. 4A can be used as a 100-140 ton mobile crane, in the same manner as the largest capacity, road transportable wheeled cranes presently available. Where a mobile crane of this capacity is adequate, the supplementary transport vehicle 23 is not necessary. However, where the job requirements call for a crane having a larger load capacity than that available from the mobile crane unit shown in FIG. 4A, the present invention provides a means for at least doubling the load capacity.

The supplementary vehicle 23 can be used to carry outriggers, such as the oversized outriggers 32, and counterweights and other mobile crane components on its bed when the mobile crane is being transported on the road between job sites. As illustrated in FIG. 4B, the supplementary transport vehicle 23 can also be used to pull a trailer 43. The trailer 43 can be used to carry sections of the boom 42.

Also, as noted above, the supplementary transport vehicle 23 can be fitted with a crane to form a complete, smaller capacity mobile crane unit for operations during the time that the larger capacity provided by joining the two vehicles 22 and 23 is not needed.

As illustrated in FIGS. 6 and 7, the beds of the vehicles 22 and 23 and the base of the turntable 29 can be constructed to have an interlocking skidrail and slot arrangement to facilitate guiding of the lateral shifting of the crane and also to provide an additional interlock for holding the vehicles 22 and 23 in alignment during operations of the crane. As illustrated in FIGS. 6 and 7, the beds of the vehicles 22 and 23 are formed with slots 46 and the turntable base 29 has skidrails 47. The phantom outline indicated by the reference numeral 48 in FIG. 6 shows the position of the turntable and the crane when the crane is carried entirely by the basic transport vehicle 22. The phantom outline indicated by the reference numeral 49 shows the position of the turntable and the crane when the crane has been shifted laterally across the beds of the vehicle 22 to the operating position for operation as a large capacity crane.

The skidrails 47 may preferably be formed with beveled ends, as indicated by the reference numeral 51, and the slots 46 may preferably be formed with flared openings 52 to facilitate engagement of the skidrails 47 with the corresponding slots 49 during lateral shifting of the crane from position 48 to position 49.

The crane is fastened in each of the positions 48 and 49 by suitable fastening means, which are not illustrated. The drawworks of the crane itself may be used to winch the crane from position 48 to position 49 and also back to position 48.

FIGS. 8-11 show guide structure which may be used to facilitate alignment of the vehicles 22 and 23. In this case, the adjoining sides of the vehicles 22 and 23

have a complementary shaped channel member 53 and T-bar 54. As best shown in FIG. 8, the channel 53 may taper from a wider opening at the backside to a narrower opening at the front. The T-bar 54 may be generally arrow shaped, as viewed in side elevation, so that the smallest part of the T-bar 54 easily engages the widest part of the opening of the channel 53 as the supplementary vehicle 23 is driven up alongside and parallel to the basic transport vehicle 22. As the vehicle 23 moves up to the location at which the slots 46 of the vehicles 22 and 23 are in alignment, the T-bar 54 wedges against the inside surfaces of the channel 53 to stop further movement. See FIG. 9.

FIGS. 12 and 13 show how a complementary shaped key 56 and keyway 57 can be formed on the adjoining sides of the vehicles 22 and 23 to serve as locking means for maintaining the vehicles in alignment.

As also shown in FIGS. 12-14, a pin 58 and power operated hook 59 may also be used to lock the vehicles 22 and 23 together. The hook 59 may preferably have an inclined camming surface 61, and the mounting for the hydraulic motor 62 may be pin-jointed at 63 and 64 to produce automatic engagement of the hook 59 with the pin 58 on extension and subsequent retraction of the piston of the motor 62. With this arrangement, it is not necessary for the operator to leave his cab to complete the connection between the vehicles 22 and 23.

While the present invention has been described with reference to a mobile crane, it will be apparent that the structure and mode of operation in which two individual transport vehicles are joined side-by-side and the working mechanism is shifted laterally across the vehicles to a new position on the enlarged base have utility in other types of construction equipment. For example, this structure and mode of operation could also be used to form an enlarged base and to increase the load capacity of mobile heavy-duty drill rigs.

What is claimed is:

1. A mobile crane comprising, two individual transport vehicles aligned side-by-side, connector means connecting the vehicles together in side-by-side relationship, and a crane which is shifted laterally from a first position in which the crane is carried entirely by one vehicle when the vehicles are not joined together to a second position in which the crane is carried by both vehicles when the vehicles are joined side-by-side whereby the crane can be operated as a smaller capacity crane and can be transported on roads with reduced overall width in the first position and can be operated as a larger capacity crane, because of the wider space provided by the joined transport vehicles, in the second position.

2. A mobile crane as defined in claim 1 wherein the connector means include a continuous outrigger frame that extends across the entire width of the adjoining vehicles.

3. A mobile crane as defined in claim 1 wherein the connector means include an interlocking key and keyway on the engaged sides of the transport vehicles and a power operated pin and hook mechanism for holding the vehicles together.

4. A mobile crane as defined in claim 1 wherein the beds of the transport vehicles and the turntable for the crane have interlocking slots and rails for guiding the lateral shifting of the crane.

5. A mobile crane as defined in claim 1 wherein the connector means include interengageable guides on the adjoining sides of the transport vehicles for aligning the vehicles as one vehicle is drawn up parallel alongside the other vehicle.

6. A mobile crane as defined in claim 1 wherein the transport vehicles are wheeled transport vehicles and each

includes drive and control means for independent operation as a self-propelled transport vehicle and including inter-connecting control means for operating both vehicles as an integral unit from one transport vehicle when the vehicles are connected together.

7. A large capacity mobile crane comprising a smaller capacity mobile crane in operative combination with a supplementary transport vehicle, the smaller capacity mobile crane including a basic transport vehicle and a crane which are constructed for operation as a unit independently of the supplementary transport vehicle when the crane is carried and supported on only the basic transport vehicle, connector means connecting the basic transport vehicle to the supplementary transport vehicle in adjoining side-by-side relationship, and wherein the crane is shifted laterally across the adjoining vehicles from a first position in which the crane is carried entirely by the basic transport vehicle to a second position in which the crane is carried by both vehicles, and means for retaining the crane in the second position whereby the crane can be operated as a larger capacity crane on a wider base with the crane in a second position and can also be operated as a smaller capacity crane on a narrower base without the supplementary transport vehicle.

8. A method of constructing a large capacity mobile construction unit for operations at a job site by combining a smaller capacity mobile construction unit, having a working mechanism mounted on a basic transport vehicle, with a supplementary transport vehicle, said method comprising, aligning the two mobile transport vehicles side-by-side, connecting the transport vehicles together in adjoining side-by-side relationship, subsequently shifting the working mechanism laterally from a first position in which the mechanism is carried and supported entirely by the basic vehicle to a second position in which the mechanism is carried and supported on both of the vehicles, and fastening the mechanism to the joined transport vehicles in the second position.

9. A mobile construction unit comprising a basic transport vehicle and working mechanism in operative combination with a supplementary transport vehicle, the two transport vehicles being aligned side-by-side, connector means connecting the vehicles together in adjoining side-by-side relationship, first mounting means for retaining the working mechanism in a first position in which the mechanism is carried entirely on the basic vehicle, and second mounting means for retaining the working mechanism in a second position in which the mechanism, after being shifted laterally across the adjoining vehicles, is located and carried on both vehicles, whereby the construction unit can be operated as a wide base unit with the mechanism in the second position and can be transported on roads with reduced overall width when the transport vehicles are separated for movement to a different job site.

10. A mobile crane comprising, two individual wheeled transport vehicles joined side-by-side and a crane mounted on both of the transport vehicles for operation at a job site and laterally shiftable to another position in which the crane is carried entirely by one of the transport vehicles when two transport vehicles are separated for movement to a different job site.

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