Feb. 7, 1967 A. W. BROWN ETAL 3,302,806

METHOD AND APPARATUS FOR REMOVING THE CRANE DECK FROM A CRANE CARRIER

Filed Jan. 6, 1965 4 Sheets-Sheet 1

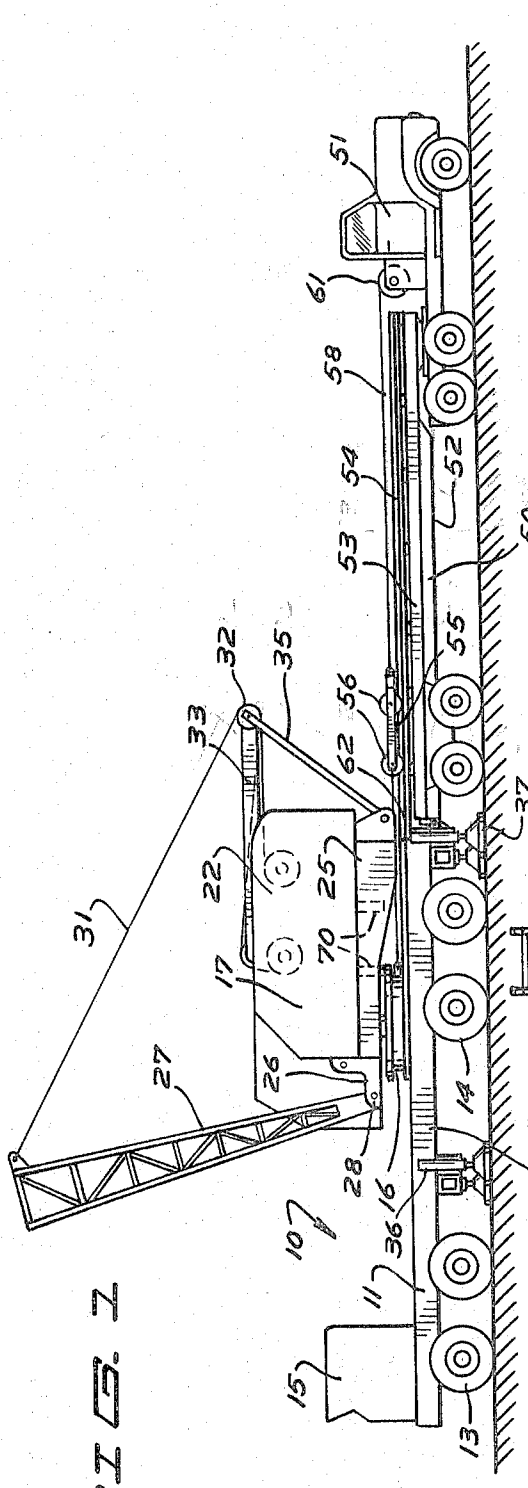


FIG. 1

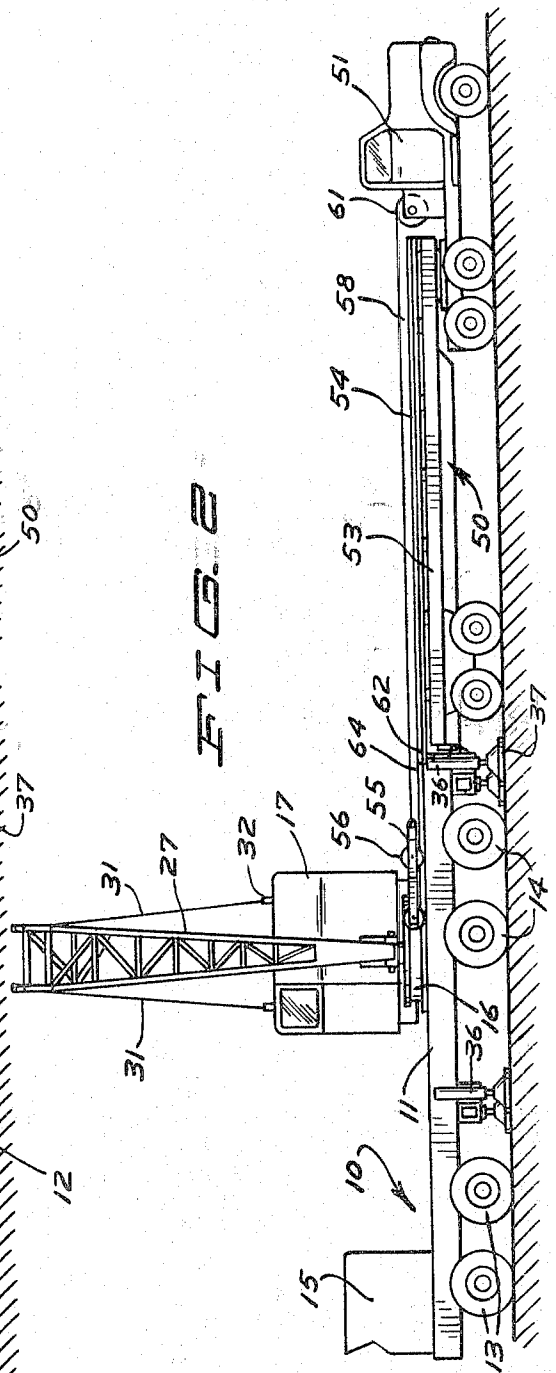


FIG. 2

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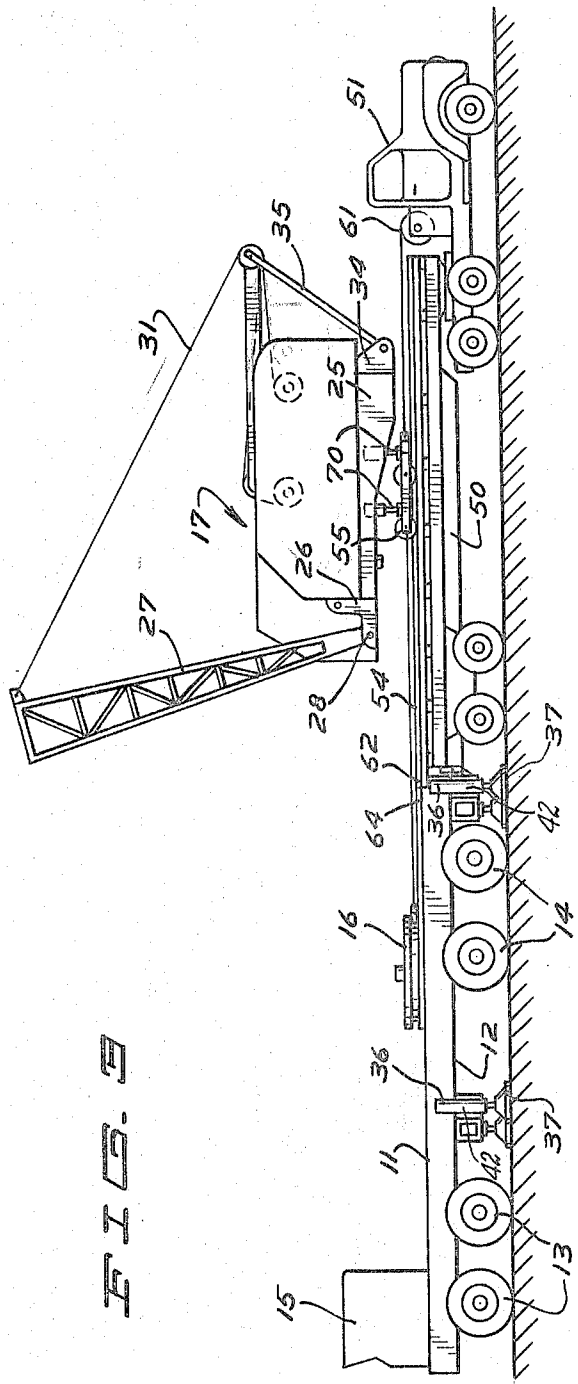


FIG. 5

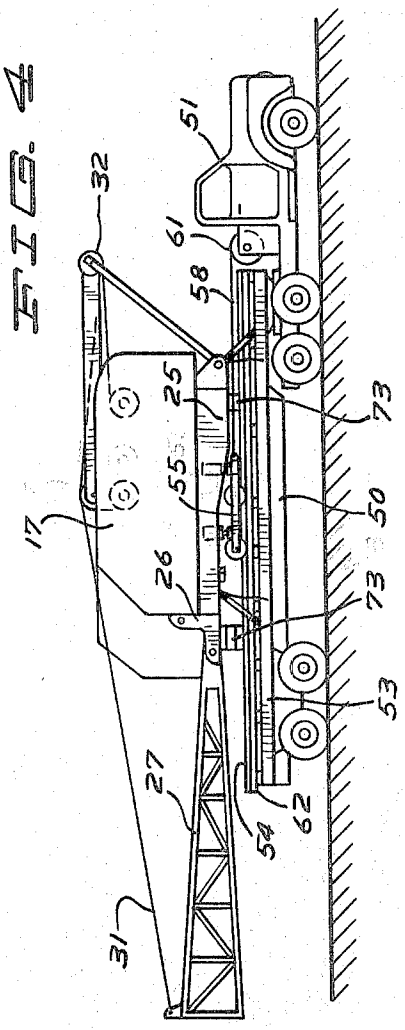


FIG. 4

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FIG. 5

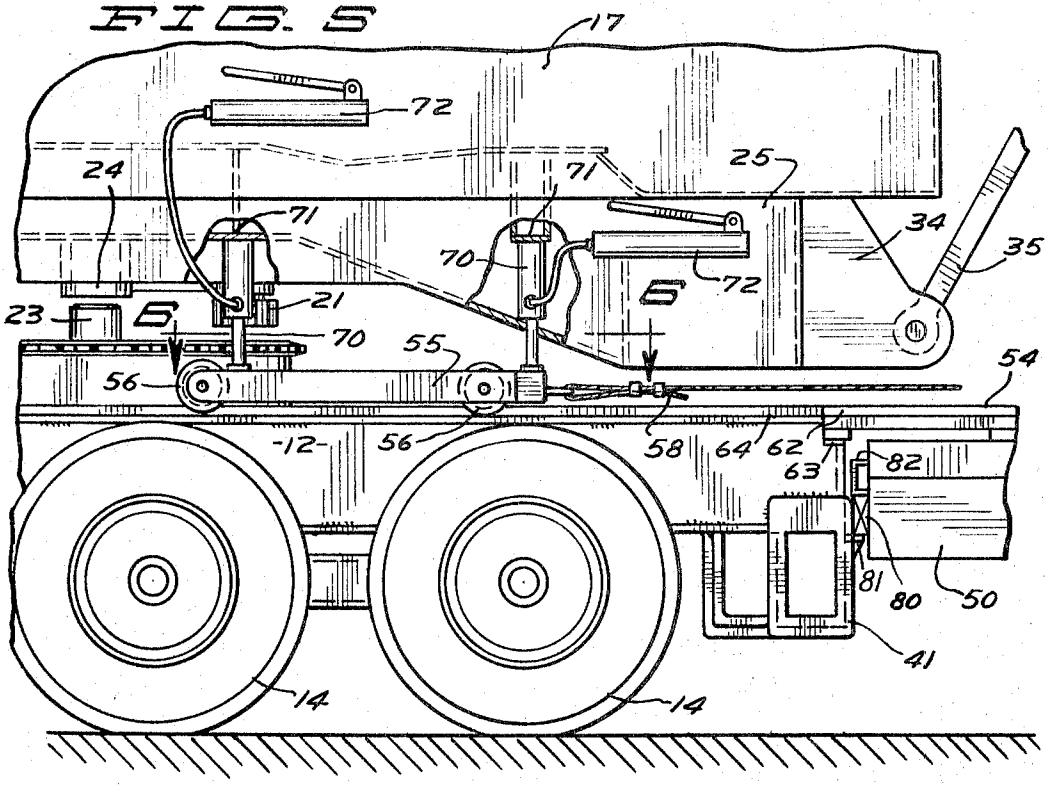
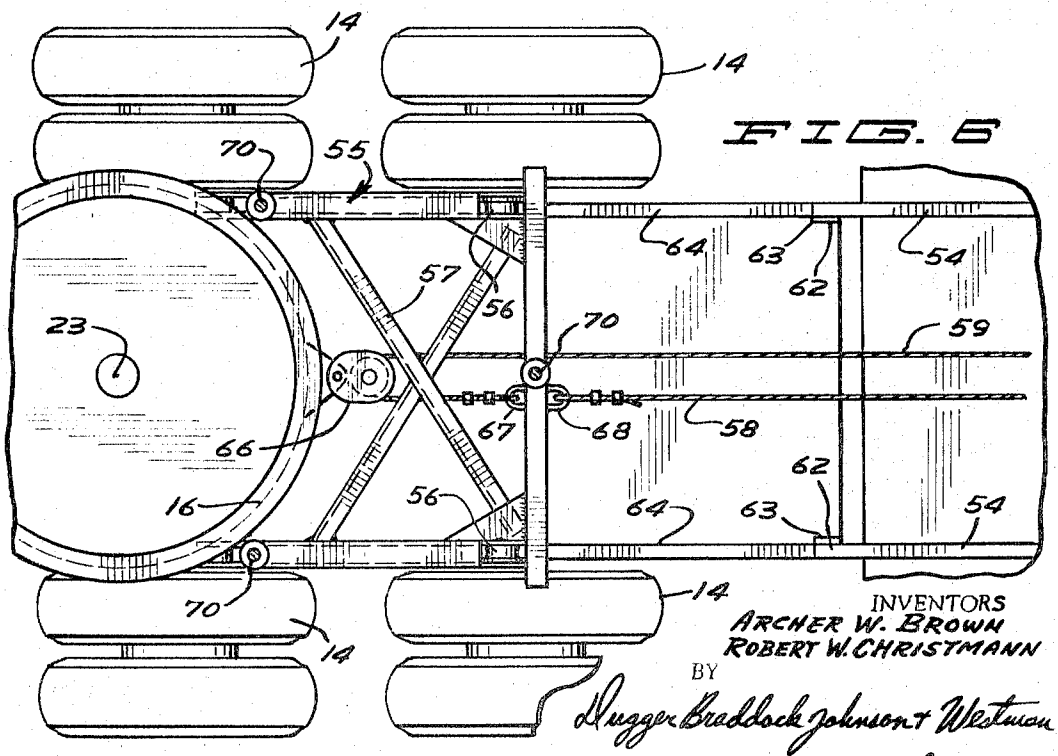


FIG. 6



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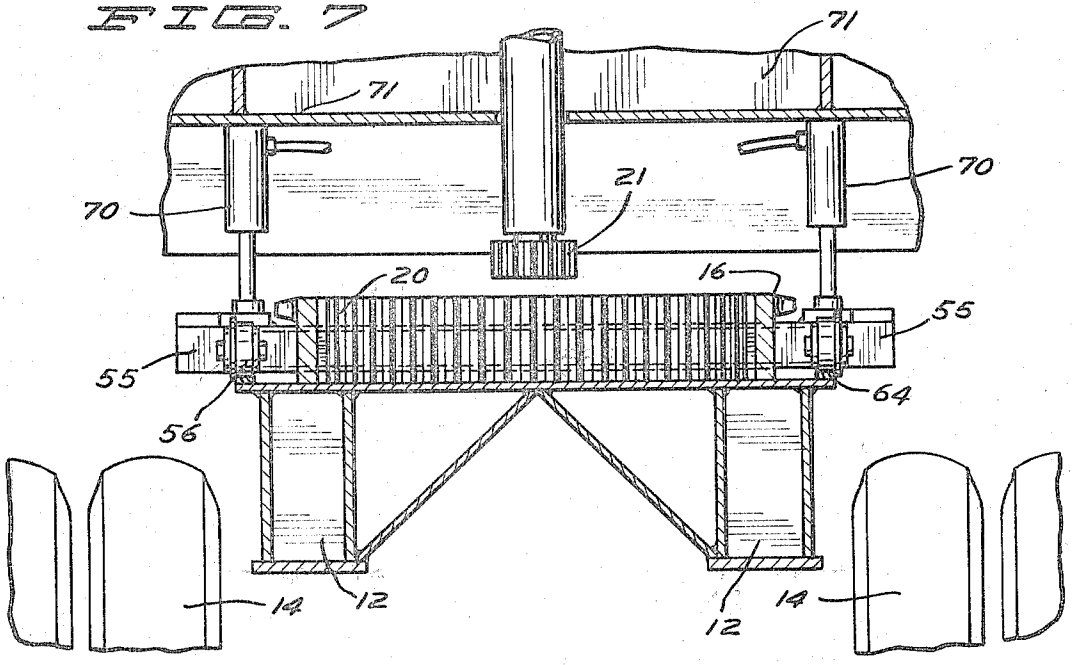
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FIG. 7



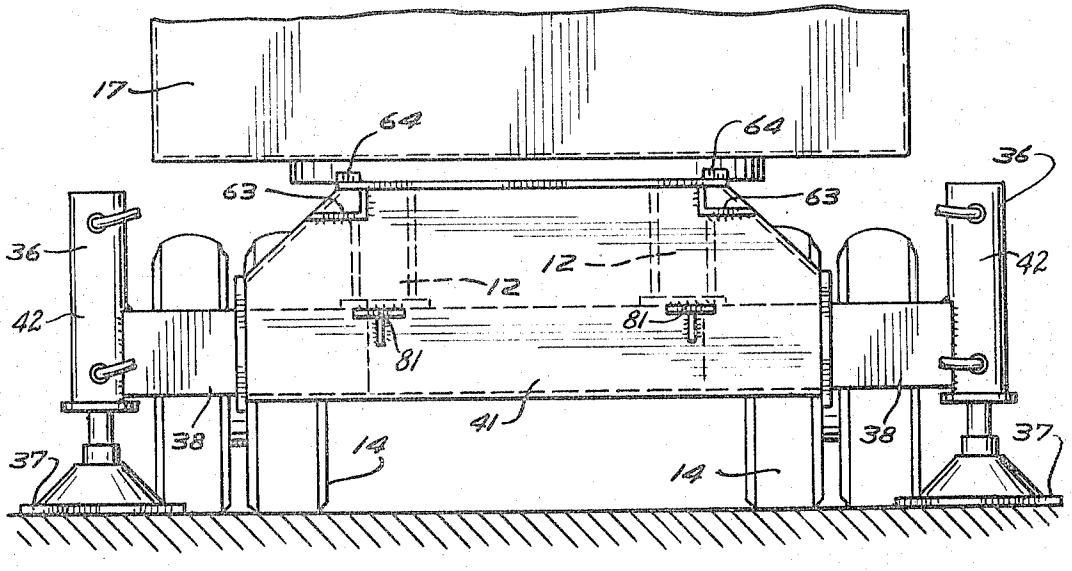


FIG. 8

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METHOD AND APPARATUS FOR REMOVING THE CRANE DECK FROM A CRANE CARRIER

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Filed Jan. 6, 1965, Ser. No. 423,810

7 Claims. (Cl. 214—38)

The present invention has relation to an apparatus for transferring the upper deck of a mobile crane from the crane carrier to another transport vehicle so that the two crane units can be separated for transport, and a method for accomplishing the transfer.

At the present time there are several States where the road load limits severely restrict the size of mobile cranes which can be driven on the highways. When large cranes cannot be used, the tasks of contractors becomes greater and the length of time spent on each job is necessarily longer. Some jobs require extremely large cranes and if a mobile crane cannot be driven to the site, a large crane must be disassembled, transported to the site, and reassembled at tremendous costs.

It has long been customary to remove sections of the boom and transport them separately from the crane itself, but this does not reduce the weight sufficiently to get below the legal load limits in many States.

The device of the present invention, as disclosed, presents a structure for removing an upper deck assembly from a mobile crane and moving it onto a separate semi-trailer bed. In this manner the heavy crane base or carrier can be driven to a job location and the upper deck separately transported.

As shown, the device and the method of operating the device include providing a pair of rails on a flat semi-trailer bed with a dolly which moves on these rails. Rails are also provided on the crane carrier. The flat bed is positioned adjacent to the crane carrier or base, and the two units, the flat bed and the crane base are joined together so that the rails on the crane base form an extension of provided rails on the trailer. A winch provided at the forward end of the trailer is used for moving the dolly into position underneath the crane upper deck. Suitable hoist means are provided for raising the crane deck (cab, boom, power unit, controls, etc.) off the crane roller path and clear of any obstructions and so that the weight of the upper deck is supported on the dolly.

The dolly is then winched back onto the flat bed along the rails until the crane upper deck is completely supported on the flat bed. The flat bed and the crane base are then disengaged from each other and the two units can be transported separately.

When the crane upper deck is again to be placed on to the base the process is reversed. An important feature is that the crane upper deck does not have to be disassembled or modified, the transfer is rapid, easily carried out, and works with practically all cranes.

It is an object of the present invention to present a device for permitting the removal of an upper deck of a mobile crane from its base or carrier and a method of doing the same.

In the drawings,

FIG. 1 is a side elevational view of a mobile crane and showing a flat bed trailer in position to receive the crane upper deck from the crane carrier;

FIG. 2 is a side elevational view of the device of FIG. 1 illustrating the first step for placing the crane upper deck onto a transport dolly used with the device of the present invention;

FIG. 3 is a side elevational view of the device of FIG. 1 showing the crane upper deck being moved onto the flat bed;

FIG. 4 is a side elevational view of the crane upper deck in position on the flat bed trailer;

FIG. 5 is an enlarged side elevational view of the crane base showing a dolly in position under the upper deck and also showing hydraulic rams utilized to support the deck on the dolly;

FIG. 6 is a sectional view taken as on line 6—6 in FIG. 5;

FIG. 7 is a fragmentary enlarged vertical sectional view showing the crane upper deck supported on the dolly; and

FIG. 8 is a rear elevational view of the crane showing outriggers that can be used for raising the rear portions of the crane carrier in order to provide a common support for the flat bed and carrier.

Referring to the dawings and the numerals of reference thereon, a mobile crane illustrated generally at **10** includes a crane carrier or base **11** which has longitudinally extending main beams **12**; forward support wheels **13** and rear drive and support wheels **14**. A cab **15** is provided for an operator of the unit during over the road transportation.

The longitudinally extending frame members **12** support a circular roller path **16** on which an upper deck assembly **17** of the crane is mounted. The roller path **16** includes an internal gear **20** with which a pinion **21** meshes. The pinion **21** is on the crane upper deck and is driven from a suitable power source (not shown) also enclosed in the upper deck housing or cab **22**. In addition, a center mounting pin **23** is provided on the crane base in the center of the roller path and a sleeve **24** on the crane upper deck is mounted over this pin.

The crane upper deck **17** includes main frame members **25** which support the cab **22** and the upper deck and also has a bracket **26** on which a boom **27** is pivotally mounted as at **28**. Suitable control cables **31** are operated from control winches inside the cab. The cables **31** pass over sheaves **32** at the outer end of a folding mast assembly **33**, which is shown in its folded position.

The mobile crane is a conventional unit available on the market and the particular type of crane or the particular construction of the crane itself does not form a part of the invention. Of course, slight modifications in structure and in the method of removing the crane can be made in order to accommodate different types of cranes, if necessary.

As shown, only a stub section of the boom **27** is still attached to the mobile crane. The cables **31** are controlled by the internal winch shown on the dotted lines in FIG. 1. The mast **33** is actually held down by telescoping struts **35** tied or anchored to a bracket **34** at the rear of the crane upper deck.

At intermediate and rear portion of the crane carrier **11** pairs of hydraulically actuated outriggers **36** are provided. The outriggers are mounted on a main frame **41** fixed to the frame of the carrier. Support members **38, 38** telescope into the main mounting frame **41** and extend outwardly on opposite sides thereof. A pair of cylinders **42, 42** are mounted on the opposite ends of the support members. The rod portions of the cylinders **42** extend downwardly toward the ground and have feet members **37, 37** attached thereto. The rod portions of the cylinders can be extended and retracted through suitable valves in a conventional manner. By extending the cylinders, the rear portions of the crane carrier **11** can be supported on the outriggers.

A heavy duty flat bed semi-trailer **50** is utilized in combination with the crane carrier of the present invention. The semi-trailer **50** has a semi-trailer-tractor **51** for moving the trailer over the ground. The trailer **50** has longi-

tudinally extending support beams **52** and a flat bed top **53** supported on the beams **52**. A pair of steel rails **54** are mounted on the top of the flate bed and extend in longitudinal direction. The rails are spaced apart and parallel.

A dolly assembly **55** is mounted onto the rails **54** and has four wheels **56** which roll along the rails. Two of the wheels are on each side of the dolly. The dolly also has suitable bracing **57** in order to give it adequate strength.

The dolly **55** is controlled for movement along the rails through the use of a pair of cables **58** and **59** which are in turn controlled from a suitable winch **61**. The winch **61** can be of any suitable type which will reel in one cable while paying out another cable. This can be done either with two drums or with a cable being paid out adjacent one end of a winch drum and reeled in adjacent the other end of the drum.

In practicing the method of the invention, first the outer portions of the crane boom are removed in the usual manner and the upper deck of the crane is prepared for transport as shown in FIG. 1. The semi-trailer **50** is backed into position so that the outer end portions **62** of the rails **54** set within provided receptacles **63** which are defined in the main frame of the outriggers.

A block **80** is placed on brackets **81** which are fixed to the main frame **41** of the outriggers and extend rearwardly therefrom. The block **80** is of size so that it will engage a bumper **82** fixedly attached to the hear of the trailer.

Once the semi-trailer **50** has been properly positioned, the outriggers are used to raise the rear portions of the crane carrier **11** until the outer end portions **62** of the rails **54** are actually supported on the bottoms of the pockets **63** and the trailer itself is supported on block **80** and brackets **81** through the bumper **82**. When this occurs, the rails **54** will be aligned with and form continuations of rails **64** mounted on the crane carrier. The rails **64** are also parallel and spaced apart and the wheels or rollers **56** on the dolly **55** will roll on the rails **64**. The supporting of the trailer and the rails **54** on the carrier insures good alignment and support to get smooth rolling of the dolly.

Once the outriggers have raised the crane carrier sufficiently so that the rails **54** and the rear portions of the semi-trailer are supported on the carrier, the dolly **55** will have a continuous path leading from the semi-trailer to the crane carrier. The rails will not bend at the junction.

The cables **58** and **59** are then unreeved from the winch and a snatch block **66** is attached to the crane carrier adjacent the roller path. The cable **58** is then attached to a suitable bracket **68** on the dolly and the cable **59** is passed through the snatch block and is attached to a bracket **67** on the dolly. By operating the winch **61** the dolly can be moved along the rails **54** and **64** toward or away from the crane carrier.

As shown in FIG. 1, the winch **61** is operated to move the dolly **55** toward the crane carrier. The upper deck **17** is rotated to position as shown in FIG. 2 to provide clearance for the dolly and the dolly is moved to position as shown in FIGS. 5 and 6. The dolly is placed tightly against the roller path so that it is properly positioned under the upper deck. The upper deck is then rotated to position as shown in FIG. 1 and the "hook rollers" are released from the roller path, as well as all other guides that hold the upper deck on the roller path. Usually, the center of gravity of the upper deck falls behind the forward rollers of the dolly and also behind the provided support rams for supporting the crane deck, which will be described.

Suitable hydraulic rams **70** (three as shown) are attached to cross members **71** of the upper deck. The rams **70** are compressed when the dolly is initially positioned and are properly aligned with the dolly members. After all the "hook rollers" on the upper deck are removed the upper deck is merely resting on load rollers which rest on the roller path. The construction of the roller path and rollers supporting the upper deck is conventional.

The rams **70** are then extended uniformly and sequentially by introducing fluid under pressure into the interior of the rams. A hand pump **72** can be used for raising the rams. After the upper deck has been raised a sufficient amount so that the pinion **21** clears the roller path and the sleeve **24** clears the pin **23**, the winch **61** is again operated by using known controls so that the cable **58** is under tension and pulls the dolly, together with the supported upper deck **17** along the rails **64** past the junction between the carrier and semi-trailer and along the rails **54** onto the semi-trailer. This position is shown in FIG. 3. Suitable blocking **73** is then placed under the frame members of the upper deck as shown in FIG. 4. The blocking is placed both at the forward and rear portions of the frame. The hydraulic rams **71** are then released slowly so that the deck will be lowered down onto the blocking.

The upper deck is then securely bound down to the semi-trailer using chains and load binders or other links which are well known in the art so that it is securely fastened to the trailer. The winch cables are then removed from the crane carrier.

The hydraulic outriggers of the crane carrier are released so that the crane carrier will be lowered down to position wherein the rails **54** are not supported in the pockets **63** and the trailer is also free. The crane carrier can then be moved away from the trailer. If desired, the stub boom **27** can be used for removing the rear outrigger housing from the crane carrier or for removing other equipment from the crane carrier, if this is necessary. The binding down of the crane deck onto the semitrailer gives adequate stability for these minor operations.

The stub boom is then lowered to its travel clearance position as shown in FIG. 4 by operating the winch for the cable **31**. Then both the semi-trailer and the crane carrier are ready to be driven to the next location. In this way the extremely heavy crane carrier, which must be very sturdy to support the crane base during its working operations, and the upper deck, which is also heavy, can be moved as separate units.

It has been found that hydraulic rams made by the Hein-Werner Corporation of Waukesha, Wisconsin, are suitable for the lifting of the upper deck. The rams **70** are threaded so that they can be attached to studs on the crane deck.

When the upper deck and the crane carrier have reached the new working location, the process is reversed. The stub boom will be raised up, and the carrier will be backed into position so that the end portions **62** of the rails **54** fit within the pockets **63**. The rear portions of the crane carrier will then be raised with the outriggers to support the rails **54** and the rear portions of the trailer. This will make a continuous rail as far as the carrying of the weight of the crane upper deck on the rails is concerned.

The load binders and the tie downs for the crane deck will be removed, the hydraulic rams **70** will be extended to support the weight of the upper deck of the crane on the dolly **35** and the snatch block will again be placed into its position adjacent roller path on the crane carrier.

The winch **61** will then be actuated to pull the dolly onto the crane carrier so that the crane deck is positioned with the sleeve **24** overlying the pin **23**. The rams **71** will then be lowered and the crane deck will be properly positioned on the roller path. The "hook rollers" for the upper deck will be placed in position on the roller path, the dolly and cables will be removed from the carrier, and the outriggers again released so that the rails **54** are no longer supported in pockets **63**. The semi will then be pulled away and the crane unit will be ready to operate as soon as the counterweight and crane boom have been fully installed.

It is extremely important that the outer ends of the rails of the semi are supported in suitable alignment with

the rails 64 on the carrier. By actually supporting the weight of the semi on the outriggers these rails will not shift position when the dolly moves across the junction between the rails 54 and 64. The pockets 63 serve as alignment means for the rails 54 and 64 both in transverse and vertical directions. The block 80 is of suitable size so that the rails 54 are properly supported in the pockets 63 at the same time that the trailer is supported.

If desired, the center of gravity of the upper deck can be ahead of the forward rams. A suitable tension member can be placed to hold the crane base onto the rear portion of the dolly and prevent it from tipping forwardly and off the front rams.

What is claimed is:

1. The method of transporting a crane upper deck assembly separately from its normal wheel mounted crane carrier, said crane upper deck assembly including a crane deck, a cab mounted thereon, and a boom having a first section thereof pivotally mounted with respect thereto, and said crane carrier having an upper platform, comprising the steps of:

providing a separate mobile carrier having an upper deck,

aligning said separate mobile carrier with the crane carrier to bring said carrier platform and said mobile carrier upper deck into horizontal alignment, moving a dolly along the upper deck of the mobile carrier onto the upper platform of the crane carrier,

separating the crane upper deck assembly from the crane carrier by elevating said deck assembly and supporting it on the dolly,

moving the dolly and said upper deck assembly together over the upper platform of the crane carrier onto the mobile carrier, and

transporting said crane carrier and said mobile carrier separately to a desired location for use on said upper deck assembly and crane carrier combination.

2. The method of claim 1 including the further steps of providing rails on the upper deck of said mobile carrier, and providing aligning rails on the upper platform of said crane carrier, said dolly being adapted to move along said rails.

3. The method of claim 2 including the further step of supporting portions of each aligning rail at the junctions thereof on one of said carriers.

4. The method of claim 1 including the further step of temporarily supporting said crane base assembly with respect to said mobile carrier independently of said dolly

before transporting said mobile carrier to the desired new location of said upper deck assembly and crane carrier combination.

5. The method of claim 1 including the further step of supporting the rear of said mobile carrier on the rear of said crane carrier before moving said dolly and deck assembly onto said mobile carrier.

6. The method of claim 5 including the further step of at least partially supporting said crane carrier independently of its wheel mounting before moving said dolly and deck assembly onto said mobile carrier.

7. The combination with a mobile crane having a wheel mounted crane carrier provided with an upper platform and a crane upper deck assembly normally rotatably mounted in bearing relation with respect to said crane carrier upper platform, said crane upper deck assembly including a crane upper deck, a cab mounted thereon, and at least a first section of a boom pivotally mounted with respect thereto; of means for providing for over-the-road transportation of said crane carrier, said means including:

a wheel mounted mobile carrier having an upper deck,

spaced, parallel rails mounted on said upper deck and extending rearwardly therefrom,

a dolly mounted for movement along said rails,

spaced, parallel rails mounted on said upper platform of said crane carrier and adapted to be in adjacent, longitudinal alignment with said mobile carrier rails to receive and carry said dolly when the rear end of said mobile carrier is placed in contiguous relation to the rear end of said crane carrier,

load bearing pockets on said crane carrier in position to underly said mobile carrier rail extensions when said rear ends are in such contiguous relationship,

means to move said dolly along said rails to and from position under said crane deck assembly from and to position on said mobile carrier, and

lift means to support said crane deck assembly clear of said crane carrier and on said dolly.

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