CRANE SUPPORT STRUCTURE

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References Cited
UNITED STATES PATENTS
632,368 9/1899 Robinson 212/145

A support structure for an otherwise mobile crane in which a ring is secured to the lower car body of the crane, a plurality of arms are vertically pivoted on the car body and extended out beneath the ring at spaced points around the ring periphery, and jacks are carried at the ends of the arms which, when extended, support the ring on the ground and lift the lower car body clear of the ground.

3 Claims, 3 Drawing Figures
CRANE SUPPORT STRUCTURE

This invention relates generally to cranes and more particularly concerns supporting and stabilizing a crane.

In response to ever-increasing user needs, self-propelled cranes have been made capable of lifting ever greater loads. While a number of factors enter into determining crane capacity, a basic limitation arises from the fact that, inevitably, the weight of the crane and its load must be transferred to the earth in some stable fashion and, if rotation of the load is desired, the crane-earth connection must be made stable through the arc of crane rotation.

A significant increase in crane capacity was achieved by providing a self-propelled crane with the support ring and extended boom carrier disclosed and claimed in Beduhn U.S. Pat. No. 3,485,383 assigned to the assignee of the present invention. In this design, the weight of the crane and its load is transferred to the ground through a large diameter, track-like ring. As shown in that patent, and as practiced commercially for some years, the support ring is blocked into place by timbers fitted and wedged beneath and completely around the ring.

The primary aim of the present invention is to provide an improved crane support structure utilizing a track-like ring which is easier and substantially less expensive to set up into crane operating condition.

It is also an object of the invention to provide a crane support structure as characterized above that can more rapidly be set up for crane operation, or cleared for crane travel, so as to increase the mobility of a crane using the track-like ring support.

Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings, in which:

FIG. 1 is a fragmentary elevation of a crane support structure embodying the present invention;

FIG. 2 is a section taken approximately along the line 2—2 in FIG. 1; and

FIG. 3 is an enlarged fragmentary section taken approximately along the line 3—3 in FIG. 2.

While the invention will be described in connection with a preferred embodiment, it will be understood that we do not intend to limit the invention to that embodiment. On the contrary, we intend to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

Turning to the drawing, there is shown a crane having an upper structure mounted for rotation on a car body 12 through a roller path 13. The crane 10 is normally mobile and, for moving over the ground, crawler assemblies 14 form part of the car body 12.

In order to increase the capacity of the crane 10, a track-like ring 15 is secured to the ends of support beams 16 and 17 so as to horizontally surround the car body 12. Preferably, the ring has an I-beam cross section with a hardened upper path surface 18 (see FIG. 3). To adapt the crane for this ring support configuration, the support beams 16, 17 are secured to the car body 12 running outboard and parallel to the crawler assemblies 14 so that the beams become part of the car body.

Pursuant to the invention, a plurality of ring support arms 21 are pivoted for vertical movement on the car body 12 and extend outwardly to underlie the ring 15 at spaced points around the ring circumference. A plurality of jacks 22 are positioned one at the end of each of the arms 21 with the jacks 22 being sized so as to engage the ground when extended and lift the ring 15, the car body 12 and the crawler assemblies 14 from the ground. To keep the arms 21 positioned beneath the ring 15 prior to extending the jacks, lugs 23 on the arms 21 overlie a lower flange on the ring 15 so as to interengage the arms and the ring (see FIG. 3).

In the illustrated crane 10, the jacks 22 are manually operated and include an internally threaded collar 25 fixed at the end of each arm 21 which receives a threaded column 26. The lower end of the column 26 is a socket and a socket portion of a foot plate 28. Handles 29 are provided at the tops of the columns 26.

To facilitate setting up the ring 15, hydraulic jacks 31 are mounted at the four ends of the support beams 16, 17. Manipulation of these jacks 31 allows the ring 15 to be lifted and leveled, whereupon the manual jacks 22 can be quickly extended to provide firm support for the ring completely around its periphery.

The geometry of the crane 10 contributes to its high capacities when used with the ring support. A boom carrier 35 is pivoted for vertical movement on the upper structure 11 and provided with a roller assembly 36 for rotation on the ring 15. A boom 37 is mounted on the carrier at what becomes the load lifting fulcrum 38 of the system, and a load lift line 39 runs along and over the end of the boom 37. A counterweight carrier 41 is also pivoted for vertical movement at 42 on the upper structure 11 and the carrier extends the opposite direction from the boom carrier 35 to ride on the ring 15 through roller assemblies 43, only one of which is shown. Counterweights 44 are stacked on the carrier 41.

In effect, all structure to the non-boom side of the fulcrum 38 is available for counterbalancing and stabilizing the crane 10. Preferably, a mast 46 is mounted on the carrier 35 and boom lift rigging, only line 47 being shown, interconnects the tops of the mast 46 and the boom 37 for moving the boom vertically. The mast 46 is secured by pendants 48 to gantry structure 49 on the upper structure 11 to form a substantially rigid assembly, and other pendants 51 provide substantially rigid connections between the counterweight carrier 41 and the top of the mast 46. Struts 52 establish the substantially fixed angular position of the mast 46. This geometry creates a stable, high capacity crane.

With the ring 15 supported on the jacks 21, 31 and the crane ready for operation, there is no ground mobility since the crawlers 14 are lifted from the ground. However, because of the facility with which the jacks can be operated, the crane assembly can be quickly brought to rest on the crawler assemblies 14, moved to a new location, and again set up with less time, effort and expense than formerly required when using timber blocking. When in ring supporting position, the support arms 21 form a rigid lattice beneath the ring 15 without subjecting the jacks to tilting loads.

We claim as our invention:

1. In a crane having an upper structure pivoted on a lower car body including means for moving the crane over the ground, the combination comprising, a pair of
support beams secured to and forming a part of said lower car body, a track-like ring secured to said beams and horizontally surrounding said lower car body, a plurality of ring support arms pivoted for vertical movement on said lower car body and extending outwardly to underlie said ring as spaced points around the ring, some of said arms being pivoted on said support beams of said car body, means interengaging said arms and said ring to prevent the arms from swinging away from the ring, and a plurality of jacks one positioned at the end of each of said arms and sized to engage the ground when extended so as to lift the ring, the lower car body and the means for moving the crane relative to the ground.

2. The combination of claim 1 including a boom carrier pivoted for vertical movement on said upper structure and riding for rotation on said ring, a boom mounted on said boom carrier, a counterweight carrier pivoted for vertical movement on said upper structure and riding for rotation on said ring, and means interconnecting said counterweight carrier and said boom.

3. The combination of claim 1 including hydraulic jacks mounted at the four ends of said support beams for initially positioning said ring and lower car body.