MOUNTING AND RAISING DEVICE FOR PORTABLE SPAR TOWERS


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5 Claims. (Cl. 52—115)

The present invention relates in general to mounting devices for portable spar towers and more particularly to a specially adapted mounting and raising structure for portable spar towers of the ground supported type.

It is common practice in the prior art to support a portable spar tower in a generally horizontal position on a vehicle for transport by the use of a stationary upright cradle at one end of the vehicle and a movable A-frame spaced some distance from the cradle. The A-frame serves to provide a pivot means about which the tower is pivoted when it is moved from the horizontal transport position to the erected position. Normally the A-frame includes hydraulic cylinders for rotating the A-frame to accommodate the erection of the tower and the pivot means of the A-frame may remain coupled to the tower in the erected position with the vehicle providing vertical support for the tower. In some instances, however, it is desirable to support the tower directly on the ground in the vertical erected position so as to allow the carrier vehicle to be moved away from the tower once it is erected and secured by guy cables. For this type of structure, it is necessary to provide a detachable pivot means on the conventional A-frame to allow the vehicle to be removed from the erected tower. As will be appreciated by those skilled in the art, great difficulty is oftentimes encountered when recoupling the A-frame pivot means since the ground supported tower may settle on soft ground or the vehicle may not be in the exact position as it was when the detachable pivot means was uncoupled. The present invention provides a novel A-frame or mounting and raising structure for alleviating the problems experienced in the prior art in connection with ground supported spar towers. According to the present invention the pivot means of the A-frame may be recoupled to the erected spar tower regardless of the change in relative positions of the spar tower and the vehicle.

Accordingly, the primary object of the present invention is to provide a mounting and raising device for ground supported spar towers which permits the carrier vehicle to be uncoupled and removed from the erected tower and to be quickly and easily recoupled to the tower when desired.

Another object of the present invention is to provide a mounting and raising device of the character described wherein the A-frame means is swingable about a horizontal axis and the detachable pivot means is vertically movable so as to compensate for relative misalignment between the tower and the carrier vehicle.

A further object of the present invention is to provide a mounting and raising device of the character described, the control of which can be achieved by the hydraulic control means of the carrier vehicle in cooperation with the hydraulic control of the various other components of the system to enable a quick connection to be made between the pivot means and the erected tower.

Other particular objects and advantages of the invention will be more fully apparent, appear and be understood from the following description and claims, the invention consisting of the novel construction and adaptation and combination of parts hereinafter described and claimed.

Reference is now made to the accompanying drawings in which:

FIG. 1 is a side elevation of a carrier vehicle and a ground supported spar tower incorporating the present invention;

FIG. 2 is a cross sectional view taken along lines 2—2 of FIG. 1;

FIG. 3 is a cross sectional detail taken along lines 3—3 of FIG. 1;

FIG. 4 is a cross sectional detail taken along lines 4—4 of FIG. 3; and

FIG. 5 is a schematic of the hydraulic system of the device.

Referring now to the drawings wherein like reference numerals indicate identical parts in the various views, FIG. 1 illustrates a carrier vehicle 1 including a carrier unit 2 mounted thereon. Although the particular vehicle is shown as a tracked vehicle, it will be understood that any type of vehicle known to the art and suited to the purpose may be used. The vehicle 1 is provided with a carrier frame generally indicated at 3 for supporting a portable spar tower 4 by means of a fixed cradle support 6 and the A-frame structure indicated generally at 7. The frame 3 may be of any detailed construction and will include longitudinal side beams 8 and suitable cross beams 9 which may be in the form of I-beams or the like fixed to the vehicle frame in any suitable manner so as to be rigid with the vehicle and provide the necessary support for the spar tower as will be explained. Conventional stabilizing jacks 11 may also be carried by the frame 3 and are designed to be lowered to stabilize the vehicle when the tower is in the raised position as will be understood by those skilled in the art. It might also be mentioned that the support 6 comprises a conventional cradle support for the tower 4 and will be made rigid with the vehicle to receive the tower in the horizontal position shown in FIG. 1.

The spar tower 4 may comprise any conventional telescoping spar tower and will include in this instance, a ground engaging base member 12 upon which the tower rests as illustrated in FIG. 1 in the erected position. The tower 4 will also be provided with a plurality of guy drums 13 mounted on each side of the tower, three of which are shown in FIG. 1. The guy drums are normally used for handling the guy cables which stabilize the tower when in the erected position. Mounted on opposite sides of the bottom end of the tower are a first bank of sheaves 14 and a second bank of sheaves 15 which are used in moving the tower from the horizontal transport position to the vertical erected position on the tower. Guy cables 21 which pass beneath the vehicle and are guided by the guide sheaves 18 and 19. As illustrated in FIGS. 1 and 2, the cable 17 is passed alternately about one of the sheaves 14 and a bank of sheaves 21 fixed to the cross beam 9 on the vehicle and may be lead head to either the bank of sheaves 14 or the bank of sheaves 21. With this arrangement, the winding drum 16 may also be used to haul in and out the cable 17 to accomplish the pivoting of the tower 4 from the horizontal transport position to the vertical erected position in cooperation with the action of the A-frame 7 as presently to be described. When the tower is in the erected position, the cable 17 may be anchored at the bottom of the tower 4 and the vehicle 1. It is desirable to remove the vehicle from the erected tower, the cable 17 may be more-
ly detached and hauled in to disconnect the vehicle from the tower.

Turning now to the details of the A-frame 7, specific reference is made to FIGS. 2 through 4. A support frame 22 having laterally spaced leg members 23 is located adjacent the end of the frame 7 as shown in FIG. 1 and is pivoted both to the A-frame unit 7 and to the longitudi- nal beams 8 of the mounting frame. As shown in detail in the A-frame structure thus far described may be used with a hydraulic cylinder unit 24 which is fixed to the legs of the frame and includes a piston rod 26 with each of the piston rods 26 on either side of the mounting frame being pivoted to the frame by means of the pivot pins 27.

The upper end of the support frame 22 is pivoted to the A-frame unit 7 by means of the pivot pins 28 which engage suitable brackets 29 carried by the upper end of the A-frame unit. Thus the support frame 22 is not only capable of pivoting about a horizontal axis but is also capable of being extended and retracted by means of the cylinders 34 to effect pivoting of the A-frame 7 as will presently be described.

The A-frame 7 constitutes a transverse beam 31 with converging leg members 32. The opposite ends of the transverse beam 31 is provided with suitable pivot plates 33 for receiving the pivot pins 24 which pivotally connect the opposite support frame 3 to the upper end of the end of the frame. The converging leg members 32 of the A-frame are welded or otherwise affixed to laterally spaced vertical channel members 36 which extend from the upper ends of the legs to the beam 31. It will be understood that any additional means for bracing or rigidifying the A-frame structure thus far described may be used and that the details of the attaching means between the various beams of the A-frame may be varied without departing from the scope of the invention.

Fixedly secured between the channels 36 is an hydraulic cylinder 37 having an extendible piston rod 38 extending upwardly therefrom. The cylinder 37 may be carried by any suitable frame or the like 39 welded or bolted between the channels 36 as indicated in FIGS. 2 and 3. The upper end of the piston rod 38 includes a connector member 41 for connecting the piston rod to a slidable fulcrum carriage indicated generally at 42. The fulcrum carriage 42 is vertically slidable within the channels 36 and includes the end plates 43, side plates 44 and cross members 46 and 47 with the connector 41 being secured between the cross members 46 and 47. Extending upwardly from the end plates 43 are two spaced guide plates 48 which have extended end portions 49 which are curved as illustrated in FIG. 3 in order to guide the tower trunnions into position on the fulcrum and to accommodate the curvature of the tower. The guide plates 48 may be welded into position and strengthened by the plates 51 and the fulcrum pin 52 extends between the guide plates 48 and is fixed in position. With this arrangement, the fulcrum pin 52 may not only be moved in an arc by virtue of the pivoting of the A-frame unit 7 but may also be moved vertically by means of the hydraulic cylinder 37 and the carriage upon which it is mounted. In order to hold the carriage 42 in a preset position, locking pins 53 may be passed through suitable holes in the channels 36 to support the carriage in a given vertical position in order to relieve the cylinder 37 as illustrated in FIG. 3.

As shown in FIGS. 3, 4 and, the tower 4 is provided with spaced trunnions 54 which are adapted to engage the pivot pin 52 for locking the tower to the fulcrum carriage of the A-frame. The trunnions 54 and the pivot pin 52 provide a pivot point for moving the tower from the horizontal transport position to the vertical erected position. The trunnions 54 are fixed to an adapter plate 56 carried on the side of the tower. In order to locate the trunnions to the pivot pin, the plates 57 and 58 extend between the trunnions and are positioned so as to be on opposite sides of the pivot pin 52 when the trunnions are in engagement with the pin. The plates 57 and 58 are provided with suitable holes for receiving the locking pins 59 in such a manner that the trunnions and the tower are locked to the A-frame and may be disconnected by removing the pins 59.

FIG. 3 illustrates the fluid system for operating the various winch motors and hydraulic cylinders of the system. A supply of hydraulic fluid is provided by the sump or tank 61 and the hydraulic pump 62 provides fluid pressure for the entire system. The intake side of the pump 62 is connected to the tank by means of the intake conduit 63 and delivers fluid under pressure to the unloading relief valve 64 which unloads the pump to the reservoir 61 at low pressure when the accumulator 66 reaches its maximum pressure charge in order to limit the pressure in the system to a predetermined maximum. The unloading valve 64 may be connected to the reservoir 61 by means of the conduit 67.

The high pressure line 68 delivers fluid pressure from the valve 64 to the winch motor 69 through the valve unit 71 for the purpose of operating the winch 16. The high pressure conduit 68 is also connected to the branch conduit 72 which delivers fluid pressure to the multiple valve unit 73 for controlling the selective operation of the hydraulic cylinders 24 for extending and retracting the support frame 22 and the hydraulic cylinder 37 for raising and lowering the fulcrum carriage 42. It will be noted that the double acting cylinder is shown in unison to accomplish simultaneous movement of both of the legs of the support frame 22. The hydraulic cylinders 24 and 37 may be provided with suitable flow control valves as illustrated. The branch conduit 72 is also connected to deliver fluid pressure to one of the hydraulic jacks 11 through the manifold 74 with the opposite hydraulic jack 11 being supplied from the high pressure conduit 68. Each of the jacks 11 is provided with a selectively operable valve 76 and a holding valve 77.

The various hydraulic controls for the tower 4 are serviced by the high pressure conduit 68 through the manifold 74 and include the cylinder 78 with its locking valve 79 and the plurality of guy winch drum motors 81 which are controlled by the valve units 82. The various components of the hydraulic system described will be provided with return or low pressure conduits as illustrated in FIG. 5.

In operating the system, the vehicle with the spar tower in the horizontal transport position as shown in FIG. 1 will be moved to the desired location for erection and the jacks 11 will be set in order to stabilize the vehicle frame. The winch drum 16 is then operated to haul in the cable 17 for pivoting the tower about the pivot pin 52 which is, at this time, locked to the tower. Hauling on the cable 17 pivots the tower to the vertical position shown in dotted line in FIG. 1 and the hydraulic cylinders 24 may be operated to swing the A-frame unit 7 about its pivotal connection with the vehicle frame to enable the tower to be moved to the vertical position where it is supported by the ground surface at the end of the vehicle. Once the tower is in the vertical position, the tower sections may be telescoped to extend the tower by any such means as an auxiliary winch or the like. The tower is then locked in the raised position or extended position by means of the lock cylinder 78 and guy cables for the guy winch drums 13 are strung to secure the tower. In this position, the tower end of the tower is tied to the vehicle by means of the cable 17 and the banks of sheaves 14 and 21 and the pivot pin 52 is still locked to the tower trunnions. In the event that it is desirable to remove the vehicle 1 and yarder from the location shown in FIG. 1, the cable 17 is disconnected and the lock pins 53 are removed to allow the A-frame 7 to be returned to the full line position shown in FIG. 1. The tower is then completely supported by the ground and secured by the guy cables. When the vehicle is again to be connected to the tower in order to transport the tower, the vehicles is moved into position and the cable 17 is again connected to the bottom of the tower.
frame 7 may be pivoted into position adjacent the trunnions on the vertical tower and the pivot pin carriage 42 is either raised or lowered in order to engage the pivot pins with the trunnions of the tower. This feature permits the vehicle A-frame to be reconnected to the tower regardless of shifting or settling of the tower or misalignment of the vehicle from its original position. Once the pivot pin is locked to the trunnions, the reverse procedure from that described above is used to again pivot the vertical tower to the horizontal transport position and the pins 55 may be set to relieve the load on the cylinder 37.

It will be readily apparent to those skilled in the art that the present invention provides novel and useful improvements in mounting and raising device for portable spar towers of the character described. The arrangement and types of structural components utilized within the invention may be subjected to numerous modifications well within the purview of this invention and applicant intends only to be limited to a liberal interpretation of the specification and appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by Leiters Patent is:

1. An apparatus for pivotally mounting a portable spar tower an a carrier vehicle comprising; an upstanding A-frame, means mounting said A-frame on said vehicle for pivotal movement about a horizontal axis adjacent its lower end, an extensible support frame extending between the upper end of said A-frame and said vehicle for rotatably adjusting said A-frame about said horizontal axis, a transverse pivot pin adapted to be engaged by said tower to form the trunnion thereof, mounting means to mount said pivot pin on said A-frame for reciprocal vertical movement relative thereto, and selectively operable power means connected to said mounting means for vertically positioning said pivot pin.

2. A pivotal mounting apparatus for a portable spar tower comprising; an A-frame unit, means pivotally mounting the base of said unit on a carrier vehicle for movement about a horizontal axis, an extensible support frame extending between said carrier vehicle and said A-frame, means for pivotally connecting said frame to the upper portion of said A-frame unit and to said vehicle, selectively operable power means to extend said frame to pivot said unit about its pivotal connection with said vehicle, a fulcrum carriage, means to mount said carriage on said A-frame unit for vertical sliding movement therealong, a transverse pivot pin mounted on said carriage, and power means connected to adjust the vertical position of said carriage relative to the A-frame unit.

3. The device according to claim 2 wherein said support frame comprises laterally spaced converging leg members connected to the upper end of said A-frame, the bottom end of each of said leg members having an extensible fluid motor connected thereto and to the vehicle, and means to selectively operate said motors in unison for extending said frame to pivot said A-frame unit about its horizontal axis.

4. In combination with a carrier vehicle and a portable spar tower including trunnion means carried thereby, said tower being adapted to be carried on said vehicle, a mounting and raising device comprising; a rigid A-frame unit, means pivotally mounting the base of said unit on said vehicle for pivoting about a horizontal axis, an extensible support frame pivotally connected between said unit and the vehicle, means to selectively extend said support frame for pivoting said unit, a fulcrum carriage including a transverse pivot pin, means mounting said carriage on said unit for vertical reciprocation relative thereto, means for releasibly locking said trunnion means to said pivot pin, and means carried by said vehicle for pivoting said tower to the vertical erected position about said pivot pin to be supported by the ground, whereby said vehicle may be detached from the tower in the erected position and said pivot pin may be selectively repositioned vertically and horizontally to recouple the tower trunnion means to the A-frame unit.

5. The device according to claim 4 wherein said support frame comprises laterally spaced converging leg members, the upper ends of said leg members being pivotally connected to the upper end of said A-frame, each of said leg members having an extensible fluid motor connected thereto and to the vehicle, and means to selectively operate said motors in unison for extending said frame to pivot said A-frame.

6. The device according to claim 5 including fluid motor means acting between said A-frame and said carriage with means to selectively operate said motor means to adjust the vertical position of said pivot pin relative to the A-frame.

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FRANK L. ABBOTT, Primary Examiner.
ROBERT VERMUT, PRICE FAY,
Assistant Examiners.