

- [54] **MOBILE CRANE WITH JIB EXTENSION**
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- [73] Assignee: **J. I. Case Company, Racine, Wis.**
- [22] Filed: **March 22, 1971**
- [21] Appl. No.: **127,006**
- [52] U.S. Cl. **212/144, 212/55**
- [51] Int. Cl. **B66c 23/62**
- [58] Field of Search **212/55, 144, 35, 59**

- [56] **References Cited**
- UNITED STATES PATENTS**
- 3,366,250 1/1968 Grove **212/144**

FOREIGN PATENTS OR APPLICATIONS

978,765 12/1964 Great Britain

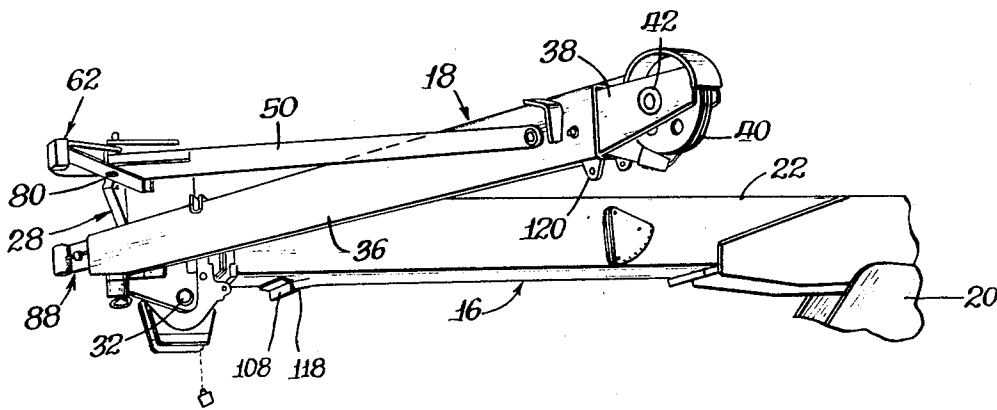
Primary Examiner—Harvey C. Hornsby

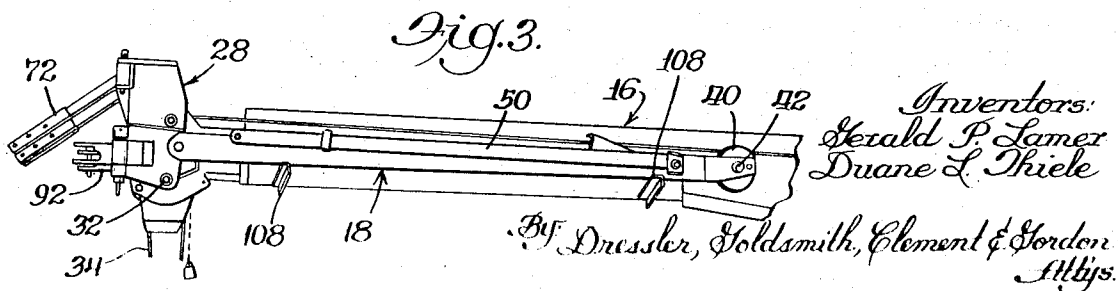
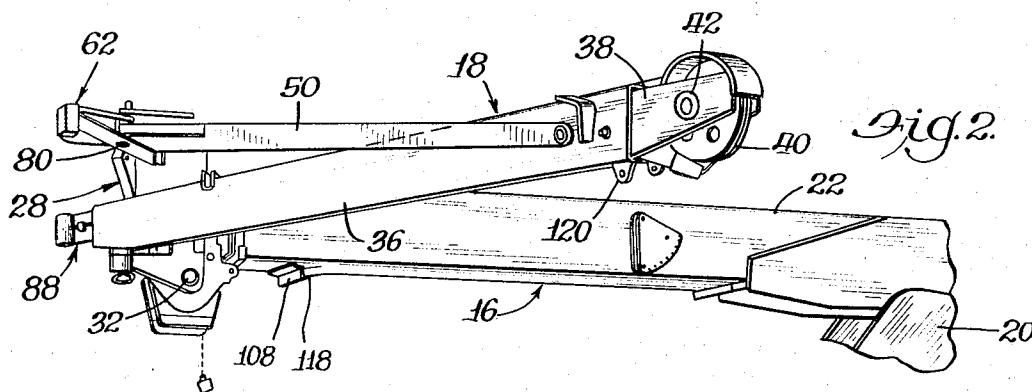
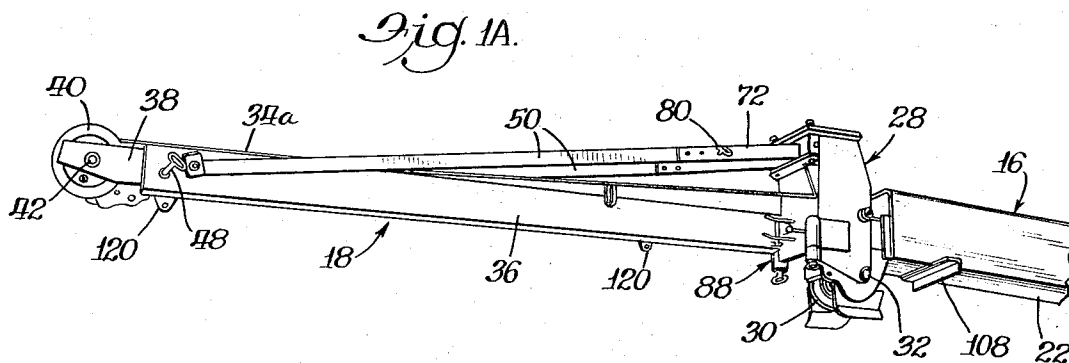
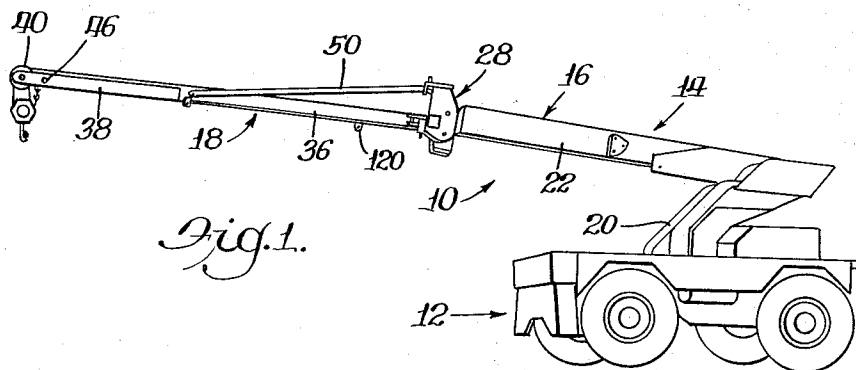
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[57] **ABSTRACT**

A crane structure including a main boom comprised of a plurality of telescopically arranged boom sections, with a jib boom being connected to the main boom for movement between a usable position in alignment with the main boom and a storage position alongside of the main boom. The jib boom is connected to the main boom by an upright pivot, so that the jib boom swings in a generally horizontal plane in moving between the usable and storage positions. The connection of the jib boom to the main boom is detachable, so that the main boom section may be extended and retracted when the jib boom is in the storage position and the connection means is detached.

14 Claims, 8 Drawing Figures





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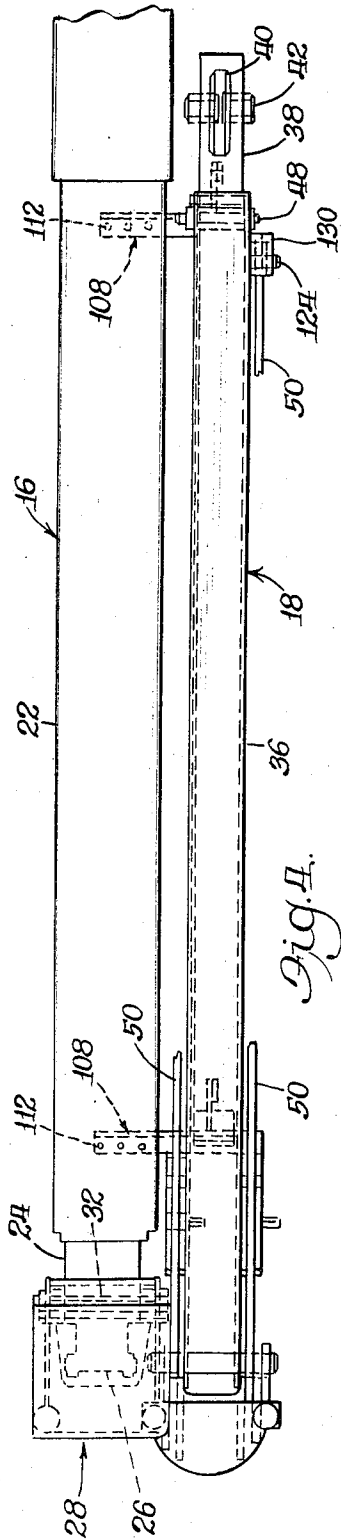


Fig. 4.

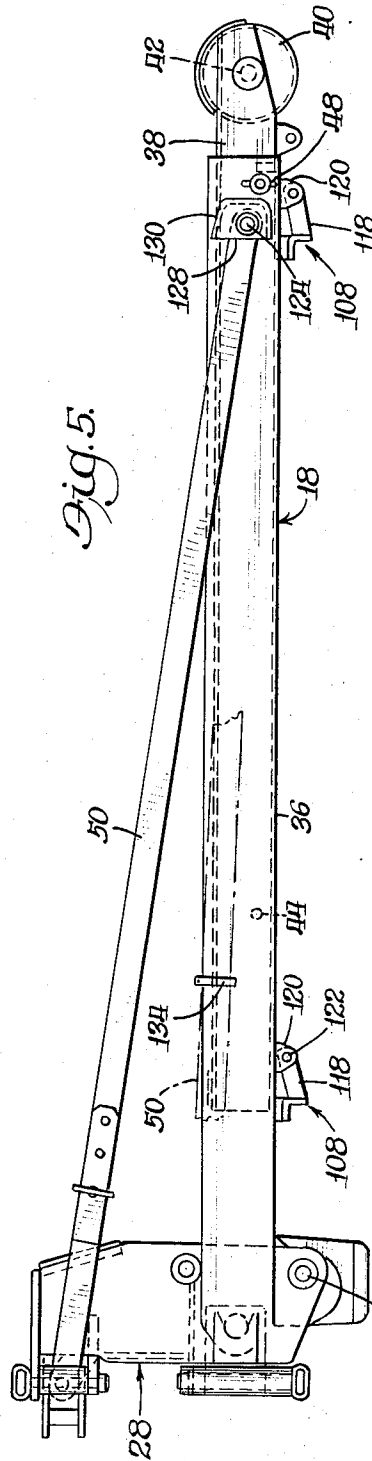


Fig. 5.

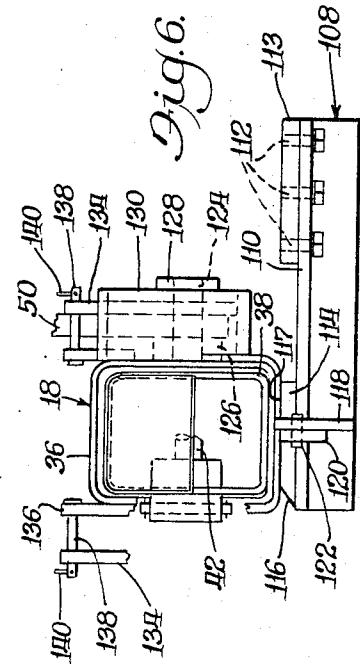


Fig. 6.

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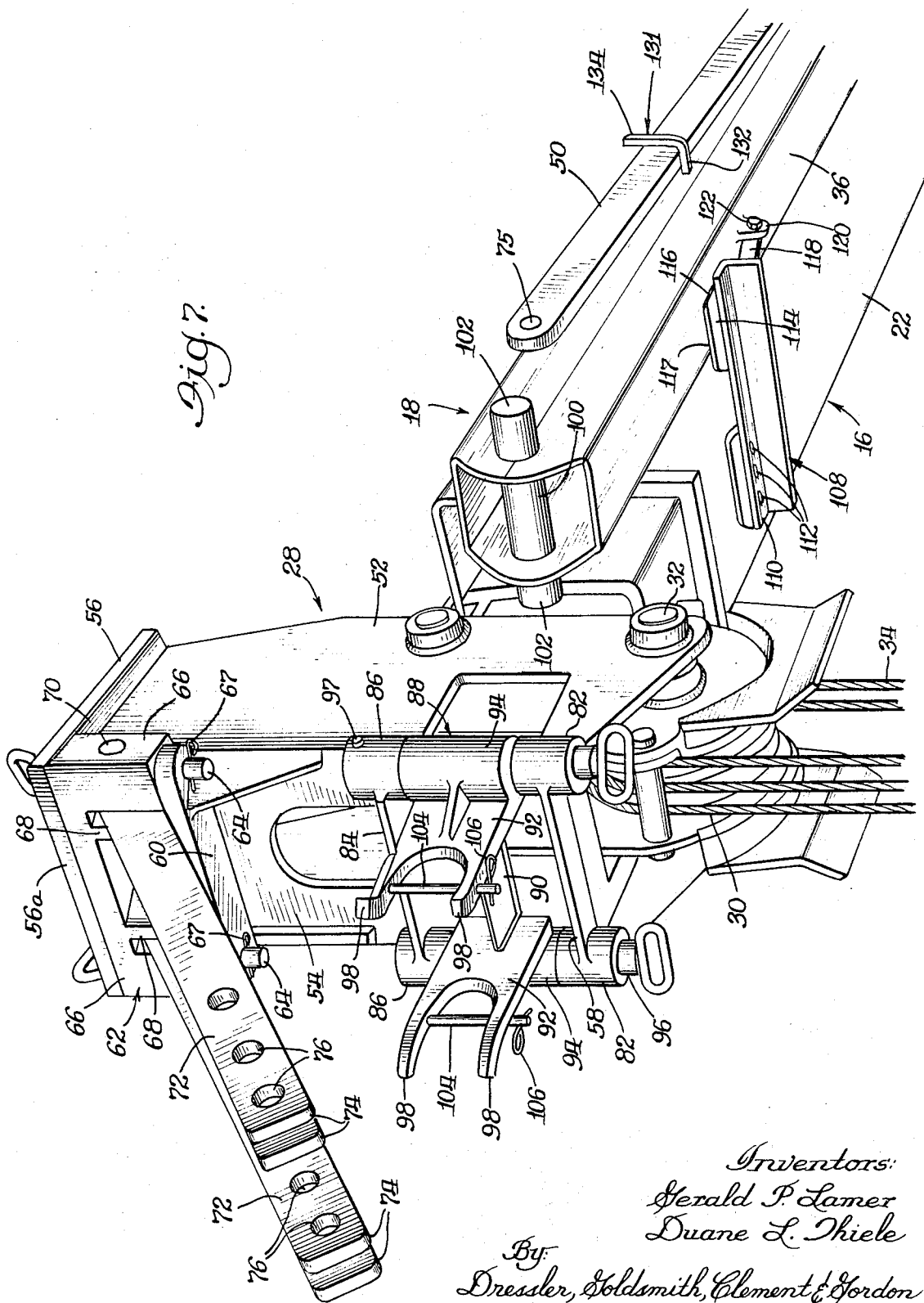


Fig. 7.

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MOBILE CRANE WITH JIB EXTENSION

BACKGROUND OF THE INVENTION

In the crane art, it is common to provide a crane boom with a jib extension to increase the working length of the boom. Heretofore, most jib extensions have been detachably mounted upon the main boom and it has been necessary to remove the jib from the main boom and to store it when it is not necessary to have a boom of extended length. Such completely detachable jib structures have been difficult and time consuming to assemble and disassemble.

To obviate the problems connected with completely detachable jib extensions, it has been proposed to provide a main boom with a jib section that can be stored directly upon the main boom when the jib is not in use. While such arrangements have obviated the problems inherent in storing a completely detachable jib, heretofore, the semi-detachable jib structures that have been used have not been entirely satisfactory.

A recent patent that illustrates a semi-detachable jib that can be stored directly upon a main boom is Grove U.S. Pat. No. 3,366,250. While structures such as that illustrated in the Grove patent have proven to be more convenient than previous arrangements wherein the jib must be completely detached from the main boom, they are not entirely satisfactory, in that it is difficult to manipulate the jib between the usable and storage positions. More particularly, with arrangements such as that illustrated in the Grove patent, the jib is located beneath the main boom in the storage position, and when it is desired to move the jib from the storage position to the usable position, it is necessary to first raise the main boom to an elevated position, so that the jib will be free to swing away from the storage position. It is then necessary to release latching means that retain the jib in the storage position, and to then lower the main boom until the sheave at the end of the jib engages the ground. The undercarriage structure supporting the boom structure must then be backed up while the main boom is simultaneously lowered to position the jib in a favorable attitude so that the hoist cable of the boom will be operative to lift the jib into alignment with the main boom. The shortcomings of the above described structure and procedure are believed to be readily apparent.

SUMMARY OF THE INVENTION

The improved crane structure of the present invention includes a jib boom that is connected to a main boom for pivotal movement about a substantially upright axis between a usable position in alignment with the main boom and a storage position alongside of the main boom. The connection between the jib boom and the main boom is detachable, so that when the jib is in the storage position and is disconnected from the main boom, the main boom sections may be extended and retracted without interference from the jib. The jib is carried by outrigger supports on the proximal section of the main boom, and a minimum number of fasteners are employed to retain the jib in the storage and in the usable positions.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the crane structure of the present invention, with the distal and intermediate sections of the main boom in a retracted position within the proximal section, and with the distal section of the jib boom in an extended position;

FIG. 1A is a perspective view similar to FIG. 1, but on an enlarged scale, and showing the jib boom distal section in a retracted position within the jib boom proximal section;

FIG. 2 is a perspective view similar to FIG. 1A, and illustrating the jib boom during movement between the usable and storage positions;

FIG. 3 is a side elevational view of the crane boom structure, with the jib boom in the storage position;

FIG. 4 is a top plan view on an enlarged scale illustrating the jib boom in the storage position, with certain parts broken away for clarity of illustration;

FIG. 5 is a side elevational view of the structure illustrated in FIG. 4, with certain parts broken away for clarity of illustration;

FIG. 6 is an enlarged end elevational view of the jib boom in the storage position; and

FIG. 7 is an enlarged perspective view illustrating the support structure at the end of the main boom.

DESCRIPTION OF THE PREFERRED EMBODIMENT

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail one specific embodiment, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

Referring now to the drawings in detail, the crane structure of the present invention is illustrated generally at 10 in FIG. 1, with the crane structure including a self-propelled undercarriage or base 12, herein a wheeled vehicle. The crane 10 includes a boom structure 14 comprised of a main boom 16 and a jib extension 18.

The main boom 14 includes a base section 20 that extends upwardly from a turntable (not shown) on the undercarriage 12, with the base section 20 being rotatable about a vertical axis, as is well known. The main boom 14 further includes a plurality of telescopically arranged sections including an inner section 22, and extension sections comprised of an intermediate section 24 and an outer section 26 said extension sections being (FIG. 4) extendable and retractable relative to one another by suitable hydraulic means, as is also well known. A bracket assembly 28 is provided at the outer end of the outer or distal boom section 26, and a sheave 30 is rotatably mounted at 32 adjacent the lower end of bracket 28. A cable 34 is trained over sheave 30, and is reeled in and out by a drum, not shown, on vehicle 12. A block and tackle, or other lifting device, is associated with cable 34, as is conventional.

The jib boom or further extension section 18 includes an inner or proximal section 36 and an outer or

distal section 38 that is mounted for telescopic movement within section 36. A sheave 40 is rotatably mounted at 42 at the outer end of jib boom section 38, and a cable extension 34a is trained over sheave 40, with a block and tackle, or similar lifting device, being connected to cable 34a. A pair of spaced openings 44 and 46 (FIGS. 1 and 5) are provided in the side wall of jib boom section 38 adjacent the inner and outer ends thereof, respectively, and a pin 48 is provided in an opening in the side wall of boom section 36 for selective insertion in opening 44 or 46 to retain the boom section 38 either in the retracted position of FIG. 1A or the extended position of FIG. 1. Tension bars 50 are connected between bracket 28 and boom section 38 to stabilize the jib, when it is in the usable position.

The jib 18 is detachably connected to the bracket 28 for movement between a usable position in alignment with the main boom as illustrated in FIGS. 1 and 1A and a storage position located along one side of the inner boom section as illustrated in FIGS. 3-6, and the detachable connection structure will be best understood from FIG. 7. Bracket 28 is a box-like structure that includes side walls 52, front and rear walls 54, a top wall 56 and a bottom wall 58. Top wall 56 extends forwardly of front wall 54 to provide a generally horizontally disposed overhanging flange 56a, and a further flange 60 extends outwardly from front wall 54 below flange 56a in parallelism therewith. A yoke bracket 62 is mounted between flanges 56a and 60, and yoke bracket 62 includes enlarged block-like end walls 66 at opposite ends thereof. Clearance openings, not shown, are provided in flanges 56a and 60 and in end walls 66, with the openings in the flanges and end walls being positionable in registry so as to receive therethrough generally vertically disposed coupling pins 64. Retention means, such as cotter pins 67, impale openings at the lower end of coupling pins 64 to retain the pins 64 in assembled relationship with the flanges 56a and yoke bracket 62.

An upright web 68 is provided on yoke bracket 62 inwardly of each end wall 66, and one end of a yoke bar 72 is pivotally connected between each end wall 66 and adjacent web 68 by a transverse pin 70, which impales aligned openings in each set of walls 66 and 68. Yokes 72 include bifurcated end portions 74 that are positionable in embracing relationship with respect to the end of tension bars 50, and yokes 72 include openings 76 therethrough that are positionable in registry with an opening 75 in the end of tension bar 50 for receiving a pin 80 therethrough to releasably couple the tension bars to the yokes 72 when the jib boom 18 is in the usable position.

Bracket 28 includes a pair of laterally spaced, generally vertically disposed, cylindrically-shaped hubs 82 forwardly of bottom wall 58 adjacent front wall 54, and hubs 82 have vertical bores therethrough. A flange 84 extends outwardly from front wall 54 above and generally parallel with bottom wall 58; and generally vertically disposed, cylindrically-shaped hubs 86 are provided at opposite ends of flange 84, with vertical bores in hubs 86 being positioned in vertical alignment with the bores in hubs 82. A bracket assembly 88 for supporting the jib boom 18 is mounted between hubs 82 and 86, and bracket assembly 88 includes a horizontally disposed web 90 having forwardly extending arms

92 at opposite ends thereof. The rearward end of arms 92 each include a generally cylindrically-shaped hub 94 having a bore therethrough that is positionable in registry with the bores in hubs 82 and 86. A vertically extending coupling pin 96 impales each set of aligned bores in hubs 82, 86 and 94 for coupling the bracket assembly 88 to the bracket 28 for retaining the jib boom 18 in the working or usable position in alignment with main boom 16. The bores in hubs 82, 86 and 94 cooperate with the pins 96 to define upright pivot axes at opposite sides of the outer section 26, said axes being generally perpendicular to the length of the main boom 14. Retention means, such as a transversely extending pin 97, may be positioned through aligned openings in hubs 86 and pins 96, to retain the pins 96 in assembled relation within the hubs 82, 86 and 94.

The forwardly extending ends of arms 92 define connection means including outwardly flaring bifurcations 98 that collectively form a female means, i.e. a clevis, for receiving attachment means in the form of outwardly extending ends 102 of a transversely extending pin 100 at the rearward end of jib boom section 36 when the jib boom 18 is in the usable position as will hereinafter appear, pin 100 cooperates with bracket 88 to provide means mounting the jib section between the above mentioned usable and storage positions. Upwardly extending clevis pins 104 impale the bifurcated end portions 98 of arms 92 to confine the male means provided by pin 100 and releasably connect the jib boom 18 with the bracket assembly 88; and retention members, such as cotter pins 106, may extend through openings in the lower ends of pins 104 to retain them in assembled relationship with arms 92.

The means for supporting the jib boom 18 in the storage position may be best seen in FIGS. 5-7. A pair of longitudinally spaced, transversely extending, inverted L-shaped support members 108 are secured to the undersurface of main boom section 22 adjacent the inner and outer ends thereof so as to engage said jib boom at positions spaced a substantial distance outwardly of the mid-portion of the jib boom. This end, fasteners 112 secure the horizontal flange 110 of each support member 108 to a mounting pad 113 that is secured to the lower wall of main boom section 22. Support members 108 extend laterally outwardly of boom section 22, and cam blocks 114 are fixed to the upper surface of the outwardly extending portion of the horizontal flange 110 of support members 108. Cam blocks 114 include an inclined cam surface 116 that is engaged by the corner of jib boom section 36 during movement of the jib boom into the storage position, and cam surfaces 116 facilitate movement of the jib boom to a position resting upon the upper horizontally disposed support surface 117 of each cam block 114. Arms 118 extend forwardly of support members 108, and an opening in the outer end of each arm 118 is adapted to be positioned in alignment with an opening in one of a pair of lugs 120 that extend downwardly from jib boom section 36, when the jib boom is in the storage position. A fastener 122 impales the aligned openings in arms 118 and lugs 120 to securely retain the jib boom in spaced parallel relationship with boom section 22 in the storage position.

The structure for connecting the forward end of tension arms 50 to the jib boom 18 can be best seen in

FIG. 6. A pin 124 extends transversely of each stabilizing arm 50 adjacent the forward end thereof, and the outer ends of each pin 124 are received in openings in a first hub 126 that is fixed to a side wall of jib boom section 36, and a second hub 128 of a generally U-shaped support 130 that is fixed to jib boom section 36. When the jib boom is in the storage position and the stabilizing arms 50 are disconnected from the yokes 72, the stabilizing arms are lowered into engagement with support means, best seen in FIGS. 5 and 7. The support means includes a generally L-shaped support member 131 at each side of jib boom section 36, with members 131 each including a generally horizontally disposed support portion 132 and a generally vertically disposed confining portion 134. Further support members 136 (FIG. 6) are secured to the side walls of jib boom section 36 in alignment with support members 130, and retaining pins 138 are adapted to extend through aligned openings in support members 130 and 136 to positively retain the stabilizing arms 50 on the jib boom. Cotter pins 140 preferably are provided in openings in the ends of pins 138 to prevent the stabilizing arms from being disconnected from the jib boom 18 when the jib boom is in the storage position.

When the jib boom 18 is in the storage position, the yoke bracket 62 is retained in place on bracket 28 by pins 64 and cotter pins 67. Also, bracket assembly 88 is retained in place on bracket 28 by connecting pins 96 and retention pins 97. When it is desired to move the jib boom 18 from the storage position alongside the main boom to the usable position in alignment with the main boom, the cable 34 is first unwound and left hanging. Brackets 62 and 88 are then readied for pivotal movement by removing pins 67 from the left hand connecting pin 64, and by removing retention pin 97 from the left hand connecting pin 96, both as viewed in FIG. 7. Cotter pins 106 and clevis pins 104 are then removed from arms 92, and the main boom section 26 is then extended approximately 14 inches. Brackets 62 and 88 are then pivoted 180° about the remaining pins 64 and 96, respectively, into a position facing the end of the jib boom section 36. The main boom section 26 is then retracted, and the bifurcations 98 on arms 92 slide over the outwardly extending ends 102 of the pin 100 at the end of jib boom section 36. Clevis pins 104 are then positioned in the openings in bifurcations 98, and cotter pins 106 are inserted through the openings in 104, so that the jib boom section 36 is positively connected to the bracket 88.

Cotter pins 140 are then removed from the stabilizing arm retention pins 138, and the pins 138 are removed to allow the stabilizing arms 50 to be placed in assembled relation between the bifurcated portions 74 of the yoke arms 72. Pins 80 are then positioned through openings 75 and the appropriate one of openings 76 in yoke arms 72 to secure the yoke arms and the stabilizing arms 50 together. The cable extension 34a is then strung over the sheave 40, and the cable control is operated to remove all slack from the cable. The jib holding fasteners 122 are then removed, and the jib boom 18 is then swung into alignment with the main boom 16 to place the opening in the end wall 66 at the left hand end of bracket 62 in alignment with the openings in flanges 56a and 60, and to place the bores in the left hand hub 94 in alignment with the

bores in hubs 82 and 86. The left hand pins 64 and 96 are then inserted, and cotter pin 67 and retention pin 97 are inserted to positively retain the brackets 62 and 88 in place on bracket 28. The jib boom 18 is then in position for use as an extension of main boom 16. When the jib extension is not necessary, the jib may be moved into the storage position by essentially repeating the steps outlined above in reverse order.

We claim:

1. Crane structure comprising: a base; a main boom pivotally mounted on said base, said main boom including an inner boom section of rectangular construction and at least one extension section mounted for telescopic movement relative to said inner section; a jib boom; means mounting said jib boom for movement between a usable position in alignment with said main boom and a storage position located along one of the vertical sides of said inner boom section, said mounting means including attachment means on said jib boom and connection means on said extension section engageable with said attachment means, said connection means being provided on a connection member which is mounted for movement about an upright pivot axis on said extension section that is generally perpendicular to the length of said main boom, means releasably retaining said connection member in a first position for supporting said jib section in said usable position, the pivotal connection between said connection member and extension section allowing said connection member and jib section to swing in a generally horizontal plane between said usable and storage positions upon release of said retaining means, disengagement of said attachment means and connection means allowing said extension section to be extended and retracted when said jib section is in the storage position; and support means at one side of said inner section transversely attached to the bottom wall of said inner boom section and extending laterally outward for positively retaining said jib section in said storage position.

2. Crane structure as set forth in claim 1 wherein said support means is defined by longitudinally spaced support members positioned beneath said jib section when said jib section is in said storage position.

3. Crane structure as set forth in claim 1 including stabilizing means connected between said main boom and said jib section for supporting said jib section in said usable position.

4. Crane structure as set forth in claim 3 wherein said stabilizing means is defined by at least one elongate member connected at one end adjacent the end of said jib section, and detachably connected at the opposite end to said main boom.

5. Crane structure as set forth in claim 4 including means on said jib section for supporting said stabilizing member when said section is in said storage position.

6. Crane structure as set forth in claim 1 wherein said jib section includes a main portion and a further portion telescopically positioned therein.

7. Crane structure comprising: a base; a main boom pivotally mounted on said base, said main boom including an inner boom section having a bottom and sides and at least one extension section mounted for telescopic movement relative to said inner section; a further extension section; means mounting said further extension section for movement between a usable posi-

tion in alignment with said main boom and a storage position located along one side of said inner boom section, said mounting means including attachment means on said further extension section and connection means on said extension section cooperable with said attachment means, said attachment means and connection means defining an upright pivot axis adjacent one side of the outer end of said extension section, said pivot axis being generally perpendicular to the length of said main boom; means releasably retaining said further extension section in said usable position, said pivot axis allowing said further extension section to swing in a generally horizontal plane between said usable and storage positions upon release of said retaining means, disengagement of said attachment means and connection means allowing said extension section to be extended and retracted when said further extension section is in the storage position; first and second longitudinally spaced support members extending generally transversely outwardly from said one side of said inner section adjacent the lower portion thereof, said support members each defining an upper support surface and said support surfaces collectively defining an upwardly facing shelf upon which said further extension section rests in said storage position; and cooperating means on said inner section and said further extension section means for releasably retaining said further extension section in said storage position on the upwardly facing shelf defined by said support surfaces, the cooperating means on said inner section and said further extension section being positioned in operative association when said further extension section is in the storage position, whereby said cooperating means can be engaged independently of telescopic movement of the extension section of the main boom.

8. Crane structure as set forth in claim 7 wherein said

support means includes longitudinally spaced support members on said inner section positioned to engage said further extension section at positions spaced a substantial distance outwardly of the mid-portion of said further extension section.

9. Crane structure as set forth in claim 7 wherein said support means and said cooperating means retain said further extension section in spaced parallel relationship with said inner section in said storage position.

10. Crane structure as set forth in claim 7 in which said connection means includes a female element at each side of the outer end of the extension section, and wherein said attachment means includes a male element at each side of said further extension section, each male element being insertable in one of said female elements when said further extension section is in the usable position.

11. Crane structure as set forth in claim 10 wherein said mounting means further includes pin means for releasably retaining said male elements in said female elements.

12. Crane structure as set forth in claim 7 wherein said pivot axis is provided by aligned openings in said attachment means and connection means.

13. Crane structure as set forth in claim 7 wherein said extension section and said further extension section include identical connection means and attachment means, respectively, at opposite sides thereof.

14. Crane structure as set forth in claim 13 wherein the connection means and attachment means on the side of said extension section and further extension section opposite from said pivot axis define the means for releasably retaining the further extension section in the usable position.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,698,569 Dated October 17, 1972

Inventor(s) GERALD P. LAMER and DUANE L. THIELE

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, before "Background of the Invention",
insert -- This is a continuation of U.S. application
Serial No. 818,948, filed April 24, 1969, now abandoned. --

Signed and sealed this 29th day of May 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents