

[54] **TELESCOPIC BOOM AND JIB ASSEMBLY
WITH MEANS TO MAINTAIN A
PREDETERMINED ANGULAR POSITION
THEREBETWEEN**

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[58] Field of Search... **212/55, 144; 52/632, 648-649**

[56] **References Cited**

UNITED STATES PATENTS

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3,374,901	3/1968	Ferwerda	212/55
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3,658,191	4/1972	Murphy	212/55 X
3,732,988	5/1973	Lamer	212/144

FOREIGN PATENTS OR APPLICATIONS

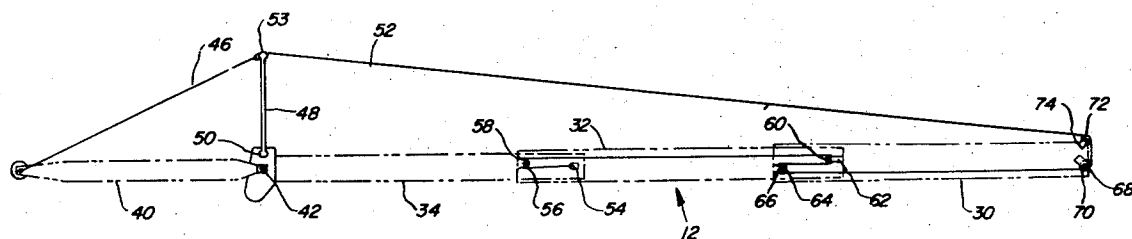
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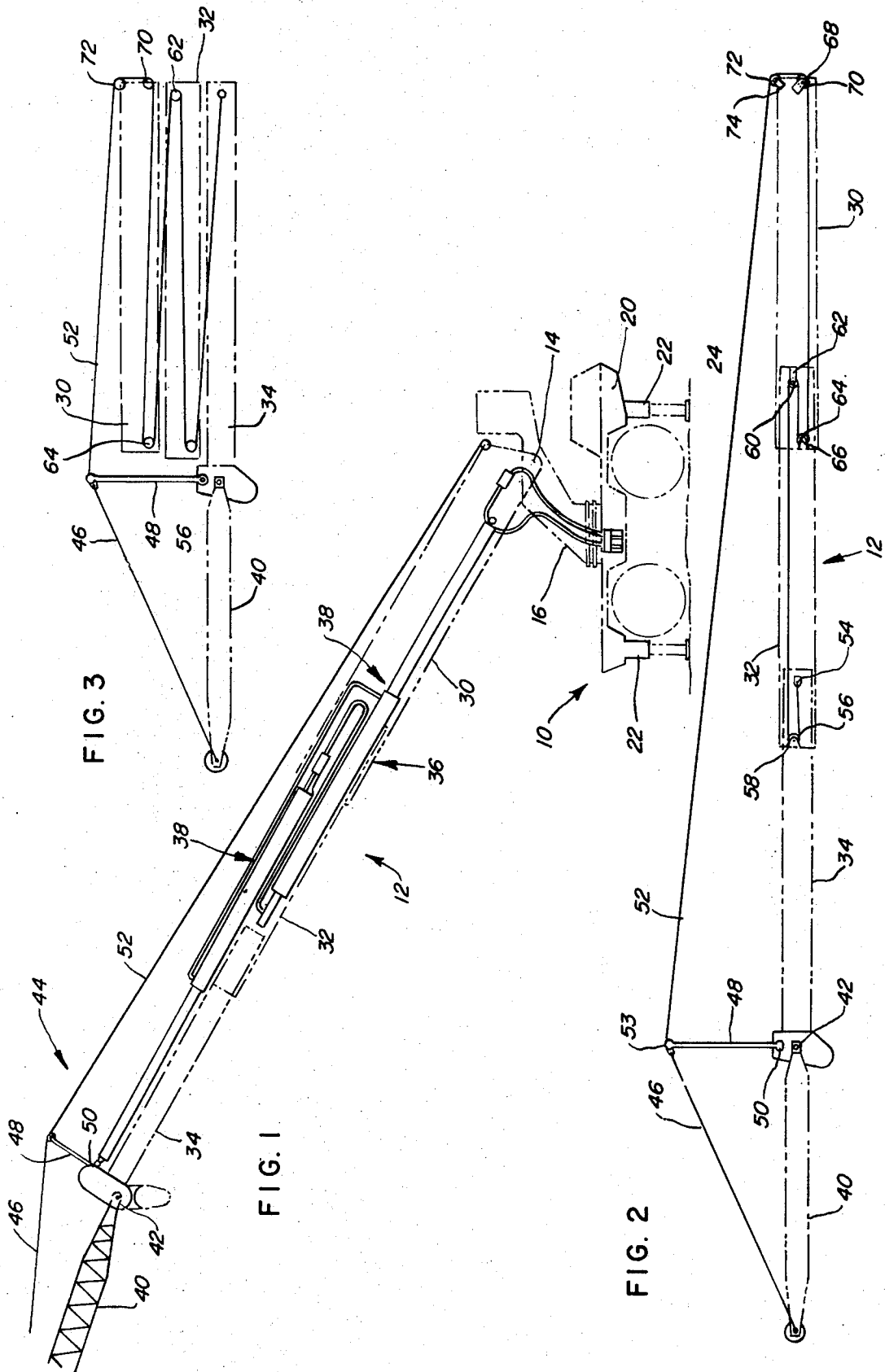
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[57] **ABSTRACT**

This application discloses a crane having an extensible boom consisting of a plurality of boom sections telescoped through power means and a jib assembly pivotally connected to the outer end of the outer or tip section of the boom. The jib assembly is automatically held in a fixed angular position with respect to the boom by a cable assembly while the boom is extended and retracted. The cable assembly includes a cable having one end connected to the inner end of the tip section of the boom and entrained over a plurality of pulleys rotatable on the remaining sections of the boom with the opposite end connected to the free end of a mast structure pivoted on the outer end of the tip boom section. The mast structure is connected to the outer end of the jib assembly through a further cable. The cable assembly will automatically hold the jib assembly at a predetermined angle while the boom sections are extended and retracted relative to each other.

4 Claims, 3 Drawing Figures





TELESCOPIC BOOM AND JIB ASSEMBLY WITH MEANS TO MAINTAIN A PREDETERMINED ANGULAR POSITION THEREBETWEEN

BACKGROUND OF THE INVENTION

The present invention relates generally to cranes and more particularly to an improvement in a crane of the type disclosed in U.S. Pat. No. 3,732,988.

In recent years it has become common in the heavy duty crane industry to have the crane boom consist of a plurality of sections that can be extended and retracted relative to each other to thereby vary the effective length of the crane which results in greater versatility for the entire unit. Furthermore, in many instances, large heavy duty cranes also incorporate a jib assembly connected to the other end of the crane. The jib assembly is usually removable and is only used in instances where extensive length for the boom is required.

The most common manner of supporting the jib assembly on the outer end of the crane boom is to pivotally connect the inner end of the jib assembly to the outer end of the outer boom section. The freely pivoted jib assembly is then held in a fixed position with respect to the outer boom section by a cable that has one end connected to the outer end of the jib assembly and the opposite end connected to a mast structure supported on the outer end of the outer boom section. Usually, the mast structure is also freely pivoted on the boom section and is held in a fixed position by a further cable that extends from the mast structure to another portion of the crane boom, usually the inner end thereof.

This arrangement substantially restricts the versatility of the entire unit when the jib assembly is connected to the outer end of the crane boom. Each time the effective length of the crane boom is changed, it is necessary to also change the effective length of the cable or backstay line that extends from the crane boom to the mast structure.

SUMMARY OF THE INVENTION

The present invention incorporates an automatic adjustment means for the backstay line that supports the jib assembly on the outer end of an adjustable crane boom so that the effective length of the backstay line or cable is automatically adjusted to correspond to the effective length of the crane boom as the crane boom sections are extended and retracted relative to each other. This results in having the jib assembly at the same angular position with respect to the boom while the boom sections are being extended and retracted.

The cable assembly consists of a single cable that has one end connected to the jib assembly and an opposite end connected to the outer end or tip section of the boom and a plurality of freely rotatable pulleys on each of the other boom sections with the cable entrained over the pulleys. The pulleys are arranged so that the effective length of the cable assembly between the inner end of the outer boom section and the jib assembly is always equal to the adjusted length of the boom.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 shows a fragmentary side view of a self-propelled crane having the present incorporated therein with many of the conventional crane elements shown in phantom;

FIG. 2 is a schematic illustration of the crane boom and jib assembly; and

FIG. 3 is an exploded view of the crane boom and jib assembly showing the boom in a retracted position.

DETAILED DESCRIPTION

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail a preferred embodiment of the invention 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.

In FIG. 1 there is disclosed a crane consisting of a vehicle 10 having a boom 12, the inner end of which is pivoted about a horizontal axis defined by a pin 14 on a turntable 16. Turntable 16 is supported for rotation on a vertical axis on a frame 20 having a plurality of outriggers 22 located at each of the corners to raise the entire frame a sufficient distance to space wheels 24 about the ground.

Boom 12 includes a main or inner boom section 30, at least one intermediate boom section 32 and an outer end or tip section 34. The respective boom sections are telescoped with respect to each other for extension and retraction through suitable power means 36 that has been illustrated as a pair of fluid rams 38 each of which has a pair of extensible and retractable elements interposed between adjacent pairs of boom sections.

Power means 36 may take any suitable form but is preferably of the type disclosed and claimed in U.S. Pat. No. 3,657,969, assigned to the assignee of the present invention. Portions of that disclosure not inconsistent with this disclosure are incorporated herein by reference. As is disclosed in this patent, the crane boom 12 is adapted to be pivoted above pivot pin 14 through a suitable fluid ram (not shown).

Crane 10 also includes a jib assembly 40 that is freely pivoted by pin 42 on the outer end of tip section 34 and is held in an angular adjusted position with respect to boom 12 by a cable assembly 44. Cable assembly 44 consists of a first cable 46 having one end attached to the outer end of jib assembly 40 and its opposite end connected to one end of a mast structure 48 that is pivoted at 50 on the outer end of outer boom section or tip section 34. The jib assembly 40, cable 46 and mast structure 48 may be of the type disclosed in U.S. Pat. No. 3,732,988. The remainder of the cable assembly 44 includes a further cable 52 having one end connected to the outer or free end of mast structure 48.

As explained above, heretofore it has been common practice to connect the opposite end of cable 52 directly to the inner end of boom section 30 adjacent pivot pin 14 so that jib assembly 40 is held in a fixed position with respect to boom 12. However, such arrangement precludes the extension and retraction of boom sections 30, 32 and 34 relative to each other without changing the length of the cable 52. According to the present invention, the effective length of cable 52 is au-

tomatically correlated with the effective length of boom 12 as the sections of boom 12 are extended and retracted relative to each other.

As more clearly shown in FIGS. 2 and 3, cable 52 is of a fixed length with one end connected at 53 to mast 48 and its opposite end connected at 54 to the inner end of the outer or tip boom section 34. Cable 52 extends forwardly from the connection 54 and is entrained about a first pulley 56 that is freely rotatable on a bracket 58 carried by intermediate boom section 32. The cable then extends rearwardly inside hollow intermediate boom section 32 and is again entrained about a further cable pulley 60 that is freely rotatable on a bracket 62 fixed to the inner end of intermediate boom section 32. Cable 52 then extends forwardly and is entrained about a further pulley 64 that is freely rotatable on a bracket 66 that is carried adjacent the forward end of base or inner end section 30. Cable 52 then extends rearwardly within inner boom section 30 and is entrained over a pulley 68 supported on a bracket 70 carried by the boom. Cable 52 may also extend around a further pulley 72 that is transversely spaced from pulley 68 and is rotatably supported by a bracket 74 carried by the upper end of inner boom section 30. Bracket 74 is positioned to have the upper periphery of pulley 72 located outside the boom section 30 so that there is an unrestricted portion of cable 52 between the inner end of inner boom section 30 and mast 48.

By proper positioning of pulleys 56, 60, 64, 68, and 72, all of the cable portions of cable 52 that are located inside the respective boom sections extends substantially parallel to each other and the cable portion between pulleys 68 and 72 extends substantially perpendicular to the axis of boom 12.

With the pulley arrangement as described, the effective length of cable 52 between mast 48 and pulley 72 will at all times be equal to the effective length of boom 12. For example, as the boom sections 30-32 and 34 are extended relative to each other, the overlapping portions within each boom section are decreased and this overlapping portion of the cable is then located outside the boom 12 and increases the effective length of cable 52 between mast 48 and pulley 72.

As can be appreciated from the above description, the present invention provides a simple and inexpensive expedient for automatically maintaining jib assembly 40 at a predetermined angular position with respect to boom 12 as the effective length of boom 12 is varied. This is accomplished by a minimum number of readily

available parts that are substantially maintenance free and can be incorporated into existing cranes.

While two pulleys have been shown at the inner end of inner boom section, it will be appreciated that pulley 68 could be eliminated without changing the operation of the system.

What is claimed is:

1. A crane including an extensible boom having a plurality of longitudinal hollow boom sections telescoped for extension and retraction with said boom including at least a base section and a tip section having a free end, power means for extending and retracting said boom section relative to each other, a jib assembly having one end pivotally connected adjacent said free end of said tip section, a cable assembly supporting said jib assembly in a predetermined angular position with respect to said boom, said cable assembly having one end connected to said jib assembly at a location spaced a substantial distance from the pivotal connection, said cable assembly having an opposite end connected inside said tip section adjacent the telescoping end, and a plurality of freely rotatable pulleys on said boom sections with said cable assembly entrained over said pulleys, said pulleys being arranged to maintain said predetermined angle between said boom and said jib assembly while said boom sections are being extended and retracted by said power means.

2. A crane as defined in claim 1, in which said extensible boom includes an intermediate section between said base section and said tip section with said plurality of pulleys including a pulley adjacent each end of said intermediate section and a pulley adjacent each end of said base section.

3. A crane as defined in claim 1, in which said cable assembly includes a mast structure having one end pivotally connected adjacent said free end of said tip section, a first cable having one end connected to an opposite end of said mast and a second cable of fixed length having one end connected to said opposite end of said mast structure and an opposite end connected to said tip section.

4. A crane as defined in claim 3, in which said boom includes an intermediate section between said base section and said tip section with a pulley adjacent each end of said intermediate section and said cable entrained over said pulleys to produce cable overlapping portions in said intermediate sections.

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