

ABSTRACT

Extensible Boom with Self Load Leveling on a Mobile Crane Machine

Extensible Boom with Self Load Leveling on a Mobile Crane Machine provided at front end of the extension boom member wherein the hook block is suspended with pulley and rope starting from winch drum and then being routed to a tilt compensation pulley fixed on outer main boom front end and then routed to another compensation pulley vertically fixed within rear end of first extension boom member and then further routed to idler pulleys fixed vertically to front end of first extension boom then further routed to hook block and then back to front face of outer main boom through another set of idler pulleys fixed to front end of first extension boom.

Figs. 1 to 5

WE CLAIM

1. Extensible Boom with Self Load Leveling on a Mobile Crane Machine provided at front end of the extension boom member wherein the hook block is suspended with pulley and rope starting from winch drum and then being routed to a tilt compensation pulley fixed on outer main boom front end and then routed to another compensation pulley vertically fixed within rear end of first extension boom member and then further routed to idler pulleys fixed vertically to front end of first extension boom then further routed to hook block and then back to front face of outer main boom through another set of idler pulleys fixed to front end of first extension boom.

2. Extensible Boom with Self Load Leveling on a Mobile Crane Machine as claimed in 1 wherein the said outer main boom front top face has a suitable provision to lock the rope end.

3. Extensible Boom with Self Load Leveling on a Mobile Crane Machine as claimed in claim 1 wherein the said compensation pulley on the said outer main boom and the compensation pulley on the said first extension telescopic boom being aligned to allow smooth passage of the rope.

4. Extensible Boom with Self Load Leveling on a Mobile Crane Machine as claimed in claim 1 wherein the said first telescopic extension has a narrow front section in comparison to its rear body.

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NO. OF SHEETS: 04
SHEET No. : 01

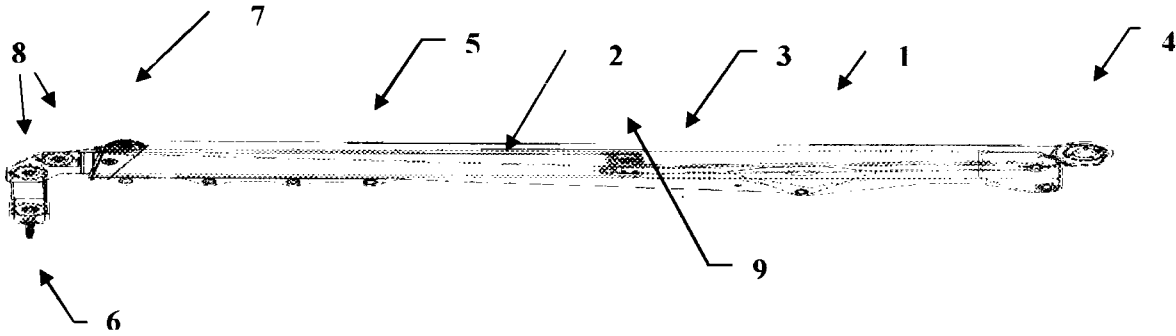


Figure 1

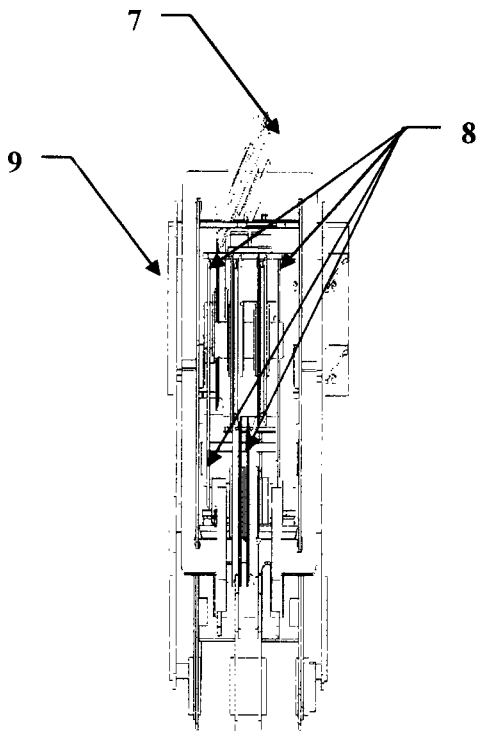
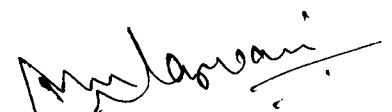


Figure 2a



Figure 2b


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NO. OF SHEETS: 04
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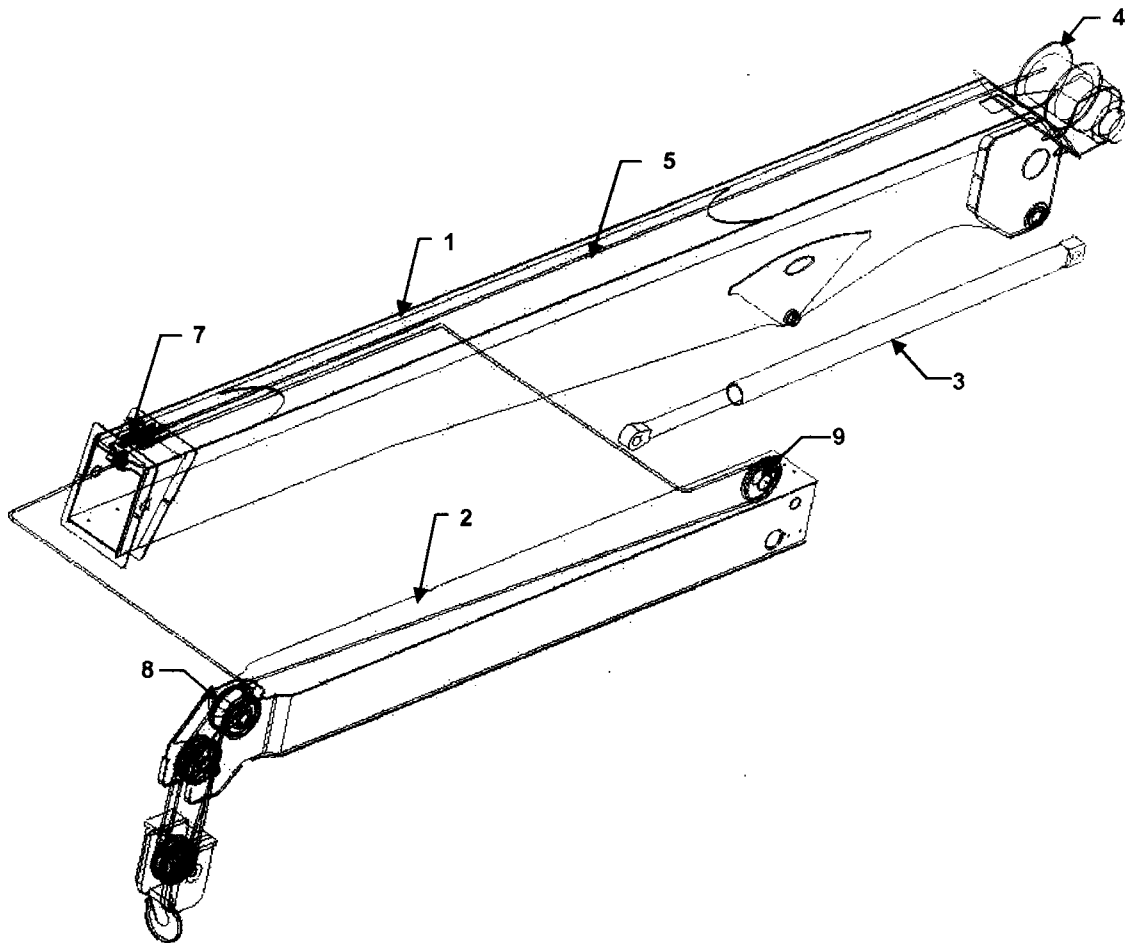
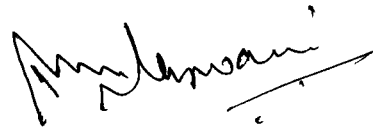


Figure 3


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NO. OF SHEETS: 04
SHEET No. : 03

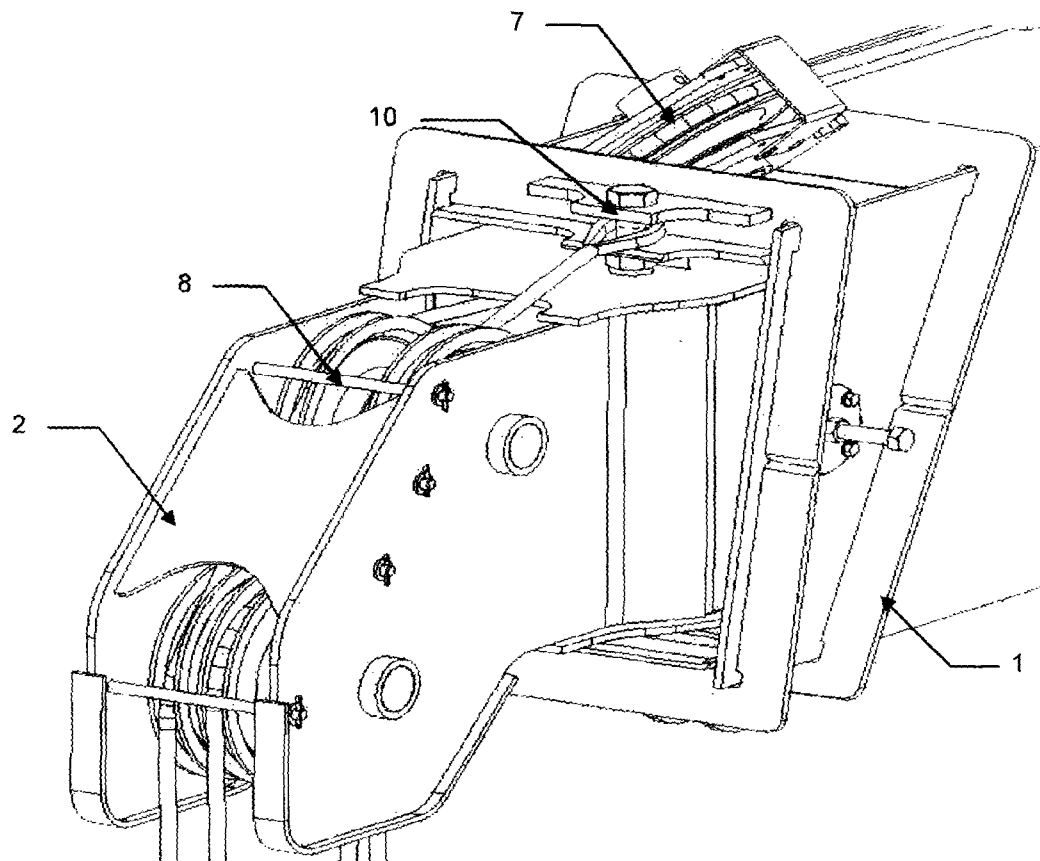


Figure 4

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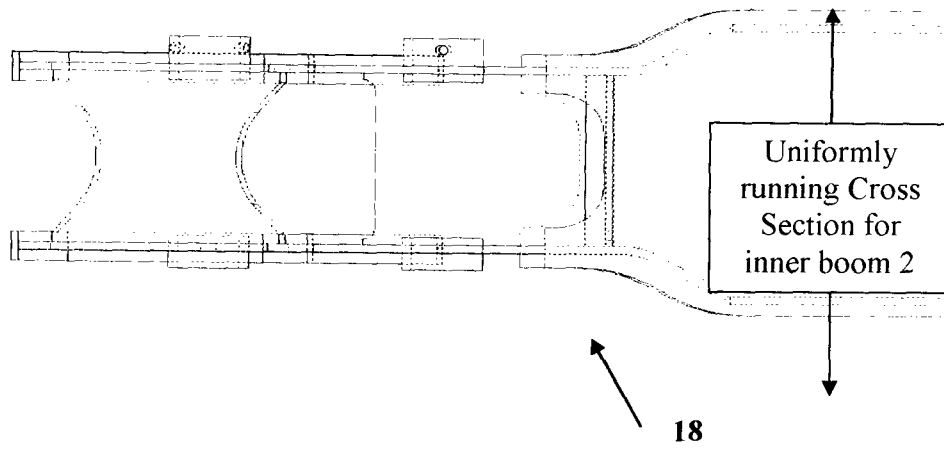


Figure 5

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FIELD OF INVENTION:

The present invention relates to Extensible Boom with Self Load Leveling on a Mobile Crane Machine and more particularly an efficient Extensible Boom with Self Load Leveling for application on Pick and Carry type of Hydraulic mobile cranes.

BACKGROUND OF THE INVENTION:

In the known Art Pick and Carry types of mobile hydraulic cranes have a telescopic boom assembly for lifting and handling the load.

The boom assembly comprises of an outer main boom attached to the crane at rear end and at least one or more extension members which are disposed inside the outer main boom from its front end. Hydraulic cylinder is connected between outer main boom and first extension boom. Hydraulic cylinder facilitates for telescopic driving in and out the first extension boom. In the event of two or more extension booms from the outer main boom, a multiple of hydraulic Ram means or a combination of hydraulic ram and synchronized extension using Chains or Cables are operated over a set of pulley or rollers.

Hook means are provided on the telescopic boom assembly for lifting the loads. Some prior art cites the usage of the said hooks main at the base of the outer main boom, while some other citations have a slotted outer main boom base, where hooks can also be mounted on to the first extension boom base and these hooks can travel along in the slotted outer main boom base for handling a variety of loads. A separate hook block is mounted at the end of First Extension

boom connected through winch driven wire rope to the Outer main boom which is movable and is used for lifting loads. The main hooks secured at the base of boom members are also used to lift and handle load.

In the known prior art as mentioned in US 3,889,818; for Load leveling in crane boom with one extension member; this arrangement employs one compensation pulley not main but is free to move forward and backward with respect to the outer main boom. The compensating pulley is moved by rope with two additional Idler pulleys. The one end of this rope is attached to compensating pulley and other end of the rope is routed through idler pulleys and main to outer main boom. The hook block is attached to extendable boom with rope from winch and routed from compensating pulley.

When the first extendable member moves, this compensating pulley also moves proportioned to first extendable boom, thereby compensating the hook block by looping in and looping out the rope from winch to hook block. This arrangement automatically keeps the hook block at a constant distance from the front end or nose on Extensible extension when the winch is not in operation. This keeps load in level condition when extension is operated and winch is not required to be operated.

A disadvantage of the said arrangement is that the automatic hook height adjustment or for load leveling on hook block with respect to boom extension or retraction, is not a exact proportionate compensation for rope length with respect to the travel of single extendible boom member.

As for a given boom extension or retraction amount, compensation pulley rotating at a slower rate will only ensure hook height getting adjusted automatically, but not by the same amount as of the boom travel.

Another disadvantage of this said arrangement is that an additional rope is required for moving the compensation pulley with respect to extensible boom.

Yet another disadvantage of this system is two additional idler pulleys are required in this load leveling.

Franna Cranes Pty. Ltd. Patent AU-8-89180/82 cites Load leveling on Crane boom but with two extensible Extensions that one extendable extension. This involves a compensation pulley mounted in horizontal manner on the proximal end of first extension. The rope from winch routes through this horizontal pulley and then to vertical pulley on second extension then to hook block and finally back to front nose of main second extension in order to achieve rope compensation or automatic leveling of hook block.

Also some prior art mentions this arrangement as compensation pulleys mounted on to the front and rear ends of the single extendible boom member itself. This arrangement uses one compensating horizontally mount pulley mounted on rear of first extendable member and vertical idler pulleys mounted at the front of first extendable member to achieve the automatic hook height adjustment or rope compensation mechanism. The rope from winch is routed to idler pulley then to hook block back to another idler pulley on extendable member then to horizontal compensating pulley and then main to side of outer main boom.

The disadvantage of the use of horizontally mounted pulley on the rear end side of extendible boom member is not a fail safe operation. as the pulley is not secured or supported from both sides and thus eventually it may come out in the event of bearing or guide bushing failure.

Another disadvantage of this is routing of rope is in various horizontal and vertical plains thus creating unbalance of force distribution in booms when load are lifted.

Yet another disadvantage of this is misalignment of booms with unbalanced force distribution.

In order to overcome the above disadvantages, one of the objectives of the present invention is to -

Improve the pulley arrangement for a single extensible extension boom for use in crane by having two compensation pulleys mounted on different boom members such that one compensation pulley mounted to the front end of the outer main boom and the other compensation pulley mounted at the rear end of the first extension boom.

Another objective of the present invention is to have the compensation pulley mounted in inclined manner on front end of the outer main boom to keep lower height. While other compensation pulley on rear of first extension boom which is mounted vertically and also supported on either side.

Yet another objective is to fix winch rope centrally on mid of front end of main boom. These all improvements ensure smooth, trouble-free and improved rope-routing in the system. The frontal and rear end of the single extendible member can be suitably designed to facilitate the smooth and trouble-free rope-routing and front pulleys installation layout.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

We shall now describe the invention with reference to accompanying drawings which are given for the sake of illustration, but do not restrict the scope of present invention.

Referring to drawings:-

Figure 1 shows Schematic view of the new two part assembly of the present invention.

Figure 2-A shows the frontal view of pulley layout;

Figure 2-B shows the rear view of pulley layout;

Figure 3 shows rope routing arrangement through pulley for auto leveling of hook block;

Figure 4 shows frontal view of pulley layout on first extension and rope fixing on outer boom; and

Figure 5 shows frontal plan view of first extension profile change from wide to narrow at front.

DESCRIPTION OF THE INVENTION

According to present invention there is provided Extensible Boom with Self Load Leveling on a Mobile Crane Machine provided at front end of the extension boom member wherein the hook block is suspended with pulley and rope starting from winch drum and then being routed to a tilt compensation pulley fixed on outer main boom front end and then routed to another compensation pulley vertically fixed within rear end of first extension boom member and then further routed to idler pulleys fixed vertically to front end of first extension boom then further routed to hook block and then back to front face of outer main boom through another set of idler pulleys fixed to front end of first extension boom.

The said outer main boom front top face has a suitable provision to lock the rope end.

The said compensation pulley on the said outer main boom and the compensation pulley on the said first extension telescopic boom being aligned to allow smooth passage of the rope.

The said first telescopic extension has a narrow front section in comparison to its rear body.

At the outset of the description which follows, it is to be understood that the ensuing description only illustrates a particular form of its invention. However, such a particular form is only an exemplary embodiment and without intending to be understood as an exemplary embodiment and teaching of the invention and not intended to be taken restrictively.

The nature of the invention, its objective and further advantages residing in the same will be apparent from the following description made with reference to the non-limiting exemplary embodiment of the invention represented in the accompanying drawing, which is given by way of illustration, but does not restrict the scope of present invention.

Referring to shown in Fig.1; It is apparent that crane boom assembly in general consist of an outer main boom 1, disposed therein first extension boom 2. The first extension boom 2 is connected through a hydraulic cylinder 3 which drives the first extension boom 2 in & out from the outer main boom 1. A hydraulic winch 4 is used to raise or lower the lifting load through a hook block 6. This hook block 6 is connected through a wire rope 5 & set of pulleys 7, 8, 9 to the boom assembly.

Further as shown in Fig. 2(a), the fixing of compensation pulley 9 mounted in vertical orientation on rear end of the single extension boom 2 and front compensation pulley 7 mounted at 45deg angle to the vertical on front end of outer main boom 1.

The Figure 2(a) also shows the installation layout scheme for idler pulleys 8 mounted on the front top side and front bottom side of single extension boom 2 with respect to compensation pulley 9 and front compensation pulley 7.

Figure 2(b) shows the fixing of compensation pulley 9 mounted in vertical orientation on rear end of the single extension boom 2 from rear side of boom.

Such an installation layout of the said pulley is aimed to achieve the smooth, trouble free and safe wire rope 5 routing and subsequent wire rope compensation or automatic hook height adjustment or self load leveling in crane boom assembly.

As shown in Fig. 3, The wire rope 5 rolled over winch drum 4 is routed through inclined compensation pulley 7 mounted on the top of the outer main boom 1, and then traveling to the inside of the outer main boom 1. The wire rope 5 is then guided through the vertical compensation pulley 9 mounted on single extension boom 2. Wire rope 5, then travels from inside of hollow body of the single extension boom 2 towards the set of idler pulleys 8 mounted on the front top side and front bottom side of single extension boom 2.

Frontal section of single extension boom 2 is so designed for mounting idler pulleys 8 for further guiding wire rope to hook block 6. The frontal section of the single extension boom 2 has a narrow front from wider main body as shown in Fig 4 and Fig 5.

Wire rope 5 from the set of idler pulleys mounted on Hook block 6 moves further to the set of idler pulleys 8 mounted on the front top and front bottom

side of the single extension boom 2. Further, the wire rope 5 is finally anchored on the top side of the outer main boom 1 in the frontal portion 10 as shown in figure 4. The wire rope eye end is mounted on to the anchor bracket 17 and locked through a hexagonal bolt 16 and with lock nut 17 on the outer main boom 1.

Compared to known prior art, the said anchoring does not utilise any special spacer, profiled bushings with grooved profile or similar arrangements to anchor the wire rope 5. To ease the assembly and rope anchoring, the rope eye end is simply held secured with the help of hexagonal bolt or a Pin 16 and lock nut 17. The improvement is aimed at rope anchoring on the outer boom 1 frontal section with suitable design of anchor brackets.

As the hydraulic cylinder 3 drives in and out the single extension boom 2 from the outer main boom 1, there will be a relative travel of compensation pulley 7 on outer main boom 1 and compensation pulley 9 on single extension boom 2, which results in looping and un-looping of wire rope 5. The wire rope 5 portion between compensation pulleys 7 and 9 and also between compensation pulley 9 and idler pulleys 8 get automatically compensated. This will help in keeping the position of the hook block 6 leveled with respect to the front of single extension boom 2 in the event of telescopic in and out action of single extension boom with respect to the outer main boom 1.

The invention as described above characterizes the following novel features:

(1) Incorporation of improved and better load leveling mechanism such as the automatic hook-height adjustment with placement of a vertical compensation pulley 9 at the rear end of single extension boom in vertical orientation.

- (2) Incorporation of relative placement of compensation pulley 7 mounted inclined on the outer main boom 1 with respect to compensation pulley 9 and also the set of idler pulleys 8 mounted on the single extension boom 2.
- (3) Incorporation of a unique single extension boom 2 narrow frontal section for mounting front idler pulleys 8 to facilitate smooth and trouble-free wire rope 5 routing.
- (4) Incorporation of wire rope 5 anchoring on the top the outer main boom 2 frontal top side 10 as shown in figure 4 and figure 3.