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TELESCOPING BOOM

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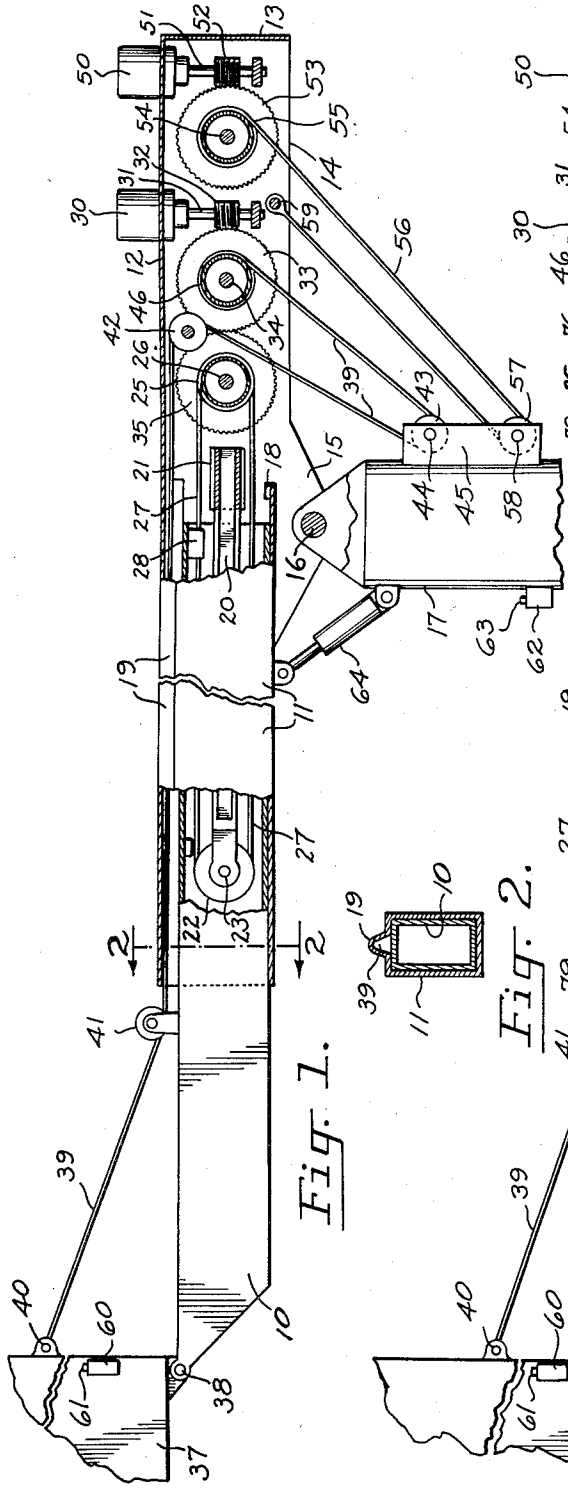


Fig. 1.

Fig. 2.

Fig. 3.

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TELESCOPING BOOM

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17 Claims. (Cl. 182—2)

This invention pertains to load handling booms, and relates particularly to a novel construction of a telescoping boom for supporting a work station at elevated positions above the ground.

It is a principal object of the present invention to provide a telescoping boom for supporting a work station in horizontal position, regardless of the angular inclination of the boom and the degree of extension of the boom.

Another important object of this invetnion is the provision of a telescoping boom in which the terminal end is adapted to move along a plane normal to the plane of the underlying support, as the boom is rotated on an axis parallel to said underlying support.

A further important object of this invention is to provide a telescoping boom wherein the mechanism effecting the extension and retraction of the boom is enclosed within the latter.

Still another important object of the present invention is to provide a telescoping boom for supporting a work station, and wherein the operation of the boom may be controlled from the remote position of said work station.

A still further object of this invention is to provide a telescoping boom which is rugged in construction to accommodate heavy usage and which requires a minimum amount of skill and effort for operation, maintenance and repair.

These and other objects and advantages of the present invention will appear from the following detailed description, taken in connection with the accompanying drawing, in which:

Figure 1 is a fragmentary foreshortened view in side elevation showing a telescoping boom embodying the features of the present invention, parts thereof being broken away to disclose details of construction;

Figure 2 is a sectional view taken along the line 2—2 in Figure 1; and

Figure 3 is a fragmentary foreshortened view in side elevation showing a modified form of telescoping boom construction embodying the features of the present invention.

Referring to Figure 1 of the drawing, the boom assembly illustrated includes a forward boom section 10 mounted slidably within the rearward boom section 11. As best shown in Figure 2, these sections are preferably of rectangular or other non-circular cross section so as to prevent the sections from rotating axially with respect to each other.

The rearward section 11 is secured to or otherwise formed integral with a housing comprising a top plate 12, rear plate 13, and side plates 14. The side plates are formed with downward extensions 15 which function to support anchor pin 16 which extends transversely through the top end of the vertical mounting post 17. This post is anchored to any suitable base (not shown) such as the flat bed of a truck, or to the boom support described and claimed in my co-pending application, Serial No. 487,268, filed concurrently herewith, now Patent No. 2,864,625. The inner boom section 10 is slidable within

the outer rearward section 11, as previously explained, and the extent of rearward movement of the end section 10 is limited by such means as a stop 18 provided adjacent the rearward end of the outer section 11 for abutment by the rearward end of the inner section.

The top plate of the outer section 11 preferably is formed with a longitudinal upward offset section 19 which functions as a cable guide in the manner more fully explained hereinafter.

An elongated post 20 is secured at its rearward end to a bracket 21 secured between the side walls 14 of the housing described above. The post 20 extends forwardly to a point adjacent the forward end of the outer boom section 11, within the hollow inner section 10, and is provided at its forward end with a pulley 22, which is mounted rotatably on shaft 23.

Also mounted within the housing rearwardly of the bracket 21 is a cable drum 25 which is mounted for rotation on shaft 26 supported between the side walls 14. A cable 27 is wound about the drum 25. One end of the cable is secured to a clamp 28 mounted adjacent the rearward end of the inner boom section 10. The other end of the cable is first reeved over pulley 22 and then secured to the clamp 28, as indicated. Thus, it will be understood that as the drum 25 is rotated in a counterclockwise direction, the lower strand of cable 27 will be wound upon it and the upper strand of cable will be unwound from it. It will be understood that cable 27 may be provided as two separate sections, each secured at one end to the drum and at the opposite end to the clamp 28.

Since the lower strand of cable is reeved over pulley 22 and thence connected to clamp 28, it will be seen that this rotation of drum 25 causes the inner boom section 10 to be extended outwardly with respect to the rearward section 11. Reverse rotation of drum 25 results in retraction of the boom section 10, as will be apparent.

Rotation of drum 25 is effected by means of drive motor 30 which is shown to be connected to the drum through a chain of gears. The system illustrated is simply a convenience in separating the parts to clarify the disclosure, and in actual practice may be simplified as explained hereinafter. However, as illustrated, the drive shaft 31 of motor 30 carries a worm 32 which meshes with worm wheel 33 mounted on shaft 34 which is supported between the side plates 14 of the housing. Worm wheel 33, in turn, meshes with worm wheel 35 which is secured to drum 25.

At the forward end of the inner telescoping boom section 10 is a work station 37, preferably constructed in the form of a cage having an open top and a platform adapted to support thereon one or more workmen. The work station 37 is pivotally secured to the boom section 10 by pivot shaft 38. In the construction illustrated, the work station 37 is pivotally attached to the boom adjacent the lower rearward edge, whereby the weight of the work station tends to rotate itself in a counterclockwise direction about the pivot point 38. Thus, to support said work station against free rotation, the forward end of cable 39 is secured thereto by means of pin 40. The cable extends rearwardly under guide pulley 41 which is mounted rotatably on a bracket secured adjacent the forward end of boom section 10. The cable then extends through the cable guide 19 into the rearward housing, where it is reeved over pulley 42 which is mounted for rotation on a shaft extending between the side plates 14. Cable 39 then extends downwardly and is reeved about pulley 43 which is mounted for rotation on shaft 44 secured to bracket 45 attached to the main support post 17.

From pulley 43, cable 39 extends upwardly and is wound about drum 46 which is secured to worm wheel 33. It will be understood that cable 39 may, in practice, be returned to a second section of drum 25, rather

than to the separate drum 46, whereby to eliminate the elements 33, 34, 46. The additional assembly is illustrated in the drawings merely to separate the cables 27, 39 for ease of understanding.

It is to be pointed out here that there exists a critical relationship between the distances separating the pivot points 38, 40 and the distances separating pulleys 42, 43 and drum 46 and pulley 43. As the boom is pivoted about pivot pin 16 to varying degrees of inclination, the distances of pulley 42 and drum 46 from pulley 43 vary. Thus, for example, as the boom is pivoted in a clockwise direction about pivot pin 16, pulley 42 and drum 46 move closer to pulley 43, thereby letting slack come into cable 39 in the stretches extending between these elements. Hence, it is necessary that the forward end of cable 39 be connected at a point 40 which is located with respect to pivot 38 in such manner that the amount of slack previously mentioned is equal to the amount of additional length of cable needed at the forward end to permit the required angular displacement between the floor of the work station 37 and the boom 10 to maintain the work station in a horizontal plane. By proper selection of these points, the boom assembly may be pivoted through a wide angle and the floor of the work station 37 is maintained horizontal at all times.

In the embodiment illustrated, the boom sections 10, 11 are pivoted about pivot 16 by means of motor 50, the drive shaft 51 of which carries worm 52 which meshes with worm wheel 53. This wheel is mounted on shaft 54 supported between the side walls 14. Cable drum 55 is secured to worm wheel 53. Cable 56 is wound upon the drum 55, with one end of the cable secured thereto. The opposite end of the cable is reeved over pulley 57 mounted for rotation on pivot pin 58 secured to the bracket 45, and said end of the cable 56 is then secured to a side wall 14 by anchor pin 59. It will be understood that various other forms of power systems may be employed to pivot the boom on support 17.

The motors 30 and 50 are preferably electric, although they may be hydraulic or any other type desired. In any case, it is desirable that these motors be controlled from the work station 37. To this end, and with the use of electric motors, there is provided at the work station 37 a control box 60 which includes a plurality of push button electric switches 61. These switches are each connected through flexible electric conductors (not shown) to the respective forward and reverse electrical circuits of said motors, in manner well-known to those skilled in the art.

It is further desirable that the motors 30 and 50 be controllable from a point on the ground, in the event that accidents or other circumstance affecting the workmen in the work station 37 prevents their manipulation of the boom assembly. Accordingly, there may be provided a second control box 62, mounted, for example, on the main support post 17 and provided with similar push button electric switches 63, each of which may be connected in parallel with its corresponding switch in control box 60.

In order to insure against accidents and damage in the event that cable 56 should break while the boom is elevated, there may be provided means for arresting the speed of counterclockwise rotation of the boom about pivot 16. Various types of shock absorber devices or other arresting means may be provided for this purpose, such as the hydraulic cylinder motor 64 which is connected pivotally between the rear boom section 11 and the support post 17. The cylinder motor may be of any of the conventional types employed as shock absorbers, wherein valve means is provided to restrict the flow of fluid from below the piston of said motor while the boom is being lowered, and to permit substantial free fluid transfer from above the piston to permit the boom to be raised without substantial restriction.

In the operation of the boom assembly described hereinbefore, the workmen enter the work station 37 by manipulating the boom to bring the station close to the ground. Then, if it is desired to rotate the boom in clockwise direction about pivot 16, to elevate the station, the operator presses the proper pushbutton 61 controlling the forward rotation of motor 50. Thereupon cable drum 55 is caused to rotate in counterclockwise direction, and the winding in of cable 56 results in the desired rotation of the boom.

As the boom is pivoted in clockwise direction, pulley 42 and drum 46 are moved closer to pulley 43 and the slack resulting in the immediate stretches of cable 39 is paid out between pulley 42 and connecting pin 40 to maintain the floor of the work station 37 in a horizontal plane. It is assumed, of course, that the vehicle or other support on which the post 17 is mounted also rests on the horizontal surface, or alternatively that the supporting post 17 has been adjusted to extend in a vertical plane. Under either of these conditions the platform of work station 37 will remain horizontal, which is parallel to the ground support and normal to the axis of post 17.

Now, if it is desired to extend the forward section 10, the operator presses the proper pushbutton 61 to energize motor 30 in its forward direction. Thus, drum 45 is caused to rotate in counterclockwise direction to extend the boom section 10, as previously explained. Simultaneously therewith, drum 46 is caused to rotate in clockwise direction, whereupon cable 39 is unwound from said drum. Since drums 25 and 46 are of equal diameter, it will be understood that simultaneous rotation of the drums causes cable 39 to be unwound from drum 46 in an amount equal to the amount of cable 27 being wound upon drum 25. Thus, the length of cable 39 is unwound from drum 46 to equal the length of extension of boom section 10. In this manner, the horizontal position of work station 37 is maintained as the boom section 10 is extended or retracted.

In certain types of use of a boom carrying a work station, it is desirable to move the work station to various positions along a vertical plane. Such operation is advantageous, for example, when the boom and work station assembly is employed to carry painters for painting the vertical walls of buildings. Thus, it is desirable that the work station be adjustable from one control to change the angle of inclination of the boom and yet maintain the work station adjacent said vertical plane. Accordingly, the modified construction of Figure 3 is provided to adjust automatically the degree of extension of boom section 10 as the boom assembly is pivoted about pivot pin 16, so that the work station 37 will follow a vertical plane.

The general construction of the boom assembly shown in Figure 3 is similar to the construction shown in Figure 1, described hereinbefore. Similar elements of construction are identified in both views by the same reference numerals. The primary difference between the two modifications resides in the arrangement of the boom extending cable 27 and the work station levelling cable 39, as follows: One end of cable 27 is wound upon drum 46, and is then reeved under pulley 66 mounted for rotation on shaft 67 carried by bracket 45. The cable then extends upwardly over pulley 68 rotatably mounted on side plate 14, and thence to cable clamp 28 where it is secured firmly to the rearward end of boom section 10. The cable then extends forwardly over pulley 22 and then rearwardly over pulley 69 mounted rotatably on side plate 14. From pulley 69 the cable extends forwardly over pulley 70 mounted rotatably on the downward projection 15 and thence under pulley 71 mounted rotatably on bracket 72 secured to the main support post 17. Cable 27 then extends upwardly over pulley 73 mounted on the extension 15 and thence under pulley 74 mounted on side plate 14. The end of cable 27 is wound upon drum 25.

From the foregoing, it will be apparent that when

motor 30 is energized to rotate the drums 25, 46 in the direction of the arrows indicated, cable 27 will be further wound upon drum 25 and unwound from drum 46 to cause outward extension of the boom section 10, substantially in the manner of the modification first described. On the other hand, when motor 30 is idle and motor 50 is energized to pivot the boom assembly, for example in clockwise direction about pivot 16, cable 27 functions in the following manner: As the boom assembly is pivoted, pulleys 70 and 73 are moved away from pulley 71. Since the end of cable 27 is anchored about drum 25, the increased distance resulting between said pulleys must be accommodated by forward movement of the cable clamp 28, thereby causing extension of the boom section 10. Cable clamp 28 is permitted to move forwardly by reason of the fact that, during clockwise rotation of the boom about pivot 16, pulley 68 and drum 46 move closer to pulley 66 to provide the slack in cable 27 needed to permit the cable clamp 28 to move forwardly with the boom section 10. In this manner the work station is moved along a vertical plane automatically as the boom is pivoted on the support 17.

It will be apparent from the foregoing that, although the boom section 10 may move automatically as the boom assembly is pivoted about pivot 16, said boom section 10 may also be moved to varying degrees of extension and retraction independently of the angular tilting of the boom assembly by proper manipulation of the push buttons 61 or 63.

A modified system for maintaining the work station horizontal is illustrated in Figure 3, as follows: The levelling cable 39 is secured at it forward end to pin 40 mounted on the work station 37, and then extends rearwardly under pulley 41 and through the cable guide 19 and is reeved over pulley 76 mounted on side plate 14. Cable 39 then extends downwardly under pulley 77 mounted rotatably on bracket 45, and then upwardly over pulley 78, forwardly through cable guide 19 and around pulley 79 mounted rotatably on the forward end of the boom section 11. Cable 39 is then doubled back to extend rearwardly through guide 19, the end of the cable being anchored to clamp 28.

It is to be noted, in the modification of Figure 3, that the levelling cable 39 is anchored firmly at both ends, at 40 and 28, and is not operated by a cable drum, in contrast with the modification first described. As in the first modification, however, the distances between the points 38 and 40 must be proportioned with respect to the distances between pulleys 76, 78 and pulley 77 to provide automatic levelling of the work station 37 as the boom assembly is pivoted about pivot 16.

The levelling cable 39 performs this levelling function while the boom section 10 is extended and retracted within the rearward section 11 by virtue of the doubled section of cable extending from pulley 78 to pulley 79 and then back to clamp 28. Thus, as boom section 10 is extended, for example, clamp 28 moves closer to pulley 79, with a corresponding reduction in the length of cable extending between them. The extra cable is thus made available to the resulting additional distance between pulley 76 and terminal connection 40.

From the foregoing, it is apparent that the present invention provides extensible booms having features of utility heretofore not available in conventional boom constructions. The boom assembly is a self-contained unit, with a majority of parts being enclosed therein for protection against wear and damage due to weather and foreign matter. The boom assembly is of sturdy construction for efficient and long operating life, and requires but a minimum of maintenance. Although the boom assemblies are illustrated herein as supporting a work station, it will be apparent that the boom may be utilized in other ways. For example, the terminal end of boom 10 may support a clamping device for gripping a telephone pole, preparatory to installing the latter in the ground. This modification of Figure 3 is particularly adapted to this use, since the boom end is capable of moving in a vertical plane.

It will be apparent to those skilled in the art that various changes may be made in the details of construction described hereinbefore without departing from the scope and spirit of this invention. Accordingly, it is to be understood that the foregoing description is primarily illustrative of the invention and is not to be considered as limiting the scope thereof.

Having now described my invention and the manner in which the same may be used, what I claim as new and desired to secure by Letters Patent is:

1. A load handling boom comprising an upstanding support, an elongated hollow rear boom member mounted pivotally on the support, power means interconnecting the support and rear boom member, an elongated hollow forward boom member mounted slidably within the rear boom member for longitudinal movement relative thereto, the forward boom member being open at its rearward end, pulley means mounted on and positioned adjacent the forward end of the rear boom member within the forward boom member, winch means mounted within the rear boom member rearwardly of the forward boom member, cable means mounted on the winch means and extending into the forward boom member through said open rearward end and reeved over said pulley means, means securing the opposite ends of the cable means to the rearward end of the forward boom member, and reversible power means for driving the winch means to retract and extend the forward boom member.

2. A load handling boom comprising an upstanding support, an elongated hollow rear boom member mounted pivotally on the support, power means interconnecting the support and rear boom member, an elongated hollow forward boom member mounted slidably within the rear boom member for longitudinal movement relative thereto, the forward boom member being open at its rearward end, an elongated post secured at its rearward end to the rear boom member and projecting forwardly into the hollow forward boom member, pulley means mounted on the forward end of the post, winch means mounted within the rear boom member rearwardly of the forward boom member, cable means mounted on the winch means and extending into the forward boom member through said open rearward end and reeved over said pulley means, means securing the opposite ends of the cable means to the rearward end of the forward boom member, and reversible power means for driving the winch means to retract and extend the forward boom member.

3. A load handling boom comprising an upstanding support, an elongated hollow rear boom member mounted pivotally on the support, power means interconnecting the support and rear boom member for pivoting the latter on the support, an elongated hollow forward boom member mounted slidably on the rear boom member for longitudinal movement relative thereto, extensible drive means interconnecting the boom members and operable to extend and retract the forward boom member relative to the rearward boom member, and auxiliary drive means associated with the extensible drive means and interconnecting the rear boom member and the support, the auxiliary drive means being operable by angular rotation of the rear boom member relative to the support to extend and retract the forward end of the forward boom member along a substantially straight line during pivotal movement of the rear boom member.

4. A load handling boom comprising an upstanding support, an elongated hollow rear boom member mounted pivotally on the support, power means interconnecting the support and rear boom member, an elongated hollow forward boom member mounted slidably on the rear boom member for longitudinal movement relative thereto, spaced pulley means mounted on the rear boom

member and on the support on opposite sides of the boom pivot, and cable means reeved intermediate its ends over the pulley means on one side of said pivot and thence over the pulley means on the opposite side of the pivot, said pulleys being so positioned that the forward end of the forward boom member moves along a substantially straight line as the boom members are pivoted.

5. A load handling boom comprising an upstanding support, an elongated hollow rear boom member mounted pivotally on the support, power means interconnecting the support and rear boom member, an elongated hollow forward boom member mounted slidably on the rear boom member for longitudinal movement relative thereto, power means interconnecting the rear and forward boom members for extending and retracting the latter, spaced pulley means mounted on the rear boom member and on the support on opposite sides of the boom pivot, and cable means reeved intermediate its ends over the pulley means on one side of said pivot and thence over the pulley means on the opposite side of the pivot, said pulleys being so positioned that the forward end of the forward boom member moves along a substantially straight line as the boom members are pivoted.

6. A load handling boom comprising an upstanding support, an elongated hollow rear boom member mounted pivotally on the support, power means interconnecting the support and rear boom member, an elongated hollow forward boom member mounted slidably on the rear boom member for longitudinal movement relative thereto, pulley means mounted adjacent the forward end of the rear boom member, winch means on the rear boom member, cable means mounted on the winch means and reeved over said pulley means, spaced pulley means mounted on the rear boom member and on the support on opposite sides of the boom pivot, the cable means being reeved intermediate its ends over the pulley means on one side of said pivot and thence over the pulley means on the opposite side of the pivot, said pulleys being so positioned that the forward end of the forward boom member moves along a substantially straight line as the boom members are pivoted, means securing the opposite ends of the cable means to the rearward end of the forward boom member, and reversible power means for driving the winch means to retract and extend the forward boom member.

7. A load handling boom comprising an upstanding support, an elongated hollow rear boom member mounted pivotally on the support, power means interconnecting the support and rear boom member, an elongated hollow forward boom member mounted slidably on the rear boom member for longitudinal movement relative thereto, a post secured to the rear boom member and terminating adjacent the forward end thereof within the hollow forward boom member, pulley means mounted on the forward end of the post, winch means on the rear boom member, cable means mounted on the winch means and reeved over said pulley means, spaced pulley means mounted on the rear boom member and on the support on opposite sides of the boom pivot, cable means reeved intermediate its ends over the pulley means on one side of said pivot and thence over the pulley means on the opposite side of the pivot, said pulleys being so positioned that the forward end of the forward boom member moves along a substantially straight line as the boom members are pivoted, means securing the opposite ends of the cable means to the rearward end of the forward boom member, reversible power means for driving the winch means to retract and extend the forward boom member.

8. In a load handling boom including an upstanding support, an elongated hollow rear boom member mounted pivotally on the support, power means interconnecting the support and rear boom member, an elongated hollow forward boom member mounted slidably on the rear boom member for longitudinal movement relative thereto, a work station mounted pivotally on the outer end of the forward boom member, power means interconnecting the rear and forward boom members for extending and retracting the latter: the combination therewith of first pulley means on the rear boom member, second pulley means mounted on the support, cable means secured at one end to the work station a spaced distance from the pivot mounting of the latter, the cable means being reeved over the first and second pulley means, and means securing the opposite end of the cable means to one of the boom members to accommodate extension and retraction of the cable means simultaneously with the forward boom member, the first and second pulley means being positioned for relative displacement as the rear boom member is pivoted on the support whereby to extend and retract the forward end of the cable means to maintain the work support substantially horizontal.

9. In a load handling boom including an upstanding support, an elongated hollow rear boom member mounted pivotally on the support, power means interconnecting the support and rear boom member, an elongated hollow forward boom member mounted slidably on the rear boom member for longitudinal movement relative thereto, a work station mounted pivotally on the outer end of the forward boom member, power means interconnecting the rear and forward boom members for extending and retracting the latter: the combination therewith of first pulley means on the rear boom member, second pulley means mounted on the support, cable means secured at one end to the work station a spaced distance from the pivot mounting of the latter, the cable means being reeved over the first and second pulley means, and means securing the opposite end of the cable means to one of the boom members to accommodate extension and retraction of the cable means simultaneously with the forward boom member, the distance between the pivot connection of the work station and the cable means connected thereto being proportioned with respect to the distance between the second pulley means and the first pulley means and cable securing means such that their relative displacements during pivoting of the boom members maintains the work station substantially horizontal.

10. In a load handling boom including an upstanding support, an elongated hollow rear boom member mounted pivotally on the support, power means interconnecting the support and rear boom member, an elongated hollow forward boom member mounted slidably on the rear boom member for longitudinal movement relative thereto, a work station mounted pivotally on the outer end of the forward boom member, power means interconnecting the rear and forward boom members for extending and retracting the latter: the combination therewith of first pulley means on the rear boom member, second pulley means mounted on the support, cable means secured at one end to the work station a spaced distance from the pivot mounting of the latter, the cable means being reeved over the first and second pulley means, and third and fourth pulley means mounted on the rear boom member adjacent the rear and forward ends respectively of the latter, the cable means being reeved forwardly over the third and fourth pulley means and thence rearwardly for attachment at its opposite end to the rearward end of the forward boom member.

11. A load handling boom comprising an upstanding support, an elongated hollow rear boom member mounted pivotally on the support, power means interconnecting the support and rear boom member, an elongated hollow forward boom member mounted slidably on the rear boom member for longitudinal movement relative thereto, a work station mounted pivotally on the outer end of the forward boom member, pulley means mounted adjacent the forward end of the rear boom member, winch means on the rear boom member, cable means mounted on the winch means and reeved over said pulley means, means securing the opposite ends of the cable means to the rear-

ward end of the forward boom member, reversible power means for driving the winch means to retract and extend the forward boom member, second pulley means on the rear boom member, third pulley means mounted on the support, second cable means secured at one end to the work station a spaced distance from the pivot mounting of the latter, the second cable means being reeved over the second and third pulley means, and second winch means mounted on the rear boom member for securing the opposite end of the second cable means thereto, the second winch means being operable simultaneously with the first winch means.

12. A load handling boom comprising an upstanding support, an elongated hollow rear boom member mounted pivotally on the support, power means interconnecting the support and rear boom member, an elongated hollow forward boom member mounted slidably on the rear boom member for longitudinal movement relative thereto, a work station mounted pivotally on the outer end of the forward boom member, a post secured to the rear boom member and terminating adjacent the forward end thereof within the hollow forward boom member, pulley means mounted on the forward end of the post, winch means on the rear boom member, cable means mounted on the winch means and reeved over said pulley means, means securing the opposite ends of the cable means to the rearward end of the forward boom member, reversible power means for driving the winch means to retract and extend the forward boom member, and power means interconnecting the boom members and support and responsive to the longitudinal movement and angular rotation of the boom members with respect to said support to maintain the work station substantially horizontal.

13. A load handling boom comprising an upstanding support, an elongated hollow rear boom member mounted pivotally on the support, power means interconnecting the support and rear boom member, an elongated hollow forward boom member mounted slidably on the rear boom member for longitudinal movement relative thereto, a work station mounted pivotally on the outer end of the forward boom member, a post secured to the rear boom member and terminating adjacent the forward end thereof within the hollow forward boom member, pulley means mounted on the forward end of the post, winch means on the rear boom member, cable means mounted on the winch means and reeved over said pulley means, means securing the opposite ends of the cable means to the rearward end of the forward boom member, reversible power means for driving the winch means to retract and extend the forward boom member, second pulley means on the rear boom member, third pulley means mounted on the support, second cable means secured at one end to the work station a spaced distance from the pivot mounting of the latter, the second cable means being reeved over the second and third pulley means, and second winch means mounted on the rear boom member for securing the opposite end of the second cable means thereto, the second winch means being operable simultaneously with the first winch means.

14. A load handling boom comprising an upstanding support, an elongated hollow rear boom member mounted pivotally on the support, power means interconnecting the support and rear boom member, an elongated hollow forward boom member mounted slidably on the rear boom member for longitudinal movement relative thereto, a work station mounted pivotally on the outer end of the forward boom member, power means interconnecting the rear and forward boom members for extending and retracting the latter, power means interconnecting the boom members and support and responsive to the angular rotation of the boom members with respect to said support to extend and retract the forward boom member such that the forward end of the forward boom member moves along a substantially straight line as the boom members are pivoted, first pulley means on the rear boom member, second pulley means mounted on the support, cable means secured at one end to the work station a spaced distance from the pivot mounting of the latter, the cable means being reeved over the first and second pulley means, and means securing the opposite end of the cable means to one of the boom members to accommodate extension and retraction of the cable means simultaneously with the forward boom member.

15. A load handling boom comprising an upstanding support, an elongated hollow rear boom member mounted pivotally on the support, power means interconnecting the support and rear boom member, an elongated hollow forward boom member mounted slidably on the rear boom member for longitudinal movement relative thereto, a work station mounted pivotally on the outer end of the forward boom member, power means interconnecting the rear and forward boom members for extending and retracting the latter, spaced pulley means mounted on the rear boom member and on the support on opposite sides of the boom pivot, cable means reeved intermediate its ends over the pulley means on one side of said pivot and thence over the pulley means on the opposite side of the pivot, said pulleys being so positioned that the forward end of the forward boom member moves along a substantially straight line as the boom members are pivoted, second pulley means on the rear boom member, third pulley means mounted on the support, second cable means secured at one end to the work station a spaced distance from the pivot mounting of the latter, the second cable means being reeved over the second and third pulley means, and means securing the opposite end of the second cable means to one of the boom members to accommodate extension and retraction of the cable means simultaneously with the forward boom member.

16. A load handling boom comprising an upstanding support, an elongated hollow rear boom member mounted pivotally on the support, power means interconnecting the support and rear boom member, an elongated hollow forward boom member mounted slidably on the rear boom member for longitudinal movement relative thereto, a work station mounted pivotally on the outer end of the forward boom member, a post secured to the rear boom member and terminating adjacent the forward end thereof within the hollow forward boom member, pulley means mounted on the forward end of the post, winch means on the rear boom member, first cable means mounted on the winch means and reeved over said pulley means, means securing the first cable means to the rearward end of the forward boom member, reversible power means for driving the winch means to retract and extend the forward boom member, second cable means interconnecting the work station and boom members and support and responsive to the longitudinal movement and angular rotation of the boom members with respect to said support to maintain the work station substantially horizontal, and power means interconnecting the boom members and support and responsive to the angular rotation of the boom members with respect to said support to extend and retract the forward boom member such that the forward end of the forward boom member moves along a substantially straight line as the boom members are pivoted.

17. A load handling boom comprising an upstanding support, an elongated rear boom member mounted pivotally on the support, power means interconnecting the support and rear boom member for pivoting the latter on the support, an elongated forward boom member mounted on the rear boom member for movement relative thereto, extensible drive means interconnecting the boom members and operable to extend and retract the forward boom member relative to the rearward boom member, and auxiliary drive means associated with the extensible drive means and interconnecting the rear boom member and the support, the auxiliary drive means being operable by angular rotation of the rear boom member relative to the support to extend and retract the forward boom member

automatically to cause movement of the forward end of the forward boom member along a substantially straight line during pivotal movement of the rear boom member.

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