Sept. 20, 1960 R. M. WHITE 2,953,259

PORTABLE CRANE

Filed Nov. 17, 1958

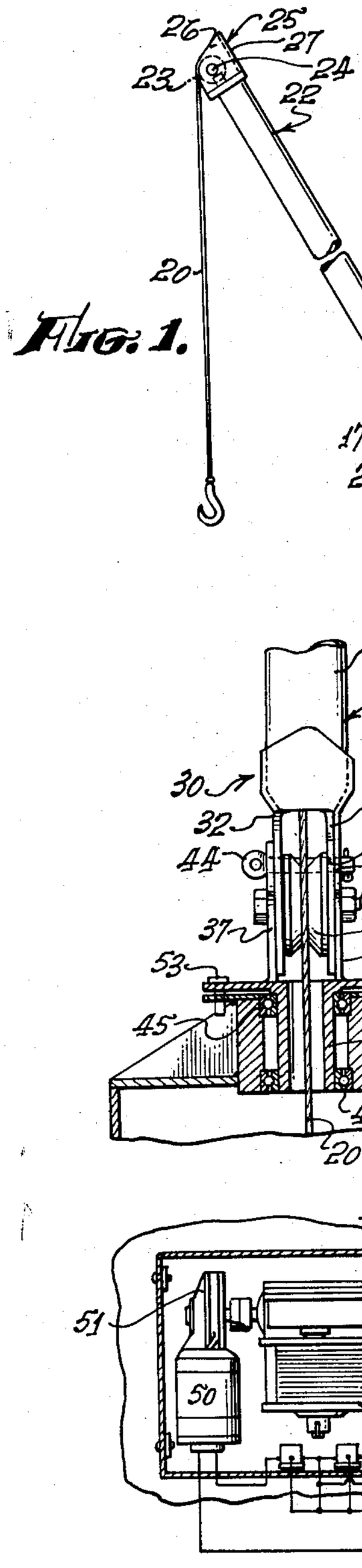

FIG. 1.

FIG. 2.

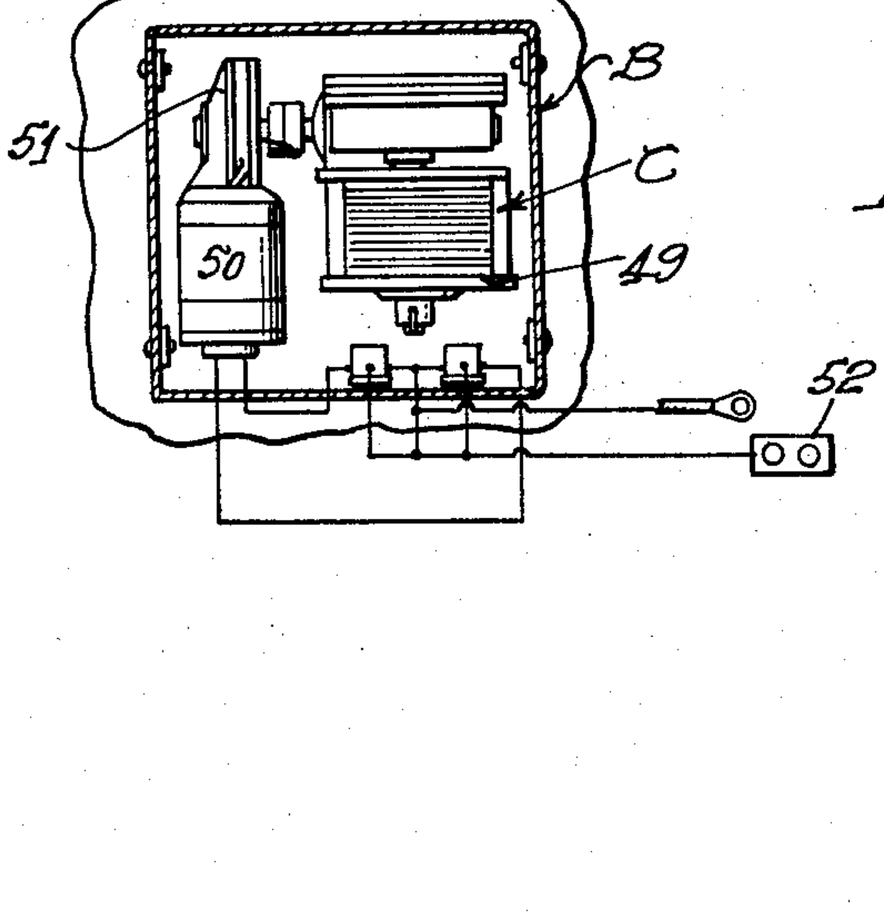

FIG. 3.

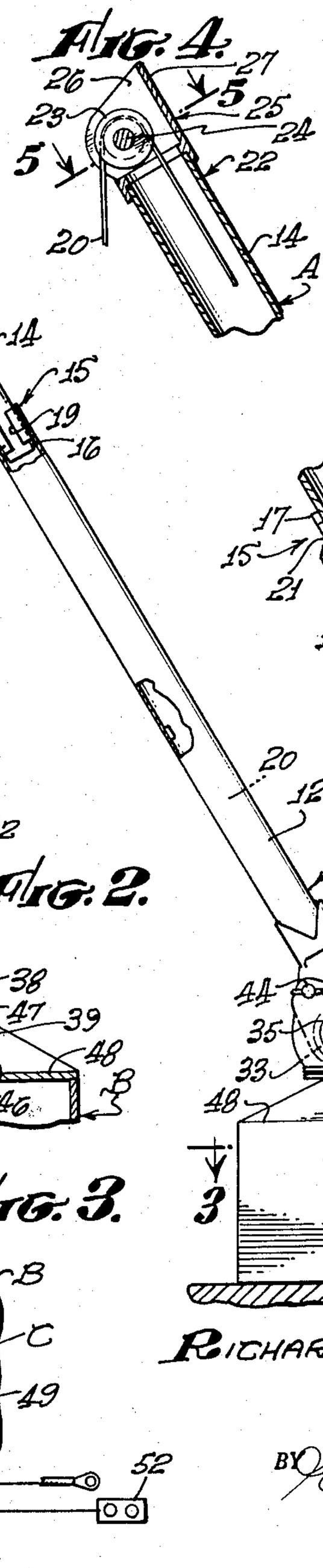

FIG. 4.

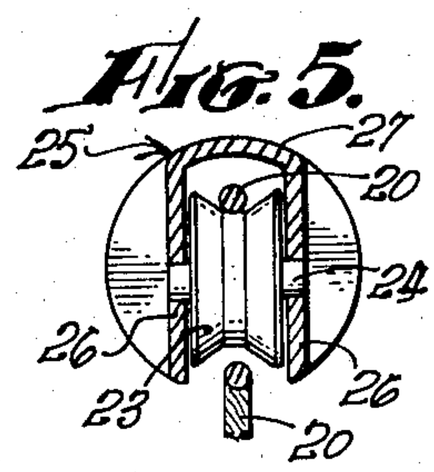

FIG. 5.

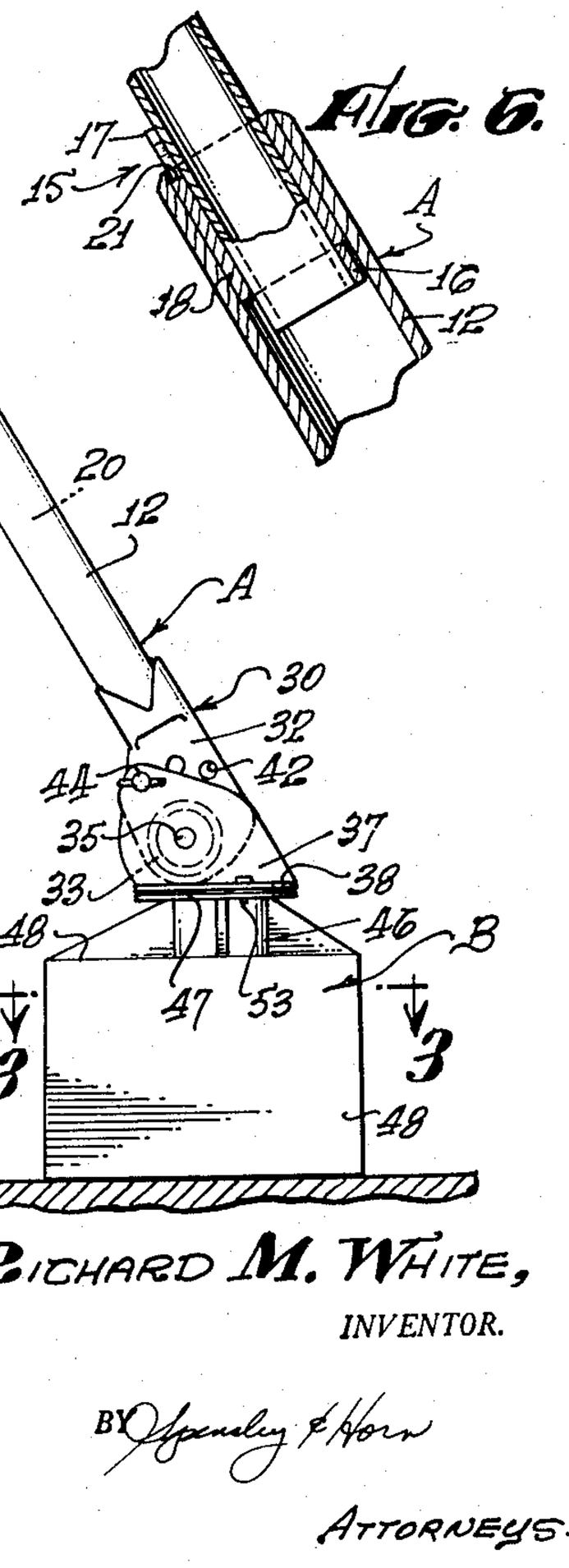

FIG. 6.

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PORTABLE CRANE

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3 Claims. (Cl. 212—58)

This invention relates to lifting apparatus and more particularly to an improved portable crane.

It is a primary object of the present invention to provide an improved portable crane which is simple and efficient in operation and economical in construction.

Another object of the present invention is to provide such a crane which is small and compact in size and especially adapted for the lifting of relatively small objects while the crane is attached to a truck or vehicle by which it is transported.

A further object of the present invention is to provide a crane of the type described which has a telescoping boom which is aligned at all positions for ease of operation. The lifting cable of the crane is at all times aligned for minimum wear and abuse of the cable.

The present invention is an improved portable crane comprising a first and second telescoping tubular boom section wherein the first tubular section is mounted at the inward end thereof upon a crane base for pivotal movement about a vertical axis and adjustable pivotal movement about a horizontal axis. The second tubular section is slidably mounted within the first tubular section at the end of the outward end of the first section for telescoping movement therein. A cable drum positioned within the base is driven by an electric motor also within the base and a crane cable extends from the drum through the tubular section and over a cable positioning sheave at the outer end of the second tubular section.

The novel features which are believed to be characteristic of the invention both as to its organization and method of operation, together with further objects and advantages thereof will be better understood from the following description considered in connection with the accompanying drawing in which a presently preferred embodiment of the apparatus of the present invention is illustrated by way of example. It is to be expressly understood, however, that the drawing is for the purpose of illustration and example only, and is not intended as a definition of the limits of the invention.

In the drawing:

Figure 1 is a view in elevation of the presently preferred embodiment of the invention shown in the extended position;

Figure 2 is a partial sectional view of the base and mounting means of the boom thereon;

Figure 3 is a sectional view taken along line 3—3 of Figure 1;

Figure 4 is a partial sectional view of the outer end of the boom;

Figures 5 is a view taken along line 5—5 of Figure 4; and

Figure 6 is a sectional view of the boom showing the second tubular section locked in extended position.

Referring now to the drawing and particularly to Figures 1, 2 and 3, the crane comprises a boom section A, a base B and a driving section C. The boom section A includes a first tubular section **12** of predetermined outside diameter and wall thickness which are determined for

sufficient strength for the maximum weight to be lifted. The first tubular section is affixed at the inner end thereof to the base section B as described hereinafter. The second tubular section **14** has an outside diameter substantially less than the inside diameter of the first tubular section **12** and is slidably mated with the first section **12** at the outer end **15** thereof. The relative diameters of the tubular sections **12** and **14** are predetermined to provide a longitudinally extending annulus between the sections of sufficient thickness to accommodate positioning lugs **16** and **17** and a spacer guide sleeve **18**. That is, the second tubular section **14** slidably telescopes within the first tubular section **12** and the lugs **16** and **17** and the sleeve **18** provide means for locking the boom sections against relative longitudinal movement and against rotation. In the presently preferred embodiment a guide or spacer sleeve **18** is affixed to the inner surface of the first boom **12** extending longitudinally inward from the outer end thereof. The sleeve **18** has an outside diameter substantially equal to the inside diameter of the first tubular section **12** and an inside diameter substantially equal to the outside diameter of the second tubular section **14**. Thus, the sleeve **18** fills the annulus proximate the outer end of the section **12** and furnishes a cylindrical bearing surface in which the second section **14** is slidable. The sleeve **18** defines a longitudinally extending slot **19** through the sleeve which for purposes of description and orientation is positioned about a horizontal radial plane of the boom A. Proximate the rearward end of the second tubular section **14** are positioning lugs **16** and **17** which are substantially diametrically opposed in this embodiment and longitudinally spaced. Relative to the orientation of the slot **19** the lugs **16** and **17** are positioned at opposite sides of a vertical plane through the boom section **14** and are spaced apart longitudinally such that the inward end of the outer lug **17** is spaced from the outer end of the inward lug by an amount substantially equal to but less than the length of the sleeve **18**. The lugs **16** and **17** are arcuate and have a thickness substantially equal to the thickness of the annulus, such that being affixed to the outer surface of the second tubular section **14** they form bearing surfaces slidable on the inner surface of the first boom **12**. The inward lug **16** is positioned proximate the inner end of the second section **14** and the width of the lugs is such that they are slidable through the slot **19**. Accordingly, installation of the second tubular section **14** into the first tubular section **12** is accomplished by rotating the second section **14** until the inward lug **16** is aligned with the slot **19** at the outer end of the first section **12**. The second section **14** is then moved inward until the outer lug **17** abuts the outer end of the first tubular section. At this point the inward lug has passed through the slot and the second section can be rotated 180° until the outer lug is aligned with the slot **19**. The second section is then moved inward to the fully telescoped position. To extend the boom to the extended separating position as shown in Figure 1, the second tube **14** is pulled outwardly until the outer lug **17** contacts the sleeve **18**, the section **14** is rotated until the lug **17** is aligned with and passes through the slot **19**. The second section is then rotated to the position at which the sleeve is properly oriented, as described hereinafter. At this position both lugs **16** and **17** are misaligned with the slot **19** and the sections **12** and **14** are longitudinally fixed. In addition, a recess **21** is provided in the outer end of the sleeve **18** which corresponds to the radial position of the outer lug **17** when the boom sections are properly oriented. By moving the second section **14** slightly inward the second lug moves into the recess **21** and relative rotation is prevented. It can be readily seen by one skilled in the art that various intermediate sets of lugs can be longitudinally positioned

along the second tubular section 14 to provide intermediate extended positions of the boom A.

At the outer end 22 of the second tubular section 14 a cable 20 sheave 23 is positioned in accordance with this invention as shown in Figures 4 and 5. With respect to the orientation of the lugs 16 and 17 the sheave 23 is rotatably mounted in the vertical plane for rotation about a horizontally disposed shaft 24. The bracket 25 includes vertically disposed side plates 26 which are spaced apart by a distance substantially equal to but greater than the width of the sheave 23. The side plates extend upward beyond the radius of the sheave and a top plate 27 forms a top portion of the bracket. The bracket 25 also terminates at its inward position in a circular end by which it is affixed to the second tubular portion 14. The shaft 24 is mounted through the side plates 26 with the sheave positioned thereon. Thus, the cable 20 extending over the sheave is retained in position and engagement due to the side plates regardless of the direction of pull on the cable although the open end of the sheave mounting bracket allows the cable to extend straight outwardly or downwardly. The shaft 24 is so oriented that it is substantially horizontal when the first and second tubular sections are interlocked. Accordingly, the sheave is maintained in the vertical position.

The inner end 30 is affixed to the base section B for pivotal movement in both the horizontal and vertical plane. As shown in Figures 1 and 2 vertically oriented mounting plates 31 and 32 are affixed to the end 30 of the boom A, and are spaced apart by a distance substantially equal to, but greater than, the width of a cable pulley 33 which is interposed therebetween in the vertical plane. The mounting plates 31 and 32 are pivotally mounted upon a bearing shaft 35 which is supported by mounting brackets 36 and 37 which are affixed to, and extend vertically from, a horizontal mounting member 38. The mounting brackets 36 and 37 are mateable with the mounting plates 31 and 32 and support the bearing shaft 35. The cable pulley 33 is also rotatably mounted upon the bearing shaft such that it is substantially tangential to the longitudinal centerline of the boom A. A tilt positioning pin 44 passes through a mateable pair of openings 41 through mounting plates 36 and 37 and through the respective openings 42 through plates 31 and 32, thereby fixing the angular position of the boom A. That is, a series of openings 42 are located upon the radius of the openings 42 with respect to the shaft 35. With the pin 44 removed, the boom A can be rotated about the axis 35 to the desired position where the respective opening 42 is provided. The pin is then inserted through the aligned openings and the boom is locked at the desired angular position.

The mounting member 38 is in turn mounted upon the base section B for pivotal movement about a vertical axis. In the embodiment shown the mounting member 38 is integral with a vertically extending cylinder 39. The mounting member and cylinder are mounted upon roller thrust bearings 45 affixed within a bearing support member 46 and support plate 47 of the base which are mateable therewith.

The support member 46 and plate 47 are positioned and supported by the base housing 48 which contains the drive section C. The drive section C comprises elements well known to the art including a winding drum 49 rotatably mounted within the housing which is driven by an electric motor 50 through suitable reduction gearing 51. Rotation of the drum 49 is controlled by a remote switch 52. The operator is thus able, by using the micromatic remote switch in one hand and guiding the boom with the other, to handle work which ordinarily requires one or two helpers.

The crane cable 20 thus extends from the winding drum 49 upward through the mounting cylinder 39 and over the cable pulley 33. The cable then extends through

the boom A, over the vertical sheave 23 and passes out of the boom through the cable bracket 25.

The boom A can be fixed to the stationary base 48 at any desired position about the vertical axis of rotation by inserting a fixing pin 53 through suitably aligned openings located in the flanges 38 and 47.

The present invention provides a portable crane which is compact and efficient in operation. The cable is at all times maintained in the position at which it is subjected to the minimum amount of wear. The boom is telescopic and is useable in any position from a truck or vehicle upon which it is mounted.

The heavy roller bearings at the base of the boom permit the boom to be turned easily through 360° and all moving mechanism of the apparatus except usable lifting cable is totally enclosed, thus eliminating the hazard of moving parts. The drive unit motor is operable from the battery of a vehicle in connection with which the apparatus is used and the power drain on a 6, 12 or 24 volt battery is very small for most commercial or other uses.

What is claimed is:

1. A portable crane comprising: a boom section, said boom section including a first tubular section; a second tubular section telescopically mounted within said first section, said second section having an outside diameter substantially less than the inside diameter of said second section, a cylindrical sleeve interposed between said first and second sections extending a predetermined longitudinal distance from the outer end of said first section, said sleeve defining a slot extending longitudinally through said sleeve, a pair of longitudinally spaced lugs affixed to the outer surface of said second section, said lugs being longitudinally spaced by a distance substantially equal to but greater than said predetermined length of said sleeve, said lugs being radially misaligned on said second section and having a radial depth substantially equal to the distance between the outside diameter of said second section and inside diameter of said first section, said lugs having a width less than the width of said slot; a base section; a cable sheave mounted upon said boom proximate the outer end thereof, said sheave being in the vertical plane when said first and second tubular sections are aligned; a base section; means for mounting said first tubular section upon said base for pivotal movement about a vertical and horizontal axis; a driving means contained within said base, said driving means including an electrically driven cable drum; and a cable extending from said drum through said boom and from said boom at the end thereof opposed to said mounted end.

2. A portable crane comprising: a boom section, said boom section including a first tubular section; a second tubular section telescopically mounted within said first section, said second section having an outside diameter substantially less than the inside diameter of said second section, a cylindrical sleeve interposed between said first and second sections extending a predetermined longitudinal distance from the outer end of said first section, said sleeve defining a slot extending longitudinally through said sleeve, a pair of longitudinally spaced lugs affixed to the outer surface of said second section, said lugs being longitudinally spaced by a distance substantially equal to but greater than said predetermined length of said sleeve, said lugs being radially misaligned on said second section and having a radial depth substantially equal to the distance between the outside diameter of said second section and inside diameter of said first section, said lugs having a width less than the width of said slot; a base section; a cable sheave mounted upon said boom proximate the outer end thereof, said sheave being in the vertical plane when said first and second tubular sections are aligned; a base section; means for mounting said first tubular section upon said base for pivotal movement about a vertical and horizontal axis; a driving means contained within said base, said driving means including an electrically driven cable drum; a

cable extending from said drum through said boom and from said boom at the end thereof opposed to said mounted end; and means in combination with said driving means for operating said driving means from a position remote therefrom.

3. A portable crane comprising: a boom section, said boom section including a first tubular section; a second tubular section telescopically mounted within said first section, said second section having an outside diameter substantially less than the inside diameter of said second section, a cylindrical sleeve interposed between said first and second sections extending a predetermined longitudinal distance from the outer end of said first section, said sleeve, a pair of longitudinally spaced lugs affixed to the outer surface of said second section, said lugs being longitudinally spaced by a distance substantially equal to but greater than said predetermined length of said sleeve, said lugs being radially misaligned on said second section and having a radial depth substantially equal to the distance between the outside diameter of said second section and inside diameter of said first section, said lugs having a width less than the width of said slot; a base section; a bracket mounted upon said second section extending from the outer end thereof; a cable sheave

mounted within said bracket, said bracket including an upper surface above said sheave and opposed side plates positioned adjacent the sides of said sheave, said sheave being in the vertical plane when said first and second tubular sections are aligned; a base section; means for mounting said first tubular section upon said base for pivotal movement about a vertical and horizontal axis; a driving means contained within said base, said driving means including an electrically driven cable drum; a cable extending from said drum through said boom and from said boom at the end thereof opposed to said mounted end; and means in combination with said driving means for operating said driving means from a position remote therefrom.

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