

- [54] **ROTATABLE AND EXTENSIBLE ELBOW**
- [72] Inventors: **Albert E. Reske**, Minneapolis; **Orlo J. Johnson**, Lakeville, both of Mich.
- [73] Assignee: **Tel-E-Lect, Inc.**, South Minneapolis, Mich.
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- [51] Int. Cl. **B66f 11/04**
- [58] Field of Search **182/2, 141**

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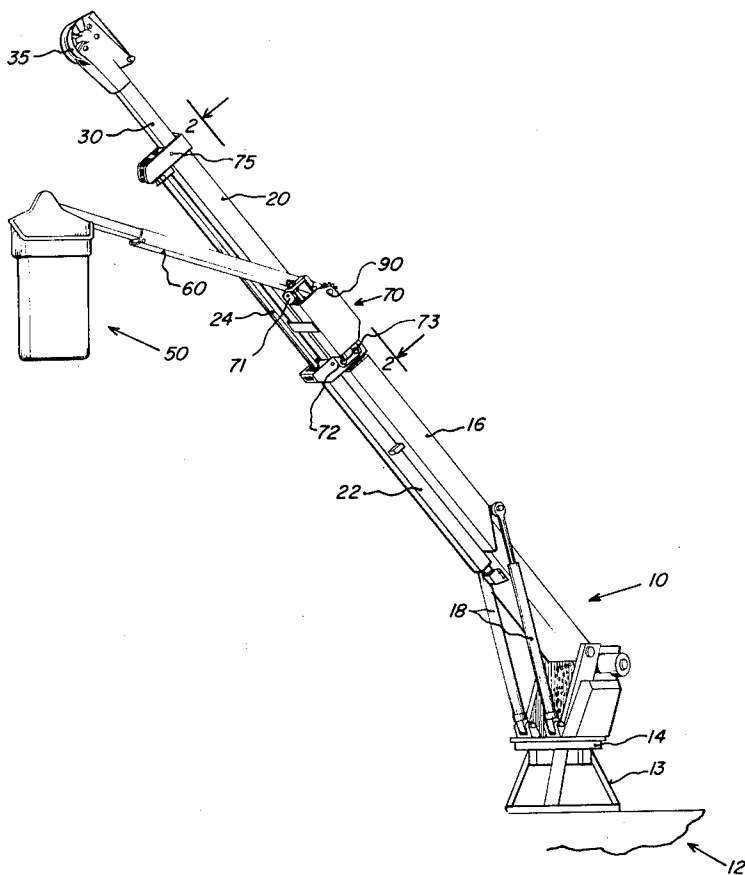
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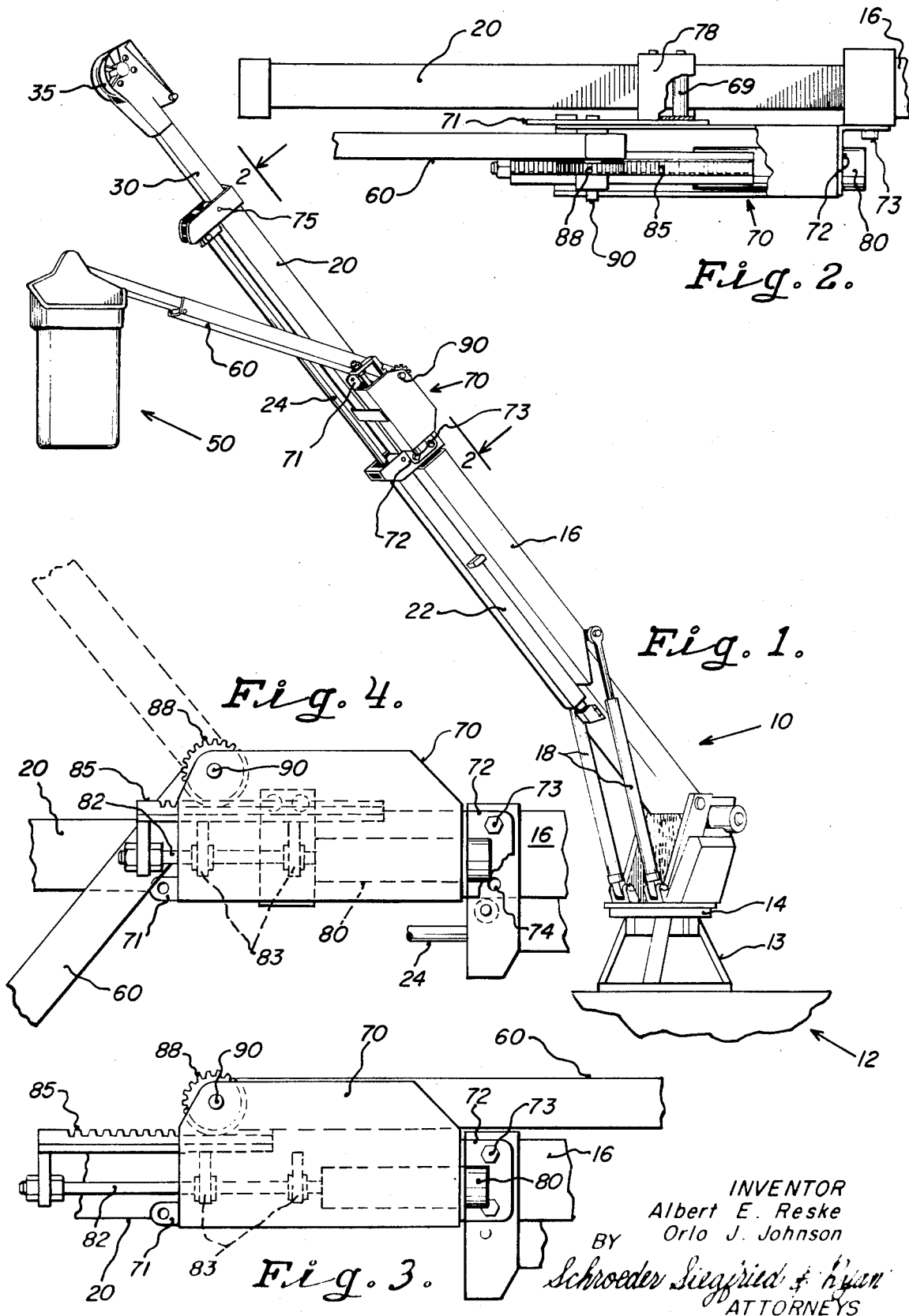
Primary Examiner—Reinaldo P. Machado
Attorney—Schroeder, Siegfried & Ryan

[57] **ABSTRACT**

A mobile aerial tower comprised of a mobile platform having a boom with an extensible section and a personnel-carrying platform or bucket mounted on an auxiliary elbow section which is pivoted on a bracket through various types of motive means and with the provisions for mounting the bracket selectively at either the end of the main boom section or the extensible portion of the same. The elbow section is also extendable to vary the length of the same.

11 Claims, 8 Drawing Figures





INVENTOR
 Albert E. Reske
 BY Orlo J. Johnson
Schroeder Siegfried & Ryan
 ATTORNEYS

Fig. 6.

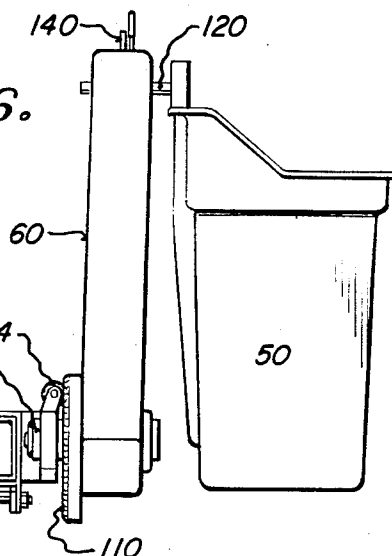


Fig. 5.

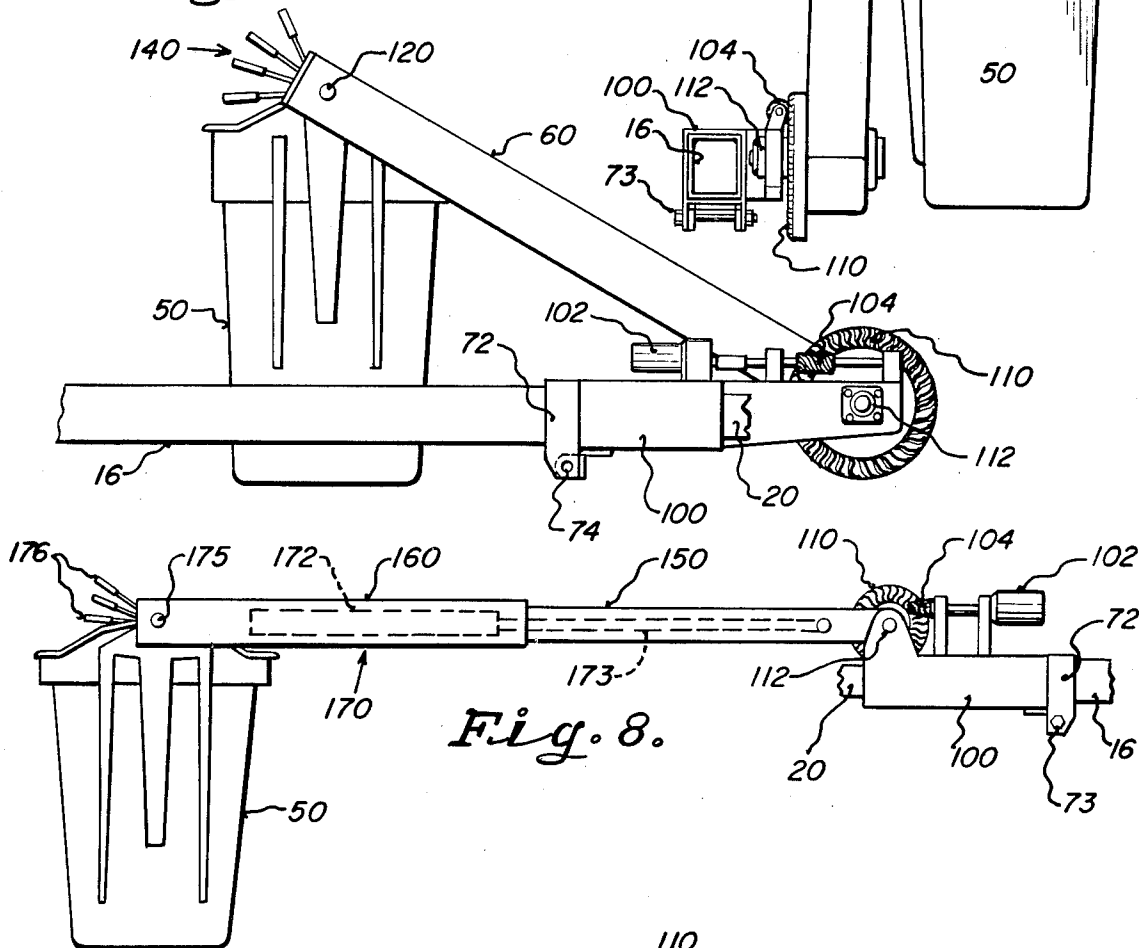


Fig. 8.

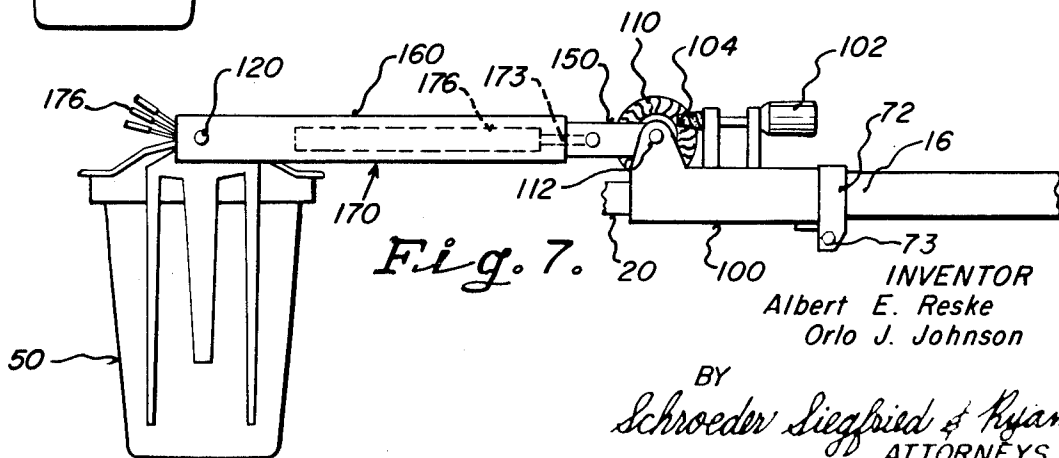


Fig. 7.

INVENTOR
Albert E. Reske
Orlo J. Johnson

BY
Schroeder Siegfried & Ryan
ATTORNEYS

ROTATABLE AND EXTENSIBLE ELBOW

This application is a continuation-in-part of our application, Ser. No. 3,944, filed Jan. 19, 1970 and entitled "ROTATABLE AND EXTENSIBLE ELBOW". It is being filed for the purpose of expanding on a portion of the disclosure relating to the mounting which would be the transferable mounting of the rotatable elbow which is disclosed and claimed in that application.

My invention relates to mobile aerial towers having a work platform or personnel-carrying bucket thereon, and more particularly to apparatus of this type in which the bucket is mounted on a rotatable elbow which is selectively carried by a boom or an extension of the same in the aerial tower.

Mobile aerial towers which have work platforms or personnel-carrying buckets, and which are articulated are known and in use. In such structures the personnel basket may be positioned in any orientation in a generally horizontal plane or through a full 360 degrees of azimuth rotation, but the basket or platform is carried on the end of a single pivoted arm of fixed length to restrict its range of articulation. Further the tower with a basket thereon is normally restricted in its usage solely for positioning the work platform, and no portion of the tower may be utilized for any other function. Thus, other vehicles are required to support tools or work to be used by personnel on the platform.

In the improved mobile aerial tower of the present invention, the personnel-carrying basket or work platform, is mounted on an elbow member which may be moved independently of the boom throughout a plane of rotation which is offset from the longitudinal extent of the boom, and in addition, the tower member supporting the work platform or personnel basket is carried by a mounting bracket which may be connected either at the end of the boom, or selectively at a telescopic extension of the same and when carried by the boom itself, permits extension and usage of the boom extension for other purposes. Thus, for example, the personnel-carrying basket may be positioned at the end of the boom while the slidable extension within the boom may be extended and utilized for supporting wires or raising the same in telephone and power work; thereby permitting workers to be positioned adjacent the same, but clear of the end of the extension, so that they may perform a work function without the danger of electric hazard. Thus, in my improved invention, the elbow member mounting the personnel-carrying basket or work platform may be selectively positioned at varying points along an aerial tower and its supporting elbow member extended in length to position the same in any desired location with respect to the end of the tower. The end of the tower or boom is further extendable rather than articulated from a mobile platform, and portions of the same may be utilized for different purposes, as for example, carrying some type of tool brace or equivalent to be used by the workers eliminating the requirement of separate towers of similar equipment.

Therefore it is the principal object of this invention to provide a mobile aerial tower in which a work platform may be selectively positioned at varying positions along the extent of the tower.

Another object of this invention is to provide in a mobile tower a boom formed of a main and an auxiliary

extensible section with a work platform connected to a rotatable support which may be positioned selectively at the end of the extensible section, or at the end of the main boom section.

A further object of this invention is to provide in a mobile aerial tower this type of an arrangement for mounting a work platform on an auxiliary section of an extensible boom for rotational movement and with provisions for extending the auxiliary section.

Another object of this invention is to provide a mobile tower structure having a personnel-carrying bucket which may be adjustably mounted on the tower boom adjacent the end thereof, or adjacent the end of intermediate section thereof.

These and other objects of this invention will become apparent from a reading of the attached description together with the drawings wherein:

FIG. 1 is a perspective view of a mobile aerial tower embodying our invention with parts broken away;

FIG. 2 is a top view of the mobile aerial tower of FIG. 1 with parts broken away;

FIG. 3 is a schematic side elevation view of a portion of the mobile aerial platform showing the elbow member which supports the platform in a stored condition of operation;

FIG. 4 is a schematic elevation view of FIG. 2 with the supporting elbow in a second condition of operation;

FIG. 5 is a schematic view of a portion of the mobile aerial platform showing an alternate embodiment of the mounting of the platform or bucket supporting elbow;

FIG. 6 is a schematic front end elevation view of the structure shown in FIG. 4;

FIG. 7 is a schematic view of a modification of the basket supporting elbow member of FIGS. 5 and 6 showing the extensible portion of the same in one condition of operation; and

FIG. 8 is a schematic elevation view of the structure of FIG. 7 shown in a second condition of operation.

Our invention in a mobile aerial platform with rotatable elbow is shown in FIGS. 1 and 2 in connection with a boom structure which is normally mounted on a turntable and fixed to and carried by a conventional truck chassis. The boom structure is indicated generally at 10 and a portion of the chassis, shown broken away, is indicated generally at 12 as the type of equipment which normally supports and mounts such structure. Such units are normally self-contained in that they provide a power source for a hydraulic pumping system to operate actuators and controls incorporated into the boom structure of the tower and for the purpose of orienting the tower through motors positioned on the chassis. The details of this structure form no part of the present invention and are eliminated for simplicity. Such a structure will normally provide a supporting frame 13 on the chassis 12 supporting a turntable or platform 14 upon which the main boom element 16 is mounted. The platform 14 will normally be driven or rotated in azimuth about a vertical axis through 360° rotation through drive means (not shown). In addition, the main boom structure 16 is oriented or pivoted in a vertical plane relative to the turntable through actuators indicated generally at 18. Such structure is largely conventional and may vary in form. Many of the

present day mobile aerial towers use a second boom element pivoted off of the free extremity of the first boom element and with a similar pair of linear actuators for elevating the same provide a scissors type extension. Such structures normally carry only the platform or personnel-carrying bucket at the free extremity of the second boom structure.

As will be seen in FIG. 1, the mobile aerial tower of the present invention incorporates a second boom member 20 or extension telescopically mounted or fitted into the first or main boom structure 16 which is extended and retracted relative to the first boom structure to lengthen the same through the use of an externally mounted linear actuator 22 whose cylinder is connected to the first boom structure and carried thereby and whose operating shaft 24 is connected to the telescopic element 20 to provide telescopic movement of the same. In addition, the overall boom structure may incorporate a third telescopic element 30 slidably mounted in the second telescopic element and extended and retracted by means of an internal motive means (not shown) for the purpose of increasing the length of the overall boom. This third boom structure is normally of a dielectric type and may incorporate a winch, such as is indicated at 35, or other work performing tool at the end of the same for the purpose of performing a separate work function beyond the support and movement of a personnel-carrying platform or bucket.

The personnel-carrying platform or bucket, depending upon which is used, is indicated generally at 50 in FIG. 1 is a part of the mobile aerial tower. In FIG. 1 it is disclosed as a bucket which is supported by an elbow member 60 pivotally mounted on a supporting and mounting bracket 70. The supporting and mounting bracket 70 is a sleeve type structure which is carried on the extensible boom element or telescopic element 20 and includes journal means 69 therein allowing the boom element to move relative thereto, for purposes to be later noted. The bracket includes flange structures 71, 72 at the extremities of the same by means of which pin connections may couple the same to the main boom element 16 or the extensible boom element 20, depending upon which is to carry the same. Thus, as will be shown in FIG. 1, the flanges 71, 72 have apertures therein through which pins 73 may be inserted to couple the sleeve type bracket structure to either the end of the boom element 16 in an aperture 74 therein or to the end of the extensible element 20 at an aperture 75 therein. Such a transfer will be made when the tower is collapsed and in a normal stored position with the extensible element retracted. The bracket support structure will be carried by the extensible element 20 and depending upon the placement of the pin may be coupled to the end of the boom allowing movement of the extensible element for forward purposes or may be pinned to the end of the extensible element and moved therewith with boom extension and retraction. Support mounting bracket apart from the sleeve structure, indicated generally at 78, includes a pivotal mounting structure for the elbow member the details of which will be set forth in the embodiment shown in FIGS. 3 through 8 to be hereinafter described. The elbow member is mounted on the support mounting bracket for rotation in a plane offset from the longitudinal ex-

tent of the boom element. For simplicity, only portions of the boom or extensible element shown and parts of the same will be removed for the purpose of simplifying the disclosure, it will be understood, however, that the bracket support structure may be carried in either position with the elbow and its rotative structure and extensible structure, to be hereinafter described functioning in the same manner. It will also be recognized that control lines and power lines to the actuators and controllers operating on the motors of the elbow member and mounted thereon will be flexible and extensible to accommodate for this change in location of the bracket mounting structure between the boom elements of the mobile aerial tower and for varying positions of movement of the elbow and platform connected thereto.

In FIGS. 3 and 4 is shown one version of the mounting of the elbow supporting the platform or bucket. This structure is shown schematically and with boom parts broken away or removed for simplicity to disclose the relationship of the key parts. Thus, as will be seen in FIG. 3, the boom 16 at the extremity thereof will mount the elbow support structure or bracket 70 which carry the elbow 60 and orients the same about a rotational axis. It will be understood, however, that the mounting bracket may be carried by and connected to the first extensible element of the boom 20 through a manual mounting of the support 70 or connection with a pin thereon. In FIG. 3, the support structure positions and carries a linear actuator whose cylinder, shown schematically at 80, is attached to the support structure through means (not shown) with its actuating shaft with extension 82 being journaled in support brackets 83 mounted on the support structure 70 and carrying at its free extremity a rack 85 which is connected thereto. The rack cooperates with a pinion gear 88 attached to the extremity of the elbow 60 with the pinion gear and the elbow being journaled on the mounting bracket through a pivot member 90. Extension and retraction of the actuating shaft 82 of the actuator will move the rack relative to the journaled pinion gear 88 to rotate the elbow from a stored position as in FIG. 3 through a limited angle of rotation, such as is indicated at FIG. 4, with such movement taking place in a vertical plane. Although not shown, it will be understood that the platform or bucket will be mounted at the extremity of the elbow through a pivoted journal member, as is shown in FIGS. 5 and 6, such that it will pivot thereon and maintain its vertical orientation for proper positioning of the occupant thereon. It will also be recognized that suitable controls may be positioned at the end of the elbow and in proximity to the platform or bucket for operation by an operator. The control lines (not shown) are flexible to allow for pivotal movement of the elbow and to permit orientation of the platform or bucket throughout a limited range of rotative movement. For example, a range of 250 degrees, depending upon the length of the rack and actuator travel, is provided to orient the platform through a wide arc for maneuverability and positioning of the occupants in the platform or bucket at the end of the elbow.

FIGS. 5 and 6 show another embodiment of the support structure or bracket mounting and elbow construction which permit continuous rotation of the elbow member and hence, the personnel-carrying platform or bucket at the end of the same through 360°

rotation and greater and in either direction of rotation. Thus, as will be seen in FIGS. 5 and 6, the main boom element 16 mounts the elbow supporting structure or bracket, shown herein at 100. The boom extensions 20 and 30 are removed for simplicity of disclosure but it will be understood that the bracket may be connected by extension 20. In this embodiment, the elbow supporting bracket mounts a reversible rotary motor 102 having a spiroid gear 104 at the end of its output shaft 105. The elbow member 60 mounts at its journaled extremity an annular spiroid gear 110 and a suitable translationally extending shaft which is journaled in the end of the support structure or bracket 100 through bearings, such as is indicated at 112. The platform or bucket 50, as is shown in FIG. 5, is pivotally mounted at the opposite extremity of the elbow member, as at 120 through a transversely extending shaft to be rotatable relative thereto and suitable control means, such as is indicated at 140, are mounted on the end of the elbow member to be accessible to an occupant of the basket. In this embodiment, continuous rotation in either direction of the elbow member relative to the support structure or bracket and the boom structure upon which the latter is mounted is provided enabling the occupant to position himself relative to an inclined boom structure at any angle with respect thereto and to approach the work at the end of the boom from either direction. FIG. 6 shows the structure from the front and with parts removed and it will be understood that the bearing and journal structure 112 will include a rotatable channel block or connector to permit continuous rotation of the elbow with respect to the supporting bracket 100 and provide coupling of the controls or the control lines through conventional rotary coupling apparatus (not shown) relative through the universal or continuous pivotal connection.

The embodiment of the structure shown in FIGS. 7 and 8 relates to a telescopic section of the elbow which structure may be utilized to lengthen or contract the extent of the elbow member relative to its pivotal connection and is applicable to either of the embodiments shown in FIGS. 3 and 4 or 5 and 6. In FIG. 7, it is applied for simplicity to the 360° rotatable pivot structure or mounting for the elbow. Thus, the mounting bracket 100 is carried by either the main boom 16 or its first extensible element 20 and the rotary motor 102 drives a spiroid gear 104 to cooperate with a spiroid gear 110 which is mounted on the inner telescopic part 150 of a pair of telescopic parts, the outer of which is indicated at 160 forming the composite elbow member. An internally mounted actuator, such as is indicated in phantom at 170, and comprised of a cylinder 172 and shaft 173 are connected respectively to the telescopic parts for the purpose of retracting and extending the same with operation of the actuator in a conventional manner. In this embodiment, the basket or platform 50, shown herein as a basket, is pivotally mounted at the free extremity of the outer telescopic part 160, as indicated at 175 and the control lines such as indicated by the control handles 176 are similarly mounted in the outer telescopic part and extend through the inner telescopic part 150 through a suitable rotatable connector in the pivot structure on the pivot structure 112 to provide an electrical connection thereto. The pivot structure will also include, although not shown, a suitable

fluid rotatable coupling for the fluid lines directed to either end of the actuator 170, for the purpose of operating the same. Such fluid lines will extend along and be connected to the source through suitable flexible fluid lines to accommodate the transfer of the support structure or bracket 100 from the boom structure to the first extensible element 20. FIG. 8 shows the elbow formed by the telescopic parts 150, 160 extended which structure will provide a further adjustment or positioning for the occupant of the basket relative to the main boom structure and any tool carried by the extent of the same.

Our improved mobile aerial tower combines with the conventional telescopic boom structure and elbow support for a personnel-carrying platform or basket which is mounted for continuous or limited rotation through suitable journaling and drive means to enable the occupant or user to position the platform or bucket relative to the boom structure and away from the same for the purpose of performing various work functions. The elbow structure is also telescopic to enable the length of the same to be changed for a wider range of positioning control for the purpose of performing various work functions. In addition, the mounting structure for the rotatable elbow is adapted to be selectively connected to various portions of the boom structure such that it may be positioned along the extent of the boom structure and enable a final section of the boom structure to carry some other working tool for performing an additional work function for greater versatility in a mobile aerial tower. The operator may position the elbow member, and hence himself, in any position relative to the work at the end of the boom and may approach the work from any direction of rotation. Further, he may lower the elbow member to the vehicle or ground without changing the boom position or the work thereon.

What is claimed is:

1. A mobile aerial tower comprising, a mobile platform, an articulated boom mounted on the platform, a slidable boom extension telescopically mounted in the articulated boom and including motive means for extending and retracting the same, an elbow member, bracket means slidably mounted on said boom extension and pivotally mounting the elbow member on the boom extension, power means mounted on the bracket means and connected to the elbow member pivoting the same on the bracket means, means on said bracket means for preventing free movement of said bracket means, and a personnel-carrying basket journaled at the free end of the elbow member.

2. The mobile aerial tower of claim 1 in which the power means pivoting the elbow member on the bracket means pivots the same for limited rotation.

3. The mobile aerial tower of claim 1 in which the power means pivoting the elbow member on the bracket means pivots the elbow member for unrestricted rotation.

4. A mobile aerial tower comprising, a mobile platform, an articulated boom mounted on the platform, a slidable boom extension telescopically mounted in the articulated boom and including motive means for extending and retracting the same, an elbow member, bracket means pivotally mounting the elbow member on the boom extension, power means mounted on the

bracket means and connected to the elbow member pivoting the same on the bracket means, and a personnel-carrying basket journaled at the free end of the elbow, said power means pivoting the elbow member on the bracket means for unrestricted rotation including a spiroid gear and rotary motor with cooperative gearing on the elbow member to provide 360° rotation of the elbow member relative to the bracket means.

5. The mobile aerial tower of claim 2 in which the power means on the bracket means and pivoting the elbow member thereon includes a linear hydraulic actuator operating a rack type gearing and cooperative with a pinion gear mounted on the elbow means for restricted rotational movement of the elbow member relative to the bracket means.

6. The mobile aerial tower of claim 1 in which the elbow member includes a pair of slidable parts permitting longitudinal extension and retraction of the elbow member relative to the bracket means.

7. The mobile aerial tower of claim 6 and including motive means connected between the slidable parts and the elbow member to slidably extend and retract the elbow member and the personnel-carrying support thereon relative to the bracket means.

8. The mobile aerial tower of claim 1 in which the means preventing free movement of the bracket means includes means releasably connecting the bracket means selectively to the free extremity of the articulated boom and the extremity of the slidable boom extension positioned therein.

9. The mobile aerial tower of claim 8 in which the

bracket means is slidably mounted on the boom extension and movable between the extremity of the articulated boom and the extremity of the boom extension for selectively positioning thereon.

10. The mobile aerial tower of claim 8 in which the means preventing free movement of the bracket means includes securing means positioned in part on the bracket means and in part on the slidable boom extension and the articulated boom for selectively locking the bracket means on the articulated boom and the slidable boom extension therein.

11. A mobile aerial tower comprising, a mobile platform, an articulated boom member mounted on the platform, a slidable boom extension member telescopically mounted in the articulated boom member and including motive means for extending and retracting the same, an elbow member, bracket means slidably mounted on one of said members and pivotally mounting the elbow member, power means mounted on the bracket means and connected to the elbow member pivoting the same on said bracket means, means on said bracket means for preventing free movement of said bracket means on said one of said members, and a personnel-carrying basket journaled at the free end of the elbow member.

12. The mobile aerial tower of claim 11 and including means included in the elbow member to slidably extend and retract the same for altering the position of the personnel-carrying means at the end of the elbow member relative to the support bracket means.

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