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BOOM CONSTRUCTION

Filed Sept. 25, 1968

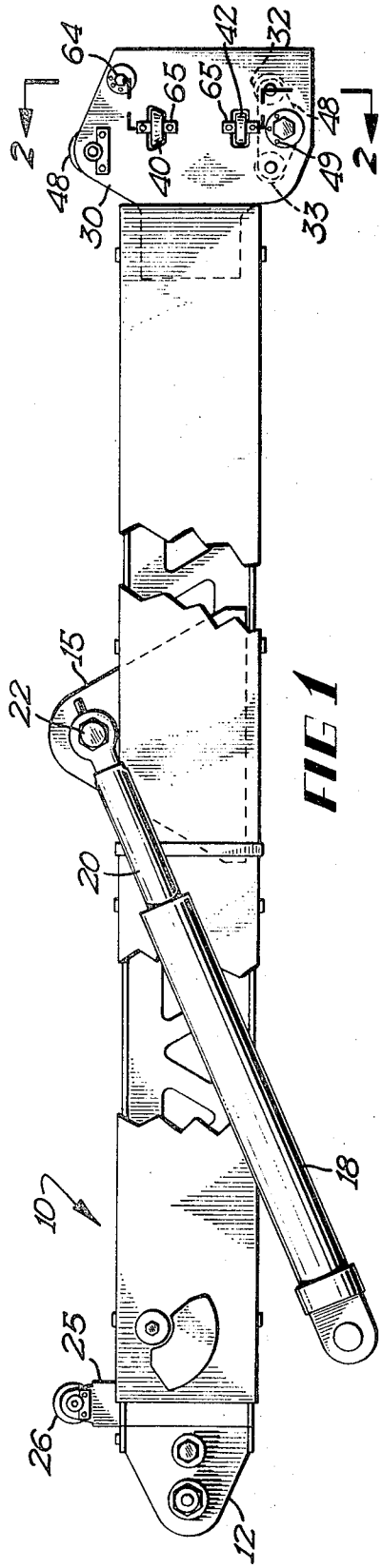


FIG 1

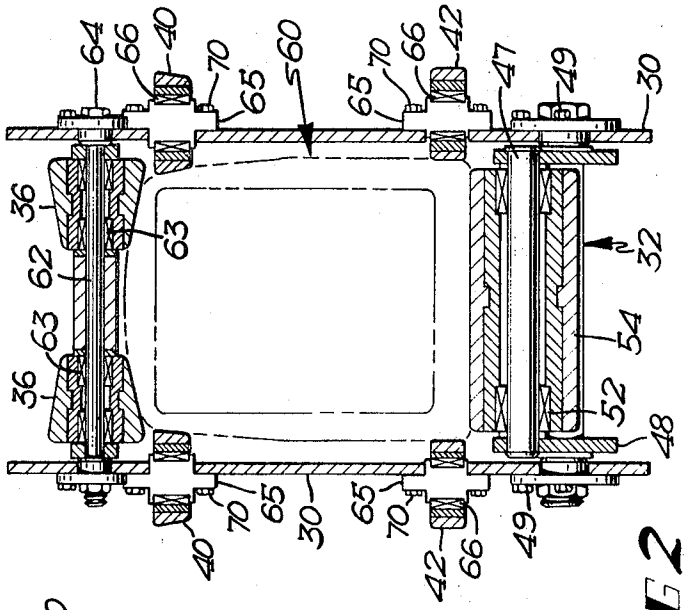


FIG 2

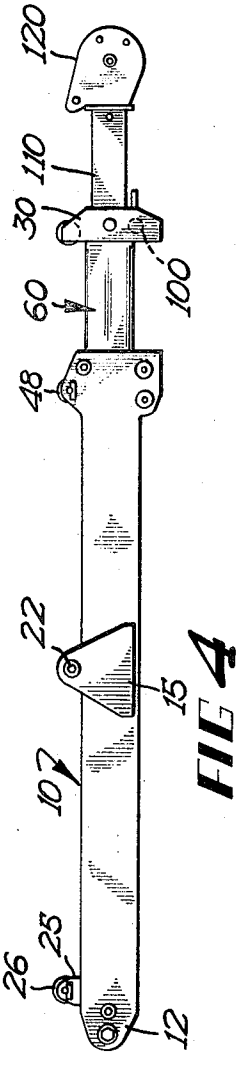


FIG 4

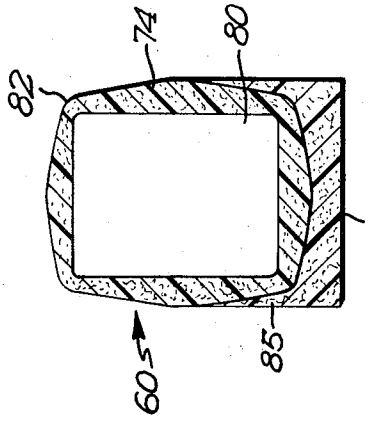


FIG 3

INVENTOR.
ALBERT E. RESKE
BY
Schroeder, Siegfried & Ryan
ATTORNEYS

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BOOM CONSTRUCTION

Albert E. Reske, Bloomington, Minn., assignor to Tel-E-Lect, Inc., Minneapolis, Minn., a corporation of Minnesota

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U.S. Cl. 212—55 13 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to a boom construction of the dielectric type used in hazardous, electrical shock areas. The improved boom construction incorporates a hollow tubular member with arcuate sides and restricted corners which have combined therewith a bottom supporting plate member made of a fiber glass and epoxy resin similar to the dielectric material in the boom element and so positioned thereon as to provide increased compression strength to the boom element.

This invention relates to boom constructions and more particularly to an improved boom of the dielectric type adapted for use as an upper boom element structure for the purpose of insulating the upper boom element from the remaining portion of the boom.

Mobile-aerial platforms specifically adapted for use in connection with electric transmission line work and around electrical installations where the danger of electric shock to personnel is present have previously employed an insulating boom extension or extremity to eliminate the electrical shock hazard. In equipment of this type, the boom extremity and personnel-carrying platforms or baskets attached to the boom extremity are normally made of a dielectric material, such as fiber glass, with suitable insulation in control lines and in actuating lines to isolate through dielectric material the boom extremity and personnel therein from the normal metallic structure employed in the remaining portion of the platform and boom parts. In such structures, the problem arises of providing sufficient strength in the fiber glass or dielectric boom extension to make it compatible with the remaining portion of the boom structure and to adequately support the loads on the same. Fiber glass structural members or members made of similar dielectric materials have adequate tensile strength but lack sufficient strength in the compression axes for this purpose. Since a portion of the boom will be in compression, this problem has limited the application and length of such boom extension.

The present invention is directed to an improved boom extension of the dielectric type made of a fiber glass material embedded in an epoxy resin which will have sufficient strength in both compression and tension axes to provide a boom member capable of supporting the normal loads placed on the same. In this improved boom construction, an additional channel or trough-like support member is added to the lower section of the boom or across the bottom of the same to support the sidewalls of the boom and the lower section of the boom in compression. This additional support member is also made of a fiber glass imbedded in an epoxy resin and bonded or otherwise secured to the underside of the boom to provide an integral unit which will telescopically fit into the metallic boom construction and be guided therein in extension and retraction through guide rollers.

Therefore, it is the principal object of this invention to provide an improved boom construction of the dielectric type.

Another object of this invention is to provide in an improved boom construction, a dielectric structural member having high compression strength in addition to tensional strength.

A further object of this invention is to provide in an improved boom construction the addition of a support member which will reinforce a conventional helically wound boom.

A still further object of this invention is to provide an improved boom construction which can be readily constructed and mounted in a metallic or dielectric boom structure as an extensible part of the same and be capable of being supported through various conventional type supports.

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 side elevational view of the improved boom construction;

FIG. 2 is a sectional view of the improved boom construction of FIG. 1 taken along the lines 2—2 therein;

FIG. 3 is a cross-sectional view of the dielectric boom showing the construction of the same; and

FIG. 4 is a schematic view of the improved boom construction.

My improved boom construction is normally used as one or two sections of a composite, telescopic boom structure which is pivotally mounted on a turntable for one axis of movement, with the turntable providing swinging movement in a conventional manner. In FIG. 1, the basic or main boom portion is shown generally at **10** with its pivot flange extremity **12** by means of which it normally would be mounted on such a platform. The main boom structure is normally made of a metallic material, such as steel, and is generally square in cross section being hollow or tubular. This main boom structure would mount flanges **15** intermediate its extent to which the elevating actuators **18** would be connected through the shaft extremity **20** of the same to provide a pivotal connection, such as is indicated at **22**. Suitable winch line guides may be placed internally or externally of the boom. Flange members **25** with rollers **26** thereon are located at one extremity of the boom to cooperate with similar members which may be located at varying points along the extent of the same. As shown in FIG. 1, a pair of guide plates **30** are attached to the opposite extremity of the boom through suitable means (not shown) and these guide plates mount therebetween a plurality of roller guides **32, 33** at the lower extremity of the boom. Similar roller guides **36** are positioned on the upper extremity of the boom and at **40** and **42** along the sides thereof. In addition, a pulley or roller guide, such as is indicated at **48**, is positioned between the guide plates for the purpose of guiding winch line cables thereon. This portion of the boom may vary in form and is conventional except for the type of roller guides adapted to position and guide the dielectric section to be hereinafter described.

As will be seen in FIG. 2, the bottom roller guides **32, 33** are flat or horizontal rollers mounted on suitable shafts **47** which are secured on flange plates **48** which are mounted on the end plates through nut and bolt means indicated generally at **49**. Suitable bearing means **52** mounted on the shafts journal the actual cylinder rollers **54**. The dielectric boom is shown in cross section generally at **60** in FIG. 3 as having a flat bottom section. The upper surface of the boom is guided by the tapered rollers **36** which are similarly mounted on a shaft **62** secured in the plates **30** by bolt means **64** with suitable bearing means **63** mounting the tapered or conical rollers. As will be hereinafter noted, these tapered rollers conform to the upper surface of the extensible boom element **60**. The side rollers **40** are similarly tapered rollers and are mounted on stub shafts **65** through bearing means **66**

and secured to the side plates. These conform to the upper side surfaces of the boom which are tapered as will be hereinafter defined. The lower guide rollers **42** are similarly constructed on stub shafts **65** with bearing means **66** mounting the same and secured in the side plates through bolt means **70**. These are cylindrical rollers and bear against the flat substantially vertical lower portions of the boom element **60**.

The boom element **60** is shown in cross section in FIG. 3 as being comprised of two portions **74**, **75** which are bonded together or suitably formed to provide an overall composite elongated boom element. The portion **74** is helically wound on a rectangular mandrel such as to provide the rectangular opening or hollow tubular form, indicated at **80**. The boom is formed of a woven fiber material, such as fiber glass having high dielectric characteristics, which is wound on a mandrel form while being imbedded in an epoxy resin. This gives a construction which provides arcuate or convex sides with the sides having the greatest thickness dimension at the midpoint and a thinner dimension at the corner and with generally restricted corners which are indicated at **82** to provide the minimum thickness for the boom. The fiber glass is helically wound in the form of a helix folded back on itself a number of times to provide an overall structure imbedded in a synthetic resin, such as an epoxy resin, which when hardened will provide an overall element having substantially the same tensile characteristics as a similar metallic structure, such as steel. A boom element of this type, however, has the disadvantage of having a lower strength in the compression axis. In an elongated boom element which is telescopically supported in the end of a similar or main boom part with the cantilever type loading on the same, the lower portion of the boom element is placed in compression. The improved boom construction herein incorporates an elongated channel type support or trough-like member **75** formed of the fiber glass material extending longitudinally and imbedded in an epoxy resin. This may be formed by a plurality of layers of fiber glass in a mold into which the elongated boom element is positioned. The support or trough member is generally U-shaped in cross section having upstanding sides, as at **85**, which conform to the convex or arcuate sides of the tubular member to support the sides off the tubular member **74**. The sides are tapered inwardly near the upper and lower extent of the sidewalls of the boom element **74**, and on either side edges of the boom element at the top and bottom surfaces thereof. These raised or bifurcated side portions will be positioned beneath and in supporting relationship with the sidewalls and the bottom surface, that is the portion of the sidewalls which are inwardly tapered to add tensile and compression strength to the composite boom element. The bottom surface of the composite boom element is flat such as to mate with the flat roller so as to uniformly distribute the load of the boom on the flat surface of the boom. In a preferred embodiment, the width of the bottom surface will be substantially the width of the curved sidewalls of the boom at their maximum dimension. Thus, the bottom surface would normally be generally rectangular but may be varied in such a manner that the upstanding portion will be disposed beneath and supporting the curved sidewall portions as well as the bottom portion. This will give a maximum density for the boom on the lower surface thereof at the corners or directly below the same. The bottom surface may, if desired, vary slightly from the maximum width dimension which will alter the slope of the sidewalls of the supstanding portions **85** of the elongated support member. This support member will be formed integral with or bonded to or otherwise attached to the generally tubular element **74** along the bottom extent of the same which, as indicated in FIG. 2, will be guided by the rollers in the support plates **30** attached to the main boom element.

In FIG. 4, a composite boom structure is shown

schematically. It includes the main boom element **10** with the elongated dielectric boom section **60** having similar flange plates **30** at the ends of the same with guide rollers therein, such as is indicated at **100**, to support a still second boom element **110** having a same general shape and construction but of a smaller dimension such that it would telescopically fit into the first boom element **60**. A suitable set of guide plates **120** would be attached to the end of this last boom element or stinger to mount any type of personnel basket (not shown) or suitable equipment adapted to be worked from the extensible boom. The improved dielectric section provides a structure which has sufficient strength to be comparable to a corresponding metallic structure, such as steel, while providing the dielectric characteristics of the epoxy resin and fiber glass materials to provide a safety feature in the use of such boom members in electrical transmission work or in other hazard areas where personnel or equipment may be grounded through the boom.

In considering this invention, it should be remembered that the present disclosure is intended to be illustrative only and the scope of the invention should be determined by the appended claims.

What is claimed is:

1. A boom construction comprising an elongated tubular element formed of a woven dielectric fiber material and a synthetic resin, said element being generally rectangular in cross section with convex shaped outer sidewalls, an elongated platelike trough member generally U-shaped in cross section with a flat bottom surface, said platelike trough member being made of a fiber material and a synthetic resin and formed integrally with the tubular element substantially along the full extent of the same, the platelike member having a width dimension equal to the width dimension of the tubular element such that the bifurcated portions of the platelike member bear against and support the convex wall surfaces of the tubular element.

2. The boom construction of claim No. **1** in which the interior surface of the elongated platelike member is symmetrical with the exterior surface of the tubular element over one-half the exposed surface of the same, such that the surfaces when mounted together and formed integral will contact over their entire surface and provide a uniform wall thickness longitudinally along the extent of the boom with the bottom wall thickness greater than the sidewall thickness.

3. The boom construction of claim No. **2** in which the fiber material in the platelike member is disposed at an angle to the fiber material in the tubular element.

4. The boom construction of claim No. **3** in which the fiber material extends along the extent of the elongated platelike member and is composed of a plurality of layers of fiber material and resin.

5. The boom construction of claim No. **4** in which the tubular element has a generally rectangular hollow cross section to provide a minimum thickness dimension at the corners for the tubular element and in which the platelike member provides a maximum thickness dimension adjacent two of said corners and supporting the same.

6. The boom construction of claim No. **5** in which the platelike member is bonded to the tubular element.

7. The boom construction of claim No. **6** in which the elongated platelike member is cast in a mold with a preformed helically wound tubular element.

8. A boom construction comprising an elongated tubular member formed of a stranded fiber glass material embedded in an epoxy resin, said member having a generally rectangular interior hollow cross section and an exterior surface which is formed by convex sidewalls rounded at the corners, an elongated platelike member having a flat bottom surface and upstanding sidewalls with an upper surface including the interior of the

sidewalls which is shaped to conform to and abut against one convex sidewall of the tubular member and portions of two of the convex sidewalls of the tubular member adjacent said one sidewall, said platelike member having a plurality of layers of stranded fiber glass material embedded in epoxy resin and connected to the tubular member, portions of said upstanding sidewalls being disposed beneath and supporting said portions of the convex sidewalls of the tubular member.

9. The boom construction of claim No. **8** in which the upstanding sidewalls of the elongated platelike member are substantially normal to the bottom surface thereof and in which the stranded fiber glass therein extend parallel with the extent of said elongated tubular member and said elongated platelike member.

10. The boom construction of claim No. **9** in which the elongated tubular member and said elongated platelike member are substantially the same length and are bonded together.

11. The boom construction of claim No. **10** in which the bottom surface of the elongated platelike member is flat and has a width dimension substantially equal to the width of the boom formed by the tubular member and the platelike member throughout the extent of the upstanding sidewalls and in a direction substantially normal

to the extent of the bottom surface of the tubular member.

12. The boom construction of claim No. **11** and including means including at least one supporting journalled roller disposed beneath and extending across substantially the entire width dimension of the boom in supporting relation therewith.

13. The boom construction of claim No. **8** and including at least one supporting and guiding member disposed beneath and extending across substantially the entire width dimension of the boom in guiding contact therewith.

References Cited

UNITED STATES PATENTS

2,404,904	7/1946	Collins	52—309
3,243,052	3/1966	Grove	212—55
3,312,034	4/1967	Steinmann	52—731
3,331,177	7/1967	Godfrey	52—727

MILTON BUCHLER, Primary Examiner

J. E. PITTENGER, Assistant Examiner

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