April 12, 1966 P. A. DICKE 3,245,642

ANTENNA SUPPORT

Filed Aug. 28, 1963

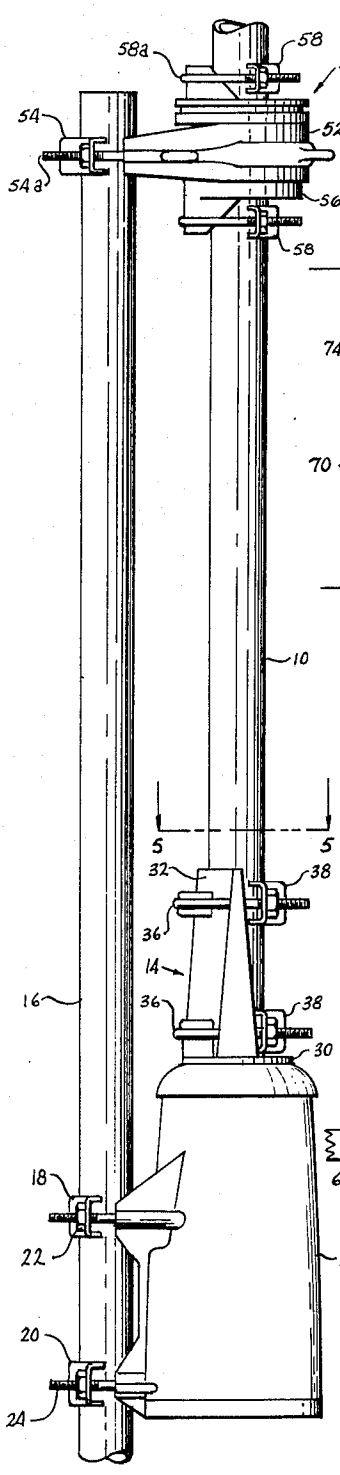


FIG. 5

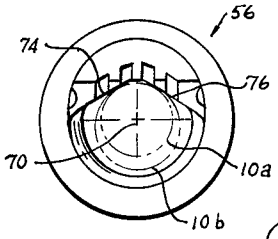
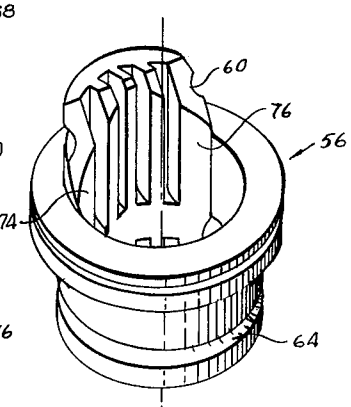


FIG 4



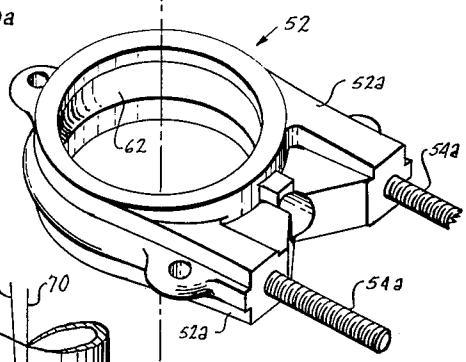


FIG. 2

FIG. 1

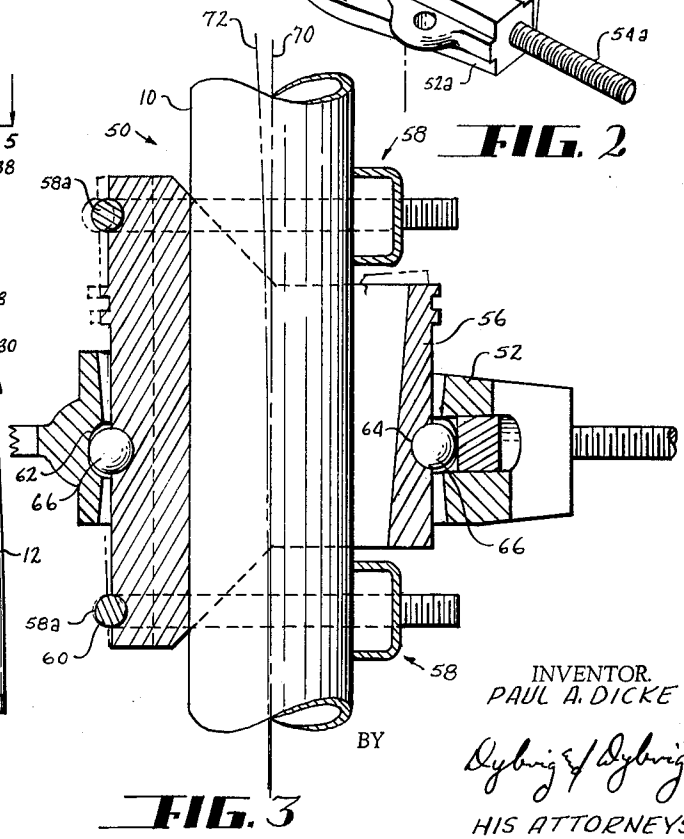


FIG. 3

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ANTENNA SUPPORT

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This invention relates to antennas and more particularly to support structures for use with a rotatable antenna mast. However, as will be apparent from the ensuing description, the invention is not necessarily so limited.

The usual supports for rotatable household television antennas and the like include a drive motor and a thrust bearing. Because of their height and weight, the torque applied when rotating antennas subjects the masts to large twisting and bending moments. An object of this invention is to provide a new and improved rotatable antenna support assembly in which the effects of twisting and bending moments are minimized.

To minimize the effects of bending moments, more than one support member is required to satisfactorily hold a rotatable antenna mast or tubing in an upright or vertical position. Even a small misalignment between the antenna support members may seriously hamper the operation of the drive motor. If inexpertly installed, it may even be impossible to rotate the antenna with the usual drive motors. Accordingly, another object of this invention is the provision of an alignment and support bearing used in the antenna support assembly which provides a bearing whether the antenna tubing is precisely vertical or is somewhat tilted away from vertical.

Television antenna masts are commercially available in a variety of diameters. When using two spaced support members, both must be so designed to accept various sizes of masts, yet support the masts in a substantially truly vertical position. Accordingly, a further object of this invention is the provision of an antenna support assembly which may be used to support a variety of antenna mast or tubing sizes in a vertical position.

Still another object of this invention is the provision of a novel support and alignment bearing.

Other objects and advantages reside in the construction of parts, the combination thereof, the method of manufacture and the mode of operation, as will become more apparent from the following description.

Referring to the drawings:

FIGURE 1 is an elevational view of an antenna support and drive structure made in accordance with this invention, illustrating portions of a fixed mast upon which an antenna drive and support assembly is mounted and a portion of the rotatable antenna mast or tubing supported thereby.

FIGURE 2 is an exploded perspective view of portions of an alignment and support bearing used in the support assembly of FIGURE 1.

FIGURE 3 is a cross-sectional view of the alignment bearing and a portion of the antenna mast supported thereby.

FIGURE 4 is a plan view of a bearing sleeve forming part of the alignment bearing illustrated in FIGURES 1, 2 and 3.

FIGURE 5 is a plan view of the support structure as viewed in the direction of arrows 5—5 of FIGURE 1.

Referring to the drawings in greater detail, a section of cylindrical, rotatable television mast or tubing, designated 10, is shown supported upon a rotator drive motor housing 12 by a support bearing or adapter 14. The motor housing 12, in turn is supported upon a fixed mast 16 by means of clamping members 18 and 20 bolted to the housing 12 by cooperating nuts and bolts 22 and 24,

respectively. The rotator drive motor enclosed within the housing 12 may be entirely conventional. The housing 12 and the motor incorporated therein may be of the type manufactured and sold by Crown Controls Corporation of New Bremen, Ohio, Model No. 9520. The antenna structure and the support for the fixed mast 16 may also be entirely conventional and hence are not described herein.

As shown best in FIGURES 1 and 5, the support adapter 14 includes a flat base 30 upon which are mounted a pair of vertical bearing support plates 32 and 34, which in transverse cross-section and as viewed in the plan view of FIGURE 5, intersect to form the two legs of a V. The plates 32 and 34 may be integral. The antenna mast 10 is clamped against the horizontally spaced bearing surfaces of the support plates 32, 34 such that a diameter thereof, if extended, would bisect the angle between the two support plates 32 and 34. This clamp is provided by a pair of spaced clamping assemblies, each including a U-bolt 36 and a pair of generally U-shaped clamping straps 38 firmly held against the tubing 10 by means of nuts 40 threadedly engaged with the ends of the U-bolts 36. As will be obvious to those skilled in the art, the base 30 of the adapter 14 is rotatably driven by the rotator drive motor enclosed within the housing 12. Accordingly, the tubing 10 clamped to the adapter 14 is also rotated. The structure incorporated within the housing 12 is designed to have considerable thrust capability and, accordingly, adequately supports the weight of the tubing 10 and the antenna structure mounted thereon. A support and alignment bearing to be discussed below also has some thrust capability. Accordingly, the thrust bearing within the housing 12 may be quite simple.

Because of the length and weight of modern antenna structures, it is necessary to provide an additional support and alignment bearing which should be placed a considerable distance from the adapter 14 to minimize the tendency of the antenna mast to bend. The additional bearing assembly is designated 50 herein and includes a support collar 52 mounted upon the fixed mast 16 by a clamping assembly 54. The assembly 50 further includes a bearing sleeve 56 which is clamped to the antenna tubing 10 by a pair of clamping assemblies 58 which may be identical to the clamping assemblies 36, 38 and 40 already described. In this case, the sleeve 56 is provided with a pair of recesses 60 for receiving the bights of U-bolts 58*a* forming portions of the clamping assemblies 58.

The bearing sleeve 56 is nested within the bearing support collar 52. To this end, the support collar 52 is generally ring-shaped and has an annular internal ball race 62 therein. Spacer arms 52*a*, which carry bolts 54*a* of the clamping assembly 54, space the support collar 52 with respect to the fixed mast 16 such that the vertical center of the aperture within the collar 52 is coaxial with the axis of rotation, designated 70, of the adapter 14. The sleeve 56 is provided with an annular external ball race 64 which, as shown in FIGURE 3, is aligned with the ball race 62 to provide a cage for ball elements 66 therebetween. Note that the ball race 64 is substantially semi-circular and has a radius substantially the same as the radius of a ball element 66. On the other hand, the ball race 62 is somewhat wider than the ball race 64. The upper and lower edges of the ball race 62 are arcuate, each having a radius substantially the same as the radius of a ball element 66. The center section of the race 62, which provides the widened effect, is also arcuate but has a spherical radius struck from the center line or axis 70 at a point on the line 70 midway between the upper and lower spherical portions of the race 62. When the sleeve 56 is truly vertical and

centered with respect to the collar **52**, such that the vertical center of the sleeve **56** is coaxial with the axis of rotation **70** of the adapter **14**, the ball elements **66** will engage and roll upon the center spherical radius of the ball race **62**. Should the mast **10** be slightly bent or the adapter **14** and bearing structure **50** slightly misaligned, the sleeve **56** will nonetheless rotate freely with respect to the collar **52**. Hence, the ball elements **66** may move longitudinally within the ball race **62** and still perform their bearing function. For example, the broken line **72** indicates an axis of rotation of the mast **10** which is tilted away from vertical. Should the mast **10** be so aligned, the bearing structure described above will still function properly.

The tendency of movable antenna masts, such as the mast **10**, to twist when being rotated is magnified by the fact that the support assemblies must be used for masts having different diameters. Unless both support members support a mast of any given diameter along a common vertical centerline, a considerable twisting moment will be applied to the mast when rotated. In accordance with this invention, the sleeve **56** is provided with a pair of horizontally spaced surface portions **74** and **76** against which the mast **10** is clamped. The surface portions **74**, **76** are adapted to occupy intersecting vertical planes common to the vertical planes occupied by the horizontally spaced bearing surfaces of the support plates **32** and **34**. As in the case of the adapter **14**, the mast **10** is clamped against the surfaces **74**, **76** such that a diameter thereof bisects the angle between the surfaces **74**, **76**. Since the surfaces of the plates **32** and **34** and also the surfaces **74**, **76** are symmetrically divergent from the vertical plane occupied by the diameter of the mast **10**, a mast of any diameter sufficiently small to pass through the bearing sleeve **56** will be held in a true vertical position. Note that, as schematically illustrated in FIGURES 4 and 5, a smaller diameter mast **10***a* may have its vertical centerline coaxial with the axis of rotation **70** of the adapter **14**. A larger diameter mast **10***b*, however, will abut against the two surfaces **74**, **76** with its center offset with respect to the axis **70**. Although the center of the larger diameter mast **10***b*, when such mast is rotated, will orbit about the axis **70**, the mast will be held in a truly vertical orientation, so long as the sleeve **56** and the adapter **14** are properly aligned. Thus, the masts **10** are held by both the bearing or adapter **14** and the bearing sleeve **56** in a truly vertical position, either aligned with or offset from the axis of rotation **70**.

From the foregoing it will be seen that the objects of the invention have been met. The spacing between the adapter **14** and the bearing assembly **50** should be sufficient to minimize the bending moments applied to the mast **10**. The twisting moments created when the rotatable mast is driven are minimized, for various mast diameters, due to the specially created alignment and centering of the mast **10**. Even if the mast **10** is installed somewhat out of alignment, the bearing structure provided by the unique shape of the ball races **62** and **64** compensates for this misalignment, permitting the sleeve **56** to rotate freely with respect to the collar **52**.

Although the presently preferred embodiment of the invention has been described, it will be understood that various changes may be made within the scope of the appended claims.

Having thus described my invention, I claim:

1. In an antenna construction including a cylindrical antenna mast and drive means to rotate said mast, an antenna support structure comprising a support adapter driven by said drive means, said adapter having a pair of substantially planar surface portions lying respectively in a pair of vertical, intersecting planes, clamp means clamping said mast to said surface portions with a diameter of said mast bisecting the angle between said intersecting planes, an alignment bearing, means mounting said bearing in vertically spaced relation to said adapter, said bearing including a rotatable sleeve, said sleeve having a pair of planar surfaces, one of the planar surfaces of said sleeve being substantially coplanar with one of the planar surfaces of said adapter and the other of said planar surfaces of said sleeve being substantially coplanar with the other of the planar surfaces of said adapter, and clamp means clamping said mast to said sleeve such that a diameter of said mast bisects the angle between said planar surfaces of said sleeve.

2. An antenna support structure including: a fixed support, a cylindrical rotatable mast; and means supporting said rotatable mast upon said fixed support including a drive motor housing affixed to said fixed support, a support adapter mounted on said housing, adapter clamp means clamping the base of said rotatable mast to said adapter, an alignment bearing assembly spaced from said support adapter including a support collar affixed to said fixed support, a bearing sleeve supported for rotation within said support collar and bearing clamp means clamping said rotatable mast to said bearing sleeve with said rotatable mast passing through an aperture therein, said support adapter and said bearing sleeve each having a pair of surface portions symmetrically divergent from a vertical plane, said surface portions of said support adapter being aligned with said surface portions of said bearing sleeve, said adapter clamp means and said bearing clamp means clamping said mast to said adapter and said sleeve with a diameter of said mast lying in said vertical plane.

3. The structure of claim **2** wherein said support collar has an internal annular ball race and said sleeve has an external annular ball race, said sleeve being supported for rotation within said collar by a plurality of ball elements confined by said ball races, one of said ball races having a larger width than the other of said ball races permitting longitudinal movement of said ball elements within said one of said ball races.

4. For use in supporting a rotatable antenna, a bearing structure comprising: a ring-shaped bearing support collar having an internal annular ball race, a generally cylindrical bearing sleeve having an external annular ball race, said sleeve being adapted to receive tubing therein and, a plurality of ball elements confined by said ball races supporting said sleeve within said collar, one of said ball races having a width greater than the other of said ball races whereby said collar and said clamp may be tilted relative to one another with said ball elements retained within said ball races.

5. The structure of claim **4** wherein said sleeve is provided with a pair of intersecting surface portions against which the tubing is clamped.

6. An antenna support structure including: a first support member having a pair of horizontally spaced, mast engaging surface portions; means mounting said first support member upon a fixed support; drive means connected to said first support member for rotating said first support member about a fixed vertical axis of rotation; a generally cylindrical second support member having an internal aperture provided with a pair of horizontally spaced, mast engaging internal surface portions vertically aligned with said surface portions of said first support member; means mounting said second support member in vertical spaced relation to said first support member and for rotation about said axis of rotation; a mast having an external diameter sufficiently small to pass through said aperture in said second support member; and a pair of clamping assemblies, one for each support member, clamping said mast to vertically aligned parts of said pairs of surface portions of both said first and second support members.

7. An antenna support structure including: a first support member having a pair of horizontally spaced, mast engaging surface portions; means mounting said first sup-

port member upon a fixed support; drive means connected to said first support member for rotating said first support member about a fixed vertical axis of rotation; a generally cylindrical second support member having an internal aperture provided with a pair of horizontally spaced, mast engaging internal surface portions vertically aligned with said surface portions of said first support member; means mounting said second support member in vertically spaced relation to said first support member and for rotation about said axis of rotation; a mast having an external diameter sufficiently small to pass through said aperture in said second support member; a pair of clamping assemblies, one for each support member, clamping said mast to vertically aligned parts of said pairs of surface portions of both said first and second support members; said second support member having an external annular ball race and said means mounting said second support member including a generally ring-shaped support collar having an internal annular ball race generally aligned with said external ball race, one of said ball races having a width greater than the other of said ball races, and a plurality of ball elements confined by said ball races supporting said second support member within said collar.

8. An antenna support structure including: a pair of mast support members, each of said support members having mast engaging surface portions, said surface portions of one of said support members being vertically aligned with said surface portions of the other of said support members; spaced means, one for each support member, mounting said support members is mutually vertically spaced relation for rotation about a common vertical axis; an antenna mast having a predetermined diameter; a pair of clamping assemblies, one for each support member, clamping said mast to said vertically aligned surface portions of said support members whereby the longitudinal axis of said mast is either aligned with said axis of rotation or vertical and parallel to but off-set from said axis of rotation, depending upon the diameter of said mast.

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