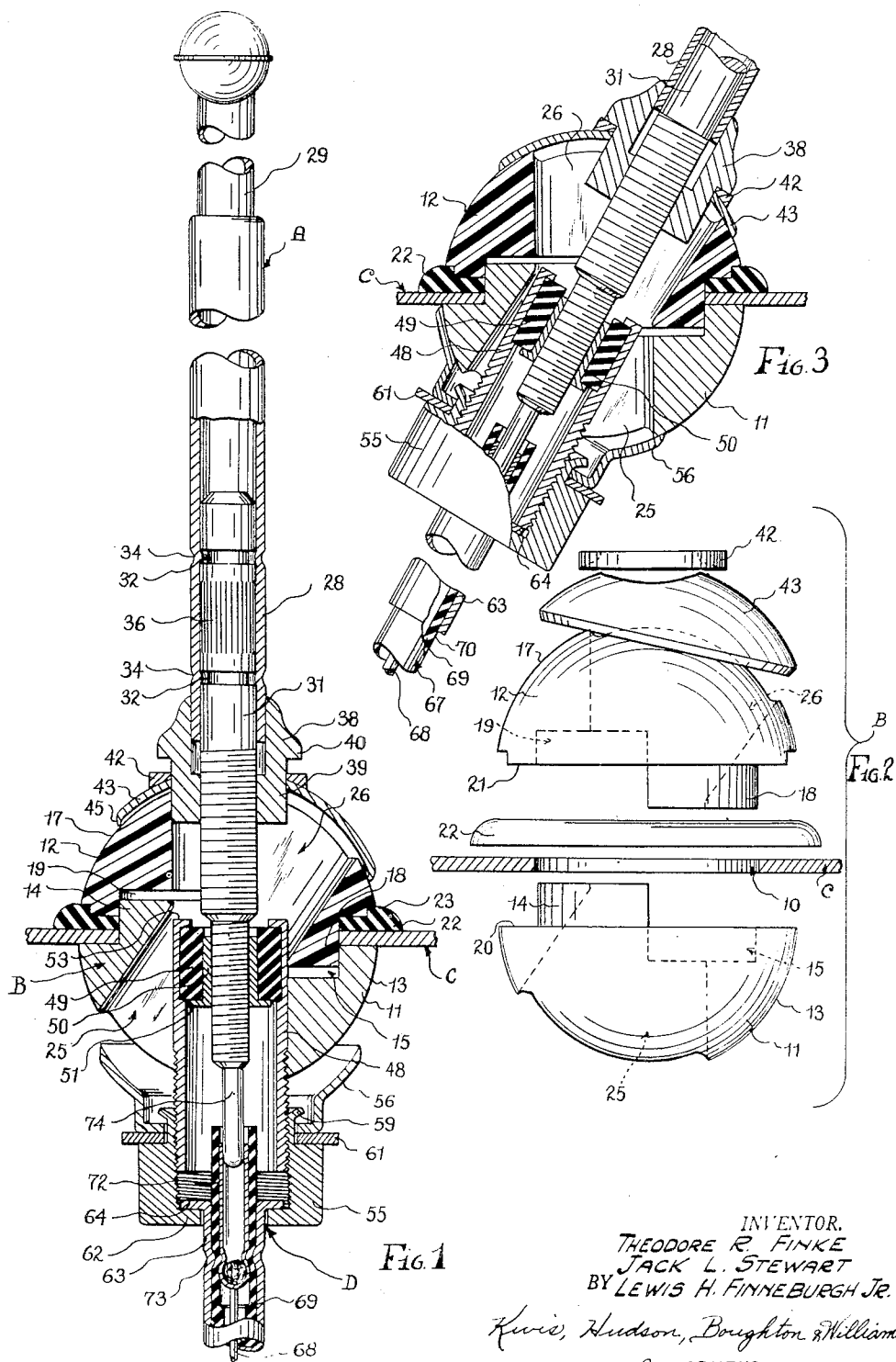


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SWIVEL BALL ANTENNA SUPPORT
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SWIVEL BALL ANTENNA SUPPORT

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This invention pertains to radio antennae for automotive vehicles and the like and, more particularly, to a radio antenna and supporting base having an angularly adjustable connection therebetween.

This application is a division of application Serial No. 748,048, filed May 14, 1947, now Patent No. 2,470,693, issued May 17, 1949.

An object of the invention is the provision of a new and improved radio antenna support adapted to be mounted at desired positions on the body of an automotive vehicle or the like and allow angular adjustment or tilting of the radio antenna relative thereto, which is attractive in appearance, has a minimum number of parts or members, may be manufactured in a minimum physical size, is self-centering in a mounting opening of the vehicle body, is easily and quickly assembled, and after assembly may be tightened to any desired adjusted angular or tilted position by access to only one side of the mounting, and when once tightened will remain adjusted, shakeproof, and rattleproof under even the most severe operating conditions.

Another object of the invention is the provision of a new and improved antenna support having members adapted to be positioned on each side of the panel of an automotive vehicle or the like for forming a relatively fixed base and a member connected to the antenna extending through the base angularly adjustable relative thereto, the member extending through the base having means for both clamping the base forming members against the body panel and fixing its position at any desired angular position relative thereto whereby the antenna support may be comprised of a minimum number of individual parts.

Another object of the invention is the provision of a new and improved antenna support having inner and outer members adapted to be positioned on the inner and outer sides respectively of the panel of an automotive vehicle or the like for forming a relatively fixed base and an assembly connected to the antenna and extending through the base, the assembly having threaded means at each end for engaging with the inner and outer base forming members, which threaded means both fix the angular position of the assembly relative to the base and clamp the base forming members into relatively fixed position, the threaded means at the outer end of the assembly being tightened down last whereby the final assembly operation and angular position of the antenna may be effected from one side of the vehicle panel only.

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The invention resides in certain constructions and combinations and arrangements of parts, and further objects and advantages will be apparent to those skilled in the art to which it relates from the following description of the preferred embodiment described with reference to the accompanying drawings forming a part of this specification, and in which:

Fig. 1 is a side sectional view of an antenna and support embodying the present invention;

Fig. 2 is an exploded elevational view showing in greater detail some of the members in Fig. 1; and

Fig. 3 is a view similar to Fig. 1 showing the antenna in an adjusted angular position relative to the support.

Referring to the drawings, the invention is shown as embodied in a radio antenna A of the so-called whip type mounted at its lower end on a supporting base B, in turn mounted or suitably positioned on the sloping panel C of an automotive vehicle body or the like.

The panel C shown may be any portion of an automotive vehicle body or the like, whether sloping, vertical, or horizontal, or at the front or rear thereof, and is preferably perforated or drilled to provide a suitable opening 10 for passage of a lead-in connection from the antenna A on the exterior of the panel to the interior thereof, as well as a passage for clamping means to fasten the base B onto the panel.

As shown, the base B is generally ball or spherical shaped and comprises a pair of half ball members, an inner or lower half ball member 11 and an outer or upper half ball member 12, positioned in aligned relationship on opposite sides of the body panel C concentric with the opening 10. As shown, the inner or lower half ball member 11 has a main generally hemispherical outer surface 13, and a chordal surface comprising an upwardly extending boss 14 and an inwardly or downwardly extending recess 15. Similarly, the upper or outer half ball member 12 has a main generally hemispherical outer surface 17 and a chordal surface comprising a downwardly extending boss 18 and an upwardly extending recess 19, which bosses and which recesses are of similar dimensions such that they will mate when the ball members are assembled on the panel C and are preferably, although not necessarily, semicylindrical in shape having a radius somewhat less than the radius of the ball members and centrally positioned, thus leaving continuous rimlike flat surfaces 20, 21 around the perimeters of the half ball members 11, 12, respectively, which surfaces as

shown abut against the respective sides of the body panel C. The size of the opening 10 is preferably of such a size to just pass the cylindrical boss formed by the mating semicylindrical bosses 14, 18 on their respective ball-like members. If desired, a sealing washer 22 of soft rubber or like sealing material may be positioned between the ringlike flat surface 21 on the half ball member 12 and the body panel C. As shown, the washer has an upwardly extending flange 23 on its outer edge which fits into a corresponding groove in the perimeter of the half ball member 12.

Each ball member 11, 12 is provided with aligned openings 25, 26, respectively, which openings as shown taper from a slot on the surface of the ball members to a generally central aligned opening on the interior of the assembled ball or base B. These openings provide a passage for clamping means to fixedly position the half ball members relative to the body panel C as well as to provide a passage for a lead-in connection from the antenna A.

The antenna may take any one of a number of different forms, and may be formed of metal or plastic. As shown, however, the antenna comprises a lower rodlike member 28 preferably of tubular construction and an upper rodlike member 29 also preferably of tubular construction of a smaller diameter than and telescopically arranged with the lower member. The lower end of the lower member 28 is provided with a stud bolt 31, which as shown extends generally through the entire length of the aligned openings in the half ball members. The stud bolt may be fixed to the antenna in any suitable manner, but in the embodiment shown the upper end thereof extends into and fits snugly with the interior of the lower end of the lower tube 28. This end has one or a plurality of spaced circumferentially extending grooves 32 in its surface into which adjacent portions of the wall of the lower tube 28 have been spun or pressed as at 34, thus providing a firm and indestructible connection between the antenna A and the bolt 31. Intermediate the grooves 32, the bolt may be knurled as at 36 on its outer surface, which knurls when the bolt is inserted into the interior of the lower member 28 upon assembly tend to bite through any film, rust, or scale on the interior thereof and provide a noiseless electrical connection between the antenna and the bolt, as well as preventing rotation of the bolt 31 relative to the lower member 28 when the antenna mounting is installed.

As shown, the bolt 31 extends downwardly through the aligned openings in the half ball members 11, 12 and an elongated captive sleeve nut 38 having its upper end counterbored to provide clearance for the lower end of the antenna A is threadably engaged thereon. The sleeve nut 38 has a guide boss 39 on its lower end extending into the opening 26 in the upper half ball member 12 and a flange 40 intermediate its ends on which wrench engaging flats may be formed. The sleeve nut 38 is one of the means for clamping the half ball members 11, 12 in engagement with the sides of the body panel C as well as clamping the antenna in a desired angular position, and the clamping force thereof is transmitted to the spherical surface 17 of the upper half ball member 12 through a circular washer 42 having a concave lower surface and a thin cup shaped or concave washer 43 having its opening eccentrically positioned relative to the

edges thereof. As shown, the washers 42, 43 are slipped over the boss 39 with the upper surface of the washer 42 in abutting engagement with the lower surface of the flange 40. It is preferred that as the sleeve nut 38 is tightened down that the concave washer 43 engage the surface 17 of the upper ball member 12 principally at its outer edges, and for this reason the curvature thereof may be slightly less than the curvature of the surface 17 and, if desired, the edges thereof may be curved inwardly at an even shorter radius of curvature as shown at 45.

For insulating the antenna A from the body panel C, either the sleeve nut 38 or the half ball member 12 or both may be formed of insulating material, although in the embodiment shown the sleeve nut is represented as being formed of a metallic material while the upper half member 12 is represented as being a non-metallic insulating material.

The bolt 31 provides a lead-in conductor for the antenna, as well as a clamping or tie bolt for firmly securing the half ball members 11, 12 in fixed assembled relationship to the body panel C. It is preferred that the lower half ball member be of an electrically conducting material, for reasons which will appear hereinafter, and accordingly means are provided for insulating the lower end of the bolt 31 from the conducting half ball member 11. In the embodiment shown, a grounding sleeve 48 is positioned concentrically around the lower end of the bolt 31 and insulated therefrom by an inner insulating sleeve 49 in turn supported on the bolt 31 by an inner threaded metallic sleeve 50. The sleeve 50 is threadably engaged on the bolt 31 and has on its lower end a short outwardly extending flange 51 in abutting engagement with the lower end of the insulating sleeve 49. The grounding sleeve at its upper end has a short inwardly extending flange 53 abutting against the opposite or upper end of the insulating sleeve 49 and at its lower end is externally threaded and extends below or beyond the spherical surface 13 of the lower half ball member 11. Preferably the external diameter of the grounding sleeve 48 as well as the diameter of the boss 39 of the sleeve nut 38 are the same and approximately equal to the width of the slots in the half ball members such that the antenna A will be tiltable with respect to the ball members in only a single plane, which plane may be rotated through 360° by rotating the base B relative to the body panel C.

While a nut threaded on the lower end of the grounding sleeve 48 and an eccentric concave washer similar to the concave washer 43 may be provided for engaging the spherical surface 13 of the lower ball member 11 and holding the base B in assembled relationship, it is preferred for reasons of simplicity in structure and otherwise to utilize means on a lead-in cable connector assembly D for this purpose. The lead-in cable connector assembly D comprises a nut 55 shown threadably engaged with the threads of the grounding sleeve 48 and a cup shaped or concave washer 56, the inner surface of which bears against the spherical surface 13 of the lower ball member 11. The upper end of the nut 55 has a thin cylindrical extension 59 around which the opening of the washer 56 is fitted, and the extension then flared outwardly to retain the washer 56 and the nut 55 in assembled relationship. As shown, the portion of the washer 56 defining the opening is offset to receive the flared end of the extension 59 and prevent interference

with the spherical surface 13 of the lower ball member 11. An internally-toothed lock washer 61 may be positioned intermediate the upper end of the nut 55 and the lower surface of the washer offset. The lower end of the nut 55 has a radially inwardly extending flange 62 defining an opening of reduced diameter through which a short grounding sleeve 63 extends having an outwardly flaring flange 64 at its upper end which abuts against the flange 62 of the nut for retaining same in assembled relationship. The grounding sleeve 63 receives a lead-in cable 67 comprising an inner radio-frequency conductor 68, an insulating sleeve 69, and a braided outer shield covering 70. The shield 70 is preferably soldered to the grounding tube 63 for providing a physically strong and low resistance electrical connection. The insulating sleeve 69 preferably extends beyond the upper end of the grounding tube 63, and a female sleeve connector 72 of thin flexible material is positioned in the end thereof and suitably connected as by soldering to the radio-frequency conductor 68. The female connector 72 is preferably slightly resilient and has an internal diameter such as to receive and form an electrical connection with a dog 74 on the lower end of the bolt 31. The grounding tube 63 as shown has been spun or necked inwardly as at 73 to firmly position the insulating sleeve 69 and the female sleeve connector 72 relative thereto. This construction is shown and described in the application for patent of Milton R. Friedberg and Theodore R. Pinke, entitled "Grooved Connector," Serial No. 657,438, filed March 27, 1946.

As hereinbefore stated, the lower half ball member 11 is preferably formed of an electrical conducting material for the purpose of providing a ground to the body panel C for the lead-in cable connector assembly D, the connection to the body panel C being formed from the braided shield 70 through the shielding tube 63, the nut 55, the concave washer 56, and the lower half ball member 11. If desired, suitable means may be provided on the flat ringlike chordal surfaces 20 of the lower ball member to insure that when the entire antenna assembly is tightened into final adjusted position, the means will bite through any rust, paint, or other films on the lower surface of the body panel C and provide a good electrical connection.

To install the preferred embodiment of the invention just described on the body panel of an automotive vehicle, the hole 10 of appropriate size is first drilled or otherwise perforated there-through. The lower and upper ball members 11, 12, respectively, are then positioned on opposite sides of the body panel with the bosses thereof extending through the opening 10 into the mating recesses. The sleeve nut 38 is threaded upwardly on the bolt 31 as far as possible, and the sleeve 50, the insulating sleeve 49, and the grounding sleeve 48 are then assembled on the bolt 31 as shown, and the entire assembly is inserted through the aligned openings in the half ball members, at this time it being necessary to manually or otherwise hold the ball members in position. The nut 55 of the lead-in cable connector assembly D is then threaded onto the lower end of the grounding sleeve 48 and threaded upwardly as far as possible, bringing the lower end of the grounding sleeve 48 into engagement with the flange 64 on the grounding tube 63 and forcing the flange 64 to firmly bear against the flange 62 on the nut 55. With the lead-in cable connector assembly D in position, it is still possible to

tilt the antenna relative to the half ball members or to rotate the ball members relative to the body panel C, which is then done so as to position the antenna A at the exact angular position desired for the final installation. The eccentric concave washer 43 is then turned to cover the slot opening 26 in the upper half ball member 12. For retaining the antenna in the adjusted position, the sleeve nut 38 is rotated downwardly on the bolt 31, thus drawing the concave washer 56 upwardly and forcing the concave washer 43 downwardly into firm engagement with the respective spherical surfaces of the half ball members, firmly clamping the half ball members into engagement with the body panel C and at the same time fixing the angular position of the antenna relative to the ball members and to the automotive vehicle or the like on which the antenna is being mounted. At the same time, the teeth of the lock washer 61 are forced into firm biting engagement with the offset 58 of the concave washer 56 and into the upper end of the nut 55. It will be seen that the final tightening operation may be effected without access to the lower side of the body panel C, thus facilitating and enabling the installation by one man.

Thus it will be seen that an embodiment of the invention has been described which accomplishes the objects hereinbefore enumerated and others wherein a minimum number of supporting members provide a dual function of electrical insulation as well as adjustable physical support and which provides a mounting wherein the final adjustments may be effected from one side only.

Although in accordance with the provisions of the patent statutes this invention is described as embodied in concrete form and the principle thereof has been described together with the best mode in which it is now contemplated applying that principle, it will be understood that the apparatus shown and described is merely illustrative and that the invention is not limited thereto, since alterations and modifications will readily suggest themselves to persons skilled in the art without departing from the true spirit of this invention or from the scope of the annexed claims.

Having thus described our invention, we claim:

1. In an antenna and support therefor, an elongated antenna member, a base, a lead-in cable connector, said base comprising half ball members adapted to be positioned on opposite sides of the panel of an automotive vehicle to form a generally ball-shaped base, and having slots eccentrically positioned in the surfaces of said half ball members and tapering inwardly to a central opening, said slots being generally aligned, said antenna having means extending through said slots, a threaded nut on the antenna end of said means, a sleeve threaded on said means having a short outwardly extending flange, an insulating sleeve on said first mentioned sleeve and abutting against said flange, a grounding sleeve surrounding said insulating sleeve and having an inwardly extending flange abutting against the opposite end of said insulating sleeve, the opposite end of said grounding sleeve being threaded, said lead-in cable connector having threads for engagement with said threads on said grounding sleeve and a cup-shaped extension for engaging the opposite side of said base from said nut.

2. In an antenna and support thereof, an elongated antenna member, a base, a lead-in

cable connector, said base comprising half ball members adapted to be positioned on opposite sides of the panel of an automotive vehicle to form a generally ball shaped base and having slots eccentrically positioned in the surface of said half ball members and tapering inwardly to a central opening, said slots being generally aligned, said antenna having means extending through said slots, a threaded nut on the antenna end of said means, a sleeve threaded on said means having a short outwardly extending flange, an insulating sleeve on said first mentioned sleeve and abutting against said flange, a grounding sleeve surrounding said insulating sleeve and having inwardly extending flanges abutting against the opposite end of said insulating sleeve, the opposite end of said grounding sleeve being threaded, said lead-in cable connector having threads in engagement with said threads on said grounding sleeve and a cup-shaped extension for engaging the opposite side of said base from said nut.

3. In an antenna and support thereof, an elongated antenna member, a base, a lead-in cable connector, said base comprising members adapted to be positioned on opposite sides of the panel of an automotive vehicle and having openings therethrough aligning with each other and

with an opening in the panel, said antenna having means extending through said openings, a nut on the antenna end of said means and adapted to engage one of the base members, a sleeve threaded on said means and having a short outwardly extending flange, an insulating sleeve on said first mentioned sleeve and abutting against said flange, a grounding sleeve surrounding said insulating sleeve and having an inwardly extending flange abutting against the opposite end of said insulating sleeve, the opposite end of said grounding sleeve being threaded, said lead-in cable connector having threads for engagement with said threads on said grounding sleeve, and a clamping element operatively associated with said connector for engaging the other base member than the base member engaged by said nut.

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