Dec. 29, 1953 W. J. RACE 2,664,506

ANTENNA FOR VEHICLE MOUNTING

Filed July 6, 1950 2 Sheets-Sheet 1

Fig. 1.

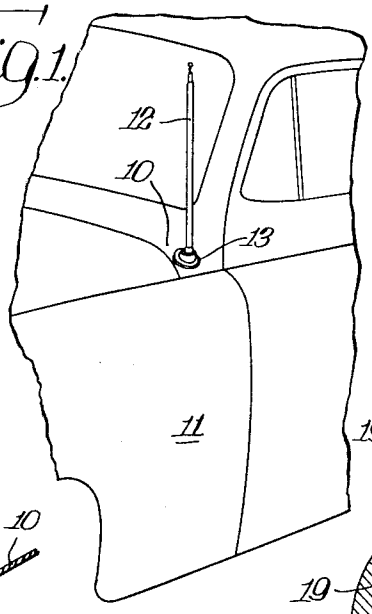


Fig. 2.

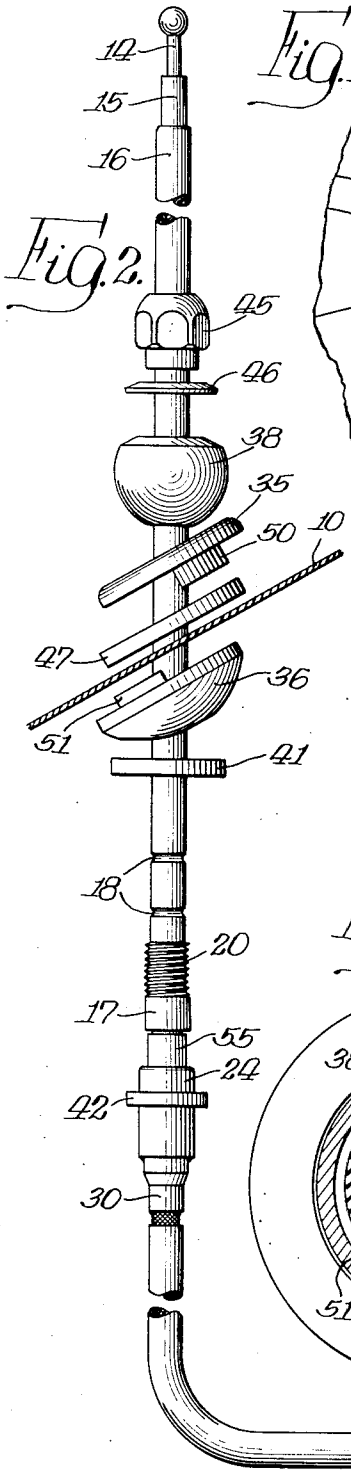


Fig. 3.

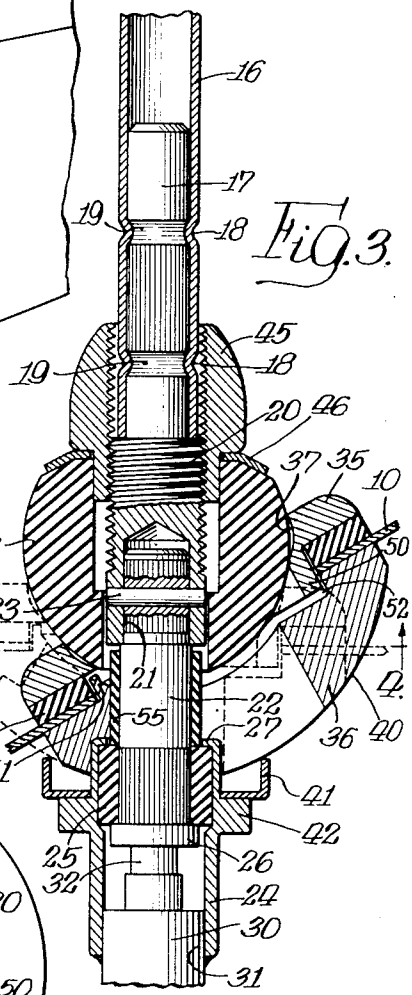
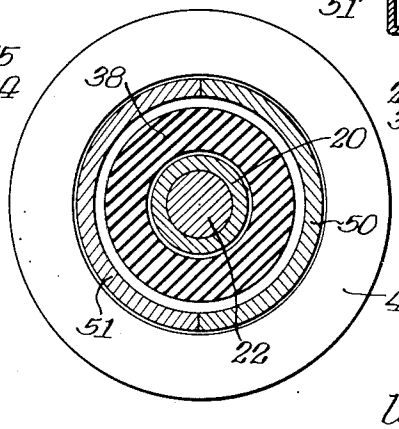


Fig. 4.



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2 Sheets-Sheet 2

Fig. 6.

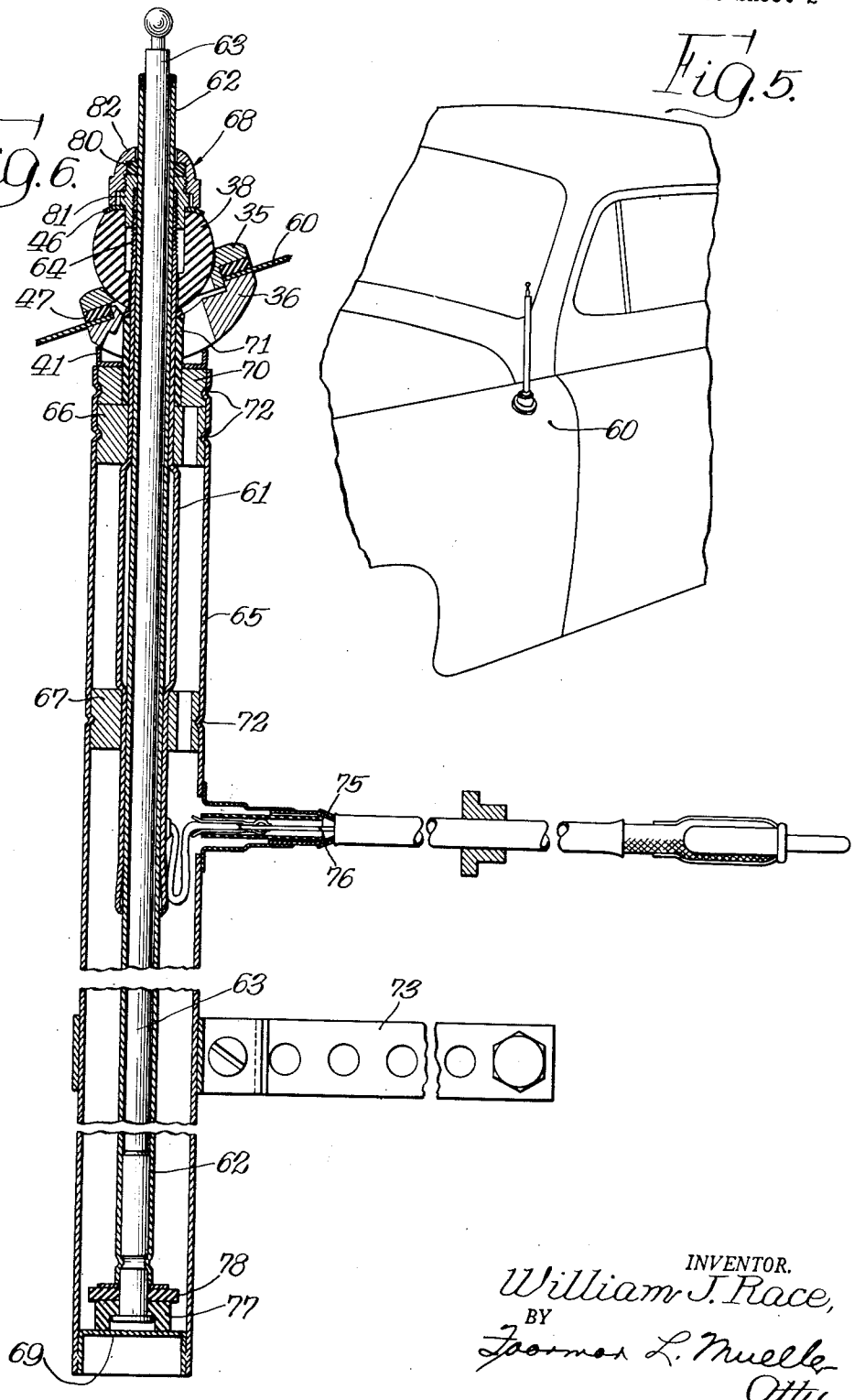


Fig. 5.

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Patented Dec. 29, 1953

2,664,506

UNITED STATES PATENT OFFICE

2,664,506

ANTENNA FOR VEHICLE MOUNTING

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Application July 6, 1950, Serial No. 172,363

5 Claims. (Cl. 250—33)

1

This invention relates generally to antennas, and more particularly to antennas suitable for installation on vehicles and which may be positioned at various angles with respect to the supporting wall of the vehicle.

It is now common practice to install radio equipment such as broadcast radio receivers in automobiles and in such application an antenna is required which may be mounted on the vehicle body. The recent automobile styling has made it desirable to provide mountings for such antennas which support the antennas at relatively widely differing angles with respect to the vehicle wall on which the antenna is mounted. Due to the vibration present in such vehicles, it is necessary that the mountings be very rugged and not subject to being disassembled by the vibration encountered. It is further desired that such antenna mountings be of simple and inexpensive construction and have a streamlined appearance to harmonize satisfactorily with present day automobile styling.

It is therefore an object of the present invention to provide an improved rugged antenna structure including an antenna element and a mounting therefor.

A further object of this invention is to provide an antenna mounting structure which may be easily and securely installed on a vehicle body for supporting an antenna element at a desired angle with respect to the surface of the vehicle body on which it is mounted.

Another object of this invention is to provide a mounting structure which is suitable for use with a telescoping antenna mounted on the cowl of a vehicle, and also with an antenna mounted on a fender and disappearing within the vehicle body.

A feature of this invention is the provision of an automobile antenna structure including mounting members positioned on opposite sides of the wall of the vehicle providing an upper concave surface for receiving a spherical member positioned about the antenna element and providing a lower convex surface cooperating with a portion of the antenna element, and securing means engaging the antenna element for holding the structure in assembled relation.

Another feature of this invention is the provision of annular mounting members which may be used to support a stud secured to a telescoping antenna or a housing into which an antenna may be telescoped, with the mounting insulating the antenna element from the vehicle and providing a ground connection for the lead-in therefor.

Further objects and features and the attending

2

advantages of the invention will be apparent from a consideration of the following description when taken in connection with the accompanying drawing, in which:

Fig. 1 illustrates the antenna in accordance with the invention mounted on the cowl of an automobile;

Fig. 2 is an exploded view illustrating the various elements of the antenna for cowl mounting;

Fig. 3 is a cross sectional view of the antenna of Fig. 1;

Fig. 4 is a cross sectional view along the lines 4—4 of Fig. 3;

Fig. 5 illustrates a disappearing antenna in accordance with the invention mounted on the fender of an automobile; and

Fig. 6 is a cross sectional view of the disappearing antenna of Fig. 5.

In practicing the invention there is provided an antenna for use with automobiles including a mounting for supporting the same at various angles with respect to the portion of the vehicle body on which the antenna is mounted. The antenna includes a telescoping antenna element which may be supported entirely above the vehicle body, or which may be supported on a housing extending within the body into which the sections may be telescoped. The antenna includes a mounting formed by a pair of mating annular members positioned on opposite sides of a wall of the vehicle body with the upper member including a concave surface for receiving the spherical surface of a tubular ball-like member. The antenna element is positioned within the ball-like member and by pivoting this member and turning the annular members, the antenna element may be adjusted to different angles with respect to the supporting wall. The lower annular member includes a convex surface which cooperates with a shoulder portion or the antenna element, with the various members being held in assembled relationship by a nut threaded to the antenna element and holding the tubular member against the top annular member. A resilient sealing washer may be provided between the top surface of the wall and the top member to provide a water tight seal therebetween and a cup washer may be positioned between the shoulder portion of the antenna element and the convex surface of the bottom annular member to hold the members tightly assembled.

Referring now to the drawings, in Fig. 1 there is shown an antenna in accordance with the invention mounted on the cowl 10 of an automobile body 11. The antenna structure includes an an-

tenna element 12 made up of a plurality of telescoping sections and a base or mounting 13 which supports the antenna element at various angles with respect to the cowl of the automobile body. In Figs. 2 to 4 inclusive, the structure of the antenna element and the mounting in particular is disclosed in detail. The antenna element includes a center rod like member 14 and outer tubular members 15 and 16 which are slidable within each other so that the antenna can be extended to the full length of the three sections or can be telescoped so that the overall length is not substantially greater than that of the outer section 16.

The antenna element 12 includes a stud portion comprising the stud members 17 and 22 which are interconnected by drive pin 23. The outer antenna section 16 is firmly fixed to the stud member 17 by inturned beads 18 which engage grooves 19 in the stud member. The stud member 17 includes an enlarged threaded portion 20 extending below the outer antenna section 16 which is enlarged and includes an opening 21 therein for receiving a portion of the member 22. The stud member 22 is connected to a sleeve 24 through an annular insulating member 25. The member 22 has an enlarged end 26, and the sleeve 24 has a turned over end 27 which engage opposite sides of the annular insulating member 25 for holding the members in assembled relation.

To provide a support for the antenna element which will permit adjustment of the angle of the element with respect to the supporting wall, the mounting 13 provides in effect a pivotal support for the antenna element. The mounting is formed of annular members 35 and 36 which are positioned respectively on the top and bottom surfaces of the cowl or body wall 10. The annular member 35 has a concave upper surface 37 for receiving the ball-like member 38. The member 38 is made of insulating material, being tubular to surround the antenna element and having a portion with a spherical surface. The bottom member 36 has a convex surface 40 which sets in a cup washer 41 resting on the shoulder portion 42 of the sleeve 24. A nut 45 engages the threaded portion 20 of the stud 17 and is effective to draw the members 35, 36 and 38 together to form a rigid assembly. The nut 45 may engage an annular washer 46 which serves as a trim for improving the appearance of the antenna mounting and also forces the ball shaped member 38 against the top annular member 35. The shoulder 42 on the sleeve 24 acting through the cup washer 41 holds the bottom annular member 40 firmly against the wall 10 so that the wall 10 is tightly clamped between the members 35 and 36. As clearly shown in Figs. 1 and 3 of the drawings, the nut 45 has a depending collar portion which is received and closely fitted within the ball-shaped member 38 to provide a fixed alignment of the antenna element 16 and threaded portion 20 with respect to the tubular ball-shaped insulating member 38. Thus the antenna element 16 will assume a position determined by the clamped position of the tubular ball-shaped member 38 in the assembled relation of the antenna. The cup washer forms a seat for the member 36 to facilitate assembly of the antenna on a car body. To provide a water tight seal between the wall and the top member 35, an insulating gasket 47 may be provided therebetween.

As is clearly shown in Figs. 3 and 6, the annular concave surface 37 of the member 35 has a smaller radius than the spherical surface of the ball-shaped member 38. This results in the engagement of the member 38 by the edges of the surface 37 so that two relatively sharp lines of engagement are provided. This engagement provides both a good mechanical interconnection and also a watertight seal between the members. The upstanding cylindrical rim of the cup washer 41 also provides a relatively sharp line engagement with the convex bottom surface of the member 36 so that the mounting is quite rigid when the nut 45 draws the ball-shaped member 38 toward the shoulder 42.

The members 35 and 36 have annular segments 50 and 51, respectively, which engage the edges of the opening in the wall to properly position the members with respect to the wall and to each other. The segment 50 is positioned in a recess 52 in the member 36 to properly position the members 35 and 36 with respect to each other. The opening in the member 36 is an elongated slot so that the member 36 may be positioned at an angle with respect to the antenna element. The members 35 and 36 may be turned so that the slot is in the proper position to allow the antenna element to extend vertically. As the ball shaped member 38 has a spherical surface which cooperates with the concave surface 37 of the member 35, limited universal movement of the antenna element on the mounting is provided.

A cable 30 for connecting the antenna to radio apparatus is connected to the sleeve 24 and may be of the coaxial type with the outer conductor 31 connected to the sleeve 24 and the inner conductor 32 connected to the end of stud member 22. The sleeve 24 is connected to the wall on which the antenna is mounted through cup washer 41 and the member 36 which are made of conducting material. This provides a ground connection for the outer conductor of the coaxial cable and the inner conductor provides a connection through the stud members 17 and 22 to the antenna element which is insulated from the wall of the automobile body. The antenna element is insulated from the mounting since the members 25 and 38 are made of insulating material. An insulating sleeve 55 is provided about the stud member 22 so that contact will not be made between the stud portion and the mounting member 36.

In Figs. 5 and 6 there is shown a modified antenna structure which includes a housing into which the antenna may be telescoped and which is adapted to be mounted within the confines of the vehicle body. The mounting for the antenna includes members 35 and 36 on the opposite sides of the body wall portion 60 and a tubular member 38, all of which may be identical to the corresponding member in the structure of Figs. 1 to 4. The antenna structure, however, is substantially different than that of Figs. 1 to 4 and includes a supporting tubular member 61 which receives the outer tubular antenna section 62. The section 62 may include one or more inner sections 63 and all sections may be almost entirely telescoped into the housing 61 so that the antenna will not project substantially above the vehicle body when not in use. The upper end of the tubular housing 61 is threaded as indicated at 64 to receive the nut assembly 69 for holding the structure in assembled relation.

An outer protective housing 65 is provided about the tubular support member 61 and is insulated therefrom. Insulating sleeves 66 and 67 hold the

tubular member 61 in insulating relationship within the housing 65 and insulator 77 and washer 78 prevent electrical contact between the antenna section 62 and the end 69 and the sides of the housing respectively. At the top of the housing 65 a conducting ring 70 is provided with the insulating sleeve 71 holding the ring 70 out of contact with the tubular support member 61. Inturned beads or dimples 72 are provided in the outer housing 65 for engaging the sleeves 66 and 67 and recesses in ring 70 for holding the members in the proper position with respect to each other. A mounting strap 73 is secured to the housing 65 for securing the same to the vehicle body.

In order to prevent relative movement between the outer antenna section 62 and the supporting tubular member 61, the nut assembly 63 including resilient washer 80 is provided. The washer 80 is held between the main nut portion 81 which is threaded to the member 61 and a trim or cap portion 82. The portion 81 holds the antenna structure in assembled relation, and the cap portion 82 serves to compress the washer 80 so that it firmly engages the section 62 to prevent rattling of the section 62 within the tubular member 61.

A coaxial lead-in may be provided for the antenna which includes an outer sleeve 75 connected to the housing 65 and an inner conductor 76 connected to the tubular member 61. The inner conductor is thereby connected through the tubular support member 61 to the antenna element, and the outer conductor is grounded through the housing 65, the conducting ring 70, cup washer 41 and the lower mounting ring 36 to the vehicle body 60.

It is seen from the above that the antenna structure disclosed provides an arrangement wherein the antenna element itself may be mounted at various angles with respect to the surface on which it is supported. Actually the slot in the lower mounting member is such that angles up to 30 degrees from the direction perpendicular to the mounting surface can be obtained. The mounting provides a rigid support with the elements of the assembly being tightly clamped together so that the mounting is not adversely affected by vibration. The mounting also presents a very neat appearance and provides the required insulation for the antenna elements while grounding the outer sleeve of the lead-in conductor as is required for satisfactory operation.

The antenna mounting disclosed is suitable for use either with an antenna element which is mounted entirely above the vehicle body and telescoped to a relatively short length, and also for an antenna having a housing within the confines of the vehicle body into which the antenna element may be telescoped so it will not appear substantially above the contour of the vehicle body. This universal arrangement makes the servicing of the antenna much easier and reduces the amount of maintenance parts required to take care of the usual servicing requirements.

Although certain embodiments of the invention have been shown which are illustrative thereof, it is obvious that various changes and modifications can be made in the structure within the intended scope of the invention as defined in the appended claims.

I claim:

1. An antenna structure for use on a vehicle including an antenna element and a mounting for supporting the same from a wall of the vehicle at an opening therein, with said antenna element being held at various angles with respect to said wall, said mounting including in combination, top and bottom base members positioned on opposite sides of said wall, said base members having apertures therein and having boss portions for positioning the same with respect to said opening, a sealing gasket provided between said top member and said wall, said top member having a concave upper surface, an annular tubular member having a spherical surface resting on said concave upper surface of said top member, said annular concave upper surface having a smaller radius of curvature than said spherical surface of said tubular member whereby two annular lines of engagement are provided between said top member and said tubular member, said bottom member having a lower curved surface, said antenna element having a portion extending through said base members and said tubular member and having a shoulder portion and a threaded portion, a cup washer positioned between said shoulder portion of said antenna element and said lower curved surface of said bottom member, said threaded portion of said antenna element extending adjacent said tubular member, and securing means having threads engaging said threaded portion for holding said tubular member against said top member and clamping said top and bottom members on opposite sides of said wall, said securing means having a collar portion adapted to be closely fitted within said tubular member in the assembled relation.

2. An antenna structure for mounting on a vehicle including rod-like antenna means and mounting means for supporting the same from a wall of the vehicle at an opening therein, with said rod-like antenna means extending at a selected angle with respect to said wall, said mounting including a first annular member positioned on the top side of said wall and having a concave upper surface, a second member having a slot therein positioned on the bottom side of said wall and having a convex lower surface, a tubular member having a spherical lower surface resting on said concave upper surface of said first member, a tubular supporting member for receiving said rod-like antenna means extending through said opening in said wall and through said first and second members and said tubular member, said supporting member having threads thereon adjacent said tubular member, and a shoulder portion adjacent said lower convex surface of said second member, and securing means including a first portion having threads engaging said threads on said supporting member holding said tubular member against said first member and clamping said wall between said first and second members, said securing means including a second portion threaded to said first portion and compressible means therebetween engaging said antenna means to prevent movement thereof with respect to said tubular supporting member.

3. An antenna structure including elongated antenna means and mounting means for supporting the same from a wall at an opening therein, with said antenna means extending at various angles with respect to said wall, said antenna structure including in combination, mounting means having upper and lower portions with openings therein extending on opposite sides of said wall, said upper portion having an upper an-

nular concave surface of generally spherical configuration, a ball-shaped member having an opening therein and a spherical surface resting on said upper concave surface of said upper portion, said upper concave surface of said upper portion having a smaller radius of curvature than said spherical surface of said ball-shaped member whereby engagement therebetween is along two spaced lines, said lower portion having a convex lower surface, said antenna means extending through said opening in said wall and through mounting means and said ball-shaped member and having a shoulder portion adjacent said lower convex surface of said lower portion and a threaded portion adjacent said ball-shaped member, and securing means having threads engaging said threaded portion for drawing said ball-shaped member toward said shoulder portion so that said upper and lower portions of said mounting means tightly engage opposite sides of the wall and said antenna means is rigidly mounted thereby.

4. An antenna structure including elongated antenna means and mounting means for supporting the same from a wall at an opening therein, with said antenna means extending at various angles with respect to said wall, said antenna structure including in combination, annular mounting means having upper and lower portions extending on opposite sides of said wall, said upper portion having an annular concave upper surface, a tubular member having a spherical surface resting on said concave upper surface of said upper portion, said concave upper surface of said upper member having a smaller radius of curvature than said spherical surface of said tubular member whereby engagement therebetween is along two annular lines, said lower portion having a convex lower surface, said antenna means extending through said opening in said wall and through annular mounting means and said tubular member and having a shoulder portion adjacent said lower convex surface of said lower portion and a threaded portion adjacent said tubular member, a cup washer interposed between said shoulder portion and said convex surface of said lower portion and having a cylindrical edge providing a sharp engagement with said convex surface, and securing means having threads engaging said threaded portion for drawing said tubular member toward said shoulder portion so that said upper and lower portions tightly engage opposite sides of the wall, and said antenna means is rigidly mounted thereby.

5. An antenna structure for mounting on a vehicle including elongated antenna means and a mounting for supporting the same from a wall of the vehicle at an opening therein, with said elongated antenna means extending at various angles with respect to said wall, said antenna structure including in combination, an annular member positioned on the top side of said wall and having a concave upper surface of generally spherical configuration, a resilient washer positioned between said annular member and said top side of said wall, a tubular insulating member having a spherical surface resting on said concave upper surface of said annular member, said concave surface of said annular member having a smaller radius of curvature than said spherical surface of said tubular insulating member, a conducting member having an elongated slot therein positioned on the bottom side of said wall and having a convex lower surface, said antenna means including a stud portion extending through said opening in said wall and through said members and having threads thereon adjacent said tubular member, tubular insulating means about said stud portion, conducting sleeve means secured to said insulating means and having a shoulder portion electrically and mechanically connected to said lower convex surface of said conducting member, securing means having threads engaging said threads on said stud portion for drawing said tubular member toward said shoulder portion, and thereby clamping said wall between said resilient washer and said conducting member, and an antenna lead-in including a first inner conductor connected to said stud portion for connection to said antenna means and a second outer conductor connected to said conducting sleeve means for connection through said conducting member to said vehicle wall.

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