May 13, 1969 W. C. GOODCHILD, JR., ET AL 3,444,313

EXPANDABLE FASTENER ANTENNA MOUNTS

Filed Dec. 28, 1966 Sheet 1 of 2

Fig. 1

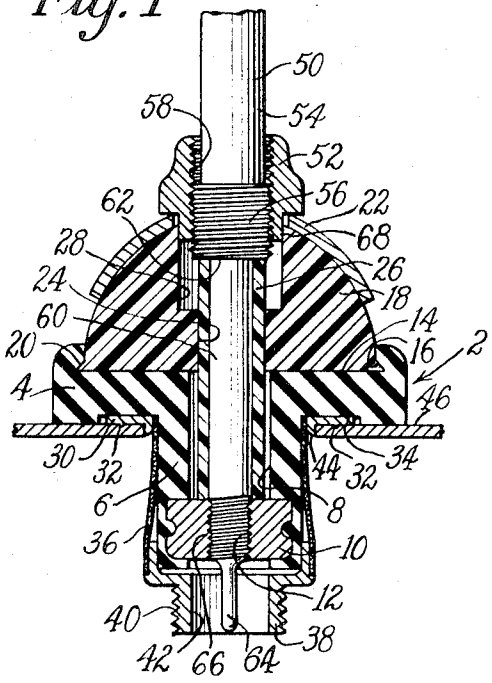


Fig. 2

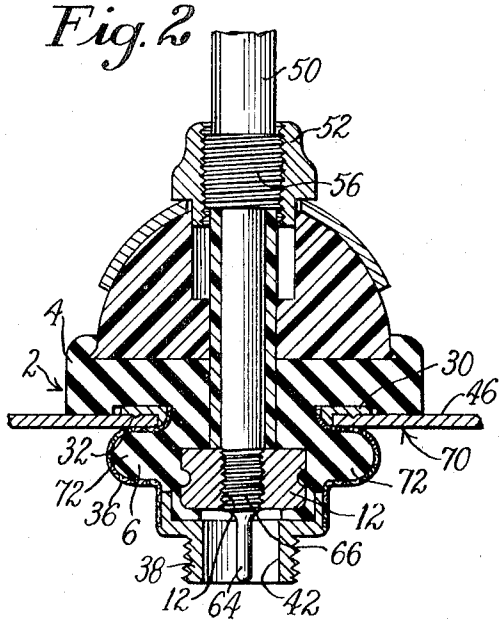


Fig. 3

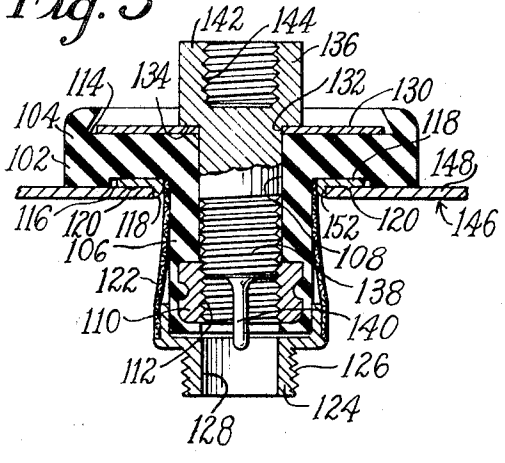
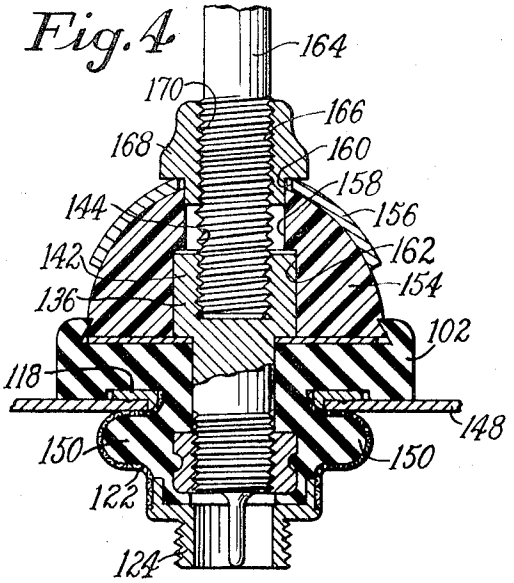


Fig. 4



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Fig. 5

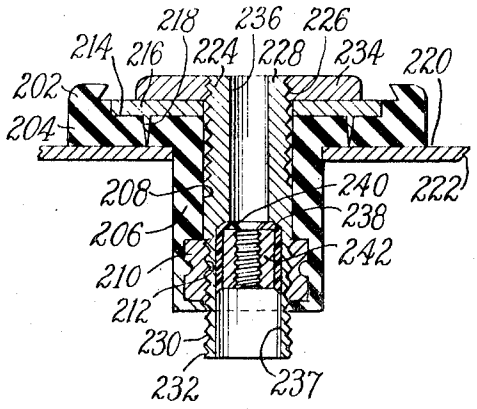


Fig. 6

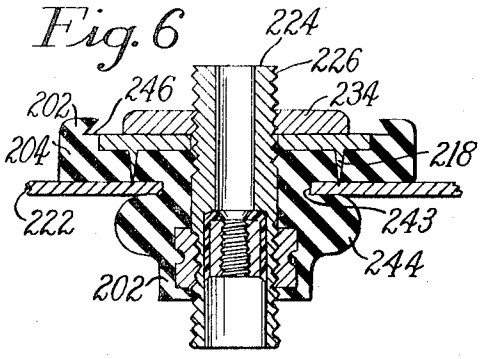
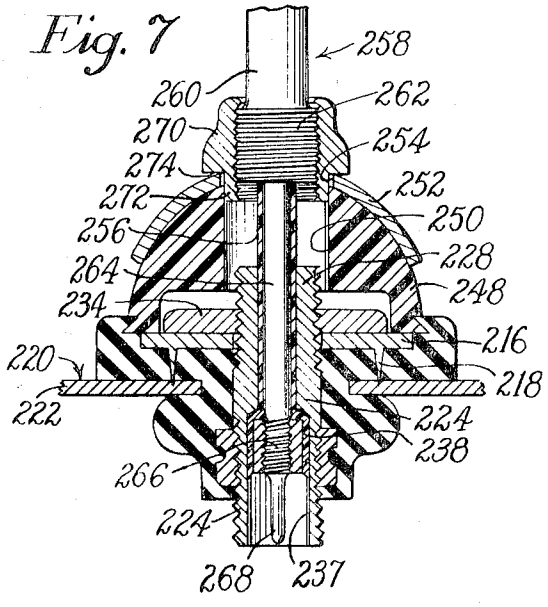


Fig. 7



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3,444,313

EXPANDABLE FASTENER ANTENNA MOUNTS

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U.S. Cl. 174—153 7 Claims

ABSTRACT OF THE DISCLOSURE

An automobile antenna mount including a rubbery member which is expanded after insertion into a hole in the automobile body. The mount retains the antenna and joins it to a lead from the radio and grounds the lead shielding to the metal surface of the automobile.

BACKGROUND OF THE INVENTION

The mounting of radio antennae on automobile bodies has proved bothersome in the automotive industry because the antenna is usually secured within an aperture punched in a fender or other body portion of the vehicle. The antenna mounting is assembled from the outside only since access to the underside of the fender is difficult or at least time-consuming. It is desirable that the antenna mounting provide a ground extending from the radio lead shielding to the body of the vehicle. This can be difficult where an undercoating material covers the inside surface of the vehicle body and several coats of paint cover the outside of the body. Further, it is desirable that the antenna mounting assembly also serve to prevent the admittance of moisture into the mounting hole which can cause corrosion of the metal components at the base of the antenna where it is joined to the radio lead. Still further, it is desirable that an antenna mounting assembly be resistant to heavy vibration and afford flexibility to the antenna; this is particularly true with respect to trucks and heavy duty vehicles. In addition, it is desirable that an antenna mounting assembly permit easy insertion and removal of the antenna for shipping, protection from vandals and the like.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an antenna mounting assembly which may be fixed to the vehicle by operations from one side only.

It is another object of the invention to provide an antenna mounting assembly having means for properly grounding the antenna connection.

It is still another object of the invention to provide an antenna mounting assembly which includes a sealing means which prevents the admittance of moisture to the connection.

Another object of the invention is to provide an antenna mounting assembly which is not susceptible to loosening by vibration of the vehicle body.

An additional object of the invention is to provide an antenna mounting assembly which may be easily installed and removed and which permits easy installation and removal of the antenna.

With the above and other objects in view, as will hereinafter appear, the present invention contemplates the provision in an automobile antenna mounting assembly of an expandable rubbery member having a head portion and a shank portion. The shank portion is readily inserted in an aperture in a vehicle body. The expandable member has a bore extending lengthwise through the head portion and the shank portion and disposed centrally thereof. Means are disposed in the bore for receiving one end of an antenna and means are provided for moving the ends of the expandable member relatively toward one another, whereby to cause the shank portion to bulge radially outwardly thereby to secure the mounting assembly in the aperture.

One feature of the invention is that the expandable member is handled from only one side of the vehicle body.

Another feature of the invention is that an electrically conductive path is provided so that the connection may be properly grounded to the body of the automobile.

In accordance with a further feature of the invention the head portion of the expandable member acts as a seal to prevent the entrance of moisture into the connection.

In accordance with a still further feature of the invention, the rubbery expandable member provides a fastener for the antenna mounting assembly which is not worked loose by vibration of the vehicle body over a long period of time.

In accordance with an additional feature of the invention, the mounting means may be easily removed from the aperture and in some embodiments the antenna may be removed while the antenna mounting assembly remains fixed in place.

The above and other features of the invention, including various novel details of construction and combinations of parts, will now be more particularly described with reference to the accompanying drawings and pointed out in the claims. It will be understood that the particular devices embodying the invention are shown by way of illustration only and not as a limitation of the invention. The principles and features of this invention may be employed in various and numerous embodiments without departing from the scope of the invention.

DESCRIPTION OF THE DRAWINGS

In the drawings,

FIG. 1 is a cross-sectional view of one embodiment of the invention, showing the antenna mounting means disposed in a hole in a sheet of metal but not yet expanded;

FIG. 2 is a cross-sectional view similar to FIG. 1, but showing the mounting means in the expanded condition;

FIG. 3 is a cross-sectional view of a portion of an antenna mounting means comprising a second embodiment of the invention but not yet expanded;

FIG. 4 is a cross-sectional view of the second embodiment of the invention and showing the mounting means in the expanded condition;

FIG. 5 is a cross sectional view of a portion of an antenna mounting means comprising a third embodiment of the invention but not yet expanded;

FIG. 6 is a cross-sectional view of the mounting means of FIG. 5 but shown in the expanded position; and

FIG. 7 is a cross-sectional view of the mounting means of FIG. 6 showing additional portions in place.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The first illustrated embodiment of the invention is shown in FIGS. 1 and 2. Referring to FIG. 1, it will be seen that the antenna mounting means comprises an expandable member **2**, which may be of rubber or plastic or other nonconductive material and which has a head portion **4** and a shank portion **6** with a central bore **8** extending through the head and shank portions. Embedded in the shank portion **6** of the expandable member **2** and in alignment with the central bore **8** is a nut **10** having internal threads **12**. A circular recess **14** is disposed in the upper surface of the head portion **4**, which recess is provided with an undercut annulus **16**. The recess **14**

retains a dome-like spacer member 18 having a lip 20 which fits into the undercut portion 16 of the expandable member 2. The spacer member 18 may have mounted thereon a decorative member 22, such as a chrome plated hemispherical dome. The spacer member 18 has a central bore 24 which is in alignment with the bore 8 of the expandable member 2. A sleeve 26 is disposed in the bores 8, 24, one end of the sleeve 26 being in abutting engagement with the nut 10. The bore 24 has an enlarged portion 28 in which is disposed the other end of the sleeve 26.

A metal collar 30 having pointed segments or projections 32 is disposed about the shank portion 6 of the expandable member 2 and in a recess 34 in the underside of the head portion 4 of the expandable member. Attached to the inner surface of the collar 30 is one end of a metallic flexible sheathing 36 which is disposed about the shank portion 6 of the expandable member 2 throughout its length. The other end of the sheathing 36 is attached to a metal end piece 38 having external threads 40. The end piece 38 is disposed on the lower or free end of the shank 6 and has a bore 42 which is in alignment with the bore 8.

An antenna 50, mounting a nut 52, is inserted into the assembly by way of the enlarged portion 28 of the bore 24. The antenna 50 includes a whip portion 54 which is threaded on its lower end, the threads 56 being engageable with threads 58 on the inside surface of the nut 52. The antenna 50 also includes a reduced portion 60 which extends from the threads 56 on the whip portion 54. A shoulder 62 is thereby provided at the termination of the threads 56 on the whip portion 54 of the antenna 50. The lower or free end of the reduced portion 60 of the antenna 50 is provided with a nipple 64 and adjacent the nipple 64 are external threads 66.

When the antenna 50 is inserted into the assembly, a shank portion 68 of the nut 52 is received within the large portion 28 of the bore 24. The reduced portion 60 of the antenna 50 is received by the sleeve 26. The external threads 66 of the antenna engage the internal threads 12 of the embedded nut 10. The nipple 64 and the end piece 38 comprise a jack for receiving the free end of the antenna lead (not shown) attached at its other end to a receiver, as for example an automobile radio.

The entire assembly, as thus far described, is inserted into a hole 44 in a metal plate or surface 46, as for example the fender or other body portion of an automobile. Clockwise rotation of the antenna 50, but not the nut 52, causes the antenna to move downwardly, as viewed in the drawings, into the assembly, until the shoulder 62 engages the upper end of the sleeve 26. To secure the antenna mounting to the plate 46, the nut 52 is turned on the threads 56. Referring to FIG. 2, it will be seen that turning of the nut 52 causes the threads 56 and thereby the antenna 50 to be pulled upwardly. However, the lower end of the antenna is now firmly attached to the lower end of the expandable member 2 by virtue of the engagement of the external threads 56 of the antenna with the internal threads 12 of the embedded nut 10. Accordingly, when the nut 52 is tightened on the threads 56 the lower or free end of the expandable member 2 is urged toward the underside 70 of the plate 46. The member 18 is of a substantially rigid material, such as hard plastic, so that it is not deformed by the compressive pressure. The relative movement of the ends of the mounting assembly toward each other causes a bowing out of the shank portion 6 of the expandable member 2, the bowing out forming an annular flange 72 pressed against the underside 70 of the plate 46. The flexible metallic sheath 36 bows outwardly with the shank portion 6 and becomes the outer case of the flange 72.

Tightening of the mounting assembly causes the pointed segments 32 to "dig" into the upper surface of the plate 46 to penetrate paint which might be present so that an electrically conductive path extends from the radio lead shielding to the body of the automobile by way of the collar 30, the metallic sheathing 36, and the metal end piece 38, whereby to provide proper grounding for the connection. The head portion 4 of the expandable member 2 affords protection for the collar 30, operating to keep out moisture which could cause corrosion of the grounding means.

It will be noted that the entire antenna mounting operation takes place from the upper side, as viewed in the drawings, corresponding to the outside of a vehicle fender or body. If it is desired to remove or replace a broken antenna whip, the nut 52 can be loosened and the whip unscrewed from the nut 12.

Furthermore, if desired for some reason, the mounting assembly can then be removed from the hole 44, clamping pressure on the flanges 72 having been released by removal of the antenna from the assembly.

A second illustrative embodiment of the present invention will now be described with reference to FIG. 3. The mounting assembly according to this embodiment includes an expandable member 102 having a head portion 104 and a shank portion 106, and a central bore 108 extending through the head and shank portions. A nut 110 having internal threads 112 is embedded in the shank portion and is in alignment with the bore 108. The head portion 104 is provided with recesses 114 and 116 similar to the recesses 14 and 34 of the expandable member 2 of the first illustrative embodiment.

A collar 118 having pointed segments or projections 120 is disposed in the recess 116 and about the shank portion 106. Attached to the inner surface of the collar 118 is one end of a flexible metallic sheath 122. The other end of the sheath 122 is connected to an end piece 124 which is mounted on the lower or free end of the shank 106 and which is provided with external threads 126 for receiving a radio lead (not shown) and a centrally disposed bore 128 which is in alignment with the bore 108. A disc 130 is disposed in the recess 114 and has an aperture 132 which is aligned with the bore 108. The disc 130 is of a hard material and provides support for a shoulder portion 134 of a connector piece 136. The connector piece 136 has external threads 138 and a nipple 140 on the lower end thereof. The other end of the connector piece 136 comprises an enlarged portion 142 having an internally threaded bore 144. The enlarged portion 142 is preferably hexagonally shaped for ready engagement with a wrench which may be used to turn the connector piece in the mounting assembly.

Turning of the connector piece 136 causes engagement of the connector piece external threads 138 with the internal threads 112 of the embedded nut 110. Further turning of the connector piece urges the free end of the expandable member 102 toward the underside 146 of a metal plate 148, causing the shank portion 106 of the member 102 to bow outwardly and form a flange 150 about a hole 152 previously drilled in the plate 148 for receiving the shank 106. Referring to FIG. 4, it will be seen that expansion of the member 102 to form the annular flange 150 securely attaches the antenna mounting assembly, as thus far described, to the plate 148.

Referring still to FIG. 4, the antenna mounting assembly is ready to receive a spacer member 154 which may be provided with a decorative cover piece 156. The spacer member 154 and the cover piece 156 are provided with bores 158, 160 respectively, the bore 158 having an enlarged portion 162 for receiving the enlarged portion 142 of the connector piece 136. After the spacer member 154 and the cover piece 156 are in place, the assembly is ready to receive an antenna whip 164 having external threads 166 on the end to be mounted and having a nut 168, with internal threads 170, mounted thereon. The threaded end of the antenna 164 is screwed into the threaded bore 144 of the connector member 136 which is then, in effect, an extension of the antenna whip 164. The nut 168 is tightened down on the antenna threads 166 to complete the assembly.

In the second illustrative embodiment the antenna whip **164** readily may be removed from the mounting means without disturbing the connection to the radio lead (not shown) which is connected to the connector piece **136**, rather than directly to the antenna. The second embodiment provides the same grounding path as was provided by the first embodiment, the flexible metallic sheathing **122**, the collar **118** and the end piece **124** providing an electrically conductive circuit.

The third illustrative embodiment of the present invention is shown in FIGS. 5–7 and will now be described. Referring first to FIG. 5, it will be noted that the antenna mounting assembly according to this embodiment includes an expandable member **202** having a head portion **204** and a shank portion **206** and having a bore **208** extending through said portions and centrally thereof. A nut **210** having internal threads **212** is embedded in the shank portion **206** of the expandable member **202** and is in alignment with the bore **208**.

The head portion **204** of the member **202** has a recess **214** which receives a metal collar **216**. The collar **216** is provided with spikes **218** which penetrate the member **202** to engage an outside surface **220** of a metal plate **222** or portion of vehicle body. The bore **208** and the nut **210** receive a connector member **224** having a set of external threads **226** on one end **228** and a second set of external threads **230** on the other end **232**. The threads **230** engage the internal threads **212** of the embedded nut **210**. The upper end **228** as viewed in FIG. 5, of the connector **224** receives a nut **234** which is internally threaded and appropriately shaped to be engaged by a wrench.

The connector member **224** has a central bore **236** which, near the end **232** has an enlarged portion **237**. The enlarged portion **237** has disposed therein a non-electrically conductive cup **238** having a central aperture **240**. The cup **238** receives an internally threaded nut **242**.

In order to securely fasten the mounting means to the plate **222**, the nut **234** is screwed upon the external threads **226** of the connector **224** so as to cause the connector to move from the position shown in FIG. 5 to the position shown in FIG. 6. Referring to FIG. 6, it will be noted that movement of the connector **224** causes expansion of the member **202** about a hole **243** which has been drilled in the plate **222** to receive the assembly. Expansion of the member **202** forms an annular flange **244** which securely retains the mounting assembly in the hole **243**. Tightening of the nut **234** also operates to cause the spikes **218** to penetrates whatever paint or preservative coating might be present on the surface **220** of the plate **222**, whereby to insure intimate contact between the plate and the spikes.

The head portion **204** of the member **202** is provided with a recess **246** for receiving a spacer member **248**, as shown in FIG. 7. The spacer member **248** has a central opening **250** which receives the end **228** of the connector **224**. A decorative member **252** having an aperture **254** may be used to cover or partially cover the spacer member. An insulator sleeve **256** is placed in the bore **236** of the connector **224**, one end of the sleeve coming to rest against the end of the cup **238**.

An antenna **258** suitable for the present mounting means includes a whip portion **260** having threads **262**, a reduced portion **264** having threads **266**, and a nipple portion **268**. A nut **270** is disposed upon the whip portion **260** of the antenna **258**, the nut being internally threaded and having a barrel portion **272**. In securing the antenna to the mounting means, the threads **266** are screwed into the nut **242**. The nut **270** is screwed upon the threads **262** until the barrel portion **272** of the nut **270** enters the opening **250** and a shoulder **274** on the nut **270** engages the decorative member **252** to securely fasten the antenna **258** to its mounting.

The end piece **224** and the nipple **268** form a jack for receiving a lead (not shown) from a radio or like device. A proper electrical ground is provided from the lead to the outside surface **220** of the plate **222** by way of the connector **224**, the nut **234**, the collar **216**, and the spikes **218**. In this embodiment the use of a flexible sheathing is not necessary in view of the electrically conductive path provided by the members just described.

Since certain obvious changes may be made in the illustrated device without departing from the scope of the invention, it is intended that all matters contained herein be interpreted in an illustrative and not a limiting sense.

Having thus described our invention what we claim as new and desire to secure by Letters Patent of the United States is:

1. A radio antenna mount for a vehicle in which there is an apertured support means for attaching the mount to the vehicle, said mount comprising an expandable member having an enlarged head portion and a shank portion of lesser diameter than the head, the shank portion being adapted to pass through the aperture in the support, the expandable member having a bore extending lengthwise of the member through the head portion and the shank portion, internal threads disposed in said bore near the end of said shank remote from said head, antenna means having a least two sets of external threads including a first set near the end of the antenna to be received by the mounting means and a second set spaced from said first set, said first set of threads being engaged with said internal threads, a nut disposed on said antenna means and engaged with said second set of antenna means threads to draw said shank end toward said head portion of the expandable member whereby to cause a bulging out of the shank portion of said member thereby to secure the antenna in the aperture.

2. A radio antenna mount for a vehicle in which there is an apertured support means for attaching the mount to the vehicle, said mount comprising an expandable member having an enlarged head portion and a shank portion of lesser diameter than the head, the shank portion being adapted to pass through the aperture in the support, the expandable member having a bore extending lengthwise through the head portion and shank portion, means disposed in said bore threadedly connecting the end of the shank portion remote from the head portion to an end of an antenna mounted in said assembly, external threads disposed on said antenna, and a nut disposed on said antenna and engaged with said external threads to cause said end of the shank portion of the expandable member to move toward the head portion whereby to cause the shank portion to bulge radially outwardly thereby to secure the antenna in the aperture.

3. A radio antenna mount for a vehicle in which there is an apertured support means for attaching the mount to the vehicle, said mount comprising an expandable member having an enlarged head portion and a shank portion of lesser diameter than the head, the shank portion being adapted to pass through the aperture in the support, the expandable member having a bore extending lengthwise of the member through the head portion and the shank portion, internal threads disposed in said bore near the end of said shank portion remote from said head portion, antenna means having at least two sets of external threads including a first set near the end of the antenna received by the mounting means and a second set spaced from said first set, said first set of threads being engaged with said internal threads, a nut disposed on said antenna means and engaged with said second set of antenna means threads to draw said shank end toward said head portion of the expandable member whereby to cause a bulging out of the shank portion of said member thereby to secure the antenna in the aperture.

4. The invention according to claim **3** including an electrically conductive annular collar disposed on the side of said head portion nearest the shank portion, an electrically conductive end piece connected to said shank end, and a flexible electrically conductive sheathing interconnecting said collar and said end piece.

5. A radio antenna mount for a vehicle in which there is an apertured support for attaching the mount to the vehicle, said mount comprising an expandable member having an enlarged head portion and a shank portion of lesser diameter than the head, the shank portion being adapted to pass through the aperture in the support, the expandable member having a bore extending lengthwise through the head and shank portions thereof, internal threads disposed in said bore near the end of said shank portion remote from said head portion, a connector piece having an enlarged portion and an elongated reduced portion, and external threads disposed on said reduced portion at the end remote from the enlarged portion, said external threads being engaged with said internal threads whereby upon turning of said connector piece the shank portion of the expandable member is caused to expand radially outwardly whereby to secure the mounting assembly in the aperture, said connector piece having means in the enlarged portion thereof for receiving one end of an antenna.

6. The invention according to claim 5 including an electrically conductive annular collar disposed on the side of said head portion nearest the shank portion, an electrically conductive end piece connected to said shank end, and a flexible electrically conductive sheathing interconnecting said collar and said end piece.

7. A radio antenna mount for a vehicle in which there is an apertured support for attaching the mount to the vehicle, said mount comprising an expandable member having a head portion and a shank portion, the shank portion being adapted to pass through the aperture in the support, the expandable member having a bore extending lengthwise through the head and shank portions thereof, internal threads disposed in said bore near the end of said shank portion remote from said head portion, a connector piece dispersed in said bore and having first and second sets of external threads, the first set of external threads being engaged with said internal threads, and a nut threadedly engaged with said second set of threads to cause the ends of the expandable member to move relatively toward one another, whereby to cause the shank portion of the expandable member to bulge radially outwardly whereby to secure the mounting assembly in the aperture, said connector piece having means for receiving one end of an antenna.

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U.S. Cl. X.R.

85—70; 343—715, 888, 906