June 24, 1958 J. B. CEJKA 2,840,816

RADIO ANTENNA

Filed Aug. 5, 1954 2 Sheets-Sheet 1

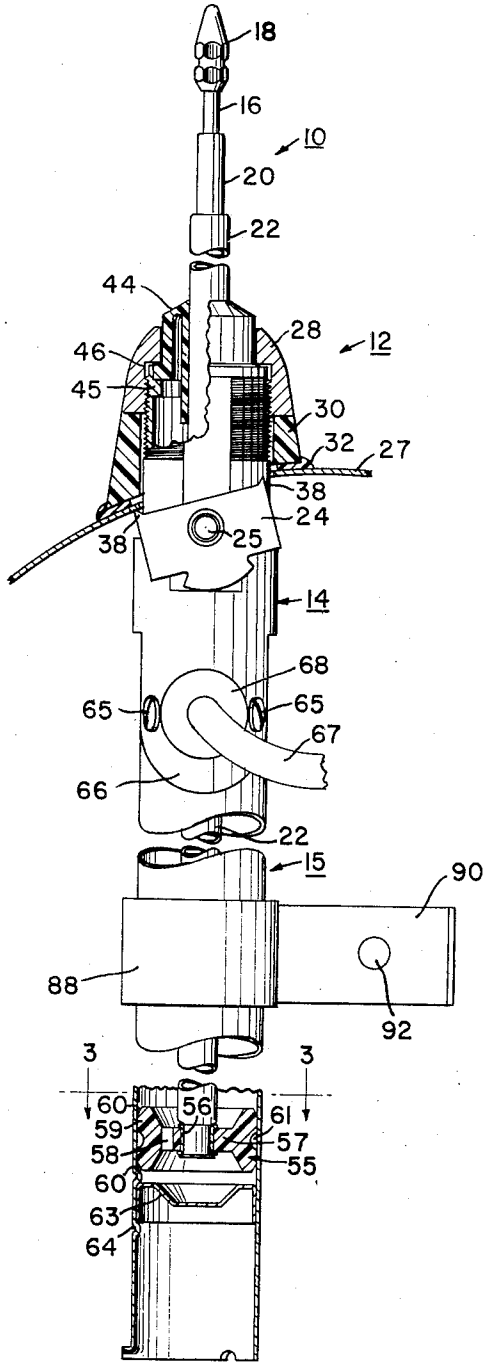


Fig. 1.

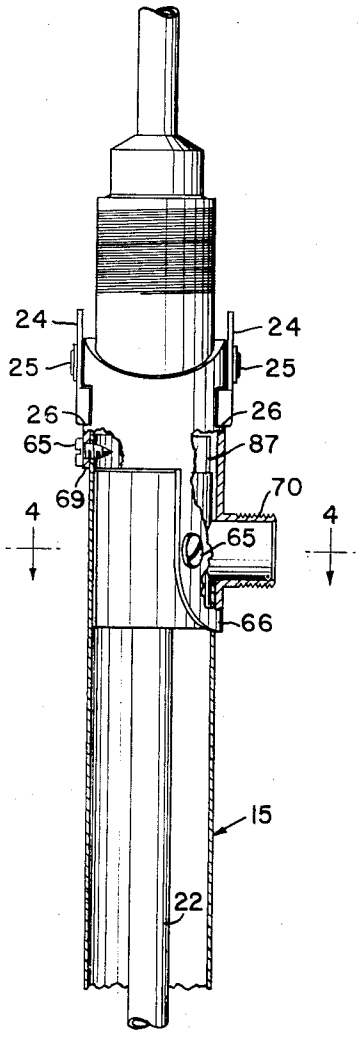


Fig. 2.

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2 Sheets-Sheet 2

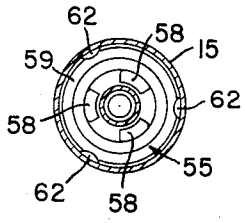


Fig. 3.

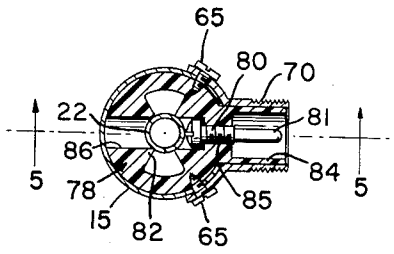


Fig. 4.

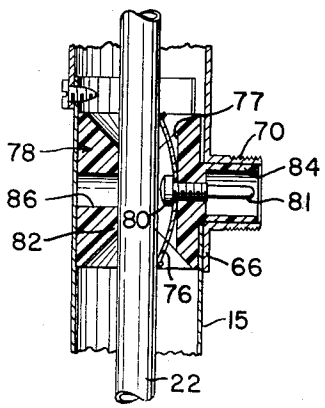


Fig. 5.

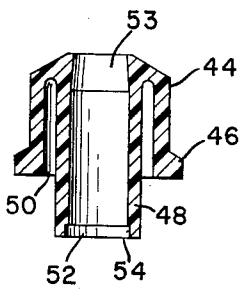


Fig. 6.

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2,840,816

RADIO ANTENNA

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Application August 5, 1954, Serial No. 447,992

4 Claims. (Cl. 343—715)

The present invention relates to automobile radio antennas and more particularly to an antenna which can be extended to a relatively great height above its mounting on an automobile body, and which can be telescoped down so that only a very small length of the antenna projects.

An antenna embodying the present invention is adapted to be mounted on an automobile in a position which affords vertical clearance space within the automobile beneath the mounting. For example, the antenna is well adapted for either cowl or fender mounting.

The invention is illustrated as embodied in an automobile antenna which is rugged, attractive in appearance, and which when telescoped extends but a small distance above the mounting surface and yet has minimum capacitance to the body of the automobile.

The various advantages and aspects of the invention will be more fully understood from the following description considered in conjunction with the accompanying drawings, in which:

Figure 1 is a front view partly in elevation and partly in section, of an antenna assembly embodying the invention, shown mounted on the body of an automobile;

Figure 2 is a side view partly in elevation and partly in section, of the mounting portion of the antenna assembly of Figure 1;

Figure 3 is a section taken along line 3—3 of Figure 1;

Figure 4 is a section taken along line 4—4 of Figure 2;

Figure 5 is a sectional view taken along line 5—5 of Figure 4; and

Figure 6 is a sectional view on enlarged scale of a sealing bushing in the mounting portion of the antenna.

The antenna assembly comprises a telescoping antenna or signal-receiving portion **10**, a mounting **12**, a tubular mounting **14**, and a tubular well **15**, into which the antenna **10** extends when in its collapsed position. The antenna portion **10** includes a top rod section **16** with a corona tip **18**, an intermediate tubular section **20**, and a lower tubular section **22**. Sections **16**, **20**, and **22** are of conventional construction and are arranged to telescope to permit the antenna to be lengthened or shortened.

A pair of arms **24** swingably mounted on lugs **25** on opposite sides of the tubular base **14** supported by shoulders **26** are arranged to grip the underside of the automobile body **27** on which the antenna assembly is mounted. A cap nut **28** is threaded onto the base **14** and bears against an insulator collar **30** and a resilient gasket **32** against the outside of the automobile body **26**. The arms **24** are generally similar in construction and mounting to those described in U. S. patent application Serial No. 393,331, filed November 20, 1953, except for two upwardly extending prongs **38** on the ends of arms **24** which bite into the underside of the automobile body to insure a firm mechanical mounting and a low-resistance ground connection.

To provide a watertight seal without excessive frictional drag a bushing **44** (see also Figure 6) of polyethylene or other suitable resilient insulating material, is positioned around the lower antenna section **22** and extends within the upper end of the tubular base **14**. This bushing has an external flange **46** at its lower end which abuts an internal shoulder **45** in the base **14**. The bushing **44** has an integral internal sleeve **48** that is joined to the remainder of the bushing **44** only at its upper end and is surrounded by an annular space **50** between the outer surface of the sleeve **48** and the inner surface of the surrounding portion of the bushing **44**. The vertical opening **52** through the sleeve **48** for the antenna section **22** is of slightly smaller diameter at its upper end, with a tapered portion in the area indicated at **53** to form an effective seal with the section **22**, while the remainder of the sleeve forms a long internal surface leakage path that adds but little to the frictional drag of the antenna section **22** when it is moved upwardly or downwardly. When the nut **28** is tightened, the outer circumference of the bushing **44** is compressed somewhat to provide a tight seal, but this does not increase the frictional drag of the antenna because of the annular space **50** around the sleeve **48**. The lower end of the inner sleeve **48** has an inner annular recess **54**.

To provide a guide for the lower end of the antenna section **22**, an insulaitng washer **55**, slidable within the tubular well **15**, is rotatably secured to the lower end of the antenna section **22**, for example by reducing the diameter of the lower end of the section **22**, passing it through a central opening in the washer **55**, and peening over its tip on the lower side of the washer **55**.

As shown in Figures 1 and 3, the washer **55** includes an inner metal sleeve **56** embracing the end of the antenna section **22**, a thin web **57** surrounding the sleeve **56** and having three holes **58** in it forming three spokes to increase the resiliency with which the lower end of section **22** is supported within the well **15**. The rim **59** of this washer has an axial length about three times the thickness of the web **57** with the top and bottom flanges of the rim being symmetrically tapered on the inside over their full length for greater strength, and with short tapered surfaces **60** on the outside of the edge of the rim to facilitate the sliding of the washer **55** within the well **15**. To further facilitate its sliding, the rim **59** has a circumferential groove **61** and three evenly spaced axial grooves **62**.

To limit the downward movement of the antenna section **22**, a cup-shaped stop **63** is staked inside and near the lower end of the well **15** by evenly spaced indentations **64** in the wall of well **15**, three indentations being above and three below the rim of the stop **63**. When the antenna is fully retracted, the washer **55** rests upon the stop **63**.

The upper end of the antenna well **15** is secured in a socket **69** in the base **14** and aligned with the bore of the base **14**, by three self-tapping screws **65**, two of which connect the top of well **15** to a tongue portion **66** extending downwardly on one side from the main body of the base **14**, and one of which engages the main body of the base **14**.

In order to provide a connection between antenna **10** and the automobile radio receiver (not shown) a high "Q", low-capacity, coaxial cable **67** is secured by a coupling nut **68** to a nipple **70** on the tongue portion **66**.

A flat Phosphor bronze spring member **76** is secured at its center within a longitudinal recess **77** along the inside of an insulator spacer **78**. The spring **76** has two forwardly extending end portions which resiliently engage the surface of the antenna section **22** to provide electrical contact with the antenna **10** regardless of its

position. A terminal screw 80 extends through the center of the contact 76 and its shank 81 forms the center terminal for engaging the center terminal of the socket 70.

In order to provide support for antena section 22 to hold it firmly in line with the spring member 76, the insulator spacer 78 has a curved pillow 82 on the opposite side of section 22 from the nipple 70. A tubular projection 84 on the insulator 78 fits into nipple 70 to form an insulating lining around the screw 80 and the shank 81; a radial hole 85 in the insulator 78 aligned with projection 84 engages the threads of the screw 80 and supports it and the spring member 76. Access to the screw 80 is provided by a hole 86 passing through pillow 82 of the insulator 78.

In assembly, the projection 84 is slid into the nipple 70, and then the well 15 is slid up into place in the socket 69 with a wide longitudinal slot 87 in the top of well 15 straddling the projection 84, as seen in Figure 2. Thus the antenna structure is quickly assembled and held together merely by engaging the parts and inserting the screw 65.

The lower end of the well 15 may be braced by a collar 88 and strap 90 secured to the automobile frame, by means of a screw hole 92. The well 15 may be seamless tubing or may have a folded seam, not shown, one of the vertical recesses 56 in washer 48 straddling the seam for clearance.

In a particular commercial form the following dimensions and materials were used, and these details are set forth to provide a specific example of a successful embodiment of the present invention to enable those skilled in the art better to use the invention. The antenna section 16 is a 0.100 inch diameter stainless steel rod, sections 20 and 22 are, respectively, 0.218 and 0.312 inch in diameter formed of admiralty brass tubing, bright chromium plated. Bushing 44 is a molded black polyethylene, with the outside diameter of the flange 46 being 0.874 inch, the outside diameter of the body of the bushing being 0.720 inch, the inside diameter of the outer sleeve being $^{19}/_{32}$ inch, the outside diameter of the sleeve 48 being $^{7}/_{16}$ inch. The top of the flange and bushing body are both chamfered at a 30° angle to the vertical. The base 14 is die cast from "Zamak" No. 3 with an overall length of about $3^{1}/_{16}$ inches, with the distance from the center of the nipple 70 to the top edge of the base being $2^{11}/_{16}$ inches. The outside diameter of the base 14 is $1^{1}/_{4}$ inches, the inside diameter of the bottom socket 64 which receives the top of the well 15 being 1.010 inches, with tongue 65, as seen in section in Figure 4, covering an angular arc of 135°. The inside diameter of the center portion of the base 14 is $^{7}/_{8}$ inch, and the inside diameter above the inner shoulder 45 is 0.880 inch. The centers of lugs 25 are $1^{1}/_{4}$ inches down from the top of the base 14 and they are 0.200 inch in diameter and project $^{1}/_{64}$ of an inch. The recesses above the shoulders 26 are .065 inch deep and have a 5° undercut on their bottom edges 0.468 inch below the centers of the lugs 25 so as better to grip the rounded lower shoulder portions on the arms 24.

The inside diameter of the nipple 74 is $^{11}/_{16}$ of an inch. The washer 48 and the insulator spacer 78 are of molded black polyethylene.

The well 15 is a one inch outside diameter seamed aluminum tube with a wall thickness of .035 inch and a length of about $15^{1}/_{4}$ inches so that when it is assembled the overall length of the base and well from the top of bushing 44 to the bottom of the well is only $17^{3}/_{8}$ inches. When extended, this antenna projects 57 inches above the top of the bushing 44 and when collapsed extends only 8 inches above this bushing.

From the foregoing, it will be understood that the present invention is well adapted to fulfill the ends and objects set forth.

What is claimed is:

1. A collapsible automobile radio antenna assembly comprising an antenna portion including a plurality of extensible telescoping sections, a base portion, having a longitudinal bore therethrough, mounting means for securing said base portion to an automobile body with said longitudinal bore projecting outside of said body, said base having a socket therein aligned with said bore, a tubular well secured in said socket and projecting from said base, one of said antenna sections extending from the outside of said body through said bore in said base and into said tubular well, a first insulator element slidably fitting within said well portion and supporting said one antenna section in spaced longitudinal relation within said well, a second insulator element secured within said base and slidably supporting said one antenna section in longitudinal spaced relationship within its bore, a third insulator element intermediate said first and second insulator elements and secured within said base portion in fixed position, said third insulator element having an opening therethrough through which said one antenna section projects, said third insulator element including a pillow portion within said opening engaging one side of said one antenna section, a spring contact element supported by said third insulator and resiliently engaging the opposite side of said one antenna section from said pillow portion, and electrical connection means in engagement with said contact element.

2. A collapsible automobile radio antenna assembly comprising an antenna portion including a plurality of extensible telescoping sections, a base portion, having a longitudinal bore therethrough, said base portion having a neck, said bore passing longitudinally through said neck, mounting means for securing said base portion to an automobile body with said neck projecting outside of said body, said base having at its lower end a socket aligned with said bore, a tongue portion projecting longitudinally from said base in the opposite direction from said neck, a threaded nipple on said tongue, connection means projecting inwardly from said nipple into said socket, a tubular well having a longitudinal slot in one end, said end being secured in said socket with its opposite end projecting from said base, said slot straddling said connection means, one of said antenna portions extending from the outside of said body through said opening in said base and through said socket into said tubular well, a first insulator element secured to said one antenna element and slidably supporting said one antenna section in spaced longitudinal relation within said well, a second insulator element secured within the neck of said base and slidably supporting said one antenna section in longitudinal spaced relationship within its bore, and a third insulator element within said socket, and a contact element secured to said third insulator element and slidably engaging said one antenna section and in electrical engagement with said connection means.

3. An automobile radio assembly as claimed in claim 2 and wherein said third insulator element has an opening therein through which said one antenna section projects, said contact element being secured within the opening of said third insulator element.

4. A collapsible automobile radio antenna assembly comprising an antenna portion including a plurality of extensible telescoping sections, a base having a longitudinal bore therethrough, a neck portion on said base, said bore passing through said neck portion, mounting means for securing said base portion to an automobile body with said neck portion passing through the exterior of said body, said base having a socket therein aligned with said bore, a tubular well having one end secured in said socket and the other end projecting from said base, the passage in said well being aligned with said bore, one of said antenna sections extending from the outside of said body through said bore of said base and into said tubular well, an insulator washer secured to the lower

end of said one antenna section and slidably fitting within said well portion and supporting said one antenna section in spaced longitudinal relation within said well, said washer comprising a hub portion around said end of said one antenna section, a perforated annular web portion surrounding said hub portion, and a rim portion surrounding said web portion and having an axial length greater than the thickness of said web portion, said rim being tapered radially inwardly on its outer surface adjacent both of its edges, a plurality of axially extending recesses in the outer surface of said washer, and a circumferential recess in the outer surface of said washer, an insulator bushing around said one antenna section in said neck portion and slidably supporting said one antenna section in longitudinal spaced relationship within the

bore of said base, a third insulator element intermediate said first and second insulator elements and secured within said base portion in fixed position, a contact element secured to said third insulator element and slidably engaging said one antenna section, and electrical connection means in engagement with said contact.

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