Dec. 15, 1959 J. GRASHOW 2,917,743

AUTOMOBILE ANTENNA APPARATUS

Filed Feb. 21, 1957 2 Sheets-Sheet 1

Fig. 1.

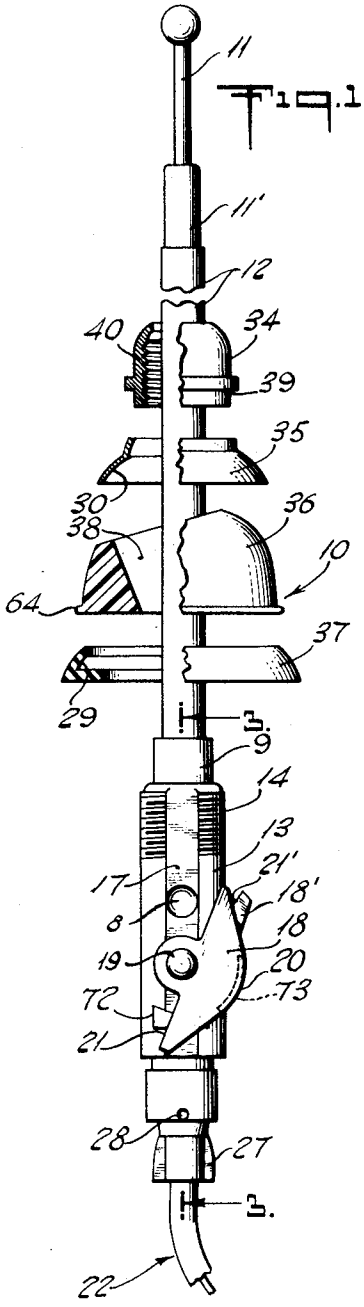


Fig. 2.

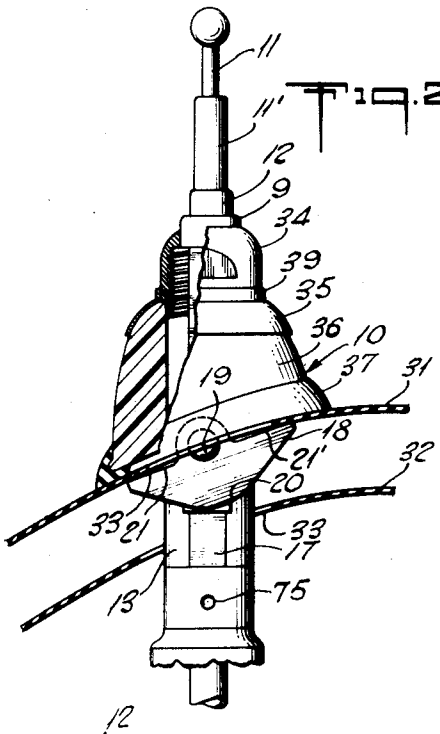


Fig. 3.

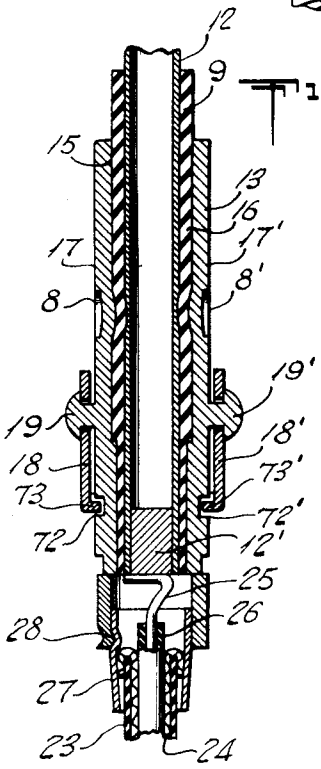
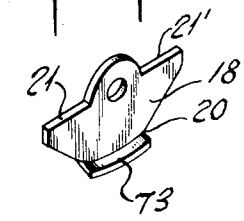


Fig. 4.



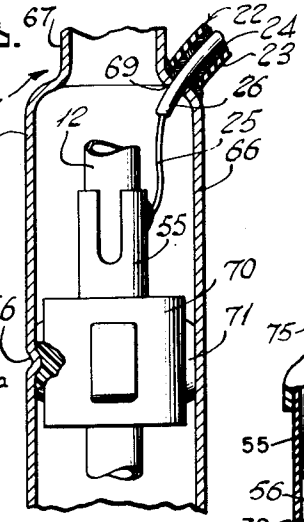
INVENTOR
JOSEPH GRASHOW
BY Eugene L. Lovette
ATTORNEY

Dec. 15, 1959 J. GRASHOW 2,917,743

AUTOMOBILE ANTENNA APPARATUS

Filed Feb. 21, 1957 2 Sheets-Sheet 2

Fig. 8.



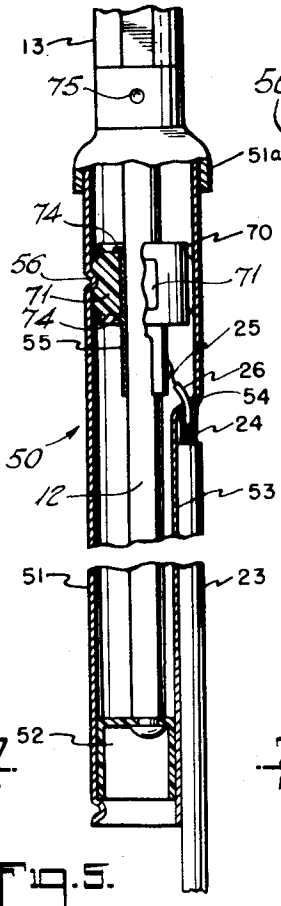


Fig. 5.

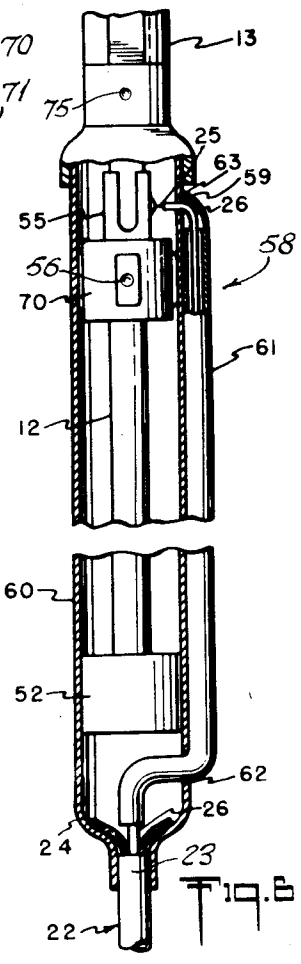
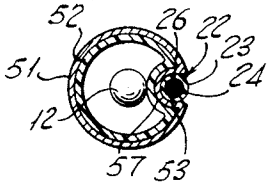


Fig. 6.

Fig. 7.



INVENTOR.
JOSEPH GRASHOW

BY Eugene S. Lovelle
ATTORNEY

United States Patent Office 2,917,743 Patented Dec. 15, 1959

2,917,743

AUTOMOBILE ANTENNA APPARATUS

Joseph Grashow, New York, N.Y., assignor to The Quick-Mount Manufacturing Co., Inc., Brooklyn, N.Y., a corporation of New York

Application February 21, 1957, Serial No. 641,577

18 Claims. (Cl. 343—713)

This invention relates to automobile radio antennas and more particularly, to means designed to effect quick and positive antenna mounting from the outside surface of the automobile body regardless of the curvature of the body at the point of mounting, and in addition, provides economical and easy electrical connections to the antenna.

The instant application is a continuation-in-part of my application for Automobile Antenna Apparatus, filed November 15, 1956, and assigned Serial No. 622,491.

There has been recognized for many years the need of providing a practical automobile antenna mounting mechanism that allows mounting of the antenna directly and entirely from the outside of the automobile. Mounting an antenna to an automobile directly from the outside provides many advantages. Installation may be effected by the owner of the automobile or an automobile parts retailer. Installation is easily and economically accomplished. Such installation does not require replacement or patching of upholstery coverings and avoids mounting at otherwise inaccessible under-surfaces of the automobile. Additionally, such antennas may be installed on the automobile production line by the automobile manufacturer and considerable time in labor costs will be saved by eliminating the necessity of working in a relatively inaccessible interior of fenders, cowls or other locations. Attachment of such antennas simplifies operation since the antenna installation need not be coordinated with other assembly operations.

Heretofore, a number of structures have been marketed for the purpose of accomplishing attachment of automobile antennas directly from the outside of the automobile surface. The successful prior art mounting mechanisms include toggle arms or swinging links. Generally, the antenna is mounted to the automobile fender. A hole is punched in the fender. The antenna is dropped through the hole from the top fender surface. The toggle arm is clamped to the under-surface by a threaded nut bearing against the upper surface of the fender. However, in recent years, automobile manufacturers have used reinforced two-walled structures in the regions of the automobile body at which it is most desired to mount antennas. Because of the close spacing of the two-walled reinforced structures, it has become impossible to mount toggle arm antennas of prior art design from an outside automobile surface. The close spacing between the two walls does not provide sufficient clearance for the toggle arms or swinging links to turn into proper position for clamping against the under-surface of the fender. In addition, the two-walled structure prevents mounting a "disappearing" type of antenna from the top automobile surface. A "disappearing" antenna is one in which a substantial portion of the antenna is suspended below the automobile surface. The prior art embodiments of this type of antenna employs a coaxial line connector extending laterally from the antenna housing. The connector serves to couple the receiver cable to the antenna. The

punched hole is generally too small to pass the antenna because the coaxial connector projects transversely from the antenna.

It is therefore the principal object of the instant invention to provide automobile antenna mounting means allowing antenna mounting from the top outside surface of the automobile regardless of close spacing between two walls of reinforced automobile structure, and regardless of the curvature of such structure.

It is a further object of the instant invention to effect the foregoing object for antennas of the collapsible extendible type whether the antenna is the type such that substantially the whole antenna extends above the automobile surface or the type such that a substantial portion is adapted for suspension below the automobile surface.

It is a further object of the instant invention to provide automobile antenna structure adapted to be mounted to the automobile directly from the outside top surface thereof in which the mounting means comprise pivotal arms obliquely shaped to allow structural clearance to permit same to pivot from a longitudinal orientation to a lateral orientation while disposed between two closely spaced reinforced automobile walls.

It is a further object of the instant invention to provide automobile mounting means for automobile antennas to be mounted directly from the top outside surface of reinforced automobile structure having two closely spaced walls contemplating one antenna embodiment in which substantially all of the antenna is suspended above the upper automobile surface and is electrically connected to a receiver-antenna coaxial cable in a novel manner at the lower end of the mounted antenna which end is disposed below the automobile surface, and in other embodiments wherein a substantial portion of the antenna is housed below the automobile surface and the cable connection thereto is made in a novel manner to the housing at points disposed below the automobile surface.

It is a further object of the instant invention to provide for automobile antenna structure mounted directly from the upper top surface of the automobile embodying novel means for connecting coaxial cable to such antennas without the need of coaxial electrical connectors; in one embodiment the coaxial cable is fastened to a crimped sleeve at the lower end of the antenna wherein the braided outer conductor of the cable is crimped to the sleeve and the inner conductor of the cable is anchored to the lower butt end of the antenna rod; in other embodiments, the antenna has a housing into which a substantial portion of the antenna extends, the housing is suspended below the automobile surface and is provided with a hole through which the inner conductor of the cable extends to connect electrically with the antenna rod whereas the braided outer conductor of the cable electrically connects to the housing.

It is a further object of the instant invention to provide an automobile antenna adaptable to be mounted from the top outside surface of the automobile in which an appreciable portion of the antenna is adapted to extend below the automobile surface; the antenna is encased in a hollow concentric housing; the housing may be provided with a longitudinal trench or with a metallic shielding sleeve in which the antenna cable is inserted to facilitate antenna mounting through an opening in the automobile structure.

It is a further object of the instant invention to provide an automobile antenna structure adapted to be mounted to the automobile from the top outside surface thereof in which novel ornamental mounting means is designed to cooperate with a pivotal clamping means to attach the antenna to the automobile wherein the

mounting means completely seals off the opening through which the antenna is inserted for such mounting.

It is a further object of the instant invention to provide antenna structure in which a number of components of the antenna are adaptable for use as components of a plurality of embodiments to effect economy of manufacture.

Further objects and advantages will become apparent from the following description taken in conjunction with the drawings, in which:

Fig. 1 is a longitudinal elevation of an automobile antenna using the improvements of the instant invention and shows the clamping arms oriented substantially in alignment with the axis of the antenna to permit insertion through the opening in the automobile structure, and in addition the figure shows the locking means partly in section and disassembled;

Fig. 2 shows the upper portion of an antenna clamped to reinforced automobile structure, which antenna differs from the embodiment of Fig. 1 in that the lower end of the sleeve is connected to an antenna housing to provide a disappearing type of automobile antenna;

Fig. 3 is a longitudinal fragmentary and sectional view taken along line 3—3 of Fig. 1;

Fig. 4 is a perspective view of a pivotal arm used for clamping the antenna to the automobile;

Fig. 5 is a longitudinal fragmentary and partly sectional view of the lower portion of antenna of the disappearing type incorporating the improvements of the instant invention, which figure may be considered to be the lower fragmentary portion of the upper portion shown in Fig. 2;

Fig. 6 illustrates another embodiment of a disappearing type of antenna and is a longitudinal, partly sectional, and lower fragmentary view which should be taken in combination with Fig. 2;

Fig. 7 is a sectional plan view taken along line 7—7 of Fig. 5; and

Fig. 8 is a longitudinal, sectional and fragmentary view of still another structure for disappearing type of antenna and may be considered the lower portion of the structure shown in Fig. 2.

The antenna **10** illustrated herein is provided with slidable, collapsible sections **11**, **11'** and **12**. Antenna rods **11**, **11'**, **12** provide the usual expandible retractable automobile antenna for radio reception. A substantially cylindrical metallic sleeve **13** has a threaded upper end **14** and a through bore **15**. In the embodiment of Figs. 1 and 3, sleeve **13** is mounted in coaxial relationship over the lower end of rod **12**. A cylindrical insulator member **16** has a through bore and is mounted in coaxial relationship over the section of rod **12** extending through sleeve **13**. Rod **12**, insulator **16** and sleeve **13** are held together by crimp indents **8**, **8'** at the opposite surfaces **17**, **17'**. Toggle means such as a pair of opposed arms **18**, **18'** are pivotally mounted along respective flat surfaces **17**, **17'**. Arms **18**, **18'** are separately hinged by rivets **19**, **19'** to rock about an axis normal to the longitudinal axis of antenna **10**. Arms **18**, **18'** have convex lower edges **20**, with oblique end portions inclined toward upper transverse edges **21**, **21'**.

A coaxial cable **22** connects antenna **10** to a radio receiver. Cable **22** is provided with an outer insulated sheath **23**, a braided outer conductor **24**, and an inner conductor **25** insulated by a non-conducting material **26**. Cable **22** is joined to antenna **10** at the lower end of sleeve **13**. A relatively non-elastic metallic crimp sleeve **27** is seated in the stepped diametered lower end of bore **15**. Sheath **23** is cut back but extends part way into the through bore of crimp sleeve **27**. Braid **24** also extends part way into crimp sleeve **27** and is folded back against crimp sleeve **27** to provide good electrical contact therewith. The protruding insulated and covered inner conductor **25** projects from the folded end of braid **24**. The end of inner conductor **25** is sheared of insulated material **26** and is anchored, such as by soldering, to a metal plug **12'** anchored to the lower end of rod **12** to provide good electrical contact therewith. Plug **12'** also serves to arrest downward movement of rod **11'**. Cable **22** is held fast to antenna **10** by crimping at **28** the lower end of sleeve **13** to sleeve **27** and by crimping sleeve **27** to cable **22**. It will be noted that the crimp connection of cable **22** to antenna **10** as shown herein has eliminated the usual coaxial conductor connectors.

It is the current practice of automobile manufacturers to reinforce cowls and fenders with two closely spaced walls such as **31** and **32**. Reinforcement of cowl and fender structure usually occurs at the regions where it is desirable to attach automobile antennas. Walls **31**, **32** are provided with aligned openings **33** at the point where antenna **10** is to be attached. Openings **33** are diametered to be slightly larger than the peripheral diameter of sleeve **13**. The over-all lateral dimension of arms **18** and **18'** is greater than the diameter of openings **33** to enable arms **18**, **18'** to clamp against the under side of top wall **31** at opposed sides of opening **33**, as shown in Fig. 2.

For the purpose of describing the instant invention, it will be assumed that two closely spaced walls **31**, **32** constitute a reinforced automobile fender structure. Upper surface of wall **31** is the outer top surface of the automobile fender. Lower wall **32** serves as a reinforcing structure. Close spacing of walls **31**, **32** will ordinarily prevent insertion and attachment of an automobile antenna from the top. The improvements of the instant invention permit the advantage of insertion from the top. To achieve a permanent and firm attachment of antenna **10** to the automobile structure, the installer punches out a fender opening made up of aligned holes **33** in walls **31**, **32**. Holes **33** are diametered slightly greater than the diameter of sleeve **13**. Opening **33** is just large enough to permit insertion of antenna **10** in the manner to be described. Antenna **10** is attached to the automobile by allowing cable **22** to drop through opening **33**, which cable is joined to the lower end of sleeve **13**. Upon downward insertion of antenna sleeve **13** through and past opening **33**, arms **18**, **18'** are pivoted so that the lateral edges **21**, **21'** are aligned substantially with the longitudinal axis of antenna **10**, as shown in Fig. 1, in order for the arms to clear opening **33**. Antenna **10** is lowered until sleeve **13** passes below opening **33** of wall **31**, such that arms **18**, **18'** are disposed between walls **31**, **32**, whereupon antenna **10** is jiggled slightly. The distributed weight of convex shaped arms **18**, **18'** causes same to rock and consequently turn to extend laterally in respect to the longitudinal axis of antenna **10**, as shown in Fig. 2. With prior art structure, this cannot be achieved because the pivotal links are ordinarily too wide to permit such turning between the closely spaced walls **31**, **32**. The obliquely upwardly turned ends of edges **20**, **20'** permit arms **18**, **18'** to clear lower wall **32** as the arms pivot between the two walls when turning from longitudinal alignment to lateral alignment. The lateral edges **21**, **21'** of arms **18**, **18'** are disposed to engage the under surface of wall **31** when the arms are laterally aligned. Antenna **10** is then drawn upwardly until such engagement is realized.

Antenna **10** is clamped to the automobile structure by locking means including an ornamental locknut **34**, a circular shield **35**, a supporting ring **36**, and a rubber-like gasket **37**. Nut **34**, shield **35**, spacer **36** and gasket **37** are provided with respective through openings to permit insertion over antenna rods **11**, **11'**, **12**. Gasket **37** is adapted to rest against the top surface of wall **31** surrounding opening **33**. Gasket **37** seals opening **33** and prevents seepage of rain and snow therethrough. Ring **36** has a semicircular outer shape and is provided with an off-centered through opening or slot **38** at the top thereof. In completing the water seal at the locking means, the bottom of spacer **36** has an annular flange

64 adapted to snap tightly into an annular recess 29 in the interior of gasket 37. Spacer 36 is proportioned to conform with the various shapes or curvatures of automobile fenders or cowls and its slot 38 is disposed to maintain antenna 10 vertical when attached to the automobile. Shield 35 is provided with a hollowed curved under surface 30 adapted to rest upon the outer upper surface of spacer 36. When the locking means is assembled, shield 35 covers the otherwise exposed slot 38 to prevent rain or snow from passing into the structure. Shield 35 is proportioned to cover slot 38 regardless of the curvature of the fender or cowl and resulting orientation of spacer 36. The central aperture of shield 35 is adapted to receive a shouldered end 39 of nut 34. End 39 is designed to project into central aperture of shield 35 to complete the seal against rain or snow. The inner bore surface of nut 34 is threaded at 40 to engage the upper threaded surface 14 of sleeve 13. Upon attaching antenna 10 to the automobile and threading nut 34 tightly to sleeve 13, arms 18, 18' are urged upwardly so that edges 21, 21' clamp against the under surface of wall 31, as shown in Fig. 2.

In the foregoing embodiment, substantially all of antenna 10 extends above upper wall 31 of the automobile fender. Frequently this is not desirable. In the following embodiments, a substantial portion of the antenna structure is adapted for suspension below the fender surface 31; this type is often called a "disappearing" antenna. A minimum of antenna structure projects above the surface of the fender.

Fig. 2 taken in combination with Figs. 5, 6 and 8 illustrate embodiments of disappearing antenna structures. In Fig. 5, antenna 50 is clamped to the automobile by clamping means as described hereinbefore and illustrated in Fig. 2. Antenna 50 comprises extendable and retractable rods 11, 11' and 12. Rod 12 is mounted in and insulated from sleeve 13 by insulator 16 as described hereinbefore and shown in Figs. 2 and 3. Sleeve 13 is preferably identical to that described hereinbefore. In contrast to the prior embodiment, sleeve 13 is not mounted to the lower end of rod 12, but is mounted coaxially thereon near the top of rod 12 when the latter is in its retracted position. The greater portion of rod 12 extends downwardly from sleeve 13 and in coaxial relationship into a hollow, cylindrical, metallic housing 51. In this embodiment and those to follow, rod 12 is adapted to slide along the inner bore surface of insulator 16 as rod 12 is extended from or retracted into housing 51.

The upper end of housing 51 is crimped over and to the lower end of sleeve 13 at 75. An insulated bead 52 is sweated or otherwise anchored to the lower end of rod 12. Bead 52 is adapted to slide along the inner bore surface of housing 51 as rod 12 is raised from housing 51 upon expanding antenna 50. Housing 51 is recessed along its side a substantial length by a depressed trenched surface 53. Trench 53 may extend down to the lower end of housing 51. The upper end of trenched surface 53 is provided with an opening 54. The insulated outer sheath 23 and braided outer conductor 24 are folded back or sheared off to allow the insulated covered inner conductor 25 to extend through opening 54 and into the interior of housing 51 at the antenna connecting end of cable 22. The inner end of inner conductor 25 is bared of insulation 26 and soldered to an electrical conducting resilient split washer 55 suspended over rod 12 near the top of housing 51. Washer 55 is slidably mounted over rod 12 to effect electrical contact thereto. A cylindrical insulating bead 70 is anchored to the inner surface of housing 51 by conventional means such as being crimped at 56 to radial reinforced projections 71 along the outer surface of bead 70. Washer 55 is anchored to bead 70 by opposed flanges 74, 74 engaged against opposed surfaces of bead 70. Bead 70 suspends washer 55 in housing 51 adjacent opening 54. As rod 12 is extended from or retracted into housing 51, rod 12 slides along the inner bore surface of washer 55 mounted thereon. Extension of rod 12 is arrested when bead 52 engages the lower end of washer 55. However, to prevent such engagement from actually happening, a stop not shown may be provided elsewhere in the structure so that bead 52 approaches washer 55 but does not hit against it.

In order to facilitate assembly of the antenna, the housing 51 is divided into upper and lower portions which are telescoped one within the other as shown at 51*a*, the two portions being secured to one another, for example, by peening.

Washers 52, 55 maintain rod 12 in coaxial relationship in respect to housing 51. Shielded braid 24 is folded back and soldered to housing 51 in the region of opening 54 to complete a ground connection and also to shield opening 54. Longitudinal recess 53 serves as a trench into which cable 22 may be inserted upon passing housing 51 and cable 22 through fender opening 33 when attaching antenna 50 to the automobile. Recess 53 is dimensioned so that when cable 22 is recessed therein, very little, if any, of cable 22 projects beyond the periphery of housing 51. This clears the cable and housing upon downward insertion through opening 33 from the top of the automobile fender. The outer cylindrical wall of washer 52 is provided with a trench-like recess 57 adapted to ride along the confronting inner surface of trench 53, as shown in Fig. 7, as rod 12 is extended or detracted with respect to housing 51.

The embodiment of Fig. 6 illustrates another disappearing type antenna 58 for achieving the objects of the instant invention. In this embodiment, a cylindrical housing 60 carries a longitudinally extending metallic tube 61 fastened to housing 60 by any known method, such as, braising. Metallic tube 61 serves as a shielding conductor. The upper end of metallic tube terminates adjacent an opening 59 at the upper end of housing 60. The lower end of metallic tube 61 is turned inwardly and extends into an opening 62 near the bottom end of housing 60. The inwardly turned lower end of tube 61 extends into the interior of housing 60 and continues downwardly to terminate near the lower end of housing 60. Cable 22 is brought into the lower opened end of housing 60. Outer insulating sheath 23 extends part way into housing 60 but is cut off adjacent the end of tube 61. Braided outer conductor 24 is folded back and disposed to effect good electrical contact with the inner surface of housing 60 adjacent its lower opened end. If desired, braid 24 may be soldered to housing 60. The lower end of housing 60 may be crimped to hold cable 22. Insulated inner conductor 25 of cable 22 extends through metallic tube 61. Inner conductor 25 projects out from the upper end of tube 61 and into the interior of housing 60 via opening 59. The bared end of conductor 25 is soldered to washer 55.

The embodiment of Fig. 6 may be inserted through the same fender structure opening as contemplated hereinbefore. A metallic patch, a piece of metal such as tin 63, may be soldered or braised over the exposed portion of insulated inner conductor 25 where it extends out from tube 61 and through hole 59. Tin 63 shields the otherwise exposed segment of insulated conductor 25. The top end of housing 60 is crimped to a sleeve 13 into which expandible contractable antenna rods 11, 11', 12 extend as described hereinbefore. In this embodiment, it will be noted that washer-bead structure 55, 70 is turned so that resiliently split portion of washer 55 projects upwardly rather than downwardly, as shown in Fig. 5. Bead 70 is crimped to housing 60. Antenna rod 12 slides within the inner bore surface of washer 55 upon extension or retraction with respect to housing 60. Bead 52 is anchored to the bottom end of rod 12 and does not have a recessed trench as in the embodiment

of Fig. 5. It is understood that bead 52 slides along the inner bore surface of housing 60 upon movement of rod 12.

The embodiment of Fig. 8 applies to another version of disappearing type antenna. In this instance antenna 65 is provided with a housing 66 which does not have a trench such as 53 or an outer tubing such as 61. Housing 66 has a narrowed diametered upper portion 67 joined by a curved shoulder to a larger diametered main portion 68. An opening 69 is provided at the curved shoulder portion of housing 66. Cable 22 is brought up to opening 69, at which point sheath 23 and braided conductor 24 are cut back such that braided conductor is soldered to housing 66 around opening 69. The insulated inner conductor 25 extends through opening 69 and into the interior of housing 66. The end of inner conductor 25 is bared of insulation 26 and soldered to resilient washer 55 slidably mounted over rod 12. As noted hereinbefore, bead 70 is anchored to housing 66 by crimping such as at 56 and suspends washer 55 so that rod 12 slides therein upon extension or retraction with respect to housing 66. The lower end of rod 12 is provided with bead 52 slidable along the inner bore surface of housing 66, as shown in Fig. 6.

It will be understood that the D.C. ground circuit includes braid 24 conductively connected to housings 51, 60 or 66. The housings in turn are conductively connected to sleeve 13. The ground may be completed through arms 18, 18' in contact with the under surface of wall 31. Hence arms 18, 18' are made preferably of conducting materials. The same applies for the embodiment of Fig. 1 except housings are not used.

Curved supporting shoulders 72, 72' on the opposed sides of sleeves 13 are disposed immediately below the convex lower edges 20. Shoulders 72, 72' are adapted to support arms 18, 18' when the arms are firmly clamped to wall 31 to prevent shearing of metallic pivots at 21, 21'. Each arm 18, 18' may be provided with a lateral ledge 73, 73' to effect support of the arms by shoulder 72, 72'.

With respect to economy of manufacture, it should be noted that rods 11, 11', 12 and sleeve 13 are adapted for use in either of the embodiments hereinabove described. The embodiments differ only in that for the first version, crimp sleeve 27 is used to connect cable 22 to antenna 10, whereas in the other instances the relatively long housings 51, 60, 66 serve to encase a substantial portion of the antenna and effect connection to cable 22. In all instances it will be noted that the usual coaxial connector used to effect connection between cable and antenna has been eliminated. Of prime importance, the embodiments incorporate features which permit attachment of the antenna from the top of the automobile.

With respect to the embodiments of Figs. 5, 6 and 8, it will be understood that insulator member 16 is pressed fit within the sleeve 13 so that these bodies remain fixed relative to each other as rod 12 slides within the inner bore of member 16.

Since many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. An automobile antenna adapted to be secured at an opening in closely spaced reinforced automobile structure which structure includes two separately spaced upper and lower walls having aligned openings comprising, a plurality of longitudinal rods one slidably suspended within another and defining an extensible retractable antenna, a sleeve having a threaded upper end and through bore mounted in coaxial relationship over the lower end of the outer antenna rod, insulating means mounted coaxially between said outer rod and sleeve and electrically insulating same, said sleeve having opposed flat outer surfaces extending longitudinally intermediate its upper and lower ends, toggle means having opposed arms, each arm being pivotally mounted along respective flat surfaces and adapted to rock about an axis normal to the longitudinal axis of said antenna rods, said arms having lateral upper edges and a convex lower edge with oblique end portions inclined toward said upper edges, electrical conducting coaxial cable having an outer conductor electrically connected to said sleeve and an inner conductor insulated therefrom and electrically connected to said antenna rods, the largest diameter of said sleeve being approximately equal to but slightly less than the diameter of the opening, the lower end of said antenna being adapted to pass through said opening from the top surface of said upper wall for engaging the upper edges of said pivotal arms with the under surface of said upper wall, and means for threadedly engaging said sleeve and bearing against said top surface of said upper wall and cooperating with said arms to clamp said antenna to said automobile structure, whereby said antenna may be attached to an automobile from the outside thereof by pivoting said arms into alignment with said longitudinal axis and downwardly inserting said joined cable and portion of said sleeve through said opening until said arms are disposed to engage the under surface of said upper wall, said arms being realigned to extend laterally to clamp against said under surface.

2. Apparatus as defined in claim 1 wherein, said sleeve being stepped diametered at the lower bore end, a metallic crimp sleeve seated in the stepped diametered end of said sleeve, the outer conductor of said cable being braided, said cable having an insulating sheath over said braid and being cut back but extending part way into the bore of said crimp sleeve, said braid also extending part way into the crimp sleeve and being folded back and disposed to make good electrical contact therewith, the insulated inner conductor of said cable protruding into said crimp sleeve past the folded back braid and secured to the lower end of said lowermost rod to provide a good electrical contact therewith, the lower end of said sleeve being crimped to said crimp sleeve and said crimp sleeve being crimped to said cable, whereby said cable is held fast to said antenna.

3. An automobile antenna adapted to be secured to automobile structure having closely spaced upper and lower walls which walls incorporate aligned openings comprising, a plurality of longitudinal rods one suspended within another and defining extensible and retractable antenna for radio reception, a sleeve having a threaded upper end and through bore mounted in coaxial relationship over the outer rod of said plurality, insulating means mounted between said outer rod and sleeve and electrically insulating same, said sleeve having opposed flat outer surfaces extending longitudinally intermediate its upper and lower ends, toggle means having opposed arms, each arm being pivotally mounted along respective flat surfaces and adapted to rock about an axis normal to the longitudinal axis of said antenna rods, each arm having an upper clamping edge and also having a convex lower edge with oblique end portions inclined toward the transverse upper edge thereof, a housing of conducting material depending from the lower end of said sleeve and having a longitudinal inner bore of sufficient axial length to receive said rods in coaxial relationship within said bore when said rods are in substantially full retracted position, said housing having a recessed trench extending longitudinally along at least a portion thereof, said housing surface having a through hole communicating with said trench, an electrical conducting coaxial cable having an inner conductor insulated from an outer braided conductor, both conductors being in coaxial relationship within an

outer insulated sheath, said braided conductor being folded back and electrically connected to said housing at said hole, said insulated inner conductor extending through said hole and having its end sheared of insulation and electrically connected to said rods, said antenna being adapted to pass through said openings from the top surface of said upper wall for engaging the upper edge of said arms with the under surface of said upper wall, and means for threadedly engaging said sleeve and bearing against the top surface of said upper wall and cooperating with said arms to clamp said antenna to said automobile structure, the diameter of said housing being approximately equal to but slightly less than the diameter of said openings, whereby said antenna may be attached to an automobile by passing the housing axially through said wall openings until said arms are disposed between said walls to engage said upper wall under surface, said cable being adapted to seat within said trench and thereby being recessed at least partially within the periphery of said housing to permit unobstructive insertion of said cable and housing through said openings upon mounting said antenna to said automobile.

4. Apparatus as defined in claim 3 wherein, the upper end of said housing is crimped to the lower end of said sleeve, a resilient electrical conducting element mounted over said outer rod and allowing slidable extensible and retractable movement of said rod with respect to said housing, an insulated bead anchored to the inner bore surface of said housing for suspending said element in relatively fixed position in said housing juxtaposed said housing hole, and a second insulated bead anchored to the lower end of said rod and slidable along said inner bore surface of said housing.

5. An automobile antenna adapted to be secured to automobile structure having closely spaced upper and lower walls which walls incorporate aligned openings comprising, a plurality of longitudinal rods one suspended within another and defining an extensible and retractable antenna for radio reception, a sleeve having a threaded upper end and through bore mounted in coaxial relationship over the outer one of said rods, insulating means mounted between said outer rod and sleeve and electrically insulating same, said sleeve having opposed flat outer surfaces extending longitudinally intermediate its upper and lower ends, toggle means having opposed arms, each arm being pivotally mounted along respective flat surfaces and adapted to rock about an axis normal to the longitudinal axis of said antenna rods, each arm having an upper clamping edge and also having a convex lower edge with oblique end portions inclined toward the upper edge thereof, a housing of conducting material depending from the lower end of said sleeve and having a longitudinal inner bore of sufficient axial length to receive said rods in coaxial relationship within said bore when said rods are in substantially fully retracted position, said housing having an outer surface provided with axially spaced apart through holes, respective ones of said holes being adjacent upper and lower ends of said housing, a hollow tubular conducting member extending axially along said outer surface of said housing, the upper end of said tubular member terminating adjacent said upper housing hole, the lower end of said tubing being turned inwardly through said lower housing hole and extending into said housing and terminating adjacent the lower end thereof, an electrical conducting coaxial cable having an inner conductor insulated from an outer braided conductor, both conductors being in coaxial relationship within an outer insulated sheath, said cable extending into the lower opened end of said housing and the sheath thereof being cut off therein, said braided conductor extending part way into the lower opened end of said housing and being folded back and disposed to make a good electrical connection thereto, said insulated inner conductor extending through said tubular member from the lower end thereof and out from its upper end and through the adjacent upper housing hole, said inner conductor having an end stripped of insulation and being conductively connected to said outer rod, and means for threadedly engaging said sleeve and bearing against the top surface of said upper wall and cooperating with said arms to clamp said antenna to said automobile structure, the combined diameter of said housing and suspended tubular member being slightly less than the diameter of said wall openings, whereby said antenna may be attached to an automobile by passing the housing vertically through said wall opening until said arms are disposed between said walls to engage said upper wall under surface.

6. An automobile antenna adapted to be secured to automobile structure having closely spaced apart upper and lower walls which walls incorporate aligned openings comprising, a plurality of longitudinal rods one suspended within another and defining an extensible and retractable antenna for radio reception, a sleeve having a threaded upper end and a through bore mounted in coaxial relationship over the outer one of said rods, insulating means mounted between said outer rod and sleeve and electrically insulating same, said sleeve having opposed flat outer surfaces extending longitudinally intermediate its upper and lower ends, toggle means having opposed arms, each arm being pivotally mounted along respective flat surfaces and adapted to rock about an axis normal to the longitudinal axis of said antenna rods, each arm having an upper clamping edge and also having a convex lower edge formed by oblique ends turned toward the upper edge thereof, a housing of conducting material depending from the lower end of said sleeve and having a longitudinal inner bore of sufficient axial length to receive said rods in coaxial relationship within said bore when said rods are in substantially fully retracted position, said housing having an outer surface defining a narrow diametered upper portion joined to a larger diametered lower portion by a curved shoulder and also having a through opening at said shoulder, a resilient conducting element coaxially mounted over said outer rod and allowing slidable extensible and retractable movement of said rods in respect to said housing, an insulated bead anchored to the inner bore surface of said housing for suspending said element in a relatively fixed position adjacent said curved shoulder, a second insulated bead anchored to the lower end of said outer rod and slidable along the inner bore surface of said housing, an electrical conducting cable having an outer sheath cut back and terminating at said shoulder opening and also having a braided outer conductor folded back and joined to said housing about said shoulder opening, said cable also having an insulated inner conductor extending coaxially through said braided conductor into the interior of said housing through said shoulder opening and having the insulation thereof sheared to permit electrical connection of the end of said inner conductor to said element, and means for threadedly engaging said sleeve and bearing against the top surface of said upper wall and cooperating with said arms to clamp said antenna to the automobile structure, whereby the antenna may be attached to the automobile by passing the housing vertically through said wall openings until said arms are disposed between said walls to engage said upper wall under surface.

7. An antenna adapted to be secured to a wall of an automobile structure, which wall includes an opening to allow insertion of the antenna from the top surface thereof when securing the antenna to the automobile structure comprising, a plurality of longitudinal antenna rods suspended one within another and defining an extensible and retractable radio antenna, a sleeve having opposed upper and lower ends and an inner through bore, said sleeve being mounted in coaxial relationship over the outer one of said rods, insulating means between said outer rod and sleeve, clamping means mounted to said sleeve, a housing depending from the lower end of said sleeve and having an axial bore to receive said antenna rods when

they are in a retracted position, said antenna rods being in extended position upon withdrawal of said rods longitudinally from said housing bore and being in retracted position upon insertion of said rods into said housing bore, means in said housing for maintaining said rods in substantially coaxial relationship with respect to said housing bore when said rods are in retracted position, an electrical transmission line cable for coupling said antenna to an electrical apparatus, means on said housing for coupling said cable to said antenna and allowing said cable to extend generally parallel to and substantially against the outer surface of said housing in the region where such coupling is effected, and means operatively associated with said sleeve and cooperating with said clamping means for engaging said clamping means against the underneath surface of said automobile wall structure, whereby the antenna may be firmly secured to the automobile structure by passing the lower end of said housing and coupled cable axially through the wall opening until said clamping means are disposed underneath the automobile structure wall for the purpose of engaging said wall in clamping relationship.

8. An antenna adapted to be secured to a wall of an automobile structure, which wall includes an opening to allow insertion of the antenna from the top surface thereof when securing the antenna to the automobile structure comprising, a plurality of longitudinal antenna rods suspended one within another and defining an extensible and retractable radio antenna, a sleeve having opposed upper and lower ends and an inner through bore, said sleeve being mounted in coaxial relationship over the outer one of said rods, insulating means between said outer rod and sleeve, clamping means mounted to said sleeve, a housing of electrically conducting material depending from the lower end of said sleeve and having an axial bore to receive said antenna rods when they are in a retracted position, said antenna rods being in extended position upon withdrawal of said rods longitudinally from said housing bore and being in retracted position upon insertion of said rods into said housing bore, means in said housing for maintaining said rods in substantially coaxial relationship with respect to said housing bore and including an electrically conducting element slidably engaging the outer rod, said element being fixed in position relative to said housing bore, a radio frequency transmission line cable for coupling said antenna to a radio, means on said housing for coupling said cable to said antenna and allowing said cable to lie generally parallel to and substantially against the outer surface of said housing in the region where such coupling is effected, and means operatively associated with said sleeve and cooperating with said clamping means for engaging said clamping means against the underneath surface of said automobile wall structure, whereby the antenna may be firmly secured to the automobile structure by passing the lower end of said housing and coupled cable axially through the wall opening until said clamping means are disposed underneath the automobile structure wall for the purpose of engaging said wall in clamping relationship.

9. An antenna as defined in claim 8, wherein said housing has an outer surface provided with a recessed trench extending longitudinally along at least a portion of the length thereof and also having a through passage communicating with said trench, said cable having an insulated inner conductor passing through said housing passage, said inner conductor being conductively connected to said conducting element, said cable being adapted to seat within said trench and thereby being recessed at least partially within the periphery of said housing surface to permit unobstructive insertion of said cable and housing through the automobile wall opening upon mounting the antenna to the automobile.

10. An antenna as defined in claim 9, further including conductive means surrounding said housing passage for electrically shielding the aforesaid conductive connection of said inner conductor and element against spurious signals.

11. An antenna as defined in claim 8, wherein said housing has a through passage, said cable having an insulated inner conductor passing through said housing passage, said inner conductor being conductively connected to said conducting element, and conductive means surrounding said housing passage for electrically shielding the aforesaid conductive connection of said inner conductor and element against spurious signals.

12. Apparatus as defined in claim 11, wherein said clamping means includes a rockable arm having a clamping edge, said arm being adapted to rock from one position wherein said arm is inclined toward alignment with the axis of said rods to permit insertion of the antenna through the automobile wall opening from the top surface thereof to a second position wherein the arm is realigned so that the edge thereof extends transversely with respect to the axis of said rods so as to overlap the wall opening in order to clamp against the underside of the structure wall.

13. Apparatus as defined in claim 12, wherein said housing has an outer surface provided with a recessed trench extending longitudinally along at least a portion thereof, the upper end of the trench communicates with said housing through passage, said cable being adapted to seat within said trench and thereby being recessed at least partially within the periphery of said housing surface to permit unobstructive insertion of said cable and housing through said wall opening upon mounting the antenna to the automobile.

14. An antenna adapted to be secured to an automobile structure, which structure includes a wall having an opening therein, said antenna comprising a plurality of longitudinal antenna rods suspended one within another and forming an extensible and retractable radio antenna, a sleeve having opposed upper and lower ends and an inner through bore, said sleeve being mounted in coaxial relationship over the outer one of said rods, insulating means between said outer rod and sleeve, a clamping arm mounted to said sleeve and adapted to rock about an axis normal to the longitudinal axis of said antenna rods, said arm having an upper edge and also having a convex lower edge with oblique end portions adjoining said upper edge, a housing of electrically conducting material depending from the lower end of said sleeve and having an inner longitudinal bore of sufficient axial length to receive said antenna rods when they are in substantially full retracted position, said antenna rods being extensible by withdrawal of said rods longitudinally from said housing bore and retractable by insertion of said rods into said housing bore, means in said housing for maintaining said rods in substantially coaxial relationship with respect to said housing bore, said means including an electrically conducting element slidably engaging the outer rod and supported in fixed position relative to said housing bore by a non-conductive washer supported by said housing, means operatively associated with said sleeve and cooperating with said clamping arm for engaging said lateral edge thereof against the underneath surface of said automobile wall structure, said housing having an outer surface provided with a recessed trench extending longitudinally for at least a portion of its length and also having a through passage communicating with said trench, a radio frequency transmission line cable having an insulated inner conductor passing through said housing passage, said inner conductor being conductively connected to said conducting element, said arm being adapted to rock from one position wherein said edge thereof is inclined toward alignment with the axis of said rods to permit insertion of the antenna through the automobile wall opening from the top surface thereof to a second position wherein said edge thereof extends generally perpendicular with respect to the axis of said rods

so as to overlap said wall opening, said arm being rocked to its second position after the antenna housing is passed axially through said opening until said arm is disposed behind said wall, said cable being adapted to seat within said trench and thereby being recessed at least partially within the periphery of said housing surface to permit unobstructive insertion of said cable and housing through said wall opening upon mounting the antenna to the automobile.

15. An antenna adapted to be secured to a wall of an automobile structure, which wall includes an opening to allow insertion of the antenna from the top surface thereof when securing the antenna to the automobile structure comprising, a plurality of longitudinal antenna rods suspended one within another and forming an extensible and retractable radio antenna, a sleeve having opposed upper and lower ends and an inner through bore, said sleeve being mounted in coaxial relationship over the outer one of said rods, insulating means between said outer rod and sleeve, clamping means mounted to said sleeve, a housing of electrically conducting material depending from the lower end of said sleeve and having a bore of sufficient axial length to receive said antenna rods when they are in a retracted position, said antenna rods being in extended position upon withdrawal of said rods longitudinally from said housing bore and being in retracted position upon insertion of said rods into said housing bore, a substantially electrically nonconductive washer in fixed position relative to said housing bore and supporting an electrically conducting element in slidable engagement with the outer rod, a substantially electrically nonconductive washer mounted at the lower end of said outer rod and adapted to slide along the bore of said housing upon extending and retracting movement of said outer rod, said washers cooperating to maintain said rods substantially coaxial with respect to said housing bore when said rods are in retracted position, a radio frequency transmisison line cable for coupling said antenna to a radio, means on said housing and including a passage therethrough for coupling said cable to said antenna and allowing said cable to lie substantially parallel with and in substantial engagement with the surface of said housing in the region where such coupling is effected, and means operatively associated with said sleeve and cooperating with said clamping means for engaging said clamping means against the underneath surface of said automobile wall structure, whereby the antenna may be firmly secured to the automobile structure by passing the lower end of said housing and coupled cable axially through the wall opening until said clamping means are disposed underneath the automobile structure wall for the purpose of engaging said wall in clamping relationship.

16. An automobile antenna adapted to be secured to a wall of an automobile structure, which wall includes an opening to allow insertion of the antenna from the top surface thereof when securing the antenna to the automobile structure comprising, a plurality of longitudinal antenna rods suspended one within the other and forming an extensible and retractable radio antenna, an outer body member having an inner bore of sufficient axial length to receive said antenna rods when they are in a retracted position, said antenna rods being in extended position upon withdrawal of said rods longitudinally from said member and being in retracted position upon insertion of said rods into the bore of said member, insulating means between said outer rod and member, means in said member for maintaining said rods in substantially coaxial relationship with respect to the bore of said member and including an electrically conducting element slidably engaging the outer rod coaxially extending therethrough, clamping means mounted to said member near its upper end, said member having an outer surface provided with a through passage for receiving a radio frequency transmission line cable for coupling the antenna to a radio wherein the inner conductor of the cable is adapted for conductive connection with said conducting element, said housing passage allowing said cable to bear substantially flush to the outer surface of said housing in the region of said passage, and means operatively associated with said member and cooperating with said clamping means for engaging said clamping means against the underneath surface of said automobile wall structure, whereby the antenna may be firmly secured to the automobile structure by passing the lower end of said member axially through the wall opening until clamping means are disposed underneath the automobile structure wall for the purpose of engaging said wall in clamping relationship.

17. Apparatus as defined in claim 16 wherein said means in said member comprising, a substantially electrically nonconductive washer supporting said conducting element, said washer being in fixed position relative to the bore of said member, said member also having a recessed trench extending axially along at least a portion of its outer surface, said passage communicating with said trench wherein the cable is adapted to seat in said trench and thereby being recessed substantially within the periphery of the surface of said member to permit unobstructive insertion of the cable and member through the automobile wall opening upon mounting the antenna to the automobile.

18. Apparatus as defined in claim 16 wherein said means in said member comprising, a substantially electrically nonconductive washer supporting said conducting element, said washer being in fixed position relative to the bore of said member, a hollow tubular conducting member extending axially along the outer surface of said member, said tubular member having one end terminating adjacent said through passage, said tubular member being adapted to receive the radio frequency transmission line cable for coupling the antenna to a radio wherein the inner conductor of the cable passes through said tubular member and through the housing passage for conductive connection with said conducting element.

References Cited in the file of this patent

UNITED STATES PATENTS

2,509,563	Grashow	May 30, 1950
2,836,648	Cejka	May 27, 1958