June 25, 1957 J. H. CONE 2,797,413

EXTENSIBLE AND RETRACTABLE RADIO ANTENNA

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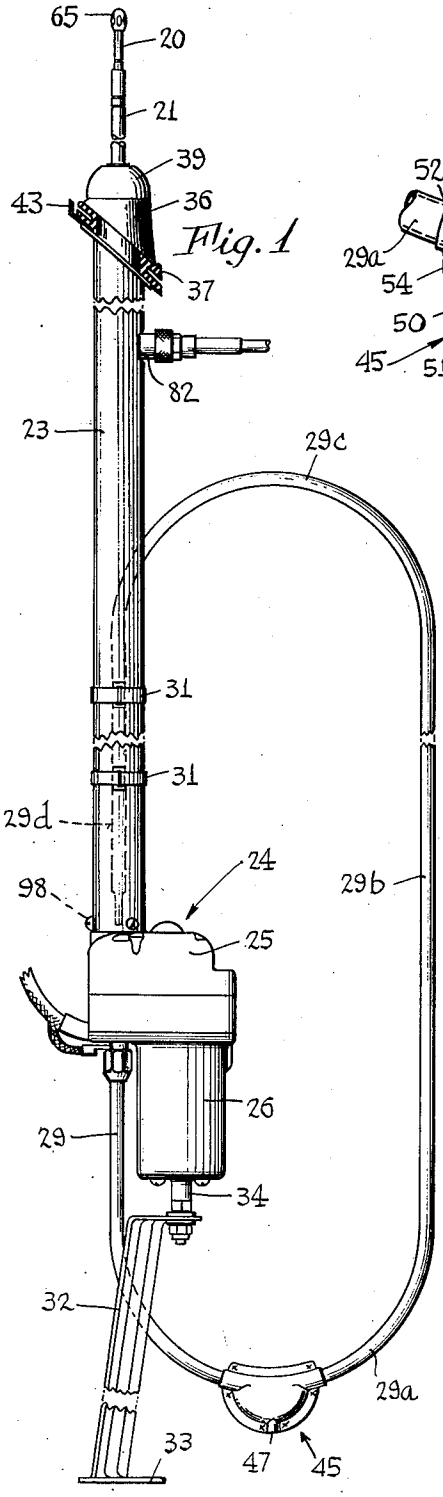


Fig. 1

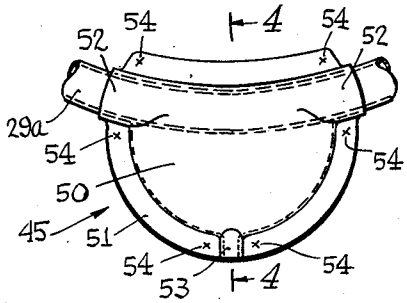


Fig. 3

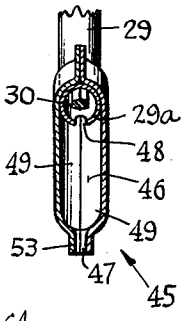


Fig. 4

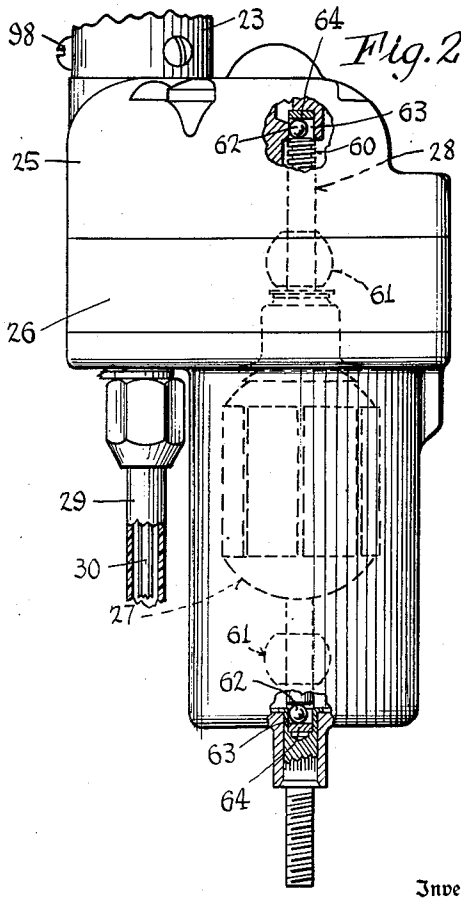


Fig. 2

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Fig. 6

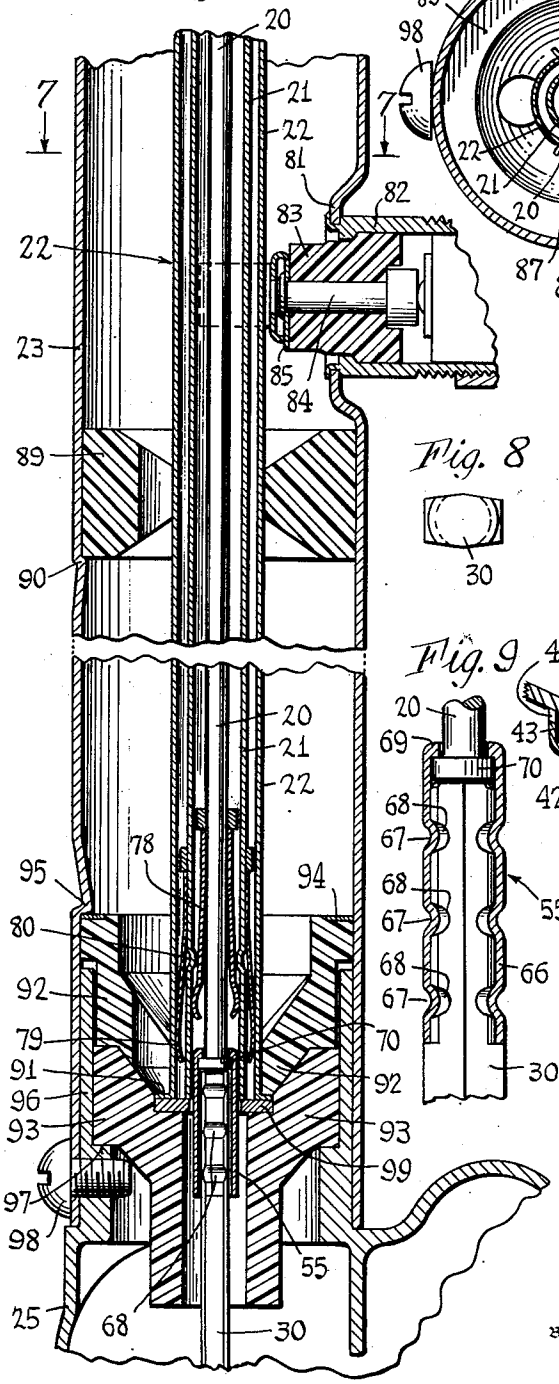


Fig. 7

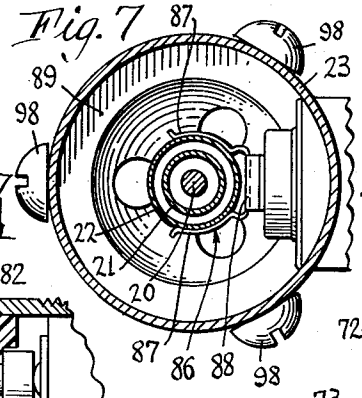


Fig. 8

Fig. 9

Fig. 5

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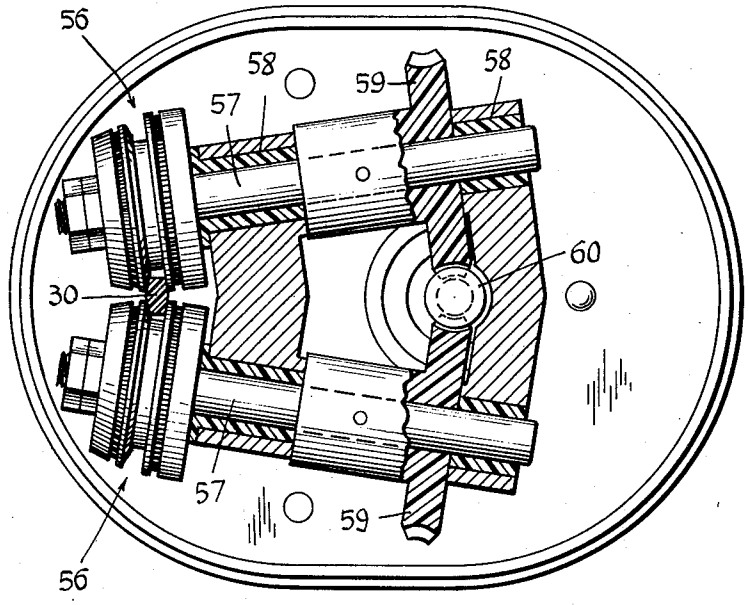
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EXTENSIBLE AND RETRACTABLE RADIO ANTENNA

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Fig. 10



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2,797,413

EXTENSIBLE AND RETRACTABLE RADIO ANTENNA

Joseph H. Cone, Bridgeport, Conn., assignor to Casco Products Corporation, Bridgeport, Conn., a corporation of Connecticut

Application May 18, 1951, Serial No. 227,006

3 Claims. (Cl. 343—901)

This invention relates to extensible and retractable telescopic radio antennas.

The invention is embodied in a power-operated automobile antenna of the type having telescoping sections actuated by an elongate push-pull strip coupled to one of the sections and driven by friction wheels powered through a worm drive from an electric motor. However, the invention is not limited to the specific structures illustrated herein, since it has utility with antennas other than that shown.

A broad object of the invention is to generally improve and simplify the construction of extensible and retractable radio antennas, particularly automobile antennas of the power-operated type.

Other objects of the invention are: the provision of improved anti-clog water-drainage means for the enclosing sheath of the driving element, to prevent water accumulation and impairment of operation of the antenna; the provision of improved and simplified antifriction thrust bearing means for the power unit; the provision of an improved slip-type connector means between the driving strip and antenna rod to enable the rod to turn freely and thereby discourage removal of the ornamental nut of the latter; the provision of improved quick-assembly clip type contact means between the antenna and lead-in to eliminate noisy reception while maintaining low fabrication costs; the provision of an improved mounting for the slidable bearing means between the telescoping sections, providing a simpler and more economical construction; the provision of an improved simplified sequence control for the telescoping sections, maintaining smaller sections housed as fully as possible in larger sections for partially raised positions of the antenna, thereby to improve the outward appearance and minimize possible bending and damage; the provision of simplified and stronger components making up the antenna; and the provision of simplified assemblies to facilitate fabrication and reduce manufacturing costs.

Other features and advantages will hereinafter appear.

In the accompanying drawings:

Figure 1 is a side elevational view of the improved radio antenna of this invention, drawn on a reduced scale.

Fig. 2 is a fragmentary view partly in elevation and partly in vertical section, showing the power and driving unit of the antenna.

Fig. 3 is a fragmentary elevational view showing the drainage means for the sheath of the antenna.

Fig. 4 is a vertical section taken on line 4—4 of Fig. 3.

Fig. 5 is a fragmentary vertical section of the upper portion of the antenna, drawn to an enlarged scale.

Fig. 6 is a fragmentary vertical section of the antenna casing and telescoping sections, with uppermost and intermediate portions omitted.

Fig. 7 is a transverse section taken on line 7—7 of Fig. 6.

Fig. 8 is an end view of the flexible driving strip of the antenna, enlarged.

Fig. 9 is a vertical section through the connector means between the driving strip and inner antenna section.

Fig. 10 is a plan view of the drive mechanism which transmits power from the motor to the flexible driving strip.

Referring to Fig. 1, the antenna embodying this invention comprises elongate movable inner and outer telescoping antenna sections **20** and **21** respectively, the latter being movably carried in a stationary elongate tubular antenna section **22**, Figs. 5 and 6, mounted in an elongate tubular casing **23**.

At its lower end the casing **23** is attached to a power and driving unit **24** comprising upper and lower casing parts **25** and **26** respectively, Figs. 1 and 2, housing an electric motor having an armature **27** carried by a shaft **28**.

Extending downward from the lower casing part **26** is a tubular sheath **29** formed of small diameter handbendable tubing such as aluminum. The sheath **29** houses a flexible friction-driven drive strip **30** preferably formed of nylon, connected with the inner movable antenna section **20** for actuating the latter and the section **21**. The sheath **29** is so constructed that it may be bent into various shapes to conform it to the space available where the installation is to be made. For example, if the antenna is to be mounted within the fender of an automobile, the sheath **29** may be advantageously formed to have a trombone shape as shown in Fig. 1, with a lower bent portion **29*a*** having a 180 degree bend, an upwardly extending portion **29*b*** which is generally straight, an upper bent portion **29*c*** having a 180 degree bend, and a downwardly extending end portion **29*d***, also generally straight.

As shown in Fig. 1, the downwardly extended portion **29*d*** of the sheath may be fastened to the casing **23** by metal straps **31**.

For purposes of mounting the antenna a strut **32** is provided, having a base **33** for attachment to the car body or fender, the upper end of the strut being fastened to a depending post **34** formed on the lower casing part **26**.

In accordance with this invention the antenna casing **23**, which is of metal tubing, is simplified and improved at its top where it passes through and attaches to the automobile body or fender, resulting in fewer parts and a desirable economy of manufacture, and also greater strength. I accomplish this as follows:

At its top the casing **23** has secured to it a threaded tubular extension **35** carrying a collar **36** which engages a rubber grommet **37** mounted in the opening of the car fender **38**. The collar **36** is held in place by a nut **39** threaded on the extension **35**, said nut carrying a bushing **40** through which the stationary outermost antenna section **22** passes.

The upper end of the casing **23** is formed by suitable tools to have an integral, outwardly extended transverse or diagonal flange **41** for engagement with the undersurface of the grommet **37**. I have found that, by the provision of the flange **41** in conjunction with the threaded tubular extension **35** which I weld to the casing **23**, a very simple and sturdy construction is obtained, and one which is practical and economical to fabricate. The flange **41** being integral with the casing **23** cannot move or slide out of place at any time, and by the use of a tubular extension which closely fits the bore of the casing **23** and welding the extension thereto a rigid and sturdy structure is obtained, as well as one in which tolerances may be closely held. As a consequence, the mounting when properly installed will not work loose or fail in

supporting the antenna adequately and without noise, rattling, etc.

In accordance with the invention, simplified and effective means are provided for establishing a ground contact between the casing **23** and the fender **38**. Referring to Fig. 5, this means comprises a resilient contact strip **42** which may be of Phosphor bronze or other suitable material, said strip being welded to the flange **41** and having an upwardly bent end portion **43** disposed beyond the edge of the grommet **37**, having prongs or tines **44** engaging the undersurface of the fender. Thus the advantage of a cushioned anti-rattle mounting is had by virtue of the rubber grommet **37**, while at the same time simple and effective electrical contact is established between the casing **23** and fender.

Under certain conditions of use, particularly in wet or damp weather, a slight amount of moisture may enter the casing **23** and pass downwardly through the casing parts **25** and **26** into the sheath **29**, as will be hereinafter brought out in more detail. By the present invention novel, advantageous water drainage means are provided for the sheath **29** to effectively remove any such moisture and thereby maintain the antenna in operative condition at all times. Referring to Figs. 1, 3 and 4, this drainage means comprises a housing **45** secured to the lowermost portion **29***a* of the sheath, providing a chamber **46** below said portion. The housing **45** has a water drain opening **47** below and communicating with the chamber **46**, and the sheath **29** has a water drain opening **48** in its lower wall, communicating with the chamber **46**.

I construct the housing **45** in an advantageous and economical manner, by forming it of sheet metal, in two identical halves. Thus the housing may be quickly stamped out, using but a single set of blanking and forming tools. The housing halves are designated **49**, each comprising a generally flat semicircular wall portion **50** bounded by a peripheral lip provided with outwardly extended flanges **51**. The lips of the housing halves are interrupted at points **52** in such a manner that when the halves are held together with their flanges in engagement circular openings will be provided through which the sheath **29** passes. The lips are also interrupted at **53** to provide the drainage opening **47** when the halves are assembled. The housing **45** is secured to the sheath **29** by assembling the halves on opposite sides of the sheath as indicated in Figs. 3 and 4, and then spot-welding the flanges **51** at the points **54**.

A drainage means constructed in the above manner is of considerable advantage if the antenna is used in places where it is subjected to rain, mud, dirt and the like. For example, when the antenna is mounted in the fender of an automobile, the sections **20**, **21** and **22** will be exposed to rain, and the sheath **29** will at times have dirt and water thrown against it.

However, the housing **45**, forming the chamber **46** below the drainage opening **48** in the sheath, provides an advantageous portection of said opening, preventing it from becoming clogged or stopped with mud and dirt. This is because the relatively small opening **47** in the housing **45** prevents mud and dirt from filling the chamber **46**. At most, the drainage opening **47** in the housing may become plugged or stopped. However, if this should occur, it will tend to clear itself as water collects in the chamber **46** and dissolves the plug. Such water will normally be clear, coming from the sheath **29** and antenna sections, and representing seepage past said sections, and condensate from within the casing **23**. Accordingly the removal at all times of water from the sheath **29** will tend to prevent impairment of operation of the antenna.

Motivation of the movable antenna sections **20** and **21** is accomplished by the flexible driving strip **30**, as already mentioned. The strip **30** is connected to the lower end of the inner movable antenna section **20** by improved means comprising a connector **55**, Figs. 6 and 9, to be described in detail later. The drive strip **30** passes between friction wheels **56**, Fig. 10, carried on divergent shafts **57** turning in bearings **58** in the lower casing part **26**. The shafts **57** have worm wheels **59** engaging a worm **60** on the end of the armature shaft **28**. It will be seen that rotation of the worm **60** and shaft **28** in one direction will raise the drive strip **30** and the antenna sections **20** and **21**, and rotation in the opposite direction will lower the strip **30** and sections **20** and **21**.

Details of the drive mechanism comprising the strip **30**, wheels **56**, shafts **57** and worm gearing **59**, **60** are described and claimed in my copending application, Serial No. 18,253, filed March 31, 1948, entitled "Projectable Antenna," now Patent No. 2,695,957, issued November 30, 1954.

In conjunction with the drive mechanism mentioned above I provide improved and simplified antifriction thrust bearing means for the armature shaft **28** of the electric motor of the antenna. Referring to Fig. 2, the shaft **28** is rotatably mounted in bearing collars **61** and at its ends engages hardened steel balls **62** carried in sockets **63**. Hardened plates **64** are disposed in the sockets **63** to engage the opposite sides of the balls **62**. By the present invention the sockets **63** are made to have a diameter substantially larger than that of the balls **62** whereby the latter will gyrate or roll in a circular path of very small diameter on the disks **64**. With this construction considerably less friction and wear is experienced by the thrust bearing assemblages, resulting in increased life and increased power available for transmission by the worm **60**. The action of the thrust bearing assemblage is substantially one of rolling friction as compared with sliding friction which characterizes thrust balls which are closely confined in their sockets and not permitted to gyrate or travel in circular paths.

By the present invention the connector **55** between the driving strip **30** and the inner antenna section **20**, see Fig. 9, enables the antenna section to turn freely about its axis at all times. By this organization unauthorized removal of the ornamental nut **65** from the antenna section **20** is made difficult for the reason that such removal requires not only turning the nut but also preventing the antenna section **20** from turning. As shown, the tubular connector sleeve **55** is secured to the end of the driving strip **30** by crimped portions **67** extending into notches **68** in the strip. The sleeve **55** has an inturned circular flange **69** at its top, in which the antenna section **20** loosely fits, the latter being provided with a head **70** loosely carried in the sleeve. Thus the antenna section **20**, being loose in the sleeve **66**, is free to turn about its axis. Accordingly, if an unauthorized person tries to remove the ornamental nut **65** he will find that turning of the nut to unscrew it will cause the rod or antenna section **20** to turn, and if means are not available to grip the rod and prevent its turning, the nut **65** will not unscrew.

By the present invention a simplified slidable bearing assemblage is provided between the relatively movable antenna sections **20**, **21** and **22**. Referring to Fig. 5, metal bushings **71** and **72** are disposed in the antenna section **21**, and metal bushings **73** and **74** disposed in the antenna section **22**. The bushings **71** and **73** abut inturned flanges at the upper ends of the antenna sections, and the bushings **72** and **74** are spaced from the bushings **71** and **73** and have annular grooves receiving inwardly displaced annular portions **75** and **76** of the antenna sections **21** and **22** respectively. Thus the bushings **72** and **74** are securely positioned in the sections **21** and **22** against movement. Between the bushings **71** and **72**, and between the bushings **73** and **74** felt backing washers **77** are disposed, for engagement with the slidable antenna sections **20** and **21**. The felt washers **77** are preferably impregnated with oil and therefore provide a substantially watertight seal between the relatively movable antenna sections while at the same time keeping friction at a minimum.

Normally the friction existing between the innermost antenna section **20** and the next antenna section **21** is less than the friction existing between the antenna sections **21** and **22**. Accordingly when the antenna sections are raised, the tendency is for the innermost section **20** to be projected upward first, out of the section **21** until it has reached the uppermost limit of movement in the section **20**. Thereafter continued application of force by the driving strip **30** will cause the innermost section **20** to pick up the next section **21** and raise the latter. This is an undesirable condition for the reason that, if the antenna is only partially raised, the innermost section **20** will be projecting by itself, and will be located in a relatively low position on the car where it can receive a blow and perhaps become bent.

In accordance with this invention novel, improved means are provided for effecting a sequence control of the movable antenna sections **20** and **21** whereby during raising of the antenna both said sections will first be raised simultaneously, with one nested in the other, and whereby the final raising movement of the antenna will be solely a movement of the innermost antenna section **20**.

In accomplishing this, referring to Fig. 6, I provide resilient bearing means between the antenna sections comprising spring fingers **78** carried by the innermost section **20** and engaging the inner surface of the next section **21**, and spring fingers **79** carried by the next antenna section **21** and engaging the outermost antenna section **22**. In conjunction with this I provide an annular constriction **80** in the wall of the antenna section **21**, adapted to be engaged by the spring finger **78** of the antenna section **20**. Such construction increases materially the friction existing between the antenna sections **20** and **21** when these are fully nested together, such friction materially exceeding the friction between the antenna sections **21** and **22**. Accordingly when the driving strip **30** is raised, it will not only raise the innermost section **20** but the said section will continuously carry with it the next antenna section **21** until the latter strikes a positive stop in the form of the bushing **74** in the antenna section **22**. Continued raising movement of the driving strip **30** will thereafter force the spring fingers **78** past the constriction **80** and result in the innermost antenna section **20** being next raised by itself.

It will be understood that the friction of the sections **20** and **21** which exceeds that existing between the sections **21** and **22**, exists only when the sections **20** and **21** are fully nested. At all other times, the friction between the innermost and next antenna sections is less than the friction between the next and the outermost antenna sections. Therefore whenever the antenna is being lowered the innermost section **20** will first be drawn in the next section **21** before the latter is pulled downward. Accordingly it will be seen that at all times the antenna is in use in partially raised position, the innermost antenna section **20** will be contained to the greatest possible degree in the next antenna section **21**.

By the present invention an improved contact assembly including clip-type contact means is provided between the outermost antenna section **22** and the leadin, effecting a simplified, economical construction, while at the same time limiting contact noises to the greatest possible degree. Referring to Figs. 6 and 7, the casing **23** is provided with a flattened portion **81** having an aperture in which a threaded sleeve **82** is secured. Within the sleeve **82** an insulating bushing **83** is fixed, carrying a central contact pin **84** having one end headed over a base portion **85** of a spring contact clip **86**. The clip **86** comprises a U-shaped part, see Fig. 7, having resilient arms **87** joined together by a yoke portion **88** overlying the base portion **85**. As seen in Fig. 6, the base portion **85** is folded back on the yoke portion **88** in fabricating the clip, to provide a resilient mounting for the arms **87**, thereby obtaining a relatively great amount of flexibility in a compact clip of small size. The clip arms

87 are adapted to embrace the outside of the antenna section **22** when the clip is supported by the insulating bushing **83**, as shown in Figs. 6 and 7.

In conjunction with said contact clip I provide an insulating bushing **89** in the casing **23**, positioned by an indent **90** in the casing wall, said bushing engaging the antenna section **22** and preventing relative lateral movement between said antenna section and the casing. I thus effect a rigid assembly which obviates relative movement between the contact clip and the antenna section **22**, eliminating contact noises.

By this invention a simple yet very secure and durable assemblage of components is provided at the lower end of the casing **23** whereby the antenna section **22** and upper casing part **25** may be quickly and easily fastened and securely held in their proper positions. Referring to Fig. 6, the lower end of the antenna section **22** has an outturned flange **91** engaged on opposite sides by insulating bushings **92** and **93** carried within the casing **23**. The bushing **92** has a metal backing ring or annulus **94** engaged by detent portions **95** of the casing to position the bushing and hold it securely against upward movement. the upper casing part **25** of the motor unit has a tubular upstanding portion **96** sized to closely fit in the lower end of the casing **23**, said portion having a shoulder **97** for engagement with the bushing **93** to position and hold the latter. The casing **23** and portion **97** of the casing part **25** have aligned openings to receive screws **98** which are threaded into the portion **97** to maintain it and the bushing **93** in the positions shown. The outermost antenna section **22** is thus rigidly secured to the lower portion of the casing **23** by virtue of the flange **91** being held between the bushings **92** and **93**. If desired, a metal washer **99** may be interposed between the flange **41** and the bushing **93** to provide increased bearing surface.

By the construction outlined above I have provided a generally improved and simplified power-operated extensible and retractable radio antenna which is simple, effective and reliable in operation and economical to fabricate and assemble. Electrical losses are at a minimum, noises due to poor contacts or movable contacts have been eliminated, and the entire structure is characterized by substantial durability and ruggedness, making for an extended useful life.

Variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

I claim:

1. An extensible and retractable radio antenna comprising inner and outer telescoping antenna sections; means mounting the antenna sections for longitudinally extending and retracting movement, said means having a predetermined amount of friction normally greater than the friction existing between the antenna sections themselves; drive means connected to the inner antenna section for extending and retracting the sections; and means on one section and cooperating means on the other section for coacting together only at the position of the sections when they are substantially fully nested within each other for creating a friction by reason of their coaction which causes a greater resistance to movement of the inner section in the outer section than is provided by the friction of said mounting means whereby the outer and inner sections will be extended first together and thereafter the inner section extended alone when an extending force is applied in the inner section.

2. An extensible and retractable radio antenna comprising inner and outer telescoping antenna sections; a stationary antenna section for mounting the outer antenna section for longitudinally extending and retracting movement, the friction existing between the stationary and outer sections being normally greater than that existing between the outer and inner sections; means on the inner section and cooperating means on the outer section for coacting

together only at the position of the sections when the inner section is substantially fully nested in the outer section for creating a friction by reason of their coaction which causes a greater resistance to movement of the inner section in the outer section, than between the outer section and the stationary section whereby the inner and outer sections will be extended first together and thereafter the inner section extended alone when an extending force is applied in the inner section.

3. An extensible and retractable radio antenna comprising inner and outer telescoping antenna sections; a stationary antenna section for mounting the outer antenna section for longitudinally extending and retracting movement, the friction existing between the stationary and outer sections being normally greater than that existing between the outer and inner sections; means including yieldable elements disposed between the telescoping antenna sections for providing greater resistance to movement of the inner section in the outer section than between the outer section and the stationary section only when the sections are substantially fully nested within each other whereby the inner and outer sections will be extended first together and thereafter the inner section extended alone when an extending force is applied in the inner section and in which the means comprises an inward projection on the outer section and the yieldable elements comprise resilient fingers mounted on the inner section for engagement with the projection.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,797,413 June 25, 1957

Joseph H. Cone

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 57, for "portection" read -- protection --; column 5, line 52, for "in" read -- into --; column 8, line 15, list of references cited, under "UNITED STATES PATENTS", for the patent number "2,391,302" read -- 2,391,202 --.

Signed and sealed this 15th day of October 1957.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents