June 11, 1957 T. E. MARION 2,795,304

EXTENSIBLE ANTENNA

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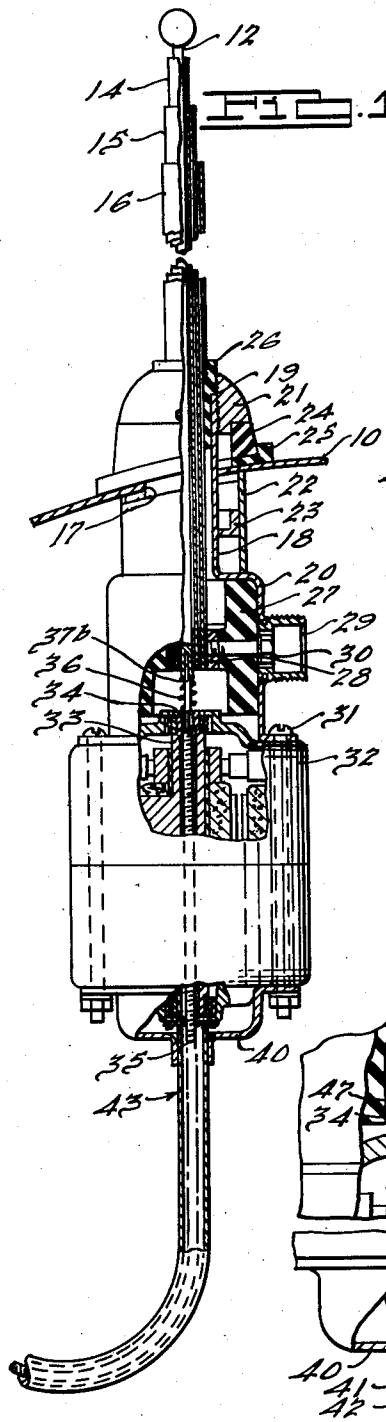


Fig. 1.

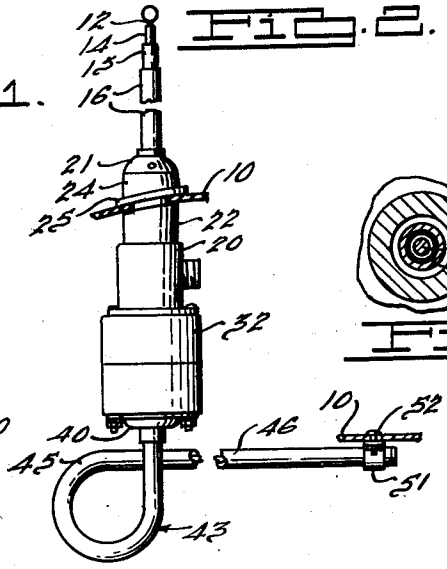


Fig. 2.

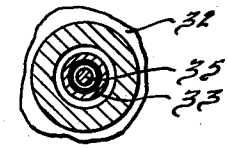


Fig. 5.

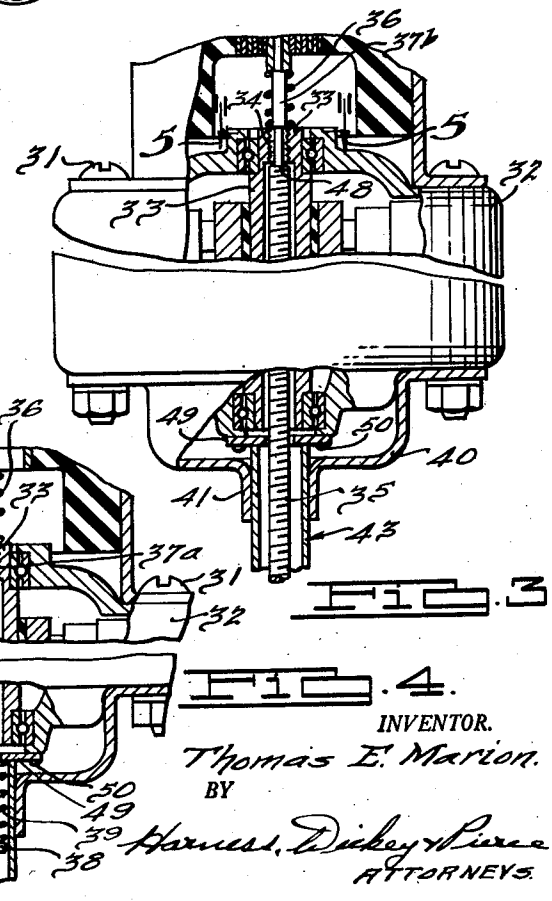


Fig. 3

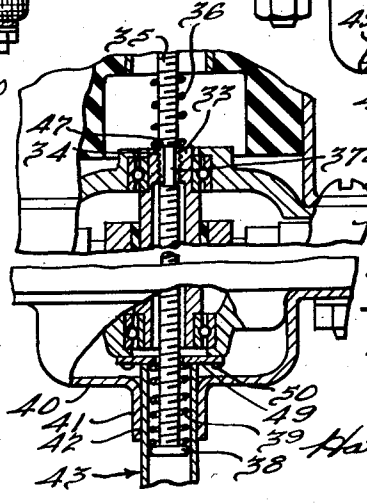


Fig. 4.

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EXTENSIBLE ANTENNA

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1 Claim. (Cl. 189—26)

This invention relates to extensible and retractable radio antennas and particularly to an improved actuating mechanism therefor, especially adapted for use on motor vehicles, or in other places where operation of the antenna from a remote point may be necessary or desirable.

In the prior art, electrically driven extensible antennas have generally been controlled, and made to stop at the desired end points of extension and retraction, by the use of limit switches. The cost of construction, assembly and installation of such limit control mechanisms has been prohibitive, and in fact constitutes one of the reasons that electrically driven antennas have met with less favor than other types.

The principal object of this invention is to provide novel and improved means, of simple and rugged character, whereby telescoping antenna sections and the like may be operated, to extend and retract the same, so that no damage can be done to the operating parts in the event of an attempt to drive the antenna beyond the fully extended or retracted position by means of the power actuating mechanism, yet wherein the necessity for utilization of limit switches, and the attendant wiring thereof, are eliminated.

Another object of the invention is to provide an improved actuating mechanism for telescoping antennas which is positive in action both during extension and retraction of the antenna and which is constructed to prevent any jamming at the fully extended or retracted position of the antenna.

It is a further object to provide a radio antenna embodying improved actuating means for extending and retracting it which is characterized by its low cost and simplicity of construction, as well as its ease of operation.

Other objects and advantages of the invention will be apparent from the following specification, the drawings relating thereto, and from the claim hereinafter set forth.

In the drawings:

Figure 1 is a side elevational view, partly in cross section, showing the operative parts of the improved antenna and its associated mechanism in its retracted position;

Fig. 2 is a side elevational view of a telescopic antenna assembly constructed in accordance with the present invention showing the same installed;

Fig. 3 is a fragmentary elevaitonal view, partly in cross section, showing the operative parts of the actuating mechanism in the retracted position;

Fig. 4 is a fragmentary elevational view, partly in cross section, showing the operative parts of the actuating mechanism in the extended position; and

Fig. 5 is a cross sectional view taken substantially on the line 5—5 of Fig. 3 and looking in the direction of the arrows.

Referring now to the drawings, the invention has been shown herein as embodied in an automobile installation; however, it may also be used in a variety of other installations. The preferred form shown is adapted to be mounted on a supporting structure **10** which may comprise, for example, a body or fender portion of a motor

vehicle. The antenna structure itself may be one of the telescopic types having a plurality of sections, the construction and arrangement of which is well known in the art and need not be considered in detail herein. Briefly, the antenna proper consists of a plurality of slidable tubular telescopic members **14, 15** and **16**, and an inner cylindrical member **12**, the outer member **16** being fixedly mounted on the supporting structure **10** by means described infra. It will be understood that the relative travel of each telescopic member with respect to its next adjacent member is limited so that as each reaches the end of its relative travel it can thereafter move only in conjunction with such adjacent member.

The supporting structure **10** is provided with an aperture **17** through which upwardly projects a cylindrical shell **18** having an upper threaded portion **19** extending above the supporting structure **10**, and an enlarged cylindrical portion **20** spaced below the supporting structure **10**. The shell **18** is securely fastened to the supporting structure **10** by means of a dome nut **21**, threaded on portion **19**, co-acting with a spacer **22**, which is located between the underside of the supporting structure **10** and enlarged cylindrical portion **20**. An annular member **23** is provided inside spacer **22** to maintain the spacer in concentric relation with shell **18**. The dome nut **21** abuts a neckpiece **24** of insulating material, the lower side of which engages a sealing gasket pad **25**. The antenna member **16** is supported in the upper end of the shell **18** by the co-action of an insulating bushing **26** mounted within the dome nut **21** and the threaded portion **19** of shell **18**.

The lower end of antenna member **16** is supported in the enlarged portion **20** of shell **18** by the co-action of insulating block **27** of circular shape, and tubular metallic insert **28**. The enlarged portion **20** supports a threaded nipple **29** in a transverse aperture on a level with the tubular metallic insert **28**. A locking bolt **30** extends transversely through the nipple **29** and the insulating block **27**, and is threadably engageable with insert **28**, the inner end of the locking bolt serving to firmly anchor the lower portion of antenna member **16**. The nipple **29** serves as a lead-in terminal to receive the lead-in cable coupling nut of a transmission line (not shown) to the radio apparatus. The lower end of enlarged portion **20** is open and outwardly flanged and is rigidly secured by screws **31** to the upper end of the housing of a rotary-type driving device shown as an electric motor **32**. The motor **32** may be of any conventional construction, but should be adapted to operate upon the normal current supply available from the vehicle battery.

The armature shaft **33** of the motor **32** is tubular in form and near one end it is reduced in internal diameter and internally threaded to define a driving nut portion **34**, the shaft being open at both ends of the motor and coaxial with the antenna rod assembly. An externally threaded driving member **35**, threadably engageable in and extending through the nut portion **34**, is attached at its upper end to the inner member **12** of the antenna and extends downwardly through the tubular shaft **33** and a coaxial sheathing tube **43**. A helical spring **36** is concentrically mounted around the driving member **35**, and the upper end of the spring is engageable by the lower end of antenna **12**.

The externally threaded driving member **35** may be formed as a wire from any flexible insulating but substantially inelastic material such as "nylon." The driving shaft or member **35** is threaded throughout its entire length with the exception of two portions **37*a***, **37*b***, which have a reduced diameter. Each of the reduced portions **37*a***, **37*b*** is slightly longer than driving nut portion **34** and of slightly less diameter than the minimum thread diameter, so that driving engagement is interrupted when

each such reduced portion reaches the driving nut portion. The reduced portions 37*a*, 37*b* thus define, and are located conformably to the desired positions of, the extreme limits of travel of the antenna. The lower end of the driving member 35 is formed with a diameter greater than the threaded part so as to provide an abutment 38. A helical spring 39, shown as mounted at the lower end of and concentric with the armature shaft 33, is engageable by the abutment 38 on the lower end of driving member 35 at the limit of upward antenna movement, and the parts are positioned so that when spring 39 is partly compressed, reduced portion 37*a* registers with nut portion 34. Similarly, when reduced portion 37*b* is in registry with driving nut portion 34, upper spring 36 is partially compressed, and this occurs at full retraction.

An end plate 40, secured to the lower end of drive motor 32 by screws 31, has a downwardly projecting tubular central boss 41 which is provided with an axial aperture 42. A sheathing tube 43, in which driving member 35 is freely slidable, is fixedly secured to the lower end of the bearing housing of motor 32 by flange 49 and bolts 50, and extends downwardly through aperture 42 to form the loop 45 which has an extending horizontal end portion 46 fastened to the vehicle by a retainer clip 51 and bolt 52. The sheathing tube 43 may be formed of a metal or a plastic sufficiently stiff to resist distortion by the driving member 35, and it may be bent to any shape to facilitate its installation upon vehicles having different body contours. One function of the looped portion 45 of sheathing tube 43 is to prevent the driving member 35 from twisting about its own axis in response to rotation of the motor armature shaft 33, whereby the driving member 35 is forced to move upwardly and downwardly, to extend and retract the telescopic members of the antenna assembly. To insure non-rotation of driving member 35, the abutment 38 and the sheathing tube 43 may be keyed together as by means of any suitable mating non-concentric cross sectional configuration.

In operation, the antenna may be moved to its extended or retracted position by actuating the drive motor 32. As shown by Fig. 4, when the antenna members are in their extended position, the tower reduced portion 37*a* of the driving member 35 registers with the threaded bore of armature shaft 33 and spring 39 is compressed. If a drive motor 32 is permitted to continue operation when the parts are in this position, in the direction which would normally cause the antenna to extend upwardly, no extention will be effected and the armature shaft will merely ratchet harmlessly over the end of the threaded section 47 of driving member 35. To retract the antenna, the drive motor 32 is actuated in the reverse direction and the helical spring 39, which biases the driving member 35 downwardly, causes the threaded section 47 of drive member 35 to engage the threaded bore of armature shaft 33, whereby continued operation of drive motor 32 will then force the driving member 35 and antenna downwardly. When, concurrently with full retraction of the antenna, the upper reduced portion 37*b* is drawn into the bore of the armature shaft 33, the threaded engagement between the driving member 35 and armature shaft 33 will be automatically discontinued and drive motor 32 will merely ratchet harmlessly over the end of threaded section 48 of driving member 35, spring 36 being compressed. When next starting from such retracted position, the spring 36 biases the driving member 35 upwardly, insuring engagement of the end of threaded section 48 of driving member 35 with the threads of nut section 34, and continued operation of drive motor 32 will force the driving member 35 upwardly. The upward movement will stop automatically when the lower reduced portion 37*a* reaches the nut section 34 and disengages the drive motor 32 as previously explained.

While it will be apparent that the preferred embodiment of the invention herein disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope of the subjoined claim.

What is claimed is:

In combination with suitable supporting means, a slidable assembly comprising an extensible and retractable aerial section and a motion transmitting section connected to and movable with the aerial section, said motion transmitting section having a driving surface corresponding substantially to the length of the full extension and retraction travel of the aerial and having reduced non-driving portions at opposite ends of said driving surface, a driving member drivingly engageable with the driving surface of said motion transmitting section to drive the latter and the aerial section and disengageable from said motion transmitting section by running off of the ends of said driving surface and onto the non-driving portions of said motion transmitting section, an abutment appurtenant to each end of said motion transmitting section and movable therewith, said abutments being located at the opposite outer extremities of said non-driving portions, and spring means fixedly mounted with respect to said supporting means in a position intermediate the ends of said motion transmitting section and engageable by said abutments, and stressable thereby, as said motion transmitting section moves to a position of disengagement with respect to said driving member, whereby, when said driving member is actuated, said assembly may be actuated to and from a position at which such actuation is stopped automatically due to the disengaging action of the driving member at the reduced non-driving portion of the elongated motion transmitting section, said springs being so stressable prior to such disengagement, and opposing such disengagement, said elongated motion transmitting element comprising an elongated flexible and substantially inelastic threaded rod, formed of insulating material, and having two threadless portions of reduced diameters, one of such portions being located at the end of the rod adjacent said aerial and the other of such portions being located at a distance away from the first portion equal to the extensible movement of said aerial, said driving member comprising a nut threadedly engageable with said rod and held against axial travel therewith, said spring means comprising a pair of springs, one mounted on each axial side of said nut, said abutments being mounted on opposite sides of said threadless portions and one such abutment being engageable with each spring as the aerial and rod complete their axial travel.

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