UNITED STATES PATENT OFFICE

EXTENSIBLE ANTENNA CONSTRUCTION


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6 Claims. (Cl. 254—135)

The present invention relates to the construction of extensible and retractable radio aerials, particularly for vehicular installations and other applications where remote control of the action of the mechanism for extending and retracting the aerial is desirable.

An important object of the invention is to provide an improved extensible aerial construction drivable by means of an electric motor and constituting an improvement upon the disclosure of my Patent No. 2,346,728.

A further object is to provide such improved driving means including a novel centrifugally applied driving nut construction, a threaded dielectric wire drivable thereby, and improved means for preventing rotation of the wire about its longitudinal axis without preventing longitudinal travel thereof.

An object related to that last stated is to incorporate in such a device improved means for controlling the operation of the driving motor.

Other objects and advantages of the invention will become apparent upon consideration of the present disclosure in its entirety.

In the drawings:

Figure 1 is a somewhat diagrammatic side elevational view of the front portion of a motor vehicle equipped with extensible and retractable aerial means constructed in accordance with the present invention;

Figure 2 is a composite view partly in side elevation and partly in vertical section taken substantially upon the line 2—2 of Figure 1 and looking in the direction of the arrows, with parts broken away;

Figure 3 is a cross section taken substantially on the line 3—3 of Figure 2 and looking in the direction of the arrows;

Figure 4 is a sectional view upon an enlarged scale taken substantially on the line 4—4 of Figure 3 and looking in the direction of the arrows, but with the actuating wire removed;

Figures 5 and 6 are fragmentary views taken substantially on the lines 5—5 and 6—6, respectively, of Figure 2 and looking in the direction of the arrows;

Figure 7 is a cross-sectional view taken substantially on the line 7—7 of Figure 6 and looking in the direction of the arrows;

Figure 8 is a fragmentary elevational view of a modified construction; and

Figure 9 is a cross section taken substantially on the line 9—9 of Figure 8 and looking in the direction of the arrows.

Referring now to the drawings, reference char...
fender. The joint between the filler 38 and the fender may be sealed by a gasket pad as 40. At its lower extremity, the housing tube 18 is attached by screws 42 to an insulating partition and supporting disc 44 which projects upwardly and inwardly from the lower end of the tube 18. The tube 18 is also attached to a substantially coaxial and cylindrical sheet metal casing 45 of greater diameter than the tube.

A guide tube 29 which may be formed of plastic is supported by and between block 34 and disc 44 in a substantially circular manner and is in turn attached to the casing of an electric driving motor generally designated 46.

The details of the motor are not illustrated, since they form no part of my invention. The motor 48 is rigidly attached to casing 45 and the motor shaft 54 is concentric with housing tube 18. The lower end of the motor housing 50 is carried by a sheet metal bracket 57 attached by bolt means 52 to the bottom flange of the fender.

The armature shaft 55 of the motor is tubular, the axial passage therethrough being designated 70. An externally threaded actuating wire 75 is attached to the inner portion 14 of the shaft and extends downwardly in casing 45 and tubular shaft 54, being slidable in such parts. The upper end of the tubular shaft 55 projects into the casing 45, and a rotatable cage 55 is secured to the shaft within the casing 45 by means of the setscrew 56. Cage 55 is rotatable by the motor 48 which is energizable by current delivered through the lead wires 58. The cage 55 is substantially cylindrical and provided with an axial opening 59 through which the wire freely extends. A horizontal diametric channel 60 in the cage 56 extends entirely therethrough and intersects axial opening 56 perpendicularly. Channel 60 may be of square cross section. In the channel 60 are a pair of slidably central centrifugal flyweight portions 62, 64 of similar construction but symmetrically opposed in arrangement. Each flyweight portion includes an integral connecting arm as 65, 66. The arms 65, 66 extend transversely across and on opposite sides of the wire 75 but are free of the wire. Each connecting arm 65, 66 carries a half nut section as 72, 74 and each such nut section extends inwardly to overlie the opposite side of the wire from that occupied by the integral flyweight section to which it is connected by its appurtenant arm.

The externally threaded wire 75 may be formed of a flexible insulating plastic material such as “nylon” and extends slidably through the channel 70 in the armature shaft and between the nut sections 72, 74, the upper end of the wire being rigidly secured to the central antenna section 14. In the shown construction, the central antenna section is a solid rod having a sleeve 80 secured to and projecting downwardly a short distance below the lower end thereof and defining a socket for reception of the upper end of the wire 75, which is fitted partially thereinto, the sleeve being formed inwardly to grip the wire. Each of the tubular antenna sections 15, 16 is flanged inwardly at its upper extremity, as also is the tube 17, the inwardly flanged sections being indicated at 16, 17 and 18. All of the antenna sections are also enlarged at their lower ends, the enlargement of the inner rod section 14 being formed by the sleeve 80, while the tubular sections 15, 16 may be swaged outwardly at their lower extremities as indicated at 81 and 82. When the antenna sections are fully projected, projections 77, 81 serve as stops limiting upward travel of the section 14, portions 77, 81 serve as stops limiting upward travel of the section 15, and portions 78, 82 limit upward movement of section 16.

The opposed inwardly directed faces of the nut sections 72, 74 are provided with complementary channels, the surfaces of which are formed with mutilated teeth as 85, 86 of tapered and rounded contour proportioned to threadedly interengage the external threads formed upon the wire 75 when the nut sections are moved inwardly toward one another and against the wire. The threads on the wire are also of tapered and rounded form.

When the nut assembly is rotated by the motor, the flyweight sections 62, 64 tend to move apart under the effect of centrifugal force and urge the nut sections 72, 74 inwardly against the wire and, by reason of the thread engaged between such nut sections and the threads of the wire, the wire is moved longitudinally through the motor to drive the antenna section 14, the wire being held against rotating about its axis. Since the nut sections are only driven against the wire by centrifugal force, they are easily moved apart if longitudinal effort is exerted upon the antenna section 14, the nut sections being then cammed apart because of the tapered and rounded contour of the threads, so that the antenna sections may be hand without damaging the mechanism.

The open lower end of the armature shaft is exposed through a concentric opening (undesignated) in the bracket 50, and the threaded wire 75 extends therethrough and is slidable in a keying and guide tube 98 which is somewhat flattened throughout the greater proportion of its length, as shown cross-sectionally in Figure 6. The wire 75 slides easily in the tube 98 and the wire is of such length that a portion thereof remains in the flat section of the tube 98 when all of the antenna sections are fully extended.

A sheet metal clip 92 is attached to the outer end of the wire. The clip 92 may be formed of a short section of metal tubing which is flattened to engage the wire and in the flattening is formed to such proportions that it will slide easily in the tube 98, but cannot rotate therein. Integral tongues as 94 may be pierced and bent inwardly from the body of the clip 92 in the application of the clip to the wire, the tongues being pointed and adapted to penetrate the wire to positively lock the clip thereupon.

In the flattened condition, the clip 92 is of substantially greater diameter than the wire 75 when applied thereto, as best shown in Figure 6, so that the laterally projecting portions of the clip define shoulders as 95, 96, lying within the tube 98 upon each side of the wire. The shoulder portions 95, 96 may be employed to operate limit switches as 98, 100, adapted to control the energization of the driving motor 48. Each limit switch is shown as a housing having a button portion as 102 projecting through a slot as 104 in the tube 98 and slidable longitudinally of the tube to actuate the switch. The detailed mechanism of the dropped portions being considered since it forms no part of my invention.

The actuating switch buttons as 102 are some-
what longer in the longitudinal dimension than the spacing between or pitch of the threads on the wire 15, and the inner ends of the buttons are smooth, so that the threads of the wire cannot catch on the buttons and actuate them. The limits of the thread grooves are drawn lines corresponding to the limits of desired antenna travel and so connected in the motor circuit as to break the circuit and stop the motor when the desired limit is reached. The manner of connection of such limit switches is well known in the art and will need no detailed description.

It will be appreciated that the wire 15, being of flexible character, the tube 90 may be bent to curved form if desired and/or to any desired configuration to facilitate installation of the aerial. The outer end of the tube 90 is preferably sealed against the entrance of dust, although the lower end of the motor casing 48 may be provided with openings as indicated at 105, so that if any water finds its way into the inside of the antenna housing, it may flow downwardly through the internally connected housing portions 18, 45 and through the motor casing 48 and thence outwardly through the openings 105.

The lead-in connection to the antenna may be made in any convenient or desired manner. A lead-in cable 108 is shown attached by a ferrule nut 108 to a nipple 116 formed upon the side of the neck portion 22 and projecting through a slot 112 in the upper end of the housing tube 18. A terminal portion 114 of the lead-in cable is thereby held in electrically conductive engagement with contact tube 18.

In the modified construction shown in Figures 8 and 9, parts analogous to those already described are designated by like reference characters distinguished by the addition of the letter "a," and many of such corresponding parts will require no detailed redescription.

The open lower end of the tubular armature shaft 54a (Figure 8) is exposed below the bracket 50a and the actuating wire 16a extends therefrom into and is slidably in a guide tube 90a which also serves to prevent rotation of the wire about its longitudinal axis. The guide tube is connected to the lower end of the motor casing by suitable coupling means as 92a in such position that the wire may slide freely into and out of the tube, and at one or more points along its length a bend is formed in the tube, as indicated at 120 and 112. The tube and wire are of round cross section and the bends 120, 112 are smoothly curved to permit easy sliding of the wire. The wire is effectively restrained against rotation about its longitudinal axis by the bends, since in order to twist the wire to turn it about its axis, it would be necessary, in effect, to rebind it in the curved area. The wire 16a is long enough so that even when the aerial assembly is fully extended a part of the wire lies within the curved portion 120 of the tube, and the wire is thereby held against rotation while it is moved longitudinally under the influence of the driving nut assembly.

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 or fair meaning of the subjoined claims.

What is claimed is:

1. Means for longitudinally actuating an extensible rigid member such as a radio antenna comprising a flexible elongated externally threaded wire-like actuating element adapted to be mechanically connected to such an antenna, a cooperatively threaded driving nut structure engaging the threads of said element and rotatable to actuate the same, and means for preventing rotation of said said element about its longitudinal axis comprising a longitudinally curved guide tube in which said element is slidably fitted.

2. Actuating means for a slideable rigid member such as an antenna including an externally threaded flexible wire-like actuating element, driving nut means threadedly engaging said element, and housing and keying means for preventing rotation of said element about its longitudinal axis comprising a tube within which said element is slideable, said tube having an integral longitudinally extending flattened portion, and a keying portion carried by said element and slidably engageable with such flattened portion of the tube.

3. Actuating means for a slideable rigid member such as an antenna including an elongating flexible actuating element including a portion carried thereby which is of noncircular cross section, said element being adapted to be mechanically connected to such an aerial, a driving member engageable with the exterior of said element to move the same longitudinally, and means for preventing unwanted twisting of said element about its longitudinal axis comprising a guide tube within which said element is slidably but nonrotatably fitted, the cross-sectional contour of said guide tube substantially corresponding to the cross-sectional contour of said noncircular portion.

4. Actuating means for a slideable rigid member such as an antenna including an externally threaded flexible elongated actuating element, driving means threadedly engaging said element, and housing and keying means for preventing rotation of said element about its longitudinal axis comprising a tube within which said element is slideable, and complementarily contoured noncircular keying portions carried partly by said actuating element and partly by said tube.

5. Means as set forth in claim 2 in which said keying portion comprises an abutment member extending laterally of said actuating element within said tube to define abutment shoulders.

6. Means as set forth in claim 2 in which said keying portion comprises a partially flattened sleeve fitted over said element, the initial internal diameter of the sleeve exceeding the outside diameter of said element whereby when the sleeve is flattened a portion thereof is moved outwardly to project laterally from said element to define an abutment shoulder.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number Name Date

2,346,728 Carlson Apr. 18, 1944