June 18, 1957 E. CARLSON 2,796,221

EXTENSIBLE ANTENNA

Filed Nov. 10, 1954 2 Sheets-Sheet 1

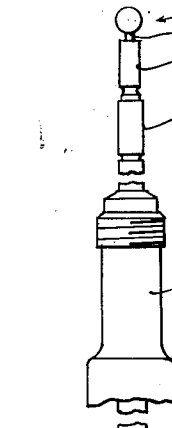


Fig. 1.

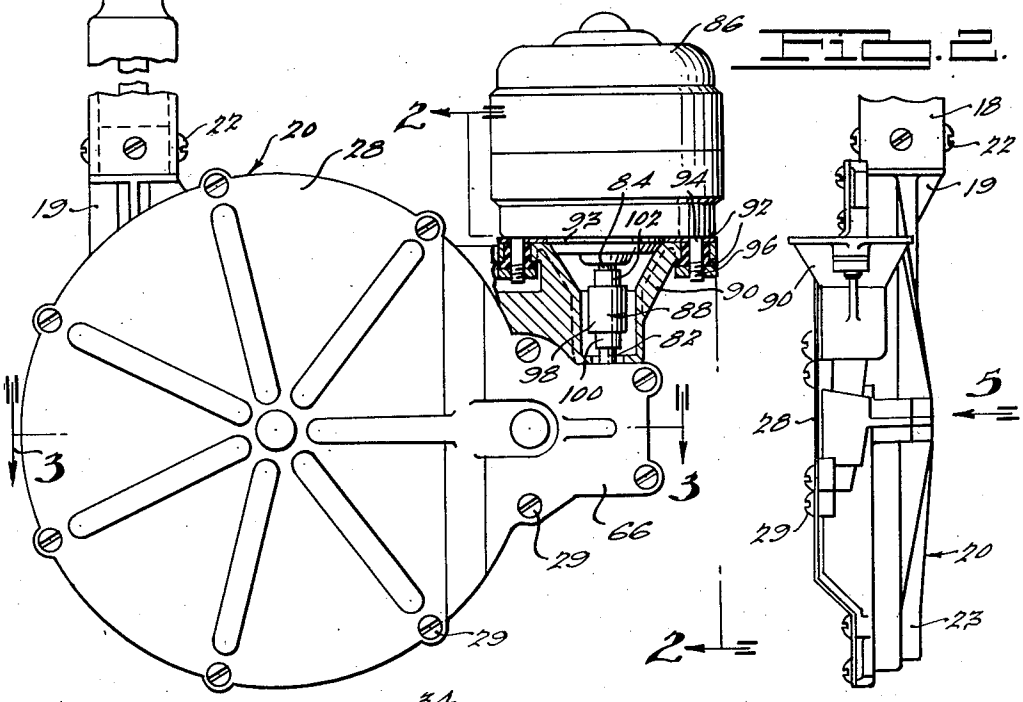


Fig. 2.

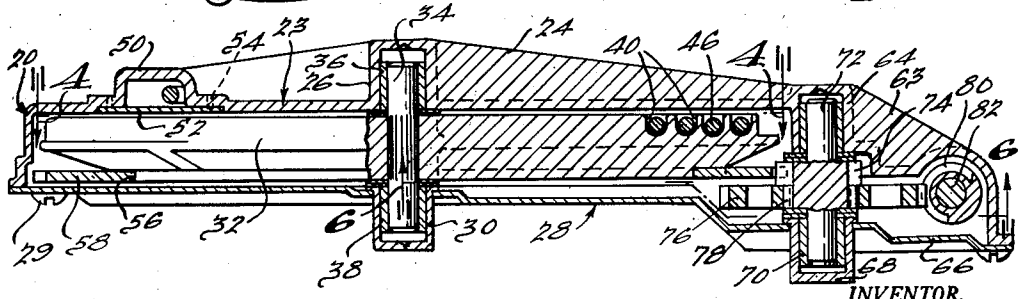


Fig. 3.

INVENTOR.
Emil Carlson.
BY
Harness, Dickey & Pierce
ATTORNEYS.

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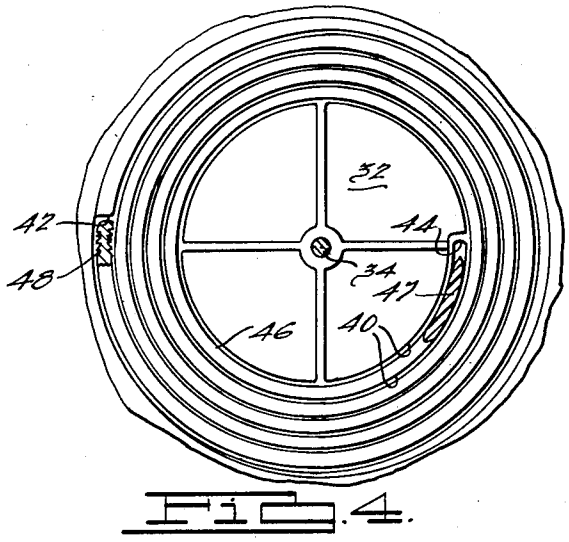


Fig. 4.

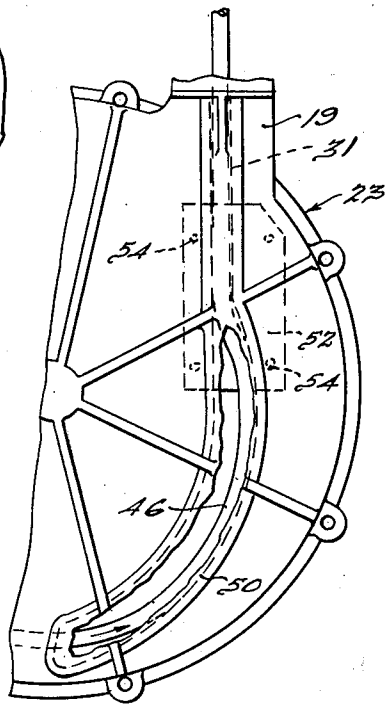


Fig. 5.

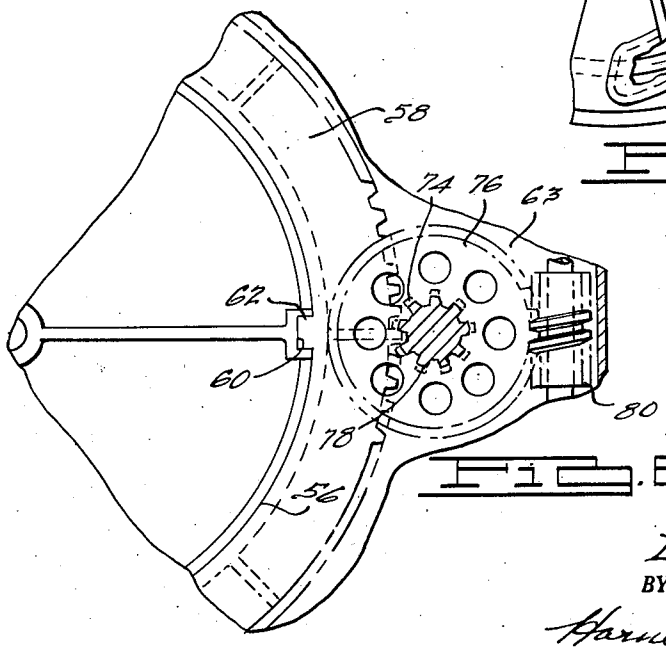


Fig. 6.

INVENTOR.
Emil Carlson.
BY
Harness, Dickey & Pierce
ATTORNEYS.

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2,796,221

EXTENSIBLE ANTENNA

Emil Carlson, Detroit, Mich., assignor to Pioneer Specialty Company, Detroit, Mich., a corporation of Michigan

Application November 10, 1954, Serial No. 468,034

3 Claims. (Cl. 242—54)

This invention relates to extensible radio antennas and, more particularly, to an improved multi-sectioned telescopic antenna of simple, inexpensive construction, incorporating power-operable means for extending and retracting all of the antenna sections.

A primary object of the invention is to provide an improved and simplified extensible antenna of the indicated character which is especially adapted for vehicular installations and which is capable of being remotely controlled, which is simple and compact in construction, fabricated largely of inexpensive die castings and sheet metal parts, and which is simple and inexpensive to assemble and install, and which further, is so designed as to be virtually proof against jamming.

A further object is to provide a device of the character indicated which employs a rotatable disc provided with a spiral groove on one face thereof adapted to receive a flexible wirelike actuating element and provided with a novel guide means for guiding the actuating element into and out of said groove.

Other objects, features and advantages of the present invention will become apparent from the following description taken in conjunction with the accompanying drawings wherein:

Figure 1 is an elevational view, partially broken away, of an extensible antenna provided with an actuating means constructed in accordance with the present invention;

Fig. 2 is a partial elevational view of the structure illustrated in Fig. 1, taken along the line 2—2 thereof;

Fig. 3 is a cross-sectional view of the structure illustrated in Fig. 1, on a larger scale, taken substantially along the line 3—3 thereof, and looking in the direction of the arrows;

Fig. 4 is a sectional elevational view of the driving and storage reel in Fig. 3, taken substantially along the line 4—4 of Fig. 3, and looking in the direction of the arrows, but on a reduced scale;

Fig. 5 is a fragmentary elevational view of the structure illustrated in Fig. 2, taken in the direction of the arrow 5; and

Fig. 6 is a fragmentary sectional elevational view of the structure illustrated in Fig. 3, taken along the line 6—6 thereof.

Referring now to the drawings, reference character 10 designates generally a conventional extensible antenna of the telescoping type comprising a plurality of rigid, slidably interfitted tubular sections 12, 14 and 16 which are adapted, when retracted, to be largely concealed within the body of a vehicle upon which the antenna is mounted. The outer antenna tube 16 is slidably supported in and insulated from a housing tube 18, which may be rigidly held in the body of a vehicle in any suitable manner, as for example, in the manner illustrated in the disclosure of my Patent No. 2,580,889. The lower end of the housing tube 18 is open and is adapted to receive the upwardly extending hollow coupling boss portion 19 of the housing 20, said boss portion being suitably held therein as by the screws 22. The housing 20

is generally cylindrically shaped with the axis thereof horizontally disposed and includes a portion 23 preferably formed from die cast metal and a stamped cover portion 28. The housing body 23 is provided with a plurality of ribs 24 and a centrally disposed bearing retainer 26. The cover 28 is suitably secured to the housing, as by the screws 29, and with a bearing 30 coaxial with the bearing retainer 26.

Rotatably carried in the housing 20 is a vertically disposed flat disc-like drum or reel 32, fixed on the stub shaft 34, which is rotatably mounted in suitable bearings, as 36 and 38, seated in the bearing retainers 26 and 30, respectively. As is best seen in Figs. 3 and 4, the flat inner face of the reel 32 is provided with a spiral groove 40. The spiral groove 40 is adapted to receive an elongated flexible wirelike actuating element or driving strand 46, preferably formed from an insulating but relatively inelastic plastic material such as "nylon" and which is secured in the groove at the outer end of the spiral, as by the teeth 48, which interfit with toothlike serrations formed in the walls of and near the outer end 42 of the spiral groove. The other end of the strand 46 is secured to the central section 12 of the antenna and the length of the strand exceeds the extended length of the antenna. An intermediate portion of the strand, extending from the secured end 42 to a position in the groove which depends upon the extent of projection of the antenna, lies in the groove, from which the strand is led to its connection with antenna section 12 in a manner to be described.

As is best seen in Figs. 2, 3 and 5, the bottom wall of reel housing portion 23 is provided with an integral, outwardly offset, inwardly opening curved hollow guide chamber portion 50, the upper end of which communicates interiorly and coaxially with a passage 31 extending through the upwardly extending coupling boss portion 19. The guide portion opens interiorly into the flat bottom wall 25 of the reel chamber 21, such bottom wall lying close to the grooved face of the disc 32 to prevent escape of any part of cable 46 except the end thereof which is led out of the groove through the guide portion. The groove 40 is several convolutions in length (four and one-half in the preferred construction illustrated) and the length of the groove is proportioned to the amount of cable which must be accommodated when the aerial is pulled down, so that at such time the groove is substantially filled, that is, the cable may then extend from the outer end of the groove to a position relatively near the inner end 44 thereof. The upper end of the cable 46 extends angularly outwardly from the open face of the groove 40 into the curved hollow guide portion 50, and upwardly therethrough, and through coupling boss 19, into housing tube 18, and is fixedly secured to the lower end of the central antenna section 12.

The guide portion 50 is curved in the plane of the disc, from a position substantially overlying the outermost convolution of groove 40 at the lower end of the guide portion, to a position substantially overlying the innermost convolution at a higher position where it communicates with the passage 31 in the coupling portion 19. The guide portion is thus in the form of a shorter spiral of approximately 105°–110° in length and which is non-concentric with and extends angularly across the open face of the spiral groove 40. The sidewalls of the guide portion are substantially perpendicular to the disc and spaced apart a distance equal to about two convolutions of the groove 40, and are joined to the walls of passage 31 as smooth continuations thereof. The open inner face of the hollow guide portion 50 is covered near its upper end by a plate 52 secured to the wall 25 as by drive screws 54.

As is best seen in Figs. 3 and 6, the front face of the reel 32 is provided with a longitudinally extending circular

shoulder 56 on which is carried an external ring gear 58. The circular shoulder 56 is provided with a plurality of inwardly extending radial slots 60, each of which is adapted to receive a matching lug 62 on the ring gear 58. The lugs 62 are preferably staked in place, in the slots 60, to fixedly secure the ring gear 58 on the reel 32.

As is best seen in Figs. 1, 3 and 6, the housing 20 is formed with a laterally extending portion 63, which is provided with a bearing retainer 64 adapted to seat a bearing 65. The front cover plate 28 is formed with a lateral extension 66 which is provided with a bearing retainer 68 adapted to seat a bearing 70. The bearings 65 and 70 are axially aligned and rotatably support a stub shaft 72 carrying a pair of speed-reducing gears 74, 76, the former meshing with the ring gear 58 and the latter driven by worm 80, fixed on the drive shaft 82 which is suitably journaled in the laterally extending portion 63 of the housing 20.

The drive shaft 82 is mechanically connected to the armature shaft 84 of a suitable reversible electric motor, as 86, by means of a torsionally flexible coupling 88, best seen in Figs. 1, 7 and 8. The motor 86 is carried by the upwardly extending supporting portion 90 which is integral with the laterally extending housing portion 63. The motor 86 may be resiliently mounted, as by the rubber bushings 92, rubber gasket 93, studs 94 and nuts 96. The flexible coupling 88 is preferably formed from a suitable rubberlike material.

In operation, with the antenna 10 in the retracted position, as shown in Fig. 1, the elongated flexible wirelike actuating element 46 will be wound up on the spirally grooved reel 32, as shown in Fig. 4, with the upper end thereof extending angularly outwardly from the slot 40 in the reel in a gradual manner commencing approximately at the point designated 47 and extending through the guide portion 50 and coupling boss 19 into operative engagement with the antenna. In order to extend the telescoping antenna sections 12, 14 and 16, the electric motor 86 is actuated in the proper direction by suitable remote controls so as to drive the spirally grooved reel 32 in a counterclockwise direction, as viewed in Figs. 4 and 5 (clockwise in Fig. 1). As reel 32 rotates, it feeds the wirelike actuating element 46 into the curved hollow guide portion 50 and upwardly into the housing tube 18 and, correspondingly, the antenna 10 is extended. In order to retract the antenna, the electric motor 86 is actuated in a reverse direction and the reel 32 will be actuated so as to pull and wind the wirelike actuating element 46 into the spiral groove 40 and thus retract the antenna. The position at which the strand 46 leaves the groove 40 and enters the guide 50 varies with the extent of projection of the antenna, being farther out on the disc radially, that is, nearer the lower end of the guide 50, when the aerial is nearer full projection, and vice versa. Fig. 6 shows the strand in the condition which exists when it is about fully payed out (aerial up) and with lifting force still being exerted. Under such conditions the strand leaves the groove 40 near the outer convolution and at the bottom of the guide 50 and is thrust against the outer wall of the guide. If the aerial were about in the same position but being pulled down, the strand would be pulled against the inner wall of the guide. By virtue of the long radius and relatively short angular extent of the guide 50, and the smoothness of its side walls, the engagement between the strand and the walls of the guide does not create a braking effect of objectionable magnitude.

The flexible coupling 88 overcomes the tendency of the worm 80 and worm gear 76 to wedge at the end point of either the extension or the retraction travel of the antenna. Such wedging action is usually caused by continued energization of the motor 86 after the antenna has reached the end point in the extension or retraction travel, due to the fact that, as a practical matter, the operator cannot release the switch at exactly the proper instant. With the present arrangement, however, after the antenna reaches the travel end point, the flexible coupling 88 will be torsionally stressed by further torque from the motor, and will absorb the impact normally taken by the driving means, such as the worm 80 and worm gear 76. When the switch is thereafter opened to deenergize the motor, the coupling 88 unwinds, spinning the armature slightly in the reverse direction, and the inertia of the armature when thus reversely driven by the energy stored in the coupling tends to carry the worm teeth away from the teeth of the worm wheel and relieve the wedging friction between them. Thus, when the motor is next energized to drive the antenna in the reverse direction, the teeth are free of wedging engagement.

While it will be apparent that the preferred embodiment of the invention herein disclosed is well calculated to fulfill the objects and features 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 driving an extensible antenna or the like, comprising in combination with a housing, an elongated flexible wirelike actuating element adapted to be mechanically connected to such an antenna, and means for driving said wirelike actuating element comprising a rotatable reel having a spiral groove on one face thereof, said groove having at least two convolutions, said flexible actuating element having an inner end held in said groove and having an outer end extending out of the groove in a direction away from the face of the reel, reversible means for driving said reel to wind and unwind said flexible actuating element in said groove, a stationary enclosure portion having an inner face closely overlying the grooved part of the reel to confine the actuating element therein, said enclosure portion having an elongated guide opening in said face which is wider than said groove and which extends over said convolutions from which said flexible actuating element is to be guided at a relatively slight angle thereto.

2. Means for longitudinally driving an extensible antenna or the like, comprising in combination with a housing, an elongated flexible wirelike actuating element formed of insulating material and mechanically connectible to such an antenna, and means for driving said wirelike actuating element comprising a reel rotatable in the housing and having a spiral groove on one face thereof, said groove having at least two convolutions, said flexible actuating element having an inner end held in said groove and having an outer end extending out of the groove in a direction away from the face of the reel, means for rotating the reel to drive said actuating element into and out of said groove, a stationary enclosure portion having an inner face closely overlying the grooved part of the reel to confine the actuating element therein, said enclosure portion having an elongated guide opening in said face which is wider than said groove and which extends, in the direction of elongation thereof, in a direction generally parallel to but at a relatively slight angle with respect to said convolutions, said guide opening being elongated and curved in the direction of the spiral groove and extending throughout more than 90° of the reel and extending across said convolutions at acute angles thereto.

3. Means for longitudinally driving an extensible antenna or the like comprising, a housing, an elongated flexible wirelike actuating element formed of insulating material and mechanically connectible to such an antenna, and means for driving said wirelike actuating element comprising a reel rotatable in the housing and having a spiral groove on one face thereof for receiving said actuating element, restraining means for preventing unwanted movement of the actuating element out of the groove, stationary guide means for guiding said actuating element into and out of said groove when the reel is rotated, comprising a slotlike opening in said restraining means de-

fined by walls extending transversely of said spiral groove at a relatively slight angle thereto, said walls being relatively close together and extending substantially perpendicularly away from said grooved face whereby said element may be guided out of said groove between said walls.

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