Sept. 7, 1954 F. V. GOSLINE 2,688,698

ANTENNA WITH POWER OPERABLE TELESCOPIC SECTIONS

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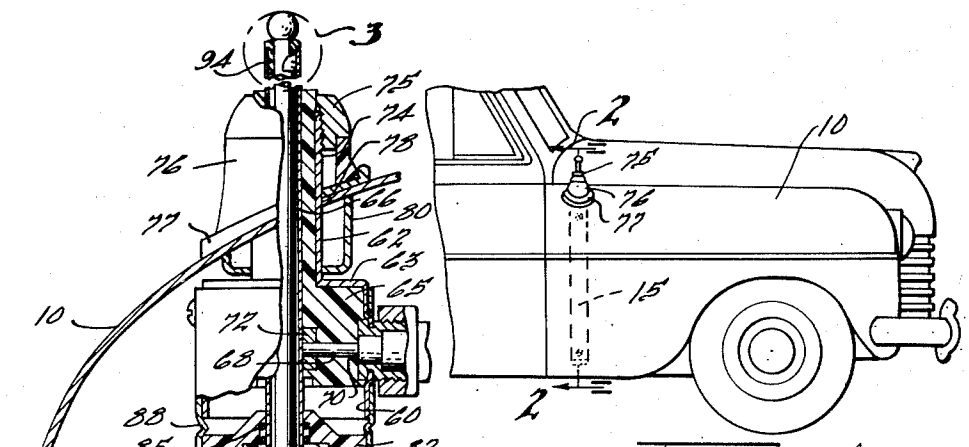


Fig. 1.

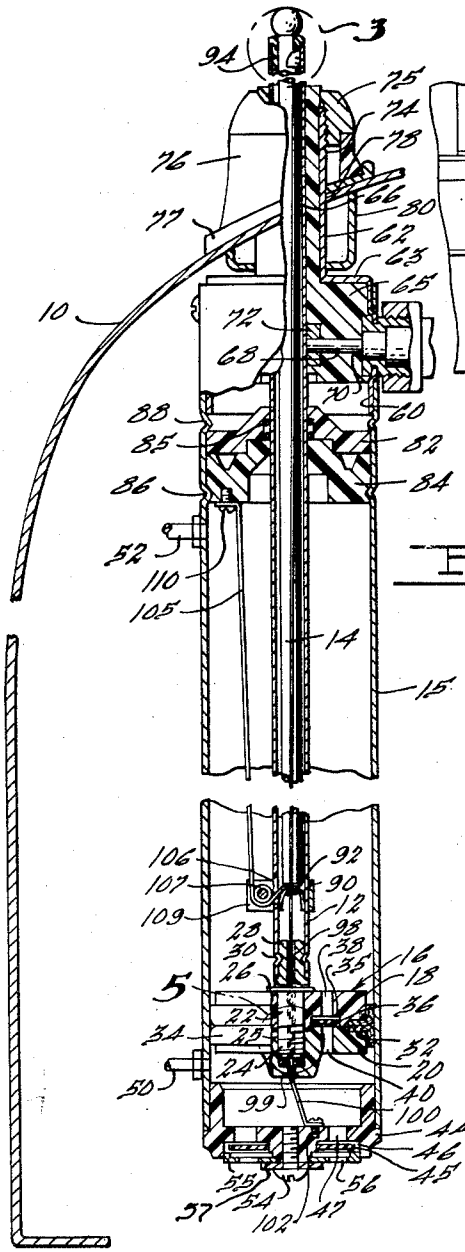


Fig. 2.

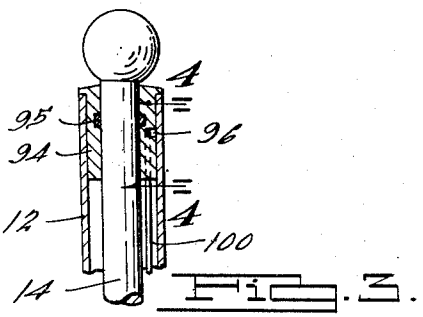


Fig. 3.

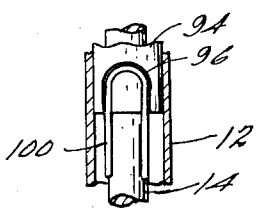


Fig. 4.

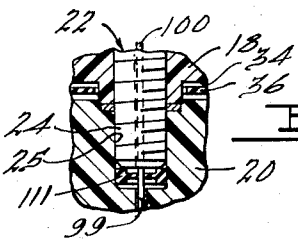


Fig. 5.

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ANTENNA WITH POWER OPERABLE TELESCOPIC SECTIONS

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2 Claims. (Cl. 250—33)

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The present invention relates to the construction of pressure operable telescopic antennae, having as its primary object the provision of improved means for actuating, by means of fluid pressure, a plurality of sections of a multi-sectioned antenna of the indicated character.

A popular type of telescopic antenna which is in large scale use in passenger motorcars is the so-called "vacuum antenna." This type is adapted for mounting in the cowl or fender of the vehicle in such manner that when retracted the antenna is largely concealed within the fender or body structure. Remotely controllable power operating means is provided, involving the use of a cylinder and piston coaxial with the antenna and forming a housing and support therefor as well as an electrical shield, such cylinder being concealed within the body structure, the piston being directly attached to one of the antenna sections and being actuatable by pressure differential derived from the intake manifold of the engine of the vehicle, and control being effected by means of a valve located in a position convenient to the driver. Such vacuum-driven antennae possess important inherent advantages over antennae actuated for example by hydraulic or electrical means. In addition to low cost and reliability, the danger of deterioration of the electrical efficiency of aerials of this type is much less than where either hydraulic fluid or mechanical driving devices, operable by electric motors or other motors, must be employed in physical contact with the antenna elements or in physical contact with parts which may be coupled electrically to the aerial. Where such is the case, contamination of the hydraulic fluid, or of the mechanical elements by which the antenna rods are actuated, introduces electrical losses by way of either high resistance leakage paths or unwanted capacitive coupling, due, for example, to impurities in lubricants, or to the entrance of carbonaceous dust, soot, or the like such as are commonly encountered in cities, and which despite careful sealing will unavoidably work past the seals. It has been found that such electrical losses, after a relatively short time, will virtually destroy the electrical efficiency of many such aerials used under conditions commonly encountered. On the other hand, with the vacuum antenna where operation is based upon the vacuum effect derived from the manifold, the air within the cylinder is the only driving agency, and it is constantly cleaned, and foreign matter is drawn away. In addition, no parts are wiped, either by liquid or mechanical parts,

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in such manner that electrical losses can develop in the manner indicated. For reasons such as those outlined, aerials of the vacuum operated type have achieved much greater popularity and more widespread use than aerials actuated by other power means, despite the fact that up to the present time there has been no practical or successful method of providing for actuation of more than a single section of such vacuum-type telescopic aerials while still retaining all of the benefits of the vacuum powered system, whereas with electrical or hydraulic operation two or more telescopic sections are easily actuatable, with apparatus of practical size and cost.

The broad object of the present invention is to provide an improved antenna of the vacuum-powered type, which retains all of the benefits of this mode of actuation, which is simple, inexpensive and reliable in character, compact and attractive in appearance, and which provides power-induced actuation of all of the sections of a multi-sectioned telescopic antenna so that they may be fully extended and fully retracted by remote control.

Other and more detailed objects and advantages will be come apparent upon consideration of the present disclosure in its entirety.

In the drawing,

Figure 1 is a fragmentary side elevational view of a passenger automobile provided with an aerial constructed in accordance with the present invention;

Fig. 2 is a vertical, sectional, elevational view on a larger scale, partly broken away, taken substantially on the line 2—2 of Fig. 1 and looking in the direction of the arrows;

Fig. 3 is a vertical sectional view of the part enclosed within the circle designated 3 in Fig. 2;

Fig. 4 is a developed sectional view taken substantially as indicated by the line and arrows 4—4 of Fig. 3; and

Fig. 5 is a vertical, sectional view of the part enclosed within the circle designated 5 in Fig. 2.

Referring now to the drawing, reference character 10 designates a portion of a motor vehicle body, shown as the front fender, in which the antenna housing structure is supported and beneath which it is largely concealed. A pair of telescopically interfitted antenna elements 12, 14 are shown, slidably supported in and coaxial with the housing cylinder 15, which is formed of aluminum tubing or other suitable material, preferably conductive, and which is substantially larger in diameter than the outer tubular antenna element 12. At its lower end the tubular antenna

element 12 is attached to a piston assembly, generally designated 16, slidable in the cylinder 15. The piston assembly comprises a pair of disk-like sections 18, 20 formed of plastic having high insulating characteristics. The piston sections 18 and 20 are secured together and to the lower end of antenna tube 12 by an axial stem portion 22 having a threaded lower extremity 24 threadedly interfitted with a suitably tapped socket 25 in the lower piston disk 20 and having a radial flange 26 which overlies and bears downwardly against the top of the upper piston section 18 when the stem is screwed into the socket 25, to thereby clamp the piston sections together. An integral nipple portion 28 of the stem projects upwardly into the antenna tube 12 and the antenna tube is secured to the nipple section as by being rolled or otherwise deformed into a suitable groove in the latter, as indicated at 30.

In the peripheral area of their abutting surfaces, the piston sections 18, 20 are rabbetted as indicated at 32 to accommodate suitable packing cup means 34 indicated as of conventional character. Near its inner periphery one of the disks as 18 is also provided with a flat-bottomed annular groove 35 within which is positioned an annular flap valve 36. The depth of the groove 35 substantially exceeds the thickness of the valve 36, and the annular valve, which may be formed of relatively soft rubberlike material, is loosely fitted in the groove, so that the valve is freely movable in an axial direction (up and down) in the groove and adapted to seat against either the flat top of the disk 20 of the flat face of the groove 35. One or more drain holes as 38, 40 extend through each of the respective piston sections 18, 20 and intersect the valve groove 35. The valve element 36 is not flat, but is wavular or bowed when relaxed, so that a substantial proportion thereof normally lies in an intermediate position, spaced from both flat surfaces, and the flexibility of the valve is such that when the pressure is reduced above the piston, the valve is forced, by the air pressure below the piston, into contact with the grooved surface surrounding the port 38 to seal the latter, while when the pressure is reduced below the piston assembly, the valve element is similarly urged ito sealing engagement with the ported face of the lower piston section 20. In either event the drain passage through the ports 38, 40 is sealed during actuation of the piston but is open during idle periods so that any moisture which condenses in or finds its way into the cylinder 15 can drain downwardly into the space below the piston and into the cuplike closure element 44 which is fast in the lower end of the cylinder 15.

Closure element 44 is similarly provided with an easily distortable resilient annular flap valve 45 mounted in a groove 46 intersected by a drain passage 47. When, in order to induce downward movement of the antenna, the pressure is reduced in the cylinder 15 below the piston assembly 16, the valve 45 moves upwardly into engagement with the flat surface of the grooved portion 46, sealing the drain holes so that admission of air through such holes cannot destroy the suction effect. As will be understood, this action occurs when the nipple 50, which opens into the lower part of the cylinder 15, is connected to the intake manifold or other source of reduced pressure, as will be appreciated by those skilled in this art. Means such as the screw 54 may also be provided for securing to the lower cylinder head member 44, a closure member 55 and a bracket element 57 by which the lower end of the assembly is attached to a suitable supporting part of the vehicle structure. Closure 55 is also provided with drain holes 56.

At its upper end, the cylinder 15 is attached to a tubular sheet metal portion 60 fitted thereinto relatively tightly and which is formed with an integral reduced neck portion 62 which extends upwardly therefrom. An insulating block 65 formed of a suitable dielectric plastic material is fitted into the neckpiece portions 60, 62 and is provided with an axial aperture 66 of such size that the antenna elements slide freely therein. A lead-in terminal connector portion 68 extends radially inwardly through a hole 70 in the block 65 into electrical connection with a brush member 72 which is in slidable electrical connection with the antenna member 12. At its upper end, the sheet metal neck portion 62 is externally threaded as indicated at 74 for reception of a suitable dome nut 75. A collar 76 and sealing pad 77 are interposed between the dome nut and the surface of the body portion 10, surrounding the aperture 78 in the body through which the neck 62 extends. A suitably contoured spacer 80 conforming to the internal contouring of the body portion, is interposed between the underside of the body and the shoulder 63 of the neckpiece.

A stop assembly and cylinder seal comprised of a pair of insulating disks 82, 84, are fitted in and near the top of the cylinder 15 below the filler block 65 to define the upper limit of piston travel. Suitable sealing means such as a pair of O-rings 85 are housed in the disks and maintain sealing engagement with the disks and with the surface of the outer antenna section 12, the disks 82 being effectively sealed at their outer peripheries to the cylinder walls, as by means of an inwardly grooved annular portion 86 tightly pressed into a suitable groove (undesignated) formed in the lower disk 84, the upper disk being similarly positioned and sealed at its outer periphery by an inwardly groved annular portion 88 which overlies the top of disk 82 and which is also forced inwardly against the upper corner of such disk. The internal bead formed by the inward deformation of the groove 88 limits the extent of insertion of the neckpiece 60.

The inner antenna section 14 is substantially smaller in diameter than the outer section 12. At its lower extremity the inner section 14 carries a star spring brush 90 of Phosphor bronze or the like axially secured to the lower end of section 14 and having arm portions which bear outwardly against the inner surface of tubular antenna section 12 to provide electrical connection between the antenna sections. The star spring may also serve to limit upward movement of the section 14. The star spring is shown as secured in the lower end of the member 14, which may be tubular, as by means of a suitable drive screw 92. At the upper end an annular collar 94 of hollow cylindrical form is secured in antenna tube 12 and serves as a bearing for the inner antenna section 14 and to hold the latter in axially centered position. A suitable sealing O-ring 95 is housed in the collar 94 in wiping engagement with the inner section 14. In the outer peripheral surface of the collar 94 which abuts the inner surface of antena tube 12, a groove 96 of inverted U form is provided, both legs of the U being open at their lower ends into the interior of the antenna tube 12. A relatively fine axial aperture 98 also extends through the

full length of the piston stem member 22 and a similar fine axial aperture extends through and from the bottom of the socket portion 25 of the lower piston disk 20. A relatively strong smooth cord which may be formed of a suitable synthetic material such as solid or twisted nylon and which is designated 100 is secured as by means of a screw 102 to the bottom head cap 44 and extends upwardly through the apertures 99, 98 into the interior of the outer antenna tube 12. Such cord then extends upwardly through the space between the antenna sections 12, 14, is trained through the groove 96 in the collar 94 and extends downwardly from such groove to the lower end of the inner or extension antenna section 14, to which it is attached by means of the same screw 92 which secures the star spring 90. Another cord designated 105 (which may be formed as a continuation of the cord 100) is also secured as by the screw 92 to the lower end of the inner antenna section 14, extends outwardly therefrom through a radial aperture 106 in the side wall of the outer antenna section 12, is trained around a friction reducing roller 107 and then upwardly through the cylinder space 15 to connection with the head disk 84, to which it is shown attached by means of a screw 110. The roller 107 is supported by a strap-type bracket 109 which embraces antenna section 12. The apertures 98 and 106 may fit the cord closely enough to reduce air leakage to a practical value while allowing the cord to run freely, although I prefer to provide a seal in the form of a resilient diaphragm 111 tightly fitted in the socket 25 in piston disk 20 and having an axial aperture (undesignated) therein slightly smaller than the cord and which therefore is in light wiping engagement with the cord to provide a continuous seal. Although after the antenna has been in use for a period of time, carbonaceous matter may become rubbed on the cord 100, significant electrical losses are not thereby introduced because of the fact that a substantial length of the cord between the lower limit of travel of the piston and the point of attachment of the cord to the plug 4 is never wiped in this manner. The cross section of the cord is small and its electrical resistance is high. The plug 44 may also be formed of insulating material, as shown, although this is not necessary and I have found die castings entirely suitable for this piece.

By virtue of this arrangement, it will be seen that when the pressure above the piston assembly 16 is reduced, to project the antenna assembly upwardly, which is effected by providing a fluid conductive connection between the upper nipple 52 and the engine intake manifold, the piston is driven upwardly by air pressure below the same entering through the nipple 50. The grooved portion 96 of the collar 94 acts like a running pulley, moving the bight portion of the cord 100 upwardly and accordingly drawing the lower end of such cord upwardly and projecting the inner antenna section 14 upwardly out of the section 12. Such upward movement takes up slack in the cord 105. When the pressure connections are reversed to force the piston assembly downwardly to retract the outer antenna section 12, the roller 107 acts in a similar fashion upon the cord 105, pulling its bight downwardly and drawing down the end of such cord which is attached to the section 14 to retract the latter. It has been found that cord formed of twisted nylon fiber is sufficiently smooth and strong to operate freely and to withstand such service

throughout a long life and a large number of cyles of operation.

Aerials constructed as herein disclosed have been operated for over 75,000 cycles in smoky industrial atmosphere in test installations with no mechanical failure and with no significant deterioration of electrical characteristics.

While it will be apparent that the preferred embodiments of the invention herein described are well calculated to fulfill the objects and advantages first above stated, it will be appreciated that the invention is susceptible to variation, modification and change without departing from the fair meaning and proper scope of the appended claims.

I claim:

1. In a telescopic antenna construction, in combination with a fixed support, an outer tubular telescopic section having a nearer end projecting into and slidable in the support whereby its farther end may project from the support to varying extent, an internal telescopic section slidable in the outer section and having a farther end extensible to varying extent from said farther end of the outer section, a cord having a portion secured immovably with respect to said support and having a free portion lying outside said telescopic sections and a portion extending into the interior of said outer section through the nearer end of the latter, guide means carried by and near the farther end of said outer section, said cord extending through the interior of said outer section outside said internal section and being trained over said guide means and connected to the nearer end of said internal section, additional cord means secured immovably to said support at a position near the extreme farther limit of movement of the nearer end of said outer section and having a free portion lying outside said telescopic sections and a portion extending into the interior of said outer section via a guide portion located near said nearer end of the outer section and connected to the innermost section, whereby the innermost section is actuated in one direction by said cord and in the other direction by said additional cord means in response to actuation of the outer section in a corresponding direction.

2. In a telescopic antenna construction adapted to be actuated by suction induced pressure, in combination with a cylinder and a piston movable in the cylinder, an outermost telescopic antenna section having an inner end connected to the piston and a farther end extending slidably through and from the farther end of the cylinder, an innermost telescopic antenna section slidable in the outermost section and projecting through and from said farther end of the outermost section, means for connecting fluid pressure means of variant pressures to said cylinder upon opposite sides of the piston to actuate the piston and said outermost antenna section, and means for automatically moving the innermost section with relation to the outermost section during travel of the latter including a cordlike portion inside and fast with respect to the cylinder, trained in a running loop over a guide portion actuatable with the outermost section, and connected to the innermost section, the innermost section being enough smaller in at least one transverse dimension than the outermost section to permit the cordlike portion to extend longitudinally therebetween, said cordlike portion being fast with respect to the nearer end of the cylinder and extending through the piston, said guide por-

tion being carried by the farther end of the outermost section, and the cordlike portion extending through the space between the sections to said guide portion, over said guide portion, and back through said space and being connected to the nearer end of said innermost section, a second guide portion carried by said outermost element near its end which is connected to the piston, a second cordlike portion fast with respect to the cylinder near the farther end thereof, said second cordlike portion being trained over said second guide portion and extending into the interior of said outermost section in the region of

the nearer end of said outermost section and being secured to said innermost section.

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