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REVERSIBLE PUMP AND MOTOR SYSTEM FOR EXTENSIBLE ANTENNAS

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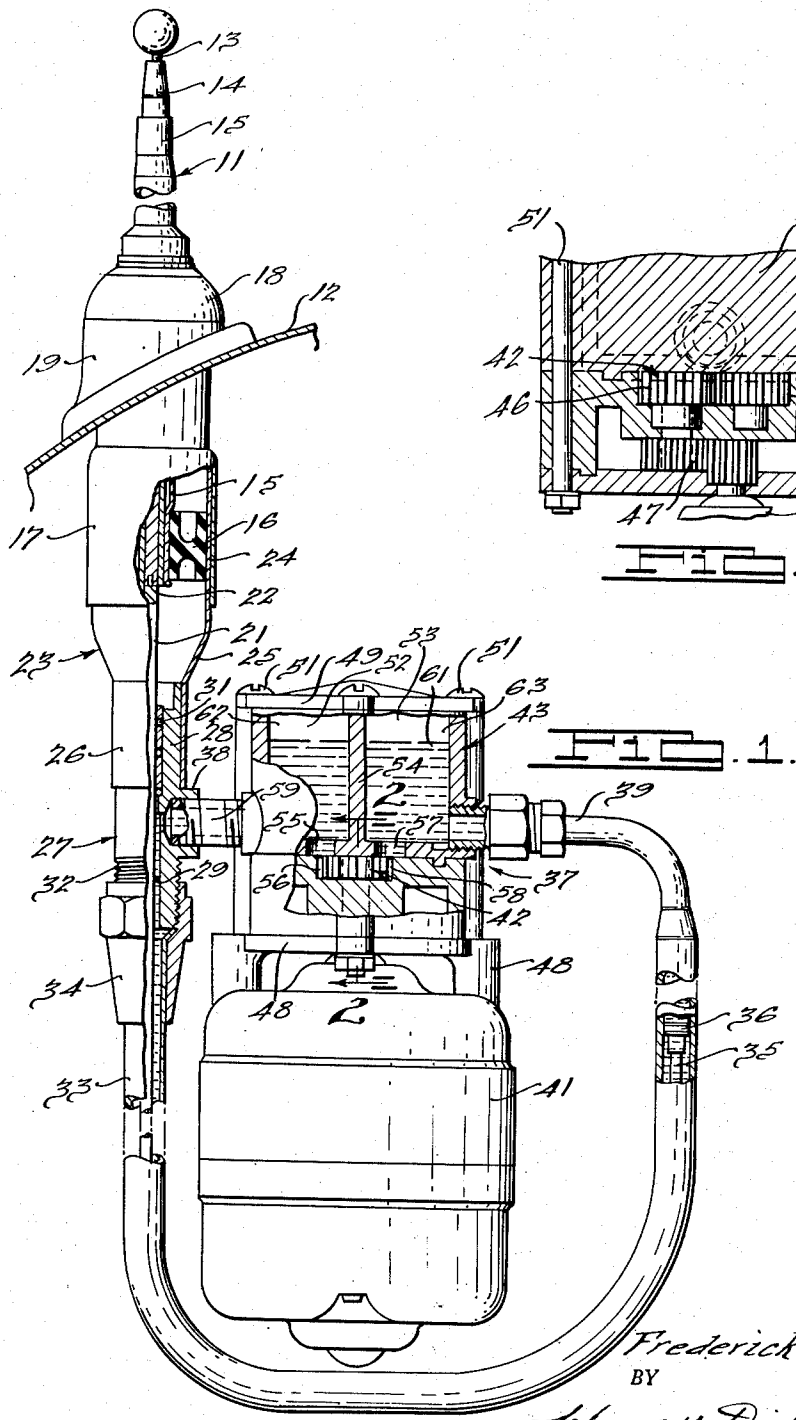


FIG. 1.

FIG. 2.

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REVERSIBLE PUMP AND MOTOR SYSTEM FOR EXTENSIBLE ANTENNAS

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2 Claims. (Cl. 60—52)

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This invention relates to extensible and retractable aerials and actuating mechanisms therefor, and particularly to radio antennas adapted for installation in vehicles and the like where it is desired to extend and retract the antenna sections by power means from a point remote from the antenna mounting.

It is an object of the present invention to provide an actuating mechanism for an extensible antenna as described which is positive in its operation and which is extremely flexible in design so as to be adaptable for various space conditions.

It is another object to provide such an actuating mechanism which utilizes a positive displacement fluid pressure system for actuating the antenna, and in which this fluid pressure system is sealed off from the operative portions of the antenna, thereby allowing the use of any of the conventional types of telescopic pole antennas.

It is also an object to provide an actuating mechanism for an antenna which utilizes, in combination with a positive displacement fluid pressure system as described, an elongated flexible dielectric member which is connected to the antenna and actuatable in an extending or retracting direction by fluid pressure, whereby the fluid pressure system may be located remotely from the antenna proper.

Other objects, features, and advantages of the present invention will become apparent from the subsequent description taken in conjunction with the accompanying drawing.

In the drawing:

Figure 1 is an elevational view, partly in cross-section showing an antenna together with the novel actuating means of this invention; and

Fig. 2 is a cross-sectional view taken along the line 2—2 of Fig. 1 and showing the details of the pump and housing construction.

The antenna proper 11 in the illustrated embodiment may be any one of several types of conventional telescopic antennas well known in the art and may be mounted, for example, on a fender, cowl, or other body panel 12 of an automotive vehicle or the like. The antenna comprises a plurality of telescopic sections 13, 14 and 15, the outer section 15 being secured indirectly to the body panel, and with means (not shown) interconnecting the sections for extending and retracting movement. This securing means need not be described in detail but may comprise an insulating block 16 to which the lower end of section 15 is secured and in which the lead-in connection (not shown) may be mounted. This insulating block is held within a cylindrical shell 17 which extends through an opening (not designated) in the body panel, a dome nut 18 and a neck piece 19 securing shell 17 to the panel.

The novel actuating means comprises an elongated rod 21 which is secured at one end to the

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antenna and which is acted upon by a positive displacement fluid pressure system to move the antenna in either an extending or retracting direction. Rod 21 is preferably constructed of a flexible dielectric material such an nylon, although it will be understood that the principles of this invention contemplate the use of other types of rigid or non-rigid actuating rods. The upper end of rod 21 is secured at 22 to the lower end of inner telescopic sections 13 of the antenna. A casing generally designated at 23 has an upper cylindrical section 24 secured within the lower end of shell 17 and extends downwardly therefrom. The intermediate section 25 of casing 23 tapers downwardly and inwardly to a lower cylindrical section 26. A connecting piece generally designated at 27 has an upper section 28 secured within section 26 and extends downwardly therefrom. The dielectric rod extends through casing 23 and through passageway 29 in connecting piece 27. A series of O-rings 31 are mounted within the upper section 28 of the connecting piece and are in operative engagement with rod 21 for purposes hereinafter described. The lower end 32 of connecting piece 27 is threaded, and a tubular housing 33 is connected at one end to section 32 by a union 34. The dielectric rod 21 extends a substantial distance into housing 33 when the antenna is in its retracted position. At the opposite end 35 of the dielectric rod is secured a piston 36, the piston being so constructed as to have a snug fit within the tubular housing. It will be understood that although in the illustrated embodiment the tubular housing 33 is substantially U-shaped, the housing may be arranged in other shapes so as to suit the particular space requirements of the job while still utilizing the principles of this invention.

Means are provided for applying fluid pressure to either side of piston 36, thereby actuating the dielectric rod in either direction. In the illustrated embodiment, this means contemplates the use as a fluid conducting medium of connecting piece 27 as well as tubular housing 33. However, it will be understood that other arrangements for actuating rod 21 in either direction by fluid pressure would still be within the principles of this invention. A reversible fluid pressure system generally designated at 37 is provided, one end of this system being connected to an intermediate portion 38 of the connecting piece 27 which leads to one end of tubular housing 33. The other side of this fluid pressure system is connected to the opposite end 39 of the tubular housing. The fluid pressure system comprises in general a power source 41 such as a reversible electric motor, a pump designated at 42 which is driven by the motor, and a two-chambered accumulator designated at 43 which supplies the fluid for the pump 42 and the remainder of the

system. As best shown in Fig. 2, the pump 42 is contained within a housing 44 and may comprise a pair of gears 45 and 46 which positively displace the fluid to either side of the housing, the gear 46 being connected by reduction gearing 47 to the reversible motor 41. However, it will be understood that other types of pumps may also be used with equal effectiveness. A mounting plate 48 is disposed in supporting relation between the motor 41 and pump housing 44. Accumulator 43 is mounted above the pump housing and is surmounted by a cap 49, and bolts 51 hold the cap, accumulator, pump housing and mounting plate in rigid relation. Accumulator 43 comprises two chambers 52 and 53 separated by a wall 54, the cap 49 cooperating with the wall to seal the chambers from each other. Chamber 52 is connected by an aperture 55 to one side 56 of the pump housing 44 and chamber 53 is likewise connected by an aperture 57 to the opposite side 58 of the pump housing. The side of chamber 52 is connected to section 38 of the connecting piece 37 by a length of tubing 59, and chamber 53 is connected by means of a nipple and union to the end 39 of tubular housing 33. It will be understood that while for illustrative purposes a short length of tubing 59 is shown, this tubing may be of any length, and the fluid pressure system 37 may thus be at any desirable point remote from the antenna proper.

In operation, the fluid pressure system, including both chambers of the accumulator and tubular housing 33, is filled with hydraulic fluid 61, leaving air spaces 62 and 63 in chambers 52 and 53 respectively. Assuming an initial position as shown in Fig. 1 in which the antenna is retracted and the dielectric rod 21 extends within housing 33, the reversible motor 41 is actuated in a direction so that pump 42 drives the fluid from side 56 to side 58 of the pump housing. This will cause an increase in fluid pressure within chamber 53 and the fluid will pass from this chamber into end 39 of housing 33, thereby forcing piston 36 downwardly and driving dielectric rod 35 into its extended position. The diameter of housing 33 and the surface properties of the rod and housing are preferably such that the dielectric rod will be guided therein without danger of binding at the bends of the housing. Simultaneously with this action, fluid will be withdrawn from chamber 52 and therefore from the opposite end of housing 33, allowing the movement of the piston to take place. As rod 21 is forced upwardly, it will be guided by O-rings 31, and these O-rings will serve to effectively seal the hydraulic fluid within the system and to prevent leakage into the casing 23. Upward movement of the rod will, of course, extend antenna section 13 and the other antenna sections in turn. It will be noted that since it will take a predetermined time to fully extend the antenna, the motor 41 may be shut off at any point during the operation, thus instantaneously stopping the antenna movement. The length of rod 21 is preferably such that when the antenna has reached its fully extended position the piston 36 will still be within housing 33. Friction and the effect of the trapped fluid are sufficient to effectively hold the aerial in any intermediate position. When it is desired to retract the antenna, the motor and pump are operated in the reverse direction, pumping fluid from chamber 53 to chamber 52. The fluid will thus be conducted to the opposite side of piston 36, drawing the rod 21 and the antenna sections into retracted position.

While it will be apparent that the preferred embodiments of the invention herein disclosed are well calculated to fulfil 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.

I claim:

1. In an antenna actuating means, a hydraulic system including a tubular passage arranged in open looped form, a piston disposed within said passage, liquid within said passage on both sides of said piston, a liquid accumulator disposed between the ends of said looped passage and connected in fluid communicating relationship to one end of said passage, the liquid partially filling said accumulator so as to leave an air space thereabove, a pump disposed between said looped ends and having two ports, one of said ports being connected in fluid communicating relationship with said accumulator and the other of said ports being connected in fluid communicating relationship with the other end of said passage, said pump having a reversible output whereby fluid may be pumped through said looped passage in either direction to drive the piston in either direction, an actuating element mechanically connected to said piston, and a fluid tight guide in said passage, said actuating element extending out of said passage through said fluid tight guide to actuate an antenna.

2. In an antenna actuating means, a hydraulic system including a tubular passage arranged in open looped form, a piston disposed within said passage, liquid within said passage on both sides of said piston, a liquid accumulator disposed between the ends of said looped passage, said accumulator comprising two chambers, one chamber being connected in fluid communicating relationship with that side of the looped passageway which is on one side of the piston, the other chamber being connected in fluid communicating relationship to that part of the looped passageway on the other side of the piston, the liquid partially filling said accumulator so as to leave an air space thereabove, a pump having a reversible output disposed between said looped ends, one side of said pump being connected in fluid communicating relationship with one of said chambers, the other side of said pump being connected in fluid communicating relationship with the other of said chambers, said pump being actuable so as to increase the pressure in one of said chambers while decreasing the pressure in the other of said chambers whereby fluid may be pumped through said looped passage in either direction to drive the piston in either direction, an actuating element mechanically connected to said piston, and a fluid tight guide in said passage, said actuating element extending out of said passage through said fluid tight guide to actuate an antenna.

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