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ANTENNA MECHANISM

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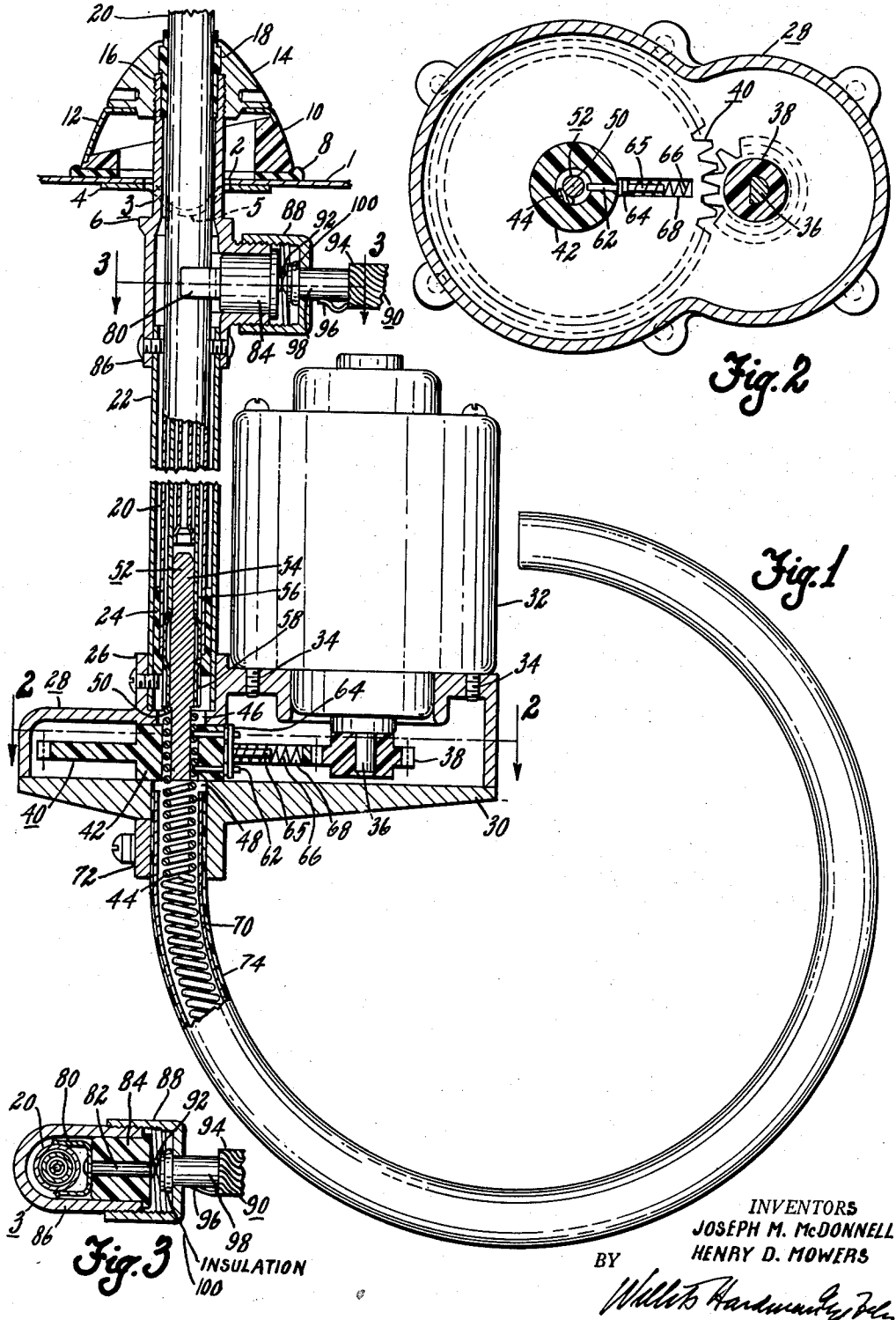


Fig. 1

Fig. 2

Fig. 3

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ANTENNA MECHANISM

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This invention relates to retractable antenna for vehicular borne radio apparatus, and provides for projecting and retracting antenna sections with respect to a vehicular body.

The antenna sections are in telescoping relation, one part insulatingly supported within a housing which is so mounted that it extends through a wall or body member to expose the antenna outside and support actuating mechanism inside by which at least one movable antenna part may be projected or retracted. Attached to the movable antenna part there is an open wound helix acting in the nature of a flexible screw device traversed by a nut to jack the antenna part in and out in response to the operation of a reversible motor turning the nut device. The nut device embraces the hub of a spur gear rotatable around the helix and provided with radially disposed pins projected inwardly under spring pressure into the space between successive turns of the helix. A gear casing encloses the gear and supports a circular tube extending the length of the helix so as to reduce the overall length of the assembly.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred embodiment of the present invention is clearly shown.

In the drawing:

Fig. 1 is a vertical section through the antenna assembly showing certain parts in elevation.

Fig. 2 is a transverse section of the transmission substantially as shown by the line and arrows 2—2 of Fig. 1.

Fig. 3 is a sectional view of the antenna lead-in substantially as shown by the line and arrows 3—3 of Fig. 1.

Referring to the drawings, the reference numeral 1 indicates a supporting wall such as a fender of an automobile having a hole 2 through which a tubular case 3 extends for mounting an antenna mast. Beneath the member 1 there is a clamp washer 4 with a hump at 5 designed to engage a shoulder 6 of the tubular casing 3 to assist in mounting the antenna structure. Above the member 1 there is a rubber pad 8 that seats a non-conducting leveling washer 10 which is engaged by a leveling cup 12 to be held in place by a nut 14 threaded on the tubular casing 3 as at 16. Within the upper end of the casing 3 and nut 14 there is an insulating bushing 18 through the axis of which extends an antenna part 20. That part is in the form of a fixed tube extending through the casing 3 and a housing tube 22, the part 20 being supported at the lower end by a nonconducting bushing 24. The lower end of the tubular housing 22 is supported within a hollow boss 26 of a cup member 28 while the upper end of the tubular housing 22 is secured within the lower end of the tubular casing 3.

A plate 30 cooperates with the cup member 28 to provide a gear casing which together supports a reversible electric motor 32 secured to the member 28 by screws 34. The motor ends in a shaft 36 which drives a pinion 38 intermeshing with a gear 40 that has a hub 42 of plain

bore that is journalled about the outside of an open wound helix 44. The gear casings 28 and 30 have aligned bores or openings 46 and 48 that are aligned with the bore of the hub 42 and permit passage axially of the helix 44. One end of the helix is secured to the lower end 50 of a pin 52 secured at the upper end 54 to a movable antenna part 56 slidable in the fixed antenna part 20. Spring connectors 58 mounted on the pin 52 are stressed to engage within and slide along the tubular part 20 as the projection and retraction is accomplished. To effect the axial movement of this antenna part the hub 42 of the gear 40 supports a pair of pins 62 that are radially disposed to project radially inwardly of the hub and engage between successive turns of the helix 44. The pins 62 are carried by a bridge member 64 with a stem 65 to guide and support a spring 66 disposed in a radial slot 68 of the gear 40.

When the motor 32 rotates the gear 40, it acts like a nut device traversing the length of the helix 44, the pins 62 following the space between the successive turns as the gear rotates upon the helix. The flexible shaft or helix 44 is housed by a circular tube 70 bent into circular form and secured within the bore 48 of the plate 30 by a clamp and screw device 72. A nonconducting cover or sheet 74 covers the tube 70 and insulates it with respect to the gear casing. The pinion 38 and gear 40 are made of nonconducting material and thus insulate the helix 44 and the other associated antenna parts.

The antenna lead-in is perfected by a spring clip 80 engaging the fixed tubular portion 20 and supported by pin 82 carried by a block of insulation 84 mounted in branch 86 of the tubular casing 3. A clamp nut 88 threads upon the branch 86 to connect the pin 82 with the conductive element of the cable 90, such as at 92, and to anchor the cable connection. The cable is covered with a braided or other shielding element 94 that is bonded at 96 to a metallic ferrule 98 in turn grounded through the nut 88 to the branch 86, and thence by 3, and 4 to the fender 1. An insulating washer 100 inside the nut insulates the ferrule 98 from the signal conductive elements, and acts as a thrust member by which the nut 88 maintains the connection at 92.

The foregoing mechanism provides a motion translating means by which a telescoping member is given a lineal movement from within a housing to a position outside thereof and return by means of a nut and thread device in the nature of a screw-jack. The screw-jack comprises a spur gear whose axial bore is in slidable engagement with a flexible helix attached to the projectable member. The hub of the gear has threaded engagement with the flexible helix by pin members in the hub that follow the turns of the helix to effect the lineal movement of the shaft upon rotation of the gear. While the gear is journalled generally on the outside of the helix it is so confined within the gear box that the ends of the hub 42 engage faces of the case members 28 and 30 that receive the thrust of movement as the gear 40 threads itself along the helix. The flexible shaft being of considerable length, that portion between the hub 42 and the free end is housed in a tube bent into circular form, the better to confine the apparatus to a limited space. As the gear or nut device threads along the helix, the latter is caused to bend and follow the confines of the tube. Should the projecting and retracting movement be suddenly opposed it is possible that the pin 62 will be canted out of the space between the coils enough to permit slippage or somewhat of a ratcheting movement between the pins and the coil. The spring 66 will hold the pins in engagement for all normal operations. The motor 32 being reversible the lineally movable element can and will be projected or retracted. The pinion 38 and gear 40 being made of nonconducting material, and the tube 70 being insulated with respect to the gear box,

then the movable element 56 and helix 44 are properly insulated for all positions of the movable element 56 within the fixed member 20, and therefor maintained in conductive relation with the lead-in 90 for signal reception.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In vehicular carried radio an antenna construction comprising, in combination, a tubular housing adapted to be mounted on a vehicle and supporting a gear box, an elevtric motor supported by the gear box, an antenna mast having a part extensible and retractable with respect to said housing, non-conducting bushings insulating the antenna from the housing, a flexible shaft movable axially in said housing to raise and lower said antenna part, said flexible shaft comprising an open wound helix extending through openings in said gear box, transmission means driven by the motor for actuating said flexible shaft, said transmission means including a spur gear rotatably mounted in said gear box, said gear being rotatable around the flexible shaft and having a central opening through which said shaft extends, spring pressed means carried by said gear and engaging the coils of said helix so that axial movement of said helix is effected by rotating movement of said spur gear.

2. In vehicular carried radio an antenna construction comprising, in combination, a tubular housing adatped to be mounted on a vehicle and supporting a gear box, an electric motor supported by the gear box, an antenna mast having a part extensible and retractable with respect to said housing, non-conducting bushings insulating the antenna from the housing, a flexible shaft movable axially in said housing to raise and lower said antenna part, said flexible shaft comprising an open wound helix extending through openings in said gear box, transmission means driven by the motor for actuating said flexible shaft, said transmission means including a spur gear rotatably mounted in said gear box, said gear being rotatable around the flexible shaft and having a central opening through which said shaft extends, spring pressed means carried by said gear and engaging the coils of said helix so that axial movement of said helix is effected by rotating movement of said spur gear, said spring pressed means comprising a member movable by the spring radially with respect to said spur gear into operative position and having a plurality of pins extending therefrom and engaging between coils of the helix when said member is in operative position.

3. In vehicular carried radio an antenna construction comprising, in combination, a tubular housing adapted to be mounted on a vehicle and supporting a gear box, an

electric motor supported by the gear box, an antenna mast having a part extensible and retractable with respect to said housing, non-conducting bushings insulating the antenna from the housing, a flexible shaft movable axially in said housing to raise and lower said antenna part, said flexible shaft comprising an open wound helix extending through openings in said gear box, transmission means driven by the motor for actuating said flexible shaft, said transmission means including a spur gear rotatably mounted in said gear box, said gear being rotatable around the flexible shaft and having a central opening through which said shaft extends, spring pressed means carried by said gear and engaging the coils of said helix so that axial movement of said helix is effected by rotating movement of said pur gear, said spur gear having an elongated hub surrounding said central opening and said spring pressed means comprising a member movable radially with respect to said spur gear and having pins extending through said hub for engagement between the coils of the helix when said member is in operative position, said member also having a pin extending therefrom into a slot in said gear and surrounded by a spring normally urging said member toward the helix.

4. In vehicular carried radio an antenna construction comprising, in combination, a tubular housing adapted to be mounted on a vehicle and supporting a gear box, an electric motor supported by the gear box, an antenna mast having a part extensible and retractable with respect to said housing, non-conducting bushings insulating the antena from the housing, a flexible shaft movable axially in said housing to raise and lower said antenna part, said flexible shaft comprising an open wound helix extending through openings in said gear box, transmission means driven by the motor for actuating said flexible shaft, said transmission means including a spur gear rotatably mounted in said gear box, said gear being rotatable around the flexible shaft and having a central opening through which said shaft extends, spring pressed means carried by said gear and engaging the coils of said helix so that axial movement of said helix is effected by rotating movement of said spur gear, said motor having a drive shaft extending into the gear box and supporting a gear rotatable therewith and engaging said spur gear.

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