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A. T. MACE

2,329,404

MAST ANTENNA ACTUATOR

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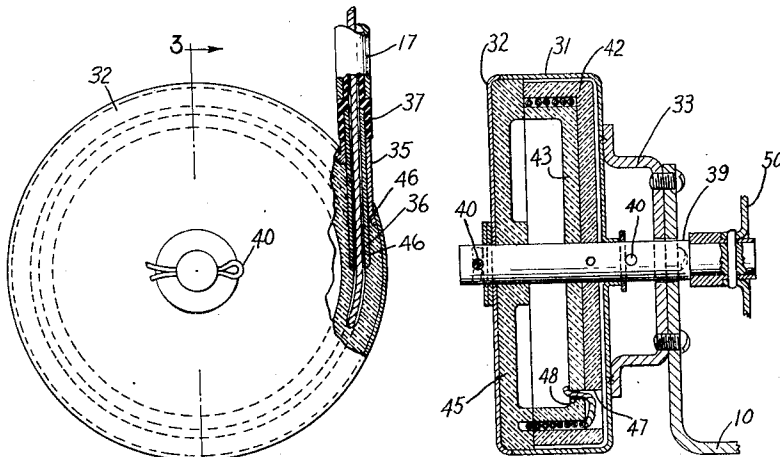


FIG. 2.

FIG. 3.

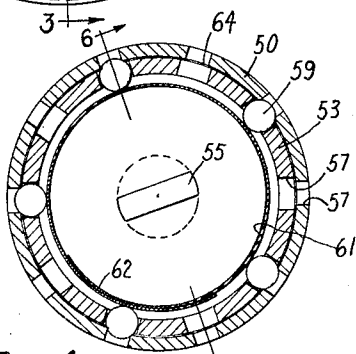


FIG. 4.

FIG. 5.

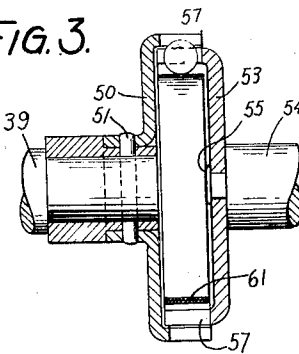


FIG. 6.

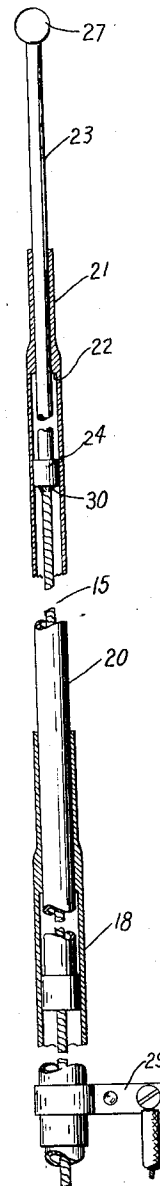


FIG. 7.

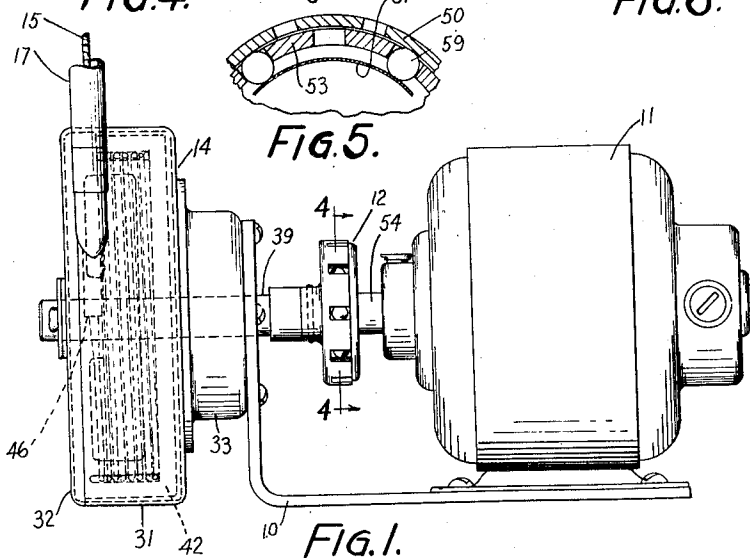


FIG. 1.

INVENTOR.

ARTHUR T. MACE

BY *Jay, Golrick, Williams & Jay*

UNITED STATES PATENT OFFICE

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MAST ANTENNA ACTUATOR

Arthur T. Mace, East Cleveland, Ohio, assignor to
The Radiart Corporation, Cleveland, Ohio, a
corporation of Ohio

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4 Claims. (Cl. 254—148)

This invention, as indicated, relates generally to antennas of the mast type now in popular use in conjunction with vehicles and has reference more particularly to a combination of such an antenna and means for actuating the same.

Antennas of this type usually comprise nested telescoping tubes usually provided with a rod projecting from the uppermost tube. Antennas of this type have heretofore been provided with elongate flexible means, such as a cable, projecting upwardly therein with the upper end of such cable connected to the lower end of the rod or uppermost telescopic element of the antenna, a reel being provided for receiving and dispensing the cable in response to manual forces applied to a crank or the like. It is desirable to locate the reel interiorly of the vehicle and in many instances some power means of actuating the same is to be preferred. An electric motor or other source of power has heretofore been used to extend or retract the antenna. Such mechanisms have been liable to jam when the antenna was fully extended or telescoped.

The primary object of this invention has been to provide power driven clutch means for actuating an antenna of the type described. Another object of this invention has been to provide a clutch as above identified which automatically renders itself ineffective when counteracting forces above the safe limit of the antenna. A still further object of this invention has been to provide a reel of the type above identified which is mechanically simple.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims; the annexed drawing and the following description setting forth in detail certain structure embodying the invention, such disclosed means constituting, however, but one of various structural forms in which the principle of the invention may be used.

In said annexed drawing—

Fig. 1 is a fragmentary side elevation of a device having incorporated the principal features of this invention;

Fig. 2 is a partially fragmentary and partially sectional end view thereof;

Fig. 3 is a fragmentary section indicated by the lines 3—3 of Fig. 2;

Fig. 4 is a section indicated by the line 4—4 of Fig. 1;

Fig. 5 is a fragmentary section similar to Fig. 4 but showing the elements in another position;

Fig. 6 is a section indicated by the line 6—6 of Fig. 4; and

Fig. 7 is a partially fragmentary and partially sectional view of an antenna having incorporated therein the principal features of the invention.

With reference more particularly to Fig. 1 there will be seen mounted upon a base 10, a suitable source of power, such as an electric motor 11, interconnected by means of a clutch 12 to a reel 14 which actuates a cable 15, the latter extending upwardly into the antenna 17. The base 10, as shown, is purely illustrative and is intended to represent any suitable specially prepared base or any suitable portion of a vehicle.

With reference more particularly to Fig. 7, the antenna proper and the cable projecting therein will now be described. It will be understood that this invention is not limited or restricted to the particular type of antenna shown and that such type is solely by way of illustration and not by way of limitation. The telescoping elements of the instant antenna comprises a relatively short base or bottom tube 18 the lower end of which, as will hereinafter appear, is suitably connected to the reel. Fixed with respect to this tube and projecting downwardly therein is an upper tube 20, both ends of which are open and the upper end of which is provided with a restriction neck 21 so as to present an interior shoulder or abutment 22 adjacent the upper end thereof. Snugly projecting through the neck 21 is a wire or rod 23 the lower end of which is provided with an enlargement 24 adapted for engaging the abutment 22 thereby limiting upward movement of the rod. A ball 27 surmounts the rod and engages the tip of the neck thereby limiting downward movement of the rod. A suitable clip 29 may be provided for lead-in purposes. The cable 15 projects upwardly into both of the tubes and the upper end 30 thereof is suitably secured to the rod 23 as by welding or soldering such end to the rod. Thus it will be seen that actuation of the cable moves the rod upwardly or downwardly as the case may be, thereby causing the antenna elements to become extended or telescoped.

The upper portion of the outer tube 18 may be rigidly insulatively supported by the vehicle body and the lower end thereof as will presently appear is supported by the reel, which is enclosed by a suitable metallic housing 31 provided with

a cover 32. The housing is suitably secured as by spot welding to a cup-like element 33 which in turn is suitably secured as by bolts to the base 10. The housing is provided with an upwardly directed tubular projection 35 into which and beyond either end of which projects an insulating sleeve 36. Interconnecting the projection 35 and the sleeve 36 with the antenna is an insulating tube 37 which is provided with suitable steps for interconnecting such elements. Thus the antenna is insulated from the housing and the base. Freely projecting through an opening in the base and in the cup-like element 33 and suitably journaled in the housing and in the cover is a shaft 39 which is restrained against axial movement by suitable means such as washers and pins 40. Suitably non-rotatably carried by the shaft is a cup-like element 42, the inner diameter of the axial portion of which is greater than the outer diameter of the axial portion of an inner cup-like element 43 which also is non-rotatably carried by the shaft. As is seen in Fig. 3 the left end of the axially extending cylindrical space thus provided between these cup-like elements is closed by a suitable cover plate 45 which is rotatably carried by the shaft and which is provided with a tangentially extending opening 46 for accommodating the lower end of the sleeve 36. The lower end of the cable is threaded through the sleeve 36, the opening 46, the axial space between the cup-like elements 42 and 43 through an opening 47 in the cup-like element 42 and then through an opening 48 in the cup-like element 43 to the interior thereof. Suitable means may be employed for securing the lower end of the cable to the interior of the cup-like element 43; however the bends of the cable in passing through the openings 47 and 48 provide adequate anchorage. The cup-like elements 42 and 43 and the cover plate 45 are preferably made of electrical insulating material, such as a plastic, and if made of metal, then such elements should be suitably insulated from the vehicle. It will be understood that the cup-like elements 42 and 43 may be made integral instead of separate. Thus it will be seen that rotation of the shaft 39 causes the cable to coil or uncoil and consequently actuates the rod 23 with respect to the inner tubes 18 and 20.

As is above indicated, power driven clutch means are provided for rotating the shaft and such means, as is seen in Figs. 4, 5 and 6, comprise a driven and a driving member, preferably in the nature of inter-fitting cups, the driven cup 50 which is suitably keyed to the shaft 39 as by a pin 51 and the driving cup 53 which is suitably connected to the motor shaft 54. For connecting the driving cup and the motor shaft, the latter is provided with a non-circular portion which projects through an opening in the former, such portion being peened over as at 55. The axial portion of each of the cups is provided with a plurality of circumferentially spaced openings, preferably in the form of axial slots, which extend from the rim towards the base of the cups. The slots of one cup are equal in number and spacing to the slots of the other cup so that the openings of one cup will register with the openings of the other cup. As is better seen in Figs. 4 and 5, the openings of one of the cups, preferably the inner cup, are somewhat greater in a circumferential direction than are the openings of the other cup. Suitable elements, such as balls 59, are accommodated by the larger open-

ings and project partially into the smaller openings, the latter being such that the balls cannot pass therethrough and preferably project but slightly therein. Resilient means for urging the balls towards the smaller openings is provided and by way of illustration is a single coil of spring ribbon 61, the ends of which overlap as at 62. It is to be noted that the axial portions of the cup are preferably not in contact with each other and provide a space 64.

The motor is controlled by a pair of manually operated switches, not shown, located preferably on the instrument panel of the vehicle. Now assuming the antenna extending switch of such switches is actuated, the torque imparted to the driving cup 53 by the motor will be transmitted to the driven cup 50 by means of the spring loaded balls and the reel cups 42 and 43 will uncoil the cable 15 and force it into the antenna, thereby pushing the rod 23 upwardly until such switch is released or until the enlargement 24 engages the shoulder 22. If such engagement takes place, then the driven cup 50 can no longer rotate and the axial edges of the openings thereof urge or cam the balls 59 against the urge of the spring 61 completely out of such openings so that the elements of the clutch eventually assume the relationship seen in Fig. 5. When this relation exists the driving cup may spin and very little or no torque is thereafter transmitted to the driven cup. By properly selecting the size of the balls, the size of the openings, and the resiliency of the springs, the elements may assume the disengaged or ineffective torque transmitting relationship seen in Fig. 5 without offensive jerks or jars being created due to tendency of the balls to re-establish a drive between the two cups. If the other of said switches be actuated, such other switch causing the antenna to contract, then just the reverse action from the action just described will take place. It will be understood that if desired, suitable reduction gearing may be inserted between the motor and the reel without departing from the scope of this invention.

Ten openings 57 in each of the cups 50 and 53 are shown in Fig. 4, but it will be understood that any number of openings instead of ten may be employed and that by inserting a proper number of balls 59, the maximum torque transmitted may be controlled as desired.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the structure herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:

1. The combination of extensible and retractable antenna elements, a cable for actuating said elements, power means for actuating said cable, and clutch means interposed between said cable and said power means, said clutch means comprising a driving cup and a driven cup the axial portion of each of which is provided with openings, the openings of one of said portions being adapted for registration with and being longer than the openings of the other of said portions, a ball carried by the larger of said openings adapted for projecting into the other of said openings, and resilient means for urging said ball towards said other of said openings.

2. The combination of nested telescopic antenna elements, a cable for telescoping said ele-

ments, means for limiting the amount of telescoping said elements, power means for actuating said cable, and clutch means interposed between said cable and said power means, said clutch means comprising a pair of cup-like elements each presenting an axial portion, each of said portions having circumferentially spaced slots extending from the rim thereof towards the body thereof, said slots being adapted for registration with each other, a plurality of elements one for each of the slots of one of said portions and adapted for projecting into the slots of the other of said portions, said slots of the other of said portions and said elements being such that a cam action is had therebetween whereby said elements are cammed out of said slots of the other of said portions when said clutch tends to urge said telescoping elements beyond the amount permitted by said limiting means.

3. The combination of extensible and retractable antenna elements, a cable for actuating said elements, power means for actuating said cable and clutch means interposed between said cable and said power means, said clutch means comprising an outer and an inner member each pre-

5 sending a plurality of openings, said openings adapted for registration with each other, and an element carried by each of the openings in said inner member, common means for urging each of said elements toward the openings in the outer member, said elements being adapted to be cammed out of said outer openings when the force differential between said members exceeds a predetermined amount.

10 4. The combination of extensible and retractable antenna elements, a cable for actuating said elements, power means for actuating said cable, and clutch means interposed between said cable and said power means, said clutch means comprising a pair of cup-shaped elements one of which is provided with recessed portions and the other of which is provided with projections resiliently urged towards said recesses and adapted for entering said recesses for establishing a drive
15 between said pair of elements, said recesses and said projections being such that said projections are cammed out of said recesses when the force differential between said pair of elements exceeds a predetermined amount.

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ARTHUR T. MACE.