

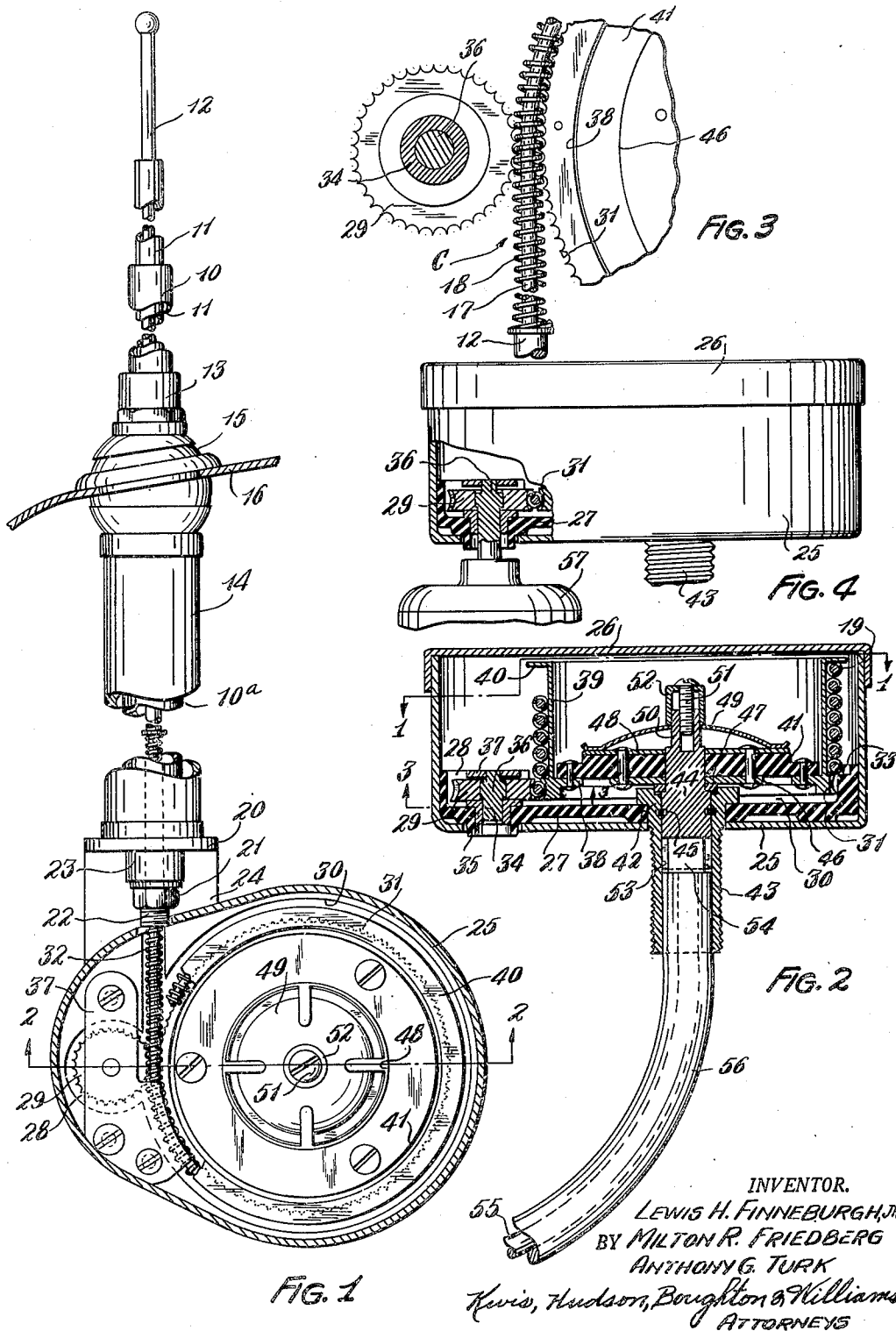
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ANTENNA REEL

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## ANTENNA REEL

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This invention relates to a reel mechanism especially adapted for use in conjunction with extensible radio antennae such as are employed on motor vehicles. Although the reel mechanism embodying the invention will be described as used for the purpose of extending and retracting extensible radio antennae it will be understood that the reel mechanism may be used advantageously in other environments.

An object of the invention is to provide a reel mechanism which actuates a flexible actuating cable that is connected to a device, such as an extensible radio antenna, and which reel mechanism includes provision for positively moving the cable in opposite directions while the drum of the mechanism performs no driving function as to the cable but acts simply as a take-up and pay-out drum for the cable and upon or from which the cable can be wound or unwound.

Another object of the invention is to provide a reel mechanism for the actuating cable of a device, such as an extensible radio antenna, and which mechanism includes positive drive means for the cable and a take-up and pay-out drum on which the cable may be wound or from which it may be unwound, said drum being driven in timed relation to said positive drive means but having no driving function with respect to the cable.

A further object is to provide a reel mechanism for the actuating cable of a device, such as an extensible radio antenna, and which mechanism is so constructed that the tension on the cable will be maintained constant at all times while no binding or snarling of the cable on the drum of the mechanism will occur.

A further object of the invention is to provide a reel mechanism for an extensible radio antenna which provides for positive extension and retraction of the antenna but is so constructed as to permit the antenna to be extended or retracted by someone directly grasping the antenna members and relatively moving the latter, even though the actuating shaft of the mechanism may be locked or held against movement.

A further object of the invention is to provide an improved, novel and efficient reel mechanism for extending and retracting an extensible radio antenna from within the structure upon which the antenna is mounted as, for example, from within a motor vehicle upon the exterior of which the antenna is mounted.

Another object is to provide an improved and novel reel mechanism as referred to in the last named object and which mechanism can be ac-

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tuated manually, either directly or remotely, or can be power actuated if desired.

A further object is to provide a reel mechanism as referred to in the last two objects and which mechanism is reversible in that it can be arranged to be actuated from either side of the drum of said mechanism in accordance with installation and operating conditions.

A further object of the invention is to provide a reel mechanism for the actuating cable of an extensible radio antenna and wherein said cable is in the form of a flexible rack while said mechanism includes cable drive gears meshing with the flexible rack and positively moving the cable, said mechanism also including a take-up or pay-out drum for the flexible cable driven in timed relation with said drive gears and upon which the cable is wound or from which it is unwound.

A further object is to provide a reel mechanism as referred to in the last named object and wherein the power for actuating said mechanism may be applied to the drum or to the cable drive gears as desired and if applied to the cable drive gears the latter provide the necessary gear reduction in the drive to the drum and if the power for operating the reel mechanism is a motor the necessity of providing a gear reduction in the motor drive is eliminated.

A further and specific object is to provide an improved and novel reel mechanism for the actuating cable of an extensible antenna and wherein all of the parts or elements of the mechanism which are in contact with said cable are effectively insulated from ground.

A still further object is to provide a reel mechanism such as referred to in the preceding objects and which mechanism is of simple construction, can be readily assembled and is efficient in operation.

Further and additional objects and advantages not hereinbefore specified will become apparent during the detailed description of an embodiment of the invention which is to follow.

Referring to the accompanying drawing illustrating said embodiment of the invention;

Fig. 1 shows the reel mechanism operatively associated with an extensible radio antenna, the reel mechanism being shown in section taken substantially on line 1—1 of Fig. 2, looking in the direction of the arrows, and the extensible antenna being shown in elevation with certain portions broken away.

Fig. 2 is a sectional view through the reel mechanism and is taken substantially on line

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2—2 of Fig. 1 looking in the direction of the arrows.

Fig. 3 is a fragmentary partly elevational and partly sectional view of the gear elements of the mechanism and is taken looking from line 3—3 of Fig. 2 as indicated by the arrows, and

Fig. 4 is a partly elevational and partly sectional view of the reel mechanism illustrating the actuating power for the mechanism applied to the gears and furnished by an electric motor.

The reel mechanism embodying the present invention may be used in conjunction with the actuating cable of various forms of devices but it has special utility when used in conjunction with the actuating cable of an extensible radio antenna and hence will be so described herein for purposes of illustration. The extensible radio antenna illustrated in Fig. 1 is well known in the art and per se forms no part of the present invention and hence needs to be only briefly described herein. The extensible antenna comprises an extensible tube 10 extending above the car body and within which is telescoped a second extensible tube 11 having telescoped therein an extensible rod 12. The tube 10 extends into a fixed tube 10a mounted in a housing 13 and a larger housing 14 in communication with each other through a fitting generally identified at 15 and by means of which fitting the antenna is secured to a suitable portion 16 of a motor vehicle. The construction of the fitting 15 and the manner in which it secures the antenna to the motor vehicle is well known and forms no part of the present invention.

The tubes 10 and 11 and the rod 12 are electrically interconnected and in extending the antenna from a retracted condition the rod 12 is first extended relative to the tubes 10 and 11 and when the rod 12 has been fully extended it picks up the tube 11 and causes an extension of this tube relative to the tube 10 and then when the tube 11 has been extended it picks up the tube 10 and extends the same relative to the housing 13 and the fixed tube 10a all as is well understood. The rod 12 and tubes 11 and 10 are retracted first by telescoping the rod within the tube 10 and then the tube 11 within the tube 10 and then the latter within the fixed tube 10a in the housings 13 and 14. It will be understood that the antenna is electrically connected by a suitable lead take-off, not shown, to the radio receiving set mounted in the motor vehicle.

The present invention contemplates a reel mechanism that is operatively associated with the flexible cable that extends and retracts the antenna and which mechanism is carried by the housing 14 and can be operated from within the motor vehicle, either directly or remotely, manually or by power means such as an electric motor.

The flexible actuating cable for the antenna is indicated as a whole at C and comprises a wire 17 which carries means acting as a flexible rack. At the present time the preferred means providing the flexible rack is a coil spring 18 surrounding and secured to the wire 17 and having its convolutions spaced apart a suitable distance to provide rack teeth which cooperate with gears later to be referred to.

It will be understood that the flexible rack might be formed of beads, a chain or any other element suitable for this purpose and through which the wire can extend. Or the wire itself could be formed as a flexible rack. The cable C formed of the wire 17 and spring 18 has one of

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its ends connected to the inner or lower end of the rod 12. The other end of the cable may be connected to one end of a coil spring 19 that has its other end anchored to the drum of the reel mechanism, or said spring 19 could be eliminated and said other end of the cable directly connected to the drum.

The lower end of the housing 14 may have secured to it the arm 20 of an angle bracket which is held in assembled relationship to said end of the housing by means of a nut 21 screwed on a threaded sleeve 22 through which the flexible cable C extends and which sleeve projects into the housing 14 and is mechanically connected to the fixed tube 10a through which the cable extends. An insulating spacer washer 23 is interposed between the arm 20 of the bracket and the nut 21. The other and vertical arm 24 of the bracket has secured to it the casing of the reel mechanism now to be described. This casing may be connected directly to the lower end of the housing 14 and the bracket be eliminated if desired.

The casing of the reel mechanism comprises a cup-shaped casing proper 25 having its open end normally closed by a cover 26. The casing 25 and cover 26 preferably are formed of sheet metal. Within the casing 25 and in engagement with the bottom wall thereof and the lower portion of the upstanding side wall thereof is a base 27 formed of suitable electrical insulating material as, for instance, a suitable plastic material. The base 27 is formed with a circular recess 28 in which is mounted a small gear 29 later to be referred to. The base 27 is also provided with a larger circular recess 30 that communicates with the recess 28 and has mounted therein a large gear 31 rigidly connected to the drum of the reel mechanism as will later be referred to. The base 27 is also provided with a groove 32 that aligns with an opening in the casing 25 and through which opening the lower end of the threaded sleeve 22 extends. The groove 32 in the base 27 extends in a direction substantially tangential to the gears 29 and 31 and the flexible cable C passes through the groove 32 and between said gears so that the teeth of the flexible rack formed by the wound spring 18 mesh with the teeth of said gears and operatively interconnect said gears. The flexible cable C extends partially around the circumference of the gear 31 and in mesh therewith but is gradually disengaged from the gear 31 and raised to a position where it will wind upon the drum later to be referred to. This raising of the cable out of meshing engagement with the gear 31 is accomplished by means of an inclined arcuate shoulder formed on the base 27 and a portion of which is indicated at 33 in Fig. 2.

The small gear 29 is shown as bearing against a bearing sleeve 34 which non-rotatably interfits a bearing boss 35 formed on the base 27 and extending through an opening in the bottom of the casing 25. The gear 29 has fixed therein a shaft 36 provided at its upper end as viewed in the drawings with a reduced portion rotatable in an opening formed in a bracket or plate 37 that is secured to the base 27 by suitable means such as the screws indicated in Fig. 1. It will be noted that the gear 29, sleeve 34, shaft 36 and plate 37 are electrically insulated from the casing 25 by the base 27.

The large gear 31 is formed on a ring 38 and which ring 38 rigidly mounts a drum 39 that is provided at its end adjacent the cover 26 with an annular retaining flange 40. The drum 39 may

be integral with the ring 38 or it may be separate therefrom and rigidly connected to the ring as will be well understood. The gear 31, ring 38 and drum 39 are illustrated as formed of metal but it will be understood that in some instances it may be desirable to form these parts of a different material as, for instance, an electrical insulating material. The diameter of the drum preferably is the same as the root diameter of the gear 31.

The ring 38 is rigidly secured to a disk-like hub 41 as by the rivets indicated in Fig. 2 or by any other suitable securing means. The disk-like hub 41 is located within the drum 39 and is formed of suitable electrical insulating material as shown for purposes of illustration. The head 42 of an externally threaded sleeve 43 is rigidly mounted in aligned openings formed in the base 27 and the bottom of the casing 25 while the sleeve 43 projects outwardly of the casing 25 through the opening therein. A shaft 44 is rotatable in the head 42 and sleeve 43 and is provided with an intermediate circular reduced portion on which the hub 41 is freely rotatable. The shaft 44 is held against axial displacement by means of an annular key 45 engaging in cooperating annular grooves formed in the head 42 and in the shaft 44. The hub-like disk 41 has secured to its side adjacent to the head 42 a suitable wear plate 46 while a spacer washer 47 is mounted on the shaft 44 intermediate said wear plate 46 and cooperating shoulders formed on the shaft 44 and the head 42 of the sleeve 43.

The hub-like disk 41 has secured to its side that is remote from the head 42 a clutch plate or disk 48 with which a bowed radially slotted spring clutch plate 49 cooperates. The spring clutch plate 49 is provided with a central opening the circumference of which has flats that cooperate with flats formed on the reduced end portion 50 of the shaft 44, wherefore said spring clutch plate 49 will rotate with the shaft 44. The reduced portion 50 of the shaft 44 is provided with an axially extending tapped opening into which an adjusting screw 51 can be screwed and said adjusting screw is carried by a cup-shaped clamping member 52 that telescopes upon the reduced portion 50 of the shaft 44 and engages the spring clutch plate 49. It will be understood that the clutch plate 48 and spring clutch member 49 constitute a friction clutch between the shaft 44 and the hub 41 so that said shaft may drive the hub and drum. It will also be understood that the adjusting screw 51 and cup adjusting member 52 enables a predetermined frictional engagement to be established between the clutch members 49 and 48 to provide for slippage therebetween upon a predetermined resistance to the rotation of the hub 41 and drum 39. The outer or lower end of the shaft 44 as viewed in Fig. 2 is provided with a diametral slot 53 for receiving the driving tongue 54 of a reel actuator. The particular form of friction clutch shown is for purposes of illustration only, it being understood that other forms of friction clutch might be employed herein or other devices providing the same purpose as the friction clutch might be used. Also various forms of adjustment might be provided for the friction clutch other than that shown.

The reel actuator may be a manually operated device or a power operated mechanism. In Fig. 2 the reel actuator which carries the driving tongue 54 is shown as a flexible drive cable 55 contained in a sheath 56 and extending to a suitable point remote from the reel mechanism where manually

actuated means may be located for operating the cable 55. It will be understood, however, that in some installations it might be desired to actuate the reel remotely by power means or manually by means of a short crank or actuating handle applied directly to the reel mechanism. In some installations it might be desirable to have the reel actuator applied to the opposite end of the shaft 44 from that to which the cable 55 is applied in Fig. 2 and it will be readily understood that the structure might be easily altered to provide for such an arrangement.

In Fig. 4 the reel mechanism is shown as actuated by an electric motor 57 which is operatively connected by suitable coupling means to the shaft 36 on which the small gear 29 is mounted. The construction shown in Fig. 4 likewise could be readily modified to have the spindle of the motor 57 connected to the opposite end of the shaft 36 then the end to which it is connected in Fig. 4. The motor 57 can of course be controlled by switch means located at any desired point.

It will be noted that when the reel mechanism is actuated through a power source such as a motor and said source is operatively connected to initially drive the small gear 29, said gear 29 acting through the flexible rack of the cable C and driving the large gear 31 provides a good gear reduction in the drive to the drum 39. Of course if the electric motor or other power source is connected to the shaft 44 then the drum is driven through the friction clutch and in such instance a gear reduction might be necessary between the motor and the shaft 44. The operation of the reel mechanism when actuated by initially rotating the shaft 44 will now be explained.

It will be assumed that the antenna is in retracted condition and that the flexible cable C is wound on the drum 39 of the reel mechanism. When it is desired to extend the antenna the shaft 44 is rotated either manually or by power with a resultant rotation of the spring clutch member 49. Assuming that the spring clutch member 49 has been adjusted to exert the required friction on the clutch plate 48 it will be understood that the hub 41 will be driven from the shaft 44 and in turn will rotate the drum 39 and the gear 31. The rotation of the gear 31 which is in mesh with the flexible rack 18 of the cable C positively moves said cable in a direction to unwind or pay out the cable from the drum and further positively operates the cable to raise the rod 12, then the tube 11 and finally the tube 10 until the antenna is fully extended. Of course during this operation of the cable the small gear 29 which is also in mesh with the flexible rack 18 will rotate, it being noted that said small gear 29 functions to maintain the flexible rack of the cable C in mesh at all times with the cable drive gear 31. It will be observed that the cable C is positively unwound from the drum and is positively actuated in an antenna extending direction. If the power should continue to be applied after the antenna has been fully extended no damage will result since a slippage will occur between the elements 49 and 48 of the friction clutch.

It will now be assumed that it is desired to retract or collapse the antenna, whereupon the shaft 44 is rotated in the opposite direction, with the result that the gear 31 positively actuates the cable in the antenna collapsing direction to move the rod 12 and the tubes 11 and 10 telescopically into each other and into the housings 13 and 14. In collapsing the antenna the drum

39 does not function as a driving element for the cable C but merely acts as a take-up drum on which the positively actuated cable is wound in a helix.

The reel mechanism applies constant tension or force to the cable C and since the drum 39 rotates in timed relation to the movement of the cable and the rotation of the gears 29 and 31 and functions merely as a take-up or pay-out drum the cable will be smoothly wound on the drum in a helix without snarling or any binding action and, conversely, will be properly unwound therefrom.

It will also be noted that should the antenna be extended or collapsed by someone directly grasping the rod 12 and moving the same in the proper direction to extend or collapse the antenna, as the case may be, such operation can take place without injury to the reel mechanism. In the case referred to the manual direct movement of the rod 12 simply moves the flexible cable to cause the gears 29 and 31 to rotate in accordance with the movement of the cable with a resultant rotation of the drum 39 and a paying out or taking up of the cable from or upon the drum.

When the reel mechanism is actuated by a power means operatively connected to the small gear 29 the cable C will be positively driven by the gear 29 in either antenna extending or retracting direction and said cable in turn will drive the gear 31 and the drum 39 in timed relation to the movement of the cable to cause an even non-binding and non-snarling paying out or taking up of the cable from or upon the drum.

At all times the cable C is positively actuated in either direction depending upon whether the antenna is being extended or retracted.

It will be understood that the details of structure of the reel mechanism may be varied for manufacturing and other reasons and that the manner in which the drum and the gears are insulated from the casing 25 may be changed so long as the reel mechanism positively drives the cable C and the drum of the mechanism functions simply as a take-up or pay-out drum.

Although a preferred embodiment of the invention has been illustrated and described herein, it will be understood that the invention is susceptible of various modifications and adaptations within the scope of the appended claims.

Having thus described our invention, we claim:

1. A reel mechanism for actuating an extensible and retractable antenna comprising, in combination, a flexible actuating cable having one of its ends operatively connected to said antenna and being provided with means constituting a flexible rack, a take-up and pay-out drum connected to the other end of said cable and upon or from which said cable may be wound or unwound, a gear rotatable in constant timed relation to said drum and constantly meshing with said rack means, and means independent of said rack for rotating simultaneously said drum and gear in either direction to cause said gear to positively actuate said cable to extend or retract said antenna and said drum to have said cable helically wound thereupon or unwound therefrom.

2. A reel mechanism for actuating an extensible and retractable antenna comprising, in combination, a flexible actuating cable having one of its ends operatively connected to said antenna and being formed of a wire upon which is

mounted means constituting a rack, a take-up and pay-out drum connected to the other end of said cable and upon or from which said cable may be wound or unwound, a gear rotatable in constant timed relation to said drum and constantly meshing with said rack means, and means independent of said rack for rotating simultaneously said drum and gear in either direction to cause said gear to positively actuate said cable to extend or retract said antenna and said drum to wind or unwind said cable helically thereupon or therefrom.

3. A reel mechanism for actuating an extensible and retractable antenna comprising, in combination, a flexible actuating cable having one of its ends operatively connected to said antenna and formed of a wire surrounded by a coiled spring the convolutions of which are spaced apart to act as rack teeth, a take-up and pay-out drum connected to the other end of said cable and upon or from which said cable may be wound or unwound, a gear operatively connected with and rotatable in constant timed relation to said drum and constantly meshing with said rack teeth formed by said spring convolutions, and means independent of said rack teeth for rotating simultaneously said drum and gear in either direction to cause said gear to positively actuate said cable to extend or retract said antenna and said drum to take up or pay out said cable.

4. A reel mechanism for actuating an extensible and retractable antenna comprising, in combination, a flexible actuating cable having one of its ends operatively connected to said antenna and being provided with means constituting a flexible rack, a take-up and pay-out drum connected to the other end of said cable and upon or from which said cable may be wound or unwound, a gear operatively connected with and rotatable in constant timed relation to said drum and meshing with said rack means, means constantly maintaining said rack means in mesh with said gear, and means independent of said rack for rotating simultaneously said drum and gear in either direction to cause said gear to positively actuate said cable to extend or retract said antenna and said drum to take up or pay out said cable.

5. A reel mechanism for actuating an extensible and retractable antenna comprising, in combination, a flexible actuating cable having one of its ends operatively connected to said antenna and being provided with means constituting a flexible rack, a pair of gears between which said cable passes with said rack means intermeshed with both of said gears, a rotatable take-up and pay-out drum operatively connected to one of said gears independently of said cable and to which drum the other end of said cable is secured and upon or from which drum said cable may be wound or unwound, and means for rotating one of said gears to positively actuate said cable to extend or retract said antenna and through said rack means to rotate the other gear, said drum rotating simultaneously with the gear to which it is operatively connected and acting to take up or pay out said cable.

6. A reel mechanism as defined in claim 5 and wherein the means for rotating one of said gears is applied to the said gear which is operatively connected to the take-up drum.

7. A reel mechanism as defined in claim 5 and wherein the gear which is operatively connected to the take-up drum is substantially larger than

the other gear and is substantially equal in diameter to the diameter of said drum.

8. A reel mechanism for actuating an extensible and retractable antenna comprising, in combination, a flexible actuating cable having one of its ends operatively connected to said antenna and being formed with means constituting a flexible rack, a take-up and pay-out drum connected to the other end of said cable and upon or from which drum said cable may be wound or unwound, a gear operatively connected with and rotatable synchronously to said drum and constantly meshing with said rack means, and means independent of said rack for synchronously rotating said drum and gear in either direction to cause said gear to positively actuate said cable to extend or retract said antenna and said drum to take up or pay out said cable, said last named means including a friction clutch providing slippage in the drive to said drum and gear upon a predetermined resistance to their rotation.

9. A reel mechanism for actuating an extensible and retractable antenna comprising, in combination, a rotatable actuating shaft, a take-up and pay-out drum freely rotatable on said shaft, a gear connected with said drum for constant timed rotation therewith and substantially of the diameter of said drum, friction clutch means operatively interconnecting said shaft and drum and gear for simultaneously rotating but providing for slippage therebetween upon a predetermined resistance to the rotation of said drum and gear, and a flexible actuating cable having one of its ends operatively connected to said antenna and its other end to said drum and being provided with means constituting a flexible rack constantly meshing with said gear, said gear positively actuating said cable and said drum acting to take up or pay out said cable as it is wound thereon or unwound therefrom.

10. A reel mechanism for actuating an extensible and retractable antenna comprising, in combination, a take-up and pay-out drum, a gear having a root diameter substantially the same as the diameter of said drum and coaxial therewith and operatively connected thereto, a second and smaller gear rotatable in the plane of rotation of said first gear and having its periphery spaced from the periphery of said first gear, a flexible actuating cable having one of its ends operatively connected with said antenna and its other end to said drum and being provided with means constituting a flexible rack, said cable passing between said gears with the rack means of the cable constantly meshing with both of said gears, and means for simultaneously rotating one of said gears to cause said cable to be positively actuated under constant tension by said gears and said drum to take up or pay out said cable as the latter is wound thereon or unwound therefrom, whereby the amount of slack in the cable on the

drum will always be substantially the same regardless of the amount of cable wound up.

11. A reel mechanism as defined in claim 10 and wherein means is provided for rotating said drum and said first named gear with the rotation of said first named gear acting through said cable to rotate said second named and smaller gear.

12. A reel mechanism as defined in claim 10 and wherein means is provided for rotating said second named and smaller gear which acts through said cable to rotate said first named and larger gear and said drum.

13. A reel mechanism as defined in claim 10 and including a casing enclosing said drum and gears and provided with means insulating said drum and gears from said casing and from ground.

14. A reel mechanism for actuating an extensible and retractable antenna comprising, in combination, a rotatable actuating shaft, a take-up and pay-out drum freely rotating on said shaft, a gear connected with said drum for constant timed rotation therewith and substantially of the diameter of said drum, friction clutch means operatively interconnecting said shaft and drum and gear for synchronous rotation but providing for slippage therebetween upon a predetermined resistance to the rotation of said drum and gear, a flexible actuating cable having one of its ends operatively connected to said antenna and its other end to said drum and being provided with means constituting a flexible rack constantly meshing with said gear, said gear positively actuating said cable and said drum acting to take-up or pay-out said cable as it is wound thereon or unwound therefrom, and a second gear rotatable on an axis parallel to the axis of said drum and said first gear and in mesh with said flexible rack and acting to maintain said flexible rack always in mesh with said first gear.

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