March 7, 1944. A. T. MACE 2,343,684

ANTENNA

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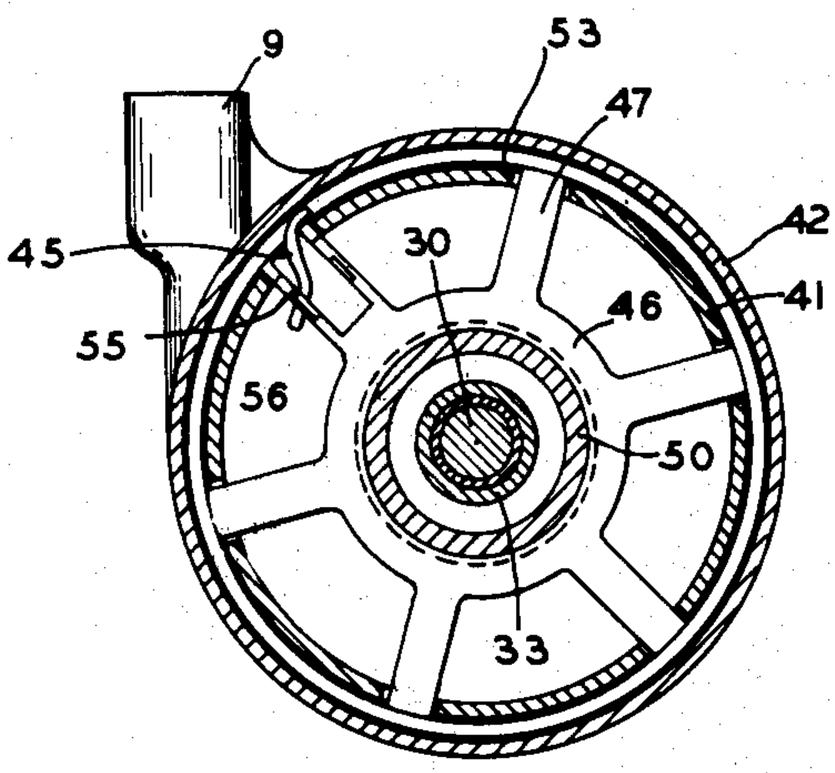

FIG. 5.

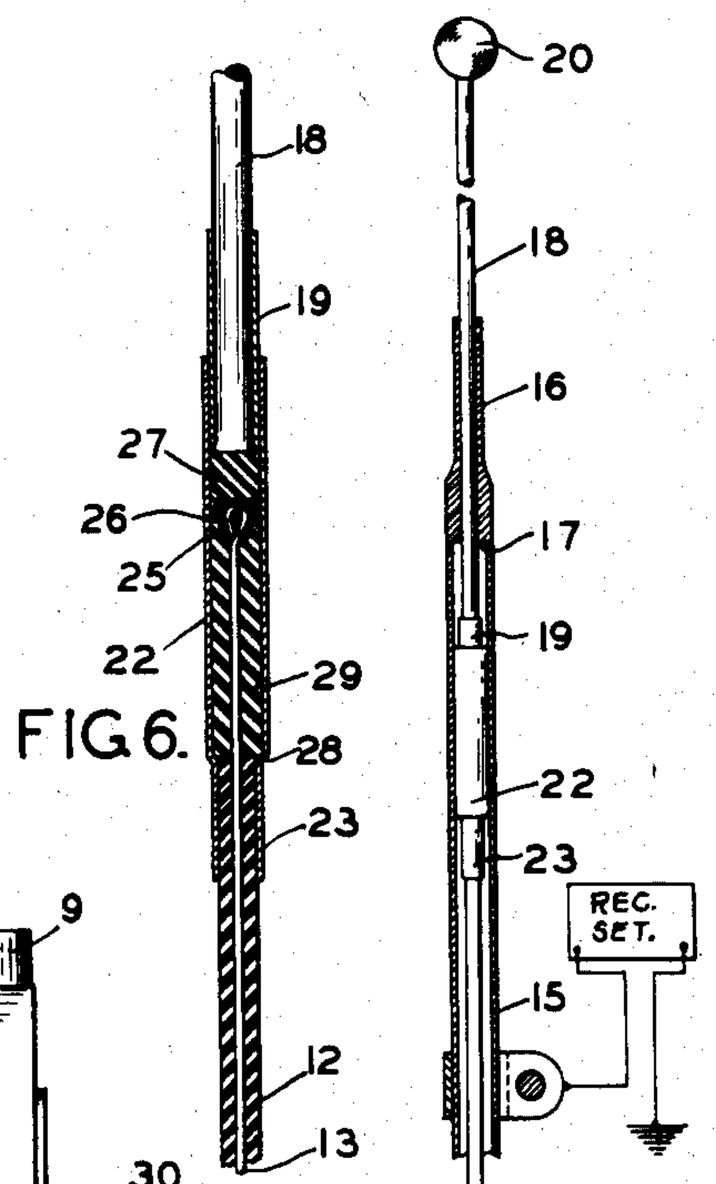

FIG. 6.

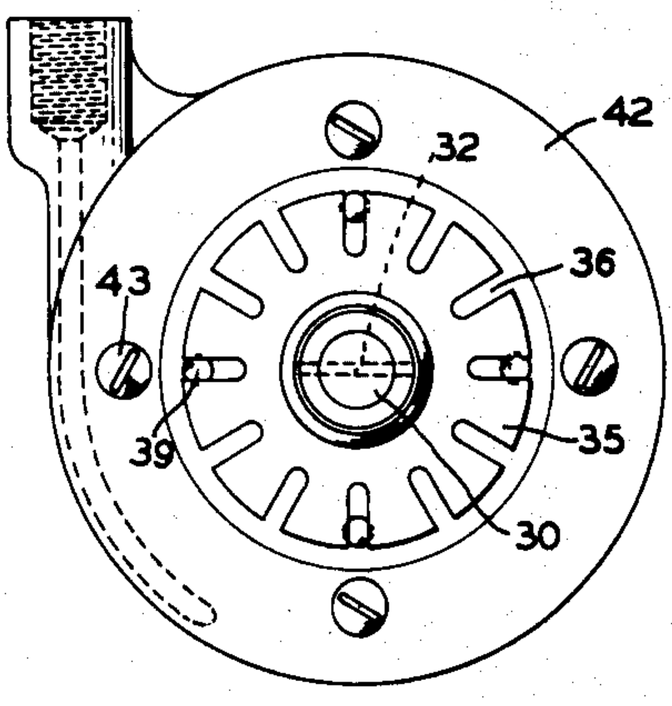

FIG. 3.

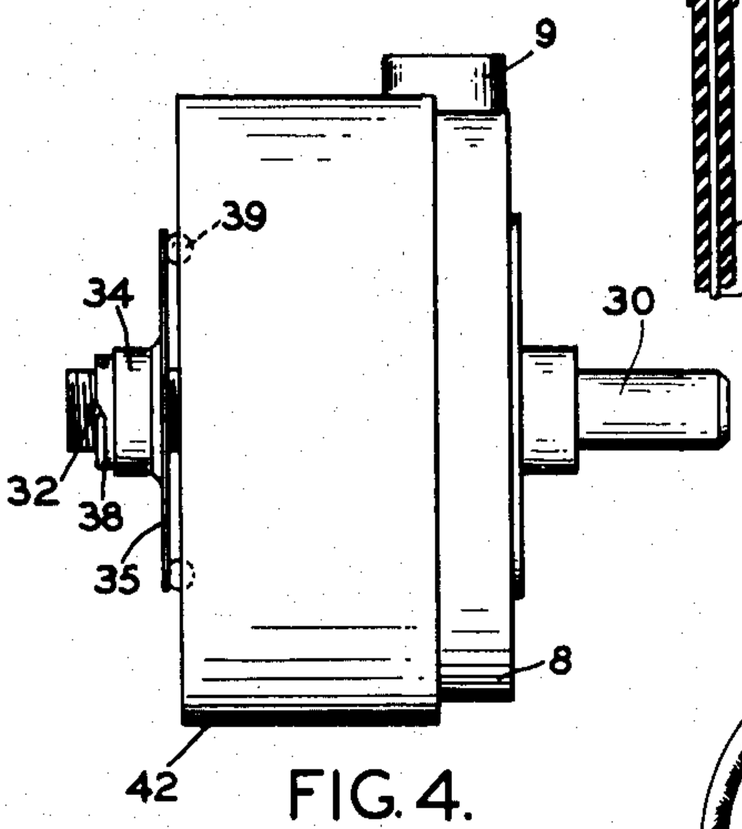

FIG. 4.

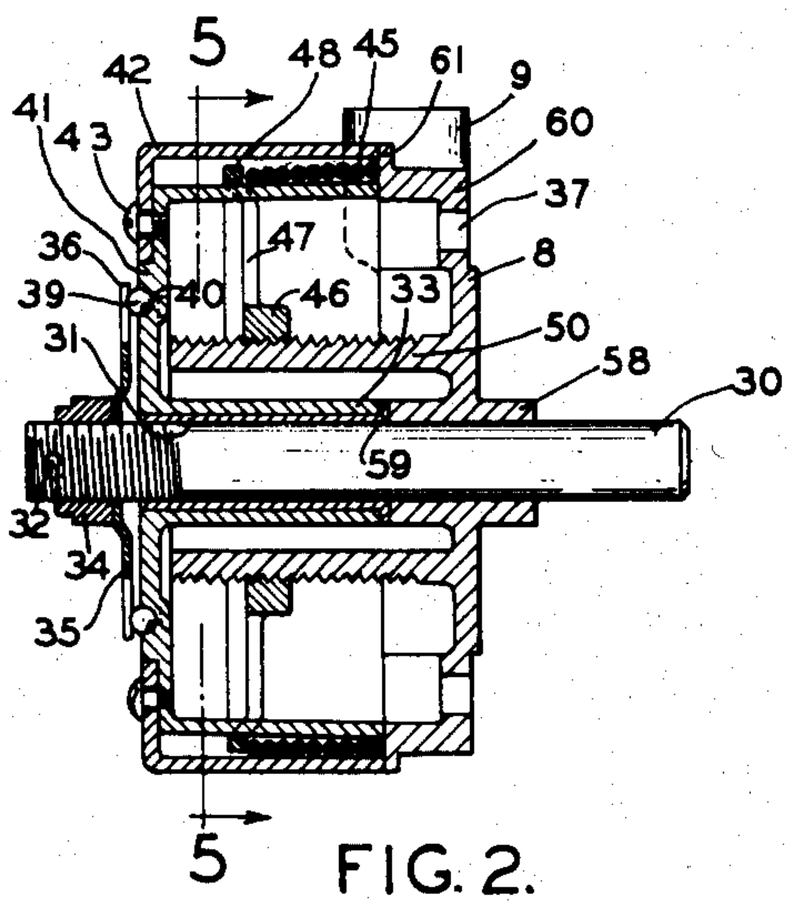

FIG. 2.

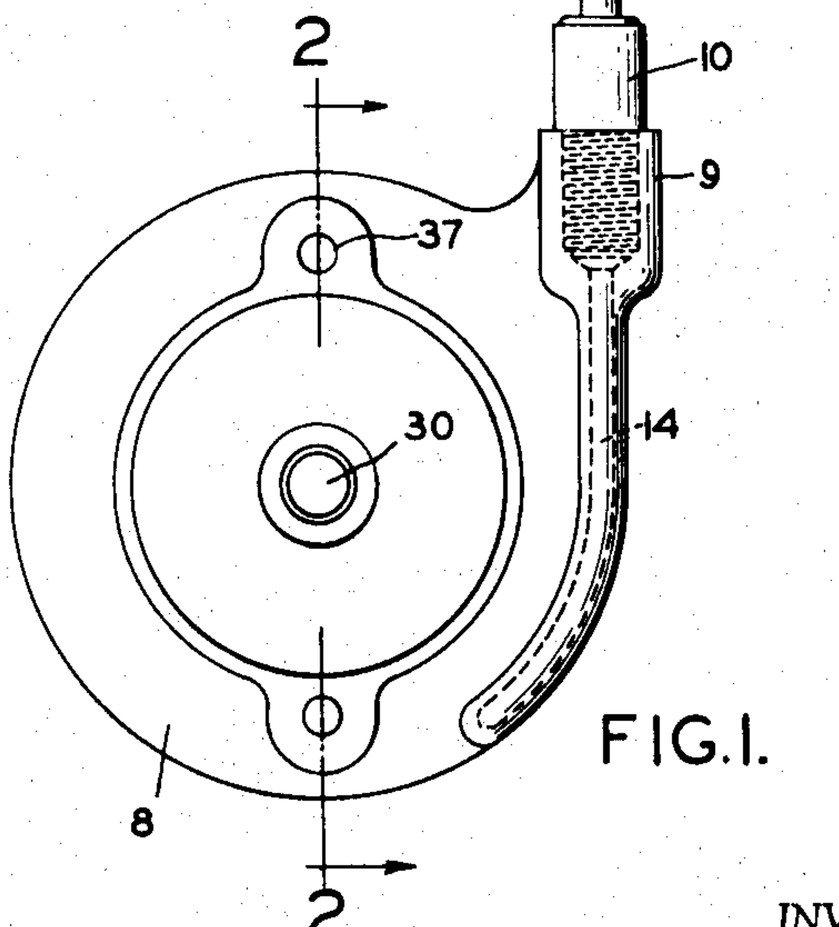

FIG. 1.

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6 Claims. (Cl. 254—176)

This invention relates to an antenna assembly unit including a telescopically extensible aerial and reels for extending and retracting the aerial.

In antenna units of this type it has up to now been customary to attach the antenna to some part of the car while insulating it from the same, whereas the wire inside the tubes of the collapsible aerial was not insulated at all.

It is one object of the present invention to provide an insulation for the wire inside the tubes thereby rendering the attachment of the antenna unit to the car quite simple, since no insulation from the car need be provided for when using this modified device.

Moreover, reel operated antennae normally comprise a long flexible member, which upon coiling and uncoiling has a tendency to bind or jam on its confining case, a very serious drawback which has to be met if the antenna unit is to be dependable in use.

The chief object of the present invention is, therefore, to provide an operating mechanism which will function smoothly and with a minimum of effort without becoming jammed or locked during use. Another object is the provision of an electrically efficient antenna with completely insulated wire in the aerial proper, at low costs and simple to manufacture.

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 as disclosed.

In said annexed drawing:

Fig. 1 is a front view partly in section of the assembly antenna unit;

Fig. 2 is a sectional view taken along lines 2—2 of Fig. 1;

Fig. 3 is a rear view of the reel unit, the aerial proper being taken away;

Fig. 4 is a side view of the reel unit;

Fig. 5 is a section along lines 5—5 of Fig. 2; and

Fig. 6 is an enlarged sectional view of a part of the aerial.

Referring to Fig. 1 of the drawing, 8 is a top plate of a metal casting, hereafter called the body casting, having holes 37 formed therein which serve for connection with any desired part of the car or other vehicle designated for carrying the antenna unit. A cup-shaped member 9 is formed on said plate 8, with an internally threaded wall, into which an adaptor 10 can be fitted by means of a thread corresponding to the one in the member 9. A channel 14 leads from member 9 into the interior of the coiling device, which channel serves as a passage for receiving or dispensing a cable 12 when coiling or uncoiling of the latter takes place.

Adapter 10 carries a confining sheath 11 which serves as a covering for the rubber cable 12 with a core of piano-wire 13. I choose piano-wire because it is of great strength and elasticity, which will both help in smoothly extending the aerial and keeping it in position after it has been extended. This part of the antenna mounting is located within a sheltered place, where a sheath of textile material will be sufficient to protect the cable. The covering of the piano wire with the textile material has the further advantage to provide bulk in cross-section which will help to keep the antenna stable when in the extended position. For the portions of the aerial which are designed to project beyond the walls of the car, a metal tube 15 is provided having a restricted neck portion 16 and an interior shoulder 17 which serves as an abutment for the upper adjacent element. This may be another section of tube or, as shown in the embodiment shown in the drawing, a rod 18.

Within said tube 15 another closely fitting tube 22 is housed, having restricted portions 23 and 19. This tube serves for carrying the cable 13 and moves up and down when the aerial is extended or retracted respectively. Portion 19 is in rigid connection with rod 18 and limits the upward movement of the same when in abutment with shoulder 17. On its upper end the rod carries a ball 20.

Fig. 6 shows the inner construction of this part on an enlarged scale with the outer tube 15 removed. As already mentioned, the core 13 of the cable has a rubber covering 12, which continues up to the shoulder 28 in the tube 22. Adjacent thereto a tube 29 of Bakelite is provided for enclosing the wire 13 up to its loop-shaped end 26. Said end is embedded in a block of cement 25 which fixes it within the Bakelite tube. The upper end of this insulating carrier is again formed by a piece of Bakelite, designated by numeral 27, which serves as support for rod 18.

Referring to Fig. 2, a shaft 30 is connected in a manner not shown to a small motor which serves for operating the coiling device. The shaft is located partly in the body casting 8 and partly in a bushing 31, which fits into a space between said casting and a wall 33 of a casting 41 serving as an inside drum for the cable while it is being

uncoiled or coiled respectively. All the castings mentioned in the specification are preferably made of die cast zinc alloy, though other die cast alloys may be used if desired.

One end of shaft **30** is threaded to engage with a stepped hub **34** rigidly connected with a clutch spring **35** in any known manner. The hub is held in position by a pin **32** fitted into a notch **38** of hub **34** (Fig. 4). Spring **35**, which is best seen in Fig. 3, is disk-shaped and comprises a plurality of longitudinal slots **36** along its circumference, which serves for holding down a number of suitable elements, for instance balls **39**. Said balls are slightly larger than the width of the slots **36** and are thus prevented from slipping through. The balls are accommodated by holes formed in the inner drum **41** at **40**. The clutch spring **35** thus serves for insuring temporary engagement between shaft **30** and the inner drum, while such engagement is desired, viz., during the coiling or uncoiling of the cable, as will be explained hereafter.

The coiling device proper comprises the inner drum **41** and an outer drum **42** both of which form together a winding reel and are held together by screws **43**. The inner drum is formed by a substantially U-shaped casting, the outer drum by an L-shaped casting. The two drums are assembled in a way to leave a clear space for receiving the wire **45**. This space is slightly widening toward the bottom, which helps in properly accommodating the wire.

The mechanism devised for accomplishing the accurate positioning of the wire and preventing the same from getting jammed, consists in a spider having a hub-like central member **46** engaging with a threaded sleeve **50** forming part of the body casting **8**. The member **46** carries spokes **47** which are slightly bent downward at their peripheral end where they carry a rim **48**. The rim will thus move in a different plane than the hub, the offsetting amounting to the width of one coil winding. The inner drum **41** is provided with slots **53** (Fig. 5) through which the spokes **47** pass freely, thus being enabled to move toward the right side in Fig. 2 during the uncoiling and in opposite direction during the coiling operation, as will be seen from the description which follows below. One of the spokes **47** carries a slot **55** formed thereon through which the end of the wire is passed and where it remains fixed without any particular clamping means.

The body casting **8** has a sleeve-shaped portion **58** enclosing shaft **30**, a clearance of a few thousandths of an inch being provided between said parts to avoid frictional engagement thereof. Moreover, the body casting comprises a rim portion **60** with a flanged end **61** adapted to close the annular channel between the two drums where the wire is housed. Here too a clearance of a few thousandths of an inch will prevent frictional engagement of part **61** and drums **41** and **42**.

The mechanism is operated in the following manner: When the aerial is in its retracted state, the entire length of the cable will be lying wound up between the two drums, the rim **48** will be close to the vertical branch of drum **42**, the hub **46** lying adjacent to the vertical portion of reel **41**. The motor is now started and uncoiling of the cable will set in. The body casting with its extensions **50** and **61** remains stationary, while the rotating shaft **30** actuates the two drums **41** and **42** through clutch member **35** rigidly connected by means of hub **34** to said shaft. Drum **41**, while rotating, takes along the rim **48** of spider **46**, thus causing the latter to travel along the threaded sleeve **50** in the direction toward the cup **9** (see Fig. 2). Since the cable **45** is paid out at the same rate as the rim **48** moves in that direction, the latter acts as a support and guide member for the cable during its travel, thus insuring its regular uncoiling without jamming. The front part of the uncoiling cable meanwhile pushes up the end section **18** of the aerial until the portion **19** bears on abutment **17**, the aerial being then completely extended. At this moment or shortly after, the movement of the reel ought to be stopped in order to prevent undesirous torque in said parts. To bring about disengagement of the driven parts even if the motor is still spinning, the clutch connection is provided, which now comes into action. By the increased torque prevailing after the uncoiling of the wire has taken place, balls **39** are forced out of the slots **36**, thus breaking the connection between the driven drum **41** and the driving part, viz., spring **35**, secured to shaft **30**.

If the aerial is to be retracted the reverse operation takes place, the motor now rotating in the opposite direction. The slot **36** again engages balls **39**, both drums being now driven in the opposite directions from the one they had during the uncoiling operation. The hub-part **46** of the spider travels to the left side on sleeve **50** while the cable **45** is supported by rim **48** gradually being moved toward the left side too as the cable advances, the aerial parts being telescoped at the same time. As soon as the rim again bears against part of the drum **42** and can travel no further, the driving action is stopped by disconnection of the spring **35**.

While I have described my improved mechanism in combination with an antenna unit normally used in automobiles, it should be understood that I do not want to limit myself to such use since the construction may be applied to any reel operated antenna.

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

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

1. In an antenna unit in combination an aerial, a cable connected to said aerial, mechanism for alternately extending and retracting said aerial while coiling and uncoiling said cable, said mechanism comprising a stationary body casting, a threaded sleeve extending from said body casting, a wheel-shaped member having a threaded hub for engagement with said threaded sleeve, two reel forming drums coaxially mounted with said threaded sleeve and enclosing between them a cylindrical space for receiving the cable upon coiling thereof, one of said drums having slots to receive the spokes of said wheel-shaped member, a rim on said wheel-shaped member adapted to serve as a support and positive guide for said cable while it is uncoiled and coiled, and power means operatively connected to said reel forming drums for driving the same.

2. In an antenna unit for automobiles in combination, an aerial, a cable connected to said aerial, a mechanism for alternately extending and retracting said aerial while uncoiling and coiling said cable, said mechanism comprising a

motor-driven shaft, a stationary body casting mounted on but without engagement with said motor-driven shaft, a threaded sleeve extending from said body casting, a wheel-shaped member having a threaded hub for engagement with said threaded sleeve, two reel-forming drums coaxially mounted with said threaded sleeve and enclosing between them a cylindrical space for receiving the cable upon coiling thereof, one of said drums having slots to receive the spokes of said wheel-shaped member, a rim on said wheel-shaped member adapted to serve as a support and positive guide for said cable while it is uncoiled and coiled, and power means for driving said motor shaft.

3. In a antenna unit in combination, an aerial, a cable connected to said aerial, and a mechanism for alternately uncoiling and coiling said cable, said mechanism comprising a motor-driven shaft, power means to drive said shaft, two rotatable reel-forming drums rigidly connected to each other and adapted to be driven by said shaft, said drums having different diameters thus providing a cylindrical space for housing said cable, an annular guide member mounted coaxially with said drums and adapted to rotate therewith, said guide member serving as a support for said cable while the same is uncoiled and coiled, and clutch means to bring one of said drums into and out of driving engagement with said driven shaft.

4. In an antenna unit in combination, an aerial, a cable connected to said aerial, and mechanism for alternately uncoiling and coiling said cable, said mechanism comprising a power-driven shaft, power means for driving said shaft, a stationary body casting mounted on said shaft, a threaded sleeve extending from said body casting, a wheel-shaped member having a threaded hub for engagement with said threaded sleeve, two reel-forming drums of different diameter coaxially mounted with said threaded sleeve and embracing a cylindrical space adapted to receive said cable, one of said drums having slots to engage the spokes of said wheel-shaped member, a rim on said wheel-shaped member adapted to move in said cylindrical space and to serve as a support and positive guide for said cable while it is uncoiled and coiled, and torque responsive means having resilient elements therein which serve to bring into and out of driving engagement one of said drums with said power-driven shaft.

5. In an antenna unit in combination, an aerial, a cable connected to said aerial, and power-driven mechanism for alternately extending and retracting said aerial while uncoiling and coiling said cable, said mechanism comprising two drums of different diameter for uncoiling and coiling said cable in the cylindrical space enclosed by said drums, an annular guide member mounted coaxially with said drums and adapted to rotate at equal speed, said guide member serving as a support for said cable while the same is uncoiled and coiled, and a torque responsive clutch mechanism comprising a disk-shaped spring having circumferentially spaced slots, said inner of the two drums having holes corresponding in number to said slots for cooperation therewith, and balls in said holes capable of engagement with said slots for operatively connecting said inner drum to said power-driven shaft.

6. In an antenna unit in combination, an aerial, a cable connected to said aerial, mechanism for alternately extending and retracting said aerial while uncoiling and coiling said cable, said mechanism comprising a two-part coiling reel, said two parts being in fixed relationship to each other with a cylindrical space formed between them, an annular member rotated at equal speed with said coiling reel, said member being mounted for axial movement with respect thereto for positively guiding said cable while the same is wound onto and off said reel within the said cylindrical space and means for driving said mechanism.

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