Dec. 23, 1952 T. R. FINKE 2,623,175

REEL ANTENNA

Filed March 25, 1949 2 SHEETS—SHEET 1

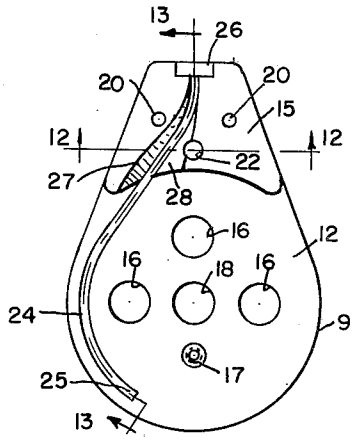

Fig. 6

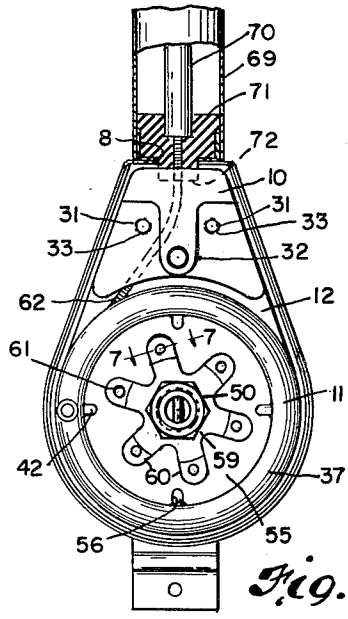

Fig. 5

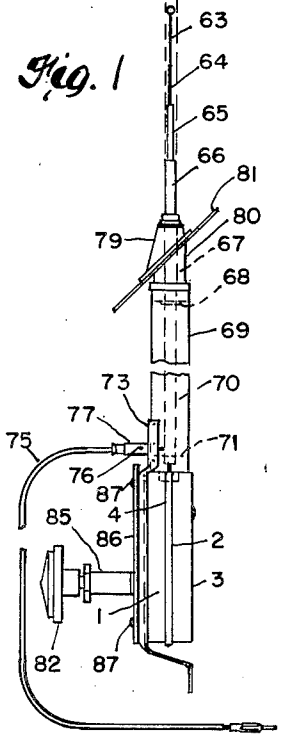

Fig. 1

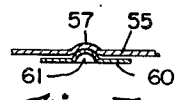

Fig. 7

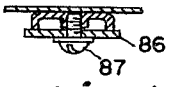

Fig. 4

Fig. 2

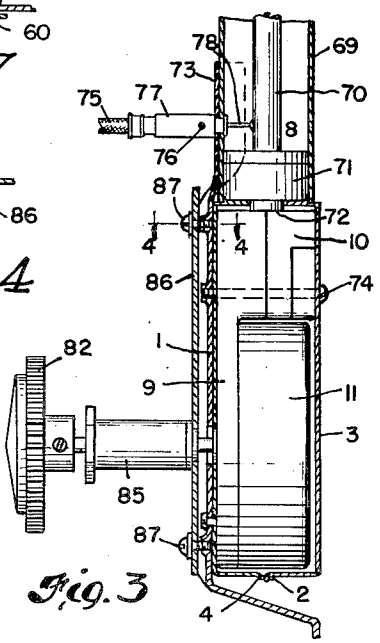

Fig. 3

INVENTOR.
THEODORE R. FINKE
BY
William Isler
ATTORNEY

Dec. 23, 1952 T. R. FINKE 2,623,175

REEL ANTENNA

Filed March 25, 1949 2 SHEETS—SHEET 2

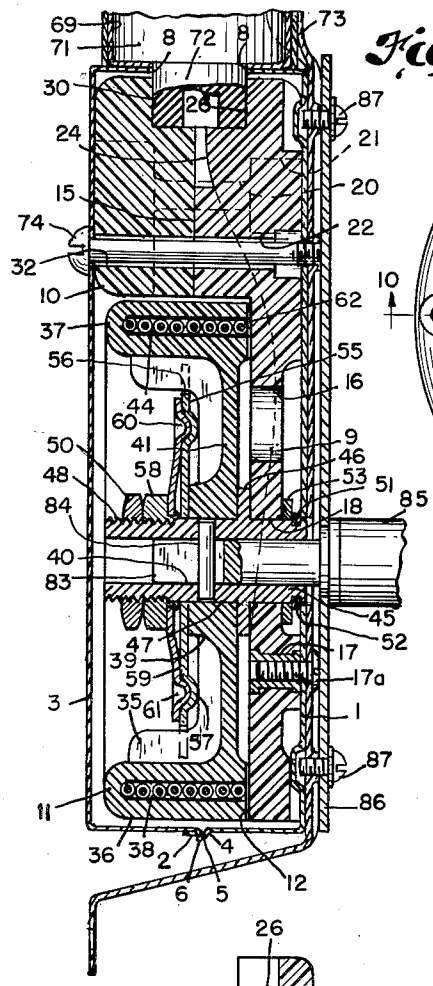

Fig. 8

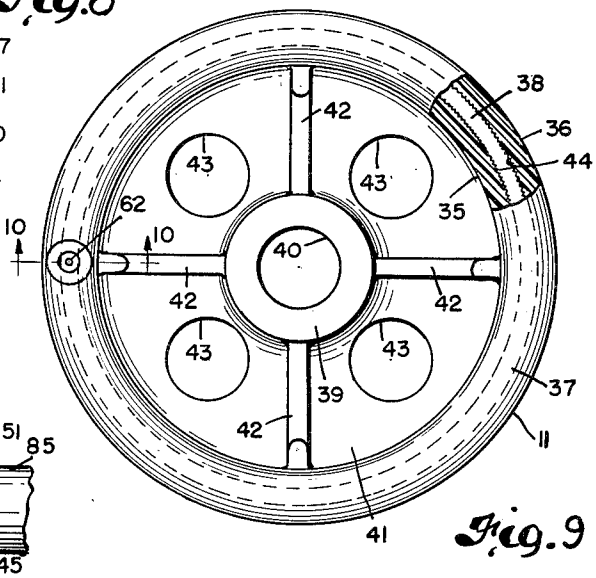

Fig. 9

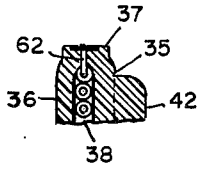

Fig. 10

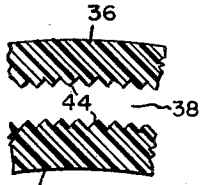

Fig. 11

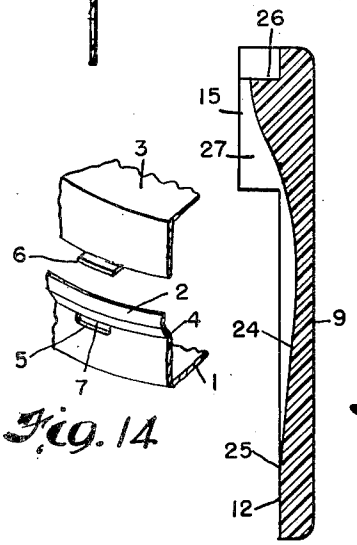

Fig. 14

Fig. 13

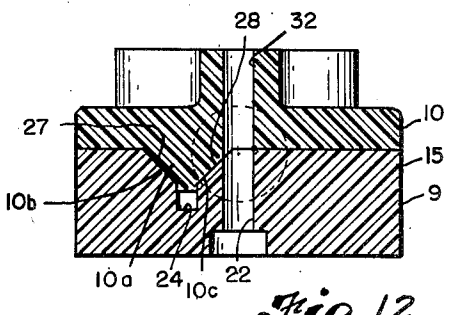

Fig. 12

INVENTOR.
THEODORE R. FINKE
BY
William Isler
ATTORNEY

Patented Dec. 23, 1952

2,623,175

UNITED STATES PATENT OFFICE

2,623,175

REEL ANTENNA

Theodore R. Finke, Euclid, Ohio, assignor to The Radiart Corporation, Cleveland, Ohio, a corporation of Ohio

Application March 25, 1949, Serial No. 83,503

18 Claims. (Cl. 250—33)

1

This invention relates, as indicated, to a reel antenna.

A primary object of the invention is to provide a reel antenna having a drum in which the antenna cable is wound, the drum having characteristics enabling it to function effectively in the winding and unwinding of the cable.

Another object of the invention is to provide a reel antenna having a cable winding drum which is designed to provide space for an overload clutch, to thereby reduce the overall dimensions or thickness of the assembly to a minimum.

Another object of the invention is to provide a reel antenna having a cable winding drum and an overload clutch of novel design, through which the drum is driven.

Another object of the invention is to provide a reel antenna, embodying a cable winding drum and drum cover in which the antenna cable is completely enclosed, and from which the cable is fed in a smooth and positive manner.

A further object of the invention is to provide a reel antenna embodying a cable winding drum and an overload clutch for driving the drum, utilizing a maximum torque in the drive.

A further object of the invention is to provide a reel antenna having a casing of novel, symmetrical design, enabling it to be mounted at either side of an automobile.

A still further object of the invention is to provide a compact, easily handled unit, consisting of a mast antenna, a reel or drum for extending or collapsing the antenna, a casing for efficiently housing the drum, and a bracket for supporting the unit on an automobile.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings, forming a part of this specification, and in which like numerals are employed to designate like parts throughout the same,

Fig. 1 is a side elevational view of a reel antenna embodying the principal features of the invention, and showing, in broken lines, the antenna mast in fully extended condition;

Fig. 2 is a view of the antenna, as viewed from the left side of Fig. 1;

Fig. 3 is a vertical sectional view through the drum casing, with the elements within the casing shown in elevation;

Fig. 4 is a fragmentary cross-sectional view, taken on the line 4—4 of Fig. 3;

Fig. 5 is an enlarged fragmentary view of the

2

reel and reel casing, with the casing cover removed;

Fig. 6 is a plan view of the drum or reel cover, with the cover block removed;

Fig. 7 is a fragmentary cross-sectional view, taken on the line 7—7 of Fig. 5;

Fig. 8 is a fragmentary cross-sectional view, on a greatly enlarged scale, taken on the line 8—8 of Fig. 2.

Fig. 9 is an elevational view of one side or end of the cable drum;

Fig. 10 is a fragmentary cross-sectional view, taken on the line 10—10 of Fig. 9;

Fig. 11 is an enlarged detail of a portion of Fig. 9;

Fig. 12 is a cross-sectional view, taken on the line 12—12 of Fig. 6, but showing also a section through the drum cover block;

Fig. 13 is a cross-sectional view, taken on the line 13—13 of Fig. 6, and

Fig. 14 is a fragmentary perspective view, showing means for interlocking the parts of the casing.

Referring more particularly to the drawings, the antenna will be seen to comprise a casing comprising a base or bottom 1 of generally pear-shaped contour having an offset peripheral flange 2, and a cover or top 3, of substantially the same contour and depth as the bottom 1, the peripheral edge of which rests on the shoulder or ledge 4 formed by the offsetting of the flange 2 of the bottom of the casing.

A portion of the shoulder 4 is removed to provide a slot 5 (Fig. 14) for the reception of a tongue 6 of the casing top 3, for interlocking these parts of the casing together at this point. The top or upper edge 7 of the slot 5, as viewed in Fig. 14, is substantially flush with the ledge or shoulder 4.

The members 1 and 3 of the casing are formed in their upper ends to provide a circular opening 8, for a purpose to be presently described.

Disposed within the case which has been described, is an antenna reel or drum, consisting of a drum cover 9, a cover block 10, and a cable drum 11.

The drum cover 9 is of substantially the same contour as the base or bottom 1 of the casing, so as to fit snugly in the latter, and is preferably molded, in a single piece, of a plastic insulating material, such for example, as a general purpose phenolic or thermoplastic plastic material. It is molded to provide a surface 12, and an upper end portion 15 which is of considerably greater thickness than the body of the drum cover. Three

circumferentially-spaced openings 16 extend through the drum cover, for the purpose of lightening the cover. The drum cover is also provided with a nut 17 (Figs. 6 and 8) for the reception of a screw 17a for securing the drum cover to the casing bottom 1. The drum cover also has an opening 18 which extends through the cover, laterally spaced openings 20 which extend through the portion 15 of the drum cover and have counterbores 21 at their lower ends, and an opening 22 which extends through the portion 15. The drum cover is also provided with a cable groove 24 which begins at a point 25 adjacent the lower end of the drum cover and lies below the surface 12, a portion of this groove being concentric with the opening 18. This groove extends through the portion 15 of the drum cover and communicates with the base of a recess 26 in the upper end of the portion 15. The groove is of uniform width, and the base thereof is curved as shown in Fig. 13. The portion 15 of the drum cover has divergent walls 27 and 28 which extend from the upper edges of the groove 24, as best shown in Figs. 6, 12 and 13.

The cover block 10, which is likewise molded, in a single piece, from a plastic material, overlies the portion 15 of the drum cover, and has a semi-circular recess 30 therein which coacts with the recess 26 in the drum cover to form a circular opening which is in alignment or registry with the opening 8 of the casing. The cover block 10 is also provided with threaded openings 31 which register with the openings 20 in the drum cover, and with an opening 32 which registers with the opening 22 in the drum cover. It also has a projection 10a which nests in the opening or recess formed by the walls 27 and 28 of the drum cover, and which projection has walls 10b, and 10c which engage the walls 27 and 28 respectively, leaving a passageway of square cross-section (Fig. 12) formed by the groove 24 and projection 10a.

The cover block 10 is secured to the drum cover by means of screws 33, the screws passing through the aligned openings 20 and 31 with the heads of the screws lying in the counterbores 21 and the ends of the screws in threaded engagement with the openings 31.

The cable drum 11 is also molded, in a single piece, from a plastic material, and consists of a pair of spaced annular portions 35 and 36, which are interconnected at one end, as at 37, to form an open ended annular cable groove 38, a central hub portion 39 having an opening 40 in axial alignment with the opening 18 in the drum cover, a web 41 which interconnects the annular portion 35 and hub portion 39, and reinforcing ribs 42 which extended radially from the hub 39 to the annulus 35. Four openings 43, located intermediate the spaces between the ribs 42, extended through the web 41, and serve to lighten the drum. The radially outer face of the annulus 35 and the radially inner face of the annulus 36 are molded to provide serrations 44 having sharp edges, these serrations serving a purpose to be presently described.

The cable drum is supported in close proximity to the surface 12 of the drum cover, with the open end of the groove 38 thereof facing said surface, and is connected to the drum cover by means of a sleeve, preferably formed from brass rod, to provide a base portion 45 which extends through the opening 18 in the drum cover, a radial flange 46 which is interposed between the surface 12 and the hub portion of the drum, a bearing portion 47 which passes through the opening 40 in the drum, and an externally threaded portion 48, to which a lock nut 50 is secured. The sleeve is maintained in assembled relation with the drum cover by means of a split retaining ring 51, which is snapped within a groove 52 in the sleeve and bears against a thrust washer 53. The washer 53 bears against the base of the drum cover.

Disposed between the lock nut 50 and the hub portion 39 of the drum is a clutch consisting of an annular clutch plate 55 having notches 56 into which the reinforcing ribs 42 extend, and a multiplicity of circumferentially-spaced cup-shaped embossments 57, and a clutch hub 58 which is threadedly secured to the portion 48 of the sleeve and has securely fastened thereto a clutch spring 59 comprising an annular sheet metal member having radially-extending spring arms 60 provided with cup-shaped embossments 61 which are adapted to nest with the embossments 57 when the clutch spring and clutch plate are engaged, as they are during normal operation of the reel. The tension of the clutch spring on the clutch plate may be adjusted by adjustment of the clutch hub 58 along the threaded portion 48 of the sleeve, the nut 50 serving to lock the clutch hub in adjusted position. The function of this clutch will be described in connection with the operation of the antenna reel.

The reel further includes a cable 62, one end of which is secured to the cable drum 11 at the bottom of the groove 38, as shown in Figs. 9 and 10. The cable is a flexible cable of the wound "Monocoil" type having a loose internal stiffening wire. The cable is wound spirally about the drum, within the groove 38, the width of this groove being such that only a single row of convolutions of the cable can be wound about the drum, thereby precluding the possibility of convolutions of the cable slipping over each other. The cable emerges from the drum and passes directly into the groove 24, at the point 25, emerging from the groove into the opening formed by the recesses 30 and 26, and thence through the opening 8 in the casing. The outer end of the cable is connected to the uppermost section 63 of the antenna mast. The antenna mast further includes a section 64 in which the section 63 is slidable, a section 65 in which the section 64 is slidable, and a section 66 in which the section 65 is slidable. The section 66 is slidable in a sleeve 67 which is supported in an insulator bushing 68 rigidly mounted in the upper end of a shielding tube 69. Disposed within the tube 69 is a tube 70, the upper end of which bears against the lower end of the sleeve 67, and the lower end of which is supported in a rubber insulator 71 which is secured within the lower end of the tube 69. The cable 62 passes through an opening in the insulator 71 and through the tube 70, sleeve 67, and sections 66, 65 and 64 of the antenna mast. The insulator 71 has a portion 72 of reduced diameter, which extends into the circular opening formed by the semi-circular recesses 30 and 26.

The casing 1, 3 of the antenna reel is secured to a supporting bracket 73, as by means of a screw 74, which extends through the openings 32 and 22, and is threadedly secured to the bracket, as shown in Fig. 8. The bracket has an upper portion of arcuate cross-section which embraces the lower end of the shielding tube 69 and is rigidly secured to said tube. In this way,

the bracket, shielding tube and reel casing are assembled together as a unit. The bracket may be secured to the automobile adjacent one of the corner posts thereof.

The lead-in from the antenna is indicated by reference numeral 75, the shielding of this lead-in being soldered as at 76 to a tube 77, which is riveted or otherwise secured to the bracket 73. The lead-in has a terminal 78 (Fig. 3), which is connected to the tube 70. The usual insulator sleeves 79 and 80 are provided at the point where the sleeve 67 passes through the body 81 of the automobile.

The antenna drum may be actuated manually, as by a hand wheel 82, or through a flexible cable, or by means of a motor. The handwheel 82, in this case, is provided with a shaft 83 having a slotted end through which a pin 84 extends, the pin 84 being mounted in the sleeve 43 (Fig. 8). The shaft 83 is rotatable in a sleeve 85 which is mounted on a support plate 86. The plate 86 is secured to the bracket 73 by means of screws 87. Rotation of the handwheel 82 thus effects rotation of the drum 11 through the intermediary of the shaft 83, pin 84, sleeve 46, and clutch 59 and 55.

The operation of the reel will be readily understood from the foregoing description. Upon rotation of the sleeve 48 in one direction, the drum 11 will be driven through the intermediary of the clutch, thereby causing the cable 62 to be unreeled from the drum and projected out of the drum cover and casing through the groove 24 and opening formed by the recesses 30 and 26, thereby causing the antenna mast to be extended.

The serrations 44 of the drum act in a manner similar to gear teeth, the serrations meshing with and engaging the windings of the cable.

When the antenna drum is driven, the inertia or initial resistance to movement set up by the cable causes the coil of the cable to expand and thereby the windings of the cable snugly engage the serrations 44. By thus engaging the serrations, the cable is forced out of the drum by forces applied to the cable through the serrations at the point where the cable emerges from the drum. The serrations prevent slippage of the cable in the drum as the cable meets resistance in raising the antenna. With slippage of the cable thus prevented, the cable propelling force is not transmitted throughout the length of the cable from the point of fastening, but is transmitted from the actual point where the cable enters or leaves the drum. The serrations also aid in holding the cable at right angles to the direction of depth of the cable groove in the drum, and in this way, any tendency of the cable to buckle is obviated.

The antenna mast may also be extended or collapsed by manually moving the antenna mast. When the antenna is thus directly moved, the cable, by engaging the serrations of the drum, will cause the drum to rotate. As the drum begins to rotate, the cable is wound up by the drum as fast as it is pushed into the drum, and unwound as fast as it is pulled out of the drum. This driving of the drum through the serrations prevents jamming of the cable in the cable groove of the drum, and is in contrast to the action of the cable in a smooth, unserrated groove, which permits the cable to buckle in the groove when pushed, due to the drum not rotating and accepting the cable as fast as it is supplied to the drum.

Due to the fact that the drum bearing hub is on the same side and adjacent to the cover bearing support hub, a very rigid mounting between the drum and drum cover is provided, excessive tolerance build-up, such as is characteristic of existing or conventional drum and drum cover assemblies, is eliminated, and the effect of molding shrinkage and warping is minimized.

By having the supporting web 41 on the end of the drum adjacent the drum cover, space is available for the clutch components. This allows placing of the clutch in the open where it is easy of access for assembly and repairs. Also, the supporting web is close to the open end of the cable groove in the drum, at which point the operating forces involved are greatest.

The reinforcing ribs of the drum serve as keys to hold the clutch plate in position, and since the ribs engage the clutch plate at the peripheral edge of the clutch plate, the maximum torque is applied to the drum or plate. Moreover, this method of locking the clutch plate to the drum permits quick and easy assembly of the clutch with the drum.

The design of the drum hub is such that it acts not only as a thrust support for the clutch plate, but as a bearing for the drum. It provides additional bearing space without increasing the overall length of the drum.

The design of the overload clutch provides a number of advantages. The clutch plate, being keyed to the drum at the periphery of the plate, instead of at the center thereof, provides a maximum torque in the driving of the drum. The embossments on the clutch plate are designed to give maximum holding power when the plate is engaged with the clutch spring, yet permit easy disengagement of the clutch plate and spring when excessive torque forces the clutch spring to become disengaged. The clutch spring is highly effective in its action due to the fact that it has a multiplicity of spring fingers which act independently of each other on the clutch plate. The embossments on the fingers are designed to nest completely in the embossments in the clutch plate, thereby providing maximum holding qualities. When the embossments on the clutch spring are disengaged from those on the clutch plate, they act in a manner similar to balls, providing a low friction engagement with the surface of the clutch plate, riding easily over the latter.

The mounting of the clutch spring on the threaded sleeve 48 permits the pressure of the clutch spring against the clutch plate to be varied, and adjusted to slip at a predetermined torque. This adjustability feature also permits compensation for wear and other variable factors. Since the pressure of the clutch spring is transmitted to the drum through the sleeve 48, the stresses are confined to the hub of the drum and are not distributed to the drum cover. The clutch can be easily adjusted by means of a torque wrench to any desired degree of pressure before the clutch and drum assembly is mounted on the cover plate. The jam nut 50 provides a positive locking of the adjustment.

It will also be noted that the design of the parts is such as to deliver the cable, when unwound from the drum, in a straight line from the axis of the cable drum, that the cable groove is formed by assembly of the drum and drum cover, and that the contour along the cable groove is such as to preclude breakage of the molded parts.

It will be further noted that the cable groove is square in cross-section, and that the width the square section is slightly greater than the

diameter of the cable. By thus having a round cable sliding in a square groove, friction losses are negligible, due to the contacting surfaces being minute, as evidenced by inscribing a circle in a square.

Although a cable of the type embodying a loose internal stiffening wire is disclosed, it will be understood that the cable may have externally wound wire of various shapes and winding pitches to engage correspondingly molded serrations in the cable groove, or may be of any other type, such as flat wire, plastic rod, etc.

The pear or banjo shape of the antenna reel and casing provides a symmetrical design which permits the reel to be mounted in the automobile at either the right or left side. All of the moving of electrically functioning parts below the mounting insulators are totally enclosed and shielded, and the design of the mounting bracket and manner of fastening it to the shielding tube and casing eliminates all strains at the junction of the casing and tube. The antenna supporting sleeve is rigidly fastened to the mounting bracket, and the supporting bracket provides a method of grounding the lead-in shield braid by soldering through a hole in the support sleeve. This prevents breakage of the shield braid at the soldered joint, due to the braid being supported beyond the soldered joint.

The method of connecting the parts of the casing, as shown in Fig. 14, permits easy assembly and disassembly by a simple pivotal movement of the casing part 1 relatively to the casing part 3.

It is to be understood that the form of my invention, herewith shown and described, is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of my invention, or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. An antenna reel, comprsing a drum having an annular groove therein, the walls of said groove having serrations extending into the groove and extending also longitudinally for substantially the entire depth of the groove, and a cable adapted to be coiled within said groove, said cable formed of convolutions of wire, said serrations adapted to enter the spaces between said convolutions and frictionally engaging the cable to facilitate winding and unwinding of the cable from the drum.

2. A reel antenna, as defined in claim 1, in which said serrations extend in lines substantially parallel with the axis of the drum.

3. A reel antenna, comprising a molded one-piece drum consisting of spaced annular walls defining a cable groove therebetween, said walls being interconnected at one end to close said groove, a cable coiled within said groove and adapted to be fed from the open end of said groove, said cable formed of convolutions of wire, the faces of said walls provided with serrations adapted to enter the spaces between said convolutions for frictionally engaging said cable during winding and unwinding thereof, said serrations extending axially of the drum from substantially the closed end to the open end of the groove.

4. A reel antenna, as defined in claim 3, in which serrations are parallel with each other and extend in lines substantially parallel with the axis of the drum.

5. A reel antenna comprising a molded one-piece drum consisting of spaced inner and outer annular walls defining a cable groove therebetween, said walls being interconnected at one end to close said groove, said drum having a web extending across the inner wall adjacent the open end of said groove, a drive shaft extending through the center of said drum, and a clutch mounted on said shaft and disposed in its entirety within the space between said web and the closed end of said groove.

6. A reel antenna comprising a molded one-piece drum consisting of spaced inner and outer annular walls defining a cable groove therebetween, reinforcing ribs extending radially-inwardly from said inner wall, a drive shaft extending centrally through said drum, and a clutch mounted on said shaft, said clutch comprising a clutch plate interengaged with said ribs.

7. A reel antenna, as defined in claim 6, in which said clutch plate has pheripheral slots into which said ribs extend.

8. A reel antenna, as defined in claim 6, in which said clutch also includes a clutch spring having radial spring arms bearing on said clutch plate.

9. A reel antenna, as defined in claim 8, in which means are provided for adjusting the pressure of said clutch spring against said clutch plate.

10. In a reel antenna of the character described, a clutch comprising a clutch plate having circumferentially spaced cup-shaped embossments, and a clutch spring having similarly spaced cup-shaped embossments adapted for nesting in the embossments of said plate, said spring embossments having rounded bottoms.

11. A reel antenna comprising a molded one-piece drum consisting of spaced inner and outer annular walls defining a cable groove therebetween, said walls being interconnected at one end to close said groove, said drum having a web adjacent its other end provided with a hub, a drive shaft extending through said hub, and a clutch having driving and driven components disposed in the space between said web and the closed end of the drum and closely adjacent said web, whereby the overall length of the drum is not greater than the overall length of the drum and said clutch components.

12. A reel antenna, as defined in claim 11, in which one of said clutch components is a clutch plate which bears directly against said hub.

13. A reel antenna comprising a molded one-piece drum consisting of spaced inner and outer annular walls defining a cable groove therebetween, said inner wall having reinforcing ribs extending radially inwardly therefrom, portions of which terminate in edges which are closely adjacent said inner wall, a drive shaft extending centrally through said drum, and a clutch mounted on said shaft, said clutch comprising a clutch plate interengaged with said portions of said ribs, whereby a maximum torque in the driving of said drum is effected.

14. A reel antenna, as defined in claim 13, in which said clutch plate has slots extending radially inwardly from the periphery thereof, said ribs extending into said slots, whereby the clutch plate is, in effect, keyed to the drum.

15. A reel antenna, as defined in claim 14, in which said clutch also includes a clutch spring having radially extending spring arms bearing on said clutch plate.

16. A reel antenna, as defined in claim 15, in which means are provided for adjusting the pres-

sure of said spring arms against said clutch plate, said means comprising a nut adjustable along said shaft and bearing on said clutch spring, and a lock nut on said shaft for locking said adjustable nut in adjusted position.

17. A reel antenna of the character described, comprising a rotatable drum consisting of spaced inner and outer annular walls defining a cable groove therebetween, said walls being interconnected at one end to close said groove, a cable coiled within said groove and adapted to be fed from the open end of the groove, a non-rotatable drum cover of pear-shaped contour disposed adjacent and closing the open end of said groove, said cover having a groove therein, a portion of which is in registration with the open end of the groove in the drum, and the remaining portion of which extends through the stem portion of the cover in a direction such as to constrain movement of the cable through the cover and out of the cover in a direction which is radial to the drum and intersects the axis of the drum.

18. A reel antenna, as defined in claim 17, in

which the cable is of circular external cross-section, and the portion of the groove in the stem portion of the cover is of rectangular cross-section, whereby the cable is propelled through said groove with minimum friction.

THEODORE R. FINKE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
596,580	Dvork	Jan. 4, 1898
1,805,619	Fuller	May 19, 1931
2,130,993	Dubilier	Sept. 20, 1938
2,274,883	Brach	Mar. 3, 1942
2,327,163	Barrett	Aug. 17, 1943
2,329,404	Mace	Sept. 14, 1943
2,341,401	White	Feb. 8, 1944
2,343,684	Mace	Mar. 7, 1944
2,344,490	Brach	Mar. 21, 1944
2,496,785	Finneburgh	Feb. 7, 1950