

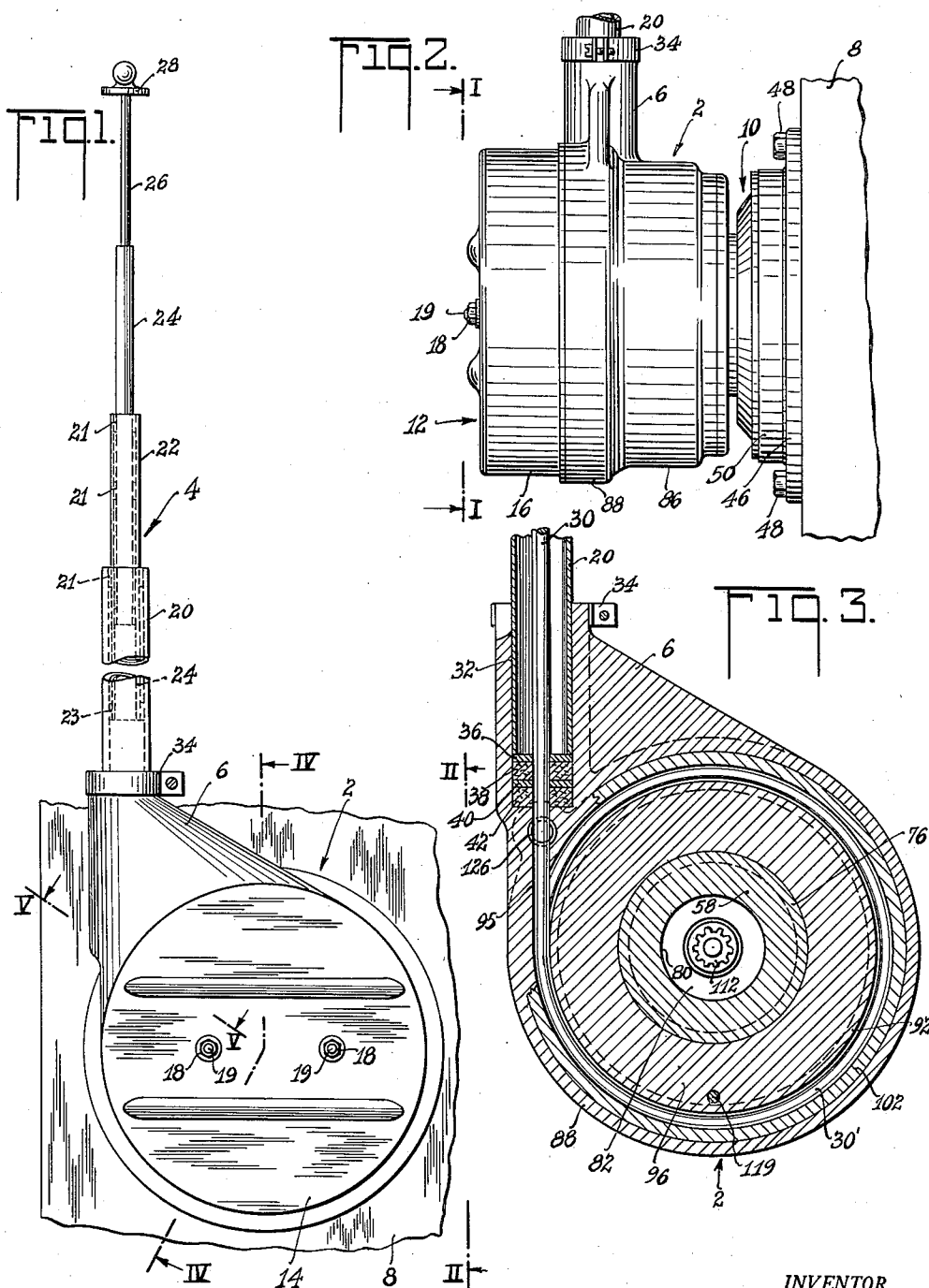
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F. L. PARSONS
RADIO ANTENNA

2,537,481

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3 Sheets-Sheet 1



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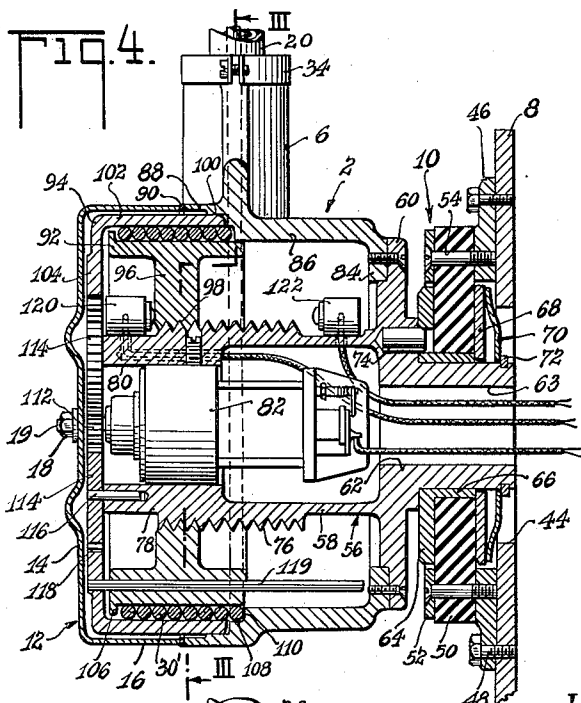
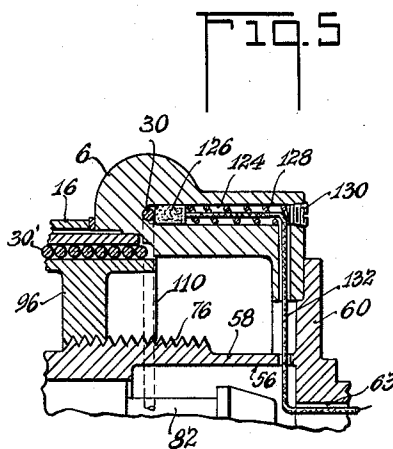
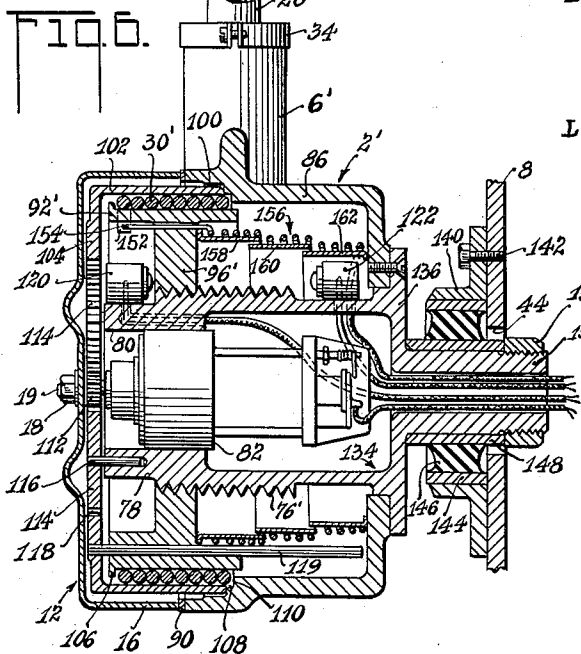
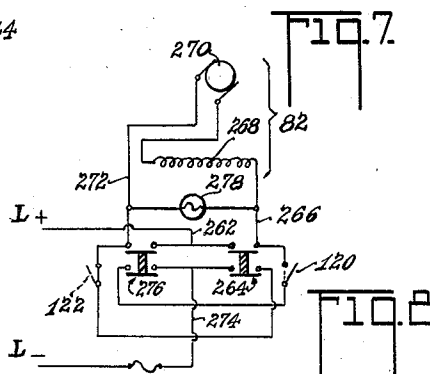
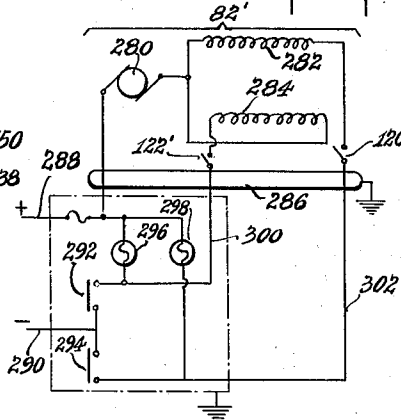
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UNITED STATES PATENT OFFICE

2,537,481

RADIO ANTENNA

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14 Claims. (Cl. 250—33)

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This invention relates to a radio antenna, more particularly to an antenna of the selectively extensible and retractable type. The antenna of the invention is particularly adapted for use on land and water vehicles, although it is not limited to such use.

The invention has among its objects the provision of an improved antenna in which the impulse receiving and/or transmitting antenna member is continuous and is provided with a telescopic non-electrically conducting shield or cover.

The invention has as a further object the provision of an improved reeling device and driving mechanism therefor for extending or retracting the impulse receiving and/or transmitting antenna member, the reel and driving unit being self-contained and being characterized by its compactness, simplicity, and positiveness of control.

Yet a further object of the invention, in one embodiment thereof, resides in an improved means for connecting the antenna member to the radio apparatus whereby a continuous unbroken conductor is interposed between such member and the set.

A still further object of the invention, in another embodiment thereof, lies in the provision of an improved dipole radio antenna of the retractable type and the operating mechanism therefor.

These and further objects of the invention will be more readily apparent in the following description of the preferred embodiments of the radio antenna within the teaching of the invention.

In order to provide efficient short wave radio communication for land vehicles such as automobiles, tanks, and for water vehicles such as boats, it is necessary that the antenna be of appreciable length, in the first two preferred embodiments described herein the extended impulse receiving member being 17½ ft. overall in typical constructions thereof.

It is also desired that such antenna shall rise as far as possible to clear any obstruction on the vehicle. Such antennas are thus generally too long and extend too high to be left at all times in fully extended position, and must be retracted from time to time, as when an automobile so equipped passes beneath a bridge or beneath power lines such as trolley wires. It is thus necessary that a successful antenna of this type may be quickly and easily extended or retracted and shall be under the instant control, as to its posi-

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tion, of the operator. It is further very desirable that such antenna shall be constructed as to be a self-contained unit so as to be easily mountable on, or demountable from, the vehicle. Previous antennas of this type have been complicated, difficult to control, and hard to install. Such previous antennas furthermore have been objectionable in that the impulse receiving and/or transmitting member was sectional, thus introducing numerous mechanical connections into the circuit which soon became faulty when exposed to the weather.

As indicated above, the antenna of the present invention overcomes such difficulties by providing a positive, easily controlled, compact driving unit for the antenna and by providing a continuous impulse receiving and/or transmitting circuit. The invention will be more readily understood by reference to the drawings appended hereto, showing preferred embodiments of the antenna of the invention, in which

Fig. 1 is a view in side elevation of the radio antenna of the first described embodiment, the point of view being taken along the line I—I in Fig. 2;

Fig. 2 is a fragmentary end view of the structure of Fig. 1, the point of view being taken along the line II—II in Fig. 1;

Fig. 3 is a view in vertical cross-section through the structure shown in Figs. 1 and 2, the section being taken generally along the line III—III in Fig. 4 but the front portion of the motor and its driving pinion being shown;

Fig. 4 is a view in transverse section through such structure, the section being taken along the line IV—IV in Fig. 1;

Fig. 5 is a view in transverse section through a portion of the main body casing of the first embodiment of the antenna, the section being taken along the line V—V in Fig. 1;

Fig. 6 is a view in vertical cross-section of a second embodiment of the antenna of the invention, section being taken in a manner similar to that of Fig. 4;

Fig. 7 is a schematic wiring diagram of the control circuit for the driving motor of the reeling device for either of such two previously shown embodiments when a D. C. source of supply is employed;

Fig. 8 is a schematic wiring diagram showing the control circuit for the motor of such embodiments when an A. C. source is employed;

Fig. 9 is a fragmentary view in side elevation of a third embodiment of the antenna of the invention, such embodiment being a dipole antenna;

Fig. 10 is a fragmentary view in plan of the structure shown in Fig. 9;

Fig. 11 is a view partially in vertical section and partially in elevation of the structure shown in Figs. 9 and 10, the section being taken along XI—XI in Fig. 9; and

Fig. 12 is a view in vertical section through the main housing of such third embodiment of the antenna, the section being taken along the line XII—XII in Fig. 10.

The first embodiment of the antenna described is shown in Figs. 1-5, inclusive. Such antenna includes a main, reel and motor enclosing, housing 2 made of insulating material such as a reinforced synthetic resin of which that known as "Micarta" is typical. Housing 2 is generally of cylindrical form but has rising therefrom a generally tangentially disposed hollow extension 6 on which is carried the extensible impulse receiving and/or transmitting antenna member and cover structure therefor, indicated generally by the reference character 4. The antenna is shown mounted on a supporting member 8, which may be a part of an automobile for example, there being provided a resilient connecting and supporting means generally indicated at 10 between the support and the antenna unit, member 10 providing an electrically insulating barrier between the support and the antenna. The antenna housing 2 has provided on its outer end a removable cover 12, which may be made of a metal such as aluminum, the outer end portion of the covering being shown at 14 and the side wall thereof, which is generally in the shape of a cylindrical flange telescoping the end of the housing, being shown at 16. The cover is held in assembled position on the housing by means of the nuts 18 screwed onto the studs 19 which project from a fixed part of the structure within the housing, in this case the forward end of hub 56.

The impulse receiving and/or transmitting member of the antenna consists of the stranded cable, designated 30 in its straight extended position, and 30' in that portion where it exists in coiled condition. The antenna cable is made of sufficient stiffness so that a thrust on its inner coiled end will extend it into fully elevated position without undue buckling, but at the same time it is sufficiently flexible so as easily to be coiled on the reel, subsequently to be described, without acquiring a permanent set. The straight portion 30 of the antenna cable is provided with a series of telescopic mounting cover members in the form of tubes along the axis of which cable 30 extends, the largest tube, designated 20, being fixedly mounted on the housing 2 by having its lower end telescoped into the bore 32 provided in extension 6, such extension being split at its upper end and being clamped tightly about tube 20 by the squeeze clamp 34.

The other telescopic tubes, successively designated 22, 24, and 26, reading in an upward direction, slide within each other as shown, being guided by the short tubular sleeve members 21 within the next lower tube, one such sleeve being placed at the upper end and one being spaced some distance below such end of the tube. The lower end of each of the slidable tubes is provided outwardly thereof with a short sleeve 23 which functions as a stop member when it abuts the lower sleeve 21. The antenna cable cover is completed by the cap 28 affixed to the upper end of tube 26, such cap incorporating means (not shown) to which the outer end of cable 30 is affixed. It will be evident that when the cable

is thrust upwardly it carries with it the cover sections until finally they lie fully extended, and that when the cable is retracted it pulls them downwardly until they reach a fully telescoped position. In Fig. 1 the aerial is shown in a partially extended position.

It is preferred, in accordance with the invention, to make each of tubes 20, 22, 24, and 26 as well as the cap 28, of an electrically insulating plastic material. In such case the sleeves 21 and 23 are likewise of such plastic material and may be affixed to the tubes by means of plastic cement. Such construction is preferred because it fully protects the antenna cable from the atmosphere and includes in the impulse receiving and/or transmitting circuit no connections which may become faulty due to corrosion, wear, etc. In some instances, however, it may be desired to make the upper tube 26 and cap 28 of metal, since positive connection between the antenna cable and such members may easily be made and maintained.

The fit between the outer surfaces of telescopic tube members constituting the cover portion and sleeve members 21 is such that little if any moisture can penetrate between such sections. There is, however, provided a sealing means between the atmosphere and the interior of housing 2 in the form of a packing through which the antenna cable runs. Such packing preferably takes the form shown in Figure 3, in which there is shown a first metal washer 36, a first graphite impregnated felt washer 38, a second metal washer 40, and a second similar felt washer 42.

The structure of the cable reeling device, the driving and controlling means therefor, and of the antenna housing mounting means 10 will be more clearly apparent by consideration of Fig. 4. As there shown, the device is adapted for mounting on the support 8 at a hole 44 provided in such support. Affixed to support 8, as by screws 48, is a mounting plate 46 on the outer face of which is mounted a resilient electrically insulating disc 50. Such disc 50 may be made of an elastomer such as natural or synthetic rubber. On the outer face of disc 50 there is positioned a retaining ring 52 secured to member 46 by means of the screws 54 which extend through member 50. The antenna reel hub 56, made in this instance of metal, provides the main support for the antenna structure. Such hub is provided at its rear end with a sleeve 62 of reduced diameter, such sleeve being received within the cylindrical portion 66 of a mounting member having a radial flange 64 engaging the outer face of disc 50. The peripheral edge of flange 64 is spaced somewhat from the inner edge of ring 52 so as to allow appreciable flexing of disc 50 with no danger of metallic contact through the parts of the mounting member 10. The mounting member is completed by the outer ring 68 which engages the outer face of disc 50 and the forward edge of cylindrical sleeve 66, member 68 being held in place by the spring washer 70, which in turn is retained on sleeve portion 62 of the hub by the split retaining ring member 72 which is snapped into an annular groove on the outer end of part 62, as shown. Rotation between hub 56 and the mounting member 10 and thus support 8 is prevented by the hub retaining pin 74, which extends, as shown, into openings in the rear of radial flange 60 on the reel hub and in the flange 64 of the inner mounting member, respectively.

The reel hub 56 is provided, forward of flange 60, with an annular wall 58, the intermediate

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portion thereof being thickened as shown and being provided with screw threads 76 on its exterior, the extreme forward end 78 of the hub being of reduced thickness and unthreaded. The hub is provided with an opening therethrough, the forward end of the opening being of a somewhat reduced diameter as shown at 80, for the reception of the forward end of electrical motor 82 which fits tightly thereinto. The motor is retained in the bore by a set-screw, as shown.

The generally cylindrical casing member 2 is provided at its rear end with an inwardly directed radial flange 84 which fits within an annular groove on the forward face of flange 60 of the hub at its outer edge, as shown in Fig. 4, the two parts being connected by screws, as shown. The main cylindrical wall portion of casing 2 is designated 86. Such wall has integral therewith at its forward edge a thinner portion 88 of larger diameter, which with portion 16 of the removable cover provides an enclosure for the forward end of the reel. An annular gasket 90 is interposed between the edge of cover portion 16 and of housing portion 88.

The antenna cable reel 92, made of strong electrically insulating material such as "Micarta," cooperates with the antenna cable sleeve 94, which may be made of the same material, so that the coiled cable 30' is caused to lie on the reel in a tightly coiled condition. The sleeve and reel rotate together, and the reel in addition travels lengthwise of the hub, so as to present that portion of the cable being payed off the reel in accurate guided position into the cable guiding channel 95 provided in member 2 beneath extension 6 of the housing. Mounting of the reel and sleeve to accomplish such result is effected as follows: Reel 92 is provided with an inwardly directed web or flange 96 having a central axial opening therein provided with screw threads 98 accurately engaging screw threads 76 on the hub. Thus rotation of the reel causes it to progress axially of the hub. Sleeve 94 is provided with a cylindrical portion 102 surrounding the reel, the inner surface of part 102 of the sleeve closely engaging the outer surfaces of coils 30' of the antenna cable. The sleeve is rotatably supported at its rear open end of part 102, such part of the sleeve being accurately carried on the inner cylindrical bearing surface 100 of casing part 88. The sleeve has an inwardly directed radial flange 104 at its forward end, engagement between the outer surface of such flange and the inner surface of cover part 14 keeping the sleeve in place.

The pitch of threads 76 and 98 is made equal to the diameter of the antenna cable so that the reel travels sufficiently to continuously thrust the cable, by means of the end flange 106 on the reel, accurately into, or to withdraw it from the channel 95, depending on the direction of rotation of the reel. The portion of the coiled cable which has just been fed off the reel and is about to be fed into channel 95, after it has left the forward end of sleeve part 102, is in engagement with the guiding channel in wall 86 of the casing provided by surfaces 108 and 110. Surface 108 is a portion of a cylinder lying as a prolongation of the inner surface part of sleeve 102. Surface 110, elements of which are at right angles to elements of surface 108, lies on a helix having the same pitch as the coils of cable 30'.

Motor 82 has provided on the driving shaft at the forward end thereof the pinion 112, which meshes with two intermediate gears 114 rotating on the fixed mounting pins 116 projecting from

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the forward end of the reel hub. Gears 114 also mesh with the internal ring gear 118 formed on the inner edge of flange 104 of the sleeve. Such gears provide a positive reducing drive between the motor and sleeve 94. Reel 92 is positively driven from such sleeve by means of the driving pin 119 affixed to flange 104, such pin extending snugly but slidably through a bore in the web 96 of reel 92 so that when the sleeve is rotated, the reel is rotated with it but slides relative thereto.

There are further provided within the housing the two limit switches, 120 and 122, supported on the hub 56 as shown. Such switches, which may be of a conventional normally closed, single pole, spring pressed type, are mounted so that the contacts of each are opened when the operating member of either of the switches is contacted by the web 96 of the reel. The control circuit for motor 82, incorporating such limit switches, will be more fully discussed below.

In the embodiment of the antenna discussed above contact between the antenna cable and the antenna lead is provided by means of a spring pressed brush which bears upon the cable within the channel 95. In Figs. 3 and 5 the brush is shown at 126, its location in the casing being more clearly shown in Fig. 3. A bore 124 is provided in casing part 6 so as to intersect the channel 95. Within such bore is positioned the brush 126, which is pressed into contact with the straight cable portion 30 by the helical coil spring 128 which is retained in the bore by the plug 130. The antenna lead wire 132 is connected to the brush and is brought within the casing and thence outwardly through the bore 63 in the rear portion of the hub member. Although in this instance the antenna lead is shown as a single conductor, it is to be understood that preferably such lead will be shielded.

In the embodiment of the antenna shown in Fig. 6 the parts which exactly correspond to those shown in Fig. 4 are designated by the same reference characters. The embodiment now to be described differs from that above discussed as to the character of the means for effecting connection from the antenna cable to the radio set, and the structure of the means by which the main housing 2' is attached to the support 8. In the embodiment shown in Fig. 6, the reel hub, generally designated 134, which preferably is made of metal, is provided with a radial flange 136 and with a rear portion 138 of reduced diameter beyond such flange. The housing mounting means consists of the flanged mounting sleeve member 140 secured to member 8 by studs 142, and of a composite resilient insulating bushing interposed between the cylindrical portion of member 140 and part 138 of the hub. Such bushing consists of an outer metal sleeve 144, an intermediate resilient insulating sleeve 146 made of rubber or synthetic rubber, and an inner metal sleeve 148 within member 146, sleeves 144 and 148 being bonded to member 146. Portion 138 of the hub is inserted within inner sleeve 148, the rear end of the former protruding through hole 44 in the support, the hub being retained by the nut 150 screwed onto its threaded rear end and contacting the rear edge of sleeve 148.

In this embodiment a continuous electrical connection is provided between the antenna cable and the radio set, and no cable contacting brush is employed in housing extension 6'. Such connection is provided by bringing the inner end

152 of the coiled cable 30' through an opening into the interior of the reel 92' and by permanently securing thereto the end of the flexible lead wire 154 which extends through an opening in the web 96' of the reel. Within the housing 2' there is provided a collapsible hollow support 156 upon which coils of the lead wire 154 are supported. The collapsible support may be either in the form of a helical coil compression spring, as shown, succeeding turns 158, 160 and 162 of which are telescoped, the spring being retained in place between the web 96' and the rear inner face of casing 2' by the expansive force of the spring. Alternatively support 156 may consist of disconnected telescopic portions the end sections of which are connected respectively to the web and casing, the center section being prevented from sliding out of telescopic relation with the end sections by means of radial flanges which interengage at the fully extended position of such support.

It will be seen that as the antenna cable is fed from the reel as the reel travels to the right, in Fig. 6, the flexible antenna lead 154 will have its coils more closely spaced with respect to each other. The effective length of such lead remains substantially the same throughout such travel, the collapsible support maintaining substantially the initial size of the coils of the lead wire and preventing the tangling of the coils thereof.

In Figs. 9-12, inclusive, there is shown a dipole antenna which embodies some of the salient features of the two previously described embodiments. Such antenna is adapted for ultra-high frequency radio reception and/or transmission, and must, for efficient operation, be placed relatively high above its support. The antenna extending and retracting mechanism of the present invention is admirably adapted for use in such dipole antenna since it is readily controllable from a distance.

In this embodiment there is provided a central hollow housing 164 made of insulating material such as "Micarta," such housing having a split sleeve 166 on the bottom thereof to receive the upper end of a vertical supporting member (not shown). Casing 164 provides the support for two oppositely extending extensible antenna members, there being at the left in Fig. 9 a flanged supporting member 168 on which is fixedly mounted the first hollow cable covering member 170, the two movable telescopically mounted cover members 172 and 174, together with cap 176 for the latter, being mounted thereon. The flexible antenna cable 178 is connected to cap 176 as in the first embodiment. Preferably members 168, 170, 172, 174, and 176 are made of insulating plastic material. The antenna member to the right of the casing in Fig. 9 is similar to that above described, corresponding parts being designated by the same reference characters primed.

As shown in Fig. 10 the oppositely extending antenna members are displaced somewhat laterally from each other. This arises from the fact that each extensible antenna member has its own reel, the reels being mounted on a common axis along which they are spaced. Connected to the main housing 164, within which such reels are contained, is the motor, gearing, and limit switch containing housing 180, the housing parts 164 and 180 being connected by means of the fixed shaft 184 extending longitudinally through them and through the removable end plate 182, the shaft being secured at the left in Fig. 10 by nut 186 and at the right by nut 188.

Shaft 184, which is made of metal, is provided, as seen in Fig. 12, in the portion within housing 164 with a right-hand threaded portion 190 and a left-hand threaded portion 192. Such threaded portions, as will be apparent hereafter, provide the mounting for the hubs of the respective reels and cause them selectively to approach or travel away from each other depending upon the direction of rotation of the motor 194. Such motor is mounted, as shown, in casing 180 and is provided with the driving pinion 196. Such pinion meshes with the large spur gear 198 keyed to the sleeve 200 which is rotatably mounted on the left-hand end of shaft 184. The right-hand end of such sleeve provides the means to drive the first reeling device 202, shown at the left, the drive for the second reeling device 204, at the right, being derived therefrom. Sleeve 200 is pinned as shown to the hub 214 on the sleeve 210 of reeling device 202. Thus, when sleeve 200 rotates, it drives sleeve 210. A driving pin 220 fixedly connected to the radial flange 212 of sleeve 210 slidably extends through a bore in the web 218 of reel 216. The coiled cable 206 on the first reeling device feeds off the reel into a helical channel and thence is led through a guideway through the housing wall into the extensible antenna member in the same manner as described in the first embodiment. The helical channel is provided in the annular enlargement 222 in housing 164, the left-hand edge of such enlargement shown at 224 lying on a spiral.

The right-hand reeling device is composed of the reel 232, a sleeve 226 having a radial flange 228, and the hub 230 which rotates upon the smooth right-hand end of shaft 184. The reeling device is also provided with a driving pin 236 between sleeve and reel and the coiled cable 208 delivered therefrom is guided into a helical channel provided by the right-hand edge 238 of enlargement 222. The reels and sleeves of this embodiment are made of electrically insulating material such as "Micarta."

Driving of reeling device 204 from device 202 but in a reverse direction is effected by means of the bevel gear 240 on the outer open edge of the sleeve 210 which meshes with the connecting bevel gear 244. Gear 244, which rotates about a vertical axis, is retained on cover plate 246 on the housing by means of the retaining collar 248. Gear 244 in turn meshes with a bevel gear 242 on the outer open end of sleeve 226. It will be seen that when sleeve 210 is driven in one direction it drives sleeve 226 in the reverse direction, the corresponding reels thus being caused to travel on their supporting threads selectively toward or away from each other.

Connection between the antenna leads (not shown) and the two impulse receiving members 178 and 178' is effected by means of brushes (not shown) affixed in the housing 164 immediately inwardly of members 168 and 168'. Since the construction and function of such brushes have already been discussed, further description of them here is unnecessary.

The limit switches in this device are shown at 250 and 252. Cooperating with the limit switches is a movable switch actuating member in the form of a nut 256 engaging screw threads 254 on sleeve 200, the nut being provided with a radial flange 258 and being prevented from rotation by means of a longitudinal rib 260 on the inner surface of housing 180, such rib being engaged in a slot in flange 258. It will be seen that when sleeve 200 is rotated it causes nut 256 and

flange 258 to travel, the hand and pitch of threads 254 and the spacing of the limit switches being such that motor 194 will be stopped thereby when the antenna cables are both either fully extended or fully retracted.

In Fig. 7 there is shown a schematic wiring diagram for the current supplying and controlling circuit for any one of the described embodiments when employing a direct current source of supply for the driving motor. For the purpose of simplicity motor 82 in this instance is taken to be one which has a rotor composed of fixed magnets and a field 268 connected to the current source through a commutator driven by the rotor. In a motor of this type a simple reversal of the leads to the field will effect reversal of rotation of the rotor.

The two supply wires L+ and L- are connected as shown by wires 262 and 274, respectively, to contacts of a switch composed of components 264 and 276. The switch is so constructed that such two components are interlocked, allowing only one to be placed in circuit closing position at a time. The other upper contact of switch component 264 is connected to the motor field by wire 266, and that of switch component 276 being connected to the commutator by wire 272. A lamp 278 is connected between wires 266 and 272 so that when such wires are energized to drive the motor the lamp is lighted.

The two limit switches, 120 and 122, are normally closed except when their operating elements are depressed. When the reel is in the position shown in Fig. 4 switch 120 is open but switch 122 is closed as shown in Fig. 7. To elevate the antenna the control switch is actuated to elevate switch portion 264. Thus the circuit including wires 262 and 266, the field 268, the commutator on the rotor 270, wire 272, switch 122, the bottom portion of switch 264, and wire 274 to the lead wire L- is closed. The motor then rotates in a forward direction and continues to rotate in that direction until either switch portion 264 is returned to neutral, or when limit switch 122 is opened as the aerial reaches fully extended position and the web 96 of the reel actuates such limit switch. Reverse operation of the motor is effected in the same manner, except that in this case switch component 276 is employed and rotation of the motor in reverse direction is stopped either by the opening of such switch component or by the opening of limit switch 120.

In Fig. 8, which depicts a schematic wiring diagram for the current supplying and controlling circuit when supplied by alternating current, the motor designated 82' is for simplicity shown as of the series type in which there are provided two fields, one being wound in a reverse direction from the other. The wound rotor designated 280 may selectively be placed in series with either the field 282 or the reversely wound field 284. The single phase alternating current supply is connected to lead wires 288 and 290, wire 290 being connected to the contacts of a reversing switch shown as having components 292 and 294 which are so connected that only one may be in contact closing position at a time. The upper contact of component 292 is connected to field 284 through the medium of wire 300 and limit switch 122'. The lower contact of component 294 is connected to field 282 through the medium of wire 302 and limit switch 120'. A grounded shield 286 is provided about the three leads to the motor. Indicating lamps 296 and 298 are

connected as shown, one being lighted when the motor operates in a forward direction and the other being lighted when it operates in the reverse direction.

It will be apparent that the control circuit of Fig. 8 is such that when switch component 292 is closed field 284 will be energized, assuming that limit switch 122' is closed, and the motor will be driven in a forward, antenna elevating, direction. The motor continues to rotate in such direction until field 284 is de-energized either by the opening of switch component 292 or of limit switch 122'. When switch component 294 is closed, field 282 is energized to drive the motor in a reverse direction, the motor continuing to rotate in such direction until either switch component 294 or limit switch 120' is opened.

Although for purposes of illustration I have described preferred embodiments of the radio antenna of my invention, it is to be understood that the invention is not limited thereto, but that it is capable of considerable variation as to details. The scope of the invention is therefore defined by the following claims.

I claim as new the following:

1. A reel for operating a flexible antenna cable selectively to extend its forward uncoiled end or to retract the same comprising a housing, a reel having a cylindrical periphery rotatably mounted within the housing, a cable receiving guideway through the housing wall, an antenna cable sleeve cooperating with the peripheral surface of the reel to confine the coiled cable on the reel to one thickness thereof, means to rotate the reel, means responsive to reel rotation for moving said reel longitudinally along its axis at such rate as to continually maintain successive turns of the cable in a predetermined relationship with and throughout the surface of the reel, and a prime mover within the housing for driving the reel.

2. A reel for operating a flexible antenna cable selectively to extend its forward uncoiled end or to retract the same comprising a nonrotatable cylindrical supporting member, a housing spaced from and surrounding the supporting member, a reel having a cylindrical peripheral surface disposed within the housing and rotatably mounted on the supporting member, a cable receiving guideway through the housing wall generally opposite a peripheral edge of the reel, an antenna cable sleeve having a cylindrical periphery spaced from and cooperating with the peripheral surface of the reel to confine the coiled cable on the reel to one thickness thereof, a prime mover axially-disposed within the supporting member, means to connect the prime mover to the sleeve member to rotate the latter, means to connect the sleeve member and reel together for positive rotation together, means to rotate said reel, means responsive to reel rotation to axially move said reel along the supporting member, including, a threaded portion on the supporting member, the portion of the reel engaging the supporting member having screw threads thereon engaging with those on the supporting member, the pitch of such threads being substantially equal to the diameter of the cable, whereby the reel travels along its axis as it rotates to maintain the cable payed off or delivered to the reel at its aforesaid peripheral edge accurately aligned with the guideway.

3. In the combination set forth in claim 2, the supporting member being a hollow hub, the prime mover being located within such hollow hub, the

hub including means by which the reel may be attached to an external support.

4. In the combination set forth in claim 2, the prime mover being a reversible electric motor, a current supplying and controlling circuit for the motor, said circuit including switch means for starting, stopping, and reversing the motor, and means included in said circuit and responsive to the axial location of said reel upon said supporting member to stop the motor both when the antenna cable is fully extended and when it is fully retracted.

5. A reel for operating a flexible antenna cable selectively to extend its forward uncoiled end or to retract the same comprising a housing, a centrally located shaft running lengthwise of the housing, a reel having a cylindrical periphery rotatably mounted on the shaft within the housing, a cable receiving guideway through the housing wall, means cooperating with the peripheral surface of the reel to confine the coiled cable on the reel to one thickness thereof, means to move the reel along its axis at such rate as to continually maintain successive turns of the cable in a predetermined relationship with and throughout the surface of the reel, including a screw threaded portion on the shaft and a screw threaded portion of the reel cooperating therewith, means to rotate the reel, said means including a prime mover within the housing, a sleeve on the shaft, spaced from the reel, means drivingly connecting the motor to the sleeve, and means drivingly connecting the sleeve and the reel to rotate the latter.

6. A duplex reel structure for operating two oppositely disposed flexible antenna cables selectively simultaneously to extend the forward uncoiled end of each or to retract the same comprising a housing, oppositely directed laterally offset extensible antenna cable guiding means on opposite sides of the housing, the housing having a guideway through its wall on each side thereof, each guideway cooperating with its respective antenna guiding means to conduct the cable to the latter, two similar coaxial cylindrical reels rotatably mounted within the housing, each reel cooperating with its respective guideway, each reel having associated therewith means cooperating with the peripheral surface of the reel to confine the coiled cable on the reel to one thickness thereof, means to move each reel along its axis at such rate as to continually maintain successive turns of the cable in a predetermined relationship with and throughout the surface of the reel, a prime mover within the housing, and means connecting the prime mover to both reels to drive them simultaneously.

7. A duplex reel structure for operating two oppositely disposed flexible antenna cables selectively simultaneously to extend the forward uncoiled end of each or to retract the same comprising a housing, oppositely directed laterally offset extensible antenna cable guiding means on opposite sides of the housing, the housing having a guideway through its wall on each side thereof, each guideway cooperating with its respective antenna guiding means to conduct the cable to the latter, a supporting shaft located longitudinally of the housing and centrally thereof, two similar coaxial cylindrical reels rotatably mounted on the shaft within the housing, one reel and its guideway being substantially a reversed counterpart of the other such parts, each reel cooperating with its respective guideway, and each being placed with its peripheral edge

adjacent the other reel substantially opposite its respective guideway, each reel having associated therewith means cooperating with the peripheral surface of the reel to confine the coiled cable on the reel to one thickness thereof, said last named means comprising a sleeve member rotatably mounted in the housing coaxial of the reel, the sleeve member having a cylindrical portion adapted to surround the peripheral surface of the reel and lying parallel thereto, such cylindrical portion of the sleeve being open at the end confronting the peripheral edge of the reel from which the cable is payed out, a prime mover within the housing, means to connect the prime mover to the sleeve member associated with one reel to rotate such sleeve, means to connect the two sleeve members together so that they rotate in opposite directions, means to connect together the sleeve member and reel of each unit for positive rotation together, means responsive to rotation of said reels for axially moving said reels with respect to said supporting shaft to continually maintain successive turns of said cable in a predetermined relationship with and throughout the surface of the reels, including, oppositely threaded portions on the supporting shaft, the portions of each reel engaging the supporting shaft having screw threads thereon engaging with one of those on the supporting shaft, the pitch of such threads being substantially equal to the diameter of the cable, whereby each reel travels along its axis as it rotates to maintain the cable payed off or delivered to the reel at its aforesaid peripheral edge accurately directed into its associated guideway.

8. In the combination set forth in claim 7, the prime mover being a reversible electric motor, a current supplying and controlling circuit for the motor, said circuit including switch means for starting, stopping, and reversing the motor, and means included in said circuit and responsive to the axial location of the reels on the supporting shaft to stop the motor both when the antenna cables are fully extended and when they are fully retracted.

9. An extensible antenna, comprising, a flexible antenna cable, a casing, means in the casing to selectively coil the cable at its rear end and to uncoil it at such end thereby retracting its forward end towards, and extending its forward end from the casing, respectively, an antenna cable cover composed of a series of tubes of graduated sizes telescopically mounted about the forward end of the cable, the tube at one end of such series being fixedly attached to the casing, the remainder of the tubes being slidable, and the tube at the other end of the series being attached to the forward end of the cable, all tubes of said cover being made of insulating material, and means for maintaining an integral electric contact with the antenna cable, said last-mentioned means including a coiled flexible antenna lead wire connected at one end adjacent the rear end of said antenna cable, and telescoping means to support the coiled lead wire substantially coaxial of the coiled antenna cable.

10. An extensible antenna, comprising, a flexible antenna cable, a telescopic casing for said cable, means for selectively extending the forward uncoiled end of said cable and for retracting the same, including, a housing, a non-rotatable hollow hub contained within said housing, a reel member having a cylindrical periphery rotatably mounted on the hub, an antenna cable sleeve having a cylindrical periphery concentric

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cally positioned with respect to the periphery of the reel member and spaced therefrom, said reel member and said antenna cable sleeve cooperating to provide an annular chamber to confine a single thickness of coiled cable therein, means connecting said reel member and said antenna cable sleeve for rotation together, means disposed within said hub for rotating said reel member and said antenna cable sleeve, and means responsive to rotation of the reel member for axially displacing the reel member with respect to the antenna cable sleeve and the hub at a predetermined rate for maintaining successive turns of the cable in a predetermined relationship with and throughout the surface of the reel.

11. The device in accordance with claim 10, including, means responsive to the axial position of said reel member on the hub for limiting the axial displacement of said reel member.

12. An extensible dipole antenna, comprising, a pair of flexible antenna cables, telescopic casings for each of said cables, means for selectively extending the forward uncoiled ends of each of said cables equivalent amounts and for equally retracting the same, including, a housing, a non-rotatable shaft contained within said housing, a reel for each of said antenna cables rotatably mounted on said shaft, a cable sleeve positioned concentric with each of the reel members for confining the coiled cables thereon to one thickness thereof, means for counterrotating said reel members, means associated with the reel members and said shaft for axially displacing the reel members with respect to their respective cable sleeves and the shaft at a predetermined rate for maintaining the antenna cables in a predetermined fixed relationship with respect to the peripheral surfaces of the reel members.

13. An extensible dipole antenna, comprising, a pair of flexible antenna cables, telescoping casings for each of said cables, means for selectively extending the forward uncoiled ends of said cables equivalent amounts and for equally retracting the same, including, a housing, a reel member for each of said cables rotatably mounted within the housing, an antenna cable sleeve concentric with each of said reel members for confining the coiled cables thereon to one thickness thereof, means counterrotating said reel

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members together with their respective antenna cable sleeves, means associated with said reel members and said last-mentioned means for axially displacing said reel members with respect to their respective antenna cable sleeves at a predetermined rate for maintaining successive turns of the cables in a predetermined relationship with and throughout the surfaces of the reels.

14. An extensible dipole antenna, comprising, a pair of flexible antenna cables, telescoping casings for each of said cables, means for selectively extending the forward uncoiled ends of each of said cables equivalent amounts and for equally retracting the same, including, a housing, a non-rotatable shaft contained within said housing, a reel member for each of said antenna cables having a cylindrical periphery rotatably mounted on said shaft, an antenna cable sleeve having a cylindrical periphery concentrically positioned with respect to the periphery of each of said reel members and spaced therefrom, each of said reel members and their respective antenna cable sleeves cooperating to provide an annular chamber for confining a single thickness of coiled cable therein, means connecting each reel member and its respective cable sleeve for rotation together, means for counterrotating said reel members, and means responsive to rotation of the reel members for axially displacing each of said reel members with respect to their respective cable sleeves and the shaft at a predetermined rate for maintaining successive turns of the cables in a predetermined relationship with and throughout the surfaces of the reel members.

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