Feb. 25, 1964 R. N. LEONARD 3,122,746

VERTICAL MONOPOLE PIVOTALLY AND TELESCOPICALLY MOUNTED ON SUPPORT

Filed Jan. 30, 1962

Fig. 1

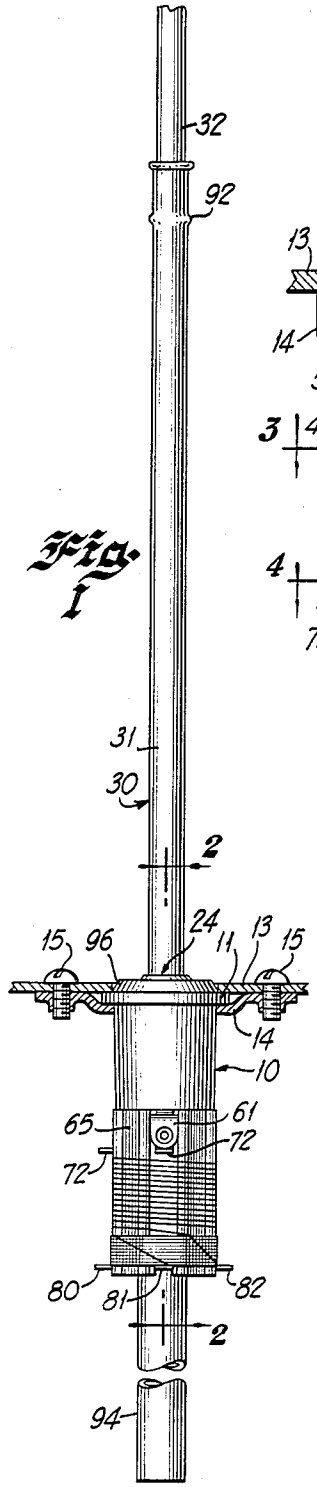


Fig. 2

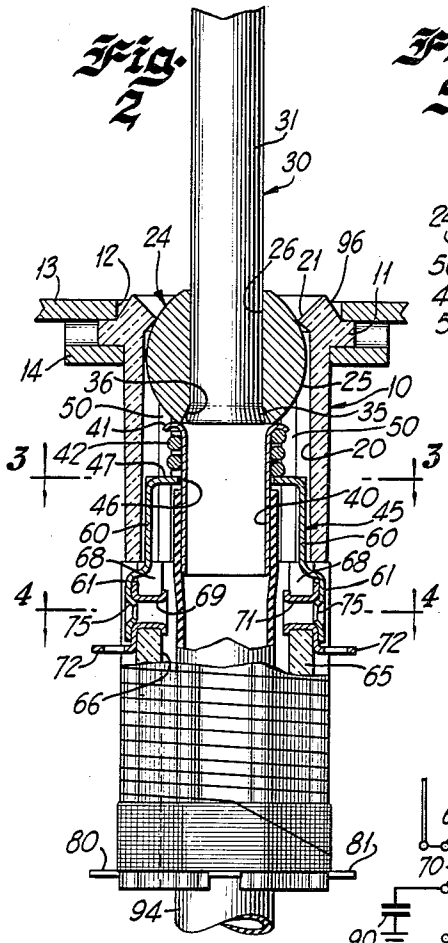


Fig. 3

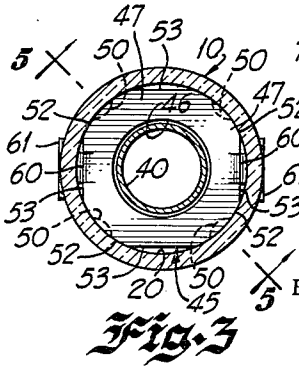


Fig. 4

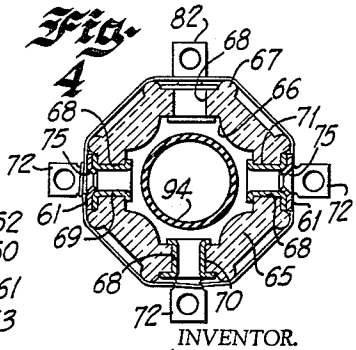


Fig. 5

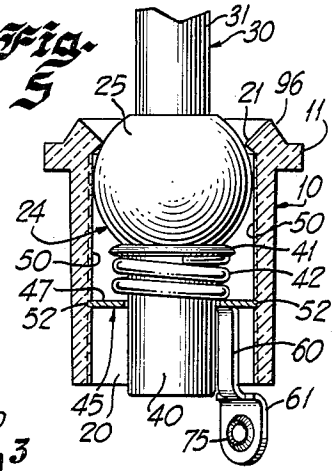


Fig. 6

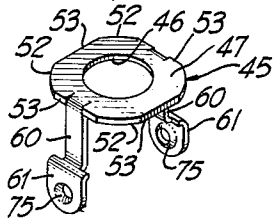


Fig. 7

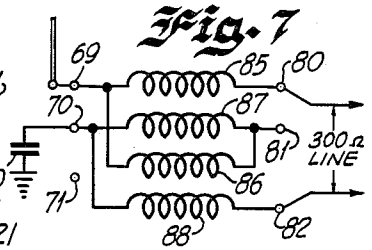
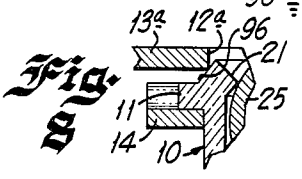


Fig. 8



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United States Patent Office 3,122,746 Patented Feb. 25, 1964

3,122,746

VERTICAL MONOPOLE PIVOTALLY AND TELESCOPICALLY MOUNTED ON SUPPORT

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Filed Jan. 30, 1962, Ser. No. 169,773
7 Claims. (Cl. 343—859)

The present invention relates to an indoor television antenna arrangement, and more particularly, to an arrangement in which a telescoping antenna assembly is mounted in the top wall of a television receiver cabinet and can be withdrawn to an extended position, tilted to any desired angle for best reception or retracted completely within the cabinet when the receiver is not in use.

Indoor television antenna arrangements which are of the so-called monopole type and employ a single telescoping antenna assembly are generally not of the correct electrical impedance to provide a proper match to the input of the television tuner and hence have required a matching transformer or so-called balun. In the past, this balun has been mounted on the receiver chassis, or in some instances the television tuner chassis and special facilities are usually required for such mounting. It would be desirable if an indoor television antenna assembly could be provided which incorporates the matching transformer or balun so as to avoid separate mounting means therefor and minimize the number and complexity of interconnecting television cables.

It is, therefore, an object of the present invention to provide a new and improved indoor television antenna arrangement wherein the balun or matching transformer is mounted as a part of the antenna assembly itself.

It is another object of the present invention to provide a new and improved indoor television antenna arrangement wherein a unitary assembly is provided in which the antenna matching transformer is mounted on the base member of the telescoping antenna array.

It is a still further object of the present invention to provide a new and improved indoor television antenna arrangement wherein a telescoping antenna assembly is provided in an arrangement which is of simplified construction, is economical, and is particularly adapted for mass production.

Briefly, in accordance with one aspect of the present invention, a telescoping antenna assembly is provided with a base member which includes a spherical bearing arrangement spring biased so that the assembly can be held in adjusted position when the telescoping members thereof are in an extended position. A retaining member is provided for maintaining this spring bias while at the same time providing support for a coaxially arranged balun or matching transformer so that this transformer is supported immediately beneath the base member of the antenna assembly and is electrically connected thereto through the retaining member.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification taken in connection with the accompanying drawings, in which:

FIG. 1 is a side elevation view of an indoor television antenna arrangement embodying the principles of the present invention.

FIG. 2 is a fragmentary cross sectional view taken along the lines 2—2 of FIG. 1 and shown on a somewhat enlarged scale;

FIG. 3 is a sectional view taken along the lines 3—3 of FIG. 2;

FIG. 4 is a sectional view taken along the lines 4—4 of FIG. 2;

FIG. 5 is a sectional view taken along the lines 5—5 of FIG. 3;

FIG. 6 is a perspective view of a retaining member employed in the arrangement of FIG. 1;

FIG. 7 is an electrical schematic diagram of the antenna assembly of FIG. 1; and

FIG. 8 is a fragmentary view similar to FIG. 2 but showing a different cabinet mounting arrangement of the antenna assembly of the present invention.

Referring now to the drawings, the indoor television antenna arrangement of the present invention is therein illustrated as comprising a cylindrical base member indicated generally at 10 which is preferably made of a low loss ceramic or other suitable insulating material which is capable of withstanding high temperatures. A mounting flange 11 is provided near the upper end of the base member 10 so that the antenna assembly may be secured within an opening 12 in the top of the television receiver cabinet 13 by clamping the flange 11 against the underside of the cabinet top 13 by means of a bracket 14 which is secured to the top 13 by any suitable means such as the screws 15.

The base member 10 is provided with a cylindrical bore 20 therethrough and has an inwardly projecting lip or shoulder 21 at the upper end thereof. A bearing member 24 is positioned within the bore 20 and a portion of the outer surface of the bearing member 24 is provided with a spherical surface 25 having a diameter somewhat larger than the inner diameter of the shoulder 21 so that the bearing 24 is retained within the base member 10 by means of this shoulder. The bearing member 24 is also provided with an axial bore 26 therethrough and a telescoping antenna assembly indicated generally at 30 is slidably mounted within the axial bore 26 in the bearing member 24. The telescoping assembly 30 may comprise an outer sleeve 31 and a number of sleeves of smaller diameter, one of which is shown at 32, which may be telescoped within the outer sleeve 31 so as to provide an antenna arrangement of substantial length when the elements of the telescoping antenna assembly are completely extended, as will be readily understood by those skilled in the art. The outer sleeve 31 is provided with an enlarged portion 35 at the base thereof so as to prevent the telescoping assembly 30 from being pulled out of the bearing member 24. However, the bearing member 24 is provided with a cone-shaped recess 36 at the bottom end thereof which is adapted to receive the enlarged end portion 35 of the sleeve 31 so that when the assembly 30 is pulled upwardly to the fully extended position shown in FIG. 2 the assembly may be tilted from a vertical axis to provide best television reception, as will be readily understood by those skilled in the art.

In order to bias the bearing member 24 against the lip 21 with sufficient force to hold the antenna assembly 30 in an adjusted position even though the members of this assembly are in an extended position, there is provided a metallic sleeve 40 which is provided with an outwardly extending curved flange 41 at the top end thereof so as to provide a smooth surface which can engage the spherical bearing surface 25 of the bearing member 24. A coil spring 42 is positioned around the sleeve 40 with one end thereof in engagement with the flanged portion 41 of the sleeve 40. A retaining member indicated generally at 45 is provided with a central opening 46 in the top plate portion 47 thereof and the other end of the spring 42 rests upon the top plate portion 47 of the retaining member 45.

The retaining member 45 is positioned within the bore 20 of the base member 10 at a point such that the spring 42 urges the sleeve 40 into engagement with the bearing member 24 and holds this bearing member against the

shoulder 21. To this end, the base member 10 is provided with a plurality of inwardly projecting splines 50 which extend along the length of the bore 20 of the base member 10. The plate portion 47 of the retaining member 45 is provided with arcuate portions 52 at the four corners thereof, these arcuate portions 52 being of the same radius as the bore 20. Between the arcuate corner portions 52 the plate portion 47 is provided with flat sides 53. These flat sides 53 provided clearance for the splines 50 on the side walls of the bore 20 so that the retaining member 45 may be inserted into the bore 20 from the bottom with the sleeve 40 extending through the opening 46 of the retaining member 45. The retaining member 45 is then moved upwardly to a desired point along the length of the bore 20 at which point the spring 41 exerts a predetermined force on the bearing member 24 so that this bearing member is urged against the shoulder 21 so as to hold the antenna assembly 30 in any desired adjustable position. When the retaining member 45 is thus positioned at the desired point along the length of the bore 20, this member is then twisted so as to cause the arcuate corner portions 52 thereof to cut into the splines 50, as best illustrated in FIG. 5. The retaining member 45 is thus securely positioned and held within the bore 20 so that the desired spring bias on the spherical bearing member 24 is provided.

In order to provide a unitary antenna assembly wherein the matching transformer or balun for the antenna elements is included in the assembly, the retaining member 45 is provided with a pair of downwardly extending leg portions 60 which terminate in a pair of offset end portions 61. The matching transformer element of the assembly comprises a coil form 65, which is preferably also of low loss insulating material, the coil form 65 being of generally octagonal cross-section and having an irregularly shaped opening 66 extending therethrough. A plurality of ribs 67 are provided at the intersections of the octagonally shaped peripheral faces of the coil form 65 and a plurality of electrical windings may be wound in these ribs about the periphery of the coil form 65, as will be described in more detail hereinafter. The upper end of the coil form 65 is provided with vertical slots 68 in diametrically opposed sides of the coil form 65 and terminal members are secured by any suitable means such as riveting in three of the four slots 68, these terminal members being indicated as the terminals 69, 70 and 71. Each of these terminal members such as the terminal members 69 and 71 shown in FIG. 2, is provided with an offset portion 72 to which electrical contact can be made by suitable lead wires, or the like.

As best illustrated in FIG. 2, the offset end portions 61 of the depending legs 60 provided on the retaining member 45 are so arranged that they extend into the slots 68 provided in the coil form 65 and the offset end portions 61 are adapted to engage and interlock with the corresponding opposed terminals 69 and 71 mounted on the coil form 65. To this end, the offset portions 61 are provided with inwardly extending conically shaped prong portions 75 which interfit with the hollow end portion of the terminals 69 and 71, as best illustrated in FIG. 2, to provide a means for physically supporting the coil form 65 below the base member 10 in concentric or coaxial relation therewith. The coil form 65 is thus supported in the position shown in FIG. 2 by virtue of the leg portions 60 provided on the retaining member 45, the offset end portions 61 of which snap into the hollow terminal members 69 and 71 provided on the coil form 65. If desired, the offset portions 61 may be soldered to the corresponding terminals 69 and 71 to provide a rigid unitary assembly of the base member 10 and the coil form 65. In this connection it will be noted that since one of the slot 68 does not have a terminal member mounted in it, it is impossible to assemble the coil form 65 to the base member 10 improperly since only in the positions shown in FIG. 2 do both of the offset leg portions 61 engage terminals on the coil form 65.

At the bottom end of the coil form 65 there is provided a series of slots similar to the slots 65 which extend upwardly from the bottom edge of the coil form 65 on diametrically opposed sides thereof. A plurality of terminals 80, 81 and 82 are positioned within these slots and are connected to the other end of the windings wound on the coil form 65.

Considering now the manner in which the electrical windings of the matching transformer may be wound on the coil from 65, a first pair of wires are connected to the terminal 69 (FIG. 7) and are wound bifilarly around the coil form 65 for approximately six turns so as to provide the windings 85 and 86 shown in FIG. 7. In a similar manner a second pair of wires are connected to the terminal 70 at the top end of the coil form 65 and are wound bifilarly around this coil form to provide the windings 87 and 88. The other terminal 71 in the upper end of the coil form 65 is not connected to any windings of the matching transformer and serves only as a support for the coil form 65 in the manner described above by engagement with one of the legs 60 of the retaining member 45.

At the bottom end of the coil form 65, the other end of the winding 85 is connected to the terminal 80, the other ends of the windings 86 and 87 are connected to the terminal 81 and the other end of the winding 88 is connected to the terminal 82. The terminals 80 and 82 act as the output terminals of the matching transformer and are connected by means of a suitable transmission line to the antenna terminals of the television receiver (not shown), as will be readily understood by those skilled in the art. The terminal 70 at the upper end of the coil form 65 may either be connected directly to ground in situations where ground is a metal cabinet or an isolated or so-called "cold" television chassis. In the alternative, the terminal 70 may be connected through an isolating condenser 90 to ground in situations where the antenna terminals are to be connected to a "hot" chassis, as will be readily understood by those skilled in the art.

When the television receiver is not in use, the telescoping antenna assembly 30 may be moved downwardly through the axial bore 26 in the bearing member 24 and through the sleeve 40 until a ridge 92 on the outer sleeve 31 engages the upper surface of the bearing member 24, at which point the antenna assembly is substantially fully retracted. It will thus be noted that when the antenna assembly 30 is fully retracted, the telescoping members extend through both the sleeve 40 and the coil form 65 which is positioned coaxially therewith beneath the base member 10. If desired, a tube 94 of insulating material may be secured over the bottom portion of the sleeve 40 so that when the antenna assembly 30 is fully retracted the outer metal sleeve 31 thereof will be insulated by the tube 94 so as to prevent any accidental short circuit thereof to ground. Such an arrangement is particularly desirable for hot chassis operation.

In order to provide a universal mounting arrangement for the antenna assembly of the present invention, so that this assembly may be mounted in cabinets having different diameter openings in the top wall thereof, the portion of the base member 10 adjacent the mounting flange 11 is provided with a conically shaped surface 96 which functions to center the assembly in cabinets having widely varying diameters. Thus, a cabinet 13*a* (FIG. 8) having a substantially smaller diameter opening 12*a* in the top wall thereof, may be accommodated by the self-centering action of the conical surface 96 provided adjacent the mounting flange 11 of the base member 10, as best illustrated in FIG. 8. Also, it will be understood that a wide variety of cabinet mounting centers may be accommodated while using the same antenna assembly of the present invention by merely providing differently

shaped brackets 14 having suitable holes matching the desired cabinet mounting centers.

While there has been described what is at present considered to be the preferred embodiments of the invention, it will be understood that various modifications may be made therein which are within the true spirit and scope of the invention as defined in the appended claims.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. An indoor antenna assembly, comprising a cylindrical base member having a cylindrical bore therethrough and having an inwardly projecting lip at one end thereof, said base member also having a mounting flange adjacent said one end thereof, said base member also being provided with a plurality of inwardly projecting splines extending along the length of said cylindrical bore, a spherical bearing positioned within said bore and seated on said lip, said bearing having an axial bore therethrough, a telescoping antenna assembly slidably positioned within said axial bore, a sleeve one end of which is provided with an outwardly extending flange, a coil spring positioned around said sleeve with one end thereof in engagement wtih said outwardly extending flange, a locking member positioned transversely within said cylindrical bore with the edges of said locking member positioned within corresponding grooves in said splines, said locking member having a central opening through which said sleeve extends and being positioned in engagement with said spring so that said sleeve holds said spherical bearing against said lip, a tubular coil form of insulating material, said coil form having at least two opposed terminal members at one end thereof to which electrical windings wound on said form are attached, and said locking member having a pair of opposed depending arms which extend below the other end of said base member and engage said opposed terminals of said coil form so that said coil form is supported thereby and is positioned coaxially wtih said base member, said antenna assembly being slidable through both said sleeve and said coil form to a retracted position.

2. An indoor antenna assembly, comprising a cylindrical base member having a cylindrical bore therethrough and having an inwardly extending lip at one end thereof, said base member also having a mounting flange adjacent said one end thereof, a spherical bearing positioned wtihin said bore and having a diameter somewhat larger than the diameter of said lip, said bearing having an axial bore therethrough, a telescoping antenna assembly slidably positioned within said axial bore, a sleeve one end of which is provided wtih an outwardly extending flange, a coil spring positioned around said sleeve with one end thereof in engagement with said outwardly extending flange, and a locking member positioned within said cylindrical bore, said locking member having a central opening through which said sleeve extends and being positioned in engagement with the other end of said spring so that said spherical bearing is urged upwardly against said lip sufficient force to hold said telescoping antenna assembly in adjusted position when said telescoping antenna assembly is extended, said antenna assembly being slidable through both said bearing and said sleeve to a retracted position when said axial bore is aligned with said sleeve.

3. An indoor antenna assembly, comprising a cylindrical base member having a cylindrical bore therethrough and having an inwardly projecting shoulder at one end of said bore, said base member also having a mounting flange adjacent said one end thereof, a bearing member positioned in said bore in said base member and having an axial bore therethrough, a portion of the outer surface of said bearing member forming a spherical bearing surface of a diameter somewhat larger than the inner diameter of said shoulder so that said bearing member is retained within said bore of said base member by said shoulder, a telescoping antenna assembly slidably positioned within said axial bore, a sleeve one end of which is provided with an outwardly extending flange, a coil spring positioned around said sleeve with one end thereof in engagement with said outwardly extending flange, and a retaining member adapted to engage the other end of said coil spring and having an opening through which said sleeve extends, said retaining member being positioned within the bore of said base member in such manner that said spring urges said bearing member upwardly with sufficient force to hold said telescoping antenna assembly in adjusted position when said assembly is extended, said antenna assembly being slidable through both said axial bore of said bearing member and said sleeve to a retracted position when said axial bore is aligned with said sleeve.

4. An indoor antenna assembly, comprising a cylindrical base member having a cylindrical bore therethrough and having an inwardly projecting shoulder at one end of said bore, said base member also having a mounting flange adjacent said one end thereof, a bearing member positioned in said bore in said base member and having an axial bore therethrough, a portion of the outer surface of said bearing member forming a spherical bearing surface of a diameter somewhat larger than the inner diameter of said shoulder so that said bearing member is retained within said bore of said member by said shoulder, a telescoping antenna assembly slidably positioned within said axial bore and having an enlarged portion at the bottom end thereof, said bearing member being recessed adjacent one end of said axial bore to accommodate said enlarged portion of said antenna assembly so that said bearing member may be tilted within said base member as said antenna assembly is adjusted to a desired position, a sleeve one end of which is provided with an outwardly extending flange, a coil spring positioned around said sleeve with one end thereof in engagement with said outwardly extending flange, and a retaining member adapted to engage the other end of said coil spring and having an opening through which said sleeve extends, said retaining member being positioned within the bore of said base member in such manner that said spring urges said bearing member upwardly with sufficient force to hold said telescoping antenna assembly in adjusted position when said assembly is extended, said antenna assembly being slidable through both said axial bore of said bearing member and said sleeve to a retracted position when said axial bore is aligned with said sleeve.

5. An indoor antenna assembly, comprising a cylindrical base member having a cylindrical bore therethrough and having an inwardly projecting shoulder at one end of said bore, said base member also having a mounting flange adjacent said one end thereof, a bearing member positioned in said bore in said base member and having an axial bore therethrough, a portion of the outer surface of said bearing member forming a spherical bearing surface of a diameter somewhat larger than the inner diameter of said shoulder so that said bearing member is retained within said bore of said base member by said shoulder, a telescoping antenna assembly slidably positioned within said axial bore, a sleeve one end of which is provided with an outwardly extending flange, a coil spring positioned around said sleeve with one end thereof in engagement with said outwardly extending flange, and a retaining member adapted to engage the other end of said coil spring and having an opening through which said sleeve extends, and means for holding said retaining member within the bore of said base member in such position that said spring urges said bearing member upwardly with sufficient force to hold said telescoping antenna assembly in adjusted position when said assembly is extended, said antenna assembly being slidable through both said axial bore of said bearing member and said sleeve to a retracted position when said axial bore is aligned with said sleeve.

6. An indoor antenna assembly, comprising a cylindrical base member having a cylindrical bore therethrough and having an inwardly projecting shoulder at one end of said bore, said base member also having a mounting flange adjacent said one end thereof, a bearing member positioned in said bore in said base member and having an axial bore therethrough, a portion of the outer surface of said bearing member forming a spherical bearing surface of a diameter somewhat larger than the inner diameter of said shoulder so that said bearing member is retained within said bore of said base member by said shoulder, a telescoping antenna assembly slidably positioned within said axial bore, a sleeve one end of which is provided with an outwardly extending flange, a coil spring positioned around said sleeve with one end thereof in engagement with said outwardly extending flange, and a retaining member adapted to engage the other end of said coil spring and having an opening through which said sleeve extends, said retaining member being positioned within the bore of said base member in such manner that said spring urges said bearing member upwardly with sufficient force to hold said telescoping antenna assembly in adjusted position when said assembly is extended, a tubular coil form of insulating material, said coil form having a plurality of terminal members to which electrical windings wound on said form are attached, and means for positioning said coil form below said base member and coaxially therewith, said antenna assembly being slidable through both said sleeve and said coil form to a retracted position when said axial bore is aligned with said sleeve.

7. An indoor antenna assembly, comprising a cylindrical base member having a cylindrical bore therethrough and having a conical seat at one end thereof, said base member also having a mounting flange adjacent said conical seat, whereby said base member may be mounted in cabinet apertures of different diameters, said base member also being provided with an inturned lip adjacent said one end thereof, a spherical bearing positioned within said bore and seated on said lip, said bearing having an axial bore therethrough, a telescoping antenna assembly slidably positioned within said axial bore, a sleeve one end of which is provided with an outwardly extending flange, a coil spring positioned around said sleeve with one end thereof in engagement with said outwardly extending flange, a locking member positioned transversely within said cylindrical bore, said locking member having a central opening through which said sleeve extends and being positioned in engagement with said spring so that said sleeve holds said spherical bearing against said lip, a tubular coil form of insulating material, said coil form having at least two opposed terminal members at one end thereof to which electrical windings wound on said form are attached, and said locking member having a pair of opposed depending arms which extend below the other end of said base member and engage said opposed terminals of said coil form so that said coil form is positioned coaxially with said base member, said antenna assembly being slidable through both said sleeve and said coil form to a retracted position.

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