Oct. 25, 1966 L. GIL DE GIBAJA HERRERO 3,281,847

ANTENNA SYSTEMS

Filed April 30, 1963 2 Sheets-Sheet 1

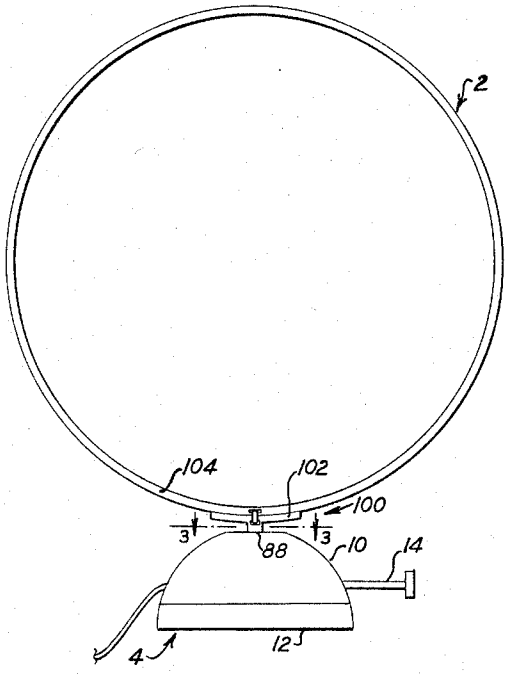


Fig. 1

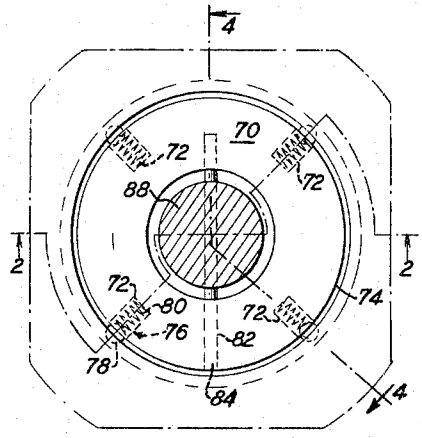


Fig. 3

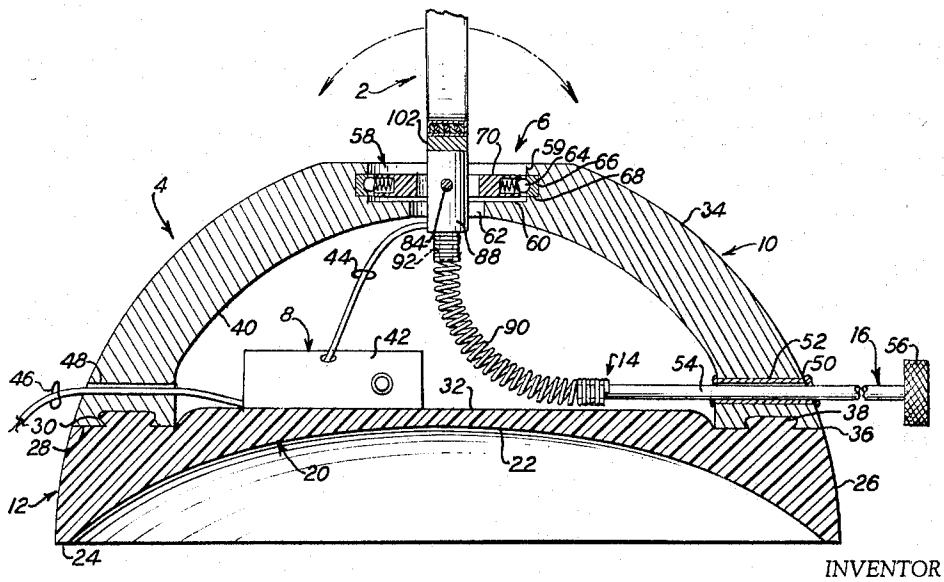


Fig. 2

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Filed April 30, 1963 2 Sheets-Sheet 2

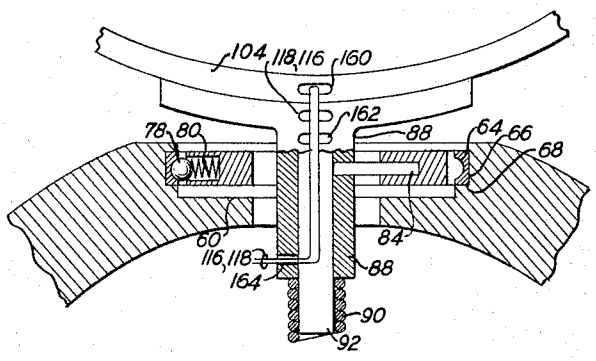


Fig. 4

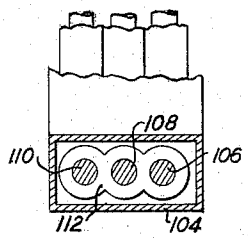


Fig. 5

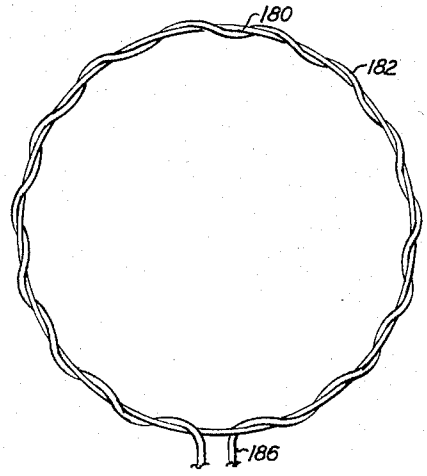


Fig. 6

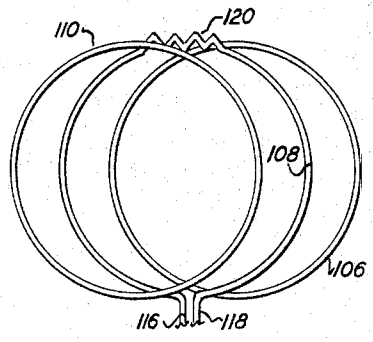


Fig. 7

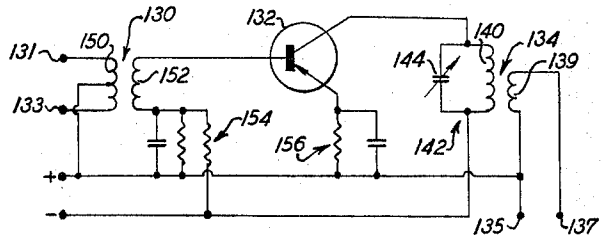


Fig. 8

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ANTENNA SYSTEMS

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3 Claims. (Cl. 343—702)

This invention relates generally to antenna systems, and is particularly concerned with antennas of the type adapted to receive very high frequencies (VHF) and ultra-high frequencies (UHF).

Transmitting frequencies in the VHF and UHF ranges are commonly employed today for the transmission of television signals and frequency modulated radio signals. Accordingly, in a somewhat more specific sense, the present invention is particularly concerned with the provision of an antenna assembly which finds particular utility as used with television receivers and so-called FM radio receivers.

At the present time, it is more or less conventional with television receivers, for example, to use one of three types of antenna systems, namely, a so-called outdoor antenna, a so-called indoor antenna, or a so-called "built-in" antenna. The outdoor antennas are normally formed from antenna rods or bars of substantial size so coupled together as to form a large antenna network. The antenna network or structure is usually fixed in some elevated location, such as, on the roof of a building, the chimney of a house, or the top of a support tower. The outdoor antennas, by virtue of their inherent size and desired intended location, are quite expensive to manufacture and to install. Moreover, the user is required to have a building, or the like, on which to mount the outdoor antennas.

Thus, in metropolitan areas where signals of some strength are common, it is conventional to use an indoor antenna or a built-in antenna. The built-in antenna, quite commonly, and in contrast with the other types, usually includes an antenna loop comprising a single antenna wire which is disposed within the receiver cabinet. Insofar as simplicity is concerned, the built-in antenna leaves little to be desired. However, if an interference pattern is experienced in the region of the particular receiver in which the antenna is disposed, or if one signal is overpowering with respect to others in such region, then it is difficult, and often impossible, to obtain from the antenna system a single defined signal which gives completely satisfactory reception.

Because of the aforesaid problems, and in order to increase signal strength in some instances, indoor antennas have found widespread use. The common indoor antenna consists of a base and an antenna network supported on the base. With some indoor antennas, as for example, the so-called "rabbit ears," two antenna rods project from the base and are selectively movable to different locations. In other systems, the base with the antenna network mounted thereon can be adjusted as a unit to different relative positions, and further, a matching or tuning network can be selectively coupled with the antenna so as to exercise some control over the signal transmitted from the antenna to the particular receiver with which it is used. Still, prior indoor antennas have not eliminated interference problems effectively, nor have they adequately compensated for signal strength problems.

From the standpoint of the above classification, the instant invention is concerned with an indoor antenna assembly. From a more specific standpoint, the present invention is concerned with the provision of such an antenna assembly which affords directional selectivity and increased signal strength in a comparatively simple and relatively inexpensive antenna arrangement so as to permit the average homeowner to substantially eliminate any interference or signal strength problems which would

otherwise be experienced with previously available antenna systems.

One of the more important, yet more specific objects of the present invention, is to provide in an indoor antenna assembly, a base structure which is comparatively small, an antenna loop means which is somewhat larger than the base structure but which is still relatively small, a generally universal coupling between the base structure and the antenna means which permits selective directional adjustment of the antenna loop means, and an operating means which permits at least partial adjustment of the antenna means with respect to the base structure without requiring direct contact between the antenna means and the individual operating the assembly. Still further, in this regard, it is an object of the present invention to provide such an assembly which further includes a pre-emplifying circuit carried within the base structure and adapted to increase the gain of the overall assembly so that signals of sufficient strength are supplied to a receiver with which the assembly is used.

Moreover, it is a still further important and basic object of the present invention to provide an antenna assembly such as described above and wherein means are incorporated for easily detachably coupling the base structure to a support surface such as a shelf, or even the top of a receiver cabinet. Consistent with this particular object, and the foregoing more specific objects, the invention has certain additional detailed objects. For example, one of the more detailed objects of the present invention is to provide an improved coupling arrangement between an antenna loop means and a base support therefor which permits generally universal movements of the antenna loop means with respect to the base support.

Still further detailed, but significant, objects of the present invention include the following: (a) the provision of an improved antenna loop means adapted for use in an antenna assembly conforming with the preceding objects and including a reflector antenna element, a director antenna element, and a receiving antenna element commonly mounted within a loop support; (b) the provision of an improved base structure for use in an antenna assembly consistent with the preceding objects, which base structure is adapted to conveniently house a pre-amplifier circuit, and support a coupling joint for universally mounting an antenna loop means; and (c) the provision of an overall combination in an antenna assembly of expedients and means so arranged and disposed as to yield the improved results indicated above and particularly directional sensitivity.

Again, in a more general sense, it is a primary object of the present invention to provide an improved indoor antenna assembly which overcomes the disadvantages of presently available indoor antenna assemblies, and yet which can be manufactured comparatively inexpensively and as an attractive arrangement so as to be readily available and usable by members of the public at large.

The invention lies in the particular combination of expedients incorporated in an antenna assembly constructed in accordance herewith, as well as in certain novel constructions of an antenna loop means and a support structure for an indoor antenna assembly. These phases of the invention, as well as the overall assembly, will be better understood, and objects other than those set forth above will become apparent, when consideration is given to the following detailed description. Such description refers to the annexed drawings presenting preferred and illustrative embodiments of the invention.

In the drawings:

FIGURE 1 is a front view of an antenna assembly constructed in accordance with the present invention;

FIGURE 2 is a cross-sectional view of the base structure and lower part of the antenna loop means of the

overall assembly shown in FIGURE 1, FIGURE 2 presenting the antenna loop means as rotated about a vertical axis through 90° from the position shown in FIGURE 1;

FIGURE 3 is a plan view, partially in section, and taken on the line 3—3 of FIGURE 1;

FIGURE 4 is a fragmental detailed view of the coupling joint incorporated in the preferred form of antenna assembly constructed in accordance herewith, FIGURE 4 having been taken on the line 4—4 of FIGURE 3;

FIGURE 5 is a fragmental detailed view, partially in section, of the preferred form of antenna loop means incorporated in an assembly constructed in accordance herewith;

FIGURE 6 is a front view of a modified form of antenna loop means which can be incorporated in the assembly hereof;

FIGURE 7 is an exemplary, fragmental and exploded view of the preferred form of antenna loop means incorporated in an assembly constructed in accordance herewith; and

FIGURE 8 is a circuit diagram of a suitable type of transistor pre-amplifier circuit adapted to be utilized in an assembly constructed in accordance herewith.

If reference is now made more particularly to FIGURES 1 and 2, it will be noted that the antenna system shown in such figures includes a directional antenna loop means 2, and a base means 4 which supports the antenna loop means. For purposes of mounting the antenna loop means 2 on the base means 4, there is provided a coupling means 6 (FIGURE 2) which is connected between the base means 4 and the antenna loop means 2. The mounting provided by the coupling means serves to support the antenna loop means 2 on the base means 4 such that the antenna loop means is movable rotationally and pivotally above the base means.

A pre-amplifier circuit generally designated by the numeral 8 is carried within the base means, and to this end, the base means 4 is preferably formed in part by a housing portion 10 of generally semi-spherical shape. The housing portion 10 is interiorly hollow and, as shown, the pre-amplifier circuit 8 is carried in the hollow interior of the housing portion. Aside from the housing portion 10, the base means 4 preferably further includes an attaching means 12 which, as shown, is in the form of a suction cup base. The attaching means 12 serves to detachably secure the base means 4 to a support surface, such as a shelf, receiver cabinet, or the like.

For purposes of operating the antenna without touching the same so as to achieve a desired adjustment, a manual drive means generally designated by the numeral 14 is incorporated. The manual drive means is mechanically coupled to the coupling means 6 for moving the antenna in at least one set of opposite directions, namely, rotationally opposite directions as shown. The mechanical drive means 14 includes an operating handle 16 which projects from the housing portion 10 as shown.

Having now set forth the general overall arrangement of the antenna system presented in the drawings, attention can be directed to the individual component parts or means provided therein. It should be here understood, however, that certain of the elements or means can be varied from the preferred embodiments discussed in detail without departing from the scope and spirit of the invention. For example, while a particular pre-amplifier circuit is presented in the drawings and described in detail below, there are various types of pre-amplifier circuits which are suitably adapted for use in accordance with the invention.

Since the base means 4 serves as the support and housing for the overall assembly, it seems appropriate to first consider the details of such means. In order to insure permanent placement of the antenna system, and in order to prevent the same from being easily accidentally knocked from a surface, the base means 4 hereof, as indicated above, desirably includes the attaching means 12 which comprises a suction cup in essence.

Specifically, the attaching means 12 comprises an elastomeric body or member 20, preferably of rubber, having a spherically and concavely recessed lower surface 22. The lower surface 22 terminates at its lower extremities adjacent a preferably planar peripheral lower lip 24. The outer side wall or peripheral wall 26 of the body 20 is spherically convexly contoured and terminates at its upper end adjacent a peripheral shoulder flange portion 28. The flange portion 28 of the body 20 carries a projecting ring rib or projection 30 extending thereabout. The central and upper surface 32 of the body 20 is preferably flat or planar and merges at its periphery into the flange portion 28.

The housing portion 10 of the base means 4, as indicated above, is also generally semi-spherically shaped about its exterior. In detail, the housing portion 10 has a truncated spheroidal outer surface 34. The lower end of the housing portion 10 is formed by a base wall 36 having a centrally disposed ring recess 38 therein. The inner wall 40 of the housing portion 10 may be of any suitable shape, but, as shown, it is also of a truncated spheroidal contour.

The elastomeric body or member 20 is joined with the housing portion 10 of the base means 4 through the cooperation of the coupling projecting ring 30 which can be pressed into the position shown to extend within the ring recess 38 in the bottom wall 36 of the housing portion 10. The joint between the ring recess 38 and the ring rib 30 is preferably of the dove-tail type, and the dimensions of the body 20 and housing portion 10 are such that the housing portion 10 and body 20 together form a continuous truncated spheroid as semi-spherical base.

The pre-amplifier circuit 8, as shown in FIGURE 2, is housed within a casing 42, and this casing is fixed on the upper surface 32 of the body by any suitable means (e.g. adhesive), such that it is located within the housing portion 10. Leading into the casing 42 for connection with the input portion of the pre-amplifier circuit is a pair of input leads 44 which extend from the antenna loop means 2. Leading from the casing 42 is a pair of output leads 46 which are adapted to be coupled directly with a conventional receiver antenna connection. To permit the leads to pass from the interior of the housing portion 10 to the exterior thereof, a suitable opening or passageway 48 is provided transversely of the side wall of the housing portion 10. Similarly, the housing portion 10 is bored as at 50 so as to provide a passageway therethrough. Mounted within the passageway 50 is a bearing collar 52, and supported within the bearing collar 52 is a shaft 54 which forms part of the operating handle 16, and in turn of drive means 14. The exterior end of the shaft 54 has a knurled disc 56 fixed thereon which permits rotational adjustment of the shaft 54 and in turn, movement of the antenna, in a manner explained more fully below.

It should be apparent from the foregoing description that the base means 4, and the separate parts thereof, are adapted to be mounted on a support surface and secured in position. Due to the flexibility of the elastomeric body 20, when downward pressure is applied on the housing portion 10 of the base means 4, the body 20 is laterally expanded, so that the surface 22 moves adjacent the surface on which the base means is to be supported. This results in creating a partial vacuum under the base means 4, and due to the existence of the partial vacuum, the exterior air pressure maintains the base means 4 detachably fixed in position. The operation, in this regard, is the same operation as experienced with a suction cup. Notwithstanding the provision of the elastomeric body 20, however, it may be found convenient in certain instances to use a plurality of suction cups, and/or to modify the particular detaching means and incorporate a clamp bracket, or the like. Thus, while the preferred embodiment is shown in the drawings and described in detail

above, modifications such as those suggested in this paragraph would not depart from the intended scope of the instant invention.

The coupling means **6** which supports the antenna loop means **2** on the base means **4** comprises essentially a coupling joint. By initially referring to FIGURE 2, it will be noted that the housing portion **10** is provided with a recess **58** centrally of the top thereof. The recess **58** is circular and has a lower wall **60** intermediate the outside and inside walls **34** and **40**, respectively, of the housing portion **10**. Communicating with the recess **58** is an opening or counter-bore **62** which is coaxial with the recess **58**. The recess **58**, for purposes of understanding this invention, can be considered as being defined by the circular side wall **59**, and a circular bottom wall **60**, and as having an open top. The side wall **59** has a bearing surface **64** intermediate the upper and lower extremities thereof, the bearing surface being formed by a bearing ring **66** mounted in a recess **68** extending about the wall **59**. The bearing ring **66** is preferably formed of a suitably annealed spring bronze, for example, and is so dimensioned that the same can be conveniently snapped into the recess **68**. When located in its desired position, the peripheral exposed surface of the bearing ring **66** has a circular groove facing centrally of the recess **58**.

Cooperating with the recess **58** and bearing surface thereof, is a rotational mounting means and a pivotal mounting means. The rotational mounting means comprises a ring member **70** which is received in the recess **58**. The ring member **70**, as shown in FIGURE 3, has a plurality of sockets **72** disposed about, and opening onto, the outer periphery **74** of the ring member **70**. The sockets **72** comprise bores, preferably equally angularly spaced about the side periphery of the ring member **70**.

Disposed in each of the sockets **72** is a biased bearing means **76** which comprises a ball member **78** and a coil spring **80**. The spring **80** is disposed interiorly of the ball member **78** in each instance, whereby the spring urges the ball member outwardly of the member **70**. The balls of each bearing means ride in the bearing surface **64** of the bearing ring **68**, and in turn the ring member **70** is rotationally mounted within the recess **58**. The bearing ring **70** is bored diametrically thereof as at **82**, and a pivot pin **84** is passed through such bore. The pivot pin **84** extends through a suitable bore in a post member **88** so that the post member **88** is pivotally mounted on the pivot pin **84**, and in turn pivotally mounted with respect to the ring member **70**. The post or post member **88** can thus be pivoted in the opposite directions designated by the arrows in FIGURE 2, and also rotated with respect to the base means **4**. The rotation results from rotation of the ring member **70**.

To achieve the rotational movement of the post or post member **88**, a flexible coupling **90** is connected between the inner end of the shaft **54**, i.e., the end of such shaft disposed in the housing portion **10**, and a coupling extension **92** extending from the bottom of the post member **88**. The flexible coupling is preferably in the form of a spring, and when connected as indicated, rotation of the shaft **54** through movement of the knurled disc **56** results in rotation of the post member **88**. The rotation of the post is supported, however, by virtue of the cooperation between the bearing means **76** and the bearing surface of the recess **58**. It should be here noted that the post member **88** can be rotated by the handle **16**, regardless of the position to which the post **88** has been tilted. In other words, the post **88** can be manually tilted about the pivot pin **86** and can be then rotated through operation of the handle **16**.

The post or post member **88** forms part of a support bracket **100**. Such bracket includes, in addition to the post **88**, a coupling head **102**. The coupling head **102** mounts the antenna loop means **2**. As shown in FIGURE 1, the coupling head **102** has fixed thereto, by any suitable means, such as adhesive, or the like, an antenna loop casing **104**.

The casing **104**, as shown in FIGURE 5, houses a plurality of antenna loops generally designated by the numerals **106**, **108** and **110**. The loop **108** is the central loop, and this loop, as explained more fully below, has a pair of output leads extending therefrom. On the other hand, the loops **106** and **108** are preferably closed loops. The three loops, disposed concentrically with respect to one another, and equally dimensioned, as shown, are embedded in insulated relation to one another within an insulating cover **112**. The insulating cover **112** is in turn carried within the hollow tubular antenna support casing **104**, the casing **104** being in turn coupled to the bracket means **100**, as indicated above.

The particular construction of the antenna means shown in FIGURE 5 would possibly be better understood by reference to FIGURE 7. Here it will be noted that the antenna loop **110** is a continuous closed loop, that the loop **108** has the leads **116** and **118** extending therefrom, and that the loop **106** is also a closed loop. Quite obviously, each of such loops is electrically conductive. Moreover, as shown in FIGURE 7, the loop **108** has a matching resistor **120** connected therein. As well known in the art, the matching resistance can be connected within the loop in any suitable manner. The same can also then be encased within a covering such as that designated by the numeral **112**. The important point here to note is that the preferred form of antenna assembly shown in FIGURES 5 and 7 includes an antenna loop having a matching resistor therein and having twin leads extending therefrom. Further, two additional antenna loops are included, one of which will serve as a reflector loop, and the other of which will serve as a director loop. Whether the reflector loop is that designated by the numeral **106** or that designated by the numeral **110** makes little difference. For a director and reflector relationship, however, the loops **110** and **106** are disposed concentrically and on opposite sides of the central and primary signal detecting loop **108**.

The casing **104**, like the covering **112**, is preferably made of a plastic material or other insulating type electrical material. In this manner, interference from the casing and covering is eliminated.

Having now discussed the preferred form of antenna means, attention can be directed to the pre-amplifying fed by the antenna means. As indicated above, the pre-amplifier circuit or means incorporated in the assembly hereof can take various forms. However, such pre-amplifier preferably comprises a circuit arrangement such as shown in FIGURE 8. As will be apparent to those of ordinary skill in the art, the circuit of FIGURE 8 represents a typical radio frequency amplifier incorporating a transistor in the amplifying stage thereof. The input to the amplifier is fed across the terminals **131** and **133** of an input transformer coupling generally designated by the numeral **130**. The output of the circuit is taken across the terminals **135** and **137** of an output transformer **134**. Specifically, the output terminals **135** and **137** are connected across the secondary winding **139** of the transformer **134**. The primary winding **140** of such transformer forms part of a tuned circuit **142**. The tuned circuit includes a parallel condenser **144**, i.e., a condenser **144**, coupled across the primary winding **140**. The condenser **144**, as shown, can be of the variable type, or alternatively, it can have a fixed value. Here, the provision of a variable condenser or of a fixed condenser will depend upon the particular band pass required for the use of the antenna. The adjustment of the condenser, as well known, will fix the resonant frequencies of the tuned circuit, and while a fixed condenser can be used over a considerable range for the intended purpose, i.e., a wide band pass can be achieved, if more selective adjustment is desired, a variable condenser can be incorporated with a suitable operating mechanism for

adjusting the same, if necessary, so as to permit obtaining selectively adjustable band pass characteristics.

The input arrangement to the amplifying stage includes the primary winding **150** and the secondary winding **152** of the transformer **130**. The secondary winding is connected between the negative terminal of the power supply through a suitable biasing network such as that designated by the numeral **154** and the base of the transistor **132**. Moreover, a biasing network **156** is provided for the emitter of the transistor. The output of the circuit is taken between the collector of the transistor and the negative terminal of the power supply.

With respect to the power supply, a standard battery having voltages adapted to operate the particular transistor incorporated, can be provided within the casing **42** which houses the pre-amplifier circuit. However, as an alternative, a standard rectifying circuit can be incorporated as part of the pre-amplifier means so as to provide the power for the pre-amplifier means. In the latter instance, a cord for attachment with a wall socket would lead from the base means of the antenna assembly whereby the rectifier means can be coupled with the standard wall outlet to supply the necessary power. This alternative, like the alternative of using a variable condenser **144**, are matters well within the scope of a mechanic in the art and detailed discussion thereof appears unnecessary. The important point to understand here is that a pre-amplifying means is incorporated in the base means or housing portion thereof so as to achieve the desirable gain characteristics.

As indicated above, the input portion, namely, the input transformer **130**, or specifically the input terminals **131** and **133** of the pre-amplifier means are connected with the antenna loop means. To this end, and for purposes of initial consideration, it can be assumed that the leads **116** and **118** of loop **120** (FIGURES 5 and 7) are connected, respectively, to the terminals **131** and **133**. To establish such connection, the leads **116** and **118** either individually or in a unitary standard lead connection, extend from the antenna casing **104**, as shown in FIGURE 4. Such leads pass through an outlet aperture **160** in such casing, and then enter a suitable opening **162** in the side of the post **88**. Such post, as possibly best shown in FIGURE 4, is hollow, and permits the leads to pass downwardly therethrough for connection with the input portion of the pre-amplifier means. Accordingly as the antenna loop means is rotated, the leads extending therefrom and to the pre-amplifier means do not interfere with the operation. Of course, it is here to be noted that an opening **164** toward the base of the post **88** permits the exit of the leads **116** and **118** from the post for the necessary connection with the pre-amplifier means.

Whether the antenna assembly described above and presented in FIGURES 5 and 7 is used, or the antenna arrangement of FIGURE 6 to be described below is used, the general arrangement and passage of the leads is the same. In each instance, twin leads extend from the antenna loop. However, in the antenna arrangement of FIGURE 6, as opposed to using three wire loops, antenna core member **180** is incorporated, and an antenna wire **182** is wrapped about the core **180** first interiorly and then exteriorly in alternate or serpentine fashion. The core **180** preferably comprises a somewhat flexible ring of pulverized or powdered metals joined by a suitable binder. The powdered metals should have some magnetic properties preferably, so as to render the same suitable for use as an antenna. In this regard, the arrangement of FIGURE 6 may well include a core comprising powdered iron particles joined together by a suitable resin binder, such as, for example, polyethylene. Alternatively, however, and for some uses, it may be found desirable to use other metals, such as, aluminum. Still, the construction of the core can be flexible so long as a flexible binder is used and the relative proportions of the powdered metal to the binder yields the flexibility. With the core **180**, there is a high directional sensitivity achieved, and this is particularly so where the antenna wire is wrapped alternately interiorly and then exteriorly about the core so as to form a twisted strand about the core.

As opposed to using an outer casing for the antenna of FIGURE 6, the core can be attached directly to the head **102** of the bracket means **100**. However, in this instance, the bracket means is preferably formed of an insulating material, such as a molded plastic, e.g., polyethylene, so that there is no conduction from the antenna to the elements of the base means or coupling joint. At the same time, the bracket **100** and post **88** are formed exactly as described above so that the leads **184** and **186** which extend from the antenna wire **182** pass through the post just as the leads **116** and **118** of the antenna arrangement of FIGURES 5 and 7 pass through the post.

After reading the foregoing detailed description of the illustrative and preferred embodiments of the instant invention, it should be apparent that the objects set forth at the outset of the present specification have been successfully achieved. Accordingly,

What I claim is:

1. An antenna system comprising:

(a) a circular directional antenna loop assembly;

(b) a base for said assembly, said base having a maximum dimension which is substantially smaller than the diameter of said loop assembly, said base having a hollow interior with a recess in the top portion thereof, said recess being defined by a circular wall having a bearing surface thereabout;

(c) a coupling joint means for movably supporting said antenna loop on said base, said coupling joint comprising a ring member received in said recess, said ring member having a plurality of sockets disposed about and opening onto the outer periphery thereof;

(d) a biased bearing means received in each of said sockets, each of said bearing means engaging said bearing surface to rotationally mount said bearing ring in said recess;

(e) said bearing ring having a central opening therein;

(f) a pivot shaft mounted in said bearing ring and extending diametrically across said opening;

(g) a support bracket including a support post pivotally mounted on said pivot shaft and projecting above said base;

(h) said antenna loop assembly being mounted on said bracket;

(i) an operating handle shaft rotatably journaled in said base, said operating handle projecting at one end laterally of said base and having its opposite end extending within the interior of said base;

(j) a flexible coupling connected between said opposite end of said handle shaft and said post;

(k) a transistor pre-amplifier circuit disposed within the interior of said base, said pre-amplifier circuit having an input portion;

(l) said post being hollow;

(m) a connection cable extending through said post and electrically connecting said antenna loop assembly with said input portion of said pre-amplifier circuit;

(n) and suction cup means forming part of said base for detachably mounting said base on a support surface.

2. An antenna support comprising:

(a) a base having a hollow interior with a recess in the top portion thereof, the periphery of said recess being defined by a circular wall having a bearing surface thereabout;

(b) a coupling joint means for movably supporting an antenna loop on said base, said coupling joint comprising a ring member received in said recess, said ring member having a plurality of sockets disposed about and opening onto the outer periphery thereof;

(c) a biased bearing received in each of said sockets, each of said bearing means engaging said bearing surface to rotationally mount said bearing ring in said recess;

(d) said bearing ring having a central opening therein;

(e) a pivot shaft mounted in said bearing ring and extending diametrically across said opening;

(f) a support post pivotally mounted on said pivot shaft and projecting above said base, said post being adapted to support an antenna loop thereon;

(g) an operating handle shaft rotatably journaled in said base, said operating handle shaft projecting at one end laterally of said base, and having its opposite end and extending within the interior of said base; and

(h) a flexible coupling connected between said opposite end of said handle shaft and said post.

3. A self-contained antenna system comprising in combination:

(a) a circular directional antenna loop assembly including a conductive insulated first wire loop having a pair of output leads, a matching resistor means connected in said first wire loop, a second closed wire loop disposed concentrically with and on one side of said first wire loop, a third closed wire loop disposed concentrically with and on the opposite side of said first wire loop, and a non-conductive hollow tubular casing enclosing said wire loops and supporting the same;

(b) a base for said assembly, said base having a maximum dimension which is substantially smaller than the diameter of said loop assembly;

(c) a transistor preamplifier circuit disposed within said base, said preamplifier circuit having an input portion;

(d) bracket means supporting said antenna loop assembly;

(e) coupling means interposed between said base and said bracket means for mounting said bracket means and thereby said antenna loop assembly for both rotary and pivotal movement thereof with respect to said base;

(f) operating means carried by said base and including a handle portion projecting therefrom for operating said coupling means to move said bracket and thereby said antenna loop assembly; and,

(g) means connecting said output leads to said input portion of said preamplifier circuit.

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