Oct. 7, 1952 D. M. LISBIN ET AL 2,613,319

ADJUSTABLE ANTENNA

Filed March 18, 1950

Fig_1

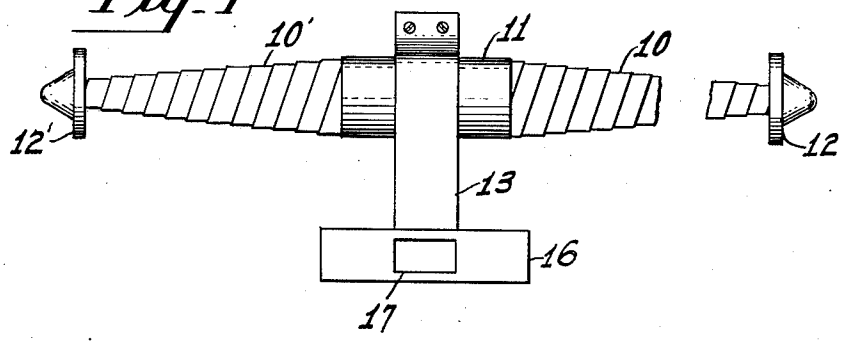
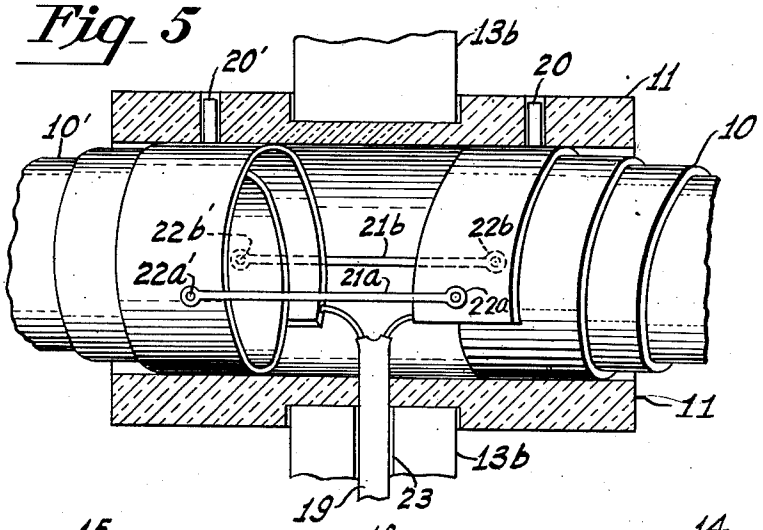


Fig_5



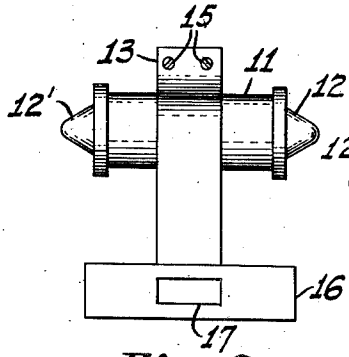


Fig_2

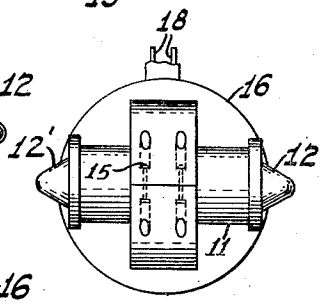


Fig_3

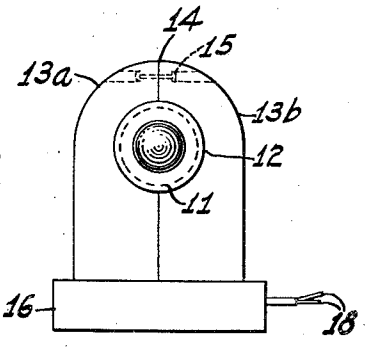


Fig_4

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ADJUSTABLE ANTENNA

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7 Claims. (Cl. 250—33)

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The invention relates to adjustable antennas and it particularly pertains to portable adjustable dipole antennas.

Adjustable antennas possess decided advantages in applications where a wide range of operating frequencies argues against the use of a single fixed antenna in the interest of good reception, and where the use of a number of fixed antennas is impractical. For most practical purposes, adjustable antennas provide the only means for tuning the antenna at every operating frequency for optimum gain.

In the field of television the use of adjustable antennas is particularly advantageous owing to the extremely wide range of operating frequencies, extending over several octaves. Structures have been proposed in which telescoped sections or similar expedients have been employed for length adjustment. However, over a range of several octaves a comparatively large number of sections must be used, increasing the thickness of the antenna and creating a discontinuity of considerable proportions at the ends of the outer sleeve when, for example, only one section is extended.

Other expedients in general have proven objectionable on the score of low antenna gain. In regions of low signal strength, especially where the antenna is designed for indoor use, this is a fatal objection. Since the design of indoor antennas requires careful consideration of both appearance and convenience, it has not been possible heretofore to provide such an antenna with the high gain desirable for clear reception.

It is, therefore, an object of this invention to provide a high gain adjustable antenna of convenient size, attractive appearance and novel construction.

It is another object of this invention to provide an adjustable antenna small enough to permit portable use.

Yet another object of this invention is to provide an adjustable antenna requiring little time and effort to adjust by even the least skilled user.

A further object of the invention is to provide, in an adjustable antenna, means providing a continuous path for electric current from its tip to the point of energy transfer, irrespective of the position of adjustment.

A still further object is to provide an antenna having one or more arms of adjustable length and of uniformly varying cross section.

These and other objects and advantages will be apparent from the following description in which reference is had to the accompanying

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drawing illustrating an embodiment of the invention.

In the drawing:

Fig. 1 is a front elevation of a dipole antenna according to the invention;

Figs. 2, 3 and 4 are a front elevation, a plan view and a side elevation, respectively, showing the same antenna in closed position; and

Fig. 5 is an enlarged longitudinal cross section of the central portion of the antenna shown in the preceding figures.

Referring to the drawing in detail:

As best seen in Fig. 1, the antenna is of the dipole type comprising two arms 10, 10' shown, for clarity of illustration, in fully extended and partially extended positions, respectively. Each arm is formed by a volute conductive strip or spiral of stainless steel or similar spring material. In the closed position shown in Figs. 2 to 4 the coils fit closely within a dielectric sleeve 11 to which they are fastened. Plastic knobs 12, 12' are fixed to the ends of the arms 10, 10', respectively.

The sleeve 11 is supported by a plastic frame 13, which, for economy of manufacture, comprises two symmetrical sections 13a, 13b bolted together along the line 14 by nuts and bolts 15. The frame assembly stands on a round base 16. A calibrated chart 17 relating frequency to proper antenna length is included in the base. As best seen in Fig. 3, antenna lead terminals 18 are incorporated in frame section 13b. Connections to the antenna are made over cable 19 which passes through frame section 13b into sleeve 11, as shown in Fig. 5. A groove 23 along frame section 13b accommodates the cable 19.

The arrangement of the volute strip within the sleeve is illustrated in detail in Fig. 5 which also shows means for facilitating adjustment of the arms 10, 10' to at least approximately equal length. As shown, the first loop or turn of each coil is held by pin 20 or 20'. The aforementioned loops are electrically insulated but mechanically coupled together by bars 21a, 21b, pivoted thereto at 22a, 22a' and 22b, 22b', respectively, in such manner that any extension or retraction of arm 10, or 10', will tend to produce a corresponding extension or retraction of arm 10', or 10.

To adjust the antenna, it is necessary only to pull out the coils 10, 10' to the desired length, as shown in Fig. 1, and turn knobs 12 and 12' counterclockwise, i. e., in a direction tending to expand the turns of the coil, thereby locking the coil in position. To retract the arms or vary their length, the knobs may be turned clockwise,

hence in a direction tending to contract the turns, whereupon the desired adjustment may be made. This effect is due to the fact that the volute strip or coil possesses two modes of expansion, one tending to produce axial and the other radial motion. In the arrangement shown, these tendencies may be made mutually opposing. Thus, by turning the knobs 12, 12' until the turns of the coils press against one another and, ultimately, against the fixed sleeve 11, the binding effect produced by the outward pressure of the spirals prevents further lateral expansion.

In order to adjust both arms to substantially the same size, the operator simply extends one of the arms 10, 10' to the desired length, loosens the other arm, and allows the latter to find its proper length as the result of the stresses imparted by the bars 21a, 21b. The operator will be able to determine when this length has been reached by a marked restoring force opposing any motion around that point. It will be understood, however, that the bars 21a, 21b may be omitted if such automatic adjustment is deemed unnecessary, and that notwithstanding the presence of these bars the arms 10, 10' may also be set at materially different lengths, as shown in Fig. 1.

It will be noted that the improved antenna according to the invention presents at all times a large cross sectional antenna area, resulting in comparatively high gain. Furthermore, the discontinuities between successive sections, or turns, of the extended arm are very small, being equal to the thickness of the spring material, and each volute strip represents a continuous path for electric currents, extending from the very end of each arm to the sleeve 11.

It will thus be seen that there has been disclosed, in accordance with the objects outlined hereinabove, a portable, high gain adjustable antenna in which all discontinuities have been substantially eliminated. The invention is, of course, not limited to the specific form described and illustrated but may be embodied in a variety of modes of realization without exceeding its scope as defined in the appended claims.

We claim:

1. In an adjustable antenna, in combination, a support including a rigid sleeve and a volute strip of resilient conductive material, each turn of which is an overlapping contact with the next succeeding turn, said strip having its outermost turn bearing against the inside of said sleeve and anchored to said support, said strip being extendible and capable of fixation in any extended position by rotating its free end in a sense tending to expand the turns of the strip.

2. The combination according to claim 1 wherein said strip is provided with a knob at its free end.

3. An adjustable antenna comprising a support, a pair of flexible volute conductors extending from said support in different directions, each of said conductors having one end anchored to said support, each of said conductors having each turn in overlapping contact with the next succeeding turn, and locking means for adjustably maintaining the other end of each of said conductors in axially spaced relation to said support.

4. An adjustable antenna comprising a support including a rigid sleeve with two open ends, a pair of flexible volute conductors each having its outermost turn secured to the inside of said sleeve adjacent a respective one of said open ends, each of said conductors having each turn in overlapping contact with the next succeeding turn, and locking means for adjustably maintaining the innermost turn of each of said conductors in axially spaced relation to said sleeve.

5. An adjustable antenna comprising a support including a rigid sleeve with two open ends, and a pair of volute strips of resilient conductive material each having its outermost turn bearing against the inside of said sleeve, adjacent a respective one of said open ends, and anchored to said support, said strips having each turn in overlapping contact with the next succeeding turn, said strips being extendible in opposite directions and capable of fixation in any extended position by rotating their free ends in a sense tending to expand the turns of the respective strip.

6. An antenna according to claim 5, comprising a pair of knobs each secured to the free end of a respective one of said strips.

7. An antenna according to claim 5, comprising linkage means interconnecting said outermost turns of said strips, said outermost turns being pivoted to said sleeve, said linkage means constraining each of said outermost turns to duplicate any displacement of the other, thereby tending to place the free end of the corresponding strip in a position related to that of the free end of the other strip.

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