This invention relates to electronic receiver apparatus, and more particularly to antenna structure for the same. While of broader applicability the invention has particular utility in the field of portable television receiver apparatus.

In receiver apparatus of the foregoing type, loop antenna structure has been employed to provide for UHF signal pick-up. However, prior antenna construction and arrangement for portable television receivers has not been entirely satisfactory, due, for example, to difficulties encountered in storing the same while a receiver is being carried and not in operation. It will therefore be appreciated that an object of the present invention is to provide portable television receiver apparatus which overcomes the above mentioned difficulties.

It is a primary object of this invention to provide antenna structure comprising antenna holding and adjusting means which is of compact and economical design, as well as simple and effective in operation.

A specific object of the invention is to improve the effectiveness of antenna operation as to the adjustment of an antenna loop and as to the stability of retention of adjustment.

Still another object of the invention is to provide antenna structure so configured as to blend with surface contours of a receiver casing whereby an attractive appearance is presented and the antenna is protected from damage.

It is still a further object of the invention to provide movable antenna structure having improved slip ring contact means cooperating with an insulative base both to provide support for and electrical contact with a loop antenna element.

In achievement of the foregoing and other objectives the invention contemplates loop antenna structure for use with a television receiver comprising a housing or casing containing the receiver elements, which casing has a protuberance accommodating the enclosure of a similar enclosure of a substantially sectional view taken along the lines 5–5 in FIGURE 3; and FIGURE 6 is a showing similar to FIGURE 3, but illustrating a modified embodiment of the invention.

Now making particular reference to the drawing, and first to FIGURES 1 and 2, a portable television receiver is shown which includes an outer cabinet 10, a viewing screen 11, a carrying handle 12, and control knobs 13 and 14 operably connected to suitable control elements for television circuit means disposed within the cabinet. Reference will hereinafter be made only to portions of the circuit means directly related to novel features of the present invention.

The antenna structure 15 with which the invention is concerned comprises a mounting base 16 affixed to the rear cover 20 of television receiver cabinet 16. A loop antenna 21 is mounted to base 16, said antenna comprising a curved loop portion 23 and a pair of shank portions 23 which provide mounting thereof. The shank portions 23 are associated with a rotatable disk element or knob 24 of base 16, by means of which to be hereinafter more fully described, to provide for at least 180° rotation of loop portion 22 transversely of its plane and for substantially 360° rotation of the loop portion about its diameter as an axis. Positions to which the antenna may be moved are illustrated in the drawings by means of broken and solid lines.

As best seen in FIGURE 2, loop antenna 21 is pivoted into a storing position in which it lies adjacent the cabinet rear cover 20 and surrounds a protuberance 25 formed in the cover and into which the neck of the picture tube (not shown) extends. Such a protuberance in a cover of this type is frequently required, and storing the loop portion 22 of the antenna in a position around the protuberance permits loop antenna 21 to lie well within the maximum projection of the cabinet, thereby protecting the antenna.

With reference to FIGURES 3, 4, and 5, the antenna mountings base 16 is featured by means which permits the above described adjustments of the antenna and includes means for making the necessary electrical connections between loop antenna 21 to lead wire elements, one of which is shown at 31 (FIGURES 3 and 5) connected to the antenna terminals (not shown) of receiver apparatus disposed within the casing. Conveniently, lead wire elements 31 may have bifurcated terminals to provide for ready connecting and disconnecting of such leads to the receiver antenna terminals.

Considering the construction of the antenna further, it is seen that rotatable knob 24 which is of electrically non-conductive material, is axially aligned with bracket 17 of electrically non-conductive base 16 and is affixed thereto by means of a screw 33 threadedly engaging a hub portion 29 of knob 24 that is adapted for rotation within a bore 27 provided in bracket 17. Screw 33 is axially aligned with a coil spring 34 which is compressed between a flat, disk-like portion 35 of bracket 17 and a washer 36 of electrically non-conductive material that is forcibly engaged through a smaller washer 32 by the head 40 of screw 33. The degree of spring compression conveniently is limited to a fixed value since the travel of the screw is limited by seating of the washer against the flat end portion 29a of hub 29.

A pair of slots 41 extend through the flat, disk-like portion 35 of bracket 17, and are positioned equidistantly from the opening 27 through which hub portion 29 extends. A pair of combination slip-ring and antenna terminal elements are seen at 42, and each comprises a flat, antenna contacting ring segment 43 disposed along the upper surface 44 of the electrically insulative disk-like portion 35 and a lead wire terminal portion 45...
disposed at right angles to portion 35 and extending through one of slots 41. Bracket 17 includes a skirt portion 18 which depends therefrom and provides a mounting for the antenna structure, as will be hereinafter explained. Conveniently, insulative washer 36 is of such a diameter as to ensure that lead wire terminals 37 do not touch spring 34, thereby to prevent electrical shorting of the antenna structure by contact of the terminals with the spring.

Knob 24, which is held in assembled relation as respects the mounting bracket 17, by screw 33, is generally cup-shaped, and comprises a skirt portion 47 and a segmented flat ring 46 that extends along an inner surface of disk-like portion 48 of the electrically insulative knob and in confronting parallel relation to antenna contacting ring segments 43. Ring 46 advantageously prevents wearing of knob 24 by serving as a bushing for elements 50 to be hereinafter described.

Antenna shank portions 23 include connector portions 28 that are turned inwardly and toward one another at the extremities of the shank portions. Each of connector portions 29 extends through slots 38 in knob skirt portion 47 (FIGURE 5) and is provided with a pair of cam-like detent means each of which, in preferred practice, comprises an octagonal disk element 50 having its axis extending substantially at a right angle to the axis of screw 33, and having pairs of opposed, substantially parallel flats 31 as shown in FIGURE 5.

The construction and arrangement of the above described apparatus is such that the compressive force exerted by spring 34 is sufficiently great to urge segmented ring 46, through knob 24, and portion 43 of combination terminal and antenna contacting element 42, through bracket 17, into frictional engagement with opposed face portions of octagonal disk elements 50, whereby, as seen in FIGURE 2, selective positioning of the antenna loop 22 in directions transverse the plane of the same is accommodated. When the antenna is pivoted from one position to the other, the high spots 51a of disk elements 50 urge knob 24 axially away from bracket 17, this movement being accommodated by the resilience of spring 34. Also, it will be appreciated that rotation of the antenna about its vertical diameter as an axis, as shown in FIGURE 1, is achieved by rotation of bracket 17 with respect to the mounting bracket 17, as provided by the journalling of hub portion 29 within the bore 27.

With additional reference to FIGURES 2 and 4, it will be seen that skirt portion 18 of bracket 17 includes a flat portion 49 that is slightly inclined as respects the vertical. A mounting hole 52 is provided in face portion 49 through which an antenna structure mounting screw 53 (FIGURE 2) extends and threadedly engages rear cover 20. A pair of bracket locating pins 55 extend outwardly from face portion 49, and each pin is so positioned and shaped as to extend into a ventilating slot 54 provided in the back cover 20. The pins 55, slots 54 and screw 53 therefore rigidly mount and locate the base portion 16, and consequently the antenna structure. Note also that the base portion 16 is disposed well within the limits of protuberance 25, face portion 49 being inclined in correspondence to the upper contour (not shown) of the rear cover 20.

The invention is particularly featured by the fact that the entire assembly of the antenna loop 21, knob 24, bracket 17 and segmented rings 43 and 46 is maintained by the screw 33 and spring 34 compressed thereby. Additional frictional retention—as against sliding movements of disk elements 50 thereupon—upon rotational movement of the loop 21 is achieved by a notch 46a (FIGURE 4) in the segments of ring 46 and edge portions thereof received within similarly configured recesses 56. Segments of slip-ring 43 are similarly retained within recesses 57 provided in bracket 17.

It will be further appreciated that the skirt portion 47 of knob 24 is disposed and adapted to enclose the cylindrical, antenna terminals 51 and the slip-ring means. The skirt portion 18 of bracket 17 is disposed and adapted to enclose the hub means of the knob, the antenna terminal means, and the spring.

In order to facilitate rotational positioning of the antenna loop there is provided indexing means comprising raised, spaced ridges 59 (FIGURE 4) on the surface of bracket 17 that extend radially from its center. Knob 24 has a pointer 58 that orients the former, and hence the antenna, with respect to the spaced ridges 59. Thus for a predetermined orientation of the television receiver, the corresponding position of the antenna can be preselected, once the position is established.

A modified embodiment of the invention is seen in FIGURE 6, in which it will be noted that the knob 24b comprises a flat, electrically insulative, disk portion 48b having a hub portion 29b. The antenna mounting and connector portions 30b are cylindrical and have smooth surfaces, portions that are engaged by slip ring segments 43b. Additional elements are provided as in the previous embodiment, such as mounting hole 52b, washer 36b, screw 33b, and spring 34b. By thus providing a smooth, cylindrical detent a finer degree of adjustment of the antenna loop is achieved than with the octagonal disk elements 50 of the previous embodiment. However, it will be understood that elements 50 may also be made smoothly cylindrical if desired.

From the foregoing description it will be appreciated that the invention provides an antenna structure advantageously characterized by holding and adjusting means which is both compact and economical in design and simple and effective in operation.

While this description and the accompanying drawing are illustrative of particular preferred embodiments of the invention, it will be recognized that additional changes and modifications may be made in the described antenna structure without departing from the spirit of the invention as defined in the appended claims.

We claim:

1. Antenna structure comprising: an antenna loop having a pair of shank portions, each said shank portion being provided with a generally cylindrical, loop-mounting portion, said latter portion being axially aligned with one another; a pair of axially aligned disk elements having confronting surface portions disposed for frictional engagement with opposed surfaces of said axially aligned cylindrical loop-mounting portions; means for connecting one of said disk elements to the other of said disk elements and producing relative movement between said disk elements toward one another and into such frictional engagement with said cylindrical loop mounting portions; slip-ring means disposed and adapted to be urged by one of said disk elements into contact with said cylindrical loop mounting portions, and including a pair of ring segments each of which are provided with antenna terminal means; and mounting means for said antenna structure associated with one of said disk elements.

2. Antenna structure according to claim 1 and characterized in that each of said generally cylindrical mounting portions includes pairs of opposed, substantially parallel flat surface portions disposed and adapted for engagement as said slip-ring means and one of said disk elements.

3. Antenna structure according to claim 1 and characterized in that said antenna loop comprises a single turn of a wire.

4. Antenna structure according to claim 2 and characterized in that said antenna loop comprises a single turn of electrically conductive material.

5. Antenna structure according to claim 1, and characterized in that said means for connecting one of said disk elements to the other comprises means defining a hub extending from one of said disk elements and with
clearance through the other of said disk elements, a screw disposed in threaded engagement with said hub of said one disk element, and spring means reactive between said screw and said other disk element through which said hub portion passes to provide a frictional antenna engaging force.

6. Antenna structure according to claim 1, and characterized in that said means for connecting one of said disk elements to the other comprises hub means extending from one of said disk elements and with clearance through the other of said disk elements, and coil spring means axially aligned with said hub means and disposed and adapted to react between the latter and said other disk element to provide a frictional, antenna engaging force.

7. Antenna structure according to claim 6 and further characterized in that each of said disk elements includes a skirt portion, the skirt portion of said one disk element being disposed and adapted to enclose said cylindrical loop mounting portions and said slip-ring means, and the skirt portion of said other disk element being disposed and adapted to enclose said hub means, said antenna terminal means, and said spring means.

8. Antenna structure according to claim 7 and further characterized in that said skirt portion of said other disk element comprises mounting bracket means for the antenna structure.

9. In television receiver apparatus, loop antenna structure including a loop conductor and a base portion hingedly and rotatably mounting said loop conductor upon said apparatus for movement to various positions, said loop conductor including a pair of generally cylindrical loop conductor mounting portions axially aligned with one another, said base portion comprising a pair of axially aligned disk elements having confronting surfaces disposed for frictional engagement with opposed surfaces of said axially aligned cylindrical loop mounting portions, one of said disk elements being rotatable relative to the other to produce rotational movements of said loop conductor, and slip ring means disposed within said base portion and adapted to electrically connect said loop conductor to electronic elements of the apparatus while permitting movements of the antenna structure.

10. Antenna structure according to claim 9, and characterized in that one of said disk elements comprises hub means extending therefrom and with clearance through the other of said disk elements, and coil spring means axially aligned with said hub means and disposed and adapted to react between the latter and the other of said disk elements to provide frictional engagement between said slip ring means and said loop conductor mounting portions.

11. Antenna structure according to claim 10 and further characterized in that each of said disk elements includes a skirt portion, the skirt portion of one of said disk elements being disposed and adapted to enclose said cylindrical loop mounting portions and said slip ring means, and the skirt portion of the other of said disk elements being disposed and adapted to enclose said hub means, said antenna terminal means, and said spring means.

12. In television receiver apparatus, loop antenna structure including a loop conductor and a base portion hingedly and rotatably mounting said loop conductor upon said apparatus for movements to various positions, said base portion being disposed and adapted for releasable clamping engagement with said loop conductor and having slip ring means associated therewith and adapted electrically to connect said loop conductor to electronic elements of the apparatus while permitting movements of the antenna structure, said base portion including a pair of axially aligned disk elements having confronting surface portions disposed for frictional engagement with opposed surfaces of said loop conductor to provide the required clamping engagement, one of said disk elements being rotatable relative to the other to produce rotatable movements of said loop conductor, hub means extending from one of said disk elements and with clearance through the other of said disk elements to provide for relative movements between the same, and coil spring means axially aligned with said hub means and disposed and adapted to react between the latter and said other disk element to provide the loop conductor engaging force.

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