

Jan. 18, 1944.

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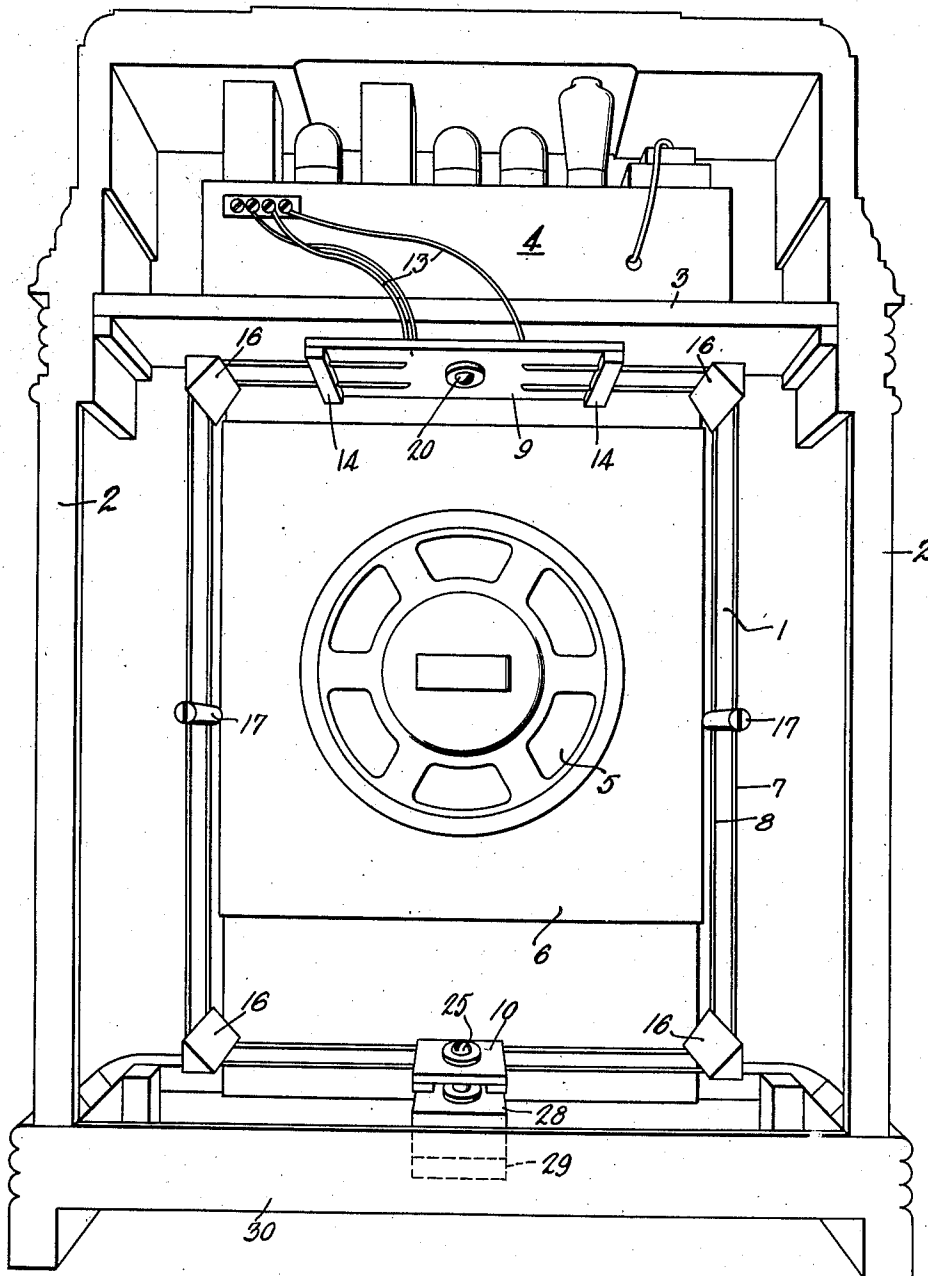
2,339,619

LOOP ANTENNA

Filed April 23, 1941

3 Sheets-Sheet 1

FIG. 1.



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FIG. 2.

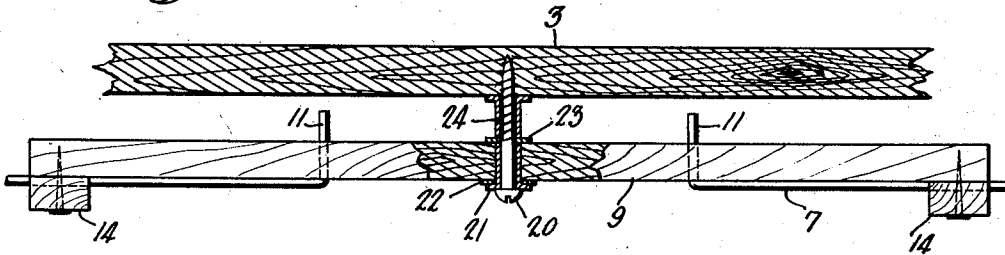


FIG. 3.

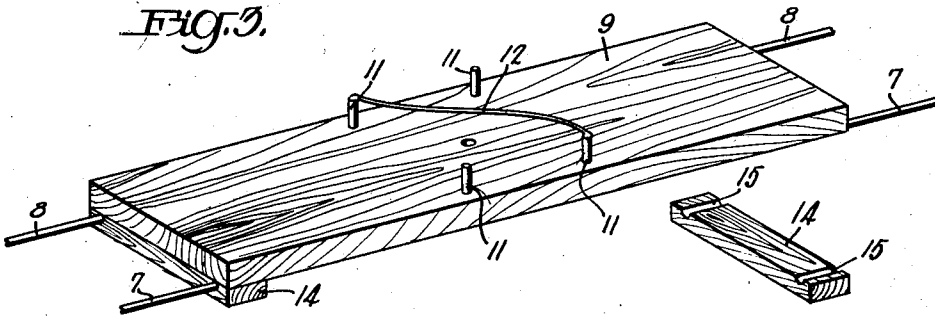


FIG. 5.

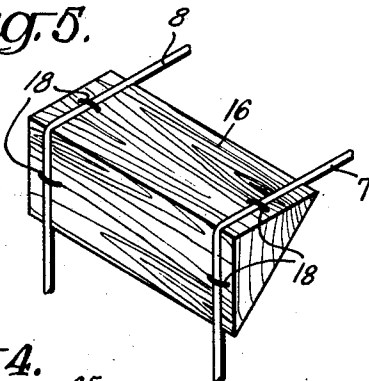


FIG. 6.

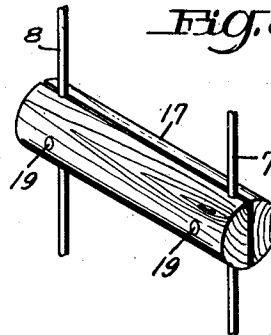
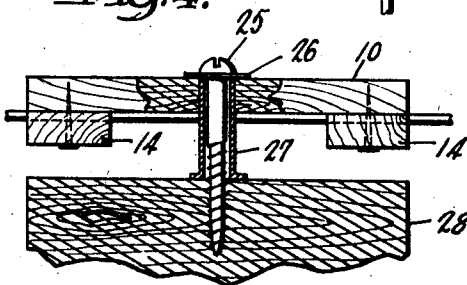


FIG. 4.



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Fig. 7.

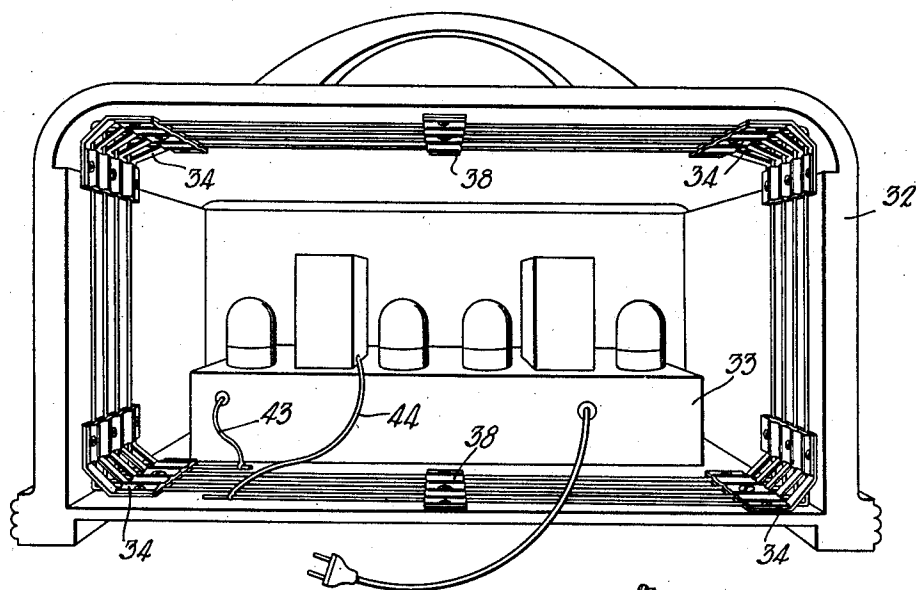
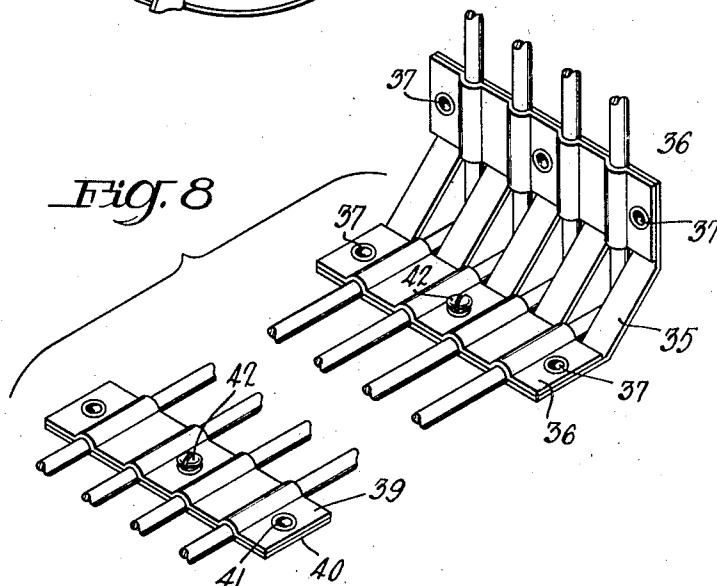


Fig. 8



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UNITED STATES PATENT OFFICE

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LOOP ANTENNA

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Application April 23, 1941, Serial No. 389,991

3 Claims. (Cl. 250—33)

This invention relates to a novel loop antenna structure and, more particularly, to a novel low impedance antenna of the type disclosed in the copending application of William H. Grinditch, Serial No. 389,987, filed April 23, 1941. In the said copending application, there is disclosed a novel low impedance loop antenna circuit employing a loop of large area comprising a few turns of wire of relatively large diameter. By the present invention, there is provided a novel loop antenna structure for use in such a circuit and adapted for disposition within the cabinet of a radio receiver so as to make the receiver entirely self-contained.

One object of the present invention is to provide a simple loop antenna structure which may be manufactured and installed in a radio cabinet very economically and which is highly efficient in operation.

Another object of the invention is to provide a large loop antenna formed of a few turns of wire of such rigidity that the wire turns themselves are substantially self-supporting, and wherein the wire turns are maintained in spaced relation and the entire loop structure is rigidified by elements attached to the wire turns at spaced points. Thus there is provided a self-supporting loop antenna which does not require the use of a supporting frame for the wire turns.

Other objects and features of the invention will be apparent hereinafter.

In the accompanying drawings:

Fig. 1 is a perspective rear view of one form of the self-supporting loop antenna mounted in a radio receiver of the console type;

Figs. 2 to 6 are detail views illustrating the mechanical features of the loop antenna and the mounting therefor as embodied in the device of Fig. 1;

Fig. 7 is a perspective rear view of another form of the loop antenna structure adapted for use in a table model or portable radio receiver as illustrated; and

Fig. 8 is a detailed illustration of the spacer and mounting elements employed in the device of Fig. 7.

As illustrated in Figs. 1 and 7, the loop antenna provided by the present invention comprises a few turns of wire of relatively large diameter wound to enclose a large area. This area is preferably as large as the dimensions of the radio cabinet will permit. When the loop is to be adapted for limited rotational adjustment, as in Fig. 1, it will be necessary, of course, to make the dimensions of the loop somewhat smaller than the in-

side dimensions of the cabinet. Where it is desired to rotate the loop a full 180 degrees its width should be made smaller still. On the other hand, where the loop is to be fixed with respect to the cabinet, as in the device of Fig. 7, the loop dimensions may be substantially the same as the inside dimensions of the cabinet.

The wire employed in the loop turns may advantageously be copper-weld wire approximately 0.10 inch in diameter and having a copper coating of about 0.003 inch on a steel core. The steel core does not affect the electrical characteristics of the loop in any substantial degree, but adds to the mechanical rigidity of the structure making it substantially self-supporting. While it is preferred to use wire of this specific type, the invention contemplates the use of any suitable wire having a diameter such that the wire itself is substantially self-supporting.

Referring now to Fig. 1, the loop antenna 1 is rotatably mounted as hereinafter described within the console cabinet 2 below the shelf 3 upon which the radio chassis 4 is mounted. The radio receiver is provided with the usual loud speaker 5 mounted upon a baffle board 6 at the front of the cabinet.

In this instance, the loop comprises two separate turns 7 and 8 of heavy wire bent into a substantially rectangular form and secured in parallel relation by upper and lower insulating blocks 9 and 10 which also serve as parts of the pivotal mounting, as will be described later. As illustrated in Figs. 2 and 3, the end portions of each turn are bent at right angles and extend upward through holes in the upper block 9. The extending ends of the wire turns are designated generally by reference character 11. The two turns may be connected in series by means of a short wire 12 soldered to diagonally located ends of the turns. As illustrated in Fig. 1, the loop is electrically connected to the radio receiver chassis and circuits by means of connections 13. The turns 7 and 8 of the loop are secured to the upper and lower blocks 9 and 10 by means of transverse clamping pieces 14 which may be tacked or otherwise fastened to the blocks 9 and 10. Preferably, the clamping pieces 14 are provided with grooves 15 within which the wire may seat, so as to maintain the wire turns in predetermined spaced alignment. One of the grooved pieces is shown removed in Fig. 3 to illustrate more clearly the structure thereof.

In addition to blocks 9 and 10, there are provided at the corners of the rectangular loop structure the triangular corner blocks 16 (see Fig. 5)

and on the opposite sides of the loop structure there are also provided split clamping blocks 17 (see Fig. 6). The corner pieces 16 may be secured to the wire turns by means of staples 18 or the like. The clamping blocks 17 may comprise semi-cylindrical pieces which are preferably provided with complementary grooves for seating the wire and which may be secured together by rivets 19 or the like.

The loop structure is mounted for rotation by means of the pivotal mountings illustrated in Figs. 2 and 4. Referring to Fig. 2, the upper pivotal mounting may comprise a screw 20, a bushing 21 about which the block 9 may rotate, washers 22 and 23 and a sleeve 24. As illustrated, the screw extends through bushing 21 and sleeve 24 and is driven into the shelf 3 upon which the receiver chassis is mounted. By this structure, the loop is rotationally suspended from the shelf 3, as will appear more clearly hereinafter.

The lower pivot structure for the loop, as shown in Fig. 4, comprises a screw 25, washer 26 and bushing 27. The bushing extends through an opening in block 10 and is secured in place by means of the screw which is firmly driven in the stationary block 28 which in turn is glued or otherwise secured to a cross-piece 29 extending from the front of the cabinet to the back brace member 30. The opening in member 10 through which bushing 27 extends is sufficiently large to permit the block 10 to rotate freely about the bushing 27 as a pivot. Thus, it will be seen that in this particular embodiment the lower pivot structure serves only as a pivot for the lower portion of the loop, and the stiffness and rigidity of the loop itself enables it to be pivotally suspended from shelf 3 by means of the upper pivotal mounting. Moreover, the loop structure is sufficiently self-sustaining that it does not become distorted by reason of its suspension mounting and it maintains its original shape at all times.

The spacer and support elements 9, 10, 16 and 17 may be formed of any suitable insulating material. For example, these elements may be conveniently formed of wood, as illustrated.

Referring now to the embodiment shown in Fig. 7, in this instance, the loop 31 is wound in the form of a rectangular spiral of such size that it fits snugly within the cabinet 32 at the rear thereof and behind the chassis 33. As before, the loop is wound of large diameter wire which is substantially self-supporting. The few loop turns (in this instance four) are maintained in spaced relation and the entire loop structure is rigidified by means of corner braces 34 which are preferably formed of fibre sheet material, although they may be formed of any suitable insulating material. As shown clearly in Fig. 8, each of the corner braces may comprise a member 35 formed as illustrated to accommodate the corner portions of the wire turns, and clamping members 36 attachable to the angularly extending portions of member 35 and having depressions within which the wire may seat. The clamping members 36 may be secured to member 35 by rivets 37 or in any other suitable manner.

In addition to the corner braces, there are provided clamps 38 at the top and bottom of the loop. These clamps may also be formed of fibre sheet material and, as illustrated in Fig. 8, each may comprise a pair of clamping members 39 and 40 secured together by rivets 41 or the like, and

at least one of said members having depressions to seat the wire of the spaced turns.

In this instance, since the loop is to be stationary, it is convenient to employ the corner braces and intermediate clamping members to secure the loop in place within the cabinet. To this end, the spacer elements may be secured to the cabinet by screws 42 or the like, as shown in Fig. 8, inserted through one or more of the securing rivets.

The ends of the spiral loop may be connected to the receiver chassis and circuits by means of lead wires 43 and 44, as shown in Fig. 7.

From the foregoing description, it will be seen that the invention provides a novel loop antenna construction which eliminates the necessity for a supporting frame and which renders the loop antenna simple in construction and easy to manufacture and assemble. It will be understood, of course, that the illustrated embodiments are merely illustrative and that the invention is capable of embodiment in other specific forms within the scope of the appended claims.

I claim:

1. A low impedance loop antenna, comprising a small number of turns of a conductor having uniform diameter sufficiently large to be substantially self-supporting, all of said turns being substantially equidistant from the central axis of the loop and encompassing a relatively large area, a plurality of spacing and aligning elements formed of insulating material affixed to the loop at spaced points around its perimeter to increase the rigidity of the structure and to maintain the spacing between turns at a predetermined value, each of said turns being an individual loop and having its ends extending through openings in one of the spacer elements, and means electrically connected to said ends so as to connect said individual loops in series.

2. A low impedance loop antenna, comprising a small number of turns of a conductor having uniform diameter sufficiently large to be substantially self-supporting, all of said turns being substantially equidistant from the central axis of the loop and encompassing a relatively large area, a plurality of spacing and aligning elements formed of insulating material affixed to the loop at spaced points around its perimeter to increase the rigidity of the structure and to maintain the spacing between turns at a predetermined value, a pivotal suspension mounting at the central portion of the top of the loop, and a pivotal support at the central portion of the bottom of the loop vertically aligned with said top mounting, whereby the loop is rotatable about a vertical axis.

3. A low impedance loop antenna, comprising a small number of rectangular turns of a conductor having uniform diameter sufficiently large to be substantially self-supporting, all of said turns being substantially equidistant from the central axis of the loop and encompassing a relatively large area, mounting and spacer elements affixed to the loop at the central top and bottom portions thereof, means pivotally mounting said elements for rotation of the loop about a vertical axis, each of said turns being an individual loop and having its ends extending through openings in the top element, and means electrically connected to said ends so as to connect said individual loops in series.

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