March 29, 1932. H. C. HEBIG 1,851,178

ANTENNA

Filed June 18, 1923 2 Sheets-Sheet 1

Fig. 1.

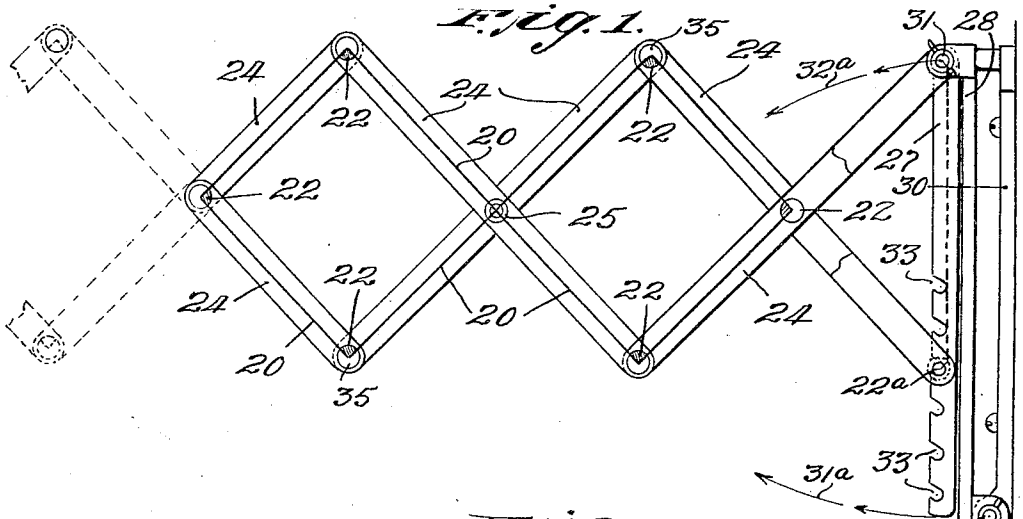


Fig. 2.

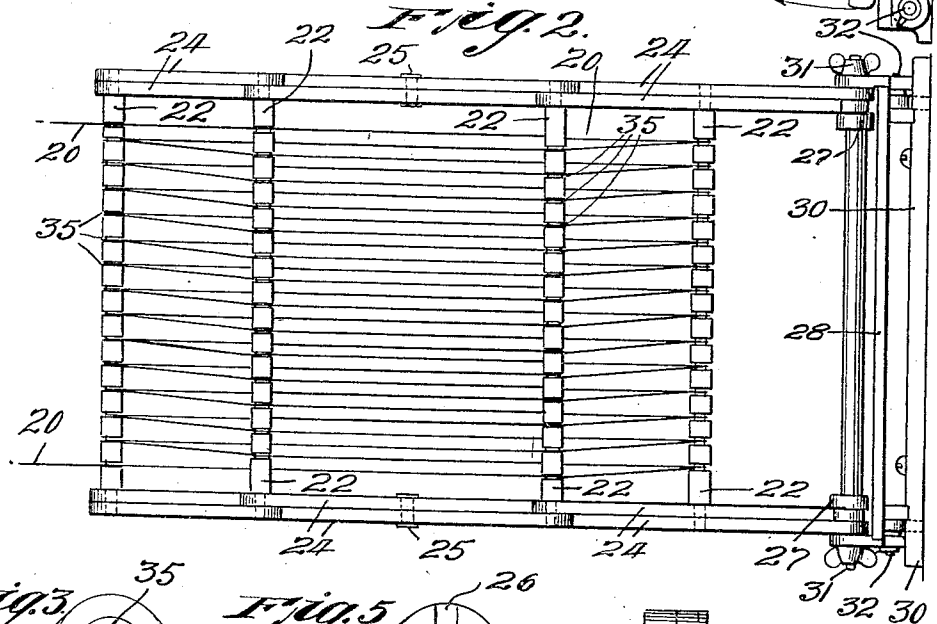


Fig. 3.

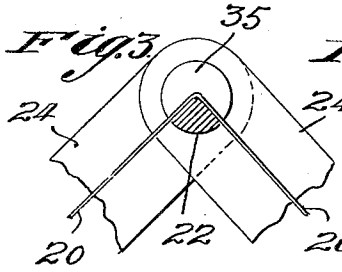
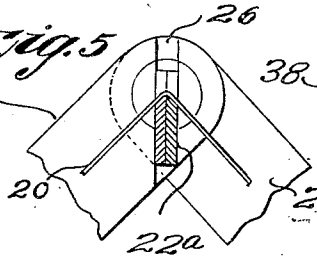


Fig. 5.



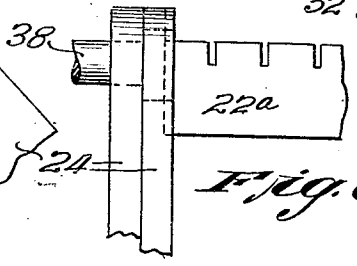


Fig. 6.

Fig. 4.

INVENTOR
HENRY CONRAD HEBIG
BY
Moses, Hammond & Betts
ATTORNEY

March 29, 1932. H. C. HEBIG 1,851,178

ANTENNA

Filed June 18, 1923 2 Sheets-Sheet 2

Fig. 7.

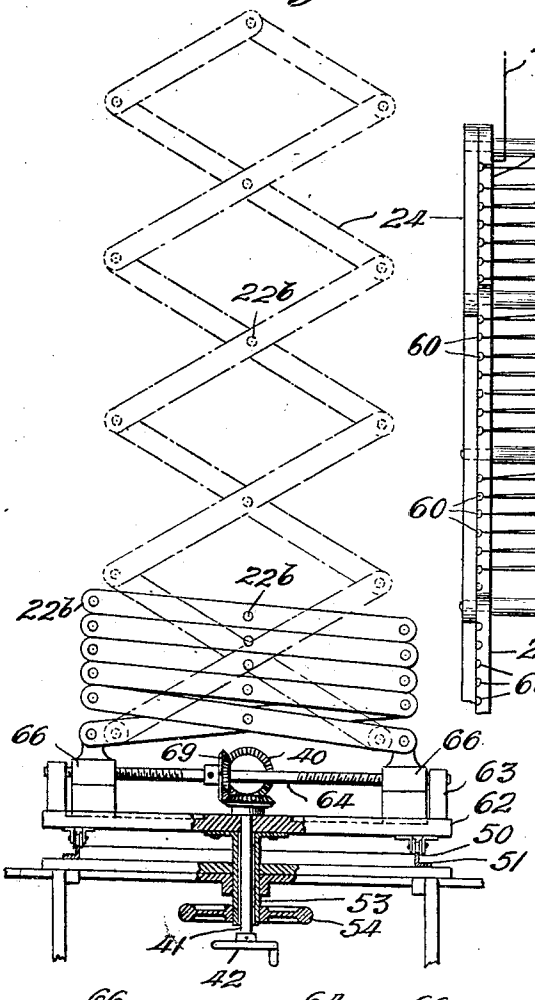


Fig. 9.

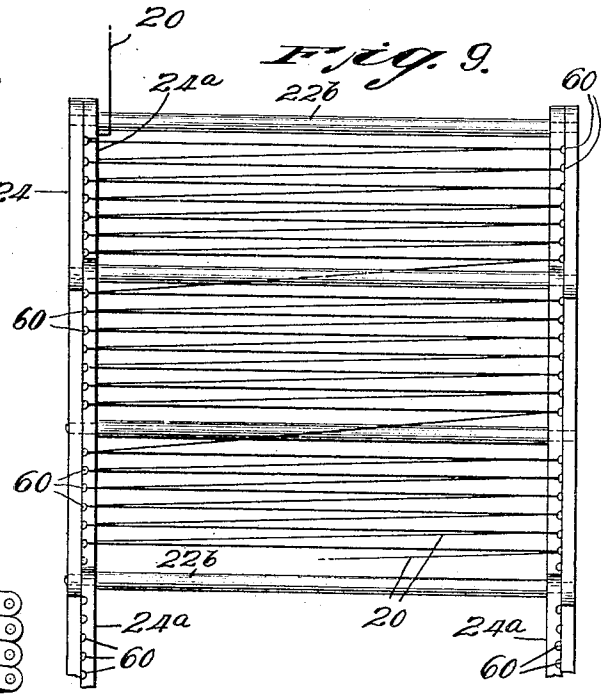
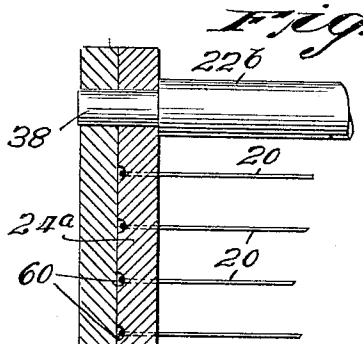


Fig. 10.



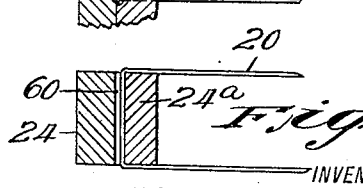


Fig. 11

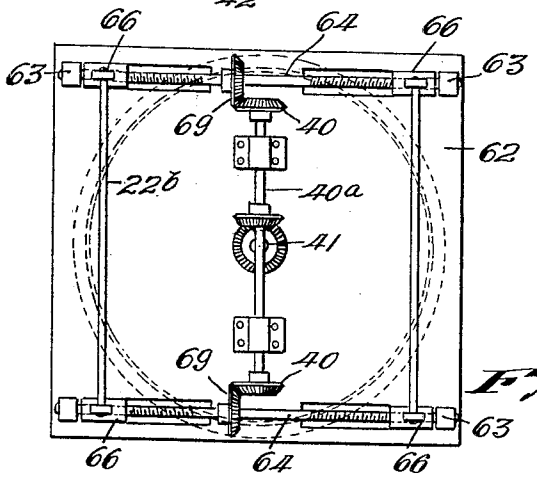


Fig. 8

INVENTOR
HENRY CONRAD HEBIG
BY
Moses, Hammond & Nolte
ATTORNEYS

Patented Mar. 29, 1932 1,851,178

UNITED STATES PATENT OFFICE

HENRY CONRAD HEBIG, OF WOODHAVEN, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO LILLIAN LOUISE HAMMOND AND WILLIAM P. HAMMOND, JR.

ANTENNA

Application filed June 18, 1923. Serial No. 645,960.

This invention relates to improvements in wireless antennæ and more especially to antennæ employed with wireless telephone apparatus.

It is the object of this invention to provide means whereby the electrical characteristics of the antenna conductors may be adjusted and varied to attune the telephone apparatus to the wave length and direction of another station without involving the use of the contacts, switches, conductor interconnections, condensers and other devices which have heretofore been required to make a tuning possible.

It is the especial object of this invention to provide a wireless antenna which is of adjustable height, and has directional qualities and whose effective area may be varied as desired by the operator without interrupting the sending or receiving circuit.

Wireless antenna heretofore employed have involved fixed conductors slung between spreaders suspended from posts. To obtain some degree of change in conductor effect and arrangement it has been common to provide taps leading to switches or connecting plugs for effecting changed connections involving the making and breaking of the antenna circuit and providing changes in steps of considerable magnitude. Thus if the operator having altered his station tuning devices, such as condensers, loose couplers and the like, still finds that considerable further adjustment would improve conditions, is forced to change to one of the other antenna taps and finds his apparatus completely out of adjustment again. The invention disclosed herein eliminates these taps and provides means for varying the antenna through as large or as small amounts as desired, such variation involving gradual changes and permitting the operator to select the adjustment most desirable. Coil antennæ pivoted to obtain directional effects have been used but such antennnæ are usually crude rectangular frames and are adjustable only as to direction and in a single plane.

The herein disclosed device provides for the support of an antenna in such manner that it may be adjusted in a multiplicity of planes while its height and effective area are also easily changeable by the station operator.

Like numerals have been employed to indicate like parts throughout the description and drawings in which

Fig. 1 is a plan view of one embodiment of my invention.

Fig. 2 is an elevation of the embodiment shown in Fig. 1.

Fig. 3 is a detail view of a portion of the device shown in Figs. 1 and 2.

Fig. 4 shows an elevation of a part of the detail shown in Fig. 3.

Fig. 5 is a detail view of a further modification of the part shown in Fig. 3.

Fig. 6 is an elevation taken at right angles, of the detail shown in Fig. 5.

Fig. 7 is an elevation of a preferred modification of my invention.

Fig. 8 is a plan view of a part of the device shown in Fig. 7.

Fig. 9 shows an elevation taken in another plane of the device shown in Figs. 7 and 8.

Figs. 10 and 11 serve to show further details of the mechanism employed.

Referring particularly to the modifications shown in Figs. 1 and 2 the antenna conductors 20 are supported by the cross members 22, carried by the members 24 which are pivoted together at points 25 and at the ends of members 22, to form a collapsible supporting structure carried upon base frame members 27 and 28 which are hingedly connected to the base board 30.

The end structures formed by the members 24 may be moved upon the pivoted joints to change their angular relationship to each other and to the base 30, thereby changing the extension of the structure, after the same manner that the well-known lazy tongs structure is operated with the exception that in this case extension and contraction are preferably accomplished by adjusting the distance between clamping pivots 31 and 32 and the end cross member 22b, the adjustment being held by such means as the notches 33 in the base frame members 27.

The double hinged relationship of the base frame members 27 and 28 also permits of the entire antenna supporting structure being

swung to other angular relationships to the base 30 for the purpose of obtaining directional receiving or sending characteristics. The clamping pivots 32 control the movement of levers 28 and the motion of the antenna structure as indicated by arrows 32*a*. The clamping pivots 31 control the movement of levers 27 and the motion of the antenna structure as indicated by the arrows 31*a*. Thus if the base board 30 be secured to the wall the antenna may be swung through 180° which will permit of obtaining directional qualities embracing an entire circle since either side of the aerial may be employed equally well. When not in use the entire structure can be folded flat against the wall out of the way; this construction is especially suitable when used indoors and my improved antenna is especially adapted for such use, incorporating as it does a compact, aerial of large area possessing directional and tuning qualities.

It is important that the antenna conductors remain separated and taut and one important feature of this invention is the provision of means for accomplishing conductor mounting at constant spacing and at constant tension regardless of the movements of the supporting structure. This is accomplished by causing the center line of the conductor to pass through the center line of the cross members 22, which are the pivoting points of the members 24. To permit this it has been found preferable to reduce the cross section of the members 22 to an angle whose apex is slightly below the center line of the pivot axes as shown in Fig. 3. This may be accomplished by intersecting saw cuts 35, or by the use of cross members having sharp top edge as is shown in Fig. 5. Where the span between the end structures is considerable, or where the weight of the antenna conductors is great, I have found it advantageous to construct the cross members to the form shown in Figs. 5 and 6 and indicated at 22*a*. It will be seen that these cross members 22*a* have considerable depth to provide added rigidity and are preferably made from two strips glued together with their grains in opposite directions to prevent warping. When these two strips of greater depth are employed I have found it preferable to slot one of the members 24 for a portion of its depth as is shown at 26 to receive the members 22*a* and to provide a round pivot 38 at the ends of the members 22*a*, beyond the portions engaging the slots 26.

In the construction which has already been described it will be noted that the conductors are strung substantially parallel to side members 24. It will be understood, however, from an inspection of Figs. 9, 10 and 11, that the conductors may be equally well strung in a direction parallel to the cross members, the cross members 22*b* here serving as spacing and reinforcing members. In Figs. 9 and 10, it will be noted that side members 24*a*, which are the inside members of the frame, have been provided with notches 60 for receiving antenna conductor 20 and that such notches are of greater depth than is required to admit the conductor 20, so that the other side members 24 may slide freely upon the members 24*a*, without interference as may be seen most clearly in Fig. 11.

The wire is brought diagonally across the structure from the far end of one of the members 24*a* to the near end of the next in order of such members so that the completed structure constitutes a series of parallel planes of windings which may be moved nearer together or further apart by adjusting the length of the structure as hereinbefore described.

In both of the constructions I have described, extending or contracting the structure varies the relation of the planes in which the wire is wound and thereby, I believe, causes the inductance and also the capacity existing by virtue of the relations of these planes to vary. In this manner the tuning of the antenna is accomplished. It is to be understood, however, that my device is not to be limited to this particular theory of operation.

In Fig. 7 I have shown my improved antenna structure as mounted upon a base 62 which has bearings 63 and cross-shafts 64, the ends of which shafts are provided with a right and left-hand thread engaging the blocks 66 pivotally connected to the first set of cross members 24. The threads upon the shaft 64 and their engagement with the blocks 66, allow the rotation of the shaft 64 to force the blocks toward or away from each other and cause my improved antenna structure to rise or fall as may be desired. This is plainly shown in Fig. 7, where the solid lines indicate the structure as collapsed and the dotted lines indicate one position of extension. For the convenient control of extension in the antenna and for the driving of shaft 64, I have found it convenient to mount a beveled gear 69 on this shaft engaging the further gear 40 upon a cross shaft 40*a* to which motion is imparted from a vertical shaft 41 provided with a hand wheel 42. It is also convenient to provide the base 62 with rollers 50 running upon a track 51 and to secure a hollow shaft 53 to the center of this base 62, said shaft 53 having a hand wheel 54 mounted adjacent to the elevation controlling hand wheel 42 so that my antenna may be controlled as to extension and as to vertical plane, from a single easily accessible point. The detailed construction of the elevating mechanism is best seen in the plan view, Fig. 8.

In either one of the modifications that I have shown, the lead-in wire may be connect-

ed at any desired point or points on the antenna but preferably at the end or ends of the wire.

It will be seen that I have provided an antenna which may be mounted in any convenient location either inside, or outside, of a building or ship structure, and which may be raised to any height desired, or revolved upon its base to give directional qualities. It will also be evident that my structure is an inexpensive one and one that is adapted to withstand most trying conditions of use, or abuse without being destroyed or thrown out of adjustment.

It will of course be plain that many changes and modifications may be made in the embodiment of my invention, that certain parts may be used without certain other parts to secure beneficial results without departing from the spirit of my invention or from the scope of the following claims.

What I claim is:

1. An antenna for wireless telephony of the class described comprising a fixed length conductor wound on a plurality of interconnected relatively movable crossed frame sections, so as to provide a plurality of conductors in parallel planes corresponding to the planes of the frame sections, said frame sections and conductors being parallel during the relative movement, means to maintain the parallelism between the sections and to increase or decrease the distance between the planes and means to vary the angular relation of the antenna with respect to the earth.

2. A receiving antenna for wireless telephony of the class described, comprising a fixed length conductor, and a frame construction adapted to receive said conductor, said frame comprising a plurality of interconnected relatively movable frame sections, all of said sections having superimposed portions of said antenna being parallel to other of said sections having superimposed portions of said antenna and adapted to maintain said parallelism during relative movement of said sections, said antenna wound on said sections to provide a plurality of conductors lying in parallel planes whereby the movement of said antenna will move certain of said planes with respect to other planes to vary the total electrical capacity of said antenna.

In testimony whereof I have affixed my signature to this specification.

HENRY CONRAD HEBIG.