May 3, 1938. E. J. STAUBITZ 2,116,368

ANTENNA TOWER

Filed July 21, 1936

Fig. 1.

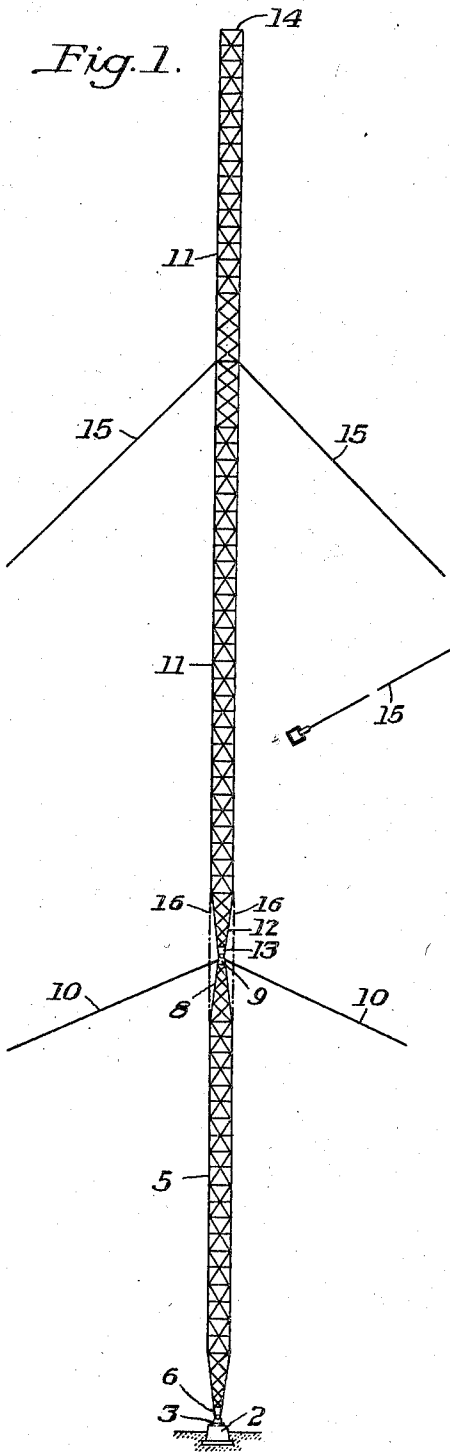


Fig. 2.

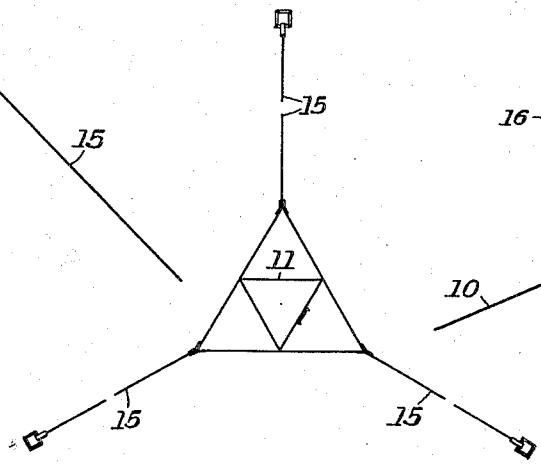
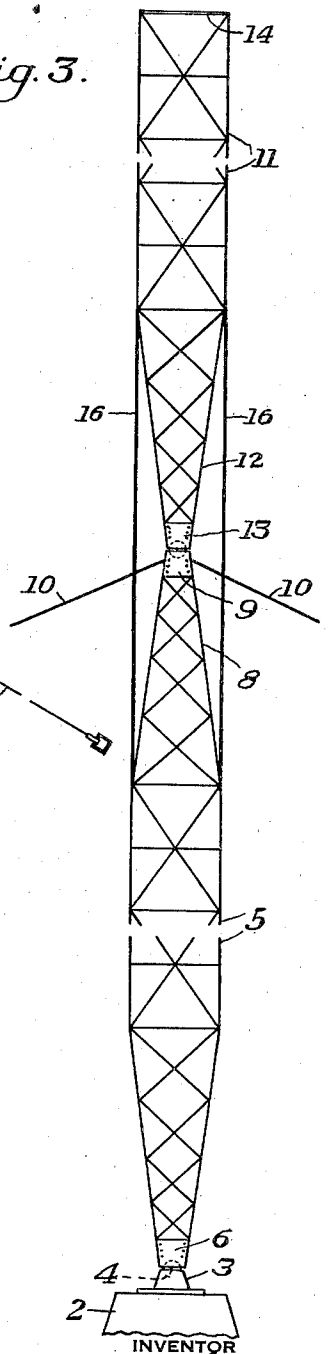


Fig. 3.



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Patented May 3, 1938 2,116,368

UNITED STATES PATENT OFFICE

2,116,368

ANTENNA TOWER

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Application July 21, 1936, Serial No. 91,677

2 Claims. (Cl. 250—33)

This invention relates to structural towers used as radiating antenna.

Vertical radio broadcasting towers made of structural metal are of a height which is a function of the wave length being broadcast. In broadcasting in the so-called commercial broadcast band, the height of the towers may vary from a few hundred feet to a height of approximately one thousand feet. The ideal tower from a structural standpoint is one which is of non-uniform cross section as, for instance, the antenna disclosed in Patent No. 1,897,373, to N. Gerten. From the electrical standpoint, however, it is desirable that the cross-sectional area of the tower be substantially uniform throughout the height of the antenna and that the cross-sectional area be kept as small as possible consistent with the height of the structure. Many structures have been built as a continuous unit from top to bottom, using from one set to several sets of guy wires. Considerable difficulty is encountered in calculating the design and the stresses of the metal in such a structure. For instance, from a standpoint of the mechanical engineer, when more than one set of guy wires is used the structure is assumed to be a rigid member having the characteristics of a beam or truss of continuous construction with more than two supports. The first support is provided at the base and the succeeding supports are provided by the various sets of guy wires. Such a construction has been accepted as one in which stresses cannot be calculated because there are no formulae which can be used for definitely calculating the stresses in various component parts under any condition of loading. It is quite important, however, that the tower have the necessary strength to safely maintain itself under all conditions of wind. It is likewise important from the electrical standpoint as well as from the cost of the tower, that the sizes of the structural parts employed be kept at a minimum. There is, therefore, an advantage in constructing the tower in such manner that the calculation of stresses to a reasonably definite extent can be made and materials of the proper dimensions used.

The present invention provides an antenna construction of this type wherein the uncertainty of calculation is avoided and wherein the stresses can be determined with reasonable definiteness. At the same time, the tower provides a structure which for electrical purposes is of substantially uniform cross section throughout its height.

Generally speaking, the present invention contemplates the construction of the tower in two sections. The lower end of the bottom section is secured to a pier through a flexible mounting similar to the flexible mountings now used for this purpose and as disclosed, for instance, in the Gerten patent above referred to, such flexible mounting being a ball and socket connection. The top of this bottom section is supported by a set of guy wires connected to the tower in a common plane immediately adjacent the upper end of the bottom section. This member may then be considered as a rigid structure or beam having two points of support, i. e., one at the bottom where it is anchored and one at the top where the guy wires attach. The upper section of the tower is mounted on the lower one through a non-rigid connection, similar, for instance, to the flexible connection used at the base of the tower. A single set of guy wires is connected to this upper section in a plane intermediate the bottom and top of the upper section, preferably at a point above the middle but well below the top. The upper member is then structurally a simple cantilever, the one point of support being the non-rigid connection at the top of the bottom section, and the other point of support comprising a set of guy wires attached to the upper section at the intermediate location.

By this method of construction I obtain a structure which will permit the calculation of stresses in accordance with the standard practice which governs members of this character.

The point of connection between the two sections of the tower requires that the adjoining ends of the section be of reduced cross section in order to accommodate the non-rigid connection between the two sections. This is undesirable from an electrical standpoint, and according to the present invention is corrected by the provision of jumpers or conductors which span those portions of reduced area, but which are of such character that they will not serve to transmit mechanical stresses in the tower structure.

The invention may be readily understood by reference to the accompanying drawing, in which

Figure 1 shows a side elevation of a tower constructed in accordance with my invention;

Figure 2 is a top plan view of the tower shown in Figure 1; and

Figure 3 is a view generally similar to Figure 1, but on a larger scale with intermediate portions of the tower broken out in order to show more clearly the connections.

Referring to the drawing, 2 designates a sup-

porting pier or base on which is carried a mounting member 3. The mounting member is here illustrated as having a spherical end 4 to provide a ball and socket connection with the base of the tower, but any other type of non-rigid connection may be provided. The tower itself comprises a bottom section 5 formed of structural framework. The lower portion of this section tapers down to accommodate a connector or socket 6 for cooperation with the mounting 3—4 on the pier. Whether or not insulation between the tower and ground is provided in this mounting is a matter which is determined by the character of the electrical circuit employed in the broadcasting station, and insulation may or may not be used as the case may require. The manner of providing insulation at this point and also in the various guy lines is well understood by those skilled in the art and need not be considered in connection with the present invention. The upper end of the bottom section 5 tapers at 8 to a connector member 9 which may have a spherical surface thereon similar to the portion 4 of the mounting 3—4. A set of guy wires 10 are connected to the upper end of the section 5 adjacent the connector 9.

Supported by the lower section 5 is an upper and longer section 11 of a generally similar construction, being formed from structural metal parts. It has a portion 12 at the lower end thereof that tapers toward a connector 13 cooperating with the connector 9 on the top of the bottom section. The top of the radiating antenna is designated 14. Secured to the upper section of the tower intermediate the top and bottom thereof and preferably at a point somewhat above the middle of the upper section, but well below the top thereof, is a set of guy wires 15, these guy wires adjoining the tower in a common horizontal plane. The ball and socket joint 9, 13 provides a non-rigid or flexible connection between the top of the bottom section 5 and the upper section 11. Since this is a flexible connection, the bottom section 5 may be considered a rigid structure within the elasticity of the materials involved, having one point of support at the base of the tower and the other point of support where the wires 10 attach thereto. This lower section, of course, carries the weight of the upper section 11. The upper section 11 having one point of support at the universal joint 9, 13 and having its other point of support in the plane where the wires 15 attach thereto, comprises a cantilever. If the connection 9, 13 were a rigid connection, then the stress distribution in the tower would present an entirely different problem and the structure would be one wherein there is no formula for calculating stresses.

The provision of a non-rigid or flexible connection between the two sections requires the tapering off in the cross-sectional area of the two sections to the single point of connection. This is undesirable from an electrical standpoint for the reason that the radiator is intended to be energized with electrical currents of radio frequencies, and it is important that the cross-sectional form of the structure be maintained throughout the height in order to permit radiation in a normal manner. To overcome the variation in cross section imposed by the provision of the flexible or non-rigid connection 9, 13, I provide several jumpers 16 of conducting material to maintain electrically the straight-sided contour of the tower. These jumpers, however, are flexible or of such physical character or dimensions that no mechanical strain will be transmitted through the jumpers from one section of the tower to another under any condition of loading. The jumpers are preferably located so as to form continuations of the legs of the tower across the distance where the adjoining ends of the two sections taper.

The drawing illustrates the tower as being of triangular cross section. This is merely for the purpose of illustration, and it will be understood that the tower may be square, round or have any other cross-sectional form that may be required or may be suitable from the standpoint of design.

While I have illustrated one specific embodiment of my invention and one particular form of flexible connection, it will be understood that this is merely by way of illustration and that the invention may be variously embodied and that various modifications and changes may be made in the construction shown.

I claim:

1. A tower antenna comprising a vertical bottom section formed of structural metal anchored at its lower end and supported at its upper end by guy wires attached thereto, an upper vertical section formed of structural metal carried on the lower section by a flexible coupling, said upper section being supported by guy wires attached thereto in a common plane intermediate the top and bottom of the upper section, the cross-sectional area of the two sections of the tower diminishing toward said flexible connection, and electrical jumpers across such areas of reduced cross section maintaining the contour of the tower for electrical purposes but not capable of functioning to transmit stresses.

2. A tower antenna having upper and lower structural sections of metal comprised of uprights and cross bracing, a flexible coupling between the two sections, the top of the lower section and the bottom of the upper section tapering inwardly toward the flexible connection whereby the continuity of the contour of the structure is interrupted adjacent the coupling, and flexible metallic jumpers connecting the two sections around the flexible coupling and the tapered end portions which maintain the continuity of the contour of the tower for electrical purposes, but are incapable of functioning to transmit stresses from one section to the other, the structure as a whole constituting a linear radiator.

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