

Sept. 13, 1949.

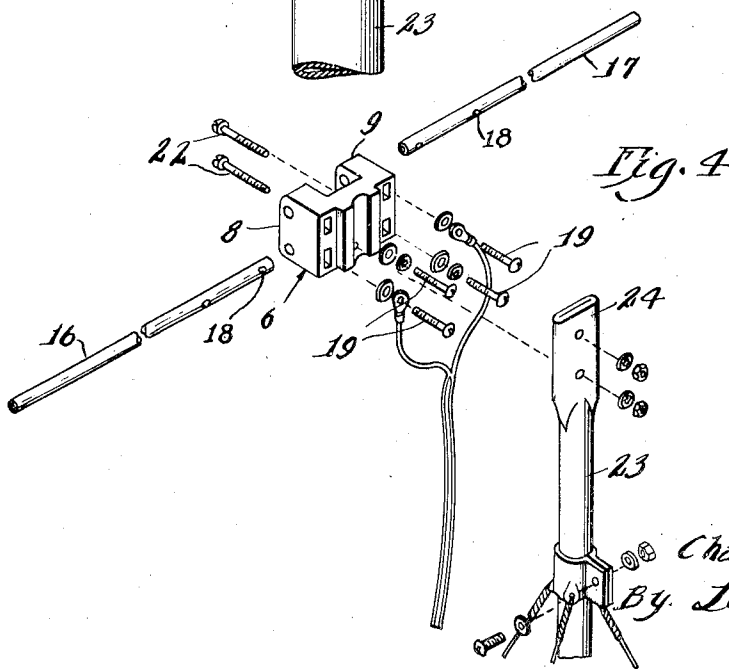
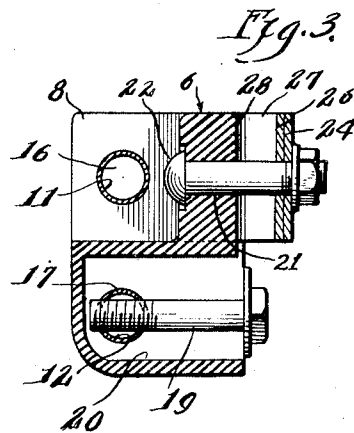
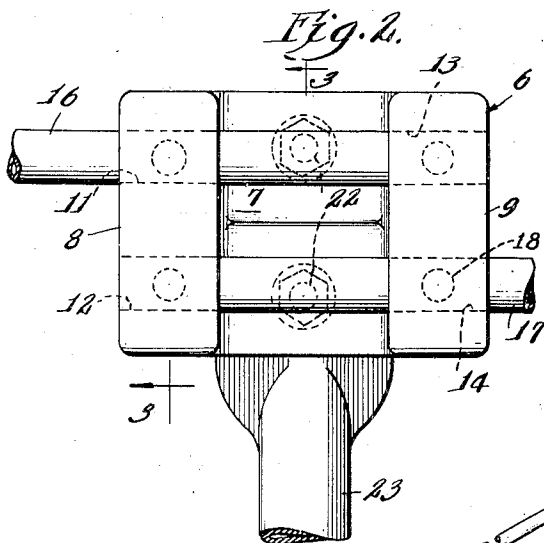
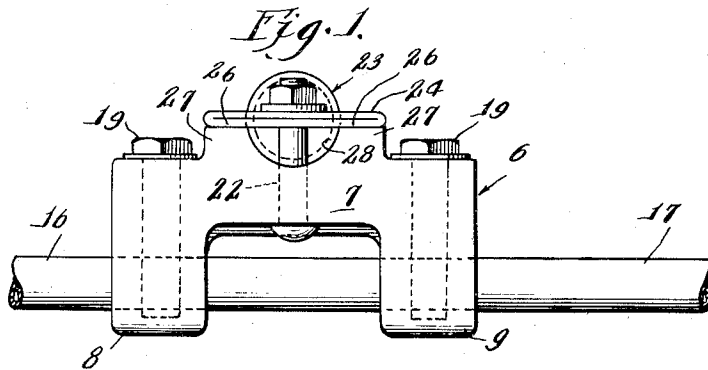
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2,481,801

ANTENNA ARRAY

Filed Dec. 8, 1945

3 Sheets-Sheet 1



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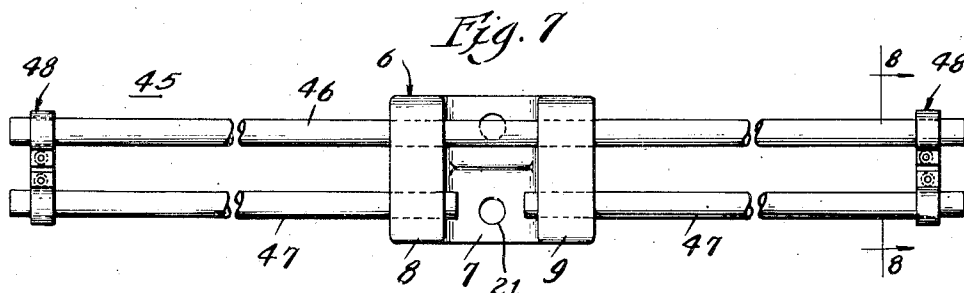
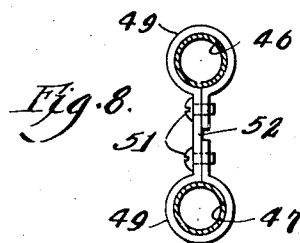
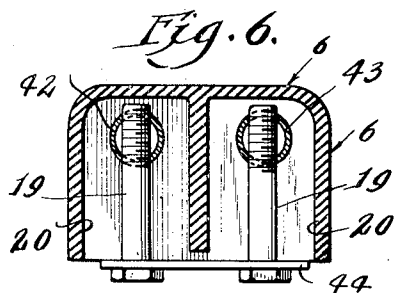
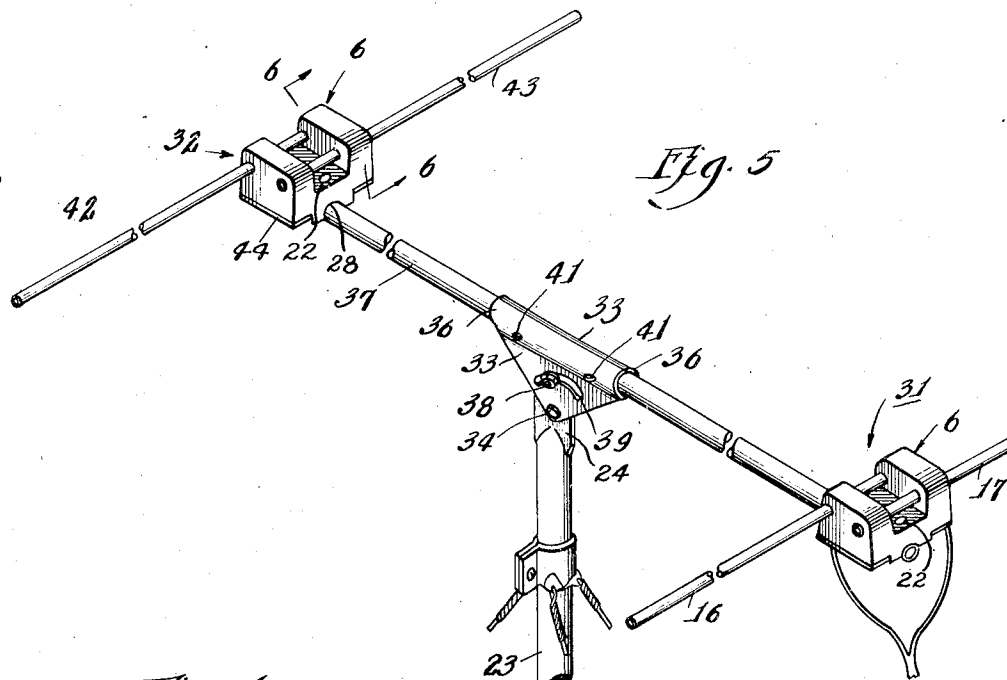
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Filed Dec. 8, 1945

3 Sheets-Sheet 2



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ANTENNA ARRAY

Filed Dec. 8, 1945

3 Sheets-Sheet 3

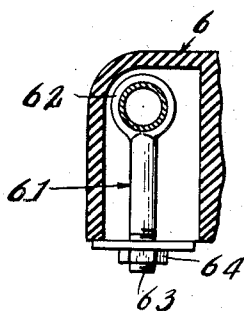
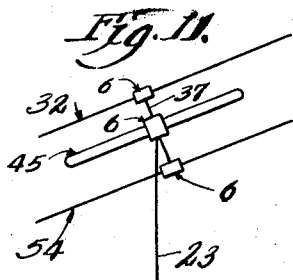
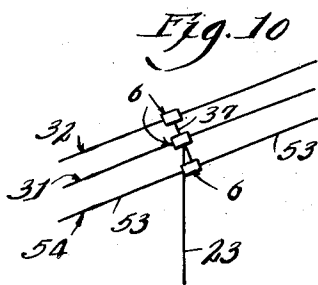
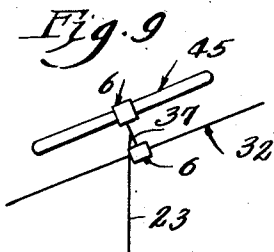


Fig. 12

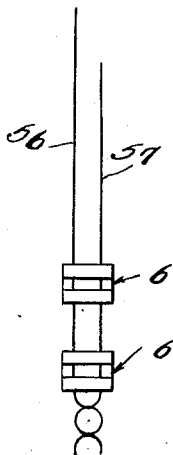
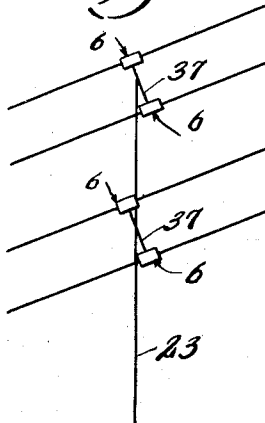


Fig. 13



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UNITED STATES PATENT OFFICE

2,481,801

ANTENNA ARRAY

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Application December 8, 1945, Serial No. 633,732

3 Claims. (Cl. 250—33)

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This invention relates to improvements in antenna arrays of the type now commonly employed with television, high frequency modulation, or conventional AM receiving sets, and has for an object the provision of an improved insulator mounting adapted for use in supporting antenna elements in forming various types of antenna arrays such as single dipole; folded dipole; dipole and reflector; folded dipole and reflector; dipole, reflector and director; folded dipole, reflector and director; J type antenna; and stacked arrays.

This invention further contemplates the provision of an insulator mounting which may be interchangeably used with a single or folded dipole with either vertical or horizontal polarity.

A still further object of the invention is to provide an insulator mounting of a standard type which may be used in the construction of antennas or antenna arrays, and which will lend itself broadly to the varying applications which antenna arrays may require in each specific instance.

This invention further contemplates the provision of an insulator mounting for antenna elements embodying means for detachably securing antenna elements against displacement therefrom, and other means for securing the insulator mounting to a mast or to a cross arm supported on the mast.

This invention further contemplates the provision of an insulator provided with longitudinally extending apertures preferably disposed in spaced parallel alignment to receive metallic rod-like members which may be formed and arranged to serve as dipole elements, folded dipole elements, reflectors, directors, etc.

It is a further object of this invention to reduce the cost of manufacture of the various types of antenna arrays and to facilitate assembly of the several parts in mounting an antenna array for use with a receiving set. During installation of an antenna array, it is contemplated that the antenna elements should be adjustably mounted to improve the reception of signals, and means are provided for pivotal movement of a cross member upon a supporting mast for adjustably positioning the antenna elements.

This invention embodies other novel features, details of construction, and arrangement of parts which are hereinafter set forth in the specification and claims and illustrated in the accompanying drawings wherein:

Fig. 1 is a top plan view of a single dipole array embodying the improved insulator mounting.

Fig. 2 is a front elevational view of the same.

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Fig. 3 is a sectional view taken along the line 3—3 of Fig. 2.

Fig. 4 is an explosion view illustrating the parts embodied in the single dipole antenna array illustrated in Figs. 1 to 3.

Fig. 5 is a perspective view showing the improved insulator mounting employed in an antenna array embodying dipole and reflector elements.

Fig. 6 is a sectional view taken along the line 6—6 of Fig. 5, showing one of the shorting straps employed for electrically connecting the reflector elements.

Fig. 7 is a front elevational view showing the insulator mounting as employed in a folded dipole antenna construction.

Fig. 8 is a sectional view taken along the line 8—8 of Fig. 7.

Fig. 9 is a schematic view illustrating a folded dipole and reflector antenna array which may be constructed from parts shown in Figs. 1 through 8.

Fig. 10 is a schematic view showing an antenna array comprising a dipole, reflector and director.

Fig. 11 is a schematic view showing an antenna array comprising a folded dipole, reflector and director.

Fig. 12 is a schematic view showing a J type antenna.

Fig. 13 is a schematic view showing a stacked array.

Fig. 14 is a sectional view corresponding to Fig. 3, showing an eye-bolt for detachably connecting antenna elements to the insulator mounting.

Referring now to the drawings for a better understanding of this invention and more particularly to Figs. 1 to 3 therein, a single dipole antenna is shown as comprising an insulator 6 which may be inexpensively molded of suitable insulating material to provide a base portion 7 having a pair of end walls 8 and 9 projecting outwardly from the upper face thereof in spaced parallel relation. The end wall 8 is formed with a pair of apertures 11 and 12 disposed in spaced parallel relation, and the end wall 9 is formed with a pair of apertures 13 and 14 which are also disposed in spaced parallel relation. It will be noted that the opening 11 is in axial alignment with the opening 13 and that the opening 12 is in axial alignment with the opening 14.

The openings 11, 12, 13 and 14 provided in the end walls 8 and 9 of the insulator 6 are formed to snugly receive and engage the inner ends of dipole antenna elements 16 and 17, in the

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manner illustrated in Figs. 1, 2 and 3. The dipole elements 16 and 17 may be formed of rods but are preferably formed of metallic tubing to provide maximum strength with minimum weight. The dipole elements 16 and 17 are also preferably tapered from their inner ends toward their outer ends. The inner ends of dipole elements 16 and 17 are provided with transversely extending threaded openings 18 to receive cap screws 19 disposed in openings 20 in the insulator 6 for securing the dipole elements against axial displacement from the insulator.

The insulator 6 is also provided with a pair of apertures 21 to receive bolts 22 for engaging the insulator to a mast 23. The mast is preferably formed of metallic tubing having its upper end flattened at 24 for line engagement against the flat faces 26 of a pair of spaced parallel bosses 27 formed on the back side of the insulator. The back face of the insulator is also formed with a concave arcuate surface 28 between the bosses 27 to receive a tubular supporting member, as hereinafter shown and described in connection with other forms of antenna arrays.

Figs. 5 and 6 in the drawings illustrate an antenna array embodying a dipole 31 and reflector 32. This form of antenna is shown as comprising a mast 23 having a pair of swivel plates 33 journaled on opposite sides of the flattened end 24 thereof by means of a bolt 34. The free ends of the swivel plates are formed arcuate at 36 to engage opposite sides of a transverse supporting member 37. An adjustment bolt 38 extends through an aperture provided in the mast for engagement in arcuate slots 39 provided in the swivel plates 33. By means of the bolts 38 and slots 39, the transverse supporting member 37 may be angularly adjusted with respect to the mast 23. If desired, aligning apertures may be formed to extend through the swivel plates 33 and transverse member 37 to receive bolts 41 to secure the member 37 against axial or rotational displacement with respect to the swivel plates. However, it is contemplated that the holes provided for the bolts 41 may be relocated, if desired, to angularly dispose the dipole and reflector elements between a horizontal and a vertical plane, or set screws (not shown) may be substituted in place of the bolts 41.

An insulator 6 is secured to each end of the supporting member 37 by means of bolts 22 which extend through the apertures 21 provided in the insulator and through openings provided in supporting member 37. The concave arcuate surface 28 of the insulator is formed to correspond with the contour of the supporting member 37. The dipole elements 16 and 17 are mounted on the insulator 6 by means of the screws 19 in the manner heretofore described in connection with Figs. 1 to 3 in the drawings. The reflector elements 42 and 43 are also mounted on the insulator 6 by means of screws 19 with a pair of shorting plates 44 disposed under the heads of the screws 19 for electrically connecting the inner ends of the reflector elements, as illustrated in Fig. 6.

Figs. 7 and 8 illustrate a folded dipole antenna 45 comprising an insulator 6 adapted to be supported upon a mast (not shown) similar to mast 23 to receive, for example, a half-wave length antenna element 46 and a pair of quarter-wave length antenna elements 47. The antenna element 46 is secured to the insulator 6 intermediate its ends by means of screws (not shown) similar to screws 19, and the inner ends of the antenna

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elements 47 are secured on the insulator 6 in spaced parallel relation to the element 46 by means of screws (not shown) similar to screws 19. The elements 46 and 47 are connected at their ends by means of a metallic shorting clamp 48 formed with loop portions 49 to receive said elements connected by a web 52. A pair of screws 51 are provided to clamp the loop portions into tight engagement around the antenna elements.

Fig. 9 is a schematic illustration of another form of antenna array embodying a folded dipole 45 of the type illustrated in Figs. 7 and 8, and a reflector 32 of the type illustrated in Figs. 5 and 6. The insulators 6 are secured to the ends of a transverse supporting member 37 which is pivotally connected to a mast 23 by means of swivel plates 33 in the manner heretofore shown and described in connection with Fig. 5 in the drawings.

Fig. 10 is a schematic illustration of another form of antenna array embodying a dipole 31, a reflector 32, and a director 54. The dipole 31 and reflector 32 are constructed in the manner heretofore described with reference to Fig. 5 in the drawings, and the director is formed of similar parts including an insulator 6 and a pair of director elements 53. The dipole, reflector and director are supported upon a transverse member 37 which, in turn, is connected to swivel plates 33 mounted on the mast 23 in accordance with the disclosure in Fig. 5.

Fig. 11 is a schematic illustration of another form of antenna array embodying a folded dipole assembly 45, a reflector assembly 32, and a director assembly 54, said assemblies being mounted on a transverse member 37 pivotally connected to a mast 23.

Fig. 12 is a schematic illustration of a J type antenna embodying a half-wave length antenna element 56 and a quarter-wave length antenna element 57 which are mounted upon a pair of insulators 6 by means of screws (not shown) similar to screws 19.

Fig. 13 is a schematic illustration showing a stacked array of antenna elements adapted to be mounted in insulators 6 secured to the ends of transverse members 37.

In some forms of antenna arrays it may not be desirable to secure the antenna elements to the insulator 6 by means of screws 19 in the manner illustrated in Fig. 3. Fig. 14 illustrates the use of eye-bolts 61 formed with an eye portion 62 to receive an antenna element, the bolts being threaded at 63 to receive a nut 64. By threading the nut 64 along the threaded shank of the eye-bolt 61, the antenna elements are secured in tight frictional engagement against the walls of the apertures adapted to receive them as hereinbefore described in conjunction with the insulator 6.

In the construction of antenna arrays of the several types shown and described, it will be noted that the mast 23, transverse supporting members 37, and antenna elements may be formed from standard size tubing, if desired, and that the several parts may readily be assembled to provide the desired type of antenna array by means of the improved insulator 6. It will thus be seen that various types of antenna arrays are relatively simple and inexpensive to manufacture and may readily be assembled at the point of use. By providing swivel connection plates 33 between the mast 23 and the cross arms 37, the antenna elements may readily be adjusted to improve high frequency reception.

Throughout the claims, the term "antenna ele-

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ment" is used as a generic term to define dipoles, reflectors, directors, etc., unless limited to a specified type of antenna element.

While this invention has been shown in several forms, it is obvious to those skilled in the art that it is not so limited but is susceptible of various changes and modifications without departing from the spirit and scope of the claimed invention.

I claim as my invention:

1. An insulator mounting for rod-like antenna elements comprising a body portion having a pair of walls extending outwardly in spaced relation from the front face thereof, each of said walls being formed with a pair of apertures to receive rod-like antenna elements, and bolt receiving apertures formed in the rear face of the body portion to intersect each of said antenna receiving apertures.

2. An insulator mounting for elongated antenna elements comprising a body portion having an obverse face and a reverse face, a pair of spaced ribs formed upon the reverse face to provide a seat upon an antenna mast, a pair of walls extending outwardly from the obverse face of the body at opposite ends of said body, each of said walls being provided with a pair of apertures to receive elongated antenna elements, said walls being provided with bolt-receiving apertures opening to the reverse face of said body and intersecting said antenna-receiving apertures whereby said antenna elements may be secured in said antenna-receiving apertures, said body being provided with bolt-receiving apertures between said ribs whereby said body may be secured in seated position upon an antenna mast.

3. An insulator mounting for elongated antenna elements comprising a body portion having

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an obverse face and a reverse face, a pair of spaced ribs formed upon the reverse face providing a recess between said ribs co-extensive with said ribs for the reception in supporting registration of an antenna supporting member, a pair of walls extending outwardly from the obverse face of the body at opposite ends of said body, each of said walls being provided with a pair of apertures to receive elongated antenna elements, said walls being provided with bolt-receiving apertures opening to the reverse face of said body and intersecting said antenna-receiving apertures whereby said antenna elements may be secured in said antenna-receiving apertures, said body being provided with bolt-receiving apertures between said ribs whereby said body may be secured in seated position upon an antenna supporting member.

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