

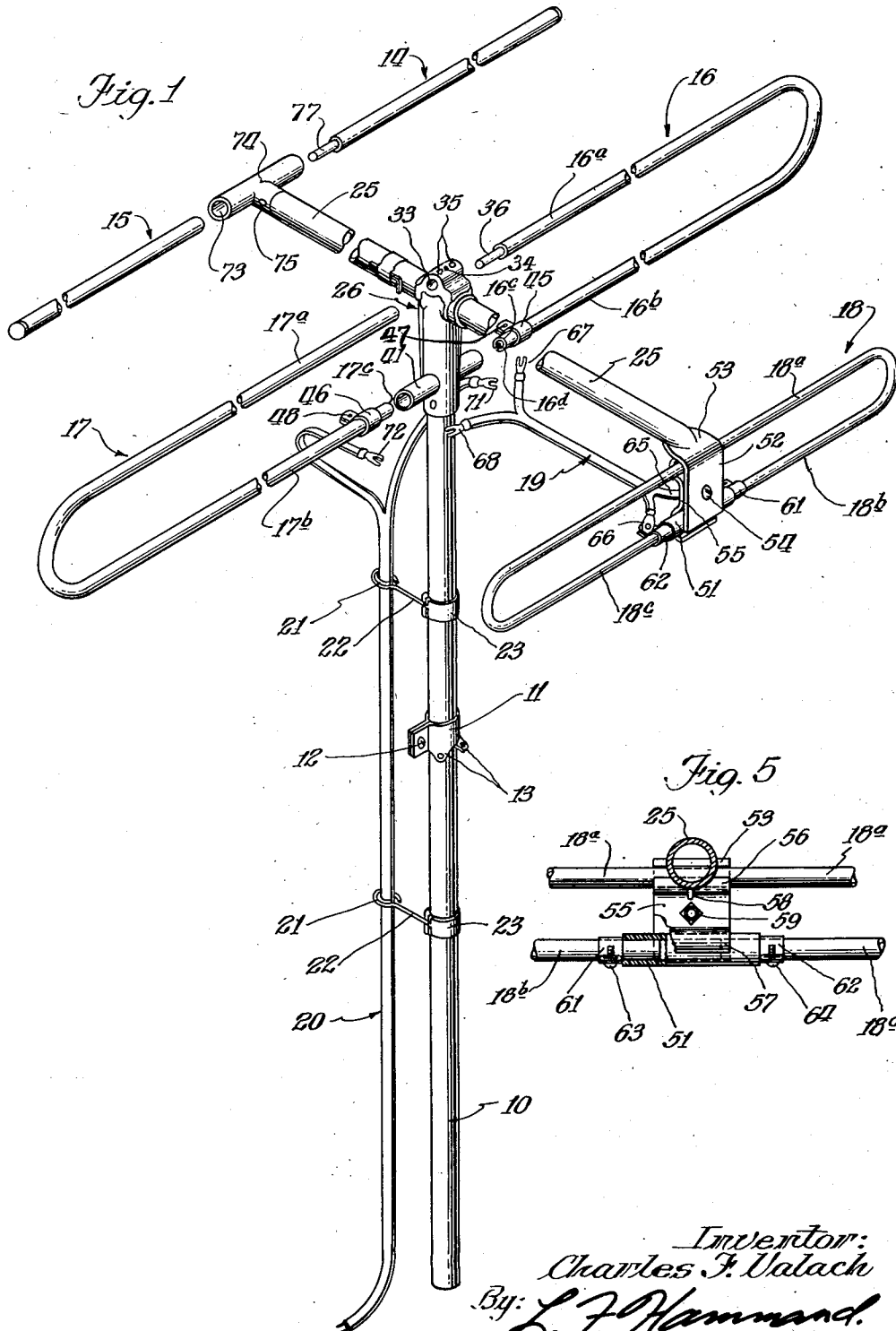
June 9, 1953

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ANTENNA STRUCTURE

2,641,703

Filed Sept. 21, 1949

2 Sheets-Sheet 1



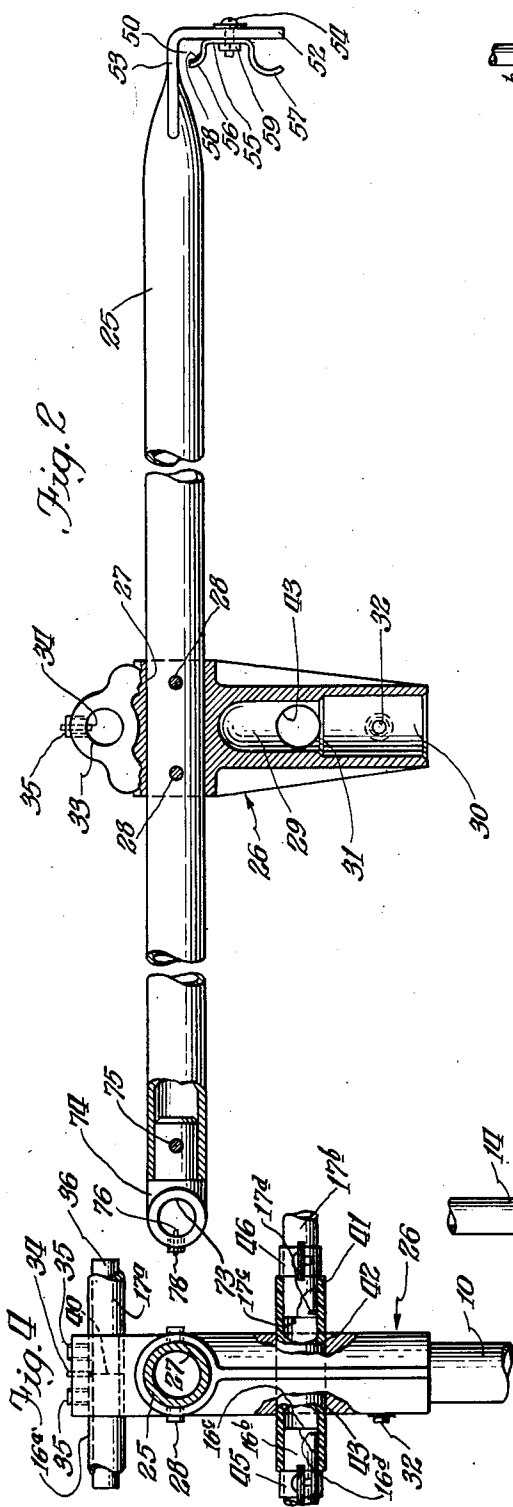
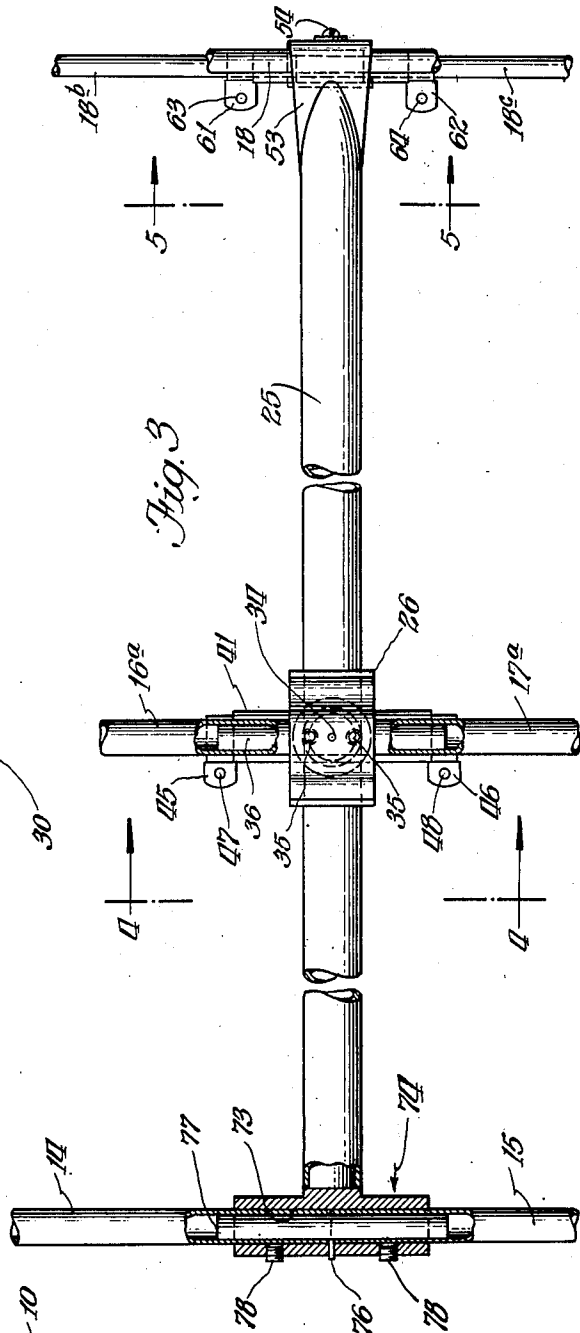
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UNITED STATES PATENT OFFICE

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ANTENNA STRUCTURE

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This invention relates to an improved mechanical structure for a television antenna having the electrical characteristics disclosed in Kearsse Patent No. 2,474,480.

It is basic that any outdoor antenna, in addition to being electrically efficient, should be permanent and safe; that is, sufficiently strong and rugged to withstand the severe strains occasionally imposed on it by storms, high winds or ice loading. This is particularly important in a television installation, since in the present state of the art these structures are preferably mounted at as high an elevation as practical; usually on a mast above the highest point of a rooftop or on an antenna tower. In either case they are completely unprotected from the elements and exposed to the full fury of windstorms, hail or sleet, and apt to cause serious injury and property damage if they should fall.

In the manufacture and sale of commercial television antennas there is, however, another extremely important factor; that is, ease of installation. This, in itself, is an obviously desirable quality, but it has heretofore been attained only at the sacrifice of strength and safety. Nevertheless, uninformed buyers (who do not in all cases appreciate the magnitude of the forces imposed on an antenna by adverse weather) often choose a weak, questionable, or downright dangerous structure purely for the reason that it appears to be more easily erected than other types. This has caused considerable concern in some communities, particularly when accidents have occurred resulting in injury by falling antennas, with the result that in some localities safety surveys are being conducted and revisions of building codes proposed to specify acceptable standards for structures of this type. In any case, it is an obvious desideratum to provide a structure that is relatively easy and quick to install, yet is capable of withstanding extreme stresses and strains far beyond those normally imposed on it, and to nevertheless retain its electrical efficiency at all times.

It is, therefore, an important object to provide an antenna structure so designed that it may be easily, quickly and securely erected, yet will have ample strength and physical rigidity to withstand high winds, storms, sleet, hail and ice loading, yet at the same time will maintain its electrical efficiency.

A further object is to provide an antenna as indicated above wherein all of its parts are grounded with respect to D. C. potentials, to achieve the greatest possible safety against lightning.

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It is to be remembered, of course, that in the average installation the entire unit is mounted on a rooftop mast or tower as high above the ground surface as practicalities permit, and that the inherent difficulties of assembling any device under these conditions make it extremely important from a practical standpoint to provide a structure that can be assembled quickly and with ease, yet with assurance that all of the inter-related parts are properly mounted, not only as to security in withstanding strain, but also in correct orientation with respect to each other and in the precise spacing required by an instrumentality of this kind. This feature becomes doubly important in installations made in winter, since it is often necessary as a practical matter to install the units in a high wind, sleet or snow, and often in the dark, and these factors, taken with the fact that the workmen may have very insecure footing and experience difficulty and discomfort in handling the cold metal parts with bare hands, means that it is desirable, insofar as possible, to have a structural unit which may be completely fitted together and assembled largely by "feel," without a real need for visually noting the positions of the various parts. To this end, the present disclosure is provided with locating devices so that the several parts of each of the active elements are self-positioning on their mounting and cannot well be assembled wrongly.

It is to the accomplishment of these general objects that the present invention is directed. Specifically, the present disclosure is directed to the novel mechanical structure disclosed herein, whereby a pair of folded dipoles of unequal length and a reflector are mounted in parallelism and in predetermined spaced relationship with each other, yet wherein the several parts are arranged to be assembled with ease and accuracy not possible with the structural details of the Kearsse patent previously referred to, yet with the parts so firmly assembled that they have ample strength to withstand any strains apt to be imposed upon them.

The manner in which the foregoing objects are accomplished is best described in connection with the drawings of the present specification, wherein:

Figure 1 is a perspective exploded view showing the antenna structure in the preferred form here contemplated;

Figure 2 is a side elevational view, partly in section, showing a pre-assembled structural cross-arm unit adapted to be secured at the up-

per end of a mast to support all of the antenna elements in predetermined relationship;

Figure 3 is a plan view of the cross-arm assembly illustrated in Figure 2, showing fragmental portions of the reflector and dipole elements of the antenna, to illustrate the manner of attachment of these elements to the cross-arm;

Figure 4 is a detail sectional view of the union between the cross-arm structure and the central dipole element, the view being taken substantially on the plane of the line 4—4 of Figure 3; and

Figure 5 is a detail sectional view taken substantially on the plane of the line 5—5 of Figure 3, showing the manner of mounting the forward dipole unit at the end of the cross-arm.

The entire structure is supported on a vertical mast 10 (Figure 1) which may comprise a length of standard pipe and is ordinarily provided with a bottom mounting fitting, not shown, and if desired, with a plurality of guy wires. To facilitate the installation of guy wires, a clamping bracket 11 having a tightening screw 12 is fitted over the pipe, and the bracket is provided with a plurality of perforated tabs 13 to which wires may be attached and stretched downwardly in different directions to support the mast.

The functioning elements of the antenna include a reflector 14—15, a center folded dipole 16—17, and a forward folded dipole 18. The two dipoles are joined by a section of radio frequency transmission line 19, the terminals of which are also joined to a lead-in 20 which comprises another length of radio frequency transmission line. This lead-in is mounted in sleeve insulators 21 carried on outwardly projecting brackets 22 threaded into the clamping devices of band-like hose clamps 23, so that the clamps serve to support the brackets and insulators rigidly with respect to the mast 10 to carry the transmission line parallel with but spaced back of the mast.

The functioning elements of the antenna are all supported on a unitary cross-arm assembly, which, in the preferred embodiment, is pre-assembled at the factory and shipped with the antenna parts as a knocked-down package, so that the ultimate purchaser or person installing the unit merely assembles the active elements on the cross-arm unit to complete the structure.

The cross-arm assembly comprises two main structural parts, that is, a horizontal tubular arm 25 and a supporting fitting 26. Preferably, the supporting fitting 26 has a transverse bore or socket 27 through which the arm 25 is fitted and permanently locked in position by any convenient means, as by the drive pins 28. The fitting 26 also includes a vertically extending bore 29 having an enlarged socket 30 to receive the upper end of the mast 10. The upper end of the mast bears against the internal shoulder 31 of the bore to support the assembly, and a set screw 32 is provided to firmly secure the fitting to the mast.

The fitting 26 has a cross bore 33 extending at right angles to the cross-arm 25 above the bore 27, with a stop pin 34 fixed in the wall of the fitting and extending slightly into the bore. This bore serves to receive the inner end of the top spans 16a and 17a of the dipole element 16—17, which is formed in two separate and oppositely oriented U-shaped sections. The transverse bore 33 is thus separated into two oppositely aligned sockets by the limit pin 34, which serves as a positioning stop to limit the depth that the dipole elements may be inserted into the fitting 26. A

pair of set screws 35 are threaded through the upper wall of the fitting 26 at each side of a pin 34 to clamp the upper span of the central dipole 16—17 in position, and a solid plug 36 is pressed into one of the dipole sections, which are preferably tubular. With the pin 34 projecting only slightly into the bore 33 (less than the wall thickness of the dipole tubes), the ends of each of these tubes may be inserted till they strike the pin, which will locate them both properly and center the dipole 16—17 with respect to the fitting. The plug strengthens the dipole tubes, aids in establishing electrical contact, and permits the set screws 35 to be adequately tightened without distorting or damaging the tube ends.

The lower spans 16b and 17b of the dipole 16—17 are slightly shorter than the upper spans 16a and 17a, so that when the ends of the upper spans are brought together in abutting relationship, as indicated at 40 (Figure 4), the ends 16c and 17c of the lower spans do not connect, but are held spaced apart from each other. Thus the inner ends of the lower spans 16b and 17b are insulated from each other electrically but are received in an insulating sleeve 41, which extends through aligned openings 42—43 in the fitting 26. These openings thus serve as sockets for the insulating sleeve, and the inner ends of each of the dipole sections extend into the projecting ends of the sleeve sufficiently so that when the set screws 35 are tightened on the upper spans 16a and 17a of the dipole, the parts are held in firmly assembled relationship. Inwardly extending keys 16d and 17d are formed at the end of the lower spans (Figure 4). These prevent inadvertent inversion of either half of the dipole during assembly, since these spans cannot be telescoped over the plug 36.

The electrical connections from the dipole 16—17 are taken from the clamps 45 and 46 secured to tubes 16b and 17b at the opposite ends of the insulating sleeve 41. These clamps are provided with tightening screws 47 and 48, which also serve to connect the dipole to the transmission line.

The short dipole 18 is of unitary tubular construction, having an upper span 18a across its entire length folded downwardly at the ends and back into spans 18b and 18c, the inner ends of which each enter an insulating tube 51. The midpoint of the upper span 18a of this dipole is supported in a socket 50 formed on the inside corner of an angularly offset bracket 52 on the flattened forward end portion 53 of the cross-arm 25, and the dipole is provided with a notch (not shown) at the center point of the upper span. The bracket 52 is perforated to receive a clamping screw 54, and this screw extends through a clip 55 having an arcuate surface 56 to secure the tube 18a in the socket 50, and a lower curved socket surface 57 to hold the insulator 51. The bracket is provided with a detent 58 so that in assembling the parts, the dipole may slide in the socket until the detent 58 rests in the notch of the tube. When this is done, the screw 54 may be tightened into the nut 59 with assurance that the dipole is properly centered.

The electrical connections from the short dipole are established through clips 61 and 62, each of which has clamping and contact screws 63 and 64 which clamp the clips in position on the tubes 18b and 18c, and also serve to secure and establish electrical connection with the terminals 65 and 66 of the phasing wire 19. The opposite terminals 67 and 68 of the phasing wire are secured to the set screws 47 and 48, which also secure and estab-

lish electrical connection with the terminals 71 and 72 of the lead-in 20.

The reflector 14—15 comprises a pair of straight metal tubes, adapted to be fitted into the opposite ends of a cross bore 73 in a T fitting 74 secured to the rear end of the cross-arm 25 by a pin 75. A limit pin 76 is fixed in the wall of the fitting and projects into the bore enough to limit the insertion of the ends of tubes, but not enough to contact the solid plug 77, which serves to insure electrical conductivity and to strengthen the assembly when the set screws 78 are tightened to secure the reflector units in position.

Having thus described my invention, what I claim as new and desire to secure by United States Letters Patent is:

1. In an antenna structure the sub-combination of a horizontal cross arm, a plurality of fittings secured to said cross arm at spaced apart points therein, a pair of mounting sockets on each of said fittings, each of said sockets being disposed perpendicularly to the cross arm, each pair of said sockets comprising a single transverse aperture through the fitting, with an internal abutment at its center to act as a locating stop for antenna elements mounted therein, and means comprising a set screw on each side of the locating stop for securing the antenna elements in said sockets.

2. In an antenna structure, in combination, a horizontal cross arm and a mounting fitting, with said arm extending outwardly on each side of said fitting; a pair of dipole mounting sockets on said fitting, each of said sockets being disposed perpendicularly to the cross arm, said pair of said sockets comprising a single transverse aperture through the fitting, with an internal abutment at its center to act as a locating stop for a pair of dipole antenna elements mounted therein, and means comprising a set screw on each side of the locating stop; a pair of antenna elements secured in said sockets, said elements comprising two U-shaped half-sections of a folded dipole with one end of each of said half-sections secured in one of the sockets of said fitting; a reflector mounting fitting secured to said cross arm at one end thereof with a pair of reflector mounting sockets in said fitting, each of said sockets being disposed perpendicularly to the cross arm, said pair of sockets comprising a single transverse aperture through the fitting, with an internal abutment at its center to act as a locating stop for reflector elements mounted therein, and means comprising a set screw on each side of the locating stop for securing the reflector elements in said sockets; with a half-section of a reflector rod mounted in each of said sockets and extending outwardly therefrom perpendicular to the cross arm.

3. In an antenna structure, the subcombination of a horizontal cross arm of tubular formation having a flattened mounting portion at one end thereof, with a threaded clamping screw and a mounting clip carried by said flattened portion of the cross arm, said clip having clamping surfaces adapted to engage the midpoint of an antenna element and hold it against the flattened portion of the cross arm; a reflector fitting secured to the cross arm at the other end thereof, said reflector fitting having a pair of mounting sockets comprising transverse apertures in the fitting parallel to the transverse span of the aforesaid dipole, with an internal abutment in each aperture to act as a locating stop for a reflector element mounted therein, and screw threaded

means at each of said sockets for securing said reflector element therein; together with a mounting fitting secured to the cross arm at a point intermediate the ends thereof and spaced substantially from said dipole and reflector fitting; said mounting fitting having a pair of dipole mounting sockets disposed perpendicularly to the cross arm and parallel with the dipole and with the sockets of the reflector fitting, with internal abutments in said sockets for positioning the ends of antenna elements mounted therein and screw threaded clamping devices in each of said sockets for securing said elements therein, together with a cylindrical mast socket at right angles to the cross arm and to all of the aforementioned sockets, whereby the assembly may be supported upon a vertical mast to hold the cross arm, the reflector and the dipole elements in horizontal position; with clamping devices on said mast socket to secure said fittings and cross arm in oriented position on a mast therein.

4. In an antenna structure, the subcombination of a horizontal cross arm with a reflector fitting secured to the arm at one end thereof, said reflector fitting having a pair of mounting sockets comprising transverse apertures in the fitting, with an internal abutment at the bottom of each aperture to act as a locating stop for a reflector element mounted therein, and means comprising a set screw in each of said sockets for securing said reflector element therein; together with a mounting fitting secured to the cross arm at a point intermediate the ends thereof and spaced substantially from said reflector fitting, said mounting fitting also having a pair of mounting sockets disposed perpendicularly to the cross arm and parallel with the sockets of the reflector fitting, with a locating stop for positioning the ends of antenna elements mounted therein comprising an internal abutment between said pair of said sockets and a set screw in each of said sockets for securing said elements therein; together with a cylindrical mast socket at right angles to the cross arm and to all of the aforementioned sockets, whereby the assembly may be supported upon a vertical mast to hold the cross arm, the reflector and the dipole elements in horizontal position; with clamping devices on said mast socket to secure the fittings and cross arm in oriented position on a mast therein.

5. In an antenna structure, the subcombination of a horizontal cross arm with a dipole mounting fitting secured to the cross arm at a point intermediate the ends thereof; said dipole mounting fitting having a pair of dipole mounting sockets disposed perpendicularly to the cross arm for receiving the ends of antenna elements mounted therein, and a set screw in each of said sockets for securing said elements therein; said elements each consisting of a half-section of a folded dipole secured to said fitting with one end of each half-section clamped in one of said sockets, together with a transverse aperture through the fitting with a single insulating tube extending entirely through said fitting and having its opposite ends in telescoping relationship with the free end of each of said half-sections.

6. In an antenna structure, the subcombination of a horizontal cross arm of tubular formation having a flattened portion at one end thereof with a folded dipole antenna element comprising a single transverse member having both ends thereof folded back to a point adjacent the center thereof and in alignment with each other,

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with a tubular insulator extending between the ends of said dipole and in telescoping relationship therewith; together with a double-ended mounting clip having clamping surfaces at one end engaging the insulator and clamping surfaces at the opposite end engaging the midpoint of the transverse member and clamping them against the flattened portion of the cross arm to secure the folded dipole thereto.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,471,256	Wintermute	May 24, 1949

Number

2,474,480
2,481,801
2,489,720
2,496,646
2,523,531
2,567,577

5

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Name

Date

Kearse	June 28, 1949
Valach	Sept. 13, 1949
Newell	Nov. 29, 1949
Winer	Feb. 7, 1950
Flippen	Sept. 26, 1950
Pariser	Sept. 11, 1951

OTHER REFERENCES

10 American Phenolic Corporation, 1830 South 54th Ave., Chicago 50, Illinois. "Assembly Instructions for Amphenol Two-bay Stacked Array Television Antenna" Model No. 114—301 lower bay only; Model No. 114—302 Complete Two-bay Kit. March 10, 1949.

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