

June 30, 1970

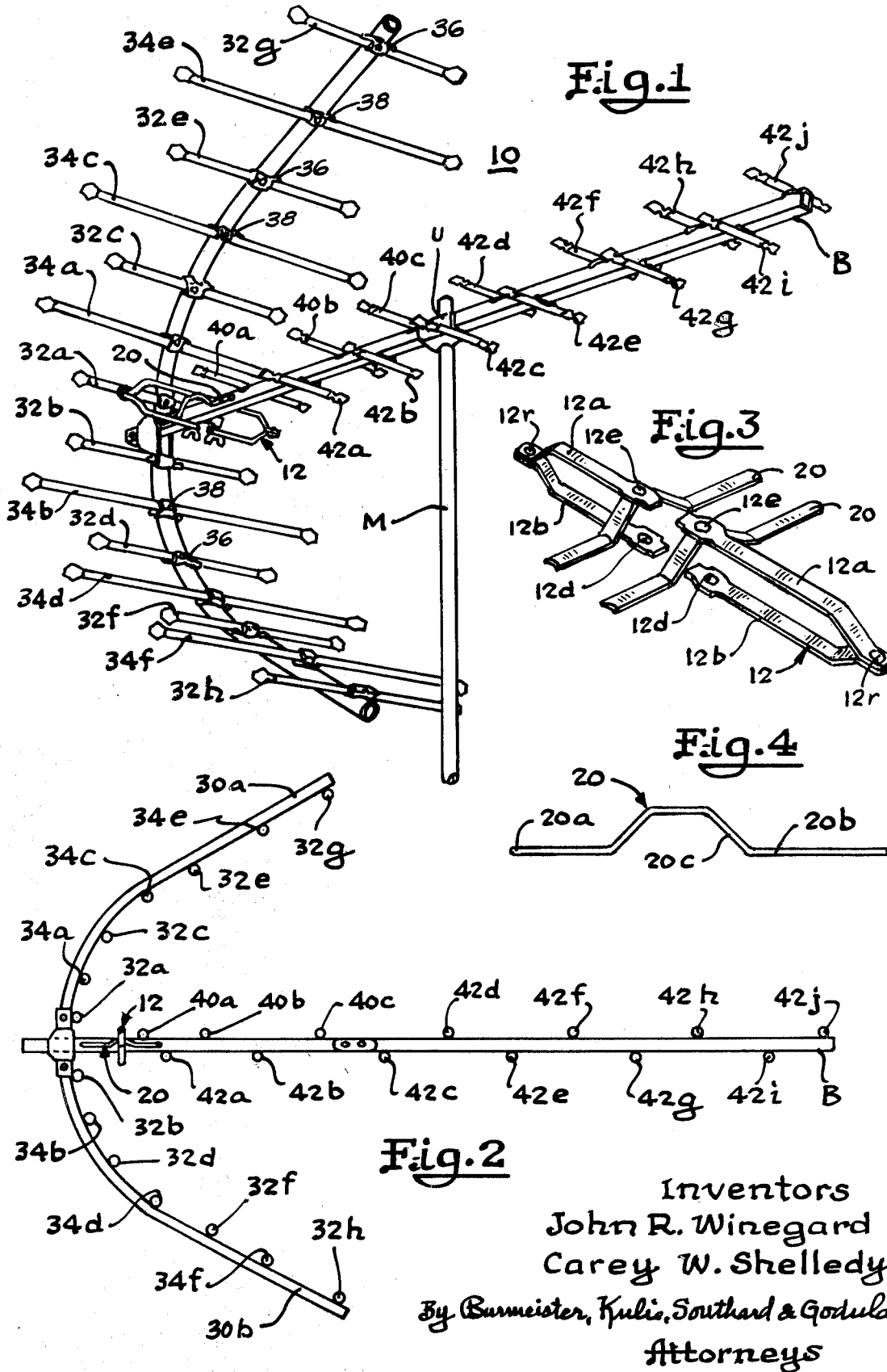
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ULTRA HIGH FREQUENCY TELEVISION ANTENNA

Filed June 10, 1968

4 Sheets-Sheet 1



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ULTRA HIGH FREQUENCY TELEVISION ANTENNA

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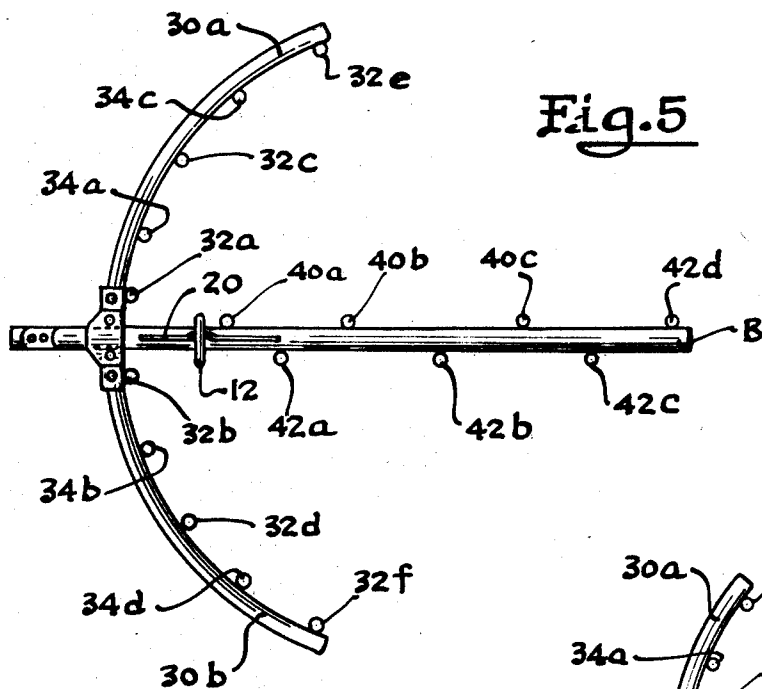


Fig. 5

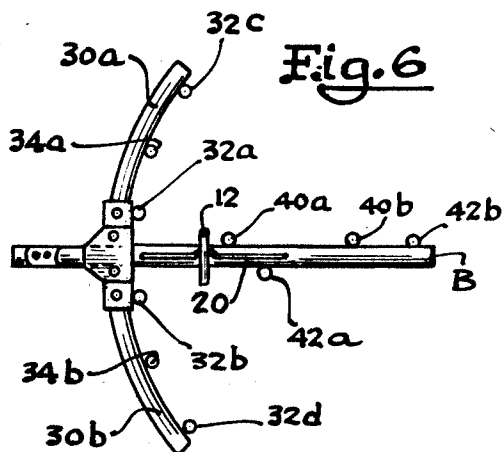


Fig. 6

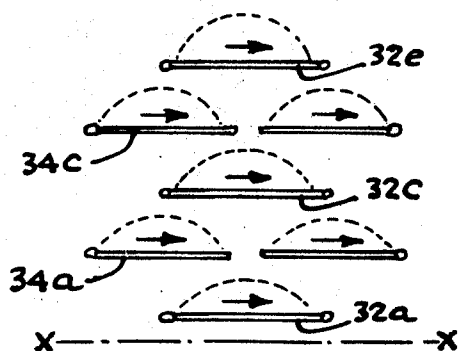


Fig. 7

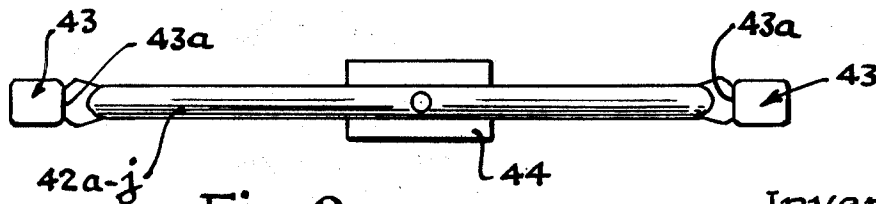


Fig. 8

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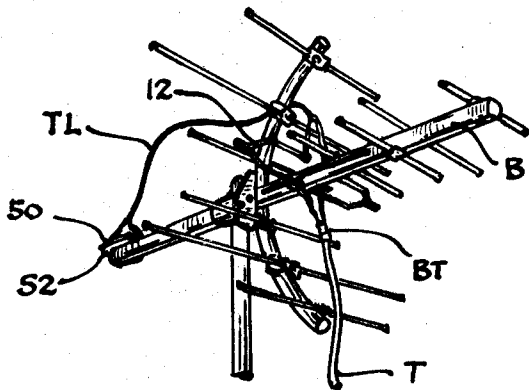


Fig. 9A

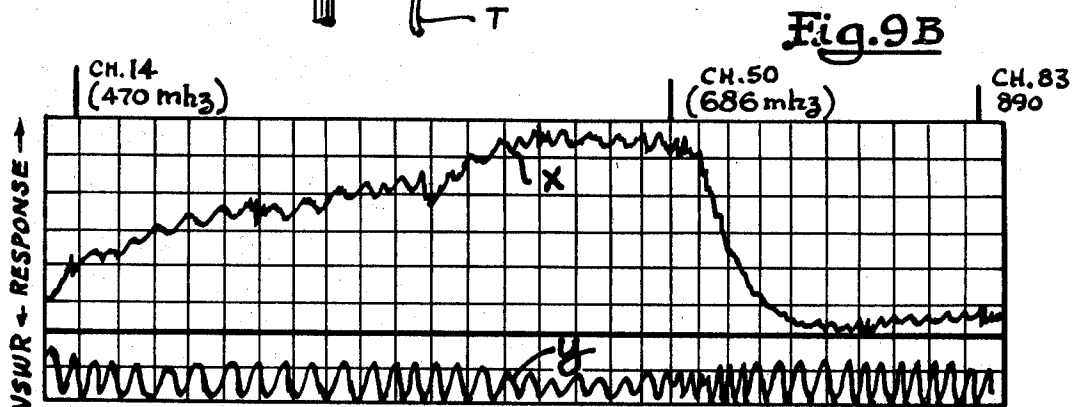


Fig. 9B

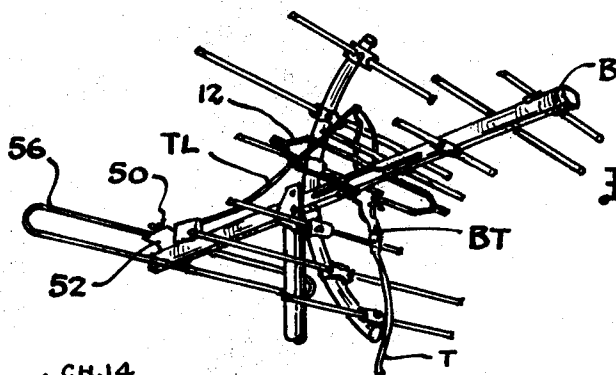


Fig. 10A

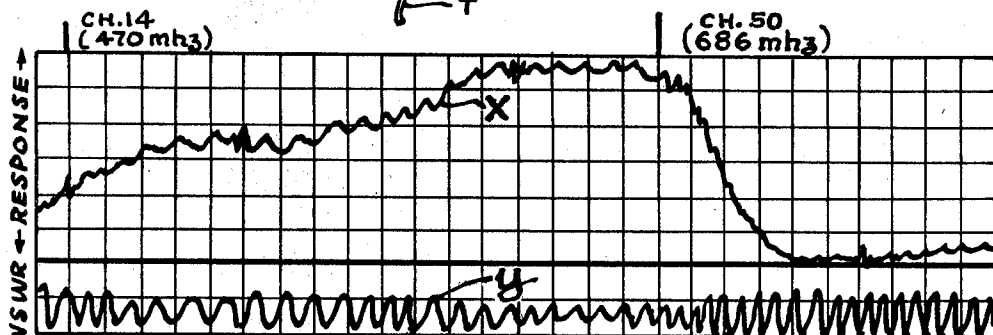


Fig. 10B

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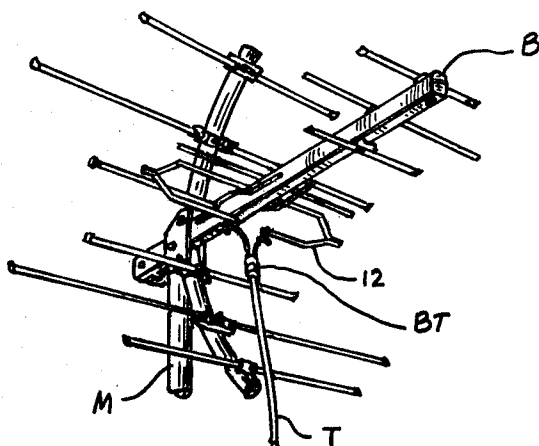


Fig. 11A

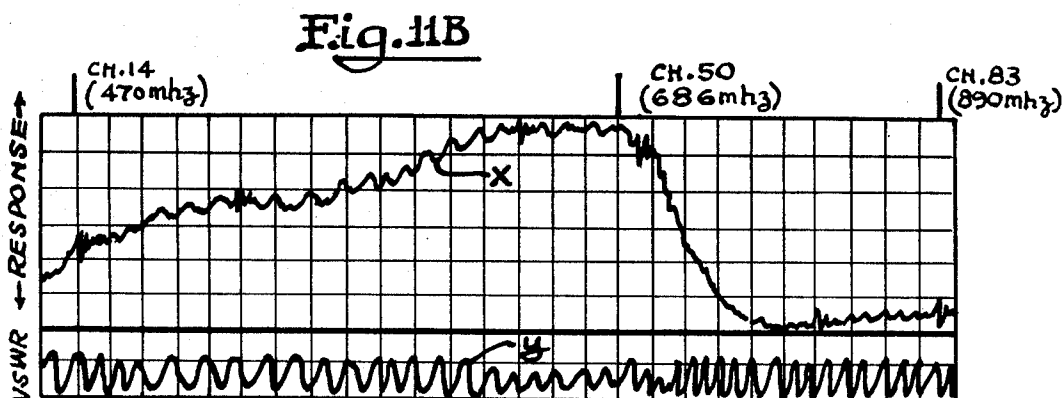


Fig. 11B

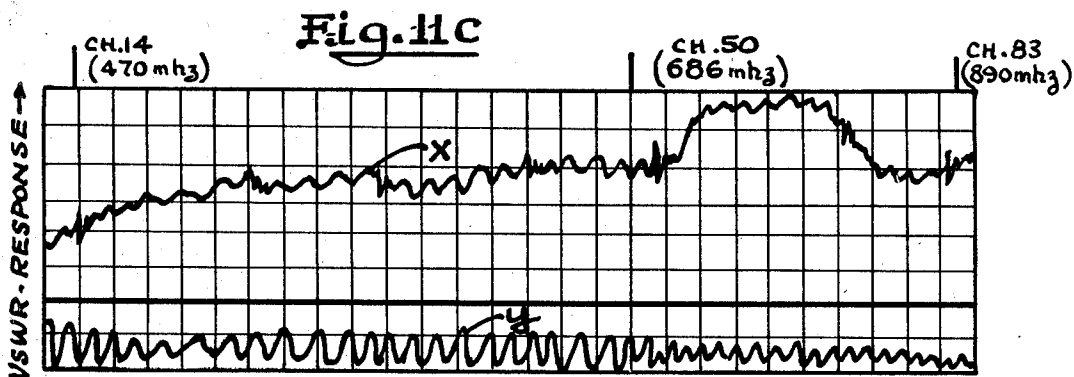


Fig. 11C

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ULTRA HIGH FREQUENCY TELEVISION ANTENNA

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U.S. Cl. 343-802

13 Claims

ABSTRACT OF THE DISCLOSURE

An improved television antenna effective for coverage of the ultra high frequency range and suitable for combining with additional antenna structures covering other frequency ranges such as the very high frequency range. The antenna includes a multi-element reflector system of interspersed half and full wave resonant elements arranged in a paraboloidal-shaped configuration about a split-element folded dipole serving as the collector element, which dipole has tuned feeder stubs associated therewith.

DISCLOSURE

This invention relates in general to television antennas are more particularly to an improved television antenna of the "yagi" class suitable for efficient and effective coverage of the ultra high frequency (UHF) frequency band and which incorporates a plurality of interspersed half and full wave resonant reflector elements above and below a split-element folded dipole with associated feeder stubs serving as the collector elements.

Antennas of the yagi class are of course known in the art. This type of antenna usually employs a single driven element cut to half wave resonance at the desired reference frequency with a series of director elements in line to the front of the driven element and in co-planar relation thereto. One or more reflector elements cut to a frequency lower than the half wave resonance reference frequency are positioned to the rear of the driven element.

Antennas based on the yagi principle, which have proved satisfactory in the very high frequency (VHF) range (channels 2-13), have not proven entirely satisfactory for coverage of the UHF band. This is because they are essentially frequency sensitive to a relatively narrow range. That is, they are effective for reception on one or two television channels. Attempts to widen the bandwidth of the yagi type antenna have usually resulted in a lowering of gain across the increased bandwidth.

Antennas using plane reflectors with "bow tie" or other driven elements located in front of the same have had some measure of success, but their performance (especially sensitivity) have been limited. Parabolic antennas, whether in the form of an imperforate dish or in the form of a dish defined by close spaced conducting rods, are effective in some applications for the UHF frequency range, but for household television receiving use, they are unduly large and expensive.

Moreover, the prior art structures, and especially the parabolic reflector type, must operate as separate and independent structures and are not easily adaptable or integrated into another antenna system such as structures intended for coverage of the VHF frequency ranges. Usually separate down leads or transmission lines must be used for each of the UHF and VHF antenna structures and connected to a coupling apparatus so as to provide the necessary isolation between the respective antenna systems.

An antenna constructed in accordance with the principles of the present invention is not only characterized

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by a relatively high gain across the entire UHF band and a relatively constant 300 ohm impedance match exhibited but also the antenna has a capability of being easily integrated into any other antenna structure effective on other frequency ranges and may be mounted in front of and in coplanar relation therewith without a degradation in performance and with the respective antenna systems interconnected so as to require only one down line. The antenna is also characterized by foldable support arms as well as the associated reflector elements so as to provide a small cross section suitable for convenient shipping in cartons in a manner to minimize the overall volume required.

It is accordingly a general object of the present invention to provide an improved television antenna suitable for use in the UHF frequency range and characterized by high gain and uniform characteristic impedance across the entire band.

An additional object of the present invention is to provide a UHF antenna of the foregoing type which may be easily integrated into other antenna structures operative in the VHF or other frequency ranges to form a single composite structure.

A more particular object of the present invention is to provide an antenna of the foregoing type suitable for coverage of the UHF band which incorporates a plurality of half and full wave resonant reflector elements alternately interspersed along a paraboloidal-shaped support mast extending outwardly above and below the plane of the driven element.

Still another object of the present invention is to provide an improved antenna of the foregoing type which incorporates a split-element folded dipole as the collector element having feeder stubs extending transverse the driven element and connected to one set of terminals so as to provide a relatively low impedance, or R-F short, at frequencies within the UHF band but, at the same time, effect a relatively high impedance, or open circuit, at other frequencies, such as the VHF band.

Yet another object of the present invention is to provide an improved antenna of the foregoing type wherein director elements are utilized with removable end portions so as to be capable of shifting the effective director action as a whole between differing portions of the UHF frequency band.

The novel features which are believed to be characteristic of the present invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a view in perspective of an antenna which has been constructed in accordance with the present invention;

FIG. 2 is a view in side elevation of the antenna as shown in FIG. 1;

FIG. 3 is a view in perspective of the split-element folded dipole and associated feeder stubs;

FIG. 4 is a view in side elevation of one of the feeder stubs connected to the split-element dipole driven element of FIG. 3;

FIG. 5 is a view in side elevation of another embodiment of the present invention;

FIG. 6 is a view in side elevation of still another embodiment of the present invention;

FIG. 7 is a schematic representation of a portion of the reflector system of the embodiment as shown in FIG. 5;

FIG. 8 is a plan view of one of the unitary director elements;

FIG. 9(a) is a view in perspective of the antenna structure as shown in FIG. 6 with a section of twin lead transmission line connected to the split-element dipole driven element at one end but open-circuited at the other end.

FIG. 9(b) is a graphic representation of the bandpass, gain and impedance characteristics of the antenna as shown in FIG. 9(a);

FIG. 10(a) is a view in perspective of the antenna as shown in FIG. 6 with a section of twin lead transmission line interconnecting the split-element dipole and a folded dipole operative in the VHF band positioned to the rear thereof;

FIG. 10(b) is a graphic representation of the bandpass, gain and impedance characteristics of the antenna as shown in FIG. 10(a);

FIG. 11(a) is a view in perspective of the antenna as shown in FIG. 6;

FIG. 11(b) is a graphic representation of the response, gain and impedance characteristics of the antenna of FIG. 11(a) as obtained with director elements cut to approximately $7\frac{1}{4}$ inches in length; and

FIG. 11(c) is a graphic representation of the response, gain and impedance characteristics obtained for the antenna as shown in FIG. 11(a) with director elements cut to approximately $5\frac{1}{4}$ inches in length.

Referring now to the drawings, a television antenna 10 is shown in FIG. 1 which has been constructed in accordance with the present invention. The antenna 10 is supported on a vertical support mast M, to which a horizontal cross-arm boom B is affixed. The boom B is supported on the mast M by suitable means, such as the U-bolt assembly U. The driven element of the antenna array 10 is indicated generally at 12. As best seen in FIG. 3, it is in the form of a split-element folded dipole formed of conductive material, preferably of aluminum. Upper dipole arms are indicated at 12a. The inboard ends thereof identified as 12e are secured to a conventional support saddle bracket not shown by any suitable means, such as machine screws or rivets passing through clearance holes provided in the bracket and dipole arms. The lower dipole arms of the collector element 12 are indicated at 12b and form connecting terminals 12d at their inboard ends, as indicated. The saddle bracket is formed of a suitable insulating material and is affixed to the boom B by suitable fastening means, such as a machine screw or rivet passing through clearance holes provided therein.

As indicated, the split-element folded dipole 12 extends an equal distance above and below the boom B. Terminals 12d form the connecting points to which the transmission line T (FIGS. 9-11) is to be connected and leads to the television receiver set (not shown).

The driven element 12 is in the form of a folded dipole effective at UHF frequencies, as will hereinafter be described, and thus has a characteristic impedance of approximately 280 ohms to closely match the nominal 300 ohm conventional twin-lead transmission line. In the preferred form, the driven element 12 is shown in FIG. 3 has a total span of approximately $11\frac{1}{4}$ inches in the horizontal direction and approximately 2 inches in the vertical direction. Driven element 12 is preferably constructed from flat metal strip stock formed in the configuration illustrated in FIG. 3, although it is to be understood that other configurations may be employed if so desired. As shown in FIG. 3, four metal strips are employed with the outboard ends of the pairs of dipole arms 12a and 12b secured together, such as by rivets 12r. The inboard ends form terminals 12e and 12d as previously described. The split-element dipole 12 so formed may also be descriptively referred to as a "tetrapole."

A pair of feeder stubs 20 are connected at each of the upper terminals 12e at the inboard ends of the upper dipole arms 12a. In the preferred form, the stubs are constructed from similar flat metal strip stock and which

extend normal to the vertical plane of the driven element 12 to the front and rear thereof but in a parallel spaced relation on either side of the support boom B.

As best seen in FIG. 4, each of the feeder stubs 20 include a forward section or portion 20a, a rear portion 20b and a central portion 20c. The off-set central portion 20c is provided so as to position the portions 20a and 20b at approximately the center of the support boom B and thereby minimize the possibility of the stubs 20 from physically contacting any of the unitary director elements as will be hereinafter described. Preferably, stubs 20 extend approximately 4 inches to the rear of collector element, portion 20b, and approximately 3 inches in to the front, portion 20a. It is to be understood, however, that these particular dimensions are not to be considered critical in any way and reasonable departure may be employed, if so desired.

The antenna of FIGS. 1 and 2 further includes a pair of support arms 30a and 30b extending above and below the support boom B in the manner indicated. Support arms 30a and 30b are constructed in an essentially paraboloidal-shaped configuration about the driven element 12. In the embodiment shown in FIGS. 1 and 2, the radius of curvature is approximately 15 inches, although other radii may be incorporated without departing from the true scope and spirit of the present invention.

As also shown in FIGS. 1 and 2, a series of reflector elements are mounted on the support arms 30a and 30b. For this embodiment, the reflector elements are indicated at 32a through 32h inclusive, and at 34a through 34f, inclusive. Reflector elements 32a-32h are of the unitary type and are mounted on the support arms 30a and 30b by associated spring saddle brackets 36 constructed of a suitable conducting material. As will also be hereinafter described, unitary reflector elements 32a-32h may be cut to exhibit half to full wave resonance at a reference frequency slightly below the lower end of the UHF band. Preferably they are cut to provide essentially half wave resonance. Reflector elements 34a-34f are of the dipole type and are supported on the support arms 30a and 30b by suitable support saddle brackets 38 formed of insulating material. Reflector elements 34a-34f are of the dipole type and preferably of a length to provide full wave resonance at the aforesaid reference frequency below the UHF band.

As will be seen, a series of director elements are mounted on the support boom B to the front of collector element 12. The director elements are indicated at 40a through 40c, inclusive, and at 42a through 42j inclusive. Director element 42a-42j preferably are of the unitary type and elements 40a-40c of the split dipole type. As shown, director elements are also preferably mounted above and below the boom B on an alternate basis.

It is of course to be understood that other embodiments of the present invention may be effected without departing from the true scope and spirit thereof. Two other embodiments by way of example are shown in FIGS. 5 and 6, respectively, although others may be readily visualized.

FIG. 5 shows an embodiment wherein unitary reflector elements 32a through 32f are provided interspersed with dipole reflector elements 34a through 34d. That is, unitary elements 32g and 32h have been eliminated in this embodiment as well as dipole reflector elements 34e and 34f. Also, in this embodiment, unitary director elements 42a through 42d are utilized with the dipole director elements 40a through 40c. Director elements 40e through 40j being eliminated. It will of course be appreciated that the gain characteristics of the embodiment of FIG. 5 is somewhat reduced as compared with the antenna structure depicted in FIGS. 1 and 2.

FIG. 6 illustrates still another embodiment of the present invention wherein only unitary reflector elements 32a through 32d are utilized along with the dipole reflector

elements 34a and 34b. Also in this embodiment, only the director elements 40a, 40b, 42a and 42b are employed. As may be expected, the gain characteristics of this antenna structure is somewhat reduced as compared with the other embodiments as shown in FIGS. 1 and 2 or FIG. 5. The embodiment of FIG. 6 is also shown in perspective in FIGS. 9a and 11a. A schematic representation of a portion of the reflector system of the embodiment of FIG. 5 is shown in FIG. 7.

The above description gives the general organization of the antennas as shown in the drawings. A more specific construction will be better understood by reference to the following dimensions which were used in antennas that were found highly effective in the UHF frequency band:

	Inches
Length of unitary reflector elements 32a-32h	15
Length (tip-to-tip) of dipole reflector elements 34a-34f	25
Length of unitary director elements 42a-42j	7¼
Length (tip-to-tip) of dipole director elements 40a-40c	10¾
Vertical distance from center of boom B to center of reflector element:	
32a or 32b	2¼
34a or 34b	5¾
32c or 32d	9½
34c or 34d	13
32e or 32f	15½
34e or 34f	18½
32g or 32h	22
Horizontal distance between centers of reflector elements:	
32a/32b and 34a/34b	2
34a/34b and 32c/32d	2¼
32c/32d and 34c/34d	3
34c/34d and 32e/32f	4½
32e/32f and 34e/34f	5½
34e/34f and 32g/32h	6½
Horizontal distance between center of support arms 30a-30b and driven element 12	5
Horizontal distance between:	
Center of driven element 12 and dipole director element 40a	1½
Director elements 40a and 42a	2¾
Director elements 42a and 40b	2¾
Director elements 40b and 42b	5
Director elements 42b and 40c	5½
Director elements 40c and 42c	5½
Director elements 42c and 42d	5½
Director elements 42d and 42e	5½
Director elements 42e and 42f	5½
Director elements 42f and 42g	5½
Director elements 42g and 42h	6
Director elements 42h and 42i	6¼
Director elements 42i and 42j	6¼

The dimensions between the various elements of the embodiments of FIGS. 5 and 6 are the same as above for those elements incorporated therein.

FUNCTIONAL CONSIDERATIONS

In each of the illustrated embodiments, the split-element folded dipole 12 serves as the collector element in the antenna array. As mentioned previously, the folded dipole element 12 exhibits a characteristic impedance of approximately 280 ohms for an effective impedance match to the nominal 300 ohm transmission line and associated television receiver set. The lower inboard ends 12d serve as a convenient terminal connection point for the down line T. As will be observed, the dipole element 12 is approximately half wave resonant at the lower end of the UHF band (470 MHz) and three-quarter to full wave resonant at the upper end of the UHF band (890 MHz).

The dipole 12 differs from the conventional folded

dipole in that the upper dipole arms 12a are not continuous but split to form separate inboard ends. However, with the feeder stubs 20 mounted at the inboard ends of the upper dipole arms 12a as previously described, a low impedance, or R-F short, is presented across these ends at frequencies within the UHF frequency band. As a result, driven element 12 serves as a folded dipole in the conventional sense for this frequency range with signals being fed across the gap at the inboard ends of dipole arms 12a without any substantial effect. At frequencies below the UHF range, however, the R-F short between dipole arms 12a is no longer present and a high impedance (open circuit) is effected. With this result it will be understood that the antenna constructed in accordance with the present invention will operate effectively on frequencies within the UHF band and at the same time permit signals within the VHF band or other frequencies from a separate antenna structure to be coupled to the inboard ends of dipole arms 12a, and therethrough to the terminal connection points 12d to the down lead T. No adverse effect is encountered for either the signals in the VHF or UHF bands and signals in both bands are coupled to but one down line without an intervening coupling apparatus being required.

This effect may be more fully appreciated by reference to FIGS. 9 and 10. FIG. 9a shows the embodiment of the antenna of FIG. 6 with a down line T connected through a balun transformer BT to the terminal connection points 12d at the inboard ends of the lower dipole arms 12b of driven element 12. The balun transformer effects the proper impedance match between the nominal 72 ohm coaxial cable employed and the approximately 300 ohms of the driven element 12. A section of twin-lead line TL is connected between the connection points 12e at the inboard ends of upper dipole arms 12a and a pair of terminals 50 on an insulating support bracket 52 mounted to the rear on boom B as shown. Terminals 50 are electrically isolated from each other and from the boom so that an open circuit, D-C wise, is maintained across the inboard ends of dipole arms 12a. FIG. 9b is a graphic illustration of the oscilloscope traces as obtained from the antenna structure shown in FIG. 9a. Observations were accomplished by the use of a dual trace oscilloscope connected by the transmission line T to the driven element 12 and set to sweep the UHF band. A crystal marker generator was employed to provide visual indication of set reference frequencies, such as those indicated for channels 14 and 83. One trace (curve X) provided an indication of the response characteristics of the antenna structure and the second trace (curve Y) the VSWR as an indication of the impedance match between the antenna and transmission line T. It should be noted that in the antenna structure shown in FIG. 9a, the director elements 42a-42j were cut to lengths of approximately 7¼ inches and elements 40a-40c to approximately 10¾ inches to provide the maximum director action in the middle of the UHF band. Increased response at the high end of the UHF band may be obtained by means which will be subsequently described.

In any event, it will be seen that the antenna as shown in FIG. 9a is effective for the reception of signals within the UHF band even though there is no direct electrical connection between the inboard ends of dipole arms 12a. The same is shown in FIG. 11a and the graphic illustration of the oscilloscope traces depicted in FIG. 11b. The only difference is that the section of twin-lead line TL is not present. The response characteristics as depicted in FIGS. 9b and 11b are seen to be essentially identical.

In the configuration as shown in FIG. 10a, a folded dipole 56 is mounted on the bracket 52 with the feed points of the dipole 56 corresponding to the terminal points 50 of bracket 52. In all other respects, the antenna structure of FIGS. 9a and 10a are identical. The graphic

illustration of the response obtained from the antenna structure of FIG. 10a is seen to be essentially identical with that obtained for the antenna structure of FIG. 9a, notwithstanding the fact that signals in the VHF band are being simultaneously fed through driven element 12 from dipole element 56 to the connection points 12d.

It should be understood that it is possible to use other stub configurations without departing from the scope and spirit of the present invention. Feeder stubs 20 of various lengths were employed and, in some instances, connected to extend outwardly only from one side of the driven element 12 with satisfactory results being obtained. However, in the latter case, a somewhat frequency sensitive condition was observed. Accordingly, the most efficient operation was found to be the center-tapped arrangement (best seen in FIG. 4), with the dimensions as described above. That is, an overall length of approximately 7 inches, with a 4 inch portion in one direction and a 3 inch portion in the other direction.

As previously described, the reflector elements 32a-32h and 34a-34f (for the embodiment as shown in FIGS. 1 and 2) are positioned transverse the support arms 30a and 30b formed in a paraboloidal-shaped configuration. Such an arrangement increases the response of the antenna at the low end of the UHF band by effecting a substantial increase in the vertical capture area. A focusing effect is seen to be present for the reflected energy about the driven element 12. However, it has been found that for optimum performance the reflector system should comprise half wave resonant unitary elements alternately interspersed with full wave dipole reflector elements. This can be more clearly seen in FIGS. 1 and 7. By "resonant" it is meant that the reflector elements exhibit a half wave or full wave resonance at a frequency slightly below the lower end of the UHF band, 470 mHz.

With the interspersing of the unitary half wave and full wave dipole reflector elements at selected spacings along the paraboloidal-shaped support mast, the current fields are all effectively in phase as illustrated in FIG. 7, whereby maximum signal energy is concentrated on the collector element 12. The current fields developed by the unitary director elements 32 and the dipole director elements 34 are interlaced for uniformity in the resultant magnetic screen. That is, the maximum field developed by the unitary elements 32 are positioned to correspond to the minimum field developed by the adjacent dipole elements 34 at their center. Conversely, the maximum field developed at the center of each of the dipole arms of the elements 34 are positioned at the low points of the field developed by the unitary elements 32 at respective outboard ends thereof. Using all half wave elements aligned along a common axis, or all full wave dipole elements, does not provide the foregoing operational feature of interlaced magnetic fields. There will either be cancellations in these fields or gaps in the resultant screen, such as in the center thereof if all full wave dipoles are employed, or at the outer ends if all unitary elements are employed. In either of these two instances, there would be a resulting loss of potential gain for the antenna structure.

Another feature of the present invention is the provision of increasing the response of the antenna structure at the high end of the UHF band. As previously described, the director elements 40a-40c are initially provided with an overall length of approximately 10¾ inches and the director elements 42a-42j of approximately 7¼ inches, which have been found to be effective in providing director action optimized for the middle of the UHF band. Each of the director elements 40a-40c and 42a-42j include end portions of a predetermined length which may be conveniently removed therefrom to shift the effective direction action toward the high end of the UHF band. As shown in FIG. 8, each of the director elements 42a-42j include end portions 43 of approximately one inch in length. These end portions are conveniently and

easily removable from the main body of the director elements by simply flexing them causing a separation along the pre-scored line indicated at 43a. Dipole director elements 40a-40c include similar prescored end portions of approximately one-half inch, which when snapped off, reduces the overall length thereof to approximately 9¾ inches. Removal of the end portions 43 reduces the overall length of the director elements 42a-42j to approximately 5¼ inches.

This shifting of the effective director action may be more fully appreciated by reference to FIGS. 11a-11c. FIG. 11a shows the antenna structure of FIG. 6. A graphic illustration of the response obtained from the antenna with the full 7¼ and 10¾ inch director elements is depicted in FIG. 11b, which represents the traces observed on the dual trace oscilloscope. The response obtained from the antenna with the director elements 42a-42j reduced to the 5¼ inch overall length and the director elements 40a-40c to the 9¾ inch overall length is depicted in FIG. 11c. The increased response of the latter at the high end of the UHF band is readily apparent.

While only certain specific embodiments are shown and described herein for the present invention, it will, of course, be understood that various modifications and alternative constructions may be made without departing from the true scope and spirit thereof. The appended claims are thus intended to cover all such modifications and alternative constructions as fall within their true scope and spirit.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A television antenna effective for the reception of signals in the UHF frequency band and suitable for combining with additional antenna structures covering other frequency bands without impairment of operation, comprising in combination:

a horizontal support boom having a longitudinal axis; a split-element folded dipole mounted on said boom transverse to said longitudinal axis and having upper and lower dipole arms, said split-element dipole having pairs of connecting terminals at the inboard ends of both the upper and lower dipole arms with said lower connecting terminals at the inboard ends of said lower dipole arms forming the coupling points for connecting a transmission down-line thereto;

a pair of feeder stubs connected to said upper connecting terminals, respectively, at the inboard ends of said upper dipole arms and extending parallel to said longitudinal axis along each side of said horizontal boom, said feeder stubs effecting a substantially low impedance across said upper connecting terminals for signals at frequencies within said UHF frequency band and substantially a high impedance for signals at frequencies therebelow;

a multi-element reflector system, said reflector system including a pair of vertical support masts arranged end-to-end in a paraboloidal shaped configuration about said split-element dipole above and below the horizontal boom and a plurality of reflector elements arranged transverse said vertical support masts and supported thereon, said reflector elements exhibiting half to full wave resonance at a reference frequency slightly below the lower end of the UHF frequency band and having progressively increased spacings between adjacent reflector elements extending along a line from said horizontal boom outwardly along each of said vertical support masts; and

a plurality of director elements positioned in front of said split-element dipole and mounted on said horizontal support boom transverse said longitudinal axis.

2. An antenna in accordance with claim 1 wherein the split-element dipole exhibits approximately half wave resonance at the lower end of the UHF frequency band and three-quarter to full wave resonance at approximately the upper end of said UHF frequency band.

3. An antenna in accordance with claim 1 wherein each of the pair of feeder stubs includes a first portion extending forwardly of the split-element dipole of approximately three inches in length and a second portion extending rearwardly of the split-element dipole of approximately four inches in length.

4. An antenna in accordance with claim 1 wherein the upper connecting terminals at the inboard ends of the upper dipole arms of the split-element dipole form the connecting points for coupling signals thereto from additional antenna structure covering frequency bands other than the UHF band.

5. An antenna in accordance with claim 1 suitable for mounting in front of additional antenna structure covering the VHF frequency range and having said upper connecting terminals at the inboard ends of said upper dipole arms connected to the transmission feeder line of said other additional antenna structure whereby signals therefrom are coupled to said lower connecting terminals at the inboard ends of said lower dipole arms.

6. An antenna in accordance with claim 1 wherein the reflector system includes a plurality of half and full wave resonant reflector elements alternately interspersed along the vertical support masts.

7. An antenna in accordance with claim 1 wherein the multi-element reflector system includes a plurality of unitary half wave resonant elements alternately interspersed with a plurality of dipole full wave resonant elements mounted transversely of and supported on the paraboloidal shaped vertical support masts.

8. An antenna in accordance with claim 1 wherein the multi-element reflector system includes a plurality of unitary reflector elements each approximately 15 inches in length supported directly on the paraboloidal shaped vertical support masts and a plurality of dipole reflector elements having respective dipole arms insulatively supported on said vertical support masts and alternately interspersed with said unitary reflector elements, said dipole reflector elements each having a total span of approximately 25 inches.

9. An antenna in accordance with claim 1 wherein the plurality of director elements are alternately mounted above and below the horizontal support boom along the longitudinal axis thereof.

10. An antenna in accordance with claim 1 wherein each of the plurality of director elements is of a length to provide maximum director action at frequencies in the central portion of the UHF band and wherein each of said plurality of director elements includes an end portion at each end prescored at predetermined lengths therealong which may be snapped off by flexure of said end portions to provide a resultant length effective for maximum director action at frequencies at the high end of the UHF band, when so desired.

11. A collector element for an antenna operative in one frequency band and capable of coupling signals from an additional antenna structure operative in another lower

frequency band, without impairment of operation, comprising in combination:

a split-element folded dipole, said split-element dipole having a pair of upper dipole arms defining connecting terminals at the inboard ends thereof and a pair of lower dipole arms defining other and additional connecting terminals at the inboard ends thereof, said last named connecting terminals forming the feeder points at which an associated transmission downline may be connected; and

means for effecting a low impedance across the upper connecting terminals for frequencies within said one frequency band and a substantially high impedance thereacross at frequencies in said other lower frequency band, said means including a pair of feeder stubs connected to said upper connecting terminals, respectively, at the inboard ends of said upper dipole arms, said feeder stubs extending outwardly normal to said split-element dipole and parallel to one another.

12. A multi-element reflector system for an antenna structure intended for the reception of signals within a given band of frequencies, comprising in combination:

a vertical support mast having a paraboloidal shaped configuration;

a plurality of unitary reflector elements arranged transverse said vertical support mast and directly supported thereon, each being of a length to provide half wave resonance at a reference frequency slightly below said given band of frequencies; and

a plurality of dipole reflector elements arranged transverse said vertical support mast and having dipole arms insulatively supported thereon, said dipole reflector elements being alternately interspersed with said unitary reflector elements, each of said dipole reflector elements having a total span effective to provide full wave resonance at said reference frequency slightly below said given band of frequencies.

13. A multi-element reflector system in accordance with claim 12 wherein the spacings between adjacent reflector elements increase progressively along a line from the central portion of said vertical support mast to the respective ends thereof.

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