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BROADBAND U.H.F.-V.H.F. TELEVISION ANTENNA

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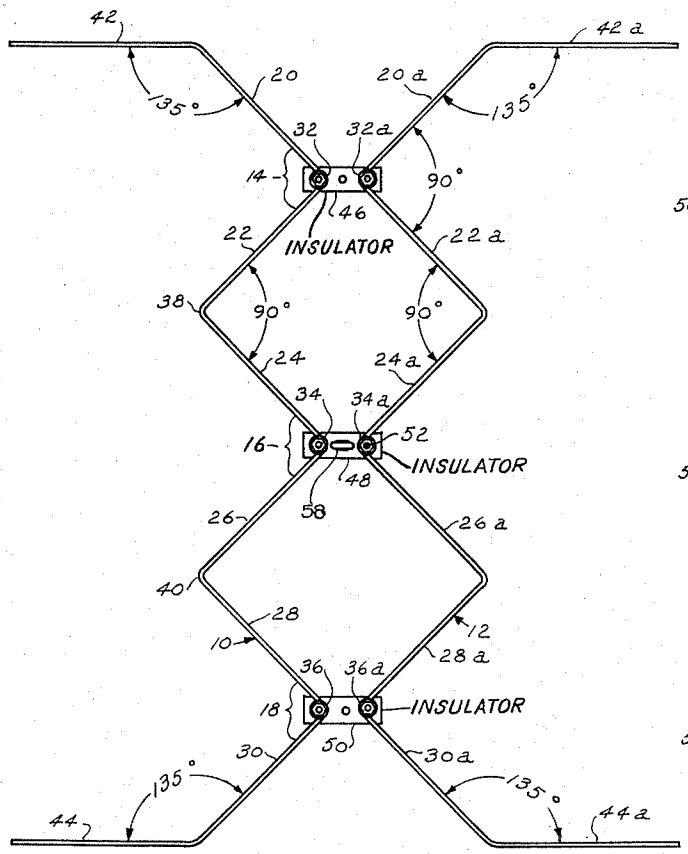

Fig 1

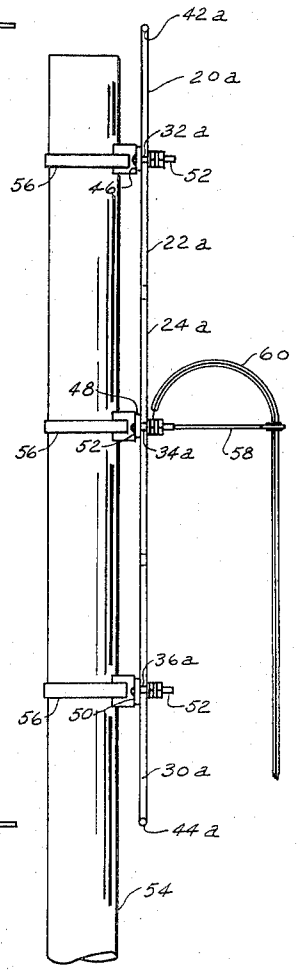

Fig 2

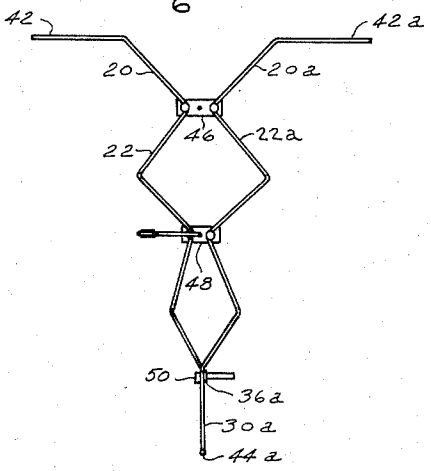

Fig 3

INVENTOR.
Doyt R. Hoverman
BY
Gust & Orish
Attorneys

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BROADBAND U.H.F.-V.H.F. TELEVISION ANTENNA

Doyt R. Hoverman, Van Wert, Ohio

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The present invention relates to a television-receiving antenna, and more particularly to a unitary antenna structure having broad frequency response in both the UHF and VHF television spectra.

Commercial television signals are telecast in the frequency spectra normally characterized as "very high frequency" and "ultra high frequency," respectively. These spectra are commonly referred to in abbreviated form as "VHF" and "UHF." The VHF spectrum extends between 54 to 88 and 174 to 216 megacycles, and the UHF spectrum extends from 470 to 890 megacycles.

Because of the extensive separation between the UHF and VHF spectra, it is normally considered impossible to utilize a receiving antenna designed for one spectrum in another. In other words, an antenna designed for use in the UHF spectrum is inoperative in the VHF spectrum in areas which are not completely saturated with television signal. This separation and operation of such antennas is particularly true in the so-called television fringe areas.

In adapting television receivers for receiving both UHF and VHF stations, two separate antennas normally are used, one being particularly designed for UHF reception and the other for VHF.

The antenna of the present invention overcomes this requirement of two, discrete antenna installations for both of UHF and VHF reception by providing a single and uniquely simple structure which is capable of receiving signals over relatively wide portions of both spectra.

It is therefore an object of this invention to provide a single antenna construction capable of receiving signals in both the UHF and VHF spectra.

It is another object of this invention to provide a combination UHF–VHF antenna having broadband characteristics in both the UHF and VHF spectra.

It is still another object of this invention to provide, in a single construction, an antenna of simple and lightweight design which is capable of receiving signals in both the UHF and VHF spectra.

It is still another object of this invention to provide a combination UHF and VHF antenna which is bidirectional.

Yet another object is to provide a combination UHF and VHF antenna which is omnidirectional.

Other objects will become apparent as the description proceeds.

To the accomplishment of the above and related objects, my invention may be embodied in the forms illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that specific change may be made in the specific constructions illustrated and described, so long as the scope of the appended claims is not violated.

In the drawings:

Fig. 1 is a front elevation of one embodiment of this invention;

Fig. 2 is a side elevation of the antenna of Fig. 1, shown as being installed on a mast or pipe; and

Fig. 3 is an elevation of another embodiment of this invention.

Referring to the drawings, and more particularly to Figs. 1 and 2, the antenna comprises two elongated, metallic rod or wire-like members **10** and **12** which constitute essentially the only operating elements in the antenna. Since these two members or antenna sections **10** and **12** are substantially identical, the description of one will suffice for both.

Each antenna section or wire-like member **10**, **12** is bent into a series of V-shaped elements, as indicated respectively by the reference numerals **14**, **16** and **18**. Each of these V-shaped elements **14**, **16**, **18** have outwardly extending legs **20**, **22**, **24**, **26**, **28** and **30**, which are joined together, end-to-end, to provide three apices **32**, **34** and **36** along one side and two apices **38** and **40** along the other side. The apices **32**, **34** and **36** are disposed along a substantially straight imaginary line, as are the two apices **38** and **40** along another substantially straight imaginary line, these two imaginary lines being substantially parallel. On the extremities of the two endmost legs **20** and **30** are formed or integrally connected two substantially straight extensions **42** and **44**, these extensions being at substantially right angles to the two imaginary lines just described and, further, extending at obtuse angles with respect to the respective legs **20** and **30**.

As shown in Fig. 1, the two antenna sections **10** and **12** are assembled in substantial parallelism and in a common plane. Further, the end extensions **42**, **44** are disposed to project oppositely to the end extensions **42***a* and **44***a*, respectively, the letter suffixes on the reference numerals indicating the same element on the antenna section **12** as appears on the antenna section **10** which bears the same numeral. Further, these sections **10** and **12** are positioned with the respective apices **32**, **34** and **36** juxtaposed and spaced from the respective apices **32***a*, **34***a* and **36***a*.

Three bar-like insulators formed of Plexiglas or polystyrene, **46**, **48** and **50**, are fastened to the respective pairs of apices **32**, **32***a* through **36**, **36***a*. Any suitable fastening means may be used, suitable bolts, nuts and washers, as indicated by the reference numeral **52**, being illustrated. Each individual apex **32** through **36** is clamped into a conformed groove in the insulator under the head of the bolt **52**, the bolt passing through the insulator and receiving on the other side a nut and washer. By means of this fastening, the two antenna sections **10** and **12** are secured in assembled relation, but are electrically insulated from each other.

As shown in Fig. 2, the antenna may be mounted on a pole or mast **54**. Any suitable fastening means may be used, the one illustrated comprising the usual strap metal clamping band, as indicated by the numerals **56**, these clamping bands being securely fastened to the respective insulators **46**, **48** and **50** by means of suitable screws which pass through center openings in the insulators. The screw used for fastening the insulator **48** to its clamping band **56** may consist of the usual transmission line "stand-off" rod or bar **58**, a conventional transmission line of the ribbon or ovular type, as indicated by numeral **60**, being held in place by the "stand-off" bar. The transmission line **60** is further provided with an inverted loop and connected at its ends to the two bolts **52** which pass through the insulator **48** whereby a conductive connection may be made to the two antenna sections **10** and **12** through the respective apices **34** and **34***a*.

Experimentation has revealed that broadband operating characteristics for the reception of both UHF and VHF

television stations are achieved when the angles of all the apices 32 through 40 are substantially ninety degrees (90°) while the lengths of the legs 20 through 30 and the extensions 42 and 44 are substantially seven inches (7"). When constructed according to these dimensions, the antenna exhibits good performance even in class B fringe areas for channels 2 through 7 in the VHF spectrum and channels 14 through 35 in the UHF spectrum. The antenna is bidirectional at right angles to the plane thereof, and it is installed in an upright position as shown in Fig. 2; that is, with the extensions 42, 42*a*, 44 and 44*a* extending horizontally.

While the angle of the individual apices 32 through 40 may be something other than ninety degrees (90°), experiments have shown that either enlarging or reducing the size of the angle affects the frequency response, causing the antenna to resonate at other points in the frequency spectra. If these angles are made too large or too small, the antenna becomes inoperative.

The length of the rod or wire-like member forming the antenna section 10 or 12 is selected to be equal to or correspond to a quarter wavelength at a frequency lying in the VHF spectrum. The lengths of the individual legs 20 through 30 and extensions 42, 42*a*, 44 and 44*a* are selected to be equal to or correspond to a quarter wavelength at a frequency lying in the UHF spectrum. Thus, the antenna may be optimized for use in connection with any selected series of television stations lying in both the UHF and VHF spectra.

The antenna of Figs. 1 and 2, with only a slight sacrifice in gain, may be easily converted into an omnidirectional antenna by providing a ninety degree (90°) longitudinal twist in the arrangement of Fig. 1 and as more clearly shown in Fig. 3. In this arrangement, the extensions 42, 42*a* are at right angles to the extensions 44, 44*a*, with the intermediate portions of the antenna being at different angles according to the progressive twist imparted thereto proceeding from one antenna end to the other.

From the foregoing, it will be appreciated that this invention provides either a bidirectional or omnidirectional antenna which may be used to receive both UHF and VHF television stations. Furthermore, since this antenna has such broad frequency response, it is particularly adapted to receive color television signals.

In the specific embodiment of the invention already mentioned, the following materials and dimensions may be used, it being understood that by giving this example the scope of the invention is not to be limited thereto but shall be determined by the coverage of the claims appended hereto.

Antenna sections 10, 12—No. 9 hardened aluminum wire
Insulators 46, 48, 50—Plexiglas or polystyrene, 2½ inches by ⅝ inch by ¼ inch with the two holes for the bolts 52 being spaced ⅞ inch each side of the center
Transmission line 60—270-ohm or 300-ohm ovular or ribbon-type transmission line.

What is claimed is:

1. A broadband UHF–VHF antenna comprising two side-by-side, coplanar, metallic antenna sections formed of rod-like material, said two sections being of substantially identical configuration; each section comprising three series-connected V-shaped elements arranged in end-to-end relation thereby providing three, spaced-apart apices along one side and two spaced apart apices along the other side, said three apices being disposed on a first imaginary substantially straight line, said two apices being disposed on a second imaginary substantially straight line which is substantially parallel to said first straight line, two parallel straight extensions integrally connected to the extremities of the two endmost V-shaped elements, respectively, and extending away from both of said imaginary lines, the angles separating the V-shaped elements and the angles in the V-shaped elements themselves being substantially ninety degrees, the angle between said extensions and said second imaginary line being substantially ninety degrees; said two antenna sections being spaced apart in parallelism with the three apices thereof being respectively juxtaposed and lying on respective lines at right angles with respect to said imaginary lines, thereby providing three pairs of adjacent but spaced apart apices, three spaced apart bar-like insulators, said three pairs of apices being secured to said three insulators respectively; the legs of said V-shaped elements and said extensions being approximately seven inches long, and two terminals connected to the intermediate pair of apices for attaching a dual conductor transmission line thereto.

2. A broadband UHF–VHF antenna comprising two side-by-side, coplanar, metallic antenna sections formed of rod-like material, said two sections being of substantially identical configuration; each section comprising three series-connected V-shaped elements arranged in end-to-end relation thereby providing three, spaced-apart apices along one side and two spaced apart apices along the other side, said three apices being disposed on a first imaginary substantially straight line, said two apices being disposed on a second imaginary substantially straight line which is substantially parallel to said first straight line, two parallel straight extensions integrally connected to the extremities of the two endmost V-shaped elements, respectively, and extending away from both of said imaginary lines, said two antenna sections being spaced apart in parallelism with the three apices thereof being respectively juxtaposed and lying on respective lines at right angles with respect to said imaginary lines, thereby providing three pairs of adjacent but spaced apart apices, three spaced apart bar-like insulators, said three pairs of apices being secured to said three insulators respectively; and two terminals connected to the intermediate pair of apices for attaching a dual conductor transmission line thereto.

3. A broadband UHF–VHF antenna comprising two side-by-side, coplanar, metallic antenna sections formed of rod-like material, said two sections being of substantially identical configuration; each section comprising three series-connected V-shaped elements arranged in end-to-end relation, each element having two legs, the ends of the legs of the intermediate element being integrally connected to the adjacent legs of the end elements respectively, thereby providing three apices along one side and two apices along the other side, said three apices being disposed on a first imaginary substantially straight line, said two apices being disposed on a second imaginary substantially straight line which is substantially parallel to said first straight line, two parallel straight extensions integrally connected to the extremities of the two endmost V-shaped elements, respectively, and extending away from both of said imaginary lines, said two antenna sections being spaced apart in parallelism with the three apices thereof being respectively juxtaposed and lying on respective lines at right angles with respect to said imaginary lines, thereby providing three pairs of adjacent but spaced apart apices, three spaced apart bar-like insulators, said three pairs of apices being secured to said three insulators respectively; and two terminals connected to the intermediate pair of apices for attaching a dual conductor transmission line thereto.

4. A broadband UHF–VHF antenna comprising two side-by-side, coplanar, metallic antenna sections formed of rod-like material, said two sections being of substantially identical configuration; each section comprising three series-connected V-shaped elements arranged in end-to-end relation thereby providing three, spaced apart apices along one side and two spaced apart apices along the other side, said three apices being disposed on a first imaginary substantially straight line, said two apices being disposed on a second imaginary substantially straight line which is substantially parallel to said first straight

line, two parallel straight extensions integrally connected to the extremities of the two endmost V-shaped elements, respectively, and extending away from both of said imaginary lines, said two antenna sections being spaced apart in parallelism with the three apices thereof being respectively juxtaposed thereby providing three pairs of adjacent but spaced apart apices, three spaced apart bar-like insulators, said three pairs of apices being secured to said three insulators respectively; and two terminals connected to the intermediate pair of apices for attaching a dual conductor transmission line thereto.

5. The antenna of claim 2 but progressively twisted longitudinally ninety degrees whereby said extensions at one end of the antenna are disposed at right angles to the extensions at the other antenna end.

6. A broadband UHF–VHF antenna comprising two side-by-side, coplanar, metallic antenna sections formed of rod-like material, said two sections being of substantially identical configuration; each section comprising three series-connected V-shaped elements arranged in end-to-end relation thereby providing three, spaced-apart apices along one side and two spaced apart apices along the other side, two parallel straight extensions integrally connected to the extremities of the outer legs of the two endmost V-shaped elements, respectively, said extensions being set at obtuse angles with the respective legs; said two antenna sections being spaced apart in parallelism with the three apices thereby being respectively juxtaposed thereby providing three pairs of adjacent but spaced apart apices, three spaced apart bar-like insulators, said three pairs of apices being secured to said three insulators respectively, and two terminals connected to the intermediate pair of apices for attaching a dual conductor transmission line thereto.

7. The antenna of claim 6 wherein the lengths of the legs of the V-shaped elements are substantially equal and correspond to a quarter of a wavelength at a frequency lying in the UHF spectrum, and the length of each antenna section corresponds to a quarter of a wavelength at a frequency lying in the VHF spectrum.

8. A broadband UHF–VHF antenna comprising two side-by-side, coplanar, metallic antenna sections formed of rod-like material, said two sections being of substantially identical configuration; each section comprising an odd plurality of series-connected V-shaped elements arranged in end-to-end relation thereby providing a first series of spaced apart apices along one side and a secured series of spaced apart apices along the other side, two parallel straight extensions connected to the extremities of the two endmost V-shaped elements respectively, said extensions being set at obtuse angles with the respective legs; said two antenna sections being spaced apart in parallelism with the first series apices being respectively juxtaposed thereby providing plural pairs of adjacent but spaced apart apices, and means fixedly securing said antenna sections into assembled relation, the lengths of the legs of the V-shaped elements being substantially equal and corresponding to a quarter of a wavelength at a frequency in the UHF spectrum, and the length of each antenna section corresponding to a quarter of a wavelength at a frequency lying in the VHF spectrum.

9. The antenna of claim 8 wherein the angles in the V-shaped elements and the angles between the V-shaped elements are substantially ninety degrees.

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