This invention relates to antennas and more particularly to a driven element used in an antenna system, which will operate so as to effectively isolate itself at undesirable frequencies which may be present in the antenna system.

In the television antenna art it is desirable to have an antenna system which is designed to receive signals for several bands of frequency. These bands are in the very high frequency range with a low band ranging from 54 to 88 megacycles and a high band ranging from 174 to 216 megacycles. It has become highly desirable to design antenna systems which give peak performance for several channels within these bands. It is also desirable to design antenna systems which give optimum performance over all of the channels in both the low band and the high band of frequencies. In designing antennas with these purposes in mind, however, a problem arises in that several driven elements must be used and the driven elements for one channel may adversely affect the operation of another driven element for another channel. In all channel antennas likewise the driven element for the low band may adversely affect the operation of the driven element used to receive the high band of frequencies.

It is therefore an object of this invention to provide a driven element which may be used in an antenna system and coupled to other driven elements without adversely affecting the operation of other driven elements.

Another object of this invention is to provide an antenna system that will operate effectively over a wide range of frequencies and is simple and inexpensive to construct.

Further objects and advantages of this invention will become more readily apparent from the following drawings, descriptions and claims.

In the drawings, Fig. 1 is a view of the driven element. Fig. 2 is a view of an antenna system for specific channels using the driven element, and Fig. 3 is a view of an all channel antenna system using the driven element. The driven element 1 is composed of a folded dipole 2 which is made a half wave length for the frequency of the desired channel or band, and an element 3 which is normally a half wave length for the frequency of the undesired channel or band placed in close proximity to the open ends of the folded dipole 2.

One type of antenna system in which the driven element 1 may be used is shown in Fig. 2. The antenna system is composed of the driven element 1 and a driven element 4, connected to terminal points 5 by transmission lines 6 and 7. The folded dipole 2 of the driven element 1 is a half wave length for the lower end of the low band and the element 3 is a half wave length for the high band. The driven element 4 is composed of a folded dipole 8 which is a half wave length for the high end of the low band. Isolating stubs 9 for the high band are connected to the folded dipole 4 so that the open ends of the isolating stubs 9 are near the open ends of the folded dipole 4. The lines 6 are normally so that the open ends of the isolating stubs 9 are near the open ends of the folded dipole 4. The lines 6 and 7 are relatively short in relation to the wave length of the high band so as to have no effect on the operation of the driven element 4. The physical length of the lines 6 and 5 and the element 3 may be varied in relation to each other to obtain the desired effect.

The electrical properties of the driven element 1 are such that there is a low impedance for high band frequencies across the open ends of the dipole 2 which is caused by placing the half wave length element 3 in close proximity to the open ends of the dipole 2. When connected to the terminals 5 by the quarter wave length sections of lines 6, the impedance across the terminals 5 reflected by the driven element 1 is high to frequencies in the high band. Also the driven element 4 will reflect a high impedance to frequencies in the high band across the terminals 5 as a result of the isolating stubs 9 being placed near the open ends of the folded dipole 8. Thus, if the antenna system shown in Fig. 2 is connected at terminal points 5 to a separate antenna system tuned to the high band, the result is that the antenna system shown in Fig. 2 will not adversely affect the operation of the high band antenna system.

Another type of antenna system in which the driven element 1 may be used is shown in Fig. 3. This antenna system is composed of the driven element 1 and a driven element 10, connected to terminal points 11 by lines 12 and 13. The folded dipole 2 of the driven element 1 is a half wave length for the lower end of the low band and the element 3 is a half wave length for the high band. The driven element 10 is composed of a folded dipole 15 which is a half wave length for the high end of the low band. Isolating stubs 14 for the high band are connected to the folded dipole 15 so that the open ends of the isolating stubs 14 are near the center of the folded dipole 15. The lines 12 are normally a quarter wave length for the high band and the lines 13 are relatively short in relation to the wave length of the high band so as to have no effect on the operation of the driven element 10. The physical length of the lines 12 and the element 3 may be varied in relation to each other to obtain the desired effect.

The electrical properties of the driven element 1 are the same as in the antenna system shown in Fig. 2, that being that there is a low impedance for high band frequencies across the open ends of the dipole 2 which is caused by placing the half wave length element 3 in close proximity to the open ends of the dipole 2. The driven element 1 is connected to the terminal points 11 by the quarter wave length sections of line 12, and thus the impedance across the terminals 11 reflected by the driven element 1 is high to frequencies in the high band. The driven element 10 is tuned to high band frequencies by the addition of the isolating stubs 14 which convert the folded dipole 15 to operate as colinear high band driven elements. The signals received by the driven element 10 are thus effectively isolated from the driven element 1.

In using either of the antenna systems shown in Fig. 2 or Fig. 3 it may be desirable to use reflectors and directors in connection with the driven elements to increase the gain for either the high or the low band. These reflectors and directors are not shown, but it is to be understood that they may be added to these antenna systems. The various elements of the antenna systems shown are held in a single plane by the supporting rods 16.

We claim:

1. An antenna system comprising an antenna driven element composed of a first dipole having two open ends near its center and which is a half wave length for a desired frequency and an element which is a half wave length for the high band and the lines 6 are relatively short in relation to the wave length of the high band so as to have no effect on the operation of the driven element 4.
length for an undesired frequency that is higher than the frequency of the first dipole and which is placed in close proximity to the open ends of the first dipole, a quarter wave length section of line for the undesired frequency attached to the open ends of the first dipole, a second dipole having two open ends near its center and isolating stubs for the undesired frequency connected on both sides of the two open ends of the second dipole and the second dipole connected to the ends of the quarter wave length section of line opposite the first dipole.

2. An antenna system comprising an antenna driven element composed of a first dipole having two open ends near its center and which is a half wave length for a desired frequency and an element which is a half wave length for an undesired frequency that is higher than the frequency of the first dipole and which is placed in close proximity to the open ends of the first dipole, a quarter wave length section of line for the undesired frequency attached to the open ends of the first dipole and a second dipole for the undesired frequency attached to the ends of the quarter wave length section of line opposite the first dipole.

3. An antenna system comprising an antenna driven element composed of a first folded dipole having two open ends near its center and which is a half wave length for a desired frequency and an element which is a half wave length for an undesired frequency that is higher than the frequency of the first folded dipole and which is placed in close proximity to the open ends of the first folded dipole, a quarter wave length section of line for the undesired frequency attached to the open ends of the first folded dipole, a second folded dipole having two open ends near its center and which is a full wave length for the undesired frequency and isolating stubs for the undesired frequency connected at their closed ends to the second folded dipole so that the open ends of the isolating stubs are near the center of the second folded dipole opposite its open ends, and the second folded dipole connected at its open ends to the ends of the quarter wave length section of line opposite the first folded dipole.

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