Nov. 15, 1955 C. M. HEPPERLE 2,724,112

ENERGY ABSORBER

Filed March 3, 1950

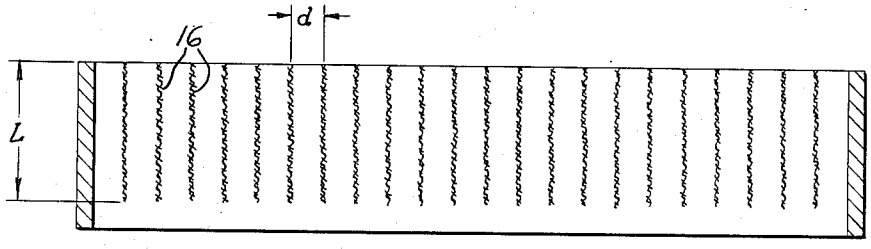

FIG 2

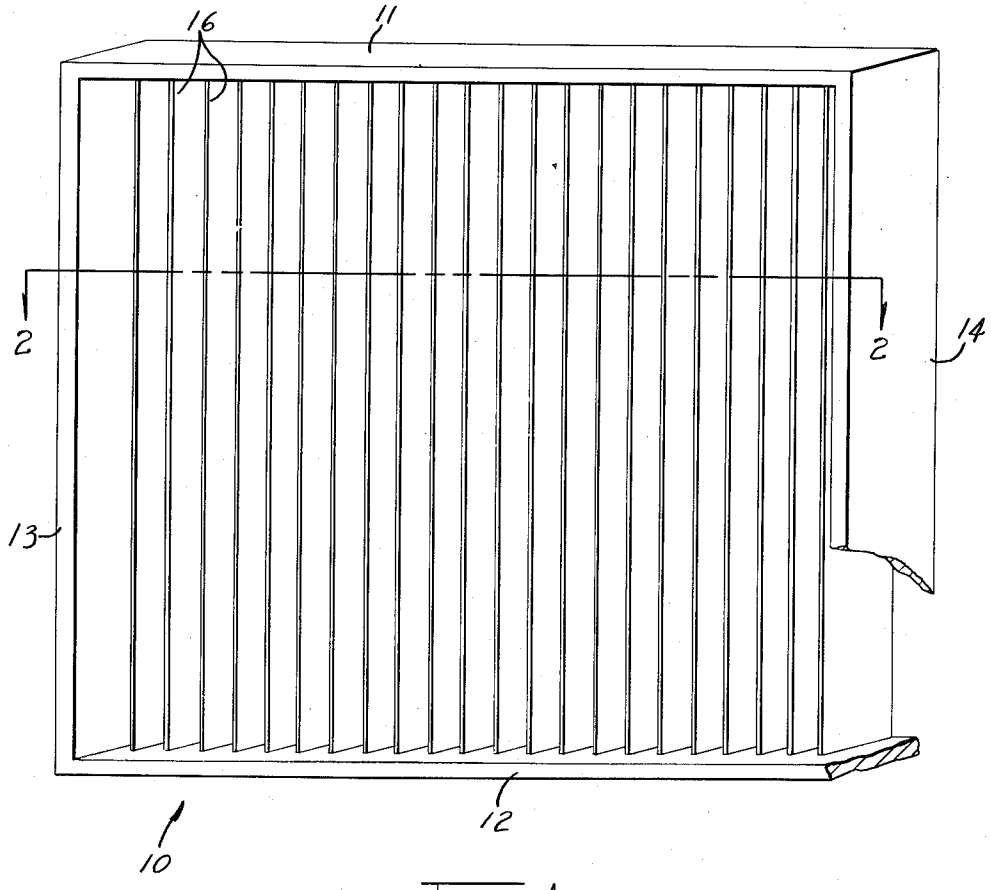

FIG 1

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ENERGY ABSORBER

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3 Claims. (Cl. 343—18)

This invention relates in general to energy absorbers, and in particular to a high frequency broad-band non-reflecting attenuator.

It is often desirable in testing antennas and transmitters to terminate in a non-reflective load. One method of obtaining such a termination is to point the antenna toward open space so that none of the energy which is transmitted will be reflected. At times this becomes inconvenient in that the radiating antenna must always be placed in the open, and at times even the transmitter must be placed outside. In radiometry it is usually necessary to calibrate the receiver by directing the antenna toward a non-reflecting surface of known temperature.

It is an object of this invention, therefore, to provide means for terminating an antenna in a manner so that it may be tested inside a building.

A further object is to provide a broad band non-reflecting absorber for magnetic waves which will substantially absorb all of the impinging energy.

Yet another object is to provide a non-reflective energy absorber to be used as a calibration device for a radiometry receiver.

A feature of this invention is found in the provision for a supporting frame adapted to hold a plurality of lossy strips spaced laterally apart in a position so as to intercept electromagnetic waves.

Further objects, features, and advantages of this invention will become apparent from the following description and claims when read in view of the drawings, in which:

Figure 1 is a front isometric view of the energy absorber of this invention; and,

Figure 2 is a sectional view taken on a line 2—2 of Figure 1.

Referring to Figure 1, a frame **10** of dielectric material such as wood comprises the upper and lower members **11** and **12**, respectively, and the side members **13** and **14**. A plurality of lossy sheets or strips **16** of a width L substantially equal to the width of the frame **10** are supported between the members **11** and **12** parallel to the side walls **13** and **14**. The strips **16** are spaced equidistant apart, as shown in Figure 2.

The material is lossy and may be, for example, coarse fabric strips. The United States Rubber Company manufactures a cloth named Uskon which may be used, for example. As used herein, the term "lossy" is an adjective which indicates that the loss in a material is appreciable when compared to incident energy. See second paragraph, page 274, Fields and Waves in Modern Radio, Ramo and Whinnery, published by John Wiley 1944. The ends of the strips **16** are attached to the end walls **11** and **12** by gluing or other suitable holding means. If the distance between each of the lossy strips **16** is designated as *d*, electromagnetic waves impinging on the front of the energy absorber will be shorted and attenuated if the wave length of the energy is greater than the *d* dimension and less than 2*d*. In other words, the attenuator is broad band in that it attenuates over a range of wave lengths from *d* to 2*d*. Thus no tuning is required within this range, as is necessary in the conventional type of

energy absorbers which comprise a flat piece of lossy material supported in front of a metal sheet, with the distance between them being ¼ wave length. It is seen in this instance that the attenuator must be tuned, in that the ¼ wave length distance will change for each frequency. The broad band characteristic of the present invention is a major improvement over this type of energy absorber. Another advantage, which is a corollary of the above one, is that the dimension *d* need not be maintained to a very small tolerance.

The dimension L of the strip **16** affects the attenuating characteristic of the energy absorber. Another variable is the type of material used in the strips, and if the resistivity of the material is 377 ohms per square, optimum performance is obtained. If any energy passes through the attenuator and is reflected through it from the reverse direction, it will be decreased again as it passes through it from the reverse direction, and should be negligible when it arrives at the transmitter once again. The lossy strips might be mounted on the four walls and roof of a room to obtain a "space room" from which no reflection will be forthcoming between the wave length from *d* to 2*d*.

It is seen that this invention provides means for terminating an antenna in a non-reflecting manner over a relatively broad band of frequencies, and thus makes it possible to calibrate antennas and radiometric receivers within the confines of a building.

Although this invention has been described with respect to a particular embodiment thereof, it is not to be so limited as changes and modifications may be made therein which are within the full intended scope as defined by the appended claims.

I claim:

1. An electromagnetic wave attenuator comprising a frame member defining an axially extending opening, and a plurality of laterally disposed, equally spaced lossy strips of electrically conductive material having the impedance of free space extending across said opening, each strip supported at each end by said frame member parallel to the remaining strips.

2. A broad band non-reflecting absorber for electromagnetic waves comprising, a frame member, a plurality of laterally disposed lossy strips extending across said frame member with each strip parallel to the remaining strips, the lateral distance between each strip substantially constant and the distance between strips being greater than one-half wave length of the energy to be absorbed and less than one wave length of the energy to be absorbed.

3. A broad band non-reflecting absorber of electromagnetic radiant energy comprising, a frame member, a plurality of electrically resistive strips of cloth having the impedance of free space, each of said strips being supported by said frame member with the broad sides of the strips parallel and laterally spaced apart between the limits of a half wave length and one wave length of the energy to be absorbed.

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