June 8, 1965 E. A. SIELAFF 3,188,644

WEIGHTED DEVICE FOR DAMPING OUT VIBRATION IN AN ANTENNA ELEMENT

Filed June 12, 1961

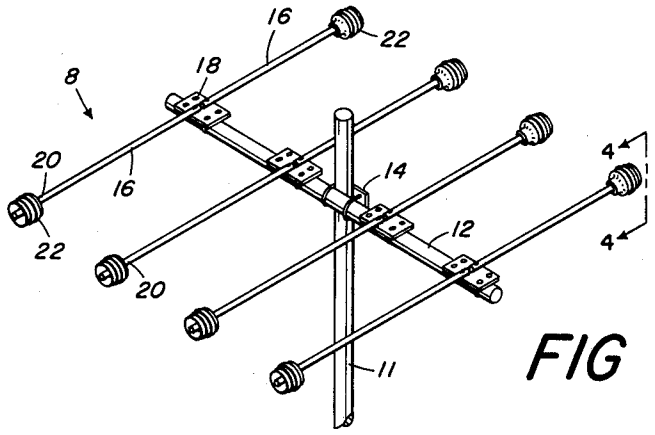


FIG 1

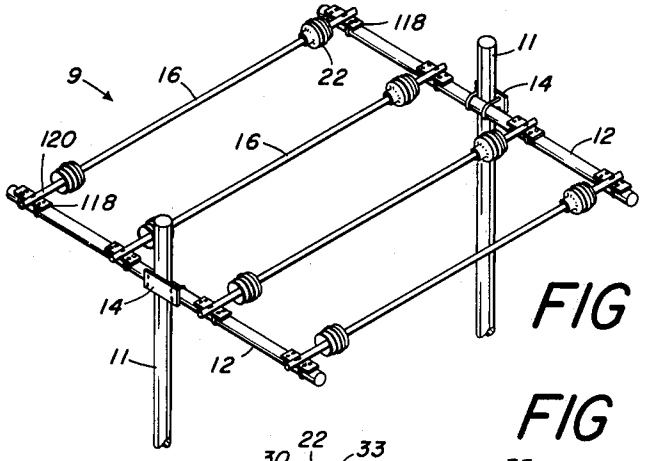


FIG 2

FIG 4

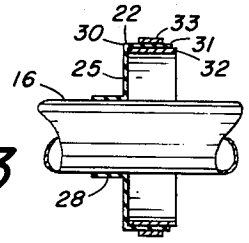
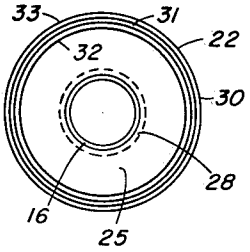


FIG 3



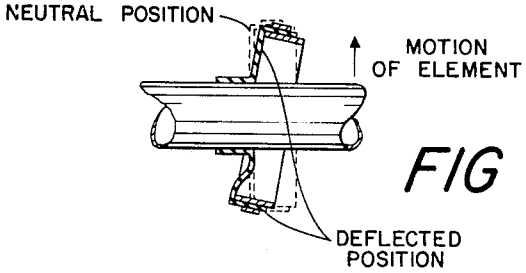


FIG 5

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WEIGHTED DEVICE FOR DAMPING OUT VIBRATION IN AN ANTENNA ELEMENT

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This invention relates to an antenna structure, and more particularly to a damping means having a readily flexible portion and a weighted portion for substantially eliminating vibration of an antenna element due to external vibration producing forces acting thereon.

As is well known in the art, antenna structures are commonly subject to various vibration producing forces, particularly wind forces, that have heretofore acted to greatly shorten the life of the antenna by causing excessive vibration of antenna elements, which vibration soon results in snapping or breaking of the elements.

To overcome this problem, many devices have heretofore been proposed or utilized, but none of these devices have been completely successful in providing a relatively simple, yet dependable damping means that can be used not only on a cantilever antenna element but also on any antenna structure regardless of the manner in which the antenna elements are mounted.

An improved damping device for use in connection with cantilever antenna elements, for example, is shown in the concurrently filed United States patent application, Serial No. 116,377, entitled "Antenna Element Damping Device," by Paul R. Jones, and assigned to the assignee of the present invention.

The damping device of this invention, on the other hand, by utilizing the structure as described hereinafter, provides a damping means that can be used equally well on any type of antenna element subject to vibratory forces regardless of the manner in which the antenna element is mounted.

It is an object of this invention to provide a relatively simple, yet efficient and reliable means, for damping vibration in any antenna element the use of which is independent of any particular manner of mounting of the element.

It is a further object of this invention to provide an antenna structure having damping means which may be positioned anywhere along the length of an antenna element, which damping means has a readily flexible portion that extends substantially radially outwardly from the antenna element and has a weighted portion at its free end which portions cooperate to substantially eliminate vibration in said antenna element.

With these and other objects in view which will become apparent to one skilled in the art as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein disclosed invention may be submitted as come within the scope of the claims.

The accompanying drawing illustrates one complete example of the embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof, and in which:

FIGURE 1 is a perspective view of an antenna structure with cantilever antenna elements having damping means thereon as taught by this invention;

FIGURE 2 is a perspective view of an antenna structure having antenna elements secured at both ends with damping means thereon spaced from said ends as taught by this invention to substantially eliminate vibration in said antenna element;

FIGURE 3 is a side view of the damping means of this invention secured to an antenna element with the damping means shown in section for illustrative purposes;

FIGURE 4 is a cross section view of the damping means of this invention taken through the line 4—4 of FIGURE 1; and

FIGURE 5 is a side view with the damping means shown in section illustrating how the damping means absorbs energy to thereby damp out vibrations in an antenna element.

Referring now to the drawings in which like numerals refer to like characters throughout, the numeral **8** refers generally to an antenna structure illustrating the use of the damping means of this invention on a cantilever antenna element, while the numeral **9** refers generally to an antenna structure illustrating the use of the damping means of this invention on an antenna element secured at both ends.

As shown in FIGURE 1, antenna structure **8** may include a mast **11** and a crossbar or boom **12**, which boom may be secured to mast **11** by conventional means, such as, for example, by clamp **14**. In addition, antenna structure **8** may also include a plurality of antenna elements **16**, which antenna elements may be cantilever mounted, as shown in FIGURE 1, by conventional fastening means, such as, for example, by clamp **18**, or may be an elongated rod or tube attached at its mid-point to the crossbar. As is conventional, mast **11**, boom **12**, and elements **16** are preferably tubular with elements **16** being of relatively small diameter.

As shown in FIGURE 2, antenna structure **9** may include a pair of masts **11** having a pair of crossbars, or booms, **12** secured thereto conventionally, as by clamps **14**, for example. In addition, a plurality of antenna elements **16** may be secured conventionally at their end portions **120** between the crossbars, as shown in FIGURE 2, for example, by clamps **118**.

The cantilever antenna elements **16**, as shown in FIGURE 1, may have secured to their free ends **20** a damping device **22** to substantially eliminate vibration due to vibration producing forces, particularly wind forces. As shown in FIGURE 2, damping device **22** may be secured inwardly of the mounted ends **20** of antenna elements **16** for the same purpose.

As shown best in FIGURES 3 and 4, damping device **22** may be wheel-like in appearance and have a disc-like portion, or web, **25** connecting a hub **28** and a rim **30**. As shown in FIGURE 3, hub **28** and rim **30** extend axially in opposite directions, but it is to be appreciated that rim **30** is not meant to be limited to the exact configuration shown. Web portion **25** is preferably relatively thin and readily flexible and may be a rubber membrane. Hub **28** may likewise be of rubber and may be integrally formed with the web portion. Hub **28** is, of course, of a diameter so as to readily receive the antenna element so that damping device **22** may be secured to the antenna element by any conventional means, such as, for example, by a clamp (not shown) over hub portion **28**.

Rim **30** must be of greater weight than is web portion **25**, and, as is shown in FIGURE 3, may consist of a center layer, or ring **31**, of rubber (which may be integrally formed with web portion **25**) and an inner and outer heavier layer, preferably of metal, which may be rings **32** and **33**, which rings may be secured to the inner and outer surfaces of the rubber ring, respectively, in any conventional manner. It is to be appreciated, of course, that the needed weight could be provided in other ways obvious to one skilled in the art, such as, for example, by a relatively large rubber ring formed integrally with web **25** or attached to any one surface of ring **31**,

without departing from the teachings of this invention.

As shown in FIGURE 1, the damping device of this invention is preferably mounted near the free end of a cantilever antenna element. When the antenna element is mounted at both ends, however, as shown in FIGURE 2, the damping means of this invention is secured to the antenna element inwardly of the mounted ends. The exact positioning and size of each damping device depends, of course, upon the particular antenna element utilized. With respect to use of the antenna damping device on an antenna element secured at both ends, however, it has been found that the damping device operates very effectively if placed one eighth of the distance from each end of the antenna element. In practice, of course, the damping device **22** is placed on the antenna element and then adjusted as to position for the particular antenna element and damping device utilized until vibration is substantially eliminated after which the antenna structure is ready for use.

FIGURE 5 illustrates the manner in which the damping device **22** absorbs the energy imparted to the antenna element by vibratory forces acting thereon. When the antenna element starts to vibrate, the damping device is also caused to vibrate, as shown by the dotted lines in FIGURE 5. The flexible web portion **25** readily vibrates and due to the weight at the free end of the web portion (which vibrates out of phase with the antenna element), substantially all vibration is quickly damped out of the antenna element.

From the foregoing, it should be evident to those skilled in the art that the damping device of this invention provides a means for substantially eliminating vibration in an antenna element and can be utilized regardless of the manner in which the antenna element is mounted.

What is claimed as my invention is:

1. In an antenna structure, the combination of: a substantially rigid antenna element a portion of which is subject to vibratory forces; and a damping member connected to the portion of said antenna element subject to vibratory forces, said damping member having a readily flexible portion extending outwardly from said antenna element and a second portion of greater weight than said readily flexible portion with said second portion being connected to and extending from said readily flexible portion whereby the energy of vibrations transferred to said antenna element from said vibratory forces are absorbed by said damping member.

2. The combination of claim **1** wherein said readily flexible portion is of rubber and said portion of greater weight includes metallic weighting means.

3. The combination of claim **1** wherein said antenna element is securely fastened at both ends and said portion subject to vibratory forces is therebetween, and said damping means is connected to said portion subject to vibratory forces at a distance substantially one-eighth of the distance from the end of said antenna element.

4. In an antenna structure, the combination of: a substantially rigid antenna element a portion of which is subject to vibratory forces; and annular damping means for absorbing energy transferred to said antenna element by said vibratory forces, said damping means having a substantially disc-shaped and readily flexible portion with a central aperture through which said antenna element is received and a second portion of greater weight than said disc-shaped portion, said second portion being connected to the periphery of said disc-shaped portion.

5. The combinatin of claim **4** wherein said disc-shaped portion is of rubber and said second portion is an annular ring extended from the periphery of said disc-shaped portion substantially coaxially with said antenna element.

6. The combination of claim **5** wherein said annular ring includes a center layer of rubber integrally formed with said second portion and an upper and lower layer of metal.

7. A damping device for substantially eliminating vibrations in an antenna element due to vibratory forces acting thereon, said damping device comprising: a substantially disc-shaped portion of relatively thin, readily flexible material, said portion having a central aperture therein of a size to receive an antenna element; a hub adapting said damping device for mounting on an antenna element received in said central aperture; and a rim extending substantially normally from the periphery of said disc-shaped portion, said rim being of greater weight than said disc-shaped portion.

8. The combination of claim **7** wherein said disc-like portion is of rubber and is integrally formed with said hub and at least a part of said rim.

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HERMAN KARL SAALBACH, *Primary Examiner.*