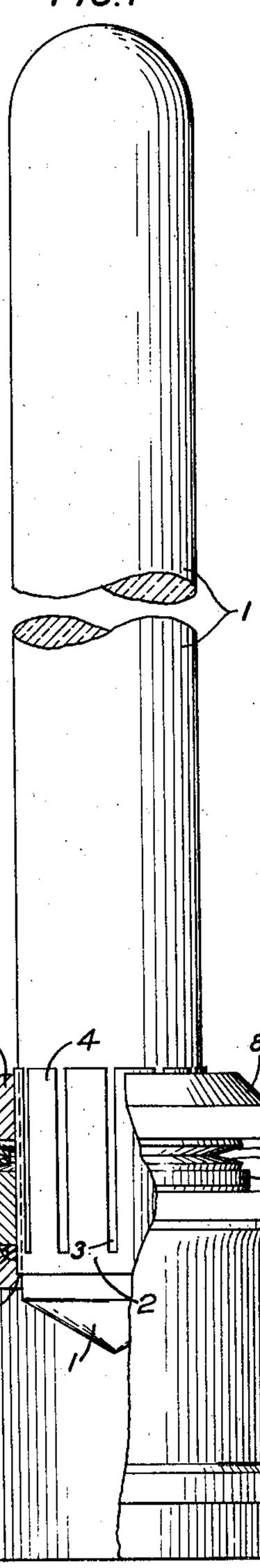
July 23, 1946. M. FRITTS 2,404,385

SPRING HOLDER FOR CANTILEVER ELEMENTS

Filed Sept. 3, 1942

FIG. 1



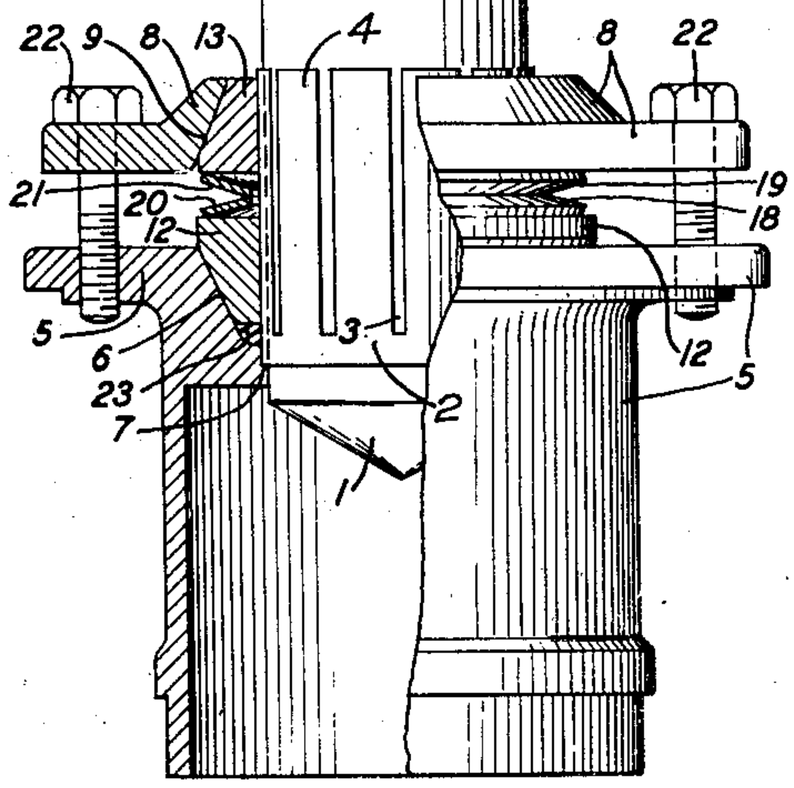
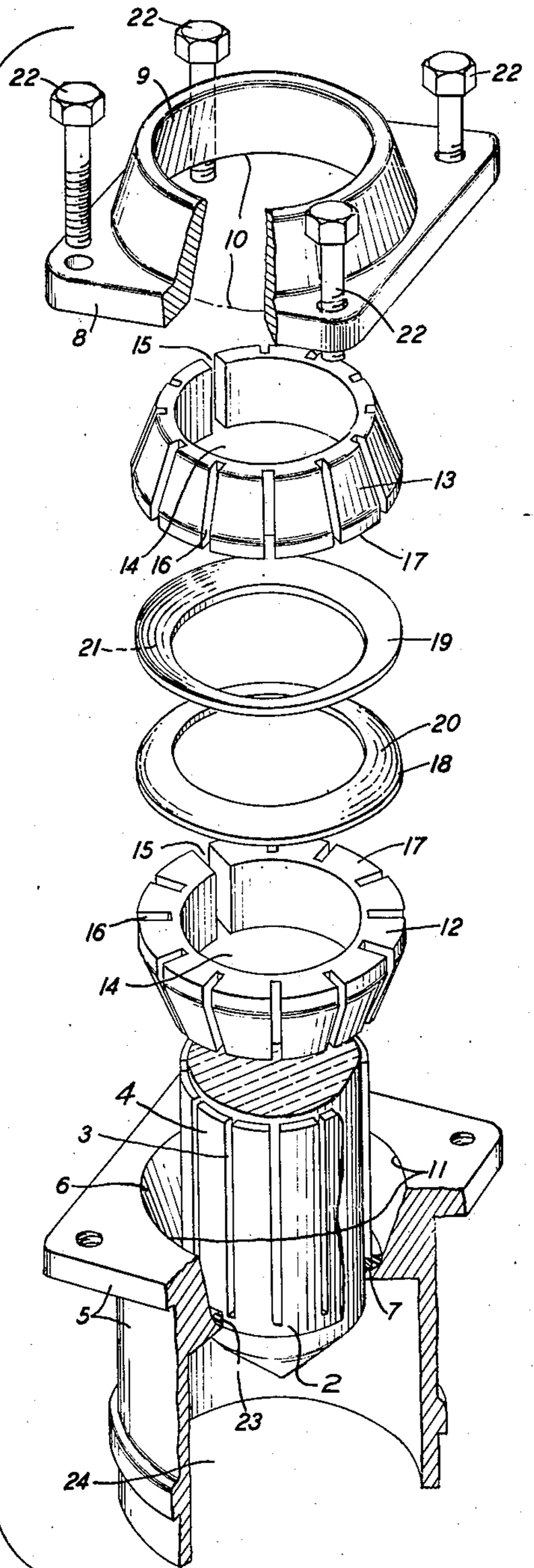


FIG. 2



INVENTOR
M. FRITTS
BY
A. J. Zerbarini
ATTORNEY

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SPRING HOLDER FOR CANTILEVER ELEMENTS

Morris Fritts, Chatham, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

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7 Claims. (Cl. 287—119)

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This invention relates to holders or mountings for supporting cantilever elements and particularly to holders of the spring socket type for supporting dielectric antenna rods having changeable transverse dimensions.

As disclosed in the copending applications of G. E. Mueller, Serial No. 469,284, filed December 17, 1942, and C. B. H. Feldman, Serial No. 464,479, filed November 4, 1942, linear dielectric wires or rods are now used in radio systems employing microwaves as end-on antenna elements, the dielectric antennas ordinarily being horizontal and supported or mounted at one end in cantilever fashion. Since most of the dielectric substances commonly used in forming these antenna elements, as, for example, polystyrene, have appreciable temperature coefficients of expansion, the antenna elements are exceedingly sensitive to temperature changes and undergo relatively large dimensional changes with atmospheric temperature fluctuations. As a result, considerable difficulty has been experienced in rigidly securing the base of the antenna rod to its supporting structure. It now appears desirable, especially in connection with aircraft and battleship radio installations, to provide a mounting or holder which will maintain the dielectric antenna rod firmly secured to its support in a manner independent of lateral or diametrical contraction and expansion induced by temperature variations.

It is one object of this invention to maintain a linear cantilever element rigidly secured to its supporting structure regardless of dimensional changes in the element.

It is another object of this invention to obtain a rugged weather-proof holder of the socket type for linear antenna elements having variable transverse dimensions.

It is a further object of this invention to maintain a cylindrical or tapered dielectric antenna rod rigidly secured at one end to a support, regardless of diametrical changes in the rod resulting from temperature variations, and in a manner such as to prevent twisting or partial rotation of the element.

In accordance with the preferred embodiment of the invention a polystyrene linear antenna element, hereinafter designated "polyrod" of the type illustrated in the above-mentioned copending applications, is fastened at its base to a short, slotted metallic sleeve. The sleeve and associated polyrod base portion extend through a conical or tapered aperture in a fixed metallic clamping plate or retaining member, and into a similarly shaped aperture in a fixed base casting spaced

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from the clamping plate, the plate and casting being positioned so that the wide openings of the apertures or cavities face each other. The sleeve is prevented from projecting through the cavity or socket in the casting by a peripheral shoulder at the bottom of the conical aperture. The polyrod extends through the opening at the bottom of the socket and into an air-filled microwave guide a predetermined distance or amount. Separate annular, cone-shaped bushings or wedge members are slidably fitted into the conical cavities of the plate and casting so as to contact circumjacently the sleeve and the cavity surfaces, the bushings being disposed so that their large annular surfaces face each other. Each bushing is of the broken ring type, that is, each has a sectorial opening and several slots of the keyway type. A pair of concavo-convex or dished spring washers is included between the bushings, the convex ring surfaces being adjacent and the concave surfaces contacting the large annular surfaces of the bushings. Thus, the polyrod and the apertures in the clamping plate, casting, slotted bushings and spring washers are coaxially related. Bolts are provided for securing the clamp plate to the base casting, the bolts being set or adjusted so that the spring washers are compressed a small predetermined amount and the bushings forced into the conical cavities of the clamping plate and casting, whereby at all times the bushings tightly grip the polyrod and associated sleeve, irrespective of diametrical changes in the polyrod.

The invention will be more fully understood from a perusal of the following specification taken in conjunction with the drawing on which like reference characters denote elements of similar function and on which:

Fig. 1 is a longitudinal cross-sectional view and Fig. 2 is an exploded view of a mounting or holder assembly constructed in accordance with the invention.

Referring to the two drawing figures, reference numeral 1 denotes a solid linear polystyrene antenna rod which is circular in cross section and which changes diametrically with atmospheric temperature variations. The rod may be either cylindrical or longitudinally tapered. Numeral 2 designates a thin brass sleeve having the longitudinal slots 3 and the fingers 4. Numeral 5 denotes a base casting having the conical cavity 6 and numeral 7 designates a ring-shaped shoulder which prevents sleeve 2, but not polyrod 1, from projecting through the small bottom opening of cavity 6. Reference char-

acter 8 denotes a stationary clamping plate or retaining member having a conical cavity 9, the large opening 10 of which faces the large opening 11 of casting 5. Numerals 12 and 13 refer to annular conical or wedge-shaped bushings each having a cylindrical axial aperture 14, a sectorial opening or break 15 and keyway slots 16. Each bushing is, by reason of the opening 15 and the slots 16, resilient to a limited degree. Bushing 12 is slidably positioned in the conical cavity 6 of casting 1 between sleeve 2 and the surface of cavity 6; and the wedge member 13 is similarly positioned in the conical cavity 9 of clamping plate 8 between sleeve 2 and the surface of cavity 9. The bushings 12 and 13 are disposed so that their large ring-shaped surfaces 17 face each other. Reference characters 18 and 19 designate a pair of dished spring washers having their convex surfaces 20 contiguous and their concave surfaces 21 in contact with bushings 12 and 13. Numerals 22 denote bolts extending through clamping member 8 and into casting 5, the bolts being adjusted or set so that a proper amount of pressure is applied through the bushings to the spring washers to maintain the washers under small compression. Numeral 23 designates a rubber ring gasket placed at the junction of sleeve 2 and bushing 12, at the bottom of cavity 6, for the purpose of preventing moisture and water from entering the tubular portion 24 constituting a portion of a waveguide structure.

In operation, assuming a temperature increase causes rod 1 to expand diametrically, the conical bushings 12 and 13 are forced to move toward each other and against the pressure of the spring washers 18 and 19, and the bushings therefore increase the compression applied to the washers. When the polyrod 1 contracts in response to a temperature decrease the spring members 18 and 19 cause the bushings 12 and 13 to slide back into the conical cavities. At all times the bushings 12 and 13 are wedged, to some degree, between the sleeve 2 containing the polyrod base portion and the fixed members 5 and 8, respectively. Thus, in accordance with the invention, the polyrod element 1 is secured rigidly to its mounting, irrespective of dimensional changes resulting from temperature variations.

Although the invention has been explained in connection with the preferred embodiment it should be understood that it is not to be limited to the particular embodiment described. Obviously, the invention may be satisfactorily used in connection with antenna rods or cantilever elements having a square, or other geometrical, cross-sectional area, instead of a circular cross section. If desired, for economical or other reasons, the bushing 13 and concavo-convex spring member 19 may be omitted and clamping plate 8 may be positioned or adjusted so as to apply pressure directly to spring member 18.

What is claimed is:

1. A spring mounting for shaft-like elements comprising a fixed member having a tapered socket or cavity for receiving one end of the element, a tapered member slidably included between the cavity surface and said element, a retaining member, and a concavo-convex spring washer included between said tapered member and said retaining member for maintaining the tapered member wedged between the element and cavity surface.

2. A holder for a linear element comprising a

casting having a conical socket for receiving one end of the element and means for maintaining said element rigidly secured to said socket irrespective of changes in the cross-sectional dimensions of said element, said means comprising a conical bushing slidably included between said socket and said element, and resilient means contacting said bushing for continuously exerting pressure on said slidable bushing in a direction toward said socket.

3. In combination, a linear shaft-like element having a contractile and expansible transverse dimension, a holder therefor comprising a first stationary member having a conical socket for receiving said element, a tapered member included between the socket surface and said element, a second stationary member, a spring member included between said tapered member and said second stationary member, and means for clamping said stationary members, said tapered member being movable in response to a change in the transverse dimension of said element and a change in the compression of said spring member.

4. In combination, a cylindrical element diametricaly responsive to temperature fluctuations, a mounting therefor comprising a casting member having a conical aperture for receiving said element, a conical wedge member having a sectorial opening and positioned in said aperture between said casting and said element, an annular retaining member, an annular concavo-convex spring member included between the retaining member and the wedge member, said members being coaxially disposed, and means for clamping the retaining member and casting member.

5. In combination, a cylindrical element diametrically responsive to temperature variations, a mounting therefor comprising a stationary base member having a conical cavity, a conical bushing movably positioned in said cavity, a retaining member, a dished spring washer included between said bushing and the retaining member, a sleeve member having slots, said members being coaxially related, said cylindrical element extending through the apertures in said members and into said cavity, and means for clamping the retaining member and the base member.

6. In combination, a cylindrical rod diametrically responsive to temperature variations, a mounting therefor comprising a base casting having a conical cavity, a conical bushing member positioned in said cavity and axially movable relative thereto, an annular retaining member, an annular dished spring member included axially between the retaining member and the bushing member, said cylindrical rod extending through said members and into the cavity of said base casting, and means for clamping the base casting and retaining member.

7. In combination, a dielectric cylindrical rod composed of polystryene and responsive to temperature variations, a spring socket mounting therefor comprising a base casting having a conical socket, a clamping plate member having a conical aperture, a pair of conical diametrically flexible bushing members and means for clamping said plate member and casting, a pair of annular concavo-convex spring washer members included between said wedge bushing members and having their convex surfaces contiguous, said rod extending through the apertures in said members and into said socket.

MORRIS FRITTS.