United States Patent [19]

Koizumi

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[54] **HELICAL RESONATOR**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** ..... **333/83 R,** 333/82 B

[51] **Int. Cl.** **H01p 7/06,** H01p 7/04

[58] **Field of Search** .... 333/82 A, 82 B, 83 R, 24 C, 333/70 S, 73 R, 73 C, 76; 317/256; 334/73, 82; 336/69

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Primary Examiner—James W. Lawrence

Assistant Examiner—Wm. H. Punter

[57] **ABSTRACT**

A resonator comprises a metal housing, a helical coil disposed inside the housing, and means for adjusting the resonant frequency of the coil. The adjustment means takes the form of a generally L-shaped metallic strip having a first portion secured to the housing and a second portion extending into the interior of the coil. The position of the second portion is changeable relative to the coil turns to adjust the resonant frequency of the coil.

5 Claims, 5 Drawing Figures

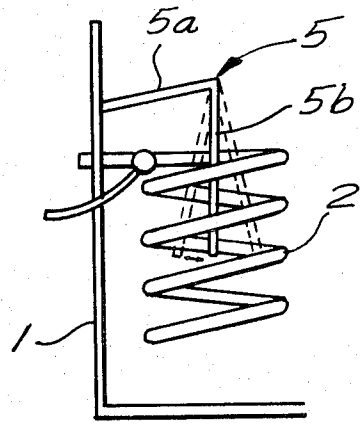


FIG. 1
PRIOR ART

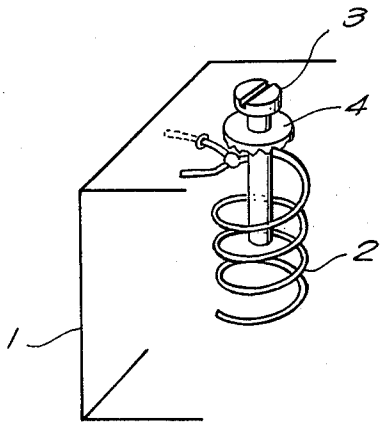


FIG. 2

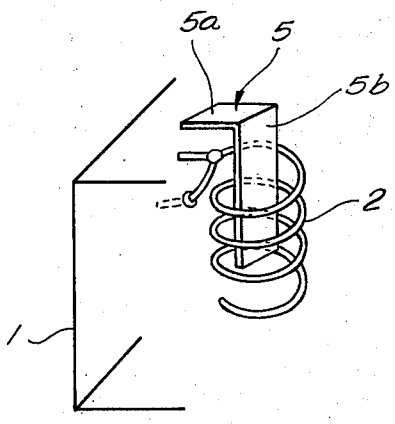


FIG. 3

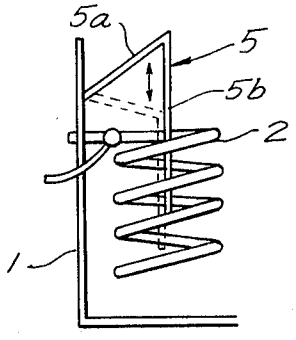


FIG. 4

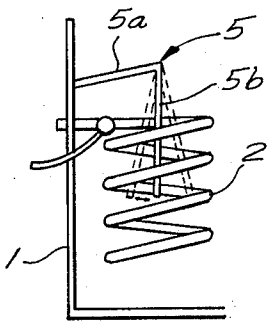
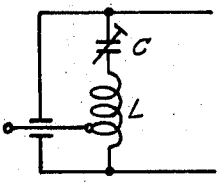


FIG. 5



HELICAL RESONATOR

This invention relates to resonators and, more particularly, to a helical resonator suitable for use as a filter in the VHF and UHF frequency ranges.

Conventional helical resonators utilize a frequency adjusting member in the form of a screw which is movably supported by a nut fixed on the resonator housing. The resonant frequency set by the member therefore tends to be unstable due to the mechanical "play" present between the screw and the nut.

It is, therefore, a prime object of the present invention to provide a novel helical resonator in which the resonant frequency is accurately maintained by stabilizing the position of the adjusting member.

It is another object of the present invention to provide a helical resonator suitable for use in VHF and UHF frequency ranges which is inexpensive to produce and is of simple construction.

In accordance with the present invention, a novel resonator is provided which comprises a resonator housing, a helical coil, and a metal strip for adjusting the resonant frequency of the resonator. The strip has a first portion mounted on the housing and a second portion positioned in the interior of the coil which is movable relative to the coil turns. Preferably, the metal strip is generally L-shaped with its longer part inserted into the coil.

To the accomplishment of the above and to such other objects as may hereinafter appear, the present invention relates to a resonator, as defined in the appended claims and as described in the specification, taken together with the accompanying drawings wherein like numerals refer to like parts and wherein:

FIG. 1 is a schematic perspective view of a typical helical resonator of the prior art;

FIG. 2 is a schematic perspective view of a preferred embodiment of a resonator according to the present invention;

FIG. 3 is a partial cross-sectional view of the resonator shown in FIG. 2 illustrating the step of coarse adjustment;

FIG. 4 is a view similar to FIG. 3 illustrating the step of fine adjustment; and

FIG. 5 is an equivalent circuit diagram of the helical resonator.

A conventional helical resonator which is widely employed as a filter in the VHF and UHF ranges is shown in FIG. 1. This resonator comprises a housing 1 and a coil 2 disposed within the housing 1. The resonant frequency of the resonator is adjusted by changing the position of a trimmer screw 3 relative to the coil 2. Screw 3 is mounted to housing 1 by means of nut 4.

In the structure as shown, the resonant frequency set by initial adjustment of the trimmer screw 3 tends to deviate from the set value due to the existence of "play" between the trimmer screw 3 and a guide support or nut 4, thus making the resonator unstable and changing the resonant frequency thereof. Further, the manufacturing cost of such a resonator is comparably high. The present invention obviates the foregoing drawback by the novel structure shown in FIGS. 2 through 4 which show a preferred embodiment of the present invention.

The invention comprises a helical coil 2 which is disposed within and mounted to a housing 1. Means for adjusting the resonant frequency of coil 2 is provided in the form of metal strip 5, preferably having an L-shaped configuration. Strip 5 has a first portion 5*a*, which is mounted to housing 1 by any conventional means, and a second portion 5*b* which extends into the interior of coil 2.

A coarse adjustment of the resonant frequency is achieved, as shown in FIG. 3, by moving the first portion 5*a* up and down to adjust the length of second portion 5*b* positioned within the interior of the coil 2. Fine adjustment is achieved, as shown in FIG. 4, by pivoting the second portion 5*b* (as shown in phantom in the drawing) so as to be as near to the turns of the coil 2 as necessary. As a result, complete adjustment of the resonant frequency of the resonator is obtained.

Preferably, strip 5 is made from nonmagnetic brass (including copper, for instance, as the principal element) or aluminum.

It will be understood from FIG. 5, which shows an electrical schematic diagram of the helical resonator, that a series equivalent capacitance C is increased by inserting portion 5*b* deeply into the coil 2 or positioning this portion near the coil turns. On the other hand, the series equivalent capacitance C can be made small by positioning only a small part of portion 5*b* within the coil 2 and keeping it in the center portion of the coil and thus remote from the coil turns.

As was described hereinabove, adjustment of the resonant frequency of the helical resonator constructed in accordance with the present invention can be achieved simply and reliably through positional adjustment of the metal strip 5, thus achieving stability of the resonant frequency with a low cost structure.

A single preferred embodiment of the present invention has been specifically disclosed herein for purposes of illustration. It is apparent that many variations and modifications may be made upon the specific structure disclosed herein. It is intended to cover all of these variations and modifications which fall within the scope of this invention as defined by the appended claims.

I claim:

1. A resonator comprising a housing, a helical coil mounted on said housing and means for adjusting the resonant frequency of said coil, said means comprising a metallic strip having a first and a second portion, said first portion being mounted on said housing and said second portion extending into the interior of said coil, said first and said second portion being flexibly joined such that said second portion is movable relative to said first portion and to the turns of said coil to adjust the resonant frequency of the resonator.

2. The resonator of claim 1 wherein said strip has a generally L-shaped configuration with the longer part thereof corresponding to said second portion.

3. The resonator of claim 1 wherein said strip is brass.

4. The resonator of claim 1 wherein said strip is aluminum.

5. The resonator of claim 1 wherein said strip is made of nonmagnetic material.

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