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CAVITY RESONATOR HAVING A VARIABLE QUALITY FACTOR

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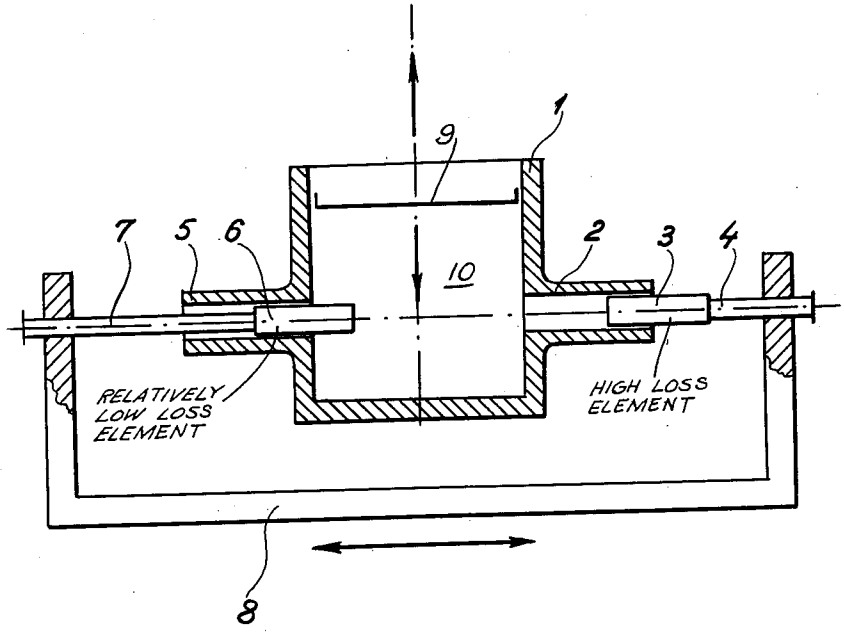

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CAVITY RESONATOR HAVING A VARIABLE QUALITY FACTOR

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In the microwave technique, cavity resonators having a variable quality factor are sometimes required. If, for example, the frequency of a transmitter is to be measured, a cavity resonator having a high quality factor must be employed, but in the testing of the modulator of a transmitter a cavity resonator having a larger band width than the tested signal must be employed, and this can therefore generally be done by means of a signal decoupled from a cavity resonator and detected. If the quality factor of the cavity resonator of lower quality factor is variable, the same resonator may be employed for both purposes.

The quality factor of the cavity resonator can be reduced by artifically increasing the cavity losses. Methods are known from the technical literature, in which, for example, a high-loss material is introduced into the cavity, or a plate coated with a high-loss material is moved relative to the electric force lines, and so on.

The essence of all such methods resides in the simultaneous variation of the cavity resonance frequency and of the quality factor. Measurements effected with such cavities are attended by some difficulty, in that the cavity must be tuned simultaneously with the variation of the quality factor.

In the construction according to the invention, the mechanism varying the quality factor of the cavity resonator is so connected to a mechanism by which the frequency thereof is finely tuned that the frequency variation set up at the variation of the quality factor is automatically balanced out.

For an understanding of the principles of the invention, reference is made to the following description of a typical embodiment thereof as illustrated in the accompanying drawing. In the drawing, the single figure is a sectional view of a cavity resonator embodying the invention.

A constructional example of the cavity resonator according to the invention is illustrated in the drawing at **1**. The diameters of the tubes **2** and **5** extending from the wall of the cavity resonator **1** must be so dimensioned that, if the tubes are also filled by the dielectric elements **4, 7**, the resonance frequency of the cavity **10**, which is tunable by the tuning piston **9**, is higher than the lowest limit frequency.

Disposed in the tube **2** is the tuning piston **3**, which can be moved by means of the dielectric rod **4**. The piston

may consist of various high-loss materials, such for example as iron powder cores, or dielectric materials and the like saturated wtih graphite may be employed, but the greatest advantage is afforded by a ferromagnetic material, because in this case a given percentage variation of the quality factor is accompanied by a smaller detuning of the frequency.

Disposed in the tube **5** is the tuning piston **6** consisting of dielectric material or metal and movable by means of the dielectric rod **7**.

Tuning piston **3** effects a greater loss than tuning piston **6**, and it will be noted that piston **3** may thus consist of ferromagnetic material.

The dielectric rods **4** and **7** are connected together by the connecting rod **8**. The dimensions of the tuning piston **6** must be such that the resonance frequency variation resulting from the displacement of the tuning piston **3**, constructed of high loss material is compensated for by the displacement of the piston **6**.

The resonance frequency variation may also be balanced out by connecting the dielectric rods **4** and **7**, not directly, but indirectly by means of an appropriate transmission system.

We claim:

1. In a cavity resonator having a variable quality factor, means for varying the quality factor comprising at least one pair of tuning pistons operatively associated with the resonator cavity and movable conjointly and in opposed directions relative to such cavity; the dimensions of said pistons being so selected that the resonance frequency of the cavity is not appreciably varied by such conjoint movement of said pistons; the materials of the respective pistons differing as to loss factors.

2. Cavity resonator according to claim 1, characterized in that the tuning piston effecting the greater loss consists of ferro magnetic material.

3. Cavity resonator according to claim 1, characterized in that the tuning pistons are rigidly connected together for such conjoint movement.

4. Cavity resonator according to claim 1, characterized in that the tuning pistons are connected together through a transmission system for such conjoint movement.

5. Cavity resonator according to claim 1 in which the pistons of each pair are movable in cylinders extending in aligned opposed relation from, and communicating with, the cavity of said resonator.

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