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HERMETIC VARIABLE GAP CRYSTAL HOLDER

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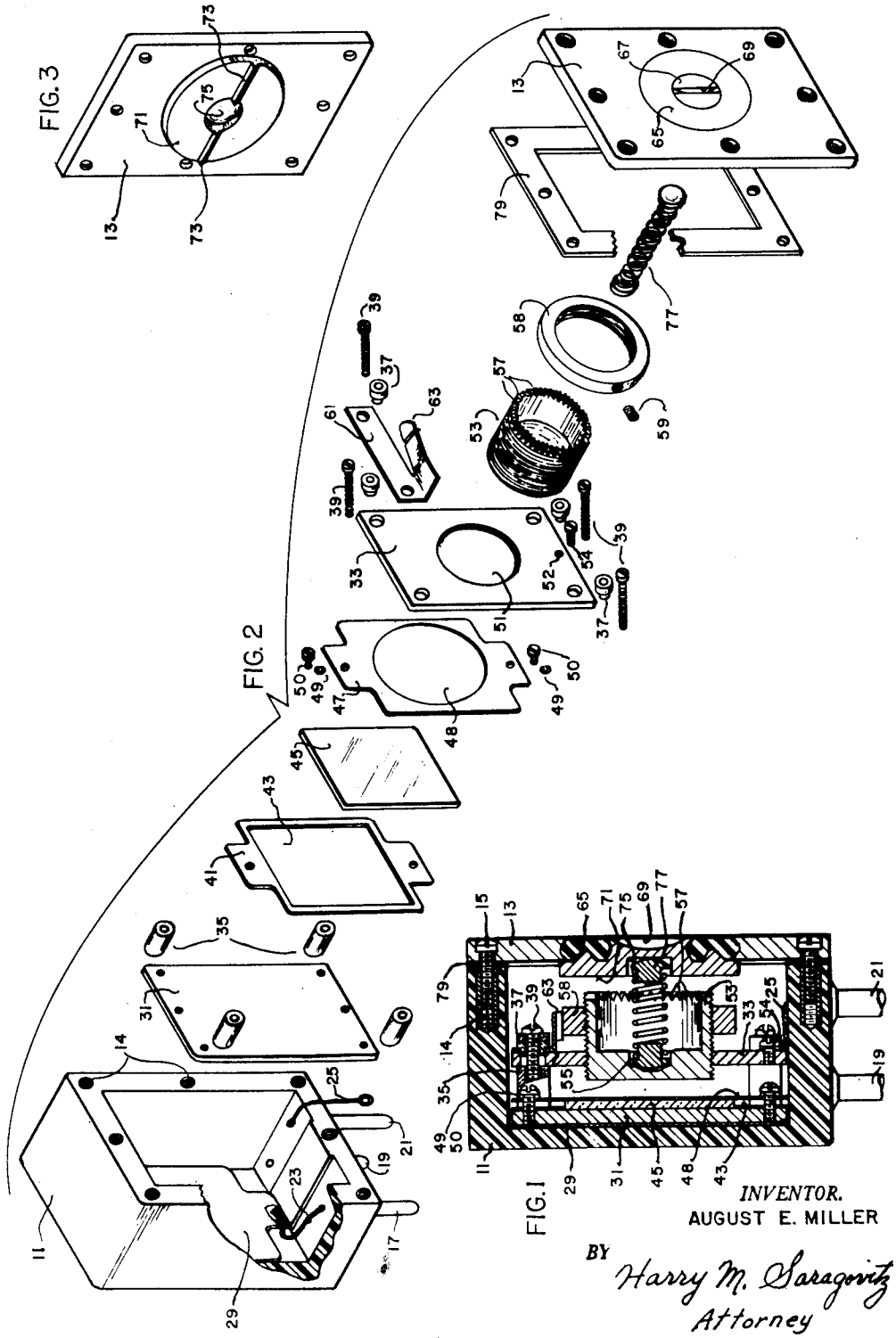

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HERMETIC VARIABLE GAP CRYSTAL HOLDER

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The invention relates broadly to piezo-electric crystal apparatus, and more particularly to an improved construction of a piezo-electric crystal holder.

The invention is directed primarily to a crystal holder that is hermetically sealed and having fixed and movable electrodes, and a piezo-electric crystal of fixed frequency positioned between said electrodes whereby the frequency of the crystal can be varied within certain fine limits by varying the air gap between the crystal and the movable electrode.

It is, accordingly, one of the objects of the present invention, to provide a piezo-electric crystal holder wherein the frequency of a particular crystal may be varied by providing means for varying the air gap between the crystal and the movable electrode.

Another object of the invention is to provide a crystal holder, wherein the crystal is hermetically sealed at all times, thereby providing for more stable operation of the device.

A still further object of the invention is to provide a piezo-electric crystal holder wherein actuation of the adjustable electrode is accomplished from a source external of the inner elements of the holder, thus assuring a completely hermetically sealed holder at all times.

For a clearer understanding of the nature of the invention and additional advantages, features and objects thereof, reference is made to the following description, taken in connection with the accompanying drawing, in which,

Fig. 1 is a cross-sectional view of a crystal holder embodying the present invention,

Fig. 2 is an exploded view showing, in perspective, the several parts of the holder, and

Fig. 3 is a perspective view showing the inside of the cover plate and driver plug.

Referring to the drawing, the crystal holder comprises a housing consisting of a rectangular container 11 and a cover 13, the container 11 being composed of an insulating material, such as Bakelite, or the like, while the cover plate 13 is preferably made of metal. The cover 13 is removably fastened to the container 11 by screws 15, insertable through circular openings in the cover 13 and engaging corresponding openings of internally threaded sleeves 14 in the container 11.

For mechanically supporting and for establishing external electrical contacts for the holder, three tubular metal pins or prongs 17, 19 and 21 are provided, which are secured to the outside bottom surface of the holder. The wires 23 and 25 are provided to make the appropriate

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electrical connections to the prongs 17, 21, as in conventional commercial practice. In the specific embodiment herein, wire 23 has its other end secured to a slightly arced contact plate 29, preferably made of springy copper, which is immediately adjacent the back wall of the container. Wire 25 is similarly secured to the plate supporting the movable electrode which will be more fully described hereinafter. Lying flush against the contact plate 29 is a fixed electrode 31. Parallel to, and anteriorly positioned with respect to the fixed electrode, is a supporting plate 33, for the movable electrode, the construction and function of which will be hereinafter described. The plate 33 is spaced from the fixed electrode 31 by tubular ceramic spacers 35 and further insulated from the fixed electrode by ceramic insulators 37. The insulators 37 are likewise tubular, each having a shank portion, which is insertable into a hole in plate 33, and a head portion which is slightly larger than the aforementioned hole of the plate. Four screws 39, insertable through both the insulators 37 and the spacers 35 and engageable in corresponding circular threaded openings in the fixed electrode 31, serve to fasten together the fixed and movable electrode fixture. Disposed in the space between the fixed electrode 31 and the plate 33 is a frame 41 having a substantially rectangular aperture 43 of a size to accommodate a piezo-electric crystal 45. To hold the crystal 45 in position, and complete the crystal sub-assembly, there is provided a flat retainer 47, having a central aperture 48 and holes for the insertion of lock washers 49 and screws 50, which are insertable through corresponding holes in the frame 41 and threaded holes in the fixed electrode 31.

The plate 33 is provided with a threaded central circular aperture 51 and further provided with a threaded hole 52 for accommodating the screw 54, which serves as a binding post for the wire 25. Within the aperture 51, there is positioned an externally threaded electrode 53 which, by virtue of such screw threaded surface, is adjustably movable in the plate 33.

As shown in Fig. 1, movable electrode 53 is substantially cup-shaped and further provided with a central depressed portion 55. The entire forward lip or edge of the electrode is provided with teeth 57, thereby forming a series of radial grooves about the entire edge of the electrode 53. Encircling and threadably engaging the movable electrode 53 is an internally threaded ring 58, having a hole to accommodate a set screw 59,

which serves to retain or hold the electrode 53 firmly in position within the ring 58. Secured to the upper portion of the front of the plate 33 is a friction lock 61, comprising essentially a flattened face portion that lies flush against the plate 33 and a perpendicularly extending spring-like element 63 which resiliently engages the ring 58.

The cover plate 13 has a central aperture which is in substantial alignment with the cavity of the movable electrode 53. Bonded to the cover plate 13, and confined within the aperture of said plate is a resilient rubber ring 65. Extending through the opening of the ring 65, and similarly bonded thereto, is a metallic driver plug 67. The outside, or exposed, face of the driver plug is provided with a channel or kerf 69 for accommodating a screw driver or similar instrument. The inner face of the driver plug 67 comprises a substantially flat plate or disk 71 of a diameter slightly larger than that of the movable electrode 53. Rising from the face of the disk 71 are knife-edge ridges 73 that are always in alignment with any one pair of opposite grooves of the movable electrode 53. Plate 71 is also provided with a central depression 75 which serves as a receptacle for one end of a coil spring 77. The other end of the spring 77 rests within the depressed portion of the movable electrode 53. To insure an air-tight seal, I provide a rubber gasket 79 between the cover 13 and the container 11.

In operation, a screw driver or similar instrument is inserted into the kerf 69 of the driver plug. The plug can then be depressed, causing the knife edge ridge 73 to mesh with or engage grooves in the adjustable electrode 53. Slight movement, either clockwise or counterclockwise of the screw driver will then effect a slight axial movement of the adjustable electrode to vary the air gap between the crystal and movable electrode as desired. The screw driver is then withdrawn, and the resiliency of the rubber ring, aided by the action of the spring 77, will force the plug back to its original position where the operation can be repeated as often as required to set the adjustable electrode in any desired position relative to the fixed electrode. To prevent any accidental or inadvertent movement of the movable electrode, the lock 61 is utilized wherein spring action of element 63 will resist any movement of ring 58 from its desired position.

While there has been described one specific embodiment of the invention, it is obvious that modifications and changes may be made without departing from the spirit and scope of the invention, as defined by the accompanying claims.

What is claimed is:

1. A hermetically sealed, adjustable air gap piezo-electric crystal holder comprising a container and a cover plate therefor, a fixed electrode within said container and a substantially cup-shaped movable electrode comprising a cylindrical housing terminating at one end in a flat base and its other end in a rim having radially disposed teeth, said base being spaced from and substantially parallel to said fixed electrode, a piezo-electric crystal positioned between said fixed and movable electrodes, and means on said cover plate for engaging the teeth on the rim of said movable electrode and effecting rotational movement thereof.

2. A hermetically sealed, adjustable air gap piezo-electric crystal holder comprising a container and a cover plate therefor, a fixed electrode within said container and a movable electrode spaced from said fixed electrode, a piezo-electric crystal positioned between said fixed and movable electrodes, means on said cover plate comprising a central resilient ring and a plug in said ring for engaging and effecting movement of said movable electrode, means in juxtaposition with said movable electrode for braking said electrode and spring means adjacent said cover plate for reverting said flexible mass to its normal non-operating position.

3. An hermetically sealed adjustable air-gap piezo-electric crystal holder comprising a container having an aperture in one wall thereof, a fixed electrode mounted in said container, a rotatable screw threaded electrode having engageable means thereon and spaced from said fixed electrode, a piezo-electric crystal between said fixed and rotatable electrodes, a resilient diaphragm secured to the periphery of said aperture and means secured to said diaphragm for engaging said engageable means of said rotatable electrode for effecting rotational movement thereof.

4. An hermetically sealed inclosure for an electric device having a fixed electrode and a rotatable screw threaded electrode mounted in said inclosure, comprising a container and an apertured cover therefor, a resilient diaphragm secured to the periphery of said aperture and means secured to said resilient diaphragm for engaging and effecting rotational movement of said rotatable electrode.

5. An inclosure of the type described in claim 4, wherein the means in said resilient diaphragm for engaging and effecting movement of said rotatable electrode comprises a plate-like plug secured to said resilient diaphragm, said plug having a groove in its outer face and a knife-like ridge on its inner face.

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