Jan. 21, 1958 K. KLINGSPORN 2,820,911

PIEZOELECTRIC CRYSTAL RESONATOR SUPPORT

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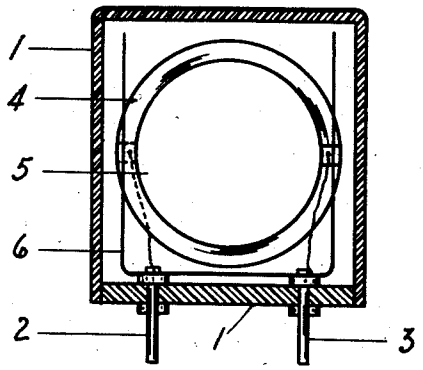


FIG. 1

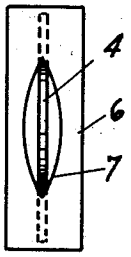


FIG. 2

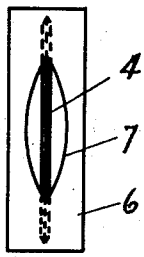


FIG. 3

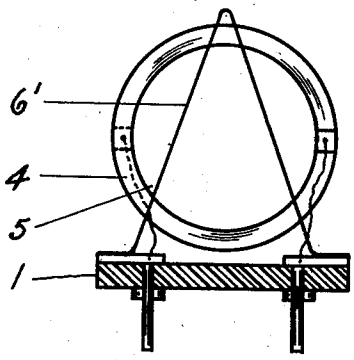


FIG. 4

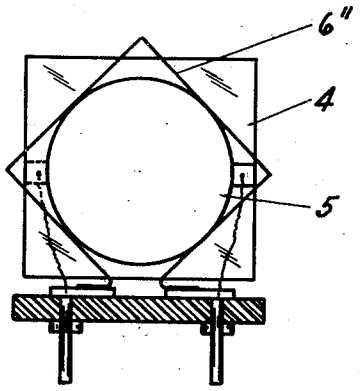


FIG. 5

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PIEZOELECTRIC CRYSTAL RESONATOR SUPPORT

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8 Claims. (Cl. 310—9.1)

This invention relates to quartz crystal supports, and more particularly to a high-frequency piezoelectric crystal resonator support allowing the crystal to oscillate freely in every direction.

As is shown thin-bodied high-frequency piezoelectric crystal resonators are being held in position by having them suspended from large diameter wires. Such a kind of suspension device, however, is statically unstable. It is, therefore, liable to tensional stress.

The object of the present invention is to provide a supporting device for piezoelectric crystal resonators which will hold them in the position previously determined upon while allowing them to oscillate freely in every direction.

According to the present invention, the supporting device for high-frequency piezoelectric crystals having silvered electrodes on each side comprises a housing consisting of a base plate and a cap removably mounted to said base plate, two current-conducting wires carried through the base plate and into said housing, a several-sided and angular-bent supporting strip of insulating material provided on top of the base plate and having narrow longitudinal slots of preferably elliptical shape, and the width of which is a little less than the width of the base plate, a crystal resonator of flat shape each side of which is partially silvered and connected to one current-conducting wire, said crystal resonator which may be cut in any particular orientation such as square, circular, or the like, with respect to the crystallographic axes, being loosely held in position by partially protruding through the longitudinal slots of the insulating strip.

By means of this piezoelectric crystal holding arrangement the crystal is freely held and kept in its position with respect to every direction within said narrow slots of the insulating strips, whereby the edges of the slots of said insulating strip are only in very slight contact with the crystal itself; viz., only at its edges or facet, according to the structure of the crystal.

The invention is illustrated in the accompanying drawings by way of example, showing preferred embodiments.

In the drawings:

Fig. 1 is a front elevational view, partly in section, of a circular piezoelectric crystal resonator support, the crystal being held in position by a U-shaped insulating strip being provided with narrow longitudinal slots;

Fig. 2 is a side elevational view of the insulating strip and the protruding portion of the crystal resonator;

Fig. 3 shows in side elevation an arrangement similar to Fig. 2, the piezoelectric crystal, however, having bevelled edges;

Fig. 4 is a front elevational view of a circular crystal held in position by a triangular insulating strip;

Fig. 5 shows in the same view as in Fig. 4 a square-cut crystal held in position by an upended four-sided strip.

Referring now more particularly to the drawings, the piezoelectric crystal resonator support as shown in Figs. 1–3 is provided with a housing 1, into and through the base plate of which very small-diameter current-conducting wires 2, 3 are led which are attached to silvered electrodes 5 provided on each side of the circular piezoelectric crystal 4 having sharp edges as shown in Fig. 2 or bevelled edges as shown in Fig. 3, and which is held in a vertical position at two sides by a U-shaped insulating strip 6 being provided with elliptical slots 7 adapted to hold said crystal in position. The width of said insulating strip 6 is a little less than the width of base plate 1.

Fig. 4 shows a circular piezoelectric crystal resonator held in position by a triangular insulating strip 6', whereas in Fig. 5 the support for a square crystal is in form of an upended four-sided insulating strip 6''.

While the form of apparatus herein described constitutes preferred embodiments of the invention, it is to be understood that the invention is no limited to this form of apparatus, and that changes, for instance, the insulating strip being in form of an M or W may be made without departing from the scope of the invention which is defined in the appended claims.

A further modification of this invention provides the insulating strip to be secured not to the base plate but to the current-conducting wires which in this modification are of somewhat heavier gauge diameter. The current-conducting wires may be connected with the insulating strip in a suitable manner by a small clamp passing through the slot in the insulating strip and clamping the current-conducting wire to the insulating strip. In this embodiment a fine wire would suitably connect this small clamp, which connects the insulating strip with the current-conducting wire, in such a way with the two silvered areas on each side of the crystal that its oscillations are nowise impeded.

I claim:

1. A high-frequency piezoelectric crystal resonator support comprising in combination a housing consisting of a base plate and a cap removably mounted to said base plate, two current-conducting wires carried through the base plate and into said housing, a several-sided and angular-bent supporting strip of insulating material provided on top of the base plate and having narrow longitudinal slots of elliptical shape, and the width of which is a little less than the width of the base plate, a crystal resonator of flat shape each side of which is partially silvered and connected to one current-conducting wire, said crystal resonator being loosely held in suspended and freely oscillating position by equal side portions partially protruding through the longitudinal slots of the insulating strip and engaging the supporting strip at spaced points along the major axis of said elliptically shaped slots.

2. A high-frequency piezoelectric crystal resonator support as claimed in claim 1, wherein the supporting strip is of U-shape.

3. A high-frequency piezoelectric crystal resonator support as claimed in claim 1, wherein the supporting strip is of triangular-shape.

4. A non-conductor mounting for supporting a high frequency piezoelectric crystal resonator having oscillation freedom in every direction without loading or dampening crystal oscillation at maximum amplitudes comprising in combination a base plate, current conductors extending through said base plate, a vertical piezoelectric crystal support mounted on said base plate comprising spaced upwardly extending non-conductor insulation strips, the width of each strip being less than the width of said base plate, narrow longitudinal elliptically shaped slots provided in said spaced insulation strips, a vertical flat crystal resonator loosely suspended with opposite balanced side portions extending through said longitudinal slots and engaging the supporting strip at spaced points along the major axis of said elliptically shaped slots and

being free to oscillate in every direction, silvered electrode surfacings on each side of said crystal resonator, and small diameter current conducting devices attached to said electrode surfacings and the said current conductors extending through said base plate.

5. In the combination of claim 4, the said non-conductor insulation strips being rectangular in shape.

6. In the combination of claim 4, the piezoelectric crystal resonator being in circular shape.

7. In the combination of claim 5, the piezoelectric crystal resonator being in rectangular shape.

8. In the combination of claim 5, the piezoelectric crystal resonator having beveled edges.

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