Oct. 22, 1946. H. M. BACH 2,409,607

MULTIPLE CRYSTAL HOLDER

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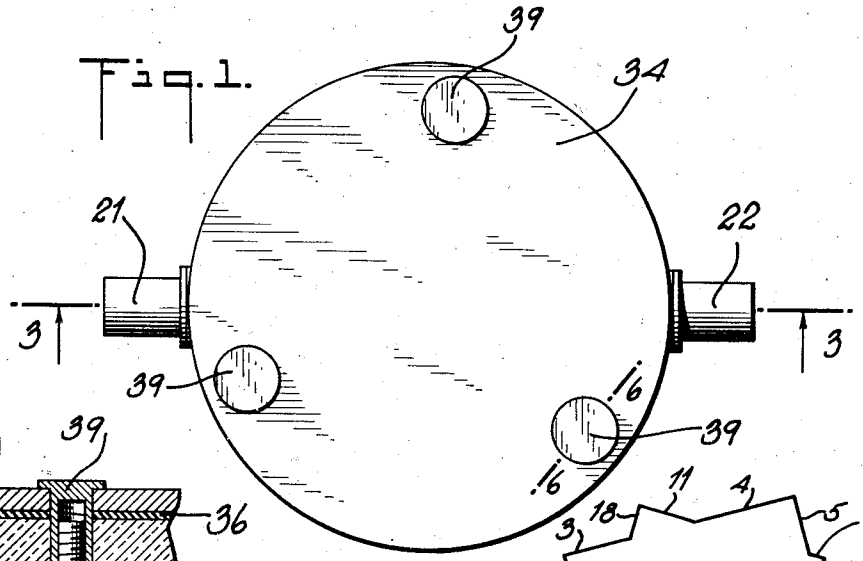
Fig. 1.



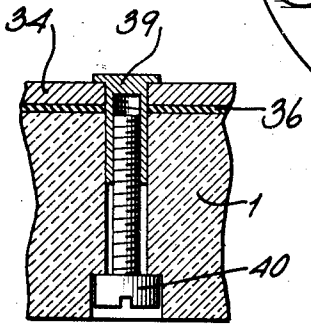


Fig. 6.

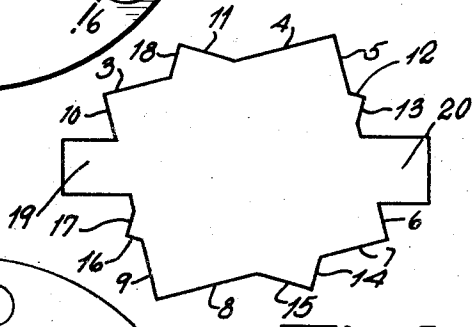


Fig. 5.

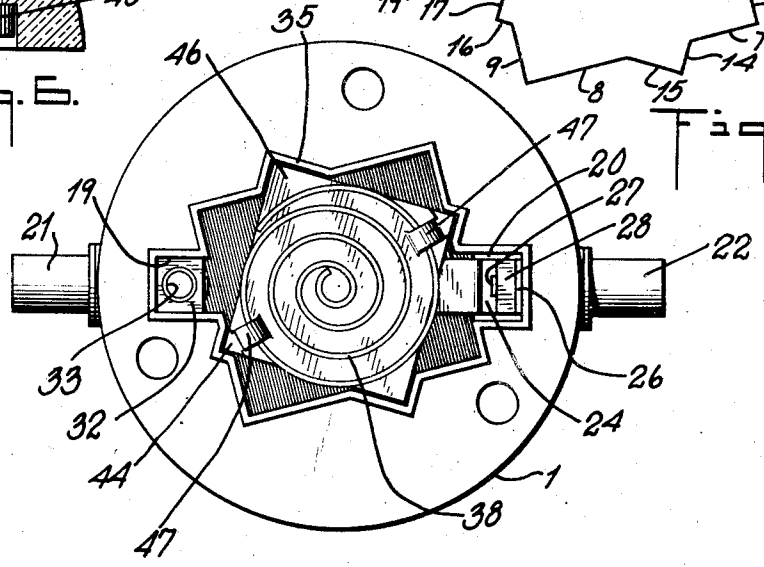


Fig. 2.

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Fig. 3.

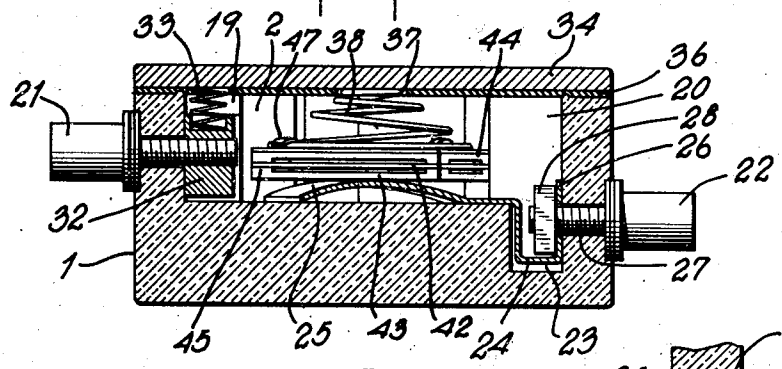
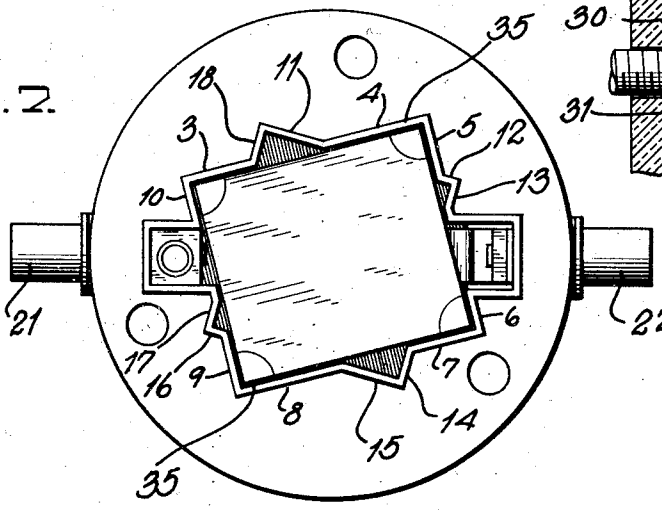


Fig. 2.



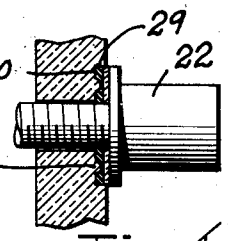
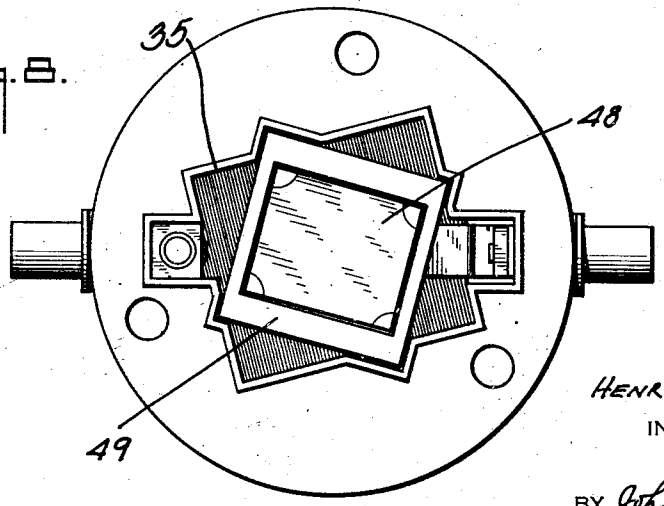


Fig. 4.

Fig. 8.



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MULTIPLE CRYSTAL HOLDER

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Application October 15, 1943, Serial No. 506,303

6 Claims. (Cl. 171—327)

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This invention relates to piezo-crystal devices and more especially to holders for such devices.

A principal object of the invention is to provide an improved piezo-crystal holder which is capable of use with crystals of a wide variety of crystal sizes.

A feature of the invention relates to a crystal holder having a specially designed cavity on its interior to receive and closely retain crystals or crystal assemblies of different peripheral sizes.

Another feature relates to an improved crystal holder for use with square or rectangular crystal units of the clamped type.

A further feature relates to a piezo-crystal unit specially designed for service under extreme mechanical shock conditions, which is airtight and moisture-proof and embodies a holder which is capable of accommodating crystals or crystal assemblies of widely different peripheral dimensions.

A still further feature relates to the novel organization, arrangement and relative location and inter-connection of parts which cooperate to constitute an improved holder for use with clamped crystal units.

Other features and advantages not specifically enumerated will be apparent after a consideration of the following detailed descriptions and the appended claims.

In the drawings which illustrate certain preferred embodiments of the invention,

Fig. 1 is a top-plan view of the crystal device according to the invention.

Fig. 2 is a view of Fig. 1 with the cover plates removed, and with the upper spring pressure unit removed.

Fig. 3 is a sectional view of Fig. 1 taken along the line 3—3 thereof.

Fig. 4 is an enlarged view of part of Fig. 3.

Fig. 5 is a diagrammatic view of the shape of the housing cavity.

Fig. 6 is a sectional view of Fig. 1 taken along the line 6—6 thereof.

Fig. 7 is a view similar to Fig. 2 but using a rectangular crystal assembly.

Fig. 8 shows a smaller crystal assembly used with a special insulator insert.

Referring to the drawings the holder comprises a cup-shaped member 1 of suitable insulating material such as Bakelite, ceramic, etc., having a main cavity 2 for receiving and closely restricting the movement of the crystal assembly, which cavity is of general irregular polygonal shape in plan as illustrated diagrammatically in Fig. 5. The sides of the cavity define internally a plu-

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rality of rectangular boundaries of different peripheral sizes. In the particular embodiment shown, the cavity is such as to provide two different shaped boundaries, one of which is rectangular and defined by the straight side walls 3—10, the other of which is square and defined by the straight side walls 11—18.

The cavity 2 is recessed laterally at opposite sides as indicated by numerals 19, 20, and the housing wall is perforated in alignment with these recesses to receive the contact arms 21, 22. The recess 20 is undercut at 23 to receive the right-angled bent lug 24 of a bowed metal spring contact plate 25. The vertical portion 26 of the lug 24 is perforated to receive the threaded shank 27 of arm 22. A metal block or nut 28 is threaded on to shank 27 to clamp the lug 24 in place. Preferably the outer face of member 1 is countersunk around the respective openings through which the contact arms 21 and 22 pass, to receive a rubber or Neoprene washer 29. Also the surface 30 of the countersunk portion has a continuous raised rib or recess 31 so that when the arms 21 and 22 are tightened in place there is provided a more effective moisture-proof and dust-proof seal.

The arm 21 is mounted similarly to arm 22 except that the metal block 32 into which it is threaded has a circular recess on its top face to receive a coiled contact spring 33 which is adapted to contact with the metal cover plate 34 when the latter is fastened against the top of member 1 as shown in Fig. 6. The said top surface of member 1 immediately surrounding the edge of the cavity is provided with a completely continuous raised rib 35, and there is a rubber or Neoprene gasket 36 which has an enlarged central opening 37 to allow the top of a coiled contact spring 38 to engage the cover plate 34. Likewise, the gasket is provided with a series of three smaller perforations around its margin to receive the internally threaded but exteriorly smooth flat-headed metal sleeves 39 which in turn are adapted to receive the fastening screws 40 which pass through the bottom face of member 1. Gasket 36 also has a small perforation to accommodate contact spring 33. In accordance with one feature of the invention, the holes in gasket 36 through which the sleeves 39 pass are of slightly smaller diameter than the external diameter of the sleeves so that when the cover plate is finally and tightly fastened in place the margin of each hole in the gasket tightly embraces the corresponding sleeve. If externally threaded screws were used in place

of the smooth surfaced sleeves **39**, it would be necessary to have the holes in the sealing gasket slightly larger than the screw diameter in order to allow the screw to be turned. If the gasket holes were made slightly smaller than the screw diameter, turning of the latter to fasten the cover **34** in place would result in buckling and permanent deformation or even tearing of the gasket around each screw. In either case there would be a less effective seal than with the sleeve fastening arrangement as shown.

In the particular embodiment shown in Figs. 1 to 3 the crystal unit is of square shape and comprises a thin square crystal **42** which is sandwiched between a pair of square metal electrodes **43**, **44**, whose corners are provided with a very slightly raised portion **45** so that the crystal is clamped only at its four corners while leaving a slight air gap between each of the electrodes **43**, **44**, and the cooperating faces of the crystal. For a more detailed description of this type of clamping arrangement, reference may be had to U. S. Patent No. 2,329,321.

In order to maintain the proper clamping pressure there is provided a conical coiled spring **38** to whose lower turn is fastened a square metal retainer plate **46**. Thus the plate **46** may have its corners provided with struck-up tongues which overlie and grip the lowermost turn of the spring thus rendering the spring and plate **46** an integral unit. This combination distributes the spring pressure uniformly over the surface of the electrode **44**. This prevents sliding of the spring due to the fact that it cannot be tangent to the four sides of a rectangle.

When it is desired to use a rectangular crystal assembly within the housing the cavity defined by the walls **3—10** is used, as illustrated schematically in Fig. 7.

It is not necessary to use crystals or crystal assemblies which fit the respective cavities closely. Thus as shown in Fig. 8, the crystal assembly **48** can be fitted into a square or rectangular insert **49** of insulation material which fits closely in the correspondingly shaped cavity, thus allowing a smaller crystal assembly **48** to be closely fitted within the insert.

While in the drawings a cavity capable of accommodating two different sizes of crystal assemblies has been illustrated, it will be understood that the side walls of the main cavity may be notched or indented so as to define more than two rectangular outlines. Various changes and modifications may be made in the disclosed embodiments without departing from the spirit and scope of the invention.

What I claim is:

1. In combination, a housing of insulation having a crystal-unit receiving cavity, a bowed spring contact plate resting on the bottom of said cavity, a crystal unit resting on said plate, said unit comprising a crystal sandwiched between a pair of metal electrodes, a metal pressure plate resting on the top electrode, a coiled spring attached to said pressure plate, a metal cover plate fastened to said housing and contacting with said spring, a sealing gasket between said cover plate and said housing, a pair of contact arms passing through the said walls of said housing and electrically connected to the crystal electrodes, a sealing washer between each arm and the side walls of the housing to render it dust-proof, the surface of said side wall surrounding each arm and underlying the washer being offset to form a sealing rib for increasing the sealing effect of said washer.

2. In a piezo crystal device, a member having a cavity to receive a crystal unit, a cover plate for said cavity, a sealing gasket located between said cover plate and said member, and means to fasten said cover plate to said member comprising a plurality of externally smooth but internally threaded flanged-headed sleeves passing through the cover plate and through corresponding openings in the gasket, fastening screws passing through the said member on the opposite side of said cover plate and threaded into said sleeves, said sleeves having an outside diameter which is greater than the normal diameter of the said gasket openings whereby tightening of said screws into said sleeves increases the effective seal between said sleeves and said gasket.

3. A holder for polygonal piezo crystals comprising a member having side walls defining a crystal receiving cavity adapted to receive a crystal of one size with substantial surface abutment of the crystal edges, said side walls being recessed to receive the corners of a crystal of another size with substantial surface abutment of the crystal edges adjacent said corners.

4. A holder for use with square or non-square rectangular crystals, comprising a member having a cavity whose main side walls define a rectangular crystal receiving cavity adapted to receive a rectangular crystal with substantial surface abutment at its edges, said side walls having substantially right angled notches arranged to receive a square crystal with substantial surface abutment of the edges of said square crystal adjacent the corners thereof.

5. A holder for piezo crystals comprising a member having a crystal receiving cavity adapted to receive a rectangular crystal with surface abutment at the crystal edges around substantially the entire periphery thereof, the walls of said cavity being formed with four right angled notches adapted to receive the corners of a smaller rectangular crystal with substantial surface abutment of the edges of said smaller crystal adjacent said corners.

6. A holder according to claim 5, wherein said walls have lateral recesses to accommodate contact members for electrical connection to the crystal electrodes.

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