

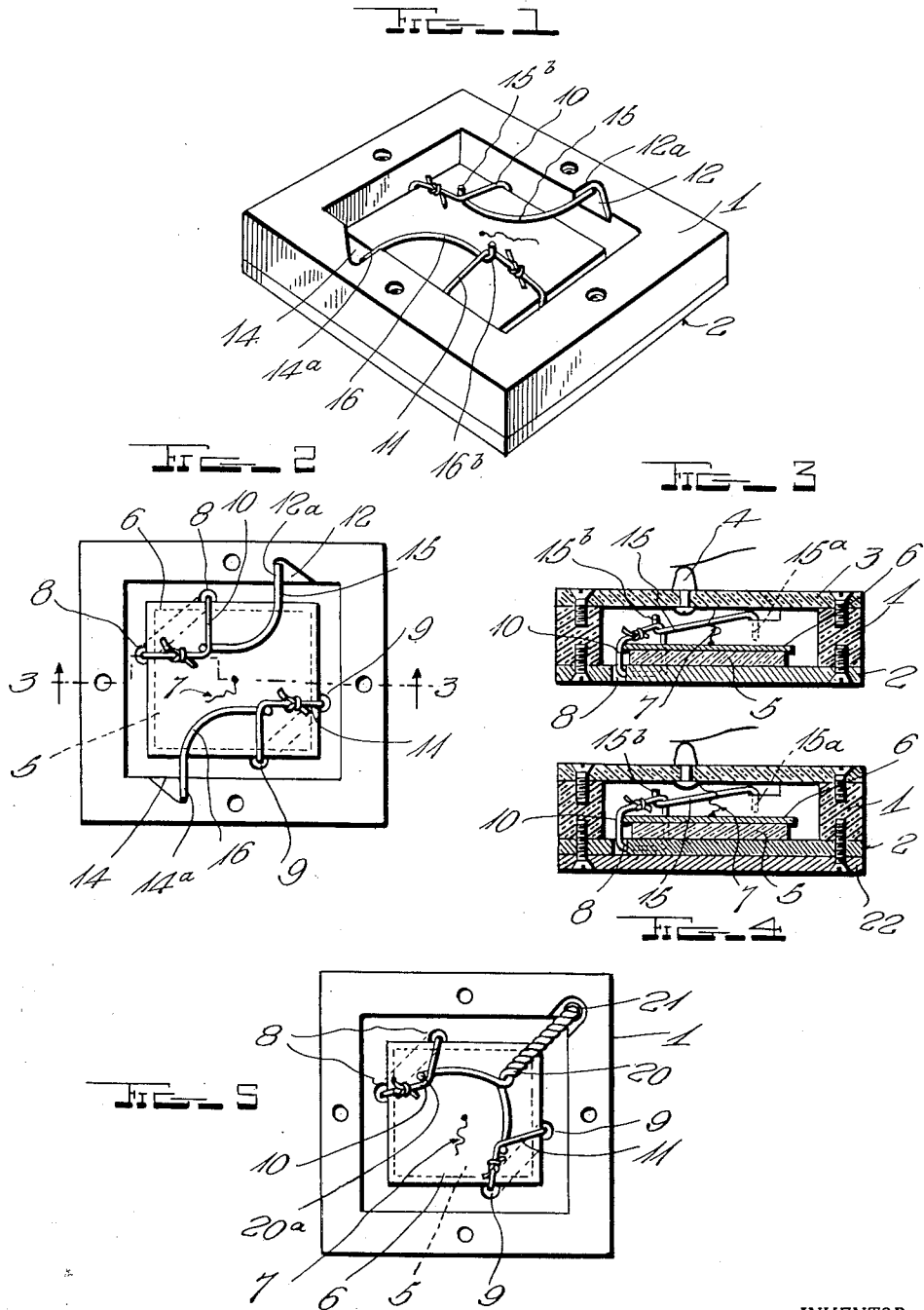
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PIEZO ELECTRIC CRYSTAL HOLDER

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PIEZO-ELECTRIC CRYSTAL HOLDER

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My invention relates broadly to piezo electric crystal apparatus and more particularly to a mounting for a piezo electric crystal where the crystal may be centered within a casing with substantially no restriction with respect to the vibration thereof.

One of the objects of my invention is to provide means for centering a piezo electric crystal element within a casing which substantially conforms to the shape of the piezo electric crystal element with means for preventing the crystal from contacting at its edges with the interior walls of the casing at the same time that the crystal is free to vibrate.

Another object of my invention is to provide a mounting for a piezo electric crystal within a substantially flat shelf like casing where resilient means are employed to maintain the crystal out of contact with the inner walls of the casing while permitting the free vibration of the crystal.

Still another object of my invention is to provide a construction of crystal holder which is particularly adapted for use in aircraft radio apparatus where the crystal may be subjected to sudden shocks or mechanical vibration which would normally tend to injure or destroy the crystal by the chipping of the edges thereof.

Other and further objects of my invention reside in the construction of piezo electric crystal holder described in the following specification and shown in the accompanying drawings in which:

Figure 1 is a perspective view of the crystal holder with the top thereof removed in order to show the interior arrangement; Fig. 2 is a plan view of the piezo electric crystal holder showing the mounting of the piezo crystal within the casing; Fig. 3 is a cross-sectional view taken through the piezo electric crystal holder on line 3—3 thereof; Fig. 4 is a cross-sectional view through a modified form of piezo electric crystal holder; and Fig. 5 is a plan view showing a further modified form of piezo electric crystal holder constructed in accordance with my invention.

In types of piezo electric crystal holders where the piezo electric crystal is mounted

in a casing which closely conforms to the contour of the crystal, it is difficult to properly center the crystal within the holder without imposing restraint upon the vibratory motion of the crystal. The crystal holder of my construction has been found to be highly satisfactory by reason of the increased output from the crystal due to greatly reduced mechanical damping since the edges of the crystal cannot touch the solid sides of the holder, as the crystal is maintained substantially in the center of the casing by an arrangement of cords limited in position by resilient means extending from the interior walls of the casing. The crystal holder of my invention has been found to be particularly satisfactory in avoiding the breakage of crystals due to mechanical shocks. Breakage is greatly reduced since the crystal and its top plate are held in intimate contact with the bottom plate while being spaced from the interior sides of the holder at the same time that the vibratory movement of the crystal is not unduly damped.

Referring to the drawings in detail, reference character 1 designates an insulated frame member to which there is secured a conductive bottom plate 2 and an insulated top plate 3. The top plate 3 carries a contact member 4 to which connection may be made in establishing electrical connection with the upper surface of the piezo electric crystal element 5 within the piezo electric crystal holder. A plate member or electrode 6 rests upon the upper surface of the piezo electric crystal element 5 and is connected through flexible lead 7 with contact 4. In order to maintain the piezo electric crystal element in position within the casing, the lower plate 2 is apertured as represented at 8 and 9 permitting the passage of loops of cord or thread shown at 10 and 11. It will be observed that the apertures 8 and 9 are aligned with respect to each other in opposite corners of the holder. This permits the piezo electric crystal element 5 to have its corner slipped through the loops 10 and 11 for locating the crystal with respect to the casing. The upper electrode plate 6 is also centered by means of the loops of cord 10 and 11. The

interior of the frame 1 is cut away at its opposite interior edges as represented at 12 and 14 to permit the mounting of the angularly movable resilient arms 15 and 16, respectively. Each arm 15 and 16 extends downwardly into the side of the frame 1 at its end as represented at 15a. The opposite ends of the arms 15 and 16 are bent upwardly at an angle as represented at 15b and 16b, serving as hooks over which the loops of cord 10 and 11 are anchored. The members 15 and 16 have sufficient resiliency as to tend to continuously stretch the loops of cord 10 and 11 taut, thereby centering the piezo electric crystal 5 and the upper electrode 6 within the inner walls of the frame 1 and out of contact therewith. It will be observed that chipping of the edges of the crystal 5 is prevented as the crystal is at all times maintained out of contact with the interior walls of frame 1. Movement of the crystal under conditions of shock such as may be encountered in aircraft operation is prevented by virtue of the position of the loops 10 and 11. In assembling the piezo electric crystal apparatus, it will be observed that the members 15 and 16 are removable and are each free to swing out of position to allow assembly of the apparatus. During this motion the arms 15 and 16 are limited by an abutment with the walls 12a and 14a respectively.

In Fig. 5, I have shown a construction of piezo electric crystal holder wherein a double hook is formed from a twisted wire designated at 20, the wire having hooks 20a and 20b for engaging the loops 10 and 11 respectively. The twisted portion of the wire member extends downwardly into the frame 1 as indicated at 21 in one corner of the piezo electric crystal holder. The piezo electric crystal apparatus may be readily assembled or disassembled to permit the insertion of a crystal of different frequency within the casing. It may be desirable to cover the bottom plate 2 with a shield to entirely close the bottom of the plate as represented more clearly in Fig. 4, where the auxiliary bottom plate 22 closes the apertures 8 and 9. It will be understood that grooves interconnect the apertures 8 and 9 on the lower surface of the plate 2 thereby enabling the cords 10 and 11 to occupy a position flush with the lower surface of the piezo electric crystal holder.

While I have described the preferred embodiments of my invention I desire that it be understood that modifications may be made and that no limitations of my invention are intended other than by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is as follows:

1. A piezo electric crystal apparatus comprising a frame member, a metallic base plate carried by one side of said frame member, a

top plate positioned upon the opposite side of said frame member, a piezo electric crystal having its lower face resting in contact with the metallic base, an electrode touching the upper surface of said piezo electric crystal, a multiplicity of textile cords passing through said metallic base and embracing the edges of said electrode, and independently removable spring means extending from two opposite walls of said frame to a position removed from the center of said crystal for maintaining said textile cords taut and centering said piezo electric crystal element within said frame with substantially no restriction to the vibration of said crystal.

2. A piezo electric crystal apparatus comprising a frame structure, a metallic member closing one side of said frame structure, a piezo electric crystal element having its lower surface resting in contact with said metallic member, an electrode touching the upper surface of said piezo electric crystal element, flexible cord members passing through said metallic member and embracing the edges of said electrode, and spring means extending from two of the opposite walls of said frame structure to a position removed from the center of said crystal for maintaining said flexible cord members under tension and centering said piezo electric crystal element within said frame structure with substantially no restriction to the vibration of said crystal.

3. A piezo electric crystal apparatus comprising a frame member of insulated material, a metallic base plate closing one side of said frame member, a terminal plate closing the opposite side of said frame member, a piezo electric crystal element having its lower surface resting in contact with said metallic base plate, an electrode touching the upper surface of said piezo electric crystal element, flexible members engaging opposite edges of said electrode, and resilient means projecting from two of the opposite interior walls of said frame member to a position adjacent diagonally opposite corners of said crystal element and engaging said flexible means for stretching said flexible means around said crystal and maintaining said piezo electric crystal element in a central position within said frame for vibration substantially without restriction.

4. In a piezo electric crystal apparatus a frame member of insulating material, a metallic plate closing one side of said frame member, a piezo electric crystal having its lower surface resting in contact with said metallic plate, an electrode touching the upper surface of said piezo electric element, flexible means engaging opposite edges of said electrode, and spring members substantially in the form of hooks extending from two of the opposite walls of said frame member to positions substantially over two of the

corners of said crystal, said spring members embracing each of said flexible members for stretching said members and centering the piezo electric crystal element within said frame.

5 5. In a piezo electric crystal apparatus a frame member of insulating material, a metallic plate closing one side of said frame member, a piezo electric crystal having its
10 lower surface resting in contact with said metallic plate, an electrode touching the upper surface of said piezo electric crystal element, flexible means engaging opposite edges of said electrode and independent means extending from diagonally opposite positions
15 in the interior sides of said frame member and terminating in hooks substantially over two of the corners of said crystal, said hooks embracing said flexible means for stretching
20 said means and centering said crystal within the frame member.

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