

Sept. 4, 1928.

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C. B. MIRICK

PIEZO ELECTRIC CRYSTAL HOLDER

Filed June 7, 1927

Fig. 2

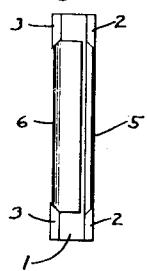


Fig. 1

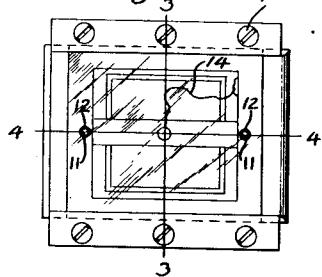


Fig. 3

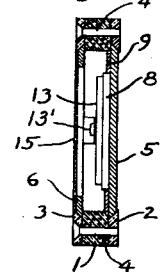


Fig. 4

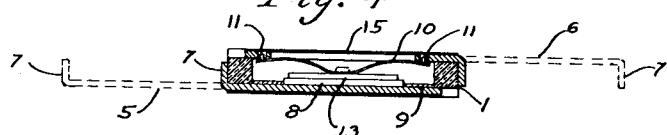


Fig. 5

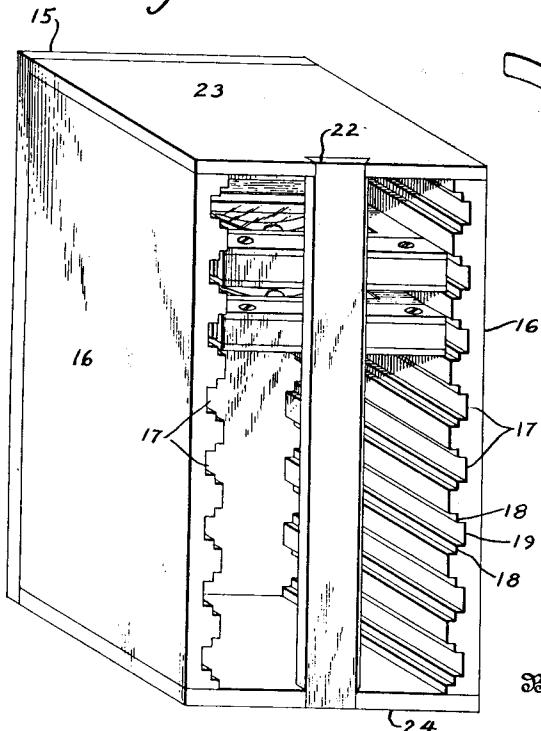
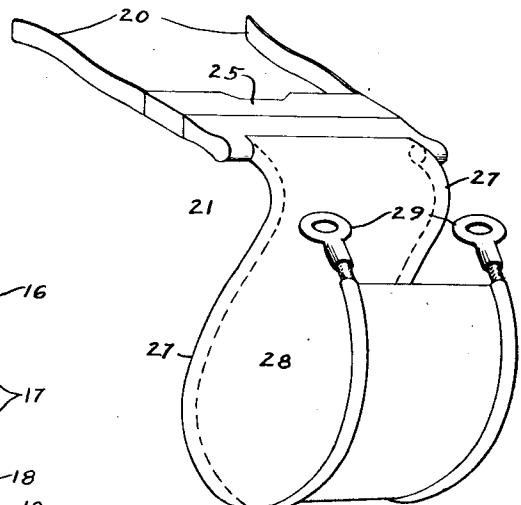


Fig. 6



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# UNITED STATES PATENT OFFICE.

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## PIEZO-ELECTRIC CRYSTAL HOLDER.

Application filed June 7, 1927. Serial No. 197,133.

My invention relates broadly to piezo electric crystal holders and more particularly to a piezo electric crystal holder of unique design such that a plurality of crystals may be mounted in one unit for substitution of any one of the crystals in a circuit for change of wave length.

The object of my invention is to produce a crystal holder of such compact design that a plurality of crystal holders may be mounted in a single unit in which the individual crystal holders are separate from each other.

Another object of my invention is the production of a clip that may be used with the unit and by which one crystal may be readily substituted in a radio circuit without changing the other constants of the circuit and without appreciable change of apparatus.

Further objects of my invention will appear more fully hereinafter as the description of the method and apparatus is developed.

My invention consists substantially in the construction, combination and arrangement of parts associated therewith or as will be more fully hereinafter set forth as shown by the accompanying drawings and finally pointed out in the appended claims.

Reference is to be had to the accompanying drawings forming a part of this specification in which like reference characters indicate corresponding parts throughout the several views and in which:

Figure 1 is a plan view of my improved crystal holder,

Figure 2 is an end view of the same.

Figure 3 is a sectional view on the line 3—3 of Figure 1,

Figure 4 is a sectional view on the line 4—4 of Figure 1,

Figure 5 is a view of a plurality of holders mounted in a single unit, and

Figure 6 is a perspective view of the clip used for making contact with any one of the crystals as desired and the connections thereto.

Referring particularly to Figures 1—4, numeral 1 represents a rectangular frame of insulating material such as bakelite or hard rubber. Upon the opposite surfaces of the rectangular frame 1 are mounted bevelled retainer strips 2 and 3 that are held in place by screws 4 and form grooves into which are fitted the metallic cover plates 5 and 6. Plate

5 is a solid plate bent up at the end as shown at 7 and forms one electrode for the piezo electric crystal 8 that rests firmly thereon.

Surrounding the crystal is a retainer plate 9 of insulating material. This retainer plate is so designed that the crystal is firmly held in position relative to any horizontal movement over the cover plate 5.

The cover plate 5 has an aperture in its central portion that is somewhat larger than the crystal itself but smaller than the internal periphery of the frame 1. Upon the inner side of the plate is mounted an arcuate spring member 10 that is firmly held in position relative to the plate by means of pins 11 riveted to the ends of the arcuate member 10 and engaging holes 12 in the cover plate. Upon the center of the arcuate member 10 there is pivotally mounted an electrode plate 13 that engages the surface of the crystal 8. By means of the pivotal connection 13' the electrode plate 13 exerts an even pressure over the surface of the crystal which in turn exerts an even distributed pressure upon the cover plate 5 which serves as the other electrode for the crystal.

In order that possible poor contact of the pivotal connection to the electrode plate 13 and the contacts at the points 11 and 12 will not introduce resistance in the circuit a pigtail connection 14 is made from the cover plate 6 directly to the electrode plate. Over the opening in the cover plate 6 there is a piece of transparent material 15 such as celluloid or the like inlaid in the surface of the cover plate, or held in position thereon by a dovetail groove machined in the surface of the plate and allowing ready removal of the window. By this structure I have developed a crystal holder that is dust proof and constitutes substantially a moisture proof container for the crystal that rigidly holds the crystal in place and allows transportation without danger of breakage.

Referring to Figure 5, numeral 15 represents a miniature cabinet made of insulating material, in the sides 16 of which are a plurality of double grooves 17. These double grooves constitute an inner groove 18 and an outer groove 19. The width of the cabinet is such that the crystal holder described with reference to Figures 1 to 4 fits between the sides of the cabinet within the inner grooves. The crystal holders are placed in the cabinet

with the bent up ends 7 engaging the grooves 18. In this manner the individual crystal holders are locked in a closed position.

The outer grooves 19 lie within the inner 6 grooves 18 and constitute a passage way for the terminals 20 of the clip 21, Figure 6, to make contact with the bent up ends 7 of the cover plates and in this manner make electrical contact with the crystal. The unit 10 when filled with a number of crystal holders is then completed by the insertion of a retainer strip 22 dovetailed into the top 23 and the bottom 24 of the cabinet.

Referring particularly to Figure 6 that 15 represents the clip that I devised to use with the above described unit, numeral 25 represents the body portion that is of such size that it fits snugly within the double grooves 17 of the cabinet. Along the sides of the body 20 portion are inlaid the metallic spring clips 20 that snugly fit the inner grooves 18 of the double grooves 17 and make electrical contact with the bent up ends 7 of the cover plates.

25 The electrical leads 27 for the spring clips consist of flexible wires sewn into a flexible strip 28, which is firmly fastened to the body portion 25 of the clip. The electrical terminals of the leads consist of the usual circular 30 binding clips 29 soldered to the ends of the flexible wires.

In a unit of this type it is possible to arrange a series of crystal holders containing 35 crystals that have a fundamental frequency of any predetermined value, such as 10 kilocycles difference, or any other value of desired wave lengths. By the mere shifting of the clip 25 from one groove to another the 40 frequency of the transmitter or of the apparatus in which the crystal control of the frequency is utilized is changed without affecting the other constants of the circuit.

It will be understood that the above 45 description and accompanying drawings comprehend only the general and preferred embodiment of my invention and that minor detail changes in the construction and arrangement of parts may be made within the scope of the appended claims without sacrificing any of the advantages of my invention.

Having thus described my invention what I claim is:

1. In a piezo electric crystal holder, the 55 combination of a frame having grooves recessed in its faces, a crystal and electrodes therefor within the frame, and metallic cover plates inserted within the grooves and having bent up ends, said bent up ends constituting electrical contacts for the electrodes of 60 the crystal.

2. In a piezo electric crystal holder, the 65 combination of a frame having grooves recessed in its faces, a crystal and electrodes therefor within the frame and metallic cover plates inserted within the grooves and hav-

ing bent up ends, said bent up ends conforming in contour with the sides of the frame and constituting electrical contacts for the electrodes of the crystal.

3. In a piezo-electric crystal holder, the 70 combination of a frame having grooves recessed in its faces, a crystal and electrodes therefor within the frame and metallic cover plates removably inserted within the grooves and having bent up ends, said bent up ends 75 conforming in contour with the sides of the frame and constituting electrical contacts for the electrodes of the crystal.

4. In a piezo electric crystal holder, the 80 combination of a frame having grooves recessed in its faces, a metallic cover plate removably inserted in one of the grooved faces, a piezo electric crystal within the frame, said metallic cover plate constituting one electrode for the crystal, a retainer plate within 85 the frame for preventing lateral movement of the crystal over the surface of the said cover plate, an electrode engaging the other surface of the crystal, a second cover plate removably inserted in the other grooved face 90 of the frame and resilient means between the cover plate and the electrode for maintaining an even pressure of the crystal upon the electrode cover plate and for maintaining an even pressure of the electrode upon the crystal. 95

5. In a piezo electric crystal holder, the combination of a frame having grooves recessed in its faces, a metallic cover plate removably inserted in one of the grooved faces, 10 a piezo electric crystal within the frame, said metallic cover plate constituting one electrode for the crystal, a retainer plate within the frame for preventing lateral movement of the crystal over the surface of the said 10 cover plate, an electrode engaging the other surface of the crystal, a second cover plate removably inserted in the other grooved face of the frame and resilient means between the 11 cover plate and the electrode for maintaining an even pressure of the crystal upon the electrode cover plate and for maintaining an even pressure of the electrode upon the crystal, said resilient means consisting of an ar- 11 cuate spring member the center of which en- 12 gages the electrode and the ends of which engage the second mentioned cover plate.

6. In a piezo electric crystal holder, the combination of a frame having grooves recessed in its faces, a metallic cover plate removably inserted in one of the grooved faces, 12 a piezo electric crystal within the frame, said metallic cover plate constituting one electrode for the crystal, a retainer plate within the frame for preventing lateral movement of the crystal over the surface of the said cover plate, an electrode engaging the other surface of the crystal, a second cover plate removably inserted in the other grooved face 12 of the frame and resilient means between the 13

- cover plate and the electrode for maintaining an even pressure of the crystal upon the electrode cover plate and for maintaining an even pressure of the electrode upon the crystal, said resilient means consisting of an arcuate spring member the center of which pivotally engages the electrode and the ends of which are fixed under slight pressure.
7. In a piezo electric crystal holder, the combination of a frame having grooves recessed in its faces, a metallic cover plate removably inserted in one of the grooved faces, a piezo electric crystal within the frame, said metallic cover plate constituting one electrode for the crystal, a retainer plate within the frame for preventing lateral movement of the crystal over the surface of the said cover plate, an electrode engaging the other surface of the crystal, a second cover plate removably inserted in the other grooved face of the frame and resilient means between the cover plate and the electrode for maintaining an even pressure of the crystal upon the electrode cover plate and for maintaining an even pressure of the electrode upon the crystal, said resilient means consisting of an arcuate spring member the center of which pivotally engages the electrode and the ends of which are fixed under slight pressure, and means for establishing positive electrical contact between the electrode and the second mentioned cover plate.
8. In a piezo electric crystal holder, the combination of a frame having grooves recessed in its faces, a metallic cover plate removably inserted in one of the grooved faces, a piezo electric crystal within the frame, said metallic cover plate constituting one electrode for the crystal, a retainer plate within the frame for preventing lateral movement of the crystal over the surface of the said cover plate, an electrode engaging the other surface of the crystal, a second cover plate having a transparent window thereto removably inserted in the other grooved face of the frame and resilient means between the cover plate and the electrode for maintaining an even pressure of the crystal upon the electrode cover plate and for maintaining an even pressure of the electrode upon the crystal.
9. In a multiple crystal unit the combination of a cabinet of insulating material having a plurality of double grooves in its inner walls, a plurality of crystal holders inserted within the grooves and means conforming to the shape of a portion of the grooves for establishing contact with the terminals of the crystal holders.
10. In a multiple crystal unit the combination of a cabinet of insulating material having a plurality of double grooves in its inner walls, a plurality of crystal holders having contact surfaces upon their edges inserted within the grooves and means conforming to the shape of a portion of the grooves for establishing electrical contact with the contact surfaces of the crystal holders.
11. In a multiple crystal unit the combination of a cabinet of insulating material having a plurality of double grooves in its inner walls, a plurality of crystal holders having contact surfaces upon their edges inserted within the grooves and means conforming to the shape of a portion of the grooves for establishing electrical contact with the contact surfaces of the crystal holders said means consisting of a clip engaging the entrance portion of the grooves.
12. In a multiple crystal unit the combination of a cabinet of insulating material having a plurality of double grooves in its inner walls, a plurality of crystal holders inserted within the grooves and means conforming to the shape of a portion of the grooves for establishing electrical contact with the contact surfaces of the crystal holders, said means consisting of a clip having a body portion the edges of which conform to the shape of the grooves.
13. In a multiple crystal unit the combination of a cabinet of insulating material having a plurality of double grooves in its inner walls, a plurality of crystal holders inserted within the grooves and means conforming to the shape of a portion of the grooves for establishing electrical contact with the contact surfaces of the crystal holders, said means consisting of a clip having a body portion the edges of which conform to the shape of the grooves and metallic terminals attached to the edges of the body portion and extending within the grooves between the cabinet wall and the contact surfaces of the crystal holder.
14. In a multiple crystal unit the combination of a cabinet of insulating material having a plurality of double grooves in its inner walls, a plurality of crystal holders inserted within the grooves and means conforming to the shape of a portion of the grooves for establishing electrical contact with the contact surfaces of the crystal holders, said means consisting of a clip having a body portion the edges of which conform to the shape of the grooves and metallic terminals attached to the edges of the body portion and extending within the grooves between the cabinet wall and the contact surfaces of the crystal holder, said clip adapted to be removed from one set of said grooves and to be placed in another set without changing the constants of the circuit in which it is used other than those constants controlled by the individual crystal with which the clip is in contact.