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HOLDER FOR PIEZOELECTRIC OSCILLATORS

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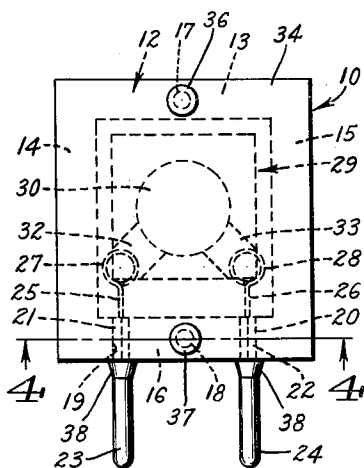


Fig. 1

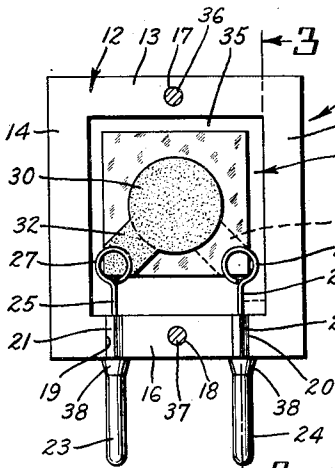


Fig. 2

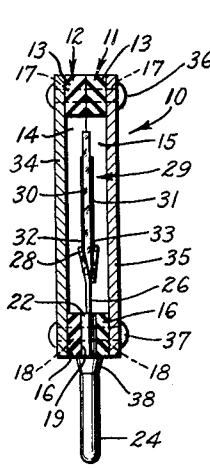


Fig. 3

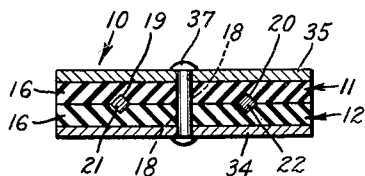


Fig. 4

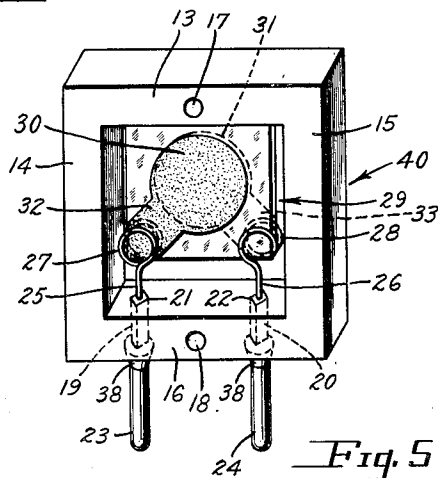


Fig. 5

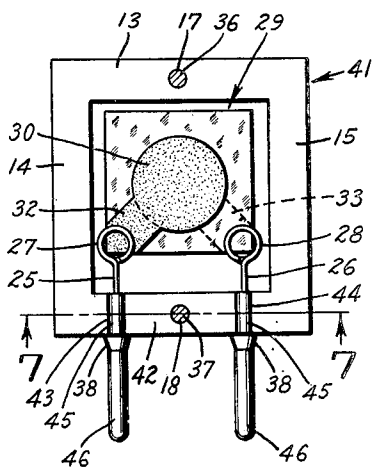


Fig. 6

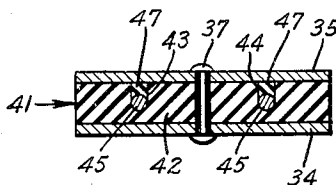


Fig. 7

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HOLDER FOR PIEZOELECTRIC
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This invention relates to new and useful improvements in frequency control apparatus for communication systems and has particular relation to a simple and inexpensive construction of holder for piezoelectric crystals.

The objects and advantages of the invention will become apparent from a consideration of the following detailed description taken in connection with the accompanying drawing wherein satisfactory embodiments of the invention are shown. However, it is to be understood that the invention is not limited to the details disclosed but includes all such variations and modifications as fall within the spirit of the invention and the scope of the appended claims.

In the drawing:

Fig. 1 is a front elevational view showing a crystal holder constructed in accordance with the invention;

Fig. 2 is a view somewhat similar to Fig. 1 but with the front closure plate and the front insulating frame removed;

Fig. 3 is a sectional view through a complete holder, the view being taken as along the plane of the line 3—3 of Fig. 2;

Fig. 4 is a sectional view taken along line 4—4 of Fig. 1;

Fig. 5 is an isometric view showing a modification;

Fig. 6 is a view somewhat similar to Fig. 2 but showing a further modification; and

Fig. 7 is a sectional view through the complete holder of Fig. 6, the view being taken as along line 7—7 of that figure.

The present invention is concerned chiefly with the providing of a simple and inexpensive holder for a piezoelectric crystal. The holder shown provides for the proper mounting of the crystal and yet the holder is of simple and inexpensive construction and of a construction permitting of the manufacture of very small holders.

Referring in detail to the drawing and at first more particularly to the structure shown in Figs. 1-4, the holder there generally designated 10 comprises a pair of frame-like pieces 11 and 12 formed of a suitable insulating material. As shown, the pieces 11 and 12 are of identical construction and each is shown as a rectangular frame. The pieces are made up in the desired size and thickness and they may be molded of a suitable plastic compound or they may be blanked from impregnated fibre sheets or the like.

The method of their manufacture is not a feature of the invention however. Thus, each frame piece (see particularly Fig. 2) includes a top bar 13, side bars 14 and 15, and a bottom bar 16. The bars 13 and 16 are perforated, as at 17 and 18. In addition, each bottom bar has a pair of grooves or notches 19 and 20 formed in

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one of its faces. In the completed assembly, the frame members 11 and 12 are arranged in contacting relation with their respective notches or channels 19 and 20 in registry and defining openings in which are located stem portions 21 and 22 of contact prongs or pins 23 and 24, respectively.

Preferably, the dimensions of the shanks 21 and 22, with respect to the size of the channels or openings formed by the grooves 19 and 20, are such that in the assembly the shanks are tightly gripped between two assembled frames. Conductors 25 and 26 are formed with spring clips 27 and 28 at their upper ends and at their lower ends these conductors are welded, soldered, or otherwise fixed and electrically connected to the shanks 21 and 22, respectively.

A piezoelectric crystal or oscillator is generally designated 29 and the same may comprise a quartz wafer or the like, as is well-known in the art. Electrodes 30 and 31 are plated on opposite sides of the central portions of the oscillator and extensions 32 and 33 of such electrodes are carried to the lower corner portions of the oscillator. Thus, when the oscillator is mounted by inserting its lower corner portions between the convolutions of the respective spring clips 27 and 28, the respective electrodes 30 and 31 are electrically connected with the respective pins or prongs 23 and 24.

With the parts thus far described assembled as suggested, a pair of metal plates 34 and 35 are disposed against the outer sides of the respective frame members 11 and 12. Thereafter, rivets or other fastening means 36 and 37 are passed through openings provided in the metal plates 34 and 35 and the openings 17 and 18 in the frame members. When such fastening devices are headed over or otherwise tightened, they serve to draw the metal plates 34 and 35 against the frame members 11 and 12 and to fasten the latter together clampingly engaging the shanks 19 and 20. In the completed assembly the metal plates 34 and 35 are held spaced from the crystal 29 by the frame constructions 11 and 12 and fully close the openings through such construction.

Thus, these metal plates offer mechanical protection to the crystal and serve to electrically shield the same. The space between the edges of the metal plates is fully enclosed by the bars 13, 14, 15 and 16 of the respective frames. To assist in locating the pins or prongs 23 and 24 and to assist in closing the openings provided by the grooves or channels 19 and 20, each pin or prong may be headed up to provide it, intermediate its ends, with an enlargement 38 located against the lower edges or against the outer edges of the bar 16 of the assembled frame members.

Preferably, the grooves or recesses 18 and 19 are V-shaped, or of other angular shape, where-

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by the completed openings, provided when a pair of frame members are assembled, are transversely angular. Then the shanks 21 and 22 of the pins or contact prongs are similarly shaped so that the pins or contact prongs are held against any tendency to turn about their longitudinal axis in any such manner as to permit the clips or loops 27 and 28 or the crystal 29 to engage either of the metal plates 34 and 35.

In Fig. 5, a structure somewhat similar to that above described is illustrated. However, in this figure, the metal plates are not shown and a one-piece frame 40 of insulating material is substituted for the two-piece frame of Figs. 1-4. However, the other parts shown in Fig. 5 correspond with the parts previously described and so have been given the same reference characters.

It will be understood that a pair of metal plates 34 and 35 are to be applied at the opposite sides of the frame 40 of Fig. 5 in the manner and for the purpose described in connection with Figs. 1-4. The only differences between the holder of Fig. 5 and that of Figs. 1-4 resides in the fact that the insulating frame 40 in Fig. 5 is a solid one-piece structure of a molded insulating compound.

In this structure, the shanks 21 and 22 of the contact pins or prongs 23 and 24 are molded into the frame 40, as inserts, when the latter is being formed. Thus, in this figure, the thickness of the one frame member 40 is the same as, or substantially the same as, the combined thicknesses of the two assembled frame members 11 and 12 in the figures first described.

In the modification of Figs. 6 and 7, many of the parts are those already described and where such is the case, the same reference characters are applied. In these figures, the modification resides in providing a one-piece molded insulating frame 41 which, through its lower bar portion 42, is provided with a pair of grooves or slots 43 and 44 opening through one of its faces. These grooves receive the shanks 45 of a pair of contact pins or prongs 46, the inner ends of which are electrically connected with the crystal 29.

The shanks 45 are arranged at the inner ends of the grooves or channels 43 and 44 and thereafter plugs 47 of insulating material are used to fill said grooves or channels. Then, when the plates 34 and 35 are made fast against opposite sides of the frame 41 and held in place by the rivets 36 and 37, such plates are thoroughly insulated from the shanks 45 of the pins or prongs. In addition, the plates serve to assist in holding the plugs 47 in place. In this modification, the shanks 45 are shown as transversely round but it will be understood that they may be transversely angular, if desired.

In each of the modifications described, it will be noted that I have provided a piezoelectric crystal holder including a frame-like construction of insulating material serving as a mount for contact prongs which latter, through suitable leads, serve to mount the crystal wafer. A pair of metal plates close the opposite sides of the frame construction and offer mechanical protection to the latter and to the mounted wafer and in addition, provide for the electrical shielding of the latter.

The metal plates are held on the insulating frame structure by simple fastening means, such as a rivet, passing through such structure within the overall outline of the holder. Thus, it will be seen that I have provided a simple and inexpen-

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sive construction of holder for a piezoelectric crystal. Yet the holder provides for the proper mounting of the quartz wafer, or other oscillator, and for the mechanical and electrical protection of the same.

Having thus set forth the nature of my invention, what I claim is:

1. A piezoelectric crystal holder comprising a circumferentially continuous four-sided open frame of insulating material, a pair of spaced contact prongs including shanks passing through and held in one side of said frame, a piezoelectric crystal oscillator in the opening in said frame and spaced from all sides thereof and located intermediate the faces thereof, said oscillator having electrodes on its opposite faces, electrical conductors supporting said oscillator in said spaced relation to the frame and electrically connecting the respective electrodes with the respective contact prongs, metal plates arranged one against each of the faces of said frame and closing the opening therethrough, means securing said plates to said frame, and said frame comprising a pair of similar parts clampingly engaging opposite portions of said shanks of the contact prongs.

2. A piezoelectric crystal holder comprising a circumferentially continuous four-sided open frame of insulating material, a pair of spaced contact prongs including shanks passing through and held in one side of said frame, a piezoelectric crystal oscillator in the opening in said frame and spaced from all sides thereof and located intermediate the faces thereof, said oscillator having electrodes on its opposite faces, electrical conductors supporting said oscillator in said spaced relation to the frame and electrically connecting the respective electrodes with the respective contact prongs, metal plates arranged one against each of the faces of said frame and closing the opening therethrough, means passing through portions of said frame and spaced from the opening through the latter and securing one of said plates against each face of the frame whereby said oscillator is completely enclosed, and said frame comprising a pair of similar parts held in assembled clamping engagement with opposite sides of the shanks of the contact prongs by said fastening means.

3. A piezoelectric crystal holder comprising a circumferentially continuous four-sided open frame of insulating material, a piezoelectric crystal oscillator in said frame, an electrode on each side of said oscillator, conductors connected with the respective electrodes and extending to the outside of said frame and supporting the piezoelectric crystal oscillator in spaced relation to the frame and intermediate the faces of the latter, a metal plate against each face of said frame, means securing said plates to the frame, and said frame comprising a pair of frame-like parts held in face-to-face relation with said electrical connectors passing between them.

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