May 9, 1933. J. W. CONKLIN 1,908,320

PIEZO ELECTRIC CRYSTAL HOLDER

Filed Dec. 9, 1929

Fig. 1

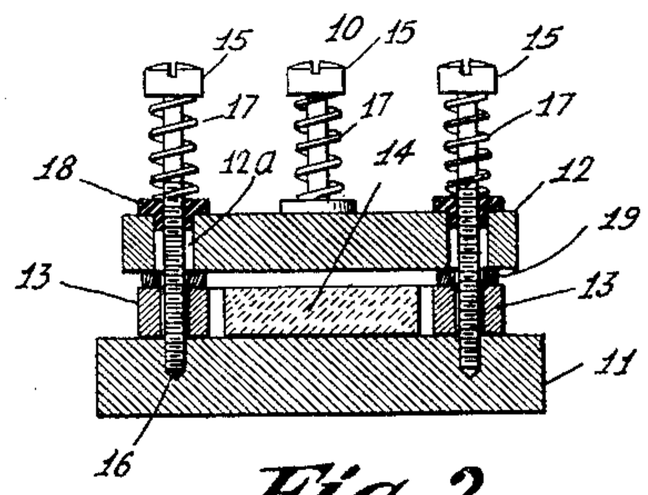
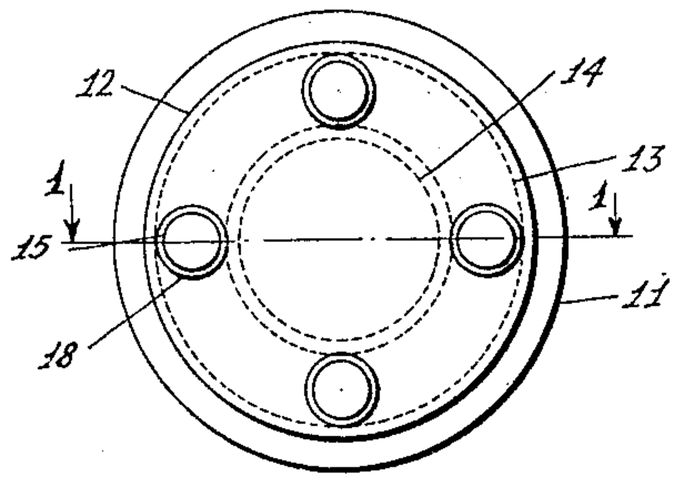


Fig. 2



INVENTOR
J.W. CONKLIN
BY W. B. Grover
ATTORNEY

Patented May 9, 1933 1,908,320

UNITED STATES PATENT OFFICE

JAMES W. CONKLIN, OF ROCKY POINT, NEW YORK, ASSIGNOR TO RADIO CORPORATION OF AMERICA, A CORPORATION OF DELAWARE

PIEZO-ELECTRIC CRYSTAL HOLDER

Application filed December 9, 1929. Serial No. 412,687.

This invention relates to the piezo-electric art and deals more specifically with a piezo-electric crystal holder or housing.

In piezo-electric crystal holders or housings, constructed in accordance with present day practice, it has been found that variations in the ambient temperature of the housing, as well as variations in the temperature of the housing itself, and also of the crystal, cause corresponding variations in the width of the air gap between the crystal and plates or electrodes. It has been found in practice that this variation in the width of the air gap introduces serious errors in the operation of the crystal as a frequency standard or frequency control means.

It is therefore an object of this invention to provide a crystal holder or housing in which the plates are mounted so as to have an air gap or predetermined fixed width for varying conditions of temperature.

A further object of this invention is to provide a crystal holder in which the spacing of the electrodes is varied in a predetermined manner with changes in temperature.

It is a further object of this invention to provide a piezo-electric crystal holder having an air gap between the top plate and crystal, which air gap is designed to vary in accordance with a predetermined thermal coefficient.

It is a further object of this invention to provide certain standard spacing members, which may be selectively used to give a predetermined size of air gap in a piezo-electric crystal holder.

It is a further object of this invention to provide a piezo-electric crystal holder, in which the spacing of the plates is predetermined in such a manner as to prevent variations in temperature of the housing or the material enclosed therein from affecting the desired frequency characteristic of the crystal oscillator.

Further, it is an object of this invention to provide a piezo-electric crystal housing having spacer members between the electrodes which are of the exact thickness of the piezo-electric material.

Finally, it is an object of this invention generally to improve the piezo-electric crystal holder art by providing a housing or holder which is cheap to construct, easy to adjust and which is rugged and highly efficient in its operation.

These and other objects of the invention will be readily apparent to those skilled in the art from the following description taken in connection with the accompanying drawing, in which:

Fig. 1 is a sectional view of a device embodying the present invention; and

Fig. 2 is a plan view of the device shown in Fig. 1.

In order to simplify the drawing the spacing between the oscillator and the electrodes has been shown to be of considerable extent. It should be noted, however, that in actual practice this spacing is really only a few thousandths of an inch. Also, the terminals whereby the electrodes are connected to an alternating current circuit have been omitted, for they may be readily applied in a manner now well understood in the art.

Referring in detail to the drawing, the holder or housing 10 is seen to comprise a lower plate 11 and an upper plate 12; both plates being of any suitable metal, preferably Monel metal. Between the plates 11 and 12 there is disposed the quartz spacer 13, which may be either an annular ring enclosing the crystal 14; or alternatively, separate spacer sections may be employed at suitable locations, whereby properly to separate and hold the plates 11 and 12 with respect to each other. The primary quartz spacer is of the same material and thickness as the crystal itself and preferably con-

sists of pieces or corners of the particular crystal in use, which pieces or corners have been cut off after the grinding process of the crystal oscillator is completed. The screw members 15 pass through the upper electrode 12 and are fixed in the plate 11 in screw-threaded engagement therewith at 16. The plate 12 is provided with holes 12*a* through which the screw 15 passes. Coil springs 17 disposed between the head of the screw 15 and insulating bushings 18 press the plate 12 firmly against secondary spacers 19. The secondary spacers may be in the shape of an annular ring or alternatively, these spacers may be separate sections mounted upon the primary spacers, depending upon whether or not the primary spacers are of the ring or separate formations as described above. The secondary spacers or shims 19 are of some material which has a zero coefficient of thermal expansion such as invar, for example, and are also of a standard thickness such as 1 or 2 mils., for example, depending of course upon the width of the desired air gap.

In accordance with the principles of this invention a complete set of secondary spacers or shims are prepared, each of which is of a predetermined standard thickness, and each of which varies in thickness from the others by a standard predetermined amount. Since these secondary spacers are easily replaceable it is merely necessary to insert a certain selected spacer to obtain the desired width of air gap in the crystal housing.

Since the piezo-electric material and the primary spacers have the same coefficient of thermal expansion, variations in temperature of the primary spacers will not alter the width of the air gap. Also, since the secondary spacers have a zero coefficient of thermal expansion, the air gap will remain substantially constant as the temperature of the holder varies.

Where other piezo-electric materials then quartz are used, the primary spacers shall also be of this material, for reasons apparent. If other than a zero coefficient for the air gap is desired, secondary spacers having the desired coefficient would be used.

Many changes in the present disclosure will readily suggest themselves to those skilled in the art. It is therefore to be understood that this invention is not limited except as defined in the appended claims.

Having thus described my invention, I claim:

1. The combination with a piezo-electric crystal oscillator of a holder therefor, said holder comprising a first plate, spacer means mounted upon said plate, said means being of the same material and substantially the exact same thickness as said crystal, a second spacer means removably mounted upon said first mentioned spacer means, and a second electrode spring pressed upon said last mentioned means.

2. The combination with a piezo-electric crystal oscillator of a holder therefor, said holder comprising a first plate, a first spacer means mounted upon said plate, said first spacer means having the same coefficient of thermal expansion as the crystal oscillator, a second spacer means mounted upon said first spacer means, said second means having a zero coefficient of thermal expansion, and a second plate spring pressed upon said last mentioned means.

JAMES W. CONKLIN.