

July 23, 1946.

W. E. KUENSTLER

2,404,445

CRYSTAL

Filed Aug. 2, 1944

Fig. 1.

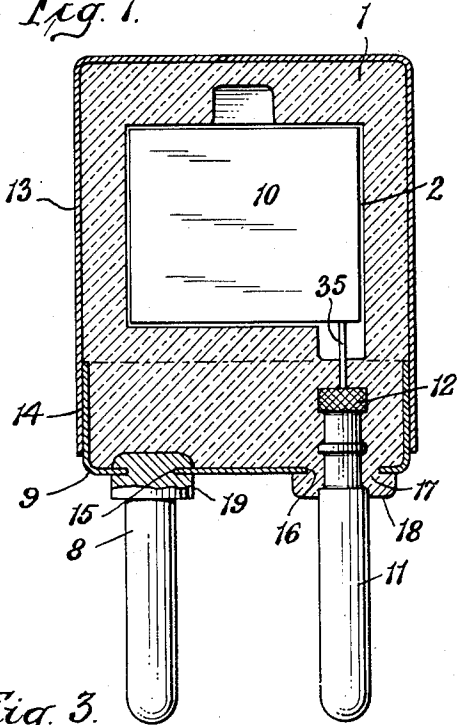


Fig. 2.

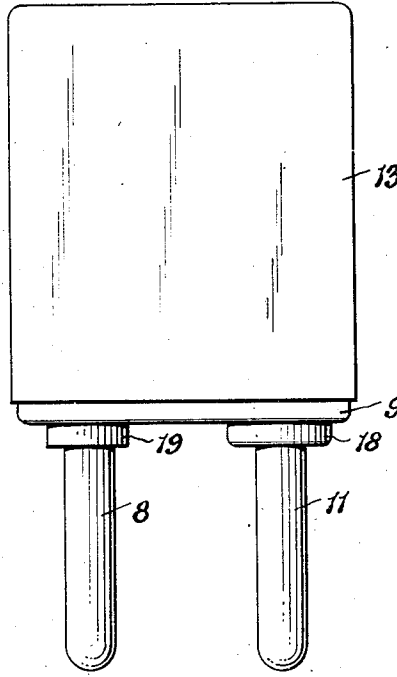


Fig. 3.

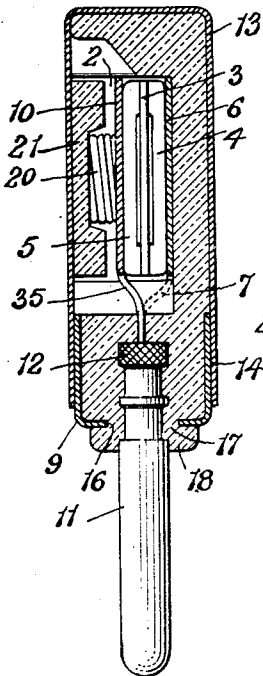


Fig. 4.

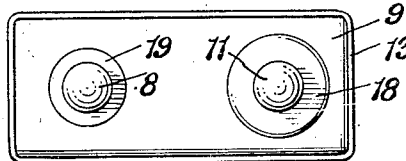


Fig. 5.

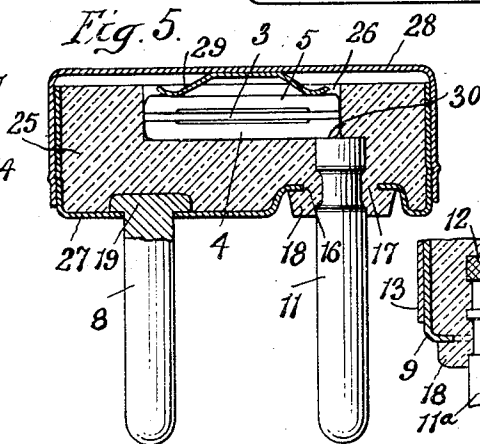
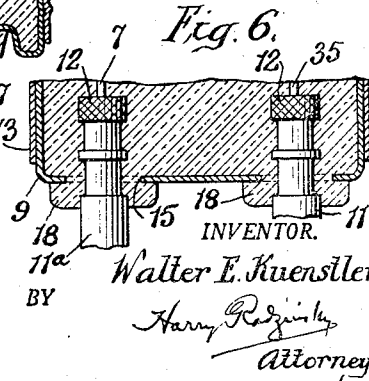


Fig. 6.



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2,404,445

CRYSTAL

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Application August 2, 1944, Serial No. 547,692

16 Claims. (Cl. 171—327)

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This invention relates to crystals of the character employed in radio work, such as crystals of quartz, tourmaline, or other piezo-electric material, and one of the objects of the invention is to provide an improved mounting and housing means for crystals of this character.

At the present time, crystals of the kind used for radio purposes, are housed in various ways in box-like enclosures on which a removable cover or end-piece is usually secured by means of screws or similar fasteners. The mounting of the wafer-like crystal between electrodes, and the structure of the casing itself are such that both the crystal and its associated elements are often subjected to the effects of climatic conditions and particularly to dampness, vibration and the entry of dust and dirt, all of which create deficiencies in operation, reduce the activity of the crystal and result in the raising or lowering of the natural frequency.

The present invention contemplates the provision of an air-tight, dust-proof container which will completely exclude moisture, and which includes an outer casing of metal serving as a shielding and aiding in the elimination of body capacity. The invention further contemplates means by which one of the electrodes may be grounded by the simple insertion of one of the contact pins in the proper socket aperture; it contemplates the provision of means by which an efficient seal is provided around the pins at the points where they emerge from the casing, and it provides for an efficient seal between the outer metallic casing and the inside housing or block of insulating material.

In the accompanying drawing, wherein several illustrative embodiments of the invention are shown, Fig. 1 is a vertical sectional view of a crystal and its casing constructed as hereinafter described; Fig. 2 is a face view of the same; Fig. 3 is a vertical sectional view, taken at right angles to the view of Fig. 1; Fig. 4 is a view of the bottom of the crystal and housing; Fig. 5 is a vertical sectional view through a modified structure, and Fig. 6 is a sectional view through a structure in which both of the contact pins are similarly mounted.

In the structure of Figs. 1 to 4 inclusive, 1 indicates the portion of the enclosure for the crystal which I herein refer to as the "housing". This part of the structure is in the form of a block of insulating material, such as glass, or any one of the numerous plastic insulations suitable for the purpose. The housing so constructed, is provided with a recess 2 shaped to receive the crystal 3, the latter being sandwiched in the conventional man-

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ner, between the two electrodes 4 and 5. Held in firm contact with the electrode 4 is a metallic plate 6 which connects, by means of a wire 7, to a contact pin 8. If the pin is grounded to the metallic casing part 9 as indicated in Fig. 1, the wire 7 can be connected to any suitable part of the metallic casing, but if the pin 8 is not grounded to the metallic casing, as shown, for example, in Fig. 6, the wire 7 is extended directly to the pin without being brought into contact with the casing.

Held in firm contact with the electrode 5 is a metallic plate 10 which is electrically connected by means of the wire 35 to a second contact pin, designated at 11.

As clearly seen in Fig. 1, the contact pin 11 extends well up into the insulating material of the housing 1 and has its inner knurled end 12 securely embedded therein.

The outer casing, preferably made of relatively thin sheet metal or other conducting material is, in the form shown, composed of two cup-shaped parts 9 and 13 which telescopically overlap as shown at 14. When the two parts 9 and 13 of the metallic casing are fitted together in the overlapped or telescoped relation shown, the overlapped portions are secured together by welding, soldering or other fusing means so that the casing is thereupon sealed and it not only effectively prevents the entry of dust, dirt and moisture, but being of metal and preferably grounded by connection to the pin 8 which is placed in the socket so that it connects to the grounded side of the circuit, it constitutes a shield and eliminates body capacity which, when existant, greatly reduces the activity of the crystal and tends to alter the frequency of it.

The lower part 9 of the metallic casing is secured to and carried by the lower part of the housing 1, said casing part 9 being provided with two apertures or holes 15 and 16 through which the contact pins 8 and 11 protrude, the edge portion of the hole 16 being insulated from pin 11 by being spaced therefrom, with a portion of the insulating material indicated at 17, being interposed between the pin and the edge portion of the casing around the hole 16. Thus, a portion of the insulating housing extends through the hole 16 and insulates the pin 11 from contact with the casing part 9, and the marginal edge portion of the casing part 9 around the hole 16 is embedded in the insulation to thereby provide a tight joint or seal at this point. The result of this arrangement is that a button-like projection or head 18 of insulation appears on the outside of the metal-

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lic casing around the pin and holds the pin spaced from the edge of the hole 16, while the edge portion of the casing is embedded in the insulation and forms a seal.

The contact pin 3, which in the embodiment of Fig. 1 is grounded to the casing, has a metallic head 19 in which the edge portions of the casing around the hole 15 are embedded to establish firm electrical contact with the pin and form a seal around the same.

The contact plate 10 is held firmly against the electrode 5 by means of a coil spring 20 compressed against the plate 10 by means of a pressure plate 21 of insulating material, shaped to fit within the recess 2, as clearly seen in Fig. 3. In assembling the metallic casing, the top part 13 is slid or telescoped over the bottom part 9, which is secured to the insulating housing or block 1 by having parts embedded therein as described, the top part 13 holding the pressure plate 21 in place. The pressure plate 21 forces the coil spring 20 against the crystal assembly, thus holding the same, including the contact plates 6 and 10, firmly together in the recess 2. If it is desired that electrode 5 rather than electrode 4 shall be the grounded electrode, the insulated pressure plate 21 can be omitted and the spring 20 then arranged to electrically connect plate 10 to the metal casing part 13, which will then be electrically connected to the pin 3, while pin 11 will then be connected by a wire or other means to the electrode 4 through contact plate 6.

In the embodiment of the invention shown in Figs. 1 to 5 inclusive, one of the contact pins is shown grounded to the metallic case. In suitable conditions where this is not desired, both of the contact pins may be arranged similarly to the contact pin 11, such an arrangement being disclosed in Fig. 6, wherein the pin indicated at 11a is insulated from the casing by the means disclosed in connection with the pin 11 of Fig. 1.

In Fig. 5 is shown a modified construction wherein the crystal is of the horizontal or flat type and is contained in a relatively shallow cylindrical case. Therein the housing or block of insulating material is shown at 25 and is provided in its top with a recess 26 conforming in shape to the crystal assembly, consisting of the crystal 3 sandwiched between the electrodes 4 and 5. The two-part metal casing consists of the cup-shaped metal elements 27 and 28 which telescope as shown and when in closed position are welded, soldered or otherwise fused together to seal them into a closed unit. The upper part 28 of the casing carries a leaf spring 29 welded or otherwise permanently secured to its under side, said spring bearing down on the electrode 5 and establishing electrical contact therewith as well as acting to hold the crystal assembly accurately and firmly seated in the recess 26. In this embodiment of the invention, the contact pin 8 is directly connected to the casing half 27 and thus is electrically connected to electrode 5 through the spring 29.

It will be observed that the upper end of the contact pin 11 is exposed in the recess 26, as indicated at 30, and it is thus in direct contact with the electrode 4 which is firmly held against the end of the contact pin 11 by the pressure of the leaf spring 29. Thus, with this arrangement, no connecting wires are required, one pin being directly connected to the casing which is electrically connected to one electrode by the

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spring 29, and the other contact pin being in direct contact with the second electrode.

It will be obvious from the foregoing, that various modifications may be made in the disclosed structures without departing from the spirit of the invention. The shape and size of the casing may be materially altered; the manner in which the crystal and electrodes are held in place may be varied materially; the connections from the electrodes to the contact pins may be made in a number of ways, and the grounding and non-grounding of one of the pins may be also done in various ways. Accordingly, while several embodiments of the invention are disclosed and modifications thereof are herein suggested, they are contemplated as being within the scope of the invention and the annexed claims.

What I claim is:

1. In a crystal assembly, a crystal, electrodes between which the crystal is located, a housing of insulating material within which the crystal and electrodes are contained, a two-part metallic casing enclosing the insulating material, one part of the metallic casing having an opening, a contact pin embedded in the insulating material and projecting through the opening in the casing, said insulating material surrounding the pin and insulating it from the casing, the edge portions of the casing defining said opening being embedded in the insulating material.

2. An enclosure for crystals and the like comprising, a housing of insulating material containing the crystal and electrodes, a metallic casing extending over and around the insulating material, a contact pin embedded in and projecting from the housing, the casing having an opening through which the contact pin extends, the insulating material extending through said opening around the contact pin and serving to insulate the pin from the casing, and the edge portions of the casing defining said opening being embedded in the insulation around the pin.

3. An enclosure for crystals and the like comprising, a housing of insulating material in which the crystal and electrodes are contained, an outer casing of metal enclosing the insulating housing, the casing having a plurality of openings through which the insulating material projects, the edge portions of the metallic casing around the openings therein being embedded in that part of the insulating material which extends through said openings.

4. In a crystal construction, a crystal, electrodes between which the crystal is sandwiched, a housing of insulating material extending around the crystal and electrodes, contact pins electrically connected to the electrodes, a metallic outside casing enclosing the insulating housing, said metallic casing having openings through which the contact pins protrude, the edge portion around at least one of the openings being embedded in the insulating material which surrounds the contact pin extending through said opening, a part of the insulating material forming a head portion on the outside of the metallic casing.

5. In a crystal assembly, a housing of insulating material having a recess, a crystal and electrodes mounted in said recess, a removable closure-piece closing said recess, a contact plate disposed against each electrode, resilient means interposed between one of the plates and the closure-piece for urging said plate against its electrode and for holding the crystal and elec-

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trodes in place within the recess, contact pins embedded in and extending from the insulating housing, each of said pins being electrically connected to a contact plate, and a metallic housing enclosing the insulating housing, said metallic housing being apertured to permit the passage of the contact pins.

6. A construction as called for in claim 5, wherein parts of the insulating housing extend through the apertures in the metallic housing, and parts of the metallic housing defining the apertures therein are embedded in those parts of the insulating housing which pass through the openings in the metallic housing.

7. In a crystal assembly of the character described, a housing of insulating material containing a crystal and electrodes, contact pins extending from the housing and electrically connected to the electrodes, and a two-part metallic casing enclosing the housing, the parts of said casing being in telescoped relation and being secured together, the casing having openings through which the contact pins protrude.

8. In a crystal assembly of the character described, a housing of insulating material containing a crystal and electrodes, contact pins extending from the housing and electrically connected to the electrodes, a two-part metallic casing enclosing the housing, the parts of said casing being in telescoped relationship and being secured together, the casing having openings through which the contact pins extend, parts of the insulating housing projecting through said openings and embedding the edge portions of the openings and insulating the contact pins therefrom.

9. In a crystal assembly, an insulating housing, a metallic casing enclosing the housing, contact pins extending from the housing, one of said pins being insulated from the metallic casing by interposed parts of the insulating housing, the other pin being electrically connected to the casing, a crystal and electrodes contained within the housing, one of the electrodes being electrically connected to one of the contact pins and the other electrode being electrically connected to the metallic casing.

10. In a crystal assembly, a block of insulation in which a pair of contact pins is embedded and from which parts of the pins project, the block having a recess, a crystal and electrodes seated in said recess, the electrodes being respectively connected to the contact pins, a two-part metal casing enclosing the block, crystal and electrodes, one of the parts of the casing being secured to the block by having parts embedded therein, the second part of the casing telescopi-

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cally fitting over and being secured to the first part.

11. A structure as set forth in claim 10, wherein the casing has apertures and the embedded parts of the casing are circumferential edge parts of one of said apertures, the contact pin extending through said aperture and being spaced therefrom by parts of the insulating block.

12. A structure as set forth in claim 10, wherein in one part of the metal casing carries resilient pressure means operative against one of the electrodes to establish electrical contact therewith and to hold the crystal and electrodes in the recess in the block.

13. In a crystal assembly, a block of insulating material having a recess, a crystal and electrodes located in the recess, a cup-like metallic shell fitted around a part of the block and having parts embedded therein, contact pins embedded in the block and extending through the shell, at least one of said pins being insulated from the shell, and a metal cover member fitting over the block and extending over a part of the shell and co-operating therewith in forming a metallic enclosure for the block, crystal and electrodes.

14. In a crystal assembly, a block of insulation having a recess, a crystal and electrodes seated therein, an enclosing metal case having a part secured to the insulation, and a cover member fitted thereover, and resilient means urged by the cover toward the crystal and electrodes to hold the same seated in the recess.

15. In a crystal assembly, a block of insulation having a recess, a contact pin embedded in the block and having an end exposed in the recess, a crystal and electrodes seated in the recess, one of the electrodes resting against and in electrical contact with the exposed end of the contact pin, a two-part metallic casing enclosing the block, one of the parts of said casing carrying spring means operative against the second electrode to establish electrical contact therewith and to hold the crystal and electrodes seated within the recess, and a second contact pin electrically connected to the casing.

16. In a crystal assembly, a block of insulation having a recess, a crystal and electrodes seated in said recess, a metal case enclosing the block, a pair of contact pins extending out of and insulated from the case, a spring for urging the crystal and electrodes toward the recess, and a pressure plate of insulation disposed between the spring and the metal case, and means for connecting the electrodes to the contact pins.

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