May 23, 1950 W. E. KUENSTLER 2,508,720

PIEZOELECTRIC CRYSTAL AND CONDENSER COMBINATION

Filed April 16, 1947

Fig. 2.

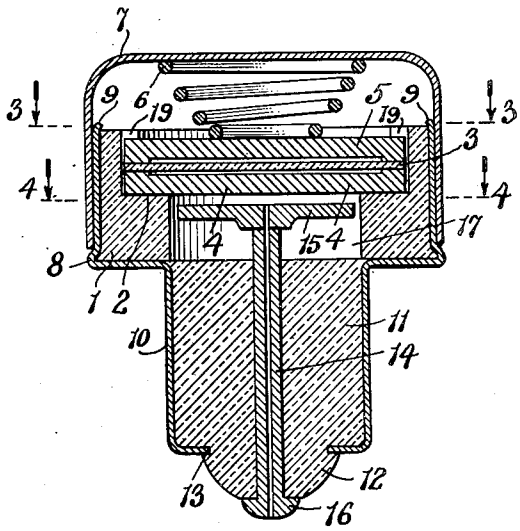


Fig. 1.

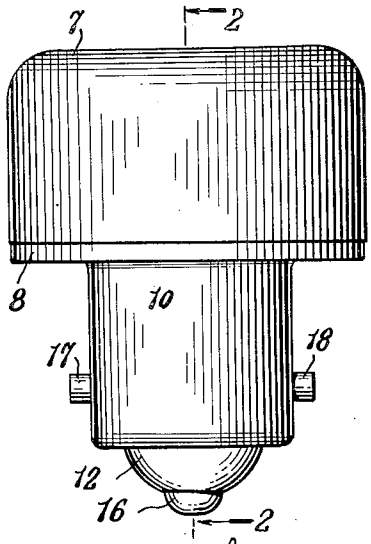


Fig. 3.

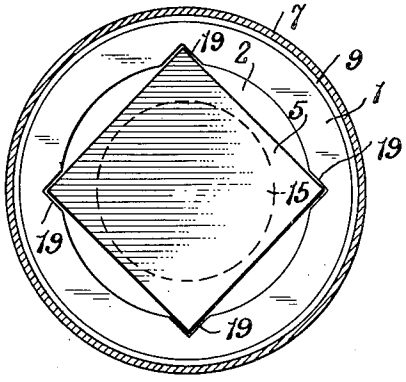
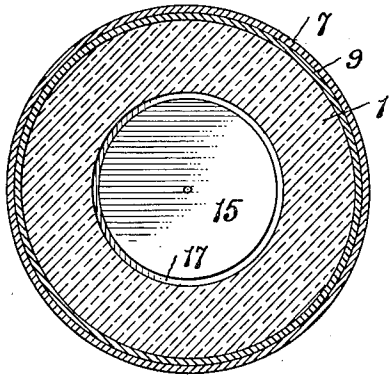


Fig. 4.



INVENTOR.
Walter E. Kuenstler
BY
Harry Radzinski
Attorney

Patented May 23, 1950 2,508,720

UNITED STATES PATENT OFFICE

2,508,720

PIEZOELECTRIC CRYSTAL AND CONDENSER COMBINATION

Walter E. Kuenstler, Cliffside Park, N. J.

Application April 16, 1947, Serial No. 741,835

8 Claims. (Cl. 171—327)

1

This invention has relation to piezo-electric crystals and more particularly to the manner in which the crystals are mounted and enclosed and are combined with a condenser.

At the present time, in many electrical or radio circuits in which a piezo-electric crystal is incorporated a fixed condenser is occasionally interposed between one of the electrodes of the crystal and an adjacent vacuum tube, while the second electrode of the crystal is sometimes connected to a resistor which is grounded to the metal chassis or base of the instrument. I have found that the set can be rendered more compact and the wiring of the same simplified considerably if the condenser can be combined with the crystal assembly and be housed therewith in a single container. Hence, the primary object of the present invention is to provide means by which a condenser and piezo-electric crystal can be combined in a single unit, with a portion of the container or housing in which the condenser and crystal are contained possibly serving as a resistance between one of the electrodes of the crystal and the chassis-grounded potential.

In the accompanying drawing, wherein an illustrative embodiment of the invention is disclosed, Fig. 1 is a side elevation of a combined crystal and condenser and the container therefor; Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1, looking in the direction of the arrows; Fig. 3 is a sectional view on the line 3—3 of Fig. 2, looking in the direction of the arrows; Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2 looking in the direction of arrows.

Referring to the drawing, 1 indicates the base portion of the crystal holder, said base consisting of an annular section of insulating material formed with a continuous shoulder 2 constituting a seat for the support of the crystal 3 of the quartz or other piezo-electric material. The crystal 3 is sandwiched between a pair of metallic electrodes, shown at 4 and 5 in the known manner, the lower electrode 4 being supported upon the seat 2. The crystal assembly, consisting of the crystal 3 and the two electrodes 4 and 5, is held upon the seat 2 by engagement with the notches 19 in the wall of the support. A coil spring 6 exerts its pressure upon the upper electrode 5 and is confined between the same and a domed cap or cover member 7 of the container in which the crystal is housed. Spring 6 thus holds the crystal assembly resiliently against the seat 2 and also establishes an electrical connection between the cover member 7 and the top electrode 5.

The insulating-material base 1 is surrounded by a metallic casing 8 which has its circumferential wall 9 telescoping with the wall of the metallic cover member 7, and the overlapped portions of the wall 8 and the cover member 7 are

2

soldered together to thus provide a sealed container for the crystal and other parts.

Extending from the container body 8 is a tubular extension 10 constituting the stem or plug portion of the device, said extension enclosing a body of insulating material 11 which protrudes out of the tubular extension 10, as indicated at 12, the end of the tubular extension 10 being in the form of an inturned flange embedded in the insulating material, as indicated at 13. Passing axially through the insulating material 11 is a tubular metallic stem or pin 14 which terminates at its outer end in a rounded head 16 and is provided at its inner end with a disk-shaped plate 15 of metal or conducting material, said plate 15 constituting one of the plates of a condenser. Plate or disk 15 is located in the central aperture 17 of the insulating base 1 and it is spaced from the electrode 4, so that the plate or disk 15 will constitute one plate of a condenser, and the electrode 4 will constitute the second plate thereof, the two plates being separated by a suitable air space forming a dielectric in the known manner. The spacing of the condenser plate 15 from the electrode 4, its thickness and area relative to the electrode 4, may, of course, be regulated to secure the required condenser capacity and no effort is made herein to show the correct relative spacing and proportions of these parts since the same are to be varied, as above stated, to obtain the required results for any particular installation.

In the form shown, the condenser plate 15 is disclosed as being fixedly secured on the end of the stem 14, but it will be obvious that adjustable arrangement might be had whereby, during assembly of the described structure, the plate 15 might be adjusted to or from the second plate of the condenser, consisting of the electrode 4, to secure the required condenser capacity. For example, the plate or disk 15 might be threadably mounted on the end of the stem or pin 14 and be thus adjustable thereon to enable it to be situated at the precise distance required from the electrode 4. Also, in herein describing the electrodes 4 and 5, I have indicated that the same may be metallic plates between which the crystal 3 is sandwiched. As an alternative for such an arrangement, the surfaces of the crystal may be plated or metal-coated, and in such an instance one of the metallic platings or coatings will co-operate with the condenser plate 15 in forming a condenser. Hence, when herein referring to the crystal "electrodes" I wish to be understood in not only meaning electrodes of the metal plate type, but metal coatings or platings as well, or any suitable equivalent thereof, capable of functioning as a condenser plate in the manner herein described.

In the use of the improved crystal and condenser assembly, the same is placed in the cir-

cuit by the insertion of the stem portion 10, 11 into a standard bayonet-type socket, which engages the radially extending pins 17 and 18, to hold the device in the socket in the known manner. The head 16 at the end of the stem 14 establishes contact with the central contact spring of the socket, thus placing the condenser, consisting of the plate 15 and co-operating plate 4 (the crystal electrode) in the circuit. At the same time, the sleeve 10 contacts with the shell of the socket, thus closing circuit between the same and upper electrode 5 of the crystal. Thus, the effect secured in a circuit is that of a fixed condenser interposed between one of the electrodes of the crystal and an adjacent tube element to which the condenser might be connected. At the same time, the effect of a resistor is obtained between the second electrode of the crystal and chassis-grounded potential, since the metal casing consisting of the electrically connected parts 7, 8 and 10, are interposed between the electrode 5 and the chassis and might be employed as a substitute for the conventional resistor.

From the foregoing, it will be clear that I have provided a construction of simple and effective form wherein a crystal and a condenser are unitarily housed, with a portion of the crystal assembly serving as one of the plates of the condenser, so that simplicity in wiring and conservation of space is had, and other advantages secured, as will be readily apparent to those skilled in this art.

What I claim is:

1. A crystal mounting comprising, a support of insulating material, a pair of electrodes, a crystal interposed between the same, means for holding the crystal and electrodes on the support, a stem of insulating material extending from the support, a metallic pin extending through the stem, one end of the pin terminating near one of the electrodes, and a plate carried by said end of the pin and located near but spaced from the electrode whereby said plate and electrode co-operate to form a condenser.

2. In a crystal mounting, an insulating support including a seat, a crystal and electrodes held on said seat, a plug portion extending from the support, a metallic enclosure for the support and plug, a metal cover fitted over and secured to the enclosure, a spring interposed between the cover and one of the electrodes, a pin extending through the plug, said pin having a head at one end of the plug and having a disk at its opposite end, the disk being located within the support and adjacent to and spaced from one of the electrodes whereby said disk and said electrode co-operate to form a condenser.

3. In a crystal mounting, a seat upon which a crystal and electrodes are supported, a stem of insulating material extending from the seat, a metal shell surrounding the seat and a substantial part of the stem, a cover member fitted over and enclosing the top of the shell, a spring interposed between said cover member and one of the electrodes to thereby urge the crystal and electrodes toward the seat, a pin extending through the stem and exposed at one end of the same, the opposite end of the pin carrying a disk spaced from and extending substantially parallel to one of the electrodes whereby said electrode constitutes one of the plates of a condenser and the disk constitutes the second plate of the condenser.

4. In a crystal mounting, a metallic housing, a seat of insulating material located within the

housing, a crystal and electrodes supported on said seat, means for resiliently urging the crystal and electrodes toward the seat, said means establishing electrical connection between the housing and the first of the electrodes, the housing including a plug extension containing insulating material, a pin extending through said insulating material and carrying a condenser plate at one end, said plate being located adjacent to the second one of the electrodes, whereby said second electrode serves as a second condenser plate.

5. In a crystal mounting, a housing enclosing a crystal having electrode portions, a condenser plate within the housing located adjacent to one of the electrode portions whereby said electrode portion will act as the second plate of the condenser, the condenser plate having a terminal located externally of the housing and insulated from the same, and the second electrode portion of the crystal being electrically connected to the housing, said housing having a plug extension for fitment in a socket.

6. In a crystal mounting, a metallic housing, an annular seat of insulating material located within the housing, a crystal and electrodes supported on said seat, spring means for resiliently urging the crystal and electrodes toward the seat, said spring means establishing electrical connection between the housing and the first of the electrodes, the housing including a tubular metal plug extension containing insulating material, a pin extending axially through said insulating material and carrying a disk-like condenser plate at one end, said plate being located adjacent to the second of the electrodes, whereby said second electrode serves as a second condenser plate, said pin having an end located at the end of the insulating material and spaced from the metal plug extension.

7. In a crystal mounting, a metal housing having a plug portion, a crystal and electrodes contained in the housing, one of the electrodes being electrically connected to the housing whereby the housing serves as a resistor, a condenser plate in the housing and insulated therefrom and spaced from the second electrode, the latter electrode serving as a second condenser plate, and an extension from the condenser plate, extending through the plug and terminating in a contact member.

8. A crystal mounting comprising, a metallic housing, a support of insulating material, a pair of electrodes, a crystal interposed between the electrodes, means for holding the crystal and electrodes in the support, a metallic pin insulated from the metallic housing, one end of the pin terminating near one of the electrodes, and a plate carried by said end of the pin and located near but spaced from the electrode whereby said plate and said electrode co-operate to form a condenser.

WALTER E. KUENSTLER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,768,888	Coleman et al.	July 1, 1930
2,069,633	Tripp	Feb. 2, 1937
2,157,665	Hollman	May 9, 1939
2,284,545	Usselman	May 26, 1942
2,390,048	Bach	Dec. 4, 1945
2,429,414	Kuenstler	Oct. 21, 1947