

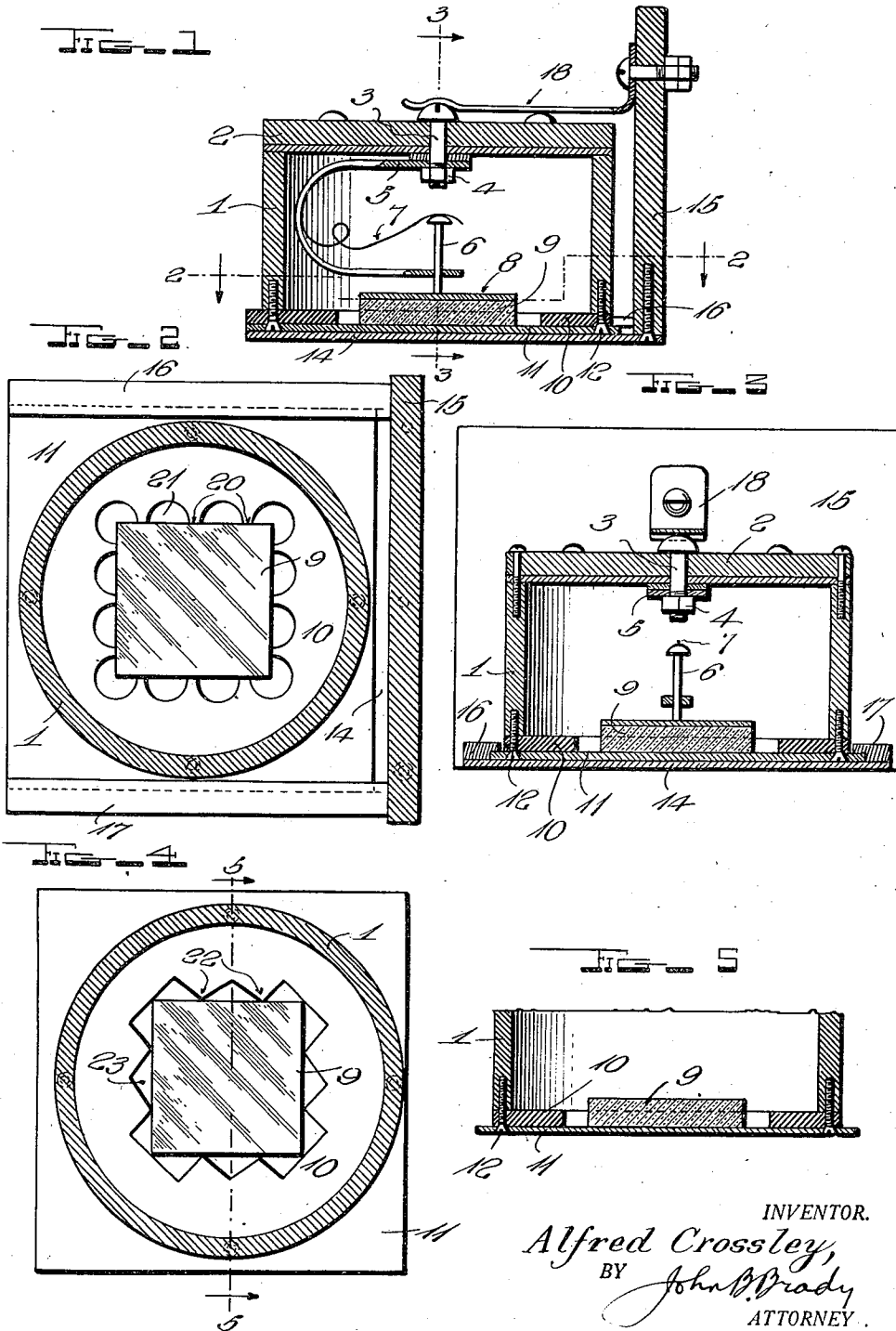
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1,619,854

A. CROSSLEY

PIEZO ELECTRIC CRYSTAL APPARATUS

Filed Feb. 26, 1926



INVENTOR.

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UNITED STATES PATENT OFFICE.

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PIEZO-ELECTRIC-CRYSTAL APPARATUS.

Application filed February 26, 1926. Serial No. 90,931.

My invention relates broadly to piezo-electric crystal apparatus and more particularly to a method of securing the piezo-electric crystal within a container during the rapid mechanical vibration thereof in the process of sustaining oscillations in an electrical circuit.

One of the objects of my invention is to provide a construction of securing device for piezo-electric crystals enabling the free mechanical vibration of the crystal in spaced relation to a crystal holding device.

Another object of my invention is to provide a retaining ring for piezo-electric crystals for centering a crystal within a suitable housing at the same time that the crystal is free to vibrate mechanically in the sustaining of electrical oscillations in an electron tube system.

Still another object of my invention is to provide a construction of retaining device for piezo-electric crystals in which a minimum area of contact is existent between the retaining device and the piezo-electric crystal for avoiding all obstructions to the mechanical vibration of the crystal during the process of electrical oscillation generation in an electron tube circuit associated with the piezo-electric crystal.

My invention will be more fully understood from the specification hereinafter following by reference to the accompanying drawings, in which:

Figure 1 is a cross-sectional view taken through a piezo-electric crystal holder showing a retaining ring in accordance with my invention in position for centering a piezo-electric crystal within the housing; Fig. 2 is a plan view of the retaining device for piezo-electric crystals taken on a sectional line 2—2 through the piezo-electric crystal holder; Fig. 3 is a cross-sectional view through the piezo-electric crystal housing and the retaining ring for guiding the piezo-electric crystal within the housing on line 3—3 of Fig. 1; Fig. 4 is a plan view of a modified form of retaining ring for piezo-electric crystals; and Fig. 5 is a fragmentary cross-sectional view taken on line 5—5 of Fig. 4 showing the modified form of retaining ring in position within the piezo-electric crystal housing for guiding a piezo-electric crystal therein.

My invention contemplates the positioning of a piezo-electric crystal within a crys-

tal housing similar to the construction illustrated in my Letters Patent No. 1,572,773, issued February 9, 1926, with special means for retaining the piezo-electric crystal centrally within the housing and yet without obstruction to the free mechanical vibration thereof. I provide a retaining ring member which has a central aperture therein of a size sufficient to admit the piezo-electric crystal and having inner dimensions defined by substantially point contact portions which form guide members for the piezo-electric crystal. The guide ring is substantially less than the thickness of the crystal so that there is no tendency for the guide ring to interfere in any manner whatever with the free mechanical vibration of the piezo-electric element. The guide ring is suitably secured to the interior of a suitable housing and spaces the crystal away from the wall of the housing while it is free to mechanically vibrate in the sustaining of electrical oscillations in an associated electron tube circuit.

Referring to the drawings in more detail, reference character 1 designates a housing for a piezo-electrical crystal having a top closure 2 and a bottom closure 11. The closure 2 has a terminal post 3 projecting centrally therethrough secured interiorly thereof at 4 for the support of a spring guide member 5. The guide member 5 has a vertically extending guide post 6 centered in its lower extremity, the post connecting through resilient connection 7 with the guide 5. The post 6 is secured to a plate 8 which normally rests upon the surface of piezo-electric crystal 9 within the housing. The piezo-electric crystal 9 is centrally positioned within the housing by means of the retaining ring 10 of my invention. The retaining ring 10 is provided as represented in Fig. 2 with a number of spaced contacting portions 20 separated by substantially semi-circular cutaway portions 21. In this way only an extremely small area of the material of the retaining ring 10 is actually adjacent the sides of the piezo-electric crystal 9. I may further reduce the rubbing contact between the retaining ring 10 and the sides of the piezo-electric crystal by constructing the retaining ring as represented in Fig. 4 where the inner periphery of the retaining ring is defined by a plurality of abrupt points 22 separated by triangular cutaway

sections 23. In this manner the triggering action is considerably improved. That is to say, load on the crystal is substantially removed and loading normally tends to render the crystal sluggish in starting oscillation. The action of starting oscillations quickly may be termed the triggering effect and it is for the purpose of reducing friction between the walls of the guide device and the sides of the piezo-electric crystal that I have designed the retaining ring 10. Bottom plate 11 which closes the housing 1 may fit into side guide portions 16 and 17 secured to the plate 14 which forms a part of the frame 15. The upper terminal 3 may be contacted with a spring clip 18 secured to the frame 15 for establishing connection with the piezo-electric crystal as described in my patent before mentioned. The retaining ring 10 is constructed of suitable insulation material such as bakelite cut away in the manner heretofore described. The cutting away of the bakelite guide ring reduces the friction between the crystal and the retaining ring considerably. The retaining ring can be fitted into the bottom of the crystal container by employing a pressed fit with the side walls of the container or it may be secured to the bottom plate by screws 12 as I have illustrated in the drawings. The binding screws 12 are employed to secure both the bottom conductive plate 11 and the insulated retaining ring 10 in position with respect to the housing 1. While I have described the piezo-electric crystal housing as employing a bakelite retaining member 10, it will be understood that the member 10 may be constructed of any suitable material and that various shapes may be imparted to this guide ring and that no limitations upon my invention are intended other than those imposed by the scope of the appended claims.

What I claim and desire to secure by Letters Patent of the United States is as follows:

1. A piezo-electric crystal apparatus comprising in combination with a piezo-electric crystal, a housing for said crystal, and means for locating said crystal substantially in the center of said housing, comprising a retaining ring having a plurality of inwardly directed contacting portions arranged to substantially embrace the sides of said crystal, while permitting free mechanical movement thereof.

2. Piezo-electric crystal apparatus comprising in combination a housing, a piezo-electric crystal, a retaining ring for centering said piezo-electric crystal in said housing, said retaining ring comprising a plurality of diametrically opposed contacting portions arranged to embrace the periphery of said piezo-electric crystal for preventing substantial horizontal movement thereof while permitting free mechanical vibration of said crystal in a direction transverse to the plane of said retaining ring.

3. Piezo-electric crystal apparatus comprising in combination a housing, a piezo-electric crystal secured within said housing, a retaining ring for centering said crystal within said housing, said retaining ring having a thickness substantially less than the thickness of said piezo-electric crystal and having inwardly directed faces for embracing the sides of said piezo-electric crystal for preventing substantial movement of said piezo-electric crystal in a direction parallel to the plane of said retaining ring while permitting free transverse movement of said piezo-electric crystal in accordance with its natural frequency characteristics.

4. Piezo-electric crystal apparatus comprising in combination a housing, a piezo-electric crystal, and means for mounting said piezo-electric crystal within said housing and substantially removed from the walls thereof comprising a retaining member having a plurality of faces substantially surrounding the sides of said piezo-electric crystal while said crystal is free to vibrate mechanically within said housing.

5. Piezo-electric crystal apparatus comprising in combination a pair of conductive plates, a piezo-electric crystal supported between said plates, a retaining ring member of insulating material mounted on one of said plates and extending to a distance substantially less than the thickness of said crystal and substantially spaced away from the other of said plates, said ring member having inwardly directed faces arranged to embrace the sides of said piezo-electric crystal for preventing substantial movement thereof in planes parallel to the plane of the retaining ring, while permitting free mechanical vibration of the piezo-electric crystal at the natural frequency thereof.

In testimony whereof I affix my signature.

ALFRED CROSSLEY.