Feb. 25, 1958 W. J. WARDEN 2,824,981

PIEZOELECTRIC CRYSTAL HOLDER

Filed Nov. 3, 1954

FIG. 1

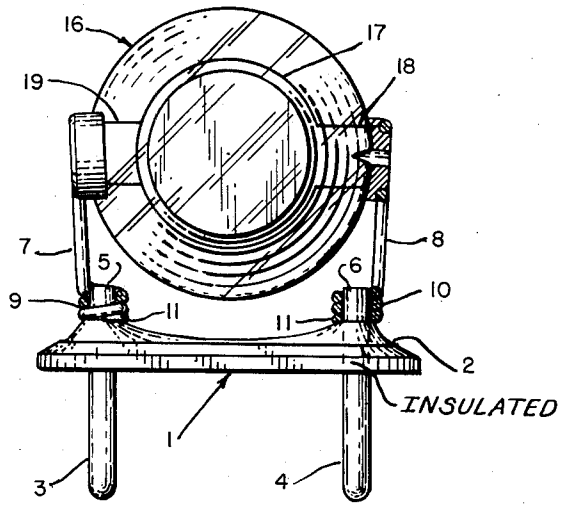


FIG. 2

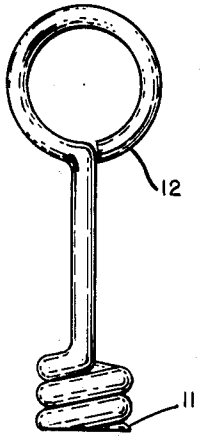


FIG. 3

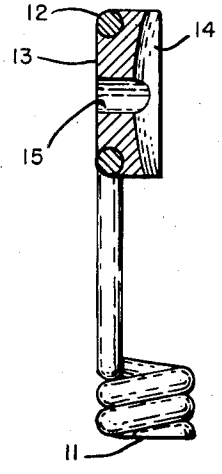


FIG. 4

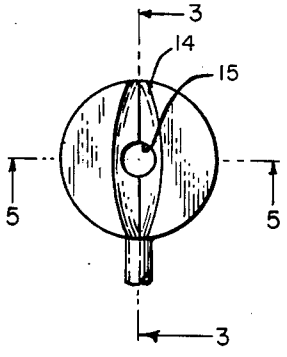
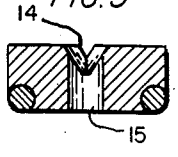


FIG. 5



INVENTOR,
WALTER J. WARDEN.

BY

Harry M. Saragovitz

ATTORNEY.

United States Patent Office 2,824,981
Patented Feb. 25, 1958

2,824,981

PIEZOELECTRIC CRYSTAL HOLDER

Walter J. Warden, West Long Branch, N. J.

Application November 3, 1954, Serial No. 466,704

1 Claim. (Cl. 310—9.4)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

This invention relates to piezoelectric crystal holders.

The design of mounts or holders of quartz crystals is governed by many fundamental considerations. To permit the crystal to vibrate freely the means holding the crystal and the means maintaining contact with its plated electrodes should have a very low mechanical impedance. At the same time these holding means must provide a rigid support for the crystal to take up most of the shock from normal handling so as not to dampen the oscillation of the crystal which would cause undesired frequency changes. Moreover, it is essential from a military point of view that crystal holders should be capable of being quickly and cheaply manufactured in huge quantities by semi-skilled labor requiring only short training periods.

It is an object of the present invention to provide a crystal mount assembly which will markedly decrease the mechanical impedance of the crystal holder without impairing the characteristics of the crystal as an oscillator while insuring at the same time greater ease, speed and uniformity in the manufacturing of such holders.

These and other objects of the invention are achieved by a crystal holder which essentially comprises peripheral clamping means consisting of two spring clamps firmly secured to terminal pins in the base of the mount. The free end of each spring clamp carries a small "button" preferably made from lead. Inwardly positioned slots in these buttons are used for the circumferential support of the crystal blank which is cemented to the button through a centrally located hole in the latter. These buttons efficiently dampen harmful vibrations in the spring clamps and also improve the electrical characteristics of the holder.

The invention may best be understood by reference to the following description of a specific embodiment taken in connection with the accompanying drawing in which

Fig. 1 is a front elevation of the holder,

Fig. 2 is a side elevation of one of the spring clamps of Fig. 1,

Fig. 3 is a section of the spring clamp taken along the line 3—3 of Fig. 2, the lower portion of the spring clamp being shown in elevation,

Fig. 4 is a right-hand elevational view of the upper part of Fig. 3, and

Fig. 5 is a horizontal cross-section taken along the line 5—5 of Fig. 4.

The crystal holder shown in Fig. 1 consists of a base 1 made in known manner from insulating ceramic material, glass or the like. The base 1 is constructed in well known manner so as to be easily inclosed in a housing (not shown in the drawing) that fits into the groove indicated at 2. Contact pins 3 and 4 are inserted into the base with the ends 5 and 6 extending above the base 1. The spring clamps 7 and 8 that are soldered to the ends 5 and 6 consist preferably of piano wire. The lower ends of these spring clamps 7 and 8 are wound into helical coils 9 and 10 each coil ending preferably into a sharp tooth as indicated at 11. The inner diameter of

each helical coil 9 and 10 is somewhat smaller than the diameter of each of the ends 5 and 6 so that each of the sharp teeth 11 will cut some kind of a thread into the ends 5 and 6 of the contact pins 3 and 4. In this manner the clamps 7 and 8 will be rigidly secured to the ends 5 and 6 and soldering of the clamps to these ends may be accomplished simply and efficiently without the necessity of providing special means for holding the spring clamps 7 and 8 in the right position during soldering.

Each of the spring clamps 7 and 8 ends into a loop 12 as shown in Fig. 2. The loop 12 is filled with a button 13 consisting preferably of lead. The button 13 has an inwardly arranged slot 14 (Figs. 3, 4 and 5) which is shaped in accordance with the shape, diameter, width or length of the crystal blank to be used in the crystal holder.

The button 13 is provided with a centrally located hole or cavity 15 which should be of a size no larger than is needed to produce a firm bond between the button and the crystal with the aid of an appropriate cement to be introduced into the hole 15. This cement consists preferably of a conductive bonding mixture such as, for instance, a mixture of silver flakes and a thermosetting resin, e. g., a Bakelite cement. After the crystal blank 16 is inserted between the spring clamps 7 and 8, the hole 15 is completely filled with the conductive bonding mixture and the entire mount or holder is then baked at about 150° C. Before the crystal blank 16 is inserted, the spring clamps 7 and 8 are preferably toed in to provide the necessary spring action for securely holding the blank.

The crystal blank 16 is provided on each major face with suitable electrodes by well known processes such as plating, sputtering, evaporation in vacuum or the like, using preferably gold, aluminum or the like as the electrode material. These electrodes may have various patterns. The electrodes shown in Fig. 1 have a central portion 17 and terminal leads 18 and 19. The terminal 18 connects the electrode of one side of the blank with the button of spring clamp 8 while the terminal 19 on the other side of the crystal blank engages the button of spring clamp 7.

It will be obvious to those skilled in the art that many modifications and variations of the described specific embodiment may be made within the scope of the present invention as defined by the following claim.

What is claimed is:

Piezoelectric crystal holder for holding a crystal blank peripherally without touching its faces and without impairing its characteristic as an oscillator comprising a base of insulating material, terminal contact pins secured in said base, the ends of said contact pins extending above the base, resilient spring clamps connected to the ends of said contact pins, said spring clamps being toed in to provide spring action for securely holding said crystal blank, the free ends of said spring clamps terminating into loops, said loops carrying lead buttons for circumferentially holding said crystal blank, the faces of said lead buttons being perpendicular to the faces of said crystal blank, the inwardly positioned surfaces of said buttons possessing slots, said slots being shaped in accordance with the peripheral shape of the crystal blank, said slots having centrally located holes filled with a conductive cement securing said crystal blank circumferentially in said slot.

References Cited in the file of this patent

UNITED STATES PATENTS

2,371,613	Fair	Mar. 20, 1945
2,392,429	Sykes	Jan. 8, 1946
2,505,121	Knights	Apr. 25, 1950
2,571,167	Ruggles et al.	Oct. 16, 1951
2,656,473	Warner	Oct. 20, 1953