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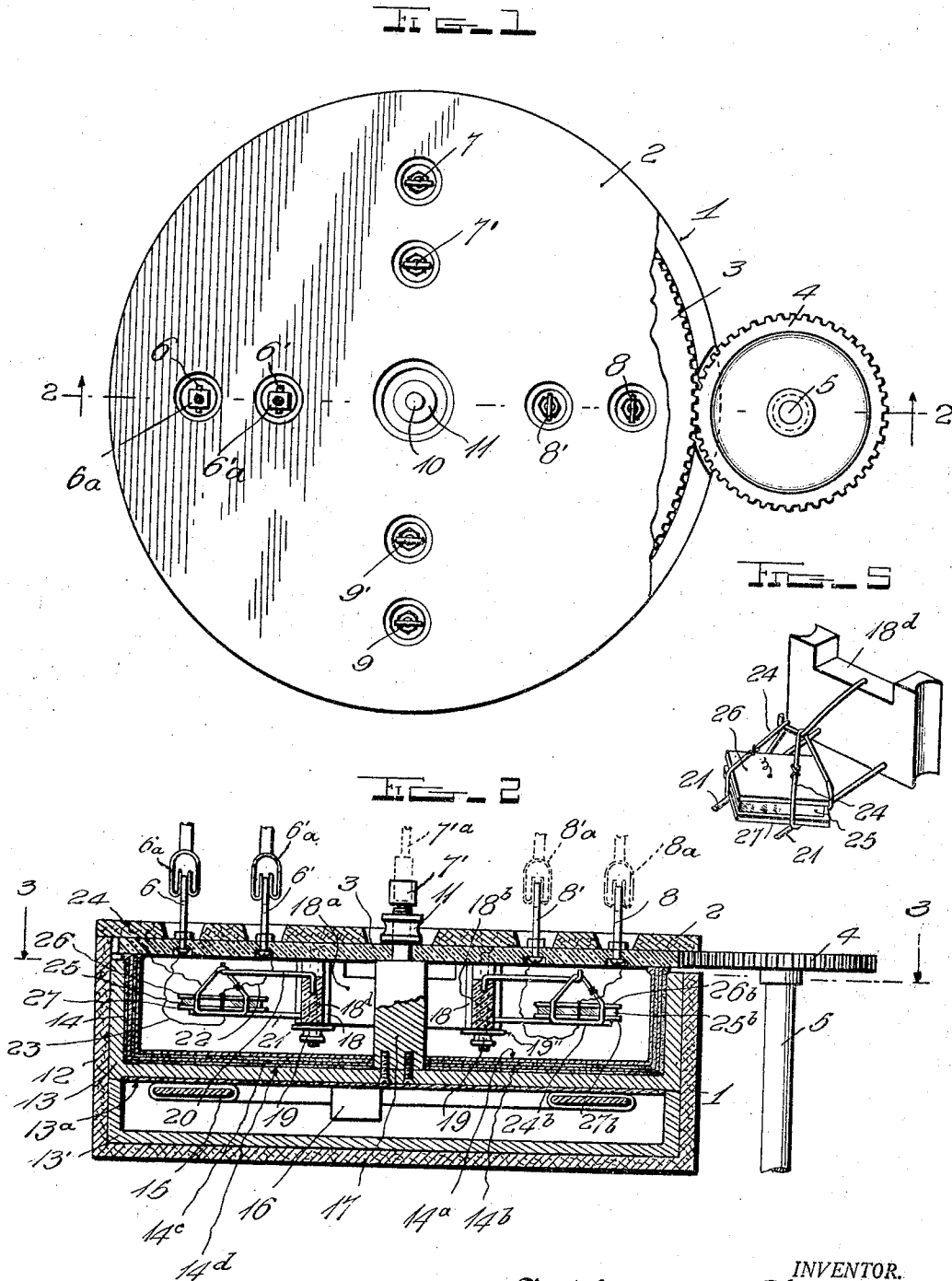
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PIEZO ELECTRIC CRYSTAL HOLDER

Filed March 26, 1929

2 Sheets-Sheet 1



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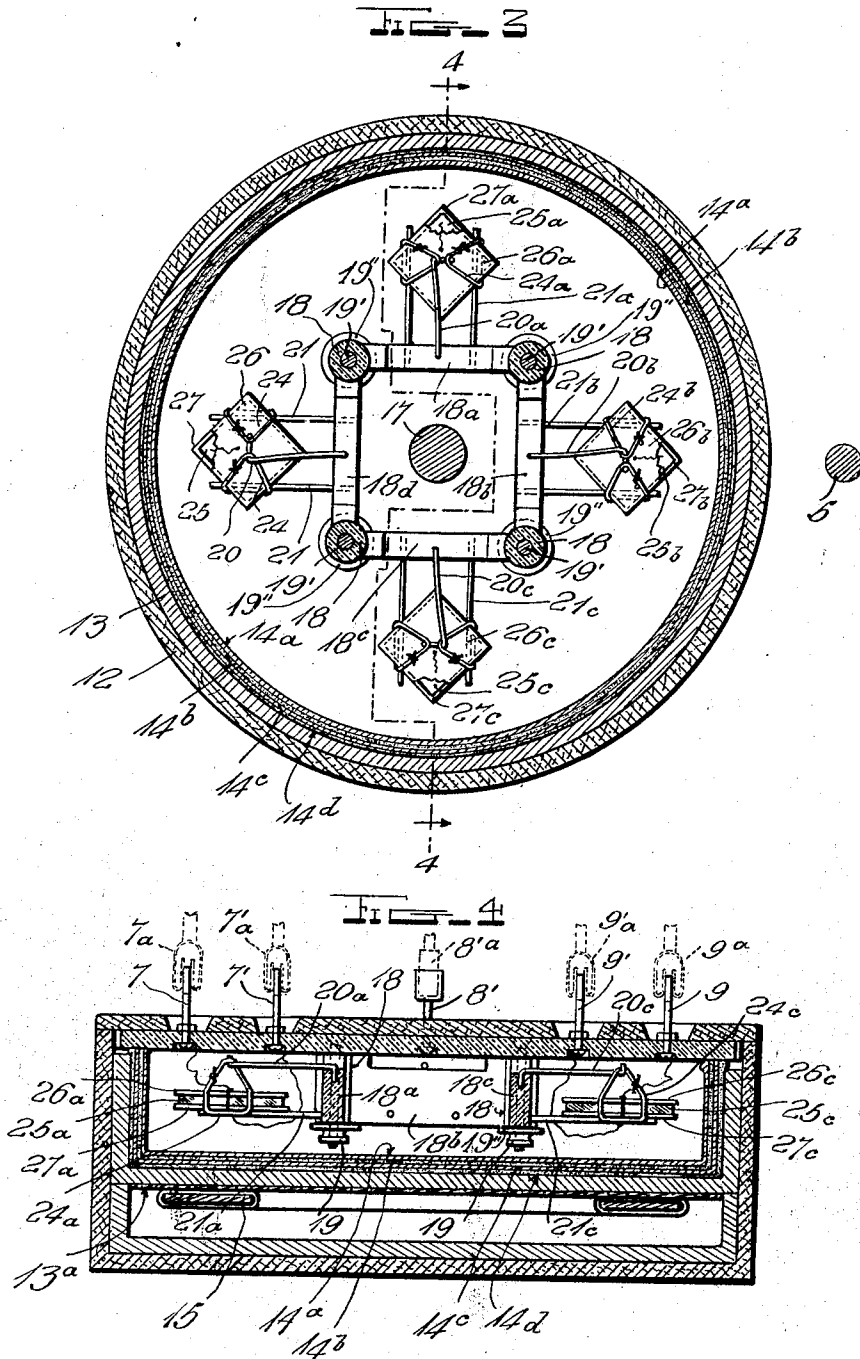
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2 Sheets-Sheet 2



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PIEZO ELECTRIC CRYSTAL HOLDER

Application filed March 26, 1929. Serial No. 350,094.

My invention relates broadly to frequency stabilizing devices for high frequency oscillation generators, and more particularly to holders for frequency stabilizing devices of the piezo electric element type.

One of the objects of my invention is to provide a more efficient holder and housing for piezo electric elements.

Another object of my invention is to provide a piezo electric element holder by means of which any one of a plurality of piezo electric elements may be connected into circuit.

A further object of my invention is to provide a piezo electric element holder in which the electrostatic capacity between the ground and each of the contacting plates is substantially equal.

Still another object of my invention is to provide a compact heat insulated piezo electric element holder for housing a plurality of piezo electric elements in which any one of the elements is selectively readily accessible for use in oscillation generator circuit arrangements.

My invention will be more fully understood from the following specification by reference to the accompanying drawings.

According to my invention a rotatable container for housing piezo electric elements is provided with a panel member of insulating material upon which are mounted contacts connected to the contacting plates in electrical relation with the surfaces of the piezo electric elements. The contacts mounted upon the insulating panel are adapted to engage other contacts connected to the oscillation generator circuit as the housing is rotated by means engaging the housing. My invention is adapted for use in conjunction with wave changing devices shown in my copending application, Serial Number 140,377 and United States Letters Patent 1,732,547, dated October 22, 1929. By employing gear and shaft or flexible member and pulley or simply gear arrangements to interconnect the shafts of the wave changing devices shown in my copending application and patent identified above, and the rotatable piezo electric element housing of my present invention, a different piezo electric element may

be connected into the circuit of the oscillation generator at the same time as the frequency of the system is changed by changing the value of inductance in the oscillatory circuits of the signal transmitting system.

In the drawings, Figure 1 shows a top view in partial section of the preferred embodiment of my invention; Fig. 2 shows a sectional view in side elevation taken along line 2—2 of Fig. 1; Fig. 3 shows a top sectional view taken along line 3—3 of Fig. 2 of one embodiment of my invention; Fig. 4 illustrates a cross-sectional view in side elevation along lines 4—4 of Fig. 3; and Fig. 5 is a detail view of a piezo electric element supporting arrangement.

Referring to Fig. 1 of the drawings reference numeral 1 designates a heat insulated container having a top 2. A gear member 3 of insulating material is positioned against the top 2 of the container 1. A pinion 4 mounted upon the shaft member 5 is provided to engage with gear 3 for rotating the container. Terminals 6, 6', 7, 7', 8, 8', 9 and 9' are supported by the container gear member 3. A nut 11 is provided for the bolt 10 for centering and retaining the member 3 in position.

In Fig. 2 a cross-sectional view of the heat retaining container 1 having an outer wall 12 of fibrous heat insulating material and successive heat distributing and heat absorbing walls 13 and 14, respectively, is shown. Inner linings 13 and 13' are made of material, such as aluminum, having a high thermal conductivity in a direction parallel to its surface and a low heat capacity. These linings are provided for the purpose of evenly distributing the heat generated by the heating element 15 through the piezo electric element compartment. More elaborate linings of, for example, laminated aluminum spaced by thin insulation, such as paper or relatively well formed coatings of aluminum oxide formed on the laminated aluminum may be provided instead of the homogeneous linings 13 and 13'. Lining 14, consisting of an inner layer 14a of heat conducting material and heat retaining layers 14b and 14c spaced by layer 14c of heat conducting ma-

terial, is provided within the lining 13 for the purpose of reducing the effect of rapid temperature variations which may take place within the heating compartment, in which the heating unit 15 is located, upon the temperature within the piezo electric element compartment.

The heat retaining layers of lining 14 are made of such materials as felt, asbestos, rubber and phenol condensation products or combinations thereof. The heat conducting layers of lining 14 consist of sheet copper, sheet aluminum or similar materials. A sensitive thermostat 16 which may be of the mercury contact type wherein an electrical circuit is completed between two contacting members by expanding mercury, is provided to regulate the temperature within the heating compartment by establishing or interrupting the electric circuit through the heating unit 15, or through a relay system associated with the circuits of heating unit 15. An upright member 17 is attached to the bottom of compartment 13 for firmly retaining member 3 through the cooperation of bolt and nut members 10 and 11. Members 18 of insulating material, such as phenol condensation products, are supported against the combination carrier and gear member 3 by means of the pins 19'. Washers 19'' and nuts 19 coact with the pins 19' for supporting the panel members 18a, 18b, 18c and 18d as shown in Fig. 3. Panel members 18a, 18b, 18c and 18d are adapted to slide from between the members 18 and may be removed by taking off nuts 19 and washers 19'' from pins 19'. Flexible insulating threads 24 of silk, impregnated cotton or similar materials, are provided between the extending arms 20 and 21, which are supported by the member 18d, for carrying the piezo electric element 25 and the contacting plates 26 and 27. Plates 27 are rigidly secured to arms 20 and 21. Arms 20a, 20b and 20c similar to the arm 20, and arms 21a, 21b and 21c similar to arm 21, are provided on panel members 18a, 18b and 18c, respectively for supporting piezo electric elements 25a, 25b and 25c, respectively, through the cooperation of the flexible insulating members 24a, 24b and 24c, respectively.

Upper and lower contacting plates 26, 26a, 26b and 26c and 27, 27a, 27b and 27c positioned in electrical relation with the piezo electric crystals 25, 25a, 25b and 25c, respectively, are connected to terminals 6, 7, 8 and 9 and 6', 7', 8', and 9', respectively. Contacting members 6a and 6a' are provided for engaging the terminals 6, 6', 7, 7', 8, 8' and 9, 9', successively as the housing member is rotated for connecting any one of the piezo electric elements selected into circuit. Where it is desired to employ all the piezo electric elements at once, additional contacting members 7a, 7a', 8a, 8a', and 9a, 9a' (shown dot-

ted) may be provided. A sheet of heat resisting material 13a such as mica is provided between the lower portion of lining 13 and heating unit 15 as shown in Figs. 2 and 4. In Fig. 5 a detail view of the slidably removable panel member 18d and the piezo electric crystal supporting arrangement comprising arms 20, 21, flexible members 24 and contact plates 26, 27, is illustrated. The panel members 18a, 18b and 18c are similar to the panel 18d.

The piezo electric element housing of my invention may be employed with any convenient number of piezo electric elements. Additional walls may be provided for housing each of the piezo electric elements in a separate compartment.

While I have described my invention in a certain preferred embodiment, I desire it be understood that modifications may be made and that no limitations upon the invention are intended other than are imposed by the scope of the annexed claims.

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

1. In a multiple piezo electric crystal holder, a cylindrical housing, a closure for one end of said housing, a cover plate closing the other end of said housing, said cover plate being removable from the end of said housing, a plurality of pins parallel to the axis of said cylindrical housing and carried by said removable cover plate, a plurality of panel members adapted to be removably supported by said pins, a plurality of piezo electric crystals, arms projecting from each of said panel members, flexible elements holding each of said piezo electric crystals in fixed spacial relationship with the arms of a corresponding panel element, and means for connecting said crystals with an external circuit.

2. In a multiple piezo electric crystal holder, a cylindrical housing mounted for rotation about its axis, means for rotating said cylindrical housing, a closure for one end of said housing, a removable cover plate closing the other end of said housing, a plurality of pins parallel to the axis of said cylinder and carried by said removable cover plate, a plurality of panel members adapted to be removably supported by said pins, a plurality of piezo electric crystals, arms projecting from each of said panel elements, filamentary elements holding each of said piezo electric crystals in fixed spacial relationship with the arms of a corresponding panel element, contact elements mounted on said cylindrical housing, means for connecting each of said crystals with a corresponding set of said contact elements, and fixed contact elements mounted adjacent said housing and adapted to engage said first mentioned contact elements as said housing is rotated.

3. In a multiple piezo electric crystal

holder, a cylindrical housing having multi-layer walls and mounted for rotation about its axis, means for rotating said cylindrical housing, a closure for one end of said housing, a detachable cover plate covering the other end of said housing, said walls of said cylindrical housing comprising an outer layer of heat insulating material and an inner layer of heat conducting material, a partition in said housing forming with said heat conducting inner layer of said wall a heating compartment and a crystal compartment, means for maintaining said heating compartment at a predetermined temperature, a plurality of pins parallel to the axis of said cylinder and carried by said detachable cover plate, a plurality of panel members adapted to be removably supported by said pins, a plurality of piezo electric crystals, arms projecting from each of said panel elements, filamentary elements holding each of said piezo electric crystals in fixed spacial relationship with the arms of a corresponding panel element, contact elements mounted on said cylindrical housing, means for connecting each of said crystals with a corresponding set of said contact elements, and fixed contact elements mounted adjacent said housing and adapted to engage said first mentioned contact elements as said housing is rotated, said crystals and panel members and their respective supporting members being positioned in said crystal compartment.

4. In a multiple piezo electric crystal holder, a cylindrical housing having multi-layer walls and mounted for rotation about its axis, means for rotating said cylindrical housing, a closure for one end of said housing, a removable cover plate covering the other end of said housing, said walls of said cylindrical housing comprising an outer layer of heat insulating material and an inner layer of heat conducting material, a partition in said housing forming with said heat conducting inner layer of said wall a heating compartment and a crystal compartment, a laminated lining for said crystal compartment comprising alternate layers of heat conducting and heat insulating material, means for maintaining said heating compartment at a predetermined temperature, a plurality of pins parallel to the axis of said cylinder and carried by said removable cover plate, a plurality of panel members adapted to be removably supported by said pins, a plurality of piezo electric crystals, arms projecting from each of said panel elements, filamentary elements holding each of said piezo electric crystals in fixed spacial relationship with the arms of a corresponding panel element, contact elements mounted on said cylindrical housing, means for connecting each of said crystals with a corresponding set of said contact elements and fixed contact elements mounted adjacent said housing and adapted to engage said first

mentioned contact elements as said housing is rotated, said crystals and panel members and their respective supporting members being positioned in said crystal compartment.

5. In a multiple piezo electric crystal holder, a cylindrical housing having multi-layer walls and mounted for rotation about its axis, means for rotating said cylindrical housing, a closure for one end of said housing, a removable cover plate covering the other end of said housing, said walls of said cylindrical housing comprising an outer layer of heat insulating material and an inner layer of heat conducting material, a partition in said housing forming with said heat conducting inner layer of said wall a heating compartment and a crystal compartment, thermostatically controlled means for maintaining said heating compartment at a predetermined temperature, a plurality of pins parallel to the axis of said cylinder and carried by said removable cover plate, a plurality of panel members adapted to be removably supported by said pins, a plurality of piezo electric crystals, arms projecting from each of said panel elements, filamentary elements holding each of said piezo electric crystals in fixed spacial relationship with the arms of a corresponding panel element, contact elements mounted on said cylindrical housing, means for connecting each of said crystals with a corresponding set of said contact elements, and fixed contact elements mounted adjacent said housing and adapted to engage said first mentioned contact elements as said housing is rotated, said crystals and panel members and their respective supporting members being positioned in said crystal compartment.

6. In a multiple piezo electric crystal holder, a cylindrical housing having multi-layer walls and mounted for rotation about its axis, means for rotating said cylindrical housing, a closure for one end of said housing, a removable cover plate covering the other end of said housing, said walls of said cylindrical housing comprising an outer layer of heat insulating material and an inner layer of heat conducting material, a partition in said housing forming with said heat conducting inner layer of said wall a heating compartment and a crystal compartment, said partition being laminated and comprising a plurality of layers of different materials one of which is a heat conductor and one of which is a heat insulator, means for maintaining said heating compartment at a predetermined temperature, a plurality of pins parallel to the axis of said cylindrical housing and carried by said removable cover plate, a plurality of panel members adapted to be removably supported by said pins, a plurality of piezo electric crystals, arms projecting from each of said panel elements, filamentary elements holding each of said piezo electric crystals

- tals in fixed spacial relationship with the arms of a corresponding panel element, contact elements mounted on said cylindrical housing, means for connecting each of said
6 crystals with a corresponding set of contact elements, and fixed contact elements mounted adjacent said housing and adapted to engage said first mentioned contact elements as said housing is rotated, said
10 crystals and panel members and their respective supporting members being positioned in said crystal compartment, whereby the rate of temperature variations in said crystal compartment is minimized.
- 15 7. Piezo electric crystal apparatus comprising a container, a cover member for said container, a multiplicity of pedestal members disposed normal to said cover member within said container, a plurality of slidable
20 panels engageable between said pedestal members, and piezo electric crystal elements of different frequency characteristics carried by each of said slidable panels.
- 25 8. Piezo electric crystal apparatus comprising a casing, a removable cover member on said casing, a multiplicity of pedestal members carried by said cover member and projecting normal thereto within said casing, a plurality of movable panel members slidable
30 to a position between said pedestal members, means for securing each of said panel members in position, and piezo electric crystal elements of different frequency characteristics supported by each of said panels.
- 35 9. Piezo electric crystal apparatus comprising a casing, a cover member for one end of said casing, a multiplicity of pedestal members carried by said cover member and projecting normal thereto within said casing,
40 panel members slidable to a position between said pedestal members and having the edges thereof shaped to conform with the contour of said pedestal members, a support carried by each of said panel members substantially
45 normal to the plane thereof, piezo electric crystal elements of different frequency characteristics carried by each of said supports, and means for securing said panel members in position with respect to said panel mem-
50 bers.

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