Oct. 24, 1944. G. E. WOODMARK 2,361,343

CRYSTAL CONTAINER

Filed Jan. 31, 1944 2 Sheets-Sheet 1

Fig. 1

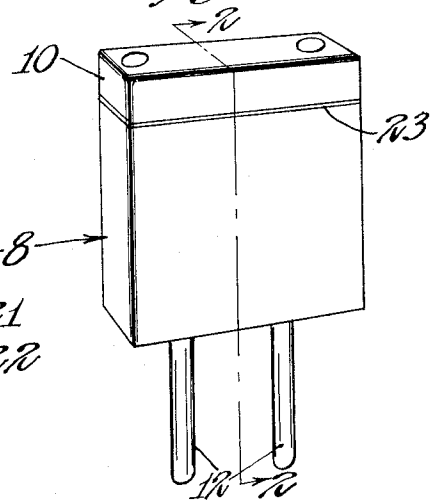

Fig. 4

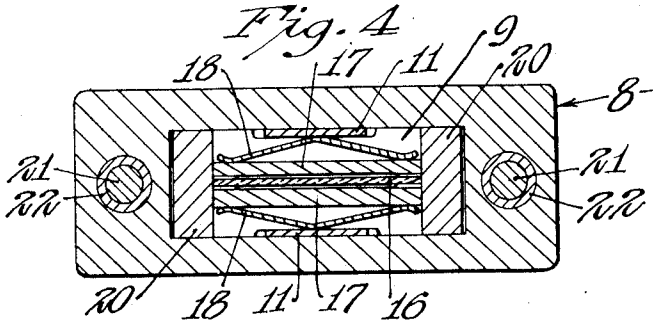

Fig. 3

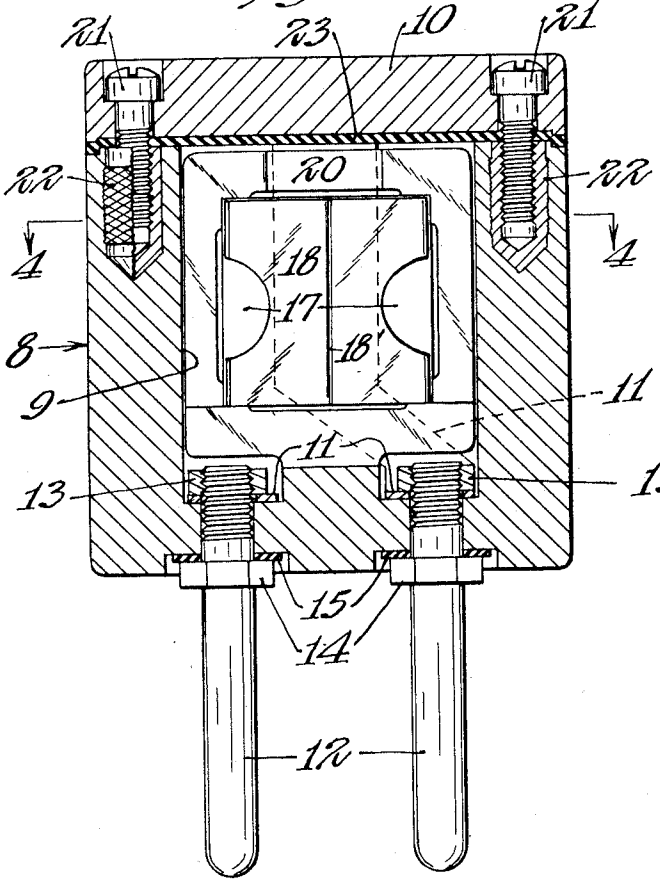

Fig. 2

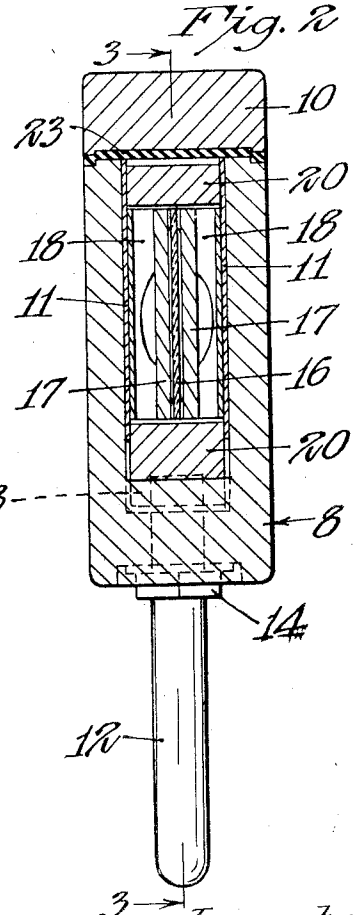

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Fig. 5

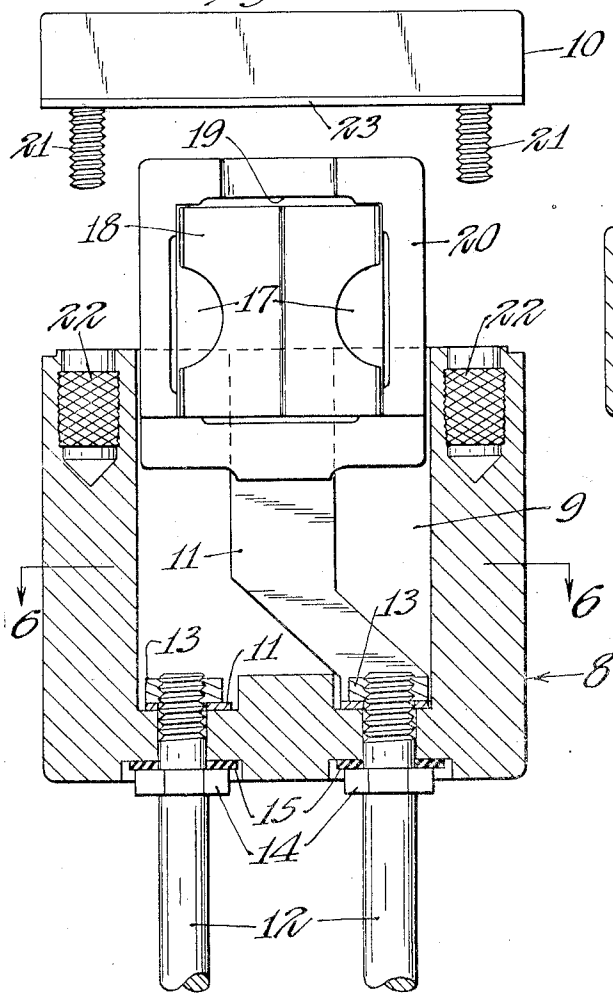


Fig. 6

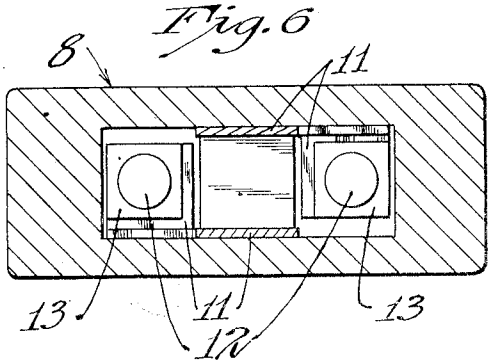
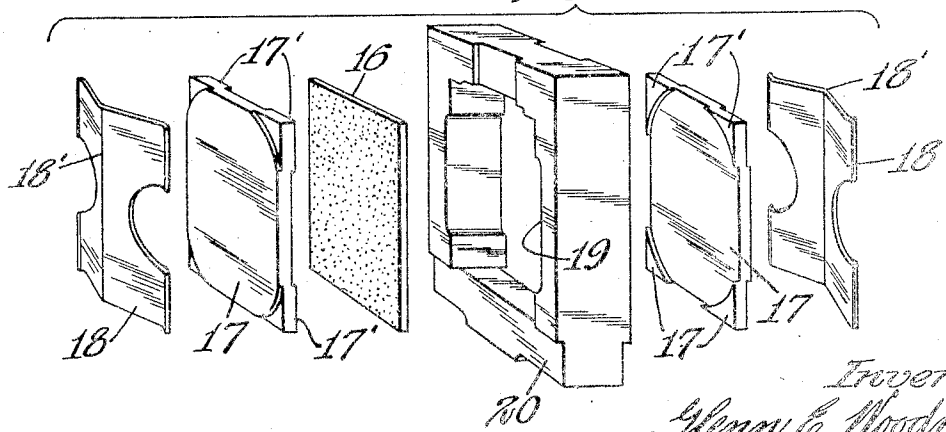


Fig. 7



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UNITED STATES PATENT OFFICE

2,361,343

CRYSTAL CONTAINER

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Application January 31, 1944, Serial No. 520,421

20 Claims. (Cl. 171—327)

My present invention relates to an improved holder and container for crystals of the kind used in connection with radio sending and receiving sets for tuning the same to operate at a pre-selected radio frequency and which, crystals, are usually ground to resonate at the said selected frequency.

Although crystals of this type are very sensitive to moisture, and particularly to frozen moisture, no great amount of trouble is usually encountered from this source so long as the crystals be covered and protected against rapid changes in temperature. However, crystals of this type are widely used in connection with radio communication equipment and when so used are subject to rapidly changing altitudes with consequent rapid changes in temperature which latter, if the crystal be in communication with the surrounding atmosphere, causes precipitation and subsequent freezing of moisture on and about the crystal. Such accumulation of moisture, and particularly frozen moisture, on the crystal and its associate parts tends to vary the frequency characteristics of the crystal and sometimes renders the crystal entirely inoperative, all of which is very objectionable. This, of course, indicates the desirability of hermetically sealing the crystal, but experience has shown that unless the sealing of the crystal is complete and positive, it is better to leave the same in free communication with the surrounding atmosphere so that precipitated moisture will be given a free opportunity to evaporate rather than be trapped and progressively collected.

An important object of my present invention is, therefore, the provision of a holder and container for crystals of the general character described provided with external contacts and in which the crystal will be hermetically sealed.

Another object of the invention is the provision of an improved crystal holding structure that is particularly adapted to hermetic sealing of the crystal.

A further object of the invention is the provision of a hermetically sealed crystal holder of the plug-in type.

A still further important object of the invention is the provision of an improved plug-in type crystal container wherein the crystal is removably contained and hermetically sealed.

A still further object of the invention is the provision of an improved crystal holder and container having external contacts for connecting into a circuit and into which the crystal may be quickly and easily inserted, properly connected to the external contacts, and hermetically sealed.

A still further object of the invention is the provision of a crystal holder and container of the general character described comprising a casing having a primarily open but normally closed crystal-receiving cavity wherefrom contact elements extend to the exterior of the casing, and means whereby the crystal and certain cooperating elements for connecting the same to the respective contact elements of the casing may be rapidly assembled externally of the casing cavity and applied as a unit to the casing cavity.

The above and other highly important objects and advantages of the invention will be made apparent from the following specification, claims and appended drawings, which latter illustrate a commercial embodiment of the invention.

In the accompanying drawings, like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a perspective view of a completely assembled crystal holder of the present invention on a somewhat enlarged scale with respect to the commercial forms of the device;

Fig. 2 is a transverse vertical sectional view taken on the line 2—2 of Fig. 1 and on a still further enlarged scale;

Fig. 3 is a vertical sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a horizontal sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is a sectional view similar to Fig. 3 but showing the cover removed and the crystal and certain associated parts partially removed from the casing cavity;

Fig. 6 is a transverse section view taken on the line 6—6 of Fig. 5 and similar to Fig. 4 but taken lower down the casing and with certain of the parts removed; and

Fig. 7 is a composite perspective view of a drawer-like receptacle and several parts including the crystal, a pair of pressure plates, and a pair of yielding contacts, all of which are normally assembled together for unitary movements therewith into and out of the casing cavity.

The main casing body of the improved crystal holder is indicated as an entirety by 8, the cavity thereof by 9, and the removable cover of the casing by 10. The casing body 8 and cover 10 are preferably molded of a suitable plastic having very low electric conductivity and consequent high insulating qualities. In the preferred embodiment of the invention illustrated, the casing cavity 9, which is primarily open but is normally closed by the cover 10, is rectangular in both

transverse and vertical section and is provided along opposite walls with stationary strip contacts 11 that are adapted to be connected to opposite sides of an interposed crystal and are connected to opposite terminal prongs 12 that project through the end of the casing opposite the cover 10 thereof. The projecting ends of the prongs 12 are adapted to be plugged in to suitable socket-type contacts in the radio apparatus. The inner ends of said prongs are externally threaded for cooperation with threaded nuts 13, while the intermediate portions of the said prongs are shown as being integrally formed with angular nut-shaped flanges 14 for application to a wrench used in screwing the prongs 12 tightly into the nuts 13.

The stationary strip contacts 11 of the casing body extend longitudinally of the casing cavity 9 from the upper primarily open end portion thereof to a point well below the center of the cavity and then extend diagonally along their respective walls to the bottom of the cavity at which point they are turned crosswise of the cavity and are clamped one under each of the terminal anchoring nuts 13, the lower out-turned ends of the strip contacts 11 being perforated to receive the threaded end portions of the terminal prongs 12. In order to positively prevent the leakage of air through the terminal prong-receiving apertures of the casing body 8, resilient washers 15 (preferably of synthetic rubber) are applied under the prong flanges 14 and compressed.

The crystal 16, which is of the conventional variety ground to resonate at a pre-determined radio frequency and may be assumed to be of quartz, is shown as being in the form of a rectangular sheet. This crystal is normally disposed between a pair of rectangular pressure plates 17 which are yieldingly pressed against the crystal 16 by an opposite pair of yielding contact elements 18. The pressure plates 17 (see particularly Fig. 7) are stamped or otherwise formed to provide crystal-engaging bosses 17' at their four corners, and it is only these bosses 17' of the pressure plates that engage the crystal, thereby leaving the major area of the crystal free to resonate between the pressure plates.

The crystal 16, pressure plates 17, and yielding contact elements 18, are normally contained within the open central portion 19 of a drawer-like receptacle 20, which latter is externally sized and shaped to freely, but snugly, fit within the cavity 9 of the casing body 8, as shown, for example, in Figs. 2, 3, and 4. The open central portion of this drawer-like receptacle is shaped to freely, but snugly, receive the crystal 16, pressure plates 17, and yielding contact elements 18, and all these parts 16, 17, and 18 are assembled in the drawer-like receptacle 20 externally of the casing cavity 9 and are inserted thereinto and removed therefrom as a unit much in the manner of a cabinet drawer. The yielding contact elements 18, preferably and as shown, have outside dimensions closely corresponding to those of the crystal 16 and pressure plates 17, so that they, too, will be retained by the drawer-like receptacle against any material movement with respect to the pressure plates 17, and these are formed from flat spring metal into outwardly bowed or outwardly convex shape in transverse cross section. The vertical edges of these yielding contact elements engage the vertical edge portions of the pressure plates and the outwardly bowed central portions or apexes 18' thereof normally engage opposite contacts 11 of the casing body. It is important to note that the normal spacing between the apex portions 18' of opposite pressure plates is greater than the spacing between opposite contacts 11, so that lateral compression of the contact elements 18 is a necessary preliminary to insertion of the drawer-like receptacle and its contained parts 16—18 inclusive into the casing cavity. In practice, this is best accomplished by assembling the parts and then squeezing the opposite yielding contact elements 18 between the thumb and forefinger of one hand to the extent necessary to initiate application of the entire unit into the casing cavity to a position approximately corresponding to that shown in Fig. 5, after which endwise pressure on the drawer-like receptacle 20 will cause the parts 16, 17, 18, and 20 to slide into operative position as a unit. With this arrangement, the assembled parts are always maintained tightly clamped together under lateral pressure exerted thereon by the yielding contact elements 18, thereby preventing any possible rattling or vibration of parts and assuring good electrical contact therebetween at all times.

From the above, it will be obvious that when the parts are properly assembled as shown, for example, in Figs. 2, 3, and 4, opposite sides of the crystal 16 will be connected to opposite stationary contacts 11 and through said contacts 11 to opposite contact prongs 12.

When the parts have been duly assembled within the casing cavity, the cover 10 may be applied and anchored in place by means of anchoring screws 21 that work in internally-threaded nuts 22 in the casing body 8. These anchoring nuts 22 are shown as being closed at their lower ends and as being knurled or otherwise roughened on their outer surfaces and are cast in the molded casing body 8. Final hermetic sealing of the casing is accomplished by applying between the cover 10 and casing body 8 a resilient gasket 23 which is preferably of synthetic rubber and may be compressed by tightening of the anchoring screws 21.

The crystal holder described is inexpensive, quickly and easily assembled and disassembled, and hermetically seals the crystal under all the extreme altitude and temperature variations encountered in aircraft communication equipment.

What I claim is:

1. A container for radio crystals comprising a casing body having a cavity that is open at one end of the casing body, stationary contacts exposed to the casing cavity and having terminals that project through the casing body, a drawer-like receptacle adapted to slide into and out of the casing cavity and having an opening in its central portion to which the stationary casing contacts are exposed when the drawer is in operative position, a crystal, a pair of laterally resilient contact elements electrically connected with opposite sides of the crystal, said crystal and said laterally resilient contact elements being disposed within the open central portion of the drawer-like receptacle for unitary movements therewith into and out of the casing cavity, said laterally resilient contact elements each engaging a different of said stationary casing contacts when in operative position in the cavity and maintaining a yielding pressure thereon and the crystal, and a cover for said casing cavity.

2. A container for radio crystals comprising a casing body having a cavity that is open at one end of the casing body, stationary contacts ex-

posed at opposite sides of the casing cavity and having terminals that project through the casing body, a drawer-like receptacle adapted to slide into and out of the casing cavity and having an opening through its central portion to which the opposite stationary contacts are exposed when the drawer is in operative position, a crystal, a pair of contact elements between which the crystal is disposed, one of said contact elements being laterally resilient, said crystal and opposite contact elements being disposed within the open central portion of the drawer-like receptacle for unitary movements therewith into and out of the casing cavity and being laterally removable from said drawer-like receptacle when the receptacle is removed from the cavity, said contact elements engaging opposite fixed contacts of the casing when in operative position and said laterally resilient contact element maintaining a yielding pressure on the parts interposed between the opposite casing contacts, and a cover for said casing cavity.

3. The structure defined in claim 1 in which the said stationary casing contacts are in the nature of flat strips and in which the said terminals thereof are in the nature of prongs that extend through the casing body.

4. The structure defined in claim 1 in which the casing cavity and drawer-like receptacle are rectangular and in which the shape and dimensions of the drawer-like receptacle closely correspond to the dimensions and shape of the casing cavity.

5. The structure defined in claim 2 in which the said stationary casing contacts are in the nature of flat strips lying along opposite sides of the casing cavity and in which the terminals thereof are in the nature of contact prongs that extend through the casing body at its end opposite the opening thereof, said contact strips being electrically connected to opposite of said prongs and extending therefrom toward the open end of the casing cavity.

6. The structure defined in claim 1 in which the drawer-like receptacle closely embraces the edges of the crystal and snugly fits in the casing cavity.

7. The structure defined in claim 2 in which the drawer-like receptacle snugly fits in the casing cavity and closely embraces the edges of the crystal and opposite contact elements contained therein.

8. The structure defined in claim 1 which further comprises pressure plates also mounted in the opening of said drawer-like receptacle and in direct engagement with opposite side portions of the crystal, the outside of said drawer-like receptacle closely corresponding in shape and dimensions to that of the casing cavity, and said drawer-like receptacle closely embracing the edges of said crystal and pressure plates.

9. A container for radio crystals comprising a casing body having a cavity that is open at one end of the casing body, stationary contacts exposed at opposite sides of the casing cavity and having terminals that project through the casing, a drawer-like receptacle adapted to slide into and out of the casing cavity and having an open central portion to which the opposite stationary contacts are exposed when the drawer-like receptacle is in operative position, a crystal, a pair of laterally yielding contact elements between which the crystal is disposed, said crystal and opposite laterally yielding contact elements being disposed within the open central portion of the drawer-like receptacle for unitary movements therewith into and out of the casing cavity and being laterally removable from said drawer-like receptacle when the receptacle is removed from the casing cavity, said yielding contact elements engaging the opposite fixed contacts of the casing when in operative position and maintaining a yielding pressure thereon and the interposed crystal, and a cover for said casing cavity.

10. A container for radio crystals comprising a casing body having a cavity that is open at one end of the casing body, stationary contacts exposed at opposite sides of the casing cavity and having terminals that project through the casing, a drawer-like receptacle adapted to slide into and out of the casing cavity and having an open central portion to which said stationary contacts are exposed when the receptacle is in operative position, a crystal, a pair of pressure plates between which the crystal is disposed, and a pair of laterally yielding contact elements engaging the outside faces of opposite pressure plates, said crystal, pressure plates, and laterally yielding contact elements being disposed within the open central portion of the drawer-like receptacle for unitary sliding movements therewith into and out of the casing cavity and being laterally removable therefrom when removed from the casing cavity, said yielding contact elements engaging the opposite fixed contacts of the casing when in operative position and exerting yielding squeezing pressure on the interposed pressure plates and crystal, and a cover for said casing cavity.

11. The structure defined in claim 9 in which the said stationary contacts are in the nature of flat strips lying along opposite sides of the casing cavity and in which the said terminals are in the nature of prongs that extend through the end of the casing opposite the primarily open end thereof, said contact strips being electrically connected to opposite of said prongs and extending therefrom toward the open end of the casing cavity.

12. The structure defined in claim 9 in which the casing cavity and drawer-like receptacle are rectangular and in which the shape and dimensions of the drawer-like receptacle closely correspond to the inside dimensions of the cavity.

13. The structure defined in claim 10 in which the casing cavity and drawer-like receptacle are rectangular and in which the shape and dimensions of the drawer-like receptacle closely correspond to the inside dimensions of the cavity.

14. The structure defined in claim 10 in which the said stationary contacts are in the nature of flat strips lying along opposite sides of the casing cavity and in which the said terminals are in the nature of prongs that extend through the end of the casing opposite the primarily open end thereof, said contact strips being electrically connected to opposite of said prongs and extending therefrom toward the open end of the casing cavity.

15. The structure defined in claim 9 in which the drawer-like receptacle closely embraces the edges of the crystal and laterally yielding contact elements.

16. The structure defined in claim 10 in which the drawer-like receptacle closely embraces the edges of the crystal, pressure plates, and laterally yielding contact elements.

17. The structure defined in claim 9 in which the casing cavity is substantially rectangular in both longitudinal and transverse cross section and in which the drawer-like receptacle is shaped

to snugly fit in said cavity, the central opening in said drawer-like receptacle being substantially rectangular and closely embracing the edge portions of the crystal and laterally yielding contact elements.

18. The structure defined in claim 10 in which the casing cavity is substantially rectangular in both longitudinal and transverse cross section and in which the drawer-like receptacle is shaped to snugly fit in said cavity, the central opening in said drawer-like receptacle being substantially rectangular and closely embracing the edge portions of the crystal, pressure plates, and laterally yielding contact elements.

19. The structure defined in claim 9 in which the casing cavity is substantially rectangular in both longitudinal and transverse cross section and in which the drawer-like receptacle is shaped to snugly fit in said cavity, the central opening in said drawer-like receptacle being substantially rectangular and closely embracing the edge portions of the crystal and laterally yielding contact elements, said laterally yielding contact elements being in the nature of outwardly convex sheet metal springs with their apexes in engagement with the stationary contacts.

20. The structure defined in claim 10 in which the casing cavity is substantially rectangular in both longitudinal and transverse cross section and in which the drawer-like receptacle is shaped to snugly fit in said cavity, the central opening in said drawer-like receptacle being substantially rectangular and closely embracing the edge portions of the crystal and laterally yielding contact elements, said laterally yielding contact elements being in the nature of outwardly convex sheet metal springs with their apexes in engagement with the stationary contacts.

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