July 28, 1953 C. W. DAVIS 2,647,210

CRYSTAL CAP AND HOLDER

Filed May 11, 1951

Fig. 1

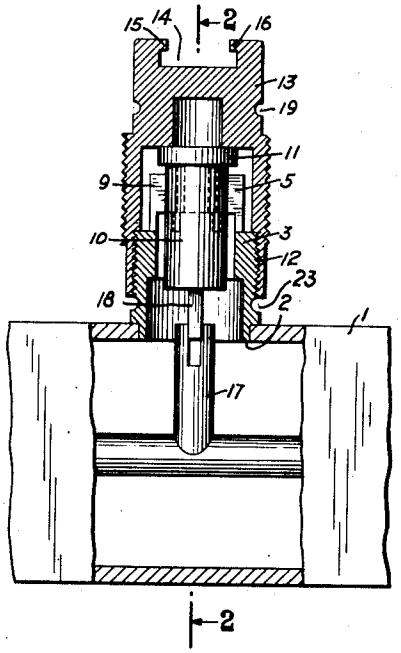


Fig. 2

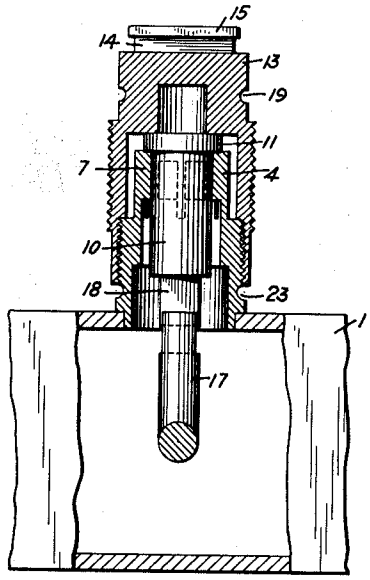


Fig. 3

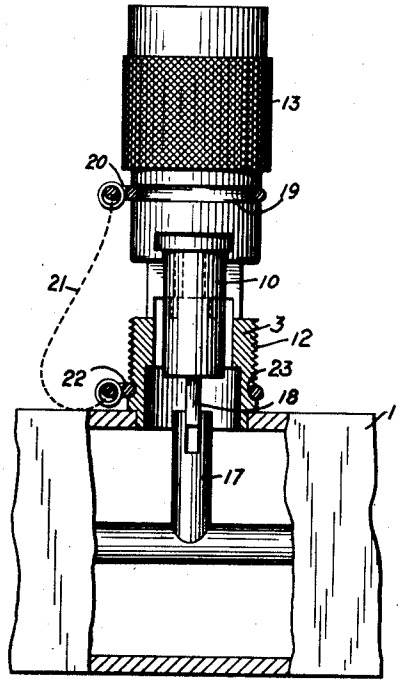


Fig. 4

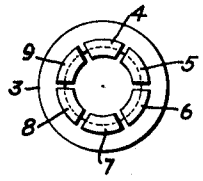
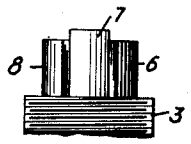


Fig. 5



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Patented July 28, 1953

2,647,210

UNITED STATES PATENT OFFICE

2,647,210

CRYSTAL CAP AND HOLDER

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Application May 11, 1951, Serial No. 225,893

3 Claims. (Cl. 250—31)

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This invention relates to holders for crystals such as used in high frequency communication systems.

In communication systems employing waveguides and cavity resonators it is often desirable to dispose a crystal in the waveguide or cavity resonator as a part of the electrical circuit thereof. This is commonly done by providing a crystal holder mounted in a wall of the electrical apparatus. Heretofore, the crystal holders are made to receive the crystal in a removable gripping relation. While the crystal may be removed from such holders, it is difficult for a repair man to remove the crystal without damaging it. If a screwdriver or other tool is used to pry it out of the holder, there is danger of the crystal broken, dropped or lost.

One of the objects of this invention is to provide an improved holder for crystal units for electrical apparatus whereby the crystal is supported in proper relation in the apparatus and an element of the holder is always present for use in removing and/or inserting crystals.

A further object is to provide a crystal holder in two parts, the first part to receive and support the crystal and the second part for gripping the crystal for insertion and removal from the first part.

The crystal holder in accordance with my invention comprises a hollow cylindrical member adapted to be mounted in an opening in the wall of a waveguide or other electrical apparatus, the cylindrical member having at its outer end a plurality of circumferentially spaced fingers or tines adapted to receive and support a crystal. Certain of the fingers are made longer than others to determine the positioning of the crystal, the crystal unit being provided with a rim at one end which is engaged by the longer fingers. The shorter fingers provide a space beneath the rim whereby a recessed portion of a closure element may be received to grip the crystal unit. With the crystal unit thus gripped by the closure element it may be inserted or removed and replaced in the holder at will.

The above-mentioned and other features and objects of this invention and the manner of attaining them will become more apparent and the invention itself will be best understood, by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings, wherein:

Fig. 1 shows the holder in longitudinal cross-section with a crystal held therein in coupled relation with a waveguide;

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Fig. 2 is a view in cross-section taken substantially along line 2—2 of Fig. 1;

Fig. 3 is a view in elevation with parts in section showing the closure element in crystal gripping position;

Fig. 4 is a view in plan of the crystal holding member; and

Fig. 5 is a view in side elevation of the upper portion of the crystal holding member.

Referring to the drawings, the electrical apparatus illustrating the use of the crystal holder of this invention is shown to be a waveguide 1 having an opening 2 in a wall thereof. The crystal holding member 3 is shown to be a hollow cylindrical member receivable in the opening 2 whereby it may be sealed to the waveguide by brazing or welding. The outer end of the member 3 is provided with a plurality of fingers 4, 5, 6, 7, 8 and 9, the opposed fingers 4 and 7 being longer than the other fingers 5, 6, 8 and 9. The crystal unit 10 is provided at one end thereof with radially outwardly extending portions in the form of a rim 11 which is adapted to be engaged by the longer fingers 4 and 7 whereby a space is provided between the rim 11 and the shorter fingers 5, 6, 8 and 9. The fingers 4 to 9 are each provided with inwardly disposed projections to engage and grip the sides of the crystal unit.

The outer surface of the crystal holder member 3 is provided with threads 12 to threadably receive a closure element 13 which when threadably received on the member 3 is adapted to engage the upper end of the crystal 10 to hold it tightly against the upper ends of the fingers 4 and 7. The crystal 10 may be inserted by hand when the closure element 13 is removed from the member 3. To remove the crystal 10 from the holder 3 considerable exertion is required if one uses his fingers. If he does he may break his finger nails and have to resort to using a screwdriver which is apt to result in damage to the crystal. According to one of the features of my invention I make the closure element so that it can be used for this purpose. The outer end of the closure element 13, for example, is provided with a T-shaped recess 14 having two inwardly projecting portions 15 and 16. By sliding the T-shaped recess 14 crosswise onto the rim portion 11 of the crystal unit with projections 15 and 16 beneath the rim in the spaces provided by the shorter fingers 5, 6, 8 and 9, the crystal will be held in a tight grip. By lifting upwardly on the closure element 13 the crystal unit is easily removed from the holder member and the coupling element 17

with which the crystal terminal 18 is releasably connected.

To insure against the loss of the closure element 13, the element is provided with a groove 19 to receive a chain connecting ring 20 to which a chain 21 is connected and anchored to a similar ring 22 received in the groove 23 on the crystal holder 3.

From the foregoing it will be clear that the holder is made to receive and support a crystal unit in proper electrical connection between a wall of the waveguide and the coupling conductor 17, and further, a closure element is provided for the holder which may be used to grip the crystal unit for insertion and removal from the holder. This gripping element being chained to the holder member provides means for holding the crystal while it is removed from the holder 3 without danger of it being lost during repair operations. The element 13 may thus be used to return the crystal to its position in the holder 3 whereupon it is slid sideways from the crystal unit and by inverting it, the element may be threadably received onto the holder 3 as a closure element.

While I have described above the principles of my invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of my invention, as set forth in the objects thereof and in the accompanying claims.

I claim:

1. A holder for crystal units of cylindrical shape having a laterally projecting rim at one end, comprising a hollow cylindrical member having circumferentially spaced fingers at one end thereof to receive said crystal unit with the rim of the unit engaged by the upper ends of certain of said fingers, other of said fingers being shorter to provide a space between such certain fingers and the rim of the unit, and a crystal gripping element having inwardly projecting portions receivable in the spaces between the short fingers and the rim whereby the crystal may be gripped for removal from said member.

2. In electrical apparatus having a wall with an opening for the reception of a crystal, a cylindrical member disposed adjacent said opening, said member having a plurality of fingers at its outer end for supporting a crystal unit receivable therein, said member having threads on the outer surface thereof and a closure element receivable over said fingers in threaded engagement with said member, certain of the fingers of said member being longer than other of said fingers and said crystal unit is provided with a rim at one end adapted to be engaged by the upper ends of said longer fingers.

3. In electrical apparatus according to claim 2, wherein said closure element includes a T-shaped recessed portion adapted to receive the rim of said crystal unit whereby the crystal unit may be removed from said member by lifting said closure element.

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