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CRYSTAL CONTACT DEVICE

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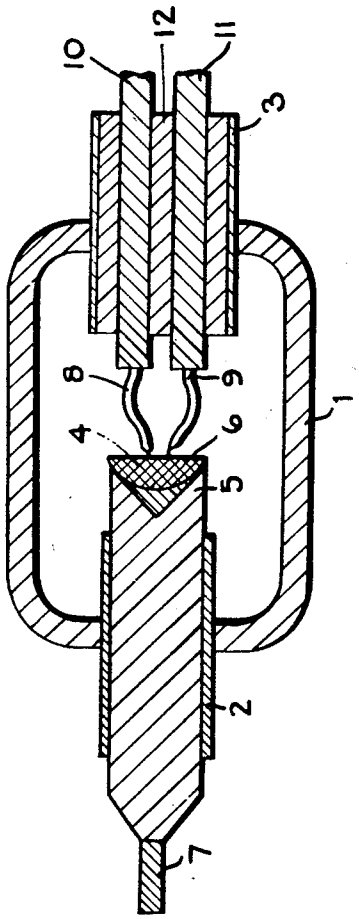


FIG. 1

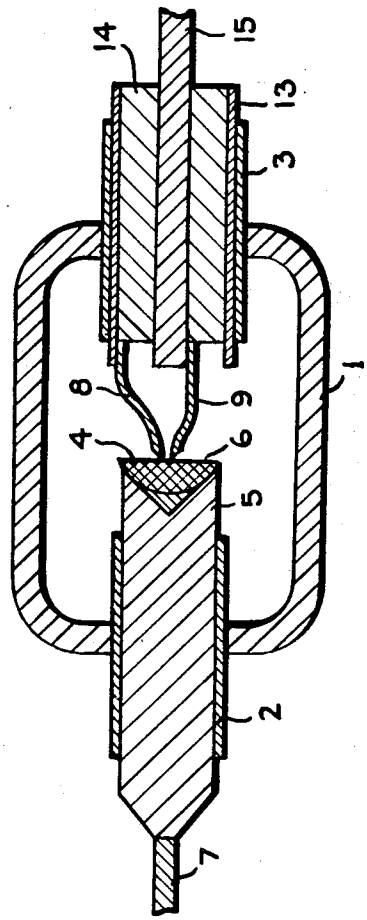


FIG. 2

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CRYSTAL CONTACT DEVICE

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The present invention is concerned with improvements in or relating to crystal contact devices and to method of manufacture thereof.

More particularly, the invention relates to crystal contact devices of the kind comprising an element of semi-conducting crystalline material adapted to co-operate with at least two metallic contact members which each make point-contact therewith, the element and contact members being housed in a suitable protective envelope.

It is to be understood that the term "contact member" in this specification does not include any metallic contact which may have a relatively large surface in contact with the crystalline element, such as the contact forming one electrode of the device, but only refers to contact members of the kind commonly known as "whiskers."

Such devices having two contact members are known, in which by suitable spacing of the contact points of each of the contact members relative to one another on the surface of the crystalline element, the devices may be used for amplification or generation of electric signals.

One object of the present invention is to provide improvements in methods of manufacturing crystal contact devices of the kind specified.

According to the present invention a crystal contact device comprises in combination a glass envelope having two metallic tubes sealed therethrough, an element of semi-conducting crystalline material, a first supporting member inserted in and fixed to one of the tubes and supporting the crystalline element inside the envelope, at least two metallic contact members, a second supporting member inserted in and fixed to the second of the tubes and supporting the contact members so that they are mutually insulated from one another and each is in point contact with the crystalline element, and means passing inside the tubes for making electrical connection from outside the envelope to each of the contact members and the crystalline element respectively.

Thus in one arrangement the second supporting member may consist of a cylinder of insulating material through which the contact members, or electrically conducting members electrically connected to the contact members, pass longitudinally.

Alternatively the second supporting member may consist of a hollow metallic cylinder to which one of the contact members is secured, the cylinder having a fitting of insulating material through which at least one contact member, or an electrically conducting member electrically connected thereto, passes longitudinally.

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In either case each member passing through the cylinder or filling of insulating material may be sealed into the insulating material during the fabrication of the cylinder or filling, or may be fixed in a longitudinal hole formed in the cylinder or filling during the fabrication thereof.

A method of assembling a crystal contact device according to the invention comprises the steps of inserting the first supporting member in one of the tubes so that the crystalline element is inside the envelope, fixing the first supporting member to the tube, inserting the second supporting member in the second of the tubes so that each of the contact members is in point contact with the crystalline element, adjusting the position of the second supporting member until the desired contact pressure between the contact members and the crystalline element is attained, and, finally, fixing the second supporting member to the second of the tubes.

Two embodiments of the present invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings, in which Figures 1 and 2 show sectional views of two alternative forms of construction for a crystal contact device of the kind specified having two contact members.

Referring to the drawings, in each embodiment the device includes a glass envelope 1 having two hollow metallic tubes 2 and 3 of different internal diameters sealed therethrough. The crystalline element 4, which is preferably of germanium, is soldered into a conical hole in a metallic supporting member 5 which is arranged to be a close fit in the tube 2. After the element 4 has been mounted on the member 5 it is ground to produce a flat face as indicated by the reference numeral 6 in the drawings. The member 5 is then inserted in the tube 2 and is fixed therein, for example by spot welding. A conducting wire is soldered to the outer end of the member 5 to enable electrical connection to be made to the element 4.

As thus far described the devices in both embodiments are similar, the difference between the two embodiments lying in the method of supporting the two contact members.

Referring to Figure 1 of the drawings, in the first embodiment the contact members 8 and 9 are in the form of pointed wires which may be for example of tungsten or Phosphor bronze. The contact members 8 and 9 are respectively joined to tinned copper or nickel lead wires 10 and 11, which are of greater diameter than the wires 8 and 9. The wires 10 and 11 are mounted in a cylinder 12 of insulating material which is ar-

ranged to be a close fit in the tube 3. The cylinder 12 may for example be moulded from a suitable plastic, the wires 10 and 11 being sealed through the cylinder 12 during the moulding. Alternatively the cylinder 12 may be moulded with two longitudinal holes therein, in which the wires 10 and 11 are inserted and fixed by means of a suitable cement. After the supporting member 5 has been fixed in the tube 2 the cylinder 12 is inserted in the tube 3 so that each of the wires 8 and 9 is in point contact with the element 4 at the required distance apart. The position of the cylinder 12 is then adjusted until the correct contact pressure between the wires 8 and 9 and the element 4 is attained, and the cylinder 12 is then finally cemented into the tube 3. It may be stated by way of example that typical dimensions for the cylinder 12 might be 2 millimetres diameter and 4 millimetres length, the lead wires 10 and 11 being approximately 0.6 millimetre in diameter and 4 millimetres length, the lead wires proximately 0.1 millimetre in diameter. Instead of using the lead wires 10 and 11 for making electrical connection to the contact wires 8 and 9, these latter wires may themselves be arranged to pass through the cylinder 12 to the outside of the envelope 1.

Referring now to Figure 2 of the drawings, in the second embodiment the two contact members 8 and 9, which are of similar form to those described with reference to Figure 1, are supported by means of a hollow metallic cylinder 13 provided with a filling 14 of insulating material through the centre of which is sealed a lead wire 15. The wire 15 may be sealed through the filling 14 during moulding, or the filling 14 may be moulded with a longitudinal hole therein, in which the wire 15 is cemented. The contact wires 8 and 9 are respectively attached to the cylinder 13 and the wire 15 by soldering or welding. During assembly of the device, after the member 5 has been fixed in the tube 2 the cylinder 13 with its filling 14 is inserted in the tube 3 so that each of the wires 8 and 9 is in point contact with the element 4 at the required distance apart. The position of the cylinder 13 is then adjusted until the desired contact pressure is attained, and the cylinder 13 is finally fixed to the tube 3, for example by spot welding. A suitable conducting wire may be soldered or welded to the outer end of cylinder 13 if desired; alternatively the wire 15 may be replaced by a rigid metal pin or spigot so that the end of the device is adapted to plug in to a suitably designed socket.

We claim:

1. A crystal contact device comprising a glass envelope having two metallic tubes sealed therethrough, an element of semi-conducting crystalline material, a first supporting member inserted in and fixed to one of the tubes and supporting the crystalline element inside the envelope, at least two metallic contact members, a second supporting member inserted in and fixed to the second of the tubes and supporting the contact members so that they are mutually insulated from one another and each is in point contact with the crystalline element, and means passing inside the tubes for making electrical connection from outside the envelope to each of the contact members and the crystalline element respectively.

2. A crystal contact device comprising a glass envelope having two metallic tubes sealed therethrough, an element of semi-conducting crystalline material, a first supporting member inserted in and fixed to one of the tubes and supporting

the crystalline element inside the envelope, at least two metallic contact members, a cylinder of insulating material through which the contact members pass longitudinally so as to be mutually insulated from one another, said cylinder being inserted in and fixed to the second of the tubes and supporting the contact members so that each is in point contact with the crystalline element, and means passing inside the first of the tubes for making electrical connection from outside the envelope to the crystalline element.

3. A crystal contact device according to claim 2, in which each contact member is sealed into the insulating material.

4. A crystal contact device according to claim 2, in which each contact member is fixed in a longitudinal hole in the cylinder.

5. A crystal contact device comprising a glass envelope having two metallic tubes sealed therethrough, an element of semi-conducting crystalline material, a first supporting member inserted in and fixed to one of the tubes and supporting the crystalline element inside the envelope, at least two metallic contact members, a hollow metallic cylinder to which one of the contact members is secured and having a filling of insulating material through which the rest of the contact members pass longitudinally so that the contact members are mutually insulated from one another, said cylinder being inserted in and fixed to the second of the tubes and supporting the contact members so that each is in point contact with the crystalline element, and means passing inside the first of the tubes for making electrical connection from outside the envelope to the crystalline element.

6. A crystal contact device according to claim 5, in which each contact member passing through the filling is sealed into the insulating material.

7. A crystal contact device according to claim 5, in which each contact member passing through the filling is fixed in a longitudinal hole in the filling.

8. A crystal contact device comprising a glass envelope having two metallic tubes sealed therethrough, an element of semi-conducting crystalline material, a first supporting member inserted in and fixed to one of the tubes and supporting the crystalline element inside the envelope, at least two metallic contact members, a number of electrically conducting members equal to the number of contact members, each of the conducting members being electrically connected to a different one of the contact members, a cylinder of insulating material through which the conducting members pass longitudinally so that the contact members are mutually insulated from one another, said cylinder being inserted in and fixed to the second of the tubes and supporting the contact members so that each is in point contact with the crystalline element, and means passing inside the first of the tubes for making electrical connection from outside the envelope to the crystalline element.

9. A crystal contact device according to claim 8, in which each conducting member is sealed into the insulating material.

10. A crystal contact device according to claim 8, in which each conducting member is fixed in a longitudinal hole in the cylinder.

11. A crystal contact device comprising a glass envelope having two metallic tubes sealed therethrough, an element of semi-conducting crystalline material, a first supporting member inserted in and fixed to one of the tubes and supporting

the crystalline element inside the envelope, at least two metallic contact members, a number of electrically conducting members one less than the number of contact members, each of the conducting members being electrica .y connected to a different one of the contact members, a hollow metallic cylinder to which is secured that one of the contact members which is not connected to a conducting member and having an insulating filling through which the set of conducting members passes longitudinally so that the contact members are mutually insulated from one another, said cylinder being inserted in and fixed to the second of the tubes and supporting the contact members so that each is in point contact with the crystalline element, and means passing inside the first of the tubes for making electrical connection from outside the envelope to the crystalline element.

12. A crystal contact device according to claim 11, in which each conducting member is sealed into the insulating material.

13. A crystal contact device according to claim 11, in whcih each conducting member is fixed in a longitudinal hole in the filling.

14. A crystal contact device according to claim 1, in which said first supporting member consists of a metallic body to which the crystalline element is secured.

15. A crystal contact device according to claim 1, in which said contact members are in the form of pointed wires.

16. A crystal contact device comprising a glass envelope having two metallic tubes sealed therethrough, a metallic body inserted in and fixed to one of the tubes, a semi-conducting crystalline element secured to the metallic body inside the envelope, at least two metallic contact members in the form of pointed wires, a number of electrically conducting members equal to the number of contact members, each of the contact members being secured to a different one of the conducting members, and a cylinder of insulating material through which the conducting members pass longitudinally so that the contact members are mutually insulated from one another, said cylinder being inserted in and fixed to the second of the tubes so that each of the contact members is in contact with the crystalline element only at its point.

17. A crystal contact device comprising a glass envelope having two metallic tubes sealed therethrough, a metallic body inserted in and fixed to one of the tubes, a semi-conducting crystalline element secured to the metallic body inside the envelope, at least two metallic contact members in the form of pointed wires, a number of electrically conducting members one less than the number of contact members, each of the conducting members having secured to it a different one of the contact members, and a hollow metallic cylinder to which is secured that one of the contact members which is not secured to a conducting member and having an insulating filling through which the set of conducting members passes longitudinally so that the contact members are mutually insulated from one another, said cylinder being inserted in and fixed to the second of the tubes so that each of the contact members is in contact with the crystalline element only at its point.

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