June 1, 1965 M. J. GRIMES 3,187,083

CONTAINER FOR AN ELECTRICAL COMPONENT

Filed June 17, 1963

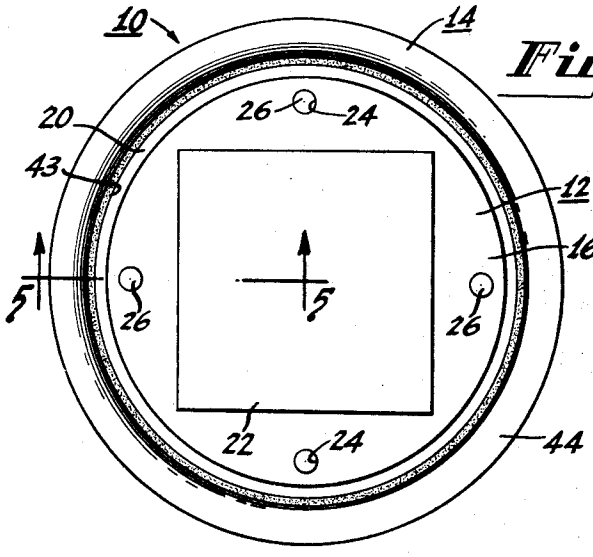


Fig. 1.

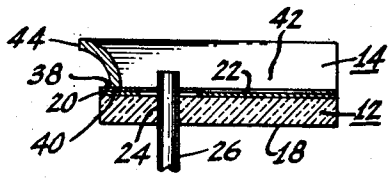


Fig. 4.

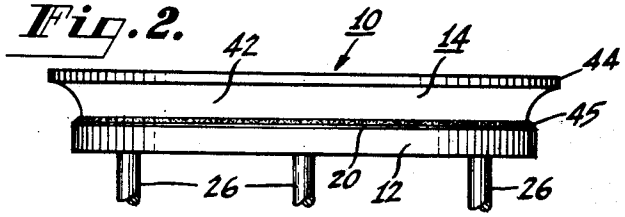


Fig. 2.

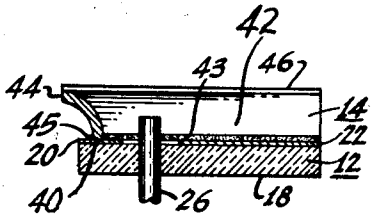


Fig. 5.

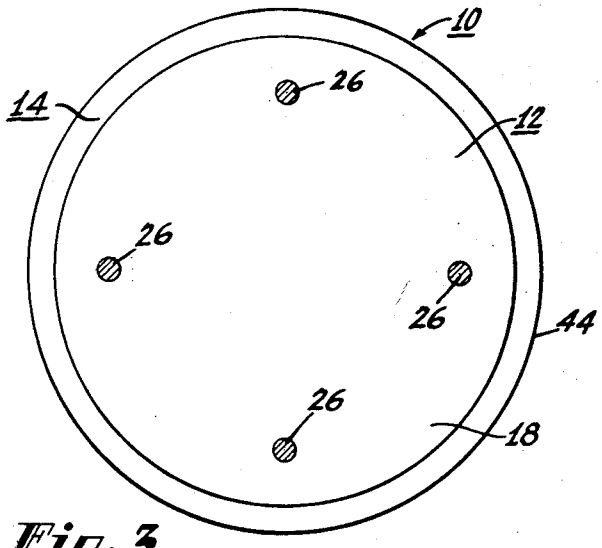


Fig. 3.

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CONTAINER FOR AN ELECTRICAL COMPONENT

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This invention relates generally to containers, and more particularly to an improved, hermetically sealed container employing a metal-to-ceramic seal. The improved container of the present invention is particularly useful for enclosing electronic components, integrated circuits, and the like.

It has been proposed to enclose electronic components that are mounted on a ceramic base by surrounding the electronic components with a metallic tubular member and covering the open end of the tubular member. The tubular members were formed with either an outwardly or an inwardly extending flange at each end, and one of these flanges was soldered to a metalized surface of the ceramic base. A metal cover was sealed to the other flange of the tubular member. Since there was usually a difference in the coefficients of thermal expansion between the ceramic base and the tubular member, severe thermal stresses were set up in the ceramic base under normal operating conditions, often resulting in a fracture of the ceramic base and, thereby, breaking the hermetic seal of the enclosure.

It is an object of the present invention to provide a container employing an improved metal-to-ceramic seal by means of which the danger of cracking the ceramic material due to thermal stresses is greatly reduced.

Another object of the present invention is to provide an improved container of the type described that is relatively simple in construction, easy to manufacture, and highly efficient for hermetically sealing electronic components and the like.

Briefly, the improved container of the present invention comprises a base of ceramic material that has a metalized coating fired on one side and a tubular member that has a tubular wall disposed substantially perpendicularly to the metalized coating. The edge of the end (called the lower end for convenience of description) of the tubular wall adjacent the base is fixed to the metalized coating by a brazed joint. The other, upper, end of the tubular member is formed with an outwardly extending flange for receiving a cover, as by means of a cold seal.

The improved features of the present invention, both as to its organization and method of operation, as well as additional objects and advantages thereof, will be more readily understood from the following description, when read in connection with the accompanying drawing, in which similar reference characters designate similar parts throughout, and in which:

FIG. 1 is a plan view of an improved container according to the present invention, with its top cover removed;

FIG. 2 is a side elevational view of the improved container shown in FIG. 1;

FIG. 3 is a bottom view of the improved container shown in FIG. 1;

FIG. 4 is a central, cross-sectional view of one half of the improved container shown in FIG. 1, taken along the line 5—5, illustrating the tubular member before it is brazed to the metalized coating on the ceramic base; and

FIG. 5 is a cross-sectional view similar to FIG. 4, but showing the tubular member brazed to the metalized coating of the ceramic base, and also showing a cover, in phantom, fixed to the upper flange of the tubular member.

Referring, now, with greater particularity to the drawing, there is shown an improved container **10** comprising a ceramic base **12** and a metallic tubular member **14**, preferably of copper. The ceramic base **12** may comprise an insulating material, such as alumina, having an upper surface **16** and a lower surface **18**.

At least one portion of the upper surface **16** of the base **12** is metalized, as with a molybdenum-manganese fire-on paint. In the embodiment of the container **10** illustrated in the drawing, an annular, metalized coating **20** is fired on the upper surface **16** adjacent to its outer periphery. A rectangular, metalized coating **22** is fired on the upper surface **16**, in its middle portion, to form a part of an electronic circuit (not shown).

The base **12** is formed with a plurality of openings **24**, each for receiving therethrough a different one of a plurality of pins **26** which are suitably hermetically sealed to the base **12** and provide electrical connections for electronic components (not shown). The electronic components are adapted to be disposed on the ceramic base **12**, surrounded by the tubular member **14**, but they are not illustrated in the drawing for the sake of clarity and because they form no part of the present invention. Each pin **26** may be fixed, as by welding, to a separate electrical connector (not shown) for external circuit connection.

Means are provided to fix the tubular member **14** to the ceramic base **12** substantially perpendicular thereto to provide a hermetic seal therebetween. To this end, a washer **38** of brazing material, such as BT eutectic solder (a copper-silver solder) is placed between the metalized coating **20** on the base **12** and the lower edge **40** of the tubular wall **42** of the tubular member **14**, as shown in FIG. 4. When heated to a temperature above 779° C., preferably 850° C., the washer **38** of solder melts and forms a brazed joint with fillets **43** and **45** (see FIG. 5) between the metalized coating **20** and the inner and outer walls, respectively, of the tubular member **14** adjacent to its lower edge **40**.

Since only the narrow, lower edge **40** of the tubular member **14** is fixed to the ceramic base **12**, the stresses due to any difference in the coefficients of thermal expansion between the tubular member **14** and the ceramic base **12** are greatly reduced. It has been found that, unless such stresses are reduced, the ceramic base tends to crack, thereby breaking the hermetic seal. The smaller the area on the metalized coating **20** that is contacted by the lower edge **40** of the tubular member **14**, the smaller will be the stresses produced in the ceramic base **12**.

The tubular member **14** is formed with an outwardly extending flange **44** at its upper end for receiving a soft metal cover **46** thereon, as shown in phantom in FIG. 5. The cover **46** may be a soft metal disc that is adapted to be sealed to the flange **44**, as by a cold pressed seal.

From the foregoing description, it will be apparent that there has been provided an improved container with a metal-to-ceramic seal adapted to reduce stresses in the ceramic part due to changes in the temperature of the container during the manufacturing processes and the operation of the components within the container. While only one improved container has been described herein, variations in the structure coming within the spirit of this invention will, no doubt, readily suggest themselves to those skilled in the art. Hence, it is desired that the foregoing shall be considered as illustrative and not in a limiting sense.

What is claimed is:

A container for electrical components comprising, in combination,

(a) a base comprising a wafer of alumina for supporting said components thereon, said wafer having a flat upper and lower side,

(b) a metalized coating on at least a portion of one of said sides of said base,

(c) a tubular member of copper open at both ends and comprising a tubular wall disposed substantially perpendicularly to said metalized coating, one end of

said tubular wall having only its edge fixed to said metalized coating with a brazed butt joint, the other of said ends of said tubular member comprising an outwardly extending flange, and

(d) a cover of a soft metal cold pressed sealed to said metal flange, whereby to provide a hermetically sealed container for said components.

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