

May 12, 1953

M. N. GLICKMAN ET AL

2,638,573

HERMETIC SEAL HAVING FLOATINGLY MOUNTED SOCKET CONTACTS

Filed Nov. 17, 1949

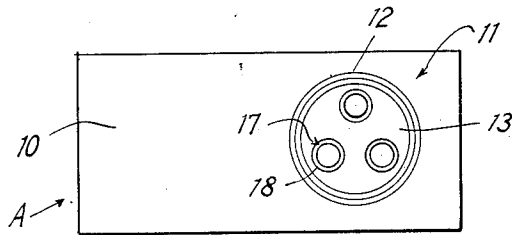


Fig. 1

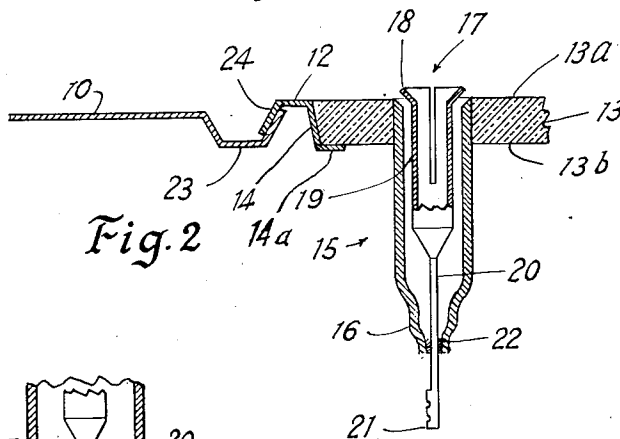


Fig. 2

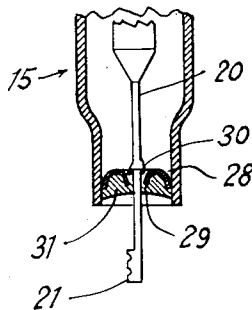


Fig. 3

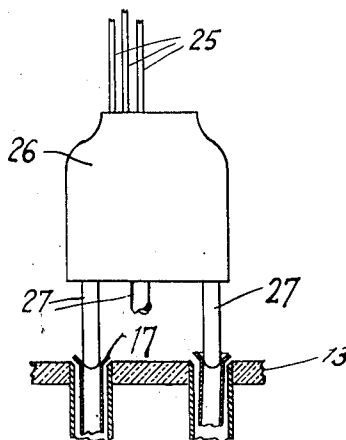


Fig. 4

Mannes N. Glickman
Michael Klebanoff &
Samuel W. Neidorf
INVENTORS

BY *Philip G. Hilbert*
ATTORNEY

UNITED STATES PATENT OFFICE

2,638,573

HERMETIC SEAL HAVING FLOATINGLY
MOUNTED SOCKET CONTACTSMannes N. Glickman, Michael Klebanoff, and
Samuel W. Neidorf, Nutley, N. J.

Application November 17, 1949, Serial No. 127,984

2 Claims. (Cl. 339-64)

1

This invention relates to hermetically sealed electrical connectors and method of making the same. More particularly, the invention concerns a glass metal seal in combination with a plug in, friction type electrical connector.

In providing sealed containers for electrical apparatus, lead in conductors usually take the form of a glass metal seal which is mounted on a wall of the container. Interconnection of the lead in conductor to outside conductors is facilitated when the lead in conductor takes the form of a jack or plug, thus providing simple, efficient and readily detachable connector means.

To form a combination glass metal seal and connector, it is necessary to conduct successive thermal bonding operations at different temperatures and conditions. Thus, a plurality of metal members having a relatively low electrical conductivity, are thermally bonded to a vitreous body, the body and members having substantially the same coefficient of expansion. Thereafter, metal connector means having a high electrical conductivity and a coefficient of expansion different from that of the vitreous body, is thermally bonded to certain of the metal members. The temperatures and conditions of the second bonding operation would adversely affect the previously formed glass metal seal. Accordingly, an object of this invention is to provide a glass metal seal in combination with electrical connectors, together with a method of making the same, wherein the elements of the combination are joined by successive bonding operations, the arrangement of the elements relative to each other being such that the temperatures and conditions incident to a later bonding operation will not adversely affect the glass metal seal formed by a previous bonding operation.

A further object of this invention is to provide a header for hermetically sealed electrical apparatus which comprises a vitreous body separating a pair of metal elements and bonded thereto, and an electrical connector of the jack or plug type which is attached in sealed relation to one of the metal elements, the connector having a structure which prevents thermal or physical shocks originating in the connector from being transmitted to the bond between the vitreous body and the metal elements and to the vitreous body.

Still another object of this invention is to provide a structure which includes an elongated, metal tubular member, a vitreous body bonded thereto and a plug in type, electrical connector, wherein the connector is mounted within and attached to the tubular member at the lower ends thereof, the connector including a flexible intermediate portion whereby the upper portion has a floating relation to the tubular member and is thus adapted to accommodate itself to a misaligned, complementary connector with which it

2

is to be engaged. The property of flexure in the fixed connector localizes any physical strain incident to the interengagement of the connectors within the upper portion of the fixed connector and avoids the transmission of such strain to the bond between the vitreous body and the tubular metal member, as well as to the vitreous body.

Yet another object of this invention is to provide a method of forming a structure which comprises a vitreous body, a pair of metal elements having a coefficient of expansion substantially equal to that of the vitreous body and of relatively low electrical conductivity, and a resilient metal electrical connector of relatively high electrical conductivity and having a coefficient of expansion different from that of the vitreous body, such method including the steps of thermally bonding the metal elements to the vitreous body under conditions which would impair the characteristics of the electrical connector and thereafter thermally bonding the electrical connector to one of the metal elements under conditions which will avoid the transmission of undue amounts of heat to the first formed bond and to the vitreous body.

Still a further object of this invention is to provide a structure of the character described, which is simple in construction, economical to manufacture, is resistant to physical and thermal breakdown, and is practical and efficient to a high degree in use.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, arrangement of parts and procedural steps, which will be exemplified in the construction and method hereinafter described, and of which the scope of invention will be indicated in the following claims.

In the drawing illustrating embodiments of the invention;

Fig. 1 is a top plan view of a hermetically sealed container having a sealed electrical connector embodying the invention, mounted on a wall thereof;

Fig. 2 is a partial vertical sectional view showing the details of the sealed connector;

Fig. 3 is a partial vertical sectional view of a modified form of the sealed connector and

Fig. 4 is an elevational view, with parts in section, showing a plug being inserted into a socket or receptacle type sealed electrical connector, one of the plug prongs being misaligned yet accommodated by the complementary socket element.

Referring in detail to the drawing, as shown in Fig. 1, 10 designates the top wall of a metal container A, which is adapted to hold various electrical components interconnected to each

other and hermetically sealed within the container against the ingress of moisture, dust, oil or any other matter which may adversely affect the operation of the electrical components.

A hermetic seal 11, embodying the invention, is mounted on the wall 10 for the purpose of providing electrical leads into the container for connection to the electrical components within the container and to provide improved means for external connection thereto. The seal 11 may take any desired geometric shape and is shown as circular in form, for the purpose of illustration. The seal comprises an endless, ring shaped, metal member 12 which may have a generally channel shaped cross section. A vitreous body 13, such as a glass disc having opposite faces 13a, 13b, is disposed within the ring shaped member 12. The peripheral portions of the disc contact the wall portion 14 of the member 12 and the disc is seated on a radially extending flange portion 14a projecting inwardly from the lower end of wall portion 14. The metal of which member 12 is formed and the vitreous material of disc 13, are selected so as to have substantially the same coefficient of expansion. Such metals and alloys are well known in the art and may take the form of an alloy of nickel, cobalt and iron. Suitable vitreous compositions having the desired matching characteristic for a specific metal or alloy, are also well known in the art.

Mounted in suitable openings formed in disc 13, are one or more elongated, tubular metal members 15, which are thus insulated from the member 12. The members 15 extend transversely of the disc with one end substantially flush with disc surface 13a, while the other end projects beyond disc surface 13b.

Upon suitably assembling the disc 13 with rim member 12 and tubular members 15, the assembly is subjected to temperatures in a range of 1600-1900° F., whereby the contacting portions of the disc 13 and metal members 12, 15, are thermally bonded. The members 15 are formed of a metal or alloy similar to that of which member 12 is formed, thus providing a glass metal seal which is proof against ordinary thermal and physical shock. The seal is heat treated to anneal the disc 13.

Each of the members 15 includes a constricted or compressed portion 16, at the lower ends thereof, for the purpose hereinafter appearing. The number and the distribution pattern of members 15 is determined by the number of leads from the components within container A and the distribution pattern of the complementary connector, as hereinafter described.

Each of the members 15 is adapted to receive a plug in type of electrical connector which may take the form of a jack 17. The jack 17 is made of a metal or alloy such as copper, Phosphor bronze or the like, which has a high electrical conductivity and is of a flexible, resilient nature. Such metals and alloys have a coefficient of expansion different from that of vitreous disc 13 and metal members 12, 15 and therefore cannot be directly bonded to the disc 13 to give a good hermetic seal.

The jacks 17 may be formed from a tubular blank which includes an outwardly flared portion 18 at the upper end thereof, a longitudinally slotted wall receptor section 19 extending therefrom, an intermediate stem portion 20 of reduced cross section and a flattened end portion 21 which may be curved and grooved to form a terminal to

which an electrical lead may be soldered or otherwise connected.

A jack 17 is mounted axially within each of the tubular members 15. The jacks may be so disposed that the flared portion 18 overlies the upper edge of member 15. The overall length of jack 17 is such that the terminal portion 21 projects outwardly of the lower end of member 15. It will be noted from a consideration of Fig. 2, that the outside diameter of the receptor section 19 of the jack is less than the inside diameter of the member 15, thus providing an annular space between the upper portion of the jack and the tubular member. The jacks 17 are fixedly attached at a lower end of their stem portions, to the members 15. To this end, the lower end of portion 16 is compressed to frictionally grip the stem portion 20 of the jack. The jack is then sealed in this position by means of a brazing operation which deposits brazing material 22 over the contacting portions of the jack stem and tubular portion 16.

The brazing operation is conducted at temperatures of 1150-1400° F. The incident heat would normally have an adverse effect on the thermal bond between the disc 13 and tubular members 15 and additionally affect the annealed vitreous material of the disc so as to introduce new stresses therein. However, due to the length of the tubular members 15, the brazing area is sufficiently displaced relative to the upper portion of member 15 which is in bonded contact with disc 13, to avoid the transfer of injurious amounts of heat. If desired, the transfer of any heat along the length of members 15 may be substantially eliminated, by positively cooling the upper and intermediate portions of members 15. This may be accomplished by the use of air jets or by immersing the upper portions of members 15 in water or other suitable cooling medium during the brazing operation. The length of members 15 is kept at the minimum necessary to limit the heat transfer between the opposite ends thereof so as to attain the desired results, thus reducing the amount of projection of the members within the container A.

The completed unit 11 is mounted in an appropriate opening formed in wall 10 of the container A. Such opening is defined by a pressed out flange 23 which is adapted to receive flange portion 24 of the rim member 12. After making suitable connections between the leads of the components within the container and the jack terminals 21, the container may be exhausted and the seal properly seated in the opening in wall 10. The contacting portions 23, 24 are then soldered or otherwise secured together to complete the seal.

External electrical connections may be made by way of the sealed connector 11, as shown in Fig. 4. For example, conductors 25 connected to a plug 26 having prongs 27, may be electrically connected to the complementary jacks 17. Each of the jacks is disposed opposite a corresponding prong 27 and is adapted to receive and grip the same upon appropriate movement of the plug toward the seal 11. The flared portions 18 on the jacks facilitate the entry of the prong into the receptor section of the jack where the slotted wall 19 frictionally grips the inserted prong. In the event that one or more of the prongs 27 is slightly bent and would not normally align properly with the corresponding jack, proper engagement of the prong and jack will still take place, since the stem portion 20 of the jacks

5

is flexible and the upper end of the jack has a floating characteristic. This is shown in the right hand jack in Fig. 4, which is displaced to the right, from its normal position, to align itself with a complementary prong 27. Due to the resilience of the jack stems, upon withdrawal of the plug, the jacks will assume their normal position.

It is understood that various pronged type connectors may make suitable interconnection with the jacks 17, including electronic tubes as well as other hermetically sealed units having projecting pronged or plug type connectors.

It is apparent that the lateral movement or float of the upper end of the jacks 17 is made possible by the flexibility and resilience of the stem portions 20 thereof, which are fixed at their lower ends only to the members 15. The transverse section, as well as the length of stem portions 20, are suitably proportioned to provide the requisite characteristics. It is understood that any stress incident to the insertion or withdrawal of the plug prongs relative to the jacks 17, will be substantially confined and absorbed within the lower portions of members 15. Thus, practically all stresses which might be otherwise transmitted to the glass metal bond at the upper end of members 15, to the detriment thereof, are substantially insulated therefrom. As a result rough treatment during the making of connections, will leave the seal unimpaired.

The jacks 17 may be positioned and bonded within members 15, in an alternative manner, as shown in Fig. 3. A cup shaped mounting member 28 is provided for each jack 17. The member 28 is formed with a central opening 29 to receive jack stem 20. Ears 30 formed on stem 20 act as a stop means to properly position member 28 on the jack stem. The mounting member 28, in inverted position, frictionally engages the inner surface of tubular member portion 16, thus positioning the jack relative to member 15. Brazing material 31 is received within member 28 to seal the same to the tubular member 15 and to the jack stem 20.

While the description of the invention has been directed to electrical connectors of the receptacle or socket type, it is understood that the jack members 17 may be replaced by male connectors such as prongs or the like. Such prongs may be provided with intermediate flexible stem portions and terminal portions, in the manner previously described. With the lower end of the stem portions fixedly attached within tubular members 15, the outwardly projecting, upper ends of the prongs will have a floating action of the type previously described and connection with a misaligned, complementary jack will be facilitated. Also, any stresses incident to the movement of the prong connector, will be substantially confined to the lower end of the tubular member in which the connector is mounted, thereby insulating the glass metal bond, as well as the glass body, from physical shock, in the manner previously described.

It will thus be seen that there is provided a sealed electrical connector, together with a method for making the same, in which the several objects of this invention are achieved and which are well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above described invention, and as various changes might be made in the embodiments set forth, it is understood that all matter herein

6

set forth or shown in the accompanying drawing, is to be interpreted as illustrative and not in a limiting sense.

Having thus described our invention, we claim as new and desire to protect by Letters Patent:

1. A hermetically sealed device comprising a vitreous body, a plurality of elongated tubular metal members embedded within said body and disposed in a predetermined spaced relation to each other, each of said members having a coefficient of expansion substantially equal to that of said body and comprising a portion in bonded relation to said body and extending to one face thereof, and another portion spaced from said first mentioned portion and extending beyond the other face of said body, a jack having a coefficient of expansion different from that of said body mounted in each of said tubular members, said jack including a portion fixedly attached to said tubular member at the second mentioned portion thereof, a flexible stem portion extending from said attached portion and a socket receptor portion extending from said stem portion, said receptor portion being adapted to receive and frictionally grip a prong of a multi-prong device wherein each prong is normally disposed in alignment with a complementary jack of said device, the stem portions of said jacks being adapted to be laterally displaced to align the receptor portions thereof with misaligned prongs complementary thereto.

2. A hermetic seal comprising a ring shaped metal member, a vitreous disc within said member and sealed thereto, and a plurality of tubular members extending transversely of said disc and sealed thereto in predetermined, spaced relation, said ring shaped and tubular members and said disc having substantially the same expansion coefficient, an elongated, flexible electrical conductor positioned within each of said tubular members and conductively secured thereto at a point remote from said disc, said conductors having an expansion coefficient different from that of said tubular members, each of said conductors terminating in a frictionally gripping electrical connector, said connectors being adapted to be laterally displaced upon frictional interconnection thereof with fixedly spaced complementary connectors of an electrical device, the stresses incident to the displacement of said first mentioned connectors being transmitted to portions of said tubular members remote from said disc and leaving the portions of said disc sealed to said tubular members free of said stresses.

MANNES N. GLICKMAN.
MICHAEL KLEBANOFF.
SAMUEL W. NEIDORF.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,093,997	Kraus	Apr. 21, 1914
1,775,218	Thurneyssen	Sept. 9, 1930
1,837,745	Zworykin	Dec. 22, 1931
1,848,544	Raus	Mar. 8, 1932
2,151,809	Shardlow	Mar. 28, 1939
2,152,319	Link	Mar. 28, 1939
2,220,742	Thorson	Nov. 5, 1940
2,273,488	Hofman	Feb. 17, 1942
2,518,848	Aakjer et al.	Aug. 15, 1950

FOREIGN PATENTS

Number	Country	Date
354,620	Great Britain	Aug. 13, 1931