GLASS-TO-METAL SEAL AND EYELET FOR CONSTRUCTING THE SAME

Filed Aug. 2, 1940

INVENTORS
Simon H. Stupakoff
Frank R. Prescott

By Christy, Karr, and Wheaton
their attorneys
This invention pertains to the art of making glass-to-metal seals, and is for an improved seal and for an eyelet by means of which the seal may be made.

In various types of equipment, and particularly in electrical equipment, it is necessary to bring a wire through a metal casing, and to have a pneumatic seal which is also an insulated joint where the wire passes through the metal casing. Considerable difficulty has been encountered in constructing such seals, due to the fact that, when the seal is being made, the glass is ruptured or such strains are set up in the glass which forms the seal as are likely to produce a rupture at a later time. Such seals also fail due to the fact that forces are set up in the glass, sufficient to disrupt the glass, due to some subsequent mechanical strain, and due to the thermal expansion or contraction of the metal shell or casing on which the seal is mounted.

The present invention provides a seal which is designed to eliminate these common causes of failure, and it may be easily constructed and at relatively low cost.

According to the invention, a flanged eyelet is provided which may be brazed or welded directly to the metal shell or casing of the apparatus on which the seal is to be formed. This eyelet is provided with a sleeve through which a wire may pass, and a body of glass fused to the wire and fused to the eyelet forms the seal. The eyelet is formed with an annular wall portion between the sleeve and the flange, and such wall portion imparts sufficient resilience to the structure to absorb strains which are set up when the eyelet is heated to fuse or weld it to the casing on which it is mounted, and to absorb any strains which result from the expansion or contraction of the metal shell.

The invention may be fully understood by reference to the accompanying drawing in which:

Figure 1 is a transverse vertical section through an eyelet made in accordance with the present invention; and

Figure 2 is a transverse vertical section through the complete seal embodying my invention; and

Figure 3 is a view similar to Figure 2, illustrating a permissible modification.

Referring to the drawing, 2 designates generally an eyelet formed of a metal which glass will "wet" and to which glass will fuse, and which, moreover, has a coefficient of thermal expansion equal to that of commercially available glass suitable for this purpose. One metal which may be used is a metal which is available commercial-
ing the joint cannot transmit compressive strains to the glass sufficient to damage the glass. Moreover, this same structure increases substantially the length of the grate through which the heat must travel from the flange to the glass, thus providing an additional protection against rupture of the glass when the eyelet is being welded to the supporting body. The intensity of the heat transmitted to the glass is not sufficient to set up harmful strains in the glass.

The looping of the metal in the eyelet also protects the assembly after the joint has been made. The expansion or contraction of the casing wall 10, which in some cases may be of considerable magnitude, can be absorbed in the looped portion of the eyelet, without subjecting the glass to excessive pressure. Additionally, mechanical stress transmitted to the conductor 7 may be absorbed in the eyelet, and thus protect the glass from breaking.

Figure 3 is illustrative of a modified form of eyelet, in which the strain-absorbing wall portion 4a of the eyelet is arranged above the rim of the sleeve portion 3a. As in the case of the wall portion 4 of the eyelet first described, the annular wall portion or skirt 4a of the modified structure is arranged between the sleeve portion that receives the glass seal 8 and the flange portion that is welded and sealed to the metal wall 10, and, as the drawing shows, such wall portion or skirt is spaced laterally from the sleeve portion. However, there is this qualification to be noted: Whereas in the structure of Figures 1 and 2 the wall portion 4 is formed by turning (or otherwise shaping) the wall of the eyelet through one angle—an angle of approximately 180°—from the upper end of the sleeve portion 3, in the alternative structure of Figure 3 the wall portion 10 is formed by turning the wall of the eyelet through two angles from the upper end of the sleeve portion—an angle 8a of approximately 90°, and an angle 8b of approximately 90°. The good effects are enjoyed in both of the structures described.

While we have illustrated and described two particular embodiments of our invention, it will be understood that they are for purposes of illustration, and that various changes and modifications may be made within the contemplation of our invention and within the scope of the following claim.

We claim as our invention:

A glass-to-metal seal of the class described comprising an eyelet having a sleeve portion and a flange portion and a reversely turned skirt portion between the flange and the sleeve and substantially perpendicular to the flange, a body of glass in the sleeve portion whose coefficient of thermal expansion is matched to that of the eyelet, and a metal body passing through the body of glass having its coefficient of thermal expansion matched to that of the glass and to which the glass is also fused, the body of glass forming both a hermetic seal and an insulator between the conductor and the sleeve.

FRANK R. PRESCOTT.
SEMON H. STUPAKOFF.