[Second Edition.]

PATENT SPECIFICATION.



Application Date: Jan. 20, 1943. No. 1032/43. **563,027**

(*Patent of Addition to No. 513,025: dated March 23, 1938*).

Complete Specification Left: Nov. 2, 1943.

Complete Specification Accepted: July 26, 1944.

PROVISIONAL SPECIFICATION

Improvements in Gas-Tight Seals wherein Electric Conductors pass through Quartz or like Vitreous Material.

We, THE GENERAL ELECTRIC COMPANY LIMITED, of Magnet House, Kingsway, London, W.C.2, a British company, and EVAN HERBERT NELSON, of Research Laboratories of The General Electric Company Limited, Wembley, Middlesex, a British subject, do hereby declare the nature of this invention to be as follows:—

This invention relates to gas-tight seals of the type wherein a pair of rods make electrical contact one on either side of a thin sheet of metal and the edges of this thin sheet are embedded in quartz or like material. Seals of this type are described and claimed in Patent Specification No. 513,025. Material like quartz in the present specification means highly siliceous material whose thermal expansion, when measured by a method that gives to quartz the accepted value 0.55×10^{-6} per ° C., is less than 2×10^{-6} per ° C.

In the said specification it was suggested that the rods should be welded or nickel-soldered to the sheet. We have now found that when the rods are nearly or quite prolongations one of the other, in such a manner that they can press one against the other without distorting the sheet, a welded or soldered junction is unnecessary; sufficient electrical connection can be secured by merely pressing the rods against the sheet in the course of embedding the edges of the sheet.

According to one aspect of the invention in a seal of the type specified at least one of the said rods (preferably both) makes contact with the sheet merely by pressing against it.

According to another aspect of the invention the manufacture of a seal of the type specified comprises the steps of (1) arranging the rods one on either side of the sheet with their axes substantially parallel and their ends substantially facing each other without affixing either rod to the sheet and (2) pressing the two rods against the sheet while the quartz or like material in which the edges of the sheet are ultimately embedded is plastic.

Unless possibly if the diameter of the rods is much greater than is usual in seals of the said type, it is preferable to attach a disc to the end of each rod where it contacts with the sheet, so that the diameter of the end of each rod is considerably greater than the diameter of the main part of it.

One embodiment of the invention will now be described, by way of example, with reference to Figures 1 and 2 of the accompanying drawing in which Figure 1 shows an early stage in the manufacture of the seal and Figure 2 the completed seal, the drawings are not to scale.

The sheet 1 is a circular disc of molybdenum sheet, 28 mm. in diameter and 0.05 mm. thick at the centre and tapering to 0.02 mm. at the edge. The rods 2, 2^1 are each of molybdenum or tungsten 6 mm. in diameter; to their ends are riveted molybdenum or tungsten discs 6, 6^1, 15 mm. in diameter and 0.5 mm. thick. (There may be intermediate parts 3 and 3^1). The upper end of the quartz tube 4 is closed and the upper end of the rod 2 bears against the closed end through a spring 3, so that in the position shown in Figure 1 the disc 6 is lightly pressed against the sheet 1 which is ~~superposed~~ supported by the rod and disc 2^1, 6^1 and the disc 6^1 bears against the flanges 5^1 of the quartz tube 4^1. The outer edges of the flanges 5, 5^1, which may be some 35 mm. in diameter, are now sealed together without the sheet 1 being embedded in them. The space now enclosed is evacuated through the tube 4^1, and the flanges 5, 5^1 heated so that they collapse on to the sheet 1 and at least the outer parts of the discs 6, 6^1; these discs are then pressed together by atmospheric pressure. When this process is completed, a body similar to that shown in the said Figure 2 results; it is finally sealed into an aperture in a quartz vessel either by the edges of the quartz disc formed by the process or by means of a ring sealed to the quartz surrounding the rod on the inner side of the seal.

The discs 6, 6^1 must have flat opposing

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faces; and they and the sheet must be superficially clean; but no greater cleanliness is required that is customary in the making of strip seals.

Dated the 20th day of January, 1943.
For the Applicants,
A. F. CORNOCK,
Chartered Patent Agent.

COMPLETE SPECIFICATION

Improvements in Gas-Tight Seals wherein Electric Conductors pass through Quartz or like Vitreous Material.

We, THE GENERAL ELECTRIC COMPANY LIMITED, of Magnet House, Kingsway, London, W.C.2, a British company, and EVAN HERBERT NELSON, of Research Laboratories of The General Electric Company Limited, Wembley, Middlesex, a British subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

This invention relates to an improvement in or modification of gas-tight seals of the type claimed in Claim 2 of Patent Specification No. 513,025. In the present specification, as in the prior specification, material like quartz means highly siliceous material whose thermal expansion when measured by a method that gives to quartz the accepted value of 0.55×10^{-6} per °C., is less than 2×10^{-6} per ° C.

In the said specification it was prescribed in Claim 1, on which Claim 2 is dependent, that the " pair of conductors " are each " attached " to a part of the sheet. We have now found that when the conductors are rods that are nearly or quite prolongations one of the other, in such a manner that they can press one against the other without distorting the sheet, attachment, e.g. by welding or soldering, is unnecessary; sufficient electrical connection can be secured by merely pressing the rods against the sheet in the course of embedding the edges of the sheet.

According to one aspect of the invention, in a seal of the type specified, at least one (preferably each) of the said pair of conductors is a rod making contact with the sheet merely by the pressure of its end against the sheet.

According to another aspect of the invention the manufacture of a seal of the type specified comprises the steps of (1) arranging rods one on either side of the sheets with their axes substantially parallel and their ends substantially facing each other without affixing either rod to the sheet and (2) pressing the two rods against the sheet while the quartz or like material in which the edges of the sheet are ultimately embedded is plastic.

Unless possibly if the diameter of the rods is much greater than is usual in seals of the said type, it is preferable to attach a disc to the end of each rod where it contacts with the sheet, so that the diameter of the end of each rod is considerably greater than the diameter of the main part of it.

One embodiment of the invention will now be described by way of example with reference to Figures 1 and 2 of the drawing accompanying the provisional specification in which Figure 1 shows an early stage in the manufacture of the seal and Figure 2 the completed seal, the drawings are not to scale.

The sheet 1 is a circular disc of molybdenum sheet, 28 mm. in diameter, 0.05 mm. thick at the centre and tapering to 0.02 mm. at the edge. The rods 2, 2^1 are each of molybdenum or tungsten 6 mm. in diameter; to their ends are riveted molybdenum or tungsten discs 6, 6^1 15 mm. in diameter and 0.5 mm. thick. (There may be intermediate parts 3 and 3^1). The upper end of the quartz tube 4 is closed, and the upper end of the rod 2 bears against the closed end through a spring 3, so that in the position shown in Figure 1 the disc 6 is lightly pressed against the sheet 1, which is supported by the rod and disc 2^1, 6^1; and the disc 6^1 bears against the flanges 5^1 of the quartz tube 4^1. The outer edges of the flanges 5, 5^1, which may be some 35 mm. in diameter, are now sealed together without the sheet 1 being embedded in them. In order to avoid oxidation of the disc during the joining of the flanges nitrogen is passed through the tube 4^1 until the edges of the flanges are joined. The space now enclosed is evacuated through the tube 4^1, and the flanges 5, 5^1 are heated so that they collapse on to the sheet 1 and at least the outer parts of the discs 6, 6^1; these discs are then pressed together by atmospheric pressure. The parts of the tube 4, 4^1 near the sheet 1 are then collapsed on to the rods 2, 2^1. When this process is completed the top end of the tube 4^1 is cut off and the spring 3 removed so that a body similar to that shown in Figure 2 results, in which the discs 6, 6^1 are pressed against the sheet 1 by the quartz walls. The body is finally sealed into an aper-

ture in a quartz vessel either by the edges of the quartz disc formed by the process or by means of a ring sealed to the quartz surrounding the rod on the inner side of the seal.

The discs 6, 6[1] must have flat opposing faces; and they and the sheet must be superficially clean; but no greater cleanliness is required than is customary in the making of strip seals.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is :—

1. An improvement in or modification of gas-tight seals of the type claimed in Claim 2 of Patent Specification No. 513,025, wherein at least one of the said pair of conductors is a rod making contact with the sheet merely by the pressure of its ends against the sheet.

2. A gas-tight seal according to Claim 1 wherein both the conductors are rods, each forming substantially a prolongation of the other.

3. A gas-tight seal according to Claim 1 or 2 wherein the end of each said rod that presses against the sheet is a disc of diameter considerably greater than the diameter of the main part of the rod.

4. The manufacture of a gas-tight seal which is an improvement in or modification of a gas-tight seal of the type claimed in Claim 2 of the Patent Specification No. 513,025 which comprises the steps of (1) arranging rods one on either side of the sheet with their axes substantially parallel and their ends substantially facing each other without affixing either rod to the sheet and (2) pressing the two rods against the sheet while the quartz or like material in which the edges of the sheet are ultimately embedded is plastic.

5. The manufacture according to Claim 4 wherein the pressure applied in step (2) is the pressure of the atmosphere.

6. The manufacture according to Claim 4 which is carried out substantially as hereinbefore described with reference to Figures 1 and 2 of the drawing accompanying the provisional specification.

Dated the 3rd day of November, 1943.

For the Applicants,
A. F. CORNOCK,
Chartered Patent Agent.

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1. An improvement in or modification of gas-tight seals of the type claimed in Claim 2 of Patent Specification No. 513,025, wherein at least one of the said pair of conductors is a rod making contact with the sheet merely by the pressure of its ends against the sheet.

2. A gas-tight seal according to Claim 1 wherein both the conductors are rods, each forming substantially a prolongation of the other.

3. A gas-tight seal according to Claim 1 or 2 wherein the end of each said rod that presses against the sheet is a disc of diameter considerably greater than the diameter of the main part of the rod.

4. The manufacture of a gas-tight seal which is an improvement in or modification of a gas-tight seal of the type claimed in Claim 2 of the Patent Specification No. 513,025 which comprises the steps of (1) arranging rods one on either side of the sheet with their axes substantially parallel and their ends substantially facing each other without affixing either rod to the sheet and (2) pressing the two rods against the sheet while the quartz or like material in which the edges of the sheet are ultimately embedded is plastic.

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