Sept. 21, 1948. A. BRASCH ET AL 2,449,872

ELECTRON DISCHARGE VESSEL

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Fig. 1.

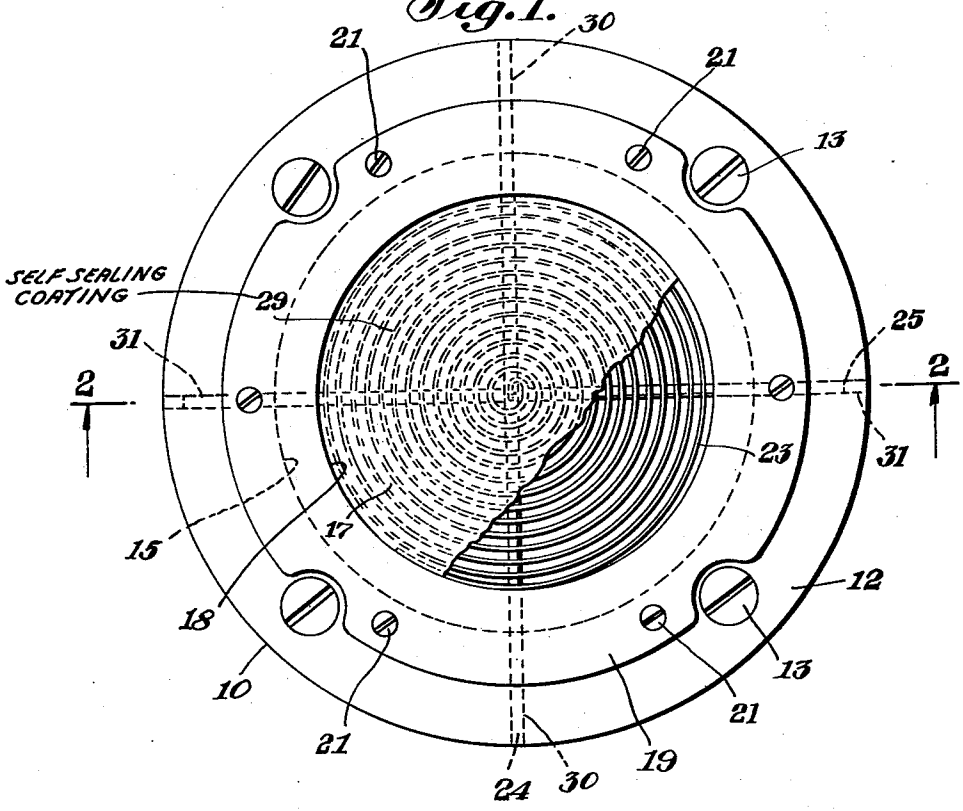

Fig. 2.

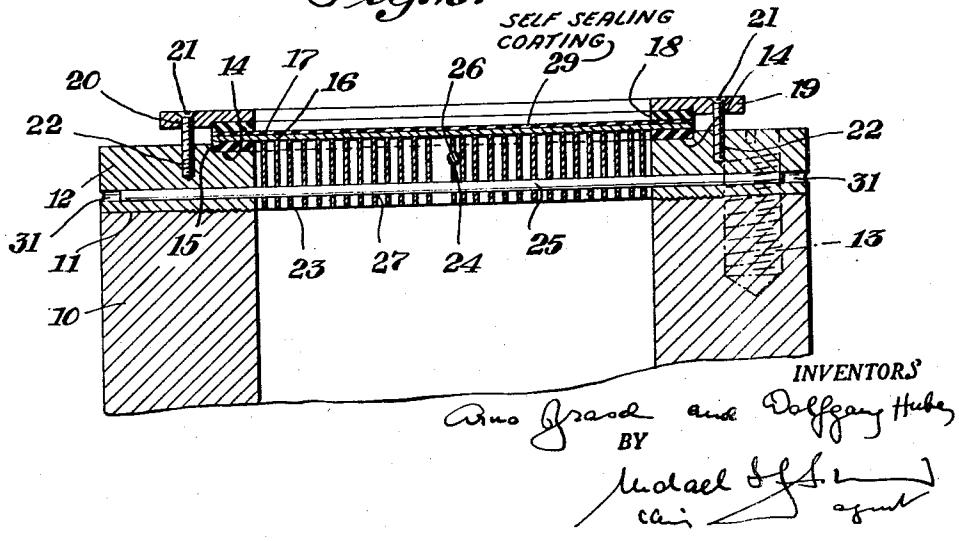

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Fig. 3.

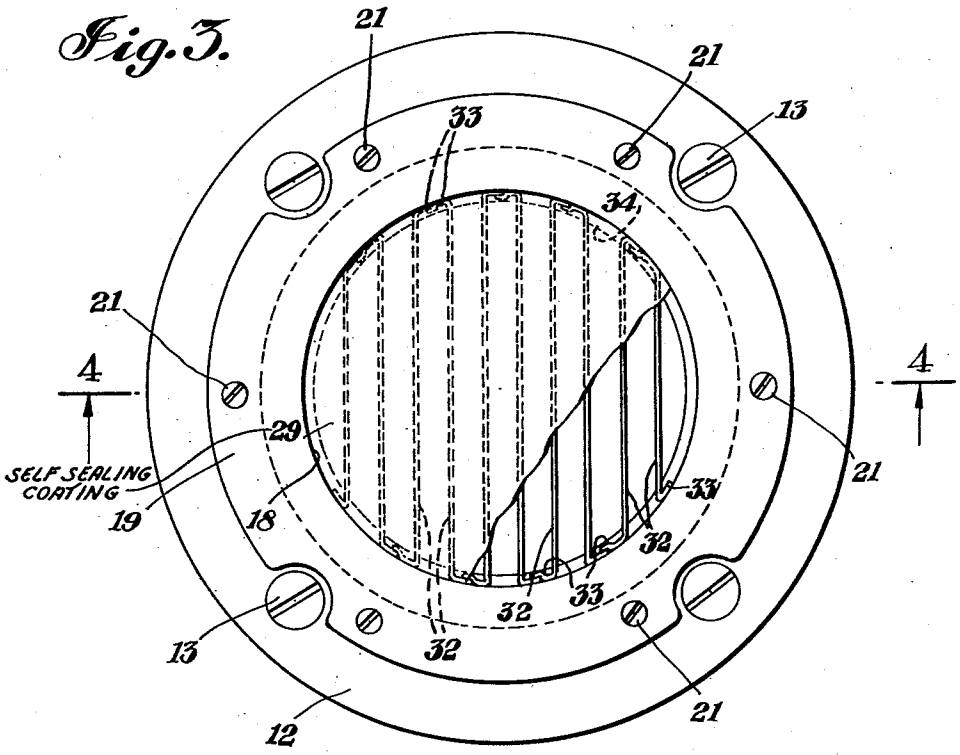
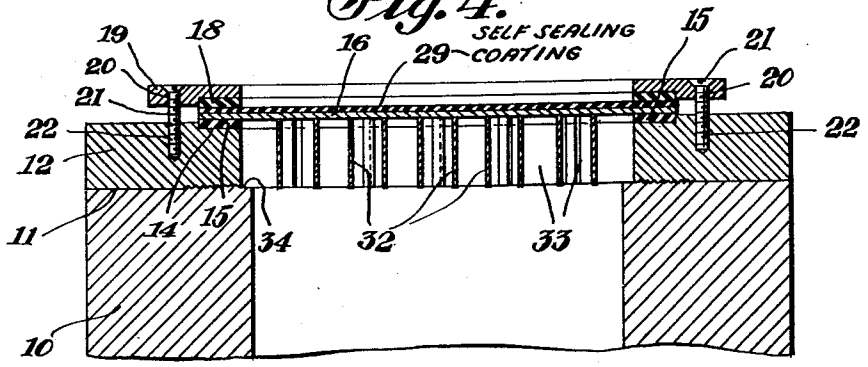


Fig. 4.



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ELECTRON DISCHARGE VESSEL

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18 Claims. (Cl. 250—154)

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Our present invention relates to electron discharge vessels and more particularly to electron transmitting window arrangements for such discharge vessels.

It is an object of our present invention to provide means preventing formation of holes in the electron transmitting window of an electron discharge vessel.

It is another object of our invention to provide a window construction for electron discharge vessels which is adapted to withstand bombardment by high-speed electrons and permits transmission of the same without formation of holes.

Still another object of our present invention consists in means for supporting the electron transmitting window of an electron discharge vessel without substantially reducing the amount of electrons passing through this window.

With the above objects in view, our present invention mainly consists in the provision of an electron transmitting window for electron discharge vessels composed of a metallic foil covered on at least one face with a thin sheet of a self-sealing substance. If a window of this type is bombarded by high-speed electrons, the metallic foil might eventually be pierced; however, the moment the metallic foil is punctured, the self-sealing substance covering the metallic foil will expand and extend over the hole and close it.

We wish to note that the term "self-sealing substance," as used above and in the following description and claims, is intended to define substances which are adapted to automatically close small holes punctured or otherwise formed in a coating or sheet of such a substance.

Particularly good self-sealing results are obtained with self-sealing elastomers, particularly with self-sealing rubber.

In accordance with a preferred embodiment of our invention, we use a very thin aluminum foil as electron transmitting window and provide the same on its outer face with a thin coating of a self-sealing substance, e. g. a self-sealing elastomer as self-sealing rubber, adhering to the aluminum foil.

A window of this type is particularly well adapted for the purposes of the present invention since it is not only highly electron transmitting, but also adapted to withstand bombardment with high-speed electrons without formation of permanent holes.

Although well known to everybody skilled in this art, it should be mentioned that formation of permanent holes, even if the same are extremely small, would defeat the purpose of an

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electron discharge vessel: such vessels are usually evacuated, i. e. do not contain any appreciable amount of air or other gases and therefore—if permanent holes are formed in the window—the outside air would be sucked in through the holes and prevent proper operation of the discharge vessel.

We have found it also of advantage to combine with the electron transmitting window of an electron discharge vessel one or more band-shaped rigid supporting members arranged inside the discharge vessel parallel to the path of the electrons, i. e. normal to the electron transmitting window adjacent to and in contact with this window supporting the same. An arrangement of this type has the great advantage that band-shaped rigid supporting member or members permit transmission of a relatively great percentage of the emitted electrons while preventing inward bending and breaking of the electron transmitting window by the vacuum inside the discharge vessel.

Particularly good results were obtained by the use of a spiral-shaped supporting band arranged inside the discharge vessel parallel to and in contact with the electron transmitting window; satisfactory results were, however, also obtained by the use of a plurality of parallelly arranged rigid supporting bands as supporting members for the window.

Particularly good results were obtained with a window arrangement composed of all elements defined above; such a window arrangement comprises in combination a thin, rigid, preferably aluminum, electron transmitting foil, a thin coating of self-sealing substance, preferably self-sealing rubber, covering the outer face of this foil firmly adhering to the same and a supporting member consisting of one or more rigid supporting bands arranged inside the discharge vessel normal to and in contact with the inner face of the above mentioned foil, supporting the same.

The novel features which we consider as characteristic for our invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a top view of an electron discharge vessel with an electron transmitting window of the type proposed by us, seen in direction of arrow 1 of Figure 2;

Fig. 2 is a cross section through the top portion of the electron discharge vessel and the electron transmitting window shown in Fig. 1, along line 2—2 of Fig. 1;

Fig. 3 is a top view of an electron discharge vessel with an electron transmitting window of the type proposed by us and modified supporting means, seen in direction of arrow 3 of Fig. 4; and

Fig. 4 is a cross section through the top portion of the electron discharge vessel and the electron transmitting window shown in Fig. 3, along line 4—4 of Fig. 3.

The electron transmitting window constituting our present invention can be used in combination with electron discharge vessels of any type. Therefore, we have not shown on the drawing the entire discharge vessel but only its top portion on which the window arrangement is mounted.

The electron discharge vessel comprises in a conventional manner a cylindrical wall 10 having a ring-shaped flat top face 11. The steel ring 12 is mounted on this top face and held in proper position by means of screws 13. This steel ring is provided with a ring-shaped depression 14 into which the rubber gasket 15 is inserted as shown in the drawing.

The aluminum foil 16 is shaped so as to entirely cover the window opening 17 at the top end of wall 10 and to extend to the outer edge of the rubber gasket 15. Thus, the aluminum foil 16 forms an electron transmitting window which is supported by the rubber gasket 15.

In accordance with our present invention, the thin aluminum foil window 16 is provided on its outer face with a thin self-sealing rubber coating 29 as shown in Fig. 2.

A second rubber gasket 18, having preferably the same shape and size as the rubber gasket 15, is placed on the outer face of the foil 16 along the edge of the same.

The two rubber gaskets 15 and 18, together with the rubber coated aluminum foil window 16 inserted between them, are held in place by outer steel ring 19, placed on the second gasket 18 as shown in Fig. 2. This ring 19 is slightly larger than the rubber gaskets 15 and 18 and provided along its outer protruding edge with screw holes 20. The screws 21 are inserted through the screw holes 20 and engage corresponding screw holes 22 in the steel ring 12 so as to firmly hold the steel ring 19 in the position shown in the drawing.

The securing arrangement, composed of the two rubber gaskets 15 and 18, and the steel ring 19, is absolutely air-tight and well adapted to properly hold the self-sealing rubber coated aluminum window 17 in operative stretched position.

As mentioned above, the discharge vessel is evacuated and thus the atmospheric pressure tends to bend the self-sealing rubber coated foil 17 inward into the discharge vessel. In case the foil is very thin, such inward bending might result in formation of cracks and breaking of the foil.

In order to avoid such inward bending and breaking of the foil, we provide in the discharge vessel shown in Figs. 1 and 2 a spiral band 23, arranged parallel to and in contact with the inner face of the self-sealing rubber coated foil 16. This spiral band 23 serves as supporting member and is held in proper position by means of the supporting rods 24 and 25 passing through the holes 26, and 27, respectively, in the spiral band 23 and protruding into corresponding holes 30 and 31 provided in the steel ring 12, as clearly shown in Figs. 1 and 2.

In the discharge vessel shown in Figs. 3 and 4, we provide a supporting arrangement composed of a plurality of parallelly arranged rigid supporting bands arranged normal to and in contact with the inner face of the rubber coated foil 16. These supporting bands 32 are provided with bent end portions 33 welded or otherwise secured to the inner face of the steel ring 12. This steel ring 12 has a slightly greater diameter than the cylindrical wall 10 of the discharge vessel so as to form along the inner edge of its top face 11 a circular rim 34 supporting the rigid supporting bands 32 as shown.

We have found that supporting members of the above described type permit passage of a great percentage of the electrons emitted by the cathode and thus is particularly adapted for the purposes of the present invention.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of electron discharge vessels differing from the types described above.

While we have illustrated and described the invention as embodied in electron discharge vessels for emission of high-speed electrons, we do not intend to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of our invention.

Without further analysis, the foregoing will so fully reveal the gist of our invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention, and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What we claim as new and desire to secure by Letters Patent is:

1. In an electron discharge vessel an electron transmitting window arranged in the wall of said discharge vessel and composed of a metallic foil covered on at least one face with a thin sheet of a self-sealing substance.

2. In an electron discharge vessel an electron transmitting window arranged in the wall of said discharge vessel and composed of an aluminum foil covered on at least one face with a thin sheet of a self-sealing substance.

3. In an electron discharge vessel an electron transmitting window arranged in the wall of said discharge vessel and composed of an aluminum foil covered on at least one face with a thin sheet of a self-sealing elastomer.

4. In an electron discharge vessel an electron transmitting window arranged in the wall of said discharge vessel and composed of a metallic foil covered on at least one face with a thin self-sealing rubber sheet.

5. In an electron discharge vessel an electron transmitting window arranged in the wall of said discharge vessel and composed of an aluminum foil covered on at least one face with a thin self-sealing rubber sheet.

6. In an electron discharge vessel an electron transmitting window arranged in the wall of said discharge vessel and composed of a metallic foil covered on its outer face with a coating of a self-sealing substance adhering to said metallic foil.

7. In an electron discharge vessel an electron

transmitting window arranged in the wall of said discharge vessel and composed of an aluminum foil covered on its outer face with a thin coating of a self-sealing substance adhering to said aluminum foil.

8. In an electron discharge vessel an electron transmitting thin metallic window covered on its outer face with a thin coating of a self-sealing elastomer.

9. In an electron discharge vessel an electron transmitting thin metallic window covered on its outer face with a thin self-sealing rubber coating.

10. In an electron discharge vessel an electron transmitting thin aluminum window covered on its outer face with a thin self-sealing rubber coating adhering to said thin aluminum window.

11. In an electron discharge vessel an electron transmitting window arranged in the wall of said discharge vessel and composed of a thin rigid foil covered on at least one face with a thin sheet of a self-sealing substance.

12. In an electron discharge vessel an electron transmitting window arranged in the wall of said discharge vessel and composed of a thin rigid foil covered on at least one face with a thin sheet of a self-sealing elastomer.

13. In an electron discharge vessel an electron transmitting window arranged in the wall of said discharge vessel and composed of a thin rigid foil covered on at least one face with a thin self-sealing rubber sheet.

14. In an electron discharge vessel an electron transmitting window arranged in the wall of said discharge vessel and composed of a thin rigid foil provided on its outer face with a coating of a self-sealing substance adhering to said thin rigid foil.

15. In an electron discharge vessel an electron transmitting window arranged in the wall of said discharge vessel and composed of a thin rigid foil provided on its outer face with a coating of a self-sealing rubber substance adhering to said thin rigid foil.

16. In an electron discharge vessel an electron transmitting window arrangement comprising in combination a thin rigid electron transmitting foil; a thin coating of a self-sealing substance covering the outer face of said thin rigid electron transmitting foil firmly adhering to the same; and a spiral band-shaped metallic supporting member arranged inside said discharge vessel in contact with the inner face of said thin rigid electron transmitting foil, supporting the same.

17. In an electron discharge vessel an electron transmitting window arrangement comprising in combination a metallic foil; a thin sheet of a self-sealing substance covering the outer face of said metallic foil; and at least one rigid band-shaped supporting member arranged inside said discharge vessel normal to and in contact with the inner face of said metallic foil, supporting the same.

18. In an electron discharge vessel an electron transmitting window arrangement comprising in combination a thin rigid electron transmitting foil; a thin coating of a self-sealing substance covering the outer face of said thin rigid electron transmitting foil firmly adhering to the same; and a plurality of parallel band-shaped supporting members consisting of a rigid material, each of said band-shaped supporting members arranged inside said discharge vessel normal to and in contact with the inner face of said rigid electron transmitting foil, supporting the same.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,907,507	Coolidge	May 9, 1933
2,031,722	Loewe	Feb. 25, 1936

FOREIGN PATENTS

Number	Country	Date
299,735	Great Britain	Oct. 30, 1928