June 21, 1938. W. ESPE 2,121,590

VACUUM- AND GAS-TIGHT VESSEL FOR ELECTRIC APPARATUS

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Fig. 1.

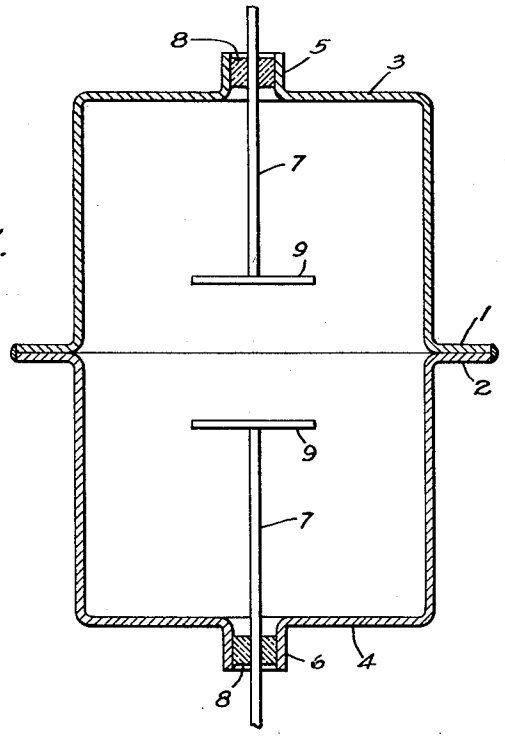
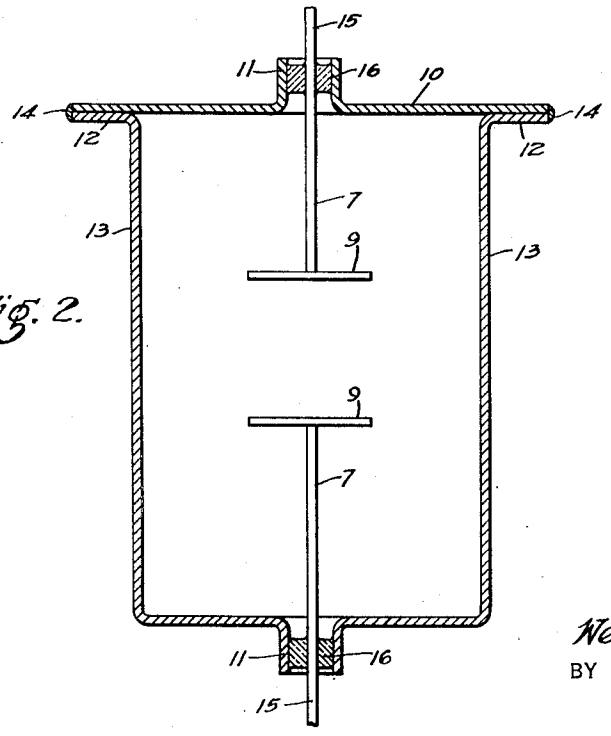


Fig. 2.



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VACUUM- AND GAS-TIGHT VESSEL FOR ELECTRIC APPARATUS

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3 Claims. (Cl. 250—27.5)

My invention relates to a vacuum- and gas-tight vessel for electric apparatus which consists wholly or in part of metal and which may be employed particularly in electric discharge apparatus.

It is well known in the art to manufacture vacuum- and gas-tight vessels for electric discharge apparatus consisting wholly or in part of metal. A variety of metals are employed for the metallic parts of such vessels. In the case of vessels which have portions consisting of insulating material, particularly of glass, such metals or alloys are given the preference whose physical properties are substantially similar to the physical properties of the insulating bodies; this applies particularly to the capability of expansion due to heat of the materials to be united with one another. Chromium-iron-alloys are preferred as metal alloys, since they are relatively cheap as compared to metals, such as platinum or the like, and have approximately the same coefficient of expansion as glass. A disadvantage of these known chromium-iron-alloys consists in the fact that they are very hard and, therefore, relatively difficult to machine. Furthermore, in many cases they do not prove to be sufficiently vacuum- and gas-tight in the case of high power apparatus.

Instead of a pure chromium-iron alloy, an alloy is employed according to the invention which contains as an essential constituent a small percentage of molybdenum. This alloy may be, furthermore, mixed with a small amount of silicon, for instance 1%. The other constituents are again chromium and iron, the percentage of chromium amounting preferably to 10–30%.

The novel alloy is characterized by a particularly easy machineability and ensures a better gas and vacuum tightness than the known alloys. The molybdenum is not only advantageous for the production of the alloy but also when the electric discharge device is in operation, since it substantially prevents the oxidation of the chromium. Oxygen compounds of molybdenum are formed which are easily volatile. Furthermore, the molybdenum renders the structure of the alloy more compact, thus increasing the vacuum and gas tightness thereof. Since oxides in detrimental amounts do not occur around the grains, the material is very ductile and may be deformed to any desired shape without there occurring any inter-crystalline fractures and diffusion gaps. A further advantage of this molybdenum alloy consists in the fact that it forms favorable compounds with the adjacent insulating materials (glass and ceramic). Thus, for instance, glass may be fused with the molybdenum alloy in a particularly reliable manner, since molybdenum dioxide may be absorbed in a relatively easy manner by the silicates of the insulating materials. The novel material proves to be suitable when soldering it both by the use of hard and soft solders.

The easy machineability of the novel molybdenum alloy makes it possible to manufacture vessels and parts thereof in any form whatever. Owing to the great ductility of the material it is possible to give portions of the plates the form of sleeves, eyes, lugs and the like which may be employed for the reception of current junctions, support parts and the like.

In the accompanying drawing is shown two embodiments of my invention. Fig. 1 is a discharge tube in diagrammatic form and Fig. 2 shows a sleeve fused to a part of an electric discharge device.

In the embodiment shown in Fig. 1 the discharge vessel is made of two plates 1 and 2 of sheet metal. The two plates 1 and 2 were given the form of pots 3 and 4 with the sleeves 5 and 6. The great ductility of the material renders it possible to give the vessels such forms. The openings of the sleeves 5 and 6 were closed at the lower end thereof by an asbestos disc and then the sleeve was filled with glass powder which was dielectrically fused. The terminals 7 which were separately vitrified were sealed in the glass plug 8. Instead of glass also other insulating materials, particularly ceramic, may be employed. The electrodes 9 are shown schematically. The flanges of the plates 1 and 2 are then welded together.

In the embodiment shown in Fig. 2 the middle portion of the plate 10 of sheet metal was given the form of a sleeve 11. The edge of the plate 10 was welded to the edge 12 of the vessel jacket 13. The weld is indicated at 14. The rod 15 is sealed in the insulating body 16 or soldered therein.

I claim as my invention:

1. A vacuum-tight vessel for electric apparatus consisting in part at least of metal, for electric discharge apparatus, characterized in that the metallic wall parts consist of an alloy which contains besides iron 10–30% chromium, ½–5% molybdenum and up to about 1% silicon.

2. A discharge vessel in part at least of metal, characterized in that the metallic wall parts consist of an alloy which contains besides iron 20% chromium, 1% molybdenum and ½% silicon.

3. A vacuum-tight container for a discharge device comprising a metal wall of 10% to 30% chromium, ½ to 5% molybdenum, up to 1% silicon and the remainder iron, said wall having an opening therethrough, a flange about said opening, a lead-in conductor spaced from said flange in said opening and insulating material in said opening sealed to said flange and said lead-in conductor.

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