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B. BERGHAUS ET AL

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CATHODE DISINTEGRATION APPARATUS

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Fig. 1.

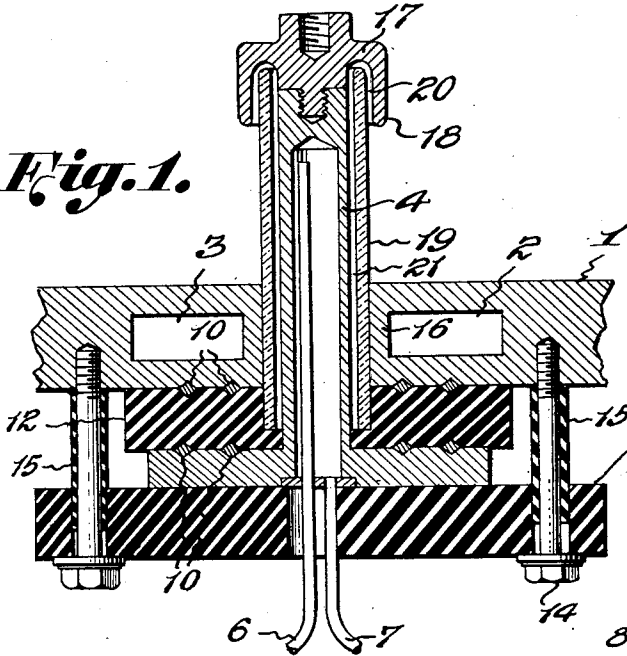


Fig. 2.

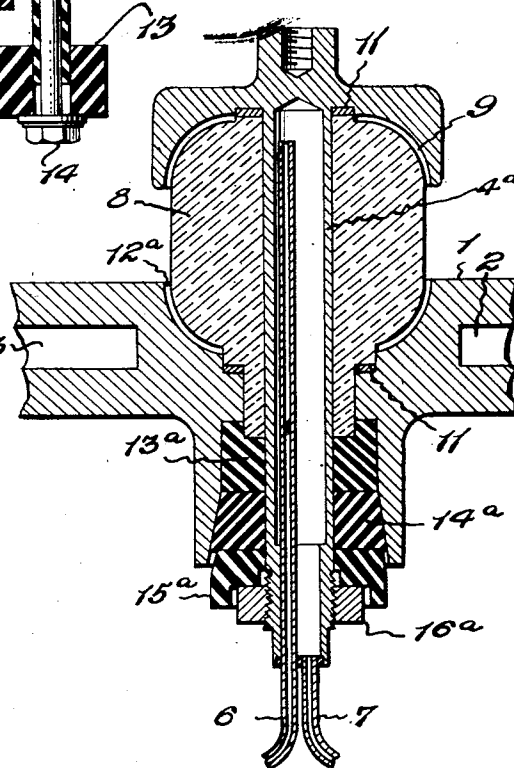
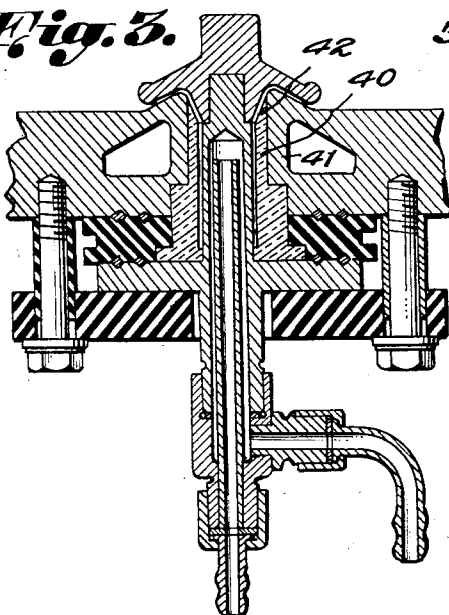


Fig. 3.



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CATHODE DISINTEGRATION APPARATUS

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4 Claims. (Cl. 250—27.5)

The invention relates to a lead-in conductor for cathode disintegration apparatus, the characteristic feature of which is that the insulating material is protected by a gap against any attack by the gas discharge. The invention also relates to an insulated lead-in conductor for metal vacuum vessels of cathode disintegration apparatus, the characteristic feature of which is that, between the conductor and the insulator there is provided all around such a narrow gap that no glow discharge can take place therein with the existing vacuum and the voltage which is applied. The distance of the insulator from the conductor is less than ten and preferably between 3 and 0.1 millimeters. Moreover the gap is preferably made of labyrinth shape, in order to make it difficult for the charge carriers to penetrate therein from the vacuum space, the length of the protective gap being a multiple of its width. The insulator preferably consists of a material having a high fusing point, preferably over 1200° C., such as quartz, porcelain, sintered bodies of alumina, zirconium oxide, thorium oxide, magnesium oxide, beryllium oxide or the like. The insulator may, for instance, consist of a quartz tube.

The insulator preferably surrounds the conductor. However, the conductor may partly surround the insulator. The conductor is preferably made capable of being cooled. Similarly the insulator may be provided with cooling means. These measures are essential when large electrical energies are to be supplied to the vacuum vessel which entail a corresponding development of heat. The insulator may advantageously be surrounded by a metal covering wholly or partly. It is also advisable to provide between the insulator and its metallic covering such a narrow gap that no glow discharge can take place therein.

The invention also relates to an insulated lead-in conductor, preferably for a cathode, the characteristic feature of which is that, between the insulator surrounding the conductor and the conductor which abuts against it, there is provided a protective gap which opens into the vacuum space and is narrower than the width of the glow fringe formed in the vacuum space around the cathode. Between the insulator and the metallic wall of the vessel which is preferably cooled there may also be provided a narrow protective gap. In this way the starting of a detrimental glow or arc discharge at the point where the insulator abuts against the metal is avoided.

The invention also relates to a lead-in conductor for the anode of a metal vacuum vessel

for cathode disintegration, the characteristic feature of which is, that the metallic cooled wall of the vessel constitutes the cathode and surrounds the insulated conductor of the anode, on all sides, at such a short distance that no glow discharge can take place in the free gap between the two. The extension of the gap may be formed by an insulator provided with a corresponding recess. The anode conductor may also be provided with a metal cap which forms a narrow gap with the cooled metal wall of the vessel acting as a cathode. Between the cooled anode lead-in conductor and the cathode metal wall of the vessel there may be provided an insulated, metal, neutral or anode screening through the interposition of a protective gap. In the case of an anode metallic intermediate screening the middle cooled lead-in may also be neutral. Further, the insulator may surround the conductor so as to abut against it. In this way it is attained that the insulator is cooled at the same time as the conductor is cooled. The insulator may abut against the cooled wall of the vessel forming the cathode in such a manner that, between the insulator and the lead-in conductor, there remains a narrow gap. In this case the cooling of the insulator is effected by the cathode wall of the vessel. Moreover, the insulator may be so arranged between the cooled wall of the vessel which forms the cathode and the anode conductor that there remains a narrow gap between it and the conductor, as well as between it and the cooled wall of the vessel.

The present invention avoids the difficulties hitherto encountered with such anode lead-in conductors owing to the undesirable glow and arc discharges at the points where the lead-in conductors enter into the vessel, which would otherwise lead to the destruction of the sealing and insulating material. The lead-in conductor allows powers of over 100 kw. for voltages of a few thousand volts to be reliably supplied to vacuum apparatus of any desired construction in which the wall of the vessel forms permanently or temporarily the cathode. A direct or alternating current voltage may be applied to the lead-in conductor.

The accompanying drawing illustrates by way of example three different forms of construction according to the invention, Figures 1, 2 and 3 being sectional elevations of different constructions of lead-in conductor of a cathode disintegration apparatus.

Referring to Figure 1, the conductor 4 is introduced into the vacuum space through the wall

1 of the vacuum vessel, which is provided with cooling channels 2 and 3. The insulated metal lead-in conductor is, for instance, made hollow, so as to be capable of being cooled, a cooling medium being introduced through the pipe 6 and discharged through the pipe 7. The conductor 4 is surrounded on all sides by an insulator 19, which may, for instance, be a quartz tube, in such a manner that, between the conductor and the insulator, there remains such a narrow gap 21 that no glow discharge can take place therein. 10 are packing rings for rendering the insulator 12 airtight. 13 is an insulating and clamping ring which is clamped on by insulated screws 14 surrounded by an insulation 15. The quartz tube is surrounded at its lower end by the cooled metal wall 16 of the vacuum vessel. The conductor is provided with a screwed-in metal cap 17, which partly surrounds with its part 18 the insulator 19 at a short distance so that a gap 20 is left in between, which, together with the gap 21, forms a labyrinth gap.

Referring to Figure 2, the conductor 4a is introduced into the vacuum space through the wall 1, which is provided with cooling channels 2 and 3. The insulated metal lead-in is, for instance, made hollow and capable of being cooled; the cooling medium may be supplied through the pipe 6 and be discharged through the pipe 7. The conductor 4a is surrounded by an insulator 8, for instance, a porcelain insulator abutting against it, and between the insulator and the conductor there is provided a gap 9 which is, for instance, curved. The insulator 8 may be cemented on the conductor, for instance, by an elastic cement. 11 are lead or copper parts which are provided in order to obtain a uniform pressure stress on the insulator. Between the insulator 8 and the cooled metal wall of the vessel there is further provided a second protective gap 12a; 13a is an insulating member, 14a a sealing member, for instance of rubber, 15a an insulating ring and 16a a metal screw nut.

The characteristic feature of the anode lead-in conductor according to Figure 3 is that the insulator 40 abuts in such a manner against the cooled wall 41 of the vessel which forms the cathode in such a manner that, between the insulator and the lead-in conductor there remains a narrow gap 42. In this case the insulator is cooled by the wall of the vessel.

What we claim is:

1. In apparatus for coating articles by cathode disintegration, a metal housing wall having an opening therein, a hollow insulating member having a tubular portion with the periphery thereof engaging the housing within said opening, a hollow coolable metal conductor extending into the housing through said insulating member, means carried by the inner end of said conductor having an annular skirt covering the inner end of the insulating member and spaced

therefrom at such a small distance as to prevent a glow discharge within the housing from taking place in said space, means arranged outside said housing for insulating and sealing said conductor with respect to said housing wall, and said housing wall having channels therein adjacent said opening for receiving a cooling medium.

2. In apparatus for coating articles by cathode disintegration, a metal housing wall having an opening therein and an arcuated shaped recess in the inner face thereof adjacent said opening, an insulating member having an axial passage extending therethrough, said insulating member having a tubular end portion with the periphery thereof engaging said housing wall within said opening, an end portion of said insulating member adjacent said tubular portion being arcuated shaped and extending into said recess and spaced from the housing wall providing the recess, a hollow conductor extending into the housing through said passage and engaging said insulating member, means carried by the conductor covering the inner end of the insulating member, and means for cooling said hollow conductor so as to carry heat away from the insulating member and the conductor.

3. In apparatus for coating articles by cathode disintegration, a metal housing wall having an opening therein and an arcuated shaped recess in the inner face thereof adjacent said opening, an insulating member having an axial passage extending therethrough, said insulating member having a tubular end portion with the periphery thereof engaging said housing wall within said opening, an end portion of said insulating member adjacent said tubular portion being arcuated shaped and extending into said recess and spaced from the housing wall providing the recess, a hollow conductor extending into the housing through said passage and engaging said insulating member, means for cooling said hollow conductor so as to carry heat away from the insulating member and the conductor, and said housing wall adjacent said opening having channels therein for receiving a cooling medium.

4. In apparatus for coating articles by cathode disintegration, a metal housing wall having an opening therein, a tubular insulating member extending through said opening with the periphery engaging said housing within the opening, a metal conductor extending into the housing through said insulating member, means arranged outside said housing for sealing said insulating member and said conductor with respect to said housing wall, a cap member carried by said conductor covering the inner end of the insulating member, and said housing wall having channels therein adjacent said opening for receiving a cooling medium to carry heat away from said insulating member.

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