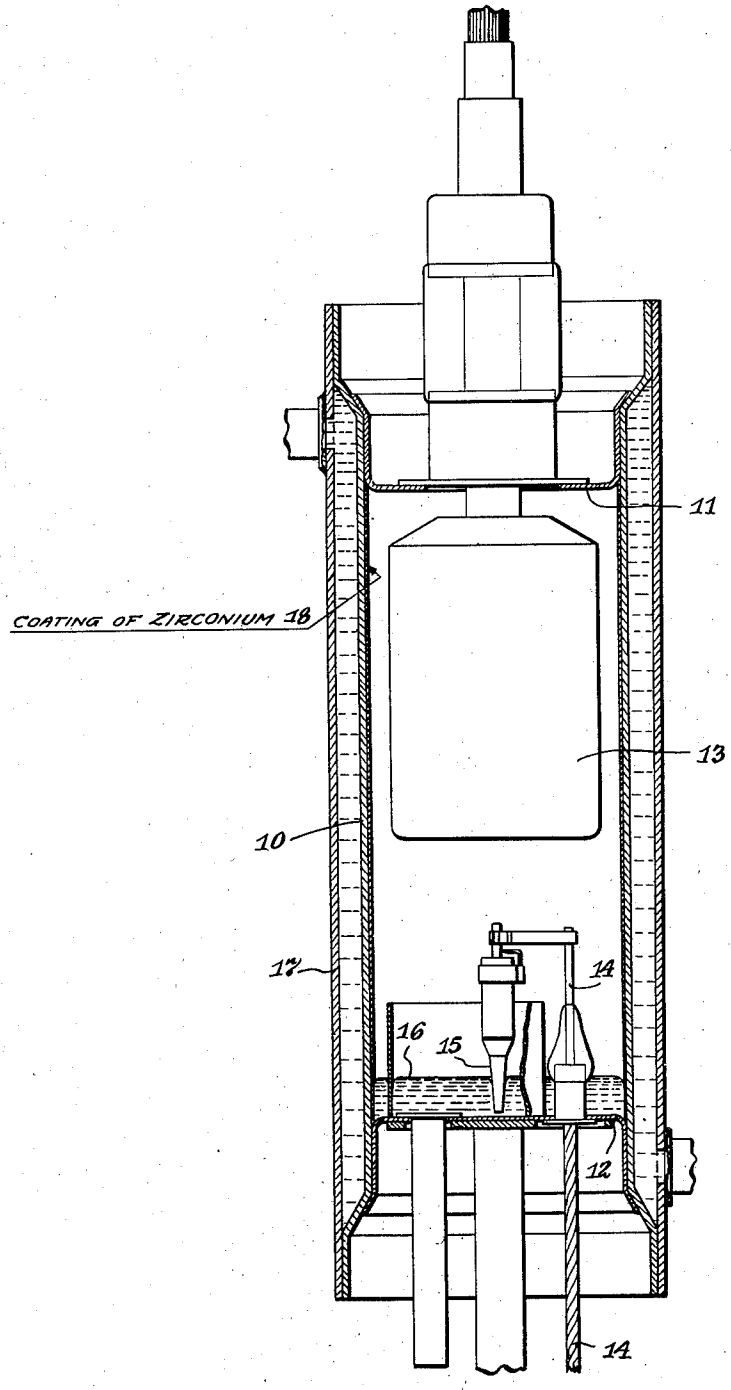
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MERCURY VAPOR TUBE

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MERCURY VAPOR TUBE

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This invention relates to mercury vapor tubes and has particular application with respect to ignitrons.

Mercury vapor tubes, such as ignitrons and mercury arc rectifiers, have frequently experienced trouble, such as arc-back and slow de-ionization, which is partially due to excessive vapor density. Thus, the rating of mercury vapor tubes is often limited by the efficiency with which mercury vapor in the tubes is condensed. The body or envelope portion of ignitrons is at present made of steel or steel alloy, and it has been determined that condensation efficiency in commercial tubes is generally less than ten percent. This circumstance readily accounts for the excessive vapor density prevailing in ignitrons in use.

Generally viewed, this invention has for an object the reduction of vapor density in mercury vapor tubes.

Likewise from a broad aspect, the invention has for an object to improve the efficiency of the vapor condensation in a mercury vapor tube.

More specifically, an object of the invention is to provide means aiding condensation of mercury vapor in a steel or steel alloy container.

Other objects of the invention will appear to those skilled in the art to which it appertains as the description progresses, both by direct recitation thereof and by inference from the context.

For aid in readily understanding the invention and its application in the art, a drawing accompanies this specification, the single view whereof illustrates in longitudinal vertical section an ignitron wherein my invention is incorporated.

In said drawing the general ignitron structure shown comprises a steel or steel alloy body or envelope constituted essentially by a cylindrical wall or portion 10 closed at top and bottom by headers 11, 12, welded or otherwise secured to the cylindrical wall so as to form a vacuumtight enclosure. From the upper head 11 is suspended, with interposed insulation, an anode 13. Through the bottom header 12, likewise with interposed insulation, is a lead-in connection 14 by which current is conducted to an ignitor 15, a part of which is submerged in a mercury pool 16 covering the bottom header with appropriate depth. The pool 16 constitutes a reconstructing cathode, and it will be appreciated that arc discharge between the cathode and anode, as well as between the ignitor and the cathode, creates heat and vaporizes some of the mercury. Obviously as more and more mercury vaporizes, and in the absence of equal condensation, the vapor density within the body or envelope increases. Such increase of vapor density is undesirable, as it is well known that the successful operation of mercury vapor tubes is strongly dependent on the vapor density being kept low.

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To promote condensation, as well as to carry off undesired heat, it is common practice to provide a jacket 17 for circulation of a cooling medium around the envelope. Heat transfer thereby effected is of course helpful, but even with the most efficient operation of the cooling medium, the condensation efficiency in commercial tubes still is exceedingly low. This apparently is due to a considerable extent to the character of the surface where condensation is intended to be effected. Under ideal conditions, the mercury atoms reaching the surface would all be condensed and none be reflected; but, unfortunately, that ideal condition is far from the fact in practice, and such a great portion of reflection of the mercury atoms takes place that the ten percent efficiency mentioned above is a common and prevailing circumstance. The desideratum to be accomplished, therefore, is to obtain an inner surface for the cylindrical wall of the envelope, which will retain the mercury atoms more effectively and deter reflection.

According to the present invention, the desired objective is accomplished by coating the envelope wall, as at 18, with zirconium, which I find greatly promotes the condensation of the mercury vapor and provides a surface deterring reflection of the mercury atoms. The cooling system is adequate for extraction of the heat from all mercury atoms which lodge and remain upon the surface, and since a much greater proportion thus lodge and remain on the zirconium coated surface than occurs with an uncoated steel or steel alloy surface, the resultant efficiency of condensation of the mercury vapor is enhanced many fold.

Zirconium as the coating surface is of especial benefit in that zirconium does not amalgamate with mercury and therefore is neither injurious to the constituency of the pool or its vapor, nor does it deteriorate and become less effective in its condensing characteristic from use. Furthermore, the zirconium functions advantageously as a corrosion resistant, has high thermal emissivity and serves incidentally in assisting in the cleaning up of foreign gas in the envelope by virtue of the gettering properties inherent in zirconium.

The zirconium may be applied in various ways, of which may be mentioned application thereof by mixing either the metal or a compound of the metal, such as the hydride, with a nitrocellulose

binder and painting, spraying or otherwise applying the same to said wall or its surface. The coating 18 may likewise be accomplished by electroplating zirconium on the envelope wall. Inclusion of zirconium in the alloy of which said envelope wall is composed is likewise contemplated in the invention and is to be understood as included in the broad recitation of zirconium applied to said wall or its surface exposed to the interior of the envelope.

I claim:

1. A mercury vapor tube having an envelope on a wall whereof mercury is condensed in use, mercury in said envelope, means for vaporizing the mercury, and zirconium on said wall exposed to the interior of the envelope for assisting in condensation of the vaporized mercury.

2. A mercury vapor tube having an envelope on a wall whereof mercury is condensed in use, mercury in said envelope, means vaporizing the mercury, and a coating containing zirconium on the surface of said wall exposed to the interior of the envelope for promoting condensation of the vaporized mercury impinging on said coating.

3. A mercury vapor tube having an envelope providing a cylindrical wall and headers at top and bottom thereof and sealed thereto, a cathode pool of mercury on the bottom header, an anode

suspended from the top header, said cathode and anode adapted to sustain an arc discharge by which mercury is caused to vaporize, and a coating of zirconium on the inside of said cylindrical wall exposed to the mercury vapor and assisting in condensation of said vapor.

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