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Kasper et al.

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[54] **APPARATUS FOR THE PRODUCTION OF CLOSED END TUBES OF SEMICONDUCTOR MATERIAL**

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[51] **Int. Cl.** **C23c 13/08**

[58] **Field of Search** 118/48–49.5; 117/106–107.2; 264/81; 425/447; 219/271, 275; 338/217, 218

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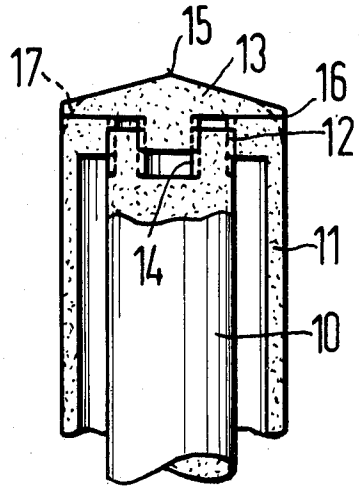
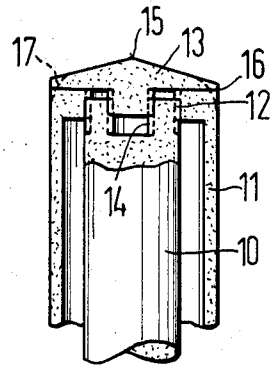
[57] **ABSTRACT**

An apparatus for producing semiconductor tubes by means of depositing semiconductor material from a gaseous atmosphere onto a heated receiver body, the receiver body consists of a concentric assembly of inner and outer conductive members connected at one end by means of cooperating screw threads on the two members, and a conical end cap member covering the end of the assembly and forming a smooth continuous surface with the exterior of the outer member.

5 Claims, 1 Drawing Figure

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APPARATUS FOR THE PRODUCTION OF CLOSED END TUBES OF SEMICONDUCTOR MATERIAL

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to apparatus used in the production of closed end tubes made of semiconductor material by depositing semiconductor material from a gaseous atmosphere onto a receiver body, and more particularly to an improved structure for such a receiver body.

2. The Prior Art

Apparatus used in the production of closed end tubes by depositing the material from a gaseous atmosphere has been described in co-pending application Ser. No. 253,629 filed on May 15, 1972, now U.S. Pat. No. 3,747,559 by Wolfgang Dietze for "Apparatus for Production of a Closed Tube of Semiconductor Material." As described in the Dietze application, a receiver body is provided to receive a coating of the semiconductor material. The receiver body is made up of a rod and a concentric surrounding tube, the tube and rod being interconnected at one end by means of cooperating screw threads or the like. Electrical current is passed through the rod and tube to heat them to the proper temperature, and the resistance of the circuit is adjusted by modifying the distance which the rod is screwed into the tube, which determines the contact area. The end of the tube is covered by a cap member. The Dietze application describes several varieties of cap member, however, all of the cap members of the Dietze application form, with the tube member, a right circular cylinder, having an end surface normal to the axis of the receiver body. It has been found that heating of the receiver body is not uniform over its entire surface with such an arrangement, with the result that the deposited semiconductor material has a non-uniform thickness. Accordingly, it is desirable to provide a receiver body in which the heating of the receiver body is uniform.

SUMMARY OF THE INVENTION

It is a principal object of the present invention to provide a cap structure, for a heated receiver body adapted for receiving a deposited layer of semiconducting material, which provides for uniformity in heating over the entire surface of the body.

Another object of the present invention is to provide such a cap structure in which grinding of the receiver body after assembly to obtain a smooth, continuous surface between the cap member and the exterior of the tube can be reduced to a minimum.

A further object of the present invention is to provide a receiver body which has great mechanical stability.

These and other objects and advantages of the present invention will become manifest upon an inspection of the following description and the accompanying drawings.

In one embodiment of the present invention there is provided an end cap, for closing the end surface of an axially symmetric receiver body, having a convex, conical end surface coaxial with the axis of the receiver body, the edges of said convex end surface being rounded to form a smooth, continuous surface between the cap member and the exterior of the receiver body.

BRIEF DESCRIPTION OF THE DRAWINGS

Reference will be made to the accompanying drawing which is a vertical cross-section through a receiver body incorporating an illustrative embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, an axially symmetric receiver body is illustrated, the plane of the cross-section of the drawing passing through the axis of the body. The body includes a central rod **10** and an outer tube **11** which surrounds the rod **10.** The tube **11** has an inwardly extending flange at its end, and the rod **10** and the tube **11** are interconnected by means of cooperating threads **12** disposed on the end of the rod **11,** and on the inner surface of the inwardly extending flange. The area of contact between the rod **10** and the tube **11** may be varied by relative rotation between the rod **10** and the tube **11.**

A central bore **14** is provided in the end of the rod **10,** and the stem of a cap member **13** is disposed in the bore and threadably connected therewith. One set of the threads is provided on the external surface of the stem of the cap member **13,** and a set of cooperating threads is provided within the bore **14.**

The inner surface of the cap member **13** lies closely adjacent the upper end of the tube **11,** and the outer surface is convexly conical in shape, being thickest near the center **15** and thinest near the peripheral edge **16.** After the cap is assembled in cooperation with the rod **10** and the tube **11,** the sharp corner formed at the outer edge **16** of the cap **13** is removed by grinding, forming the shape indicated by the dashed lines **17,** and producing thereby a smooth continuous surface between the conical surface of the cap **13** and the circular cylindrical outer surface of the tube **11.**

It has been found that the provision of the conical outer surface facilitates uniform temperature distribution throughout the receiver body, and enhances the deposition of a uniform thickness of semiconducting material thereon. In addition it provides a cap structure of greater mechanical stability, as compared with a thin flat cap structure. Because the outer edge **16** is thin, very little material is removed during grinding the outer edge to produce the desired smooth, continuous surface of the completed receiver body.

The cap **13** is made of the same material as the rod **10** and the tube **11,** in order to enhance uniform heating over the entire surface of the receiver body. Preferably, the material is vitreous carbon, spectral carbon, or pyrolytic graphite.

We claim as our invention:

1. In an apparatus for producing closed end tubes of semiconductor material wherein is provided a vacuum deposition chamber including a gaseous supply of such semiconductor material and electrical means to heat and mount a heated receiver body upon which said semiconductor material is deposited, the improvement wherein said receiver body comprises a central rod formed of electrically conductive material a surrounding tube formed of electrically conductive material, and having an end in electrical contact with an end of said tube; and an electrically conductive cap member for covering said end of said tube, said cap member having a convex outer surface including a curved edge

surface which, at the outer extremity of said surface, forms a smooth, continuous surface with the exterior of said tube.

2. The cap member of claim **1**, wherein the outer surface of said cap member is axially symmetric.

3. The cap member of claim **1**, wherein the outer surface of said cap member is conical.

4. The cap member of claim **1**, wherein said tube has an end surface defining a plane normal to the longitudinal dimension of said tube, and said cap member has an annular inner surface adapted to lie closely adjacent the end surface of said tube.

5. The cap member of claim **1**, wherein said central rod is provided with a central threaded bore, and said cap member has a stem threadably received in said bore.

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