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United States Patent [19]

[11] **4,159,440**

Little

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[54] **DIELECTRIC GUIDE FOR ELECTRON BEAM TRANSPORT**

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[73] Assignee: **Spire Corporation, Bedford, Mass.**

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Related U.S. Application Data

[62] Division of Ser. No. 548,438, Feb. 10, 1975, Pat. No. 4,079,285.

[51] Int. Cl.² **H01J 23/16; H01J 29/96**

[52] U.S. Cl. **315/3; 313/352; 313/361; 250/396 R; 219/121 EB**

[58] Field of Search **315/3, 4, 5; 313/421, 313/423, 424, 361, 450, 474, 352, 355; 250/396; 219/121 EB**

[56] References Cited

U.S. PATENT DOCUMENTS

3,412,196	11/1968	Figgins	250/396 X
3,914,637	10/1975	Bennett	250/396 X
4,079,285	3/1978	Little	313/355

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[57] ABSTRACT

An evacuated enclosure in the form of a cylindrical cavity having a dielectric located therein defines a dielectric guide for transporting an electron beam introduced into the cavity. The dielectric, which is disposed about the cavity wall, is operative to trap the charge associated with normal vacuum expansion of the electron beam. The trapped charge, in cases where the injected electron beam is not space charge limited, modifies the electric fields within the cavity in such a way as to provide focusing forces on the electron beam propagating through the cavity, the focusing forces being sufficient to guide a major portion of the beam through the enclosure without attenuation. Within the injected beam is space charge limited, the trapped charge induces an electrical discharge—either surface flashover or volume puncture of the dielectric—which liberates gaseous material. This gas then ionizes, is attracted by space charge electric fields into the body of the beam, and provides space charge neutralization. In this situation the beam is confined by its self-magnetic field and propagates through the cavity with little attenuation.

6 Claims, 14 Drawing Figures

