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METHOD OF FABRICATING ELECTRON DISCHARGE DEVICES

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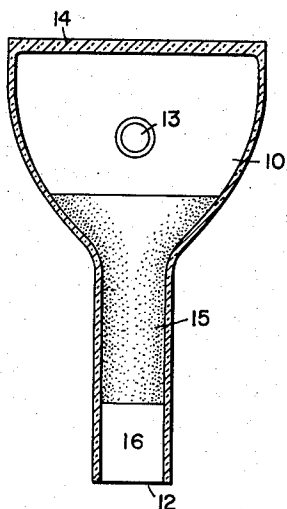


FIG. 1A

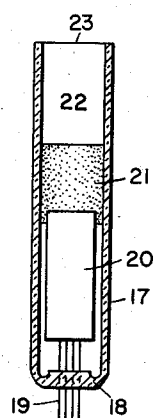


FIG. 1B

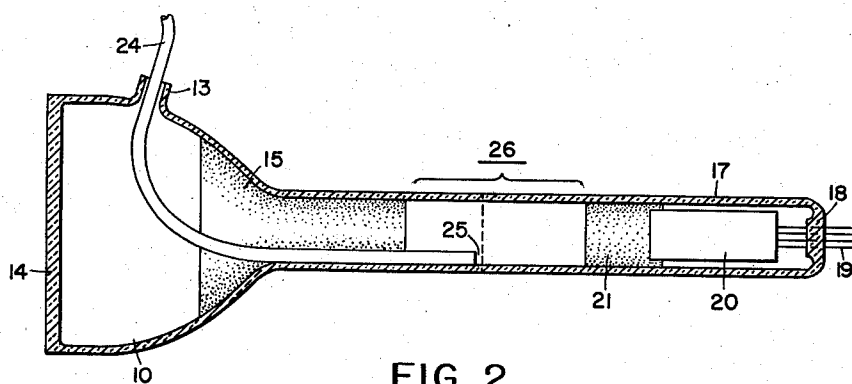


FIG. 2

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METHOD OF FABRICATING ELECTRON DISCHARGE DEVICES

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2 Claims. (Cl. 29—25.13)

This invention relates to improvements in the manufacture of internally coated envelopes for electron discharge devices and is especially concerned with envelopes comprising two major sections which are sealed together to form a single envelope and in which a continuous internal coating is required to extend from one portion to the other of the envelope.

Although the present invention is described with specific relation to the manufacture of an internally coated envelope for a cathode-ray tube, it will be appreciated by those skilled in the art that the method according to the invention may have application in the manufacture of other electron discharge devices having internal coatings.

It is found convenient in the manufacture of certain types of cathode-ray tube to form the envelope in two parts, a bulb portion containing a member which in operation will be scanned by a cathode ray beam and a neck portion containing an electron gun for generating a cathode ray beam. The scanned member and the electron gun are formed or assembled separately in their respective envelope portions and the two portions are sealed together to form a single envelope before the tube is evacuated. In the majority of such cathode ray tubes it is necessary to provide a continuous conductive coating upon the inner wall of the envelope extending from within the neck portion to within the bulb portion, and it is often advantageous that the coating be terminated at desired distances from the extremities of the two portions.

In the repair or salvage of electron discharge devices, the same requirements are presented. For example, when the electron gun of a cathode ray tube proves defective, it is desirable to cut away the neck section of the tube envelope and replace it entirely with a new envelope section containing a usable gun. It is then necessary to provide an internal coating interconnecting the two tube sections. In both instances a difficulty arises, since if each of the two envelope sections is provided with an appropriate internal coating and the two sections are then sealed together the coating in the vicinity of the seal is usually destroyed or damaged by the heat necessary for the sealing operation.

It is an object of the invention, therefore to provide a new and improved method of fabricating an internally-coated envelope for an electron discharge device where that envelope is formed by joining two individual envelope sections.

It is a more specific object of the invention to provide a new and improved method of coating the internal surface of an electron discharge device envelope comprising two individual sections after those sections have been sealed to each other.

It is another object of the invention to provide a new and improved method of fabricating an internally-coated electron discharge device envelope which inherently avoids damage to the internal coating due to sealing operations.

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The invention is thus directed to a method of fabricating an internally-coated envelope for an electron discharge device where the envelope initially comprises two individual sections having mating open ends each provided with an internal electrically conductive coating extending to within a predetermined distance of the mating end. In accordance with the invention, the method comprises the following steps in sequence. First, the mating ends of the two envelope sections are sealed to each other to form a complete envelope having a pair of end walls joined by a side wall. A predetermined quantity of a liquid electrically conductive coating material is then introduced through the side wall and flowed onto the inner side wall surface of the envelope in the region adjacent the junction between the two sections. Thereafter, the envelope is rotated about an axis extending between the end walls to distribute the coating material upon the inner walls of the envelope adjacent the junction of the envelope sections to form a continuous coating extending across the envelope section junction and into contact with the previously applied coatings of the envelope sections.

The features of the invention which are believed novel are set forth with particularity in the appended claims. The organization and manner of the operation of the invention, together with further objects and advantages thereof, may best be understood by reference to the following description taken in conjunction with the accompanying drawing in which:

Figure 1A shows a first envelope section for a cathode-ray tube;

Figure 1B illustrates a second envelope section for a cathode-ray tube which may be joined to the section shown in Figure 1A to complete the tube; and

Figure 2 illustrates the method of carrying out the present invention in the manufacture of a cathode-ray tube from the components shown in Figures 1A and 1B.

Figure 1A shows the bulb portion of a cathode-ray tube, comprising a glass envelope section 10 which is reduced to form a neck 12 of desired diameter and is provided with an exhaust tubulation 13. The flat end 14 of the bulb has been provided in known manner with a luminescent screen and the shaded portion 15 of the envelope is coated with colloidal carbon deposited in known manner from a suspension. A portion 16 of neck 12 is free from deposited carbon to avoid the deleterious action of heat upon the layer during sealing.

Figure 1B shows a tubular glass envelope section 17 provided at one end with a press 18 through which pass leads 19 connected with a conventional electron gun 20. The shaded part 21 of envelope section 17 is coated with colloidal carbon and the part 22 left free of any deposit. The diameter of the open end 23 of the envelope section 17 is the same as that of the neck end 12 of bulb section 10.

To complete the cathode-ray tube the two envelope sections 10, 17 are mounted coaxially in a known type of glass-working lathe (not shown) with their open ends adjacent and these ends are then sealed together by known techniques to yield a complete but unevacuated cathode-ray tube as shown in Figure 2.

In accordance with the present invention a rubber or other appropriate flexible tube 24 is now introduced through exhaust tubulation 13 and manipulated so that its open end 25 reaches to about the center of the uncoated area 26 of the envelope which surrounds the seal between the two envelope portions 10, 17. An appropriate quantity of a suspension of colloidal graphite is now introduced through tube 24 into the envelope, the flexible tube is removed and the envelope is rotated about its axis to distribute the coating material sufficiently

evenly over the hitherto uncoated area 26 of the tube envelope. The coating material should be sufficient in quantity to cover the entire surface of area 26 and provide good electrical contact with the previously-applied coatings 15 and 21; any excess material merely forms an additional layer upon coatings 15 and 21. The speed of rotation is not particularly critical; it may for example, be of the order of 60 revolutions per minute.

When the coating material has dried sufficiently the complete cathode-ray tube may be connected to a pumping system by means of exhaust tubulation 13 and evacuated in known manner. Drying of the coating medium may be accelerated by passing dry gas through the envelope by means of a tube inserted similarly to tube 24, or by connecting the exhaust tubulation to a rough vacuum line independent of the vacuum system used for the final exhausting process.

Thus by the use of the present invention a continuous carbon coating is obtained extending from a desired part of one of the two initially separate envelope sections over the seal between the two portions and terminating at a desired part of the other of the two sections.

Where the axial extent of a coating is not required to be accurately controlled the present invention may be employed to provide the whole of the internal coating on at least one of the envelope sections, but it will usually be more convenient to apply any desired coating to within a short distance of the seal before the envelope sections are assembled together.

Although the coating material referred to in the specific description of the invention is colloidal carbon the invention is not limited to the use of this material nor does it relate solely to the manufacture of cathode-ray tubes as it may equally well be applied in the formation of continuous layers of other materials, or in other types of electron discharge device. For example, by the use of metallic paints other kinds of conductive layer may be applied to the envelopes of electron discharge devices; or suspensions of other materials, for example luminescent powders, in appropriate binding media, may be used to provide coatings of a desired nature in for example, tubular lamps containing an internal coating of material excited by a gas discharge.

While particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention in its broader aspects, and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of the invention.

We claim:

1. The method of fabricating an internally-coated envelope for an electron discharge device, said envelope initially comprising two individual envelope sections having mating open ends and each provided with an internal electrically conductive coating extending to within a predetermined distance of said mating end, said method comprising the following steps in sequence: sealing said mating ends of said two envelope sections to each other to form a complete envelope having a pair of end walls joined by a side wall; introducing through said side wall and flowing onto the inner sidewall surface of said envelope, in the region adjacent the junction between said two sections, a predetermined quantity of a liquid electrically conductive coating material; and rotating said envelope about an axis extending between said end walls to distribute said coating material upon the internal walls of said envelope adjacent said junction of said envelope sections and form a continuous coating extending across the junction of said envelope sections into contact with the previously applied coatings of said envelope sections.

2. The method of manufacturing a cathode-ray tube comprising a first envelope section including an exhaust tubulation and a target to be scanned by an electron beam and a second envelope section containing an electron gun for generating an electron beam, said two envelope sections initially having mating open ends and each being provided with an internal electrically conductive coating extending to within a predetermined distance of said mating end, said method comprising the following steps in sequence: sealing said mating ends of said two envelope sections to each other to form a complete envelope having a pair of end walls joined by a side wall, said exhaust tubulation being in said side wall; introducing through said exhaust tubulation a predetermined quantity of a liquid electrically conductive coating material and flowing said material onto the inner side wall of said envelope in the region adjacent the junction between said two envelope sections; and rotating said envelope about an axis extending between said end walls to distribute said coating material and form a continuous coating on the internal surface of said envelope extending across the junction of said envelope sections and into electrical contact with the previously-applied coating in each of said envelope sections.

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