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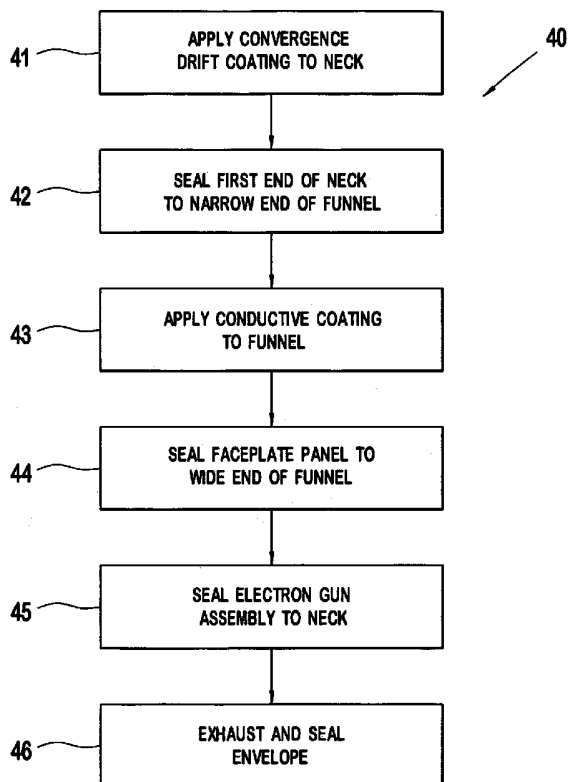
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(54) Title: METHOD FOR APPLYING A CONVERGENCE DRIFT COATING TO A NECK OF A CATHODE RAY TUBE



(57) Abstract: In a method for applying a convergence drift coating (17) to a cathode ray tube (1), the convergence drift coating is applied to a neck (4). A first end (27) of the neck is sealed to a narrow end (30) of a funnel (50) after having applied the convergence drift coating to the neck. A conductive coating (15) is applied to an internal surface (32) of the funnel so that the conductive coating contacts the convergence drift coating. The wide end (29) of the funnel is sealed to a panel (3) having a luminescent screen (12) to form an envelope (2). An electron gun assembly (13) is sealed to the neck. The envelope is then exhausted and sealed to form the cathode ray tube.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

METHOD FOR APPLYING A CONVERGENCE DRIFT COATING TO A NECK OF A CATHODE RAY TUBE

Field of the Invention

5 The invention relates to a method for making a cathode ray tube and, more particularly, to a method for applying a convergence drift coating to a neck of a cathode ray tube.

Background of the Invention

10 To prevent convergence drift within a cathode ray tube (CRT), it is known to coat an internal surface of a neck of a funnel with a convergence drift coating. Examples of convergence drift coatings are disclosed in U.S. Pat. No. 6,515,411 to Bae and U.S. Pat. No. 6,406,742 to Hasegawa et al. There are several known methods for applying the convergence drift coating. In a first method, a conductive coating is applied to the internal surface of the
15 neck. The convergence drift coating is then brushed, sprayed, or flowed onto the internal surface of the neck such that it contacts the conductive coating. If the conductive coating is not dry when the convergence drift coating is applied, the conductive coating will mix with the convergence drift coating, which causes smearing. To ensure that the conductive coating is dry before applying the convergence drift coating, the conductive coating is usually cured at
20 a temperature of about 400 degrees Celsius. This requires an additional heating step, which is costly and requires additional handling.

 In a another method, the convergence drift coating is brushed, sprayed, or flowed onto the internal surface of the neck after a faceplate panel has been sealed by a glass frit to the funnel. Because the convergence drift coating is applied after the faceplate panel has been
25 sealed to the funnel, special equipment must be used to apply the convergence drift coating

through an end of the neck. Additionally, spraying or flowing the convergence drift coating increases the probability of unwanted particles being trapped in the CRT. Therefore, a method of manufacturing a CRT which eliminates the probability of unwanted particles being trapped in the CRT 1 is needed.

5

Summary of the Invention

In a method for applying a convergence drift coating to a cathode ray tube, the convergence drift coating is applied to a neck. A first end of the neck is sealed to a narrow end of a funnel after having applied the convergence drift coating to the neck. A conductive
10 coating is applied to an internal surface of the funnel so that the conductive coating contacts the convergence drift coating. The wide end of the funnel is sealed to a panel having a luminescent screen to form an envelope. An electron gun assembly is sealed to the neck. The envelope is then exhausted and sealed to form the cathode ray tube.

15

Brief Description of the Drawings

The invention will now be described by way of example with reference to the accompanying drawings, wherein:

Figure 1 is a cross sectional view of a cathode ray tube;

Figure 2 is an exploded cross-sectional view of a neck and a funnel of the cathode ray
20 tube; and

Figure 3 is a flowchart of a method for manufacturing the cathode ray tube.

Detailed Description of the Invention

Figure 1 shows a cathode ray tube (CRT) 1 having a glass envelope 2 comprising a
25 rectangular faceplate panel 3 and a tubular neck 4 connected by a funnel 5. The faceplate

panel 3 consists of a viewing faceplate 8 and a peripheral flange or sidewall 9 sealed to a wide end 29 of the funnel 5 by a glass frit 7. A three-color phosphor screen 12 is carried by an inner surface of the faceplate panel 3. The screen 12 may be, for example, a line screen of phosphor lines arranged in triads. A mask support frame assembly 10 is removably mounted
5 in predetermined spaced relation to the screen 12.

The neck 4 has a first end 27 sealed to a narrow end 30 of the funnel 5. A glass mount 16 containing an electron gun assembly 13 is centrally mounted within the neck 4. The electron gun assembly 13 can comprise three cathodes (not shown) arranged at a second end 28 of the neck 4. The electron gun assembly can comprise first, second, third, and fourth
10 electrodes 21, 22, 23, 24, respectively are arranged at predetermined locations between the cathodes (not shown) and the first end 27 of the neck 4. The third and fourth electrodes 23, 24 can form a main lens 25. Although four electrodes are described herein, the invention is applicable to CRTs 1 having electron gun assemblies 13 having more or less electrodes. Adjacent to the main lens 25 is a shielding cup 26. The electron gun assembly 13 can
15 generate and direct three inline electron beams, a center beam 18 and two side or outer beams 19, 20, along convergent paths through the first, second, third, and fourth electrodes 21, 22, 23, 24, the shielding cup 26, and the mask frame assembly 10 to the screen 12. An external magnetic deflection yoke 14 is arranged near the first end 27 of the neck 4 and the narrow end 30 of the funnel 5. When activated, the yoke 14 subjects the three beams to magnetic fields
20 that cause the center beam 18 and outer beams 19, 20 to scan horizontally and vertically in a rectangular raster over the screen 12.

As best shown in Figure 1, the neck 4 has a convergence drift coating 17 on an internal surface 31 thereof that extends from the second end 28 of the neck 4 adjacent to the main lens 25. Fig. 2 shows the convergence drift coating 17 on the internal surface 31 of the funnel 5
25 with the electron gun assembly 13 and panel 3 omit. The convergence drift coating 17 may

consist of, for example, chromium oxide, manganese oxide, tin oxide, or tantalum carbide and a binder consisting of, for example, an inorganic silicate, such as, potassium silicate, or a glass frit. The funnel 5 has a conductive coating 15 on an internal surface 32 thereof that extends from an anode button 6 toward the faceplate panel 3 and into the neck 4. The conductive coating 15 contacts the convergence drift coating 17 and overlaps a portion of a top surface 33 of the convergence drift coating 17 near the second end 28 of the neck 4. A method of manufacturing the CRT 1 will now be described in greater detail with reference to flowchart 40 shown in Figure 3. In step 41, the convergence drift coating 17 is applied to the internal surface 31 of the neck 4. The convergence drift coating 17 may be applied by, for example, by brushing, swabbing, or dipping, and extends from the first end 27 of the neck 4 toward the second end 28. Examples of formulations which can be applied to the funnel to form convergence drift coatings include the following:

Example 1: Manganese Oxide:

7.65 $\pm$ 1.53 wt. % manganese oxide powder;

15 68.82 $\pm$ 13.76 wt. % glass frit;

0.020 $\pm$ 0.004 wt. % acrylic resin; and

23.51 $\pm$ 4.70 wt. % alcohol or ketone or mixture thereof.

Example 2: Tin oxide:

20 50 $\pm$ 10 wt. % aqueous tin oxide colloidal dispersion and

50 $\pm$ 10 wt. % aqueous potassium silicate solution.

Example 3: Tantalum carbide:

40.81 $\pm$ 8.16 wt. % tantalum carbide;

25 40.81 $\pm$ 8.16 wt. % glass frit;

0.030 $\pm$ 0.006 wt. % acrylic resin; and

18.35 $\pm$ 3.67 wt. % alcohol or ketone or mixture thereof.

Example 4: Chromium oxide:

22.22 $\pm$ 4.44 wt. % chromium oxide;

5 44.44 $\pm$ 8.88 wt. % glass frit;

0.030 $\pm$ 0.006 wt. % acrylic resin; and

33.31 $\pm$ 6.65 wt. % alcohol or ketone or mixture thereof.

In step 42, the first end 27 of the neck 4 is sealed to the narrow end 30 of the funnel 5.

10 The neck 4 may be sealed to the funnel 5 by known means, for example, by heating the first end 27 of the neck 4 and the narrow end 30 of the funnel 5 at a temperature of about 450-500 degrees Celsius. The heat from the sealing process simultaneously cures the convergence drift coating 17 as the neck 4 is being sealed to the funnel 5.

After sealing the neck 4 to the funnel 5, the funnel 5 is typically washed. The method
15 of washing the funnel 5 is known in the art and will not be described in further detail herein.

In step 43, the conductive coating 15 is applied to the internal surface 32 of the funnel 5. The conductive coating 15 is applied by known methods and is applied from the wide end 29 of the funnel 5 to the first end 27 of the neck 4. The conductive coating 15 contacts the convergence drift coating 17 and overlaps a portion of a top surface 33 of the convergence
20 drift coating 17 near the second end 28 of the neck 4.

In step 44, the faceplate panel 3, which has a screen 12 and the mask support frame assembly 10 therein, is aligned with the funnel 5 and sealed to the funnel 5 at the wide end 29 by melting the glass frit 7. In step 45, the electron gun assembly 13 is aligned and permanently mounted in the neck 4 of the funnel 5 using known methods. The electron gun
25 assembly 13 is aligned and mounted in the neck 4 such that the main lens 25 is positioned

adjacent to the convergence drift coating 17. In step 46, the envelope 2 is evacuated and hermetically sealed to form the CRT 1 using known methods.

The method of manufacturing the CRT 1 according to the invention thereby eliminates the probability of unwanted particles being trapped in the CRT 1 and uses a single heating
5 operation to cure the convergence drift coating and seal the neck 4 to the funnel 5. The cost and amount of time required to manufacture the CRT 1 can therefore be kept at a minimum by using this method.

The foregoing illustrates some of the possibilities for practicing the invention. Many other embodiments are possible within the scope and spirit of the invention. For example, in
10 one embodiment the convergence drift coating 17 can be cured during cold neck seal. The convergence drift coating 17 could then be cleaned during a suitable funnel wash. There is a low probability of smearing the coating with conventional funnel cleaning. With such an application and cleaning, the convergence drift coating 17 can have a well-defined line of demarcation and exhibit good high voltage stability characteristics.

15 It is, therefore, intended that the foregoing description be regarded as illustrative rather than limiting, and that the scope of the invention is given by the appended claims together with their full range of equivalents.

What is Claimed is:

1. A method for manufacturing a cathode ray tube, comprising the steps of:
 - applying a convergence drift coating to a neck;
 - sealing a first end of the neck to a narrow end of a funnel after having applied
 - 5 the convergence drift coating to the neck;
 - applying a conductive coating to an internal surface of the funnel so that the conductive coating contacts the convergence drift coating;
 - sealing the wide end of the funnel to a faceplate panel having a luminescent screen to form an envelope;
 - 10 sealing an electron gun assembly to the neck; and
 - exhausting and sealing the envelope.
2. The method of claim 1, further comprising simultaneously curing the convergence drift coating while sealing the first end of the neck to the narrow end of the funnel.
3. The method of claim 1, wherein the electron gun is sealed to the neck such that a main
- 15 lens of the electron gun is arranged adjacent to the convergence drift coating.
4. The method of claim 1, wherein the conductive coating overlaps a portion of a top surface of the convergence drift coating
5. The method of claim 1, wherein the convergence drift coating contains chromium oxide, manganese oxide, tin oxide, or tantalum carbide.
- 20 6. The method of claim 5, wherein the convergence drift coating contains an inorganic silicate or a glass frit.
7. The method of claim 6, wherein the convergence drift coating contains an inorganic silicate potassium silicate.
8. The method of claim 1, wherein the convergence drift coating contains an inorganic
- 25 silicate or a glass frit.

9. The method of claim 1, wherein the convergence drift coating is applied by brushing, swabbing, or dipping
10. A method for forming a funnel of a cathode ray tube, comprising the steps of:
 - applying a convergence drift coating to a neck;
 - 5 sealing a first end of the neck to a narrow end of a funnel after having applied the convergence drift coating to the neck; and
 - applying a conductive coating to an internal surface of the funnel so that the conductive coating contacts the convergence drift coating.
11. The method of claim 11, further comprising simultaneously curing the convergence drift
10 coating while sealing the first end of the neck to the narrow end of the funnel.
12. The method of claim 11, wherein the conductive coating overlaps a portion of a top surface of the convergence drift coating
13. The method of claim 11, wherein the convergence drift coating contains chromium oxide, tantalum carbide, tin oxide, or manganese oxide.
- 15 14. The method of claim 11, wherein the convergence drift coating contains potassium silicate.
15. The method of claim 13, wherein the convergence drift coating contains an inorganic silicate or a glass frit.
16. The method of claim 13, wherein the convergence drift coating contains an inorganic
20 silicate or a glass frit.
17. The method of claim 11, wherein the convergence drift coating is applied by brushing, swabbing, or dipping

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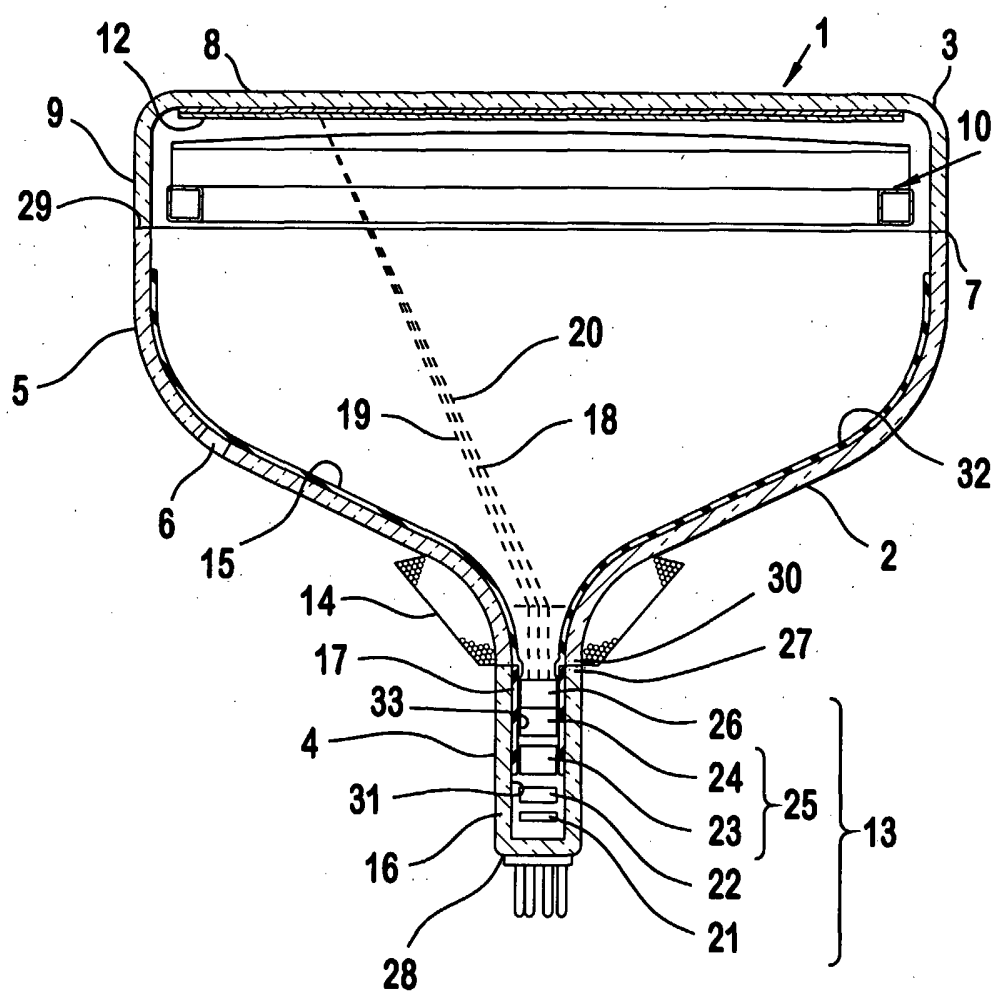


FIG. 1

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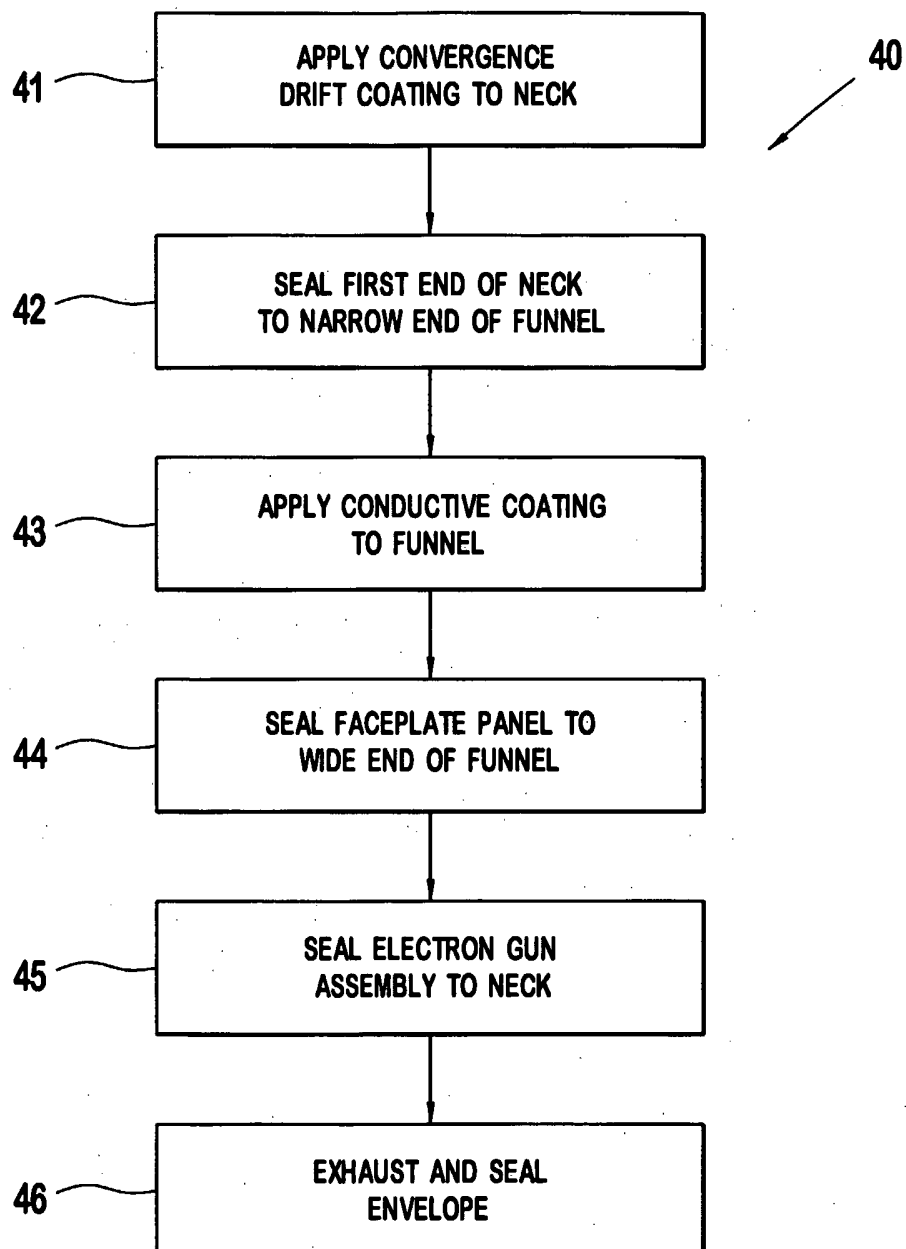


FIG. 3

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US2004/037146

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01J29/88 H01J9/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 515 411 B1 (BAE MIN-CHEOL) 4 February 2003 (2003-02-04) cited in the application the whole document	1-17
A	US 6 406 742 B1 (HASEGAWA TAKAHIRO ET AL) 18 June 2002 (2002-06-18) cited in the application the whole document	1-17
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☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 12, 29 October 1999 (1999-10-29) -& JP 11 195389 A (TOSHIBA CORP), 21 July 1999 (1999-07-21) abstract; figures 1-14 -----	1-17

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