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(54) **A method of coating an end cap of a fragment retention lamp, apparatus therefor, and lamp manufactured thereby**

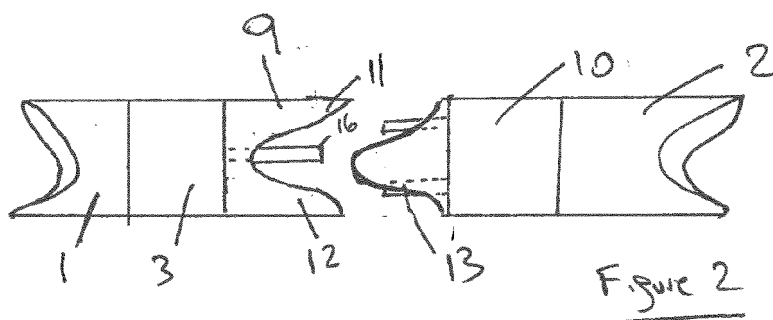
(57) A method of coating an end cap of a fragment retention lamp, comprising the steps of:

- Dividing a continuous coating arranged about a first lamp (1) and a second lamp (2), whereby said division is located between one end of said first lamp and a neighbouring end of said second lamp; wherein a flap portion (11,12) formed by dividing said coating extends beyond

an end cap (3) located at said first end of said first lamp (1); and

- Arranging said flap portion (11,12) over a centre portion of an end face of said end cap (3).

The application further concerns an apparatus for carrying out the method, and a lamp manufactured thereby.



Description

Field of the Invention

[0001] The invention relates to methods for coating electrical lamps, and in particular to fragment retention lamps.

Background of the Invention

[0002] The closest prior art is the Applicant's own process of coating fluorescent tubes with a plastics film, so that if the tube shatters in use, the plastics film retains all of the glass fragments.

[0003] There are a number of methods which utilise a shroud which covers the metallic end cap of a fragment retention lamp. The protective shroud is typically placed over contact pins of the lamp, whereby the pins protrude through the body of the shroud. A continuous film coating is then applied to both the light emitting outer surface of the lamp and the shroud. Or, alternatively the continuous film coating is applied to the light emitting outer surface of the lamp and its associated end caps. The protective shrouds are then located over the end caps of the lamp and directly attached to the coating of the lamp.

Problem to be Solved

[0004] The problem of the fragment retention lamp is that if the lamp hits the ground and shatters, glass fragments or debris may become separated from the fragment retention lamp. This may result in the glass fragments or debris protruding through the centre of one of the lamp's end caps.

[0005] The invention, by coating the lamp with a suitable plastics material, which has extending flat portions that are arranged over the centre portions of the end caps, seeks to solve this problem.

Summary of the Invention

[0006] In a first broad independent aspect, the invention provides a method of coating an end cap of a fragment retention lamp, comprising the steps of:

- Dividing a continuous coating arranged about a first lamp and a second lamp, whereby said division is located between one end of said first lamp and a neighbouring end of said second lamp; wherein a flap portion of said coating extends beyond an end cap located at said first end of said first lamp; and
- Arranging said flap portion over a centre portion of an end face of said end cap.

[0007] This configuration provides the advantages of:

- Providing a simple and cost effective means of enclosing the end cap portions of the lamp with portions

of the continuous coating applied to the lamp.

- The use of the coating portions to enclose the end caps of the lamp, eliminates the requirement of any additional components to enclose the ends of the lamp, such as protective shrouds.
- The use of the continuous coating to enclose the ends of the lamp, enables high speed, high volume production of the lamps without any intermediary assembly operations.
- Provides a means of reducing the size and mass of each end of the lamp, because no other components are required to enclose the end face of each end cap.

[0008] Preferably, a method of coating an end cap of a fragment retention lamp further comprising the additional step of forming a second flap portion of coating which extends beyond said end cap located at said first end of said first lamp. This provides a means of covering an increased surface of the end face surface of the end cap, which prevents glass fragments or debris from escaping the covered end face of the cap.

[0009] Preferably, a method of coating an end cap of a fragment retention lamp further comprising the additional step of arranging said second flap portion over said centre portion of said end face and said flap portion. It provides a means for a more effective closure of the coating about an end cap, whereby the second flap portion cooperates with the first flap portion to provide a means of augmenting the central covering, which prevents sharp glass fragments from cutting through the two enclosing flap portions.

[0010] Preferably, a method of coating an end cap of a fragment retention lamp further comprising the additional step of applying an adhesive material to the inner surface said second flap portion and / or said flap portion. This provides a means of fixing the portions of coating in the desired position, whilst cooperating with each other and against the end face of an end cap.

[0011] Preferably, a method of coating an end cap of a fragment retention lamp further comprises the additional step of forming a portion of coating which extends about and beyond an outer edge of said end face of said end cap, wherein said portion is arranged against said end face. This configuration prevents the movement of glass fragments or debris between the layer of coating and the outer surface of the lamp and/or end cap so that they cannot protrude from or exit the lamp.

[0012] In a second broad independent aspect, the invention provides an apparatus for coating an end of a fragment retention lamp, comprising:

- a means for dividing a continuous coating arranged about a first lamp and a second lamp, whereby said division is located between one end of said first lamp and a neighbouring end of said second lamp; wherein a flap portion of said coating extends beyond an end cap located at said first end of said first lamp; and
- a means for arranging said flap portion over a centre

portion of an end face of said end cap.

[0013] Preferably, said means for dividing said coating is a laser cutting means. This provides a means for accurately dividing the continuous coating, which enables the separation of the two lamps.

[0014] Preferably, said laser cutting means forms said flap in accordance to predetermined profile. This enables the laser cutter to accurately cut the coating in accordance with accurately stored or loaded profiles which can be either automatically or manually selected.

[0015] Preferably, said predetermined profile parabola shaped. This configuration provides the coating portion with the maximum surface area coverage at its base and providing coverage by its elongated end portion, which is located over the central portion of the end face of the cap, in between the two electrical contact pins of the lamp.

[0016] Preferably, a fragment retention lamp obtained from said method stated above.

[0017] Preferably, a fragment retention lamp manufactured by said apparatus stated above.

[0018] In a third broad independent aspect, the invention provides a fragment retention lamp, comprising a comprising a continuous coating along its length; said coating incorporates a flap portion that extends beyond an end cap located at one end of said lamp, which in use, is arranged over a centre portion of an end face of said end cap.

Brief Description of the Drawings

[0019]

Figure 1 shows a side view of two continuously coated lamps being divided by a laser.

Figure 2 shows a side view of the separation of two coated lamps.

Figure 3 shows an end portion of a coated lamp with an extended flap portion.

Figure 4 shows an end portion of a coated lamp with two flap portions arranged about the end cap of a coated lamp.

Figure 5 shows an end view of the lamp with two flap portions arranged over the end face of the end cap.

Detailed Description of the Figures

[0020] Figure 1 shows two fluorescent tube lamps 1 and 2 axially arranged end to end, whereby an end cap 3 of the first lamp 1 is arranged in close proximity to an end cap 4 of the second lamp 2. A linking member 5 is arranged between the two lamps 1 and 2, which links the two lamps 1 and 2 together in a continuous cylinder con-

figuration. A continuous coating 6 is applied to the outer surface of the two lamps 1 and 2, and the linking member 5. The coating is a continuous plastics film coating applied to the lamps 1 and 2 by a cross head application process.

[0021] Once the coating of tubes 1 and 2 has been completed a laser cutting means 7 emits a cutting laser beam 8 onto the coating 6 that extends across the link member 5, located between the two lamps 1 and 2. The laser cutting means 7 incorporates information/program that is indicative of a predetermined profile which is used to cut the coating 6. The profile of the laser cut provides two engaged parabola-shaped end portions 9 and 10. Both of the parabola shaped end portions 9 and 10 are rotated 180 degrees in relation to other.

[0022] Figure 2 shows the separation of the two lamps 1 and 2 whereby the link device 5 has been removed and the profiles of the two end portions 9 and 10 of the coating are rotated by 180 degrees in relation to each other. Lamp 1 shows two flap portions 11 and 12 arranged within the coating 6, and lamp 2 shows a flap portion 13 arranged within coating 6. The flap portion 13 is the inverse of flap portions 11 and 12.

[0023] Figure 3 shows an end portion 9 of the lamp 1 whereby the coating portion 12 has been folded over, against the end face surface 15 of the end cap 3. The electrical connect pins 16 of the lamp 1 are shown to be extending from the folded portion 12. The second portion 11 is shown to be extending from the end face surface 15 of the end cap 3.

[0024] Figure 4 shows the lamp 1 whereby the second portion of coating 11 is folded over the folded first portion of coating 12. The second portion of coating 11 overlays the first portion 12 and allows the electrical contact pins 16 to protrude from the end cap 3 and from the folded portions of coating 11 and 12 folded over/ arranged about the end face 14 of the end cap 3. The first and second portions form a multi-layered coating which retains any fragments of broken glass. This is due to the increased thickness and therefore the increased mechanical strength of the multi-layered coated, which resists the sharp edges of the glass fragments.

[0025] Further the first portion is retained in its folded position, over the face of the end cap, by the position of the folded second portion.

[0026] Figure 5 shows an end view of the enclosed end cap 3 of the fragment lamp 1 whereby the first portion 12 of coating 6 has been folded over the centre portion of the end face 15 of the end cap 3 and a second portion of coating 11 has been folded over the top of the first portion of coating 12 and is laying directly across the centre portion of the end cap 3, between the two electrical contact pins 16.

[0027] In use, the arranged flat portions of the coating prevent any chards from escaping the fragment retention lamp through the centre portion of the end cap. This is of great of great concern as slithers of glass or debris may protrude through the end portion if the lamp is

dropped and or shatters; this is particularly relevant in a clean room environment such as food or drug processing facilities.

[0028] In an alternative embodiment of the invention a protrusion of coating may extend about the outer edge of the end face, which is the subsequently be folded over the outer edge of the end cap and against the end face of the end cap to form a bevelled edge; therefore preventing any glass fragments or debris from escaping the lamp, by limiting their movement between the coating and the end cap.

[0029] In an alternative embodiment of the invention the flap portions of coating that have been folded over and re-arranged against the end face of the end cap may incorporate an adhesive substance on each of the inner surfaces of the flaps that allows the flaps to be formed and held flat against the end cap's end face therefore preventing the coating portion from springing back into the original positions.

[0030] In an alternative embodiment of the invention a hot air device may be used to soften the continuous plastics coating which surrounds the lamp so that when the flaps and/or bevelled edge are formed and pushed into the position the substances will co-operate with the hot air gun and will set in position once the plastics material has cooled.

[0031] In an alternative embodiment of the invention various cutting profiles may be loaded and maintained in the memory of the cutting device which can be called upon when needed, i.e. different cutting profiles may be required for different tube diameters and flap configurations.

[0032] An embodiment of the protection of the end cap may be used which incorporates only a single flap which is folded across the centre of the end face of the end cap to prevent any chards from escaping through the centre portion of the end cap, without the use of a second flap.

[0033] The advantage of the claimed invention is to provide a means of coating a fragment retention lamp with a continuous coating, which also coats and seals the ends of the lamp to prevent the protrusions of any class fragments from the lamp's ends.

[0034] The claimed invention provides a solution to simplifying and improving the coating of a fragment retention lamp to prevent the protrusion of broken glass fragments at either end of the lamp.

Claims

1. A method of coating an end cap of a fragment retention lamp, comprising the steps of :

- Dividing a continuous coating arranged about a first lamp and a second lamp, whereby said division is located between one end of said first lamp and a neighbouring end of said second lamp; wherein a flap portion of said coating ex-

tends beyond an end cap located at said first end of said first lamp; and

- Arranging said flap portion over a centre portion of an end face of said end cap.

2. A method according to claim 1, further comprising the additional step of forming a second flap portion of coating which extends beyond said end cap located at said first end of said first lamp.

3. A method according to claim 2, further comprising the additional step of arranging said second flap portion over said centre portion of said end face and said flap portion.

4. A method according any of the preceding claims, further comprising the additional step of applying an adhesive material to the inner surface said second flap portion and / or said flap portion.

5. A method according to any of the preceding claims, further comprising the additional step of forming a portion of coating which extends about and beyond an outer edge of said end face of said end cap, wherein said portion is arranged against said end face.

6. An apparatus for coating an end of a fragment retention lamp, comprising:

- A means for dividing a continuous coating arranged about a first lamp and a second lamp, whereby said division is located between one end of said first lamp and a neighbouring end of said second lamp; wherein a flap portion of said coating extends beyond an end cap located at said first end of said first lamp; and
- A means for arranging said flap portion over a centre portion of an end face of said end cap.

7. An apparatus according to claim 6, wherein said means for dividing said coating is a laser cutting means.

8. An apparatus according to claim 7, wherein said laser cutting means forms said flap in accordance to predetermined profile.

9. An apparatus according to claim 8, wherein said predetermined profile is parabola shaped.

10. A fragment retention lamp obtained from said method according to claims 1 to 5.

11. A fragment retention lamp manufactured by said apparatus according to claims 6 to 9.

12. A fragment retention lamp, comprising a continuous

coating along its length; said coating incorporates a flap portion that extends beyond an end cap located at one end of said lamp, which in use, is arranged over a centre portion of an end face of said end cap.

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- 13.** A method of coating an end cap of a fragment retention lamp substantially as hereinbefore described and/or illustrated in any appropriate combination of the accompanying text and/or figures.

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- 14.** An apparatus for coating an end of a fragment retention lamp substantially as hereinbefore described and/or illustrated in any appropriate combination of the accompanying text and/or figures.

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- 15.** A fragment retention lamp substantially as hereinbefore described and/or illustrated in any appropriate combination of the accompanying text and/or figures.

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