United States Patent [19]

Robinson

[11] **3,810,684**

[45] **May 14, 1974**

[54] **LAMPS**

[75] Inventor: **Kenneth Buckley Robinson,** London, England

[73] Assignee: **Thorn Electrical Industries Limited,** London, England

[22] Filed: **Dec. 23, 1971**

[21] Appl. No.: **211,490**

[30] **Foreign Application Priority Data**

Apr. 14, 1971 Great Britain 9400/71
May 26, 1971 Great Britain 17290/71

[52] **U.S. Cl.** **316/4,** 29/25.13, 316/24
[51] **Int. Cl.** **H01j 9/38**
[58] **Field of Search** 316/4, 24, 31; 65/110, 65/59, 108; 29/25.2, 25.13, 25.19

[56] **References Cited**

UNITED STATES PATENTS

2,201,694	5/1940	Illingworth	316/31
2,235,515	3/1941	Carpenter	29/25.15
2,450,197	9/1948	Ishler	316/4
2,904,716	9/1959	Malm et al.	29/25.2
2,900,771	8/1959	Levand	316/31
3,073,137	1/1963	Fraser	65/108

Primary Examiner—Lowell A. Larson
Attorney, Agent, or Firm—Dike, Bronstein, Roberts & Cushman

[57] **ABSTRACT**

A method of making a lamp comprises inserting a filament assembly into a lamp envelope, and forming a pinch seal in the envelope around the lead-in conductors to the filament with a relatively small passage remaining through the seal. The atmosphere in the lamp can be dosed and pumped through the passage, and by applying pressure to the inside of the envelope during pinching through the passage the envelope can be forced against the inside of a mould. Subsequently the passage is closed.

5 Claims, 14 Drawing Figures

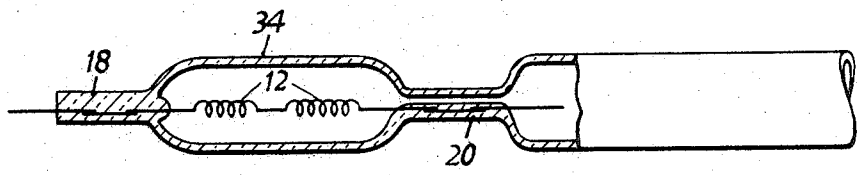


FIG. 1.

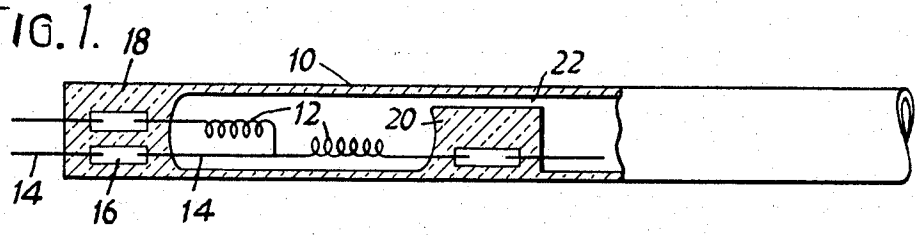


FIG. 2.

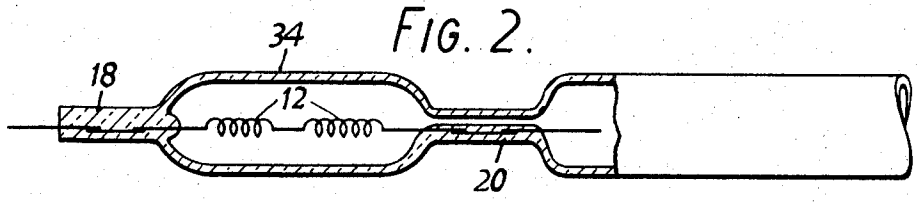


FIG. 3.

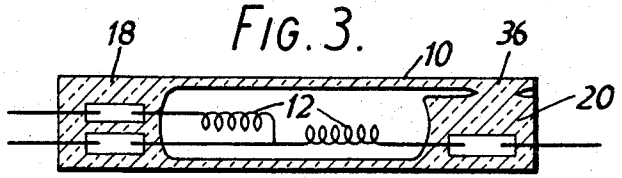


FIG. 4.

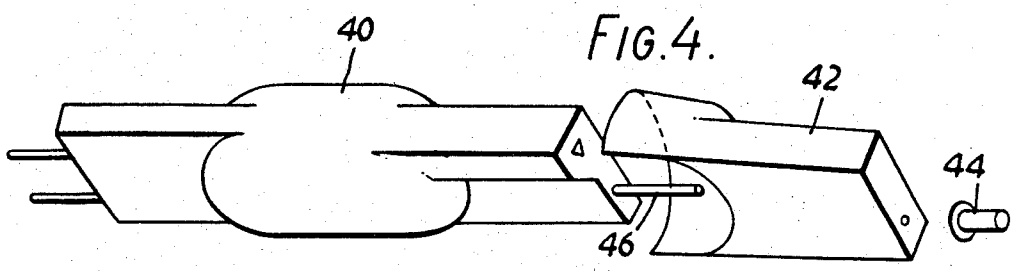


FIG. 5.

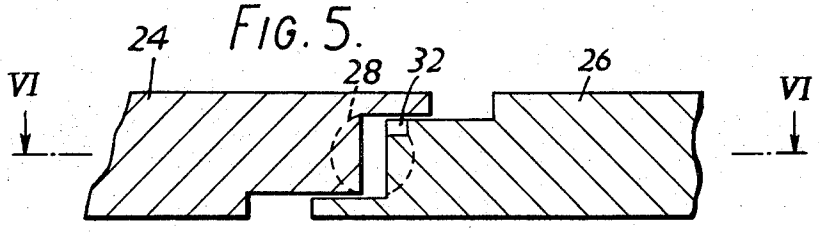


FIG. 6.

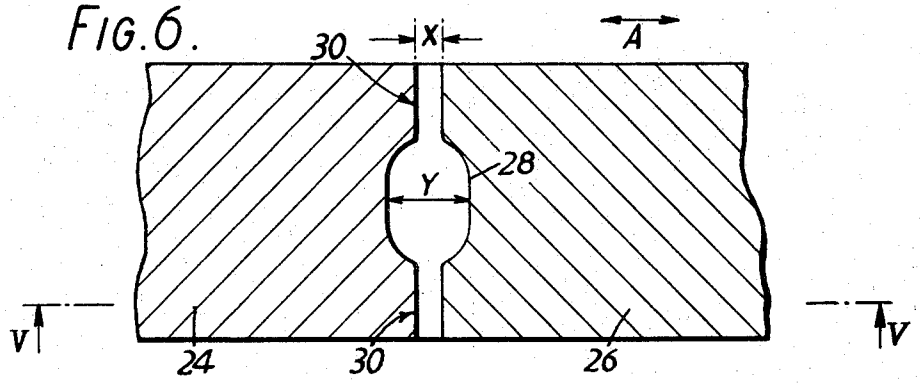


FIG. 7.

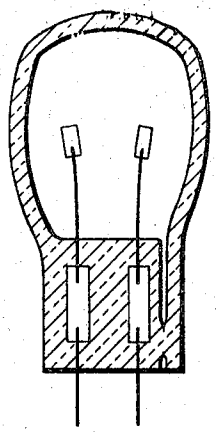


FIG. 8.

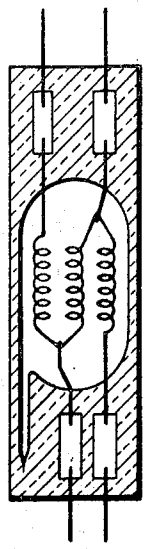


FIG. 10.

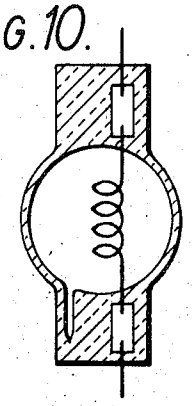


FIG. 12.

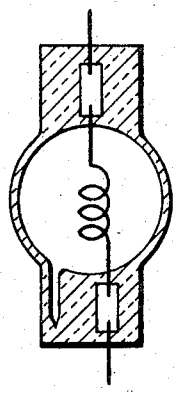


FIG. 9.

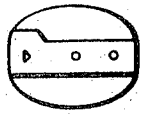


FIG. 11.

FIG. 13.

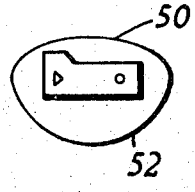
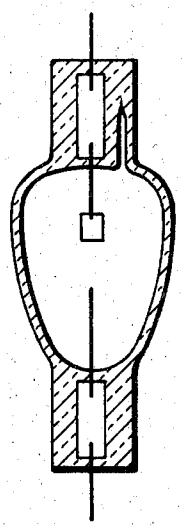


FIG. 14.



LAMPS

BACKGROUND OF THE INVENTION

This invention relates to improvements in the manufacture of lamps.

To manufacture conventional vitreous lamps a section of tube is first narrowed at one end and joined to an exhaust stem. The assembly of internal components, including the sealing foil and filament or electrodes, is loaded into the tube from the open end, and that end is then sealed while inert gas is flushed through the tube from the exhaust stem. The seal is usually formed by heating the tube and pinching its end around the foil to form a hermetically tight seal. The lamp body is then dosed and pumped through the exhaust stem. Subsequently the exhaust stem has to be tipped off close to the bulb.

In small constructions where accurate optical control is required, such as for automobile and projection applications, the resulting exhaust pip can cause unacceptable distortions, particularly in high pressure filled lamps where the bulb must be held under liquid nitrogen to "tip off," and the resulting pip is necessarily long.

Also, the manufacture requires a relatively large number of successive steps during each of which the lamp has to be mounted in a holding device. This is even more marked with double-ended lamps in which a seal has to be formed at each end of the lamp, and the exhaust stem must be joined to the side of the tube as a preliminary step. Consequently, accurate alignment of the filaments in the bulb is not easy to achieve. Furthermore the existance of the exhaust pip limits the operating pressures which can safely be used inside the lamp.

SUMMARY OF THE INVENTION

The invention has for an object the provision of a simplified and improved process for the manufacture of lamps which is not subject to the above-noted disadvantages.

The invention provides a process or method of making a lamp which comprises inserting a filament or electrode assembly having lead-in conductors into a lamp envelope. A pinch seal is formed in the envelope around the lead-in conductors with a relatively small passage remaining through the seal, and the atmosphere in the envelope is adjusted through said passage. Subsequently said passage is closed. Said step of adjusting the atmosphere in the envelope may comprise dosing and pumping of the lamp, as is done with conventional lamps. In addition by applying pressure to the inside of the bulb during pinching the envelope can be forced against the inside of a mould, so that the envelope can have a variety of shapes determined by the shape of the mould.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in more detail, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a plan view of a partially-formed double-ended filament lamp embodying the invention;

FIG. 2 is a side view of the lamp of FIG. 1;

FIG. 3 is a plan view of the finished lamp;

FIG. 4 is a perspective view of the lamp of FIG. 2 with an associated shield and contact member;

FIGS. 5 and 6 are sectional and plan view respectively of the jaws used in the manufacture of the lamp of FIG. 3;

FIG. 7 is a side view of a single-ended discharge lamp embodying the invention;

FIGS. 8 and 9 are side end views respectively of a double-ended lamp with a planar filament, and a bulb shaped to closely surround the filament;

FIGS. 10 and 11 are side and end views respectively of a double-ended projection type lamp with a bulb of elliptical cross-section to reduce distortion;

FIGS. 12 and 13 are side and end views respectively of a double-ended lamp in which the bulb acts as a reflector; and

FIG. 14 is a side view of a double-ended Xenon lamp having an isothermal bulb.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows a partially-made incandescent lamp which is formed from a section of tubing **10**. The lamp includes filaments **12**, leads **14**, and molybdenum sealing foils **16** which are all of well-known type. As can be seen in FIG. 2, two pinch seals **18** and **20** are formed in the tube **10**. The pinch seal **18** is located at an end of the tube and forms a hermetic seal at that end of the tube. The seal **20** is formed intermediate the ends of the tube and forms a hermetic seal over the greater part of the cross-section of the tube **10**. However the seal **20** is not complete, in that a small passage **22** is left unsealed which provides a connecting path between the interior of the tube between the seals **18** and **20** and the part of the tube located on the other side of the seal **20**. Each of the seals **18** and **20** surrounds and retains respective ones of the lead-in wires **14** and sealing foils **16**.

The pinch seals **18** and **20** are formed by means of the mould shown in FIGS. **5** and **6** which includes jaws **24** and **26** relatively moveable in the direction of the arrow A. A central portion **28** of the mould void is generally cylindrical, and the ends **30** of the mould serve to flatten the tube **10** to form the seals **18** and **20**. As shown in FIG. **5**, a relief in one end of the jaw **26** as indicated at **32** provides for the passage **22** through the seal **20**. It will be appreciated that either or both of the jaws **24** and **26** may be relieved in this manner.

The manufacture of the lamp shown in FIG, **1** thus proceeds as follows. The internal components are placed within the open end of the tube **10**, which is positioned between the jaws **24** and **26**. While the internal components are held in their desired positioned, the seal areas are heated to plasticity and the jaws **24** and **26** are brought together to form the seal **18**, and the seal **20** with the passageway **22**.

Then, dosing with halogen in solvent, or mercury or gas flushing can be carried out, as required, by the insertion of a hypodermic needle down the passage **22** into the now-formed envelope **34** of the lamp. Subsequently the exhaust or filling operation takes place, in which the remainder of the tube **10** acts as an exhaust tube. After this step the lamp bulb may be force cooled, for example by immersing in liquid nitrogen, to fill the envelope under pressure, while still allowing a sealing off operation to close the passage **22** at **36**, for example by means of a so-called small pin fire, this being a small,

intense flame the diameter of which is of the order of that of a pin. The exhaust tube is removed from the pump compression head and the lamp cut or broken off from the excess tube to leave the finished lamp as shown in FIG. 3.

Mercury lamps are not, in general, pressure filled and to avoid any possible retention of mercury in the passage 22, the passage 22 is preferably sealed close to its inner end in such bulbs. During all these operations the sealing foils 16 and lead wires 14 in close proximity to the seal off point are fully protected against oxidisation by being enclosed within the exhaust tube.

Thus it can be seen that a pinch mechanism is used to mould a complete lamp in one operation from a straight length of tube, the excess piece of tube subsequently acting as exhaust stem. Thus no tubulation or working operations are needed. Since basically the manufacture is a one-step operation, high dimensional accuracy and high productivity can be achieved.

FIG. 4 shows the finished lamp 40 of FIG. 3 for use as a twin-filament automobile lamp having a bulb contoured to fit a metal shield 42 for dipped beam light control. An eyelet 44 is fixed over the lead 46 to attach the shield 42 over the lead.

If the whole envelope is heated, as an additional step, during the pinching operation the interior of the envelope 34 may be subjected to pressure to blow the envelope 34 out to fill the central mould cavity 28. In this way various bulb shapes can be achieved with high accuracy of bulb dimensions. Some examples of blown bulbs are shown in FIGS. 7 to 14.

FIG. 7 shows a single-ended discharge lamp with a single pinch seal.

FIGS. 8 and 9 illustrate a double-ended bulb with a flat grid filament and a flattened tubular cross-section of the bulb around the filament. The small bulb volume obtained permits high operating pressures and hence improved life.

The bulb of FIGS. 10 and 11 has an elliptical cross-section around the filament, to reduce distortion in a projection application, while that of FIGS. 12 and 13 is flattened on one side 50 of the bulb to reduce distortion, the other side 52 being spherical or paraboloidal and acting as a reflector or shield.

FIG. 14 shows an isothermal bulb for a mercury or Xenon compact source discharge lamp.

As these techniques may conveniently be incorporated on the exhaust machine an improvement in quality can also be achieved. The assembly may be held in the exhaust head during pinching while clean gas is flushed through the tube. On sealing, exhausting can commence immediately before the bulb and seals cool appreciably enabling "outgassing" to take place at temperatures higher than can be achieved by conventional methods.

The single operation of moulding the bulb and seals around the internal components can produce a high accuracy of registration of the filament with respect to the pinch. This is particularly so if the lead-in conductors are of the type described in U.S. application Ser. No. 135,002 filed 19, 1971, and the filament is as described in U.S. application Ser. No. 165,516 filed July 26, 1971, both said applications being assigned to the assignee of the present application. This is because filament or lead wires of rectangular section can be expected to remain in more accurate axial and linear alignment than round wires. If such a bulb is used as a sub-assembly in the manufacture of sealed beam lamps, accurate alignment may be attained by simple clips onto the pinch seals.

The moulding of the bulb shape and pinch seal produces high accuracy in the internal diameter of the bulb, despite variations of wall thickness from one tube to the next. Variation of internal diameter can lead to wide variations in the final pressure in high pressure filling. Referring to FIG. 6, the final spacing X between the jaw faces across the pinch seal will depend upon the tube wall thickness. Consequently the external diameter Y of the bulb formed in the mould will increase with the tube wall thickness whereas its internal diameter will remain approximately constant.

The invention may be used wholey or in part in the manufacture of many different types of incandescent or discharge lamps, including in particular high pressure vapour or gas discharge lamps, linear or single ended halogen projector or automobile lamps, having fused silica (quartz) or vitreous envelopes. It can be used in making pre-focussed, highly loaded tungsten-halogen lamps in which the filament position is accurately related to reference planes incorporated in the pinch seals. Single push-in blade type sockets may then be used to locate them in appropriate optical control housings. High pressure metal vapour lamps and metal halide discharge lamps may be made by a similar technique.

I claim:

1. A method of making a lamp, comprising the steps of:

providing a tube of translucent vitreous material;

providing internal light-production means having lead-in conductors;

inserting said light-production means into said tube with said lead-in conductors extending out of said tube;

forming two pinch seals simultaneously around said lead-in conductors on respective sides of said light-production means so as to leave a single relatively small passage remaining through one of said seals;

adjusting the atmosphere in said tube through said passage; and

closing said passage.

2. A method as claimed in claim 1, wherein said step of adjusting the atmosphere in said tube includes applying pressure to the inside of said tube to force said tube against the inside of a mould.

3. A method as claimed in claim 1, wherein said internal light-production means comprises at least one filament.

4. A method as claimed in claim 1, wherein said internal light-production means comprises electrodes.

5. A method as claimed in claim 1, wherein said step of adjusting the atmosphere in said tube comprises dosing and pumping said lamp.

* * * * *