April 25, 1967 H. W. BROWN 3,316,049

INCANDESCENT ELECTRIC LAMPS

Filed Jan. 29, 1965

Fig. 1.

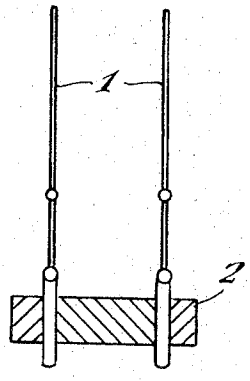
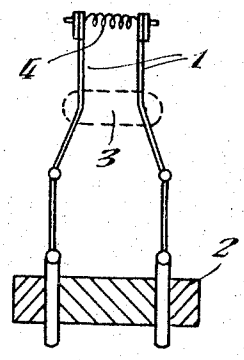


Fig. 2.



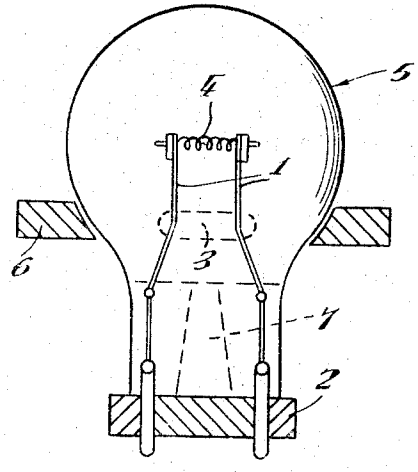


Fig. 3.

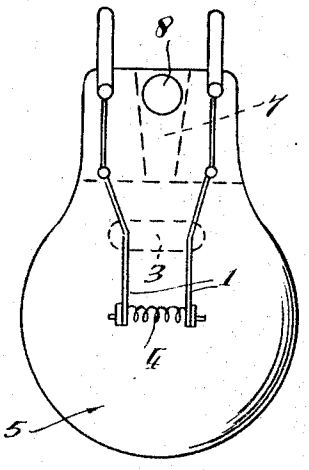


Fig. 4.

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INCANDESCENT ELECTRIC LAMPS

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This invention relates to the manufacture and construction of incandescent electric lamps, and has for objects to provide a lamp which is capless and a method of manufacture thereof without the aid of an exhaust tube.

The invention provides a method of manufacture of an incandescent electric lamp wherein a pair of lead-in wires connected to metal pins are suitably clamped, a filament is attached to the ends of said lead-in wires, a glass bulb is located over said filament and lead-in wires and the neck of the bulb suitably softened by heating, is pinched to form a gas-tight seal around the inner end of each of said pins and the portion of lead-in wire connected thereto while simultaneously an aperture is formed in the pinched base mass of glass, said aperture tapering inwards.

The method according to the invention may further include the location of a lamp or lamps so manufactured each with its pins uppermost in a chamber, locating a mass of fusible substance in said aperture so as to permit the passage of gas through said aperture, heating the chamber to a suitable temperature, evacuating the chamber and consequently evacuating the or each bulb therein, admitting a rare or inert gas to the chamber at the desired pressure so as to fill the or each bulb prior to the sealing thereof and raising the temperature of the chamber at least in the region of the pinched base of the or each bulb to soften said fusible mass and thereby to seal said aperture.

During the exhaustion of said chamber it may be flushed with a suitable inert gas.

The method of manufacture as above recited enables electric incandescent lamps, having their filaments very accurately positioned with relation to the metal pins which provide the electrical connections to a suitable socket, to be exhausted and if required gas filled in plurality, and eliminates the use of an exhaust tube as heretofore employed, which tube is sealed to the open neck of a bulb with lead-in wires projecting through the joint, individual exhaustion and if desired gas-filling of each bulb, constriction and sealing of the exhaust tube and removal of the surplus thereof, and application of a cap by cementing with soldering of the lead-in wires to appropriate portions of or terminals provided in said cap.

The invention also provides incandescent electric lamps of novel construction, capless and provided with metal connection pins located and dimensioned to be receivable in standard current supply sockets.

The present invention will now be described in greater detail by way of example with reference to the accompanying drawing, wherein:

FIGURES 1 to 4 show diagrammatically various stages in the manufacture of a preferred form of lamp.

Referring to the drawing, assemblies of composite lead-in wires 1 with substantial metal prongs (similar to those used in button base radio valves) are held in suitable jaws 2 on the periphery of an indexing turret or an indexing belt. The upper parts of these lead-in wires are suitably shaped, and if desired a separating glass bead 3 is melted in position. In due course, a wound tungsten or other metal filament 4 is transferred and clamped into hooks or otherwise attached at the tops of the lead-in wires 1.

A glass bulb 5 is then dropped over each of these assemblies, and held in position by attachments 6 so that in successive indexing stations, by heating the neck of the bulb 5 a seal is made between the lead-in wires 1 and the neck of the bulb 5. At the appropriate station, the heated

glass is pinched so that a gas tight seal is made between the bulb neck and each inner end of the prongs with the adjacent portions of the lead-in wires, and at the same time, a small hole 7, which may or may not be circular in section, and tapers inwards, is left in the pinched mass of glass. After further annealing of the glass in successive stations, the bulb 5 with the complete assembly of electrical conductors sealed in is ejected from the turret or belt. FIGURE 4 shows an inverted view of the completely sealed in lamp with a bead 8 of special glass or fusible substance placed in position in the tapered hole 7 in the seal, prior to insertion in the exhaust and gas filling chamber. The special glass or fusible substance has the following properties:

(1) It must seal properly to the bulb glass and/or if required to the wire or tube.

(2) It must soften at a lower temperature than the bulb glass.

(3) It must have a compatible coefficient of thermal expansion with the bulb glass and, if used, the wire or tube.

The invention therefore provides the complete internal assembly of a lamp with the filament and leads sealed into the bulb, without an exhaust tube, during part or the whole of one complete revolution of the machine turret or belt.

A plurality of lamps thus constructed is placed in a chamber with the prongs uppermost, and the whole is heated to an appropriate temperature, whilst the chamber is evacuated. Suitable flushing of the chamber with rare or inert gases during the exhaust schedule may be provided. This flushing assists the transfer of heat to and from the mass of the lamps in the chamber. The maximum temperature of the lamps whilst under vacuum is limited to the temperature at which the constituents of the glass bead 8 commences to volatilize or to soften.

At the appropriate time, a filling rare or inert gas is admitted to the chamber at the prescribed pressure, and the temperature of the whole chamber and its contents is raised sufficiently to soften the glass bead 8 which has previously been placed in the tapered hole 7 in the pinched base of each lamp prior to the insertion of the lamp into the chamber, in such manner as to permit, before it is softened, passage of gas from and into the bulb 5. At a prescribed temperature, a permanent gas tight seal will be made between the softened bead 8 and the wall of the hole 7, so that a complete gas filled lamp is produced.

The glass bead 8 is of a form that flow takes place at a temperature below the softening point of the glass bulb 5, but at a temperature sufficiently high to permit adequate outgassing of the lamp parts during exhaust. In one such form as illustrated it is spherical and of a size to lodge half-way down the tapered hole 7 as indicated. Instead of using a glass bead, I may use a glass powder, or small pieces of roughly broken glass, so long as none of the pieces are small enough to drop through the hole 7, or a piece of wire or tube coated with the sealing glass, so that the coating is sufficient to provide the bulk of glass necessary to form a good seal.

Instead of raising the temperature of the whole of the chamber for softening such glass beads, local additional heating may be applied. For example, the metal prongs of the lamps may be plugged upwards into sockets in a plate-like element which is adapted to be heated so as to apply to the bases of the lamps, through said prongs, sufficient local extra heat to soften the glass beads or equivalent so as to effect sealing closure of the bulbs.

Whilst the above example describes the manufacture of a lamp having only two lead-in wires, it will be appreciated that a lamp having more than two lead-in wires may be manufactured in accordance with the above described methods. For instance where two filaments are provided in one lamp three or four lead-in wires are neces-

sary. Moreover, the lead-in wire may be a single strand of wire, or they may be a number of single strands welded end to end to form a composite wire.

With a lamp so manufactured, no exhaust tube, metal cap, cement or solder is needed; the dimensional accuracy of the position of the filament(s) is guaranteed, the quality is enhanced by using a higher gas filling pressure than is normally attainable, and the lamps can be exhausted and gas filled in large numbers at one operation. Lamps produced and constructed according to the invention may be more particularly adapted for use in motor vehicles, miners lamps, electrical signalling in control panels and the like, and similar uses as distinct from space illumination.

What I claim and desire to secure by Letters Patent is:

1. A method of manufacture of an incandescent electric lamp without the aid of an exhaust tube, consisting essentially of the steps of clamping a pair of lead-in wires having prongs at their other ends, attaching a filament to the opposite ends of said lead-in wires, locating a glass bulb over said filament and lead-in wires the neck of which bulb has been softened by heating, pinching the neck to form a gas-tight seal around the inner end of each of said prongs and the portion of lead-in wire connected thereto and simultaneously forming an aperture in the pinched base mass of glass, said aperture tapering inwards, locating a mass of fusible substance in said aperture so as to permit the passage of gas through said aperture, locating a plurality of such lamps in a chamber with their prongs uppermost, heating the chamber to a suitable temperature, evacuating the chamber, admitting an inert gas to the chamber at the desired pressure so as to fill each bulb prior to the sealing thereof, and raising the temperature of the chamber at least in the region of the pinched base of each bulb to soften said fusible mass and thereby seal said aperture.

2. The method according to claim 1, which includes the additional step of flushing the chamber with an inert gas during the evacuation step.

3. A method of manufacture of an incandescent electric lamp without the aid of an exhaust tube, consisting essentially of the steps of clamping a pair of lead-in wires connected to metal prongs, attaching a filament to ends of said lead-in wires, locating a glass bulb over said filament and lead-in wires the neck of which bulb has been softened by heating, pinching the neck to form a gas-tight seal around the inner end of each of said prongs and the portion of lead-in wire connected thereto and simultaneously forming an aperture in the pinched base mass of glass, said aperture tapering inwards, locating a glass bead in said aperture so as to permit the passage of gas through said aperture, locating a plurality of such lamps in a chamber with their prongs uppermost, evacuating the chamber, admitting a rare gas to the chember after it has been evacuated so as to fill the bulb prior to the sealing thereof, applying local heat to the prongs of the lamp to soften said glass bead and thereby seal said aperture.

4. The method according to claim 3, which includes the additional step of plugging the prongs of each lamp upwards into sockets in a plate-like element during the step of locating the lamp in the chamber.

References Cited by the Examiner

UNITED STATES PATENTS

1,491,436	4/1924	Strickland	65—34 X
1,816,424	7/1931	Elsey	29—25.15

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