Aug. 9, 1966 L. M. PREZIOSI ETAL 3,265,923

BASELESS DOUBLE-ENDED ELECTRIC INCANDESCENT LAMP

Filed March 19, 1963 2 Sheets-Sheet 1

FIG. 1.

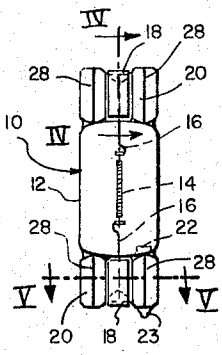


FIG. 2.

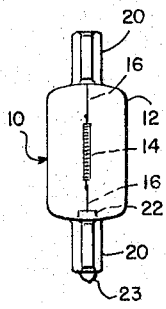


FIG. 4.

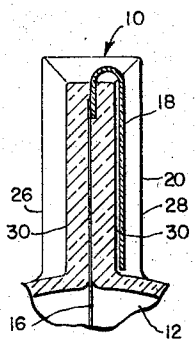


FIG. 8.

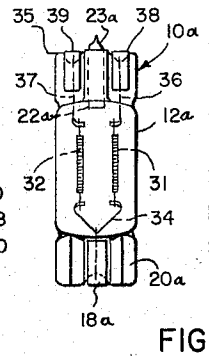


FIG. 9.

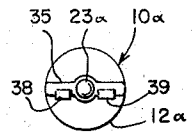


FIG. 10.

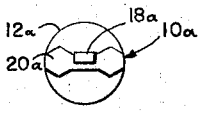


FIG. 3.

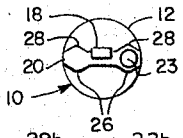


FIG. 5.

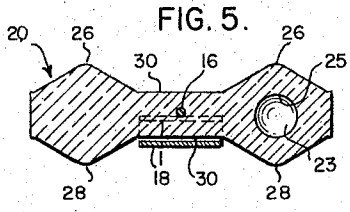


FIG. 6.

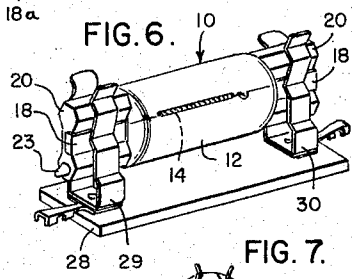


FIG. 7.

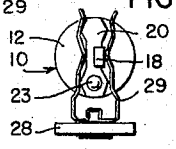


FIG. 10a

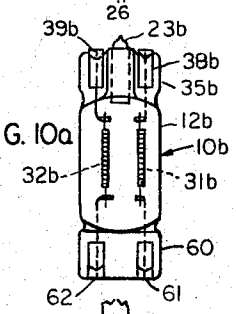


FIG. 11

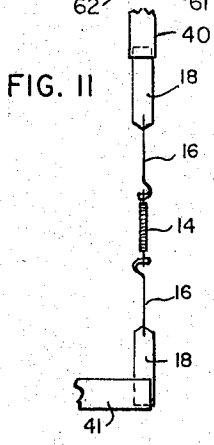


FIG. 12.

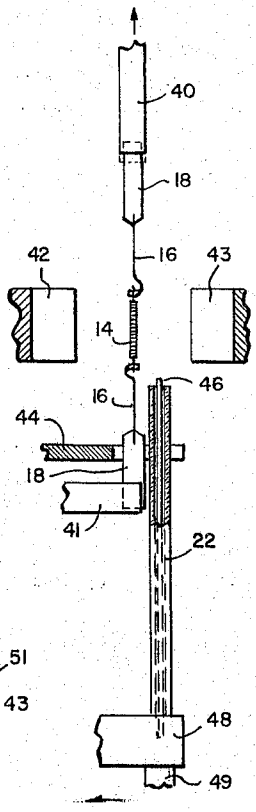


FIG. 13.

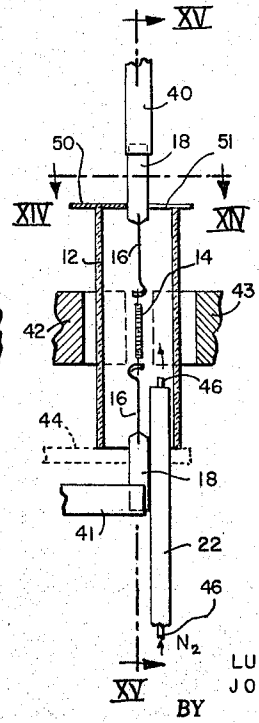


FIG. 15.

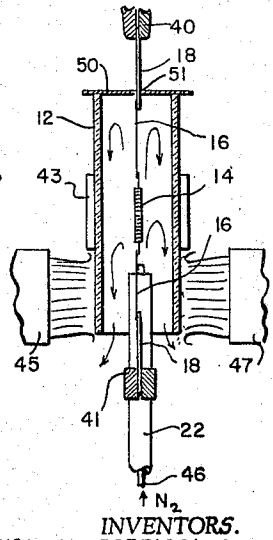
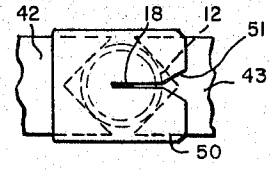


FIG. 14.



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FIG. 16.

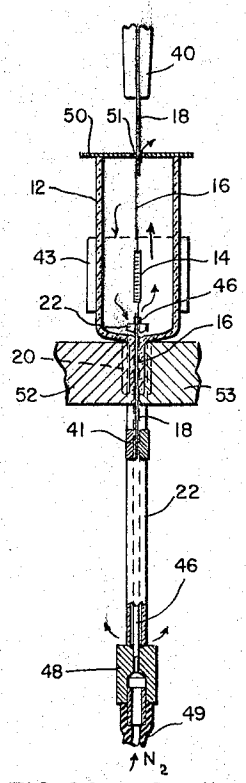


FIG. 17.

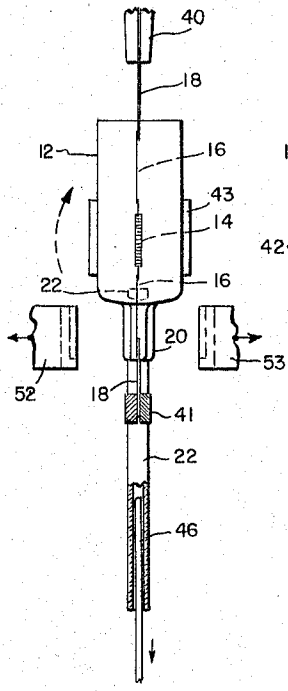


FIG. 18.

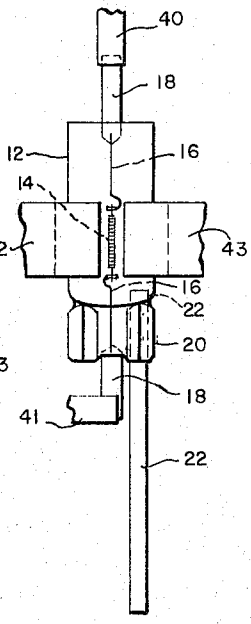


FIG. 19.

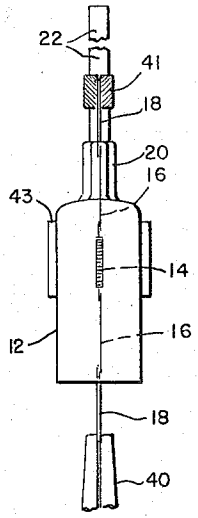


FIG. 20.

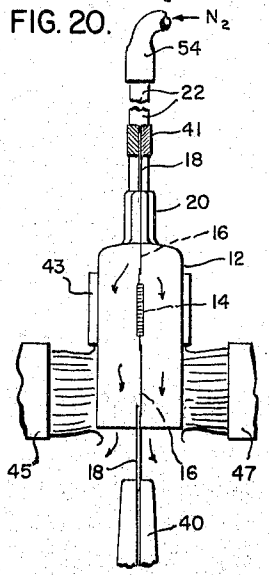


FIG. 21.

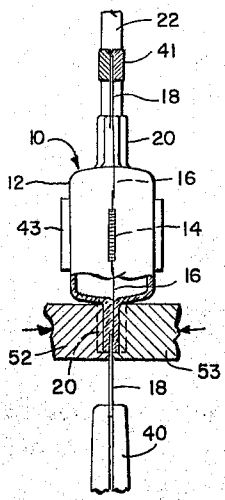


FIG. 22.

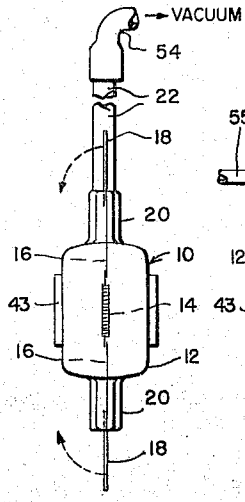
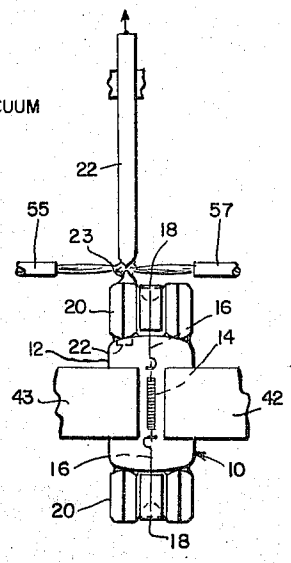


FIG. 23.



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United States Patent Office 3,265,923 Patented August 9, 1966

3,265,923

BASELESS DOUBLE-ENDED ELECTRIC INCANDESCENT LAMP

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Filed Mar. 19, 1963, Ser. No. 266,392
10 Claims. (Cl. 313—318)

This invention relates to electric lamps and has particular reference to a baseless double-ended incandescent lamp.

In view of the high cost of threaded bases and sockets, there have recently been developed miniature single-ended incandescent and photoflash lamps wherein the neck portion of the lamp envelope is molded into a press seal that serves as the base. The exposed ends of the lead wires are bent over or comprise pins that serve as contacts and the press seal is provided with a groove or the like so that it can be simply inserted into and interlocked with a resilient socket member.

The simplicity of such so-called "wedge base" lamps and sockets and their reduced cost has led to the development of a baseless double-ended incandescent lamp for use in the automotive industry. These lamps resemble a cartridge in form and are designed to fit into a "buss fuse" type socket having a pair of spaced U-shaped clamps or the like that comprise the socket contactors or terminals. Such cartridge miniature lamps have heretofore been made with blown glass bulbs having a constricted neck portion at each end that is heat-softened and molded to form the press seals. Since bulbs of this type are made by blowing the molten glass into a mold, they are not only expensive but are relatively fragile due to the wide variations in the bulb-wall thickness inherently introduced during manufacture.

It is accordingly the general object of the present invention to provide an improved double-ended baseless electric lamp that is stronger and less expensive than the prior art lamps of this type.

Another object is the provision of a cartridge type baseless miniature lamp for automotive use that can be economically fabricated and will permit one or several filaments to be sealed within the envelope.

The aforesaid objects, and other advantages that will become apparent as the description proceeds, are achieved in accordance with the present invention by using predetermined lengths of drawn glass tubing as the envelope and sealing off the ends of the tubing by means of a full-press seal. Even though the ends of the tubing are too large to permit the tube to be evacuated (and flushed or filled with gas where required) directly through its open ends and then quickly sealed off, these operations are readily accomplished according to the invention by sealing an exhaust tube in one of the press seals and keeping it open during the press-forming operation. After the press seals have been completed, the lamp is evacuated, etc. through the exhaust tube which is then tipped off close to the end of the press seal to complete the lamp. Since drawn tubing is inexpensive and has heavy walls of uniform thickness, the lamps are not only cheaper to make but are much stronger than those having blown bulbs.

In addition, the breadth of the full-press seals enable more than one filament to be mounted in the lamp in contrast to the prior art lamps having narrow seals. A dual-filament lamp embodiment and a preferred seal configuration that facilitates the insertion of the lamp into its socket and guides the socket terminals into positive electrical engagement with the lamp contacts are also described.

A better understanding of the invention will be obtained by referring to the accompanying drawings, wherein:

FIGURE 1 is a front elevational view of an improved single-filament cartridge lamp embodying the present invention;

FIGS. 2 and 3 are side and end views, respectively, of the lamp shown in FIG. 1;

FIG. 4 is an enlarged cross-sectional view of the press seal along the axial line IV—IV of FIG. 1, in the direction of the arrows;

FIG. 5 is an enlarged cross-sectional view through the press seal containing the tipped off segment of exhaust tubing along the line V—V of FIG. 1, in the direction of the arrows;

FIGS. 6 and 7 are perspective and end views, respectively, of the lamp placed in its socket;

FIG. 8 is a front elevational view of a dual-filament lamp embodiment according to the invention;

FIGS. 9 and 10 are plan views of the upper and lower ends, respectively, of the lamp as viewed in FIG. 8;

FIG. 10*a* is an elevation view of another dual-filament lamp embodiment; and,

FIGS. 11 through 23 are elevational views, partly in section, of the apparatus and the lamp components illustrating various phases of lamp fabrication.

While the present invention can be used with advantage in various types of double-ended electrical devices, it is particularly adapted for use in connection with cartridge-type miniature lamps for automotive service and has accordingly been so illustrated and will be so described.

Embodiment I

With specific reference to the drawings, in FIGS. 1 and 2, there is shown one form of a double-ended miniature or "cartridge" type lamp **10** adapted for automotive use and comprising a tubular envelope **12** that is closed at each end by a full-press seal **20**. The envelope **12** consists of a short length of heavy-walled drawn glass tubing of uniform diameter and the seals extend across the full diameter of the envelope. A linear filament **14** of coiled refractory metal wire, such as tungsten or the like, is sealed within the envelope **12** and suspended in substantially coaxial relationship therein by a pair of lead-in conductors **16** that are embedded in each of the press seals **20**. A thin metal strip **18** of nickel or the like is attached to the embedded end of each of the lead-in wires **16** and bent around the ends of respective press seals against a pressed face thereof to provide large flat contacts. The aforementioned filament **14**, lead-in wires **16** and terminal strips **18** are attached to each other in end-to-end relationship (as by welding) and constitute an elongated mount assembly that extends along the axis of the envelope **12**.

One of the press seals **20** (the lower one as the lamp **10** is viewed in FIG. 1) contains a tipped-off segment **22** of a vitreous exhaust tube. As shown, the open end of the tube segment **22** protrudes into the interior of the envelope **12** and its sealed tip **23** protrudes from the end of the press seal. In this particular embodiment, the tube segment **22** is located in an "off-center" position and passes through a side portion of the press seal, as is explained in greater detail below.

As shown in FIG. 2, the full-press seals **20** are aligned with one another and disposed in a common axial plane.

As shown more particularly in FIGS. 3, 4 and 5, each of the press seals **20** have a pair of spaced longitudinally-extending ridges or ribs **26—26** in its pressed face and a second pair of similar ribs **28—28** in its opposite face. These ribs are aligned with one another and merge to form rails or bosses of enlarged cross section that extend along and constitute the sides of the press seals. As will

be noted in FIG. 5, each of the ribs **26** and **28** have sides which taper toward the side edges of the press seals and toward the central portion thereof. The central portion of each seal **20** is of reduced and substantially uniform thickness and forms a flat **30** that defines an elongated recess in each of the seal faces. These recesses extend from the ends of the press seals **20** toward the bulbous body portion of the envelope **12** and are located between the ribs **26** and **28** and bosses which they form. The free ends of the metal strips **18** are seated in these recesses. The edges of the press seals **20** are thus beveled and the seal faces are provided with a reverse taper that leads to the flats **30** located at the center of the seals.

The aforementioned beveled edges and reverse taper not only facilitates the insertion of the lamp **10** into the "fuse type" socket with which it is used, but automatically guides the socket contactors into positive electrical engagement with the exposed ends of the metal strips **18** that serve as the lamp contacts. A socket of the foregoing type is shown in FIGS. 6 and 7 and comprises an insulator base **28** and two U-shaped metal spring clips **29** and **30**. These clips constitute the socket contactors and are shaped to interlock with and firmly grip the press seals **20** when the lamp **10** is inserted into and seated in the clips, as shown.

As shown in FIG. 3, the sealed tip **23** of the exhaust tube segment **22** projects from one of the seal bosses, and, while the exhaust tube segment is fused and merges with this portion of the seal as shown in FIG. 5, the bore **25** of the tube remains open and communicates with the interior of the lamp envelope **12**.

As is shown in FIG. 4, the end of the metal strip **18** that is connected to the sealed-in end portion of the lead-in wire **16** is embedded in the central portion of the press seal **20** and is, accordingly, firmly anchored in place between the seal bosses. The lamp contacts are thus accurately located and locked in predetermined position with respect to the seal face, preferably in recesses therein as in this embodiment.

Embodiment II

As is shown in FIG. 8, the use of drawn glass tubing instead of a blown bulb having constricted neck portions and narrow press seals affords the additional advantage of permitting two filaments **31** and **32** to be sealed in side-by-side relation within the envelope **12***a* and a dual-filament cartridge lamp **10***a* to be made. As shown, a lead-in conductor **34** having a pair of divergent arms at its inner end is sealed through one of the full-press seals **20***a* and connected to a metal strip **18***a* disposed in a centrally-located recess in the seal face in the same manner as hereinbefore described. The ends of the conductor arms are attached to the ends of the filaments **31** and **32** so that a contact common to both filaments is provided at this end of the lamp **10***a*.

A pair of spaced lead-in conductors **36** and **37** are sealed through the press seal **35** at the opposite end of the lamp **10***a* and are individually connected to the ends of the respective filaments **31** and **32** and to a pair of spaced metal strips **38** and **39** that are bent around the end of the seal and against one of its pressed faces. The filaments **31** and **32** can accordingly, be selectively energized by connecting the single contact **18***a* and a preselected one of the other contacts **38** and **39** to a suitable power source.

According to this embodiment, the exhaust tube segment **22***a* is sealed through the central portion of the full-press seal **35** and the strip contacts **38** and **39** are disposed on opposite sides thereof, as shown in FIG. 8. The exhaust tube tip **23***a* thus protrudes from the central edge portion of the press seal **35** and, as illustrated in FIG. 9, the central portion of the seal that is fused to and contains the tube segment **22***a* is of enlarged cross section. The side portions of the seal, on the other hand, are substantially flat and form seats for the ends of the metal strips **38** and **39**.

As shown in FIG. 10, the metal strip **18***a* at the single-contact end of the lamp **10***a* is seated within a flat centrally-disposed recess located between two longitudinally extending bosses in the same manner as described above in connection with the first embodiment.

Fabrication

The improved cartridge-type baseless lamp of the present invention can be readily fabricated on a mass production basis by the method illustrated in FIGS. 11 through 23, which method will now be described.

Step 1 consists of clamping the ends of the filament mount in a pair of mount holders **40** and **41** spaced a predetermined distance apart, as shown in FIG. 11. When the mount comprises a coiled filament **14**, lead-in wires **16** and metal strips **18** attached to one another in end-to-end relationship as in the present case, the free ends of the strips are gripped. It should be noted that the mount holder **41** located at the lower end of the mount grips the metal strip **18** from the side rather than from the end. This arrangement enables the exhaust tube **22** to be positioned adjacent this end of the mount in the next operation. The mount holders **40** and **41** are held in the desired fixed position by a suitable support (not shown).

Step 2 is shown in FIG. 12 and consists of moving the mount holder **40** upward a predetermined distance (as indicated by the arrow) in an axial direction to stretch the filament **14** to the proper length and keep the mount assembly taut. Bulb-holding jaws **42** and **43** are then positioned in line with the filament **14** and on opposite sides thereof as shown. A suitable horizontally-disposed and forked stop **44** is then positioned at a point a predetermined distance below the filament and a glass exhaust tube **22** is disposed adjacent and in substantially parallel relationship with the lower end of the mount. As illustrated, the exhaust tube **22** is located on the side of the mount opposite the mount holder **41** and is oriented so that the end thereof is disposed just below the hooked end of the lead-in wire **16** that is attached to the lower end filament. The exhaust tube **22** is held in the aforesaid position by means of a support **48**. A hollow needle **46** of refractory metal, such as tungsten is sealed in an opening through support **48** and fits loosely within the bore of the exhaust tube **22**. This needle is of such length that it protrudes just beyond the uppermost end of the tube. The opposite end of the needle **46** is connected with a supply of inert gas such as nitrogen by means of a nipple on the support **48** and a suitable conduit **49** that is attached to the nipple, as shown in FIG. 16.

Step 3 is shown in FIG. 13 and consists of threading a length of drawn glass tubing that comprises the envelope **12** over the mount holder **40** and the mount assembly until it strikes the stop **44**, whereupon the bulb-holding jaws **42** and **43** are actuated by a suitable mechanism (not shown) and caused to grip the tubular envelope **12**. The stop **44** is then withdrawn. The envelope is coaxially aligned with the filament mount by the action of the jaws and the end segment of the exhaust tube **22** is located within the lower end of the envelope, as illustrated. The latter, accordingly, encircles and overlies the end segment of the tube and also extends just beyond the juncture between the metal strips **18** and lead-in conductors **16** at each end of the mount, as shown. A cover **50** is preferably placed over the upper end of the envelope **12** to temporarily close off that end of the bulb and thus avoid the "chimney effect" that would otherwise occur when the opposite end of the envelope is subsequently

heated. Purified nitrogen is then fed into the envelope **12** through the needle **46** as indicated.

As shown most clearly in FIG. 14, the cover **50** is provided with a slot **51** that accommodates the metal strip **18** and enables the cover to slip therearound completely over the end of the envelope **12**.

Step 4 is shown in FIG. 15 and consists of heating the lower end of the envelope **12** after the N_2 has been circulated through the envelope for about sixty seconds and has flushed all of the air out of the envelope, as indicated by the small arrows. The heating is accomplished by a pair of gas burners **45** and **47** that are positioned so that the fires impinge on opposite sides of the envelope in a direction substantially normal to the plane containing the filament mount assembly and the exhaust tube **22**, as shown.

Step 5.—After the glass has become plastic, the burners **45** and **47** are withdrawn and the heated end of the envelope **12** is compressed and molded into a full-press seal **20** by a pair of suitably shaped press-jaws **52** and **53**, as shown in FIG. 16. The seal is preferably formed in two operations, namely, a preforming operation (in which the press-jaws are partly closed) and then a final pressing operation. Between these operations the glass is reheated to replace the heat withdrawn by the press jaws. Flushing with nitrogen is continued during both operations to avoid oxidizing the mount. After the press is formed, the gas escapes through the slot **51** in the cover **50** and also from the end of the exhaust tube **22** through the space between its inner wall and the needle **46**, as indicated by the arrows.

Step 6 is shown in FIG. 17. Immediately after the press **20** has been formed and just before the press-jaws **52** and **53** are open, the needle **46** is withdrawn from the exhaust tube **22**, as indicated by the arrow. Since the glass is still plastic, it does not stick to the needle and the sealed-in end segment of the exhaust tube **22** thus remains open.

Hence, although the end of the envelope **12** has been closed off by the seal **20** and the end of exhaust tube **22** is fused to and extends through one of the enlarged bosses of the seal (see FIG. 18), the tube is open at this stage and communicates with the interior of the envelope through the press.

Step 7.—After the cover **50** has been removed, the entire assembly is inverted as a unit (as indicated by the broken arrow in FIG. 17) without changing the spacing between the mount holders **40** and **41**. The open end of the envelope **12** thus points downwardly and the exhaust tube **22** extends upwardly, as shown in FIG. 19.

Step 8 is shown in FIG. 20 and consists of connecting the end of the exhaust tube **22** with a supply of nitrogen by a suitable conduit **54**, and then heating the open end of the envelope **12** by means of the burners **45** and **47** while nitrogen is flushed through the envelope, as indicated by the arrows.

Step 9.—After the glass becomes sufficiently plastic, the burners are withdrawn and replaced by the press-jaws **52** and **53** which are then actuated to compress the heated end of the envelope into a second full-press seal **20**, as shown in FIG. 21. The press-forming operation is again preferably accomplished in two steps as above described. The flow of nitrogen through the exhaust tube **22** is pinched off just prior to the reheating and final pressing operation to avoid deforming the seal.

Step 10.—The envelope **12** is then evacuated, as shown in FIG. 22, by connecting the conduit **54** with a suitable vacuum system (not shown) whereupon the conduit **54** is connected with a suitable inert gas, such as argon or the like, and the envelope is filled to a predetermined pressure such as about 600 millimeters. In the interim, the exposed ends of the metal strips **18** are trimmed, if necessary, and bent around the ends of the respective press seals **20** and into the recesses in their pressed faces, as indicated by the broken arrows.

Step 11.—The last step is shown in FIG. 23 and consists of tipping-off the exhaust tube **22** at a point adjacent the end of the full-press seal **20** by means of opposed sealing burners **55** and **57** while the lamp **10** is still in the bulb holders **42** and **43**. The exhaust tube is preferably severed at a point as close as possible to the end of the press-seal so that the protruding tip **23** is very short.

It will be appreciated from the foregoing that the objects of the invention have been achieved by providing a cartridge or double-ended miniature lamp that not only eliminates the need for costly metal bases and complicated sockets but permits inexpensive drawn glass tubing to be used instead of blown glass bulbs. Since such tubing has a much heavier and more uniform wall thickness, the improved lamp is many times stronger than the prior art lamps. The improved lamp also affords functional advantages in that it has specially shaped full-press seals which facilitate the insertion of the lamp into a plug-in socket and automatically seat the socket terminals in positive electrical engagement with the lamp contacts.

While several embodiments have been illustrated and described in detail, it will be appreciated that various modifications in both the construction and arrangement of the various parts can be made without departing from the spirit and scope of the invention.

For example, instead of a common terminal **18***a* being provided on one end of the dual-filament lamp **10***a* shown in FIG. 8, two separate contacts can be used at each end of the lamp (as illustrated in FIG. **10***a*) to provide completely independent energizing circuits for the filaments, or the filaments can be so connected that they burn in series. The lamp **10***b* shown in FIG. 10*a* is fabricated in the same manner as the lamp **10***a* of FIG. 8 except that the end of the tubular envelope **12***b* opposite the press seal **35***b*, which contains the exhaust tube tip **23***b*, is closed by a flat press seal **60** having a pair of spaced bent-over contacts **61** and **62**. These contacts are connected to the proximate ends of the filaments **31***b* and **32***b* by separate lead-in conductors so that each filament is provided with its own set of contacts.

We claim:

1. A baseless double-ended electric incandescent lamp comprising,

a length of vitreous tubing of substantially uniform diameter,

a press seal at each end of said tubing that extends across the full width of and closes off said tubing, said press seals comprising a pair of spaced elongated bosses and a recessed portion therebetween which extend from the ends of the respective seals toward the bulbous body portion of said tubing, each of said bosses having a transverse inwardly-tapered portion that is located immediately adjacent to and extends along the side edge of the associated recess,

an elongated filament extending longitudinally within said tubing, and

a lead-in conductor sealed through each of said press seals and attached to the end of the filament located at that end of the tubing,

each of said conductors being sealed through a portion of the respective press seals such that said filament is suspended within said tubing and the free ends of said conductors emerge from the ends of said seals,

the exposed ends of said lead-in conductors being bent around the ends of the respective press seals and seated within the recesses in said seals and thereby forming accurately located contacts for said lamp.

2. An electric incandescent lamp as set forth in claim **1** wherein one of the press seals contains a tipped-off segment of an exhaust tubulation that is fused with and extends through one of the seal bosses and communicates with the interior of said tubing.

3. An electric incandescent lamp as set forth in claim 1 wherein; a tipped-off segment of a vitreous exhaust tube extends through and is fused with one of the seal bosses, the open end of said exhaust tube segment projects into the interior of said tubing, and the tipped end of said exhaust tube segment protrudes beyond the end of the aforesaid boss.

4. A baseless double-ended miniature electric incandescent lamp comprising,

a length of drawn vitreous tubing of substantially uniform diameter having a press seal at each end that extends across the full width of and hermetically closes off said tubing,

a pair of elongated filaments disposed in spaced apart relation within and extending longitudinally along said tubing,

a single lead-in conductor sealed through one of said press seals and connected to the proximate ends of both of said filaments, and

a pair of spaced lead-in conductors sealed through the other of said press seals, one of said pair of lead-in conductors being connected to the proximate end of one of said filaments and the other of said pair of conductors being connected to the proximate end of the other filament,

the exposed free ends of said lead-in conductors being bent around the ends of the respective press seals and seated against a pressed face thereof and thereby providing a single contact at one end of said lamp that is common to both of said filaments, and a pair of spaced contacts at the other end of said lamp each of which connect with only one of the aforesaid filaments.

5. A cartridge-type baseless electric incandescent lamp comprising,

a short length of drawn glass tubing that is closed at each end by a full-press seal,

a lead-in wire embedded in each of said press seals and extending into the interior of said tubing,

a refractory wire filament connected to the inner ends of said lead-in conductors and supported thereby in substantially coaxial relationship with said tubing, and

an elongated metal strip of predetermined length electrically connected to the embedded end of each of said lead-in conductors and extending from the end of the respective press seals,

the pressed faces of each of said press seals having a pair of spaced elongated ribs therein that extend along the sides of the seal and are separated by a flat which extends inwardly from the ends of the press seals toward the bulbous body portion of the tubing, said ribs being aligned with one another and each having a transverse inwardly-tapered portion that is located immediately adjacent to and extends along the side edge of the associated flat,

the ends of said metal strips that are connected to said lead-in wires being anchored in the respective press seals and said strips being so oriented relative to said seals that their free ends extend from the ends of the respective press seals and therearound against the flats in the pressed faces of the seals thereby to provide accurately-located recessed contacts for said lamp.

6. A cartridge-type baseless electric lamp as set forth in claim 5 wherein the longitudinally extending ribs in the pressed faces of the press seals also taper toward the proximate side edges of the seal and thus provide reverse-tapered surfaces that facilitate the insertion of the press seals into a socket and then guide the socket contacts into positive electrical engagement with the contact strips located between said ribs.

7. A baseless double-ended miniature electric incandescent lamp comprising,

an elongated envelope of drawn glass tubing that is substantially uniform in diameter throughout its length, a full press seal at each end of said envelope that extends across the diameter of said tubing and hermetically closes off said envelope,

a pair of elongated filaments disposed in spaced apart relation within and extending longitudinally along said envelope, and

a pair of lead-in conductors sealed through each of said full press seals and having their inner ends connected to the proximate end of a preselected and different one of said filaments,

the exposed ends of said lead-in conductors being bent around the ends of the respective press seals and seated against a pressed face thereof and thereby providing a pair of spaced contacts at each end of said lamp for selectively energizing said filaments.

8. A baseless double-ended electric incandescent lamp comprising,

a vitreous tubular envelope of substantially uniform diameter having a full-press seal at each end that extends across and closes off said envelope,

a pair of filaments disposed in spaced apart relationship within said envelope,

a single lead-in conductor sealed through one of said full-press seals and having its inner end connected to the proximate ends of both of said filaments, and

a pair of spaced lead-in conductors sealed through the other of said full-press seals, one of said pair of lead-in conductors being connected to the proximate end of one of said filaments and the other of said pair of conductors being connected to the proximate end of the other filament,

the full-press seal through which the single lead-in conductor extends being of predetermined configuration and comprising a pair of spaced elongated bosses and a recessed portion therebetween which extend from the end of the seal toward the bulbous body portion of said tubing, each of said bosses having a transverse inwardly-tapered portion that is located immediately adjacent to and extends along the respective side edges of said recessed portion,

the exposed ends of said pair of lead-in conductors being bent around the end of the associated full-press seal and seated against a pressed face thereof and the exposed end of said single lead-in conductor being bent around the end of the other full-press seal and seated within the recessed portion thereof between said bosses thereby providing a single contact at one end of said lamp that is common to both of said filaments, and a pair of spaced contacts at the other end of said lamp each of which is connected to only one of the aforesaid filaments.

9. The baseless double-ended electric incandescent lamp set forth in claim 8 wherein the recessed portion of the full-press seal at the single-contact end of said lamp comprises a flat of predetermined width, and the exposed bent-over portion of said single lead-in conductor comprises a thin metal strip that is seated against said flat.

10. The baseless double-ended electric incandescent lamp set forth in claim 8 wherein; a medial portion of the full-press seal at the dual-contact end of said lamp is of enlarged cross section and contains a tipped-off segment of an exhaust tube, and the contacts are disposed on opposite sides of the enlarged medial portion of said full-press seal.

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