

Jan. 13, 1942.

W. E. ANDERSON

2,269,840

TIPLESS EXHAUST

Filed March 1, 1940

Fig. 1.

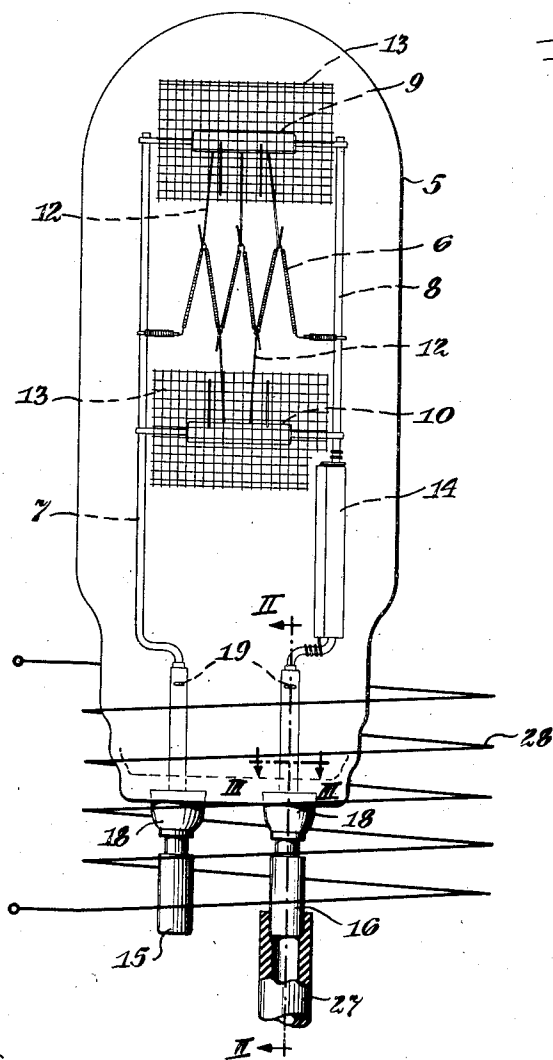


Fig. 3.

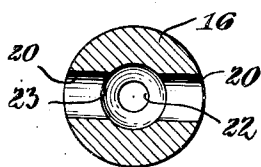


Fig. 2.

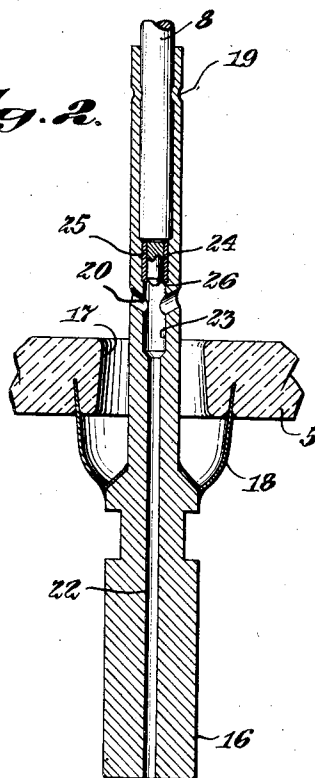
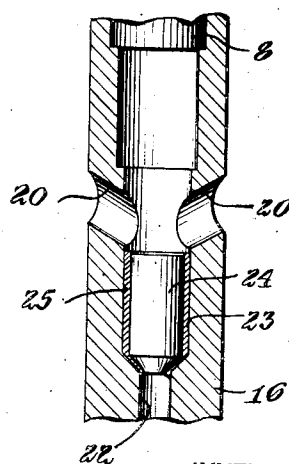


Fig. 4.



INVENTOR
W. E. ANDERSON.
BY *J. M. Neuhme*
ATTORNEY

UNITED STATES PATENT OFFICE

2,269,840

TIPLESS EXHAUST

Waldemar E. Anderson, Montclair, N. J., assignor
to Westinghouse Electric & Manufacturing
Company, East Pittsburgh, Pa., a corporation of
Pennsylvania

Application March 1, 1940, Serial No. 321,634

4 Claims. (Cl. 250—27.5)

The present invention relates to evacuated devices such as incandescent electric lamps and discharge tubes and has particular reference to the sealing-off thereof after exhaustion and, if desired, the introduction of a gas into the envelope.

It is customary at present in the art to utilize an exhaust stem which usually protrudes from the glass or metal envelope adjacent the leading-in conductors so that when a base is secured to the lamp or tube, the exhaust tip is concealed. In the manufacture of high wattage incandescent lamps and large power and rectifier tubes, quite frequently no base is provided, but in lieu thereof the envelope is closed by a vitreous or metallic plate to which is secured a pair of contact terminals serving as both leading-in conductors and supports for the lamp or tube.

This accordingly positions the exhaust tip adjacent the metal prongs or terminals, which exhaust tip constitutes a continuous source of trouble, both during manufacture and in service. Inasmuch as the contact terminals usually engage a socket, a recess must necessarily be provided in the socket to accommodate the exhaust tip. Despite this provision, in inserting and removing the lamp or tube from the socket, the exhaust tip is all too frequently broken, thus destroying the useful life of the device.

It is accordingly the primary object of the present invention to avoid the above noted disadvantages by utilizing one of the metal prongs or contact terminals as the exhaust tip.

Another object of the present invention is the provision of a contact terminal for a high wattage incandescent lamp or high power discharge tube wherein one of the terminals which supports the lamp or device and transmits electrical energy to the energy translation element interiorly of the envelope, is also employed as the exhaust stem for evacuating the interior of the envelope.

Still further objects of the present invention will become obvious to those skilled in the art by reference to the accompanying drawing wherein:

Fig. 1 is an elevational view of a high wattage incandescent lamp employing a contact terminal in accordance with the present invention, which terminal also serves as the exhaust tube for evacuating the device during manufacture;

Fig. 2 is a cross-sectional view taken on the line II—II of Fig. 1 and looking in the direction indicated by the arrows;

Fig. 3 is a cross-sectional view taken on the line III—III of Fig. 1 and looking in the direction indicated by the arrows, and

Fig. 4 is a fragmentary cross-sectional view on an enlarged scale of the composite terminal and exhaust tube as shown in Fig. 2, showing the structure after sealing-off of the device.

Referring now to the drawing in detail, there is shown in Fig. 1 an evacuated device which

may be a high wattage incandescent lamp or a high power transmitting or rectifying tube. As illustrated, however, the device of Fig. 1 comprises an evacuated vitreous envelope 5 provided with an energy translation element such as a tungsten filament 6 connected to a pair of leading-in and supporting conductors 7 and 8 and suspended between a pair of insulators 9 and 10 by a plurality of supporting hooks 12.

The insulators 9 and 10 may be surrounded with a vaporized metal collecting screen 13 and the leading-in and supporting conductor 8 may be provided with a fuse lead 14, such as shown and described in my Patent 2,183,952, issued December 19, 1939, and assigned to the same assignee as the present invention. The leading-in conductors 7 and 8 are connected to and supported by a pair of metallic terminals or metal prongs 15 and 16 sealed to the envelope 5, as hereinafter described, and which extend exteriorly of the envelope for insertion into a suitable socket.

Inasmuch as the subject-matter of my present invention, as above stated, is equally applicable to a high wattage incandescent lamp or power tube, a further detailed description of the device to which the invention is applied is believed unnecessary.

Referring now more particularly to Fig. 2, it will be noted that the contact terminal or metal prong 16 is provided with a slightly reduced diameter portion which extends through an opening 17 provided in the vitreous or metallic end closure of the envelope 5. A metallic cup-shaped member 18 is welded, brazed, soldered, or otherwise affixed to the metallic terminal 16 and forms a vacuum-tight seal with the end closure member for the envelope 5.

This cup-shaped member 18 may be of the same metal as the end closure member for the envelope 5 if the latter is of metal, as is frequently the case with electronic discharge tubes. On the other hand, if the closure member for the envelope 5 is of the same vitreous material as the envelope as shown in Fig. 1, then the cup-shaped member 18 may be composed of an alloy known under the trade-mark "Kovar" consisting of nickel, cobalt and iron, which alloy has a coefficient of expansion approximating that of the vitreous envelope 5.

The metallic terminal member 16 at its upper end, which extends interiorly of the envelope 5, is recessed so as to telescopically engage the leading-in and supporting conductor 8, with the latter rigidly secured therein by an indentation 19. A transverse bore 20 is provided in the contact terminal which communicates with the interior of the envelope 5, and communicating with this bore is a longitudinally extending bore or

passageway 22 extending to the outer end of the contact terminal.

It will be noted that the longitudinally extending bore 22 is of slightly larger diameter adjacent the point of communication with the transverse bore 20 so as to form a recess 23. Immediately above the recess 23 is a plug 24 which may be of metal or vitreous material. If this plug 24 is of a vitreous material, it naturally should have a coefficient of expansion approximating that of the metal of which the terminal 16 is formed so as to form a vacuum-tight bond therewith. On the other hand, if there is too great a difference between the coefficient of expansion between the vitreous plug 24 and the metallic terminal 16, or if the plug is formed of metal, a cementing agent in the form of a sleeve 25 may be employed. This sleeve, for example, may be of some readily fusible material, such as a low melting point vitreous material that would form a graded seal between the vitreous plug and the metal terminal, or solder or the like, when the plug is of metal, with the plug 24 being held in place as by a shoulder 26 provided on the fusible sleeve 25.

Inasmuch as the contact terminal 16 is sealed vacuum-tight to the envelope 5 by the cup-shaped member 18, the only communication between the interior of the envelope 5 and the atmosphere is by means of the transverse bore 20, recess 23, and longitudinally extending bore 22. After complete assembly of the device, such as shown for example in Fig. 1, the contact terminal 16 is connected by means of a rubber hose or the like 27 (Fig. 1) thus establishing direct communication between the interior of the envelope 5 and a vacuum pump. While the device is thus on the pump, the various parts are degasified in the manner well known in the art; and after evacuation and the introduction of a gas or vapor into the envelope, it is in condition for sealing-off.

In order to seal off the device, the contact terminal 16 is appropriately heated, such as by a surrounding induction coil 28, which thus heats the terminal together with the readily fusible metallic or vitreous sleeve 25. The metal or vitreous material of which the sleeve 25 is composed is thus melted, allowing the metallic or vitreous plug 24 to gravitate into the recess 23 with the tapered end thereof fitting a similar seat in the recess 23. At the same time the molten metal or vitreous material of the sleeve 26 also gravitates and surrounds the plug 24 in the recess 23. Upon cooling, this material thus closes off the bore 22 and establishes a vacuum-tight seal between the interior of the envelope 5 and the vacuum pump or atmosphere, as can be readily seen from Fig. 4. The contact terminal 16 is then disconnected from the pumps and fabrication of the device completed.

It thus becomes obvious to those skilled in the art that a relatively simple and efficient vacuum seal is formed by utilizing at least one of the contact terminals of the device as an exhaust stem as well as a terminal and support for the energy translation element disposed interiorly of the envelope. Thus, an additional sealing-off tip is completely dispensed with which would otherwise interfere with proper engagement of the device in its socket and the ever present possibility of the exhaust stem being inadvertently broken, thus destroying the vacuum and the useful life of the device, is likewise eliminated.

Although one specific embodiment of the present invention has been shown and described, it is to be understood that other modifications thereof may be made without departing from the spirit and scope of the appended claims.

I claim:

1. An electrical device comprising an envelope, an energy translation element in said envelope, metallic terminals hermetically sealed to said envelope for conducting electrical energy there-through to said energy translation element and for supporting the latter, one of said terminals having an opening therein for exhausting said envelope with a portion of said opening being of slightly larger diameter to form a shoulder, and means positioned in the larger diameter portion of said opening and operable upon heating of said terminal during exhaust to engage said shoulder for sealing-off the opening in said terminal to form a vacuum-tight seal for said envelope.

2. An electrical device comprising an envelope, an energy translation element in said envelope, and metallic terminals depending from said envelope and hermetically sealed thereto for supporting said energy translation element and for conducting electrical energy thereto, one of said terminals having a bore therein for establishing communication between the interior of said envelope and a vacuum system with a portion of said bore being of slightly larger diameter to form a shoulder, and means positioned in the larger diameter portion of said bore and operable to gravitate into engagement with said shoulder and close communication of the bore with the interior of said envelope upon heating of said terminal during exhaust to form a vacuum-tight seal for said envelope.

3. An electrical device comprising an envelope, an energy translation element supported in said envelope, and metallic terminals depending from said envelope and hermetically sealed thereto for supporting said energy translation element and for supplying electrical energy thereto, one of said terminals having a recess therein communicating with the interior of said envelope and with a vacuum system and provided with a shoulder interiorly of said terminal, and a member positioned adjacent said recess and movable into engagement with said shoulder upon heating of said terminal during exhaust to seal-off communication with the interior of said envelope and to form a vacuum-tight seal for said envelope upon exhaustion thereof.

4. An electrical device comprising an envelope, an energy translation element in said envelope, and metallic terminals depending from said envelope and hermetically sealed thereto for supporting said energy translation element and for supplying electrical energy thereto, one of said terminals having a recess therein with a tapering surface to form a seat, a longitudinal bore in said terminal and a transverse bore communicating with said longitudinal bore above the level of said seat to enable evacuation of said envelope by a vacuum system, and a member adjacent said recess above the opening of said transverse bore provided with a surface conforming to the contour of the seat in said recess and movable past the opening of said transverse bore into engagement with said seat upon heating of said terminal during exhaust to form a vacuum-tight seal for said envelope upon exhaustion thereof.

WALDEMAR E. ANDERSON.