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ELECTRODE FOR LUMINOUS TUBES

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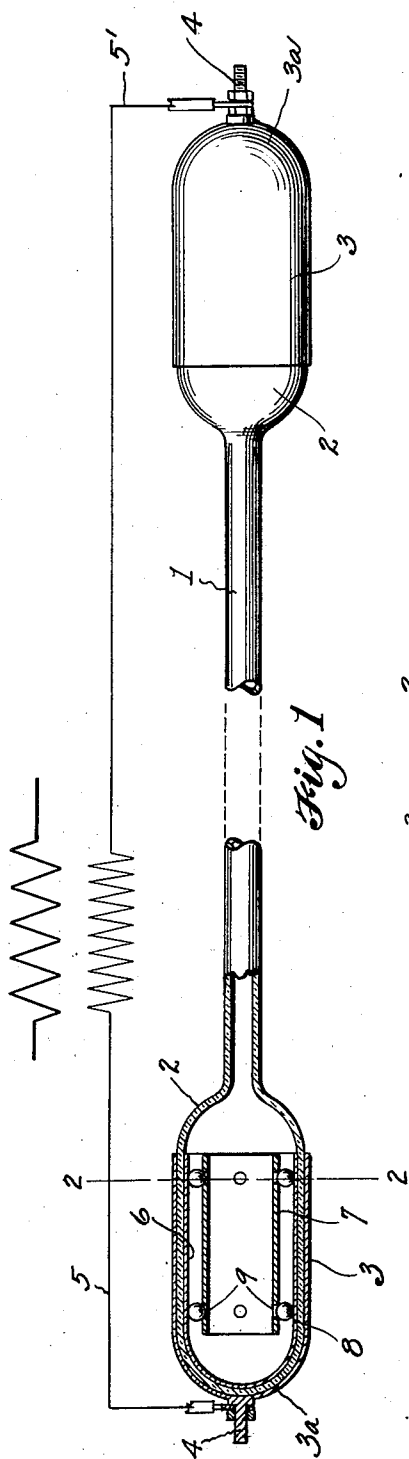


Fig. 1

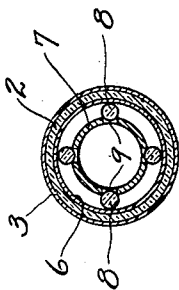


Fig. 2

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ALBERT EDWIN JACOBSEN, OF SEATTLE, WASHINGTON, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO NEON SPECIALTY & MANUFACTURING CO., A CORPORATION

ELECTRODE FOR LUMINOUS TUBES

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This invention relates to an improved electrode for use in systems of illuminating by luminous glass tubes that have been more or less evacuated and into which various gases or chemicals have been introduced as a means of producing lights of various colors incident to the passing of an electric current through the tubes.

As a matter of explanation, it will be here stated that in lighting systems of the above character, glass tubes with enlarged opposite end portions are employed, and electrodes for passing the circuit through the tubes are affixed in or applied to the enlarged end portions. Heretofore, the electrodes employed for passing the electric current into and from the tube have made electrical contact from the outside to the inside of the glass tube by metallic connections that are sealed or cemented in or to the glass. This form of contact, or connection, has proven to be not altogether satisfactory owing to possible and frequent leakage along the sealed-in metallic connecting wire or cemented-on metallic portion of the electrode, resulting from an unequal expansion or contraction of the connecting element and glass incident to temperature changes.

In view of the above, it has been the principal object of the present invention to overcome this undesirable result by the provision of luminous tubes of the above character, wherein no metallic or wire conductor is sealed in or extended through the glass tube, or wherein any direct metallic connection is made which may act as an electric conductor from the source of electricity to the gases within the tube.

A further object of the invention resides in the provision of an effective and durable electrode and terminal member associated therewith, which is of simple construction, relatively inexpensive and not subject to becoming inactive through leakage or breakage.

More specifically, the object of the invention resides in the provision of an electrode consisting of a metallic cap, tube, film or coating adapted to be fitted about a terminal of the glass tube and which serves as one plate of a condenser for capacitatively connecting

the circuit with the contained gas in the tube which, by itself, or in combination with other supplementing parts, serves as the other plate of the condenser.

Other objects of the invention reside in the various details of construction and in the combination of parts and in their use, as is hereinafter described.

In accomplishing these objects, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein—

Figure 1 is a view illustrating the construction, application and use of electrodes embodied by the present invention as applied to the opposite ends of a luminous, glass tube; one terminal of the tube and its electrode being shown in longitudinal section for better illustration.

Figure 2 is a cross section taken on the line 2—2 in Figure 1.

Referring more in detail to the drawings—1 designates a glass tube of that character used in illuminating systems of the above mentioned type and which is provided at its opposite ends with bulb-like enlargements 2—2 in open communication with the tube; the tube and enlargements being sealed after being more or less evacuated and after the introduction thereof of suitable gas, gases or chemicals for producing the path for the electric current and the desired colored lighting effects when an electric current is passed through the tube. The bulb-like terminal enlargements of the tube are of cylindrical form and are closed at their outer ends by semi-spherical end walls, which are important in the operation of the present tube system. It is to be noted also that these semi-spherical end portions are formed perfectly smooth with no projections of any kind.

For conducting the electric current into and from the tube, I have provided the latter at its opposite ends with the electrodes in which the present invention resides. Each of these electrodes consists of a suitable metal casing 3, or a coating, or even a film of a suitable metallic quality, for conducting the electric current and which is fitted about or

applied over the bulb-like enlargement 2 at one end of the tube. As here shown, the member 3 is in the form of a metallic sleeve that fits snugly about the cylindrical body portion of the terminal and is closed at its outer end by a semi-spherical end portion 3a that fits snugly about the semi-spherical end of the bulb and from which a metallic terminal member 4 extends; the terminals 4 of the two members 3 being of a suitable character for the connection thereto of circuit wires 5-5' which lead, respectively, from and to a source of low frequency, preferably 60 cycle alternating high voltage electric current.

Applied to or fitted within the bulb-like portion of the tube and directly within the outer sleeve-like portions 3, is a metallic film, coating or lining 6 and in addition thereto there is disposed co-axially within the bulb-like portion of the tube and within the sleeve-like portion 6, a metallic, tubular element 7 supported in spaced relation from the lining sleeve 6 by means of a plurality of insulating balls 8 which are set within openings 9 formed in the tube about the opposite end portions.

It will be readily apparent that the electrical connection between the outside portions 3 of the electrodes and the inside included gases is made by thus capacitatively connecting the outside of the electrode with the inside, using the outside metallic tube 3 as one plate of a condenser and the contained gas in the tube, by itself, or supplemented by the sleeve-like element 6, or in combination with the tube 7, as the other plate of a condenser while the glass bulb itself serves as the dielectric separator or insulator between the condenser plates; the path of the electric current flowing from the source of low frequency alternating high voltage electric current through the wire 5 to the electrode contact terminal 4, thence to the outside condenser element 3, thence to sleeve 6 and tube 7, or connecting directly with the included, inclosed gases in the tube, thence following the gases to the other end of the tube where the current passes out by virtue of the condenser action of the other electrode in a manner similar to that above described except in a reverse order, and thence flows back to the source of the electric current through wire 5'.

The action of the electric current on the gas when applied, not only to the cylindrical portions of the electrode, but also to the spherical end portions, wherein metallic conductive capacity media is at right angles to the tube, and the effective electric action is in line with the movement of the polarized molecules of the rarefied gases. There is no "breaking down" of the glass, or the gases, even though they are not of the noble group and no perceptable heat will be generated. Furthermore, sufficient amount of light will

not pass from the tube to disturb surrounding lighting effects, nor will the light from the tubes blend together even though tubes are of small size and placed closely together. However, ample light or glow will be produced for the purpose intended, and the amount of current used will be very small in comparison with other types or systems of lighting.

It will be here stated that while in some instances the inside elements 6 and 7 are not essential, they are in all instances desirable and in most instances essential. In any event, they aid materially in the condenser action of the electrodes and add to the efficiency of the electrode as a whole.

Having thus described my invention, what I claim as new therein and desire to secure by Letters-Patent, is:

1. An electrode for luminous tubes of the character described, consisting of a metallic cap, or sleeve, applied about a terminal portion of a luminous tube and having provision for connection with one side of an electric circuit, a metallic lining member fitted to the inner surface of said terminal portion of the tube directly within the outer sleeve or cap, a metallic tube disposed within the said lining, and non-conductive elements supporting said tube in spaced relation from said lining member.

2. An electrode for luminous tubes of the character described, comprising inner and outer metallic, conductive elements applied, respectively, to and about the inner and outer surfaces of a terminal portion of a luminous tube, a metallic, conductive tube disposed within the said conductive elements and having a plurality of small openings therein, and insulating supporting members seated within said openings and engaging with the said inner conductive element.

3. A luminous tube of the character described having a bulb-like terminal portion formed with a cylindrical body and a semi-spherical end wall with an electrode comprising conductive elements fitted respectively to the outer and inner surfaces of the said terminal portion of the tube to cover the surfaces of the cylindrical body and semi-spherical end wall, and having no metallic connection between the said elements and thus capacitatively serving as inner and outer plates of a condenser, while the terminal portion of the tube serves as the dielectric separator therefor; the outer conductive element being adapted for connecting with an electric circuit of low frequencies.

4. A luminous tube of the character described having a bulb-like terminal portion formed with a cylindrical body, and a semi-spherical end wall with an electrode consisting of outer and inner conductive elements fitted respectively to the outer and inner surfaces of the terminal portion to cover the en-

5 tire body portion and end wall surfaces, metallic tubular elements supported in spaced relation within the said inner element; said outer conductive element having terminals for connection with one side of an electric circuit of low frequencies, and said element serving as one plate of a condenser, the inner conductive element and the metallic tube as the other plate of a condenser, while the terminal portion of the tube serves as the dielectric separator for said plates.

10 Signed at Seattle, Washington, this 28th day of September, 1928.

ALBERT EDWIN JACOBSEN.

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