Jan. 5, 1932. H. HARTMAN 1,839,479

ELECTRIC INCANDESCENT LUMINOUS TUBE

Filed Aug. 20, 1928

Fig. 1.

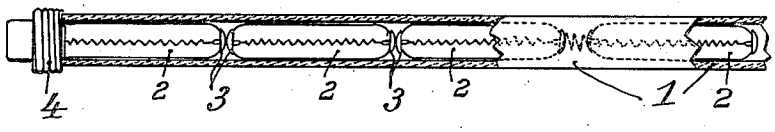


Fig. 2.

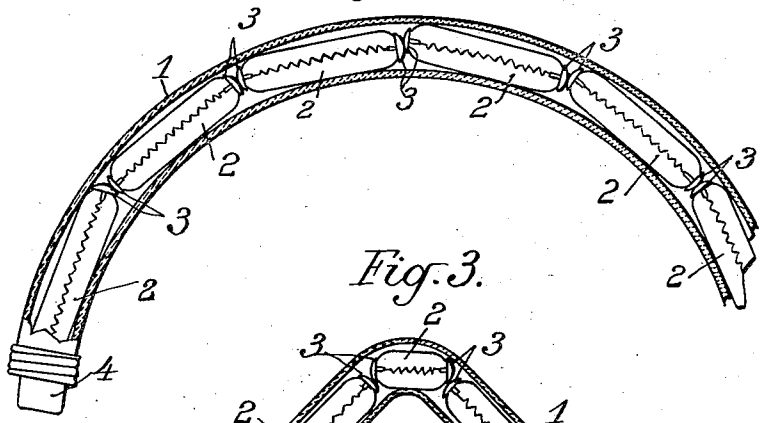


Fig. 3.

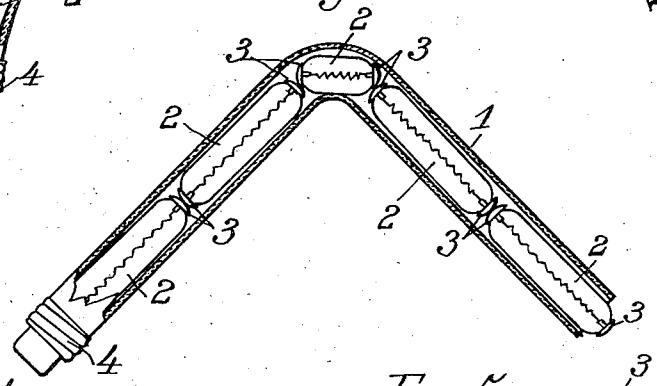


Fig. 4.

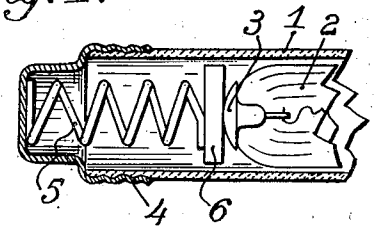
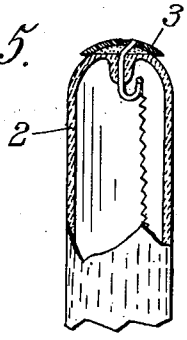


Fig. 5.



INVENTOR

Hans Hartman

Patented Jan. 5, 1932

1,839,479

UNITED STATES PATENT OFFICE

HANS HARTMAN, OF NEW YORK, N. Y., ASSIGNOR TO METRO LIGHT CORPORATION, OF WILMINGTON, DELAWARE, A CORPORATION OF DELAWARE

ELECTRIC INCANDESCENT LUMINOUS TUBE

Application filed August 20, 1928, Serial No. 300,844, and in Germany August 26, 1927.

My present invention relates to a novel type of electric illuminators of tubular form and considerable length and consists mainly in arranging within a long outer glass envelope of preferably tubular shape a plurality of shorter incandescent electric lamps, also of preferably tubular form. Said electric lamps abut with their ends against each other, thus forming within the long glass envelope a continuous line of light, giving the said glass tube the aspect of a long luminous tube, which is closed at each end by means of suitable caps, said caps forming at the same time contact members for the electric current.

The main object in view is, to provide electric luminous tubes of a length, as has been hitherto impossible to produce with the well known, tubular electric incandescent lamps in single units and another object is, to reduce thereby the costs of producing long luminous tubes as well as the expenses of renewal of burnt out lamps. A further object in view is, to produce long electric luminous tubes in curved or other forms, suitable for electric signs and also luminous tubes in various colors.

A preferred embodiment of my invention is illustrated in the accompanying drawings, wherein same numerals designate the same parts throughout the different views.

Fig. 1 is a sectional view of a part of a straight luminous tube, made in accordance with my invention;

Fig. 2 is a sectional view through a part of a curved luminous tube;

Fig. 3 is a sectional view through a part of an angularly bent luminous tube;

Fig. 4 is a sectional end view of a luminous tube, showing the cap attached thereto, the resilient contact spring therein and the end part of one lamp within the long tube;

Fig. 5 is an end view of a lamp as utilized to fill the long glass tubes showing the small flat contact member thereon and the bent-back lead-in wire.

Referring to the drawings, 1 denotes a glass or other translucent tube wherein are arranged a series of tubular electric incandescent lamps 2, each having at both ends a flat contact member 3 to which is connected in the ordinary way the lead-in wire, which in turn contacts with the filament, passing through each lamp from one end to the other in the usual known manner. The glass tube 1, is closed at each end by means of a suitable cap 4 made of metal or any other suitable or desired material as the case may require, which may be screwed directly upon the glass tube, as shown in Fig. 4.

Within said cap 4, is arranged a resilient, metallic coil spring 5, which in turn contacts with the first electric incandescent tubular lamp 2, by touching its contact cap 3 with a metallic washer or disk 6, as shown in Fig. 4. Thus the electric current, entering through the metal cap 4, will pass through the resilient coil spring 5, the washer 6, cap 3 and through the lead-in wire of the lamp, attached in the usual manner to said member or cap 3, into the lamp and pass its filament, to enter again into the following lamp and so on. All lamps are arranged within a tube electrically in a series and the contact cap 4 at the other end of each long tube represents thus the second, electric contact member required.

If the outer glass envelope 1, is slightly larger in diameter than the outer diameter of the tubular incandescent electric lamps with which it is to be filled or "loaded" and if said tubular lamps are made at a certain predetermined length, corresponding with the curvature of the outer glass envelope 1, it is possible to make curved luminous tubes as illustrated in Fig. 2.

And by inserting a comparatively short tubular lamp at the point of angular curvature, it is also possible to produce angularly bent or curved luminous tubes, as shown in Fig. 3. All lamps, filling the long luminous tube will then always abut properly with their flat contact caps 3, against each other as shown, and thus permit the electric current, entering at both ends by way of the end caps 4, to pass from one lamp to the other.

As the incandescent electric tubular lamps, with which each long tube is filled, will heat up considerably while their filaments are in an incandescent state, and said lamps will

thereby expand, it is necessary to provide resilient contact means, either at one or, preferably at both ends, or, if so desired, also only at some point intermediate between two of the tubular lamps themselves, as shown between the last two lamps in Fig. 1.

These resilient contact means may be simply a metallic coil spring, as shown at 5, in Fig. 4 or any other preferred resilient forms of contact may be used.

To reduce the dark or dark appearing spots between the single lamps with their ends against each other within a luminous tube, it is preferable to bring the filament of said lamps as close as possible towards the ends of each lamp envelope, which can be done by bending back the lead-in wire as shown in Fig. 5. Each single lamp will thus appear illuminated practically from one end to the other and the resulting darker spots between the abutting ends of adjoining lamps will be greatly reduced.

Due to the fact that the color of incandescent electric lamps is white, the long luminous tubes can be produced in practically any desired color, by simply using glass tubes or outer glass envelopes 1, which are of the desired color. Said glass tubes 1, can also be in- or outside-frosted or may be frosted on both sides, or transparent colored glass tubes may be used and inside frosted to improve the effect of the colored glass and to give the tubes a certain degree of diffused light.

When one of the tubular lamps, with which the long luminous tubes are filled, burns out or its filament breaks, it can be readily exchanged by simply screwing the cap 4, at one end, removing the intermediate lamps, replacing the damaged lamp by a new one, reinserting all lamps removed and attaching again the screwed off cap 4. As short tubular lamps, wherein the filament extends from one end to the other without any intermediate wire support are inexpensive to manufacture, a long luminous tube, made in accordance with my invention, can thus be kept always in perfect working condition at low costs of renewing burnt out lamps.

It is of course essential that the total resistance of all single incandescent electric lamps, inserted into one tube and burning in series, corresponds to the voltage at which said tube shall be used. That is to say, if the tube shall be used on 110 volts and if it contains ten lamps burning in series, the normal voltage of each lamp would be only 11 volts, thus giving a total of 110 volts. Also the filaments of all lamps, burning in one series, must be equal in thickness and resistance, as is well known to those skilled in the art.

It is also evident that the caps 4, do not need to be screwed directly upon the glass tubes, which then must have a special, corresponding thread pressed upon their ends, but that for instance a threaded metallic ring can be attached by means of cement or in any other preferred manner upon the ends of said tubes and the caps 4, may then be screwed upon said rings. Said caps 4, may also be made of insulating material and have therein inserted the required electrical conductors and instead of coil springs 5, other type resilient contact members may be used, for instance similar as in the well known Swan lamp sockets.

The modus operandi of my long luminous tubes is as follows: the glass tube 1, is filled with a corresponding number of tubular, incandescent electric lamps, by inserting one after the other, until the tube is loaded from one end to the other. Then the two end caps 4, are screwed upon the two ends of the said tube 1, and the same may be now inserted into two suitable holders or sockets, which are connected to an electric light circuit. The current will pass through caps 4, resilient contact springs 5, into the series of lamps and their filaments will become incandescent and the tube will be illuminated.

While I have shown and described a preferred form and construction of a long luminous, electric tube, it is obvious that variations in construction and arrangements of parts as well as in the form of parts can be made, without deviating from the spirit of my invention. Without limiting myself to the special form and specific shape or construction of parts as described and illustrated, I claim:

1. An electric illuminating tube, comprising an outer translucent envelope of tubular form, a plurality of shorter tubular lamps, flat and slightly curved metal caps upon each end of the said tubular lamps, resilient contact members at each end of the outer envelope to press the said tubular lamps against each other within the said envelope and means to close the latter at each end.

2. An electric illuminating unit comprising an outer tubular and translucent envelope, a plurality of separable illuminating units carried within said envelope, contact caps mounted on the ends of the respective separable units, resilient means within the envelope to yieldingly retain the contact caps of the successive units in direct contact one with the other and detachable means to close the ends of said envelope and retain said units and resilient means therewithin.

Signed at Paris, France, this 8th day of August, 1928.

HANS HARTMAN.