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MERCURY AMALGAMATIVE MATERIAL
ON ITS ELECTRODE STEMS
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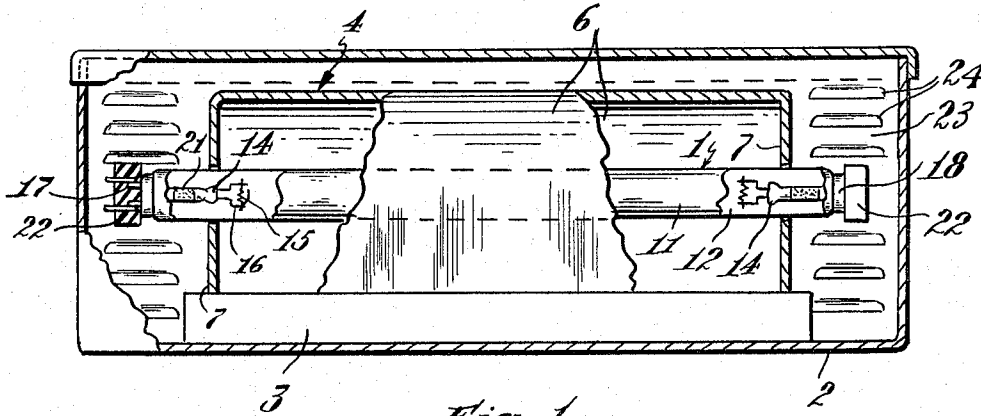


Fig. 1

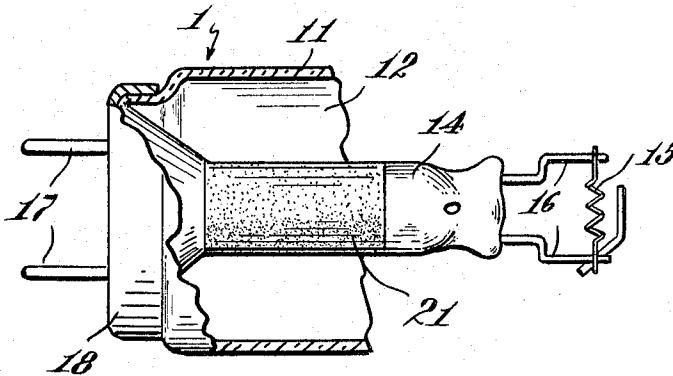


Fig. 2

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HIGH TEMPERATURE FLUORESCENT LAMP WITH REFLECTOR HAVING MERCURY AMALGAMATIVE MATERIAL ON ITS ELECTRODE STEMS

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This invention relates to high thermal, very high output (VHO) mercury vapor fluorescent lamps, and particularly to lamps for use in the light compartment of photocopying apparatus.

As is well known, the illuminating efficiency of a fluorescent lamp, for example, drops off from its maximum as the pressure of mercury vapor, being dependent on temperature, varies above or below an optimum, typically about four microns at about 35° C. at the coolest part of the lamp envelope. In many installations, particularly in almost completely enclosed fixtures such as troffer fixtures, or where the ambient temperature rises very high at times, the lamp may be required to operate at temperatures considerably above 35° C. with a consequent reduction in efficiency.

One type of high thermal VHO lamp has a deposit of indium or other mercury-amalgamative metal on its inner wall in the form of a ring or spot which wets the glass wall and adheres thereto. Mercury pressure in such a lamp is reduced by amalgamation of the vaporized mercury fill with the indium. At ordinary lamp temperatures mercury vapor pressure is held below optimum. But, as the lamp environment approaches the anticipated abnormally high temperatures, the mercury evaporates from the indium alloy and reaches optimum pressure.

The high thermal VHO lamp described above very successfully achieves high light output in most high temperature illuminating fixtures where conventional lamps would operate at greatly lowered efficiency. However, some lamp installations require a very high level of light to be restricted within a close fitting compartment such as a reflector which greatly intensify the over heating problem. For example, within a photocopying machine the lamp must provide an intense, reliably uniform light for printing from the copy material to a sensitized record in a very short time. At the same time the lamp must be shielded from sensitized paper outside the printing zone. Hitherto it has been necessary to cool even high thermal lamps by forced ventilation. Otherwise the very high temperatures arising will heat the high thermal lamps above their elevated operating temperature.

The object of the present invention is to provide a fluorescent lamp capable of efficient operation in the most severe high temperature environments.

According to the invention a mercury filled fluorescent lamp comprises an elongate envelope, at least one stem sealing one end of the envelope, and a deposit of mercury-amalgamative metal on the surface of the stem within the end of the envelope, said end being adapted to be disposed in a cooler environment than the major lamp portion so as to promote amalgamation of the mercury fill and deposit and reduce the vapor pressure of the mercury fill, thereby to increase the light output of the major portion of the lamp.

For the purpose of illustration a typical embodiment of the invention is shown in the accompanying drawing in which:

FIG. 1 is an elevation, partly broken away of a photocopying machine with a fluorescent lamp according to the invention; and

FIG. 2 is an enlarged view of a portion of the lamp of FIG. 1.

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In FIG. 1 a fluorescent lamp 1 is shown within the housing 2 of a photocopying machine. Within the housing is a block 3 diagrammatically representing the copy feeding mechanism and printing optics of the machine.

Such mechanisms and optics, illuminated by fluorescent lamps, are well known. As is typical of such machines the external housing 2 is required to exclude ambient light. In addition the lamp 1 is located within a compartment formed by a reflector 4 having curved side and upper walls 6 which concentrate light from the lamp 1 on the printing zone of the copy feeding mechanism 3, and end walls 7. At the same time the reflector compartment 4 must shield light from parts of the printing mechanism through which sensitive paper passes before and after the exposure, and the lamp 1 is therefor closely confined within the reflector compartment 4.

As shown in FIGS. 1 and 2 the lamp 1 comprises an elongate tubular glass envelope 11 having on its inner wall a coating 12 of phosphor. At each end of the envelope are glass stems 14 which seal the ends of the envelope. Emissive electrodes 15 are mounted inwardly of the stem press on lead wires 16 extending through the stem press to terminal pins 17 insulatively mounted in bases 18. The lamp is filled with a small amount of rare gas such as argon and neon at low pressure, for example, one or two millimeters, and a fill of mercury. In operation an alternating current is applied across the electrodes 15 sustaining an arc discharge therebetween through the mercury vapor within the envelope, thereby causing the vapor to emit ultraviolet light which excites the phosphor coating 12 to fluorescence, particularly along the major portion of the lamp between the electrodes 15. During operation the lamp temperature will rise and the mercury vapor pressure increase. If the vapor pressure were uncontrolled it would, in the close confines of the reflector compartment, soon exceed an optimum value and light output would drop off.

According to the present invention a band 21 of indium or other mercury-amalgamative metal is deposited on one or both of the stems 14 in the end of the lamp between the electrode 15 and the base 17, and the lamp is mounted with the indium band in the lamp end disposed in the cooler compartment 23 of the housing adjacent ventilation openings 24 outside the hotter reflector compartment. The lamp is supported by engagement of its terminal pins 17 in sockets 22 attached to the housing 2. The indium may be deposited by heating the glass stem to a temperature of about 160° C. and rubbing a pellet of indium against the heated barrel portion of the stem.

Location of the indium band 21 in the cooler environment adjacent ventilation openings 24 outside the reflector compartment causes more mercury to condense and amalgamate with the indium than would do so in the major portion of the lamp within the reflector, and thus makes it possible for the indium to control the mercury vapor by holding it at or near the optimum value for high light output. Further, it makes such control possible without the necessity for forced ventilation. Manufacture of the lamp is simplified by applying the indium to the glass stem rather than to the inside wall of the envelope 1. It is also assured that after lamp operation mercury will condense at the lamp ends rather than on the phosphor of the major illuminating portion of the lamp.

In a one foot lamp drawing 0.800 amperes a mercury/indium ratio of 1.2 by weight is used; for example 38 milligrams of indium and 45 milligrams of mercury. Such lamps will operate at 140° F. on the glass stem with 35% to 40% greater light output than a conventional lamp.

Other ratios of indium and mercury may be used in

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proportion to the power requirements and temperature environment of the particular lamp installation. Thus it will be understood that the present invention includes all modifications and equivalents within the scope of the appended claims.

I claim:

1. A high temperature fluorescent lamp installation comprising a housing, a light compartment within said housing including a reflector, a mercury filled fluorescent lamp extending through said reflector with at least one end of the lamp outside said reflector, said lamp including a stem sealing said one lamp end and extending toward the other lamp end, and a deposit of mercury-amalgamative metal on a portion of the surface of said stem, and means to support the lamp with said portion outside said reflector, whereby said deposit is exposed to a temperature lower than that of the lamp portion within the reflector so as to reduce the vapor pressure of the mercury by amalgamation therewith, thereby to increase the light output of the lamp portion within the reflector.

2. A photocopying machine comprising a housing, partition means including a reflector forming a light compartment within said housing, said partition means forming an outer compartment between the housing and light compartment, ventilation means communicating with and

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cooling said outer compartment, a mercury filled fluorescent lamp extending through said reflector with at least one end of the lamp outside said reflector, said lamp including a stem sealing said one lamp end and extending toward the other lamp end, and a deposit of mercury-amalgamative metal on a portion of a surface at said lamp end, and means to support the lamp with said portion, whereby said deposit is exposed to a temperature lower than that of the lamp portion within the reflector so as to reduce the vapor pressure of the mercury by amalgamation therewith, thereby to increase the light output of the lamp portion within the reflector.

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