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Hough et al.

[11] **3,788,560**

[45] **Jan. 29, 1974**

[54] **LIGHTING FIXTURE**

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[73] Assignee: **GTE Sylvania Incorporated**

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[52] **U.S. Cl.** ..... **240/51.11 R**, 219/347, 240/11.4 R

[51] **Int. Cl.** **H05b 33/02**

[58] **Field of Search** . 240/51.11 R, 41.35 R, 11.4 R; 219/343, 347, 349

[56] **References Cited**

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[57] **ABSTRACT**

An ultraviolet lighting source for curing organic coatings is disclosed herein. The high intensity lamp of the fixture is held in a temperature resistant lamp holder that allows the lamp freedom for expansion and contraction. Also, a shield is provided to protect the critical lamp seal from the high operating temperatures generated by the lamp.

3 Claims, 4 Drawing Figures

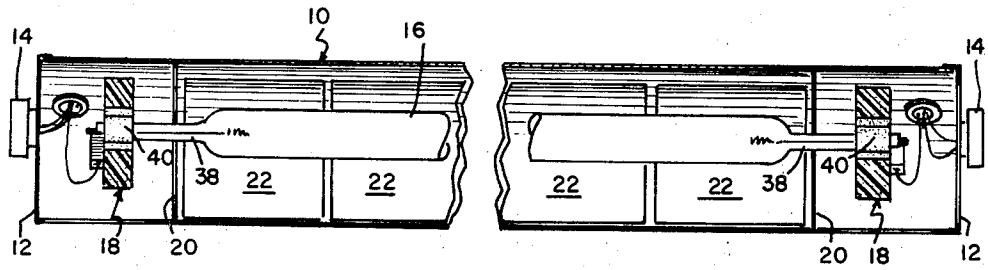
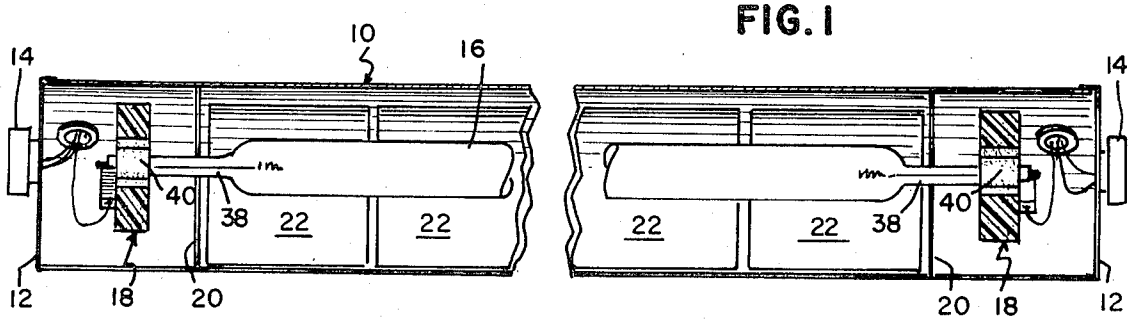


FIG. 1


14
10
16
40
38
22
22
12
18
20
22
22
38
40
14
20
18
12

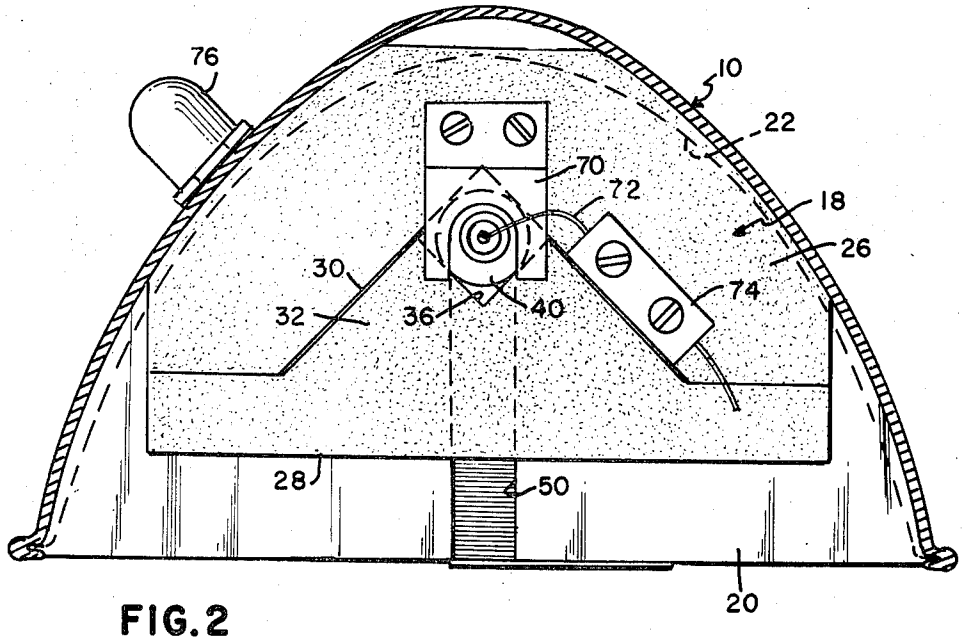

76
10
22
70
72
18
26
30
74
32
36
40
28
50
20

FIG. 2

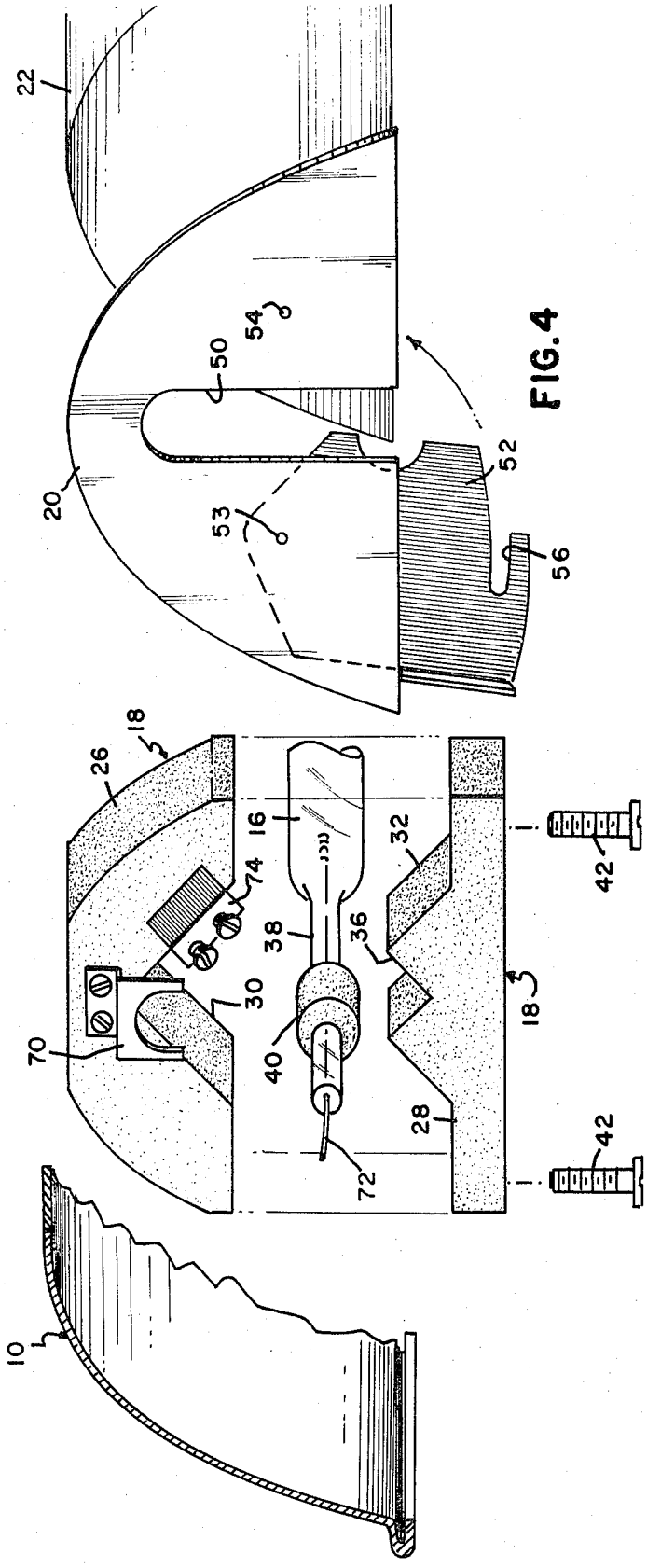


FIG. 4

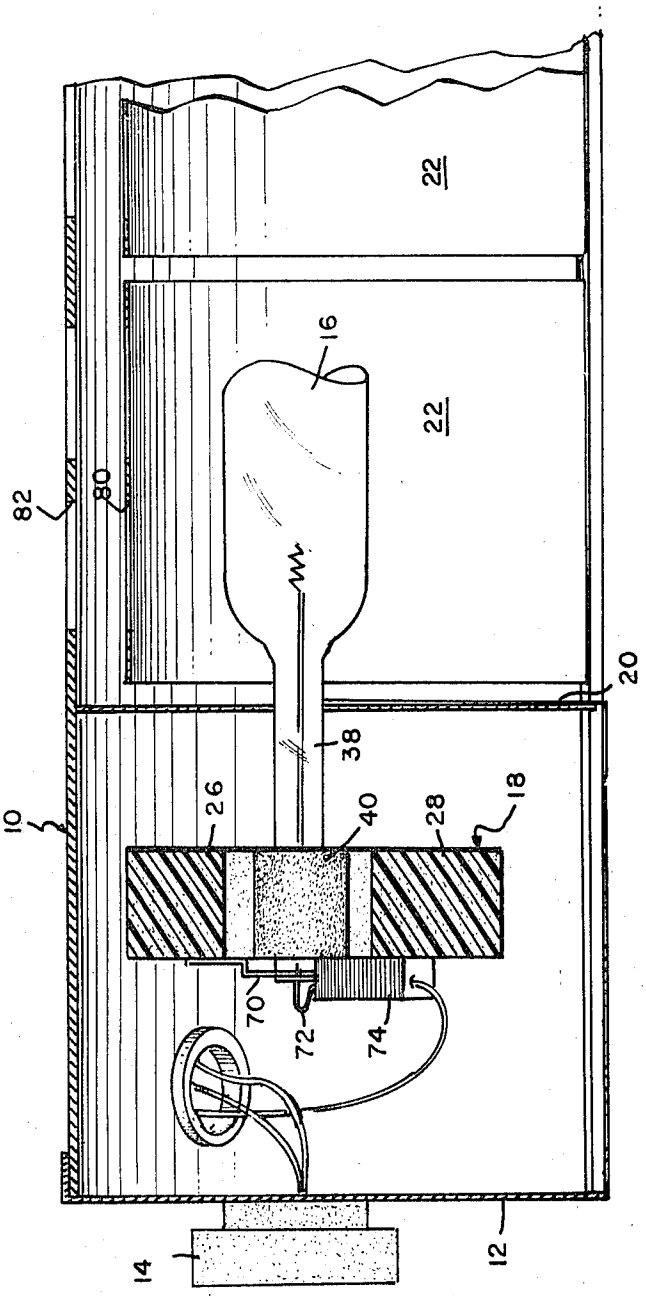


FIG. 3

LIGHTING FIXTURE

FIELD OF THE INVENTION

This invention relates in general to radiation curing and more particularly to ultraviolet irradiation sources that cure organic coatings having ultraviolet sensitive resins such as used in the printing industry.

The ultraviolet lighting source is ideal for this type of curing because the lamp and its optics can be made to cover a standard printing mill belt and because of the fixture's low profile the fixture can be placed at the critical area of curing without redesigning the printing mills.

PRIOR ART

Present ultraviolet curing sources are primarily used in confined areas of automated lines, where the fixtures themselves are in proximity to the work. The lamp used in this process is of the quartz type which operates at extremely high temperatures (550°C to 850°C) and necessitates large blowers to protect the lamp. The lamp holders are either spring loaded or rigid. In the spring loaded holder, the springs act as electrical contacts for the lamp. In this arrangement of using spring contacts, the fixture has inherently short life due to the combination of the heat and the resin curing vapors affecting the spring contact. In the use of rigid lamp holders, early failure is also high, this being due to intense heat which expands the glass in their holders, thereby causing breakage of the lamp.

SUMMARY OF THE INVENTION

In our present invention, we have designed a fixture specifically for tubular mercury arc lamps to be used as the ultraviolet source for curing UV sensitive resins which are being developed in the general printing industry. The lamp and its reflective optics are designed for use in close proximity to the work (generally within a few inches of the resin to be cured). A typical application might be the arrangement of banks of these fixtures at strategic places on the printing mills.

The fixture design is such that any length can be accommodated merely by providing sufficient length fixture extrusion and adding segmented reflectors as necessary. For all length lamps, the fixture ends remain the same. The lamps themselves have a round tubular type seal and are terminated with a round ceramic end cap which is cemented to each sealed end.

The lamp when in position in the fixture is loosely retained by two heat resistant type holders, the design of which permits the lamp to be held, yet allows for free expansion and contraction. The electrical conductors of the lamp are directed to metal terminal blocks adjacent the lamp holders and thence to a power supply not shown in the drawings. A separate circuit from this power supply is directed to the safety interlocks located on the outer surface of the end caps of the fixture.

Other features incorporated in the fixture design are segmented slip-in reflectors that minimize warpage and a reflectorized lamp seal shield for lamp seal temperature protection. With the design of the lamp holders and the reflectorized shields the fixture can be utilized without the use of added cooling means such as blowers. As mentioned above, the safety interlocks located on the outer surface of the end caps give the fixture an added safety feature in that lamp removal cannot be made without disconnecting the safety interlocks.

Other objects, features and advantages will become apparent to those skilled in the art after reading the following specification when taken in conjunction with the accompanying drawings in which:

FIG. 1 is an elevational cross-section of a fixture showing in particular the overall disposition of the different components;

FIG. 2 is an enlarged end view of the fixture with the end plate removed;

FIG. 3 is an enlarged end elevational view showing in particular one of the lamp holders and a lamp seal shield; and

FIG. 4 is an exploded view in perspective of the view of FIG. 3.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring to FIG. 1, a typical fixture of our design is shown in an elevational cross section. The housing body **10** is of elongated elliptical configuration. Each end of the fixture is provided with a removable end cap **12** having safety interlocks **14** fixed thereto. Positioned at the focal point of the elliptical body and running lengthwise of the fixture is an elongated tubular lamp **16** held by lamp holders **18.** The electrical connections for the lamp will be described hereinafter. A lamp seal shield **20** is positioned between the end seal portion and the main portion of the lamp. Positioned above the main portion of the lamp **16** is a series of segmented reflectors **22** slightly spaced from one another to provide room for expansion due to extensive heat of the lamp **16.**

In FIGS. **2,3** and **4,** the lamp holder and seal shield are more clearly shown. The lamp holder **18** in FIG. **4** comprises an upper portion **26** fixed to the housing **10** and mating removable bottom piece **28.** The upper portion **26** is provided with a V-notch **30** and the bottom piece **28** has a wedge **32** that mates to the V-notch **30,** the center portion of which is cut into a smaller V-notch. When the two pieces **26** and **28** are mated together, a diamond shaped relief slot **36** is developed, this can be more clearly seen in FIG. **2.**

Referring back to FIG. **1,** the lamp **16** is provided with tubular seals **38** at each end thereof and a pair of ceramic sleeves **40** are cemented to each seal. As seen in FIGS. **2** and **4,** when the bottom piece **28** of the lamp holder **18** is secured to the upper portion **26** by suitable fasteners **42** the ceramic sleeves **40** will be loosely retained within the diamond relief slot **36.** Due to the extreme operating temperatures of the lamp of this particular application, precaution must be taken to protect the tubular seals **38** of the lamp **16.** This is accomplished by providing a lamp seal shield **20** at each end of the lamp, located approximately at the junction of the sealed end and the main envelope portion of the lamp. The shield **20** conforms to the general shape of the elliptical fixture body **10** and has a slot **50** that extends along the major line of axis of the ellipse. This slot is slightly larger than the lamps tubular seal **38** and provides clearance for this portion when the lamp is inserted in the lamp holder. After the lamp is placed in the lamp holder the remaining open end of the slot is covered by a door **52** that is pivoted at **53** and is secured in place by engagement of an adjustable screw **54** in arcuate slot **56** on door **52.** When door **52** is in place the slot **50** is completely covered, thus excessive heat from the lamp envelope is shielded from the tubular seal **38.** Air ventilating ducts **80** are provided in the re-

flectors 22 and similar ducts 82 are located in the housing 10 to allow the heat from the lamp to be dissipated from the interior of the housing.

Although the lamp holders, with their diamond shaped slots 36, provide for the expansion and contraction of the glass which occurs during operation and cooling off periods, the lamp holders 18 are provided with retainers 70 (FIGS. 2 and 4) fixed to the outer portions thereof to limit horizontal movement of the lamp. Lamp lead-in wires 72 (FIGS. 1 and 3) extend through terminal blocks 74 and are directed to a power supply unit, not shown in the drawings. The safety interlocks 14 have a separate circuit also coming from the power supply. Both sets of wires are carried from one end of the fixture to the other end by conduit 76.

What we claim is:

1. A lighting fixture for the rapid curing of UV curable resins comprising: an elongated elliptical curved housing; end caps detachably secured to the ends of said housing; safety interlocks secured to said end caps; a series of separate slip-in reflectors positioned in said housing, the reflectors being spaced apart sufficiently to permit expansion thereof during normal operation; a lamp holder located at each end of said housing; an elongated tubular UV emitting arc discharge lamp disposed at the focal point of the elliptical housing and having tubular seals at its ends, said tubular seals being loosely held by said holders so as to permit longitudinal expansion of the lamp during operation; a ceramic sleeve fastened to each tubular seal of the lamp; a retainer fastened to each lamp holder, said retainer having an opening larger than the tubular seals but smaller than the ceramic sleeve in order to limit longitudinal movement of the lamp; and a shield positioned between each of said tubular seals and the main portion of the lamp.

2. The fixture according to claim 1 wherein each of said lamp holders comprises an upper portion fixed to said housing and a detachable bottom mating portion secured to said upper portion, said upper portion being provided with a V-notched relief and said lower portion being provided with a wedge mating to the V-notch relief of said upper portion, said wedge of said lower portion being provided with a V-notch smaller than the V-notch in said upper portion whereby a diamond shaped relief slot is established when said lower portion is mated to said upper portion for receiving said tubular seals and thereby supporting said lamp.

3. The fixture according to claim 1 wherein said shield is provided with a slot larger than said tubular lamp seal ends and a door pivotally mounted on said shield and positioned to cover a portion of said slot in said shield.

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