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[54] **LIGHT SHIELD AND COOLING APPARATUS**

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[73] Assignee: **The United States of America as represented by the Administrator of the National Aeronautics and Space Administration**, Washington, D.C.

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[52] **U.S. Cl.** **240/47**, 353/54, 353/61

[51] **Int. Cl.** **F21v 29/00**

[58] **Field of Search** 240/47; 352/202; 353/52, 353/54, 61; 250/504, 493

[56] **References Cited**

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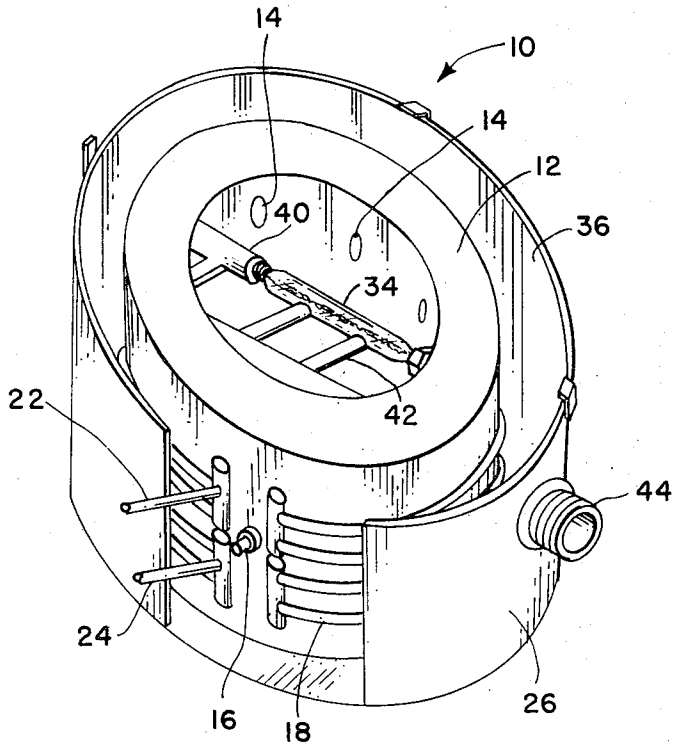
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[57] **ABSTRACT**

A light shield and cooling apparatus for a high intensity ultraviolet lamp including water and high pressure air for cooling and additional apparatus for shielding the light and suppressing the high pressure air noise.

3 Claims, 4 Drawing Figures



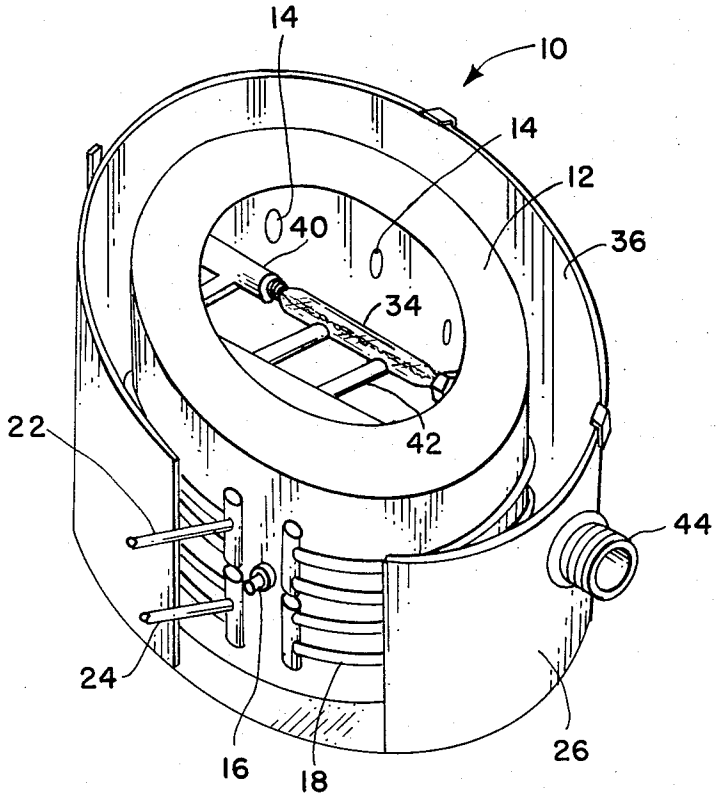


FIG. 1

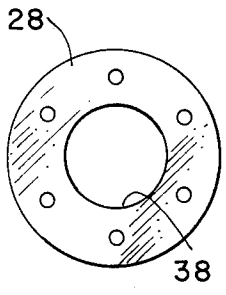


FIG. 2a

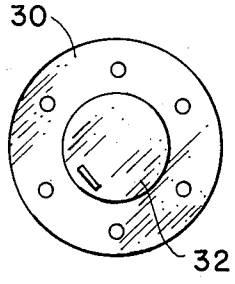


FIG. 2b

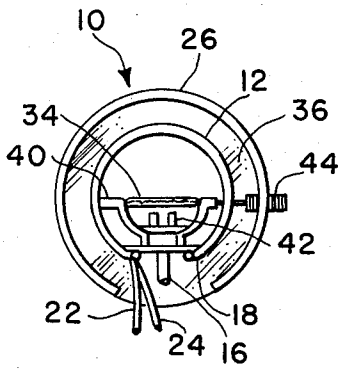


FIG. 3

LIGHT SHIELD AND COOLING APPARATUS

ORIGIN OF THE INVENTION

The invention herein described was made by an employee of the National Aeronautics and Space Administration and may be manufactured and used by or for the Government for governmental purposes without the payment of any royalties thereon or therefor.

BACKGROUND OF THE INVENTION

The invention relates generally to the shielding and cooling of a high intensity light and more specifically to apparatus for cooling a high intensity ultraviolet lamp with water and high pressure air while shielding the lamp so as to confine the intense light to a desired area and so as to suppress the noise created by the high pressure air.

In the consideration of material for possible use in outer space, tests must be conducted to determine the effect of ultraviolet light on such materials for extended periods of time. High intensity quartz-mercury lamps of the BH-6 type can produce ultraviolet light for the required period but their use has been restricted due to their tendency to explode from overheating. Lamps of this type attain temperatures over 1,000°F. and are extremely dangerous when they explode. Attempts have been made in the prior art to cool lamps of this type using high pressure air, but the noise levels generated by the air were not acceptable to personnel working nearby. Therefore there is a definite need for an improved apparatus for cooling high intensity ultraviolet lamps including apparatus for shielding nearby personnel from the intense light given off and from the danger of lamp explosions.

Accordingly, it is an object of the present invention to provide an apparatus for cooling a high intensity ultraviolet lamp so as to reduce the tendency of the lamp to explode.

Another object of the present invention is to provide an improved apparatus for shielding the intense light emitted by a high intensity ultraviolet lamp.

Another object of the present invention is to lower the noise level of a high pressure air cooling system to an acceptable level.

SUMMARY OF THE INVENTION

The foregoing and other objects are attainable in the present invention by providing a circular metallic jacket around a high intensity ultraviolet lamp so as to limit the path of high intensity light given off by the lamp. A hollow coil is wound around the outer surface of the jacket such that coolant flowing therethrough serves to keep the jacket cool. An air inlet extends through the jacket to the lamp. The jacket and coil are enclosed in a shield spaced from the jacket. High pressure air is pumped through the air inlet in the jacket to cool the lamp, the open volume between the coil and the metallic shield serving as an expansion chamber to suppress the high pressure air noise.

The use of liquid coolant circulating through the coils surrounding the jacket and high pressure air serves to cool the lamp thereby reducing its tendency to explode from over-heating, wherein the enclosing of the lamp serves to limit the path of the high intensity light and lowers the high pressure air noise to an acceptable level.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the present invention and many more of the attendant advantages thereof will be more readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

FIG. **1** is a perspective view of the shielding and cooling apparatus of the present invention;

FIGS. **2***a* and **2***b* are views of the two annular covers for the shielding and cooling apparatus shown in FIG. **1**; and

FIG. **3** is a top view of the apparatus with the annular cover removed.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, the light shield and cooling apparatus is shown in FIG. **1** and designated generally by reference numeral **10.** Light shield **10** includes an annular jacket **12** formed of a suitable conductive material, such for example, copper. A plurality of circular openings **14** are circumferentially disposed in spaced adjacency about the perimeter of jacket **12.** An air inlet **16** extends perpendicularly through one side wall of jacket **12.** A coolant coil **18,** having a coolant inlet **22** and a coolant outlet **24** in fluid connection therewith, is disposed in intimate contact with and substantially surrounding jacket **12.**

An exterior shield **26** surrounds a major portion of and is spaced from jacket **12** and coils **18** such that frontal access to air inlet **16,** coil inlet **22** and coil outlet is maintained.

Referring now to FIGS. **2***a* and **2***b*, an annular cover **28,** having a central opening **38** formed therein, is mounted onto the upper edge of shield **26.** A second annular cover **30,** having a removable cover plate **32** attached thereto, is mounted onto the lower edge of shield **26** such that an inner chamber **36** is formed between shield **26,** jacket **12,** annular cover **28** and annular cover **30.** Annular cover **28** and annular cover **30,** having cover plate **32** attached thereto, serve with shield **26** to form a unitary structure enclosing jacket **12.**

Referring now to FIG. **3,** a high intensity quartz-mercury lamp **34,** mounted on fixture **40,** is shown within the annular opening of jacket **12.** Air nozzles **42,** in fluid communication with air inlet **16,** leading from a high pressure air source (not shown), are aimed directly at lamps **34.** The interior surface of jacket **12** and the interior surface of shield **26** are coated with a black radiation absorbent material, while the exterior surface of shield **26** is coated with a white radiation reflective material. Electrical power receptable **44** is mounted in shield **26** and is in electrical connection with fixture **40** and lamp **34** in a conventional manner.

OPERATION

the operation of the present shielding and cooling apparatus, receptable **44** is connected to a suitable electric power source to activate lamp **34** and a liquid coolant supply, such for example water, is connected to coil inlet **22.** The coolant flows through coil **18** thereby directly cooling jacket **12** and indirectly cooling quartz-mercury lamp **34.** At the same time high pressure air is

pumped through air inlet **16** and air nozzles **42** such that the air impinges on and directly cools lamp **34.**

The high pressure air flows from the annular opening in jacket **12** through circular openings **14** formed in jacket **12** and into inner chamber **36.** The air then escapes from inner chamber **36** through central opening **38** formed in cover **28** and the portion of shield **26** which does not completely surround jacket **12.** Inner chamber **36** serves as a noise diffusion chamber such that the noise generated by the air escaping is reduced to a level acceptable to nearby personnel. Cover plate **32** is conventionally attached to cover **30** and is readily removed whenever lamp **34** requires servicing or whenever it is desired to monitor the intensity of the lamp.

Jacket **12** surrounding lamp **34** serves to limit the path of the intense light rays generated therefrom whereby the rays are directed only at the material to be tested such that nearby personnel are protected from the hazardous rays. Jacket **12** also serves as a guard to protect nearby personnel from injury in the event lamp **34** explodes.

The radiation absorbent material coated on the interior surfaces of shield **26** and jacket **12** and the radiation reflective material on the exterior surface of shield **26** serve to reduce the transmission of heat through the apparatus and also serve to remove radiation in the apparatus. Shield **26** is readily attachable to any suitable support structure so as to direct the light rays in the desired direction.

It is to be understood that the form of the present invention shown and described herein is to be taken as the preferred embodiment only, and that the invention may be practiced otherwise than as specifically described. The invention is not limited to the preferred embodiment and other variations and modifications will be readily apparent to those skilled in the art without departing from the spirit and scope of the appended claims.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. Apparatus for shielding personnel from lamp breakage, ultraviolet radiation, heat, and high intensity light hazards while at the same time reducing the noise level of high pressure air flow used in cooling the lamps and permitting *in-situ* service of the lamps. comprising:

a high intensity ultraviolet lamp and appropriate holding fixture;

an open ended cylindrical jacket constructed of heat conductive material positioned around said lamp to form an enclosure accessible only at both ends so as to define a path of radiation for said lamp which is coaxial to said cylindrical jacket;

conduit means in communication with a high pressure air source extending into said jacket in a direction transverse to the axis of said cylindrical jacket for direct air cooling of said lamp;

coil means substantially surrounding and attached in intimate contact with said cylindrical jacket;

coolant inlet and coolant outlet means in fluid connection with said coil means for circulating a flow of liquid coolant in said coil means to keep said jacket relatively cool when said lamp is in operation;

a cylindrical metallic shield coaxial with said cylindrical jacket surrounding the major portion of said jacket and said coil means and spaced therefrom, a first annular member having a central opening therein sufficiently large to permit radiation from said lamp to be directed upon external objects attached to one open end of said jacket and a second annular member attached to the other open end of said jacket, said second annular member having a service access port therein, and a cover plate removably covering said service access port so that said lamp can be serviced and replaced; and

means for connecting said exterior shield, said cylindrical jacket, and said coil means into a unitary structure so as to confine radiation from said lamp to the desired direction.

2. The apparatus of claim **1** wherein the space between said jacket and said shield defines an expansion chamber, and said cylindrical jacket has a plurality of openings permitting expulsion of the high pressure air from within said jacket into said expansion chamber prior to the passage of the air from said apparatus to thereby reduce the air pressure noise level.

3. The apparatus of claim **1** wherein the interior surface of said jacket adjacent to said lamp is provided with a black radiation absorbent coating.

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