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BLACKBODY RADIATING DEVICE WITH A PROTECTIVE HOOD

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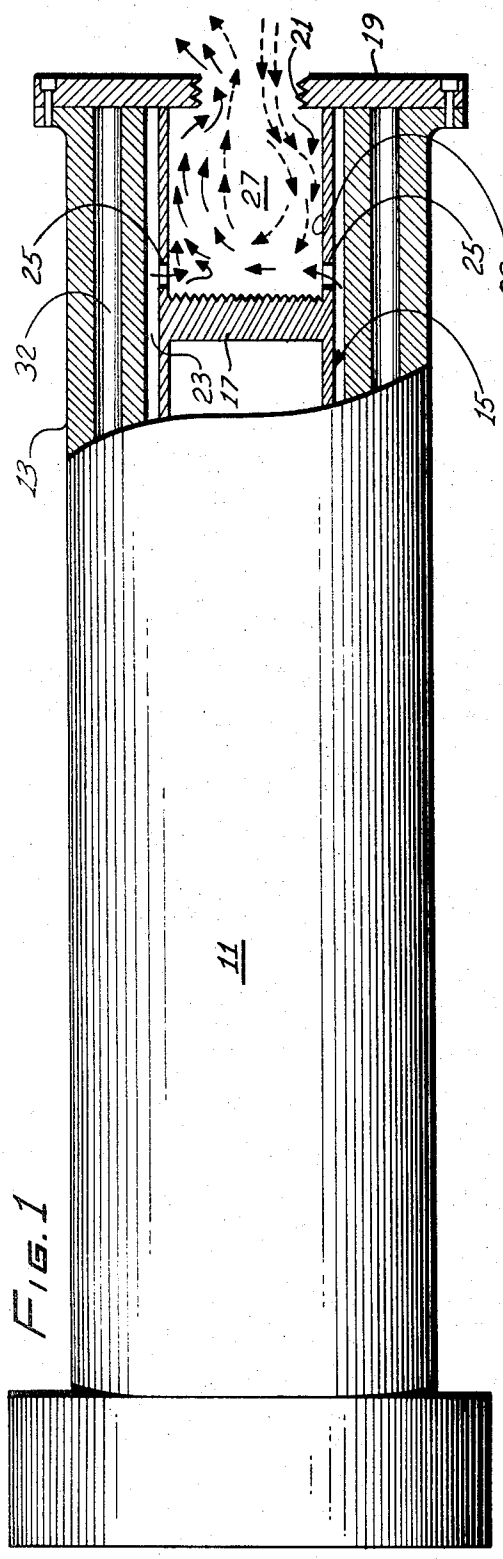


FIG. 1

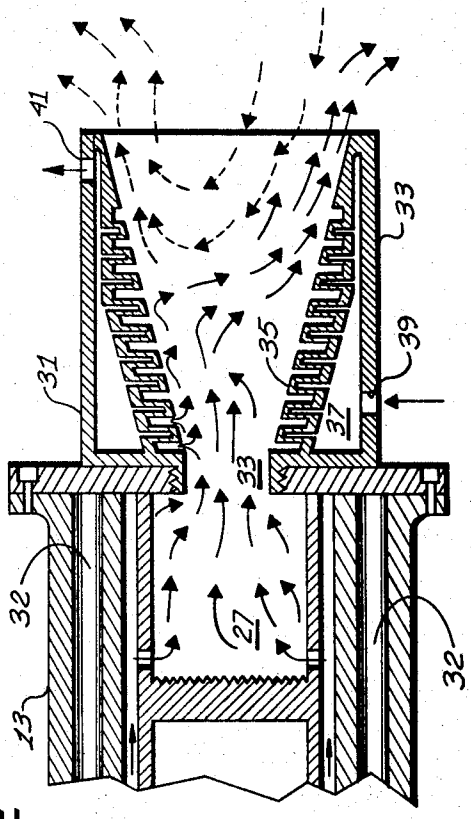


FIG. 2

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BLACKBODY RADIATING DEVICE WITH A PROTECTIVE HOOD

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ABSTRACT OF THE DISCLOSURE

A blackbody radiating device containing a heatable oxidizable body in a housing having an open end exposing said oxidizable body to ambient air. An opening in the wall of the housing to provide a flow of inert gas over the oxidizable body and a protective hood affixed to the open end of the housing so designed as to cool said inert gas when exiting from said open end **20** as to prevent egress of deleterious air into said housing.

This invention relates to a means for improving blackbody radiation devices. More particularly, the invention relates to a means for improving the life of the radiating element used in blackbody radiation devices.

In Patent 3,205,343 assigned to the same assignee, there is disclosed a blockbody source. The source contains a radiating element which is generally made of graphite. The element is connected to an electrical source which resistively heats it to temperatures at which the radiation occurs. Erosion and oxidation of the graphite or other radiation element can be reduced by flushing with a slight flow of inert gas, such as argon. However, in operation it was found that a portion of the ambient atmosphere, which was usually air, would still enter the element through the end-viewing aperture. This, in turn, caused oxidation and erosion of the graphite element more rapidly than desired.

Thus, an object of this invention is to further enhance the life of a graphite or other oxidizable element used in blockbody radiation devices.

Another object of the invention is to provide a means for reducing the quantity of inert gas needed to protect the radiation element.

The object of this invention is accomplished by affixing to the viewing end of the blackbody device a protective hood which is comprised of a water-cooled jacket extension. As will be shown in the description accompanying the figures, the extension prevents the air from entering the cavity of the blackbody device and causing any deleterious effect. The invention will be described in further detail with relation to the following drawings in which:

FIG. 1 is a partially sectioned view of a blackbody radiation device without the improvement of the invention.

FIG. 2 is a section of a blackbody radiation device incorporating the protective hood of the invention.

Referring now to FIG. 1, there is shown a blackbody radiation device **11** which essentially corresponds to the type of device shown in FIG. 3 of the referred to U.S. Patent 3,205,343. The details of the device other than the graphite radiating element are not of import to the herein invention and, thus, no details of the portion of the device extending from the front half of the graphite element toward the rear are shown. As described in the mentioned patent, the device contains an outer cylindrical shell or housing **13**. Disposed concentrically within the housing is a radiation element **15** which is of a material such as graphite. A radiation surface **17** is medially disposed within the cylindrical radiating element and serves to radiate toward the open end **19**. An aperture **21** is provided at the open end **19** to view the radiating surface

17. To prevent oxidation of the radiating element, an inert noble gas is admitted into the device and flows through a passage **23** surrounding the element. The inert noble gas then enters the element through apertures **25** and flows within the cavity **27** between the radiating surface **17** and the end **19** of the device. The inert gas which can be argon is shown by the solid line arrows in the drawing.

The argon enters, as described, the blackbody cavity through the apertures **25**. It is heated in the blackbody, which is at 2000° K., to above 450° K. At this temperature, the argon becomes less dense than air. The heavier air, as depicted by the dotted arrows, enters at the bottom of the aperture **21** and forces the argon out through the upper portion of the aperture. As the air scours the bottom of the hot graphite cavity, it causes erosion by oxidation principally along the surface **29**, which is the bottom portion of the cylindrical graphite element when the device is used in its normal horizontal position as shown. This erosion eventually causes failure of the blackbody radiation element **15**.

Turning now to FIG. 2 there is shown the improvement of the invention wherein a protective hood **31** is threadably affixed at **33** to the front portion **19** of the blackbody radiation device. The cylindrical hood has an outer wall **33** and an inner corrugated wall **35**. Between these walls is formed a cavity **37**. An inlet **39** is provided to the cavity with an outlet **41** also in the wall **33** of the device. A coolant such as water enters the inlet **39**, circulates within the cavity **37** and exits at the outlet **41**. The corrugated surface **35** serves to increase the effective heat transfer area between the coolant and the gases within the hood. Additionally, as shown, the corrugated inner wall **35** is shown in a generally frusto-conical configuration, tapering outwardly from the exit of the blackbody radiation device. This serves to allow the full field of view of the heated cavity to be utilized. Due to the utilization of the protective hood, the hot argon leaving the aperture **21** of the blackbody device is cooled by contact with the water-cooled protective hood **31**. The argon then drops below 450° K. and becomes heavier than the air. This forms a protective curtain which is effective in preventing the air from entering the aperture. As can be seen from the dotted arrows representing the air, the air progresses only slightly inwardly within the protective hood, but does not come close to reaching the confines of the blackbody cavity **27**. This serves to prevent the erosion, previously described, of the graphite element and greatly prolongs the life thereof. Additionally, less inert gas is required to effect the desired result of protecting the graphite from air.

For example, as a possible alternative to the arrangement shown in FIG. 2, the coolant water circulating in the hood extension **31** can pass from the hood into the main body **13** of the device to cool the walls thereof. With this particular arrangement, an aperture can be provided between the coolant passages **33** of the main body of the radiation device and the hood, wherein the water can exit from the hood into the coolant passages **33**.

Though the device has been shown utilizing a liquid cooled outer protective jacket or hood, it is contemplated that in certain instances the air cooled one can be utilized. In those instances where the problem is not so severe, such as in a smaller aperture at lower temperature, a mere air cooled protective hood will suffice. Thus, in accord with the concept of the invention, the protective hood should extend a length and be cooled to the degree necessary to prevent air from entering the blackbody cavity. As indicated, this occurs by keeping the temperature of the inert gas at a point where it is heavier than the air so as to form a protective curtain.

The invention as described in the attached figures has been with relation to the particular blackbody radiation

device shown and claimed in the previously issued patent as referred to above. However, it is pointed out that the blackbody radiating element in such a device, as contemplated, does not of necessity have to have the peculiar configuration shown and claimed in that patent. Rather, the concept of the herein invention relating to the protective hood is applicable in any oxidizable radiating or heated element. Thus, in virtually any shape radiating or heated element which is open to the environment, the attendant problem of corrosion and erosion from ambient air would be overcome by the utilization of the protective hood of this invention.

The use of the hood as shown has an application which is obviously far broader than the particular blackbody radiating element. In blackbody radiating elements, a window has been used over the opening through which readings are taken. The window, however, presents optical problems. With the removal of the window, as shown in the particular device of the previous patent, the attendant problem of erosion from ambient air occurs. This same problem is prevalent in various furnaces and other heated bodies which are exposed to the air and require a continuous flow of inert gas to protect the heated bodies from oxidation. In all instances, if sufficient quantities of inert gas were available, then there would not be a need for a protective device as shown. The quantities of inert gas that would be required are in fact often unattainable or impractical. Thus, the herein invention presents both a simple, easy, and in some cases, the only means for preventing the rapid and gross deterioration of a radiating or heated element due to contact with air.

Although the invention has been described and illustrated in detail, it is to be clearly understood that the same is by way of illustration and example only and is not to be taken by way of limitation, the spirit and scope of this invention being limited only by the terms of the appended claims.

I claim:

1. In a device containing a heatable oxidizable body in a housing having an open end exposing said oxidizable body to ambient air, and means in the wall of said housing defining an opening to flow an inert gas over said oxidizable body egressing from said opening is provided, the improvement which comprises:

a protective hood affixed to said open end of said housing and extending away from said oxidizable body, said hood of sufficient length and having sufficient heat absorbing characteristics whereby said inert gas is sufficiently cooled when exiting from said open end so as to prevent egress of deleterious air into said housing.

2. In a blackbody radiating device comprising:

a housing provided with opening at one end thereof for an emitting radiation,

a blackbody radiation element disposed within said housing, said element open at one end thereof, said open end aligned with said open end of said housing for emitting radiation from the interior of said element,

a radiating surface disposed within said blackbody element, whereby one side of said surface is exposed for viewing through said open end of said housing,

means for admitting an inert gas within said blackbody element between said partition and said open end,

the improvement which comprises:

a protective hood affixed to said open end of said housing and extending away from said blackbody element, said hood being of sufficient length and having sufficient heat absorbing characteristics whereby said inert gas is sufficiently cooled when exiting from said open end so as to prevent ingress of deleterious air into said housing.

3. The improvement of claim 2 wherein said protective hood is a double-walled body.

4. The improvement of claim 3 wherein said hood is provided with means for circulating a coolant therethrough.

5. The improvement of claim 2 wherein said hood is frusto-conical.

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165—186; 219—353; 250—85, 89