METHOD OF CALIBRATING LIGHT OUTPUT OF A MULTI-LAMP LIGHT FASTNESS TESTING CHAMBER

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BACKGROUND OF THE INVENTION

Chambers for the accelerated weathering and lightfastness testing of components such as fabrics, plastic items, painted surfaces and the like are generally known, for example being shown in Huber et al. U.S. Pat. No. 4,843,893 and Kashima et al. U.S. Pat. No. 4,817,447. Additionally, such testing machines can also test various items as to their resistance against heated air and humidity, or any or all of the above in combination, so that manufacturers can gain data as to the durability of their products on an accelerated basis, to simulate the effects of weathering, heat and the like.

In accordance with this invention, a component testing chamber is provided which is preferably built to large size, to allow the accelerated weathering and lightfastness testing of large components such as automotive dashboards or the like. Since the component testing chamber of this invention is large, preferably a plurality of light emission lamps are used, which light emission lamps may be xenon type lamps, metal halide lamps, fluorescent lamps, ultraviolet lamps, infrared lamps and the like. The term "light" is intended to include frequencies beyond the visible spectrum.

Since the radiation stability testing performed in the testing chamber of this invention needs to be quantitative and reproducible, there is a need for conveniently determining that the intensity of the radiation received by components or samples being tested is that which is expected. By this invention, simple and effective means are provided for the constant irradiance, on a continuing basis, in the testing chamber even though the light emission from various lamps may vary as the lamps age through continued use. Simple means are provided for automatically adjusting the radiation intensity provided to the samples being tested within the chamber of this invention, with the chamber of this invention preferably providing improved uniformity of irradiation in the various positions that samples may occupy within the chamber.

DESCRIPTION OF THE INVENTION

In this invention, an accelerated weathering and lightfastness testing chamber is provided which comprises an enclosure for samples being tested. At least one lamp is provided for irradiating samples in the enclosure. Means are provided for monitoring the light intensity from the lamp.

In accordance with this invention, the monitoring means comprises light transmission means having one end positioned adjacent the lamp and another end in communication with light intensity measuring means, which are positioned more remotely from the lamp than the one end of the rod is positioned. The light transmission means is positioned on a side of the lamp that is substantially opposed to portions of the lamp that directly irradiate samples in the enclosure. Thus, the light transmission means does not interfere with the propagation of radiation from the lamp to the samples. The light transmission means may be a transparent rod, fiber optic cable, or even an open tube, for example.

A plurality of the lamps as described above may be provided. In this circumstance, separate light transmission means such as rods may also be provided, each respectively having its one end as defined above positioned adjacent a separate lamp. Each of the rods communicates with the light intensity measuring means, typically through its other end. Control means are provided for independently controlling the light intensity emitted from each lamp.

Thus, the individual light output of each separate lamp may be separately monitored and controlled, to provide the desired light intensity to the samples being irradiated.

The light transmission means such as rods or cables may, if desired, be equipped with means for limiting light transmission through the rod or cable to substantially limit that light which is emitted by the particular lamp to which the light transmission rod or cable relates. This limiting means may comprise an opaque sleeve carried in coaxial manner about the one end of the light transmission rod or cable defined above, to limit the light acceptance angle of the rod at its one end. Alternatively, the limiting means may comprise an opaque, annular stop member carried at the one end of a light transmission rod.

Also, the enclosure may carry means for retaining in predetermined positions the samples being tested. Means may also be provided for moving the samples being tested toward and away from the irradiating lamp or lamps, to vary as desired the intensity of irradiation applied to the samples. This ma be accomplished by placing the samples to be tested on a platform, with means for elevating and lowering the platform toward and away from the lamp or lamps being provided.

Additionally, the testing chamber of this invention may be equipped with reflecting mirrors which are provided above the lamp, to direct light from the lamp toward the samples. Some of the reflecting mirrors are concave, to at least partially focus reflected light toward said samples. Other of the reflecting mirrors are substantially flat, to direct broad areas of reflected light toward said samples. By this means, an increase in the uniformity of irradiation throughout the testing chamber can be provided, so that the various samples receive substantially equal amounts of irradiation in equal times of exposure, irrespective of the positions at which they are retained within the testing chamber.

Specifically, at least a pair of lamps may be positioned in side-by-side relation in the testing chamber. The reflecting mirrors may comprise a plurality of flat mirrors forming a pair of sections extending in cross-section laterally from a region essentially between the lamps, above and outwardly of said lamps, with each lamp occupyinq an approximate focus of one of said sections, plus a curved, generally cylindrically sectioned mirror positioned laterally outwardly from said flat mirrors.

Additionally, a method is provided by this invention of calibrating the light output of a multi-lamp lightfastness testing chamber, in which the chamber interior dimension defines a sample testing area. The method comprises: sequentially turning on and then off each lamp by itself, while measuring from said sample testing area the irradiation provided by each lamp and adjusting in response thereto the intensity of irradiation from each lamp to a desired level, and also sensing with individual light monitor means the light intensity of each individual lamp from a side of each lamp that is substantially opposed to portions of each lamp that directly