ARTIFICIAL HUMAN EYE AND TEST APPARATUS

BACKGROUND OF THE INVENTION

The invention relates in general to an artificial human eye and in particular to an artificial human eye for testing the effectiveness of protective eyewear against harmful radiation.

Attempts have been made previously to simulate the function of the human eye with models. U.S. Pat. No. 1,630,944, issued to L. R. Ingersoll on May 31, 1927 includes lenses to represent the cornea and lens, and a curved metal plate which serves as the retina. A single water filled chamber represents both the aqueous and vitreous humors of the eye. An external image is projected through the lenses and water onto the metal plate. U.S. Pat. No. 2,068,950, issued to F. Hamilton on Jan. 26, 1937 is directed to an artificial eye with a single lens which represents the human cornea. Two curved sections form a hollow shell which approximates the shape of the human eye. An opening in one section houses the lens. In a second embodiment, a solid glass portion which is nearly a complete sphere approximates the shape of the human eye. A second glass portion completes the sphere and constitutes the lens. However, the above-described artificial eyes do not provide a satisfactory device with the proper refractive indices and power to simulate the form and function of a human eye.

There have been two main methods for testing the effectiveness of protection for shielding the human eye against harmful radiation. One method uses laboratory animals such as rabbits and monkeys. Using animals is disadvantageous because it is costly and time consuming to house and train the animals. Furthermore it is painful to the animals and can be a controversial public relations issue. A second method utilizes extrapolated data from tests on human subjects in which the radiation strength is well below a hazardous level. This method is of limited value because there is always the question of unexpected effects that may arise as the level of radiation increases. This uncertainty is of particular concern when the protective properties of the eyewear is not a linear function of the intensity of the radiation.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an artificial eye that is an enlarged, scaled functional replica of the human eye.

It is another object of the present invention to provide an artificial eye including fluids which mimic the aqueous and vitreous humors of the human eye.

It is yet another object of the present invention to provide an artificial eye including variable apertures and lenses which mimic the human pupil, cornea and lens.

It is still another object of the present invention to provide an artificial eye which can simulate characteristics of the human eye such as near or far sightedness and age.

It is a further object of the invention to provide an apparatus for testing protective eyewear which precludes the use of humans and animals, is less costly, and more accurate than previous designs.

These and other objects of the invention are achieved by an artificial eye comprising a generally spherically shaped container; a lens holder removably disposed in a first opening in the container; a first fluid disposed in the container; and a second fluid disposed in the lens holder.

The generally spherically shaped container comprises a substantially hemispherical posterior portion made of a substantially transparent material, a substantially hemispherical anterior portion made of a substantially opaque material and a fastener for attaching the posterior portion to the anterior portion.

Preferably, the substantially transparent material comprises plexiglass, the substantially opaque material comprises one of aluminum and stainless steel and the fastener comprises two bands of aluminum.

In a preferred embodiment, the interior surface of the substantially hemispherical posterior portion is frosted.

Another aspect of the invention is a test apparatus comprising a radiation source; a device to be tested disposed in a path of radiation from the radiation source; an artificial eye disposed in a path of radiation from the device to be tested; an image receiving device for receiving the image created in the artificial eye; and an image processor for processing an electronic image from the image receiving device into a human readable image.

Preferably, the image receiving device is one of a charged couple device camera and an optometer.

Further objects, features and advantages of the invention will become apparent from the following detailed description taken in conjunction with the drawing.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of an artificial eye according to the present invention.

FIG. **2** is a cross-sectional view of the artificial eye of FIG. **1**.

FIG. **3** is an exploded view of the lens holder.

FIG. **4** is a perspective view of a test apparatus of the present invention.

FIG. **5** is a perspective view of another test apparatus of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

One aspect of the present invention is a functional replica of the human eye. In general, the artificial eye of the invention includes a generally spherically shaped container comprised of a substantially hemispherical posterior portion, a substantially hemispherical anterior portion and a fastener for attaching the posterior portion to the anterior portion. The artificial eye includes functional counterparts to the anterior and posterior chambers of the human eye. Within these functional counterparts are fluids which mimic the characteristics of the aqueous and vitreous humors of the human eye.

An adjustable lens holder fits within the generally spherically shaped container and includes a first lens, which simulates the human cornea; an aperture, to simulate the human pupil; and a second lens, which simulates the human lens. The lenses seal a chamber in the adjustable lens holder that corresponds to the anterior chamber of the human eye. External images pass through the first lens (cornea), fluid (aqueous) and a second lens and are focused on the posterior hemisphere of the spherical container, which simulates the human retina.

Protective eyewear is tested by placing the eyewear between the artificial eye and a source of radiation. Radiation is directed through the protective eyewear and then into the artificial eye. The radiation is then received by a sensing