United States Patent

Ota

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[45] **May 30, 1972**

[54] SHADELESS DENTAL LIGHT

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.**.....**240/41.15,** 240/1.4, 240/41.36

[51] **Int. Cl.**.....**A61b 1/06**

[58] **Field of Search**.....240/41.15, 41.36, 41.35 C, 240/41.35 F, 1.4, 103 R, 41.35 R, 41.35 D

[56] **References Cited**

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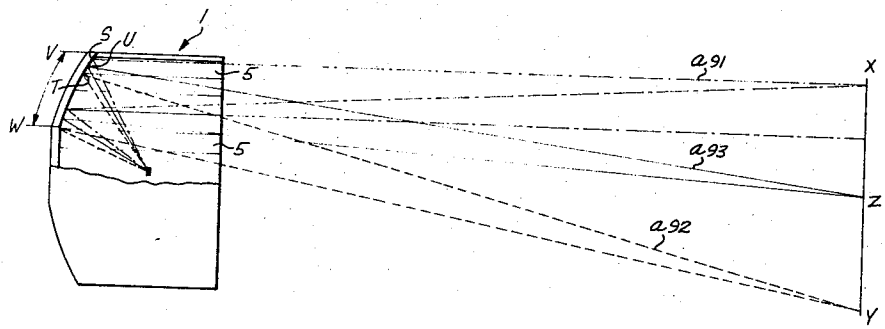
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[57] **ABSTRACT**

A shadeless dental light the reflector of which comprises a plurality of section mirrors arranged side by side along an elliptical arc. Each of the component section mirrors has a reflecting surface which is plain in transverse section and has a central portion of the length thereof fromed into a circular arc and portions extending from the opposite ends of the length of the central portion formed into a circular arc having a different radius of curvature than that of the central portion.

2 Claims, 5 Drawing Figures



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2 Sheets-Sheet 1

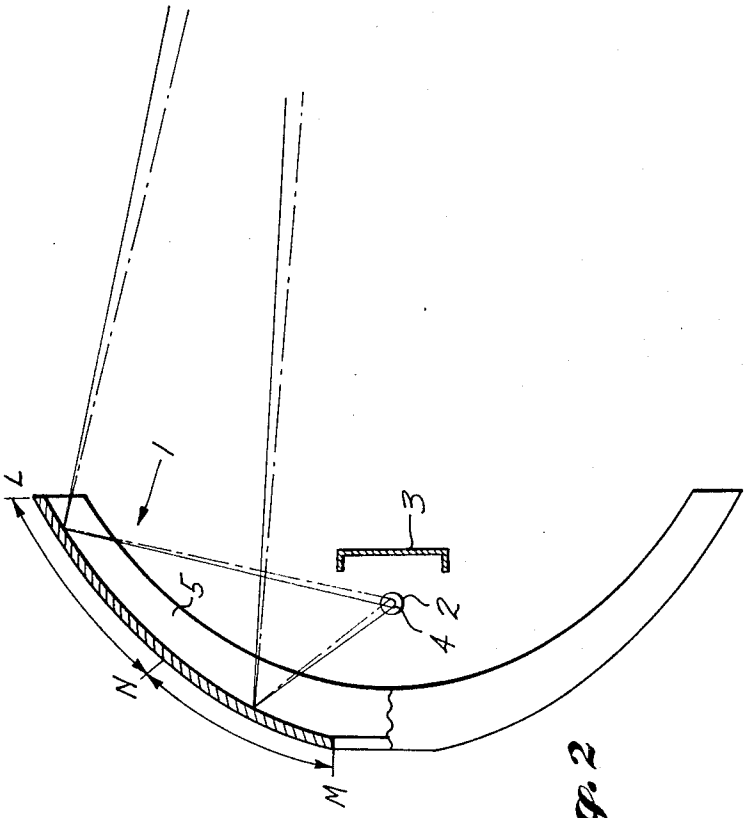


Fig. 2

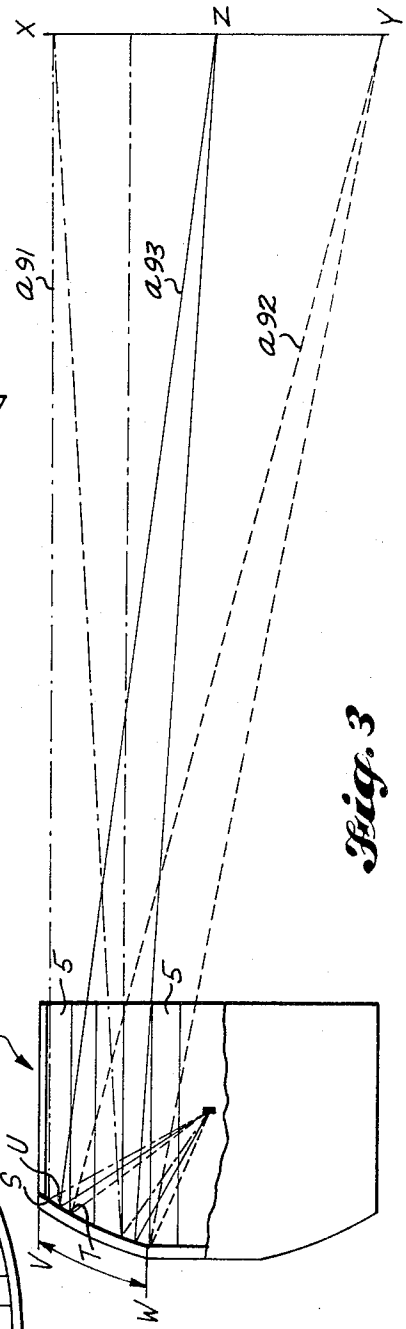


Fig. 3

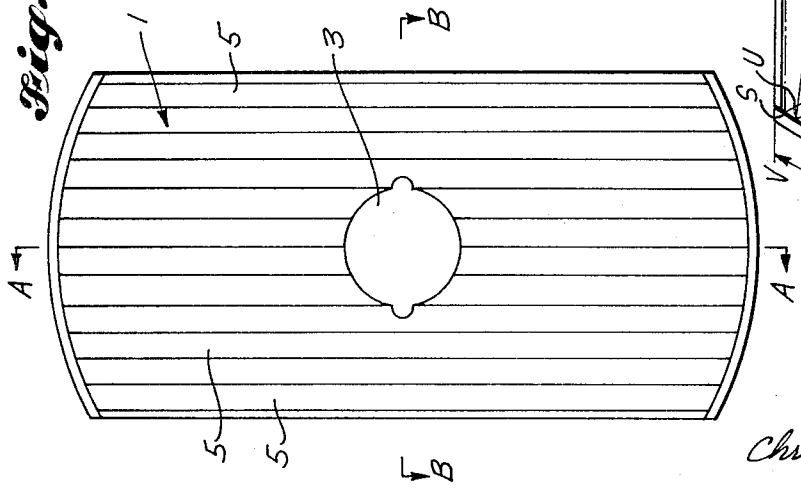


Fig. 1

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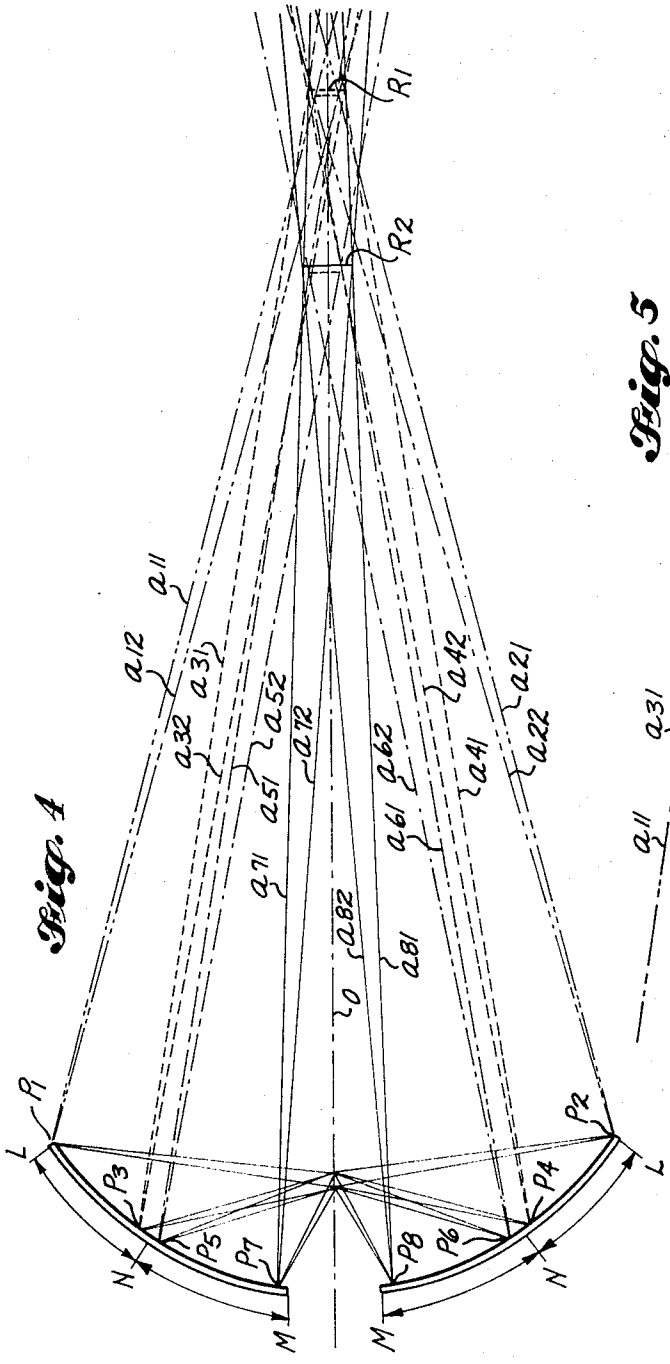


Fig. 4

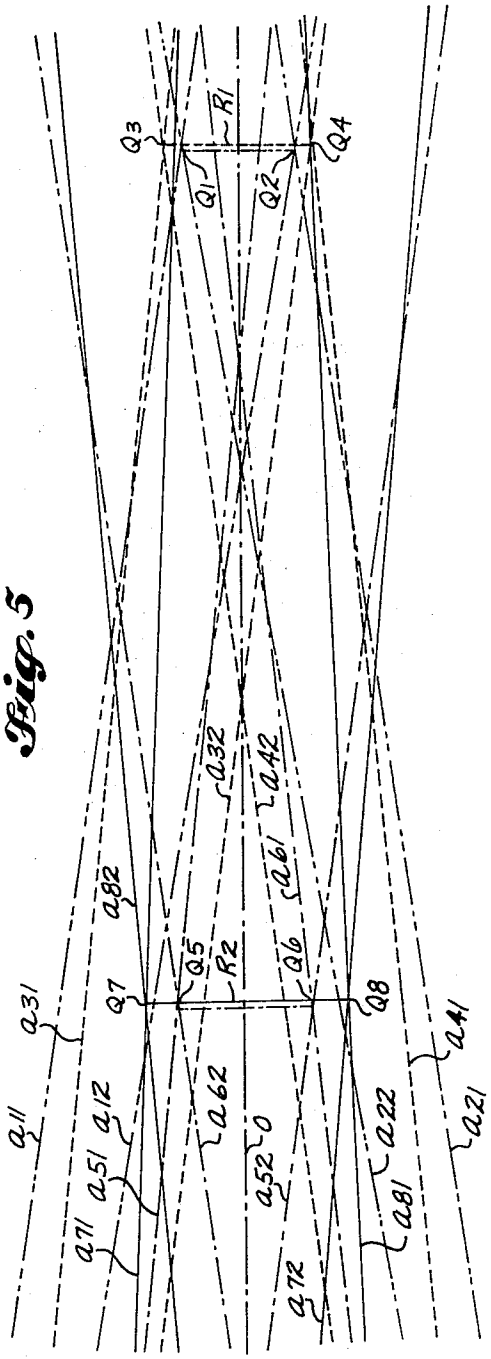


Fig. 5

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SHADELESS DENTAL LIGHT

This invention relates to a shadeless dental light. As is well known, a shadeless dental light is used in dental treatment to illuminate the oral cavity of a patient and is so arranged that the light from a lamp is reflected by a reflector onto the oral cavity. In the prior art device the reflecting surface of the reflector is spherical so that the light reflected from the surface is focussed at a single point, thereby making it difficult to widely illuminate the oral cavity. In order to illuminate a wider area or space, a long filament may be used in the lamp. However, a long bulb is required to accommodate a long filament, so that the dental light as a whole becomes large and bulky. Another defect of the prior art dental light is that the distance between the lamp and the focus is fixed, so that if, for example, the oral cavity is displaced along the optical axis of the light, it will become impossible to illuminate the oral cavity. Therefore, the position of either the light or the oral cavity must be adjusted. This certainly is very inconvenient.

The invention has been proposed to eliminate the above defects of the prior art dental light.

FIG. 1 is a front elevational view of one embodiment of the invention;

FIG. 2 is a vertical section taken along line A — A of FIG. 1;

FIG. 3 is a transverse section taken along line B — B of FIG. 1, with light rays in a horizontal plane from the lamp being illustrated for explanation;

FIG. 4 is a view similar to FIG. 2 with light rays in a vertical plane from the lamp being illustrated for explanation; and

FIG. 5 is an enlarged view of a portion of FIG. 4.

In FIG. 1 the reference numerals 1 denotes a composite reflecting mirror; 2, a lamp; and 3, a shield for preventing the light from the lamp from being projected directly onto a patient. The lamp 2 has a filament 4 extending transversely of the reflector 1 in FIG. 1 and, consequently, perpendicularly to the plane of the sheet of drawings in FIG. 4. The reflecting mirror comprises a pluarity of generally vertically elongated rectangular section mirrors 5 arranged side by side. Each section mirror 5 has a reflecting surface which is plain or linear transversely or horizontally thereof, but which, horizontally or longitudinally, is a circular arc comprising two surface sections or portions having different radii of curvatures. To put it in detail, as shown in FIG. 2, the inner sections MN of the reflecting surface have one radius of curvature and the outer sections NL, extending from the upper and lower ends of the inner sections, another radius of curvature. For example, the radius of curvature of the circular arc of the inner section MN is 51.0 mm while that of the outer section NL is 50.6 mm. The section mirrors 5 are arranged side by side along an arc of an ellipse as shown in FIG. 3.

The operation of the reflector will now be described with reference to FIG. 4 corresponding to FIG. 2. The light coming out of the filament 4 is reflected by the reflector 1 onto a patient, not shown. Since the filament has a certain diameter or length, the light advancing from the filament to the reflector has a certain width. In other words the light rays issuing from different points of the source impinge on the reflecting surface of the reflector at different incident angles so that the reflected light advancing toward the patient has a certain width or extent. In FIGS. 4 and 5 the symbol O designates the optical axis of the reflector.

Suppose that the reflected light rays at points P1 and P2 on the upper and lower reflecting surface sections NL be designated by a_{11} and a_{12}, and a_{21} and a_{22}, respectively. As shown the reflected beam has a height R1 between the point Q1 where a_{11} and a_{22} cross and the point Q2 where a_{12} and a_{21} cross. Similarly, let the reflected light rays at points P3 and P4 of the same surface sections NL be designated by a_{31} a_{32}, and a_{41} and a_{42}, respectively, and the reflected beam has a height

between the point Q3 where a_{31} and a_{42} cross and the point Q4 where a_{32} and a_{41} cross. Since the points P1 – P4 are on the surfaces of the same radius of curvature, this height substantially coincides with the previously mentioned height R1. Thus, it will be understood that the reflected light rays from the surface sections NL are collected into a certain area or space having the height R1.

With respect to the reflected light from the surface sections NM, suppose that the reflected light rays at points P5 and P6 on the upper and lower surface sections MN be designated by a_{51} and a_{52}, and a_{61} and a_{62}, respectively. The reflected beam has a height R2 between the point Q5 where a_{51} and a_{62} cross and the point Q6 where a_{52} and a_{61} cross. Similarly, let the reflected light rays at points P7 and P8 of the same reflecting surface sections MN be designated by a_{71} and a_{72}, and a_{81} and a_{82}, respectively, and the beam has a height between the points Q7 where a_{71} and a_{82} cross and the point P8 where a_{72} and a_{81} cross. Since the points P5 – P8 are on the surfaces of the same radius of curvature, this height substantially coincides with the height R2. Thus, it will be understood that the reflected light rays from surface sections MN are collected within a space having the height R2 which is displaced from the height R1 of the reflected light beam from the surface sections NL. In other words the reflector has a space having a vertical extension within which the reflected light is projected, and the space also extends axially of the optical axis between R1 and R2 wherein the reflected light is concentrated, so that an object in the space can be sufficiently illuminated.

The above explanation has been given to the vertical extension of the space or field of illumination of the reflected light from the reflector 1. In the following the lateral extension of the field of illumination (along the width of the reflector 1) will be explained. As shown in FIG. 3, the reflector 1 comprises many section mirrors 5, which are flat in transeverse section, arranged side by side along an arc VW of an ellipse. If they had the same elliptical arc as the arc VW, all the reflected light rays are concentrated at a focus Z. However, the reflecting surface of each section mirror is plain in transverse section, so that the light ray a_{91} from a point S at one side of the section mirror passes a point X; the light ray a_{92} at a point T at the opposite side thereof, a point Y; and the light ray a_{93} from a mid-point U, the focus Z. Thus, the width or lateral length or extension of the field of illumination by the reflected light is the distance between X and Y.

Thus, in accordance with the invention, even when a small-sized lamp having a small filament it is possible to obtain a field or space of illumination having certain vertical and horizontal extensions, and even when the distance between the lamp and the oral cavity of a patient has been changed within a certain limit, it is possible to sufficiently illuminate the oral cavity without changing the distance.

The inventor has manufactured a light having a field of illumination of about 80 mm × 140 mm, with the distance between R1 and R2 being about 150 mm.

What I claim is:

1. A shadeless dental light comprising a lamp and a reflector disposed at the back of said lamp and comprising a plurality of section mirrors arranged side by side along an elliptical arc, each said section mirror having a reflecting surface which is plain in transverse section and which has a central portion of the length thereof formed into a circular arc and portions extending from the opposite ends of the length of said central portion and formed into a circular arc having a different radius of curvature from that of said central portion.

2. The dental light of claim 1, wherein the radius of curvature of said opposite portions are less than that of said central portion.

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