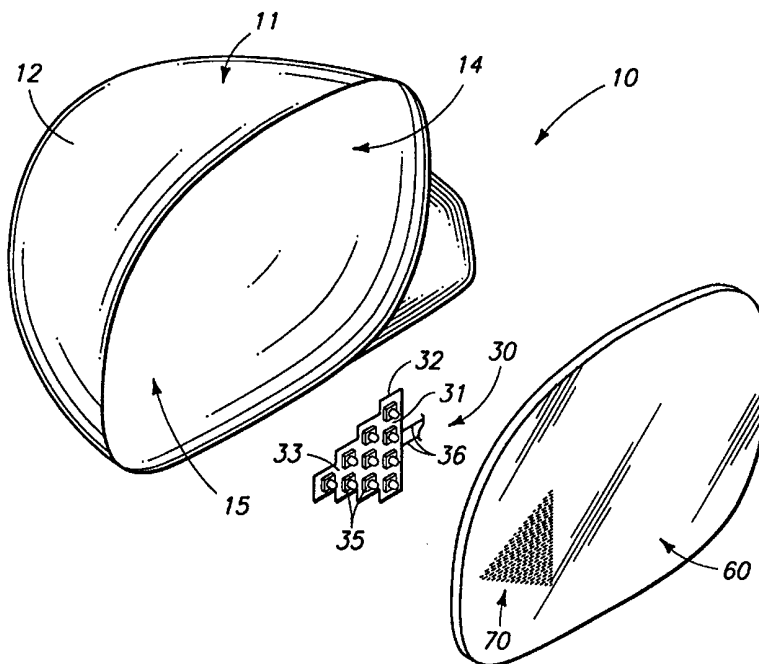




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : G02B 5/08, B60Q 1/26	A1	(11) International Publication Number: WO 00/20902 (43) International Publication Date: 13 April 2000 (13.04.00)
(21) International Application Number: PCT/US99/17062 (22) International Filing Date: 27 July 1999 (27.07.99) (30) Priority Data: 09/166,561 5 October 1998 (05.10.98) US (63) Related by Continuation (CON) or Continuation-in-Part (CIP) to Earlier Application US 09/166.561 (CIP) Filed on 5 October 1998 (05.10.98) (71) Applicant (for all designated States except US): K. W. MUTH COMPANY, INC. [US/US]; Box 418, Sheboygan, WI 53082 (US). (72) Inventor; and (75) Inventor/Applicant (for US only): TODD, Daniel, R. [US/US]; 417 Clement Avenue, Sheboygan, WI 53083 (US). (74) Agents: GRIGEL, George, G. et al.; 601 West 1st Avenue, #1300, Spokane, WA 99201-3828 (US).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>

(54) Title: MIRROR COATING, MIRROR UTILIZING SAME, AND A MIRROR ASSEMBLY

**(57) Abstract**

A mirror assembly (10) includes a mirror (50), mirror coating, and a mirror housing (11) having a sidewall (12) defining an aperture (14) of given dimensions. The mirror coating has a primary region (60) which reflects visibly discernible electromagnetic radiation, and a secondary region (70) which passes a portion of the visibly discernible electromagnetic radiation while simultaneously reflecting a given percentage of the visibly discernible electromagnetic radiation.

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DESCRIPTION**MIRROR COATING, MIRROR UTILIZING SAME, AND A MIRROR
ASSEMBLY****Technical Field**

5 The present invention relates to a mirror coating, mirror employing same and a mirror assembly, and more particularly to an invention which finds utility when coupled with the controls of an overland vehicle of the like, and which may, on the one hand, and in one form of the invention, operates as a combined warning lamp and rear view mirror assembly.

10 **Background Art**

 The beneficial effects of employing auxiliary signaling assemblies have been disclosed in various United States patents, including U.S. Patents Nos. 5,014,167; 5,207,492; 5,355,284; 5,361,190; 5,481,409; and 5,528,422, all of which are incorporated by reference herein. The mirror assemblies disclosed in the above-
15 captioned patents employ a dichroic mirror which is operable to reflect a broad band of electromagnetic radiation, within the visible light portion of the spectrum, while simultaneously permitting electromagnetic radiation having wavelengths which reside within a predetermined spectral band to pass therethrough. In this fashion, the dichroic mirror remains an excellent visual image reflector, that is,
20 achieving luminous reflectance which is acceptable for automotive and other industrial applications, for example, while simultaneously achieving an average transmittance in the predetermined spectral band of at least 58%. Further, when the predetermined band pass region is relatively narrow, that is, such as 30 nanometers or more, average in-band transmittance of 80% or more can be
25 achieved with peak transmittance in excess of 90% being common.

 In U.S. Patent No. 5,528,422, a plurality of mirror coatings were disclosed and which are operable to conceal an underlying sensor or light-emitting assembly while simultaneously providing a neutral chromatic appearance. These same mirror coatings simultaneously absorb wavelengths of electromagnetic radiation
30 which may otherwise be transmitted into the mirror assembly and which would, over time, degrade or otherwise be harmful to the subassembly which is concealed by the mirror assembly.

 In still another reference, U.S. Patent No. 5,788,357, a mirror assembly is disclosed and which includes a semitransparent nondichroic mirror which passes
35 8% or less of substantially all visible light, and which reflects about 35% to about 85% of a broad band of visible light; and a light assembly which emits

visible light which is passed by the semitransparent mirror, the luminous intensity to the mirror assembly being about 2 to about 20 candelas. The teachings of this reference are incorporated by reference herein.

While the devices disclosed in these patents have realized some degree
5 of commercial success, certain inherent physical characteristics of the earlier disclosed mirror assemblies have somewhat impeded manufacturing efforts to cost-effectively mass produce these same assemblies. For example, while the mirror coatings disclosed in Patent No. 5,528,422 operate as described, the manufacturing difficulties and costs associated with producing these rather complex coatings with
10 commercially available coating fabrication equipment has impeded the introduction of low cost products for the mass market. Similar difficulties have hampered the introduction of products fabricated in accordance with the teaching of U.S. Patent No. 5,788,357. Yet further, as the size of mirror housings have decreased in volume as a result of the recent automotive platform design changes, the amount
15 of available space within these same housings has become quite limited. Therefore, the size and weight of the enclosed light-emitting assembly or sensor has become a factor in the commercial introduction of a suitable product.

Other devices have attempted to diverge from the teachings provided in the patents noted above. These devices, however, when built in accordance with
20 their teachings, have been unable to provide the same performance characteristics. An example of such prior art is the patent to Crandall, U.S. Patent 5,436,741. Other prior art references describe devices which attempt to provide the same functional benefits, as described in the earlier patents. These references describe all manner of mirror housing modifications, where for example, lamps are located
25 in various orientations to project light into predetermined areas both internally, and/or besides the overland vehicle, and to further provide auxiliary signaling or warning capability. Examples of such patents include 4,583,155; 4,646,210; 4,916,430; 5,059,015; 5,303,130; 5,371,659; 5,402,103; and 5,497,306 to name but a few.

30 Other prior art references have attempted to provide a combined mirror and signaling assembly. These assemblies have employed a nondichroic, semitransparent mirror. Perhaps the earliest and most germane patent which discloses this type of assembly is the patent to Maruyama et al U.S. Patent No. 3,266,016. This reference was however devoid of any suggestion of how one
35 would manufacture a device which would have both an acceptable reflectivity, and an acceptable luminous output, while simultaneously avoiding the detriments

associated with the build up, and accumulation of heat within the mirror housing, and further being functional within the limited spacial area provided for by the same mirror housing. Similar problems are evident in the patent to Gotzinger, 2,263,382, which discloses a mirror signal device. This device includes a mirror
5 mounted in a bell or housing which contains an electric lamp. The mirror has a transparent backing or silvering which becomes non-reflecting when illuminated from behind. The invention permits light to pass only through a lighted area of the mirror in the form of a signal or symbol. This is done by means of a stencil in the back of the mirror, and may be further enhanced by a colored
10 transparency.

To a limited extent, the reference to Muth et al., U.S. Patent No. 5,788,357, addresses some of the apparent or perceived problems of utilizing a semitransparent nondichroic mirror in a mirror assembly as described above. However, and as noted above, the manufacturing problems associated with
15 producing a cost-effective semitransparent coating within the operational parameters as discussed in that same patent has impaired its successful commercial introduction.

In the present invention, the inventor has departed from the teachings of the prior art, noted above, by providing, in one aspect, a mirror coating which
20 has a primary region which reflects visibly discernible electromagnetic radiation, and a secondary region which passes a portion of the visibly discernible electromagnetic radiation while simultaneously reflecting a given percentage of the visibly discernible electromagnetic radiation, and wherein the average reflectance of the mirror coating is greater than about 50%. In the preferred form of the
25 invention, the primary region reflects less than about 80% of the given band of visibly discernible electromagnetic radiation and the secondary region reflects at least about 35% of the same given band of electromagnetic radiation, the mirror employing the mirror coating having an average reflectance of at least about 50%. The mirror as described, may be utilized in a mirror assembly which includes
30 about 1 to about 30 light emitting diodes and which are positioned adjacent to the secondary region. These light emitting diodes, when energized, have a cumulative luminous output of about 1 to about 1000 candelas and the luminous output of the secondary region is about 0.5 to about 120 candelas.

Objects and Summary of the Invention

Therefore, one aspect of the present invention is to provide an improved mirror coating, mirror utilizing same, and mirror assembly.

Another aspect of the present invention is to provide a mirror assembly
5 which may be manufactured and installed as original equipment on an overland vehicle or the like or which may be further manufactured in the manner of a retrofit and substantially equivalent to an original equipment installation.

Another aspect of the present invention is to provide a mirror which may be readily installed or integrated with other mirror technologies, such as
10 motorized actuators, heater films, and films of various types, including diffractive, holographic, reflective, and electrochromic devices of various designs.

Another aspect of the present invention is to provide a mirror which has a primary region which is substantially opaque, and wherein the mirror further has a secondary region which has a given surface area which is about 1% to
15 about 80% of the surface area of the primary region.

Another aspect of the present invention is to provide a mirror which has a secondary region which comprises a mirror coating having a plurality of individual apertures having given cross sectional areas formed therein, and wherein the cumulative cross sectional areas of the individual apertures comprise
20 less than about 60% of the surface area of the secondary region.

Another aspect of the present invention is to provide a mirror which has a secondary region which passes about 1% to about 80% of the visibly discernible electromagnetic radiation directed at same.

Another aspect of the present invention is to provide in one form of the
25 invention, a mirror assembly which includes an electromagnetic radiation emitter positioned adjacent to the secondary region of the mirror, and which emits visible light which is passed by the secondary region, the luminous output of the secondary region of the mirror being about 0.5 to about 120 candelas.

Another aspect of the present invention is to provide in one form of the
30 invention, a mirror assembly which includes an electromagnetic radiation emitter positioned adjacent to the secondary region of the mirror, and which has a luminous output of about 1 candela to about 1000 candelas.

Yet still another aspect of the present invention is to provide a mirror assembly having a secondary region which has a light emitting surface area of
35 about 10 to about 4000 millimeters.

Yet further, another aspect of the present invention is to provide a mirror assembly which is operable to obtain the individual benefits to be derived from related prior art assemblies and devices while avoiding the detriments individually associated therewith.

5 Further aspects and advantages of the present invention are to provide improved elements and arrangements thereof in a mirror, mirror coating utilized with same, and mirror assembly for the purposes described, and which is dependable, economical, durable, and fully effective in accomplishing these intended purposes.

10 These and other aspects and advantages are achieved in a mirror coating which comprises a primary region which reflects visibly discernible electromagnetic radiation, and a secondary region which passes electromagnetic radiation while simultaneously reflecting a given percentage of visibly discernible electromagnetic radiation.

15 **Brief Description of the Drawings**

Preferred embodiments of the invention are described below with reference to the following accompanying drawings.

Figure 1 is a perspective, front elevation view of a mirror assembly of the present invention in a deenergized state.

20 Figure 2 is a perspective, front elevation view of a mirror assembly of the present invention in an energized state.

Figure 3 is a greatly enlarged, partial, plan view taken from a position along line 3-3 of Figure 1.

25 Figure 4 is a greatly enlarged, partial, plan view taken from a position along line 3-3 of Figure 1, and showing an alternative arrangement to that shown in Figure 3.

Figure 5 is a greatly enlarged, partial, plan view taken from a position along line 3-3 of Figure 1, and showing still further an alternative arrangement to that shown in Figures 3 and 4.

30 Figure 6 is a partial, vertical sectional view of the mirror and which is taken along lines 6-6 of Figure 2.

Figure 7 is a greatly enlarged, vertical sectional view of the mirror taken from a position along line 6-6 of Figure 2, and which illustrates an alternative form from that shown in Figure 6.

35 Figure 8 is an exploded, perspective view of a mirror assembly of the present invention.

Figure 9 is a greatly enlarged, fragmentary, vertical sectional view taken from a position along line 6-6 of Figure 2, and showing a light emitting assembly utilized with same. The proportional relationship of this drawing is greatly exaggerated in order to facilitate an understanding of the invention.

5 **Best Modes for Carrying Out the Invention and Disclosure of Invention**

A mirror assembly which utilizes a mirror, and mirror coating of the present invention, is best indicated by the numeral 10 in Figures 1, 2, and 8, respectively. As shown therein, the mirror assembly 10 includes a mirror housing 11 which has a substantially continuous sidewall 12. The continuous sidewall has
10 a peripheral edge 13 which defines an aperture 14 (Fig. 8) of given dimensions. Further, this substantially continuous sidewall defines a cavity 15. It should be understood that the mirror housing is mounted on an overland vehicle of conventional design (not shown). The housing will be placed within the line of sight of an operator in a position normally occupied by an exterior rear view
15 mirror. However, it should be understood that the present device is not limited to use on overland vehicles, but may be used in all manner of industrial applications, including signs, and various visual displays.

As seen in Fig. 8, enclosed within the cavity 15 is a light emitting assembly which is designated by the numeral 30. The light emitting assembly
20 includes a supporting, substantially nonconductive substrate 31 which is defined by a peripheral edge 32. The supporting substrate has a forward facing surface 33 and an opposite rearward facing surface 34. Conductive traces, not shown, may be formed on either the forward or rearward facing surfaces, more commonly the forward facing surface 33. The conductive traces are electrically
25 coupled with a plurality of light emitting diodes 35 which are affixed on the forward facing surface 33. The conductive traces which are formed on either the forward or rearward facing surfaces 33 or 34 are electrically coupled to an automotive or other electrical system by means of the electrical leads 36. As
30 should be understood, the supporting substrate 31 provides a light emitting surface area of about 10 to about 4000 square millimeters. Of course, the surface area of the nonconductive substrate is typically larger than this. Further, about 1 to about 30 light emitting diodes are mounted on the supporting substrate and may be placed in a given geometrical pattern such as a triangle as shown, or other patterns based upon the ultimate end use. The supporting
35 substrate 31, and the light emitting diodes 35 have a combined weight of normally less than about 100 grams when used in automotive applications.

Further, it should be understood that the light emitting diodes when energized, emit visibly discernible electromagnetic radiation or other substantially invisible radiation. The luminous output of the about 1 to about 30 light emitting diodes 35 is about 0.5 to about 1000 candelas. As seen from a study of Figure 8, the
5 substrate and related light emitting diodes are formed generally or roughly into the shape of a triangle or pyramid-like shape, but any alpha-numeric designation or geometric or fanciful shape may be formed and which could be viewed from a position exterior to the mirror housing 11. Further, all manner of different optical assemblies may be utilized in combination with the light emitting diodes
10 35 to collimate, reflect, or otherwise direct the light emitted from same in a given direction, pattern, or intensity of distribution relative to the supporting substrate. Such is disclosed in the earlier prior art patents which are incorporated by reference herein.

A mirror 50 is disposed in substantially occluding relation relative to the
15 aperture 14 which is defined by the mirror housing 11. The mirror 50 comprises a supporting substantially transparent substrate 51 which has a forward facing surface 52, and an opposite rearward facing surface 53, (Figure 9). A mirror coating 54 (Figures 6 and 7) is applied on the rearwardly facing surface 53. As should be understood, the mirror coating may be applied in an
20 alternative form to the forward facing surface. The discussion which follows, therefore, is applicable to mirrors where the mirror coating is applied to either the forward or rearward facing surfaces. The mirror coating 54 may comprise any number of different, highly reflective or mirror-like coatings or substances such as chromium or the like, and which may be applied in a manner which
25 provides a commercially acceptable reflective surface. As best seen by reference to Figures 1 and 2, the mirror 50 has a primary region 60, and an adjacent secondary region 70. While only two regions are shown it is possible, of course, to have a plurality of secondary regions as operational conditions may dictate. As a general matter, the primary region 60 reflects visibly discernible
30 electromagnetic radiation and is nominally opaque, and the secondary region 70 passes a portion of the visibly discernible electromagnetic radiation directed at same while simultaneously reflecting a given percentage of the visibly discernible electromagnetic radiation. The average reflectance of the overall mirror coating 54, including both the primary and secondary regions is greater than about 50%
35 when employed for automotive applications. In other industrial applications, the average reflectance may be lower or higher, depending upon the desired end-use.

As seen in the drawings, the primary region 60 is substantially continuous, and reflects, for automotive applications, less than about 80% of the visibly discernible electromagnetic radiation striking this portion of the overall mirror 50 surface area. The primary and secondary regions each have a given surface
5 area. Still further, the primary region 60 passes on average less than about 1% of the visibly discernible electromagnetic radiation striking its surface, and the secondary region passes about 1% to about 65% of the same visibly discernible electromagnetic radiation. In the preferred form of the invention, the secondary
10 region reflects at least about 35% of the visibly discernible electromagnetic radiation striking its surface. These ranges have been found suitable for automotive applications, however, other broadened or narrowed ranges may be useful for other industrial applications.

As best seen by reference to Figures 3, 4, and 5, the mirror coating 54 in the secondary region 70, of the mirror 50 includes a plurality of discrete
15 apertures 71 which may be formed in a number of given patterns and in various densities. As seen in Figures 7 and 9, which are greatly exaggerated representations of the invention, the plurality of discrete apertures 71 extend substantially through the coating to the surface 53 of the transparent substrate 51. In an alternative form of the invention, as shown in Figure 6, reduced
20 thickness areas 74 may be formed in the mirror coating, it being understood that the reduced thickness areas 74 allow visible electromagnetic radiation to pass therethrough to a greater extent than the adjacent thicker areas. Such reduced thickness areas might be achieved by means of laser ablation, chemical mechanical polishing, and other similar techniques.

25 The plurality of discrete apertures 71 as formed in the mirror surface, may comprise round apertures 72 (Figure 3); elongated apertures 73 (Figure 5); or mixtures thereof (Figure 4). Such mixtures of aperture shapes may also include continuous lines or other geometric patterns which may or may not be symmetrical in either the shape of the apertures or the overall distribution or
30 location of the apertures. The discrete apertures 71 have a given cross-sectional area. In particular, the cumulative cross-sectional areas of the given apertures is less than about 60% of the surface area of the secondary region 70. When the discrete apertures which are selected are substantially round 72, the given apertures have a diametral dimension of about .001 millimeters to about .015
35 millimeters. Still further, the round apertures 72 are spaced apart about .005 millimeters to about .05 millimeters when measured center-to-center. As seen

in Figure 9, the mirror 50, including the mirror coating 54, and the light emitting assembly 30 comprise an optical stack 75, which has a thickness of less than about 25 millimeters. When assembled, the resulting optical stack, when energized, creates less than about 18 milliwatts of heat energy per square millimeter of surface area of the substrate 31, and further, the light emitting diodes 35 emit visibly discernible electromagnetic radiation which is passed by the secondary region such that the secondary region has a luminous output of about 0.5 to about 120 candelas. Such is best illustrated in Figure 2. As best seen by a comparison between Figures 1 and 2, the primary region 60 of the mirror 50 is an excellent reflector of visible electromagnetic radiation. Further, the secondary region 70 while it has been rendered operable to transmit electromagnetic radiation, remains an acceptable reflector such that an image can be perceived in same while electromagnetic radiation passes therethrough. Still further, the distribution and size of the apertures in the secondary region permits the easy adjustment of the reflective and transmission valves for this same region to produce a predetermined luminous output for specific industrial applications.

Operation

The operation of the described embodiments of the present invention are believed to be readily apparent and are briefly summarized at this point.

A first aspect of the present invention relates to a mirror coating comprising a primary region 60 which reflects visibly discernible electromagnetic radiation, and a secondary region 70 which passes a portion of the visibly discernible electromagnetic radiation while simultaneously reflecting a given percentage of the visibly discernible electromagnetic radiation. The average reflectance of the entire mirror coating is greater than about 50%.

A further aspect of the present invention relates to a mirror 50 comprising a supporting substrate 51 having opposite surfaces 52 and 53 respectively; and a mirror coating 54 disposed on one of the surfaces of the substrate, and wherein the mirror coating 54 defines a primary region 60 which reflects less than about 80% of a given band of visibly discernible electromagnetic radiation, and a secondary region 70 through which electromagnetic radiation may pass, and wherein the secondary region 70 reflects at least about 35% of the same given band of electromagnetic radiation.

Yet a further aspect of the present invention relates to a mirror assembly 10 comprising a substantially transparent substrate 51 having opposite surfaces 52 and 53 respectively, and a given surface area; a mirror coating 54 disposed on

one of the surfaces of the substantially transparent substrate 51, and wherein the mirror coating 54 defines a primary region 60 which reflects less than about 80 of a given band of visibly discernible electromagnetic radiation, and a secondary region 70 through which electromagnetic radiation may pass. The secondary
5 region 70 comprises about 1% to about 80% of the surface area of the substantially transparent substrate 51. Further, the secondary region 70 reflects at least about 35% of the same given band of visibly discernible electromagnetic radiation. The secondary region 70 is defined by a plurality of discrete apertures 71 which are formed in the mirror coating 54. Further, the mirror assembly 10
10 comprises about 1 to about 30 light emitting diodes 35 which are positioned adjacent to the secondary region 70, and which, when energized, have a cumulative luminous output of about 1 to about 1000 candelas. Further, the luminous output of the secondary region is about 0.5 to about 120 candelas.

As noted above, the plurality of discrete apertures 71 may be formed by
15 all manner of techniques including laser ablation, chemical mechanical polishing, and other techniques. The average reflectance of the overall mirror 50, however, remains, on average, at least about 50%; and the average luminous reflectance of the secondary region 71 is at least about 35%, and its average transmittance is at least about 1% to about 65%.

CLAIMS

1. A mirror coating comprising:

a primary region which reflects visibly discernible electromagnetic radiation,
and a secondary region which passes a portion of the visibly discernible
5 electromagnetic radiation while simultaneously reflecting a given percentage of the
visibly discernible electromagnetic radiation, and wherein the average reflectance
of the mirror coating is greater than about 50%.

2. A mirror coating as claimed in claim 1, wherein the primary region
10 is substantially continuous, and reflects less than about 80% of the visibly
discernible electromagnetic radiation.

3. A mirror coating as claimed in claim 2, wherein the primary region
is substantially continuous, and the secondary region is discontinuous, and wherein
15 the primary and secondary regions have a given surface area, and wherein the
surface area of the secondary region is about 1% to about 80% of the surface
area of the primary region.

4. A mirror coating as claimed in claim 3, wherein the primary region
20 passes less than about 1% of the visibly discernible electromagnetic radiation, and
the secondary region passes about 1% to about 65% of the visibly discernible
electromagnetic radiation.

5. A mirror coating as claimed in claim 4, wherein the secondary
region reflects at least about 35% of the visibly discernible electromagnetic
25 radiation.

6. A mirror coating as claimed in claim 5, wherein the secondary
region comprises a plurality of discrete apertures formed in a given pattern in
the mirror coating.

30

7. A mirror coating as claimed in claim 6, wherein the discrete
apertures have a given cross sectional area, and wherein the cumulative cross
sectional areas of the given apertures comprise less than about 60% of the
surface area of the secondary region.

35

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8. A mirror coating as claimed in claim 6, wherein the discrete apertures are substantially round and have a diametral dimension of about .001 millimeters to about .015 millimeters, and wherein the apertures are spaced apart about .005 millimeters to about .050 millimeters when measured center-to-center.

5

9. A mirror coating as claimed in claim 7, and further comprising:
a light emitting assembly positioned adjacent to the secondary region and which emits visible light which is passed by the secondary region, and wherein the secondary region has a luminous output of about 0.5 to about 120 candelas.

10

10. A mirror coating as claimed in claim 9, wherein the light emitting assembly comprises about 1 to about 30 light emitting diodes, and wherein the light emitting diodes, when energized, emit visibly discernible electromagnetic radiation, the luminous output of light emitting diodes being about 1 to about
15 1000 candelas.

11. A mirror coating as claimed in claim 9, wherein the light emitting assembly comprises a supporting substrate having a given light emitting surface area of about 10 to about 4000 square millimeters, and wherein about 1 to
20 about 30 light emitting diodes are mounted on the supporting substrate, the supporting substrate and the light emitting diodes having a weight of less than about 100 grams.

12. A mirror coating as claimed in claim 9, wherein the mirror coating
25 and the light emitting assembly comprise an optical stack which has a thickness of less than about 25 millimeters.

13. A mirror coating as claimed in claim 12, wherein the light emitting diodes emit, when energized, less than about 18 milliwatts of heat energy per
30 square millimeter of the supporting substrate.

14. A mirror coating as claimed in claim 13, wherein the primary region of the mirror reflects less than about 80% of the visibly discernible electromagnetic radiation and is substantially opaque.

35

15. A mirror coating, comprising:

a substantially continuous primary region which reflects a broad band of electromagnetic radiation, and a given discrete secondary region through which electromagnetic radiation may pass and which simultaneously reflects at least
5 about 35% of the same broad band of electromagnetic radiation, the mirror coating on average reflecting at least about 50% of the broad band of electromagnetic radiation.

16. A mirror coating as claimed in claim 15, wherein the primary
10 region has a given surface area, and wherein the secondary region has a given surface area of about 1% to about 80% of the primary region.

17. A mirror coating as claimed in claim 16, wherein the primary region reflects less than about 80% of a broad band of visibly discernible
15 electromagnetic radiation, and wherein the secondary region transmits not more than about 1% to about 65% of the same broad band of visibly discernible electromagnetic radiation.

18. A mirror comprising:

20 a supporting substrate having opposite surfaces; and
a mirror coating disposed on one of the surfaces of the substrate, and wherein the mirror coating defines a primary region which reflects less than about 80% of a given band of visibly discernible electromagnetic radiation, and a secondary region through which electromagnetic radiation may pass, and wherein
25 the secondary region reflects at least about 35% of the same given band of visibly discernible electromagnetic radiation.

19. A mirror as claimed in claim 18, wherein the primary region is substantially opaque, and wherein the secondary region has a given surface area
30 which is about 1% to about 80% of the surface area of the primary region.

20. A mirror as claimed in claim 19, wherein the secondary region comprises a plurality of individual apertures having given cross sectional areas which are formed in the mirror coating, and wherein the supporting substrate is
35 substantially transparent.

21. A mirror as claimed in claim 20, wherein the cumulative cross sectional areas of the individual apertures comprise less than about 60% of the secondary region through which visible electromagnetic radiation may pass.

5 22. A mirror as claimed in claim 21, wherein the secondary region passes about 1% to about 65% of the visibly discernible electromagnetic radiation.

23. A mirror as claimed in claim 22, and further comprising:
10 a light emitting assembly positioned adjacent to the secondary region, and which emits visible light which is passed by the secondary region of the mirror coating, and wherein the secondary region has a luminous output of about 0.5 to about 120 candelas.

15 24. A mirror as claimed in claim 23, wherein the secondary region passes about 1% to about 65% of the visibly discernible light emitted by the source of light, and wherein the light emitting assembly has a luminous output of about 1 to about 1000 candelas.

20 25. A mirror as claimed in claim 24, wherein the light emitting assembly comprises about 1 to about 30 light emitting diodes, and wherein the light emitting diodes are mounted on a supporting substrate which has a light emitting surface area of about 10 to about 4000 square millimeters, and wherein the light emitting diodes when energized emit less than about 18 milliwatts of
25 heat energy per square millimeter of surface area.

26. A mirror as claimed in claim 25, wherein the substantially transparent substrate, mirror coating and light emitting assembly comprise an optical stack which has a thickness dimension of less than about 25 millimeters.

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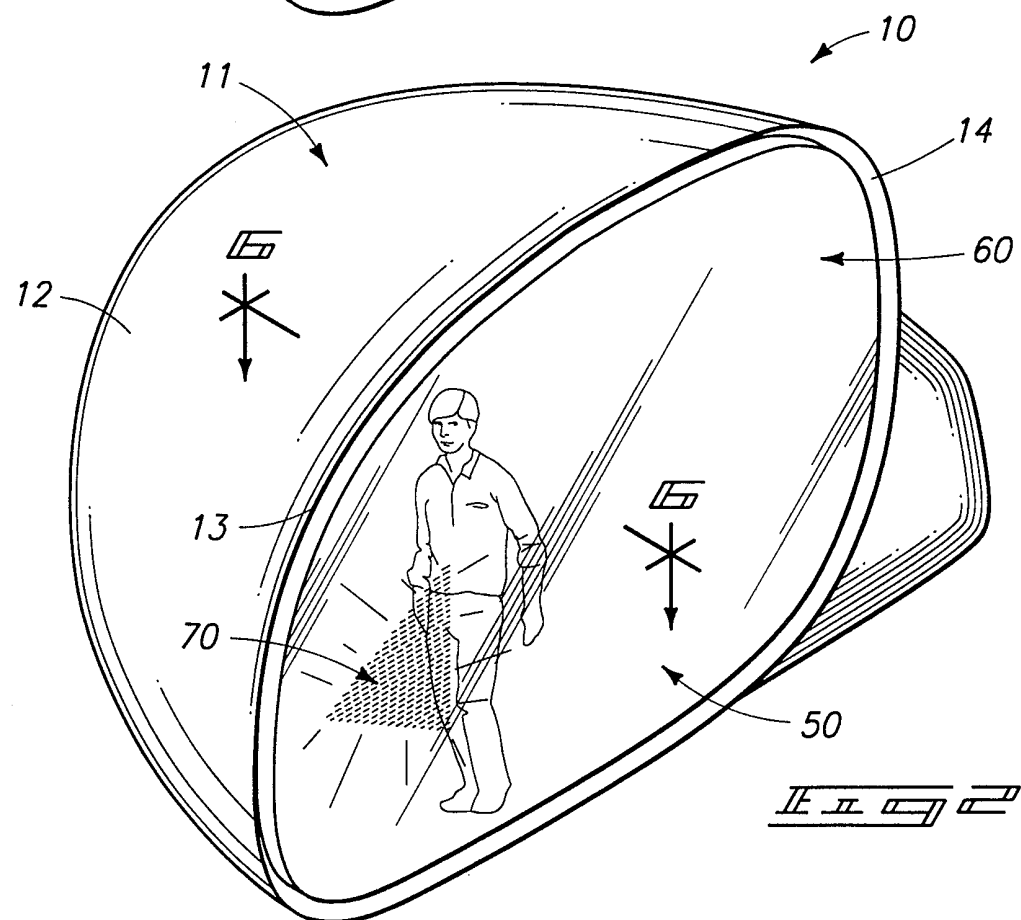
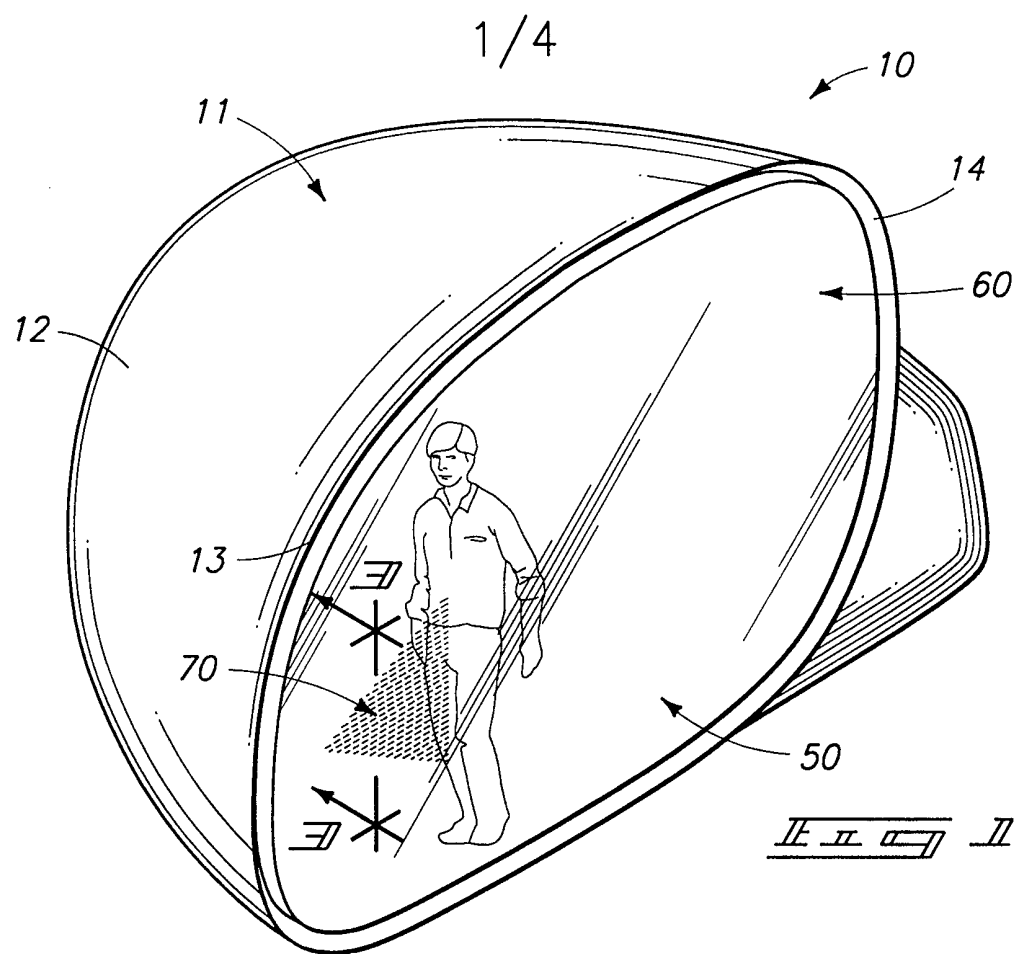
27. A mirror assembly comprising:

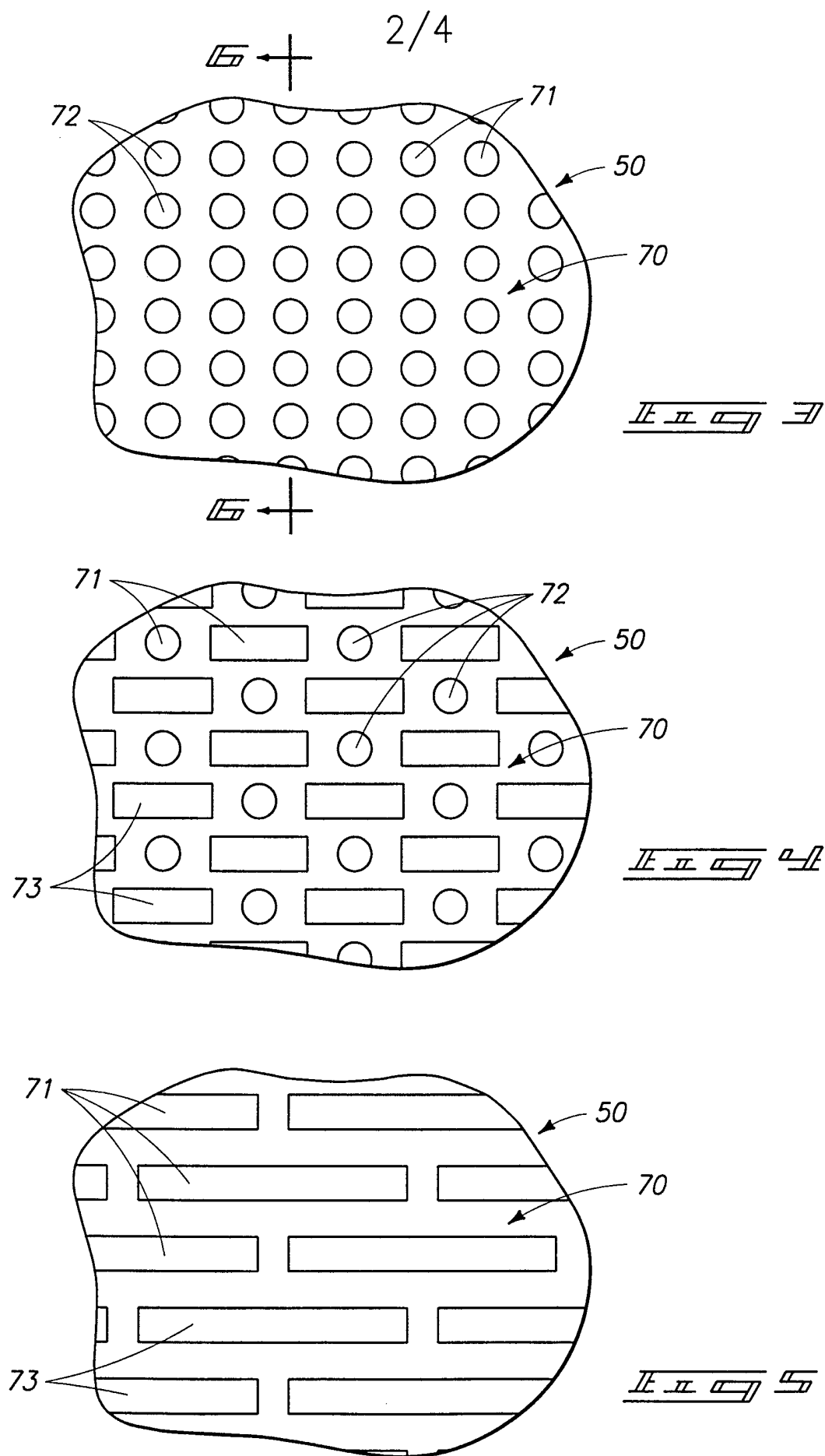
a substantially transparent substrate having opposite surfaces, and a given surface area;

a mirror coating disposed on one of the surfaces of the substantially transparent substrate, and wherein the mirror coating defines a primary region
35 which reflects less than about 80% of a given band of visibly discernible

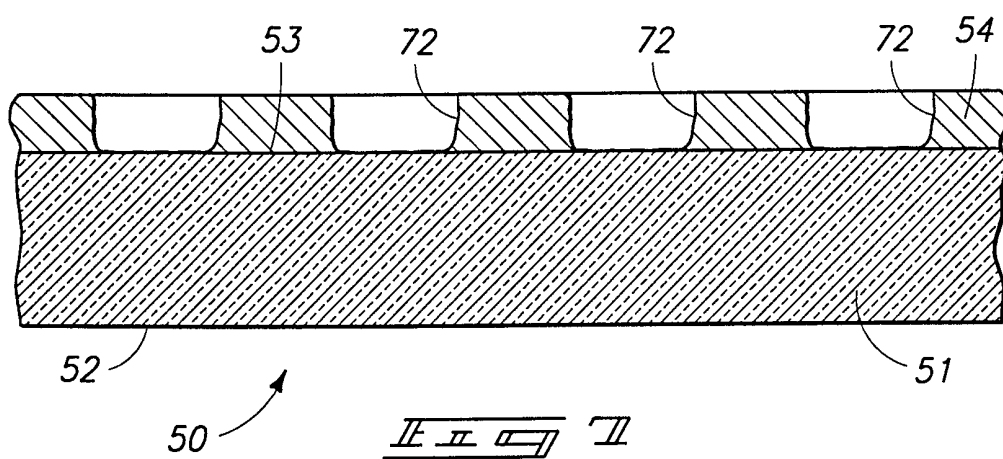
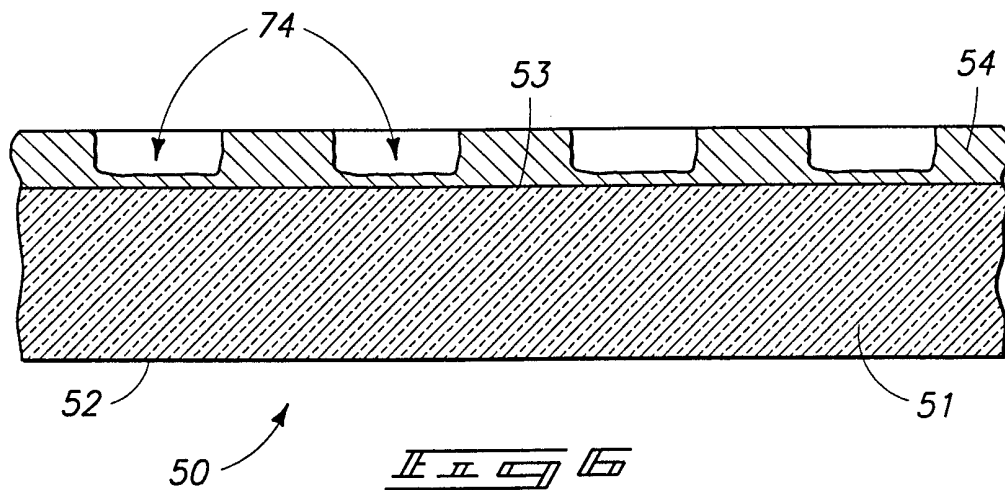
electromagnetic radiation, and a secondary region through which electromagnetic radiation may pass, and wherein the secondary region comprises about 1% to about 80% of the surface area of the substantially transparent substrate and reflects at least about 35% of the same given band of visibly discernible
5 electromagnetic radiation, and wherein the secondary region is defined by a plurality of discreet apertures formed in the mirror coating; and

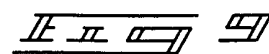
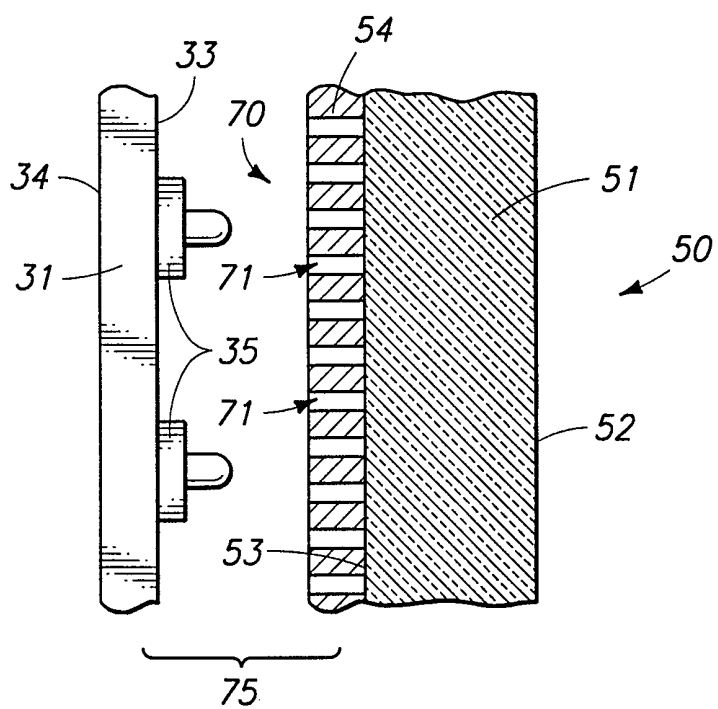
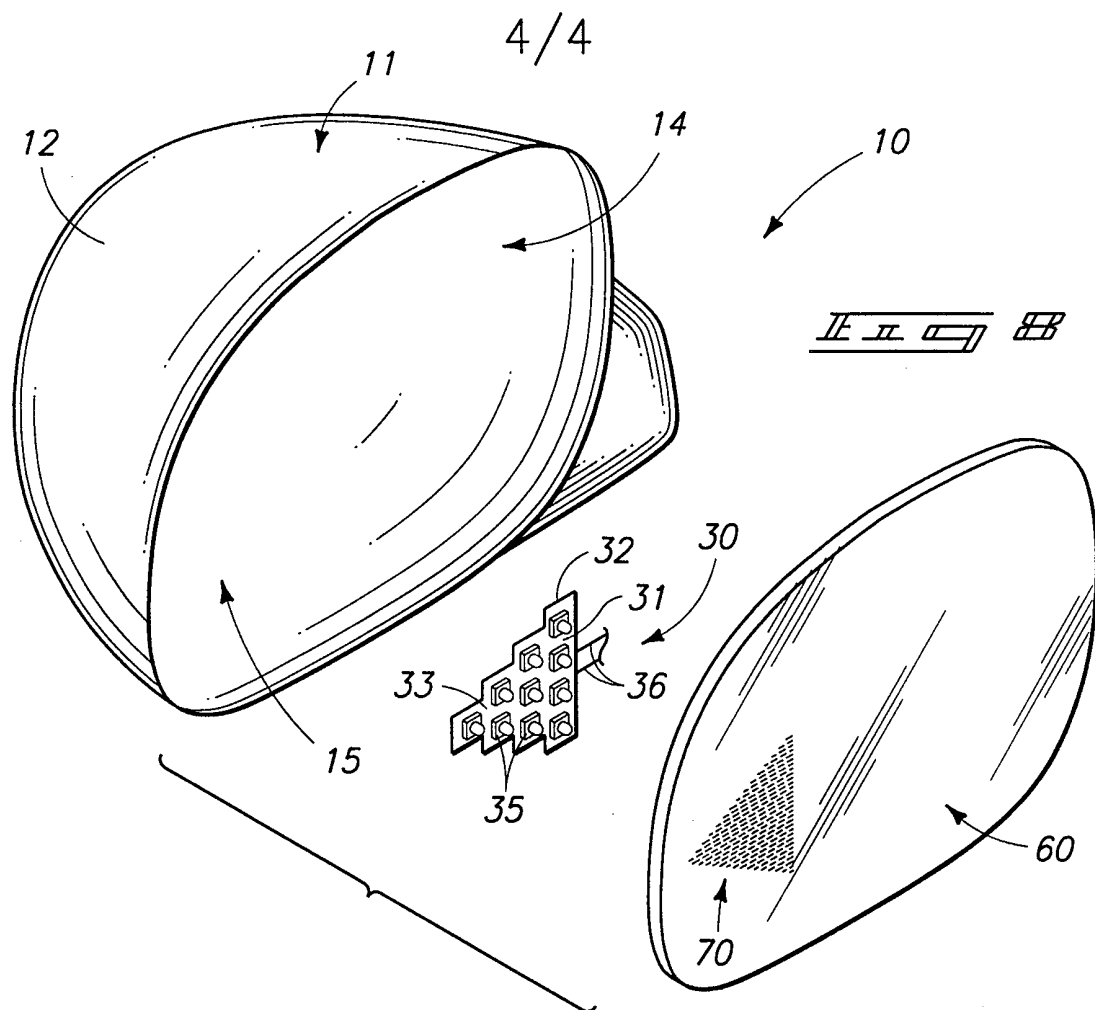
about 1 to about 30 light emitting diodes positioned adjacent to the secondary region and which, when energized, have a cumulative luminous output of about 1 to about 1000 candelas, and wherein the luminous output of the
10 secondary region is about 0.5 to about 120 candelas.





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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/17062

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G02B 5/08; B60Q 1/26

US CL :359/883, 884; 362/494

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 359/883, 884; 362/494

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y,P	US 5,879,074 A (PASTRICK) 09 March 1999 (09.03.99), see whole document.	1-27
Y	US 5,355,284 A (ROBERTS) 11 October 1994 (11.10.94), see whole document.	1-27

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Further documents are listed in the continuation of Box C.

☐

See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

02 SEPTEMBER 1999

Date of mailing of the international search report

21 OCT 1999

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