

- [0063] 第2のプリズムシート66も、平坦なシート状の基材部72と、基材部72の一方の面(表面)に並列配置された複数の柱状プリズム部74とを備えている。第2のプリズムシート66の柱状プリズム部74は、底面と平行な平坦部74aが先端に形成された台形の断面形状を備えている。この台形は、頂角が 60° 以上 150° 以下の三角形の頂部を切取った形状を有している。基材部62と柱状プリズム部74は、上記第1実施形態と同様の透明材料で構成されている。
- [0064] 第1のプリズムシート64と第2のプリズムシート66とは、互いの柱状プリズム部70、74が直交して延びるように配置され、第2のプリズムシート66の平坦部74aが、第1のプリズムシート64の基材部68の裏面に粘着剤(図示せず)によって接着され、第1のプリズムシート64と第2のプリズムシート66と一体化されている。
- [0065] また、液晶TV等においては、高輝度と高視野角が要求されるので、このような用途では、各ディスプレイに要求される視野角が得られるように各々のプリズム部の頂角を調整するのが好ましい。
- [0066] プリズムシートによる光偏向では、輝度と視野角特性は相反する特性を示す。例えば、プリズムで光出射角度範囲(視野角)を狭める、すなわち拡散光線をプリズムで狭角内に偏向(集光)すると、拡散板からの出射光のバックライト法線方向における輝度が高まる。また逆に、プリズムで光出射角度(視野角)を広げると、法線方向への集光効果を小さくなり、法線方向の輝度が低くなる。
- [0067] 柱状プリズム部70および柱状プリズム部74における断面三角形の頂角は、水平視野方向を制御する柱状プリズム部の頂角をX、垂直視野方向を制御する柱状プリズム部の頂角をYとし、下記(1)式から(3)式を満たすことが好ましい。
- $$70^{\circ} \leq X \leq 150^{\circ} \quad \dots (1) \text{式}$$
- $$70^{\circ} \leq Y \leq 130^{\circ} \quad \dots (2) \text{式}$$
- $$195^{\circ} \leq X + Y \leq 255^{\circ} \quad \dots (3) \text{式}$$
- [0068] 上記(1)式から(3)式の条件を満たす光偏向シートによれば、サイドローブと呼ばれるバックライト法線方向に対して斜め方向に出射する輝度ピークが抑制され、視野角を変えてバックライトを観察したときの角度によるバックライトの明暗ムラを低減することが出来る。

[0069] さらに、頂角Xおよび頂角Yが、下記(4)式から(6)式を満たすことがより好ましい。

$$90^{\circ} \leq X \leq 140^{\circ} \quad \dots (4) \text{式}$$

$$80^{\circ} \leq Y \leq 120^{\circ} \quad \dots (5) \text{式}$$

$$200^{\circ} \leq X+Y \leq 240^{\circ} \quad \dots (6) \text{式}$$

これらの式の条件を満たす光偏向シートでは、より高い輝度および視野角を両立させることができる。

[0070] また、水平視野方向を制御する頂角Xのプリズムシートが下側に配置(第1の光偏向シート)され、垂直視野方向を制御する頂角Yのプリズムシートが上側に配置(第2の光偏向シート)され、上記(4)式から(6)式に加えて下記(7)を満たす光偏向シートでは、より高い輝度と視野角を達成できる。

$$X \geq Y \quad \dots (7) \text{式}$$

[0071] 次に、本発明の第4実施態様の光偏向シート400について説明する。

図10(a)は、光偏向シート400の2枚のプリズムシートを接着する粘着層402を透視した光偏向シート400の模式的な平面図である。図10(b)は、図10(a)のa-a線に沿った模式的な断面図であり、図(c)は、図10(a)のc-c線に沿った模式的な断面図である。

[0072] 図10に示されているように、光偏向シート400は、第1のプリズムシート404と、第2のプリズムシート406とを備えている。

第1のプリズムシート404は、平坦なシート状の基材部408と、基材部408の一方の面(表面)に並列配置された断面三角形の複数の柱状プリズム部410とを備えている。基材部408と柱状プリズム部410は、上記第1実施形態と同様の透明材料で構成されている。

[0073] 第2のプリズムシート406も、平坦なシート状の基材部412と、基材部412の一方の面(表面)に並列配置された複数の柱状プリズム部414とを備えている。第2のプリズムシート406の柱状プリズム部414は、底面と平行な平坦部414aが先端に形成された台形の断面形状を備えている。基材部412と柱状プリズム部414は、上記第1実施形態と同様の透明材料で構成されている。

[0074] 第1のプリズムシート404と第2のプリズムシート406とは、互いの柱状プリズム部41

0、414が直交して延びるように配置されている。

第1のプリズムシート404の基材部408の他方の面(裏面)に、透明樹脂による粘着層402が設けられている。粘着層402は、粘着剤又は接着剤で構成され、互いに直交する各柱状プリズム部410、414に対し45°の傾斜角度を有するストライプパターンで配置されている。

[0075] 第1のプリズムシート404と第2のプリズムシート406とは、第2のプリズムシート406の柱状プリズム部414の平坦部414aが、第1のプリズムシート404の裏面に設けられた粘着層402に接触する部分で、貼り付けられ一体化されている。即ち、粘着層402が柱状プリズム部414の平坦部414aの一部分を覆って配置されている。

[0076] 第4実施形態では、粘着層402は、ストライプパターンとされているが、粘着層のパターンは、柱状プリズム部414の先端の平坦部414aの一部とが接合されていればどのようなパターンでも良く、例えばドットパターンであっても良い。また、粘着層192のパターンは、規則的なパターンであってもランダムパターンであっても良い。

[0077] また、第1および第2のプリズムシート404、406の密着強度の観点から、粘着層402と柱状プリズム部414の先端の平坦部414aとの接合部の面積は、平坦部414aの表面積の25%~99%が好ましく、50%~99%が更に好ましい。

[0078] 次に、本発明の第5実施形態の光偏向シート76について説明する。図11(a)は、本実施態様の光偏向シート76の模式的な断面図であり、図11(b)は、図11(a)のb-b線に沿った模式的な断面図である。

[0079] 図11に示されているように、本実施形態の光偏向シート76も、重ね合わされた第1および第2のプリズムシート78、80を備えている。

第1のプリズムシート78は、平坦なシート状の基材部82と、基材部82の一方の面(表面)に並列配置された断面三角形の複数の柱状プリズム部84とを備えている。柱状プリズム部84の頂角は、60~150°の範囲内が好ましい。基材部82と柱状プリズム部84は、第1実施態様と同様の透明材料で構成されている。

[0080] 第2のプリズムシート80も、平坦なシート状の基材部86と、基材部86の一方の面(表面)に並列配置された断面三角形の複数の柱状プリズム部88とを備えている。柱状プリズム部88の頂角は、60~150°の範囲内が好ましい。基材部86と柱状プリズ

ム部88は、第1実施態様と同様の透明材料で構成されている。

[0081] 第1のプリズムシート78と第2のプリズムシート80は、互いの柱状プリズム部84、88が直交して延びるように配置され、第2のプリズムシート80の柱状プリズム部88が第1のプリズムシート78の基材部82の裏面に接するように重ねられている。さらに、第2のプリズムシート80の柱状プリズム部88と第1のプリズムシート78の基材部82の間の空間に電離放射線硬化性樹脂Rが充填され、第1のプリズムシート78と第2のプリズムシート80が一体化されている。

[0082] 本実施形態では、電離放射線硬化樹脂Rとしては、紫外線硬化樹脂及び電子線硬化樹脂等が使用される。電離放射線硬化樹脂Rは、硬化後の屈折率が、第2のプリズムシート80のプリズム部88の屈折率より0.05以上低い樹脂が使用される。

[0083] また、電離放射線硬化樹脂Rに代えて、プリズムピッチより小さい粒径の粘着性微粒子を分散させた溶媒を充填し、溶媒を揮発させ貼り合わせを行う方法がある。この手法によるとプリズム面と粒子の間に空気層が確保される。

粘着性微粒子としては、粒子状のアクリル系粘着剤、天然ゴム系粘着剤、ウレタン系粘着剤、シリコーン系粘着剤などが使用される。粘着性微粒子は、真球状、不定形状であっても良い。

[0084] 図12(a)は、プリズム部90の頂角が 90° のプリズムシート92が拡散板94上に配置された構成における光線の軌跡を示している。プリズム部90および導光板の屈折率 n_p は1.49である。図12(a)に示されているように、プリズム部90から空気(屈折率 $n_a = 1.0$)中に出射する際には、 16° の偏向角度を確保することができる。しかし、屈折率が1.595の樹脂でプリズム部を形成し、このプリズム部の周囲に屈折率が1.49の樹脂を充填すると、プリズム部90から樹脂中への出射時に、ほとんど偏向角度を確保できない。

[0085] 図12(b)に示されているように、プリズム部の頂角を 40° とすれば約 9° の偏向角度を確保することができる。さらに、図12(c)に示されているように、充填する樹脂Rの屈折率を1.40とし、プリズム頂角 40° とすると、 14° の偏向角度を確保することができる。基材部の屈折率は、1.49である。

[0086] プリズム部を形成する高屈折率樹脂(n_h)としては、含硫黄アクリレート、フルオレン

誘導体等が用いられる。また低屈折率樹脂(n_1)としては、アクリルウレタンやフッ素化アクリルが用いられる。

[0087] 次に、本発明の第6実施形態の光偏向シート96の構成を説明する。図13(a)は光偏向シート96の模式的な断面図であり、図13(b)は図13(a)のb-b線に沿った模式的な断面図である。

本実施形態の光偏向シート96は、従来の直下方式バックライトで使用されている拡散シート、拡散フィルム、およびプリズムシートを一体化したものである。

[0088] 図13に示されているように、光偏向シート96は、平坦なシート状の基材部98の一方の面(表面)に並列配置された断面が三角形の柱状プリズム部(第1偏向レンズ部)100を備えている。また、柱状プリズム部(第1偏向レンズ部)100の断面は、頂角が 60° 以上 150° 以下の三角形であるのが好ましい。

また、光偏向シート96は、他方の面(裏面)に並列配置された断面が台形状の柱状レンズ部(第2偏向レンズ部)102を備えている。また、台形は、頂角が 60° 以上 150° 以下の三角形の頂部を切取った形状である。

[0089] 柱状レンズ部(第2偏向レンズ部)102は、断面が三角形の柱状プリズム部(第1偏向レンズ部)100に直交して延びるように配置されている。柱状レンズ部(第2偏向レンズ部)102は、内部傾斜面で低角入射した光を垂直方向に全反射させるように構成されている。この傾斜面は、必要な視野角に応じて、角度や形状が適宜選択される。柱状プリズム部(第1偏向レンズ部)100と柱状レンズ部(第2偏向レンズ部)102を、基材部98の両面に同時に形成してもよい。

[0090] さらに、光偏向シート96は、柱状レンズ部(第2偏向レンズ部)102の頂面に透明な粘着材あるいは接着剤によって貼り付けられた、拡散シート104を備えている。

[0091] このように構成された光偏向シート96は、例えば図14に示されるように、液晶表示装置のバックライト内でCCFLなどの線状光源4の上方に配置される。

[0092] 次に、本発明の第7実施形態の光偏向シート106の構成を説明する。図15(a)は第7実施形態様の光偏向シート106の模式的な断面図であり、図15(b)は図15(a)のb-b線に沿った模式的な断面図である。

[0093] 第7実施形態の光偏向シート106は、第1偏向レンズシート108と第2偏向レンズシ

ート110とを備えている。第1偏向レンズシート108は、第1実施態様の等方性レンズシート14と同様の構成であり、また、第2偏向レンズシート144は、第1実施態様のプリズムシート12と同様の構成を備えている。そして、第1および第2偏向レンズシート108、110は、第1実施形態の等方性レンズシート14とプリズムシート12と同様に、貼り合わされている。

[0094] さらに、第2偏向レンズシート110の第1偏向レンズシート108と反対側の面には、空気層Aを介して、拡散シート112が取付けられている。拡散シート112との間に空気層を確保するための複数の突起構造物114が、第2偏向レンズシート110の裏面に形成されている。突起構造物114は、断面略矩形の棒状体であり、突起構造物114の先端面が拡散シート112に透明な粘着材あるいは接着剤で貼り付けられている。

[0095] 突起構造物114は、(メタ)アクリレート系活性エネルギー線硬化性組成物等の組成物で形成されるのが好ましい。(メタ)アクリレート系活性エネルギー線硬化性組成物としては、例えば、ポリエステル(メタ)アクリレート、エポキシ(メタ)アクリレート、ウレタン(メタ)アクリレート等の(メタ)アクリレート系樹脂等が挙げられる。

[0096] 突起構造物114の形成方法としては、予めフィルムなどのシートあるいはロール上に形成された突起構造物となる柱状構造物を熱や接着剤により第2偏向レンズシート裏面に転写する方法や、予め突起構造物形状を形成した金型ロールを用いたキャスト法、もしくは電離放射線効果樹脂による2P賦型法、凹凸版によるフレキソ印刷やスクリーン版などの印刷法、インクジェットなどによるポッティングにより形成する方法が挙げられる。

[0097] 第2偏向レンズシート110のレンズの配列ピッチと、突起構造物114の配列ピッチによってモアレ縞が発生する可能性がある。このようなモアレ縞の発生を防止するため、一方の配列ピッチをランダムにする、あるいは一方の配列ピッチを他方の配列ピッチの $(N+0.4)$ 倍ないし $(N+0.6)$ 倍(N は整数)に設定するのが好ましい。

[0098] 本実施態様の偏向レンズシートは、等方性レンズシートとプリズムシートからなる構成であるが、等方性レンズシートに代えて第2実施形態から第5実施形態に記載の偏向レンズシートを用いても良い。

[0099] 次に、本発明の第8実施形態の光偏向シート116の構成を説明する。図16(a)は、

第8実施形態の光偏向シート116の模式的な断面図であり、図16(b)は図16(a)のb-b線に沿った模式的な断面図である。

[0100] 図16に示されている光偏向シート116は、平坦な基材部118の一方の面(表面)に複数の断面が三角形の柱状プリズム部120が並列配置されたプリズムシート122を備えている。柱状プリズム部120の頂角は、 $60\sim 150^\circ$ の範囲内が好ましい。

[0101] 一方、拡散シート124が、基材部118の他方の面(裏面)と対向して配置されている。プリズムシート122と対向する拡散シート124の面には、樹脂で形成された複数の半円柱状のレンズ部126が並列配置されている。更に、基材部118の他方の面とレンズ部126との間には、レンズ部126を形成している樹脂より屈折率が0.05以上高い樹脂128が充填されている。

[0102] 次に、本発明の第9実施形態の光偏向シート130の構成を説明する。図17(a)は、第9実施形態の光偏向シート130の模式的な断面図であり、図17(b)は図17(a)のb-b線に沿った模式的な断面図である。

[0103] 図17に示されている光偏向シート130は、拡散シート132の表面に断面台形状の柱状部分134が配置され、柱状部分134の頂面に、等方性レンズシート136の基材部138が貼り付けられている構成を備えている。等方性レンズシート136は、第1実施形態様の等方性レンズシート14と同様の構成である。

[0104] 低角度でレンズ内部に入射する光に対して、大きな偏向角度を確保できるように、柱状部分134の側面は、傾斜角度を大きくするのが好ましい。本実施形態では、柱状部分134の側面の傾斜角度は 70° に設定されている。また、第1の偏向レンズ136のビーズ140として、曲率の小さい直径 $5\sim 10\mu\text{m}$ 程度のビーズを使用した。

[0105] 本実施形態様の偏向レンズシートは、等方性レンズシートと拡散シートからなる構成であるが、等方性レンズシートに代えて第1実施形態から第5実施形態に記載の光偏向シートを用いても良い。

[0106] 次に、本発明の第10実施形態の光偏向シート142の構成を説明する。図18は、本発明の第10実施形態の光偏向シート142の模式的な断面図である。

図18に示されているように、光偏向シート142は、プリズムシート144と、拡散シート146とを備えている。プリズムシート144は、平坦なシート状の基材部148と、基材部

148の一方の面(表面)に並列配置された断面が三角形の複数の柱状プリズム部150を備えている。

[0107] 各柱状プリズム部150は、頂角が90°であり、48 μ mピッチで配置されている。また、柱状プリズム部分150は紫外線硬化樹脂で形成され、基材部148は、ポリエステル樹脂で形成されている。

[0108] 拡散シート146は、プリズムシート144の基材部148の裏面に離散的に配置された紫外線硬化タイプの感圧接着剤152によって、プリズムシート144に貼り付けられている。感圧接着剤152は、離散的に配置されているので、感圧接着剤152が配置されていない部分では、プリズムシート144の基材部148と拡散シート146の間に空気層が形成されることになる。

[0109] 拡散シート146は、酸化チタン粒子が分散されたPMMA(ポリメチルメタクリレート)シートであり、全光線透過率65%、拡散率45%である。PMMAシートに代えて、ポリスチレン樹脂、MS樹脂(メタクリルースチレン共重合樹脂)、AS樹脂(アクリロニトリルースチレン共重合樹脂)、ポリカーボネイト樹脂、ポリエステル樹脂、ポリオレフィン樹脂のシートを使用することもできる。

[0110] 感圧接着剤152は、常温で塗工可能な紫外線硬化タイプである。本実施形態の感圧接着剤152は、分子量が5000～30000の光重合性アクリルウレタンオリゴマーと、分子量1000以下程度のアクリルモノマーと、光重合開始剤を含有している。本実施形態の感圧接着剤152では、溶媒は使用していない。

また、UV硬化反応は、反応速度が速く、透明性、熱安定性の高いラジカル反応を用いている。ただし、酸素阻害により硬化しにくい性質があるので、半硬化時は窒素パージを行っている。

[0111] プリズムシート144の基材部148の裏面における感圧接着剤152の形状は、基材部148との接触角と、塗布時の感圧接着剤152の粘度、塗布方法等に依存する。本実施形態では、接触角を大きくし感圧接着剤152との密着性を向上させるため、基材部148の裏面にアンカーコート及び表面処理を施している。また、粘度及びチクソ性を向上させるコロイダルシリカを接着剤に添加してもよい。

[0112] 感圧接着剤152は、インクジェット、フレキソ印刷、連続スクリーン印刷によって離散

的に配置される。感圧接着剤の離散的な配置パターンとしては、図19に示されているようなパターンがある。

- [0113] 図19(a)のパターンでは、ドット状の感圧接着剤152が、プリズムシートまたは液晶表示板とのモアレを防ぐためランダムに配置されている。1つのドットの大きさは直径約 35μ 、平均の中心間距離は $215\mu\text{m}$ に設定されている。

図19(b)のパターンでは、横方向の細長い楕円状の感圧接着剤152が、ランダムに配置されている。このような異方性形状を採用することによって、水平及び垂直の視野角を調整することもできる。

- [0114] 図19(c)のパターンでは、感圧接着剤152が、プリズムシート144の柱状プリズム部が延びる方向と直交する方向に延びるストライプ状に配置されている。本実施形態では、例えば、ライン幅 35μ 、ピッチ $215\mu\text{m}$ に設定されている。

図19(d)のパターンでは、感圧接着剤152が、プリズムシート144の柱状プリズム部が延びる方向に対して傾斜しているストライプ状の配置されている。本実施形態では、ラインピッチが $215\mu\text{m}$ に設定されている。

このような構成によれば、感圧接着剤は、拡散シートとプリズムシートの間に空気層を確保する役目だけでなく、プリズムシート144の基材部148の裏面のフレネル反射によるロスを抑える効果もある。

- [0115] 次に、本発明の第11実施形態の光偏向シート154の構成を説明する。図20(a)は、本発明の第11実施形態の光偏向シート154の模式的な断面図であり、図20(b)は図20(a)のb-b線に沿った模式的な断面図である。

- [0116] 図20に示されているように、第11実施形態様の光偏向シート154は、プリズムシート156と、拡散シート158とを備えている。

プリズムシート156は、平坦なシート状の基材部160と、基材部160の一方の面(表面)に並列配置された断面三角形の複数の柱状プリズム部162と、基材部160の他方の面(裏面)に配置された複数の柱部164とを備えている。柱状プリズム部162の頂角は、 $60\sim 150^\circ$ が好ましい。柱部164は、断面台形の棒状体であり、柱状のプリズム部162と平行に延びるように互いに離間して平行に配置されている。

- [0117] 本実施形態では、拡散シート158の表面に塗布された感圧接着剤層166に柱部1

64の先端が貼り付けられることによって、プリズムシート156と拡散シート158が一体化させられている。

[0118] 次に、本発明の第12実施形態の光偏向シート170の構成を説明する。図21(a)は光偏向シート170の断面図であり、図21(b)は(a)のb-b線に沿った断面図である。

図21に示されているように、光偏向シート170は、第1のプリズムシート172と、第2のプリズムシート174とを備えている。

第1のプリズムシート172は、平坦なシート状の基材部176と、基材部176の一方の面(表面)に並列配置された断面三角形の複数の柱状プリズム部178とを備えている。基材部176と柱状プリズム部178は、上記第1実施形態と同様の透明材料で構成されている。

[0119] 第2のプリズムシート174も、平坦なシート状の基材部180と、基材部180の一方の面(表面)に並列配置された断面三角形の複数の柱状プリズム部182とを備えている。基材部180と柱状プリズム部182は、上記第1実施形態と同様の透明材料で構成されている。

[0120] 第1のプリズムシート172と第2のプリズムシート174とは、互いの柱状プリズム部178、182が直交して延びるように配置されている。

第1のプリズムシート172の基材部176の他方の面(裏面)には、透明樹脂による粘着層184が設けられている。粘着層184は、粘着剤又は接着剤で構成され、この粘着層184に第2のプリズムシート174のプリズム部184の先端が埋設されることによって、第1のプリズムシート172と第2のプリズムシート174とが一体化されている。

[0121] 各々のプリズムシートのプリズムの頂角を変更することによって、各ディスプレイに要求される視野角が得られるように、水平または垂直方向の視野角を制御することができる。

[0122] 水平視野方向を制御する柱状プリズムの頂角をX、垂直視野方向を制御する柱状プリズムの頂角をYとしたとき、柱状プリズム部178、182の頂角が下記(1)式から(3)式を満たすことが好ましい。

$$70^{\circ} \leq X \leq 150^{\circ} \quad \dots (1) \text{式}$$

$$70^{\circ} \leq Y \leq 130^{\circ} \quad \dots (2) \text{式}$$

$$195^{\circ} \leq X+Y \leq 255^{\circ} \quad \cdots (3) \text{式}$$

[0123] 頂角Xおよび頂角Yが上記(1)式から(3)式の条件を満たす光偏向シートによれば、サイドローブと呼ばれるバックライト法線方向に対して斜め方向に出射する輝度ピークが抑制され、視野角を変えてバックライトを観察したときの角度によるバックライトの明暗ムラを低減することが出来る。

[0124] 頂角Xおよび頂角Yが、(4)式から(6)式を満たすことがより好ましい。

$$90^{\circ} \leq X \leq 140^{\circ} \quad \cdots (4) \text{式}$$

$$80^{\circ} \leq Y \leq 120^{\circ} \quad \cdots (5) \text{式}$$

$$200^{\circ} \leq X+Y \leq 240^{\circ} \quad \cdots (6) \text{式}$$

これらの式の条件を満たす光偏向シートでは、高輝度および高視野角を両立させることができる。

[0125] また、水平視野方向を制御する頂角Xのプリズムシートが下側に配置(第1の光偏向シート)され、垂直視野方向を制御する頂角Yのプリズムシートが上側に配置(第2の光偏向シート)され、上記(4)式から(6)式に加えて下記(7)を満たす光偏向シートは、より高い輝度と視野角を達成できる。

$$X \geq Y \quad \cdots (7) \text{式}$$

[0126] 次に、本発明の実施態様の光偏向シートを得る製造方法について説明する。

粘着剤あるいは接着剤は、第1のシートの基材部の他方の面(裏面)、第2のシートの平坦部または、その両方に塗工される。これら粘着剤あるいは接着剤の塗工方法としては、書籍「粘着(粘接着)の新技术とその用途、各種応用製品の開発資料、626頁、図-15」(経営開発センター経営教育部編集、昭和53年5月20日発行)に記載されているような公知の塗工技術が挙げられる。

[0127] これらの塗工技術は、粘着剤塗工液の粘度や、塗工厚み(および膜厚精度)、塗膜形状(全面塗工あるいは部分塗工など)などに合わせて適宜選択される。

第1ないし第3実施形態および第12実施形態に記載の光偏向シートのように、第1シートの基材部の他方の面(裏面)全面に粘着剤を塗工するには、ダイコーター、グラビアコーター、ロールコーター、リバースロールコーター、コンマコーターなどが好ましい。

- [0128] 第2のシートの平坦部に粘着剤あるいは接着剤を塗工する方法としては、粘着剤を塗布あるいは粘着シートを形成させたロールに、レンズの平坦部を接触させてレンズ平坦部に粘着剤を転写する方法、インクジェット印刷機による印刷手法が挙げられる。
- [0129] 第4実施形態に記載の光偏向シートのように、第1のシートの基材部の他方の面(裏面)に粘着剤をドット状あるいはストライプ状に離散的に塗工するには、ドットパターンあるいはストライプパターンが形成された転写凸版ロールあるいはスクリーン版などによるフレキソ印刷、ロータリースクリーン印刷、凹凸賦型されたロール塗工などが用いられる。
- [0130] 第12実施形態様の記載の光偏向シートでは、粘着剤に埋没するプリズム先端深さが異なると光学特性に振れが生じやすくなるため、埋設するプリズム先端深さを一定にするために、接着剤の塗布厚みを高精度で塗工する必要がある。
- [0131] シートの基材部の他方の面(裏面)には、基材表面の濡れ性の改善や粘着剤あるいは接着剤との密着性を向上する目的で、表面改質処理を行っても良い。表面改質を行う方法としては、コロナ放電処理、オゾン処理、プラズマ処理、EB処理などの公知の技術が挙げられる。
- [0132] 粘着剤または接着剤は、塗工後に、加熱あるいは紫外線、電子線などの電離放射線照射によって硬化させられる。粘着剤または接着剤を硬化させる加熱装置および、紫外線、電子線などの電離放射線照射装置としては、公知の装置が用いられる。光偏向シートの基材にダメージを与えないように、基材温度が、その基材の耐熱温度以下となるような温度で硬化処理を行うことが好ましい。特に電子線照射では、光偏向シートの基材へのダメージを考慮すると、300kV以下の低加速電子線タイプが好ましい。
- [0133] 粘着剤の硬化後、第1のシートと第2のシートとをホットラミネーター、コールドラミネーターなどの公知の貼り合せ装置(ラミネート)により貼り合わせる。ラミネート時の圧力は、光偏向シートを形成するレンズ形状や、それに用いる材料特性、使用する粘着剤あるいは接着剤の材料特性などを考慮して設定される。
- [0134] 本実施形態では、硬化後粘着性を有する樹脂を用いたが、硬化前に二つのシート

を貼り合わせ、その後、紫外線照射して硬化・固定しても良い。この場合、第1実施形態から第4実施形態に記載の光偏向シートでは、下方側のプリズムシートのプリズム部の先端の平坦部に塗工した硬化前の粘着剤が、貼り合せ時にプリズム先端の斜面に溢れて、先端部を粘着剤中に埋没しやすくなる。

[0135] このような光偏向シートでは、粘着剤に埋没するプリズム先端深さが異なると得られた光偏向シートの光学的特性に振れが生じやすくなるため、埋設するプリズム先端深さを一定にする必要があり、均一な接着剤の塗布厚みを得るための高精度塗工やラミネート圧などの制御が必要となる。

[0136] さらに、予め硬化された粘着層が剥離紙上に配置あるいは剥離紙に両面サンドされてなるノンキャリア粘着シートや、常温では固化しているが、熱をかけると熔融するホットメルト系の粘着層が設けられた粘着シートを用いてもよい。

ノンキャリア粘着シートやホットメルト系の粘着シートを用いる場合は、プリズムシート等の各シートとノンキャリア粘着シートを別々に供給し、ラミネーターを用いて一度に貼り合わせる方法、あるいは一方のシートの裏面に予めノンキャリア粘着シートあるいはホットメルト系粘着シートを先にラミネートして粘着層を形成し、続いて、他方のシートを供給し、ラミネートして貼り合わせる方法が挙げられる。

[0137] 上記実施形態の光偏向シートを連続的に製造するにあたっては、第1のシートと第2のシートとをそれぞれロールから巻き出し、第2のシートの柱状プリズム部等の平坦面及び／または第1のシートの他方の面(裏面)に粘着剤または接着剤を塗布し、ラミネーターで第2のシートの柱状プリズム等の平坦面と第1のシートの他方の面(裏面)とを貼り合わせ第1および第2のシートを一体化する。

[0138] 次に、前記第7実施形態の光偏向シートの製造方法について説明する。

第1偏向レンズシート108と第2偏向レンズシート110は、上述した方法で製造される。

第2偏向レンズシート110の複数の突起構造物114は、予めフィルムなどのシートあるいはロール上に形成された突起構造物となる柱状構造物を熱や接着剤により第2レンズシート裏面に転写する方法、予め突起構造物形状を形成した金型ロールを用いたキャスト法、電離放射線効果樹脂による2P賦型法、凹凸版によるフレキソ印刷

やスクリーン版などの印刷法、インクジェットなどによるポッティング等により形成される。

[0139] 第2偏向レンズシート110の突起構造物114の先端面と拡散シート112とを貼り合わせる際の粘着剤の塗工方法および硬化方法、貼り合せ方法には、光偏向シートの製造法と同様の技術を適用できる。粘着剤あるいは接着剤は、突起構造物114の先端部および拡散シート112の貼り合せ面のいずれか一方または両方に塗工する。

[0140] 次に、第10本実施形態の光偏向シート142の製造方法について説明する。

図22、図23に示されているように、柱状プリズム部150に保護フィルム186が貼り付けられているプリズムシート144が、ロールから供給される。インクジェット印刷機等の塗布装置188により、基材部148の裏面に感圧型接着剤152が所定パターンで塗布される。

[0141] 塗布された感圧型接着剤152は、直ちにUV装置190により硬化させられる(図22(a)、図23)。次いで、拡散シート146が重ね合わせられ、さらに、押圧ローラ192によって、プリズムシート144と拡散シート146が押圧され、貼り合わせられる(図22(b)、図23)。貼り合わされた光偏向シートは、カッタ194等で、バックライトに適合する大きさに打ち抜かれる(図23)。

[0142] このとき、UV装置190による硬化工程で半硬化状態とし、拡散シート146を重ね合わせた後、保護フィルム168或いは拡散シート146側から再度、UV光を照射し、完全硬化させてもよい。

[0143] 拡散シート146として、0.65mm程度の硬質アクリルシートを使用する場合は、図23に示されているように拡散シート146をロールから供給し、完成した光偏向シートをロールに巻き取るロール ツー ロールで光偏向シートを製造することもできる。

[0144] 本発明の上記実施形態に限定されことなく、特許請求の範囲に記載された技術的思想の範囲内で種々の変更、変形が可能である。

実施例

[0145] 次に、本発明の実施例について説明する。

図9に示されている第3実施態様の光偏向シートの構成におけるプリズムシートのプリズムの頂角と、光偏向シートの光度(輝度)および視野角特性の関係をシミュレー

シジョンした。

バックライトの光学特性は、米ORA(Optical Research Associates)社光学シミュレーションソフト(Light Tools)を用いて算出した。

[0146] シミュレーションに使用した光学モデルは、以下の通りである。

主に垂直視野角を制御する第1のプリズムシートのモデルとして、タテ20mm、ヨコ20mm、厚さ0.1mmの基材部の一方の面(表面)に、50 μ mピッチで、断面台形状(頂部の平坦部の長さ5 μ m)の柱状プリズムが形成されたシートであって、60度から150度の範囲で10度刻みの異なるプリズム頂角を有する、複数のモデルを設計した。

[0147] また、主に水平視野角を制御する第2のプリズムシートとして、タテ20mm、ヨコ20mm、厚さ0.1mmの基材の一方の面(表面)に、50 μ mピッチで、断面三角形の柱状プリズムが形成されたシートであって、60度から150度の範囲で10度刻みの異なるプリズム頂角を有する複数のモデルを設計した。

[0148] 上記モデルの各部品の屈折率は、全て1.51に設定し、各部品の表面特性は、スムーズ光学-フレネル反射特性に設定した。

[0149] これら第1および第2のプリズムシートを図9に示されているように貼り合わせた光偏向シートのモデルとした。さらに、光偏向シートモデルの中心部の下方に22mmに配置された、タテ0.6mm、ヨコ0.6mm、厚み0.01mmの矩形体を光源モデルとした。

[0150] シミュレーションに用いた光源情報は、CCFLと拡散板を用いて実際に作成された直下方式のバックライトから計測した光出射パターン(角度輝度分布)を用いた。具体的には、光出射パターンの計測には、図25に沿って後述する直下方式のバックライト光源210を用い、光拡散板(三菱レイヨン製アクリライト色調NA88厚さ2mm)の角度輝度分布の測定を行った。

角度輝度分布の測定は、ELDIM社EZcontrast160R(コノスコープ)を用いて、バックライト中央における -80° $\sim$ $+80^{\circ}$ 範囲の角度輝度分布を測定した。なお、測定に際しては、前記直下方式のバックライトを点灯し、30分放置後に測定を行った。得られた角度輝度データは、 1° 刻みに出力し、輝度データに $\cos \theta$ (ここで θ は、

出光角度)を乗じて、光度データに変換し、シミュレーションにおける光源情報とした。

[0151] 光源モデルの下面の下方0.025mmに反射シートとして、タテ20mm、ヨコ20mm、厚み0.01mmの矩形体を配置し、これを反射シートモデルとした。反射シートモデルを構成する部品の表面特性は、シンプルミラー特性(反射率98%、透過率2%)に設定した。

[0152] シミュレーションにおける受光器として、光偏向シートモデルの最上面中央を中心として、LightTools内のFar Field受光器を設定した。Far Field受光器を、偏向シートの中心を基準に配置し、全角度(全球)の光度をシミュレーションした。なお、受光器における明るさの単位設定は、光度にて行ない、シミュレーションにおける光線本数は、100万本とした。

[0153] 得られた光度データは、垂直方向は角度2°刻み、水平方向は角度5度刻みの光度データとして出力される。表-1には、正面光度(明るさ)と垂直方向と水平方向の光度の半減角度(正面光度の50%光度値となる角度)を記載した。なお、各角度データ間の光度は、直近の2点による直線近似により求めた。(近似式による補間光度データは、表-1中で下線を付した。)

[0154] シミュレーションを実施しなかったプリズム頂角における光学特性は、シミュレーションで得られた結果より、直近のプリズム頂角における2点データを用いて直線近似により算出した。

[0155] バックライトに要求される視野角特性は、搭載する液晶表示装置のモードや、使用する光学フィルムにより変わり、用途によっても異なる。例えば、液晶TV用途においては、垂直方向の視野角特性よりも水平方向の視野角特性が広い設計がなされており、バックライトの視野角特性についても同様の特性が求められている。

したがって、各プリズムシートのプリズムの頂角の組み合わせは、バックライトに要求される光度(輝度)や視野角特性に応じて適宜選定される。

[0156] 表-1より、2枚のプリズムシートのプリズム頂角が90°と90°の組み合わせが、最も高い光度(明るさ)が得られるが、視野角特性は狭くなること分かる。この組み合わせは、液晶TVなどの高視野角と高輝度が求められるディスプレイに用いるためには

、視野角特性が狭すぎる。また、2枚のプリズムシートのプリズム頂角が150° と150° の組み合わせは、視野角特性は広くなるが、十分な光度が得られないことが分かる。さらに、プリズム頂角が60° と60° の組み合わせは、視野角特性が狭く、十分な光度も得られないことがわかる。

[0157] [表1]

【表-1】

上段	光度
下段	垂直／水平

	第2のプリズムシート（水平視野方向を制御する偏向レンズ）の頂角×									
	60	70	80	90	100	110	120	130	140	150
第1のプリズムシート（垂直視野方向を制御する偏向レンズ）の頂角Y	60	0.451 53/33	0.555 35/38	0.613 31/34	0.63 34.5/40	0.577 45/52	0.552 46/58	0.535 50/58	0.51 53/62	0.487 55/67
	70	0.577 45/30	0.62 41/43	0.702 38/42	0.724 41/46	0.673 49/52	0.621 52/60	0.6 52/64	0.565 56/67	0.556 58/71
	80	0.679 42/35	0.68 48/50	0.804 43.5/47.5	0.812 47.5/51	0.764 53.5/57	0.706 56/62	0.65 57.5/69	0.644 60.5/71	0.61 63/76
	85			0.839 46/50	0.856 50/53	0.805 56/59	0.728 59/64	0.68 60/70	0.655 63.5/73	0.642 66/78
	90	0.755 44/42	0.72 53/55	0.868 49/52	0.89 53/57	0.834 59/61	0.756 61/67	0.72 63/72	0.684 66/76	0.663 68/80.5
	95	0.728 46/43		0.85 52/53.5	0.869 55.5/59	0.822 61/62		0.715 65/72.5		0.64 72/87
	100	0.714 49/49	0.761 51/52	0.82 55/58	0.814 58/62	0.772 64/68	0.738 66/71	0.69 67/77	0.676 71/79	0.63 74/85
	105				0.778 61/63	0.762 66/69	0.694 69/73	0.67 70/79		
	110	0.61 67.5/52	0.66 63/56	0.703 63/60	0.744 64/63	0.7 71/69	0.662 72/73	0.622 73/81	0.61 76/82	0.58 79/87
	115	0.6 74/52		0.659 68/61	0.685 68/66	0.653 75/70	0.621 76/74	0.597 76/80	0.568 79/83	0.552 82/88
	120	0.574 75(64)/52	0.6 76/58	0.64 68/61.5	0.65 70/67	0.622 77/71	0.588 80/77.5	0.55 80/82	0.53 83/87.5	0.53 84.5/90
	125			0.63 67/64	0.63 71/69		0.577 80/79	0.537 82/84		0.512 87/92
	130	0.55 76/54	0.59 66/59	0.62 70/64	0.63 74/69	0.6 80/75	0.56 82/80.5	0.53 83/85	0.5 87/90	0.47 88/94
	140	0.52 76/58	0.56 73/61	0.6 76/66	0.6 79/70	0.58 85/76	0.55 88/79	0.51 89/86	0.49 92.5/77	0.48 95/96
	150	0.518 77/59	0.54 77/62	0.577 81/68	0.584 84/71	0.56 90/77	0.531 93/80.5	0.489 94/87.5	0.47 97/91	0.455 100/97
										0.438 101/101

[0158] 前記シミュレーションによる結果を元に実際に作成した本発明の実施例の光偏向シートを、比較例と対比しながら説明する。

[0159] (比較例)

比較例1は、現状で用いられる直下方式のバックライトの構成である。

第1の偏向・拡散フィルム(垂直・水平視野角を等方的に制御)としてKIMOTO製のライトアップGM2を、第2のプリズムシート(主に垂直視野角を制御)として頂角=90°、プリズムピッチ=50 μ の3M社BEFIIを、それぞれ用いた。

(比較例2~4)

プリズムシート(主に垂直視野角を決定)として表-2に記載のプリズム頂角、プリズムピッチ=50 μ のプリズムシートを用いた。

[0160] 【表-2】

	第2の光偏向シート の偏光レンズ の頂角角度 X	第1の光偏向 シート の偏光 レンズの頂角 角度Y	角度0°に おける輝度 cd/m2	全半値角度		品位 (ランプイ メージ)
				垂直方向	水平方向	
実施例 1	120	100	4759	67	84	○
実施例 2	120	63	3893	53	69.5	○
実施例 3	120	68	4047	53	69.5	○
実施例 4	120	90	5154	60	73	○
実施例 5	120	120	4056	80	82	○
実施例 6	100	100	4995	62	76	○
実施例 7	100	120	4221	74	80.5	○
比較例 1	拡散シート	90	4542	66.5	81.5	○
比較例 2	—	90	4366	73.5	109.5	×
比較例 3	—	100	4415	80	113.5	×
比較例 4	—	120	3854	94	125.5	×

[0161] (実施例1)

本実施例の光偏向シート200は、図24(a)および図24(b)に示されているように、第1のプリズムシート(主に垂直視野角を制御)202と、第2の偏向レンズシート(主に水平視野角を制御)204とを貼り合わせた、図9の光偏向シート62と同様の構成を有するシートである。

[0162] 本実施例では、第1のプリズムシート(主に垂直視野角を制御)202として、易接着処理を施した厚さ125 μ のクリアPETフィルムの一方の面(表面)に、頂角 $\theta 1=100$ 度、プリズムピッチ $P2=50\mu$ でレンズ部が形成されたレンズシートを用いた。また、第2の偏向レンズシート(主に水平視野角を制御)204として、クリア片面拡散処理(

易接着処理)を施した厚さ 188μ のPETフィルム的一方の面(表面)に、頂角 $\theta_2=120^\circ$ 、先端平坦部の幅 $s=5\mu$ 、プリズムピッチ $P_1=73\mu$ のレンズ部が形成されたレンズシートを用いた。

[0163] 第1のプリズムシート202の裏面に全体に、紫外線硬化樹脂(ノーテープ工業製品「アクリタックT-510」)を、バーコーターを用いて、塗布厚み約 $20\mu\text{m}$ で毎分1mの塗工速度で塗布した。この紫外線硬化樹脂は、硬化後粘着性を有し、容易に光学密着を計れる。

[0164] 塗布後、紫外線照射装置であるパルスキセノン(米国Xenon社RC-747)で紫外線を照射し、紫外線硬化樹脂を硬化させて粘着層を形成した。紫外線照射条件は、5秒間パルス照射(約50パルス)を5回繰り返した。この時の紫外線照射量は、紫外線光量計(測定ピーク波長 360nm)で、積算光量が $20\text{mJ}/\text{cm}^2$ であった。

[0165] 硬化後、2枚のプリズムシートを貼り合わせした。得られたプリズムシート200をタテ $325\times$ ヨコ 425mm に切断してサンプルとした。また、プリズムシート200の断面を顕微鏡で観察すると、第1のプリズムシートの裏面に形成された粘着層に第2のプリズムシートの先端平坦部が密着していた。

[0166] (実施例2～実施例7)

第2のプリズムシートに用いた厚さ 188μ のPETフィルムに代えて、厚さ $125\mu\text{m}$ で易接着処理を施したクリアPETフィルムを用い、表-2に記載されている頂角のプリズムシートを作成した以外は、実施例1と同様に行った。

[0167] (直下方式バックライトの構造)

本実施例において光学特性の測定に用いた直下方式のバックライト光源210の断面を図25に示す。

バックライト光源210は、20インチサイズ(タテ $325\times$ ヨコ 425mm)であり、光源として直径 $\phi 3\text{mm}$ の10本のCCFL212が平行に配置されている。また、CCFL212の下方には、白色の拡散反射板シート214が配置されている。CCFL212は、ピッチ P_1 が 30mm 、拡散反射板シート214からの距離 H_2 が 3.5mm となるように配置されている。

[0168] 拡散反射シート214は、CCFL212の真下の領域 W_2 が幅 15mm の平面とされ、隣

接するCCFL212間の領域W1が、幅15mm、高さ(H3)7mmの三角形の凸部とされている。

[0169] CCFL212の上方には、光拡散板216(三菱レイヨン製アクリライト色調NA88、厚さ2mm)が配置されている。CCFL212と光拡散板216の距離H3は13.5mmに設定されている。前記光拡散板上に実施例1～実施例7、比較例1～4の光偏向シートを配置して直下方式のバックライトを作成した。

[0170] (輝度と視野角特性の評価方法)

このような構成を有する直下方式のバックライトを点灯し、30分放置後、ELDIM社EZcontrast160R(コノスコープ)にて、バックライト中央の角度輝度分布を測定した。正面(角度 0°)における輝度値は、得られた角度輝度データの正面(角度 0°)における輝度値を用いた。

[0171] 垂直方向と水平方向の視野角特性は、得られた各角度における角度輝度値に $\cos \theta$ (ここで θ は、出光角度)を乗じて、輝度を光度に換算し、正面(角度 0°)の光度値の $1/2$ 光度値となる垂直方向および水平方向それぞれの角度範囲を全半値角度とした。

[0172] (バックライト品位の評価方法)

前記直下方式のバックライトにおけるランプイメージ(CCFLの透け度合い)をバックライトより30cm離れた地点から目視にて観察した。

判定は、ランプイメージが目視で認められない品位レベルを「○」表記し、目視で確認可能な品位レベルを「×」表記とした。

[0173] そのときの正面(角度 0°)における輝度と垂直方向と水平方向の光度の全半値角度および品位観察結果を表2に、実施例1と比較例1における水平方向、垂直方向の視野角特性を図26、図27に示す。

[0174] 2枚のプリズムシートを重ね合わせる方法では、輝度および水平・垂直の視野角が比較例に比べ上昇するか同等であることがわかる。また、画面サイズ全体における品位(ランプイメージ)も良好で、均一性も同等あるいはそれ以上である。

図面の簡単な説明

[0175] [図1]本発明の第1実施態様の光偏向シートの模式的な断面図である。

[図2]図1の光偏向シートの使用状態を説明する模式的な断面図である。

[図3]本発明の第2実施形態の光偏向シートの模式的な断面図である。

[図4]本発明の第2実施形態の光偏向シートで使用されるクロスプリズムシートの図面である。

[図5]代替例のクロスプリズムシートの図面である。

[図6]代替例のクロスプリズムシートの図面である。

[図7]代替例のクロスレンチ形状のクロスプリズムシートの図面である。

[図8]代替例のクロスレンチ形状のクロスプリズムシートの図面である。

[図9]本発明の第3実施形態の光偏向シートの模式的な断面図である。

[図10]本発明の第4実施形態の光偏向シートの模式的な断面図および透視図である。

[図11]本発明の第5実施形態の光偏向シートの模式的な断面図である。

[図12]光偏向シートにおける光路を説明するための図面である。

[図13]本発明の第6実施形態の光偏向シートの模式的な断面図である。

[図14]図13の光偏向シートの使用状態を説明する模式的な断面図である。

[図15]本発明の第7実施形態の光偏向シートの模式的な断面図である。

[図16]本発明の第8実施形態の光偏向シートの模式的な断面図である。

[図17]本発明の第9実施形態の光偏向シートの模式的な断面図である。

[図18]本発明の第10実施形態の光偏向シートの模式的な断面図である。

[図19]本発明の第10実施形態の光偏向シートにおける感圧接着剤の配置パターンを示す図面である。

[図20]本発明の第11実施形態の光偏向シートの模式的な断面図である。

[図21]本発明の第12実施形態の光偏向シートの模式的な断面図である。

[図22]本発明の第10実施形態の光偏向シートの製造方法を示す図面である。

[図23]本発明の第10実施形態の光偏向シートの製造方法を示す図面である。

[図24]本発明の実施例の光偏向シートの模式的な断面図である。

[図25]本発明の実施例で光学特性の測定に用いたバックライト光源の模式的な断面図である。

[図26]本発明の実施例の光偏向シートの水平方向の視野角特性である。

[図27]本発明の実施例の光偏向シートの垂直方向の視野角特性である。

請求の範囲

- [1] シート状の基材と、該基材の一方の面に形成された第1レンズ部とを備えた第1偏向レンズシートと、
シート状の基材と、該基材の一方の面に形成され先端に平坦部を有する第2レンズ部とを備えた第2偏向レンズシートとを備え、
前記第2偏向レンズシートの第2レンズ部の平坦部と、前記第1偏向レンズシートの基材の他方の面とが、透明材料で貼り付けられている、
ことを特徴とする光偏向シート。
- [2] 前記透明材料が、硬化後粘着性を有する電離放射線硬化樹脂からなる、
請求項1に記載の光偏向シート。
- [3] 前記透明材料が、前記平坦部の一部分に配置されている、
請求項1または2に記載の光偏向シート。
- [4] シート状の基材と、該基材の一方の面に形成されたレンズ部とを備えた第1偏向レンズシートと、
シート状の基材と、該基材の一方の面に形成されたレンズ部とを備えた第2偏向レンズシートとを備え、
前記第1偏向レンズシートが、該第1偏向レンズシートのレンズ部が前記第2偏向レンズシートの基材の他方の面に対向するように配置され、前記第1および第2偏向レンズシートの間に電離放射線硬化性樹脂あるいは粘着性粒子が充填されている、
ことを特徴とする光偏向シート。
- [5] 前記電離放射線硬化性樹脂の屈折率が、第1偏向レンズシートのレンズ部の屈折率より0.05以上低く設定されている、
請求項4に記載の光偏向シート。
- [6] シート状の基材と、該基材の一方の面に形成された第1レンズ部とを備えた偏向レンズシートと、
該光偏向シートの他方の面に対向して配置された拡散シートと、
前記光偏向シートに対向する前記拡散シートの面に設けられた樹脂製の第2レンズ部と、を備え、

前記基材の他方の面と第2レンズ部との間に、該第2レンズ部を形成している樹脂より屈折率が0.05以上高い樹脂が充填されている、

ことを特徴とする光偏向シート。

- [7] 前記第1レンズ部が、並列配置された断面三角形の複数の柱状プリズムからなり、前記第2レンズ部が、並列配置された断面半円状の複数の柱状レンズからなり、前記柱状レンズは、前記柱状プリズムと直交して延びるように配置されている、請求項6に記載の光偏向シート。
- [8] シート状の基材と、該基材の一方の面に形成されたレンズ部とを備えた偏向レンズシートと、
一端が前記基材の他方の面に接触するように配置された突起構造物と、
前記突起構造物の他端に支持され、前記基材の他方の面に対向するように配置された拡散シートと、備えている、
ことを特徴とする光偏向シート。
- [9] 前記突起構造物の他端が、前記拡散シートに透明材料で貼り付けられている、請求項8に記載の光偏向シート。
- [10] 前記第1レンズ部が断面三角形の柱状プリズム部であり、該柱状プリズム部の頂角が 60° 以上 150° 以下である、
請求項1、2および8のいずれか1項に記載の光偏向シート。
- [11] 前記第2レンズ部が、断面形状が、三角形の頂部を切取った形状である柱状プリズム部であり、前記三角形の頂角が 60° 以上 150° 以下である、
請求項1、2および8のいずれか1項に記載の光偏向シート。
- [12] シート状の基材と、該基材の一方の面に形成されたレンズ部とを備えた偏向レンズシートと、
前記偏向レンズシートの基材の他方の面に対向するように配置された拡散シートと、
備え、
該拡散シートが、前記偏向レンズシートの基材の他方の面と前記拡散シートとの間に離散的に配置された硬化後粘着性を有する透明性電離放射線硬化樹脂部によって、前記偏向連シートの他方の面から離間して配置されている、

ことを特徴とする光偏向シート。

- [13] シート状の基材と、該基材の一方の面に並列配置された三角柱状プリズムからなる第1レンズ部とを備えた第1偏向レンズシートと、

シート状の基材と、該基材の一方の面に並列配置された三角柱状プリズムからなる第2レンズ部とを備えた第2偏向レンズシートと、を備え、

前記第1偏向レンズシートと第2偏向レンズシートとが、前記第1レンズ部が、前記第2レンズ部と直交して延びるように配置され、さらに、前記第2偏向レンズシートの基材の前記第2レンズ部とは反対側の面に設けられた透明材料による粘着層に、前記第1偏向レンズシートの第1レンズ部の先端が埋設されることによって前記第1偏向レンズシートと第2偏向レンズシートとが一体化されている光偏向シートであって、

前記第1レンズ部および第2レンズ部の内の水平視野方向を制御するレンズ部の頂角をX、前記第1レンズ部および第2レンズ部の内の垂直視野方向を制御するレンズ部の頂角をYとしたとき、下記(1)式から(3)式が満たされる、

$$70^{\circ} \leq X \leq 150^{\circ} \quad \dots (1)$$

$$70^{\circ} \leq Y \leq 130^{\circ} \quad \dots (2)$$

$$195^{\circ} \leq X + Y \leq 255^{\circ} \quad \dots (3)$$

ことを特徴とする光偏向シート。

- [14] 請求項1に記載の光偏向シートの製造方法であって、

前記第1偏向レンズシートの基材の他方の面、前記第2偏向レンズシートの第2レンズ部の平坦部、または、前記第1偏向レンズシートの基材の他方の面および前記第2偏向レンズシートの第2レンズ部の平坦部に透明材料による粘着層を形成するステップと、

前記第1偏向レンズシートの基材の他方の面に前記第2偏向レンズシートの第2レンズ部の平坦部を貼りつけるステップと、備えている、

ことを特徴とする光偏向シートの製造方法。

- [15] シート状の基材と、該基材の一方の面に形成された第レンズ部とを備えた偏向レンズシートと、一端が前記基材の他方の面に連結された突起構造物と、前記突起構造物の他端に支持され、前記基材の他方の面に対向するように配置された拡散シート

と、備えている光偏向シートの製造方法であって、

前記突起構造物の他端に、硬化後粘着性のある透明材料による粘着層を形成するステップと、

前記拡散シートを前記突起構造物の他端に押圧し、前記偏向レンズシートと拡散シートを貼り合わせるステップと、備えている、

ことを特徴とする光偏向シートの製造方法。

[16] 拡散シートと、シート状の基材と該基材の一方の面に形成されたレンズ部とを有する偏向レンズシートとを備えた光偏向シートの製造方法であって、

前記偏向レンズシートの基材の他方の面に、硬化後粘着性のある透明材料をドット状またはストライプ状のパターンで塗布するステップと、

前記偏向レンズシートの基材の他方の面と前記拡散シート的一方の面とを重ね、前記偏向レンズシートと拡散シートとを貼り合わせるステップと、備えている、

ことを特徴とする光偏向シートの製造方法。

補正書の請求の範囲

[2007年02月05日 (05.02.2007) 国際事務局受理]

前記基材の他方の面と第2レンズ部との間に、該第2レンズ部を形成している樹脂より屈折率が0.05以上高い樹脂が充填されている、
ことを特徴とする光偏向シート。

[7] 前記第1レンズ部が、並列配置された断面三角形の複数の柱状プリズムからなり、

前記第2レンズ部が、並列配置された断面半円状の複数の柱状レンズからなり、
前記柱状レンズは、前記柱状プリズムと直交して延びるように配置されている、
請求項6に記載の光偏向シート。

[8] シート状の基材と、該基材の一方の面に形成されたレンズ部とを備えた
偏向レンズシートと、

一端が前記基材の他方の面に接触するように配置された突起構造物と、
前記突起構造物の他端に支持され、前記基材の他方の面に対向するように配置
された拡散シートと、備えている、
ことを特徴とする光偏向シート。

[9] 前記突起構造物の他端が、前記拡散シートに透明材料で貼り付けられて
いる、

請求項8に記載の光偏向シート。

[10] (補正後) 前記第1レンズ部が断面三角形の柱状プリズム部であり、
該柱状プリズム部の頂角が60°以上150°以下である、

請求項1または2に記載の光偏向シート。

[11] (補正後) 前記第2レンズ部が、断面形状が、三角形の頂部を切取っ
た形状である柱状プリズム部であり、前記三角形の頂角が60°以上150°
以下である、 請求項1または2に記載の光偏向シート。

[12] (補正後) シート状の基材と、該基材の一方の面に形成されたレンズ
部とを備えた偏向レンズシートと、

補正された用紙 (条約第19条)

前記偏向レンズシートの基材の他方の面に対向するように配置された拡散シートと、備え、

該拡散シートが、前記偏向レンズシートの基材の他方の面と前記拡散シートとの間に離散的に配置された硬化後粘着性を有する透明性電離放射線硬化樹脂部によって、前記偏向レンズシートの他方の面から離間して配置されている。

補正された用紙 (条約第 19 条)

ことを特徴とする光偏向シート。

[13] シート状の基材と、該基材の一方の面に並列配置された三角柱状プリズムからなる第1レンズ部とを備えた第1偏向レンズシートと、

シート状の基材と、該基材の一方の面に並列配置された三角柱状プリズムからなる第2レンズ部とを備えた第2偏向レンズシートと、を備え、

前記第1偏向レンズシートと第2偏向レンズシートとが、前記第1レンズ部が、前記第2レンズ部と直交して延びるように配置され、さらに、前記第2偏向レンズシートの基材の前記第2レンズ部とは反対側の面に設けられた透明材料による粘着層に、前記第1偏向レンズシートの第1レンズ部の先端が埋設されることによって前記第1偏向レンズシートと第2偏向レンズシートとが一体化されている光偏向シートであって、

前記第1レンズ部および第2レンズ部の内の水平視野方向を制御するレンズ部の頂角をX、前記第1レンズ部および第2レンズ部の内の垂直視野方向を制御するレンズ部の頂角をYとしたとき、下記(1)式から(3)式が満たされる、

$$70^{\circ} \leq X \leq 150^{\circ} \quad \dots (1)$$

$$70^{\circ} \leq Y \leq 130^{\circ} \quad \dots (2)$$

$$195^{\circ} \leq X+Y \leq 255^{\circ} \quad \dots (3)$$

ことを特徴とする光偏向シート。

[14] 請求項1に記載の光偏向シートの製造方法であって、

前記第1偏向レンズシートの基材の他方の面、前記第2偏向レンズシートの第2レンズ部の平坦部、または、前記第1偏向レンズシートの基材の他方の面および前記第2偏向レンズシートの第2レンズ部の平坦部に透明材料による粘着層を形成するステップと、

前記第1偏向レンズシートの基材の他方の面に前記第2偏向レンズシートの第2レンズ部の平坦部を貼りつけるステップと、備えている、

補正された用紙 (条約第19条)

ことを特徴とする光偏向シートの製造方法。

[15] (補正後) シート状の基材と、該基材の一方の面に形成された凸部とを備えた偏向レンズシートと、一端が前記基材の他方の面に連結された突起構造物と、前記突起構造物の他端に支持され、前記基材の他方の面に対向するように配置された拡散シート

補正された用紙 (条約第 19 条)

と、備えている光偏向シートの製造方法であって、

前記突起構造物の他端に、硬化後粘着性のある透明材料による粘着層を形成するステップと、

前記拡散シートを前記突起構造物の他端に押圧し、前記偏向レンズシートと拡散シートを貼り合わせるステップと、備えている、

ことを特徴とする光偏向シートの製造方法。

[16] 拡散シートと、シート状の基材と該基材の一方の面に形成されたレンズ部とを有する偏向レンズシートとを備えた光偏向シートの製造方法であって、

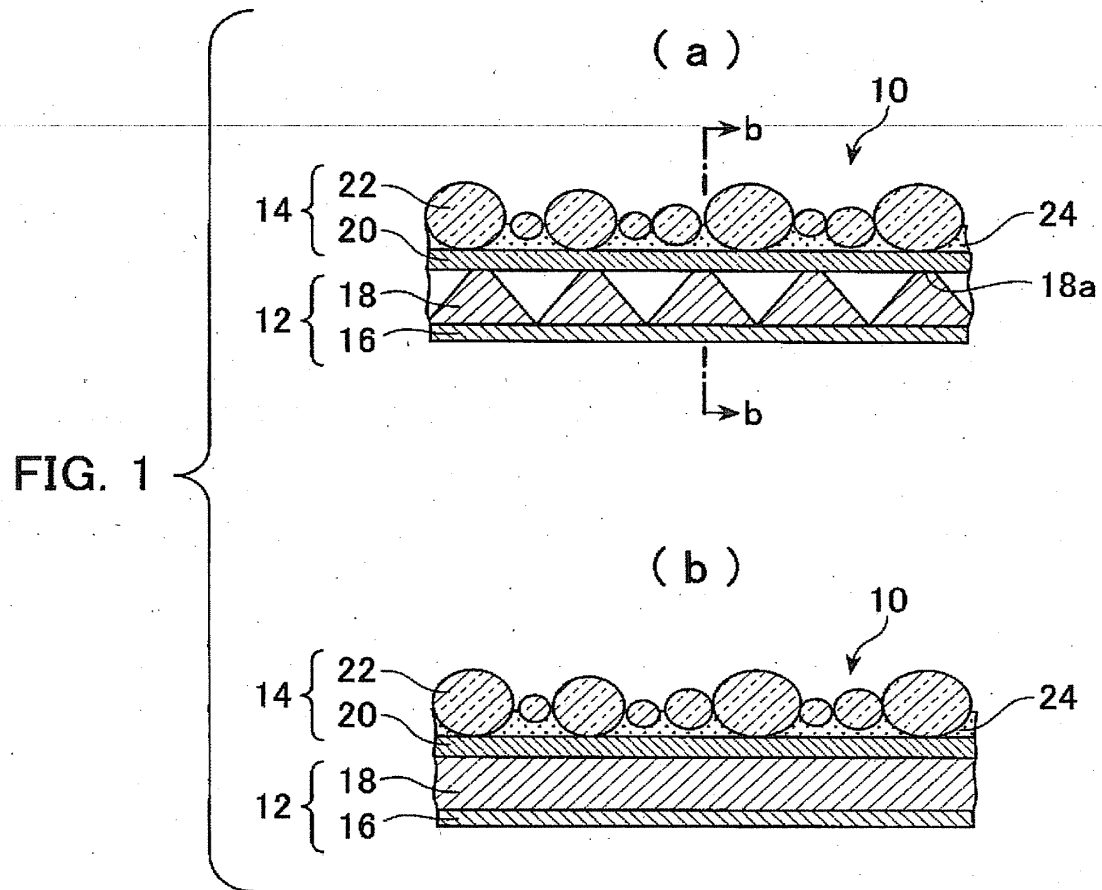
前記偏向レンズシートの基材の他方の面に、硬化後粘着性のある透明材料をドット状またはストライプ状のパターンで塗布するステップと、

前記偏向レンズシートの基材の他方の面と前記拡散シートの一方向の面とを重ね、前記偏向レンズシートと拡散シートとを貼り合わせるステップと、備えている、

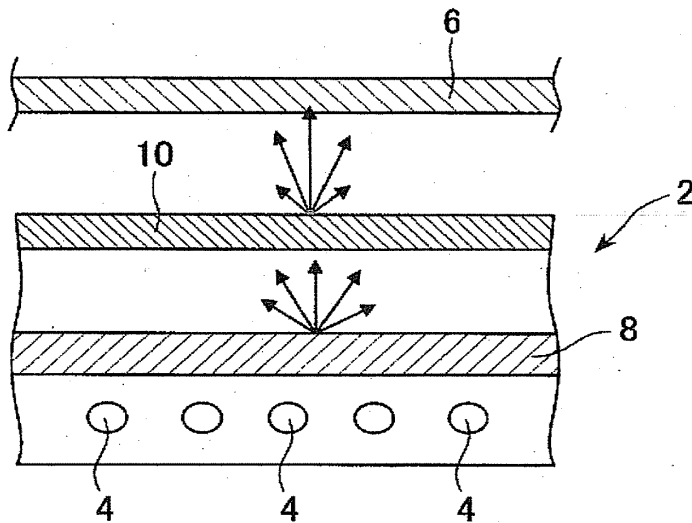
ことを特徴とする光偏向シートの製造方法。

補正された用紙（条約第19条）

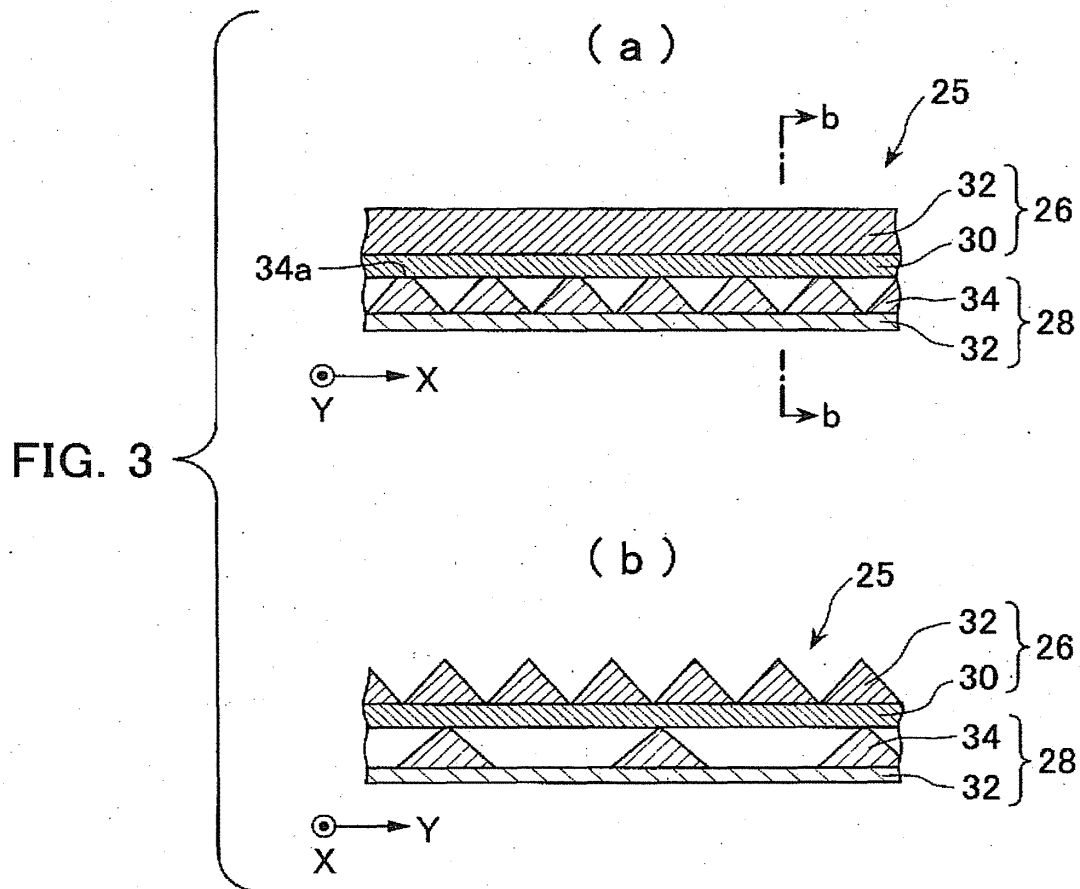
[図1]



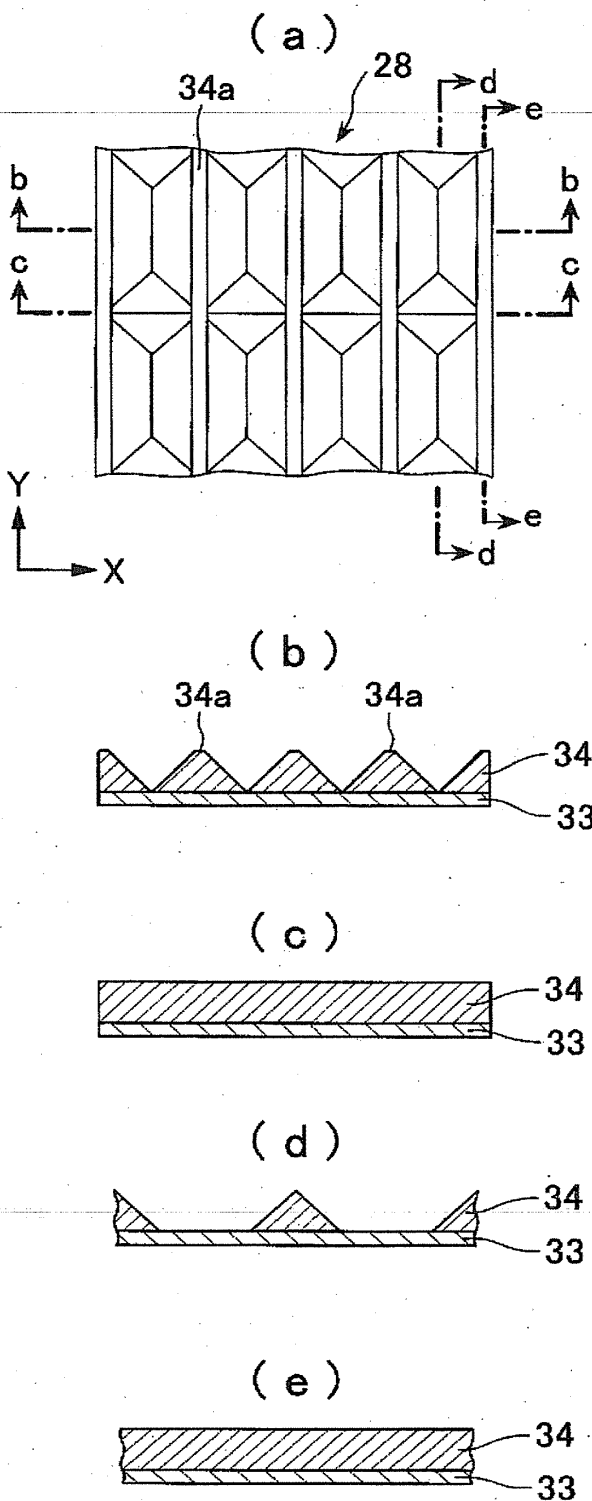
[図2]

FIG. 2

[図3]

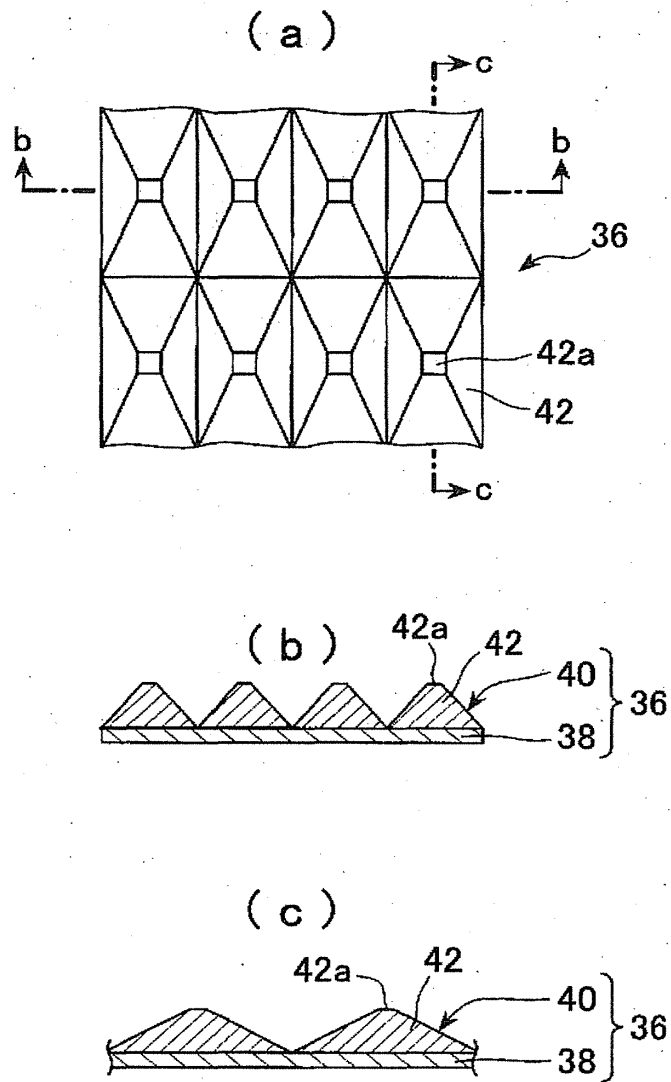


[圖4]



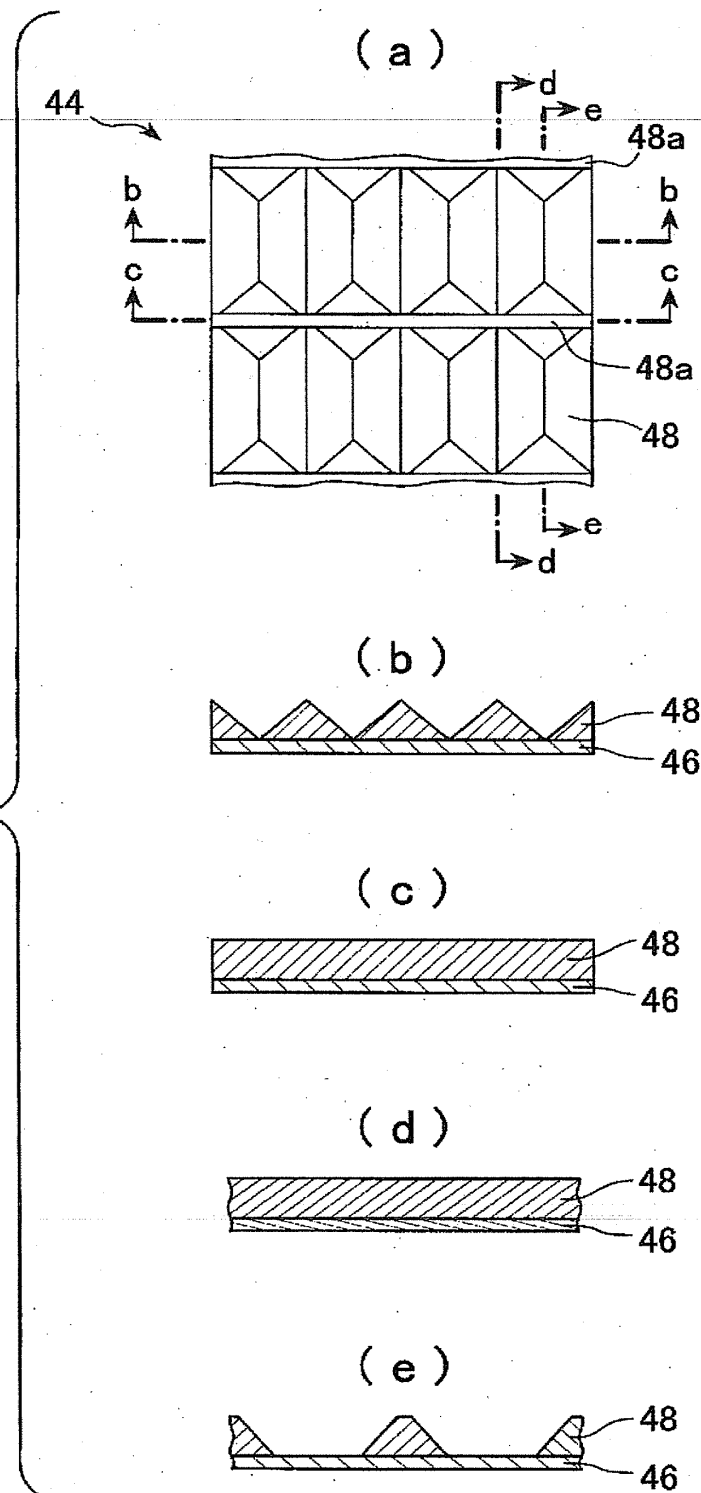
[図5]

FIG. 5



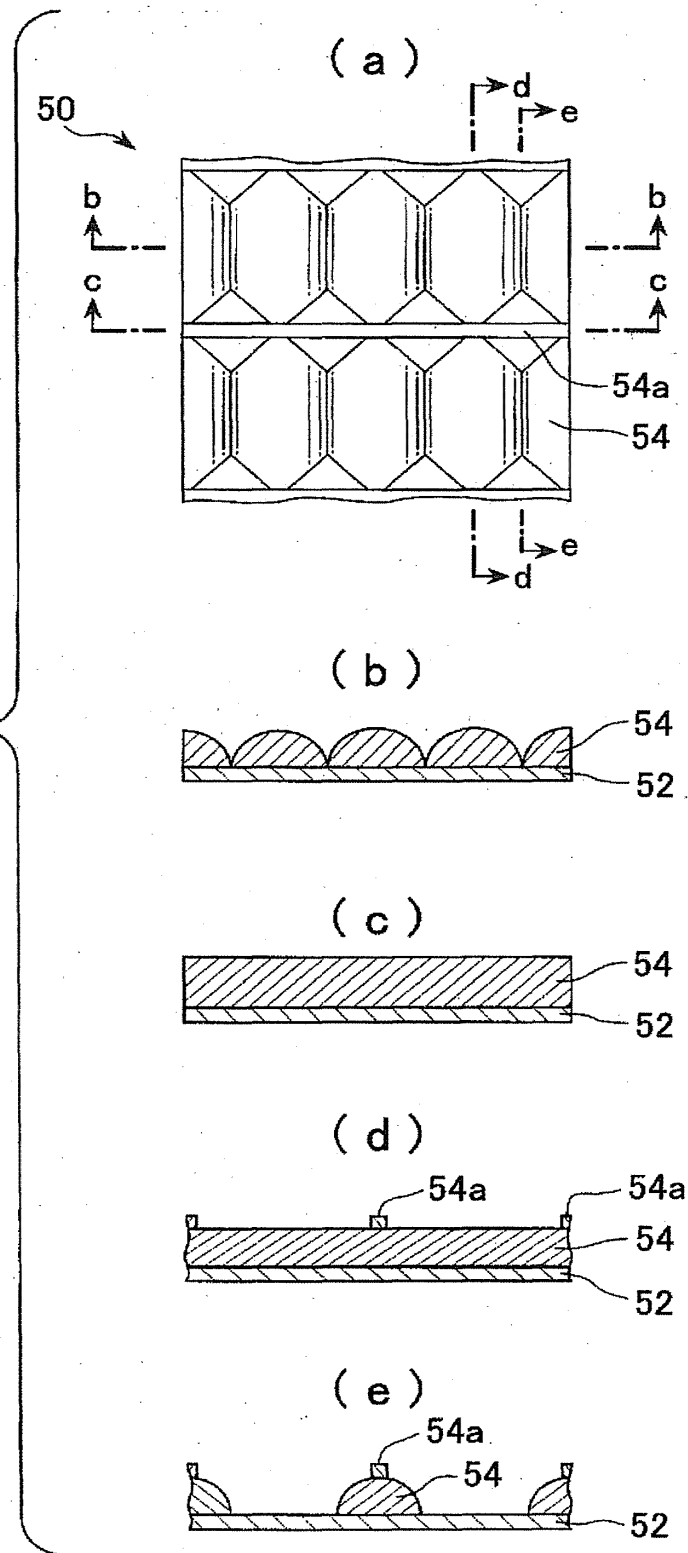
[図6]

FIG. 6



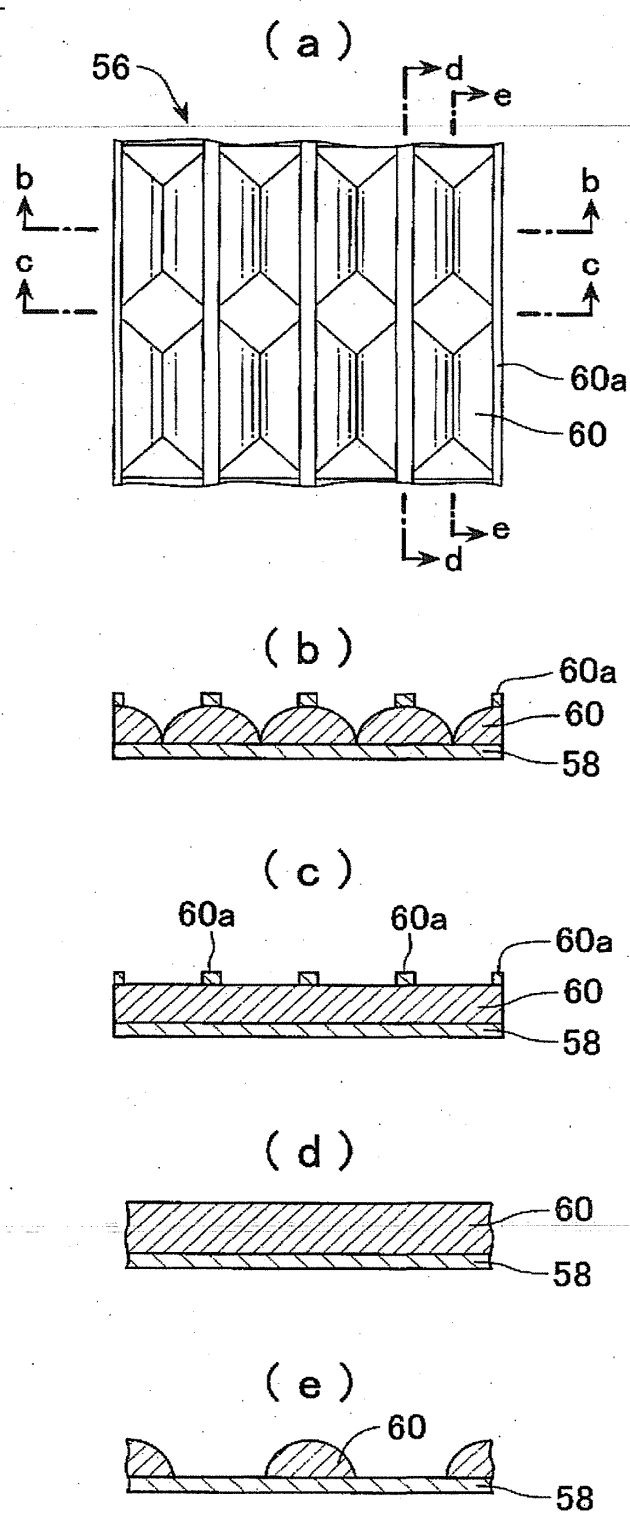
[図7]

FIG. 7



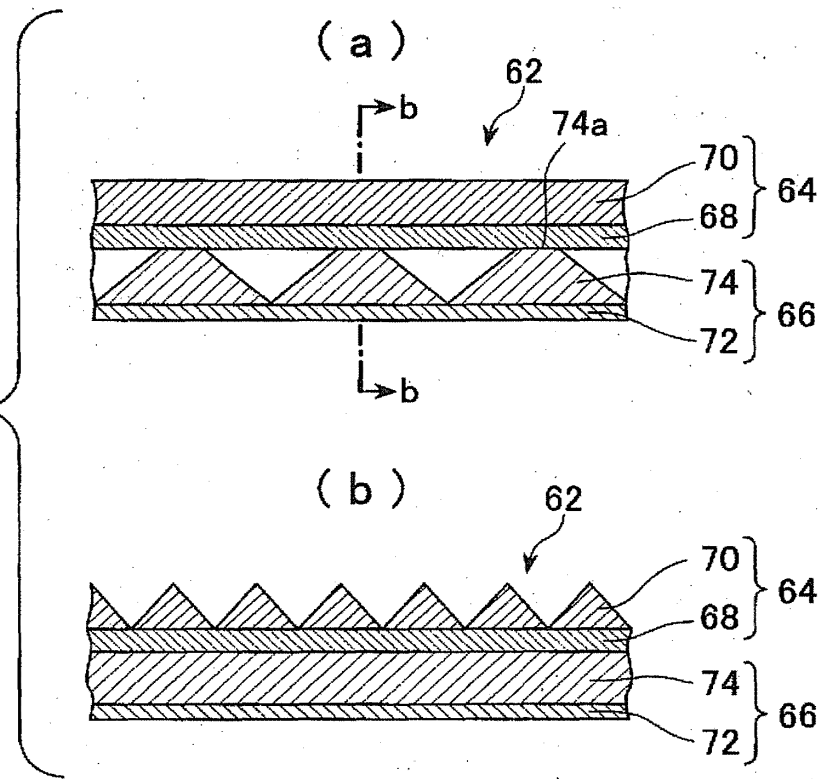
[図8]

FIG. 8



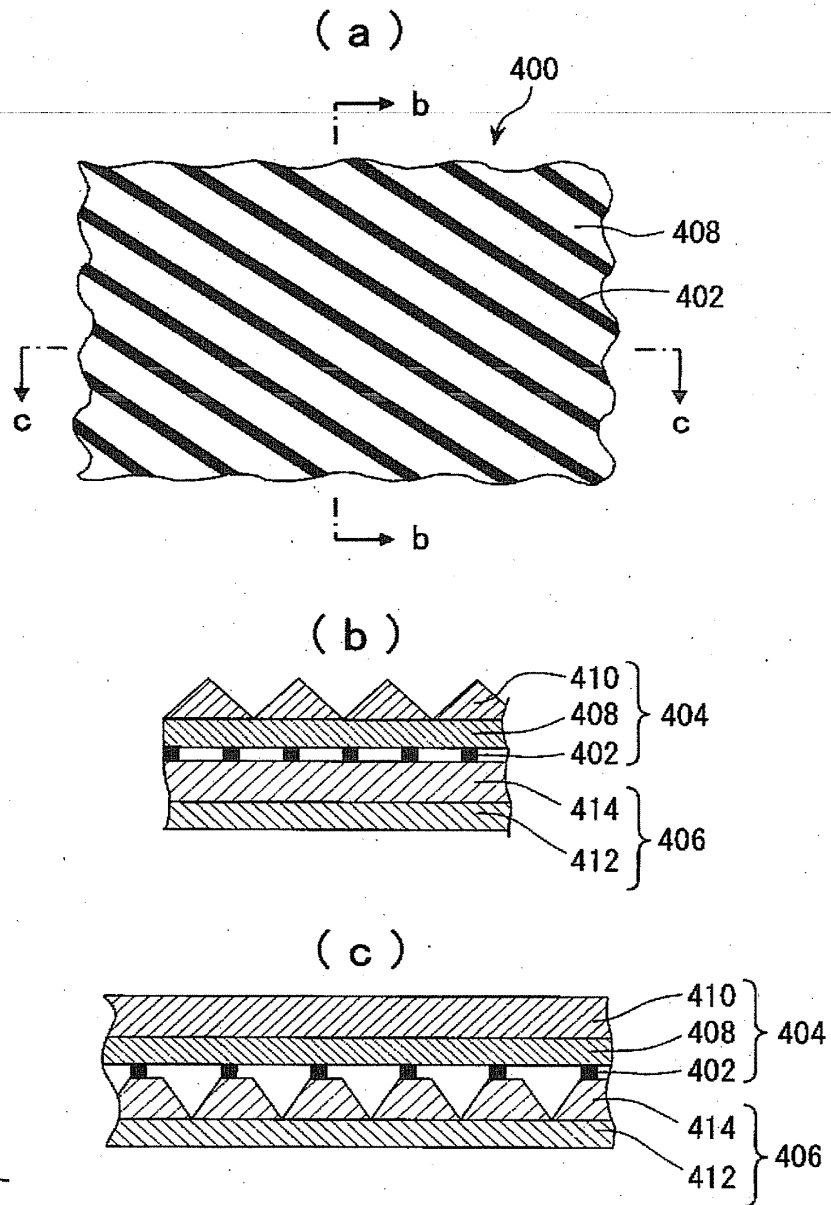
[図9]

FIG. 9



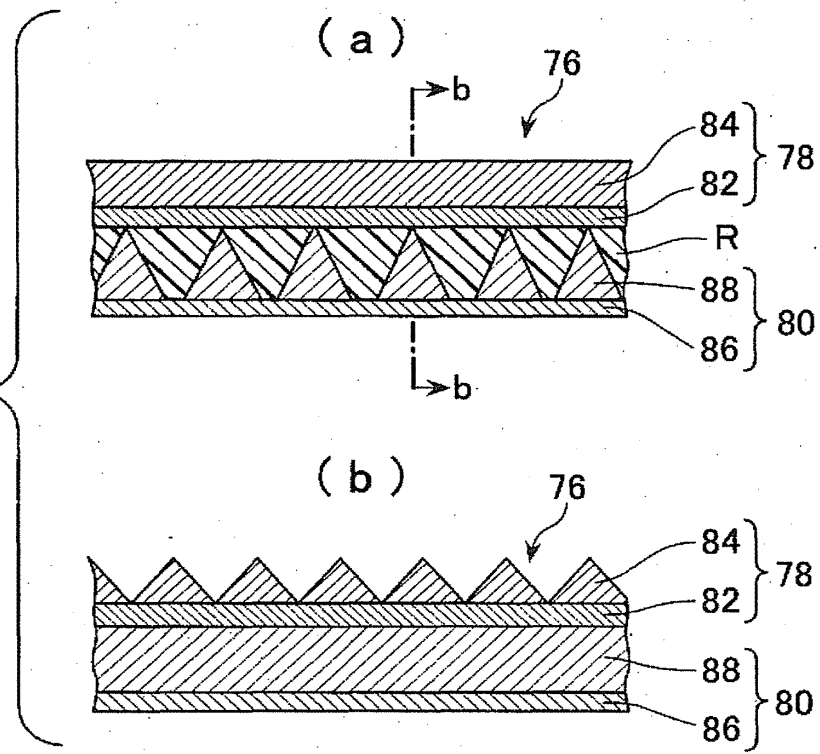
[図10]

FIG. 10



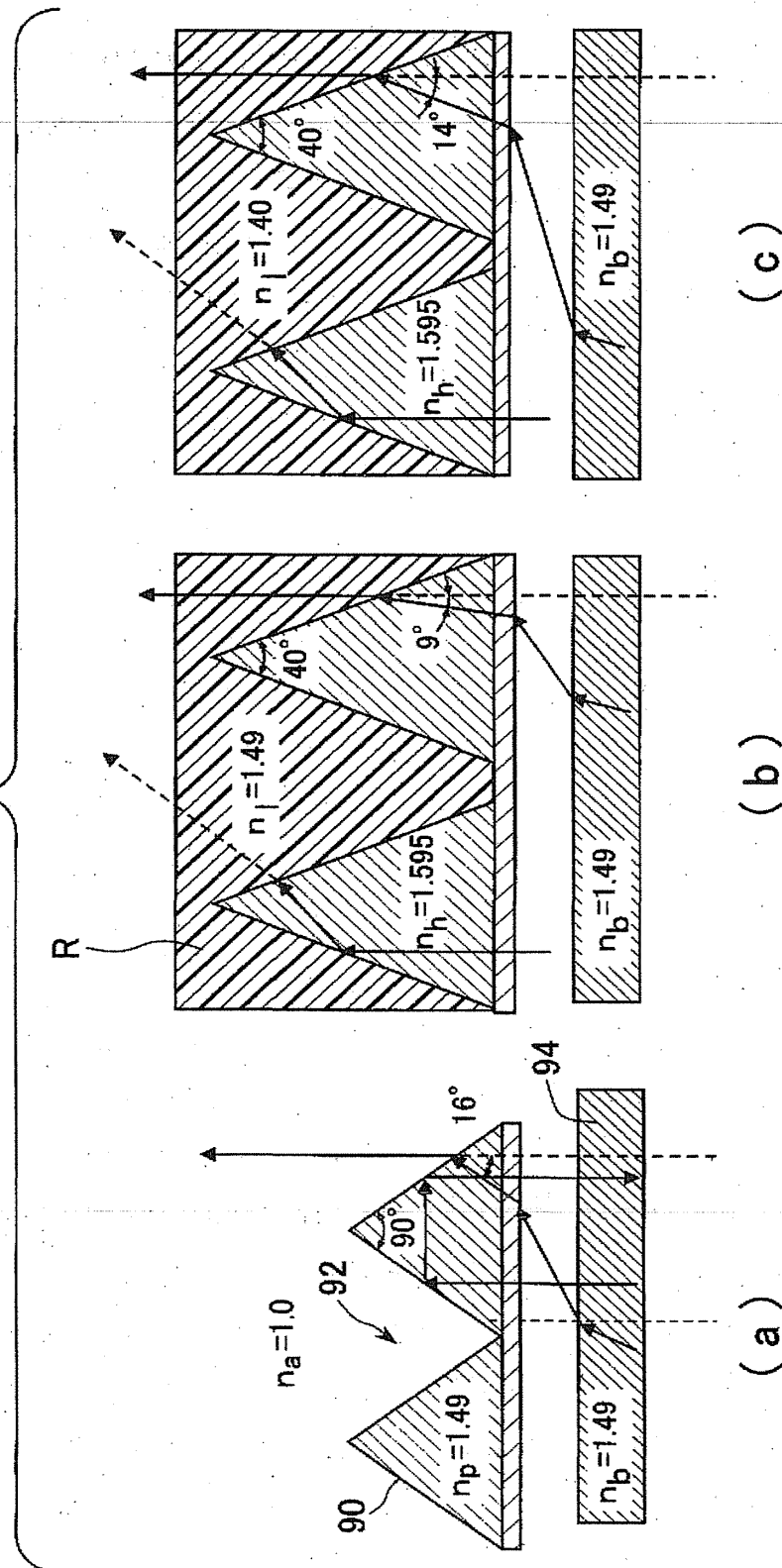
[図11]

FIG. 11



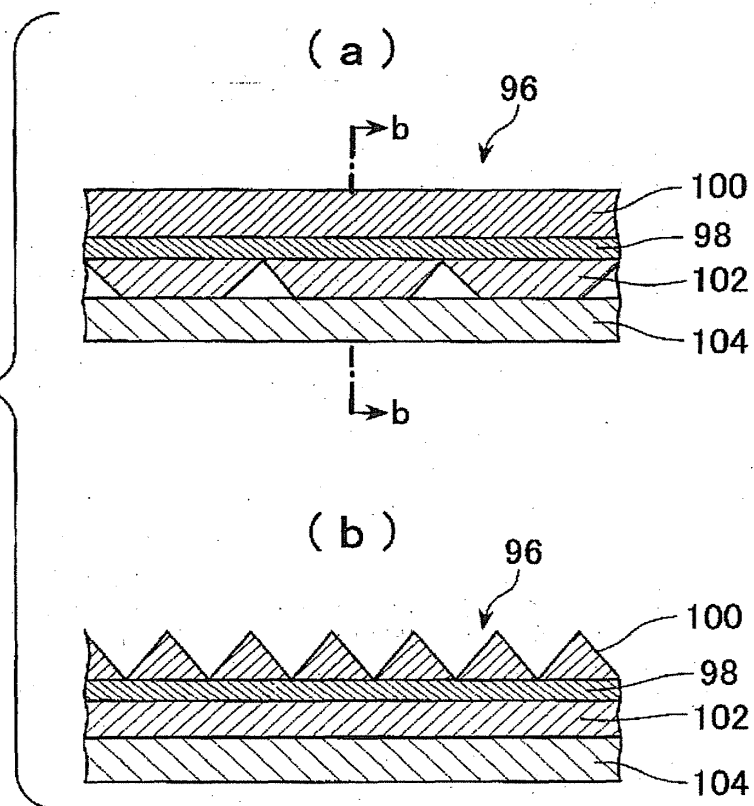
[FIG. 12]

FIG. 12



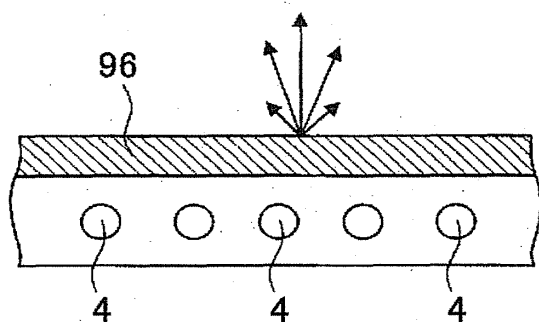
[図13]

FIG. 13



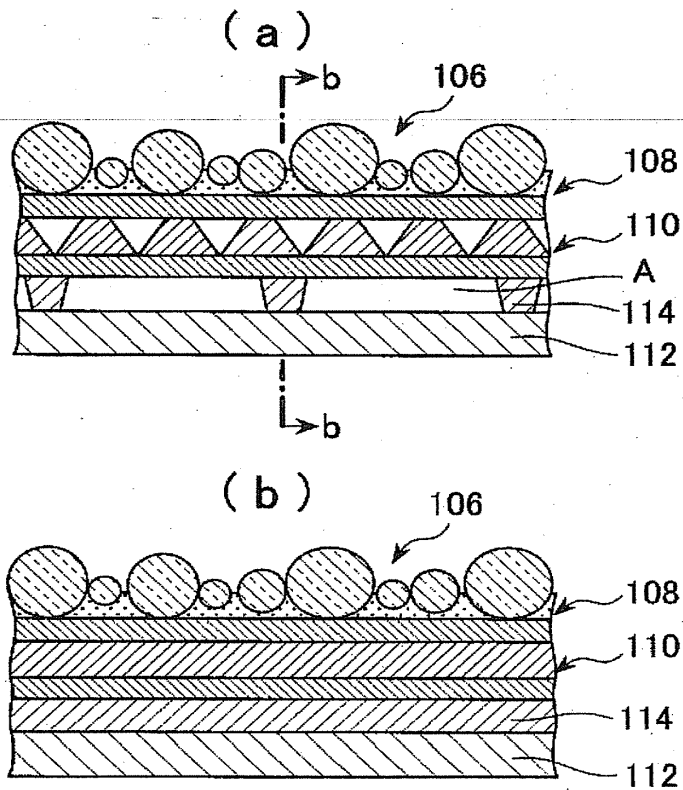
[図14]

FIG. 14



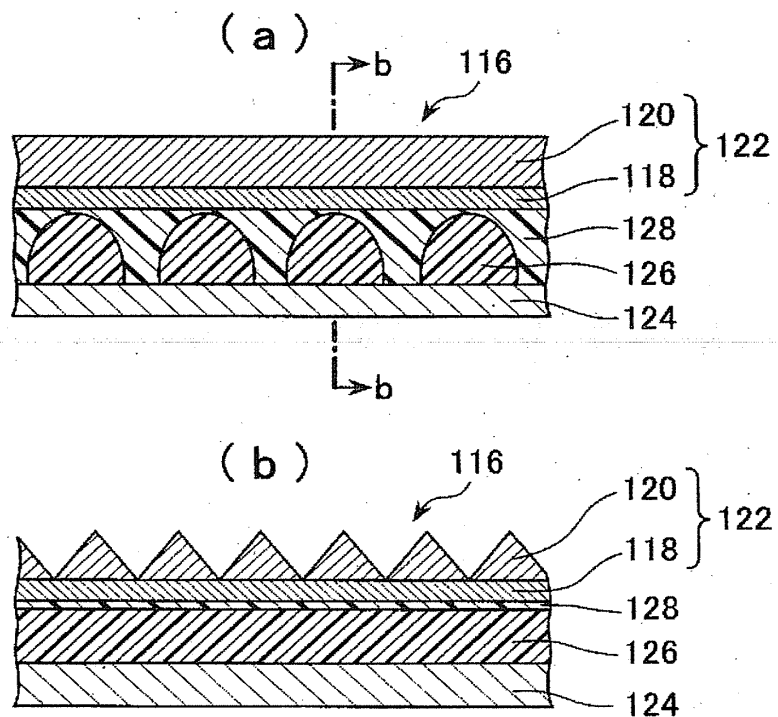
[FIG. 15]

FIG. 15



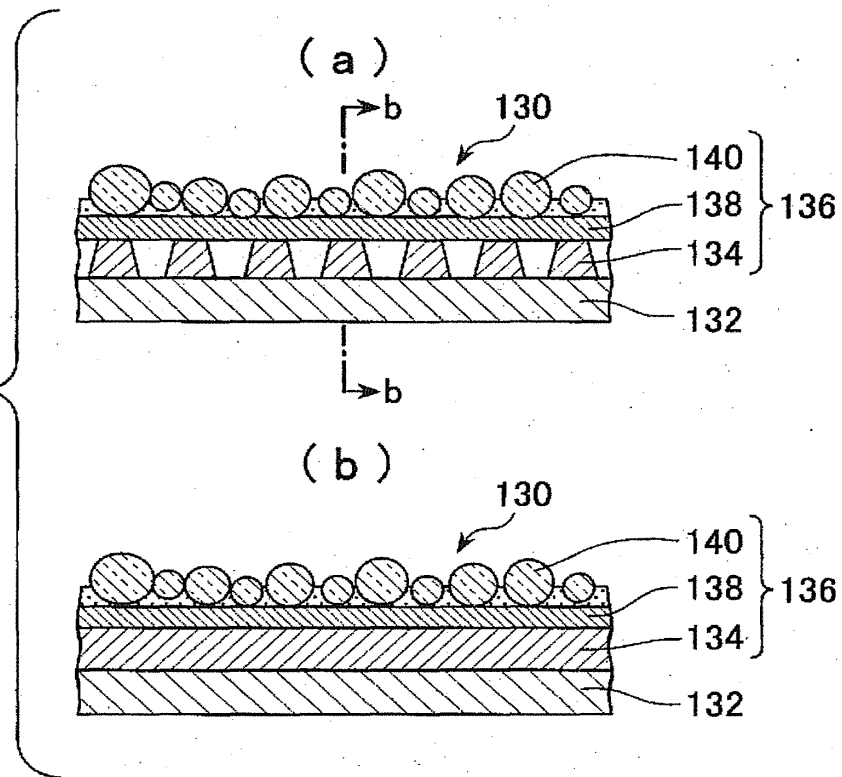
[FIG. 16]

FIG. 16



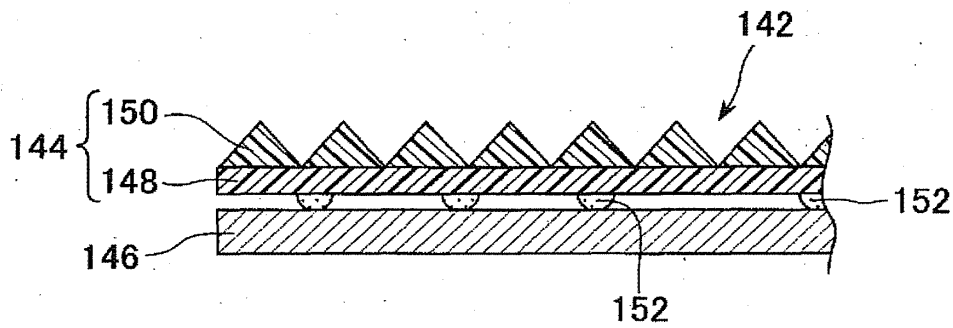
[図17]

FIG. 17



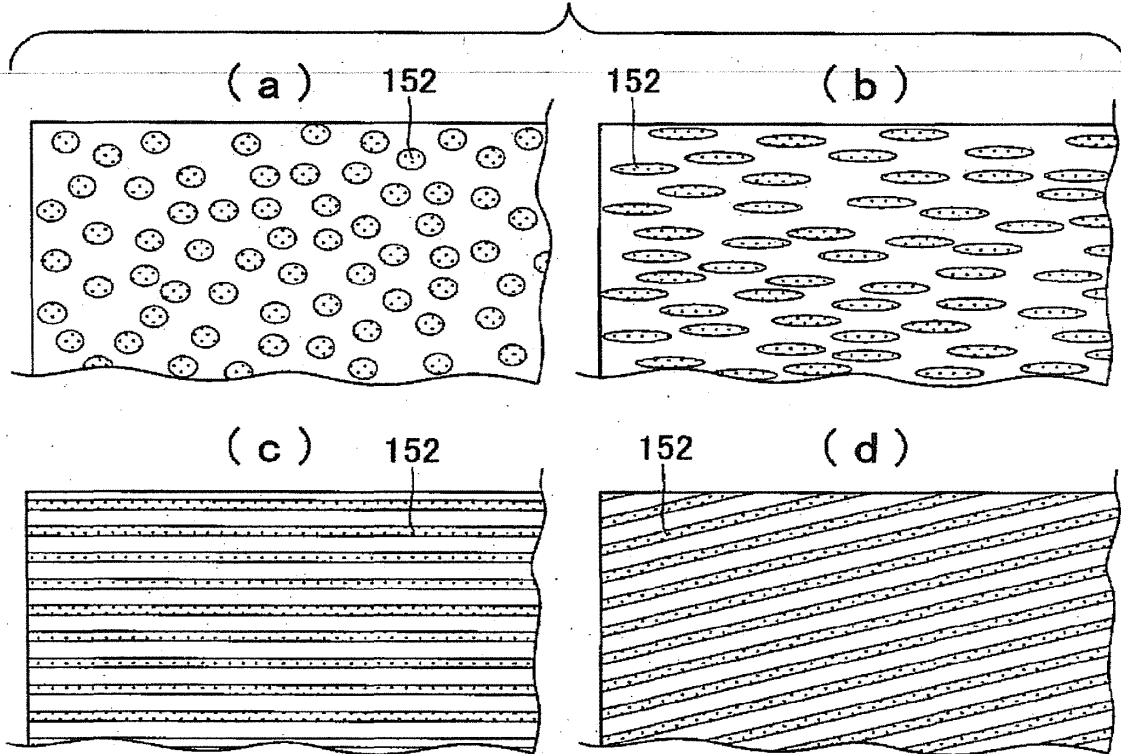
[図18]

FIG. 18

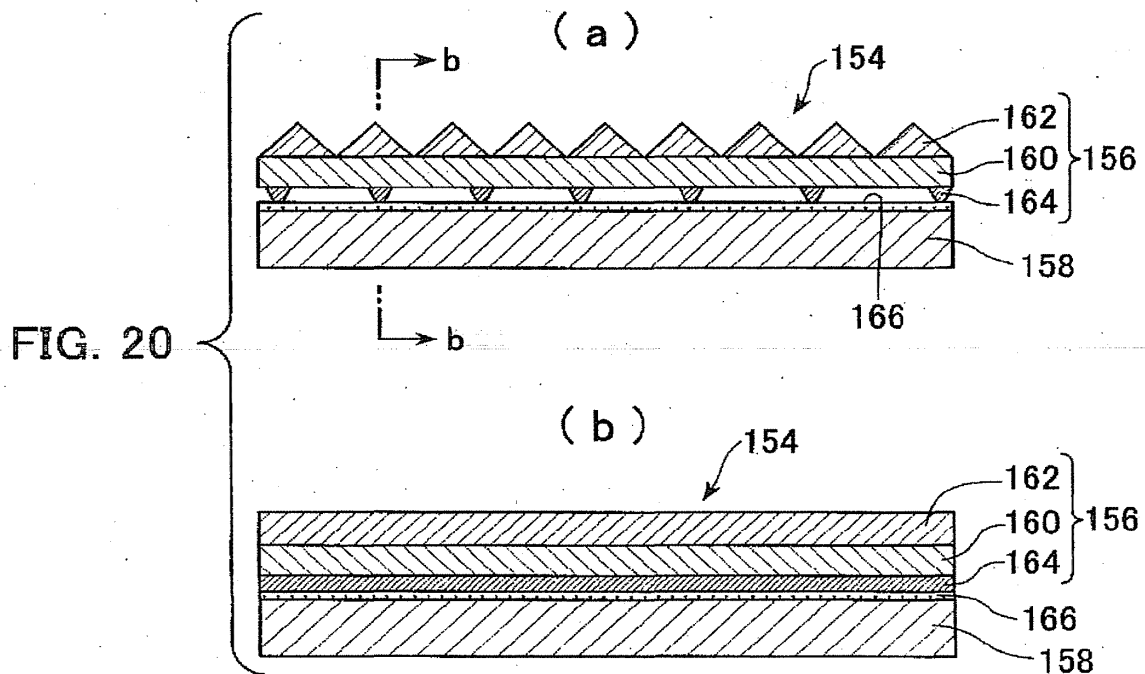


[FIG. 19]

FIG. 19

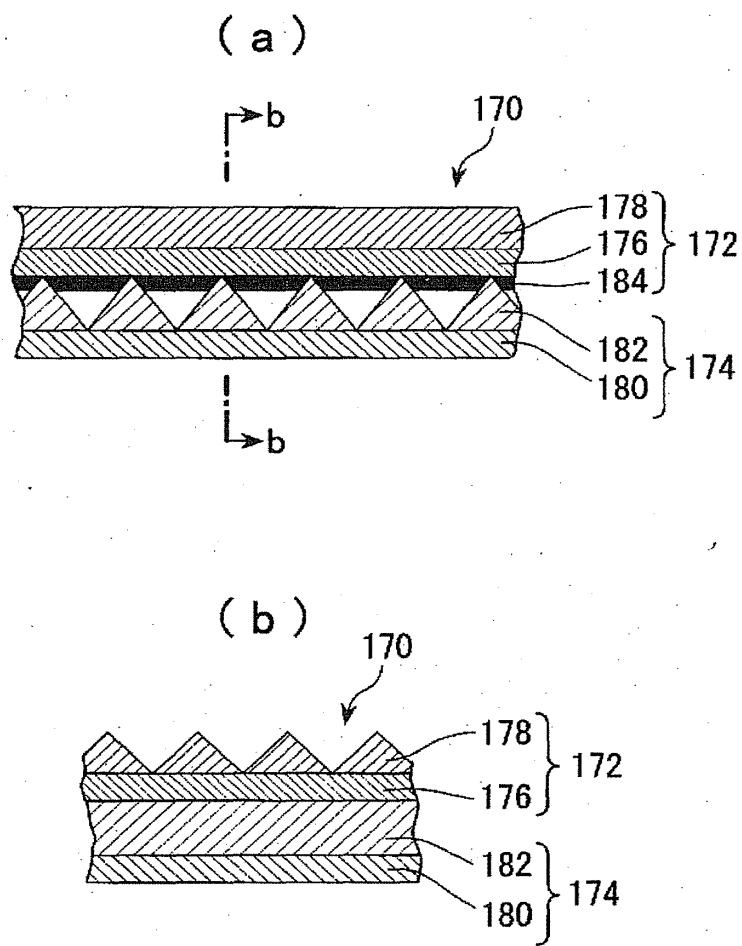


[FIG. 20]

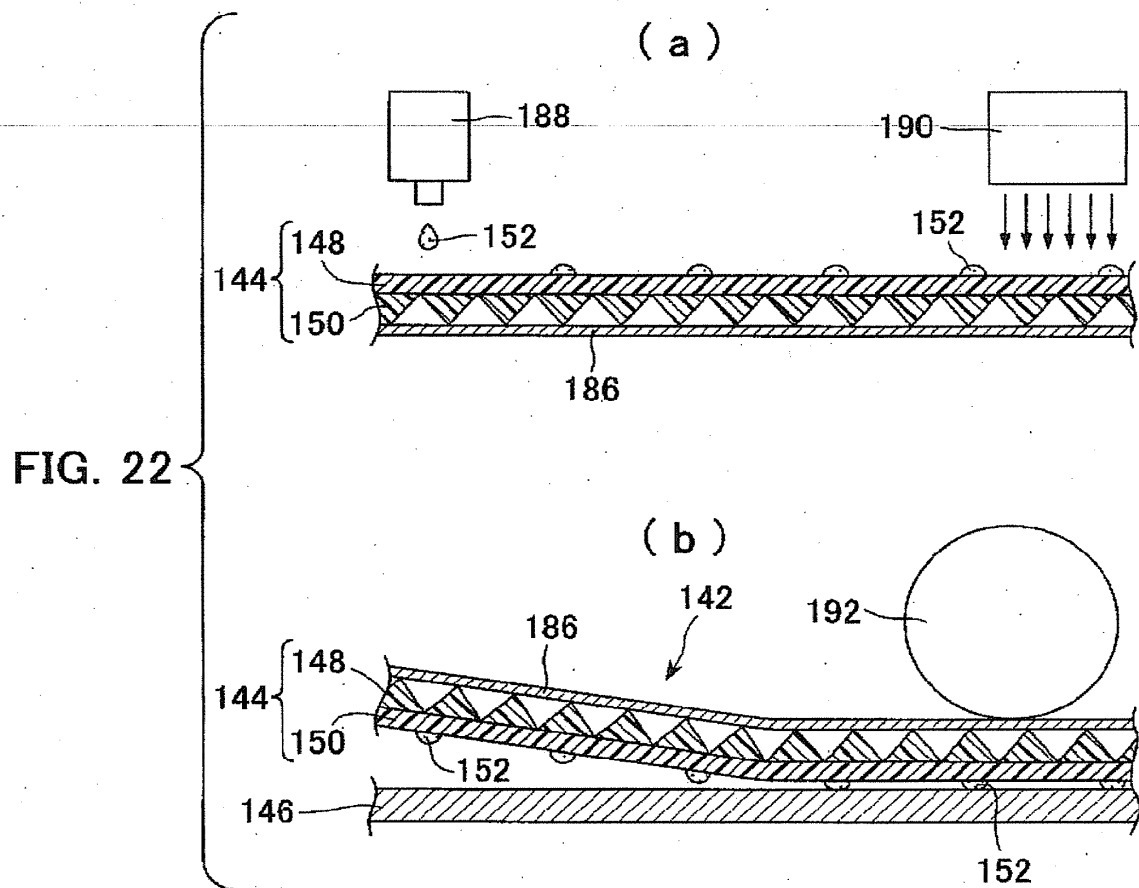


[図21]

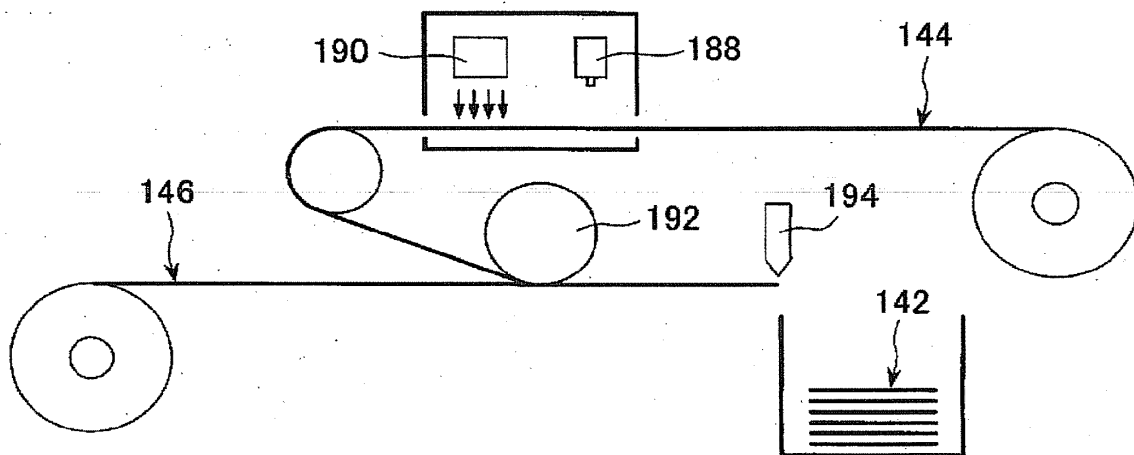
FIG. 21



[FIG. 22]

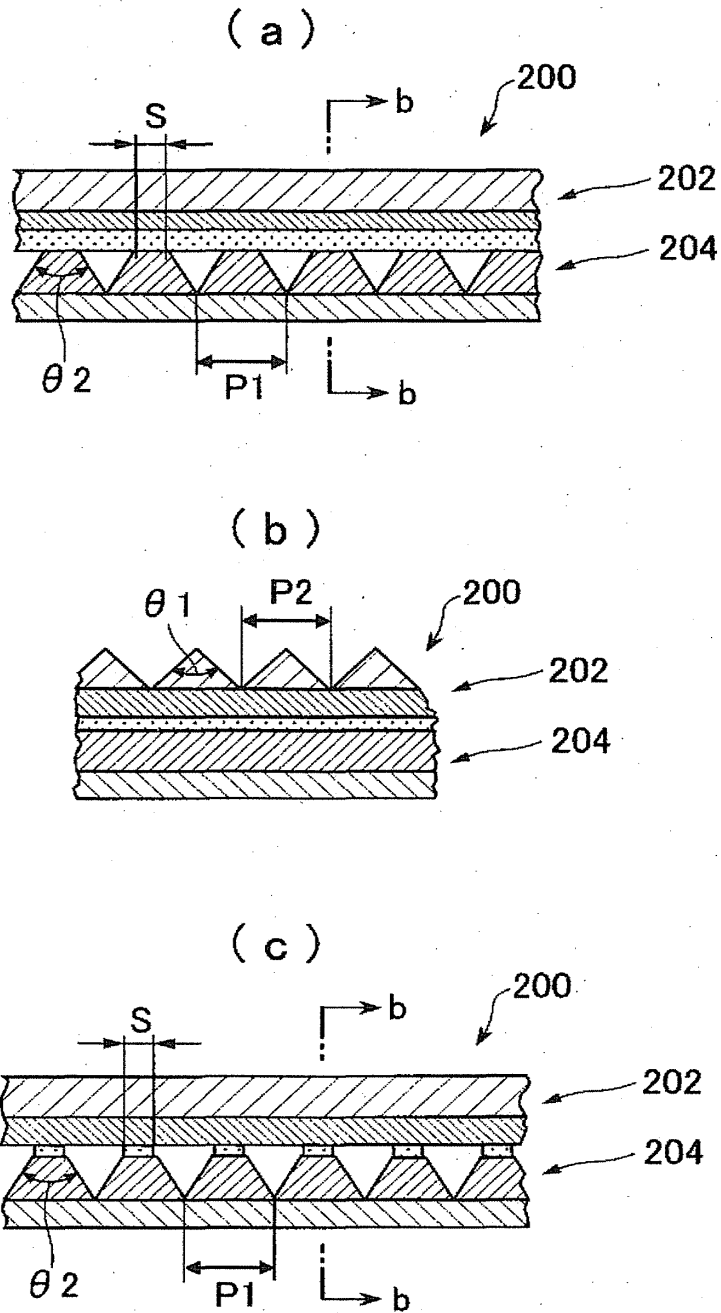


[FIG. 23]

FIG. 23

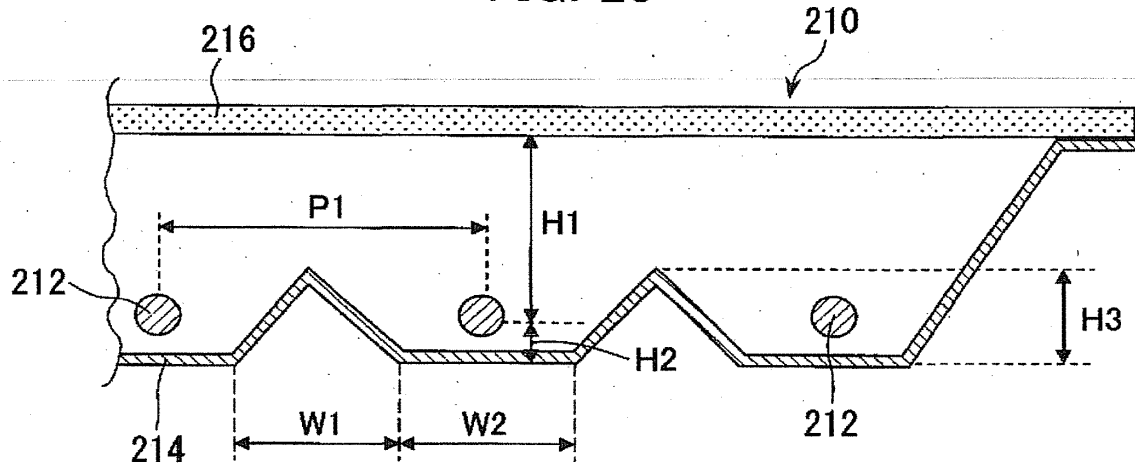
[図24]

FIG. 24



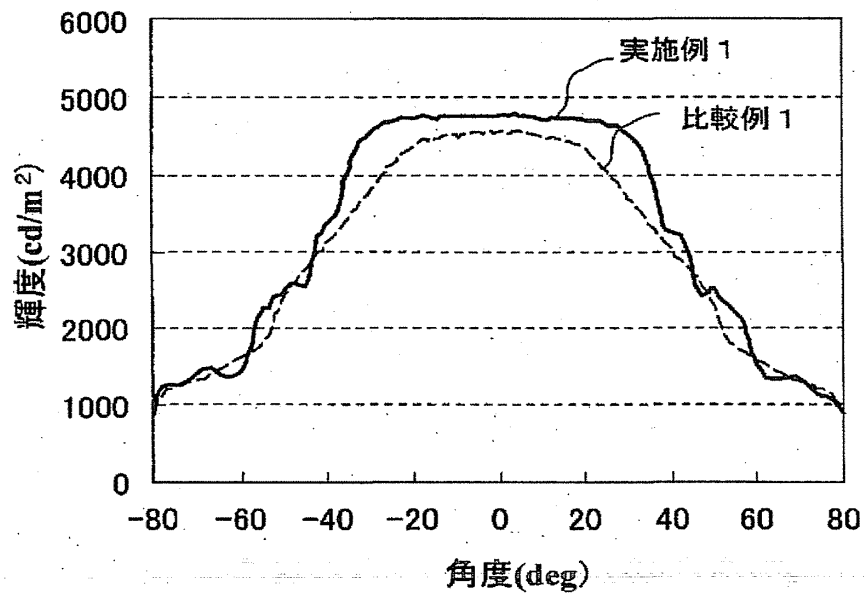
[図25]

FIG. 25



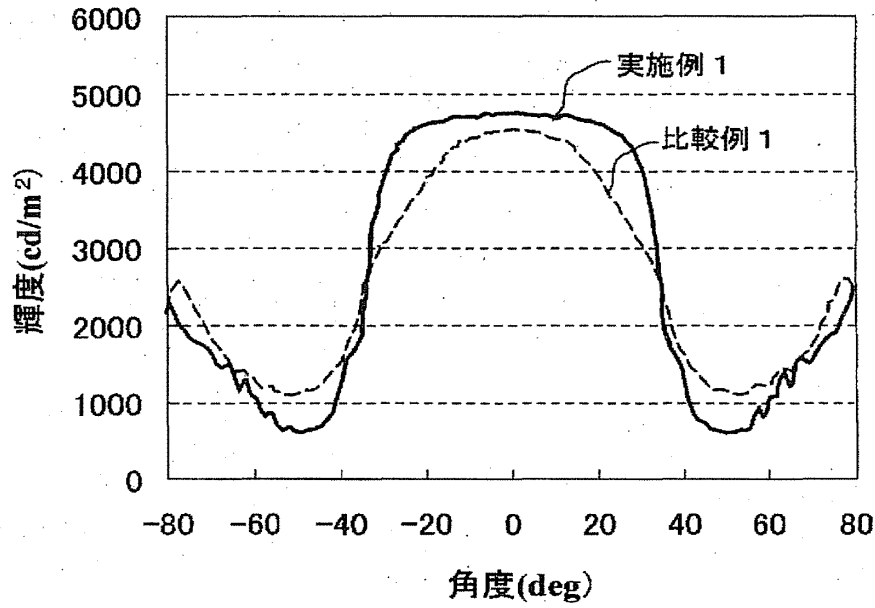
[図26]

FIG. 26



[図27]

FIG. 27



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/317128

A. CLASSIFICATION OF SUBJECT MATTER

G02B5/02(2006.01)i, G02F1/1335(2006.01)i, G02F1/13357(2006.01)i

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)

G02B5/02, G02F1/1335, G02F1/13357

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

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2006
Kokai Jitsuyo Shinan Koho	1971-2006	Toroku Jitsuyo Shinan Koho	1994-2006

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.
X	WO 03/102642 A2 (3M INNOVATIVE PROPERTIES CO.),	1-3, 8, 9, 12,
Y	11 December, 2003 (11.12.03), Page 5, lines 30 to 31; page 10, lines 17 to 27; page 10, line 32 to page 11, line 5; page 13, line 18 to page 14, line 4; page 16, line 8 to page 17, line 9; page 17, line 29 to page 18, line 5; page 19, lines 1 to 16; Fig. 1 to 3, 5, 8, 10, 11, 13 & JP 2005-527864 A & US 2003/223216 A1 & EP 1508062 A2 & AU 2003/221696 A1 & KR 2005/004238 A & TW 2004/05090 A & CN 1656395 A	14-16 10-13, 16

☒ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"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)

"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

"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search
24 November, 2006 (24.11.06)Date of mailing of the international search report
05 December, 2006 (05.12.06)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/317128

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2001-91709 A (Keiwa Kabushiki Kaisha), 06 April, 2001 (06.04.01), Par. Nos. [0023], [0024], [0027], [0037], [0042] to [0050]; Figs. 3, 5 to 8 (Family: none)	4, 5
Y	JP 2004-54035 A (Seiko Epson Corp.), 19 February, 2004 (19.02.04), Par. Nos. [0019], [0038] to [0041]; Figs. 3, 5, 7 (Family: none)	10, 11, 13
Y	JP 8-184704 A (Sekisui Chemical Co., Ltd.), 16 July, 1996 (16.07.96), Claims; Par. Nos. [0016] to [0020]; Fig. 2 (Family: none)	12, 16
Y	JP 2002-96395 A (Sharp Corp.), 02 April, 2002 (02.04.02), Par. Nos. [0013], [0103] to [0127]; Figs. 14, 17 to 20 & US 2002/057413 A1 & CN 1346069 A & KR 2002/024547 A & TW 536652 A	13
A	JP 2004-94051 A (Keiwa Kabushiki Kaisha), 25 March, 2004 (25.03.04), Par. Nos. [0033], [0034], [0047] to [0053]; Figs. 6 to 8 (Family: none)	6, 7
A	JP 11-71458 A (Asahi Optical Co., Ltd.), 16 March, 1999 (16.03.99), Claims; Par. Nos. [0011], [0100], [0101], [0142] & US 6224976 B1 & US 6465092 B1 & US 6528160 B1 & US 6531180 B1 & US 6663957 B1	2, 12, 15, 16

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2006/317128

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

The inventions of claims 6-7 have "a special technical feature" relating to that a resin having a refractivity higher by 0.05 or above than the resin forming the second lens portion is filled between the deflection lens sheet having the first lens portion and the second lens portion. The inventions of claims 1-5, 8-16 do not have "any special technical feature" or even if they do have one, it is different from "the special technical feature" of the inventions of claims 6-7.

There is no technical relationship between the inventions of claims 6-7 and the inventions of claims 1-5, 8-16 involving one or more of the same or corresponding special technical feature. (Continued to extra sheet)

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest the

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, payment of a protest fee..
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/317128

Continuation of Box No.III of continuation of first sheet (2)

Accordingly, the inventions are not so linked as to form a single general inventive concept.

Form PCT/ISA/210 (extra sheet) (April 2005)

BNSDOCID: <WO____2007028776A1_I_>

国際調査報告

国際出願番号 PCT/JP2006/317128

A. 発明の属する分野の分類 (国際特許分類 (IPC)) Int.Cl. G02B5/02(2006.01)i, G02F1/1335(2006.01)i, G02F1/13357(2006.01)i		
B. 調査を行った分野 調査を行った最小限資料 (国際特許分類 (IPC)) Int.Cl. G02B5/02, G02F1/1335, G02F1/13357		
最小限資料以外の資料で調査を行った分野に含まれるもの 日本国実用新案公報 1922-1996年 日本国公開実用新案公報 1971-2006年 日本国実用新案登録公報 1996-2006年 日本国登録実用新案公報 1994-2006年		
国際調査で使用した電子データベース (データベースの名称、調査に使用した用語)		
C. 関連すると認められる文献		
引用文献の カテゴリー*	引用文献名 及び一部の箇所が関連するときは、その関連する箇所の表示	関連する 請求の範囲の番号
X	WO 03/102642 A2 (3M INNOVATIVE PROPERTIES COMPANY) 2003. 12. 11, 5 ページ 30 行-31 行, 10 ページ 17 行-27 行, 10 ページ 32 行-11 ページ 5 行, 13 ページ 18 行-14 ページ 4 行, 16 ページ 8 行-17 ページ 9 行, 17 ページ 29 行-18 ページ 5 行, 19 ページ 1 行-16 行, Fig.1-Fig.3, Fig.5, Fig.8, Fig.10, Fig.11, Fig.13 & JP 2005-527864 A & US 2003/223216 A1 & EP 1508062 A2 & AU 2003/221696 A1 & KR 2005/004238 A & TW 2004/05090 A & CN 1656395 A	1-3, 8, 9, 12, 14-16 10-13, 16
Y		
☒ C 欄の続きにも文献が列挙されている。 ☐ パテントファミリーに関する別紙を参照。		
* 引用文献のカテゴリー 「A」特に関連のある文献ではなく、一般的技術水準を示すもの 「E」国際出願日前の出願または特許であるが、国際出願日以後に公表されたもの 「L」優先権主張に疑義を提起する文献又は他の文献の発行日若しくは他の特別な理由を確立するために引用する文献 (理由を付す) 「O」口頭による開示、使用、展示等に言及する文献 「P」国際出願日前で、かつ優先権の主張の基礎となる出願日の後に公表された文献 「T」国際出願日又は優先日後に公表された文献であって出願と矛盾するものではなく、発明の原理又は理論の理解のために引用するもの 「X」特に関連のある文献であって、当該文献のみで発明の新規性又は進歩性がないと考えられるもの 「Y」特に関連のある文献であって、当該文献と他の1以上の文献との、当業者にとって自明である組合せによって進歩性がないと考えられるもの 「&」同一パテントファミリー文献		
国際調査を完了した日 24. 11. 2006	国際調査報告の発送日 05. 12. 2006	
国際調査機関の名称及びあて先 日本国特許庁 (ISA/J P) 郵便番号 100-8915 東京都千代田区霞が関三丁目4番3号	特許庁審査官 (権限のある職員) 谷山 稔男 電話番号 03-3581-1101 内線 3271	20 8909

様式 PCT/ISA/210 (第2ページ) (2005年4月)

C (続き) . . . 関連すると認められる文献		
引用文献の カテゴリー*	引用文献名 及び一部の箇所が関連するときは、その関連する箇所の表示	関連する 請求の範囲の番号
X	JP 2001-91709 A (恵和株式会社) 2001. 04. 06, [0023], [0024], [0027], [0037], [0042] - [0050], 図 3, 図 5-図 8 (ファミリーなし)	4, 5
Y	JP 2004-54035 A (セイコーエプソン株式会社) 2004. 02. 19, [0019], [0038] - [0041], 図 3, 図 5, 図 7 (ファミリーなし)	10, 11, 13
Y	JP 8-184704 A (積水化学工業株式会社) 1996. 07. 16, [特許請求の 範囲], [0016] - [0020], 図 2 (ファミリーなし)	12, 16
Y	JP 2002-96395 A (シャープ株式会社) 2002. 04. 02, [0013], [0103] - [0127], 図 14, 図 17-図 20 & US 2002/057413 A1 & CN 1346069 A & KR 2002/024547 A & TW 536652 A	13
A	JP 2004-94051 A (恵和株式会社) 2004. 03. 25, [0033], [0034], [0047] - [0053], 図 6-図 8 (ファミリーなし)	6, 7
A	JP 11-71458 A (旭光学工業株式会社) 1999. 03. 16, [特許請求の範 囲], [0011], [0100], [0101], [0142] & US 6224976 B1 & US 6465092 B1 & US 6528160 B1 & US 6531180 B1 & US 6663957 B1	2, 12, 15, 16

様式 PCT/ISA/210 (第2ページの続き) (2005年4月)

第II欄 請求の範囲の一部の調査ができないときの意見（第1ページの2の続き）

法第8条第3項（PCT17条(2)(a)）の規定により、この国際調査報告は次の理由により請求の範囲の一部について作成しなかった。

1. ☐ 請求の範囲 _____ は、この国際調査機関が調査をすることを要しない対象に係るものである。つまり、
2. ☐ 請求の範囲 _____ は、有意義な国際調査をすることができる程度まで所定の要件を満たしていない国際出願の部分に係るものである。つまり、
3. ☐ 請求の範囲 _____ は、従属請求の範囲であってPCT規則6.4(a)の第2文及び第3文の規定に従って記載されていない。

第III欄 発明の単一性が欠如しているときの意見（第1ページの3の続き）

次に述べるようにこの国際出願に二以上の発明があるとこの国際調査機関は認めた。

請求の範囲6-7に係る発明の「特別な技術的特徴」は、第1レンズ部を備えた偏向レンズシートと第2レンズ部との間に、第2レンズ部を形成している樹脂より屈折率が0.05以上高い樹脂を充填することに関するものである。他方、請求の範囲1-5及び8-16に係る発明には「特別な技術的事項」がないか、仮にあったとしても、請求の範囲6-7に係る発明の「特別な技術的特徴」以外の事項である。

したがって、請求の範囲6-7に係る発明と、請求の範囲1-5及び8-16に係る発明は、一又は二以上の同一又は対応する特別な技術的特徴を含む技術的な関係にないから、単一の一般的発明概念を形成するように連関しているものとは認められない。

1. ☐ 出願人が必要な追加調査手数料をすべて期間内に納付したので、この国際調査報告は、すべての調査可能な請求の範囲について作成した。
2. ☒ 追加調査手数料を要求するまでもなく、すべての調査可能な請求の範囲について調査することができたので、追加調査手数料の納付を求めなかった。
3. ☐ 出願人が必要な追加調査手数料を一部のみしか期間内に納付しなかったため、この国際調査報告は、手数料の納付のあった次の請求の範囲のみについて作成した。
4. ☐ 出願人が必要な追加調査手数料を期間内に納付しなかったため、この国際調査報告は、請求の範囲の最初に記載されている発明に係る次の請求の範囲について作成した。

追加調査手数料の異議の申立てに関する注意

- ☐ 追加調査手数料及び、該当する場合には、異議申立手数料の納付と共に、出願人から異議申立てがあった。
- ☐ 追加調査手数料の納付と共に出願人から異議申立てがあったが、異議申立手数料が納付命令書に示した期間内に支払われなかった。
- ☐ 追加調査手数料の納付を伴う異議申立てがなかった。

LIGHT-EMITTING DIODE ILLUMINATING OPTICAL DEVICE**Publication number:** WO03044870 (A1)**Publication date:** 2003-05-30**Inventor(s):** GEORGES MIREILLE [FR]; NOERDINGER CLAUDE [FR]**Applicant(s):** GEORGES MIREILLE [FR]; NOERDINGER CLAUDE [FR]**Classification:**

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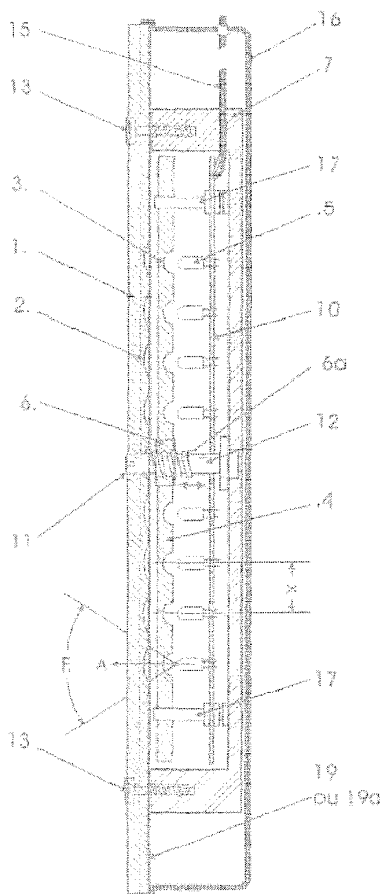
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Abstract of WO 03044870 (A1)

The invention concerns an illuminating device using light-emitting diode (LED) properties, with high luminosity, very economical, redirected and scattered by one or several transparent optical components, providing illumination powered either by the power grid, or solar or wind turbine energy. The device consists in particular of a housing (7) containing the printed circuit (10) sliding on four rods (17), the transparent optical component (1) is assembled to the housing (7) with four screws (13). The endless micrometer screw (12) vary by screwing and unscrewing the illuminating angle (F) by modifying the focal distance between the LED's (5) and the polished concave optical housings (2) positioned in the same axis. The printed circuit (10) bearing the LED's (5) is supplied with electric power by the supply line (15). The inventive device is designed for illumination, in particular when there is need for an economical self-powered illumination device.



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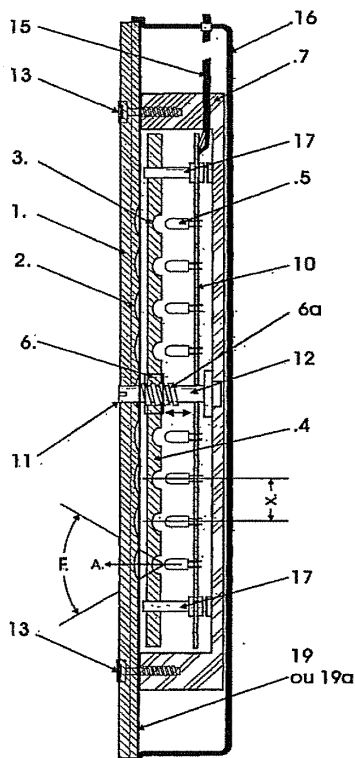
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(72) Inventeurs : GEORGES, Mireille [FR/FR]; 9, place du Château, F-06250 Mougins (FR). NOERDINGER,
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[Suite sur la page suivante]

(54) Title: LIGHT-EMITTING DIODE ILLUMINATING OPTICAL DEVICE

(54) Titre : DISPOSITIF OPTIQUE D'ÉCLAIRAGE A DIODES ELECTROLUMINESCENTES



(57) Abstract: The invention concerns an illuminating device using light-emitting diode (LED) properties, with high luminosity, very economical, redirected and scattered by one or several transparent optical components, providing illumination powered either by the power grid, or solar or wind turbine energy. The device consists in particular of a housing (7) containing the printed circuit (10) sliding on four rods (17), the transparent optical component (1) is assembled to the housing (7) with four screws (13). The endless micrometer screw (12) vary by screwing and unscrewing the illuminating angle (F) by modifying the focal distance between the LED's (5) and the polished concave optical housings (2) positioned in the same axis. The printed circuit (10) bearing the LED's (5) is supplied with electric power by the supply line (15). The inventive device is designed for illumination, in particular when there is need for an economical self-powered illumination device.

(57) Abrégé : La présente invention concerne un dispositif d'éclairage utilisant les propriétés de diodes électroluminescentes ou LED, à grande luminosité, très économes, redirigée et étalée par une ou plusieurs pièces optiques transparentes, permet l'éclairage alimenté soit par le secteur électrique, soit au moyen des énergies solaires ou éoliennes. Le dispositif est constitué notamment du boîtier (7) contenant le circuit imprimé (10) coulissant sur 4 tiges (17), la pièce optique transparente (1) est assemblée au boîtier (7) par 4 vis (13). La vis micrométrique sans fin (12) permet en vissant ou dévissant de faire varier l'angle d'éclairement (F) en modifiant la distance focale entre les LED (5) et les logements optiques concaves polis (2) positionnés dans le même axe. Le circuit imprimé (10) portant les LED (5) est alimenté en énergie électrique par le fil d'alimentation (15). Le dispositif selon l'invention est destiné à l'éclairage, surtout lorsqu'il faut recourir économiquement à un dispositif autonome en alimentation électrique.

WO 03/044870 A1



En ce qui concerne les codes à deux lettres et autres abréviations, se référer aux "Notes explicatives relatives aux codes et abréviations" figurant au début de chaque numéro ordinaire de la Gazette du PCT.

- 1 -

Dispositif optique d'éclairage à diodes électroluminescentes.

La présente invention concerne un dispositif d'éclairage utilisant les propriétés de diodes électroluminescentes ou LED, à grande luminosité, très économes en énergie et d'une très grande durée de vie, dont la source de lumière directionnelle, redirigée et étalée par une ou plusieurs pièces optiques transparentes, permet l'éclairage ou le balisage en bas voltage notamment à l'aide de dispositifs autonomes d'alimentation en énergie électrique basés sur la captation et le stockage des énergies naturelles solaires ou éoliennes.

10

Les systèmes ou appareillages destinés à l'éclairage étaient réalisés jusqu'à aujourd'hui à l'aide de lampes à incandescence, fluorescente, halogène, ou néon.

La consommation relativement importante de ces lampes (de 4W à 300W selon les besoins d'éclairage), alimentées principalement en 220 volts, leur durée de vie relativement courte (en moyenne 10.000 heures), leur dégagement de chaleur relativement important (50 à 120°), l'impossibilité de les faire clignoter sans écourter leur durée de vie (éclairage de sécurité ou routier...), limitent leur utilisation et n'autorisent qu'une alimentation par le réseau électrique alternatif, sans possibilité sérieuse d'être alimentées en autonomie d'énergie.

20

Les diodes électroluminescentes appelées aussi LED (Light Emetting Diodes), économes en énergie, ne pouvaient être utilisées auparavant, que pour un usage limité à des voyants lumineux de couleurs rouge, jaune, ambre, vert, ou bleu, dont l'unité de mesure d'intensité lumineuse était compris entre 30 et 800 milliCandelas, l'absence de diodes suffisamment puissantes et émettant une couleur blanche ne permettait pas alors d'envisager un éclairage ou un balisage identique tant en puissance qu'en couleur d'éclairement à celui de lampes à filament incandescent, ou de lampes fluorescentes.

30

L'exemple pratique des utilisations les plus connues de ce type de diodes ou LED sont les voyants lumineux ou de contrôle de matériels informatiques ou robotiques, d'ordinateurs, d'appareils vidéos, audios, ou ménagers. Dans une autre utilisation connue, le groupement de ces diodes, la plupart du temps de couleur rouge ou jaune, est destiné à former les messages à défilement de journaux lumineux, pilotées par des logiciels reliés à des circuits intégrés.

35

L'apparition sur le marché au cours de l'année 1999, de diodes électroluminescentes blanches à très faible consommation d'énergie (20 MilliAmpères par LED) et à très grande luminosité (5 à 15 Candelas, soit équivalent à 5 à 15 Watts lampe) alimentées en très bas voltage (3 à 4 Volts par diode) permet aujourd'hui

40

FEUILLE DE REMPLACEMENT (REGLE 26)

- 2 -

d'envisager leur utilisation notamment groupée au lieu et place de lampes d'éclairage de type classique (incandescence, fluorescence ou néon) leur durée de vie étant environ de 150.000 heures.

- 5 Cependant, la particularité de ces diodes électroluminescentes à grande luminosité, est que, plus la luminosité est grande, plus le faisceau de lumière est étroit (6 à 10 degrés d'angle), ainsi limité par la structure même de ce composant électronique.

- 10 Le faisceau lumineux émis est ainsi très puissant en distance (une cinquantaine de mètres) avec un angle d'éclairement très étroit (6 à 10 degrés), au détriment d'une propagation lumineuse étalée réclamée dans un éclairage traditionnel (30 à 360 degrés d'angle).

- 15 En cet état de la technique ce type de diode ne pouvait être utilisé et substitué aux moyens d'éclairage traditionnels, domestique, industriel ou urbain, sans envisager préalablement la transformation de la lumière ponctuelle émise, à l'aide de dispositifs propres à rediriger, étaler et égaliser la lumière selon les angles divers imposés par les besoins d'éclairage les plus courants.

- 20 Une fois cette mise au point effectuée, l'éclairage obtenu à l'aide de ces diodes électroluminescentes sera 20 à 50 fois plus économe en énergie (en moyenne 6 Watts au lieu de 150 Watts) et d'une durée de vie 15 fois supérieure à un éclairage traditionnel (150.000 heures au lieu de 10.000 heures).

- 25 Le but de l'invention était donc de dresser un cahier des charges et de régler les problèmes techniques liés à la mise au point de cet éclairage à diodes électroluminescentes (LED) et notamment :

- 30 1°) De répartir au moyen de dispositifs optiques simples et adaptés les rayons de lumière ponctuelle et directionnelle provenant de ces diodes électroluminescentes groupées selon un pas variable, en fonction de leur rendement lumineux, pour en obtenir une lumière redirigée et égallée.

- 35 2°) D'envisager plusieurs systèmes de répartition optique de la lumière en rapport avec l'angle d'éclairage et le rayonnement souhaité dans les applications domestiques industrielles et urbaines les plus courantes.

3°) De concevoir des systèmes de liaison électronique de ces diodes électroluminescentes lorsqu'elles sont groupées, pour former des lampes ou des rampes d'éclairage avec leurs raccordements ou connexions.

- 3 -

4°) D'implanter ce dispositif dans une infrastructure compatible en encombrement et en esthétique, avec la commercialisation d'un concept destiné principalement aux Marchés de l'éclairage et du ballage, ayant pour base la technique de l'éclairage au moyen de diodes électroluminescentes.

5

5°) De concevoir un dispositif électronique alimenté soit par le secteur électrique alternatif transformé en courant continu, soit autonome au moyen des énergies renouvelables, comprenant les sources d'éclairage constituées par les LED, ainsi que le système de captation et de stockage de l'énergie naturelle (capteur solaire, éolienne...), le générateur, le régulateur de tension filtrée, l'accumulateur et la cellule de commande jour-nuit.

10

Une fois résolus les problèmes sus-décrits, les avantages les plus remarquables du dispositif sont :

15

- sa faible consommation énergétique et son rendement lumineux élevé,
- sa durée de vie d'éclairage (environ 150.000 heures),
- la possibilité d'assurer son alimentation sans dépendance énergétique du réseau électrique,
- sa diversité d'applications par son fonctionnement à base d'électronique alliée à la propriété des diodes électroluminescentes, (clignotement, télécommande).

20

L'invention a donc pour but d'apporter les solutions au cahier des charges ainsi constitué du premier au cinquième point décrits plus haut.

25

L'invention concerne donc un dispositif d'éclairage utilisant les propriétés de diodes électroluminescentes (LED) à grande luminosité, très économes en énergie, dont la source de lumière directionnelle émise selon un angle aigu, est redirigée, étalée et filtrée par une ou plusieurs pièces optiques constituées d'un matériau transparent, permettant ainsi l'éclairage ou le ballage en bas voltage soit à l'aide du courant électrique alternatif transformé en bas voltage soit à l'aide de dispositifs autonomes d'alimentation en énergie électrique basés sur la captation, la régulation et le stockage des énergies naturelles solaires ou éoliennes.

30

Selon une première caractéristique l'invention comporte (planche 1/9 figure 1 et planche 4/9 figures 4 et 5), un couvercle étanche (16) qui contient un boîtier (7) en matière plastique ou isolante, assemblé par 4 vis (13) à une pièce optique (1), le circuit imprimé (10) est lui-même assemblé par 4 tiges (17) solidaires du boîtier (7).

35

Sur le circuit imprimé (10) sont soudées une ou plusieurs rangées de diodes électroluminescentes ou LED (5) positionnées dans l'axe (A) et perpendiculaires aux

- 4 -

logements optiques concaves (2) leur faisant face, pratiqués par usinage ou moulage dans la pièce optique (1) selon un pas régulier ou irrégulier de (X) millimètres, dont les détails et profils d'usinages sont décrits dans la quatrième caractéristique.

5 La pièce optique (1) est constituée dans un matériau transparent possédant un indice de réfraction égal à celui du verre, de préférence en matière plastique transparente ou transparente teintée ou dans certains cas diffusante (dont le verre acrylique de marques Altuglas^R Plexiglas^R Perspex^R), les logements concaves optiques (2) pratiqués dans la pièce optique (1) sont polis et transparents.

10 Le circuit imprimé (10), est alimenté en courant électrique par le fil d'alimentation (15) relié à une alimentation située de préférence à l'extérieur du dispositif comprenant un transformateur dont la tension redressée régulée et filtrée, permet de délivrer la tension nécessaire à la correcte alimentation des LED (5) de préférence en bas-voltage, (3, 6, 9, 12, 24 ou 48 volts) ou en haut voltage (110 ou 220 volts).

15 Selon une seconde caractéristique de l'invention (planche 2/9, figure 2) le boîtier (7) en matière plastique ou isolante, assemblé par 4 vis (13) à la pièce optique (1) contient le circuit imprimé (10) préalablement percé de 4 trous correspondants aux axes des 4 tiges (17) solidaires du boîtier (7) de manière à laisser coulisser avec un faible jeu, le circuit imprimé (10) portant les LED (5) rendu ainsi mobile sur les 4 tiges (17).

20 La vis micrométrique sans fin (12) agissant par son filetage (6a) sur l'écrou (6) solidaire du circuit imprimé (10) portant les LED (5), permet en vissant ou dévissant la vis micrométrique sans fin (12) débouchant dans un trou (11) pratiqué dans la pièce optique (1), de faire varier la distance focale entre les LED (5) et les logements optiques concaves (2) de la pièce optique (1) et par conséquent de faire varier selon les
25 besoins d'éclairage, l'angle d'éclairement (F) ainsi obtenu.

Les LED sont positionnées dans l'axe (A) et perpendiculaires aux logements optiques concaves (2) leur faisant face, pratiqués dans la pièce optique (1) selon un pas régulier ou irrégulier de (X) millimètres, dont les détails et profils d'usinages sont décrits dans la quatrième caractéristique.

30 La pièce optique (1) est constituée dans un matériau transparent possédant un indice de réfraction égal à celui du verre, de préférence en matière plastique transparente ou transparente teintée ou dans certains cas diffusante (dont le verre acrylique de marques Altuglas^R Plexiglas^R Perspex^R), les logements concaves optiques (2) sont polis et transparents.

35

L'alimentation en énergie électrique s'effectue dans les mêmes conditions que dans la première caractéristique.

Selon une troisième caractéristique de l'invention (planche 3/9, figure 3) le boîtier (7) en matière plastique ou isolante, assemblé par 4 vis (13) à la pièce optique (1) contient le circuit imprimé (10) fixé sur 4 tiges (17) solidaires du boîtier (7).

La vis micrométrique sans fin (12) agissant par son filetage (6a) sur l'écrou (6) inséré dans une pièce optique mobile (4) comportant des logements optiques concaves (3), préalablement percée de 4 trous correspondants aux axes des 4 tiges (17) permet en vissant ou dévissant la vis micrométrique sans fin (12) débouchant dans un trou (11) pratiqué dans la pièce optique (1), de faire varier la distance focale entre les LED (5) et la pièce optique mobile (4), de même en sens inverse la distance focale entre la pièce optique mobile (4) et la pièce optique fixe (1) et par conséquent de faire varier l'angle d'éclairage (F) ainsi obtenu par la position fixe des LED (5) en fonction de la position des logements optiques concaves (2) et (3) des pièces optiques (1) et (4).

Les LED sont positionnées dans l'axe (A) et perpendiculaires aux logements optiques concaves (2) et (3) leur faisant face, pratiqués dans les pièces optiques fixe (1) et mobile (4), selon un pas régulier ou irrégulier de (X) millimètres, dont les détails et profils d'usinages sont décrits dans la quatrième caractéristique.

La pièce optique (1) ainsi que la pièce optique mobile (4) sont constituées dans un matériau transparent possédant un indice de réfraction égal à celui du verre, de préférence en matière plastique transparente ou transparente teintée ou dans certains cas diffusante (dont le verre acrylique de marques Altuglas^R Plexiglas^R Perspex^R), les logements concaves optiques (2) et (3) sont polis et transparents.

L'alimentation en énergie électrique s'effectue dans les mêmes conditions que dans la première caractéristique.

Selon une quatrième caractéristique de l'invention (planches 3/9, 4/9 et 5/9) les logements optiques concaves (2) et (3) polis et transparents, des pièces optiques fixe (1) ou mobile (4) (figure 3), comportent selon les cas différents profils d'usinage ou de moulage en creux tenant de la demi-sphère ou du polyèdre (figures 6, 7 et 8), selon un pas régulier ou irrégulier de (X) millimètres, symétrique au pas des positionnements des LED (5) (figure 7), soit avec un profil concave sphérique (20), ou un profil concave triangulaire ou trapézoïdal (21),

Les logements optiques concaves (2) et (3) peuvent être usinés ou moulés selon l'un des profils précédents avec une inclinaison d'un angle déterminé (22), l'axe de positionnement (A) des LED (5) est alors incliné selon le même angle (figure 8), afin de toujours centrer la lumière directionnelle émise par les LED (5) dans l'axe (A) des logements optiques concaves (2) formant ainsi un faisceau de lumière élargi à un angle (F) variable en fonction des profils et diamètres d'usinage ou de moulage utilisés pour les logements optiques concaves (2) et (3), (figures 6, 7 et 8).

- 6 -

Selon une cinquième caractéristique de l'invention (planche 5/9 figures 6, 7 et 8 et planche 3/9, figure 3), la face plane usinée de la pièce optique fixe (1), à l'exception des logements optiques concaves (2) est soit dépolie, soit revêtue d'une peinture adhérente ou d'une sérigraphie de fond formant décor (19) (figures 7 et 8), soit
5 recouverte d'une plaque mince intermédiaire (19a) (figure 6), revêtue de manière identique et percée en symétrie au même pas que les logements optiques concaves (2) de la pièce optique (1) laissée dans ce dernier cas totalement transparente.

Ces trois solutions excluant ainsi toute vision du circuit imprimé (10) portant les LED (5), seuls les logements optiques concaves (2) restent libres, polis et transparents afin de
10 laisser diffracter librement la lumière directionnelle issue des LED (5), au moyen de chaque logement optique concave (2) de la pièce optique (1).

Selon une sixième caractéristique de l'invention (planche 6/9, figure 9 et planche 7/9, figure 10) un dispositif, figurant ici un ensemble d'éclairage sur mât, assemble au
15 moyen du couvercle étanche (16) l'un des systèmes d'éclairage à LED décrits de la première à la cinquième caractéristique (figure 9), avec un capteur solaire (23) protégé par une pièce optique transparente (14) servant à la captation et la diffraction de la lumière solaire, constituée en matière plastique transparente identique à celle utilisée pour les pièces optiques (1) ou (4), dont la face (24), opposée au capteur solaire (23)
20 est usinée au pas des cellules solaires, avec des fraisages ou moulages en creux continus et polis, de forme triangulaire ou arrondie (25) selon un angle (G) au minimum ouvert à 45° par rapport à l'horizontale, destinés à rediriger la lumière solaire vers la face du capteur (23) en profitant au maximum des propriétés de diffraction de la lumière solaire (L) dans la pièce transparente (14) ainsi transformée, quelque soit l'orientation du
25 capteur (23) par rapport à la position du soleil.

Comme décrit par la planche 7/9 (figure 10), ce capteur solaire (23) recharge en courant électrique de bas-voltage, à travers le régulateur (26), l'accumulateur (27) prévu d'une capacité suffisante en ampérage pour alimenter les LED (5) durant la
30 période nocturne, par déclenchement de la cellule crépusculaire (28).

Selon une septième caractéristique de l'invention (planche 8/9 figure 11), un dispositif, figurant ici un ensemble d'éclairage sur mât, assemble au moyen du
couvercle étanche (16) l'un des systèmes d'éclairage à LED décrits de la première à la cinquième caractéristique.

35 Une turbine à air solidaire d'un alternateur (29) recharge en courant électrique de bas-voltage, à travers le régulateur (30), l'accumulateur (27) prévu d'une capacité suffisante en ampérage pour alimenter les LED (5) durant la période nocturne par déclenchement de la cellule crépusculaire (28).

- 7 -

Selon une huitième caractéristique de l'invention (planche 9/9 figure 12), un dispositif, figurant ici un ensemble d'éclairage sur mât, assemble au moyen du couvercle étanche (16) l'un des systèmes d'éclairage à LED décrits de la première à la cinquième caractéristique.

- 5 Le dispositif inclus dans ce cas le couplage des deux systèmes décrits par la sixième et septième caractéristique avec d'une part l'alimentation de l'éclairage au moyen du capteur solaire (23) et d'autre part en adjonction au moyen de la turbine à air solidaire de l'alternateur (29) qui rechargent en courant électrique de bas-voltage, à travers les régulateurs (26) et (30), l'accumulateur (27) prévu d'une capacité suffisante en
- 10 ampérage pour alimenter les LED (5) durant la période nocturne, par déclenchement de la cellule crépusculaire (28).

- A titre d'exemples de réalisations, l'invention est particulièrement indiquée dans la conception et la fabrication d'éclairages de tous types, autonomes ou non,
- 15 notamment dans l'éclairage public, industriel ou domestique en substitution des lampes destinées à l'éclairage traditionnel, compte-tenu de leur très faible consommation en énergie électrique et leur grande durée de vie comparées, ainsi qu'à chaque fois qu'il est souhaitable de recourir à un dispositif autonome en alimentation électrique, notamment lorsqu'il est impossible économiquement ou techniquement de créer une
- 20 ligne de raccordement au réseau électrique.

REVENDICATIONS

1. Dispositif d'éclairage utilisant les propriétés de diodes électroluminescentes ou LED, à grande luminosité, très économes en énergie, caractérisé en ce que le dispositif
5 (planche 3/9, figure 3) est constitué d'un circuit imprimé (10) portant les LED soudées (5), solidaire par 4 tiges (17) du boîtier (7), en matière plastique ou isolante, assemblé par 4 vis (13) à la pièce optique (1) et au couvercle étanche (16) qui assure la protection de l'ensemble.

La vis micrométrique sans fin (12) agit par son filetage (6a) sur l'écrou (6) inséré dans
10 une seconde pièce optique mobile (4), préalablement percée de 4 trous correspondants aux axes des 4 tiges (17) permet en vissant ou dévissant la vis micrométrique sans fin (12) débouchant dans un trou (11) pratiqué dans la pièce optique (1), de faire varier la distance focale entre les LED (5) et la pièce optique mobile (4), de même en sens inverse la distance focale entre la pièce optique mobile (4) et la
15 pièce optique fixe (1) et par conséquent de faire varier l'angle d'éclairage (F) ainsi obtenu par la position fixe des LED (5) en fonction de la position des logements optiques concaves (2) et (3).

Les LED sont positionnées dans l'axe (A) et perpendiculaires aux logements optiques concaves (2) et (3) leur faisant face, pratiqués dans les pièces optique fixe (1) et mobile
20 (4), selon un pas régulier ou irrégulier de (X) millimètres.

La pièce optique (1) ainsi que la pièce optique mobile (4) sont constituées dans un matériau transparent.

Le circuit imprimé (10) est alimenté en courant électrique par le fil d'alimentation (15) relié à une alimentation située de préférence à l'extérieur du dispositif comprenant
25 un transformateur dont la tension redressée régulée et filtrée, permet de délivrer la tension nécessaire à la correcte alimentation des LED (5) de préférence en bas-voltage (3, 6, 9, 12, 24 ou 48 volts) ou en haut voltage (110 ou 220 volts).

Le dispositif peut être alimenté soit par le secteur électrique soit en autonomie par l'énergie éolienne ou solaire.

30 2. Dispositif d'éclairage utilisant les propriétés de diodes électroluminescentes ou LED, à grande luminosité, très économes en énergie, selon la revendication 1, caractérisé en ce que le dispositif (planche 2/9, figure 2) est constitué du circuit imprimé (10) préalablement percé de 4 trous correspondants aux axes des 4 tiges (17) solidaires
35 du boîtier (7) de manière à laisser coulisser avec un faible jeu, le circuit imprimé (10) portant les LED (5) rendu ainsi mobile sur les axes des 4 tiges (17) du boîtier (7), assemblé par 4 vis (13) à la pièce optique (1).

La vis micrométrique sans fin (12) agissant par son filetage (6a) sur l'écrou (6) solidaire du circuit imprimé (10) portant les LED (5), permet en vissant ou dévissant la vis micrométrique sans fin (12) débouchant dans un trou (11) pratiqué dans la pièce

- 9 -

optique (1), de faire varier la distance focale entre les LED (5) portées par le circuit imprimé (10) et les logements optiques concaves (2) de la pièce optique (1) et par conséquence de faire varier selon les besoins d'éclairage, l'angle d'éclairement (F) ainsi obtenu.

5

3. Dispositif d'éclairage utilisant les propriétés de diodes électroluminescentes ou LED à grande luminosité, très économes en énergie, selon la revendication 1, caractérisé en ce que le dispositif (planche 1/9, figure 1), est constitué par le circuit imprimé (10) portant les LED (5) fixé à une distance déterminée au moyen de 4 tiges (17), sur le boîtier (7) assemblé par 4 vis (13) à la pièce optique (1).

10

4. Dispositif d'éclairage utilisant les propriétés de diodes électroluminescentes ou LED, à grande luminosité, très économes en énergie, selon les revendications 1, 2 et 3 (planches 6/9 et 7/9), caractérisé en ce que le dispositif, (figure 9 et figure 10) figurant ici un ensemble d'éclairage sur mât, assemble au moyen du couvercle étanche (16) l'un des systèmes d'éclairage à LED (figures 1, 2 et 3), avec un capteur solaire (23) protégé par une pièce optique transparente (14) servant à la captation et la diffraction de la lumière solaire, constituée en matière plastique transparente identique à celle utilisée pour les pièces optiques (1) ou (4), dont la face (24), opposée au capteur solaire (23) est usinée au pas des cellules solaires, avec des fraisages ou moulages en creux continus, de formes triangulaire ou arrondie (25) polis, selon un angle (G) au minimum ouvert à 45° par rapport à l'horizontale, destinés à rediriger la lumière solaire vers la face du capteur (23) en profitant au maximum des propriétés de diffraction de la lumière solaire dans la pièce transparente ainsi transformée, quelque soit l'orientation du capteur (23) par rapport à la position du soleil.

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Ce capteur solaire (23), (figure 10), recharge en courant électrique de bas-voltage à travers le régulateur (26), l'accumulateur (27) prévu d'une capacité suffisante en ampérage pour alimenter les LED (5) durant la période nocturne, par déclenchement de la cellule crépusculaire (28).

30

5. Dispositif d'éclairage utilisant les propriétés de diodes électroluminescentes ou LED, à grande luminosité, très économes en énergie, selon les revendications 1, 2 et 3 (planche 8/9), caractérisé en ce que le dispositif, (figure 11) figurant ici un ensemble d'éclairage sur mât, assemble au moyen du couvercle étanche (16), l'un des systèmes d'éclairage à LED (figures 1, 2 et 3).

35

Une turbine à air solidaire d'un alternateur (29) recharge en courant électrique de bas-voltage à travers le régulateur (30), l'accumulateur (27) prévu d'une capacité suffisante en ampérage pour alimenter les LED (5) durant la période nocturne par déclenchement de la cellule crépusculaire (28).

6. Dispositif d'éclairage utilisant les propriétés de diodes électroluminescentes ou LED, à grande luminosité, très économes en énergie, selon les revendications 1, 2 et 3 caractérisé en ce que le dispositif (planche 9/9, figure 12), figurant ici un ensemble d'éclairage sur mât, assemble au moyen du couvercle étanche (16), l'un des systèmes d'éclairage à LED (figures 1, 2 et 3)

Dans ce cas l'alimentation de l'éclairage s'effectue à la fois au moyen du capteur solaire (23) et en adjonction au moyen de la turbine à air solidaire de l'alternateur (29) qui recharge, ensemble ou simultanément, en courant électrique de bas-voltage, à travers les régulateurs (26) et (30), l'accumulateur (27) prévu d'une capacité suffisante en ampérage pour alimenter les LED (5) durant la période nocturne, par déclenchement de la cellule crépusculaire (28).

7. Dispositif d'éclairage utilisant les propriétés de diodes électroluminescentes ou LED, à grande luminosité, très économes en énergie, selon les revendications 1 à 6 (planches 1/9 à 9/9), caractérisé en ce que les pièces optiques (1), (4) et (14) sont constituées dans un matériau transparent possédant un indice de réfraction égal à celui du verre, de préférence en matière plastique transparente ou transparente teintée ou dans certains cas diffusante (dont le verre acrylique de marques Altuglas^R Plexiglas^R Perspex^R) et que les logements concaves optiques (2), (3) et (25) sont polis et transparents.

8. Dispositif d'éclairage utilisant les propriétés de diodes électroluminescentes ou LED, à grande luminosité, très économes en énergie, selon les revendications 1 à 7 (planche 1/9, 3/9, 4/9 et 5/9) caractérisé en ce que, les logements optiques concaves (2) et (3) polis, des pièces optiques fixe (1) ou mobile (4) (figure 3), peuvent comporter différents profils d'usinage ou de moulage en creux tenant de la demi-sphère ou du polyèdre (figure 6, 7 et 8), les LED sont positionnées dans l'axe (A) et perpendiculaires aux logements optiques concaves (2) et (3) leur faisant face, pratiqués dans les pièces optique fixe (1) et mobile (4), selon un pas régulier ou irrégulier de (X) millimètres, soit selon un profil concave sphérique (20) ou un profil concave triangulaire ou trapézoïdal (21), soit selon l'un des profils précédents incliné selon un angle déterminé (22) (figure 6, 7 et 8).

L'axe de positionnement (A) des LED (5) est alors incliné selon le même angle déterminé (figure 8), afin de toujours centrer la lumière directionnelle émise par les LED (5) dans l'axe (A) des logements optiques concaves (2) et (3) formant ainsi un faisceau de lumière élargi à un angle (F) variable en fonction des profils et diamètres d'usinage ou de moulage utilisés pour les logements optiques concaves (2) (figure 6, 7 et 8).

9. Dispositif d'éclairage utilisant les propriétés de diodes électroluminescentes ou LED, à grande luminosité, très économes en énergie, selon les revendications 1 à 7

- 11 -

(planche 5/9 figures 6, 7 et 8), caractérisé en ce que, la face plane usinée de la pièce optique (1), à l'exception des logements optiques concaves (2), est, soit dépolie, soit revêtue d'une peinture plastique adhérente ou d'une sérigraphie de fond formant décor (19) soit recouverte d'une plaque mince intermédiaire (19a) revêtue de manière
5 identique et percée en symétrie au même pas que les logements optiques concaves (2) de la pièce optique (1) laissée dans ce dernier cas transparente.

Ces trois solutions excluent ainsi toute vision du circuit imprimé (10) portant les LED (5), seuls les logements optiques concaves (2) restent libres, polis et transparents afin de
laisser diffracter librement la lumière directionnelle (L) issue des LED (5), au moyen de
10 chaque logement optique concave (2) de la pièce optique (1).

1/9

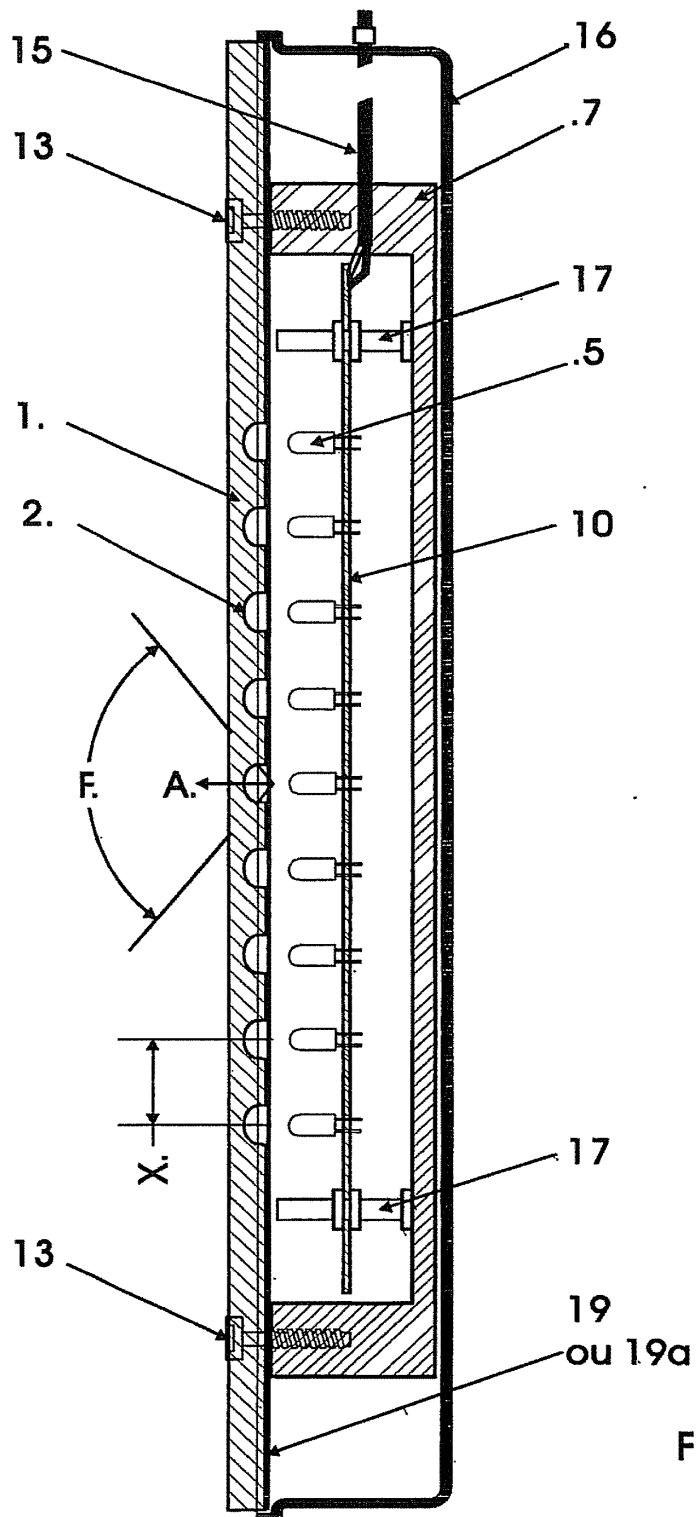


Figure 1

2/9

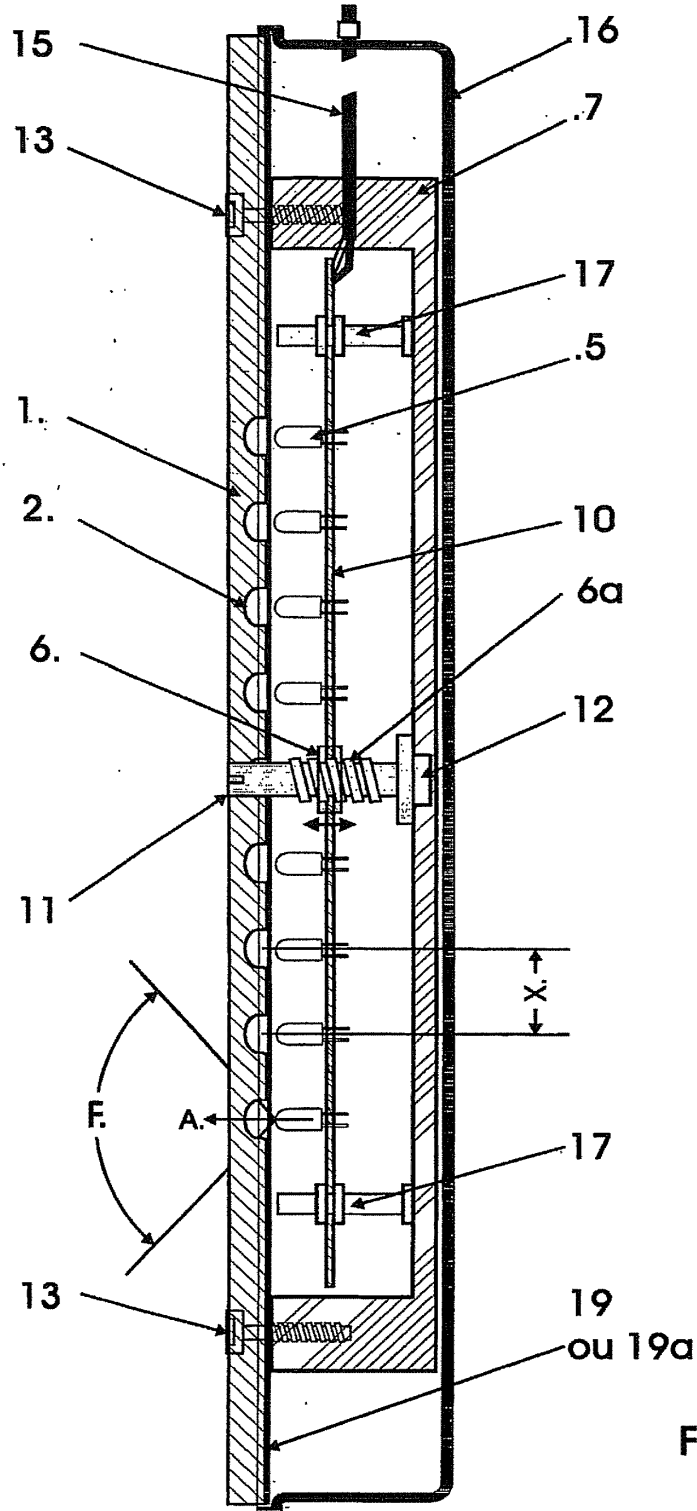


Figure 2

3/9

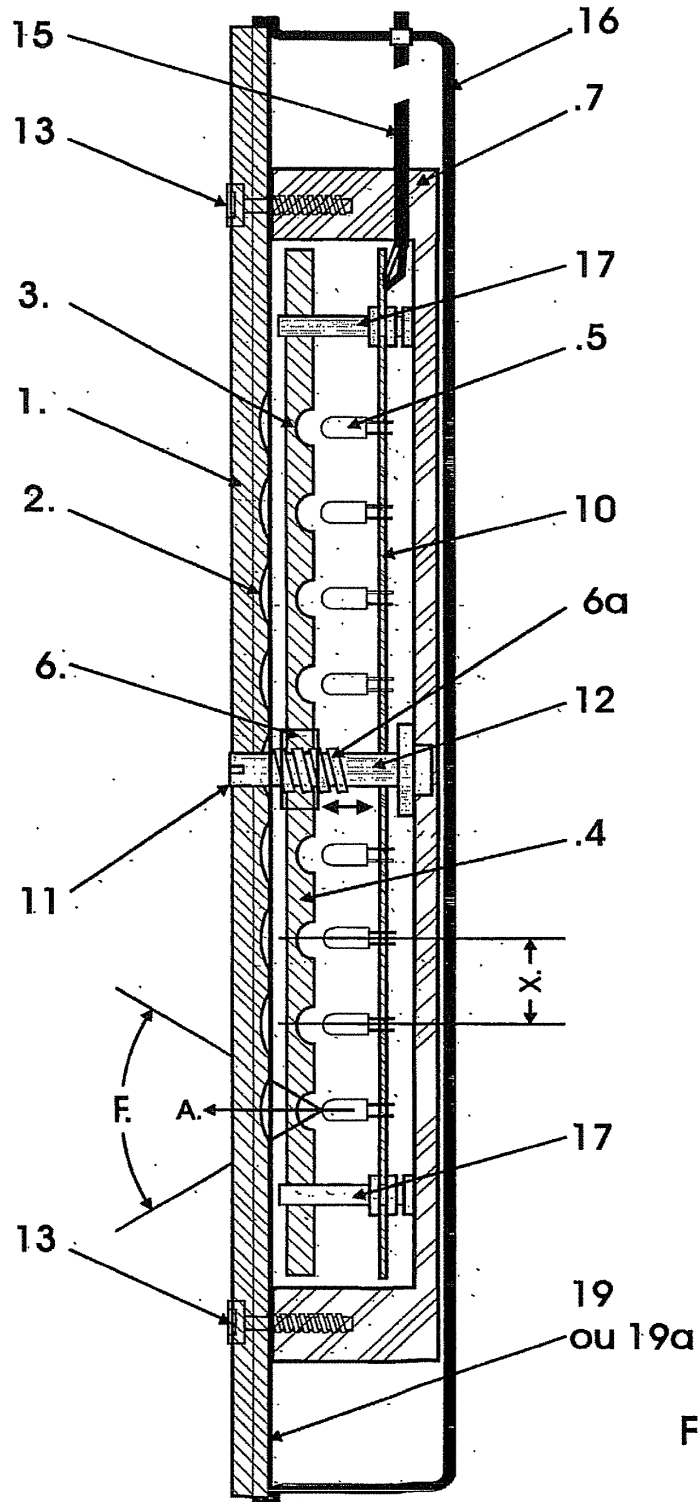


Figure 3

4/9

Figure 4

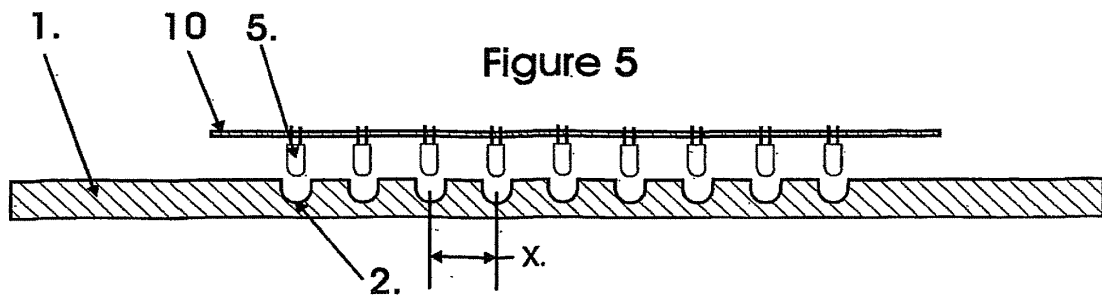
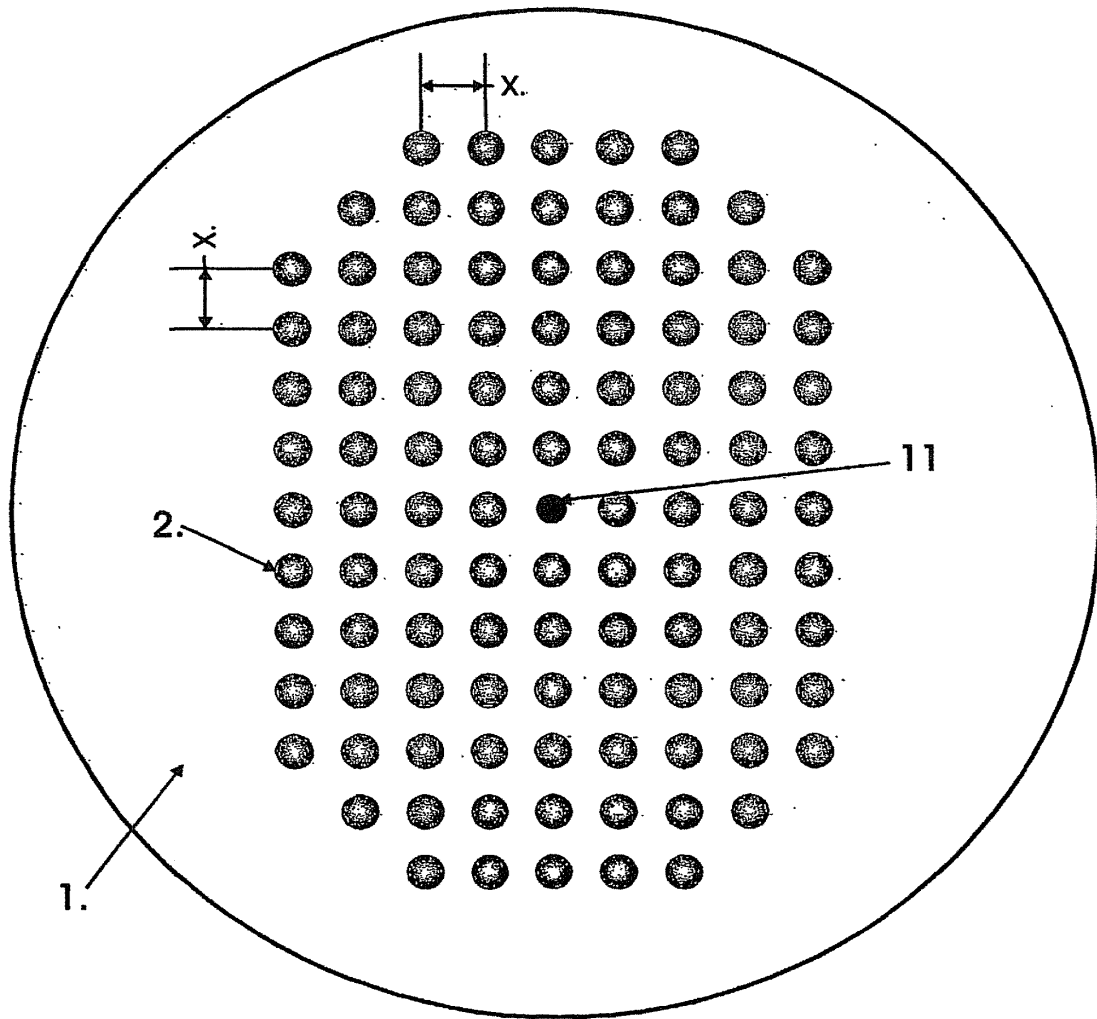


Figure 5

5/9

Figure 6

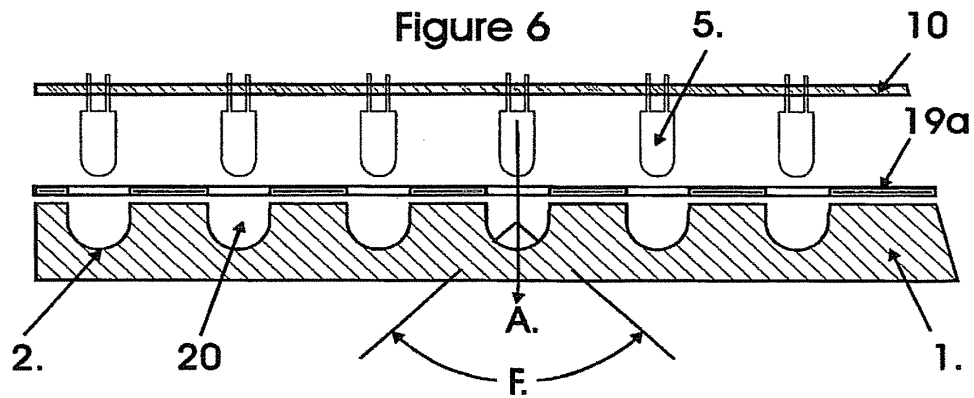


Figure 7

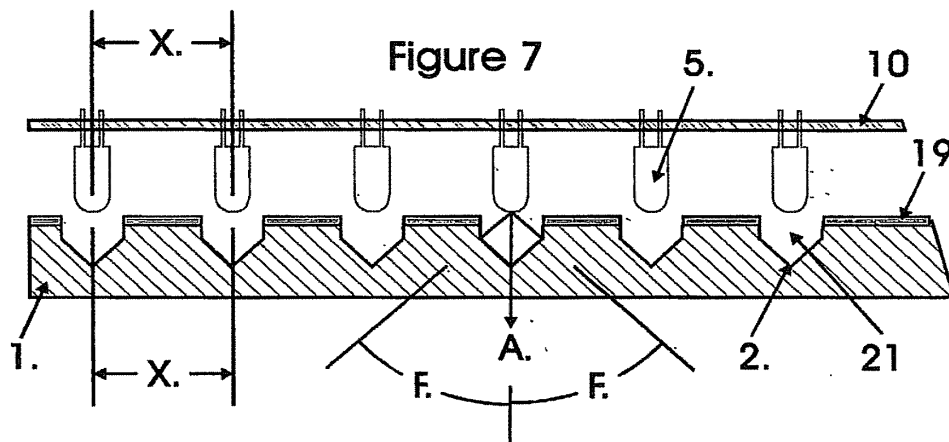
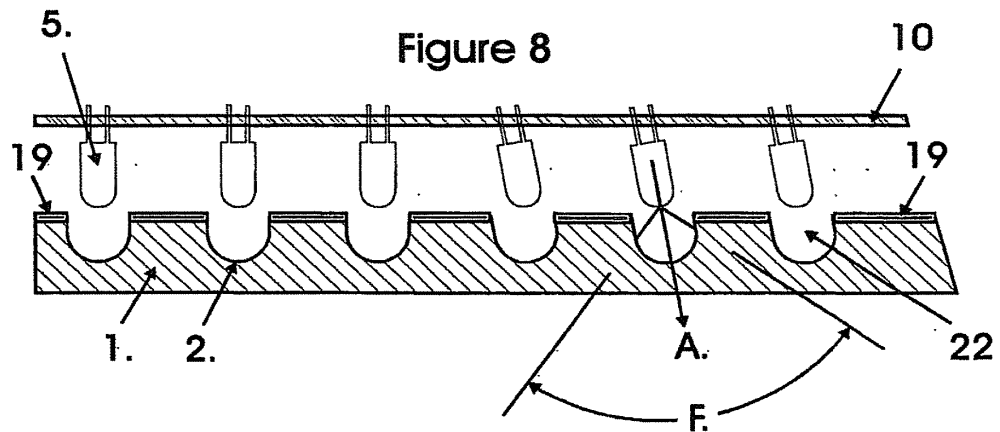
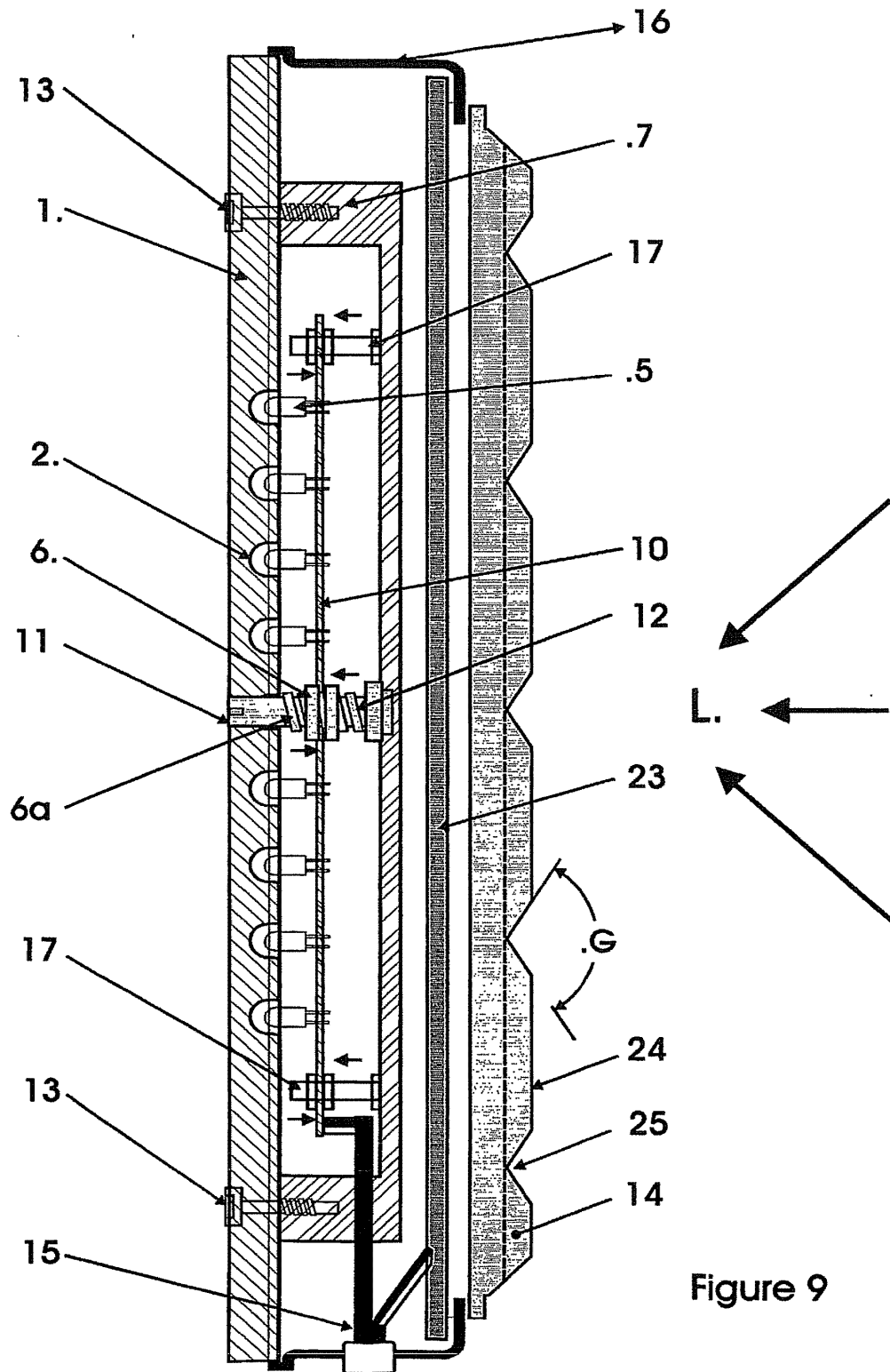


Figure 8



6/9



7/9

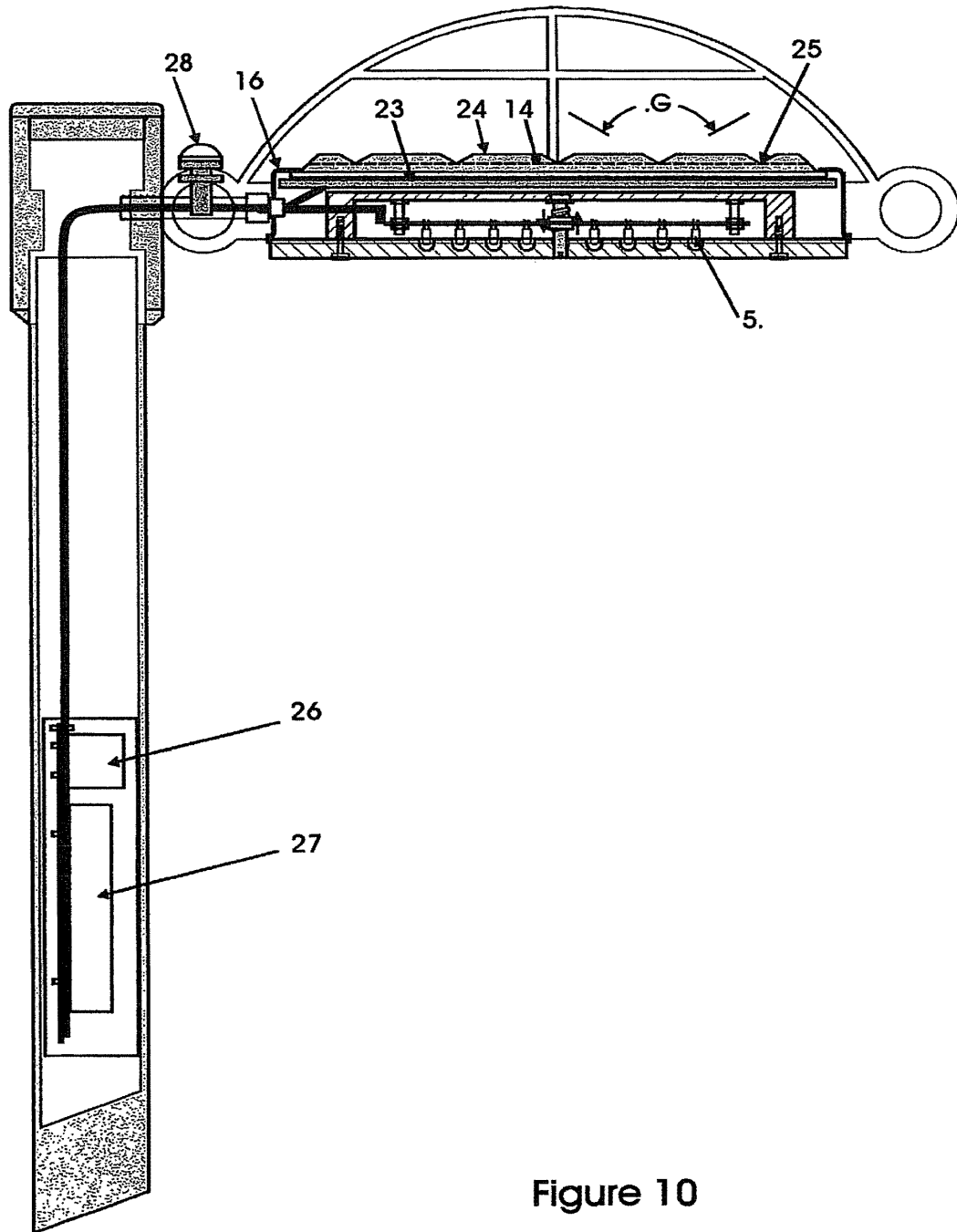


Figure 10

8/9

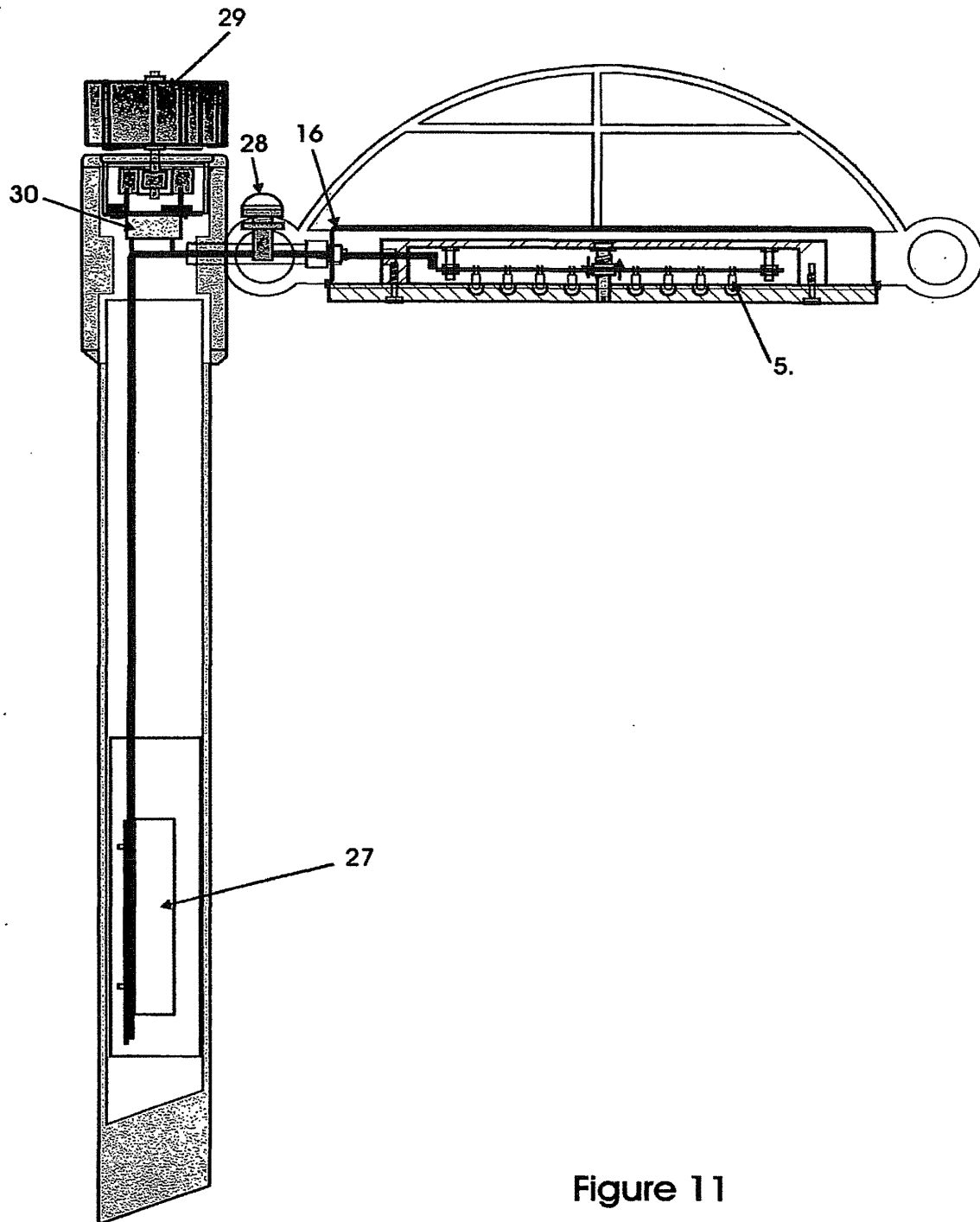


Figure 11

9/9

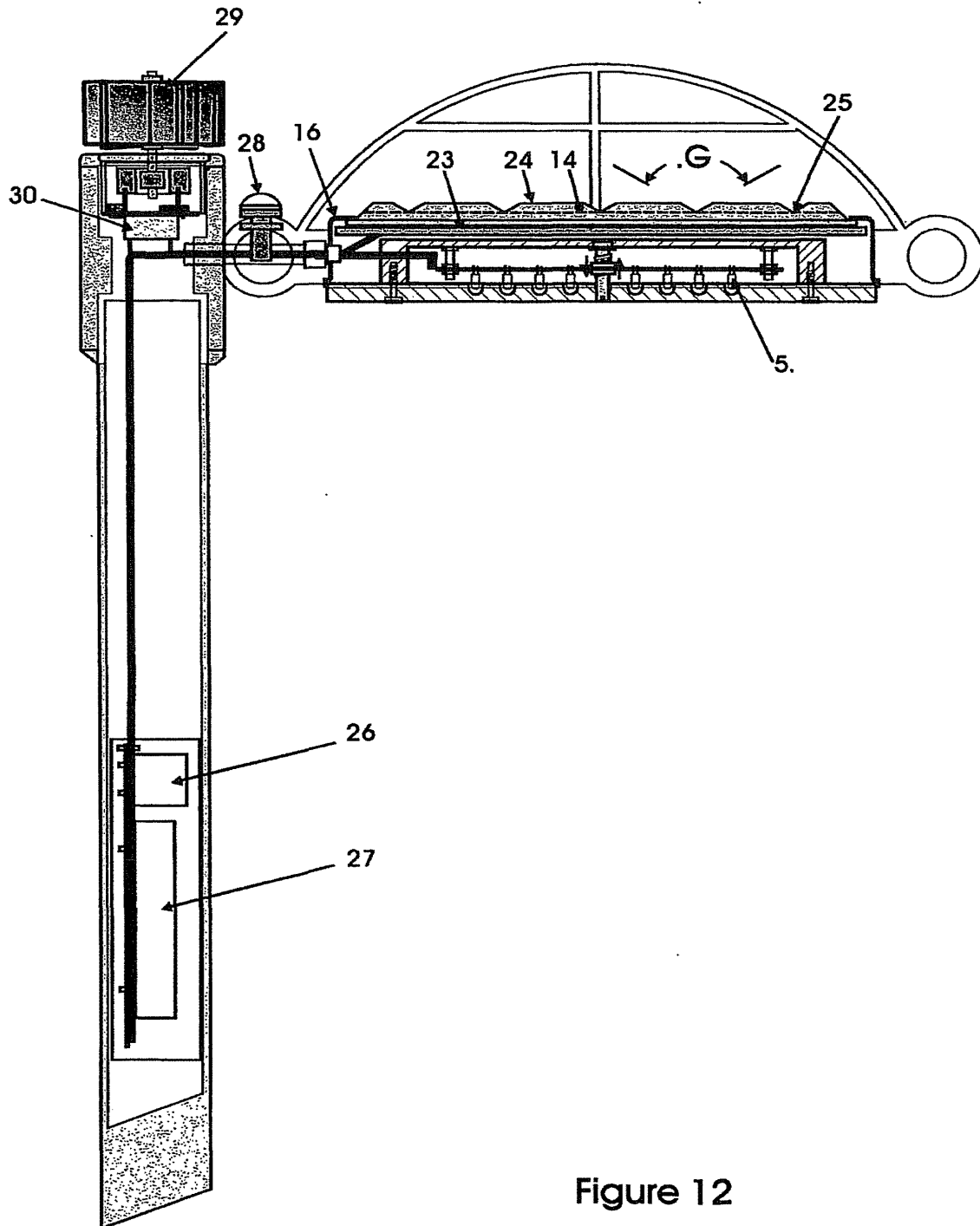


Figure 12

INTERNATIONAL SEARCH REPORT

International Application No
PCT/FR 01/03696

A. CLASSIFICATION OF SUBJECT MATTER		
IPC 7	H01L33/00	F21V14/06 F21V17/02 F21S9/03 F21S9/04
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) IPC 7 H01L F21V F21S F21Y F21K B60R F03D		
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 practical, search terms used) EPO-Internal, WPI Data, PAJ		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 100 05 795 A (INST MIKROTECHNIK MAINZ GMBH) 23 August 2001 (2001-08-23) abstract column 2, line 15 -column 2, line 27 column 2, line 49 -column 2, line 59 column 3, line 67 -column 4, line 33 column 6, line 44 -column 6, line 56 figures 2,10 ---	1-9
Y	DE 199 60 172 A (VOLKSWAGENWERK AG) 28 June 2001 (2001-06-28) column 2, line 12 -column 2, line 26 ---	1-9
Y	DE 36 11 750 A (BRAUN JEAN) 22 October 1987 (1987-10-22) abstract column 2, line 26 -column 3, line 40 figure 1 --- -/--	1-9
☒ Further documents are listed in the continuation of box C. ☒ Patent family members are listed in annex.		
* Special categories of cited documents : *A* document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international filing date *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) *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 *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 *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 *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. *Z* document member of the same patent family		
Date of the actual completion of the international search 15 July 2002		Date of mailing of the international search report 01/08/2002
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer Bagge Af Berga, H

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page 1 of 2

INTERNATIONAL SEARCH REPORT

International Application No
PCT/FR 01/03696

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 290 368 B1 (LEHRER ROBERT A) 18 September 2001 (2001-09-18) abstract column 2, line 47 -column 3, line 8 figures 3-5 ---	1-9
A	DE 37 13 854 A (WEBASTO AG FAHRZEUGTECHNIK) 29 October 1987 (1987-10-29) abstract column 1, line 62 -column 1, line 68 figure 1 ---	1-9
A	GB 2 360 834 A (ALPA IND LTD) 3 October 2001 (2001-10-03) abstract ---	1-9
A	US 6 086 214 A (RIDGE PHILIP G) 11 July 2000 (2000-07-11) abstract column 4, line 54 -column 4, line 58 figure 1 ---	1-9
A	DE 201 10 137 U (HEIZMANN MICHAEL) 13 September 2001 (2001-09-13) abstract page 1, line 25 -page 2, line 8 ---	1-9
A	DE 201 09 705 U (WUTSCHIK MARK) 4 October 2001 (2001-10-04) abstract figures 1-3 -----	1-9

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International Application No

PCT/FR 01/03696

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Form PCT/ISA/210 (patent family annex) (July 1992)

RAPPORT DE RECHERCHE INTERNATIONALE

Demande internationale No
PCT/FR 01/03696

A. CLASSEMENT DE L'OBJET DE LA DEMANDE CIB 7 H01L33/00 F21V14/06 F21V17/02 F21S9/03 F21S9/04		
Selon la classification internationale des brevets (CIB) ou à la fois selon la classification nationale et la CIB		
B. DOMAINES SUR LESQUELS LA RECHERCHE A PORTE Documentation minimale consultée (système de classification suivi des symboles de classement) CIB 7 H01L F21V F21S F21Y F21K B60R F03D		
Documentation consultée autre que la documentation minimale dans la mesure où ces documents relèvent des domaines sur lesquels a porté la recherche		
Base de données électronique consultée au cours de la recherche internationale (nom de la base de données, et si réalisable, termes de recherche utilisés) EPO-Internal, WPI Data, PAJ		
C. DOCUMENTS CONSIDERES COMME PERTINENTS		
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Date à laquelle la recherche internationale a été effectivement achevée 15 juillet 2002		Date d'expédition du présent rapport de recherche internationale 01/08/2002
Nom et adresse postale de l'administration chargée de la recherche internationale Office Européen des Brevets, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Fonctionnaire autorisé Bagge Af Berga, H

RAPPORT DE RECHERCHE INTERNATIONALE

 Demande internationale No
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C.(suite) DOCUMENTS CONSIDERES COMME PERTINENTS		
Catégorie	Identification des documents cités, avec, le cas échéant, l'indication des passages pertinents	no. des revendications visées
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A	DE 37 13 854 A (WEBASTO AG FAHRZEUGTECHNIK) 29 octobre 1987 (1987-10-29) abrégé colonne 1, ligne 62 -colonne 1, ligne 68 figure 1 ----	1-9
A	GB 2 360 834 A (ALPA IND LTD) 3 octobre 2001 (2001-10-03) abrégé ----	1-9
A	US 6 086 214 A (RIDGE PHILIP G) 11 juillet 2000 (2000-07-11) abrégé colonne 4, ligne 54 -colonne 4, ligne 58 figure 1 ----	1-9
A	DE 201 10 137 U (HEIZMANN MICHAEL) 13 septembre 2001 (2001-09-13) abrégé page 1, ligne 25 -page 2, ligne 8 ----	1-9
A	DE 201 09 705 U (WUTSCHIK MARK) 4 octobre 2001 (2001-10-04) abrégé figures 1-3 -----	1-9

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Formulaire PCT/ISA/210 (annexe familles de brevets) (juillet 1992)

Translate Text

Original text:

Description of WO03044870

<Desc/Clms Page number 1>

Dispositif optique d'éclairage à diodes électroluminescentes.

La présente invention concerne un dispositif d'éclairage utilisant les propriétés de diodes électroluminescentes ou LED, à grande luminosité, très économes en énergie et d'une très grande durée de vie, dont la source de lumière directionnelle, redirigée et étalée par une ou plusieurs pièces optiques transparentes, permet l'éclairage ou le balisage en bas voltage notamment à l'aide de dispositifs autonomes d'alimentation en énergie électrique basés sur la captation et le stockage des énergies naturelles solaires ou éoliennes.

Les systèmes ou appareillages destinés à l'éclairage étaient réalisés jusqu'à aujourd'hui à l'aide de lampes à incandescence, fluorescente, halogène, ou néon.

La consommation relativement importante de ces lampes (de 4W à 300W selon les besoins d'éclairage), alimentées principalement en 220 volts, leur durée de vie relativement courte (en moyenne 10.000 heures), leur dégagement de chaleur relativement important (50 à 120 °C), l'impossibilité de les faire clignoter sans écourter leur durée de vie (éclairage de sécurité routier...), limitent leur utilisation et n'autorisent qu'une alimentation par le réseau électrique alternatif, sans possibilité sérieuse d'être alimentées en autonomie d'énergie.

Les diodes électroluminescentes appelées aussi LED (Light Emitting Diodes), économes en énergie, ne pouvaient être utilisées auparavant, que pour un usage limité à des voyants lumineux de couleurs rouge, jaune, ambre, vert, ou bleu, dont l'unité de mesure d'intensité lumineuse était comprise entre 30 et 800 milliCandelas, l'absence de diodes suffisamment puissantes et émettant une couleur blanche ne permettait pas alors d'envisager un éclairage ou un balisage identique tant en puissance qu'en couleur.

Translation: French » English

Description of WO03044870

<Desc/Clms Page number 1>

Operative optical light emitting diode.

The present invention relates to a device 'éclairage using the properties of light-emitting diodes, or LED, a very bright, very energy efficient and a great life, including directional light source, spread and redirected by one or several pieces optical transparent, allowing light or low-voltage lighting in particular through devices autonomous electricity supply based on the capture and storage of natural solar energy or wind power.

The systems or equipment for illuminating réalisés jusqu'à were now using incandescent lamps, fluorescent, halogen or fluorescent.

The relatively high consumption of these lamps (4W to 300W depending on the lighting requirements), fuelled mainly 220 volts, their life relatively short (on average 10,000 hours), their heat relatively large (50 à 120 °C) the inability to move the flashing without shortening their life span (security lighting routier ...), limit their use and allow a power grid by the alternative, without serious possibility of autonomy to be fed d energy.

The light-emitting diodes also called LED (Light Emitting Diodes), saving energy, could not be used before, only for limited use of lights red, yellow, amber, green or blue, whose unit of measure luminous intensity was between 30 and 800 milliCandelas, the absence of sufficiently powerful and diodes emitting white did not then consider lighting or marking both in the same power that color lighting the lamp filament incandescent or fluorescent lamps.

The practical example uses the best known of such diodes or LEDs are the lights or control hardware or robotics, computers, appliances videos, audio, or household. In another known use, the grouping of these diodes, usually red or yellow, is intended to train messages scrolling newspaper light, driven by software related to integrated circuits.

The appearance on the market during the year 1999, white light-emitting diodes with a very

low energy consumption (20 MilliAmpères LED) and very light (5 to 15 Candelas, is equivalent to 5 to 15 Watts lamp) Fed a very low voltage (3 to 4 Volts Diode) allows today

<Desc/Clms Page number 2>

to consider their use in particular grouped in place of lighting classic (incandescent, fluorescent and neon) their life span is approximately 150. 000 hours.

However, the peculiarity of these light-emitting diodes high brightness, is that the more brightness, the greater the beam of light is narrow (6 to 10 degrees angle) and limited by the structure of the same electronic component.

The beam of light emitted is very strong in distance (about fifty meters) with an angle of illumination very narrow (6 to 10 degrees), rather than a spread of light spread claimed in a traditional lighting (30 to 360 degrees d 'angle).

In this state of the art this type of diode could be used and replaced the traditional means of lighting, domestic, industrial or urban, without considering beforehand the transformation of the light emitted spot, using devices to redirect, spread and equalize the light according to various angles imposed by the needs of "lighting the most common.

Once this development done, lighting obtained through these light-emitting diodes will be 20 to 50 times more energy efficient (an average of 6 watts instead of 150 Watts) and a life span 15 times greater a traditional lighting (150. 000 hours instead de10. 000 hours).

The purpose of the invention was therefore to draw up specifications and resolve technical problems related to the development of that light emitting diode (LED) including: 1) To apportion through optical devices simple and responsive rays of light punctual and directional from these LEDs grouped according to a variable, depending on their light output in order to obtain a light redirected and equalized.

2) To consider several optical systems division of light in relation to the angle of illumination and radiation desired domestic applications in industrial and urban areas the most common.

3) Develop systems of electronic linkage of these LEDs when they are grouped to form lamps or lighting ramps with their connections or connections.

<Desc/Clms Page number 3>

4) To implement this device in an infrastructure compatible congestion and aesthetic, with the commercialization of a concept intended mainly to markets lighting and marking, with the basic technique of using light-emitting diodes .

5) Develop an electronic device is powered by electricity sector alternative converted into direct current, or through self-renewable energy sources including lighting formed by LED, and the system capture and storage " natural energy (solar, wind ...), the generator, the regulator tensionfiltrée, the battery cell and command-day night.

Once solved the problems described above, the most notable advantages of the device are: - its low energy consumption and its high light output - its lifetime of lighting (environ150.000 hours), it possibilHé ensure its dependence on energy supply without electricity network - its diversity of applications by its operation based electronics combined with the property-emitting diodes, (flashing, remote control).

The invention therefore intended to provide solutions to the specifications and constituted the first to the fifth point described above.

The invention is therefore a dispositifd "lighting using the properties of light emitting diodes (LED) to very bright, very energy efficient, whose source of directional light emitted according to an acute angle, is redirected, spread and filtered by one or more pieces Optical made of a transparent material, thus allowing the lighting or marking down voltage is using the alternating electrical current turned down curtain fool with devices autonomous electricity supply based on uptake , Regulation and storage of natural solar energy or wind power.

According to a first characteristic invention involves (Plate 1 / 9 Figure 1 and plate 4 / 9 Figures 4 and 5), a tight lid (16) which contains a box (7) or plastic insulation, assembled by 4 screws (13) a piece optical (1), the printed circuit board (10) east iui-mme assembled by 4 rods (17) in solidarity with housing (7).

On the printed circuit board (10) are welded one or several rows of light-emitting diodes, or LED (5) positioned in the axis (A) and perpendicular to the

<Desc/Clms Page number 4>

housing optical concave (2) facing them, practiced by machining or grinding a piece optical (1) not according to a regular or irregular (X) millimetres, whose details and

machining profiles are described in the fourth characteristic.

The play optical (1) is made in a transparent material with a refractive index equal to that of glass, preferably plastic transparent or tinted transparent or in some cases diffuse (acrylic glass marks Altuglas R Plexiglas, R Perspex R), housing concave optical (2) charged into the room Optical (1) are polished and transparent.

The printed circuit board (10), is powered by electric current in the wire feeding (15) connected to a feeding preferably located outside of the device includes a voltage transformer whose adjusted regulated and filtered, can deliver the tension necessary for the proper feeding of LED (5) preferably enbas-voltage, (3, 6.9, 12.24 or 48 volts) or high voltage (110 volts ou220).

According to a second characteristic of the invention (plate 2 / 9, Figure 2) box (7) or plastic insulation, assembled by 4 screws (13) the optical piece (1) contains the printed circuit board (10) before pierced with holes corresponding to 4 axes of 4 stems (17) in solidarity with housing (7) so as to let slide with a low Thursday, the printed circuit board (10) bearing the LED (5) and delivered on mobile 4 stalks (17).

The screw micrometer endless (12) acting through its thread (6a) on the nut (6) solidarity with the printed circuit board (10) bearing the LED (5), allows a screw or unscrewing the screw micrometer endless (12) leading in a hole (11) performed in the play optical (1), to vary the focal length between the LED (5) and housing optical concave (2) of the optical piece (1) and consequently to vary according to lighting requirements, the angle of illumination (F) and obtained.

LEDs are positioned in the axis (A) and perpendicular to the optical housing concave (2) facing them, practiced in the play optical (1) not according to a regular or irregular (X) millimetres, whose details and profiles of 'machining are described in the fourth characteristic.

The play optical (1) is made in a transparent material with a refractive index equal to that of glass, preferably plastic transparent or tinted transparent or in some cases diffuse (acrylic glass marks Altuglas R Plexiglas, R PerspexR), Housing concave optical (2) are polished and transparent.

The electricity supply is made under the same conditions as in the first characteristic,

<Desc/Clms Page number 5>

A third characteristic of the invention (Plate

3 / 9, figure 3) box (7) or plastic insulation, assembled by 4 screws (13) the optical piece (1) contains the printed circuit board (10) set 4 on stems (17) in solidarity with bordier (7).

The screw micrometer endless (12) acting through its thread (6a) on the nut (6) inserted into a piece optical mobile (4) with accommodation optical concave (3), first breakthrough of 4 holes corresponding to the lines of 4 stems (17) allows a screw or unscrewing the screw micrometer endless (12) leading into a hole (11) performed in the play optical (1), to vary the focal length between the LED (5) and the play optical mobile (4), mme in the opposite direction focal distance between the optical piece mobile (4) and optical coin sets (1) and consequently to vary the angle of illumination (F) and obtained by the fixed position of LED (5) depending on the position of housing Optic concave (2) and (3) optical parts (1) and (4).

LEDs are positioned in the axis (A) and perpendicular to the optical housing concave (2) and (3) facing them, practiced in parts fixed optical (1) and mobile (4), not according to a regular or irregular (X) millimetres, whose details and machining profiles are described in the fourth characteristic.

The play optical (1) and the optical piece mobile (4) are made in a transparent material with a refractive index equal to that of glass, preferably plastic transparent or tinted transparent or in some cases diffuse (including glass acrylic brands Altuglas R Plexiglas, R Perspex R), housing concave optical (2) and (3) are polished and transparent.

The electricity supply is made under the same conditions as in the first characteristic.

According to a fourth characteristic of the invention (planks 3 / 9, 4 / 9 and 5 / 9) housing optical concave (2) and (3) polished and transparent optical parts fixed (1) or mobile (4) (Figure 3), as the case may involve different profiles machining or molding a hollow holding the half-sphere or polyhedron (Figures 6.7 and 8), not according to a regular or irregular (X) mm, symmetrical step placements LED (5) (Fig. 7), with a concave profile spherical (20), or a concave profile triangular outtrapézoïdal (21), The housing optical concave (2) and (3) can be machined or cast in one of previous profiles with an inclination angle of a determined (22), the axis positioning (A) LED (5) is then inclined at the same angle (figure8) to always focus directional light emitted by the LED (5) in the axis (A) housing optical concave (2) forming a beam of light expanded at an angle (F) variable based on profiles and diameters

machining or molding used for housing optical concave (2) and

According to a fifth characteristic of the invention (plank 5 / 9 Figures 6.7 and 8 and plate 3 / 9, figure 3), machined flat face of the coin fixed optical (1), except for housing optical concave (2) is either frosted or revtue adhering to a painting or a screen substantive forming decor (19) (Figures 7 et 8), is covered with a thin plate intermediate (19a) (Fig. 6), of revtue identically and breakthrough in the same symmetry not that housing optical concave (2) of the optical piece (1) left in the latter case totally transparent.

These three solutions thus excluding any vision of printed circuit board (10) bearing the LED (5), only housing optical concave (2) remain free, polite and transparent to allow light diffracter freely after directional LED (5), through each housing optical concave (2) of the optical piece (1).

According to a sixth feature of the invention (plank 6 / 9, 9 and figure plank 7 / 9, figure 10) a device, contained by a series of lighting on the mast, assembles through the tight lid (16) one lighting systems LED described the first to the fifth feature (Fig. 9), with a solar collector (23) protected by a transparent optical piece (14) used to capture and diffraction of sunlight, set up in transparent plastic identical to that used for optical parts (1) or (4), whose face (24), opposed the solar collector (23) is not machined to solar cells, with milling or casting a hollow and continuous polished, triangular-shaped or rounded (25) at an angle (G) at least open ≈ 45 from the horizontal, to redirect sunlight to the face of the sensor (23) to the maximum advantage of the properties of diffraction sunlight (L) in the transparent part (14) and transformed, whatever the orientation sensor (23) compared to the position of the sun.

As described by the board 7 / 9 (figure 10), solar (23) to recharge electric current low-voltage, through the regulator (26), accumulator (27) provided sufficient capacity to amperage to power LED (5) during night, triggering the cell twilight (28).

According to a seventh feature of the invention (plank 8 / 9 figure 11), a device, contained a set here on lighting mast, assembles through the tight lid (16) one of lighting systems described LED from first to fifth characteristic.

An air turbine several unaiternateur (29) to recharge electric current low-voltage, through the regulator (30), accumulator (27) provided

sufficient capacity to amperage to power LED (5) during night-time by triggering the cell twilight (28).

<Desc/Clms Page number 7>

According to an eighth feature of the invention (plank 9 / 9 figure 12), a device contained by a series of lighting on the mast, assembles through the tight lid (16) one of lighting systems described LED from first to fifth characteristic.

The device included in this case the coupling of the two systems described by the sixth and seventh feature with one hand feeding lighting through the solar collector (23) and partly through the addition of the turbine Air solidarity del'aRernsteur (29) to recharge electric current to low-voltage, through regulators (26) and (30), accumulator (27) provided sufficient capacity to amperage to power LED (5) during night, triggering the cell twilight (28).

As examples of accomplishments, the invention is particularly useful in the design and manufacture lighting of all types, independent or otherwise, especially in public lighting, industrial or domestic replacement lamps for lighting traditional, given their very low electric power consumption and high lifetime compared, and whenever it is desirable to use an autonomous power supply, especially when it is not possible or economically technically create a line connecting the electricity grid.

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Translate Text

Original text:

Claims of WO 03044870 (A1)

REVENDEICATIONS 1 Dispositif d'éclairage utilisant les propriétés de diodes électroluminescentes ou LED, à grande luminosité, très économes en énergie, caractérisé en ce que le dispositif (planche 3/9, figure 3) est constitué d'un circuit imprimé (10) portant les LED soudées (5), solidaire par 4 tiges (17) du boîtier (7), en matière plastique ou isolante, assemblé par 4 vis (13) à la pièce optique (1) et au couvercle étanche (16) qui assure la protection de l'ensemble.

La vis micrométrique sans fin (12) agit par son filetage (6a) sur l'écrou (6) inséré dans une seconde pièce optique mobile (4), préalablement percée de 4 trous correspondants aux axes des 4 tiges (17) permet en vissant ou dévissant la vis micrométrique sans fin (12) débouchant dans un trou (11) pratiqué dans la pièce optique (1), de faire varier la distance focale entre les LED (5) et la pièce optique mobile (4), de mme en sens inverse la distance focale entre la pièce optique mobile (4) et la pièce optique fixe (1) et par conséquence de faire varier l'angle d'éclairage (F) ainsi obtenu par la position fixe des LED (5) en fonction de la position des logements optiques concaves (2) et (3).

Les LED sont positionnées dans l'axe (A) et perpendiculaires aux logements optiques concaves (2) et (3) leur faisant face, pratiqués dans les pièces optique fixe (1) et

Translation: French » English

Claims of WO 03044870 (A1)

CLAIMS 1 device'éclairage using the properties of light-emitting diodes, or LEDs, high brightness, highly energy efficient, wherein the device (layer 3 / 9, Figure 3) consists of a printed circuit (10) bearing welded LED (5), united by 4 rods (17) Housing (7), plastic or insulation, assembled by 4 screws (13) to the optical piece (1) and tight cover (16) which ensures protection of all.

The endless micrometer screw (12) working through his threads (6a) on the nut (6) inserted into a second piece moving optical (4), previously breakthrough 4 holes corresponding to the lines of 4-pin (17) allows screwing unscrewing the screw or micrometer endless (12) leading into a hole (11) practiced in the room Optical (1), to vary the focal distance between the LED (5) and the play moving optical (4), even in Conversely the focal distance between the moving optical piece (4) and fixed optical piece (1) and consequently to vary the angle of illumination (F) and obtained by the fixed position of LED (5) according to the position housing optiques concave (2) and (3).

LEDs are positioned in the axis (A) and perpendicular to the optical concave housing (2) and (3) facing them, practiced in fixed optical parts (1) and mobile (4), according to a not regular or irregular (X) mm.

The optical piece (1) and the play moving optical (4) are made in a transparent material.

The printed circuit board (10) is

supplied with electricity by wire feeding (15) connected to a power preferably located outside the device includes a voltage transformer which rebounded regulated and filtered, can deliver the voltage necessary the proper feeding of LED (5) preferably in low-voltage (3.6, 9.12, 24 or 48 volts) or high voltage (110 or 220 volts).

The device can be powered either by the electricity sector is independently by wind or solar device of "lighting using the properties of light-emitting diodes, or LEDs, high brightness, highly energy efficient, according to claim 1 that the device (layer 2 / 9, Figure 2) consists of printed circuit (10) previously drilled 4 holes corresponding to the lines of 4-pin (17) supportive Housing (7) so as to let slide with a weak Thursday , The printed circuit board (10) on the LED (5) Summary and moving the axes of the 4-pin (17) Housing (7), assembled by 4 screws (13) to the optical piece (1).

The endless micrometer screw (12) acting through its threads (6a) on the nut (6) attached to the printed circuit board (10) on the LED (5), allows screwing or unscrewing the screw micrometer endless (12) leading in a hole (11) practiced in the room

Optical (1), to vary the focal distance between the LED (5) brought by the PCB (10) and housing optical concave (2) of the optical piece (1) and consequently to vary depending on the needs of lighting, the angle of illumination (F) thus obtained.

Disposition of "lighting using the properties of light-emitting diodes, or LED brightness, very energy efficient, according to claim 1, wherein the device (plate 1 / 9, Figure 1), consists of the printed circuit board (10) On the LED (5) set

at a distance determined using 4-pin (17) on the casing (7) assembled by 4 screws (13) to the optical piece (1).

4. 'Éclairage Device using the properties of light-emitting diodes, or LEDs, high brightness, highly energy efficient, according to claims 1,2 and 3 (planks 6 / 9 and 7 / 9), wherein the device, (Figure 9 and Figure 10) set by a lighting pole, assemble using the tight cover (16) is one of LED lighting (Figures 1.2 and 3), with a solar collector (23) Protected by a transparent optical piece (14) for the capture and diffraction of sunlight, set up in transparent plastic identical to that used for optical parts (1) or (4), whose face (24) opposite the solar collector (23) is not machined to solar cells, with milling or casting hollow continuous forms or arrondie triangular (25) polished at an angle (G) be open to 45 compared to the horizontal, to redirect sunlight to the front of the sensor (23) to make the most of the properties of diffraction of sunlight in the room and turned transparent, whatever the orientation sensor (23) compared to the position the sun.

The solar collector (23), (Fig. 10), recharging of electric power low-voltage through the regulator (26), accumulator (27) provided sufficient capacity in amperage to power LED (5) during night-time, by triggering the cell twilight (28).

5. Disposition of "lighting using the properties of light-emitting diodes, or LEDs, high brightness, highly energy efficient, according to claims 1,2 and 3 (plate 8 / 9), wherein the device (Fig. 11) listed here a light pole, assemble using the tight cover (16), one of the lighting systems LED (Figures 1.2 and 3).

An air turbine generator embedded in a (29) recharging of electric power low-voltage through the regulator (30),

accumulator (27) provided sufficient capacity in amperage to power LED (5) during night-time by triggering the cell twilight (28).

6. Disposition of "éclairage using the properties of light-emitting diodes, or LEDs, high brightness, highly energy efficient, according to claims 1.2 and 3 wherein the device (plate 9 / 9, Figure 12), shown here all lighting pole, assemble using the tight cover (16), one of the lighting systems LED (Figures 1.2 and 3) In this case the power to the lighting made in the After using the solar collector (23) and adding through the air turbine built into the alternator (29) to recharge, or all simultaneously, electric current low-voltage, through regulators (26) and (30), accumulator (27) provided sufficient capacity in amperage to power LED (5) during night by triggering the cell twilight (28).

7. Disposition of "lighting using the properties of light-emitting diodes, or LEDs, high brightness, highly energy efficient, according to claims 1 to 6 (plates 1 / 9 to 9 / 9), wherein the optical parts (1), (4) and (14) are made in a transparent material with a refractive index equal to that of glass, preferably plastic transparent or tinted transparent or in some cases diffuse (the acrylic glass marks Altuglas Plexiglas R, R Perspex R) and the housing concave optical (2), (3) and (25) are polished and transparent.

8. Disposition of "lighting using the properties of light-emitting diodes, or LEDs, high brightness, highly energy efficient, according to claims 1 to 7 (plate 1 / 9, 3 / 9, 4 / 9 and 5 / 9) wherein, Housing optical concave (2) and (3) polite, fixed optical parts (1) or mobile (4) (Figure 3), may have different profiles machining or casting hollow

light of the half-sphere or the polyhedron (Figure 6.7 and 8), LEDs are positioned in the axis (A) and perpendicular to the optical concave housing (2) and (3) facing them, practiced in fixed optical parts (1) and mobile (4), according to a not regular or irregular (X) millimeters, according to not Spherical a concave profile (20) or concave profile triangular or trapezoidal (21), or by one of the profiles previous inclined at an angle determined (22) (Figure 6 , 7 and 8).

The axis positioning (A) LED (5) is inclined at the same angle determined (Fig. 8), to always focus the light emitted by the directional LED (5) in the axis (A) housing optical concave (2) and (3) forming an expanded beam of light at an angle (F) varies based on profiles and diameters machining or molding used for housing optical concave (2) (Figure 6.7 and 8). i, DisposHif of 'éclairage uRilisant the properties of light-emitting diodes, or LEDs, high brightness, highly energy efficient, according to claims 1 to 7

(plate 5 / 9 Figures 6, 7 and 8), wherein the flat face of the workpiece machined optics (1), except for housing optical concave (2), is either frosted or revtue d a plastic paint adhering to a screen or background scenery forming (19) is covered with an intermediate thin plate (19a) revtue same way and breakthrough in symmetry to not even Optical that housing concave (2) of the coin Optical (1) left in the latter case transparent.

These three options exclude any vision of printed circuit (10) on the LED (5), only the optical concave housing (2) remain free, transparent and polished to leave freely diffract light directional (L) after LED (5), Through each optical concave housing (

2) of the optical piece (1).

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PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:
 BURR & BROWN
 Attn. Brown, Kevin C
 P.O. Box 7068
 Syracuse, NY 13261
 ETATS-UNIS D'AMERIQUE

RECEIVED
OCT 20 2008
BURR & BROWN

NOTIFICATION OF TRANSMITTAL OF
 THE INTERNATIONAL SEARCH REPORT AND
 THE WRITTEN OPINION OF THE INTERNATIONAL
 SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference 931/074. WO	Date of mailing (day/month/year) 14/10/2008 ✓✓
International application No. PCT/US2008/070132	International filing date (day/month/year) 16/07/2008
Applicant CREE LED LIGHTING SOLUTIONS, INC.	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:
 The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes
 1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 338.82.70

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to the protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.
☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90*bis*.1 and 90*bis*.3, respectively, before the completion of the technical preparations for international publication.

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

Name and mailing address of the International Searching Authority European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Eliane Maier
--	------------------------------------

Form PCT/ISA/220 (October 2005)

(See notes on accompanying sheet)

NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the *PCT Applicant's Guide*, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions, respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report and the written opinion of the international Searching Authority, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only (see *PCT Applicant's Guide*, Volume I/A, Annexes B1 and B2).

The attention of the applicant is drawn to the fact that amendments to the claims under Article 19 are not allowed where the international Searching Authority has declared, under Article 17(2), that no international search report would be established (see *PCT Applicant's Guide*, Volume I/A, paragraph 296).

What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

NOTES TO FORM PCT/ISA/220 (continued)

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

"Statement under article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

It must be in the language in which the international application is to be published.

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments and any accompanying statement, under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the time of filing the amendments (and any statement) with the International Bureau, also file with the International Preliminary Examining Authority a copy of such amendments (and of any statement) and, where required, a translation of such amendments for the procedure before that Authority (see Rules 55.3(a) and 62.2, first sentence). For further information, see the Notes to the demand form (PCT/IPEA/401).

If a demand for international preliminary examination is made, the written opinion of the International Searching Authority will, except in certain cases where the International Preliminary Examining Authority did not act as International Searching Authority and where it has notified the International Bureau under Rule 66.1bis(b), be considered to be a written opinion of the International Preliminary Examining Authority. If a demand is made, the applicant may submit to the International Preliminary Examining Authority a reply to the written opinion together, where appropriate, with amendments before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later (Rule 43bis.1(c)).

Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see the *PCT Applicant's Guide*, Volume II.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 931/074 WO	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/US2008/070132	International filing date (day/month/year) 16/07/2008	(Earliest) Priority Date (day/month/year) 17/07/2007
Applicant CREE LED LIGHTING SOLUTIONS, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed
☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☐ **Unity of invention is lacking** (see Box No III)

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant
☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant
☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 1

- ☒ as suggested by the applicant
☐ as selected by this Authority, because the applicant failed to suggest a figure
☐ as selected by this Authority, because this figure better characterizes the invention

b. ☐ none of the figures is to be published with the abstract

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2008/070132

A. CLASSIFICATION OF SUBJECT MATTER

INV. G02B1/10 G02B5/02 H01L33/00 F21K7/00

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)

G02B H01L F21K

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 practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/285332 A1 (GOON WOOL K [MY] ET AL) 21 December 2006 (2006-12-21) paragraph [0018] - paragraph [0021] page 2	1-53
X	WO 2007/026776 A (MITSUBISHI RAYON CO [JP]; KURACHI YOSHIYA [JP]; SUDA TETSUYA [JP]; ONO) 8 March 2007 (2007-03-08) figures 3a,3b	1-53
X	US 2007/008738 A1 (HAN BYUNG-WOONG [KR] ET AL) 11 January 2007 (2007-01-11) abstract; figure 5	1-53
X	US 2006/114569 A1 (CAPALDO KEVIN P [US] ET AL CAPALDO KEVIN PATRICK [US] ET AL) 1 June 2006 (2006-06-01) abstract; figure 2	1-53
	-/--	

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

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)

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

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

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

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.

G document member of the same patent family

Date of the actual completion of the international search

6 October 2008

Date of mailing of the international search report

14/10/2008

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Ward, Seamus

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2008/070132

G(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 05 100106 A (DAINIPPON PRINTING CO LTD) 23 April 1993 (1993-04-23) abstract; figures -----	1-53

1

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

page 2 of 2

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2008/070132

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2006285332 A1	21-12-2006	CN 1909258 A GB 2427754 A JP 2006352132 A KR 20060131640 A	07-02-2007 03-01-2007 28-12-2006 20-12-2006
WO 2007026776 A	08-03-2007	KR 20080042908 A	15-05-2008
US 2007008738 A1	11-01-2007	CN 1896777 A KR 20070007648 A	17-01-2007 16-01-2007
US 2006114569 A1	01-06-2006	NONE	
JP 5100106 A	23-04-1993	JP 3011802 B2	21-02-2000

Form PCT/ISA/210 (patent family annex) (April 2005)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2008/070132

International filing date (day/month/year)
16.07.2008

Priority date (day/month/year)
17.07.2007

International Patent Classification (IPC) or both national classification and IPC
INV. G02B1/10 G02B5/02 H01L33/00 F21K7/00

Applicant
CREE LED LIGHTING SOLUTIONS, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Date of completion of
this opinion

see form
PCT/ISA/210

Authorized Officer

Ward, Seamus

Telephone No. +49 89 2399-4707



**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2008/070132

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ on paper
 - ☐ in electronic form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in electronic form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
4. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2008/070132

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>8-53</u>
	No: Claims	<u>1-7</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-53</u>
Industrial applicability (IA)	Yes: Claims	<u>1-53</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. The following document is referred to in this communication:
D1: US2006285332

REMARK

2. It is noted that the term "optical feature" used in claim 1 would appear to have essentially no limiting effect. For example, the "optical feature" could be merely a smooth surface of the film opposite to the substrate. Thus claim 1 essentially amounts to a claim for a substrate having an optical film positioned on it. Needless to say, the number of novelty destroying documents for such a claim runs to (at least) several hundred thousand (for example, every coated lens, every interference filter). Furthermore, there appears to be nothing in the claims or the description which would give any further indication as to the intended form of the optical features or their function. As a result, the documents in the International Search Report inevitably represent a somewhat arbitrary selection, made on the basis that they show elements bearing some similarity to the elements schematically depicted in the figures of the present application.

INDEPENDENT CLAIM 1

- 3.1 The subject-matter of claim 1 is not new in the sense of Article 33(2) PCT. Document D1 discloses (fig 2, paragraphs [0018] - [0021]): an optical element, comprising: a substrate (230), said substrate being at least partially light-transmissive, said substrate comprising a contact surface (the upper surface), at least one optical film (240), said optical film being positioned on said contact surface of said substrate, said optical film comprising at least a first optical feature (figure 2). Claim 1 therefore lacks novelty (Article 33(2) PCT).
- 3.2 Similar objections could be made based on any of the other documents cited in the International Search Report as X.

REMAINING CLAIMS

4. The features of claims 2-7 can all be read onto D1, and hence these claims lack novelty (Article 33(2) PCT). The remaining claims appear to add only features known from the

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/US2008/070132

documents cited in the International Search Report or obvious to the skilled person, and therefore lacking inventive step (Article 33(3) PCT).

Possible steps after receipt of the international search report (ISR) and written opinion of the International Searching Authority (WO-ISA)

General information

For all international applications filed on or after 01/01/2004 the competent ISA will establish an ISR. It is accompanied by the WO-ISA. Unlike the former written opinion of the IPEA (Rule 66.2 PCT), the WO-ISA is not meant to be responded to, but to be taken into consideration for further procedural steps. This document explains about the possibilities.

Amending claims under Art. 19 PCT

Within 2 months after the date of mailing of the ISR and the WO-ISA the applicant may file amended claims under Art. 19 PCT directly with the International Bureau of WIPO. The PCT reform of 2004 did not change this procedure. For further information please see Rule 46 PCT as well as form PCT/ISA/220 and the corresponding Notes to form PCT/ISA/220.

Filing a demand for international preliminary examination

In principle, the WO-ISA will be considered as the written opinion of the IPEA. This should, in many cases, make it unnecessary to file a demand for international preliminary examination. If the applicant nevertheless wishes to file a demand this must be done before expiry of 3 months after the date of mailing of the ISR/ WO-ISA or 22 months after priority date, whichever expires later (Rule 54bis PCT). Amendments under Art. 34 PCT can be filed with the IPEA as before, normally at the same time as filing the demand (Rule 66.1 (b) PCT).

If a demand for international preliminary examination is filed and no comments/amendments have been received the WO-ISA will be transformed by the IPEA into an IPRP (International Preliminary Report on Patentability) which would merely reflect the content of the WO-ISA. The demand can still be withdrawn (Art. 37 PCT).

Filing informal comments

After receipt of the ISR/WO-ISA the applicant may file informal comments on the WO-ISA directly with the International Bureau of WIPO. These will be communicated to the designated Offices together with the IPRP (International Preliminary Report on Patentability) at 30 months from the priority date. Please also refer to the next box.

End of the international phase

At the end of the international phase the International Bureau of WIPO will transform the WO-ISA or, if a demand was filed, the written opinion of the IPEA into the IPRP, which will then be transmitted together with possible informal comments to the designated Offices. The IPRP replaces the former IPER (international preliminary examination report).

Relevant PCT Rules and more information

Rule 43 PCT, Rule 43bis PCT, Rule 44 PCT, Rule 44bis PCT, PCT Newsletter 12/2003, OJ 11/2003, OJ 12/2003

EUROPEAN PATENT OFFICE

Patent Abstracts of Japan

PUBLICATION NUMBER : 05100106
PUBLICATION DATE : 23-04-93

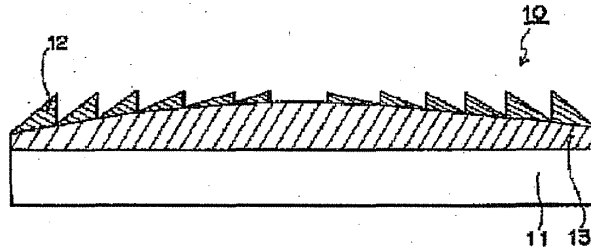
APPLICATION DATE : 08-10-91
APPLICATION NUMBER : 03289341

APPLICANT : DAINIPPON PRINTING CO LTD;

INVENTOR : HONDA MAKOTO;

INT.CL. : G02B 3/08 B29C 39/10 G02B 1/04
G02B 3/06 G03B 21/62 // B29L 11:00

TITLE : FRESNEL LENS SHEET AND
PRODUCTION THEREOF



ABSTRACT : PURPOSE: To improve a yield by reducing the consumption of costly UV resins, etc., enhancing productivity and ameliorating the adhesion defect to a transparent substrate by the deformation or strains of a lens by volumetric shrinkage on curing of the UV resin, etc.

CONSTITUTION: This Fresnel lens consists of the substantially transparent substrate 11, a Fresnel lens part 12 which is formed to a Fresnel lens shape by a UV and/or radiation curing type resin on the substrate and an intermediate resin layer 13 which is formed of the UV and/or radiation curing type resin between the substrate and the bottom of the Fresnel lens part to the thickness gradually decreasing from the central part toward the peripheral part.

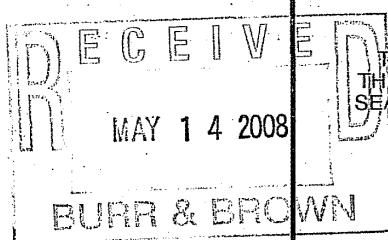
COPYRIGHT: (C)1993,JPO&Japio

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:
BURR & BROWN
Attn: Brown, Kevin C.
P.O.Box 7068
Syracuse, NY 13261
ETATS-UNIS D'AMERIQUE



NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference 931/024 WO ✓✓	Date of mailing (day/month/year) 08/05/2008
International application No. PCT/US2007/086237	International filing date (day/month/year) 03/12/2007
Applicant LED LIGHTING FIXTURES, INC.	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 338.82.70

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.
3. ☐ **With regard to the protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.
- ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

Name and mailing address of the International Searching Authority European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Josephus Wannee
--	---

NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the *PCT Applicant's Guide*, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions, respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report and the written opinion of the International Searching Authority, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only (see *PCT Applicant's Guide*, Volume I/A, Annexes B1 and B2).

The attention of the applicant is drawn to the fact that amendments to the claims under Article 19 are not allowed where the International Searching Authority has declared, under Article 17(2), that no international search report would be established (see *PCT Applicant's Guide*, Volume I/A, paragraph 296).

What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 931/024 WO	FOR FURTHER ACTION		see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US2007/086237	International filing date (day/month/year) 03/12/2007	(Earliest) Priority Date (day/month/year) 04/12/2006	
Applicant LED LIGHTING FIXTURES, INC.			

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 5 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the International application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☐ **Unity of invention is lacking** (see Box No III)

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant
- ☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☐ the text is approved as submitted by the applicant
- ☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 1

- ☒ as suggested by the applicant
- ☐ as selected by this Authority, because the applicant failed to suggest a figure
- ☐ as selected by this Authority, because this figure better characterizes the invention

b. ☐ none of the figures is to be published with the abstract

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2007/086237

Box No. IV Text of the abstract (Continuation of item 5 of the first sheet)

A lighting device which comprises at least a first solid state lighting device (16a,16b); and at least a first patterned diffuser (18) which comprises a plurality of optical features (23). If the first solid state lighting device is illuminated, at least some of the light emitted by the first solid state lighting device enters the first patterned diffuser and exits the patterned diffuser. In some embodiments, the patterned diffuser emits light in a specific shape (e.g., substantially square, rectangular, hexagonal or octagonal), in some embodiments, optical features are positioned on the first surface of the side of the first patterned diffuser that the emitted light enters. Also, a method of lighting which comprises illuminating one (or more) solid state lighting device which emits light which enters a patterned diffuser which comprises a plurality of optical features, and exits the patterned diffuser.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2007/086237

A. CLASSIFICATION OF SUBJECT MATTER

INV. F21V5/00
ADD. F21Y101/02

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)
F21V

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 practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 586 844 A (SOFRELA SA [FR]) 6 March 1987 (1987-03-06) page 1, line 31 - page 2, line 9 page 6, line 11 - line 34 page 7, line 9 - line 33 figures 4-8	1-17
X	EP 1 653 255 A (PENTAIR WATER POOL AND SPA INC [US]) 3 May 2006 (2006-05-03) paragraphs [0015], [0016], [0026] - [0028], [0031] - [0033] figures 2-5 ----- -/--	1-17

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *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)
- *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

- *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
- *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
- *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.
- *Z* document member of the same patent family

Date of the actual completion of the international search

28 April 2008

Date of mailing of the international search report

08/05/2008

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Cosnard, Denis

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2007/086237

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 477 436 A (BERTLING JOHANNES-GERHARD [DE] ET AL) 19 December 1995 (1995-12-19) column 2, line 55 - column 3, line 33 figures 1,2 -----	1-17
X	US 6 932 497 B1 (HUANG JEAN-SAN [TW]) 23 August 2005 (2005-08-23) abstract figures 2,6-8 -----	1,2, 7-10,17

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2007/086237

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
FR 2586844	A	06-03-1987	NONE	
EP 1653255	A	03-05-2006	CA 2524796 A1	29-04-2006
US 5477436	A	19-12-1995	DE 4228895 A1	03-03-1994
US 6932497	B1	23-08-2005	NONE	

Form PCT/ISA/210 (patent family annex) (April 2005)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2007/086237

International filing date (day/month/year)
03.12.2007

Priority date (day/month/year)
04.12.2006

International Patent Classification (IPC) or both national classification and IPC
INV. F21V5/00
ADD. F21Y101/02

Applicant
LED LIGHTING FIXTURES, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



European Patent Office - P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk - Pays Bas
Tel. +31 70 340 - 2040 Tx: 31 651 epo nl
Fax: +31 70 340 - 3016

Date of completion of
this opinion

see form
PCT/ISA/210

Authorized Officer

Cosnard, Denis

Telephone No. +31 70 340-3913



**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2007/086237

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ on paper
 - ☐ in electronic form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in electronic form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
4. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2007/086237

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>2,7,14,15.</u>
	No: Claims	<u>1,3-6,8-13,16, 17</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-17</u>
Industrial applicability (IA)	Yes: Claims	<u>1-17</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/US2007/086237

Re Item V.

1 Reference is made to the following documents:

- D1 : FR 2 586 844 A (SOFRELA SA [FR]) 6 March 1987
- D2 : EP 1 653 255 A (PENTAIR WATER POOL AND SPA INC [US]) 3 May 2006
- D3 : US 5 477 436 A (BERTLING JOHANNES-GERHARD [DE] ET AL) 19
December 1995
- D4 : US 6 932 497 B1 (HUANG JEAN-SAN [TW]) 23 August 2005

2 CLARITY

The application does not meet the requirements of Article 6 PCT, because claims 1-17 are not clear. The reasons are the following:

- 2.1 Claims 1-17 attempt to define the subject-matter in terms of result to be achieved (see terms "such that...so that...lighting device emits light..." or similar), which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result.
- 2.2 The relative term "patterned diffuser" used in the claims has no well-recognised meaning and leaves the reader in doubt as to the meaning of the technical features to which it refers, thereby rendering the definition of the subject-matter of said claims unclear, Article 6 PCT.

3 INDEPENDENT CLAIM 1

Furthermore, the above-mentioned lack of clarity notwithstanding, the subject-matter of claim 1 is not new in the sense of Article 33(2) PCT, and therefore the criteria of Article 33(1) PCT are not met.

- 3.1 Document D1 discloses (the references in parentheses applying to this document) a lighting device (see figure 4), comprising:
 - at least a first solid state lighting device (1); and

- at least a first patterned diffuser (25),
said first solid state lighting device being positioned relative to said first patterned diffuser (25) such that if said first solid state lighting device (1) is illuminated so that said first solid state lighting device (1) emits light, at least some of said light emitted by said first solid state lighting device (1) enters said first patterned diffuser (25) and exits said patterned diffuser (25), said patterned diffuser (25) comprising a plurality of optical features (see figure 7).

3.2 Therefore, the subject-matter of claim 1 is not new.

4 INDEPENDENT CLAIMS 10 AND 17

The same reasoning applies, *mutatis mutandis*, to the subject-matter of the corresponding independent claims 10 and 17, which therefore are also considered not novel.

5 DEPENDENT CLAIMS 2-9, 11-16

Dependent claims 2-9, 11-16 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step (Article 33(2) and (3) PCT).

Re Item VII

Certain defects in the international application

7.1 Independent claim 1 is not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3(b)(I) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).

7.2 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/US2007/086237

document identified therein.

- 7.3 The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

Possible steps after receipt of the international search report (ISR) and written opinion of the International Searching Authority (WO-ISA)

General information	For all international applications filed on or after 01/01/2004 the competent ISA will establish an ISR. It is accompanied by the WO-ISA. Unlike the former written opinion of the IPEA (Rule 66.2 PCT), the WO-ISA is not meant to be responded to, but to be taken into consideration for further procedural steps. This document explains about the possibilities.
Amending claims under Art. 19 PCT	Within 2 months after the date of mailing of the ISR and the WO-ISA the applicant may file amended claims under Art. 19 PCT directly with the International Bureau of WIPO. The PCT reform of 2004 did not change this procedure. For further information please see Rule 46 PCT as well as form PCT/ISA/220 and the corresponding Notes to form PCT/ISA/220.
Filing a demand for international preliminary examination	In principle, the WO-ISA will be considered as the written opinion of the IPEA. This should, in many cases, make it unnecessary to file a demand for international preliminary examination. If the applicant nevertheless wishes to file a demand this must be done before expiry of 3 months after the date of mailing of the ISR/ WO-ISA or 22 months after priority date, whichever expires later (Rule 54bis PCT). Amendments under Art. 34 PCT can be filed with the IPEA as before, normally at the same time as filing the demand (Rule 66.1 (b) PCT). If a demand for international preliminary examination is filed and no comments/amendments have been received the WO-ISA will be transformed by the IPEA into an IPRP (International Preliminary Report on Patentability) which would merely reflect the content of the WO-ISA. The demand can still be withdrawn (Art. 37 PCT).
Filing informal comments	After receipt of the ISR/WO-ISA the applicant may file informal comments on the WO-ISA directly with the International Bureau of WIPO. These will be communicated to the designated Offices together with the IPRP (International Preliminary Report on Patentability) at 30 months from the priority date. Please also refer to the next box.
End of the international phase	At the end of the international phase the International Bureau of WIPO will transform the WO-ISA or, if a demand was filed, the written opinion of the IPEA into the IPRP, which will then be transmitted together with possible informal comments to the designated Offices. The IPRP replaces the former IPEA (international preliminary examination report).
Relevant PCT Rules and more information	Rule 43 PCT, Rule 43bis PCT, Rule 44 PCT, Rule 44bis PCT, PCT Newsletter 12/2003, OJ 11/2003, OJ 12/2003

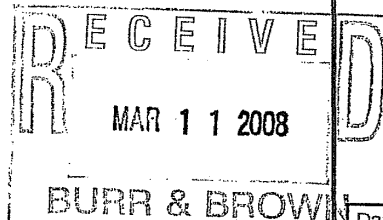
PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

BURR & BROWN
Attn. Brown, Kevin C.
P.O.Box 7068
Syracuse, NY 13261
ETATS-UNIS D'AMERIQUE



NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference 931/030 WO	Date of mailing (day/month/year) 04/03/2008 ✓✓
International application No. PCT/US2007/086242	International filing date (day/month/year) 03/12/2007
Applicant LED LIGHTING FIXTURES, INC.	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 338.82.70

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to the protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.
☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90*bis*.1 and 90*bis*.3, respectively, before the completion of the technical preparations for international publication.

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

Name and mailing address of the International Searching Authority European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Carolina Remiëns
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NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the *PCT Applicant's Guide*, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions, respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report and the written opinion of the International Searching Authority, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only (see *PCT Applicant's Guide*, Volume I/A, Annexes B1 and B2).

The attention of the applicant is drawn to the fact that amendments to the claims under Article 19 are not allowed where the International Searching Authority has declared, under Article 17(2), that no international search report would be established (see *PCT Applicant's Guide*, Volume I/A, paragraph 296).

What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 931/030 WO	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, Item 5 below.	
International application No. PCT/US2007/086242	International filing date (day/month/year) 03/12/2007	(Earliest) Priority Date (day/month/year) 04/12/2006
Applicant LED LIGHTING FIXTURES, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed
☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☐ **Unity of invention is lacking** (see Box No. III)

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant
☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant
☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 1

- ☒ as suggested by the applicant
☐ as selected by this Authority, because the applicant failed to suggest a figure
☐ as selected by this Authority, because this figure better characterizes the invention

b. ☐ none of the figures is to be published with the abstract

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2007/086242

A. CLASSIFICATION OF SUBJECT MATTER

INV. F21K7/00
ADD. F21Y101/02

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)

F21K F21V

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 practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 681 509 A (OMRON TATEISI ELECTRONICS CO [JP]) 19 July 2006 (2006-07-19) paragraphs [0051], [0052], [0068], [0102], [0130], [0133] figures 12,16,33,40,79,80 -----	1-32
X	FR 2 759 188 A (THERY HINDRICK [FR]) 7 August 1998 (1998-08-07) page 5, line 12 - page 6, line 18 figure 4 -----	1-32
X	FR 2 814 220 A (KOITO MFG CO LTD [JP]) 22 March 2002 (2002-03-22) page 6 - page 8 figures 1-3 -----	1-32
	----- -/--	

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

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)

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

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

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

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.

& document member of the same patent family

Date of the actual completion of the international search

25 February 2008

Date of mailing of the international search report

04/03/2008

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Cosnard, Denis

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2007/086242

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 330 111 B1 (MYERS KENNETH J [US]) 11 December 2001 (2001-12-11) column 5, line 2 - line 46 figures 1,4a,7	1-32
X	WO 03/044870 A (GEORGES MIREILLE [FR]; NOERDINGER CLAUDE [FR]) 30 May 2003 (2003-05-30) page 5, line 26 - line 39 figures 3,7	1-32

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2007/086242

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1681509	A	19-07-2006	JP 2006222413 A KR 20060083876 A US 2006158899 A1	24-08-2006 21-07-2006 20-07-2006
FR 2759188	A	07-08-1998	NONE	
FR 2814220	A	22-03-2002	DE 10145962 A1 JP 3839236 B2 JP 2002093212 A US 2002054495 A1	04-04-2002 01-11-2006 29-03-2002 09-05-2002
US 6330111	B1	11-12-2001	AU 6656301 A TW 518769 B WO 0196911 A1 US 6331915 B1	24-12-2001 21-01-2003 20-12-2001 18-12-2001
WO 03044870	A	30-05-2003	AU 2002222025 A1	10-06-2003

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

see form PCT/ISA/220

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2007/086242

International filing date (day/month/year)
03.12.2007

Priority date (day/month/year)
04.12.2006

International Patent Classification (IPC) or both national classification and IPC
INV. F21K7/00
ADD. F21Y101/02

Applicant
LED LIGHTING FIXTURES, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



European Patent Office - P.B. 5818 Patentlaag 2
NL-2280 HV Rijswijk - Pays Bas
Tel. +31 70 340 - 2040 Tx: 31 651 epo nl
Fax: +31 70 340 - 3016

Date of completion of
this opinion

see form
PCT/ISA/210

Authorized Officer

Cosnard, Denis

Telephone No. +31 70 340-3913



**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2007/086242

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ on paper
 - ☐ in electronic form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in electronic form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
4. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/US2007/086242

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	
	No: Claims	<u>1-32</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-32</u>
Industrial applicability (IA)	Yes: Claims	<u>1-32</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Re Item V

- 1 Reference is made to the following documents:

D1 : EP 1 681 509 A (OMRON TATEISI ELECTRONICS CO [JP]) 19 July 2006
D2 : FR 2 759 188 A (THERY HINDRICK [FR]) 7 August 1998
D3 : FR 2 814 220 A (KOITO MFG CO LTD [JP]) 22 March 2002
D4 : US 6 330 111 B1 (MYERS KENNETH J [US]) 11 December 2001
D5 : WO 03/044870 A (GEORGES MIREILLE [FR]; NOERDINGER CLAUDE [FR])
30 May 2003

- 2 CLARITY

The application does not meet the requirements of Article 6 PCT, because claims 1, 5, 9, 13, 17, 21, 25 and 29 are not clear. The reasons are the followings:

- 2.1 Claims 1, 5, 9, 13, 17, 21, 25 and 29 do not meet the requirements of Article 6 PCT in that the matter for which protection is sought is not clearly defined. The claims attempts to define the subject-matter in terms of the result to be achieved (see terms "each of ...the lighting devices is positioned relative to each other such that..." and "an illumination surface is positioned such that at least...), which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result.
- 2.2 The terms like "said illumination surface withing a first rectangular/square/hexagonal/octagonal area defined by ...segment" used in the independent claims are vague and unclear and leave the reader in doubt as to the meaning of the technical features to which they refer, thereby rendering the definition of the subject-matter of said claims unclear, Article 6 PCT. The geometrical objects (an illumination surface and polygons) have no technical meaning because they seem not to define or characterize features of the components (lighting device, patterned diffuser and optical features) of the lighting assembly.

- 3 INDEPENDENT CLAIM 1

- 3.1 Furthermore, the mentioned lack of clarity notwithstanding (see paragraph), the subject-matter of claim 1 is not new in the sense of Article 33(2) PCT, and therefore the criteria of Article 33(1) PCT are not met.

Document D1 discloses (the references in parentheses applying to this document) a lighting assembly comprising:

- at least first, second, third, fourth and fifth lighting devices, each of said first, second, third, fourth and fifth lighting devices (see ref. 21 in figures 78 and 79) comprising at least one patterned diffuser (see ref. 22 in figure 12), each of said patterned diffusers comprising a plurality of optical features (28s, 28t, 28u, 28v),

wherein each of said first, second, third, fourth and fifth lighting devices is positioned relative to each other such that if each of said first, second, third, fourth and fifth lighting devices is illuminated and an illumination surface is positioned such that at least a portion of light emitted from each of said first, second, third, fourth and fifth lighting devices travels in a direction substantially perpendicular to said illumination surface:

- (*) at least 75 percent of light emitted from said first lighting device will contact said illumination surface within a first rectangular area defined by a first line segment, a second line segment, a third line segment and a fourth line segment;
- (*) at least 75 percent of light emitted from said second lighting device will contact said illumination surface within a second rectangular area defined by said first line segment, a fifth line segment, a sixth line segment and a seventh line segment;
- (*) at least 75 percent of light emitted from said third lighting device will contact said illumination surface within a third rectangular area defined by said second line segment, an eighth line segment, a ninth line segment and a tenth line segment;
- (*) at least 75 percent of light emitted from said fourth lighting device will contact said illumination surface within a fourth rectangular area defined by said third line segment, an eleventh line segment, a twelfth line segment and a thirteenth line

segment;

- (*) at least 75 percent of light emitted from said fifth lighting device will contact said illumination surface within a fifth rectangular area defined by said fourth line segment, a fourteenth line segment, a fifteenth line segment and a sixteenth line segment.

Remarks : (*) The definition of the geometrical objects (illumination surface and the polygons) is so vague (see paragraph 2) that these elements are implicitly present in the lighting assembly disclosed in document D1.

3.2 Documents D2 to D5 show also all the features of claim 1.

3.3 Therefore, the subject-matter of claim 1 is not new.

4 INDEPENDENT CLAIMS 5, 9 AND 13

Moreover, documents D1-D5 disclose the features of these independent claims (as they can be understood, see paragraph 2). Therefore, the subject-matter of claims 5, 9 and 13 is not new.

5 INDEPENDENT CLAIMS 17, 21, 25 and 29

Independent claims 17, 21, 25 and 29 are method claims corresponding respectively to claims 1, 5, 9 and 13 and are therefore not new either.

6 DEPENDENT CLAIMS 2-4, 6-8, 10-12, 14-16, 18-20, 22-24, 26-28, 30-32

Dependent claims 2-4, 6-8, 10-12, 14-16, 18-20, 22-24, 26-28, 30-32 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step (Article 33(2) and (3) PCT), see the documents D1 to D5 and the passages in the search report.

Re Item VII

Certain defects in the international application

- 7.1 The features of the claims 1-32 are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).
- 7.2 Independent claim 1 is not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3(b)(I) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).
- 7.3 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.

Possible steps after receipt of the international search report (ISR) and written opinion of the International Searching Authority (WO-ISA)

General information	For all international applications filed on or after 01/01/2004 the competent ISA will establish an ISR. It is accompanied by the WO-ISA. Unlike the former written opinion of the IPEA (Rule 66.2 PCT), the WO-ISA is not meant to be responded to, but to be taken into consideration for further procedural steps. This document explains about the possibilities.
Amending claims under Art. 19 PCT	Within 2 months after the date of mailing of the ISR and the WO-ISA the applicant may file amended claims under Art. 19 PCT directly with the International Bureau of WIPO. The PCT reform of 2004 did not change this procedure. For further information please see Rule 46 PCT as well as form PCT/ISA/220 and the corresponding Notes to form PCT/ISA/220.
Filing a demand for international preliminary examination	In principle, the WO-ISA will be considered as the written opinion of the IPEA. This should, in many cases, make it unnecessary to file a demand for international preliminary examination. If the applicant nevertheless wishes to file a demand this must be done before expiry of 3 months after the date of mailing of the ISR/ WO-ISA or 22 months after priority date, whichever expires later (Rule 54bis PCT). Amendments under Art. 34 PCT can be filed with the IPEA as before, normally at the same time as filing the demand (Rule 66.1 (b) PCT). If a demand for international preliminary examination is filed and no comments/amendments have been received the WO-ISA will be transformed by the IPEA into an IPRP (International Preliminary Report on Patentability) which would merely reflect the content of the WO-ISA. The demand can still be withdrawn (Art. 37 PCT).
Filing informal comments	After receipt of the ISR/WO-ISA the applicant may file informal comments on the WO-ISA directly with the International Bureau of WIPO. These will be communicated to the designated Offices together with the IPRP (International Preliminary Report on Patentability) at 30 months from the priority date. Please also refer to the next box.
End of the international phase	At the end of the international phase the International Bureau of WIPO will transform the WO-ISA or, if a demand was filed, the written opinion of the IPEA into the IPRP, which will then be transmitted together with possible informal comments to the designated Offices. The IPRP replaces the former IPER (international preliminary examination report).
Relevant PCT Rules and more information	Rule 43 PCT, Rule 43bis PCT, Rule 44 PCT, Rule 44bis PCT, PCT Newsletter 12/2003, OJ 11/2003, OJ 12/2003

Electronic Acknowledgement Receipt	
EFS ID:	5190089
Application Number:	12045729
International Application Number:	
Confirmation Number:	9825
Title of Invention:	Apparatus and Methods for Multiplanar Optical Diffusers and Display Panels for Using the Same
First Named Inventor/Applicant Name:	John Roberts
Customer Number:	65106
Filer:	Timothy Jennings Wall/Paula Fisher
Filer Authorized By:	Timothy Jennings Wall
Attorney Docket Number:	5308-824
Receipt Date:	21-APR-2009
Filing Date:	11-MAR-2008
Time Stamp:	14:33:16
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
------------------------	----

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		5308-824_IDS_Transmittal_A.pdf	431539 9e99f22c9407174def912192c3be0c5afdb1c6cd	yes	4

	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Transmittal Letter		1	2	
	Information Disclosure Statement (IDS) Filed (SB/08)		3	4	
Warnings:					
Information:					
2	Foreign Reference	EP1681509.pdf	8758003	no	108
			dddec48e6c87c362227ff5e85a899d83dcd78a3e		
Warnings:					
Information:					
3	Foreign Reference	EP1653255.pdf	2093432	no	20
			423e46714c0831a14a69f8bc973484d1426c7121		
Warnings:					
Information:					
4	Foreign Reference	FR2814220.pdf	3352305	no	32
			220045e92a95bdd90cb58e102eb9ace9e11a34c4		
Warnings:					
Information:					
5	Foreign Reference	FR2759188_ref_with_Google_T ranslation.pdf	2092659	no	21
			a1bc9b32bebcf46394b9698a2e7eaff7600c20fc		
Warnings:					
Information:					
6	Foreign Reference	FR2586844_ref_abstract_and_ machine_translation.pdf	1904087	no	19
			4d1d896ac254178113a4c897dd3998c2674ec08f		
Warnings:					
Information:					
7	Foreign Reference	JP05100106_abstract_ref_and_ machine_translation.pdf	3464289	no	29
			4b11c209a77f00f2261f1318a8828cab87b9aa3a		
Warnings:					
Information:					
8	Foreign Reference	WO2007026776_and_Abstrac. pdf	7728002	no	74
			c7513b2eadd4f8b0b0a383e548dcf01407ece395		
Warnings:					
Information:					

9	Foreign Reference	WO0344870_ref_with_Google Translation.pdf	4732648 cb93d50de1b3a99f0ce3295b61b168dbf260822a	no	42
Warnings:					
Information:					
10	NPL Documents	ISR_and_Written_Opinion_070 132.pdf	1588155 b752dee3e11fde3c5eb155682eb433b006ae4296	no	14
Warnings:					
Information:					
11	NPL Documents	ISR_and_Written_Opinion_086 237.pdf	1462184 6384ecf9847bdb4972ed2a56ed9780683e041787	no	14
Warnings:					
Information:					
12	NPL Documents	International_Search_Report. pdf	1578919 e63e027dd69992630b1f78d4b7f64955e3cbeecca	no	14
Warnings:					
Information:					
Total Files Size (in bytes):			39186222		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

Attorney Docket No. 5308-824

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: John Roberts et al.
Application No.: 12/045,729
Filing Date: March 11, 2008

Confirmation No. 9825
Examiner: David C. Nelms
Group Art Unit: 2871

For: Apparatus and Methods for Multiplanar Optical Diffusers and Display Panels for Using the Same

Date: April 21, 2009

Mail Stop: Amendment
Commissioner for Patents
Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT TRANSMITTAL

Sir:

Attached is an Information Disclosure Statement listing of documents, together with a copy of any listed foreign patent document and/or non-patent literature. A copy of any listed U.S. patent and/or U.S. patent application publication is not provided herewith in accordance with 37 C.F.R. § 1.98(a)(2)(ii).

☒ In accordance with **37 CFR 1.97(b)**, the information disclosure statement is being filed:

- ☐ (1) within three months of the filing date of a national application other than a continued prosecution application under §1.53(d);
- ☐ (2) within three months of the date of entry of the national stage as set forth in §1.491 in an international application;
- ☒ (3) before the mailing of a first Office Action on the merits; or
- ☐ (4) before the mailing of a first Office Action after the filing of a request for continued examination under §1.114.

☐ In accordance with **37 CFR 1.97(c)**, the information disclosure statement is being filed after the period specified in 37 CFR 1.97(b) above, but before the mailing date of any of a final action under §1.113, a notice of allowance under §1.311, or an action that otherwise closes prosecution in the application, and is accompanied by **one** of the following:

☐ (1) The statement specified under **37 CFR 1.97(e)**, as follows:

☐ Each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; **or**

☐ No item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in §1.56(c) more than three months prior to the filing of the information disclosure statement; **or**

☐ (2) The fee set forth in §1.17(p);

☐ In accordance with **37 CFR 1.97(d)**, the information disclosure statement is being filed after the period specified in 37 CFR 1.97(c) above, but on or before payment of the issue fee, and is accompanied by **both** of the following:

☐ (1) The statement specified under **37 CFR 1.97(e)**, as follows:

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; **or**

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in §1.56(c) more than three months prior to the filing of the information disclosure statement; **and**

☐ (2) The fee set forth in §1.17(p);

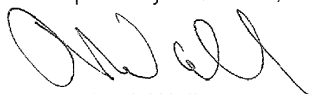
In accordance with **37 CFR 1.97(g)**, the information disclosure statement shall not be construed as a representation that a search has been made.

In accordance with **37 CFR 1.97(h)**, the information disclosure statement shall not be construed to be an admission that the information cited in the statement is, or is considered to be, material to patentability as defined in §1.56(b).

☐ The Director is hereby authorized to charge the fee specified in 37 C.F.R. § 1.17(p), and any fee deficiency or credit any overpayment, to Deposit Account No. 50-0220; **or**

☒ No fee is believed due. However, the Director is hereby authorized to charge any deficiency or credit any overpayment to Deposit Account No. 50-0220.

Respectfully submitted,



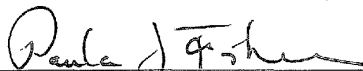
Timothy J. Wall
Registration No. 50,743
Attorney for Applicant(s)

Customer Number 65106

Myers Bigel Sibley & Sajovec, P.A.
P.O. Box 37428, Raleigh, NC 27627
919-854-1400
919-854-1401 (Fax)

CERTIFICATION OF TRANSMISSION

I hereby certify that this correspondence is being transmitted via the Office electronic filing system in accordance with § 1.6(a)(4) to the U.S. Patent and Trademark Office on April 21, 2009.



Name: Paula J. Fisher



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO.	TOT CLAIMS	IND CLAIMS
12/045,729	03/11/2008	2875	1160	5308-824	20	3

CONFIRMATION NO. 9825

UPDATED FILING RECEIPT



OC000000029224893

65106
MYERS BIGEL SIBLEY & SAJOVEC, P.A.
P.O. BOX 37428
RALEIGH, NC 27627

Date Mailed: 04/14/2008

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please write to the Office of Initial Patent Examination's Filing Receipt Corrections. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

John Roberts, Grand Rapids, MI;
Chenhua You, Cary, NC;

Assignment For Published Patent Application

Cree, Inc.

Power of Attorney: None

Domestic Priority data as claimed by applicant

Foreign Applications

If Required, Foreign Filing License Granted: 03/19/2008

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/045,729**

Projected Publication Date: 09/17/2009

Non-Publication Request: No

Early Publication Request: No

Title

Apparatus and Methods for Multiplanar Optical Diffusers and Display Panels for Using the Same

Preliminary Class

362

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

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For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

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NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/045,729	03/11/2008	John Roberts	5308-824

CONFIRMATION NO. 9825

65106
MYERS BIGEL SIBLEY & SAJOVEC, P.A.
P.O. BOX 37428
RALEIGH, NC27627

Date Mailed. 04/03/2008

NOTICE OF NEW OR REVISED PROJECTED PUBLICATION DATE

The above-identified application has a new or revised projected publication date. The current projected publication date for this application is 09/17/2009. If this is a new projected publication date (there was no previous projected publication date), the application has been cleared by Licensing & Review or a secrecy order has been rescinded and the application is now in the publication queue.

If this is a revised projected publication date (one that is different from a previously communicated projected publication date), the publication date has been revised due to processing delays in the USPTO or the abandonment and subsequent revival of an application. The application is anticipated to be published on a date that is more than six weeks different from the originally-projected publication date.

More detailed publication information is available through the private side of Patent Application Information Retrieval (PAIR) System. The direct link to access PAIR is currently <http://pair.uspto.gov>. Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Questions relating to this Notice should be directed to the Office of Patent Publication at 1-888-786-0101.

PART 1 - ATTORNEY/APPLICANT COPY

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: John Roberts et al.
Application No.: 12/045,729
Filed: March 11, 2008

Confirmation No.: 9825

For: APPARATUS AND METHODS FOR MULTIPLANAR OPTICAL DIFFUSERS
AND DISPLAY PANELS FOR USING THE SAME

Date: March 27, 2008

Mail Stop MISSING PARTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

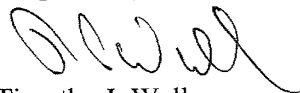
RESPONSE TO NOTICE TO FILE MISSING PARTS

Sir:

In response to the Notice to File Missing Parts of Application-Filing Date Granted (PTO-1533), mailed March 21, 2008 regarding the above-referenced patent application, enclosed is an executed Declaration and Power of Attorney document (4 pages) for this application.

A copy of the Notice and a check in the amount of \$130.00 for the surcharge under 37 C.F.R. § 1.16(f), is also enclosed. This amount is believed to be correct. However, the Commissioner is hereby authorized to charge any deficiency or credit any overpayment to Deposit Account No. 50-0220. If any extension of time for the accompanying response or submission is required, Applicant requests that this be considered a petition therefor.

Respectfully submitted,

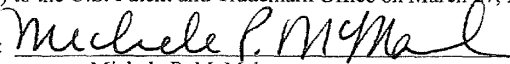


Timothy J. Wall
Registration No. 50,743

Myers Bigel Sibley & Sajovec, P.A.
P. O. Box 37428
Raleigh, North Carolina 27627
Telephone: (919) 854-1400
Facsimile: (919) 854-1401
Customer No. 65106

CERTIFICATION OF TRANSMISSION

I hereby certify that this correspondence is being transmitted via the Office electronic filing system in accordance with § 1.6(a)(4) to the U.S. Patent and Trademark Office on March 27, 2008.

Signature: 
Michele P. McMahan

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled "**APPARATUS AND METHODS FOR MULTIPLANAR OPTICAL DIFFUSERS AND DISPLAY PANELS FOR USING THE SAME,**" the specification of which

☐ is attached hereto

OR

☒ was filed on **March 11, 2008** as United States Application No. **12/045,729** or PCT International Application Number _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information that is material to patentability as defined in 37 C.F.R. § 1.56, including for continuation-in-part applications, material information that became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or (f), or § 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

NONE			☐ Yes ☐ No
Number	Country	MM/DD/YYYY Filed	Priority Claimed

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s) or § 365(c) of any PCT international application designating the United States of America, listed below.

Application No.	Filing Date	Status Patented/Pending/Abandoned

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following registered attorney(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

Send correspondence to:

Customer No. 65106

Timothy J. Wall
Myers Bigel Sibley & Sajovec, P.A.
P. O. Box 37428
Raleigh, North Carolina 27627

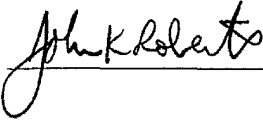
Direct telephone calls to:

Timothy J. Wall
(919) 854-1400

Facsimile:

(919) 854-1401

Full name of first inventor: **John Roberts**

Inventor's
Signature:  Date: 3/8/2008

Residence: Grand Rapids, Michigan

Citizenship: United States of America

Post Office Address: 1061 Plymouth Ave SE
Grand Rapids, MI 49506-6525

Full name of second inventor: **Chenhua You**

Inventor's
Signature: Chenhua You Date: 3/13/08

Residence: Cary, North Carolina

Citizenship: United States of America

Post Office Address: 209 Glebe Way
Cary, North Carolina 27519

Electronic Patent Application Fee Transmittal				
Application Number:		12045729		
Filing Date:		11-Mar-2008		
Title of Invention:		Apparatus and Methods for Multiplanar Optical Diffusers and Display Panels for Using the Same		
First Named Inventor/Applicant Name:		John Roberts		
Filer:		Timothy Jennings Wall/Michele McMahan		
Attorney Docket Number:		5308-824		
Filed as Large Entity				
Utility Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Late filing fee for oath or declaration	1051	1	130	130
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Total in USD (\$)				130

Electronic Acknowledgement Receipt

EFS ID:	3059868
Application Number:	12045729
International Application Number:	
Confirmation Number:	9825
Title of Invention:	Apparatus and Methods for Multiplanar Optical Diffusers and Display Panels for Using the Same
First Named Inventor/Applicant Name:	John Roberts
Customer Number:	65106
Filer:	Timothy Jennings Wall/Michele McMahan
Filer Authorized By:	Timothy Jennings Wall
Attorney Docket Number:	5308-824
Receipt Date:	27-MAR-2008
Filing Date:	11-MAR-2008
Time Stamp:	11:29:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$ 130
RAM confirmation Number	15678
Deposit Account	500220
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
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1		5308_824_MissingParts.pdf	253806 2941b0484ff5c6e2ba1a9364c00bbdf4a7b3563b	yes	5
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Applicant Response to Pre-Exam Formalities Notice		1	1	
	Oath or Declaration filed		2	5	
Warnings:					
Information:					
2	Fee Worksheet (PTO-06)	fee-info.pdf	8204 7ddb47b7d98a59e4ca1c6e473ab9ede4b5827d27	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			262010		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
12/045,729	03/11/2008	2875	1030	5308-824	20	3

CONFIRMATION NO. 9825

65106
MYERS BIGEL SIBLEY & SAJOVEC, P.A.
P.O. BOX 37428
RALEIGH, NC 27627

FILING RECEIPT



OC000000028939741

Date Mailed: 03/21/2008

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please write to the Office of Initial Patent Examination's Filing Receipt Corrections. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

John Roberts, Grand Rapids, MI;
Chenhua You, Cary, NC;

Assignment For Published Patent Application

Cree, Inc.

Power of Attorney: None

Domestic Priority data as claimed by applicant

Foreign Applications

If Required, Foreign Filing License Granted: 03/19/2008

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/045,729**

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No

Title

Apparatus and Methods for Multiplanar Optical Diffusers and Display Panels for Using the Same

Preliminary Class

362

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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LICENSE FOR FOREIGN FILING UNDER**Title 35, United States Code, Section 184****Title 37, Code of Federal Regulations, 5.11 & 5.15****GRANTED**

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

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NOT GRANTED

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UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/045,729	03/11/2008	John Roberts	5308-824

CONFIRMATION NO. 9825

65106
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FORMALITIES LETTER



Date Mailed: 03/21/2008

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The oath or declaration is missing.

A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.

Note: If a petition under 37 CFR 1.47 is being filed, an oath or declaration in compliance with 37 CFR 1.63 signed by all available joint inventors, or if no inventor is available by a party with sufficient proprietary interest, is required.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of **\$130** for a non-small entity, must be submitted with the missing items identified in this notice.

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is **\$130** for a non-small entity

- **\$130** Surcharge.

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/pwallace sr/

Office of Initial Patent Examination (571) 272-4000 or 1-800-PTO-9199

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

ATTY DOCKET NO.: 5308-824

DATE: March 11, 2008

**UTILITY PATENT APPLICATION TRANSMITTAL LETTER
AND FEE TRANSMITTAL FORM (37 CFR § 1.53(b)) FOR ELECTRONIC FILING**

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Sir:

Transmitted herewith for filing under 37 CFR § 1.53(b) is:

- ☒ a patent application
☐ a Continuation ☐ a Divisional ☐ a Continuation-in-Part (CIP) Application of
prior application no.: _____; filed _____, the disclosure of which
is incorporated herein by reference in its entirety.
☐ and claims the benefit of Provisional Application No. _____; filed _____.

Inventor(s) or Application Identifier: **John Roberts - Grand Rapids, Michigan**
Chenhua You - Cary, North Carolina

Entitled: **APPARATUS AND METHODS FOR MULTIPLANAR OPTICAL
DIFFUSERS AND DISPLAY PANELS FOR USING THE SAME**

Assignee: **Cree, Inc.**

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Attached (or filed concurrently herewith) are:

1. ☒ Application Transmittal Letter and Fee Transmittal Form.
2. ☒ 17 pages of Specification (including 20 claims)
3. ☒ 5 sheets of Formal Drawings (35 USC 113)
4. ☐ Oath or Declaration
 - a. ☐ newly executed (*copy*)
 - b. ☐ copy from prior application (37 CFR 1.63(d) (*for continuation/divisional*) [Note Box 6 Below]
 - c. ☐ DELETION OF INVENTOR(S) (*Signed statement deleting inventor(s) named in the prior application*)
5. ☐ Application Data Sheet. See 37 CFR 1.76
6. ☐ Incorporation By Reference (*useable if box 4b is checked*)

The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

7. ☐ Microfiche Computer Program (*Appendix*)
 8. ☐ Applicant claims small entity status. See 37 CFR § 1.27.
 9. ☐ Information Disclosure Statement, list of references, and non-US patent refs cited.
 10. ☐ Preliminary Amendment (*Please enter all claim amendments prior to calculating the filing fee.*)
 11. ☐ English Translation Document
 12. ☐ Certified Copy of _____ Application will follow by mail.
 13. ☐ Sequence Listing/ Sequence Listing Diskette will follow by mail.
 14. ☐ Deletion of Inventor(s) (Signed statement attached deleting inventor(s) name in the prior application. See 37 CFR 1.63(d)(2) and 1.33(b).)
 15. ☐ Nonpublication Request under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form.
 16. ☐ Other:

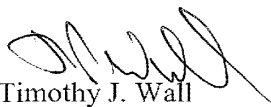
The fee has been calculated as shown below:

	Column 1 No. Filed	Column 2 No. Extra	Small Entity Rate Fee	Large Entity Rate Fee
TOTAL CLAIMS	20 - 20 =	0	* 25 = \$	* 50 = \$
INDEP CLAIMS	3 - 3 =	0	*105 = \$	*210 = \$0
FILING FEE			\$ 75.00	\$310.00
SEARCH FEE			\$255.00	\$510.00
EXAMINATION FEE			\$105.00	\$210.00
☐ MULTIPLE Dependent Claims Presented			+ 185 = \$	+ 370 = \$
☐ NON-ENGLISH SPECIFICATION			+ 130 = \$	+ 130 = \$
If the difference in Col. 1 is less than zero, Enter "0" in Col. 2			Total \$	Total \$1,030.00

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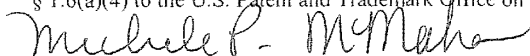
- ☒ Please charge my Deposit Account No. 50-0220 in the amount of **\$1,030.00**.
☒ The Commissioner is hereby authorized to credit overpayments or charge the appropriate fees associated with this communication to Deposit Account No. 50-0220:

Respectfully submitted,


 Timothy J. Wall
 Registration No. 50,743

CERTIFICATION OF TRANSMISSION

I hereby certify that this correspondence is being transmitted via the Office electronic filing system in accordance with § 1.6(a)(4) to the U.S. Patent and Trademark Office on March 11, 2008.


 Michele P. McMahan

**APPARATUS AND METHODS FOR MULTIPLANAR OPTICAL DIFFUSERS
AND DISPLAY PANELS FOR USING THE SAME**

FIELD OF THE INVENTION

[0001] The present invention relates to solid state lighting, and more particularly to tiles and/or panels including solid state lighting components.

BACKGROUND

[0002] Panel lighting devices are used for a number of lighting applications. A lighting panel may be used, for example, as a backlighting unit (BLU) for an LCD display. Backlighting units commonly rely on an arrangement of cold cathode fluorescent lamps (CCFL's) within a reflective enclosure. For example, referring to FIG. 1, which is a side view of a backlighting unit of the prior art, multiple CCFL's 1 can be arranged between a reflective surface 2 and an LCD panel 3. Light from the CCFL's 1 can be reflected from the reflective surface 2 and partially reflected from the inside surface of the LCD panel 3. A portion of the light directed to the LCD panel 3 can be transmitted to provide illumination for the LCD panel 3. The combination of the light directly transmitted to the LCD panel 3 from the CCFL's 1 and the reflected light from the various surfaces can create a relatively uniform backlighting unit. The CCFL's 3, however, can require higher than signal level voltages and can generate undesirable amounts of heat, which can be problematic to dissipate.

SUMMARY

[0003] A solid state lighting device according to some embodiments of the invention includes multiple solid state light emitters that are configured to emit light and a multiplane light diffuser including a first diffusion plane and a second diffusion plane that are separated by a gap. The multiplane light diffuser includes a first side that is configured to receive the light emitted from the solid state light emitters and a second side that is configured to transmit diffused light.

[0004] In some embodiments, the multiplane light diffuser includes a diffuser plate that includes the first side of the multiplane light diffuser and is positioned a first distance from the solid state light emitters. The diffuser plate is

configured to define the first diffusion plane. The diffuser further includes a diffuser sheet that includes the second side of the multiplane light diffuser and is positioned a second distance from the solid state light emitters. The diffuser sheet is configured to define the second diffusion plane and the first distance is less than the second distance. In some embodiments, the diffuser sheet includes a substantially transparent plate and a diffuser film supported by the substantially transparent plate. In some embodiments, the diffuser sheet includes a diffuser film, a brightness enhancing film, a polarizing film and a substantially clear plate configured to support the diffuser film, the brightness enhancing film, and the polarizing film.

[0005] Some embodiments may include multiple diffuser supports. In such embodiments, the diffuser supports may include a proximal end that is configured to be positioned proximate the solid state light emitters and a distal end that is configured to support the diffuser sheet. In some embodiments, the diffuser plate includes multiple diffuser plate holes that are configured to receive the diffuser supports.

[0006] In some embodiments, the diffuser supports include steps for supporting, at the first distance from the plurality of solid state light emitters, the diffuser plate via the plurality of holes. Some embodiments provide that the diffuser sheet includes a diffuser film and a substantially clear plate configured to receive the diffuser film.

[0007] In some embodiments, the solid state emitters include a third distance between adjacent ones of the plurality of solid state light emitters and the first distance is about one half the third distance. In some embodiments, the solid state emitters include a third distance between adjacent ones of the solid state light emitters and the second distance includes a distance in a range between the third distance and 1.5 times the third distance.

[0008] In some embodiments, the diffuser plate includes a scattering diffuser. Some embodiments provide that the diffuser plate includes a structured refractive diffuser. Some embodiments may include means for transmitting first diffused light from the first diffusion plane to the second diffusion plane.

[0009] In some embodiments, the multiplane light diffuser includes a first diffuser plate positioned at a first distance from the plurality of solid state emitters, a second diffuser plate positioned at a second distance from the plurality of solid state

emitters, and a diffuser sheet supported by the second diffuser plate such that the first distance is less than the second distance.

[0010] Some embodiments of the present invention may also include methods of providing diffused light. Some embodiments of such methods may include emitting light from multiple solid state light emitters arranged in a planar configuration, receiving the emitted light at a first side of a first diffusion plane that is a first distance from the solid state light emitters and transmitting first diffused light from a second side of the first diffusion plane. Methods according to some embodiments may include receiving the first diffused light from the first diffusion plane at a first side of a second diffusion plane that is a second distance from the solid state light emitters and transmitting second diffused light from a second side of the second diffusion plane.

[0011] In some embodiments, transmitting the first diffused light includes transmitting light from a diffuser plate and transmitting the second diffused light includes transmitting light from a diffuser sheet that is supported by a substantially transparent sheet.

[0012] In some embodiments, transmitting the first diffused light includes transmitting first diffused light from a first diffuser plate and transmitting the second diffused light includes transmitting second diffused light from a diffuser sheet that is supported by a second diffuser plate. In some embodiments, transmitting the first diffused light includes transmitting scattered diffusion light from a scattering diffuser plate. Some embodiments provide that transmitting the first diffused light includes transmitting the first diffused light from a structured refractive diffuser.

[0013] In some embodiments, the solid state light emitters include a third distance between adjacent ones of the solid state light emitters such that the first distance is about one half of the third distance, and the second distance includes a value in a range between substantially the third distance value and substantially 1.5 times the third distance value.

[0014] Some embodiments of the present invention include a display that includes a backlighting panel. In some embodiments, a backlighting panel may include multiple solid state light emitters arranged in a substantially planar configuration. A first diffusion plane is configured to receive light from the solid state light emitters and to transmit first diffused light. A second diffusion plane is configured to receive the first diffused light and to transmit second diffused light.

The panel includes multiple diffuser supports configured to support a first diffuser plane structure at a first distance from the solid state light emitters and to support a second diffuser plane structure at a second distance from the solid state light emitters, wherein the second distance is greater than the first distance. In some embodiments, the display may also include a LCD display panel that is configured to receive the second diffused light and selectively transmit received light as display content.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate certain embodiment(s) of the invention.

[0016] FIG. 1 is a side cross-sectional view of a CCFL backlighting panel as known in the prior art.

[0017] FIG. 2 is a side cross-sectional view of a display including a solid state lighting device in accordance with some embodiments of the invention.

[0018] FIG. 3 is a side cross-sectional view of a solid state lighting device in accordance with some embodiments of the invention.

[0019] FIG. 4 is a side cross-sectional view of a solid state lighting device in accordance with some embodiments of the invention.

[0020] FIGs. 5A-5D are side cross-sectional views of solid state lighting devices illustrating different diffuser supports in accordance with some embodiments of the invention.

[0021] FIGs. 6A-6B are side a cross-sectional view and a top view, respectively, of a structured refractive diffuser in accordance with some embodiments of the invention.

[0022] FIG. 7 is a block diagram illustrating operations for providing diffused light according to some embodiments of the invention.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0023] Embodiments of the present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be

thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

[0024] It will be understood that, although the terms first, second, etc. may be used herein to describe various elements, these elements should not be limited by these terms. These terms are only used to distinguish one element from another. For example, a first element could be termed a second element, and, similarly, a second element could be termed a first element, without departing from the scope of the present invention. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[0025] It will be understood that when an element such as a layer, region or substrate is referred to as being "on" or extending "onto" another element, it can be directly on or extend directly onto the other element or intervening elements may also be present. In contrast, when an element is referred to as being "directly on" or extending "directly onto" another element, there are no intervening elements present. It will also be understood that when an element is referred to as being "connected" or "coupled" to another element, it can be directly connected or coupled to the other element or intervening elements may be present. In contrast, when an element is referred to as being "directly connected" or "directly coupled" to another element, there are no intervening elements present.

[0026] Relative terms such as "below" or "above" or "upper" or "lower" or "horizontal" or "vertical" may be used herein to describe a relationship of one element, layer or region to another element, layer or region as illustrated in the figures. It will be understood that these terms are intended to encompass different orientations of the device in addition to the orientation depicted in the figures.

[0027] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" "comprising," "includes" and/or "including" when used herein, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0028] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. It will be further understood that terms used herein should be interpreted as having a meaning that is consistent with their meaning in the context of this specification and the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0029] Reference is now made to FIG. 2, which is a side cross-sectional view of a display 100 including a solid state lighting device in accordance with some embodiments of the invention. A display 100 includes a backlighting panel 110 configured to transmit diffused light 128 to an LCD display panel 102. The LCD display panel 102 is configured to selectively transmit the received diffused light 128 as display content 130.

[0030] The backlighting panel 110 may include multiple light emitters 112 arranged on an emission source support structure 114. In some embodiments and as illustrated in FIG. 2, the emission source support structure 114 may be substantially planar such that the multiple light emitters 112 are arranged in a substantially planar configuration.

[0031] In some embodiments, the light emitters 112 include, for example, solid state light emitting devices. Some embodiments provide solid state lighting devices that may include, for example, a packaged light emitting device including one or more light emitting diodes (LEDs). In some embodiments, light emitters 112 may include one or more LED emitter chips that are configured to emit light having one or more dominant wavelengths. In some embodiments, light emitters 112 may include white LED lamps that include a blue-emitting LED coated with a fluorescing compound that may modify the wavelength of at least some light that is emitted from the blue light emitting LED. In some embodiments, the fluorescing compound may include a wavelength conversion phosphor that converts some of the blue light emitted by the LED into yellow light. The resulting light, which is a combination of blue light and yellow light, may appear white to an observer.

[0032] The backlighting panel 110 may include a first diffusion plane 122 that is configured to receive light from the light emitters 112 and to transmit first diffused light 126. In some embodiments, the first diffusion plane 122 may include a diffuser plate. In some embodiments, the diffuser plate may be a simple scattering

diffuser such as a plate including a light filter color and/or pigment. In some embodiments, the diffuser plate may include a surface embossed diffuser, a louvered diffuser and/or a structured refractive diffuser, among others. The backlighting panel 110 may include one or more reflective structures and/or surfaces (not shown) that may be configured to recycle portions of emitted light that is not initially transmitted by the first diffusion plane 122.

[0033] The backlighting panel 110 may include a second diffusion plane 124 that is configured to receive the first diffused light from the first diffusion plane 122 and to transmit second diffused light 128 to the LCD display panel 102. In some embodiments, the second diffusion plane 124 may include a diffuser sheet that is positioned between the diffuser plate 122 and the LCD display panel 102. Some embodiments provide that the difference between the first distance and the second distance creates a gap between the first diffusion plane 122 and the second diffusion plane 124. In some embodiments, the gap may be determined as a function of a distance between adjacent ones of the light emitters 112.

[0034] Reference is now made to FIG. 3, which is a side cross-sectional view of a solid state lighting device in accordance with some embodiments of the invention. A solid state lighting device may include multiple solid-state light emitters 113 that may be supported by a support structure 114. In some embodiments, the support structure 114 includes a substantially planar geometry, however, embodiments described herein are not thus limited. For example, in some embodiments, the support structure 114 may include curved and/or curvilinear cross-sections in one or more directions. Accordingly, diffusion components that are illustrated as generally planar may include curved and/or curvilinear cross-sections in one or more directions that may be consistent with the support structure 114.

[0035] The solid state light emitters 113 may include one or more LED emitter chips that are configured to emit light having one or more dominant wavelengths. In some embodiments, solid-state light emitters 113 may include white LED lamps that include a blue-emitting LED coated with a fluorescing compound that may modify the wavelength of light that is emitted from the blue light emitting LED. In some embodiments, the fluorescing compound may include a wavelength conversion phosphor that converts some of the blue light emitted by the LED into yellow light. The resulting light, which is a combination of blue light and yellow light, may appear white to an observer.

[0036] In some embodiments, the solid state lighting device may include a multiplane light diffuser 120. A multiplane light diffuser 120 may be configured to receive light emitted from the solid state light emitters 113 into a first side 141 and transmit diffused light from a second side 143. In some embodiments, the multiplane light diffuser 120 may include a first diffusion plane that includes the first side 141 and a second diffusion plane that includes the second side 143, such that the first diffusion plane and the second diffusion plane are separated by a gap. In the case of a substantially non-planar arrangement of solid state light emitters 113, the multiplane light diffuser 120 may be more accurately termed a "multilayer" light diffuser since the diffusion components may not be limited to a planar configuration.

[0037] The first diffusion plane that includes the first side of the multiplane light diffuser may include a diffuser plate 140. The diffuser plate 140 may be positioned a first distance 147 from a surface defined by the solid state light emitters 113. The diffuser plate 140 may include a scattering diffuser. In some embodiments, a scattering diffuser may include a light filter and/or pigment. In some embodiments, a scattering diffuser may include an embossed surface. The diffuser plate 140 may include a structured refractive diffuser that may include multiple refractive structures arranged on one or more surfaces of the diffuser plate 140. In some embodiments, the diffuser plate 140 may be a polycarbonate and/or acrylic material and may include prismatic pillows and/or extrusions on one or both sides. Some embodiments provide that a structured refractive diffuser includes multiple crossed linear prismatic lenselets. In some embodiments, a pattern of lenselets, prismatic pillows and/or refractive structures may be arranged in a pitch of approximately $\frac{1}{2}$ to 2 times the pitch of the pattern of solid state light emitters 113.

[0038] The second diffusion plane that includes the second side of the multiplane light diffuser 120 may include a diffuser sheet 142. The diffuser sheet 142 may be positioned a second distance 148 from the surface defined by the solid state light emitters 113, such that the second distance 148 is greater than the first distance 147. The diffuser sheet 142 may be configured to receive light from the diffuser plate 140 and transmit light through the second surface 143 of the multiplane diffuser 120.

[0039] In some embodiments, the first distance 147 and the second distance 148 may be determined as a function of a third distance 149, which may be the distance between adjacent ones of the solid state light emitters 113. Some embodiments provide that the first distance 147 may be approximately $\frac{1}{2}$ the third

distance 149. In some embodiments, the second distance 148 may be in a range including and the third distance 149 and 1.5 times the third distance 149.

[0040] Reference is now made to FIG. 4, which is a side cross-sectional view of a solid state lighting device in accordance with some embodiments of the invention. The solid state lighting device may include multiple solid state light emitters 113, a support structure 114 and a multiplane diffuser 120 that includes a diffuser plate 140 and a diffuser sheet 142, as described above regarding FIG. 3. In some embodiments, the diffuser sheet 142 may include a substantially transparent plate 144 that is configured to support a diffuser film 146. In some embodiments, the diffuser sheet 142 may also include other films such as a prismatic brightness enhancing film (BEF) and/or a multilayer based reflective polarizer film (DBEF) (Not shown). Commercial examples of such films may include products such as those available under the name Vikuiti™, among others.

[0041] Reference is now made to FIGs. 5A-5D, which are side cross-sectional views of solid state lighting devices illustrating different diffuser supports in accordance with some embodiments of the invention. The solid state lighting device may include multiple solid state light emitters 113, a support structure 114 and a multiplane diffuser 120 that includes a diffuser plate 140 and a diffuser sheet 142, as described above regarding FIG. 3. In some embodiments, a solid state lighting device may include structural components that are configured to support the diffuser plate 140 and/or diffuser sheet 142. Referring to FIG. 5A, the solid state lighting device may include device housing sidewalls 150. Diffuser plate edge supports 152 may be attached to, supported by and/or integrally formed into one or more of the device housing sidewalls 150. In this manner, the edges of the diffuser plate 140 may be supported at the first distance 147 (FIG. 3) from the multiple solid-state light emitters 113. Diffuser sheet edge supports 154 may be attached to, supported by and/or integrally formed into one or more of the device housing sidewalls 150. In this manner, the edges of the diffuser sheet 142 may be supported at the second distance 148 (FIG. 3) from the multiple solid-state lighting emitters 113.

[0042] Referring now to FIG. 5B, the solid state lighting device may include multiple diffuser supports 164 that are configured to support the diffuser plate 140 via contact with, attachment to and/or mounting to the support structure 114. In some embodiments, the diffuser supports 164 may be supported by the support structure 114 and/or a device housing member (not shown) and be received by

multiple diffuser plate holes 162. In some embodiments, the diffuser supports 164 may be configured to include one or more gradient surfaces, such as, for example, in a wedge and/or cone shape, among others. In some embodiments, the first distance 147 (FIG. 3) may be controlled by varying the size of the diffuser plate holes 162. For example, in the circumstance when the diffuser supports 164 include a conical geometry, a diffuser plate 140 including smaller diffuser plate holes 162 would be positioned at a greater first distance 147 (FIG. 3) than a diffuser plate 140 including larger diffuser plate holes 162.

[0043] In some embodiments, the diffuser plate 140 may include diffuser plate holes 162 including more than one size such that the first distance 147 (FIG. 3) may be determined by the orientation of the diffuser plate 140 and/or the location of the diffuser supports 164. Stated differently, one set of diffuser plate holes 162 may be sized to position the diffuser plate 140 at a smaller first distance 147 (FIG. 3) than another set of diffuser plate holes 162. In this regard, the location of the diffuser supports 164 determines which set of diffuser plate holes 162 receive the diffuser supports 164. Thus a changing the locations of the diffuser supports 164, the first distance 147 (FIG. 3) may be determined.

[0044] In some embodiments, the diffuser sheet 142 may be supported by a housing side wall 150 and/or other type of structure to maintain the gap 160 between the diffuser plate 140 and the diffuser sheet 142.

[0045] Referring now to FIG. 5C, in some embodiments the diffuser supports 164 may be configured to support the diffuser plate 140 and the diffuser sheet 142. In some embodiments, the diffuser supports 164 may include a proximal end 164b that is configured to engage, contact, attach to, mount on, and/or be integrally formed in the support structure 114 and/or other device housing component. The diffuser supports 164 may include a distal end 164a that is configured to be received by the diffuser plate holes 162 and to support the diffuser sheet 142. In this regard, the distal end 164a may support the diffuser sheet 142 and a gradient surface on the diffuser support 164 may support the diffuser plate 140.

[0046] Referring now to FIG. 5D, the diffuser supports 164 may include diffuser plate support steps 170 that are configured to position the diffuser plate 140 at the first distance 147 (FIG. 3). In some embodiments, the support steps 170 may include a surface defined by a portion of greater diameter and/or cross-sectional size than the diffuser plate holes 162. In some embodiments, the support steps 170 may

include protrusions, such as wedge and/or tee structures, among others that are larger than the diameter and/or cross-section size of the diffuser plate holes 162, but do not extend to the proximal end 164b. The relative placement of the support steps 170 on the diffuser supports 164 may determine the first distance 147 (FIG. 3) and the overall length of the diffuser supports 164 may determine the second distance 148 (FIG. 3).

[0047] Reference is now made to FIGs. 6A-6B, which are side a cross-sectional view and a top view, respectively, of a structured refractive diffuser in accordance with some embodiments of the invention. Referring to FIG. 6A, a structured refractive diffuser plate 180 may include multiple refractive extrusions 182 that may be arranged in a pattern including rows and columns. The refractive extrusions 182 may include extrusion peaks 184 divided by extrusion grooves 186. In some embodiments, the extrusion peaks 184 may be formed to include a peak angle 185 in the range from 120° and 170°. The structured refractive diffuser plate 180 may be formed using materials including a polycarbonate material and/or an acrylic material, among others.

[0048] Referring to FIG. 6B, the refractive extrusions 182 may include, for example, a quadrilateral base and four extrusion facets 188 that are configured to converge at the extrusion peak 184. In some embodiments, the refractive extrusions 182 may be considered as crossed linear prismatic refractive lenselets. In some embodiments, the refractive extrusions 182 may be configured using other base shape geometries such as, for example, hexagonal, circular, elliptical, and/or octagonal, among others.

[0049] Reference is now made to FIG. 7, which is a block diagram illustrating operations for providing diffused light according to some embodiments of the invention. Light may be emitted from multiple solid state light emitters arranged in a substantially planar configuration (block 300). The emitted light may be received at a first side of a first diffusion plane that is at a first distance from the solid state light emitters (block 310).

[0050] First diffused light may be transmitted from a second side of the first diffusion plane (block 320). In some embodiments, the first diffused light may be transmitted from a diffuser plate. In some embodiments, transmitting the first diffused light includes transmitting scattered diffusion light from a scattering diffuser plate. In some embodiments, the first diffused light is transmitted from a structured refractive diffuser plate.

[0051] The first diffused light is received at a first side of a second diffusion plane that is a second distance from the solid state light emitters (block 330). In some embodiments, the second diffusion plane may include a diffuser sheet and/or film that is supported by substantially transparent sheet and/or plate. Second diffused light is transmitted from a second side of the second diffusion plane (block 340).

[0052] In some embodiments, the solid state light emitters are positioned such that adjacent ones of the solid state light emitters are a third distance from one another. In some embodiments, the first distance may be approximately $\frac{1}{2}$ of the third distance. In some embodiments, the second distance may be in a range including approximately 1.0 to 1.5 times the third distance value.

[0053] In the drawings and specification, there have been disclosed typical embodiments of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being set forth in the following claims.

That which is claimed is:

1. A solid state lighting device, comprising:
a plurality of solid state light emitters that are configured to emit light; and
a multiplane light diffuser including a first diffusion plane and a second diffusion plane that are separated by a gap, the multiplane light diffuser including first side that is configured to receive the light emitted from the plurality of solid state light emitters and a second side that is configured to transmit diffused light.
2. The device of Claim 1, wherein the multiplane light diffuser comprises:
a diffuser plate that includes the first side of the multiplane light diffuser and is positioned a first distance from the plurality of solid state light emitters, the diffuser plate configured to define the first diffusion plane; and
a diffuser sheet that includes the second side of the multiplane light diffuser and is positioned a second distance from the plurality of solid state light emitters, the diffuser sheet configured to define the second diffusion plane,
wherein the first distance is less than the second distance.
3. The device of Claim 2, wherein the diffuser sheet comprises:
a substantially transparent plate; and
a diffuser film supported by the substantially transparent plate.
4. The device of Claim 2, comprising a plurality of diffuser supports, wherein the diffuser supports comprise:
a proximal end that is configured to be positioned proximate the plurality of solid state light emitters; and
a distal end that is configured to support the diffuser sheet.
5. The device of Claim 4, wherein the diffuser plate comprises a plurality of diffuser plate holes that are configured to receive the plurality of diffuser supports.

6. The device of Claim 4, wherein the plurality of diffuser supports comprise steps for supporting, at the first distance from the plurality of solid state light emitters, the diffuser plate via the plurality of holes.

7. The device of Claim 2, wherein the diffuser sheet comprises a diffuser film, a brightness enhancing film, a polarizing film and a substantially clear plate configured to support the diffuser film, the brightness enhancing film, the polarizing film.

8. The device of Claim 2, wherein the plurality of solid state emitters comprise a third distance between adjacent ones of the plurality of solid state light emitters, and wherein the first distance comprises approximately one half the third distance.

9. The device of Claim 2, wherein the plurality of solid state emitters comprise a third distance between adjacent ones of the plurality of solid state light emitters, and wherein the second distance comprises a distance in a range between the third distance and 1.5 times the third distance.

10. The device of Claim 2, wherein the diffuser plate comprises a scattering diffuser.

11. The device of Claim 2, wherein the diffuser plate comprises a structured refractive diffuser.

12. The device of Claim 1, further comprising means for transmitting first diffused light from the first diffusion plane to the second diffusion plane.

13. The device of Claim 1, wherein the multiplane light diffuser comprises:

a first diffuser plate positioned at a first distance from the plurality of solid state emitters;

a second diffuser plate positioned at a second distance from the plurality of solid state emitters; and

a diffuser sheet supported by the second diffuser plate,
wherein the first distance is less than the second distance.

14. A method of providing diffused light comprising:
emitting light from a plurality of solid state light emitters arranged in a planar configuration;
receiving the emitted light at a first side of a first diffusion plane that is a first distance from the plurality of solid state light emitters;
transmitting first diffused light from a second side of the first diffusion plane;
receiving the first diffused light from the first diffusion plane at a first side of a second diffusion plane that is a second distance from the plurality of solid state light emitters; and
transmitting second diffused light from a second side of the second diffusion plane.

15. The method of Claim 14, wherein transmitting the first diffused light comprises transmitting the first diffused light from a diffuser plate and wherein transmitting the second diffused light comprises transmitting the second diffused light from a diffuser sheet that is supported by a substantially transparent sheet.

16. The method of Claim 14, wherein transmitting the first diffused light comprises transmitting light from a first diffuser plate and wherein transmitting the second diffused light comprises transmitting light from a diffuser sheet that is supported by a second diffuser plate.

17. The method of Claim 14, wherein transmitting the first diffused light comprises transmitting scattered diffusion light from a scattering diffuser plate.

18. The method of Claim 14, wherein transmitting the first diffused light comprises transmitting the first diffused light from a structured refractive diffuser plate.

19. The method of Claim 14, wherein the plurality of solid state light emitters comprise a third distance between adjacent ones of the plurality of solid state

light emitters, wherein the first distance comprises approximately one half of the third distance, and wherein the second distance comprises a value in a range between substantially the third distance value and substantially 1.5 times the third distance value.

20. A display comprising:
 - a backlighting panel comprising
 - a plurality of solid state light emitters arranged in a substantially planar configuration,
 - a first diffusion plane that is configured to receive light from the plurality of solid state light emitters and to transmit first diffused light;
 - a second diffusion plane that is configured to receive the first diffused light and to transmit second diffused light
 - a plurality of diffuser supports configured to support a first diffuser plane structure at a first distance from the plurality of solid state light emitters and to support a second diffuser plane structure at a second distance from the plurality of solid state light emitters, wherein the second distance is greater than the first distance; and
 - a LCD display panel that is configured to receive the second diffused light and selectively transmit received light as display content.

**APPARATUS AND METHODS FOR MULTIPLANAR OPTICAL DIFFUSERS
AND DISPLAY PANELS FOR USING THE SAME**

ABSTRACT OF THE DISCLOSURE

Provided are solid state lighting devices that include multiple solid state light emitters that are configured to emit light and a multiplane light diffuser including a first diffusion plane and a second diffusion plane that are separated by a gap, the multiplane light diffuser including first side that is configured to receive the light emitted from the solid state light emitters and a second side that is configured to transmit diffused light.

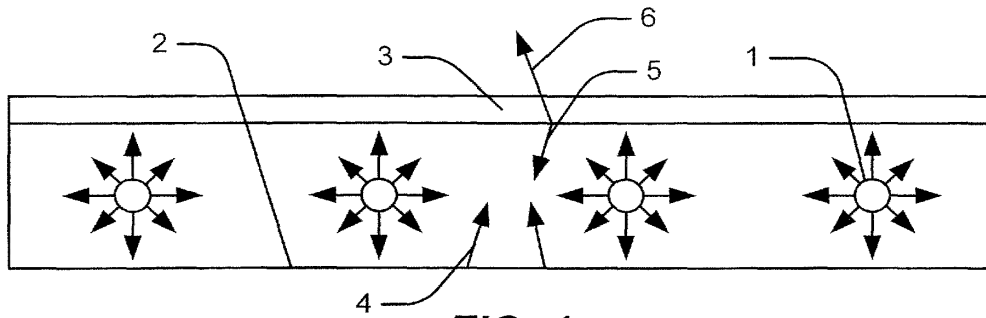


FIG. 1
(Prior Art)

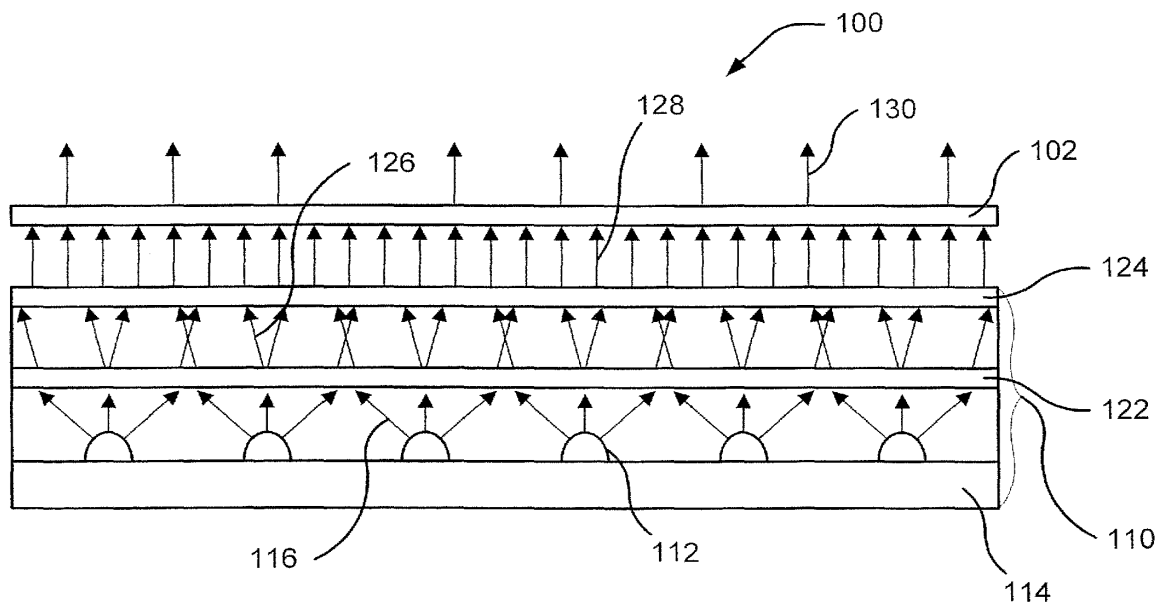
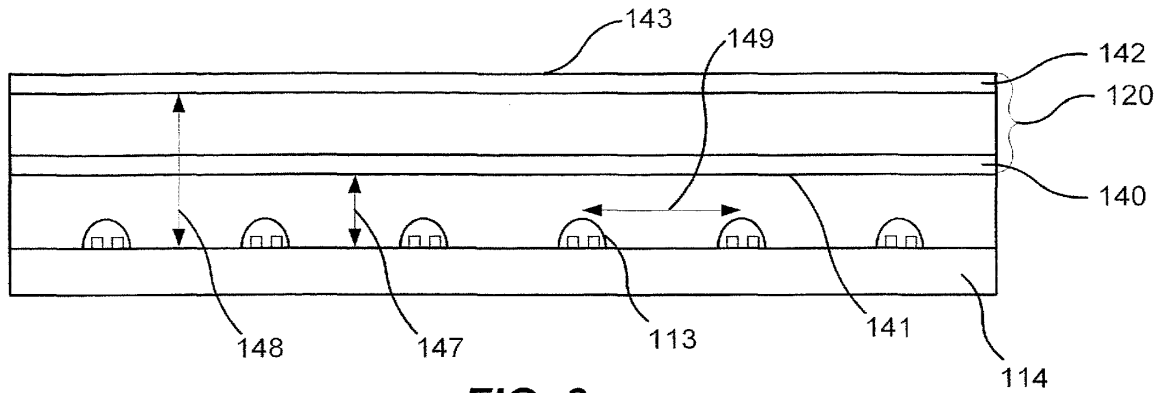
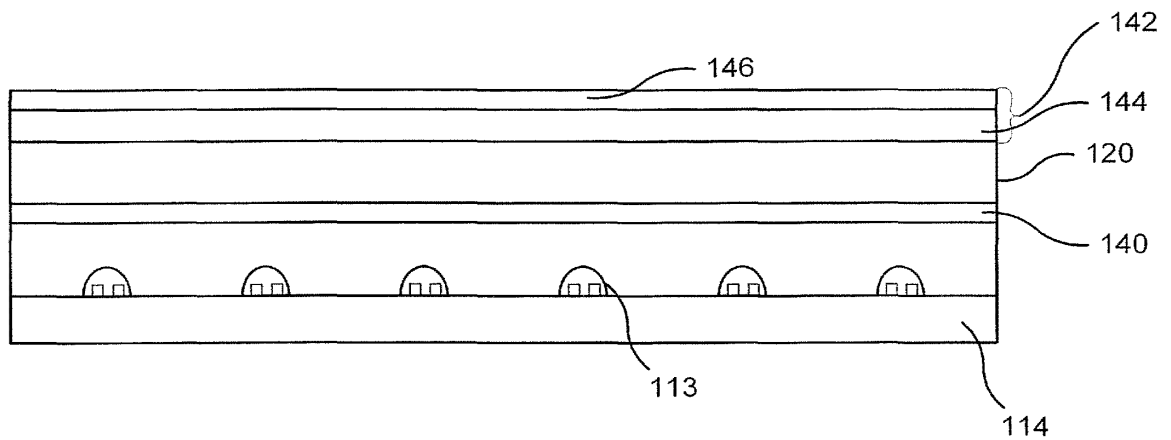
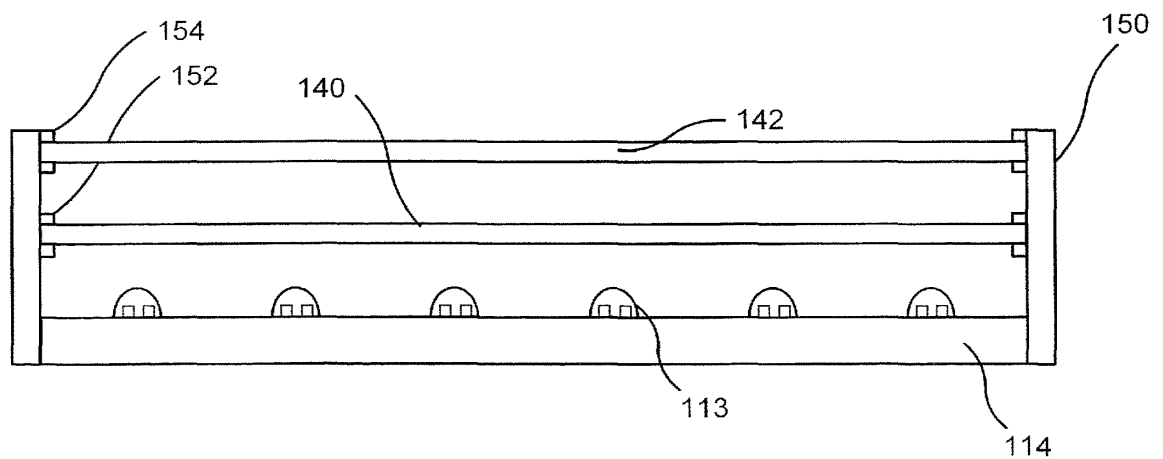


FIG. 2

**FIG. 3****FIG. 4****FIG. 5A**

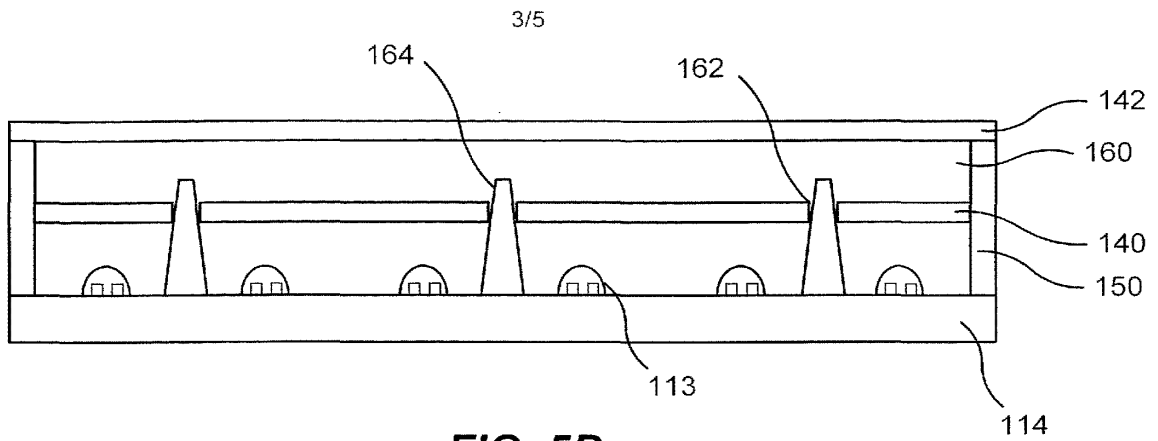


FIG. 5B

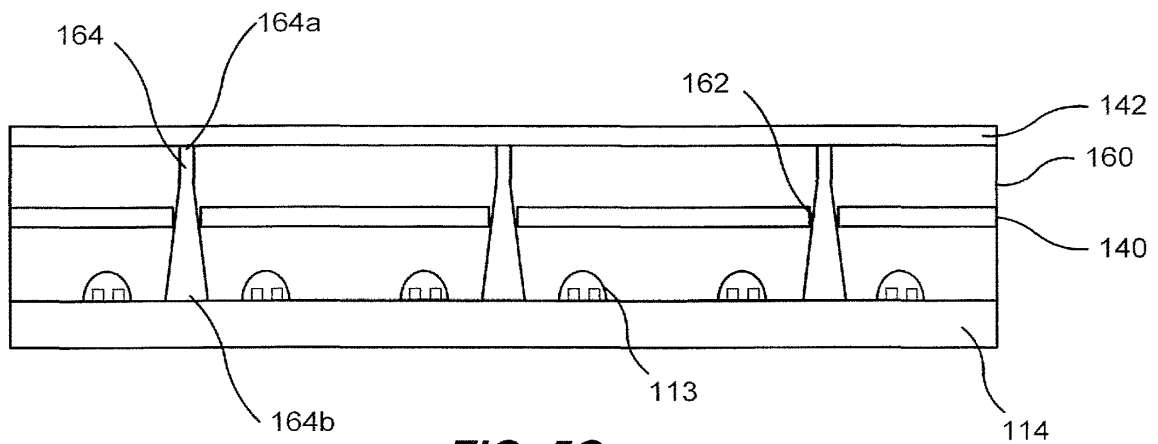


FIG. 5C

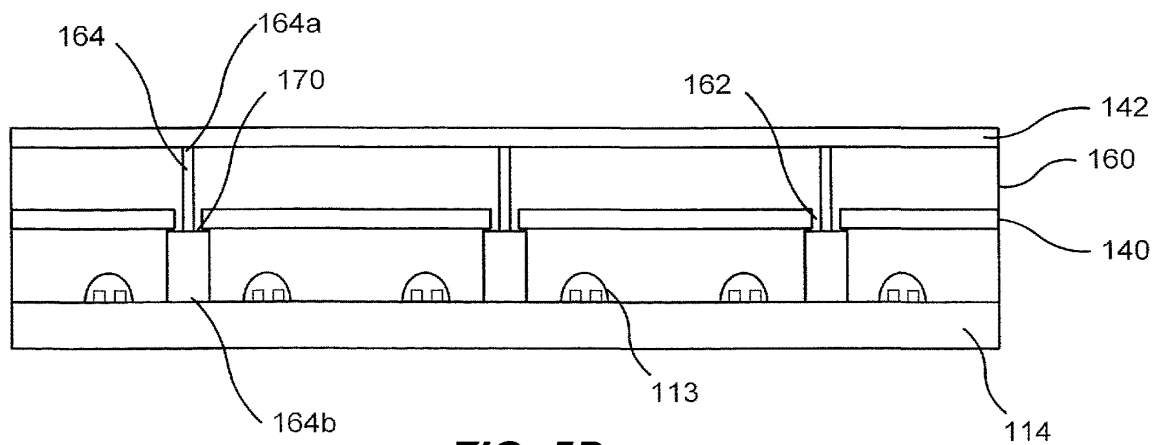
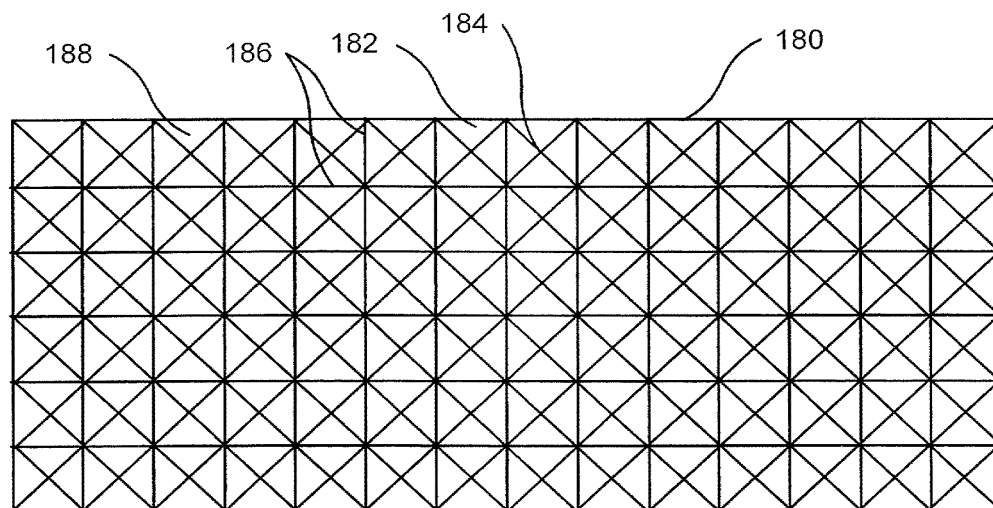
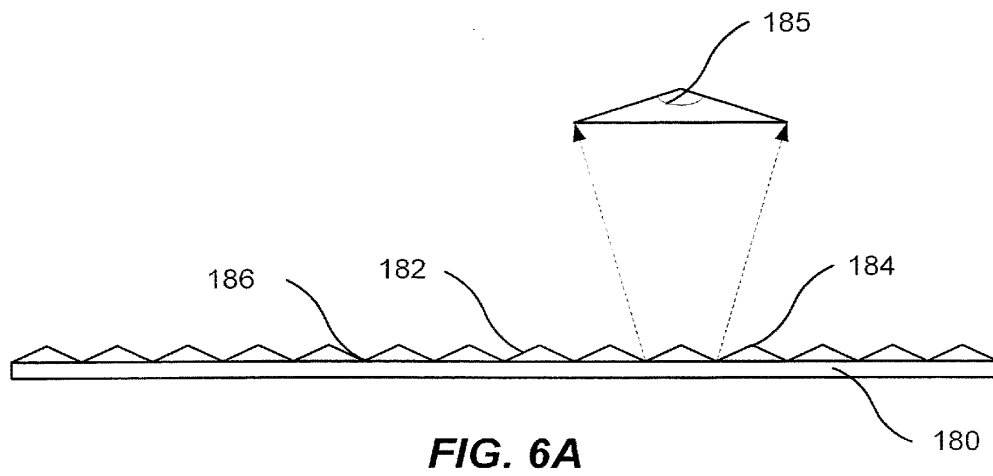
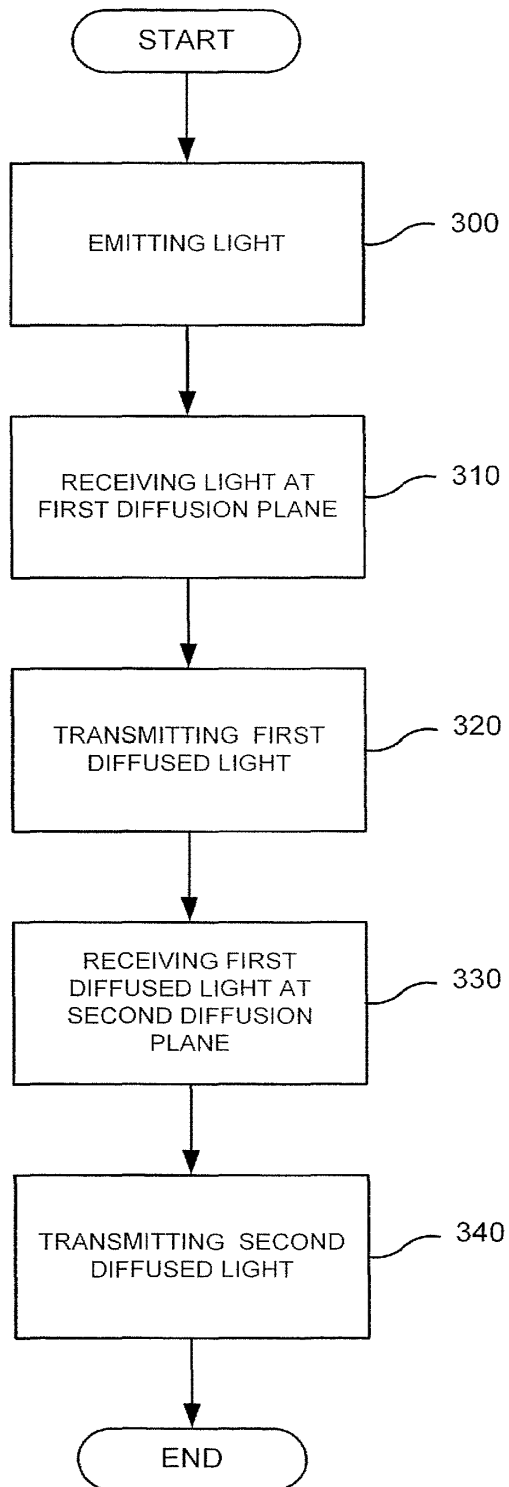


FIG. 5D



**FIG. 7**

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		Apparatus and Methods for Multiplanar Optical Diffusers and Display Panels for Using the Same		
First Named Inventor/Applicant Name:		John Roberts		
Filer:		Timothy Jennings Wall/Michele McMahan		
Attorney Docket Number:		5308-824		
Filed as Large Entity				
Utility Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Utility application filing	1011	1	310	310
Utility Search Fee	1111	1	510	510
Utility Examination Fee	1311	1	210	210
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1030

Electronic Acknowledgement Receipt

EFS ID:	2976771
Application Number:	12045729
International Application Number:	
Confirmation Number:	9825
Title of Invention:	Apparatus and Methods for Multiplanar Optical Diffusers and Display Panels for Using the Same
First Named Inventor/Applicant Name:	John Roberts
Customer Number:	65106
Filer:	Timothy Jennings Wall/Michele McMahan
Filer Authorized By:	Timothy Jennings Wall
Attorney Docket Number:	5308-824
Receipt Date:	11-MAR-2008
Filing Date:	
Time Stamp:	08:44:57
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$ 1030
RAM confirmation Number	5502
Deposit Account	500220
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
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1		5308_824_AppPackage.pdf	1779102 3376ee14c9091e5b7fb7c4844d4ce5e3a9647460	yes	24
	Multipart Description/PDF files in .zip description				
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	Transmittal of New Application		1	2	
	Specification		3	14	
	Claims		15	18	
	Abstract		19	19	
	Drawings-only black and white line drawings		20	24	
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Filing Date: 03/11/08

Approved for use through 7/31/2006. OMB 0651-0032

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875					Application or Docket Number 12/045,729	
APPLICATION AS FILED – PART I						
		(Column 1)	(Column 2)			
FOR	NUMBER FILED	NUMBER EXTRA		SMALL ENTITY		OR OTHER THAN SMALL ENTITY
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		RATE (\$)	FEE (\$)	RATE (\$)
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A		N/A		N/A
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A		N/A
TOTAL CLAIMS (37 CFR 1.16(i))	20	minus 20 =		X\$ 25		X\$50
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3	minus 3 =		X\$105		X\$210
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$260 (\$130 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR					
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				185		370
				TOTAL	0	TOTAL 1030
* If the difference in column 1 is less than zero, enter "0" in column 2.						
APPLICATION AS AMENDED – PART II						
		(Column 1)	(Column 2)	(Column 3)		
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	
	Application Size Fee (37 CFR 1.16(s))				N/A	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))				TOTAL ADD'T FEE	
		(Column 1)	(Column 2)	(Column 3)		
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus	**	=	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	
	Application Size Fee (37 CFR 1.16(s))				N/A	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))				TOTAL ADD'T FEE	
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.						

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