Filed on behalf of Wangs Alliance Corporation
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

WANGS ALLIANCE CORPORATION D/B/A WAC LIGHTING CO.
Petitioner

v.

Patent Owner of
U.S. Patent No. 6,250,774 to Simon H. A. Begemann and Albertus J. H. M. Kock

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Inter Partes Review Case No. Unassigned

PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 6,250,774 UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. §§ 42.1-.80, 42.100-.123

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I. MANDATORY NOTICES AND FEES

A. Real Parties-in-Interest

Wangs Alliance Corporation d/b/a WAC Lighting Co. is the real party-in-interest.

B. Related Matters

The following matter may affect or be affected by a decision herein: *Koninklijke Philips N.V. et al. v. Wangs Alliance Corporation*, Case No. 14-cv-12298-DJC (D. Mass.). Additionally, the Patent Owner is suing the Petitioner and/or other parties under one or more of U.S. Patent Nos. 6,013,988; 6,147,458; 6,586,890; 6,561,690; 6,788,011; 7,038,399; 7,352,138; 6,094,014; and 7,262,559, all of which generally relate to light emitting diodes ("LEDs"). On the same week as this petition, the Petitioner is also filing additional petitions for *Inter Partes* Review for six other patents asserted by the Patent Owner against the Petitioner: U.S. Patent Nos. 6,013,988; 6,147,458; 6,586,890; 6,561,690; 7,038,399; and 7,352,138.

C. Counsel

Lead counsel in this case is David Radulescu, Ph.D. (PTO Reg. No. 36,250); backup counsel is Angela Chao (PTO Reg. No. 71,991). Powers of attorney accompany this Petition.

D. Service Information

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E. Payment

Under 37 C.F.R § 42.103(a), the Office is authorized to charge the fee set forth in 37 C.F.R. § 42.15(a) to Deposit Account No. 506352 as well as any additional fees that might be due in connection with this Petition.

II. CERTIFICATION OF GROUNDS FOR STANDING

The Petitioner certifies pursuant to 37 C.F.R § 42.104(a) that the patent for which review is sought is available for *inter partes* review and that the Petitioner is not barred or estopped from requesting an *inter partes* review challenging the patent claims on the grounds identified in this Petition.

III. OVERVIEW OF CHALLENGE AND RELIEF REQUESTED

Pursuant to Rules 42.22(a)(1) and 42.104(b)(1)-(2), the Petitioner challenges claims 1, 3, 5, and 14 of U.S. Patent No. 6,250,774 (the "'774 patent") (Ex. 1001).

A. Prior Art Patents and Printed Publications

The Petitioner relies upon the patents and printed publications listed in the

Table of Exhibits, including:

1. U.S. Patent No. 5,803,579 to Turnbull, et al., ("Turnbull" (Ex. 1003)), which is prior art under § 102(e).
2. F.A Kish, et al., *High luminous flux semiconductor wafer-bonded AlGaInP/GaP large-area emitters*, 30 (21) Elecs. Letters 1790 (Oct. 13, 1994), ("Kish" (Ex. 1004)), which is prior art at least under § 102(b).

B. Grounds for Challenge

The Petitioner requests cancellation of claims 1, 3, 5, and 14 of the '774 patent ("challenged claims") as unpatentable under 35 U.S.C. § 103. This Petition, supported by the declaration of Eric Bretschneider ("Bretschneider Decl." (Ex. 1006)), filed herewith, demonstrates that there is a reasonable likelihood that the Petitioner will prevail with respect to at least one challenged claim and that each challenged claim is not patentable. *See* 35 U.S.C. § 314(a).

Ground 1: Claims 1, 3, 5, and 14 are obvious over Turnbull in view of Kish.

The Petitioner notes that the grounds for review in this Petition are distinct from those asserted in a prior petition that was denied institution by the Board. *JST Performance, Inc. d/b/a Rigid Industries v. Koninklijke Philips N.V.*, Case IPR2014-00874—in particular, the Kish reference relied upon in this Petition (co-authored by F.A. Kish and 5 others; published in *Electronics Letters*) is **different** from the publication co-authored by Kish (and 12 others and published in Applied Physics

Letters) that is referenced in the aforementioned proceeding. In the *JST Perfomrance v. Koninklijke Philips* petition, the referenced publication by Kish was F.A. Kish, et al., *Very high-efficiency semiconductor wafer-bonded transparent-substrate* $(Al_xGa_{1-x})_{0.5}In_{0.5}P/GaP$ *light-emitting diodes*, 64 (21) APPL. PHYS. LETTERS 2839 (May 23, 1994), which is attached as Exhibit 1005 hereto for the Board's reference.

IV. CLAIM CONSTRUCTION

A claim in *inter partes* review is given the "broadest reasonable construction in light of the specification in which it appears." 37 C.F.R. § 42.100(b). The broadest reasonable construction is the broadest reasonable interpretation of the claim language. *See In re Yamamoto*, 740 F.2d 1569, 1571-72 (Fed. Cir. 1984). Any claim term which lacks a definition in the specification is therefore also given a broad interpretation. *In re ICON Health & Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed. Cir. 2007).[1] Should the Patent Owner contend that the claims have a construction different from their broadest reasonable construction in order to avoid the prior art,

[1] Petitioner adopts the "broadest reasonable construction" standard as required by the governing regulations. 37 C.F.R. § 42.100(b). Petitioner reserves the right to pursue different constructions in a district court, where a different standard is applicable.

the appropriate course is for the Patent Owner to seek to amend the claims to expressly correspond to its contentions in this proceeding. *See* Office Patent Trial Practice Guide, 77 Fed. Reg. 48756, 48764 (Aug. 14, 2012).

A. "Luminaire"

The broadest reasonable construction of "**luminaire**" in the '774 patent is a "lighting device." This construction is supported by the specification of the '774 patent, which describes a luminaire as a device where "the light generated by the light source is utilized more efficiently." '774 patent, 1:31-33 (Ex. 1001). It is also supported by the description of a luminaire in the "Background of the Invention" section as "comprising a housing with a light emission window, and at least one lighting module for illuminating an object accommodated in the housing and comprising a light source and optical means." '774 patent 1:4-7 (Ex. 1001). Indeed, all figures in the '774 patent depicting a "luminaire" are further shown to be lighting devices. *See* '774 patent, 5:36-49; 7:13-30; 7:31-8:2; 8:9-12; 8:38-67 (Ex. 1001).

B. "Lighting module"

The broadest reasonable construction of the term **"lighting module"** is "set of lighting units." The specification of the '774 patent supports this construction through its description of a lighting module—"[a]ccording to the invention, the lighting module comprises a set, for example a few dozen, of lighting units." '774

patent, 1:34-36 (Ex. 1001). Similarly, the Abstract of the '774 patent states that "[t]he lighting module comprises a set of lighting units (20)." '774 patent, Abstract (Ex. 1001).

C. "Lighting unit"

The broadest reasonable construction of the term "**lighting unit**" is "at least one LED chip and an optical system cooperating therewith." This construction is supported by the specification of the '774 Patent, which describes "lighting units" as parts of a lighting module that "each comprise at least one LED chip and an optical system cooperating therewith." '774 patent, 1:34-36 (Ex. 1001). It is also consistent with the description of "lighting units" provided in the Abstract of the '774 patent. '774 patent, Abstract (Ex. 1001) ("The lighting module comprises a set of lighting units (20) which each comprise at least an LED chip (30) and an optical system (40) coupled thereto.").

V. OVERVIEW OF THE '774 PATENT

A. Background

The object of the '774 patent is to provide a luminaire in which the light generated by the light source is utilized more efficiently. *See* '774 patent at 1:30-41 (Ex. 1001); Bretschneider Decl. at ¶16. As noted in the '774 patent, known luminaires had tubular discharge lamps providing light and it was difficult to focus the light emanating from such fixtures onto a target object. *See* '774 patent at 1:22-24 ("The lighting modules in the known luminaire each have a tubular discharge

lamp as the light source and a reflector as the optical means. A disadvantage of such a luminaire is that the light from the light sources is difficult to concentrate into a beam.") (Ex. 1001); Bretschneider Decl. at ¶16. It was difficult to concentrate the light emanated from previously known luminaires into a beam directed at an object intended to be illuminated—the '774 patent reports that more than 50% of a tubular lamp's light output would often be incident outside the object intended to be illuminated in the known luminaire designs. '774 patent at 1:24-27 (Ex. 1001); Bretschneider Decl. at ¶16.

B. Summary of Alleged Invention of the '774 Patent

The '774 patent describes luminaires that include multiple "lighting units" arranged within one or more "lighting modules" within a housing. Within each of the "lighting units," there are one or more LED chips and an optical system such that, during operation of the luminaire, the "lighting units" illuminate different portions of an object. *See* '774 patent at 1:49-56 (Ex. 1001); Bretschneider Decl. at ¶17. Moreover, the '774 patent discloses that each of the LED chips in the luminaire provide a luminous flux of at least 5 lm during operation. *See* '774 patent at 1:34-41 (Ex. 1001); Bretschneider Decl. at ¶17.

According to the '774 patent, the luminaire described in the '774 patent may incorporate LED chips made of different semiconductor materials, such as AlInGaP or InGaN. *See* '774 patent at 1:42-43 (Ex. 1001); Bretschneider Decl. at ¶18.

Additionally the LED chips described in the '774 patent have surface areas varying from "the order of a few tenths of a mm^2 up to a few mm^2." '774 patent at 1:49 (Ex. 1001); Bretschneider Decl. at ¶18. The '774 patent states that this size range for the surface area of the active layer of an LED chip is "comparatively small." '774 patent at 1:47-49 (Ex. 1001); Bretschneider Decl. at ¶18. The LED chips disclosed in the '774 patent are further described as "each supply[ing] a luminous flux of at least 5 lm during operation." '774 patent at 1:57-59 (Ex. 1001).

The '774 patent contemplates a number of potential applications for the luminaire disclosed therein, including "street lighting, spotlighting, or floodlighting." '774 patent at 1:60-62 (Ex. 1001); Bretschneider Decl. at ¶19. Further, the '774 patent contemplates that the claimed luminaire could incorporate LED chips that all emit the same color of light (i.e., all of the chips emit at the same wavelength) or that the claimed luminaire could emit different colors of light (i.e., some of the LED chips emit at different wavelengths than others), depending on the desired lighting effect and intended application. *See* '774 patent at 2:30-53 (Ex. 1001); Bretschneider Decl. at ¶19.

C. Prosecution History

The '774 patent stems from European Patent Office application No. 97200149, filed on January 23, 1997. During the prosecution of the '774 Patent, original claims 1-13, 15, and 16 were subjected to an election requirement. PH

7/9/99 Office Action (Ex. 1002). The applicant responded by electing to proceed with the prosecution of original claims 1-4, 15, and 16. PH 7/21/99 Election of Species (Ex. 1002). Subsequently, the Examiner disagreed that original claim 16 was directed to the same species as the other elected claims and withdrew it from consideration. PH 11/26/99 Office Action (Ex. 1002). The Examiner also rejected original claims 1-4 as indefinite under 35 U.S.C. § 112, obvious under 35 U.S.C. § 103(a) over U.S. Patent No. 5,893,633 to Uchio ("Uchio") in view of U.S. Patent No. 5,105,199 to Smith ("Smith"), obvious under 35 U.S.C. § 103(a) over U.S. Patent No. 5,5880,156 to Suzuki ("Suzuki") in view of Smith, obvious under 35 U.S.C. § 103(a) over Suzuki in view of U.S. Patent No. 4,698,930 to Sakai ("Sakai"). PH 11/26/99 Office Action (Ex. 1002). Upon an amendment following the rejection, original claims 1-13, 15 and 16 were rejected as indefinite under 35 U.S.C. § 112, and the Examiner noted that non-elected original claims should be cancelled before the application could issue. PH 4/11/00 Office Action (Ex. 1002). In response, the applicant amended the claims and claims 1-13, 15, and 16 were allowed. PH 6/7/00 Office Action (Ex. 1002). None of the prior art relied upon here was of record during the prosecution of the '774 patent.

VI. OVERVIEW OF THE PRIMARY PRIOR ART REFERENCES

A. Summary of the Prior Art

As shown below, there is nothing new or non-obvious in the Patent Owner's claims. The claimed luminaire and lighting system in the '774 patent were well known. Bretschneider Decl. ¶ 24 (Ex. 1006).

B. Overview of Turnbull (Ex. 1003)

1. U.S. Patent No. 5,803,579 to Turnbull, filed on Jun. 13, 1996, is a prior art reference to the '774 patent under 35 U.S.C. § 102(e). Turnbull seeks to solve the problem of efficiently illuminating objects to enhance visibility in low light level environments by incorporating multiple LEDs into a single illuminator assembly. *See* Turnbull, Exhibit 1003 at 1:12-22; Bretschneider Decl. at ¶ 52. In particular, Turnbull discloses an improved illuminator wherein multiple LED chips and multiple optical components are provided within a single housing to function as an illuminator. *See* Turnbull, Exhibit 1003 at Fig. 1; 7:66-8:7; Bretschneider Decl. at ¶ 52. Turnbull further specifically notes that light emitted from different color LEDs may be projected such that their light beams overlap on the object(s) illuminated to create white-light illumination by color mixing. *See, e.g.,* Turnbull, Ex. 1003 at 7:66-8:7; 20:40-21:4; Bretschneider Decl. at ¶ 52. Turnbull also discloses the desirability of using individual LED chips with high luminous intensity and efficacy in the disclosed illuminator. *See, e.g.,* Turnbull, Ex. 1003 at 5:63-66; 7:19-24; 7:66-8:7; 21:1-40; Bretschneider Decl. at ¶ 52.

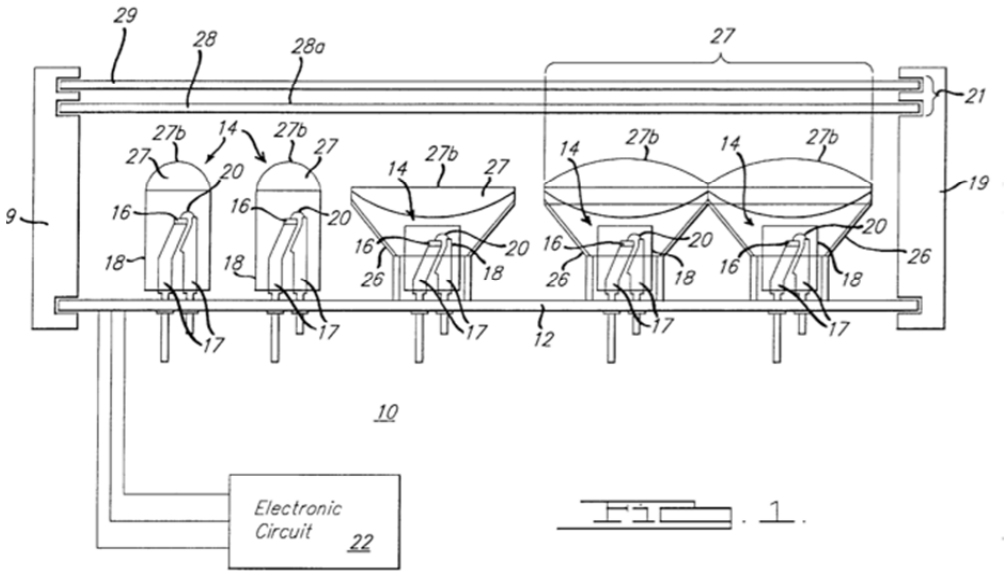


Fig. 1.

C. Overview of Kish (Ex. 1004)

F.A Kish, et al., *High luminous flux semiconductor wafer-bonded AlGaInP/GaP large-area emitters*, 30 (21) Elecs. Letters 1790 (Oct. 13, 1994), is a prior art reference to the '774 patent under 35 U.S.C. § 102(b). Kish discloses significant improvements in the luminous efficiencies of wafer-bonded AlGaInP/GaP LED chips. Bretschneider Decl. at ¶ 53. In particular, Kish discloses that luminous fluxes of 84 lumen (lm) were measured under DC operation of wafer-bonded transparent-substrate AlGaInP/GaP large-area LEDs. *See* Kish, Ex. 1004 at 1791; Bretschneider Decl. at ¶ 53. Figure 1 of Kish discloses that the high luminous flux LEDs are within a complete LED package including an epoxy dome, a copper submount, package body (TO-66 header), and a heat sink. Bretschneider Decl. at ¶ 53.

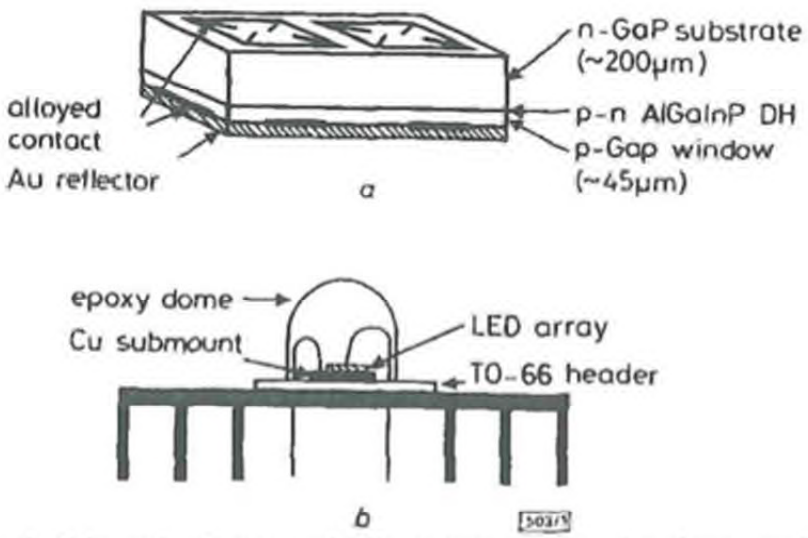


Fig. 1 *Schematic diagram of chip structure of semiconductor wafer-bonded transparent-substrate AlGaInP/GaP large-area LED*

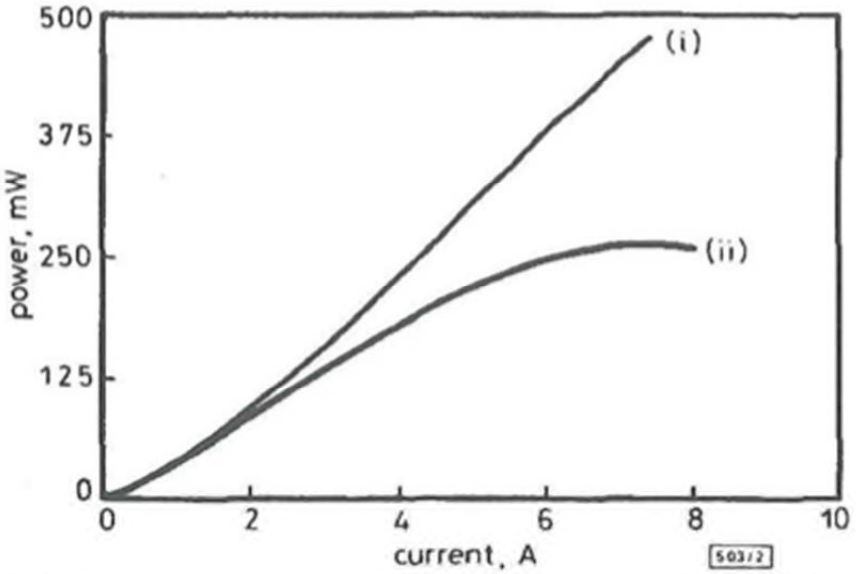


Fig. 2 *Light output against current (L-I) curves for TS AlGaInP/GaP large-area (375 × 4500 μm²) LED emitting in the λ ≈600–615 nm band under pulsed (1 μs, 0.1% duty cycle) and DC operation*

As Turnbull explains, "it is desirable to provide a highly reliable, low-voltage, long-lived LED illuminator capable of producing white light with sufficient luminous intensity to illuminate subjects of interest well enough to be seen and to

have sufficient apparent color and contrast so as to be readily identifiable." Turnbull, Ex. 1003 at 7:19-24; Bretschneider Decl. at ¶ 54. Turnbull further notes that LEDs with "very high luminous efficacy in terms of light emitted compared to electrical power consumed" are desirable for inclusion of the architecture described in therein. Turnbull, Ex. 1003 at 21:34-35; Bretschneider Decl. at ¶ 54. The LEDs disclosed by Kish exhibit high luminous efficiency and luminous flux—the LED chips in Kish emit 84 lumens under DC power while current is being ramped to 8 Amps. Kish, Ex. 1004 at 1791; Bretschneider Decl. at ¶ 54. The LEDs disclosed in Kish have high luminous flux and may be employed to illuminate an object with their amber light (emitted wavelength for Kish LED chips is approx. 602-614 nm, depending on DC drive current). Kish Ex. 1004 at 1791, Fig. 3; Bretschneider Decl. at ¶ 54. Consequently, a PHOSITA would be motivated to combine the high luminous flux LED chips disclosed in Kish with the lighting device structure disclosed in Turnbull. Bretschneider Decl. at ¶ 54. Such a combination renders claims of the '774 patent obvious, as described in element-by-element detail below.

VII. SPECIFIC GROUNDS FOR PETITION

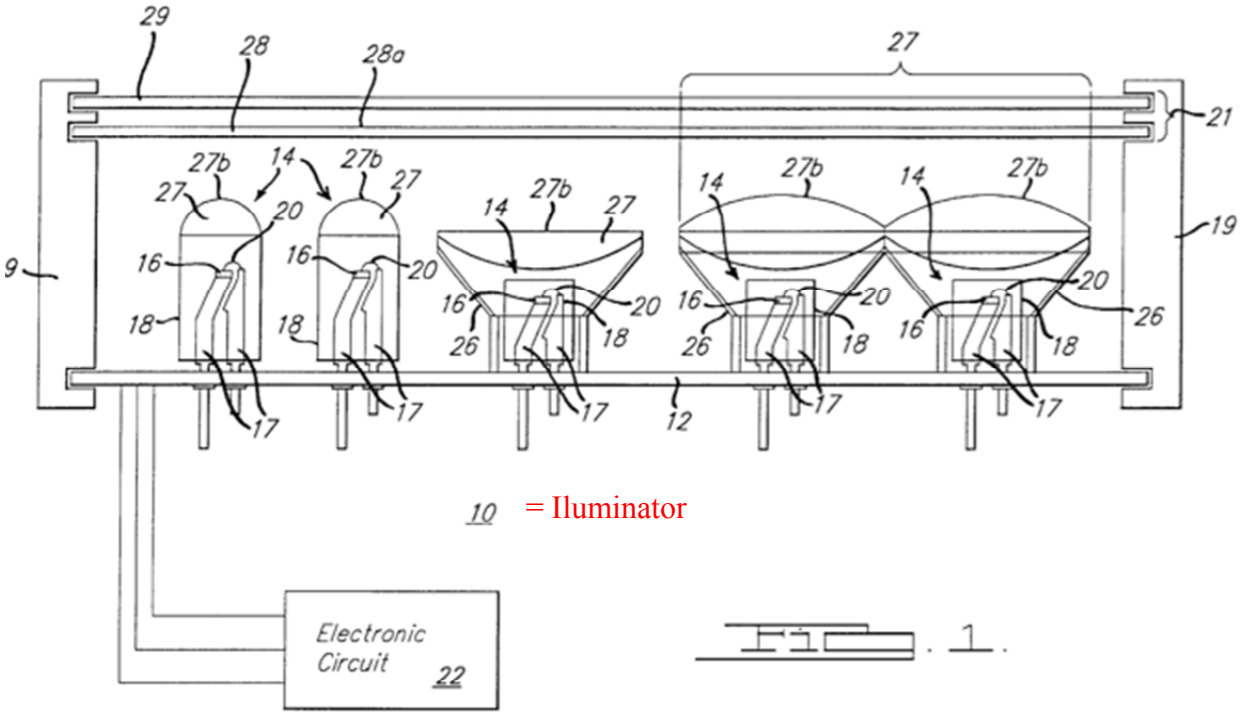
Pursuant to Rule 42.104(b)(4)-(5), the below section, and as confirmed in the Declaration of Eric Bretschneider, Ph.D. (Ex. 1006), demonstrate in detail how the prior art discloses each and every limitation of claims 1, 3, 5, and 14 of the '774 patent, and how those claims are rendered obvious by the prior art.

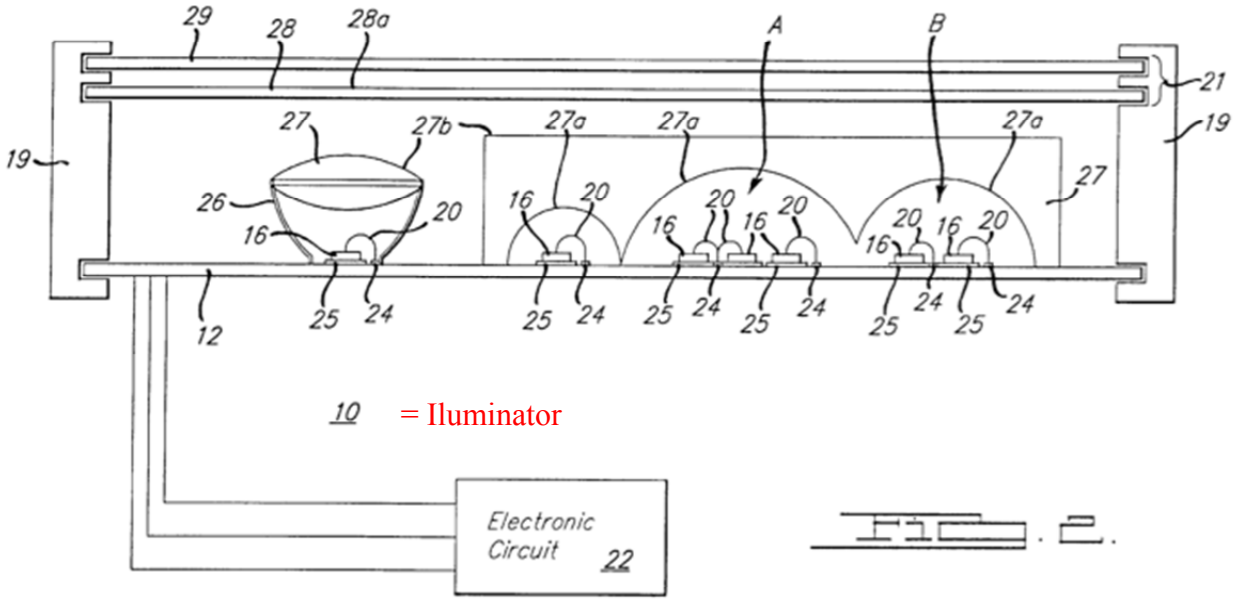
A. Ground 1: Claims 1, 3, 5, and 14 Are Obvious over Turnbull in View of Kish

1. Independent Claim 1

(a) *The preamble*: "[a] luminaire comprising:"

Turnbull teaches a luminaire, or lighting device, as described in Claim 1 of the '774 patent. Bretschneider Decl. at ¶ 55. Specifically Turnbull discloses an "illuminator assembly" with a plurality of LEDs that emit light when in operation. Turnbull, Ex. 1003 at 7:27-32; Bretschneider Decl. at ¶ 55. The illuminator assembly described in Turnbull is a device that incorporates "a plurality of light emitting diodes on a support member to provide a light-weight, robust illuminator." Turnbull, Ex. 1003 at 63-65; Bretschneider Decl. at ¶ 55. Figures 1 and 2 of Turnbull illustrate the lighting device, or luminaire, described by Turnbull.





(b) *Limitation (1A)*: "a housing with a light emission window,"

Turnbull teaches a luminaire that includes a housing with a light emission window. Bretschneider Decl. at ¶ 56. In the '774 patent, the housing is identified as the protective outer layer at number 10, and the light emission window is identified as the space within the housing surrounding the lighting units at number 11, as shown in Figure 2 below. Bretschneider Decl. at ¶ 56. Turnbull similarly teaches that a housing with a light emission window should be provided in the lighting assembly illustrated in Figures 1 and 2 of Turnbull. Bretschneider Decl. at ¶ 56.

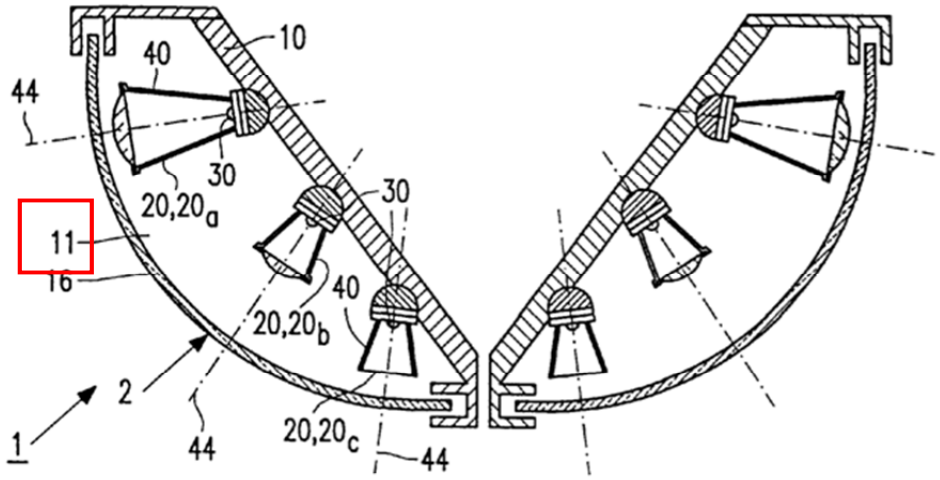


FIG. 2

'774 patent Figure 2
(red emphasis added to indicate light emission window)

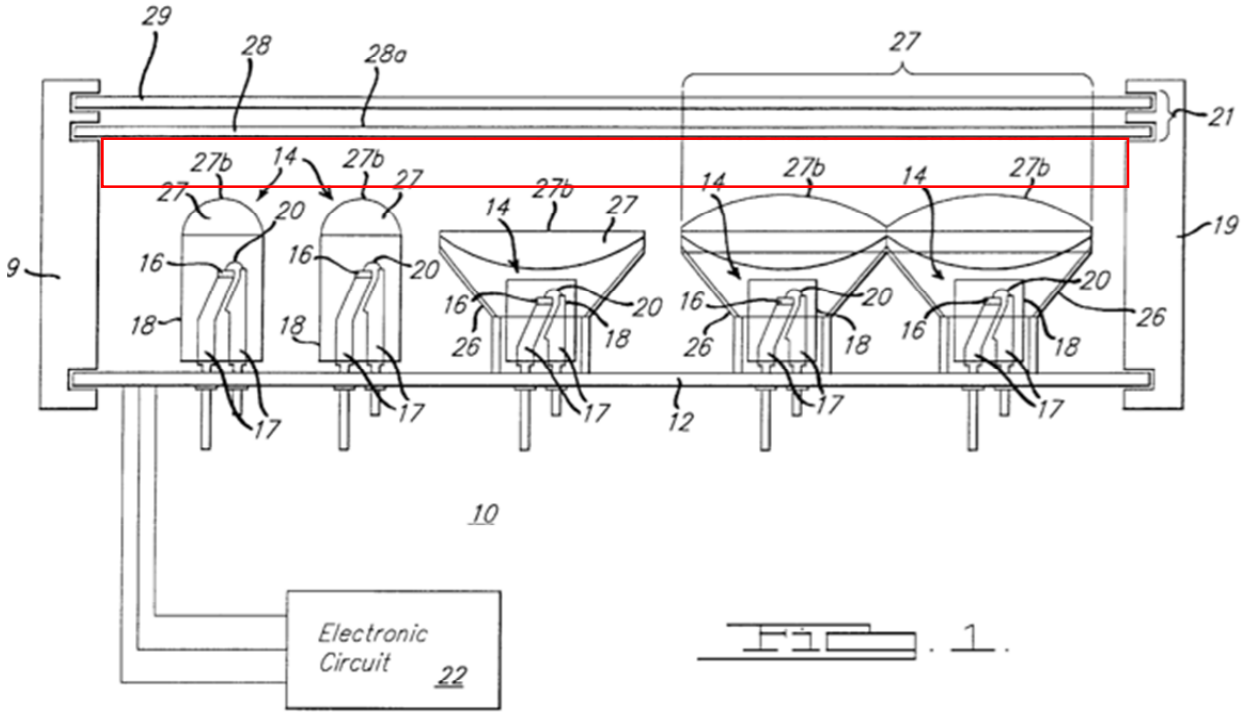
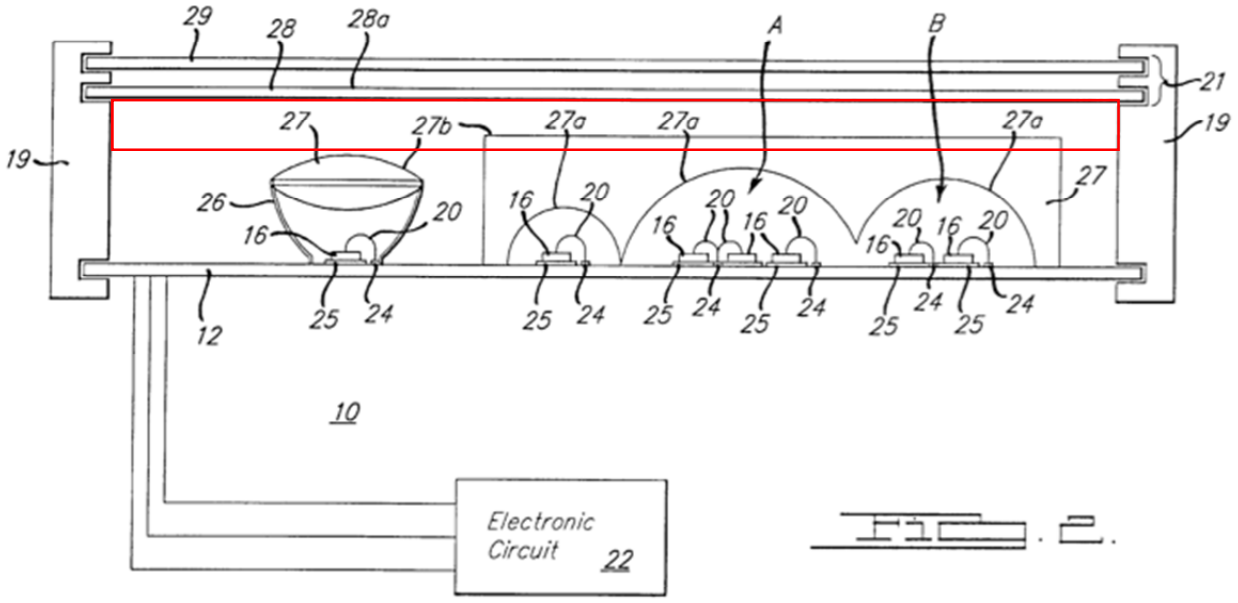


FIG. 1

Turnbull Figure 1
(red emphasis added to indicate light emission window)

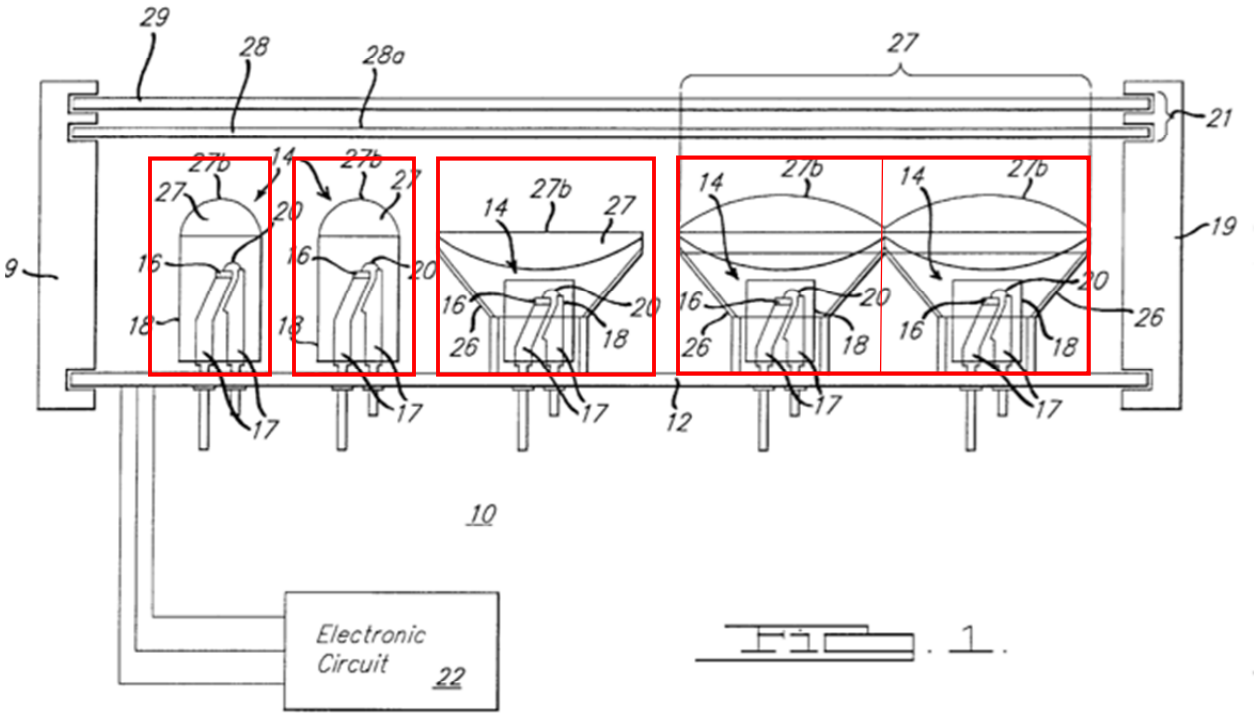


Turnbull Figure 2
(red emphasis added to indicate light emission window)

(c) *Limitation (1B)*: "at least one lighting module in said housing for illuminating an object outside said housing"

Turnbull teaches a luminaire with at least one lighting module in said housing for illuminating an object outside said housing. Bretschneider Decl. at ¶ 57. A "lighting module," according to the '774 patent, is a set of lighting units, and a "lighting unit" is at least one LED chip and a primary optical system cooperating therewith. Thus, Figure 1 of Turnbull illustrates a luminaire with five lighting units depicted that may together serve as a lighting module. Bretschneider Decl. at ¶ 57. Turnbull further discloses that the LEDs in this lighting module may be "aligned or otherwise focused on a common spot at some predetermined distance away from the

illuminator." Turnbull, Ex. 1003 at 11:4-6; Bretschneider Decl. at ¶ 57. Thus, Turnbull discloses a lighting module that will illuminate an object outside the housing. Bretschneider Decl. at ¶ 57.

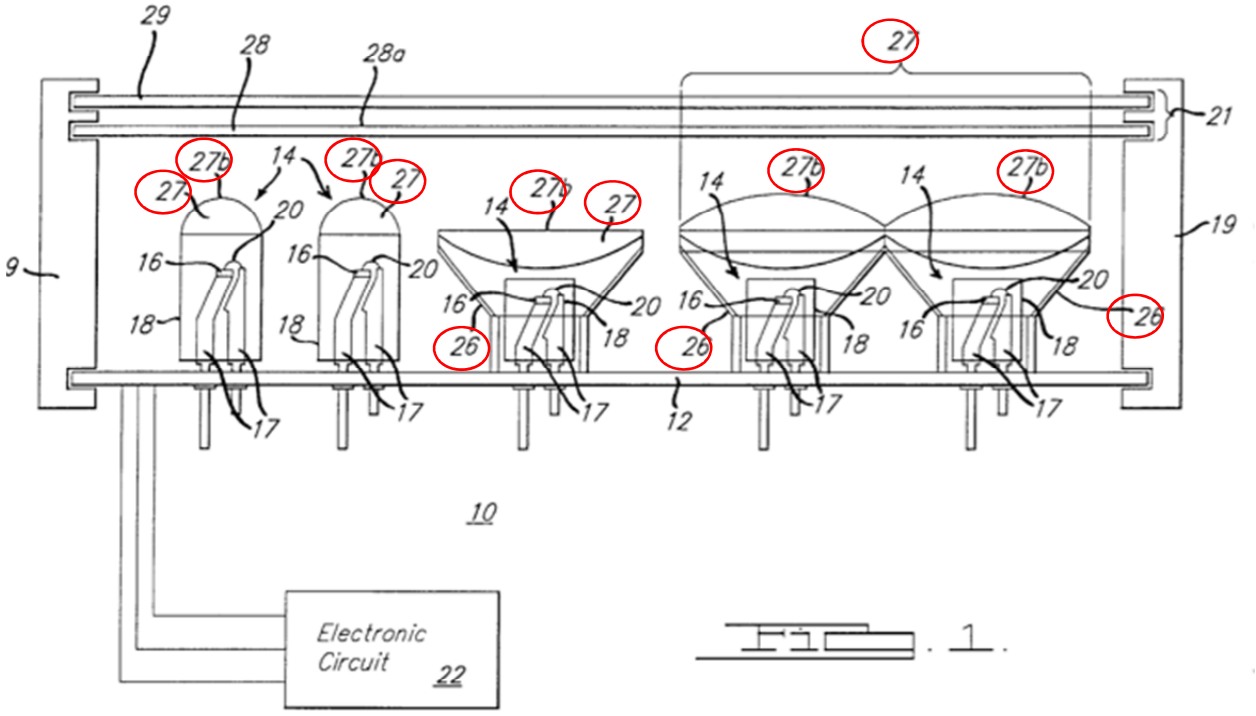


Turnbull Figure 1
(Red emphasis added to indicate the set of lighting units within the lighting module)

(d) *Limitation (1C)*: "the lighting module comprising a set of lighting units, each of said lighting units comprising at least one LED chip and an optical system configured to illuminate portions of the object during operation,"

Turnbull teaches a set of lighting units within the lighting module, where each lighting unit comprises at least one LED chip (item 16 in Figure 1 of Turnbull) and

an optical system cooperating therewith (e.g., items 26, 27, and 27b in Figure 1 of Turnbull). Bretschneider Decl. at ¶ 58. Specifically, Turnbull teaches that the individual LED chips are disposed within optical systems including an enclosure (18) that also acts as an integral optical element, such as a lens (27), deviator (28), diffuser (29), or reflector (26). Turnbull, Ex. 1003 at 11:49-51; 12:61-13:3; Bretschneider Decl. at ¶ 58. Turnbull further discloses that the optical system may include lenslets with various different structures, including Total Internal Reflection (TIR) collimating lenses, Plano-convex lenses, bi-convex lenses, aspheric lenses, Fresnel lenses, catadioptric or holographic optic elements (HOE). Turnbull Ex. 1003 at 13:35-47; Bretschneider Decl. at ¶ 58. Indeed, Turnbull discloses combinations of these disclosed optical systems as necessary and as would be known to one of ordinary skill in the art. Turnbull, Ex. 1003 at 14:42-60; Bretschneider Decl. at ¶ 58. The optical systems disclosed in Turnbull are configured to direct the light emitted by the LED to illuminate portions of the object. Turnbull, Ex. 1003 at 11:4-6; Bretschneider Decl. at ¶ 58.



Turnbull Figure 1

(e) *Limitation (1D)*: "output terminals for coupled to output means of said converter for connecting said circuit arrangement to the semiconductor light source"

Turnbull explains that "preferred types of LEDs for the present invention have very high luminous efficacy in terms of light emitted compared to electrical power consumed." Turnbull, Ex. 1003 at 21:33-35; Bretschneider Decl. at ¶ 59. A person of ordinary skill in the art would be aware that luminous efficacy is defined the ratio of luminous flux to power and that the units of luminous efficacy are lumens per watt (lm/W). Bretschneider Decl. at ¶ 59. The LEDs disclosed in Kish have very high luminous flux and, therefore, very high luminous efficacy—thus, a

person of ordinary skill in the art would appreciate that the LED chips disclosed in Kish do not require significant electrical power to produce their high luminous flux. Bretschneider Decl. at ¶ 59. Thus, a person having ordinary skill in the art would be motivated to combine the LED lamp architecture disclosed in Turnbull with the LEDs disclosed in Kish. Bretschneider Decl. at ¶ 59.

Kish discloses transparent substrate (TS) AlGaINP/GaP large area LEDs ("Kish LEDs") with very high luminous efficacies. Bretschneider Decl. at ¶ 60. In particular, Kish discloses that the Kish LEDs exhibited "[l]uminous fluxes (output powers) of 84 lumen (265 mW) under DC operation [. . .] in the λ = 600-615 nm band for a monolithic LED bar 375 x 4500um^2." Kish, Ex. 1004 at 1790; Bretschneider Decl. at ¶ 60. These are very high luminous flux measurements—indeed, Kish explains that "[t]hese fluxes represent a two order of magnitude improvement compared to conventional LEDs and differ from that of unfiltered 60W tungsten incandescent sources (~1000 lumen) by only approximately an order of magnitude)." Kish, Ex. 1004 at 1790; Bretschneider Decl. at ¶ 60. These luminous flux measurements correspond to LEDs chips with surface areas of 1.6875 mm^2, which is almost 17 times the size of a standard LED chip. Bretschneider Decl. at ¶ 60. Notably, the size of the Kish LED chips falls within the low end of the range of LED chip surface area measurements disclosed in the '774 patent. *See* '774 patent at 1:47-49 ("The surface area of the active layer of an LED chip is

comparatively small, for example of the order of a few tenths of a mm^2 up to a few mm^2."); Bretschneider Decl. at ¶ 60.

The Kish LEDs exhibit a luminous flux of 84 lumens at 7 A input current (7,000 mA). Kish, Ex. 1004 at 1791; Bretschneider Decl. at ¶ 61. However, Kish discloses that the Kish LEDs will exhibit luminous flux in excess of 5 lumens even when DC drive current is lower. Bretschneider Decl. at ¶ 61. A person of ordinary skill in the art would understand that to a first approximation the relationship between luminous flux and DC drive current is linear. Bretschneider Decl. at ¶ 61. A PHOSITA would also understand that assuming a linear relationship based on maximum output would actually underestimate the luminous flux at lower currents. Bretschneider Decl. at ¶¶ 61-68.

In light of the luminous flux calculations detailed in Paragraphs 61-68 of the Bretschneider declaration, it is clear that a person of ordinary skill in the art would be motivated to combine the high luminous flux and high luminous efficacy LEDs of Kish with the LED lamp architecture of Turnbull. *See* Bretschneider Decl. at ¶¶ 61-69. Kish discloses amber LEDs that exhibit luminous flux in excess of 5 lumens when in operation with a DC drive current of 0.321 Amps is applied. *See* Bretschneider Decl. at ¶¶ 61-69. Indeed, the Kish LEDs have 16.39 lumens of luminous flux in operation at 1 Amp (DC current) and are disclosed to show up to 84 lumens of luminous flux in non-equilibrium operating conditions when current is

at 7 Amps (during a non-equiplibrium current ramp to 8 Amp in less than 3 seconds). Kish, Ex. 1004 at 1791; Bretschneider Decl. at ¶¶ 61-69. 1 Amp of DC current is a typical amount of current that a person of ordinary skill would expect to when operating an LED street lamp or floodlight. Bretschneider Decl. at ¶ 69. Depending on the heat sink, a PHOSITA would expect up to about 1-3 W of electrical input per LED in a street lamp or floodlight. Bretschneider Decl. at ¶ 69. Given that AlInGaP LEDs have a typical forward voltage of about 2.1 V, this would suggest up to 1.4-1.5 A current input, which would have the Kish LEDs illuminating well within the linear region and over 5 lm of luminous flux. Bretschneider Decl. at ¶ 69. Additionally, Kish discloses an LED package structure with an integrated epoxy dome, copper submount and a TO-66 header, mounted on a heat sink in such a manner that would allow it to be easily incorporated into an LED lamp or other device. Kish, Ex. 1004 at 1791, Fig. 1; Bretschneider Decl. at ¶ 69.

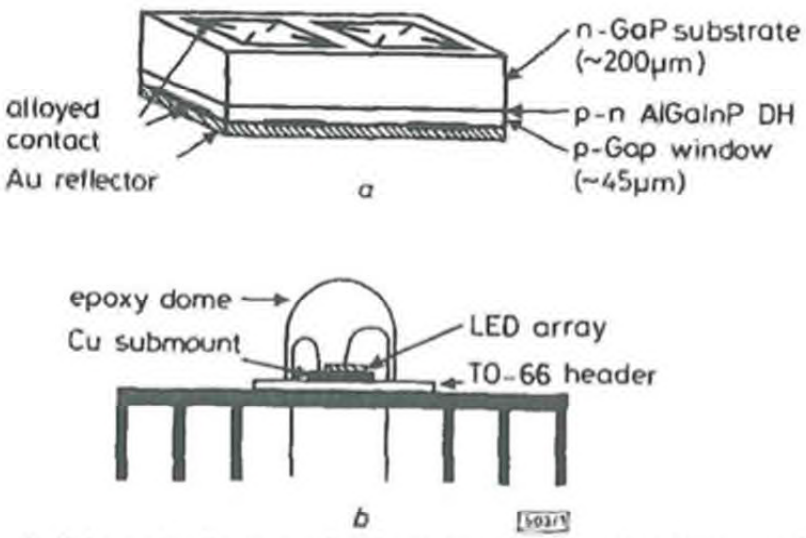


Fig. 1 *Schematic diagram of chip structure of semiconductor wafer-bonded transparent-substrate AlGaInP/GaP large-area LED*

Kish Figure 1

A person of ordinary skill in the art would look to the disclosure of Kish and understand that the Kish LEDs would supply a luminous flux in excess of 5 lumens when in operation in an LED lamp architecture and would be motivated to combine the Kish LED with the specific LED lamp architectures disclosed in Turnbull. Bretschneider Decl. at ¶ 70. Turnbull specifically suggests that transparent substrate AlInGaP amber LEDs would have the very high luminous efficacy desired for inclusion in the Turnbull LED lamp structure. Turnbull, Ex. 1003 at 21:31-38; 21:66-22:3; Bretschneider Decl. at ¶ 70. A person having ordinary skill in the art would also appreciate that the size of the Kish LED is appropriate for inclusion in the LED lamp architecture disclosed in Turnbull. Bretschneider Decl. at ¶ 70. The

Kish LEDs are transparent substrate AlGaInP/GaP large area LEDs and, consequently, a PHOSITA would be motivated to combine the Kish LEDs with the Turnbull LED lamp architecture, thereby achieving the goal of high luminous flux and efficacy. Bretschneider Decl. at ¶ 70.

While Turnbull teaches that amber LEDs may be used in combination with blue-green LEDs to achieve white light by color mixing, a person of ordinary skill in the art would understand that use of the amber Kish LEDs alone in the Turnbull LED lamp architecture would yield desirable results. Bretschneider Decl. at ¶ 71. A person of ordinary skill would be aware that many lighting applications do not require a particular type or color tone of "white" light—indeed, Claim 1 of the '774 patent does not require a particular type or color tone of white light. Bretschneider Decl. at ¶ 71. For just one example, it would have been well known to those of ordinary skill in the art that amber colored lights could function as floodlights for outdoor illumination tasks—Turnbull itself refers to such uses for highly saturated yellow light. Turnbull, Ex. 1003 at 2:36-47; Bretschneider Decl. at ¶ 71. Indeed, until just a few years ago, Low Pressure Sodium ("LPS") lamps were the highest efficacy light sources known (up to 180-200 lumens/W) and were commonly used for street lighting. Bretschneider Decl. at ¶ 71. LPS lamps are almost purely monochromatic with highly saturated yellow light emitted at about 589 nm. Bretschneider Decl. at ¶ 71. A person of ordinary skill in the art would appreciate

that an LPS lamp yields highly saturated yellow light with the same chromaticity and color rendering properties that is acceptable for street lighting applications. Bretschneider Decl. at ¶ 71. Overall, a person having ordinary skill in the art would be motivated to combine the amber LEDs disclosed in Kish with the LED lamp architecture disclosed in Turnbull to create an LED lamp with a luminous flux in excess of 5 lumens during operation. Bretschneider Decl. at ¶ 71.

2. Claim 3

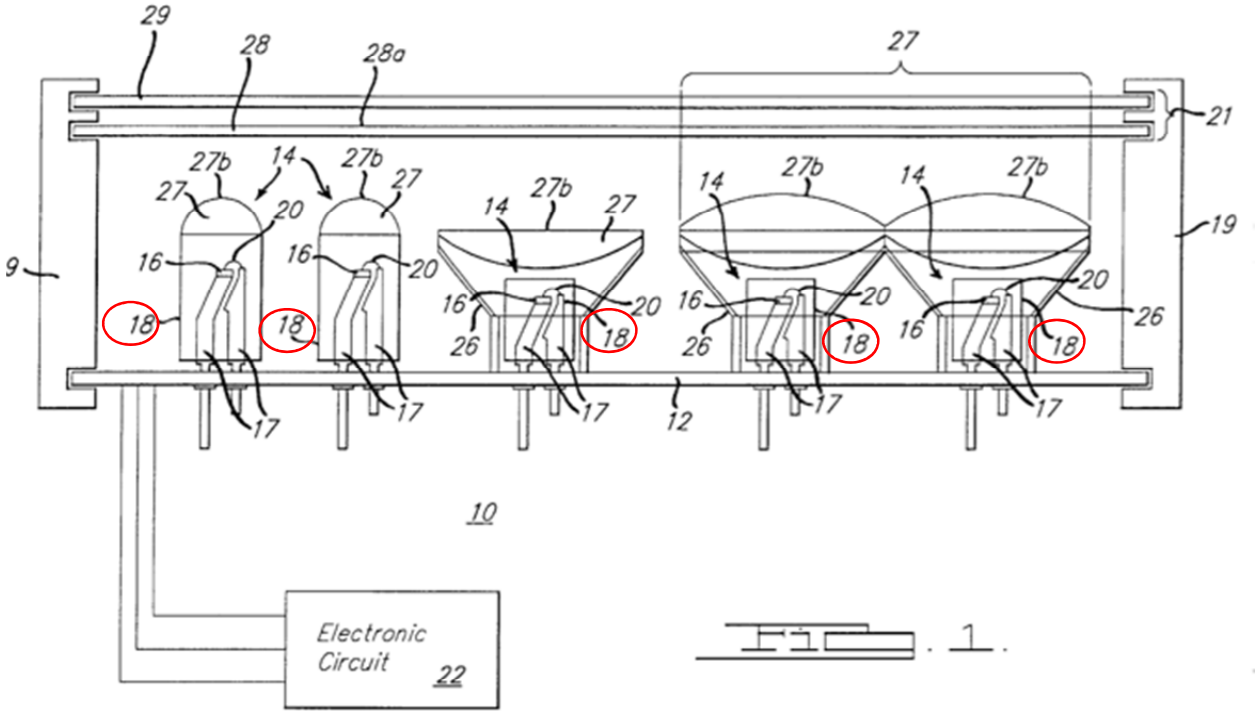
(a) *Limitation (3a)*: "A luminaire as claimed in claim 1 wherein the optical system of the lighting units comprises a primary and a secondary optical system,"

Turnbull discloses a luminaire wherein the lighting units include both a primary and a secondary optical system. Bretschneider Decl. at ¶ 72. For example, Turnbull teaches a primary optical system including a polymer matrix enclosure (18) located adjacent to the LED chip. Turnbull, Ex. 1003 at 11:18-25; Bretschneider Decl. at ¶ 72. Turnbull also teaches a secondary optical system comprising a reflector that is conically shaped (26) surrounding the LED chip. Turnbull, Ex. 1003 at 12:61-13:3; Bretschneider Decl. at ¶ 72.

(b) *Limitation (3b)*: "said primary optical system being provided with a primary reflector on which the LED chip is provided and with a transparent envelope in which the LED chip is embedded,"

Turnbull teaches a primary optical system being provided with a primary reflector on which the LED chip is provided and with a transparent envelope in

which the LED chip is embedded. Bretschneider Decl. at ¶ 73. In particular, Turnbull teaches a "miniature reflector cup" that may be located adjacent to the LED chip that functions as a primary reflector. Turnbull, Ex. 1003 at 11:18-20 ("a miniature reflector cup (not shown) may also be located adjacent to chip 16 to further improve light extraction from the device"); Bretschneider Decl. at ¶ 73. Turnbull also teaches that the LED chip is embedded in a transparent envelope. Turnbull, Ex. 1003 at 11:20-25 ("a clear, tinted, or slightly diffused polymer matrix enclosure 18 is used to suspend, encapsulate, and protect the chip 16, lead frame 17, optional reflector cup (not shown) and wire conductor 20 and to provide certain desirable optical characteristics"); Bretschneider Decl. at ¶ 73. Turnbull further explains that "[i]n most conventional discrete LED designs, enclosure 18 also acts as an integral optical element such as a lens 27, deviator 28 or diffuser 29." Turnbull, Ex. 1003 at 11:49-51; Bretschneider Decl. at ¶ 73.

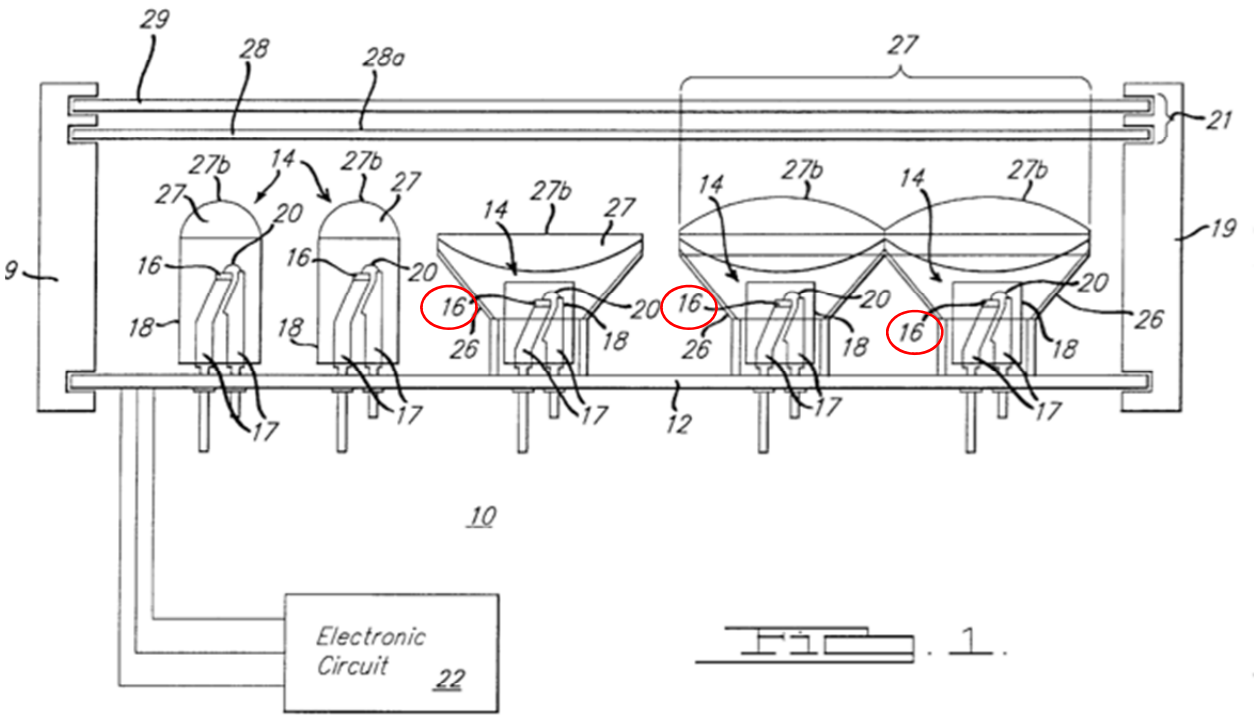


Turnbull Figure 1

(c) *Limitation (3c)*: "said secondary optical system being provided with a secondary reflector in whose comparatively narrow end portion the LED chip is positioned."

Turnbull teaches a secondary optical system being provided with a secondary reflector in whose comparatively narrow end portion the LED chip is positioned. Bretschneider Decl. at ¶ 74. Reflector 26 is shown in Figure 1 of Turnbull to have a conical shape with the LED chip positioned in the narrow end portion of the cone, as indicated by the annotations on Figure 1 of Turnbull below. Turnbull, Ex. 1003 at 12:61-13:3 ("The reflector 26, if used, is normally a conical parabolic, or

elliptical reflector and typically is made of metal or metal-coated molded plastic. The purpose of the reflector 26 is to collect or assist in the collection of light emitted by the LED chip 16 and project it toward the area to be illuminated in a narrower and more intense beam than otherwise would occur."); Bretschneider Decl. at ¶ 74.



Turnbull Figure 1

3. Claim 5

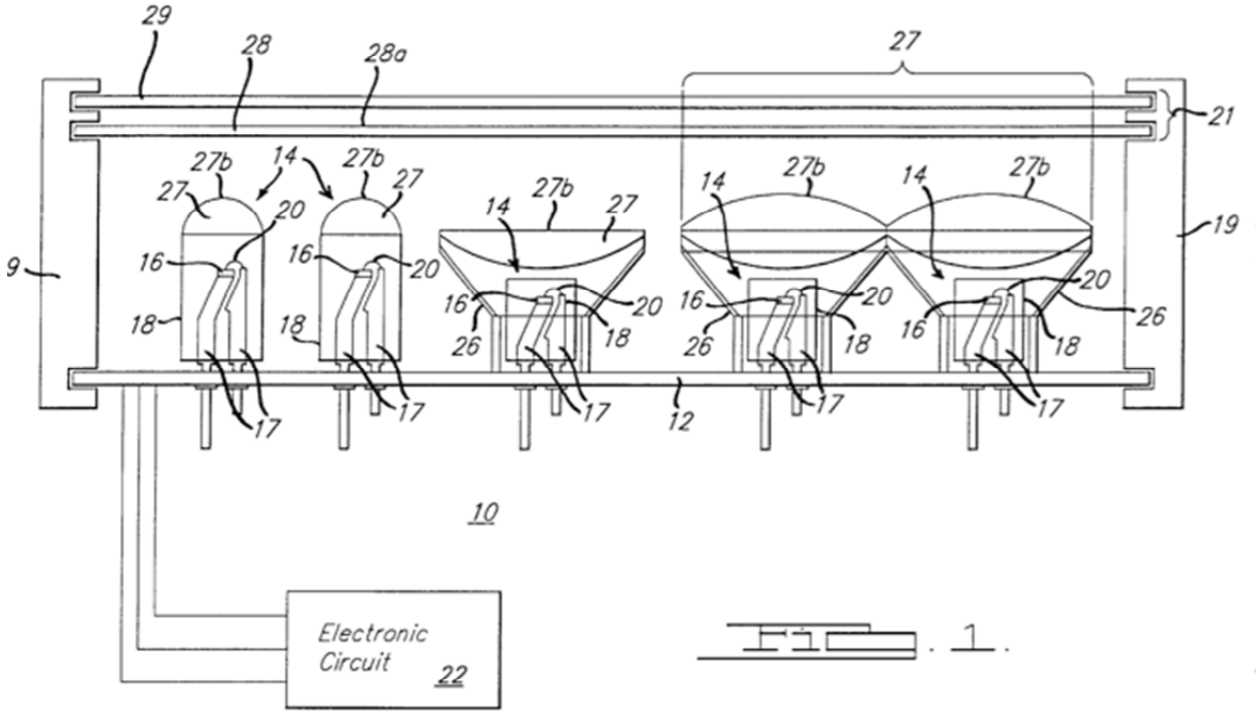
(a) *Limitation (5a)*: "A luminaire as claimed in claim 1 wherein the optical system of the lighting unit comprises a transparent body with a first optical part which deflects the light generated by the LED chip through refraction"

Turnbull discloses a luminaire as claimed in claim 1 of the '774 patent wherein the optical system of the lighting unit comprises a transparent body with a first optical part which deflects the light generated by the LED chip through refraction. Bretschneider Decl. at ¶ 75. Turnbull discloses that the optical system of the lighting unit may include secondary optical elements (21) that perform refraction on the light generated by the LED chip. Turnbull, Ex. 1003 at 13:49-63; Bretschneider Decl. at ¶ 75. In particular, Turnbull provides that such secondary optical elements may "comprise one or more of a lens 27, a deviator 28, and a diffuser 29, each of which may be in conventional form or otherwise in the form of a micro-groove Fresnel equivalent, a HOE, binary optic or TIR equivalent, or another hybrid form." Turnbull, Ex. 1003 at 13:59-61; Bretschneider Decl. at ¶ 75. Turnbull also explains that "it should be understood that Plano-convex, bi-convex, aspheric or their Fresnel, total-internal-reflection (TIR), catadioptric or holographic optic element (HOE) equivalents are variants of lenslet 27a." Turnbull, Ex. 1003 at 13:39-42; Bretschneider Decl. at ¶ 75. A catadiotripic optical element utilizes both reflection and refraction, and is clearly disclosed by Turnbull as part of the optical system for a viable lighting unit. Bretschneider Decl. at ¶ 75. A deviator (28) is specifically described by Turnbull as being "a molded clear polycarbonate or acrylic prism operating in refractive mode." Turnbull, Ex. 1003 at 14:2-3; Bretschneider

Decl. at ¶ 75.

(b) *Limitation (5b)*: "and a second optical part which deflects the light generated by the LED chip through reflection."

Turnbull further discloses that the optical system of the lighting unit includes a second optical part that deflects the light generated by the LED chip through reflection. Bretschneider Decl. at ¶ 76. Specifically, Turnbull discloses reflector (26) that is included in the optical system surrounding the LED chip and directing the light emanating from the LED chip. Turnbull, Ex. 1003 at 13:64-14:2 ("A deviator 28 may be optionally mounted on or attached to the housing 19 or otherwise attached to or made integral with the lens surface 27b and used to conveniently steer the collimated beam in a direction oblique to the optic axis of the lens 27 and/or reflector 26 used in the LED illuminator 10."); Bretschneider Decl. at ¶ 76. Also, as noted above, a catadiotripic optical element utilizes both reflection and refraction, and is clearly disclosed by Turnbull as part of the optical system for a viable lighting unit. Turnbull, Ex. 1003 at 13:39-42; Bretschneider Decl. at ¶ 76. Likewise, Turnbull discloses that "Plano-convex, bi-convex, aspheric or their Fresnel, total-internal-reflection (TIR), catadioptric or holographic optic element (HOE) equivalents are variants of lenslet 27a" and may be second optical parts in the LED lamp. Turnbull, Ex. 1003 at 13:39-42; Bretschneider Decl. at ¶ 76.

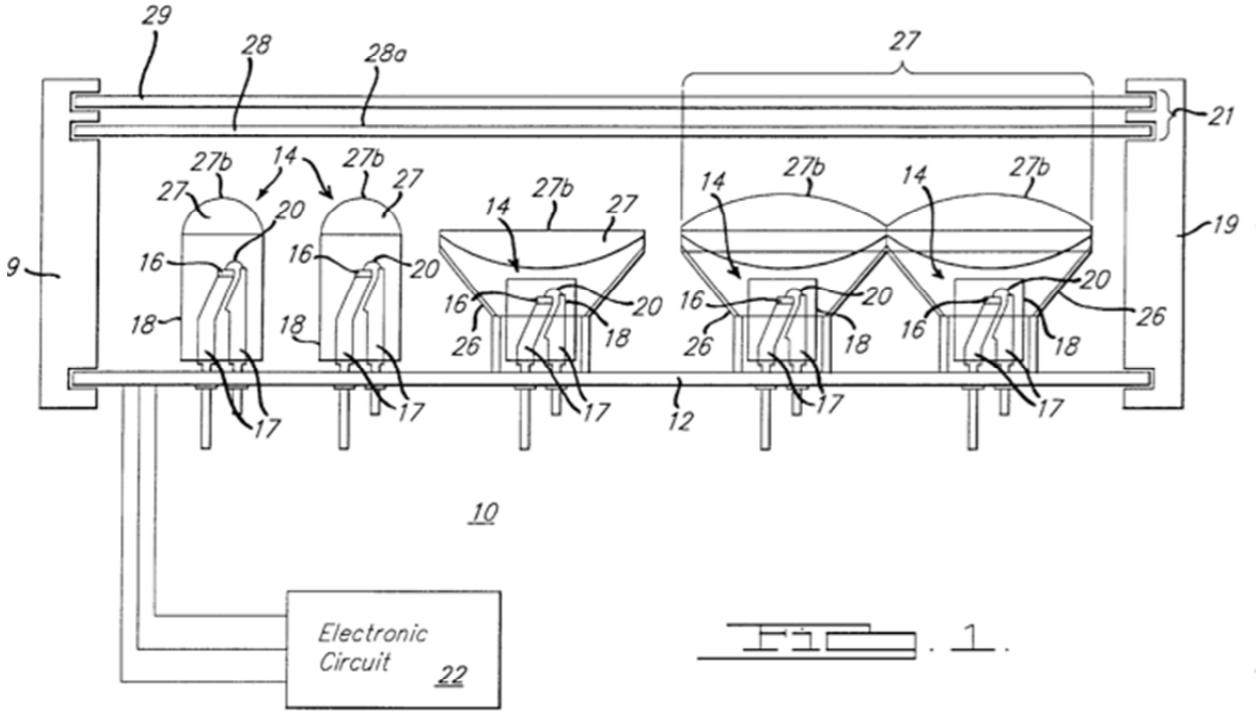


Turnbull Figure 1

4. Independent Claim 14

(a) *The preamble*: "A lighting system comprising"

Turnbull discloses a lighting system as described in Claim 14 of the '774 patent. Bretschneider Decl. at ¶ 77. For example, Turnbull discloses "[a]n illuminator assembly, having a plurality of LED." Turnbull, Ex. 1003 at Abstract; 7:28-58; Fig.1; Fig. 2; Bretschneider Decl. at ¶ 77.



Turnbull Figure 1

(b) *Limitation (14a)*: "at least one luminaire comprising a housing with a light emission window and a lighting module in said housing for illuminating an object outside of said housing"

Turnbull teaches a luminaire, or lighting device, as described in Claim 14 of the '774 patent. Bretschneider Decl. at ¶ 78. Specifically Turnbull discloses an "illuminator assembly" with a plurality of LEDs that emit light when in operation. Turnbull, Ex. 1003 at 7:27-32; Bretschneider Decl. at ¶ 78. The illuminator assembly described in Turnbull is a device that incorporates "a plurality of light emitting diodes on a support member to provide a light-weight, robust illuminator."

Turnbull, Ex. 1003 at 7:63-65; Bretschneider Decl. at ¶ 78. Figures 1 and 2 of Turnbull illustrate the lighting device, or luminaire, described by Turnbull. Bretschneider Decl. at ¶ 78.

Turnbull also teaches a luminaire that includes a housing with a light emission window and a lighting module in said housing for illuminating an object outside of said housing. Bretschneider Decl. at ¶ 79. In the '774 patent, the housing is identified as the protective outer layer at number 10, and the light emission window is identified as the space within the housing surrounding the lighting units at number 11, as shown in Figure 2 below. Bretschneider Decl. at ¶ 79. Turnbull similarly teaches that a housing with a light emission window should be provided in the lighting assembly illustrated in Figures 1 and 2 of Turnbull. Bretschneider Decl. at ¶ 79.

A "lighting module," according to the '774 patent, is a set of lighting units, and a "lighting unit" is at least one LED chip and a primary optical system cooperating therewith. Bretschneider Decl. at ¶ 80. Thus Figure 1 of Turnbull illustrates a luminaire with five lighting units depicted that may together serve as a lighting module. Bretschneider Decl. at ¶ 80. Figure 16 of Turnbull further discloses that LEDs may be oriented to illuminate portions of an object outside the housing. Bretschneider Decl. at ¶ 80. Thus, Turnbull discloses a lighting module for illuminating an object outside the housing. Bretschneider Decl. at ¶ 80.

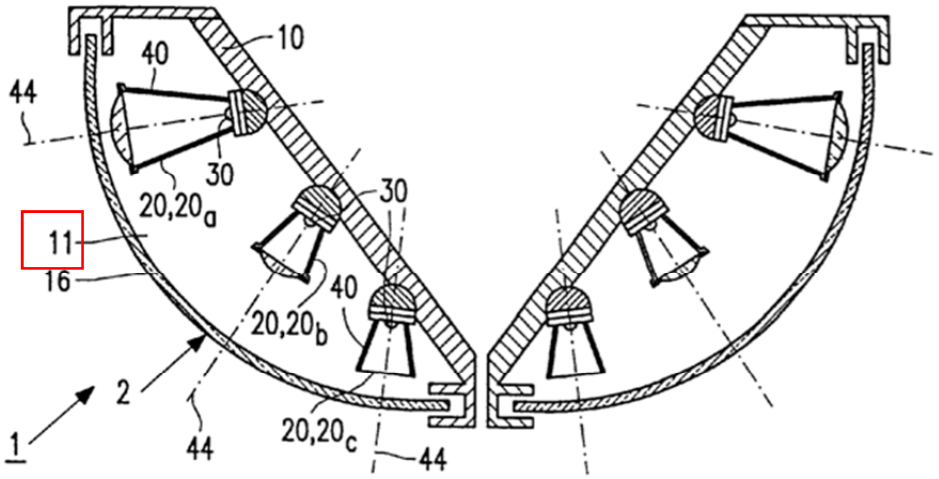


FIG. 2

'774 patent Figure 2

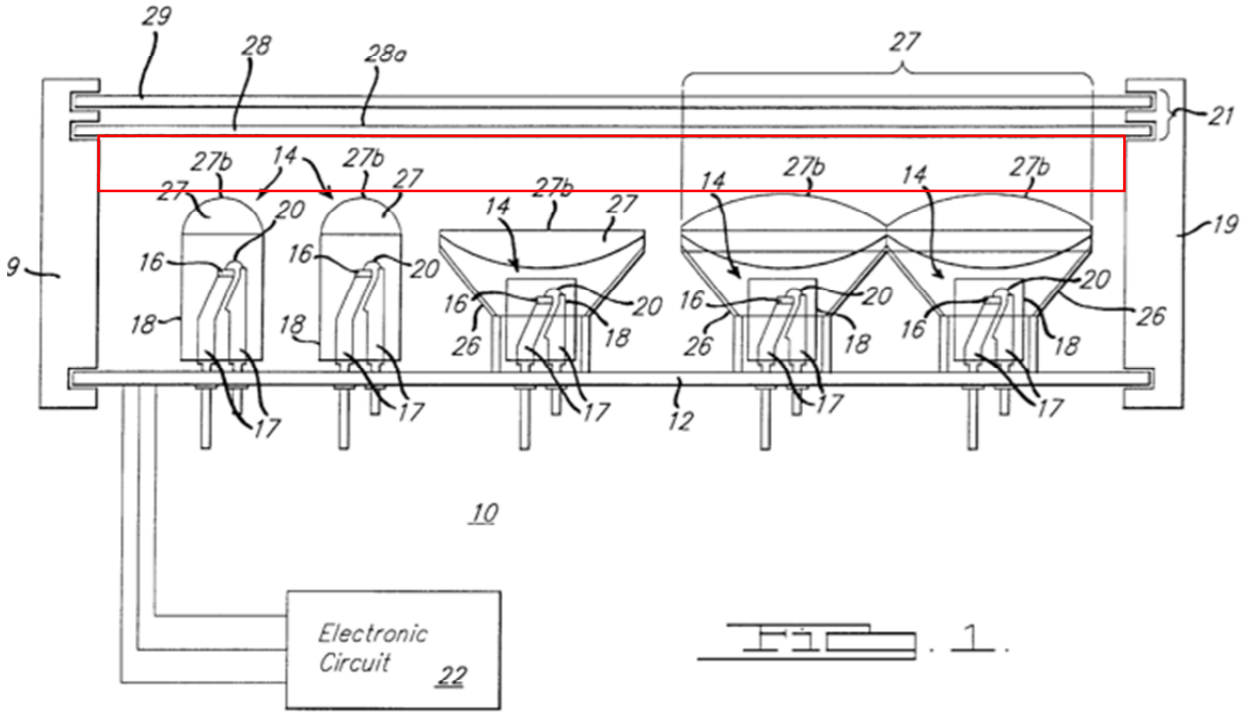
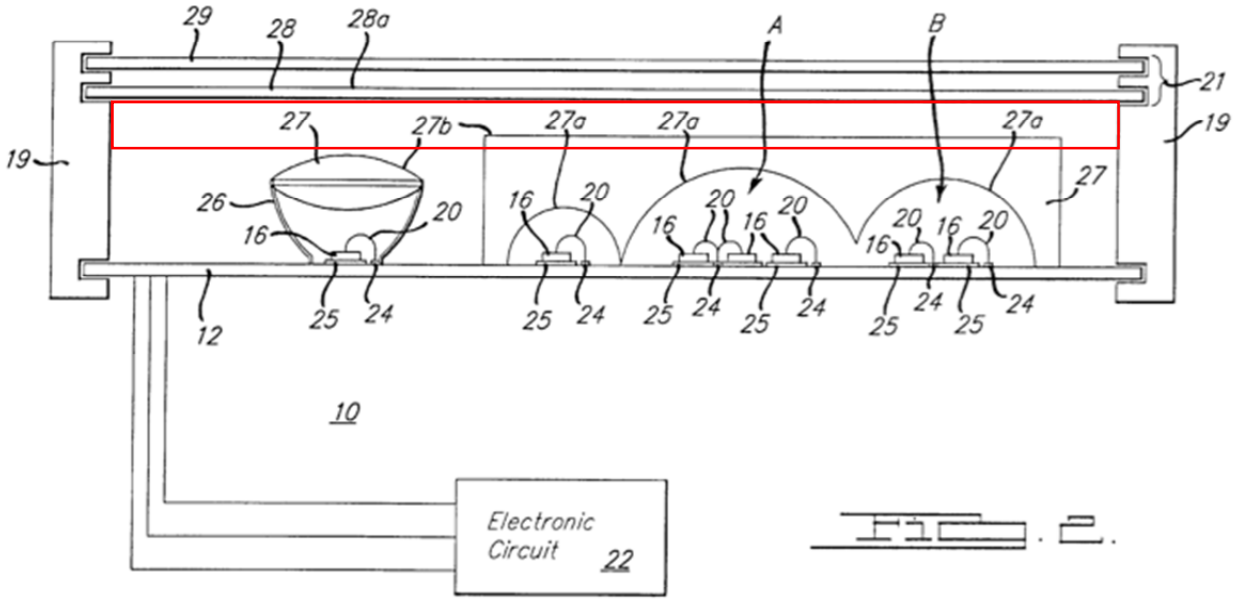


FIG. 1

Turnbull Figure 1

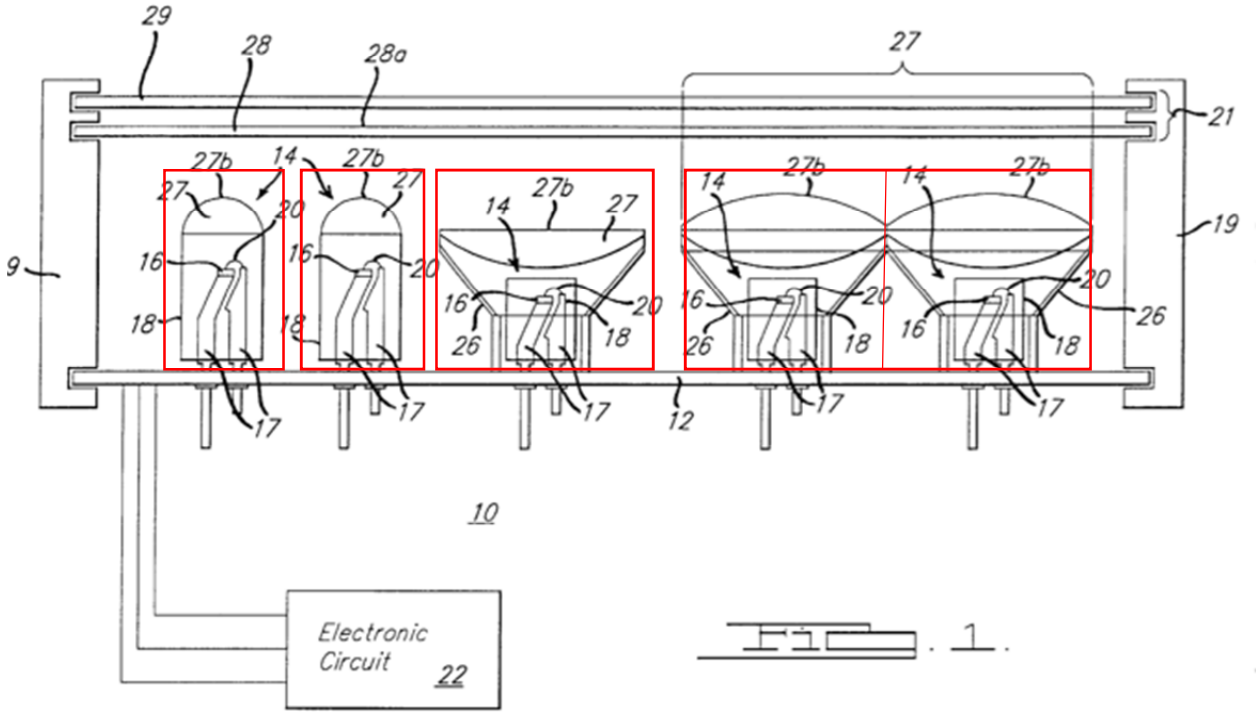


Turnbull Figure 2

(c) *Limitation (14b)*: "said module comprising a plurality of lighting units each of said plurality of lighting units comprising at least one LED chip and an optical system"

Turnbull teaches a plurality of lighting units within the lighting module, where each lighting unit comprises at least one LED chip (item 16 in Figure 1 of Turnbull) and an optical system cooperating therewith (items 18, 26, and 27 in Figure 1 of Turnbull). Bretschneider Decl. at ¶ 81. Specifically, Turnbull teaches that the individual LED chips are disposed within optical systems including an enclosure (18) that also acts as an integral optical element, such as a lens (27), deviator (28), diffuser (29), or reflector (26). Turnbull, Ex. 1003 at 11:49-51; 12:61-13:3; Bretschneider Decl. at ¶ 81. Turnbull further discloses that the optical

system may include lenslets with various different structures, including Total Internal Reflection (TIR) collimating lenses, Plano-convex lenses, bi-convex lenses, aspheric lenses, Fresnel lenses, catadioptric or holographic optic elements (HOE). Turnbull Ex. 1003 at 13:35-47; Bretschneider Decl. at ¶ 81. Indeed, Turnbull discloses combinations of these disclosed optical systems as necessary and as would be known to one of ordinary skill in the art. Turnbull, Ex. 1003 at 14:42-60; Bretschneider Decl. at ¶ 81. The optical systems disclosed in Turnbull are configured to direct the light emitted by the LED to illuminate portions of the object. Turnbull, Ex. 1003 at 11:4-6; Bretschneider Decl. at ¶ 81.

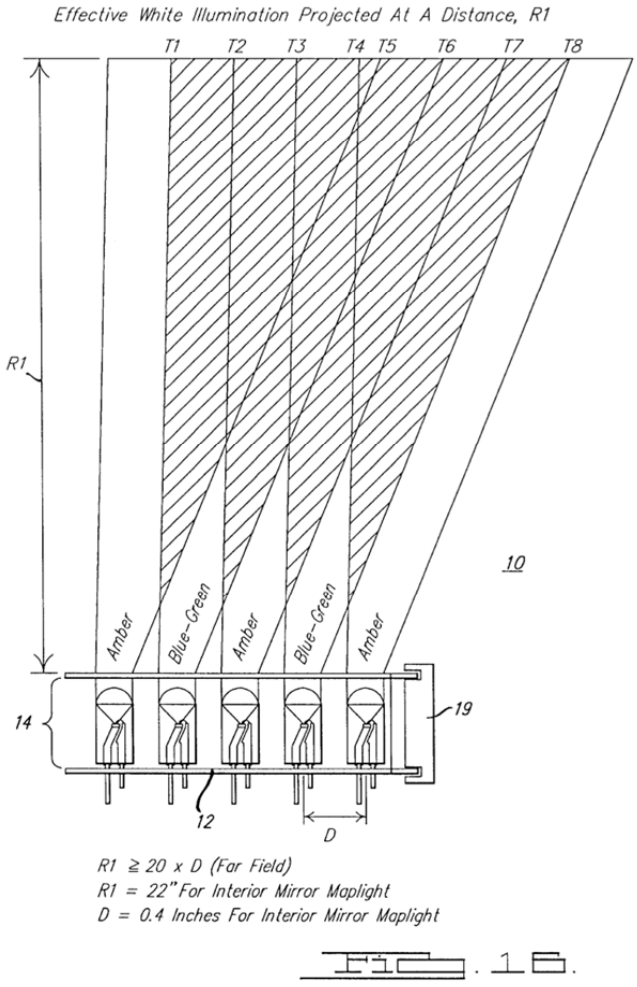


Turnbull Figure 1

(d) *Limitation (14c)*: "said LED chips each supplying a luminous flux of at least 5 lm during operation, said luminous flux being directed through a respective optical system toward respective portion of said object."

As explained in detail above in connection with Claim Limitation 1d and at Paragraphs 54 and 59 to 71 of the Bretschneider Declaration, the combination of Kish and Turnbull would disclose to one of ordinary skill in the art that each LED chip supplies "a luminous flux of at least 5 lm during operation." Bretschneider Decl. at ¶¶ 54; 59 to 71.

Furthermore, Turnbull discloses that the luminous flux generated by each LED is directed toward its respective optical system toward the respective portion of said object. Bretschneider Decl. at ¶ 83. In particular, Figure 16 of Turnbull illustrates how the luminous flux of each LED is directed toward respective portions of an object outside of the lighting system. Bretschneider Decl. at ¶ 83. Thus, the light and luminous flux emanating from each LED is directed to a portion of the object outside the housing. Bretschneider Decl. at ¶ 83.



Turnbull at Figure 16

VIII. CONCLUSION

Based on the foregoing, Claims 1, 3, 5, and 14 of the '774 patent recite subject matter that is unpatentable. The Petitioner requests institution of an *inter partes* review to cancel these claims.

RESPECTFULLY SUBMITTED,
RADULESCU LLP

Date: May 28, 2015

/s/ *David C. Radulescu*

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Attachment A:

CERTIFICATE OF SERVICE ON PATENT OWNER UNDER 37 C.F.R. §§ 42.6(e) and 42.105

Pursuant to 37 C.F.R. §§ 42.6(e) and 42.105, the undersigned certifies that on May 28, 2015, a complete and entire copy of this Petition for *Inter Partes* Review of U.S. Patent 6,250,774 was served via EXPRESS MAIL®, postage prepaid, to the Patent Owner by serving the following parties:

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Dated: May 28, 2015

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Attachment B: Appendix of Exhibits

Exhibit	Description
Ex. 1001	U.S. Patent No. 6,250,774 to Begemann
Ex. 1002	Patent History of U.S. Patent No. 6,250,774 to Begemann
Ex. 1003	U.S. Patent No. 5,803,579 to Turnbull
Ex. 1004	F.A Kish, et al., *High luminous flux semiconductor wafer-bonded AlGaInP/GaP large-area emitters*, 30 (21) Elecs. Letters 1790 (Oct. 13, 1994)
Ex. 1005	F.A. Kish, et al., *Very high-efficiency semiconductor wafer-bonded transparent-substrate* $(Al_xGa_{1-x})_{0.5}In_{0.5}P$*/GaP light-emitting diodes*, 64 (21) APPL. PHYS. LETTERS 2839 (May 23, 1994)
Ex. 1006	Declaration of Eric Bretschneider
Ex. 1007	Curriculum Vitae of Eric Bretschneider