UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.
Petitioner

v.

LYNK LABS, INC.
Patent Owner

Patent No. 10,492,251

PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 10,492,251

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I. INTRODUCTION

Samsung Electronics Co., Ltd. ("Petitioner" or "Samsung") requests *inter partes* review of claims 2-5, 7-13, and 21-23 ("challenged claims") of U.S. Patent No. 10,492,251 ("the '251 patent") (Ex. 1001) assigned to Lynk Labs, Inc. ("Patent Owner" or "PO"). For the reasons below, the challenged claims should be found unpatentable and canceled.

II. MANDATORY NOTICES

<u>Real Parties-in-Interest</u>: Petitioner identifies the following as the real parties-in-interest: Samsung Electronics Co., Ltd., and Samsung Electronics America, Inc.

<u>Related Matters</u>: The '251 patent is at issue in the following matter(s):

- *Samsung Electronics Co., Ltd. v. Lynk Labs, Inc.*, No. 1:21-cv-02665 (N.D.Ill.) (seeking declaratory judgment of non-infringement as to the '251 patent and also U.S Patent Nos. 10,492,252, 10,499,466, 10,506,674, 10,966,298, 10,687,400, 10,750,583, 10,517,149, 10,154,551, 10,652,979, and 11,019,697) ("Illinois-Litigation")
- *Lynk Labs, Inc. v. Samsung Electronics Co. Ltd. et al.*, 6:21-cv-00526 (W.D.Tex.), transferred to Illinois as Case No. 1:21-cv-05126 and consolidated with 1:21-cv-02665 (Illinois-Litigation)

- *Lynk Labs, Inc. v. The Home Depot USA, Inc. et al.*, No. 6:21-cv-00097 (W.D.Tex.) ("HD-Litigation")
- *Home Depot U.S.A., Inc. v. Lynk Labs, Inc.*, IPR2021-001369 ("HD-IPR").

The '251 patent claims the benefit of priority to, *inter alia*, two provisional applications (U.S. Provisional Application Nos. 60/574,653, filed February 25, 2004, and 60/559,867, filed April 6, 2004). The following patents claim the same benefit of priority to the '653 and '867 applications and have corresponding IPR proceedings:

- U.S. Patent No. 8,531,118 at issue in *Acuity Brands Lighting, Inc., v. Lynk Labs, Inc.*, IPR2016-01133 (terminated);
- U.S. Patent No. 10,506,674 at issue in *Samsung Electronics Co., Ltd. v. Lynk Labs, Inc.*, IPR2021-01299 (pending);
- U.S Patent No. 11,019,697 at issue in *Samsung Electronics Co., Ltd. v. Lynk Labs, Inc.*, IPR2021-01300 (pending);
- U.S Patent No. 10,492,252 at issue in *Samsung Electronics Co., Ltd. v. Lynk Labs, Inc.*, IPR2021-01345 (pending);
- U.S Patent No. 10,499,466 at issue in *Samsung Electronics Co., Ltd. v. Lynk Labs, Inc.*, IPR2021-01346 (pending);
- U.S Patent No. 10,966,298 at issue in *Samsung Electronics Co., Ltd. v. Lynk Labs, Inc.*, IPR2021-01347 (pending);

- U.S Patent No. 10,154,551 at issue in *Samsung Electronics Co., Ltd. v. Lynk Labs, Inc.*, IPR2021-01575 (pending);
- U.S Patent No. 10,652,979 at issue in *Samsung Electronics Co., Ltd. v. Lynk Labs, Inc.*, IPR2021-01576 (pending);
- U.S Patent No. 10,154,551 at issue in *Home Depot USA, Inc. v. Lynk Labs, Inc.*, IPR2021-01367 (pending).

Petitioner is concurrently filing another IPR petition challenging **different** claims of the '251 patent.[1]

Counsel and Service Information: Lead counsel: Naveen Modi (Reg. No. 46,224), and Backup counsel are (1) Joseph E. Palys (Reg. No. 46,508), (2) Arvind Jairam (Reg. No. 62,759), (3) Mark Consilvio (Reg. No. 72,065), and (4) Howard Herr (*pro hac vice* admission to be requested). Service information is Paul Hastings LLP, 2050 M St., Washington, D.C., 20036, Tel.: 202.551.1700, Fax: 202.551.1705, email: PH-Samsung-LynkLabs-IPR@paulhastings.com. Petitioner consents to electronic service.

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[1] Petitioner concurrently submits a separate paper (consistent with the Trial Practice Guide Update, July 2019), explaining why the filing of multiple petitions should not be a basis for discretionary denial under 35 U.S.C. § 314.

III. PAYMENT OF FEES

The PTO is authorized to charge any fees due during this proceeding to Deposit Account No. 50-2613.

IV. GROUNDS FOR STANDING

Petitioner certifies that the ’251 patent is available for review and Petitioner is not barred or estopped from requesting review on the grounds identified herein.

V. PRECISE RELIEF REQUESTED AND GROUNDS

Claims 2-5, 7-13, and 21-23 should be canceled as unpatentable based on the following grounds:

Ground 1: Claims 2-5, 7, 10, 13, and 21-23 are unpatentable under § 103(a) as being obvious over *Birrell* (Ex. 1005) and *Schultz* (Ex. 1046);

Ground 2: Claims 8-9 are unpatentable under § 102(a) as being anticipated by *Birrell*;

Ground 3: Claims 11-12 are unpatentable under § 102(b) as being anticipated by *Nagai* (Ex. 1040); and

Ground 4: Claims 11-12 are unpatentable under § 103(a) as being obvious over *Piepgras* (Ex. 1030) and *Kasegi* (Ex. 1014).

The ’251 patent issued from an application filed October 1, 2018, which claims priority via a chain of application to a provisional application filed February

25, 2004, which for purposes of this proceeding and without conceding entitlement to such a date, Petitioner assumes is the critical date for the ’251 patent.

Birrell, published July 17, 2003, qualifies as prior art at least under pre-AIA 35 U.S.C. § 102(a). *Piepgras*, filed September 17, 2002 and issued July 24, 2003, qualifies as prior art at least under §§ 102(a) and/or (e). *Schultz*, filed December 2, 2003, qualifies as prior art at least under § 102(e). *Nagai* published on August 22, 2002 and *Kasegi* issued February 4, 1992, and thus qualify as prior art at least under pre-AIA 35 U.S.C. § 102(b).

Other than the listing of *Nagai* among 120+ references, none of these references were substantively considered during prosecution. (*See generally* Ex. 1004; §X.C (regarding *Nagai*).)

VI. LEVEL OF ORDINARY SKILL

A person of ordinary skill in the art as of the claimed priority date of the ’251 patent (“POSITA”) would have had at least a bachelor’s degree in electrical engineering, computer engineering, computer science, physics, or the equivalent, and two or more years of experience with LED devices and/or related circuit design, or a related field. (Ex. 1002, ¶¶20-21.)[2] More education can supplement practical experience and vice versa. (*Id.*)

VII. THE '251 PATENT

The '251 patent indicates its purported invention relates to LEDs and LED drivers, and specifically to AC driven LEDs and circuits. (Ex. 1001, 1:40-44; *id.*, 3:20-9:61.) Yet, the challenged claims are broadly directed to a LED lighting system/driver including conventional/well-known generic components arranged to operate according to their known functions, such as LED circuits and drivers, smoothing capacitors, regulators, rectifiers, substrates, etc. As such, the claimed systems/devices/drivers were demonstrably obvious.[3] (§IX; Ex. 1002, ¶¶48-50; *see also id.*, ¶¶22-47 (citing, *inter alia*, Exs. 1015, 1018, 1037, 1041, 1043, 1044, 1045), 52-75, 76-169; Exs. 1054-1070.)

VIII. CLAIM CONSTRUCTION

The Board only construes the claims when necessary to resolve the underlying controversy. *Toyota Motor Corp. v. Cellport Systems, Inc.*, IPR2015-00633, Paper

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[2] Petitioner submits the declaration of R. Jacob Baker, Ph.D., P.E., an expert in the field of the '251 patent. (Ex. 1002, ¶¶1-19; Ex. 1003.)

[3] The '251 patent issued from claims identified as allowable on first Office Action without any substantive prior art analysis. (*See* Ex. 1004, 236, 256-262, 509-510.)

11 at 16 (Aug. 14, 2015) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)). For purposes of this proceeding, no special constructions are necessary to assess whether the challenged claims are unpatentable over the asserted prior art as the asserted grounds demonstrate unpatentability under any reasonable interpretation of the claimed terms.[4] (Ex. 1002, ¶51.)

[4] Petitioner reserves all rights to raise claim construction and other arguments, including challenges under 35 U.S.C. §§ 101 or 112, in district court as relevant to those proceedings. *See*, *e.g.*, *Target Corp. v. Proxicom Wireless, LLC*, IPR2020-00904, Paper 11 at 11-13 (Nov. 10, 2020). A comparison of the claims to any accused products in litigation may raise controversies that are not presented here given the similarities between the references and the patent.

IX. DETAILED EXPLANATION OF GROUNDS[5]

A. Ground 1: Claims 2-5, 7, 10, 13, and 21-23 Are Obvious over *Birrell* and *Schultz*

Challenged claims 2-5, 7, and 21 depend from claim 1. Accordingly, Petitioner demonstrates below how *Birrell-Schultz* discloses/suggests the limitations of claim 1 before addressing its challenged dependent claims.

1. Claim 1

a) An LED lighting system comprising:

To the extent limiting, *Birrell* discloses this limitation. (Ex. 1002, ¶¶68-73.) For example, *Birrell* discloses systems for "connecting electrical devices to power sources," e.g., "lighting **systems** to illuminate wide areas" and "other lighting arrangements." (Ex. 1005, 2:3-13, Title, Abstract, FIGS. 1-3, 8-10; Ex. 1002, ¶¶70-71.)[6] The system includes a lighting tile 50 and **light-emitting diode (LED)** light source(s), which are LEDs. (Ex. 1005, FIGS. 1, 8 (LEDs 59), 11:26-12:11, 13:31-

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[5] Section IX references exhibits other than the asserted prior art for each ground. Such exhibits in the respective grounds reflect the state of the art known to a POSITA at the time of the alleged invention consistent with the testimony of Dr. Baker.

[6] PO contends things like a smartphone, smart TV, smart refrigerator, and smart washer/dryer, constitute an "LED lighting system." (Ex. 1083, 2-5; Ex. 1084, 2, 7, 11, 15, 19, 24, 28, 33, 37, 41.)

33, 14:26-15:33, 15:15-16:10 (tile 50 including various components, e.g., sensors, circuitry, and microcontroller for controlling tile functions); Ex. 1002, ¶71.)

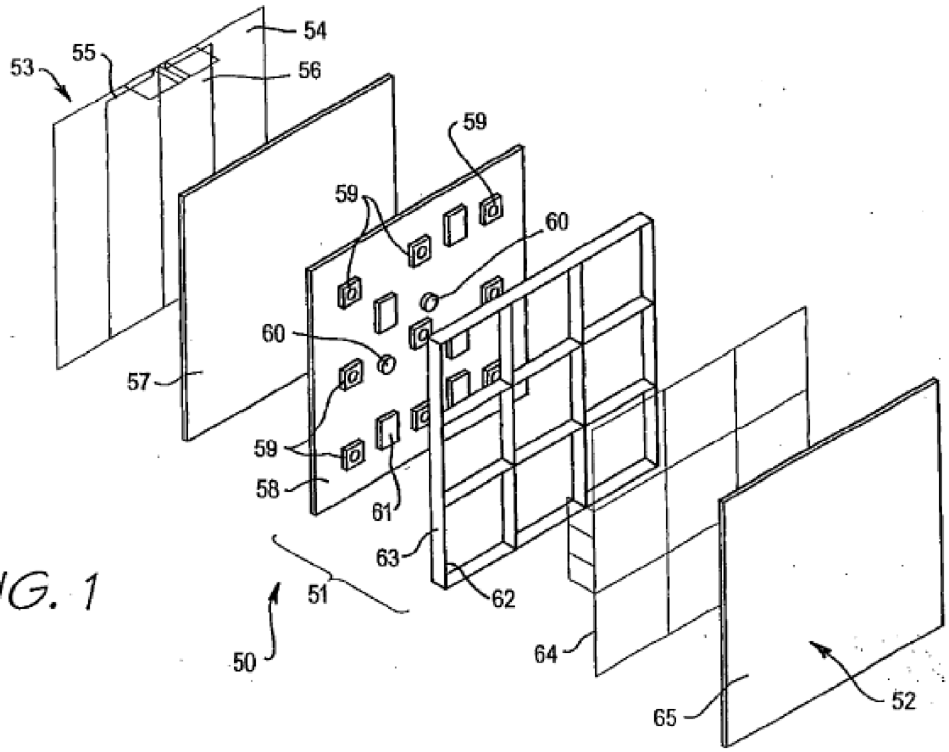


FIG. 1

(Ex. 1005, FIG. 1, 14:26-18:12, Ex. 1002, ¶71.)

Birrell describes various details and configurations of the LED lighting system in connection with other figures. (Ex. 1002, ¶¶72-73; Ex. 1005, 13:30-14:18-25, FIGS. 1-14.) Figure 3 describes such a system with four lighting tiles 50 of Figure 1 connected to an AC power source 11 (Ex. 1005, 13:34-14:2, 17:25-28, 19:12-24, FIG. 3), and Figure 4 shows a simplified circuit diagram of tile 50 in lighting system 10 (*id.*, 18:37-19:11, FIG. 4). (Ex. 1002, ¶¶72-73.) Figures 8-10 show additional details relating to the lighting system. For instance, Figure 8 shows a circuit diagram of the LED lighting system including LEDs 59 coupled to a 48 AC voltage source via a rectifier (diodes 67) and a capacitive coupling (formed by capacitors C_A and C_B). (Ex. 1005, FIG. 8, 19:1-7, 20:26-31, 20:32-23:29; §IX.A.1(b).) One example of the claimed "LED lighting system" is shown below.

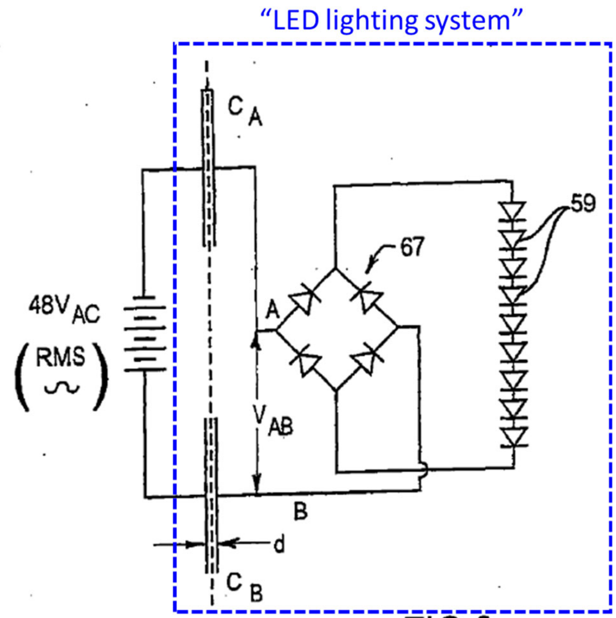


FIG 8

(Ex. 1005, FIG. 8 (annotated); Ex. 1002, ¶73.) The "lighting system" is also disclosed by the circuits and conductors to the right of the capacitors C_A and C_B. (Ex. 1002, ¶73.) Further, *Birrell*'s arrangements regarding FIGS. 1-4 associated with the circuit of FIG. 8 also disclose a lighting system, which receives power from a power source (*e.g.*, source 11). (Ex. 1005, 14:26-18:12, *see also id.*, FIGS. 9-10, 13:31-14:25, 18:37-19:11, 23:15-24:25; Ex. 1002, ¶73; *infra* §§IX.A.1(b)-(d).)

b) an LED driver having an input and an output, wherein the input is configured to receive an AC or DC voltage source, and wherein output provides an AC or DC voltage;

Birrell discloses this limitation. (Ex. 1002, ¶¶74-76.) FIG. 8 discloses a 48V AC power supply capacitively coupled to LEDs (59) via rectifier 67. (Ex. 1005, 20:26-31, 22:29-30, FIG. 8; Ex. 1002, ¶¶74-75.) Bridge rectifier (67), capacitors C_A-C_B, and interconnecting conductors (and other existing components not shown (Ex. 1005, FIG. 9)) disclose an "LED driver" because these components collectively provide power to drive LEDs 59. (Ex. 1005, FIG. 8, 19:1-7 (rectifier 67 ensures "light is emitted from the LEDs during both the positive and negative cycles of the AC power supply coupled via capacitors…").) The capacitors (C_A-C_B) couple the 48V AC source to the rectifier (diodes 67), which in turn provides rectified power ("AC or DC voltage") to drive LEDs 59. (*Id.*, FIG. 4, 19:1-11 (simplified diagram of tile 50 (part of the "LED driver") including components for controlling "any or all of the LEDs" and other functions are "not shown").)

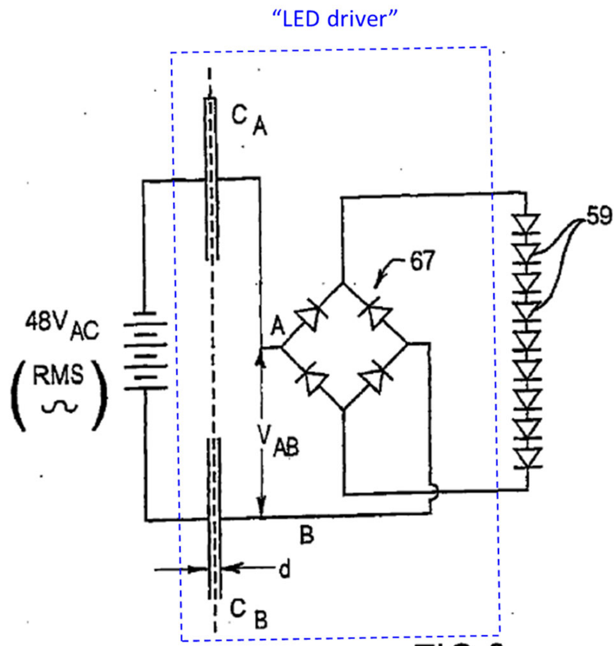


FIG 8

(Ex. 1005, FIG. 8 (annotated); Ex. 1002, ¶75.) The "LED driver" is also disclosed as above but without including capacitors (C_A-C_B), which couple the 48V AC to such a "driver." (Ex. 1002, ¶76.)

Birrell's "LED driver" has an input receiving power from an AC power source (e.g., 48V AC source) and an output providing rectified power ("AC or DC voltage"). (Ex. 1005, FIG. 8, 20:26-31 ("LEDs…capacitively coupled to an AC power supply"), 22:29-30 ("Thus, a 48 Volt AC power supply…will satisfactorily illuminate the LED's of Figure 8."); Ex. 1002, ¶76; Ex. 1013, 163-167.) Accordingly, *Birrell* discloses an LED driver with an "input [that] is configured to receive an AC [] voltage source" (*e.g.*, 48V AC) and an "output [that] provides an

AC or DC voltage" (*e.g.*, rectified power (including voltage) provided by the output of rectifier 67). (Ex. 1002, ¶76.)

c) at least one LED circuit having a plurality of LEDs connected to the output of the LED driver, wherein the at least one LED circuit is mounted on a reflective substrate; and

Birrell in view of *Schultz* discloses and/or suggests this limitation. (Ex. 1002, ¶¶77-85.) The output of the above "LED driver" is connected to multiple series-connected LEDs 59, which in combination with, e.g., the conductive wires connecting the LEDs and connecting to receive power (and thus current), discloses "at least one LED *circuit* having a plurality of LEDs connected to the output of the LED driver," as claimed. (Ex. 1002, ¶77; Ex. 1005, FIG. 8, 19:1-7; §§IX.A.1(a)-(b).) A POSITA understood that LEDs 59 receive current (and voltage, and power), and thus a circuit is needed given without a circuit, current could not flow. (Ex. 1002, ¶77.)

Further, *Birrell* describes a circuit board subassembly 58 providing mechanical support for circuitry and the electrical components, including to mount LEDs 59 (and thus the "LED circuit"). (Ex. 1005, 15:15-21, FIG. 1; *id.*, 14:26-17:3.) Although *Birrell* does not expressly state that the LED circuit is mounted on a "reflective substrate,"[7] *Birrell* describes the desire for a device "optimized for uniform optical reflection to provide a uniform diffused light source." (Ex. 1005, 12:29-33.) Moreover, the use of a reflective substrate to provide mechanical support for an array of LEDs was well known in the art. (Ex. 1002, ¶79; Ex. 1018, 6:6-18, 6:48-7:34 (LED array substrate with integral reflector component), FIGS. 18, 19, 27); Ex. 1022, Abstract (LED chips mounted on the circuit board coated with "a layer of high reflection material on the board to collect light"), FIG. 2.1, ¶¶[0018], [0034], [0081]; Ex. 1046, ¶¶[0047]-[0049] (LED array substrate is made of a reflective material or laminated with a reflective layer).) Thus, a POSITA would have found it obvious in view of *Schultz* and state of the art knowledge to configure the substrate on which to mount *Birrell*'s LED circuit. (Ex. 1002, ¶¶79-85.)

For example, *Schultz* "generally relates to a lighting or illumination assembly" and, in particular, illumination systems including LEDs. (Ex. 1046, ¶¶[0002]-[0010].) *Schultz*, being from the same general field as the '251 patent, therefore would have been considered by a POSITA. (Ex. 1002, ¶¶80-81; Ex. 1001, 1:55-58 (describing the field as relating to LEDs).) *Schultz* also teaches that with non-

[7] In Illinois-Litigation, PO contends that a non-reflective, white circuit board constitutes "a reflective substrate." (Ex. 1084, 43.)

reflective circuit boards, "[a]ny light from the LED die that strikes the circuit board is unutilized due to absorption or scattering of the light." (Ex. 1046, ¶[0048].) *Schultz* discloses that by mounting the LED dies on a reflective circuit board, "the utilization of the light is improved." (*Id.*) Thus, *Schultz* also addresses a similar problem as the '251 patent. (Ex. 1002, ¶81; Ex. 1001, 24:62-25:8.) Accordingly, a POSITA would have similarly been motivated by *Schultz*'s teachings/suggestions to address the problem of unutilized light due to absorption or scattering by the circuit board/substrate in the context of *Birrell*'s lighting system. (Ex. 1002, ¶81.)

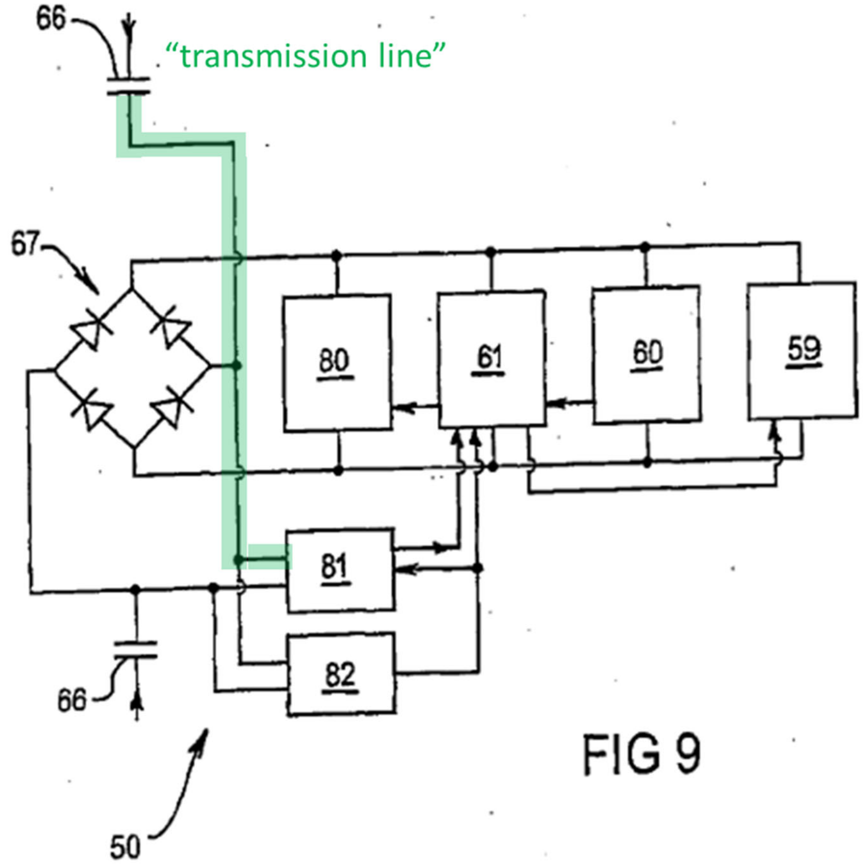
A POSITA would also have been motivated to implement such a configuration given *Birrell*'s expressed desire for a uniform optical reflection to provide a uniform light source and the knowledge of a POSITA regarding the use of reflective substrates to increase the optical efficiency of lighting systems. (Ex. 1002, ¶82; Ex. 1018, 6:6-18 (reflective substrate that redirects LED light so "light is not lost and can be effectively used"); Ex. 1022, ¶[0081] (coating the circuit board with a high reflection material for "uniform illumination"); Ex. 1023, 16:24-45.) Such a modification would have been no more than the predictable use of known lighting design techniques and components according to their established functions (*e.g.*, adding a reflective layer to a non-reflective substrate, forming the substrate from a reflective material, or using such a substrate to efficiently direct light). (Ex. 1002, ¶82.) *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).

A POSITA would have been motivated to use various known design concepts, components, and techniques in implementing the above-discussed *Birrell* lighting system, and would have recognized the predictable benefit of mounting the LED circuit on a reflective substrate, such as providing efficient light output as discussed by *Birrell* (*see supra*) and known in the state of the art. (Ex. 1002, ¶¶83-84; Ex. 1008, ¶[0017]; Ex. 1022, Abstract, FIG. 2.1, ¶¶[0018], [0034], [0081]; Ex. 1018, 2:6-10, 7:49-8:46, 6:6-7:34, FIGS. 1, 27.) Thus, a POSITA would have been motivated to modify *Birrell*'s lighting system to use a reflective substrate to mount the LED circuit because the use of reflective substrates in lighting systems was known to increase the optical efficiency. (*Id.*; Ex. 1023, 16:24-45.)

Given the disclosures of *Birrell* and *Schultz* and the knowledge of a POSITA of such mounting and optical techniques, a POSITA would have had a reasonable expectation of success in implementing such a modification. Such a design would have involved the use of known components and mounting techniques to produce the predictable result of an LED circuit that benefited from known properties of reflective base structures, as suggested by *Schultz* and the knowledge of a POSITA. (Ex. 1002, ¶85.)

d) a data receiver, wherein the data receiver can receive data from at least one of a transmission line or an antenna.

Birrell discloses this limitation. (Ex. 1002, ¶¶86-88.) For example, *Birrell* discloses that "[d]ata communication between devices or elements including controls or sensors and devices or elements without controls or sensors may be achieved by means of wireless techniques such as radio frequency, infra-red or direct connection such as modulation of the external power source used by the device." (Ex. 1005, 8:14-20.) *Birrell* explains that "power and control functionality is coordinated through the electrical coupling [*i.e.*, a transmission line] to thereby enable them to be networked with the other devices which are similarly connected." (Ex. 1005, 8:29-9:10; Ex. 1002, ¶¶86-87.) Control data may be transmitted, *e.g.*, by modulating the load current with a serial data packet. (Ex. 1005, 9:11-29, 26:6-23; Ex. 1002, ¶87.) The packets are then demodulated for local processing or repetition to other devices. (*Id.*) For example, with respect to FIG. 9, *Birrell* explains that each tile 50 can transmit data via a "data modulator 80" which is "extracted on another tile or device via a data demodulator 81." (Ex. 1005, 23:22-26; *id.*, FIG. 10, 23:30-34.) Moreover, tile 50's circuitry is "structured so that all data is transferred by the same electrical path that is used for the electrical power transfer" (Ex. 1005, 23:15-21), where data are transmitted using a data modulator 80 and **received using a data demodulator 81** ("data receiver") (*id.*, 16:4-8, 23:22-29; FIG. 9). (Ex. 1002, ¶87.)



(Ex. 1005, FIG. 9 (annotated); Ex. 1002, ¶87.) The coupling (as exemplified above) is a transmission line because it transmits the data (and power) received by tile 50, and received by demodulator 81 so that the data can be demodulated in accordance with *Birrell*'s disclosed operations. (Ex. 1002, ¶88.) Further, data demodulator 81 is a "data receiver" because it receives data as described by *Birrell*. (*Id.*) Thus, given that the data in *Birrell* is transmitted by the electrical path used for power transmission (*i.e.*, a "transmission line") and received by data demodulator 81, *Birrell* discloses that "the data receiver can receive data from at least one of a transmission line or an antenna," as claimed. (Ex. 1002, ¶¶87-88; *see also* Ex. 1001, 22:6-45, FIG. 52 (example of "transmission line" 2072 as a conductor that transmits data and power similar to that described by *Birrell*).)

2. Claim 2

a) The LED lighting system of claim 1, wherein the LED lighting system receives the data and power.

Birrell discloses this limitation. (Ex. 1002, ¶¶89-90.) *Birrell*'s tile 50 receives data and power. (§§IX.A.1(b), (d); Ex. 1005, 8:31-9:10 ("provide both data and power..."), 13:15-23 (tile 50 controlled by "data transmitted with the power supply"), 23:15-21 ("all data is transferred by the same electrical path that is used for the electrical power transfer"), 23:30-24:2; Ex. 1002, ¶¶89-90.)

The system receives power via, e.g., power supply 11 (e.g., 48VAC source (Ex. 1005, FIG. 8)). (Ex. 1005, 16:37-17:3. 17:25-28; §IX.A.1(b).) Figure 10 describes a power supply 11 with a modulator and demodulator circuit 83 to "allow external data networks or external control to communicate with the light tile network" (including an array of lighting systems as discussed for claim 1), where the power delivered to lighting tiles includes "superimposed data signals." (Ex. 1005, FIG. 10, 23:30-24:2, 24:3-12, 24:13-25; Ex. 1002, ¶90.)

3. Claim 4

a) The LED lighting system of claim 1, wherein the at least one LED circuit has at least one LED of a different color than another LED of the at least one LED circuit.

Birrell discloses this limitation. (Ex. 1002, ¶91.) LEDs of different colors may be implemented in a lighting tile included in the above-discussed "LED circuit" for claim 1. (Ex. 1005, 11:26-34 (LED light source; "[i]n one form the at **least three light sources are red, green and blue LEDs**" and "most colours of light can be generated" by the LEDs), 12:4-11 ("LEDs of any available colour...").)

4. Claim 5

a) The LED lighting system of claim 1, wherein the reflective substrate is a flexible substrate.

Birrell-Schultz discloses/suggests this limitation. (Ex. 1002, ¶¶92-95.) Section IX.A.1(c) explains how *Birrell-Schultz* discloses/suggests a reflective substrate. Further, the LED light source is mounted to a body, which may be "rigid or flexible." (§IX.A.1(c); Ex. 1005, 10:27-32 ("light source mounted to the body"), 11:4-6 ("body … may also be rigid or flexible"). *Schultz* discloses a substrate that is flexible and reflective. (Ex. 1046, ¶¶[0012], [0032], [0047]-[0049].) It would have been obvious to configure the reflective substrate of the *Birrell-Schultz* system to be flexible to accommodate applications contemplated by *Birrell* and *Schultz* where a flexible substrate would be beneficial. (Ex. 1002, ¶92.) *Schultz* explains "due to the flexible nature of the substrate, the arrays can be mounted to conform to the body of the lighting fixture, such as a parabolic shape...." (Ex. 1046, ¶[0048].) Furthermore, usage of flexible substrates for lighting applications was known. (Ex. 1002, ¶93; Ex. 1008, ¶¶[0146], [0150]-[0156], FIGS. 16-19; Ex. 1018, FIGS. 1-2, 8-9, 2:20-21, 5:8-30; Ex. 1031, 3:32-37; Ex. 1034, 2:46-48.)

Hence, *Birrell*'s modified lighting system would have predictably benefited from mounting the LEDs on a flexible, reflective substrate, allowing the *Birrell-Schultz* system to be implemented in different applications while increasing optical efficiency (*see* limitation 1(b)). (Ex. 1005, 10:27-32; §§IX.A.1(b)-(c); Ex. 1002, ¶94.) Therefore, it would have been obvious to mount the "LED circuit" on a flexible, reflective substrate to obtain such known benefits, including for curved designs and optical efficiency. (Ex. 1002, ¶94.) Given such knowledge and the state of art and *Birrell-Schultz*, a POSITA would have had a reasonable expectation of success implementing such a modification, which would have involved the use of known components and mounting techniques to produce predictable results. (Ex. 1002, ¶95.)

5. Claim 7

a) The LED lighting system of claim 1, further comprising: a proximity sensor.

Birrell discloses this limitation. (Ex. 1002, ¶96.) Tile 50 may include a proximity sensor. (Ex. 1005, 8:4-30 (various sensors may be included in the lighting system, including "integrally embedded…sensors such as…**proximity** or other **human or environmental sensors**….), 15:15-33 ("**proximity sensors**"); Ex. 1002, ¶96.) Such proximity sensors would have been included in the LED lighting system discussed for claim 1. (Ex. 1002, ¶96; §IX.A.1.)

6. Claim 10

a) The LED lighting system of claim 8, wherein an LED circuit of the at least one LED circuit is mounted on a reflective substrate.

Birrell-Schultz discloses/suggests this limitation. (Ex. 1002, ¶97.) Ground 2 below explains how *Birrell* discloses the limitations of claim 8, including an LED lighting system including at least one LED circuit. (§IX.B.1 (incorporated here).) To the extent *Birrell* does not explicitly disclose "an LED circuit of the at least one LED circuit is mounted on a reflective substrate" as recited in claim 10, it would have been obvious in view of *Schultz* to implement this feature, for reasons discussed for limitation 1(c). (§IX.A.1(c); Ex. 1002, ¶97.)

7. Claim 13

a) A lighting system comprising:

To the extent limiting, *Birrell* discloses this preamble for reasons discussed for limitation 1(a) and below. (§IX.A.1(a); *infra* §§IX.A.7(b)-(c); Ex. 1002, ¶98.)

Here, *Birrell* discloses the "lighting system" of limitation 13(a) via the same lighting system components identified for limitation 1(a) and also including the components associated with the power source (e.g., source 11, such as FIG. 8's 48VAC source). Below is an exemplary illustration of a "lighting system" recited in claim 13. (Ex. 1002, ¶98; §§IX.A.7(b)-(c).)

"LED lighting system"

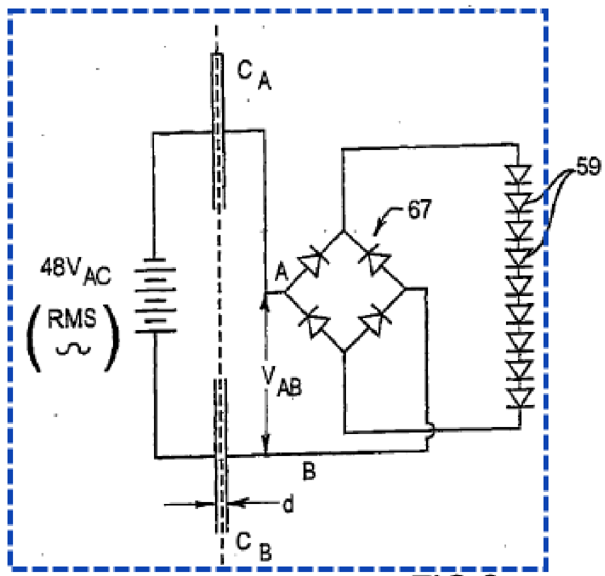


FIG 8

(Ex. 1005, FIG. 8 (annotated); Ex. 1002, ¶98.)

b) a driver having an input and an output, the input receiving an input voltage from a mains power source and the output providing an output voltage, wherein the driver includes a bridge rectifier; and

Birrell discloses/suggests this limitation. (Ex. 1002, ¶¶99-107.)

First, *Birrell* discloses "a driver having…an output…providing an output voltage, wherein the driver includes a bridge rectifier" as claimed. *Birrell*'s rectifier (formed by diodes 67), capacitors C_A/C_B, power source (*e.g.*, source 11, e.g., 48VAC power supply), and conductors connecting these components, collectively disclose a "driver" because they provide power to drive LEDs 59. (§§IX.A.1(a)-(b); Ex. 1005, FIG. 8, 19:1-7, 20:26-31, 22:29-30; Ex. 1002, ¶¶99-100.)

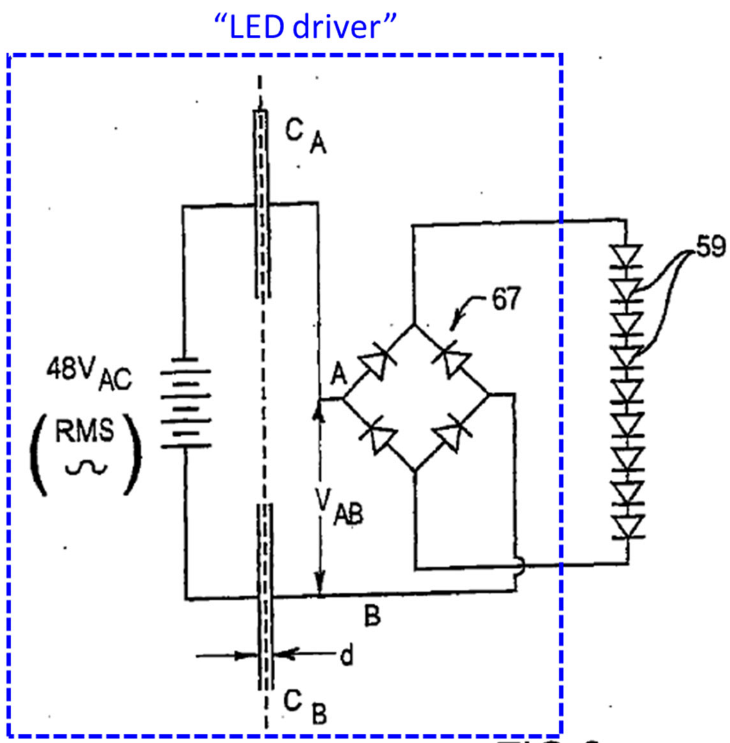


FIG 8

(Ex. 1005, FIG. 8 (annotated); Ex. 1002, ¶100.)

Birrell's "driver" includes a bridge rectifier (67) coupled to a 48VAC power supply via capacitors (C_A and C_B), and has an "output" providing an "output voltage" to power LEDs 59. (§IX.A.1(b); Ex. 1005, FIG. 8, 19:1-7, 20:26-31, 22:29-30; Ex. 1013, 163, 164-167; Ex. 1002, ¶101.)

Second, while *Birrell* does not expressly disclose the above "driver" has an input that receives an input voltage from a mains power source, it would have been obvious to implement this feature. (Ex. 1002, ¶¶102-103.)

Mains power (*e.g.*, 110V/120V AC) was a common, convenient way of providing power to lighting systems. (Ex. 1002, ¶104; Ex. 1013, 157; Ex. 1024, 1:9-28, 1:35-48, FIG. 1; Ex. 1025, 1:10-25, FIG. 1 (AC-DC converter); Ex. 1008, ¶¶[0004]-[0005], [0009], [0063], [0149].) The signal provided by mains power was typically adjusted via a transformer and/or similar components to provide voltage suitable for circuitry and/or devices to be powered. (Ex. 1002, ¶105; Ex. 1012, 12, 34-40; Ex. 1013, 161-162, 165-166; Ex. 1022, ¶¶[0043], [0083], [0093], [0103].) Additionally, a POSITA would have known and contemplated designs where a transformer (or similar components for reducing voltage from a mains power source) also adjusts the frequency. (Ex. 1009, 2:43-48, 2:60-67, 4:4:25-31 (LED apparatus including "a transformer that receives a mains input voltage and provides an output voltage having a frequency of 35 kHz to 200 kHz")[8]; Ex. 1012, 12, 34-40; Ex. 1002, ¶105.)

Accordingly, a POSITA contemplating *Birrell*'s lighting system and driver would have been motivated to connect *Birrell*'s power source (e.g., 48V AC source (Figure 8)) to an AC mains power source to provide a reliable source of power, and configure the system with a transformer (and other appropriate circuitry) to adjust

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[8] This range would encompass, *e.g.*, the exemplary 80kHz frequency provided by *Birrell*'s 48V AC. (Ex. 1005, 22:29-30; Ex. 1002, ¶105.)

the power (including voltage and frequency) to the appropriate level for proper operation for the various lighting system applications contemplated by *Birrell*. (Ex. 1002, ¶106.)

Such a configuration would have beneficially provided a known, predictable source of power typically used in the types of applications contemplated by *Birrell* that would have been adjusted using known power designs and circuitry, such as transformers and associated circuitry for adjusting frequency etc. (*Id.*; Ex. 1005, 4:24-38.) Indeed, *Birrell* discloses arrangements that had applications within "residential propert[ies]" (Ex. 1005, 8:31-36; *id.*, 4:24-32, 10:33-11:3, 17:4-9 (wall/ceiling applications)), which were known to provide access to a mains power source. (Ex. 1002, ¶106.) Nor does *Birrell* limit the power source to the 48V AC example of FIG. 8. (Ex. 1005, Abstract, claims 1-5, 17:1-3, 23:30-33, 26:15-18 (power supply 11), and so a POSITA would have been motivated to consider various ways to provide power to a lighting system consistent with the application. Mains power was a foreseeable and reliable source of such power, as was the known integration of transformer circuitry to adjust the voltage to levels suitable for the application of device(s) receiving such power. (Ex. 1002, ¶106.)

A POSITA would have had a reasonable expectation of success in configuring the above-described modification given that use of mains power and a transformer was well known and in some instances expected to ensure only suitable voltage was provided for proper operation of the device(s) and related circuitry receiving such power. (Ex. 1013, 161-162, 165-166; Ex. 1002, ¶107.) Indeed, the above modification would have involved implementation of known techniques and technologies leading to predictable results. (Ex. 1002, ¶107.) *KSR*, 550 U.S. at 416.

c) at least one LED circuit mounted on a reflective substrate, wherein the at least one LED circuit is connected to the output of the driver and has one or more LEDs connected in series or parallel sufficient to approximately match the input voltage or the output voltage of the driver.

Birrell-Schultz discloses and/or suggests this limitation. (Ex. 1002, ¶¶108-114.) Section IX.A.1(c) explains how *Birrell* and *Schultz* discloses/suggests "at least one LED circuit mounted on a reflective substrate," as claimed. (§IX.A.1(c) (discussing an "LED circuit" and rationale for modifying the "system" to include a reflective substrate in light of *Schultz* and state of art); Ex. 1002, ¶108; Ex. 1005, FIG. 8, 19:1-7.) The "LED circuit" includes LEDs 59 connected in series or parallel. (*Id.*; Ex. 1005, FIG. 8 (series), 20:26-28, 20:20-21 ("LEDs can be used in a **series or parallel** connection").) Further, as explained, the "LED circuit" is connected to the "output" of the "driver." (*Id.*; Ex. 1005, FIG. 8; §§IX.A.1(c), IX.A.7(b); Ex. 1002, ¶¶109-110.)

The LED circuit has "LEDs connected in series…sufficient to approximately match the input voltage or the output voltage of the driver." (Ex. 1002, ¶111.) First, a POSITA would have taken into account that the LED circuit would be designed such that it is sufficient to "approximately match the input voltage or the output voltage of the driver." (*Id.*) Thus, when designing and implementing the above modified *Birrell* lighting system, a POSITA would have understood and considered that the total voltage drop of the circuit would dictate the current drawn by the LED circuitry, known to be inversely proportional to the voltage, and that fewer LEDs in the design would lead to a larger current compared to a circuit with a greater number of LEDs. (*Id.*) Moreover, a POSITA would have considered that excessive current would have been harmful to the LEDs that could lead to failure, while too small a current may be insufficient to power the LEDs for sufficient illumination. (*Id.*)

Accordingly, a POSITA would have taken into consideration the number of LEDs and total voltage drop of the LED circuit when designing and implementing the above *Birrell* lighting system to ensure the LEDs in the disclosed series or parallel configuration were sufficient to approximately match the input voltage or output voltage of the driver, like that claimed. (*Id.*)

Indeed, the design for FIG. 8's arrangement ensures the identified "driver" provides sufficient voltage to the nine series-connected LEDs by taking into account the voltage drops of the capacitors (C_A and C_B) and the bridge rectifier. (*Id.*, ¶112.) The 48V AC power supply drops 15 volts across both capacitors (Ex. 1005, 22:13-19) and drops 1.5 volts across the bridge rectifier (*id.*, 22:9-11). Thus, at the output of the above-discussed driver, 31.5 V is provided to the nine series-connected LEDs, which was sufficient to illuminate each LED. (*Id.*, 20:26-31 ("satisfactorily illuminate the LEDs"), 22:9-15 ("for normal operation of the LEDs"), 22:29-30 ("…satisfactorily illuminate the LED's of Figure 8"); *see also* Ex. 1002, ¶112; Ex. 1007, ¶[0028]).)

Thus, to the extent such features are not expressly described in connection with the above-discussed *Birrell-Schultz* modified system, a POSITA would have found it obvious to configure the LED circuit in the modified *Birrell* system with such features, e.g., by designing the circuit with an appropriate number of LEDs and/or an appropriate transformer to lower the mains input voltage (in the modified *Birrell* system discussed for limitation 13(b)) to an appropriate level received and used by the circuitry in the *Birrell-Schultz* combined system. (Ex. 1002, ¶¶113-114.) As explained, a POSITA would have sought to ensure the voltage provided by the driver was sufficient to properly illuminate the LEDs without damaging them by overdriven signals. (*Id.*) A POSITA would have had a reasonable expectation of success in such an implementation, especially given it would have involved implementing known circuit design concepts and technologies leading to predictable results. (Ex. 1002, ¶¶113-114.) *KSR*, 550 U.S. at 416.

8. Claim 3

a) The LED lighting system of claim 1, further comprising: a transformer.

Birrell discloses/suggests this limitation for reasons explained for claim 13. (§IX.A.7(b) (explaining obviousness of configuring *Birrell*'s lighting system to use a transformer with the design receiving power from a mains power source); Ex. 1002, ¶115.)

9. Claim 21

a) The LED lighting system of claim 1, wherein the reflective substrate is a glass substrate.

Birrell discloses/suggests this limitation. (Ex. 1002, ¶¶116-118.) Section IX.A.1(c) explains how *Birrell-Schultz* discloses/suggests a reflective substrate. *Birrell* also discloses that the lighting system body has mounted thereon the "light source" (which includes the LEDs) (Ex. 1005, 10:22-29, 10:33-11:3, 11:25-12:21) and that the "layer within the body in which the light source is "embedded" or "attached" includes, *inter alia*, "colour tinted fused material **such as glass**") (*id.*, 11:18-25). A POSITA understood such colored layer could include colors that would reflect light, and thus where such reflective layer is glass, it is a glass reflective layer in which the LEDs are embedded/attached. (Ex. 1002, ¶¶116-117.)

Therefore, based on the disclosures/guidance above, and reasons explained for limitation 1(c), it would have been obvious to configure the *Birrell-Schultz* "reflective substrate" (*see* §IX.A.1(c)) as a glass substrate, which could have been color tinted as suggested by *Birrell*. (Ex. 1005, 11:18-25; Ex. 1002, ¶118.) A POSITA would have had similar motivation, capabilities, appreciation of benefits, and expectation of success in configuring such a modification as that explained for limitation 1(c) above (regarding implementation of a "reflective substrate") and in light of the reasons discussed above for this claim limitation. (*Id.*; §IX.A.1(c).) Indeed, providing the reflective substrate as a glass substrate would have been a foreseeable choice of known materials and design options to form such a reflective substrate to promote efficient, direct illumination like that known in the art and contemplated by *Birrell*. (Ex. 1002, ¶118.)

10. Claim 22

a) The LED lighting system of claim 8, wherein an LED circuit of the at least one LED circuit is mounted on a glass substrate.

Birrell discloses/suggests this limitation for reasons explained for claims 8, 10 and 21. (§§IX.A.6, IX.A.9, IX.B.1; *see also* §IX.A.1(c); Ex. 1002, ¶119.)

11. Claim 23

a) The lighting system of claim 13, wherein the reflective substrate is a glass substrate.

Birrell discloses/suggests this limitation for reasons explained for claims 10, 13, and 21. (§§IX.A.6-7, IX.A.9; *see also* §IX.A.1(c); Ex. 1002, ¶120.)

B. Ground 2: Claims 8 and 9 Are Anticipated By *Birrell*

1. Claim 8

a) An LED lighting system comprising:

To the extent limiting, *Birrell* discloses this preamble for reasons discussed for limitation 1(a) and below. (§§IX.A.1(a), IX.B.1(b)-(e); Ex. 1002, ¶¶121-122.)

b) at least one LED circuit, wherein the LED circuit has at least two LEDs that can be of same or different colors;

Birrell discloses this limitation for reasons similar for limitation 1(c) and claim 4. (§§IX.A.1(c) (describing how *Birrell* discloses an "LED circuit," which includes LEDs 59), IX.A.3 (LEDs having different colors); Ex. 1005, 12:4-11, 16:26-34; Ex. 1002, ¶123.)

c) an LED driver having an input and an output, wherein the input is configured to receive an AC or DC voltage source, and wherein the output provides an AC or DC voltage output;

Birrell discloses this limitation for similar reasons as those discussed for limitation 1(b). (§IX.A.1(b); Ex. 1002, ¶124.)

d) a proximity sensor for sensing the proximity of a person; and

Birrell discloses this limitation. (Ex. 1002, ¶125.) As explained for claim 7, tile 50 may include a proximity sensor. (§IX.A.5.) In particular, *Birrell* discloses "**proximity or other human** or environmental **sensors**." (Ex. 1005, 8:4-30, 15:15-33.) The sensor can be an "occupancy" sensor (Ex. 1005, 8:4-10), which was a sensor that detects the occupancy of space, which would include a person's presence in, *e.g.*, a monitored space.

e) a data receiver, wherein the data receiver can receive data from at least one of a transmission line or an antenna.

Birrell discloses this limitation for reasons discussed for limitation 1(d). (§IX.A.1(d); Ex. 1002, ¶126.)

2. Claim 9

a) The LED lighting system of claim 8, wherein the LED lighting system is configured to transmit data to an information receiver.

Birrell discloses this limitation. (Ex. 1002, ¶¶127-128.) For example, *Birrell* discloses that one lighting tile can transmit data to a demodulator ("information receiver") of another lighting tile or other device. (Ex. 1005, 23:22-29 ("Each light tile 50 is able to **transmit data**...through the data modulator 80 transmitted over the electrical path and extracted on another tile or device via a data demodulator 81."), 23:30-24:25, FIGS. 9-10; Ex. 1002, ¶127.) The demodulator in each tile thus is an "information receiver" because it receives information (data) from the other tile. (Ex. 1002, ¶127.)

Further, *Birrell* discloses this limitation an additional way. The lighting system's microcontroller can convert sensor signals to a "**remote report or command**" and can "construct and **transmit data messages** for remote reporting or command." (Ex. 1005, 15:34-16:4.) With the ability to "remote report" and "transmit data messages for remote reporting or command," the "lighting system" is configured to transmit data to an information receiver (*e.g.*, the component/element receiving the transmitted data message or remote report/command). (*Id.*, 9:6-29; Ex. 1002, ¶128.)

C. Ground 3: Claims 11 and 12 are Anticipated by *Nagai*

1. Claim 11

a) An LED lighting system comprising:

To the extent limiting, *Nagai* discloses this preamble. (Ex. 1002, ¶¶129-131.) For instance, *Nagai* discloses an LED lighting system (*e.g.*, a lighting apparatus). (Ex. 1040, ¶[0015] (describing "a lighting apparatus that includes a plurality of light-emitting units and receives power from an external power supply circuit"), ¶¶[0077], [0268]-[0385] (third embodiment and related modifications to that embodiment), FIGS. 35-60; *see also* §§IX.C.1(b)-(e); Ex. 1002, ¶130.)[9] In particular, *Nagai* teaches an embodiment of a lighting apparatus 1 including several light-emitting

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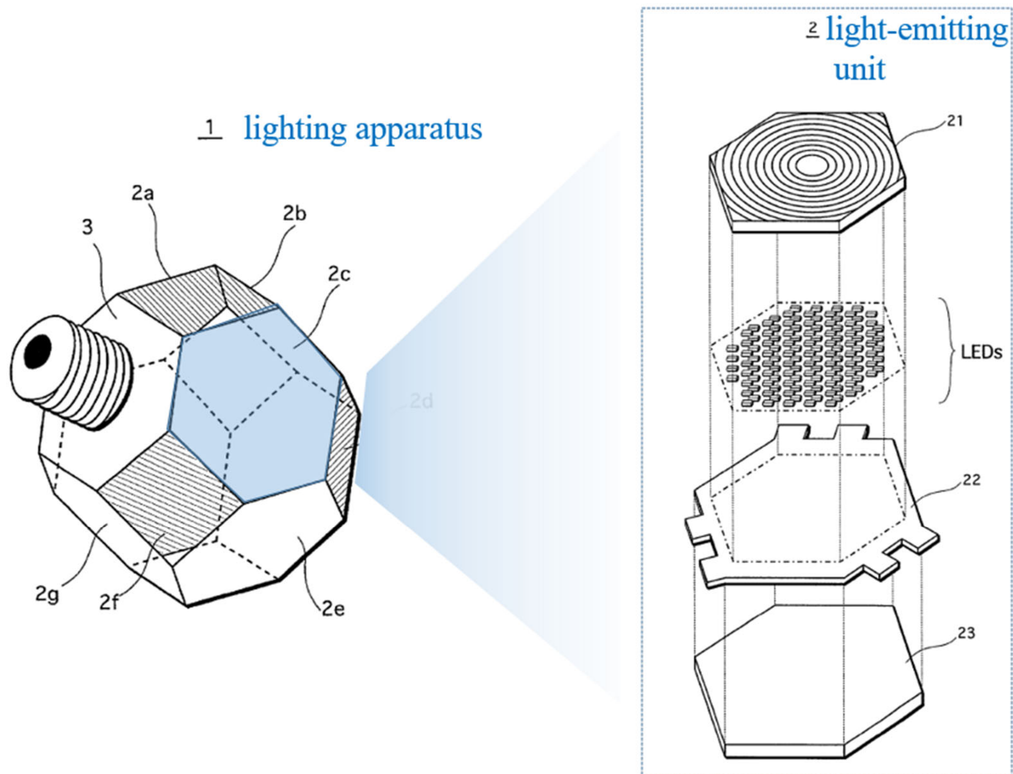
[9] In Illinois-Litigation, PO contends that a smartphone, tablet, smartwatch, smart TV, smart board, smart refrigerator, smart washer, smart dryer, and lighting product each constitute "[a]n LED lighting system." (Ex. 1083, 2-5; Ex. 1084, 2, 7, 11, 15, 19, 24, 28, 33, 37, 41.)

units 2a-2g including LEDs and a base unit 3/30000. (Ex. 1040, ¶¶[0272], [0267], FIGS. 35-36 (below).)

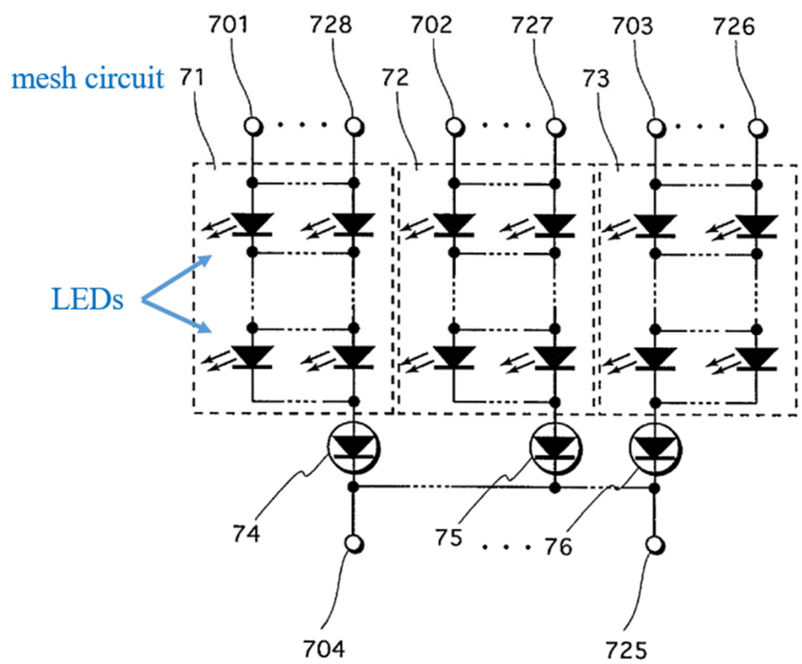


(Ex 1040, FIG. 35 (left), FIG. 36 (right) (combined and annotated); *id.*, ¶¶[0077]-[0078], [0272]-[0278]; Ex. 1002, ¶130.)

Nagai's teachings are not limited to its third embodiment, nor is the analysis herein so limited. Indeed, *Nagai* enumerates many modifications to its third embodiment. (Ex. 1040, ¶¶[0311]-[0385]; Ex. 1002, ¶131; §§IX.C.1(b)-(e).)

b) an LED circuit array having a plurality of LED circuits, each LED circuit of the plurality of LED circuits comprising at least one LED;

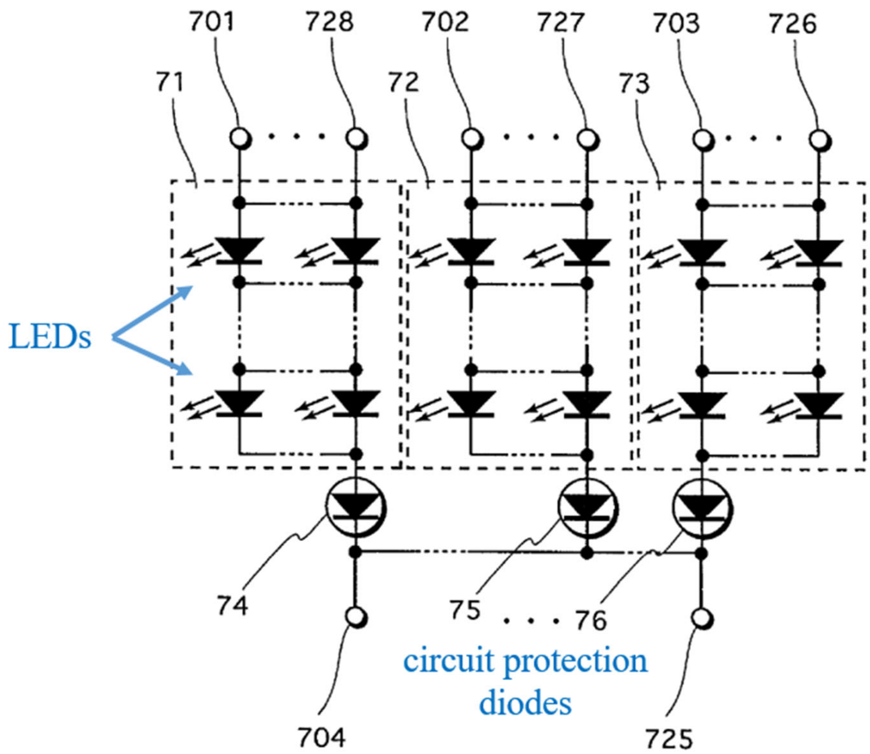
Nagai discloses this limitation. (Ex. 1002, ¶132.) *Nagai* discloses an LED circuit array having a plurality of LED circuits (*e.g.*, mesh circuits 71-73), each LED circuit of the plurality of LED circuits comprising at least one LED. (Ex. 1040, ¶¶[0077], [0272]-[0281], FIGS. 35-36 (above, illustrating an LED array), 37-40, 47 (below, illustrating LED mesh circuits 71-73); Ex. 1002, ¶132.)



(Ex. 1040, FIG. 47 (annotated); *id.*, ¶¶[0089], [0315]-[0317]; Ex. 1002, ¶132.)

c) an active current limiting device connected in series to at least one of the plurality of LED circuits; and

Nagai discloses this limitation. (Ex. 1002, ¶¶133-134.) For instance, *Nagai* discloses an active current limiting device (*e.g.*, circuit protection diodes 74-76) connected in series to at least one of the plurality of LED circuits. (Ex. 1040, ¶¶[0312] (explaining configurations for FIGS. 46-47 encompass a modification of the third embodiment for delivering different LED light colors, and thus are applicable to the embodiment discussed above for limitations 11(a)-(b)), [0315], [0316] ("The **circuit protection diode[s]** 74-76 are connected in accordance with the rated amounts of current of the three colors, **to prevent the LEDs from being broken due to overcurrent**."), FIG. 47 (below, illustrating mesh circuits 71-73); Ex. 1002, ¶¶133-134.) As illustrated below, circuit protection diodes 74-76 are connected in series with mesh circuits 71-73, respectively. (Ex. 1002, ¶134.) Each circuit protection diode 74-76 is an active current limiting device because the diodes actively prevent overcurrent and thus limit the current. (*Id.*) Indeed, claim 12 of the '251 recites "the active current limiting device is a current limiting diode." (Ex. 1001, 26:11-12 (claim 12); §IX.C.2; *see also* Ex. 1042, 99; Ex. 1002, ¶134.) Additionally, *Nagai* explains with reference to its first embodiment that "**at least one current limiter diode** may be inserted in series in each LED chip train, to prevent the LED chips from being damaged by overcurrent." (Ex. 1040, ¶[0153].)

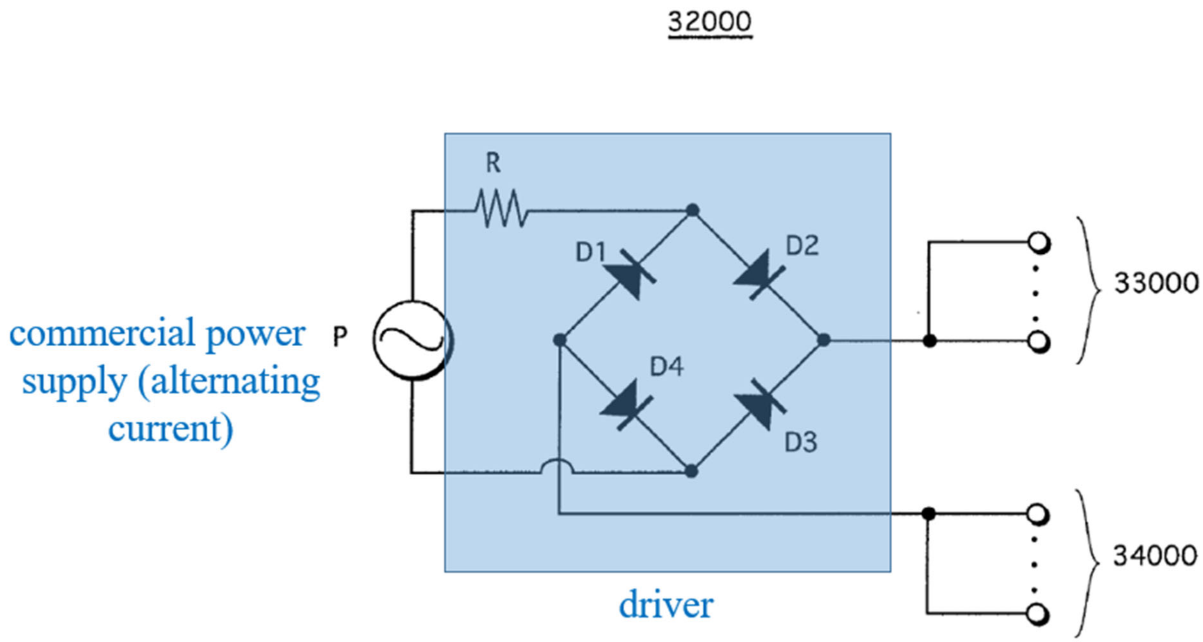


(Ex. 1040, FIG. 47 (annotated); Ex. 1002, ¶134.)

Thus, a POSITA would have recognized that the protection diodes 74-76 coupled in series to the LED mesh circuits 71-73 are current limiter diodes (and/or operate consistent to such diodes). (Ex. 1040, ¶[0316]; Ex. 1014, 1:53-60, 2:40-60; Ex. 1002, ¶134.)

d) an LED driver connected to the LED circuit array, wherein the LED driver has an input of a first voltage and a first frequency and provides an output of a second voltage, wherein the first voltage is an AC voltage;

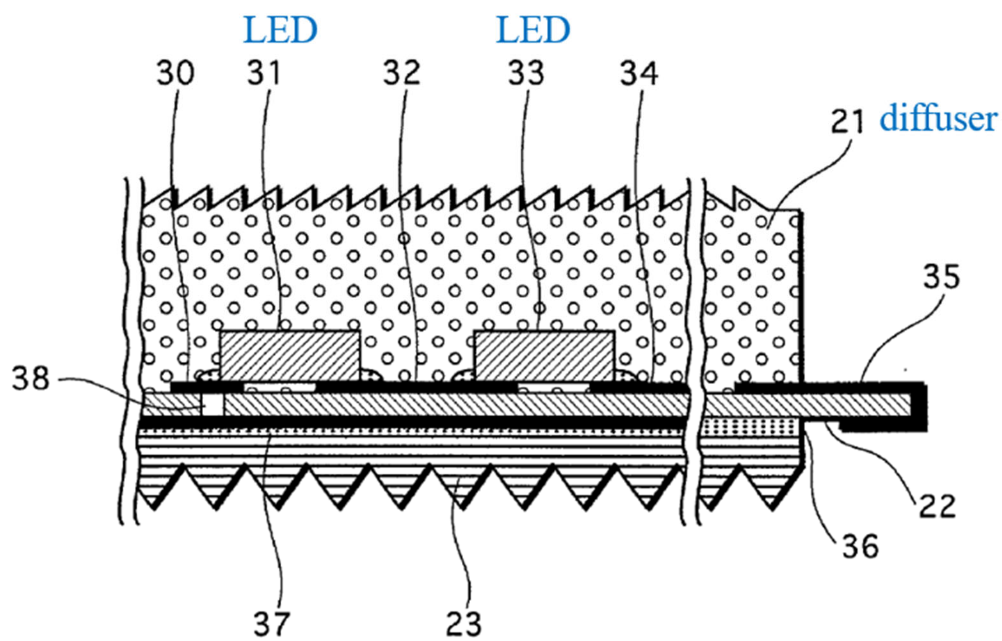
Nagai discloses this limitation. (Ex. 1002, ¶¶135-136.) *Nagai* discloses an LED driver circuit (*e.g.*, rectifier circuit 32000, resistor, connections, etc.) connected to the LED circuit array discussed above for limitation 11(b). The rectifier circuit 32000, resistor, and connections to such components constitute an "LED driver" because they provide power to drive the LED circuit array. (Ex. 1002, ¶135.) The LED driver circuitry has an input of a first AC voltage and a first frequency and provides an output of a second (DC) voltage. (Ex. 1040, ¶¶[0291]-[0294], FIG. 42; *see also id*., FIGS. 41, 42 (below); Ex. 1002, ¶¶25-28, 37-38, 44-47, 135.) In particular, *Nagai* discloses that a commercial power supply P supplies alternating current. (Ex. 1040, ¶[0294] ("[A] commercial power supply P (alternating current) shown in FIG. 42 is an external power supply which is independent of the lighting apparatus 1. The lighting apparatus 1 receives power from the alternating current power supply P via the base 33000, and emits light.").) A commercial power supply P supplying alternating current necessarily has both an AC voltage and frequency. (Ex. 1002, ¶136.) *Nagai* further discloses the base unit 30000 "supplies direct current power, using a rectifier circuit 32000." (Ex. 1040, ¶[0292].) This output power likewise necessarily includes a voltage. (Ex. 1002, ¶136.)



(Ex. 1040, FIG. 42 (annotated); *id.*, ¶¶[0293]-[0294].)

e) wherein an LED of at least one of the plurality of LED circuits in the LED circuit array is coated or doped with at least one of a phosphor, nano-crystals, or a light changing or enhancing substance, at least one of the coated or doped LEDs in the LED circuit array producing a different color of light than another coated or doped LED in the LED circuit array.

Nagai discloses this limitation. (Ex. 1002, ¶¶137-138.) *Nagai* discloses an LED of at least one of the plurality of LED circuits in the LED circuit array is coated with a light changing or enhancing substance (*e.g.*, a light diffusion layer), at least one of the coated LEDs in the LED circuit array producing a different color of light than another coated or doped LED in the array. (Ex. 1040, ¶¶[0276]-[0277], FIG. 39 (below) (light diffusion layer 21 coating LEDs 31/33); Ex. 1002, ¶137.)



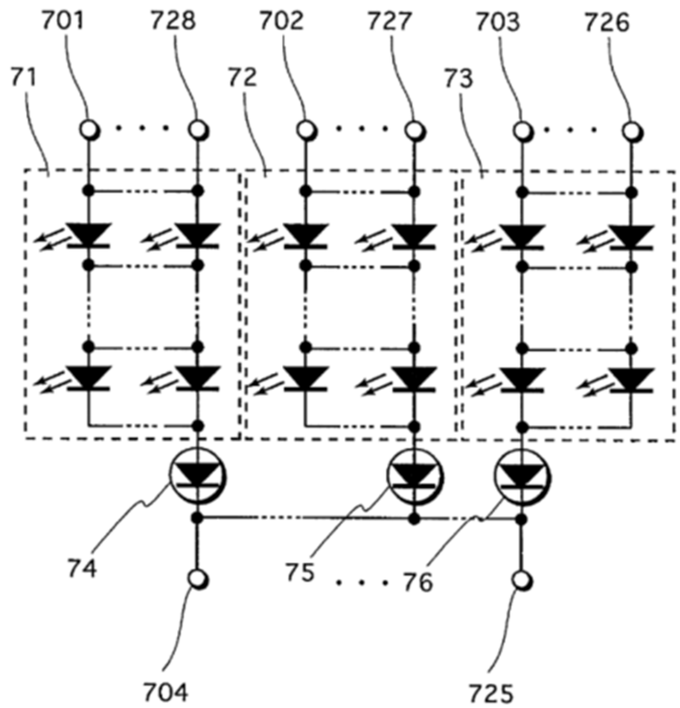
(Ex. 1040, FIG. 39 (annotated); *id.*, ¶¶[0081], [0285]-[0287]; Ex. 1002, ¶137.)

The diffusion layer includes "a light scattering material (such as an alumina powder) [that] is mixed in the light diffusion layer 21." (Ex. 1040, ¶[0277].) *Nagai* explains with respect to the first embodiment, that "an alumina powder … [acts] as a **light scattering** material" and "has a function of appropriately **diffusing (scattering)** red, green, and blue light that is emitted from the **different-colored LED chips** and that has directional orientations, **thereby mixing the different colors**." (*Id.*, ¶[0139].) This disclosure of also applies to *Nagai*'s third embodiment use of diffusion layer 21. (Ex. 1002, ¶138; Ex. 1040, ¶[0270] ("[t]hough the third embodiment has a number of similarities to the first and second embodiments, its construction is described in detail without omitting those similarities").) In addition, as discussed, *Nagai* teaches a modification to the third embodiment, where the circuit "deliver[s] light of desired colors using **different-colored LEDs**" (*id.*, ¶¶[0312]-[0317]). Therefore, the LED circuit array can include "different-colored LEDs" that are covered by the light diffusion layer ("light changing or enhancing substance"), which mixes the different colors to provide a desired color output, a POSITA would have understood *Nagai* to disclose the features of limitation 11(e). (Ex. 1002, ¶138.)

2. Claim 12

a) The LED lighting system of claim 11, wherein the active current limiting device is a current limiting diode.

Nagai discloses the active current limiting device (e.g., any of current protection diodes 72-74) is a current limiting diode. (Ex. 1040, ¶¶[0315], [0316] ("The **circuit protection diode[s]** 74-76 are connected in accordance with the rated amounts of current of the three colors, **to prevent the LEDs from being broken due to overcurrent**."), FIG. 47 (below); Ex. 1002, ¶139.) As discussed in Section IX.C.1(c), *Nagai*'s circuit protection diodes protect from overcurrent by limiting the current and thus each are a "current limiting diode" as claimed. (Ex. 1002, ¶139.)



(Ex. 1040, FIG. 47.) *Nagai*'s descriptions of current protection diodes 74-76 are consistent with the disclosures of similar protection diodes in the first embodiment. (*Id.*; Ex. 1040, ¶[0153] (describing for first embodiment that "at least one **current limiter diode may be inserted in series** in each LED chip train, to **prevent the LED chips from being damaged by overcurrent**.").) Thus, in context of *Nagai*'s disclosures, diodes 74-76 are active current limiting diodes, as claimed in claims 11-12. (Ex. 1002, ¶139.)

D. Ground 4: Claims 11 and 12 are Obvious over *Piepgras* and *Kasegi*

1. Claim 11

a) An LED lighting system comprising:

To the extent limiting, *Piepgras* discloses this limitation. (Ex. 1002, ¶¶140-145.) Regarding FIG. 1, *Piepgras* discloses "a lighting system or device 500" including, *inter alia*, LEDs 4, controllers 3, and processor 2. (Ex. 1030, ¶[0088].)

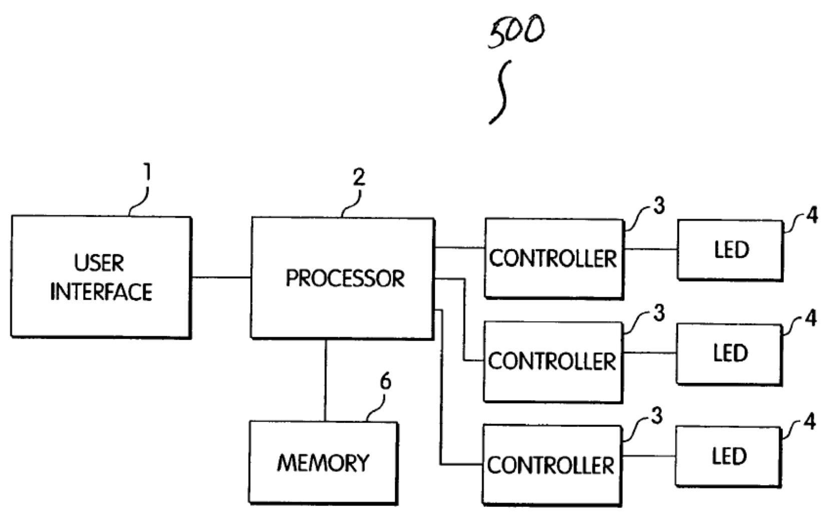


Fig. 1

(*Id.*, FIG. 1; *id.*, ¶¶[0033], [0088]-[0093] (describing Figure 1), [0094]-[0098] (operation of system 500), FIGS. 2A-2B (state diagram for system 500), [0099]-[0105]; Ex. 1002, ¶¶141-143.)

Piepgras discloses several examples of specific lighting systems implemented using system 500. (Ex. 1030, Title, Abstract, ¶¶[0083]), [0106]-[0241] (describing various exemplary lighting systems), FIGS. 3-54 (showing other exemplary lighting systems and components therein); Ex. 1002, ¶144.) System 500 of Figure 1 is a general arrangement that is implemented with the various lighting system examples described throughout *Piepgras*.[10] (Ex. 1002, ¶¶144-145.) For example, *Piepgras* describes with reference to Figure 3 an LED-based glow stick example that "include[s] the components described above with reference to FIG. 1, and may operate according to the techniques described above and with reference to FIGS. 2A-2B" (Ex. 1030, ¶[0106]), and includes similar statements regarding *Piepgras*' other examples (*e.g.*, key chain and spotlight examples described with reference to Figure 4-5, *see id.*, ¶¶[0107]-[0109], and various other examples). (*See, e.g.*, *id.*, ¶¶[0121], [0149] (listing applications of LED system described in reference to FIGS.

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[10] To the extent it is argued that *Piepgras*' embodiments are distinct, the challenged claims remain obvious over the asserted combination as explained herein because a POSITA would have been motivated, and found it obvious, to configure any of *Piepgras*' identified embodiments with features from *Piepgras*' other related embodiments given the express relationships called out by *Piepgras*. (Ex. 1002, ¶145.) Indeed, a POSITA would have had reasons to consider the collective teachings in *Piepgras* to configure a lighting system as explained below, and would have done so with a reasonable expectation of success given *Piepgras*' descriptions of a working system and processes. (*Id.*; *e.g.*, §§IX.D.1(b)-(e), IX.D.2.)

1, 2A-2B, FIGS. 7-8, 11, 16-17, 22-23, 34, 39, 41A-41C, 50, ¶¶[0111]-[0113], [0119], [0131], [0133], [0143]-[0147], [0168]-[0169], [0180], [0183], [0216]; Ex. 1002, ¶145.) Thus, the disclosures relating to system 500 are applicable to the various exemplary lighting system implementations, and such implementation discloses an "LED lighting system." (*See also* §§IX.D.1(b)-(e); Ex. 1002, ¶145.)

b) an LED circuit array having a plurality of LED circuits, each LED circuit of the plurality of LED circuits comprising at least one LED;

Piepgras discloses this limitation. (Ex. 1002, ¶¶146-150.) *Piepgras* discloses an "LED circuit" with a plurality of LEDs. For example, FIG. 1 shows LEDs 4 connected to controllers 3.

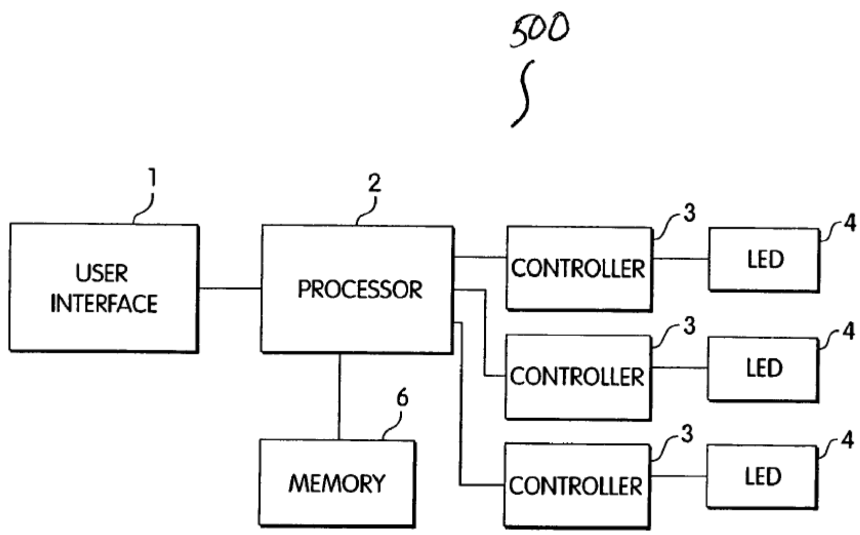

Fig. 1

(Ex. 1030, FIG. 1, ¶[0090].) LEDs 4 constitute an LED array, given their arrangement and that system 500 is implemented in the many lighting system applications described throughout *Piepgras* (§IX.D.1(a)), for example, the rope light lighting system application of FIG. 31 (below). (Ex. 1002, ¶147.) *Piepgras* discloses that a "rope light 3100 [] include[s] a plurality of LEDs or LED subsystems 3102 according to the description provided in reference to FIGS. 1 and 2A-2B." (Ex. 1030, ¶[0160].) Each subsystem 3102 includes a system 500 with different colored LEDs. (Ex. 1030, ¶[0160], FIG. 31 (below); Ex. 1002, ¶147.)

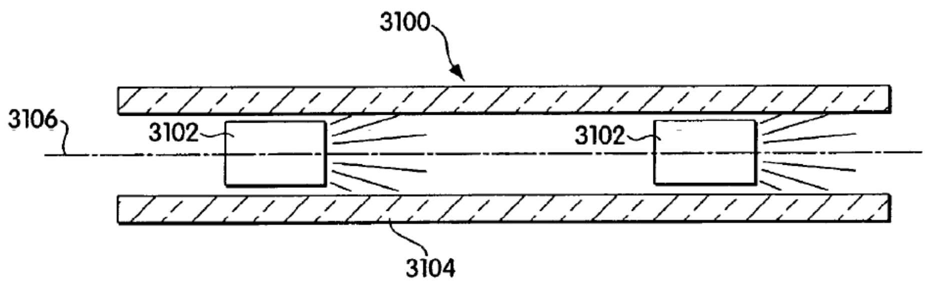

Fig. 31

(Ex. 1030, FIG. 31.)

Thus, within each subsystem 3102 is an LED array comprising a plurality of LEDs, each of which is an LED circuit (e.g., the light emitting diode and wires connecting it for current to flow, and any other circuitry that may be included in the types of LEDs contemplated by *Piepgras* (Ex. 1030, ¶[0085]). (Ex. 1002, ¶148.) *Piepgras*' LEDs receive current (and voltage, and power), and a POSITA would have known that a circuit is needed in order to achieve such electrical attributes. (*Id.*; Ex. 1030, ¶¶[0088], [0090].) Indeed, a POSITA would have known that without a circuit, current cannot flow, and thus *Piepgras* necessarily discloses LED *circuits* as claimed. (Ex. 1002, ¶148.) The same is true for the LEDs 4 described with reference to FIG. 1, and applicable to the other applications described in *Piepgras*. (§IX.D.1(a).) For example, in FIG. 31, the plurality of subsystems 3102 also disclose an "LED circuit array" that has "a plurality of LED circuits, each having at least one LED" because subsystems 3102 each include multiple LEDs, each of which necessarily includes LED circuits for the same reasons discussed above. (Ex. 1002, ¶148.)

Other applications in *Piepgras* also disclose the claimed LED circuit array. (*See*, *e.g.*, Ex. 1030, FIGS. 42-45, ¶¶[0188]-[0199] (lighting system 4200 including an LED circuit array (*e.g.*, multiple systems 500, each including LED circuits with LEDs for the reason discussed above)); *see also id.*, FIG. 50, ¶¶[0215]-[0217] (LED lighting system 5000 including LED lighting devices/system 500, which includes an LED circuit array of LED circuits and LEDs for the same reasons above); Ex. 1002, ¶149.) Accordingly, *Piepgras* discloses limitation 11(b). (Ex. 1002, ¶150.)

c) an active current limiting device connected in series to at least one of the plurality of LED circuits; and

Piepgras in view of *Kasegi* discloses/suggests this limitation. (Ex. 1002, ¶¶151-157.) While *Piepgras* does not expressly disclose that its LED lighting system (discussed for limitation 11(a), §IX.D.1(a)) includes "an active current limiting device connected in series to at least one of the plurality of LED circuits" as claimed, a POSITA would have nonetheless found it obvious to configure the

LED lighting system to implement such a feature in view of *Kasegi*. (Ex. 1002, ¶151.)

Like *Piepgras*, *Kasegi* discloses an LED lighting system that utilizes received AC power. (Ex. 1014, Abstract.) For example, *Kasegi* discloses an LED coupled to a bridge rectifier 3 that receives AC power. (Ex. 1014, 2:34-48, FIG. 1.) Thus, a POSITA implementing the system of *Piepgras* would have had reason to consider the teachings of *Kasegi*. (Ex. 1002, ¶¶152-153.)

Kasegi discloses an arrangement where "a constant current diode [5]" that is "connected in series with the light emitting diode 4." (Ex. 1014, 2:40-45, 1:53-60.) Constant current diode 5 of *Kasegi* is an "active current limiting device" as claimed because that diode 5 limits the current through the LED to a certain value, e.g., "approximately 1.0 mA or less," within "the rated operation voltage range," e.g., "10 to 100 volts" (*Id.*, 2:49-60; Ex. 1002, ¶154.) Indeed, the '251 patent states that "the active current limiting device is **a current limiting diode**." (Ex. 1001, 26:11-12 (claim 12); *see also* Ex. 1042, 99; Ex. 1002, ¶154.) Thus, *Kasegi* discloses "an active current limiting device connected in series to … [an] LED circuit[]." (Ex. 1002, ¶154; *see also* Ex. 1014, 3:1-20.)

In light of such disclosures and guidance, POSITA would have been motivated to modify the above-discussed LED lighting system by implementing an active current limiting device connected in series to at least one of the LED circuits in the above-described examples of an LED circuit array (*see* limitation 11(b), §IX.D.1(b)) to provide a constant current to improve LED operation, as suggested by *Kasegi*. (Ex. 1002, ¶155.) For example, a POSITA would have been motivated by the benefits of configuring at least one of the LED circuits with a series-connected current limiting diode (device) to expand "the operable range of the input voltage" of the LED circuit and "keep[] the brightness of the light emitting device constant over a wide input voltage range," as guided by *Kasegi*. (Ex. 1014, Abstract.) Such an implementation would have solved issues associated with LEDs' "sensitiv[ity] to voltage fluctuations" and mitigated or prevented destruction, damage, or insufficient operation of the LED(s) in the LED circuit, as explained by *Kasegi*. (*Id.*, 1:22-32; *id.*, 1:45-48, 1:62-68, 2:58-60 ("a constant brightness can be obtained even when the power source voltage fluctuates"); Ex. 1002, ¶¶155-156.)

Given the skills and knowledge of a POSITA at the time, coupled with the disclosures/guidance of *Piepgras* and *Kasegi*, a POSITA would have been motivated to implement the above modification and done so with a reasonable expectation of success. (Ex. 1002, ¶¶156-157.) Such a modification would have involved the use of known technologies and techniques (*e.g.*, known LED circuit and active current limiting device designs/components) to produce the predictable result of connecting an active current limiting device in series to at least one of the LED circuits like that described above in the *Piepgras*-*Kasegi* combination for obtaining a constant brightness even when the power source voltage fluctuates. (Ex. 1002, ¶157.) *See KSR*, 550 U.S. at 416.

d) an LED driver connected to the LED circuit array, wherein the LED driver has an input of a first voltage and a first frequency and provides an output of a second voltage, wherein the first voltage is an AC voltage;

Piepgras discloses/suggests this limitation. (Ex. 1002, ¶¶158-163.) For instance, *Piepgras* discloses that lighting system 500 includes controllers 3 (which are connected to LED(s) 4), processor 2, and associated circuitry coupling these components, and other components (e.g., memory 6). (*Id.*, ¶158.) *Piepgras* describes aspects of its lighting system 500 in Figure 1, and as noted above for limitation 11(a) such aspects are applicable to the various LED lighting devices described throughout the reference. (*Id.*)

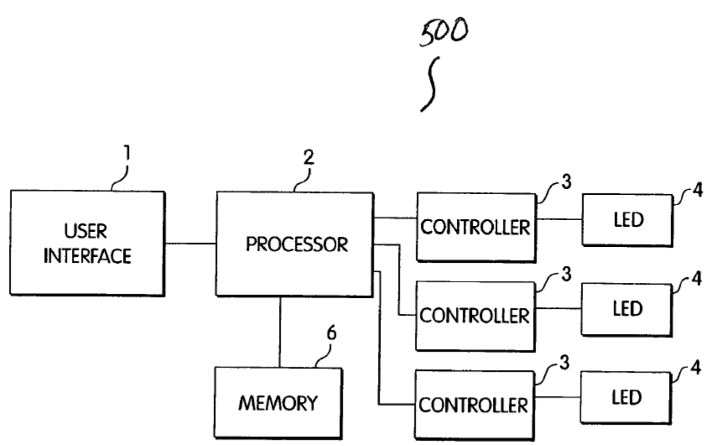

Fig. 1

(Ex. 1030, FIG. 1; §IX.D.1(a).)

For example, *Piepgras* describes controllers 3 driving LEDs 4. (Ex. 1030, ¶¶[0088], [0090] ("The controller 3 generally **regulates the current, voltage and/or power through the LED**, in response to signals received from the processor 2."); *see also id.*, ¶¶[0085]-[0086] ("LED" may refer to single LED package, multiple "LEDs" etc.), [0090], [0094]-[0105] (discussing color change and power on mode operations of "the invention"), FIGS. 2A-2B; Ex. 1002, ¶158.)

Piepgras also discloses that "processor 2 and controller 3 may be incorporated into one device," which "**drive[s] several LEDs 4** in series where it has sufficient power output, or the device may **drive single LEDs 4** with a corresponding number of outputs." (Ex. 1030, ¶[0090]; *see also id.*, ¶[0088]; Ex. 1002, ¶158.)

Piepgras' drive circuitry (e.g., controller(s) 3 in conjunction with processor 2) has an input and an output. *Piepgras* discloses that signals from processor 2 "may be converted by the controllers 3 into a form suitable for driving the LEDs 4, which may include controlling the current, amplitude, duration, or waveform of the signals impressed on the LEDs 4" (Ex. 1030, ¶[0088]) and the driver circuitry thus provides an output to the LEDs. (Ex. 1002, ¶159.)

Piepgras discloses applications of such a system 500 where power (including voltage) is received (via an input) and power is provided (via an output voltage). (Ex. 1030, ¶¶[0121], [0149] (listing applications of LED system described in reference to FIGS. 1, 2A-2B); Ex. 1002, ¶160.) For example, *Piepgras* discloses a spotlight lighting system (FIG. 5), which includes "a system such as that depicted in FIG. 1 for controlling a plurality of LEDs," includes a "converter to convert received power to power that is useful for the spotlight" and may use a housing suitable for use with "conventional lighting fixtures, as those used with AC spotlights." (Ex. 1030, FIG. 5, ¶[0108].) *Piepgras* explains that "the converter may include an **AC to DC converter** to convert one-hundred twenty Volts at sixty Hertz into a direct current at a voltage of, for example, five Volts or twelve Volts." (*Id.*; ¶¶[0108]-[0109]; Ex. 1002, ¶160.)

Other examples of receiving power (e.g., AC power from an outlet) are also provided. (*See, e.g.*, Ex. 1030, FIGS. 7-8, 11, 16-17, 22-23, 32A-32B, 34, 39, 41A-41C, 50, ¶¶[0111]-[0113], [0119], [0131], [0133], [0143]-[0147], [0164]-[0165], [0168]-[0169], [0180], [0183], [0216]; Ex. 1002, ¶161.) Thus, the various lighting systems that receive AC power as discussed here and for limitation 11(a) include system 500 (FIG. 1), and such a lighting system would likewise necessarily (or explicitly (e.g., FIG. 5 spotlight system)) include converter circuitry to convert the AC power (and thus AC voltage) to DC power (and thus DC voltage) to facilitate operation of the components in system 500 that drive LEDs 4 in such lighting systems. (Ex. 1002, ¶161.) Accordingly, in such arrangements, *Piepgras* discloses an "LED driver" (e.g., controllers 3, processor 2, and such AC-DC converter circuitry) because as explained, controllers 3 convert signals generated by processor

2 (used for controlling "stimulation of the LEDs 4") "into a form suitable for **driving** the LEDs 4" (Ex. 1030, ¶[0088]) and because *Piepgras* describes the use of converter circuitry (e.g., FIG. 5, ¶¶[0108]-[0109]) for converting AC voltage to DC voltage for proper operation of the LEDs in the lighting system. In this way, the LED lighting system (*see* limitation 11(a), §IX.D.1(a)) includes an "**LED driver**" (e.g., AC-DC converter circuitry, controllers 3, processor 2, and associated circuits connecting such components) that has an "input" of a first voltage that is an AC voltage (e.g., 110/120V AC) and a first frequency (e.g., 60 Hz), such as that provided by mains power source, wherein the driver provides an "output" of a second voltage (e.g., converted AC signal to a DC voltage), which is provided to LEDs (and LED circuits) of the above-described LED circuit array of the modified lighting system. (Ex. 1002, ¶161.) For similar reasons, *Piepgras*' LED driver is connected to the LED circuit array of the modified lighting system (e.g., because the driver provides the DC voltage to the LEDs of the LED circuit array).

To the extent such AC voltage and frequency is not disclosed in the above-discussed "LED lighting system" (limitations 11(a)-(c), §§IX.D.1(a)-(c)), it would have been obvious to configure the lighting system to receive power (and thus AC voltage) from a mains voltage source (consistent with the arrangements suggested/contemplated by *Piepgras*). (Ex. 1002, ¶162.) A POSITA would have been motivated to implement such a configuration because it would have provided a reliable source of power, for the described types of applications and circuitry to convert that AC voltage to an appropriate voltage for use by the LEDs (e.g., DC voltage), consistent with that known in the art (and described by *Piepgras* (*see supra*)). (Ex. 1002, ¶162; *see also* Ex. 1005, FIGS. 1-2, 4, 8, 19:1-11, 20:26-31 (cited here to demonstrate state of art); Ex. 1008, FIG. 7, ¶¶[0032]-[0034], ¶[0062], ¶¶[0092]-[0095]; Ex. 1021, FIGS. 1, 2, 4, 6:15-32, 6:60-7:5.) Thus, a POSITA would have had the motivation, capability and knowledge to implement such a configuration with a reasonable expectation of success, especially given the state of art knowledge in context of the disclosures of *Piepgras* as noted above, which contemplates and describes the use of AC voltage consistent with that provided by a mains power source (having known AC voltage and frequency). (Ex. 1002, ¶162.)

Consistent with the operations relating to system 500, the LED driver would have been configured to convert the AC voltage to a DC voltage to adequately power the LEDs in the LED packages (subsystems 3102). (*Id.*, ¶163.) Such a modification would have thus involved the application of known technologies and techniques (use of AC mains power source and AC to DC converter circuitry) that would have predictably led to the LED driver in the above *Piepgras*'s LED lighting system applications) to use an input to receive a "first" AC voltage and a first frequency from a mains power source (as conventionally known) and an output to provide a "second" voltage (e.g., DC voltage) for powering the LED circuit array in the system. Thus, given the disclosures of *Piepgras* and the knowledge of a POSITA at the time, a POSITA would have had the reasons and skills to implement such a modification, and done so with a reasonable expectation of success. (*Id.*)

e) **wherein an LED of at least one of the plurality of LED circuits in the LED circuit array is coated or doped with at least one of a phosphor, nano-crystals, or a light changing or enhancing substance, at least one of the coated or doped LEDs in the LED circuit array producing a different color of light than another coated or doped LED in the LED circuit array.**

Piepgras (as modified above) discloses and/or suggests this limitation. (Ex. 1002, ¶¶164-165.) Specifically, *Piepgras* discloses LEDs include "LEDs packaged or associated with [a] **phosphor**, wherein the phosphor may convert energy from the LED to a different wavelength." (Ex. 1030, ¶[0085].) Further, *Piepgras*' above-discussed applications operate in accordance with the system and operations discussed for FIGS. 1, 2A-2B, which include LEDs of different colors. (Ex. 1030, ¶¶[0085], [0088]-[0105], [0091] ("different colored LEDs 4"), [0124] (projecting different colors simultaneously"), [0125] (different colors), FIGS. 2A-2B.) Indeed, the disclosed applications provide LED light in different colors, and thus include at least one LED of at least one of the LED circuits. (Ex. 1002, ¶164.) For example, the rope light application of FIG. 30 includes different colored LEDs that are controlled by the system. (Ex. 1030, ¶[0160].) The same is true for other applications. (*Id.*, ¶¶[0163] (multicolored LED-based light source), [0168], [0175], [0178], [0185]-[0186]; Ex. 1002, ¶164.)

Accordingly, a POSITA would have understood *Piepgras*' general disclosure regarding LEDs with a phosphor is applicable to all of the applications disclosed by *Piepgras*, including those discussed above (for limitations 11(a)-(d)). (Ex. 1002, ¶165.) Given such disclosures and understanding, and that *Piepgras* discloses that those applications are configured to use different colored LEDs, a POSITA would have understood *Piepgras* to disclose and/or suggest that multiple LEDs in the LED circuit arrays discussed above are coated with phosphor to produce different colors (a common technique in the art). (*Id.*) Accordingly, *Piepgras* discloses and/or suggests that "an LED of at least one of the plurality of LED circuits in the LED circuit array" (e.g., a first LED in the array of LEDs 4 in system 500 integrated in the above described LED lighting systems), are "coated or doped with ... a phosphor" such that "at least one of the coated or doped LEDs in the LED circuit array produc[es] a different color of light than another coated or doped LED in the LED circuit array (e.g., a second LED in the array of LEDs 4 in system 500, as described above). (*Id.*)

2. Claim 12

Piepgras in view of *Kasegi* discloses and/or suggests this limitation for the same reasons explained for limitation 11(c) in Ground 2 (explaining how the

Piepgras-Kasegi LED lighting system would have included a constant current **diode** ("an active current limiting device") that is connected in series to the LED circuit(s). (§IX.D.1(c); Ex. 1002, ¶166.)

X. THE CIRCUMSTANCES WEIGH AGAINST DISCRETIONARY DENIAL

A. The *Fintiv* factors favor institution

An evaluation of the six factors under *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (Mar. 20, 2020) (precedential), weigh against the Board exercising its discretion to deny institution. Rather, the strong invalidity showing on the merits favors institution, notwithstanding Illinois-Litigation and HD-Litigation. (*See* §II).

First factor. Petitioner intends to seek a stay in Illinois-Litigation upon institution. The Board has previously explained that it will not speculate as to the outcome of such unresolved issues before a district court, *Google LLC et al. v. Parus Holdings, Inc.*, IPR2020-00847, Paper 9 at 12-13, and that this factor is neutral where no such stay motion has yet been filed, *Hulu LLC v. SITO Mobile R&D IP, LLC*, IPR2021-00298, Paper 11 at 10-11 (May 19, 2021). Accordingly, this factor does not weigh in favor of discretionary denial.

Second factor. Regarding Illinois-Litigation, the court has not set a trial date.[11] (Exs. 1076, 1080, 1086-1087.) There has not been significant resource investment by the court and the parties, particularly compared to the resource expenditures leading up to a trial. Moreover, any trial (if it occurs) would likely only occur at least 102 weeks after the service of the complaint (and indeed the complaint has been amended twice)—and thus after a final written decision in this IPR. (*Id.*; Ex. 1079, 1-2 (document available at Northern District of Illinois website, estimating "Case Ready for Trial" 102 weeks after complaint served); Ex. 1076, 8 (Dkt. #16 showing summons returned May 19, 2021).)

The HD-Litigation is not relevant to this analysis, but nonetheless has a "tentative" trial date for December 7, 2022. (IPR2021-01367, Paper 1 at 8-9; Ex. 1077, 8 (regarding Dkt. #31).) And as Home Depot noted, more than a dozen other trials are scheduled before the same judge—calling into question whether trial could practically take place as scheduled. (*Id.*)

Third factor. The minimal investment by the court and parties in Illinois-Litigation weighs against discretional denial. Discovery is at an early stage. Expert discovery is not open, no depositions have occurred, and no substantive efforts

[11] Although PO moved to transfer the Illinois-Litigation to Texas, that motion was denied. (Ex. 1085.)

toward claim construction have begun. In short, little has happened and the most resource intensive period in the district court case will occur after the institution decision in this proceeding. (*See* Exs. 1076, 1086.) This alone weighs against denial. *See*, *e.g.*, *Hulu*, IPR2021-00298, Paper 11 at 13.

Fourth factor. There is currently no overlap between issues raised in this Petition and in the Illinois-Litigation. In the Illinois-Litigation, PO has asserted only claims 1 and 6 of the '251 patent, while this Petition challenges claims 2-5, 7-13, 21-23. (§IX; Ex. 1083, 2-5; Ex. 1084, 2-45.) This weighs against denial. *See Vudu, Inc. v. Ideahub, Inc.*, IPR2020-01688, Paper 16 at 14-15 (Apr. 19, 2021) (differences in claims asserted in litigation and claims challenged in the petition weighs against denial). Nonetheless, to mitigate any potential concerns, Petitioner stipulates that it will not pursue invalidity of the '251 patent in district court based on any instituted IPR grounds in this proceeding.

Fifth factor. That Petitioner is a party to Illinois-Litigation does not outweigh the other factors that strongly weigh against discretionary denial.

Sixth factor. Petitioner diligently filed this Petition with strong grounds (*supra* §IX) **within three months** of PO's assertion of the '251 patent (Ex. 1082, ¶¶72-82, p.67), **within two months** of PO's amended preliminary infringement contentions in Illinois-Litigation (Ex. 1083), and **more than nine months before** the statutory deadline for filing an IPR (Ex. 1082, 67). Such diligence weighs against exercising discretion. *See*, *e.g.*, *Hulu*, IPR2021-00298, Paper 11 at 13; *Facebook, Inc. v. USC IP P'ship, L.P.*, IPR2021-00033, Paper 13 at 13.

Further, the '251 patent issued on first office action without any substantive prior art analysis of the ultimately issued claims. (Ex. 1004, 229-237, 256-262, 509-510).) Institution is thus consistent with the significant public interest against "leaving bad patents enforceable." *Thryv, Inc. v. Click-To-Call Techs., LP*, 140 S. Ct. 1367, 1374 (2020). And despite the HD-IPR, this Petition is the ***sole*** challenge to claims 2-5, 7-10, 12, and 21-23 of the '251 patent before the Board, which also favors institution. *Cf. Google LLC v. Uniloc 2017 LLC*, IPR2020-00115, Paper 10 at 6 (May 12, 2020).

Accordingly, based on a "holistic view of whether efficiency and integrity of the system are best served," the facts here weigh against exercising discretion denial. *Samsung Elecs. Co. Ltd. v. Dynamics Inc.*, IPR2020-00505, Paper 11 at 15 (Aug. 12, 2020). At a minimum, factors 2, 3, 4, and 6 (or combinations thereof) outweigh factors 1 (which is neutral) and 5, and thus favor institution.

B. The *General Plastic* analysis favors institution

The Board should not exercise its discretion to deny institution based on the '251 patent being at issue in HD-IPR (§II). Indeed, the facts and issues relevant to the seven factors concerning discretionary denial under 35 U.S.C. § 314(a) favor institution. *General Plastic Industrial Co., Ltd. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper No. 19 at 3, 8, 15-19 (Sept. 6, 2017).

First factor. Petitioner is not (and was not) a party in HD-Litigation or HD-IPR. And Home Depot is not a party to Illinois-Litigation. In short, Petitioner has no "significant relationship" with Home Depot. *See Valve Corp. v. Electronic Scripting Product, Inc.*, IPR2019-00062, Paper No. 11 at 8-10 (Apr. 2, 2019) (precedential). Home Depot and Petitioner are not co-defendants and there was/is no direction or control between the parties relating to this petition or HD-IPR. The accused products in HD-Litigation and Illinois-Litigation are not the same. Indeed, there is **no complete overlap in the asserted claims** of HD-Litigation and Illinois-Litigation. (Ex. 1083, 2-5; Ex. 1089, 16-28.) While there are two overlapping claims (claim 11 and 13) in the challenged claims between the HD-IPR and this petition, they are not entirely identical (*e.g.*, HD-IPR does not challenge claims 2-5, 7-10, 12, and 21-23). Petitioner and Home Depot thus remain distinct parties, with ultimately distinct interests and litigation strategies.[12] *Id.*; *Paypal, Inc. v. IOENGINE,* LLC, IPR2019-00884, Paper 22 at 3-11 (Oct. 3, 2019).

[12] A general common interest by defendants seeking to invalidate asserted unpatentable claims should not create a significant relationship to warrant

Second to fifth factors. Since Petitioner has not previously filed a petition against the same patent[13], factors 2–5 bear little relevance. *Id*. Nevertheless, Petitioner has diligently invested significant effort to prepare the detailed grounds presented in this Petition, and has not delayed the preparation or filing of this Petition. And while at the time of filing HD-IPR (August 18, 2021), Petitioner was working on its strategies and challenges against the '251 patent, Petitioner had no notice as to which claims of the '251 patent PO would assert against Petitioner. Petitioner continued its efforts to prepare and file its petition soon thereafter. This is significant because of the number of claims issued in the '251 patent, and the various different compilations of conventional arrangements claimed in those claims. Thus any delay between its filing and HD-IPR was reasonable and warranted, regardless of whether Petitioner knew at the time of HD-IPR about the prior art it ultimately asserted in this petition. If anything, any delay between the

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discretionary denial, especially where here, Petitioner asserts different prior art and challenges other claims without any coordination or direction/control, and has no significant relationship with Home Depot regarding the challenged patent asserted against different products.

[13] As noted in §II, Petitioner concurrent seeks review of claims 1 and 6 in a separate petition.

filing of the petitions is a product of PO's litigation strategy. Indeed, PO staggered its assertion of the '251 patent against Home Depot and Petitioner by more than 6 months. (Ex. 1088, 87; Ex. 1082, 50-53, 57 (counterclaim asserting infringement of the '251 patent).)

Moreover, Petitioner filed its petition less than 3 months after HD-IPR. Also, Petitioner has gained no advantage in filing its own petition. At time of this filing, no preliminary response has been filed in HD-IPR. Moreover, as noted, Petitioner asserts different prior art, based on a different expert's opinions, against different claims (*e.g.*, claims 2-5, 7-10, 12, and 21-23). Thus, **factors two through five** do not support discretionary denial. Indeed, Petitioner would be prejudiced by the denial of institution given its reasonable and significant efforts and invested resources to diligently file its petition following PO's recent infringement contentions.

Sixth and Seventh factors. Instituting this Petition would be no more a burden on the Board's finite resources than instituting any other petition. Indeed, this Petition challenges a finite set of claims based on a limited set of primary references. (§IX.) Nor are there any readily identifiable roadblocks for the Board to issue a final determination within the statutory one-year limit like those found in other cases where discretionary denial was exercised. *See, e.g.*, *Valve Corp.*, at 15.

C. The Board Should Not Exercise Discretion under § 325(d) to Deny the Petition

Discretionary denial under § 325(d) based on the Petition's reliance on *Nagai* would be inappropriate. While cited in an IDS **among 123 listed references** (Ex. 1004, 83-87), the Applicant did not point out the relevant teachings of *Nagai*. Seemingly unware of those teachings, the Office erred in a manner material to the patentability of the challenged claims by not applying the teachings of *Nagai*. *Advanced Bionics, LLC v. Med-El Elekromediznische Geräete GMBH*, IPR2019-01469, Paper 6 at 8 (precedential). *Nagai* was not substantively discussed or applied during prosecution of the '251 patent. (*See generally* Ex. 1004.) Thus, the mere disclosure of *Nagai* should not serve as a basis for denial of institution here. Moreover, the Office erred by dismissing the references' disclosures, which are material to the patentability of the challenged claims as explained above. (§IX.C.) Indeed, the Office never applied any prior art to claims that issued. (Ex. 1004, 229-237, 256-262, 509-510.) The Office mistakenly looked past the disclosures of

Nagai, which as demonstrated above, discloses and/or suggests the features found in the claims challenged in Ground 3. (§IX.C.) Such oversight is critical and warrants consideration of *Nagai* in the proceeding here. *Advanced Bionics* at 8-9. Moreover, the examiner did not have the benefit of expert testimony explaining the significance of specific teachings of *Nagai* and the state of art as explained above.

Accordingly, institution of the Petition should not be denied based on the reliance on *Nagai*.

XI. CONCLUSION

Accordingly, Petitioner requests institution of IPR for the challenged claims based on the specified grounds.

Respectfully submitted,

Dated: October 27, 2021 By: /Joseph E. Palys/
Joseph E. Palys (Reg. No. 46,508)
Counsel for Petitioner

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 10,492,251 contains, as measured by the word-processing system used to prepare this paper, 12,025 words. This word count does not include the items excluded by 37 C.F.R. § 42.24 as not counting towards the word limit.

Respectfully submitted,

Dated: October 27, 2021

By: /Joseph E. Palys/
Joseph E. Palys (Reg. No. 46,508)
Counsel for Petitioner

CERTIFICATE OF SERVICE

I hereby certify that on October 27, 2021, I caused a true and correct copy of the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 10,492,251 and supporting exhibits to be served via express mail on the Patent Owner at the following correspondence address of record as listed on PAIR:

K&L Gates LLP-Chicago
P.O. Box 1135
Chicago IL 60690

By: /Joseph E. Palys/
Joseph E. Palys (Reg. No. 46,508)