Paper No. 1

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CURRENT LIGHTING SOLUTIONS, LLC d/b/a GE CURRENT,
Petitioner,

v.

JIAXING SUPER LIGHTING ELECTRIC APPLIANCE CO., LTD.,
Patent Owner.

Case IPR2023-00270
Patent 9,723,662 B2

PETITION FOR *INTER PARTES* REVIEW UNDER 35 U.S.C. § 312

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PETITIONER'S EXHIBIT LIST

Exhibit	Shorthand	Description
1001	'662 Patent	U.S. Patent No. 9,723,662
1002	Baker	Expert Declaration of Dr. R. Jacob Baker
1003		CV of Dr. R. Jacob Baker
1004	Zhang	U.S. Patent No. 10,045,406
1005	Tao	U.S. Patent App. Pub. No. 2016/0174307
1006	Langovsky	U.S. Patent No. 8,330,381
1007		*MaxLite, Inc. v. Jiaxing Super Lighting Electric Appliance Co., Ltd.*, IPR2020-00181, Paper 1 (PTAB Nov. 25, 2019)
1008		*MaxLite, Inc. v. Jiaxing Super Lighting Electric Appliance Co., Ltd.*, IPR2020-00181, Paper 7 (PTAB May 26, 2020)
1009		Excerpts of the '662 Patent prosecution history
1010	Litigation Scheduling Order	Scheduling Order, *Jiaxing Super Lighting Electric Appliance Co., Ltd. v. Current Lighting Solutions LLC*, No. 6:22-cv-00534, Dkt. 31 (W.D. Tex. Dec. 12, 2022)
1011		U.S. Patent No. 9,338,853
1012		U.S. Patent No. 5,616,990
1013	D'Andrade Report	Excerpts of the Infringement Report of Dr. D'Andrade, *Jiaxing Super Lighting Electric Appliance Co., Ltd. v. MaxLite, Inc.*, Case No. 2:19-cv-04047 (C.D. Cal.)
1014		Draft Litigation Stipulation
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1019		U.S. Patent No. 7,557,521
1020		U.S. Patent No. 9,148,922
1021		U.S. Patent No. 6,703,795
1022		OMITTED
1023		U.S. Patent No. 8,841,897
1024		U.S. Patent No. 8,792,253
1025		U.S. Patent No. 8,134,297

Exhibit	Shorthand	Description
1026		U.S. Patent No. 3,731,148
1027		U.S. Patent App. Pub. No. 2016/0345394
1028		U.S. Patent No. 7,966,075
1029		U.S. Patent App. Pub. No. 2012/0256551
1030		U.S. Patent App. Pub. No. 2012/0038289
1031		OMITTED
1032		U.S. Patent App. Pub. No. 2013/0076255
1033		U.S. Patent No. 9,237,610
1034		U.S. Patent App. Pub. No. 2013/0234620
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1036		U.S. Patent App. Pub. No. 2014/0009076
1037		U.S. Patent App. Pub. No. 2014/0084701
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1039		U.S. Patent App. Pub. No. 2012/0147564
1040		U.S. Patent No. 9,066,403
1041		U.S. Patent App. Pub. No. 2010/0265732
1042		PCT App. No. WO 2014/115010
1043		U.S. Patent No. 8,247,999

Claim Listing

Claim	Limitation No.	Limitation
1	1[p]	A power source module for an LED lamp, comprising:
	1[a]	a filament-simulating circuit electrically connected to a first bi-pin terminal and a second bi-pin terminal of the LED lamp, each of the first bi-pin terminal and the second bi-pin terminal configured to allow a current to flow from one pin to the other pin via the filament-simulating circuit during a pre-heat process executed by a ballast;
	1[b]	a current limiting circuit electrically connected to the filament-simulating circuit and configured to limit a current from the filament-simulating circuit;
	1[c]	a first rectifier electrically connected to the current limiting circuit and configured to rectify the current from the current limiting circuit; and
	1[d]	a filter electrically connected between the first rectifier and at least one LED of the LED lamp and configured to smooth the current from the first rectifier.
2	2[a]	The power source module of claim 1, wherein the filament-simulating circuit comprises: a first filament-simulating circuit comprising a first capacitor element electrically connected between two pins of the first bi-pin terminal; and
	2[b]	a second filament-simulating circuit comprising a second capacitor element electrically connected between two pins of the second bi-pin terminal.
5	5	The power source module of claim 2, wherein the first rectifier comprises two diodes electrically connected in series, and the first rectifier is electrically connected to the first filament-simulating circuit in series.

Claim	Limitation No.	Limitation
6	6[a]	The power source module of claim 2, wherein the first rectifier comprises two diodes electrically connected in series and a connection node connecting the two diodes is coupled to the current limiting circuit,
	6[b]	wherein a current flows from the at least one LED to one pin of the first bi-pin terminal through one of the two diodes and the current limiting circuit, or from one pin of the first bi-pin terminal to the at least one LED through the other of the two diodes and the current limiting circuit.
7	7	The power source module of claim 6, wherein the current limiting circuit comprises at least a capacitor.
9	9	The power source module of claim 1, wherein the power source module is configured inside a casing of the LED lamp.
10	10	The power source module of claim 1, further comprising a discharging circuit electrically connected to the filter in parallel for discharging the filter.
15	15	The power source module of claim 1, wherein the filter comprises a filtering capacitor electrically connected to the at least one LED.
16	16	The power source module of claim 1, further comprising a discharging circuit electrically connected to the filter in parallel for discharging the filter.
17	17[p]	A power source module for an LED lamp, comprising:
	17[a]	a rectifier electrically connected to terminals of the LED lamp and configured to receive a current;
	17[b]	a filter electrically connected between the rectifier and at least one LED of the LED lamp and configured to store energy from the rectifier and to smooth the current from the rectifier;

Claim	Limitation No.	Limitation
	17[c]	a discharging circuit electrically connected to the filter in parallel and configured to discharge the energy stored in the filter; and
	17[d]	a filament-simulating circuit electrically connected to a first bi-pin terminal and a second bi-pin terminal of the LED lamp, the filament-simulating circuit comprising at least one resistor connected in parallel to at least one capacitor and configured to simulate a filament of a fluorescent lamp during a pre-heat process executed by a ballast.
18	18	The power source module of claim 17, further comprising a current limiting circuit electrically connected to the first bi-pin terminal of the LED lamp, and configured to limit a current from the first bi-pin terminal.
21	21[p]	A power source module for an LED lamp, comprising:
	21[a]	a first circuit comprising a first capacitor element electrically connected between two pins of a first bi-pin terminal of the LED lamp, and a second circuit comprising a second capacitor element electrically connected between two pins of a second bi-pin terminal, wherein the first and second circuits are configured to simulate a filament of a fluorescent lamp during a pre-heat process executed by a ballast;
	21[b]	a current limiting circuit electrically connected to the first bi-pin terminal and configured to limit a current from the first bi-pin terminal;
	21[c]	a rectifier electrically connected between the current limiting circuit and the second circuit and configured to rectify the current from the current limiting circuit and a current from the second bi-pin terminal; and
	21[d]	a filter electrically connected between the rectifier and at least one LED of the LED lamp to

Claim	Limitation No.	Limitation
		store energy from the rectifier and configured to smooth the current from the rectifier.
23	23[p]	An LED lamp, comprising:
	23[a]	a current limiting circuit electrically connected to a first terminal of the LED lamp for limiting a current from the first terminal;
	23[b]	a first rectifier electrically connected to the current limiting circuit for rectifying the current from the current limiting circuit;
	23[c]	a filter electrically connected between the first rectifier and at least one LED of the LED lamp for smoothing the current from the first rectifier; and
	23[d]	a filament-simulating circuit electrically connected to a first bi-pin terminal and a second bi-pin terminal of the LED lamp, each of the first and the second bi-pin terminals having a current flowing from one pin to the other pin of the respective bi-pin terminal via the filament-simulating circuit during a pre-heat process executed by a ballast.
24	24[a]	The LED lamp of claim 23, wherein the filament-simulating circuit comprises: a first filament-simulating circuit comprising a first capacitor element electrically connected between two pins of the first bi-pin terminal; and
	24[b]	a second filament-simulating circuit comprising a second capacitor element electrically connected between two pins of the second bi-pin terminal.
29	29	The LED lamp of claim 23, further comprising a discharging circuit electrically connected to the filter in parallel for discharging the filter.
31	31	The power source module of claim 1, wherein the current limiting circuit comprises at least a capacitor.
32	32[a]	The power source module of claim 1, wherein: the filament-simulating circuit comprises a first

Claim	Limitation No.	Limitation
		filament-simulating circuit connected between two pins of the first bi-pin terminal, and a second filament-simulating circuit connected between two pins of the second bi-pin terminal; and
	32[b]	the current limiting circuit comprises at least a capacitor connected to the first filament-simulating circuit, and at least a capacitor connected to the second filament-simulating circuit.
33	33[a]	The power source module of claim 1, wherein: the LED lamp comprises an LED module comprising the at least one LED;
	33[b]	the filament-simulating circuit comprises a first filament-simulating circuit comprising an impedance element electrically connected between two pins of the first bi-pin terminal, and a second filament-simulating circuit comprising an impedance element electrically connected between two pins of the second bi-pin terminal; and
	33[c]	the power source module further comprises a second rectifier coupled between the second filament-simulating circuit and the LED module, wherein the second rectifier is electrically connected to the second filament-simulating circuit in parallel and is electrically connected to the LED module in parallel.
34	34	The power source module of claim 17, further comprising a current limiting circuit electrically connected to the second bi-pin terminal of the LED lamp, and configured to limit a current from the second bi-pin terminal.
35	35	The power source module of claim 17, wherein the filament-simulating circuit comprises a first filament-simulating circuit connected between two pins of the first bi-pin terminal, and a second filament-simulating circuit connected between two pins of the second bi-pin terminal.

Claim	Limitation No.	Limitation
36	36	The power source module of claim 21, further comprising another current limiting circuit electrically connected to the second bi-pin terminal of the LED lamp, configured to limit a current from the second bi-pin terminal.
37	37	The LED lamp of claim 23, further comprising another current limiting circuit electrically connected to a second terminal of the LED lamp, configured to limit a current from the second terminal.
38	38	The LED lamp of claim 23, wherein the current limiting circuit comprises at least a capacitor.
39	39	The LED lamp of claim 23, wherein the filament-simulating circuit comprises a first filament-simulating circuit connected between a first pin and a second pin pin [sic] of the first bi-pin terminal, and a second filament-simulating circuit connected between a first pin and a second pin of the second bi-pin terminal.
40	40[a]	The LED lamp of claim 23, furthering comprising: an LED module comprising the at least one LED, wherein the filament-simulating circuit comprises a first filament-simulating circuit comprising an impedance element electrically connected between two pins of the first bi-pin terminal, and a second filament-simulating circuit comprising an impedance element electrically connected between two pins of the second bi-pin terminal; and
	40[b]	a second rectifier coupled between the second filament-simulating circuit and the LED module, wherein the second rectifier is electrically connected to the second filament-simulating circuit in parallel and is electrically connected to the LED module in parallel.
41	41[p]	An LED lamp, comprising:

Claim	Limitation No.	Limitation
	41[a]	a current limiting circuit electrically connected to a first terminal of the LED lamp for limiting a current from the first terminal;
	41[b]	a first rectifier electrically connected to the current limiting circuit for rectifying the current from the current limiting circuit;
	41[c]	a filter electrically connected between the first rectifier and at least one LED of the LED lamp for smoothing the current from the first rectifier; and
	41[d]	a first filament-simulating circuit electrically connected to a first bi-pin terminal of the LED lamp and a second filament-simulating circuit electrically connected to a second bi-pin terminal of the LED lamp, each of the first and the second bi-pin terminals arranged to have a current flowing from one pin to the other pin of the respective bi-pin terminal via the respective first or second filament-simulating circuit during a pre-heat process executed by a ballast.
42	42[p]	An LED lamp, comprising:
	42[a]	a current limiting circuit electrically connected to a first terminal of the LED lamp for limiting a current from the first terminal;
	42[b]	a first rectifier electrically connected to the current limiting circuit for rectifying the current from the current limiting circuit;
	42[c]	a filter electrically connected between the first rectifier and at least one LED of the LED lamp for smoothing the current from the first rectifier; and
	42[d]	a first filament-simulating circuit electrically connected to a first bi-pin terminal of the LED lamp, and a second filament-simulating circuit electrically connected to a second bi-pin terminal of the LED lamp, each of the first and the second bi-pin terminals arranged to have a current flowing from one pin to the other pin of the

Claim	Limitation No.	Limitation
		respective bi-pin terminal via the respective first or second filament-simulating circuit after the LED lamp is connected to a ballast and before a normal operation state of the LED lamp.
43	43[a]	The LED lamp of claim 42, further comprising: an LED module comprising the at least one LED, wherein the first filament-simulating circuit comprises an impedance element electrically connected between two pins of the first bi-pin terminal, and the second filament-simulating circuit comprises an impedance element electrically connected between two pins of the second bi-pin terminal; and
	43[b]	a second rectifier coupled between the second filament-simulating circuit and the LED module, wherein the second rectifier is electrically connected to the second filament-simulating circuit in parallel and is electrically connected to the LED module in parallel.

I. INTRODUCTION

Entitled "Power Source Module for LED Lamp," the '662 Patent is directed to "a power source module for an LED lamp for use in a fluorescent lamp base including a ballast." EX1001, 2:12-14. The '662 Patent discloses and claims certain aspects of an LED lamp retrofit replacement for fluorescent lamps.

None of the '662 Patent's LED lamp power source module components or their configuration were new. As described herein, Zhang, Tao, and Langovsky are each directed to LED replacement lamps for use in existing fluorescent lamp bases, and they disclose each and every limitation of the challenged claims.

II. MANDATORY NOTICES

A. Real Party in Interest (37 C.F.R. § 42.8(b)(1))

The real party-in-interest is Petitioner Current Lighting Solutions, LLC d/b/a GE Current ("Current Lighting").

B. Related Matters (37 C.F.R. § 42.8(b)(2))

1. Litigation

The '662 Patent is asserted by Patent Owner ("PO") Jiaxing Super Lighting Electric Appliance Co., Ltd. and its exclusive licensee Obert, Inc. in *Jiaxing Super Lighting Electric Appliance Co., Ltd. et al. v. Current Lighting Solutions, LLC d/b/a GE Current*, Case No. 6:22-cv-00534 (W.D. Tex.) ("*Current* Action") and *Jiaxing Super Lighting Electric Appliance Co., Ltd. et al. v. MaxLite, Inc.*, Case No. 2:19-cv-04047 (C.D. Cal.) ("*MaxLite* Action").

2. Administrative Proceedings

The ’662 Patent was the subject of a petition for *inter partes* review by petitioner MaxLite, Inc. in IPR2020-00181 (“*MaxLite* IPR”). The *MaxLite* IPR Petition asserted anticipation by Zhang and anticipation by German Patent No. DE 20 2013 000 880. *MaxLite, Inc. v. Jiaxing Super Lighting Electric Appliance Co., Ltd.*, IPR2020-00181, Paper 1 at 3 (PTAB Nov. 25, 2019) (EX1007). The Board denied institution of review based on MaxLite’s failure to demonstrate a reasonable likelihood of prevailing on anticipation of the challenged claims. *MaxLite, Inc. v. Jiaxing Super Lighting Electric Appliance Co., Ltd.*, IPR2020-00181, Paper 7 at 12, 19 (PTAB May 26, 2020) (EX1008). Specifically, the Board determined that “Petitioner has not explained sufficiently that [Zhang’s] Figures 2, 7, 10, 14, 18, and 18A are compatible embodiments such that they teach the limitations of claim 1 arranged in the same way as the ’662 patent without the need to pick and choose disparate disclosures.” *Id.*, 12.

C. Lead and Back-Up Counsel (37 C.F.R. § 42.8(b)(3))

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D. Service Information (37 C.F.R. § 42.8(b)(4))

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Petitioner consents to electronic service.

III. GROUNDS FOR STANDING

Petitioner certifies that the ’662 Patent is available for IPR and Petitioner is not barred or estopped from requesting an IPR on the grounds identified herein. The ’662 Patent has not been subject to a previous FWD in an estoppel-based AIA proceeding.

IV. STATEMENT OF PRECISE RELIEF REQUESTED

A. Claims for Which Review Is Requested (37 C.F.R. § 42.104(b)(1))

Petitioner requests review and cancellation of Claims 1, 2, 5-7, 9, 10, 15-18, 21, 23, 24, 29, and 31-43 (“Challenged Claims”).

B. Statutory Grounds of Challenge (37 C.F.R. § 42.104(b)(2))[1]

Ground	Basis	Reference(s)	Challenged Claims
1	§103	Zhang	1, 2, 5-7, 9, 10, 15-18, 21, 23, 24, 29, 31, 32, 34-39, 41, and 42
2	§103	Tao	1, 9, 15, 23, 31-33, and 38-43
3	§103	Tao, Langovsky	1, 9, 15, 23, 31-33, and 38-43

Published on August 14, 2014, Zhang (EX1004) is prior art under §102(a)(1).

Filed on July 4, 2014, Tao (EX1005) is prior art under §102(a)(2).

Published on November 18, 2010, Langovsky (EX1006) is prior art under §102(a)(1).

V. GROUNDS OF CHALLENGE ARE NOT CUMULATIVE

A. Discretionary Denial under §314(a) Would Be Inappropriate

Discretionary denial under §314(a) is inappropriate, despite the ’662 Patent having been the subject of the *MaxLite* IPR. *See General Plastic Indus. Co., LTD. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 at 15-17 (P.T.A.B. Sept. 6, 2017) (precedential).

[1] All Grounds are supported by a POSITA’s general knowledge. *Koninklijke Philips N.V. v. Google LLC*, 948 F.3d 1330, 1337-38 (Fed. Cir. 2020).

For factor (1), Petitioner was not involved in the *MaxLite* IPR. The *MaxLite* IPR was filed by a third party with whom Petitioner has not communicated or coordinated. Further, there is no significant relationship between Current Lighting and MaxLite. On the contrary, Current Lighting and MaxLite are "direct competitors ... sued separately," which "weighs against finding a significant relationship." *Google Inc. v. Uniloc 2017*, IPR2020-00396, Paper 11 at 11 (P.T.A.B. Aug. 3, 2020). They "remain distinct parties, with ultimately distinct interests, and distinct litigation strategies." *Toshiba Am. Info. Sys. v. Walletex Microelectronics Ltd.*, IPR2018-01538, Paper 11 at 22 (P.T.A.B. Mar. 5, 2019). In addition, this Petition challenges three claims—claims 33, 40, and 43—that were not challenged in the *MaxLite* IPR. *See Qualcomm Inc. v. Monterey Research, LLC*, IPR2020-01491, Paper 10 at 10-11 (P.T.A.B. Mar. 8, 2021). Further, Current Lighting and MaxLite provide completely separate products accused of infringement in separate lawsuits filed years apart. *Apple, Inc. v. UUSI, LLC*, IPR2019-00358, Paper 12 at 14-15 (P.T.A.B. Aug. 9, 2019). Indeed, PO initiated suit against MaxLite in May 2019 but filed the *Current* Action in May 2022. As such, there is no, let alone a significant, relationship between MaxLite and Current Lighting, and factor (1) weighs strongly against denying institution. *See Qualcomm*, IPR2020-01491, Paper 10 at 10.

As to factor (2), similar to the facts in *Apple*, Current Lighting was not sued until almost two years after the conclusion of the *MaxLite* IPR. Thus, Current Lighting "would have little discernable reason, at the time of filing of the [*MaxLite* IPR] petition … to look for and identify the prior art that it ultimately asserted in" this Petition. *Apple*, IPR2019-00358, Paper 12 at 15-16. Factor (2) therefore weighs against denying institution.

Factor (3) addresses fairness concerns. *Apple*, IPR2019-00358, Paper 12 at 16. However, those concerns are absent here because Petitioner "could not have 'delay[ed]' its Petition to gain a strategic advantage by learning from the [*MaxLite*] IPR because, by the time PO sued Petitioner, the [*MaxLite*] IPR was already complete." *Id*., 16-17. Instead, "any 'delay' in Petitioner's filing of the instant Petition was the direct result of PO's litigation activity, not any 'gamesmanship' of Petitioner." *Id*., 17. As a result, factor (3) weighs against denying institution. *Id.*

For the same reason, Petitioner cannot have used an improper "wait and see" approach, and factor (4) weighs against denying institution. *Id*., 17-18.

Regarding factor (5), the *Apple* Board found this factor weighed in favor of institution based on the same reasoning as factors (3) and (4), with the added explanation that "any delay between the filing of the [first petition] and the [second petition] is due to PO's delay in filing suit against [the second petitioner]." *Id*., 18-

19. The same reasoning applies in this case, and factor (5) weighs against denying institution. *Id*.

For factor (6), this Petition does not waste the finite resources of the Board because it challenges claims not challenged in the *MaxLite* IPR and raises novel claim construction and obviousness arguments. *Qualcomm*, IPR2020-01491, Paper 10 at 13 ("Consideration of these additional [issues] … would not be a duplicative or inefficient use of Board resources…."). And because the "prior petition[] in the [*MaxLite* IPR] ha[s] been denied institution," "[t]he Board's finite resources would not be strained to maintain only one proceeding challenging the ['662] patent." *Sony Mobile Commc'ns AB v. Ancora Techs., Inc.*, IPR2021-00663, Paper 17 at 15 (P.T.A.B. June 10, 2021). Accordingly, factor (6) weighs against a discretionary denial.

Factor (7) relates to the requirement of issuing a FWD within one year of institution and is not implicated in the circumstances of this case. *Apple*, IPR2019-00358, Paper 12 at 19-20.

B. Discretionary Denial Under §325(d) Would Be Inappropriate.

The grounds are not cumulative over the prior art references and combinations considered during prosecution or the prior IPR. As explained in *Advanced Bionics*, the *Becton Dickinson* factors focus on (1) whether the same or substantially the same art was previously considered by the Office and, if so, (2) whether the Office erred in some way that is material to patentability. *Advanced Bionics, LLC v. MED-EL Elektromedizinische*, IPR2019-01469, Paper 6 at 8-10 (P.T.A.B. Feb. 13, 2020) (precedential).

1. **Advanced Bionics** ***Part One***

In the *MaxLite* IPR, the petitioner challenged claim 1, among others, as anticipated by Zhang. EX1008, 10/21. Thus, Zhang has been considered under part one of the *Advanced Bionics* framework.

Regarding claim 1, the petitioner asserted that "Figures 7 and 10 … disclose parallel resistor/capacitor embodiments of the filament-imitating impedance that are equivalent to the filament-imitating impedance of Figure 18." *Id*. PO argued that "Petitioner does not 'address the structural differences between the identified filament-imitating impedances of the various figures ….'" *Id*., 11/21 (internal citation omitted). The Board agreed with PO and determined that, under the standard for showing anticipation, "Petitioner has not explained sufficiently that Figures 2, 7, 10, 14, 18, and 18A are compatible embodiments such that they teach the limitations of claim 1 arranged in the same way as the '662 patent without the need to pick and choose disparate disclosures." *Id*., 11-12/21.

2. **Advanced Bionics** ***Part Two***

Here, Petitioner challenges claim 1, among others, as rendered obvious by Zhang. Specifically, Zhang discloses a lighting apparatus 1800 that includes "a rectifier circuit 1812, a matching circuit 1814, first and second ***filament-imitating impedances 1820a, 1820b***,[2] and first and second blocking impedances 1830a, 1830b" shown in Figure 18A. EX1004, 9:4-8, FIG. 18A. Zhang also discloses "***a temperature-varying filament-imitating impedance" 1400*** shown in Figure 14. *Id.*, 3:53-55, FIG. 14. In the invaliding combination, Zhang's ***temperature-varying filament-imitating impedance*** 1400 would replace first and second ***filament-imitating impedances*** 1820a and 1820b in lighting apparatus 1800. *See* Section IX.A.2-IX.A.3, below. Zhang provides an explicit motivation to replace the filament-imitating impedances 1820a and 1820b of Figure 18A with the temperature-varying filament-imitating impedance 1400 of Figure 14. *See* Section IX.A.3, below.

The Board did not consider this argument, and whether that error is the *MaxLite* petitioner's or the Board's, it is sufficient to satisfy part two of the *Advanced Bionics* framework. *Advanced Bionics*, Paper 6 at 10-11.

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[2] All emphasis is added unless otherwise noted.

VI. LEVEL OF ORDINARY SKILL IN THE ART

A POSITA as of October 17, 2014[3]—the '662 Patent's earliest claimed priority date—would have had a Bachelor's degree in electrical engineering, or an equivalent field, as well as 1-2 years of academic or industry experience in LED lighting design, including knowledge of LEDs and related technology for driving LEDs. EX1002, ¶¶32, 33. A POSITA with a higher level of education may have fewer years of academic or industry experience, or vice versa. *Id.*, ¶33. A POSITA would have been familiar with the field of technology described in Section VII below. *Id.* The prior art and the '662 Patent also evidence this level of ordinary skill. *Id.*; *see Chore-Time Equip., Inc. v. Cumberland Corp.*, 713 F.2d 774, 779 (Fed. Cir. 1983); *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

VII. TECHNOLOGY BACKGROUND

A. Fluorescent Lamps

"A fluorescent lamp consists of a glass tube filled with an inert gas …. On each side of the glass tube is an electrode. Electricity is passed through the gas,

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[3] All statements in this Petition about the knowledge and skills of, and what would have been obvious to, a POSITA are offered from this perspective as of this date. EX1002, ¶¶18, 19.

causing an arc of illumination. The glass tube is fitted into a fixture having sockets that receive electrode pins at an end of the glass tube." EX1011, 1:23-25.

"As electrical current forms an arc through the lamp, it ionizes a higher percentage of the tube's contained gas molecules. The more molecules that are ionized, the lower the resistance of the gas. If too many gas molecules are ionized, the resistance will drop to the point that an electrical short would occur." *Id.*, 2:13-18. Therefore, a ballast is used with fluorescent lamps. "An electrical ballast is a device that [is] intended to limit the amount of current in an electric circuit." *Id.*, 1:45-47. The electrical ballast "contains electronic components that control the current, preventing the current through the lamp from rising to the point that the lamp would burn out." *Id.*, 2:18-22.

B. Pre-Heat Process

"Fluorescent lamps often require that their filaments (electrodes) be preheated prior to lamp ignition." EX1012, 1:12-13. "In lamps that require preheating, it is difficult to start a lamp when the filaments have not been sufficiently preheated." *Id.*, 1:38-40. During preheating, "current [] flows through the [starter's] electrodes and lamp filaments heating the latter." *Id.*, 1:25-26. "Once the filaments have been preheated, one or more large voltage pulses … are applied to the fluorescent lamp filaments." EX1012, 1:15-17.

Ballasts that perform pre-heating include rapid start and programmed-start ballasts. One ballast that does not is "[a]n instant start ballast" that "instead uses a relatively high voltage (~600 V) to initiate the discharge arc." EX1011, 2:30-32.

VIII. THE '662 PATENT

Entitled "Power Source Module for LED Lamp," the '662 Patent is directed to "a power source module for an LED lamp for use in a fluorescent lamp base including a ballast." EX1001, 2:12-14.

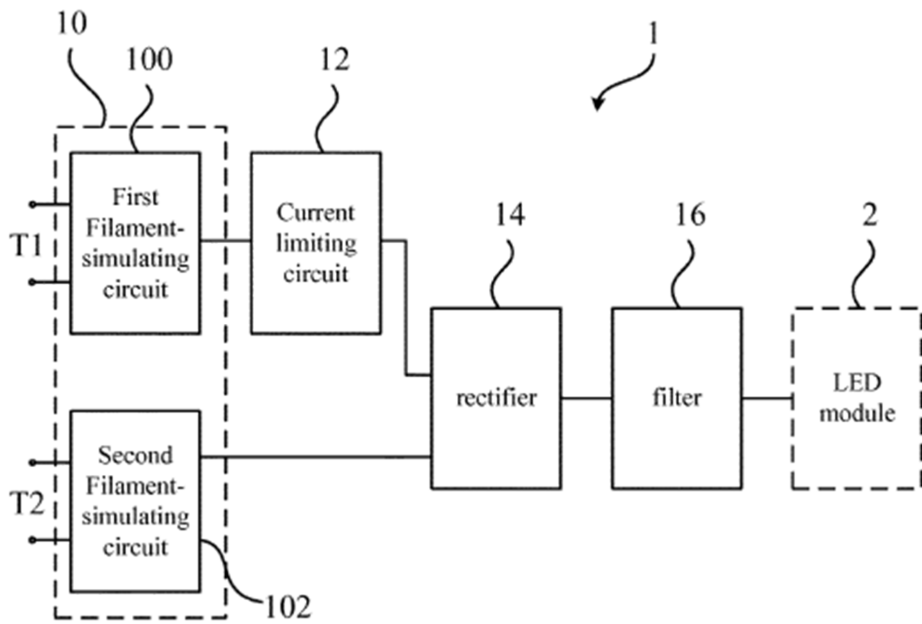
A. Issues With Replacing Fluorescent Lamps With LED Lamps

The '662 Patent states that, in order "[t]o replace the traditional fluorescent lamp by the LED lamp, the original circuit included in the fluorescent lamp base might need to be modified to adapt the LED lamp." EX1001, 1:48-50. Specifically, an "electrical ballast needs to be removed away by the user, and further the circuit in the fluorescent lamp base must be modified correspondingly for the LED lamp." *Id.*, 1:64-67. This "modification … is complicated"" and "requires manpower and material resources." *Id.*, 2:1-6.

The '662 Patent explains that fluorescent lamp base modification is required because "[t]he starter and the electrical ballast generate a gaseous electric discharge in the fluorescent lamp by raising the voltage," which "would cause the LED lamp to burn away." *Id.*, 1:56-59. Furthermore, because an LED lamp lacks filaments, the ballast may "erroneously judg[e] that the filaments are open-circuited or short-circuited during the pre-heating process of the ballast." *Id.*, 3:55-61.

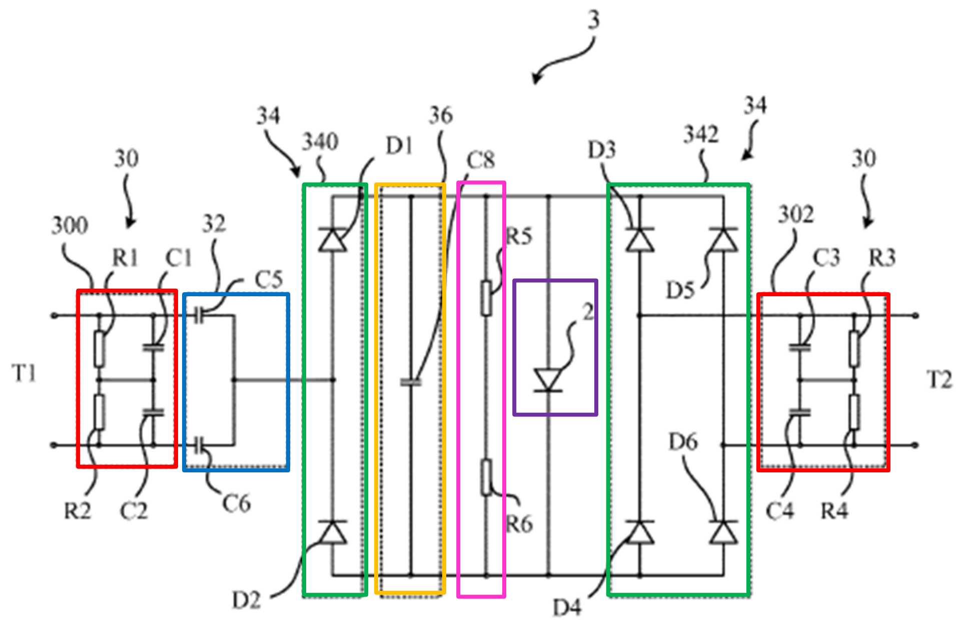
B. Summary of Alleged Invention of the '662 Patent

The '662 Patent purports to solve the LED replacement problems described above by "provid[ing] a power source module for an LED lamp for use in a fluorescent lamp base including a ballast." EX1001, 2:12-14.



Id., FIG. 1. "[T]he power source module 1 includes a filament-simulating unit 10, a current limiting circuit 12, a rectifier 14, and a filter 16." *Id.*, 3:14-16. "The filament-simulating unit 10 can simulate a filament of the traditional fluorescent lamp, so as to prevent the ballast from erroneously judging that the filaments are open-circuited or short-circuited during the pre-heating process of the ballast." *Id.*, 3:57-61.

Figure 2 provides a circuit diagram of power source module 3:



Id., FIG. 2. First filament-simulating circuit 300 and second filament-simulating circuit 302 (red), current limiting circuit 32 (blue), first rectifier 340 and second rectifier 342 (green), filter 36 (orange), LED module 2 (purple), and discharging circuit (pink) are illustrated above.

C. Claim Construction

Claim terms are each given their "ordinary and customary meaning … as understood by [a POSITA]." 37 C.F.R. §42.100(b).

1. "electrically connected"

The term "electrically connected" should be construed as "connected through wires or other intervening electrical components." EX1002, ¶34. "Electrically connected" is found in claims 1, 2, 5, 6, 10, 15-18, 21, 23, 24, 29, 34, 37, 41, and 42.

A POSITA would have understood that "electrically connected" does not require a direct connection, i.e., with no intervening electrical components or modules. *Id.*, ¶35. Claim 5 requires that "the first rectifier is electrically connected to the first filament-simulating circuit in series." But independent claim 1 describes "a current limiting circuit electrically connected to the filament-simulating circuit" and "a first rectifier electrically connected to the current limiting circuit." And each of the '662 Patent's figures consistently depicts the current limiting circuit between the first filament-simulating circuit and the first rectifier. *Id.* Limiting "electrically connected" to require a direct connection would thus improperly exclude all disclosed embodiments. *Id.*; *see Nellcor Puritan Bennett, Inc. v. Masimo Corp.*, 402 F.3d 1364, 1368 (Fed. Cir. 2005).

In the *MaxLite* Action, PO served an expert report on infringement of the '662 Patent. For Limitation 23[a], which recites "a current limiting circuit ***electrically connected***[4] to a first terminal of the LED lamp," PO's expert, Dr. D'Andrade, opined that the accused product met this limitation:

> [T]he current-limiting circuit is electrically connected with circuit elements which are electrically connected to a first terminal. As a result, the current-limiting circuit is electrically connected to a first terminal of the LED lamp for limiting current from the first terminal.

[4] All emphasis is added unless otherwise noted.

EX1013, 41/53; *accord id.*, 46/53. That is, Dr. D'Andrade understood that "the current-limiting circuit is electrically connected to a first terminal of the LED lamp," despite the presence of intervening circuit elements between the current-limiting circuit and the first terminal. EX1002, ¶36; *see also TCT Mobile (US) Inc. v. Semiconductor Energy Lab. Co.*, Case No. IPR2022-00440, Paper 13 at 10 (Aug. 3, 2022) (construing "electrically connected" as "an electrical connection of circuit components either directly connected or indirectly connected via intervening circuit components").

Moreover, the '662 Patent itself confirms this construction. Specifically, the '662 Patent describes that "[t]he filter is ***electrically connected*** between the first rectifier ***and at least one LED of the LED lamp***." EX1001, 2:24-28. As described above in Section VIII.B, there are intervening components between filter 36 and the LED module 2. EX1002, ¶37; *see also* EX1001, FIGS. 2, 3; 2:50-51 (disclosing that "[t]he rectifier [is] ***electrically connected*** to the terminals of the LED lamp for receiving a current" despite intervening components including first filament-simulating circuit 300 and current limiting circuit 32).

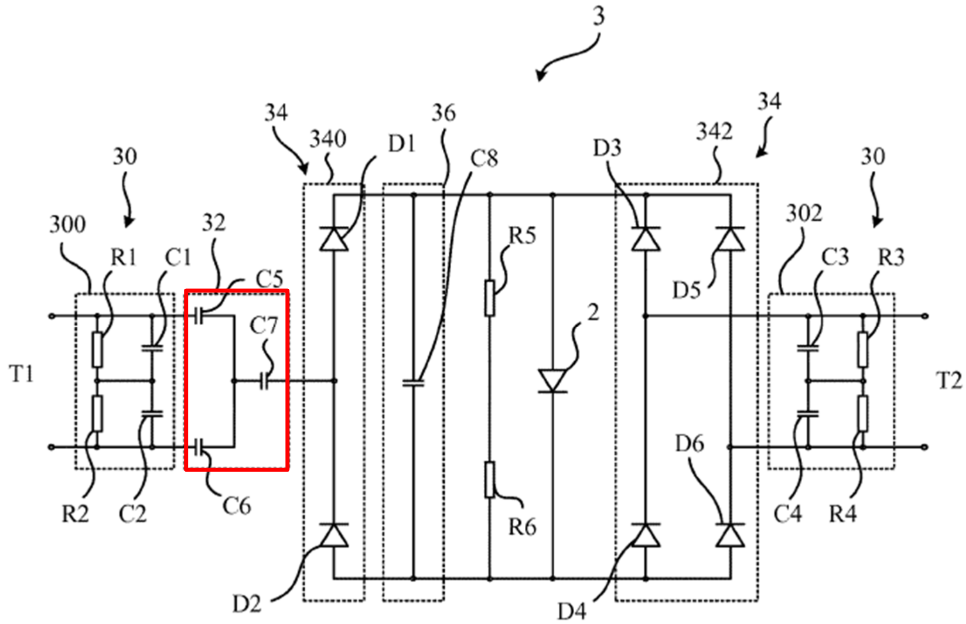
2. "current limiting circuit"

The term "current limiting circuit" is broad enough to encompass a circuit that provides an impedance. EX1002, ¶38. "Current limiting circuit" is found in claims 1, 6, 7, 18, 21, 23, 31, 32, 34, 36-38, 41, and 42. Independent claims 1, 21, 23, 41, and 42 specify that a "current limiting circuit" is either "configured to limit a current" or "for limiting a current." A POSITA would have recognized that an impedance limits a current. *Id.*; *see* EX1015, 7:51-52 ("Impedance is a more general parameter that describes a circuit's ability to resist the flow of electrical current.").

Claim 7 also supports this broad reading of "current limiting circuit." EX1002, ¶39. Claim 7 requires that "the current limiting circuit comprises at least a capacitor." Because a current limiting circuit consisting of a single capacitor would satisfy claim 7, a POSITA would have understood that a current limiting circuit merely requires an impedance element. *Id.*

PO's infringement contentions in the *Current* Action support a broad interpretation. *Id.*, ¶40. For Limitation 23[a], PO contends that "the current limiting circuit is comprised of one surface mount device (SMD) capacitor C5" and further explains that "capacitor C5 is thus ***configured to provide an impedance*** that limits a current." EX1016, 18-19/61.

The claims do not specify a value of the impedance provided by the current limiting circuit. But the '662 Patent provides the following embodiment of current limiting circuit 32, which "includes the third capacitance C7 connected between the capacitances C5 and C6," where C7 is connected in series to the parallel combination of C5 and C6. EX1001, 5:5-11.



EX1001, FIG. 3. The ’662 Patent discloses that “the values of the capacitances C5, C6, C7 are in the range of 0.47 nF to 12 nF.” EX1001, 5:11-15. For the instance in which terminal T1’s pins are shorted together, the total capacitance C_{T1} provided by capacitors C5, C6, and C7 is ((C5 + C6) * C7)/(C5 + C6 + C7) = 0.31 nF to 8 nF. EX1002, ¶41. For another instance in which the current all flows through only one of terminal T1’s pins, the total capacitance C_{T2} provided by capacitors C5 and C7 is (C5 * C7)/(C5 + C7) = 0.24 nF to 6 nF. *Id.* The formula for impedance of a capacitor is 1/(2πfC), where f is frequency. *Id.* The specification discloses that the ballast “outputs an alternating current with a high frequency, e.g., 45 KHz, to the current limiting circuit 32.” EX1001, 4:46-49. For a 45 kHz frequency, the impedance for current limiting circuit 32 ranged from 442 to 14,737 Ω. EX1002, ¶41.

IX. REASONS FOR THE RELIEF REQUESTED UNDER 37 C.F.R. §§ 42.22(A)(2) AND 42.104(B)(4)

A. Ground 1 – Zhang Renders Obvious Claims 1, 2, 5-7, 9, 10, 15-18, 21, 23, 24, 29, 31, 32, 34-39, 41, and 42

1. Zhang Overview

Zhang is titled "Solid-State Lighting Apparatus for Use With Fluorescent Ballasts." EX1004, Cover. Zhang explains that "solid-state lighting devices may be attractive for retrofit replacement applications" and notes that "LED-based replacements for fluorescent lamps have [] been developed." *Id.*, 1:46-50, 1:54-59. Zhang discloses "a solid-state lighting circuit and first and second ballast connection ports configured to be coupled to a ballast," shown below. *Id.*, 1:63-65.

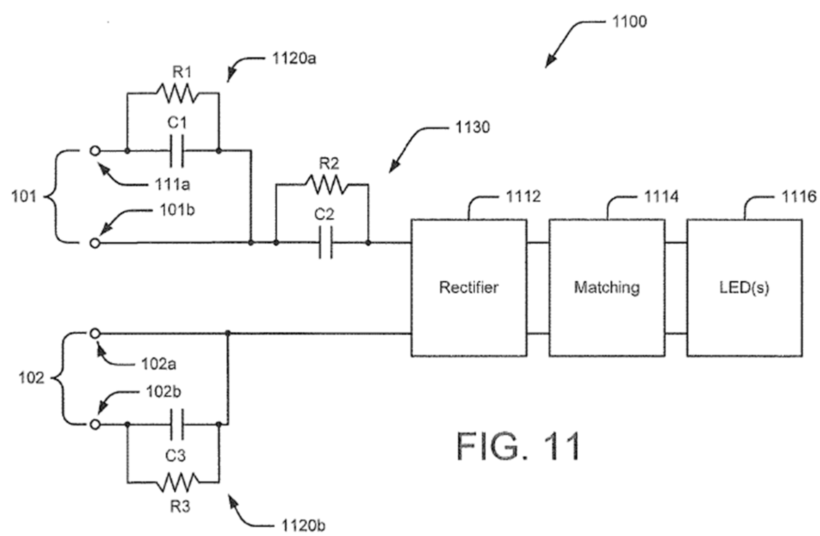


FIG. 11

Id., FIG. 11. "A first filament-imitating impedance is coupled to the first ballast connection port and a first low-frequency blocking impedance couples the first filament-imitating impedance to a first input terminal of the solid-state lighting circuit." *Id.*, 1:65 – 2:2. "A second filament-imitating impedance is coupled to the second ballast connection port and a second low-frequency blocking impedance couples the second filament-imitating impedance to a second input terminal of the solid-state lighting circuit." *Id.*, 2:2-6. "[T]he solid-state lighting circuit may include a rectifier circuit having an input port coupled to the first and second low-frequency blocking impedances and at least one light emitting diode (LED) coupled to an output port of the rectifier circuit." *Id.*, 2:34-38.

2. Modification of Zhang

In one embodiment, Zhang discloses a lighting apparatus 1800 that includes "a rectifier circuit 1812, a matching circuit 1814, first and second filament-imitating impedances 1820a, 1820b, and first and second blocking impedances 1830a, 1830b." EX1004, 9:4-8.

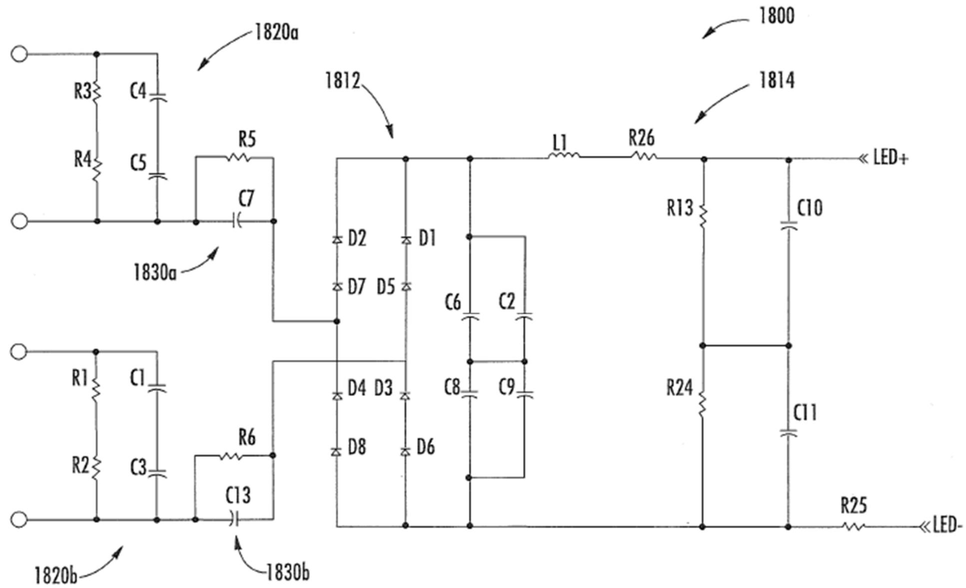
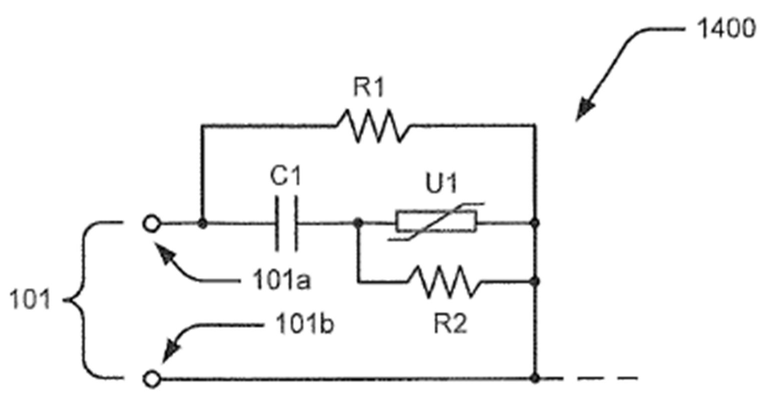


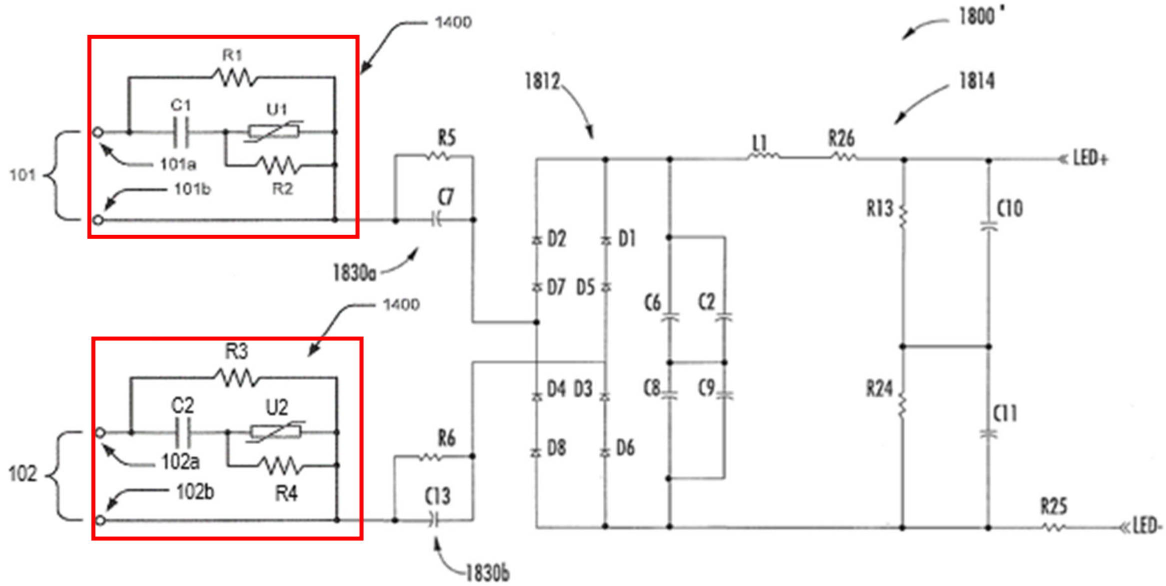
FIG. 18A

Id., FIG. 18A.

In another embodiment, Zhang discloses "a temperature-varying filament-imitating impedance" 1400, shown below. *Id.*, 3:53-55.



Id., FIG. 14. In the modified apparatus 1800', temperature-varying filament-imitating impedance 1400 would replace first and second filament-imitating impedances 1820a and 1820b, as illustrated below. EX1002, ¶44.



EX1004, FIGS. 14 & 18A.

3. Motivation to Combine

A POSITA would have been motivated to combine Zhang's temperature-varying filament-imitating impedance 1400 with lighting apparatus 1800. EX1002, ¶45. Zhang provides an explicit motivation to combine:

> According to further embodiments, a filament-imitating impedance may be a temperature-varying impedance. Some ballasts perform filament tests in which a filament is tested by measuring a "cold" impedance of the filament before energizing, and then testing the filament impedance after the filament has been energized and heated up. If the change in impedance between the two temperatures fails to meet a predetermined criteria, the ballast may prevent operation. FIG. 14 illustrates a filament-imitating impedance 1400 including a capacitor C1 and resistor R1 along the lines described above, along with

> a parallel combination of an additional resistor R2 and a positive temperature coefficient (PTC) resistor U1 coupled in series with the capacitor C1. The PTC resistor U1 has a resistance that increases as current flows through the PTC resistor U1 and heats it up. Such an arrangement can be used to accommodate such a test and prevent shutdown due to failing the test.

EX1004, 8:8-24; *see also* EX1025, 7:4-7 (claiming an "electronic ballast" having a "control circuit [that] is designed to determine the quotient of the present warm resistance and the initial cold resistance of one of the electrodes" of a connected discharge lamp). That is, a POSITA would have understood that replacing elements 1820a and 1820b with element 1400 would provide a temperature-varying impedance that would prevent ballast shutdown due to test failure, thus increasing the compatibility of modified apparatus 1800' with additional ballast types. EX1002, ¶45. And a POSITA would have recognized that the increased ballast-compatibility of modified apparatus 1800' decreased the need to remove the ballast from the fixture and modify the fixture's circuit. *Id.*; *see* EX1001, 1:64 – 2:4 (stating in Background section that when "the electrical ballast needs to be removed away by the user," it is "complicated to the user, even to the professional," it requires "manpower and material resources," and "the circuit in the fluorescent lamp base must be modified correspondingly").

4. Element by Element Analysis

(a) ***Limitation 1[p]***

To the extent it is limiting, Zhang renders the preamble obvious. EX1002, ¶56. A POSITA would have recognized that modified apparatus 1800' illustrated above includes a power source module having a filament-simulating circuit, a current limiting circuit, a first rectifier, and a filter. *Id.*; *see* EX1001, 3:29-31 ("The power source module 1 may also be described as a power source circuit, or a power supply circuit."). A ballast supplies electrical power to modified apparatus 1800' via ballast connection ports 101 and 102. EX1002*,* ¶57; *see* EX1004, 5:1-5 ("The terminals 101a, 101b may comprise, for example, pins that are configured to be connected to a fluorescent lamp connector (e.g., a tombstone connector) that provides electrical coupling to a fluorescent lighting ballast."). Modified apparatus 1800', via its power source module, provides "output [] to the LED segments 1816a, 1816b" via the ports labeled LED+ and LED-. EX1007, ¶57; EX1004, 9:64-67.

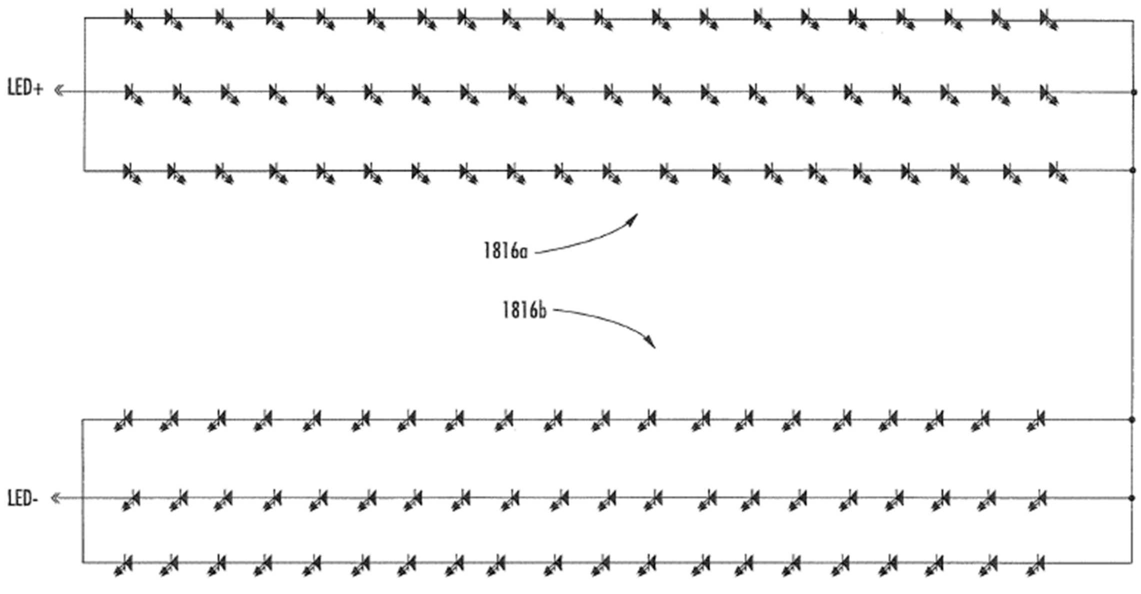


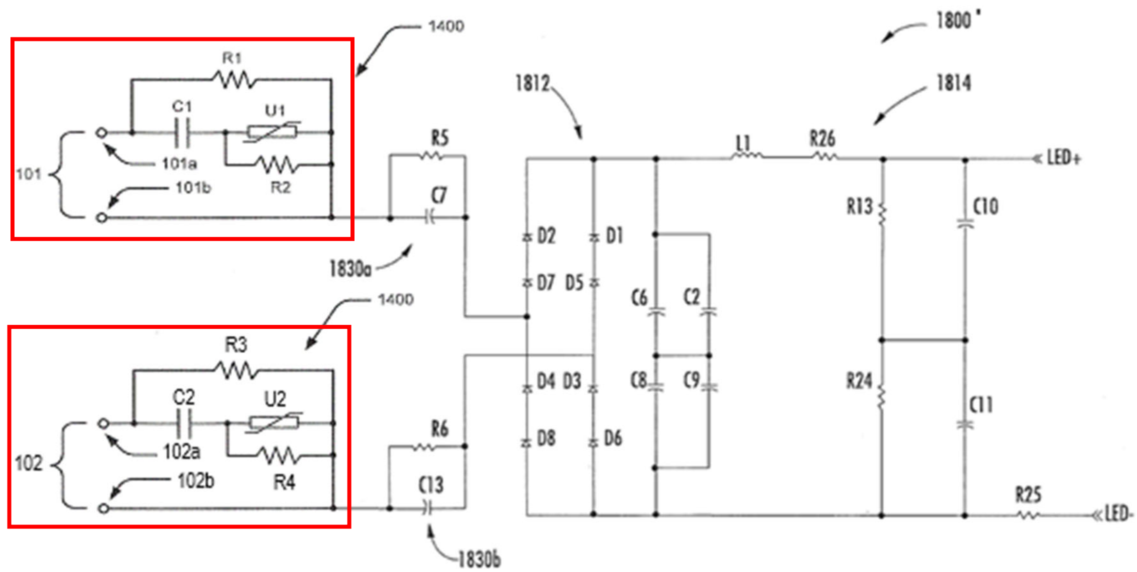
FIG. 18B

EX1004, FIG. 18B.

The power source module of apparatus 1800' (FIGS. 14, 18A & 18B) is also "for" an LED lamp, given that it is included in an LED lamp. EX1002, ¶58; *see* EX1004, 9:64-67, FIGs. 18A-B; *see also* EX1004, 10:19-20 ("The apparatus 1800 may be included in a fluorescent tube replacement lamp….").

(b) *Limitation 1[a]*

The power source module of Zhang's modified apparatus 1800' (Sections IX.A.2, IX.A.3) would have met this limitation. EX1002, ¶59. Shown below in the red rectangles, filament-imitating impedances 1400 are a filament-simulating circuit. *Id.*



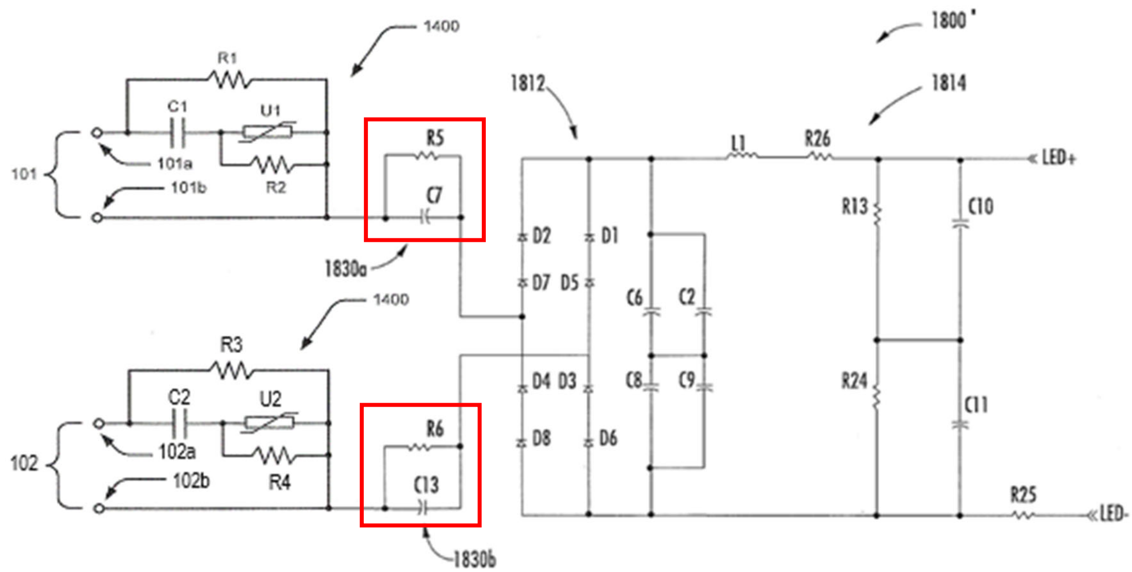
EX1004, FIGS. 14 & 18A. The top filament-imitating impedance 1400 comprises "a capacitor C1 and resistor R1 … , along with a parallel combination of an additional resistor R2 and a positive temperature coefficient (PTC) resistor U1 coupled in series with the capacitor C1." EX1002, ¶59; EX1004, 8:16-20. Likewise, the bottom filament-imitating impedance 1400 comprises a capacitor C2 and resistor R3 … , along with a parallel combination of an additional resistor R4 and a PTC resistor U2 coupled in series with the capacitor C2. EX1002, ¶59; EX1004, 8:16-20. The top filament-imitating impedance 1400 is electrically connected to first ballast connection port 101, and the bottom filament-imitating impedance 1400 is electrically connected to second ballast connection port 102, as illustrated above. EX1002, ¶59.

Zhang discloses that first ballast connection port 101 comprises a bi-pin terminal having pins 101a and 101b: "[t]he terminals 101a, 101b may comprise, for example, pins that are configured to be connected to a fluorescent lamp connector." *Id.*, ¶60; EX1004, 5:1-5. Likewise, Zhang discloses that second ballast connection port 102 comprises a bi-pin terminal having pins 102a and 102b: "[t]he apparatus 100 may also include a second port 102 with similar terminals 102a, 102b for use in, for example, bi-pin fluorescent tube replacement applications." EX1002, ¶60; EX1004, 5:5-7.

First port 101 is configured to allow a current to flow from one pin 101a to the other pin 101b via the top filament-imitating impedance 1400 during a pre-heat process executed by a ballast. EX1002, ¶61. The connected ballast "perform[s] filament tests in which a filament is tested by measuring a 'cold' impedance of the filament before energizing, and then testing the filament impedance after the filament has been energized and heated up." EX1004, 8:9-13. A POSITA would have recognized that the described filament tests disclose a pre-heat process executed by a ballast, given that they involve "testing the filament impedance after the filament has been energized and heated up." EX1002, ¶61; EX1004, 8:9-13. In addition, a POSITA would have recognized that measuring impedances and energizing and heating up a filament—or a "filament-imitating impedance" (EX1004, 8:8-9)—requires a current to flow from one pin 101a to the other pin 101b and also from one pin 102a to the other pin 102b. EX1002, ¶61; *see* EX1042, 5:29-34 ("During the preheat phase the fluorescent tube lighting fixture … appl[ies] a current between a first pair of contact pins at a first end of the fluorescent tube and between a second pair of contact pins at a second end of the fluorescent tube. The current is applied … to heat a corresponding filament connected between said first and second pair of contact pins, respectively, so that electrons are emitted."). And a POSITA would have further recognized that the only path from one pin 101a to the other pin 101b in apparatus 1800' is through the top filament-imitating impedance 1400. EX1002, ¶61. The same is true of bottom filament-imitating impedance 1400 coupled to port 102, with pins 102a and 102b. *Id.*

(c) *Limitation 1[b]*

The power source module of Zhang's modified apparatus 1800' would have met this limitation. EX1002, ¶62. Shown below in the red rectangle, first blocking impedance 1830a and second blocking impedance 1830b are each a current limiting circuit. *Id*.



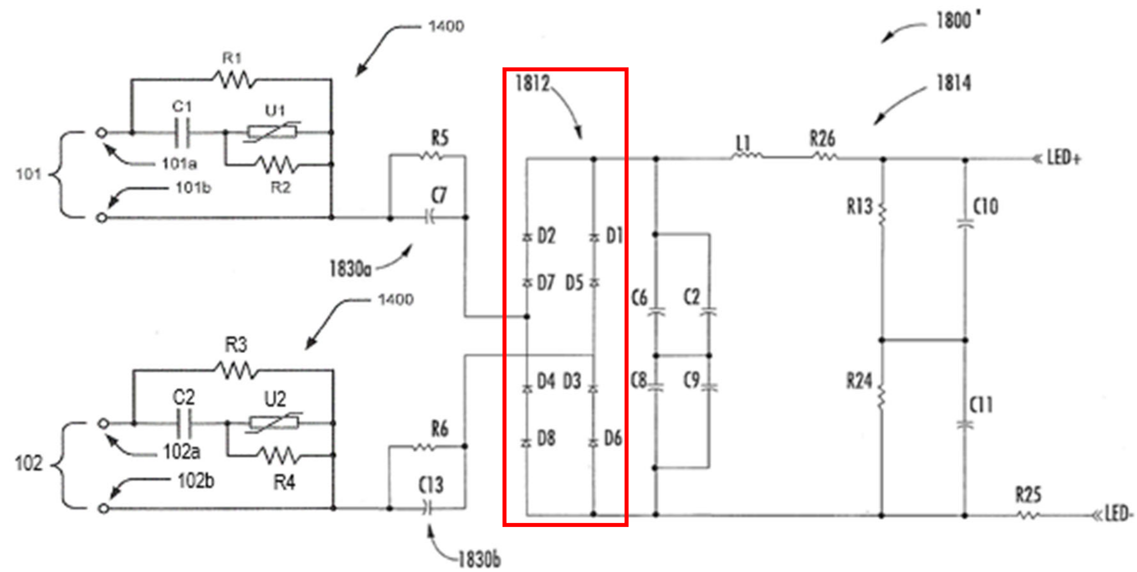
EX1004, FIGS. 14 & 18A. First blocking impedance 1830a is electrically connected to the filament-imitating impedance: "[t]he first filament-imitating impedance [1400] is coupled to a first terminal of an input port of the rectifier circuit 1812 by the first blocking impedance 1830a." EX1002, ¶62; EX1004, 9:25-28. And the same is true for the second blocking impedance 1830b: "[t]he second filament-imitating impedance 1820b … is coupled to a second terminal of the input port of the rectifier circuit 1812 by the second blocking impedance 1830b." EX1002, ¶62; EX1004, 9:28-33.

First blocking impedance 1830a is designed to provide an impedance that limits a current from the first filament-imitating impedance. EX1002, ¶63. First blocking impedance 1830a comprises "a capacitor C7 and a resistor R5" connected in parallel (EX1004, 9:25-28), which forms a high pass RC filter. EX1002, ¶63; *see*

EX1026, 2:40-42 (describing "a high-pass filter formed by a resistance 18 and a capacitance 17 connected in parallel"). A POSITA would have recognized that the impedance provided by first blocking impedance 1830a is $Z = \frac{1}{\sqrt{\left({}^{1}/_{\mathrm{R5}}\right)^{2} + (2\pi f \mathrm{C7})^{2}}}$. EX1002, ¶63. "[T]he first and second blocking impedances 1830a, 1830b may be configured to block a lower frequency component that may be provided by the ballast, such as a DC offset produced by the ballast." EX1004, 9:37-41. By blocking a lower frequency component provided by the ballast—through the filament-imitating impedance—a POSITA would have recognized that first blocking impedance 1830a, which is an RC filter, limits the current from the filament-imitating impedance. EX1002, ¶63; *see* EX1027, [0104] (stating that "the resistor and capacitor of RC filter are sized appropriately to limit current drawn from converter"). The same is true for second blocking impedance 1830b. EX1002, ¶63.

(d) *Limitation 1[c]*

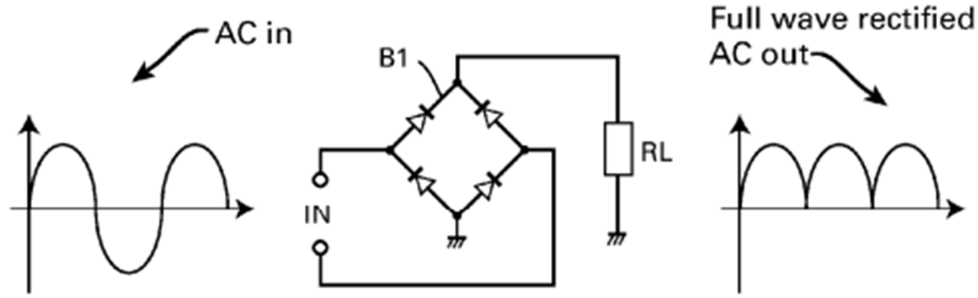
The power source module of Zhang's modified apparatus 1800' meets this limitation. EX1002, ¶64. Shown below in the red rectangle, rectifier circuit 1812 is a first rectifier. *Id.*



EX1004, FIGS. 14 & 18A. Rectifier circuit 1812 is electrically connected to first blocking impedance 1830a: "[t]he first filament-imitating impedance [1400] is coupled to a first terminal of an input port of the rectifier circuit 1812 by the first blocking impedance 1830a." EX1002, ¶64; EX1004, 9:25-28. Likewise, rectifier circuit 1812 is electrically connected to second blocking impedance 1830b: "[t]he second filament-imitating impedance 1820b…is coupled to a second terminal of the input port of the rectifier circuit 1812 by the second blocking impedance 1830b." EX1002, ¶64; EX1004, 9:28-33.

Rectifier circuit 1812 is configured to rectify the current flowing from blocking impedances 1830a and 1830b. EX1002, ¶65. "The rectifier circuit 1812 is a diode bridge including diodes D1-D8." EX1004, 9:8-10. A POSITA would have recognized that rectifier circuit 1812, as a diode bridge, performs full wave rectification of an alternating current flowing from the first and second blocking impedances 1830a and 1830b. EX1002, ¶65.

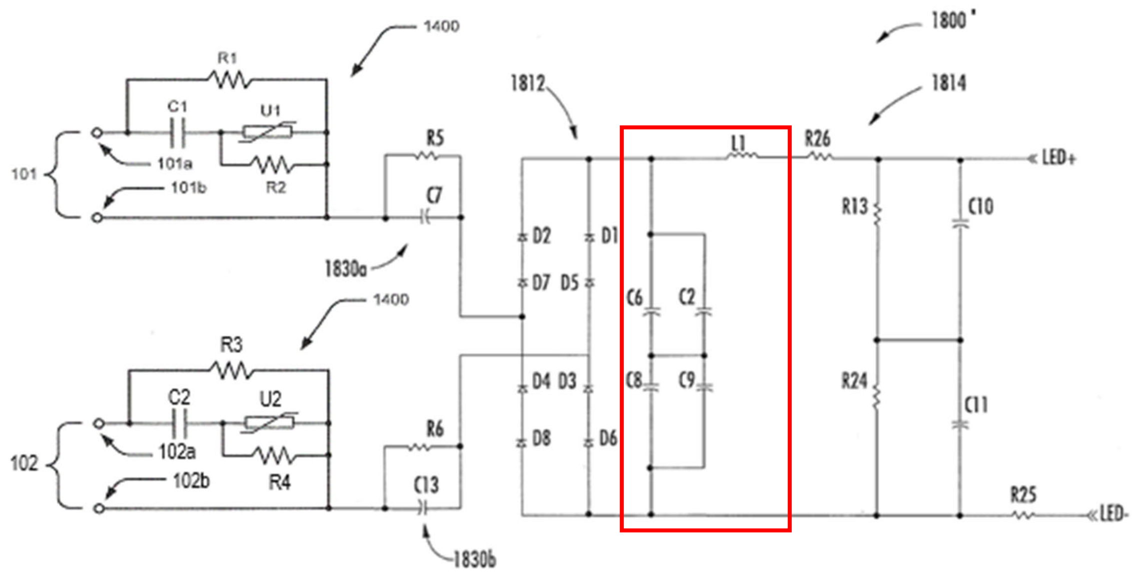
FIG. 1A



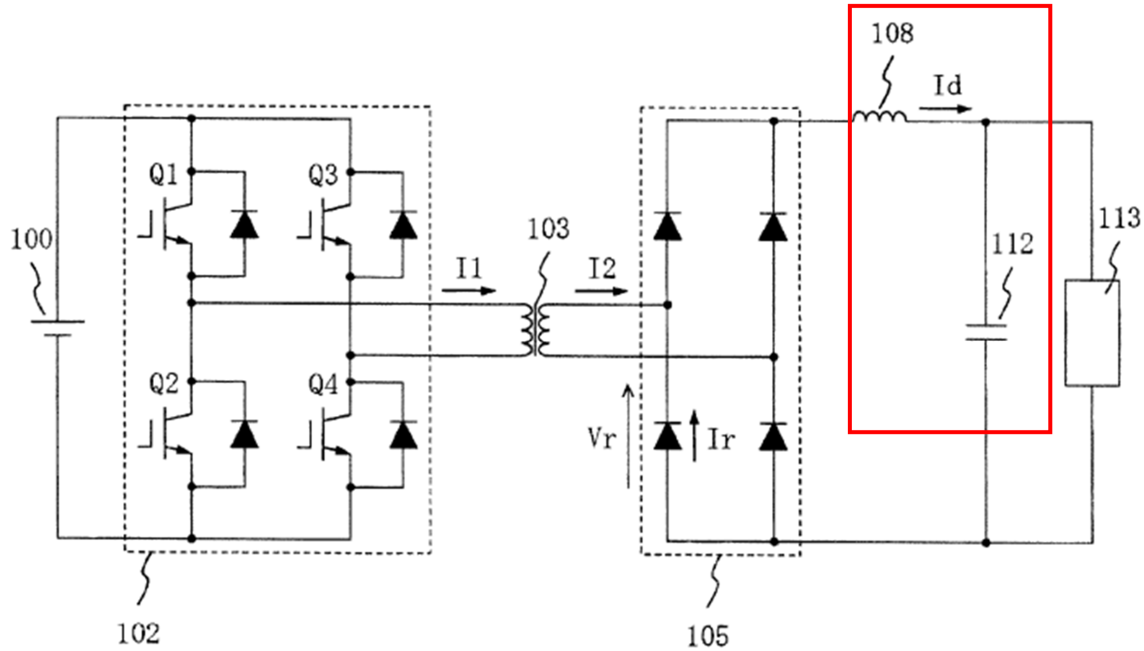
See EX1017, FIG. 1A. Although the figure above illustrates the voltage across the load, RL, a POSITA would have recognized that the rectified current flowing through the load is related to the rectified voltage by Ohm's law, I=V/R. EX1002, ¶65; *see* EX1023, 7:25-30.

(e) *Limitation 1[d]*

The power source module of Zhang's modified apparatus 1800' meets this limitation. EX1002, ¶66. Shown below in the red rectangle, matching circuit 1814 is a filter. *Id.*



EX1004, FIGS. 14 & 18A. Zhang teaches that "matching circuit 1814 includes capacitors C2, C6, C8, C[9] and inductor L1, and is configured to be coupled to at least one LED, here an LED string including first and second serially-connected segments 1816a, 1816b." *Id.*, 9:49-52. The figure below shows a "a ***filter*** reactor 108 and ***filter*** capacitor 112 for ***smoothing*** the DC power outputted from the rectifier circuit 105." EX1038, [0006].



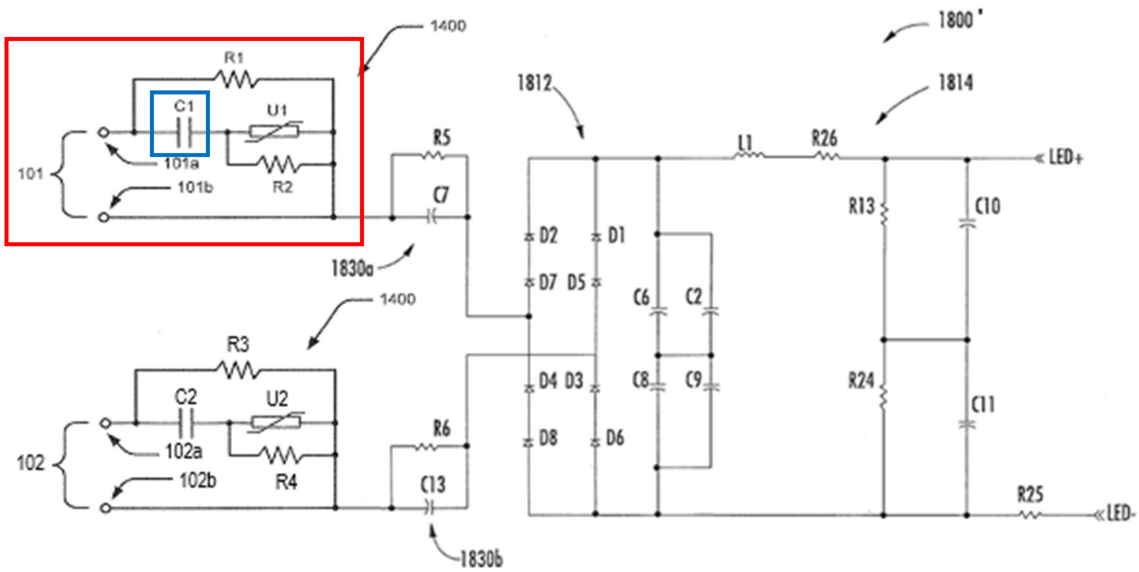
EX1038, FIG. 8. Like filter reactor [inductor] 108 and filter capacitor 112 illustrated above, a POSITA would have understood that the illustrated configuration of capacitors C2, C6, C8, C9 in parallel with the rectifier 1812 and the inductor L1 in series with the output of the rectifier 1812 filters and smooths the output of rectifier circuit 1812. EX1002, ¶66.

Zhang also explains that "[c]apacitors C10, C11 may be connected across the output of the matching circuit 1814, and may provide ***additional smoothing*** of the output provided to the LED segments 1816a, 1816b." EX1004, 9:64-67. The mention of "additional smoothing" indicates that matching circuit 1814 itself performs smoothing. EX1002, ¶67.

And shown in the figure above, matching circuit 1814 is electrically connected between rectifier circuit 1812 and LED segments 1816a and 1816b. *Id.*, ¶68; *see* EX1004, 9:49-52 ("The matching circuit 1814…is configured to be coupled to at least one LED, here an LED string including first and second serially-connected segments 1816a, 1816b.").

(f) *Limitation 2[a]*

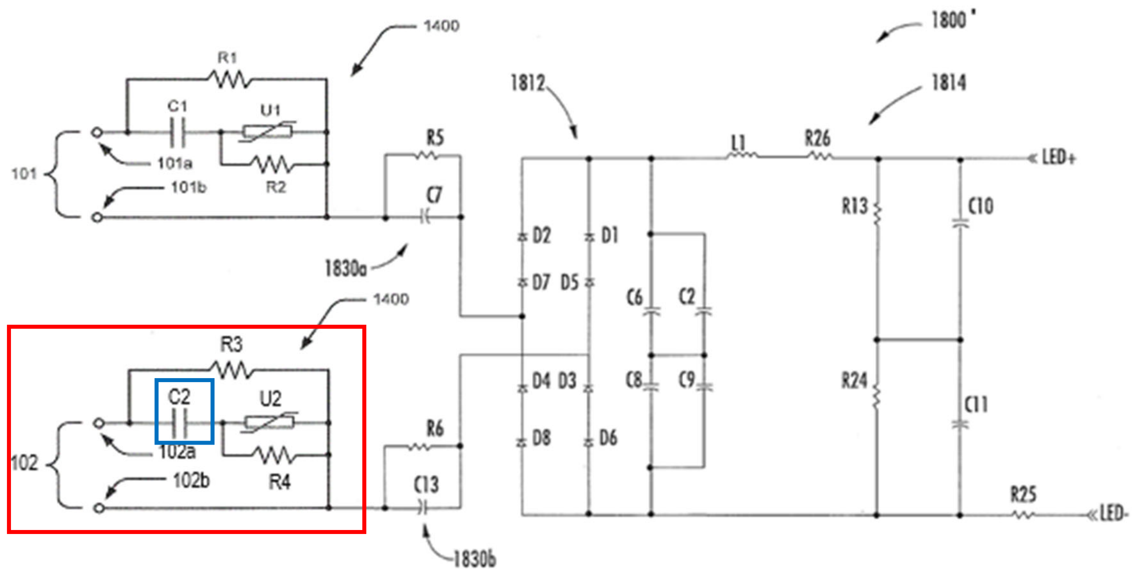
The power source module of Zhang's modified apparatus 1800' meets this limitation. EX1002, ¶69. The top filament-imitating impedance 1400 comprises a first filament-simulating circuit. *Id.* Shown below in the red and blue rectangles, the top filament-imitating impedance 1400 comprises capacitor C1. *Id.*



EX1004, FIGS. 14 & 18A. "FIG. 14 illustrates a filament-imitating impedance 1400 including a capacitor C1…." *Id.*, 8:16-20. Zhang also teaches that capacitor C1 is electrically connected between first and second pins 101a and 101b of the first port 101 under the proper construction of "electrically connected." EX1002, ¶69; *see* Section VIII.C.1. Shown above, capacitor C1 is directly connected to one pin 101a and is connected to the other pin 101b via "a parallel combination of an additional resistor R2 and a … (PTC) resistor U1." EX1002, ¶69; EX1004, 8:16-20.

(g) *Limitation 2[b]*

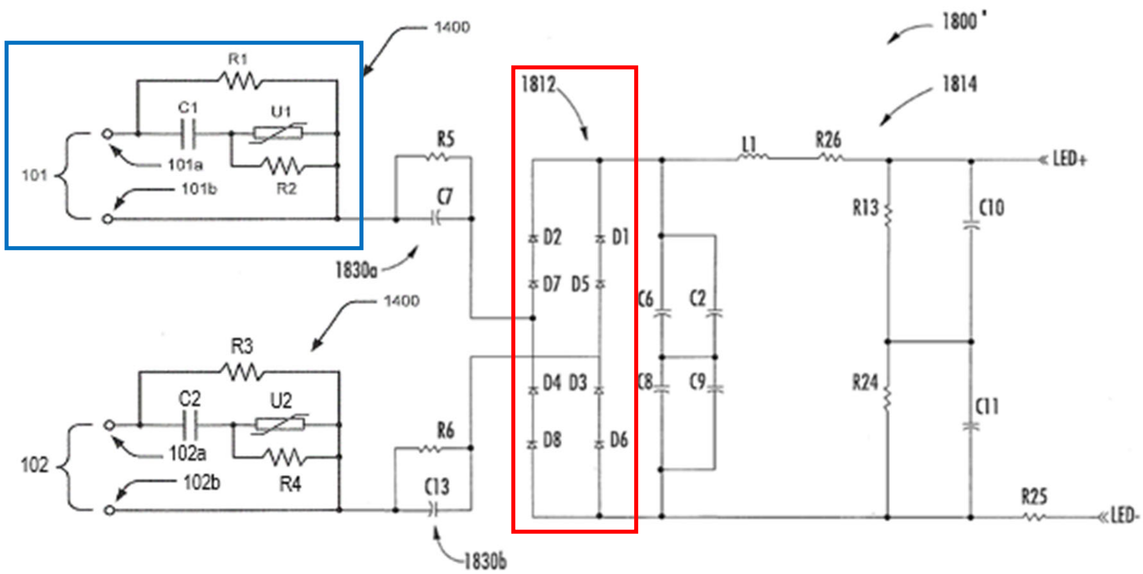
The power source module of Zhang's modified apparatus 1800' meets this limitation. EX1002, ¶70. Bottom filament-imitating impedance 1400 comprises a second filament-simulating circuit. *Id.* Shown below, bottom filament-imitating impedance 1400 (red) comprises capacitor C2 (blue). *Id.*



EX1004, FIGS. 14 & 18A. Capacitor C2 is electrically connected between pins 102a and 102b of port 102 for the same reasons as is capacitor C1 between first and second pins 101a and 101b of port 101. EX1002, ¶70; *see* Limitation 2[a], Section IX.A.4(f).

(h) *Claim 5*

The power source module of Zhang's modified apparatus 1800' meets this limitation. EX1002, ¶71. Shown below in the red rectangle, rectifier circuit 1812 comprises two diodes electrically connected in series. *Id.*

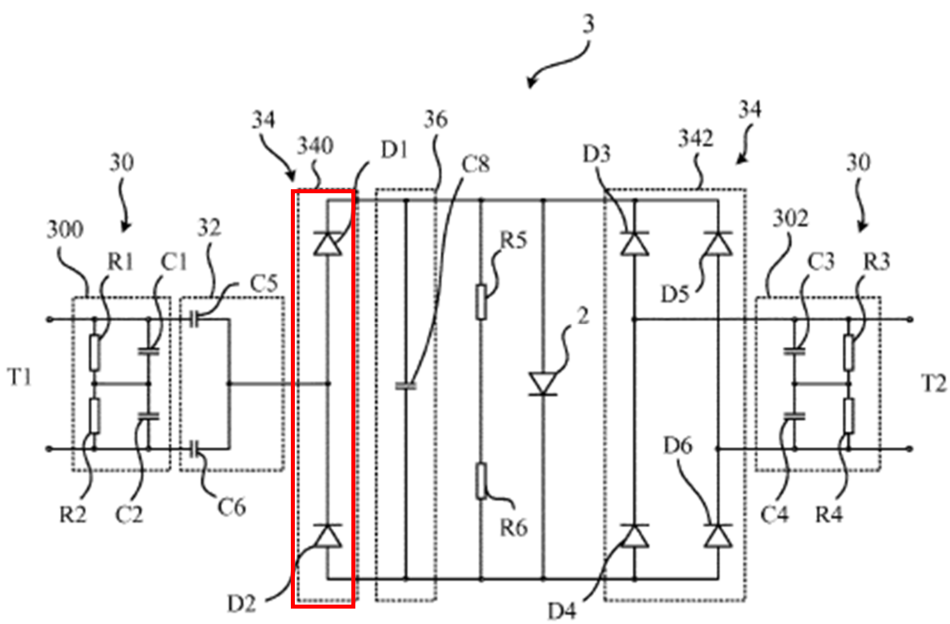


EX1004, FIGS. 14 & 18A. "The diode bridge is configured to provide redundancy by including respective serially-connected diode pairs D1/D5, D2/D7, D4/D8, D3/D6 in each branch of the diode bridge." *Id.*, 9:10-13. A POSITA would have recognized that each of the "serially-connected diode pairs" comprises two diodes electrically connected in series. EX1002, ¶71.

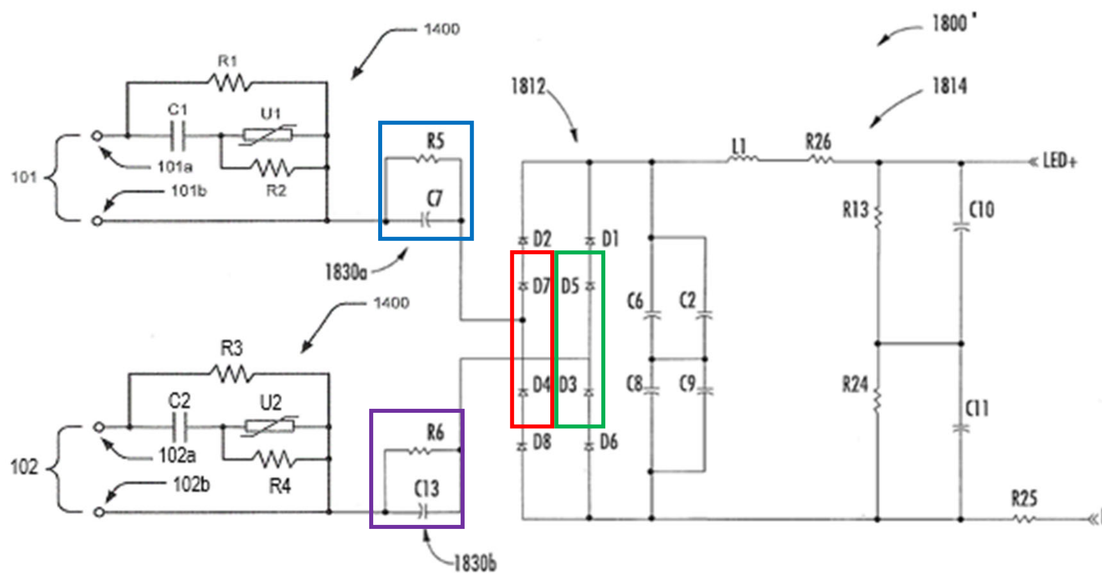
And shown above in the red and blue rectangles, Zhang also discloses that rectifier circuit 1812 is electrically connected to top filament-imitating impedance 1400 in series under the proper construction of "electrically connected." *Id.*, ¶72; *see* Section VIII.C.1 above. Rectifier circuit 1812 is connected to first filament-imitating impedance 1400 through a single conductor (i.e., in series) via first blocking impedance 1830a. EX1002, ¶72.

(i) *Limitation 6[a]*

The power source module of Zhang's modified apparatus 1800' meets this limitation. EX1002, ¶73. As an initial matter, the '662 Patent describes that "the first rectifier 340 includes diodes D1, D2 electrically connected in series." EX1001, 5:22-26.



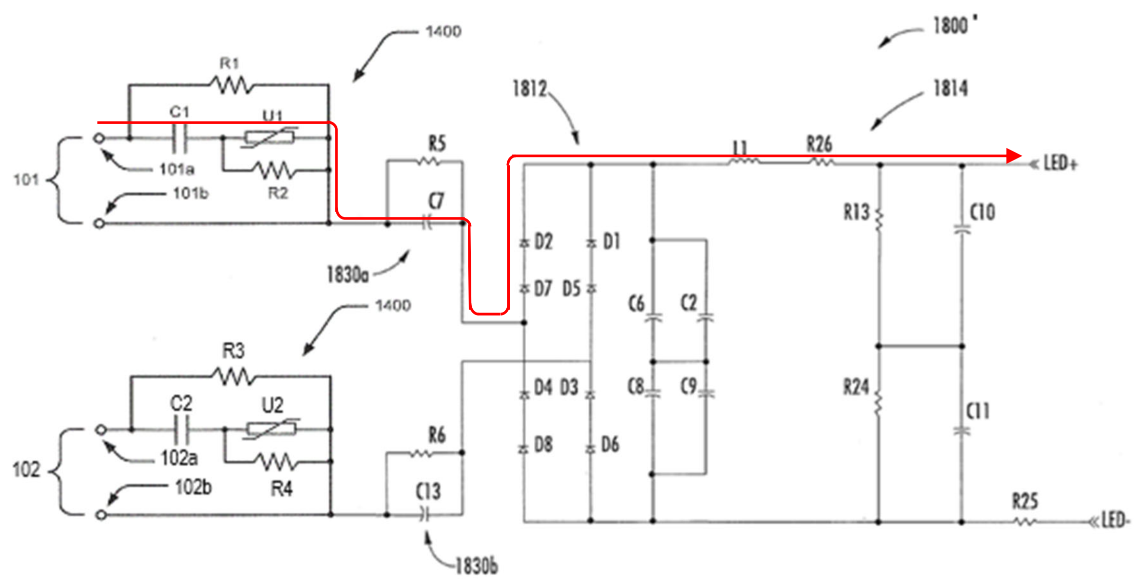
EX1001, FIG. 3. To the extent that diodes D1 and D2 are electrically connected in series, Zhang's rectifier circuit 1812 likewise comprises two diodes, D7 and D4, electrically connected in series, shown in the red rectangle, and two additional diodes, D5 and D3, electrically connected in series, shown in the green rectangle. EX1002, ¶73.



EX1004, FIGS. 14 & 18A. The node connecting diodes D4 and D7 is coupled to the first blocking impedance 1830a (blue rectangle), and the node connecting diodes D3 and D5 is coupled to the second blocking impedance 1830b (purple rectangle), wherein the first blocking impedance 1830a and the second blocking impedance 1830b comprise the "current limiting circuit." EX1002, ¶73.

(j) *Limitation 6[b]*

The power source module of Zhang's modified apparatus 1800' meets this limitation. EX1002, ¶74. Zhang specifically discloses a current flow "from one pin of the first bi-pin terminal to the at least one LED through the other of the two diodes and the current limiting circuit." *Id.* The red arrow below illustrates the flow of current. *Id.*



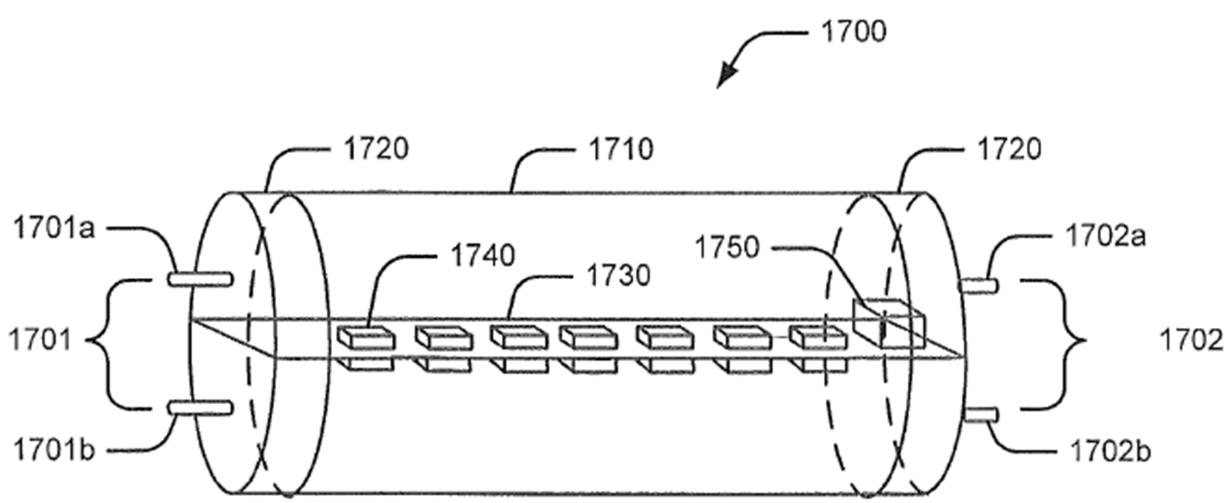
EX1004, FIGS. 14 and 18A. A POSITA would have recognized that a current flows from pin 101a of first port 101 through top filament-imitating impedance 1400 and through first blocking impedance 1830a. EX1002, ¶74. The current then flows into the connection node through diodes D7 and D2 from anode to cathode, but the current is blocked from flowing through diodes D4 and D8 from cathode to anode. *Id.* The current then flows through L1 and R26 into the LED string 1816a and 1816b through the LED+ terminal. *Id.*

(k) *Claim 7*

The power source module of Zhang's modified apparatus 1800' meets this claim. EX1002, ¶75. First blocking impedance 1830a comprises capacitor C7: "first blocking impedance 1830a [] includes a capacitor C7." *Id.*; EX1004, 9:25-28. Likewise, "second blocking impedance 1830b [] includes a capacitor C13." EX1002, ¶75; EX1004, 9:28-33.

(l) *Claim 9*

The power source module of Zhang's modified apparatus 1800' meets this claim. EX1002, ¶76. Zhang discloses that "[t]he apparatus 1800 may be included in a fluorescent tube replacement lamp along the lines illustrated in FIG. 17." EX1004, 10:19-20.

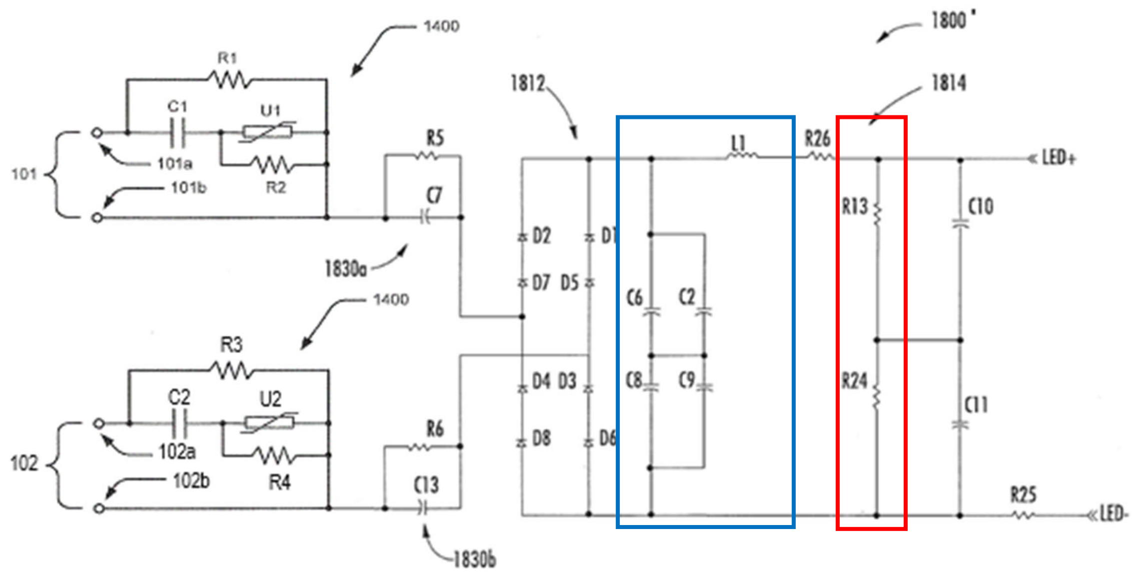


Id., FIG. 17. Further, apparatus 1800 comprises "three parallel connected strings of LEDs." *Id.*, 10:12-15. A POSITA would have thus recognized that fluorescent tube replacement lamp 1700 is an LED lamp. EX1002, ¶76; *see* EX1004, 8:50-58 (stating that "[t]he lamp 1700 includes a tubular housing 1710" and "LEDs 1740 of an LED string may be mounted on a substrate 1730 positioned within the housing 1710.") "The lamp 1700 includes a tubular housing 1710" (EX1004, 8:50-52)—a casing—within which combined lighting apparatus 1800' would be disposed. EX1002, ¶76; *see* EX1041, Abstract ("A light tube with an LED light source includes a casing" and "an LED circuit board inside the casing").

Should PO argue otherwise, it would have been obvious to place Zhang's power source module inside of Zhang's tubular housing 1710. EX1002, ¶76. Tubular housing 1710 would help protect the power source module from damage and the environment and prevent accidental contact of the power source module by a human installer. *Id.*

(m) *Claim 10*

The power source module of Zhang's modified apparatus 1800' meets this claim. EX1002, ¶77. Shown below in the red rectangle, resistors R13 and R24 comprise a discharging circuit that is connected to matching circuit 1814 (blue rectangle)—the filter (*see* Limitation 1[d], Section IX.A.4(e))—in parallel for discharging the matching circuit. EX1002, ¶77. Resistors R13 and R24 are electrically connected to matching circuit 1814 in parallel. *Id.*

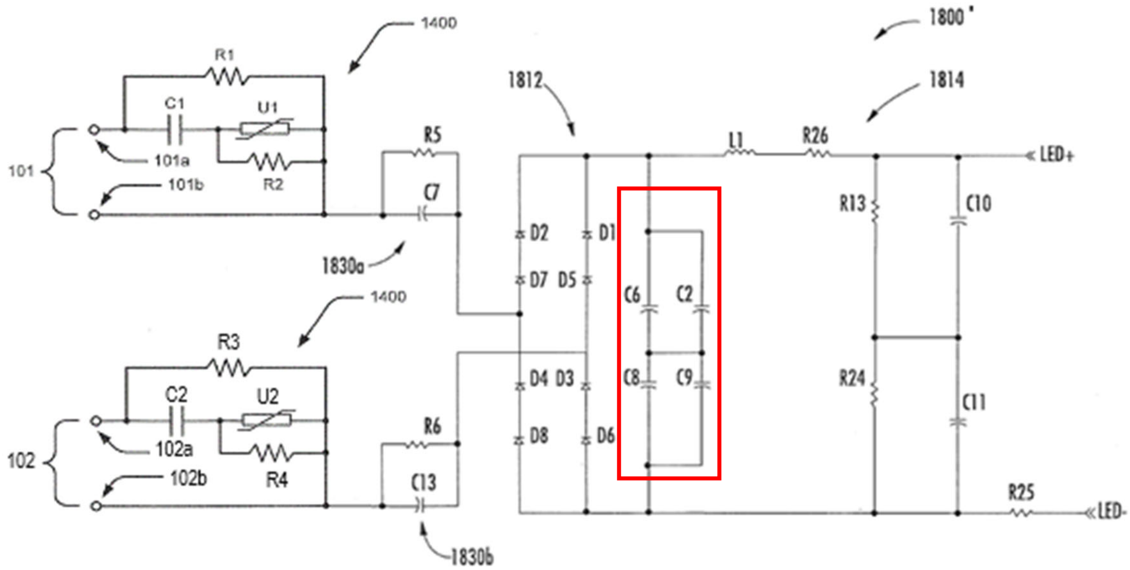


EX1004, FIGS. 14 & 18A.

Zhang discloses that resistors R13 and R24 form a discharging circuit: "Resistors R13, R24 … may be used to ***discharge*** the capacitors C10, C11 when power to the apparatus 1800 is removed, thus enabling a crisper turnoff of the LED segments 1816 a, 1816 b." EX1002, ¶78; EX1004, 9:67 – 10:4. Although Zhang explicitly discloses discharging C10 and C11, a POSITA would have understood that resistors R13 and R24 additionally discharge capacitors C2, C6, C8, C9 and inductor L1 of matching circuit 1814. EX1002, ¶78. When power to apparatus 1800' is removed, resistors R13 and R24 provide a path for the stored energy in capacitors C2, C6, C8, C9 and inductor L1 to discharge. *Id.*; *see* EX1018, 8:12-13 ("DC output of rectifier 40 charges storage capacitor 42."); EX1019, 27:47-52 ("energy is stored in the inductor's magnetic field.").

(n) *Claim 15*

The power source module of Zhang's modified apparatus 1800' meets this claim. EX1002; ¶79. Shown below in the red rectangle, matching circuit 1814 comprises a filtering capacitor, i.e., C2, C6, C8, and C9. *Id.*



EX1004, FIGS. 14 & 18A. A POSITA would have understood that capacitors C2, C6, C8, C9 are filtering capacitors because they provide a low impedance path to the high frequency signals and thus shunt those signals away from the LED segments attached to LED+ and LED-. EX1002, ¶79; *see* EX1028, 28:62-63 ("The capacitive reactance is a very low impedance at high frequency"). Capacitors C2, C6, C8, C9 are electrically connected to the at least one LED; one terminal of the capacitors is electrically connected with the LED+ terminal via inductor L1 and resistor R26, and the other terminal of the capacitors is connected with the LED- terminal via resistor R25. EX1002, ¶79.

(o) *Claim 16*

See Claim 10, Section IX.A.4(m); EX1002, ¶80.

(p) *Limitation 17[p]*

See Limitation 1[p], Section IX.A.4(a); EX1002, ¶81.

(q) *Limitation 17[a]*

The power source module of Zhang's modified apparatus 1800' meets this limitation. EX1002, ¶82. Rectifier circuit 1812 is electrically connected to first port 101 via top filament-imitating impedance 1400 and first blocking impedance 1830a. *Id.*; EX1004, 9:25-28 ("The first filament-imitating impedance 1820a is coupled to a first terminal of an input port of the rectifier circuit 1812…), FIG. 14 (illustrating that filament-imitating impedance 1400 is connected to first port 101). Likewise, rectifier circuit 1812 is electrically connected to second port 102 via bottom filament-imitating impedance 1400 and second blocking impedance 1830b. EX1002, ¶82. And a POSITA would have recognized that rectifier circuit 1812 is configured to receive a current from first ballast port 101 and second ballast port 102 on account of being electrically connected to those two ballast ports. *Id.*

(r) *Limitation 17[b]*

The power source module of Zhang's modified apparatus 1800' meets this limitation. EX1002, ¶83; *see* Limitation 1[d], Section IX.A.4(e). A POSITA would have understood that matching circuit 1814 is configured to store energy from rectifier circuit 1812. EX1002, ¶83. Rectifier circuit 1812 produces a DC voltage, which charges capacitors C2, C6, C8, C9. *Id.*; *see* Claim 10, Section IX.A.4(m).

(s) *Limitation 17[c]*

See Claim 10, Section IX.A.4(m); EX1002, ¶84.

(t) *Limitation 17[d]*

The power source module of Zhang's modified apparatus 1800' meets this limitation. EX1002, ¶85; *see* Limitation 1[a], Section IX.A.4(b). Top filament-imitating impedance 1400 comprises resistor R1 connected in parallel with capacitor C1. EX1002, ¶85. And bottom filament-imitating impedance 1400 comprises resistor R3 connected in parallel with capacitor C3. *Id.*

(u) *Claim 18*

The power source module of Zhang's modified apparatus 1800' meets this claim. EX1002, ¶86; *see* Limitation 1[b], Section IX.A.4(c). First blocking impedance 1830a is electrically connected to first port 101 via top filament-imitating impedance 1400. EX1002, ¶86.

(v) *Limitation 21[p]*

See Limitation 1[p], Section IX.A.4(a); EX1002, ¶87.

(w) *Limitation 21[a]*

The power source module of Zhang's modified apparatus 1800' meets this limitation. EX1002, ¶88; *see* Limitations 1[a], 2[a], and 2[b], Sections IX.A.4(b), IX.A.4(f), IX.A.4(g). The first circuit corresponds to the first filament-simulating circuit, and the second circuit corresponds to the second filament-simulating circuit. EX1002, ¶88.

(x) *Limitation 21[b]*

The power source module of Zhang's modified apparatus 1800' meets this limitation. EX1002, ¶89; *see* Limitation 1[b] and Claim 18, Sections IX.A.4(c) and IX.A.4(u).

(y) *Limitation 21[c]*

The power source module of Zhang's modified apparatus 1800' meets this limitation. EX1002, ¶90; *see* Limitation 1[c], Section IX.A.4(d). Rectifier circuit 1812 is electrically connected between first blocking impedance 1830a and second filament-imitating impedance 1400. EX1002, ¶90. When the alternating current has a positive voltage, a POSITA would have understood that current flows from first blocking impedance 1830a and from the anode to the cathode of diodes D7 and D2. *Id.* When the alternating current has a negative voltage, a POSITA would have understood that current flows from third and fourth terminals 102a and 102b and from the anode to the cathode of diodes D5 and D1. *Id.*

(z) *Limitation 21[d]*

The power source module of Zhang's modified apparatus 1800' meets this limitation. EX1002, ¶91; *see* Limitations 1[d] and 17[b], Sections IX.A.4(e) and IX.A.4(r).

(aa) *Limitation 23[p]*

To the extent it is limiting, Zhang renders the preamble obvious. EX1002, ¶92. A POSITA would have recognized that obvious combined lighting apparatus 1800' is contained within fluorescent tube replacement lamp 1700, which is an LED lamp. *Id.*; *see* EX1004, 8:50-58 (stating that "[t]he lamp 1700 includes a tubular housing 1710" and "LEDs 1740 of an LED string may be mounted on a substrate 1730 positioned within the housing 1710.") A POSITA would have recognized that combined lighting apparatus 1800' illustrated above includes a current limiting circuit, a first rectifier, a filter, a first filament-simulating circuit, and a second filament-simulating circuit. EX1002, ¶92; *see* Limitation 1[p] and Claim 9, Sections IX.A.4(a) and IX.A.4(l).

(bb) *Limitation 23[a]*

See Limitation 1[b] and Claim 18, Sections IX.A.4(c) and IX.A.4(u); EX1002, ¶93.

(cc) *Limitation 23[b]*

See Limitation 1[c], Section IX.A.4(d); EX1002, ¶94.

(dd) ***Limitation 23[c]***

See Limitation 1[d], Section IX.A.4(e); EX1002, ¶95.

(ee) ***Limitation 23[d]***

See Limitation 1[a], Section IX.A.4(b); EX1002, ¶96.

(ff) ***Limitation 24[a]***

See Limitation 2[a], Section IX.A.4(f); EX1002, ¶97.

(gg) ***Limitation 24[b]***

See Limitation 2[b], Section IX.A.4(g); EX1002, ¶98.

(hh) ***Claim 29***

See Claim 10, Section IX.A.4(m); EX1002, ¶99.

(ii) ***Claim 31***

See Claim 7, Section IX.A.4(k); EX1002, ¶100.

(jj) ***Limitation 32[a]***

See Limitations 2[a] and 2[b], Sections IX.A.4(f) and IX.A.4(g); EX1002, ¶101.

(kk) ***Limitation 32[b]***

The power source module of Zhang's modified apparatus 1800' meets this limitation. EX1002, ¶102. First and second blocking impedances 1830a and 1830b comprise capacitors C7 and C13. *Id.* Capacitor C7 is connected to first filament-imitating impedance 1400, and capacitor C13 is connected to second filament-imitating impedance 1400. *Id.*

(ll) *Claim 34*

The power source module of Zhang's modified apparatus 1800' meets this claim. EX1002, ¶103; *see* Limitation 1[b], Section IX.A.4(c). Second blocking impedance 1830b is a current limiting circuit electrically connected to second port 102 via the bottom filament-imitating impedance 1400 and is configured to limit a current from second port 102. EX1002, ¶103.

(mm) *Claim 35*

See Limitations 2[a], 2[b], Sections IX.A.4(f), IX.A.4(g); EX1002, ¶104.

(nn) *Claim 36*

See Claim 34, Section IX.A.4(ll); EX1002, ¶105.

(oo) *Claim 37*

See Claim 34, Section IX.A.4(ll); EX1002, ¶106.

(pp) *Claim 38*

See Claim 7, Section IX.A.4(k); EX1002, ¶107.

(qq) *Claim 39*

See Limitations 2[a], 2[b], Sections IX.A.4(f), IX.A.4(g); EX1002, ¶108.

(rr) *Limitation 41[p]*

See Limitation 23[p], Section IX.A.4(aa); EX1002, ¶109.

(ss) *Limitation 41[a]*

See Limitation 1[b], Section IX.A.4(c); EX1002, ¶110.

(tt) ***Limitation 41[b]***

See Limitation 1[c], Section IX.A.4(d); EX1002, ¶111.

(uu) ***Limitation 41[c]***

See Limitation 1[d], Section IX.A.4(e); EX1002, ¶112.

(vv) ***Limitation 41[d]***

See Limitations 1[a], 2[a], 2[b], Sections IX.A.4(b), IX.A.4(f), IX.A.4(g); EX1002, ¶113.

(ww) ***Limitation 42[p]***

See Limitation 23[p], Section IX.A.4(aa); EX1002, ¶114.

(xx) ***Limitation 42[a]***

See Limitation 1[b] and Claim 18, Sections IX.A.4(c), IX.A.4(u); EX1002, ¶115.

(yy) ***Limitation 42[b]***

See Limitation 1[c], Section IX.A.4(d); EX1002, ¶116.

(zz) ***Limitation 42[c]***

See Limitation 1[d], Section IX.A.4(e); EX1002, ¶117.

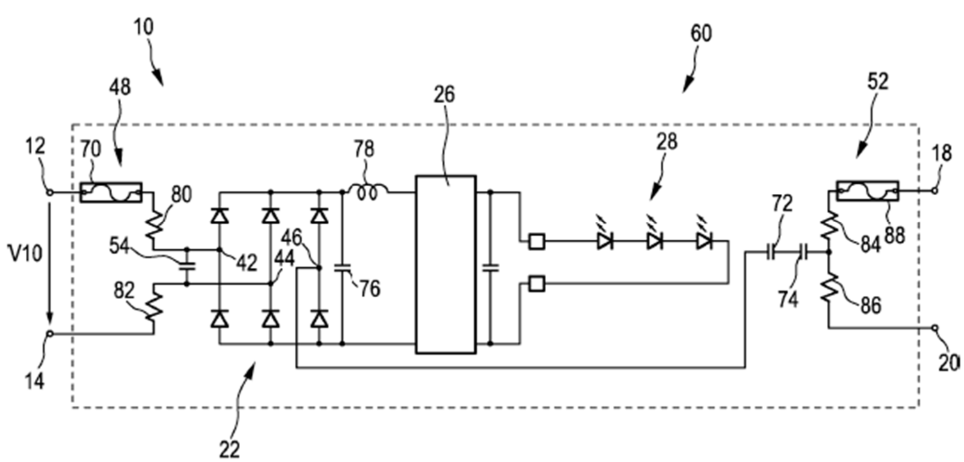
(aaa) ***Limitation 42[d]***

See Limitations 1[a], 2[a], 2[b], Sections IX.A.4(b), IX.A.4(f), IX.A.4(g); EX1002, ¶118. The connected ballast "perform[s] filament tests in which a filament is tested by measuring a 'cold' impedance of the filament before energizing, and then testing the filament impedance after the filament has been energized and heated up." EX1004, 8:9-13. A POSITA would have recognized that the described filament tests occur after the LED lamp is connected to a ballast and before a normal operation state of the LED lamp. EX1002, ¶118.

B. Ground 2 – Tao Renders Obvious Claims 1, 9, 15, 23, 31-33, and 38-43

1. Tao overview

Titled "Connection Circuit for Connecting a Driver Device to an External Power Supply for Driving an LED Unit," Tao is directed to "a light apparatus" comprising "a plurality of LEDs, a driver device for driving the lighting elements and a connection circuit according to the present invention for connecting the driver device to an external power supply." EX1005, Cover, [0013].



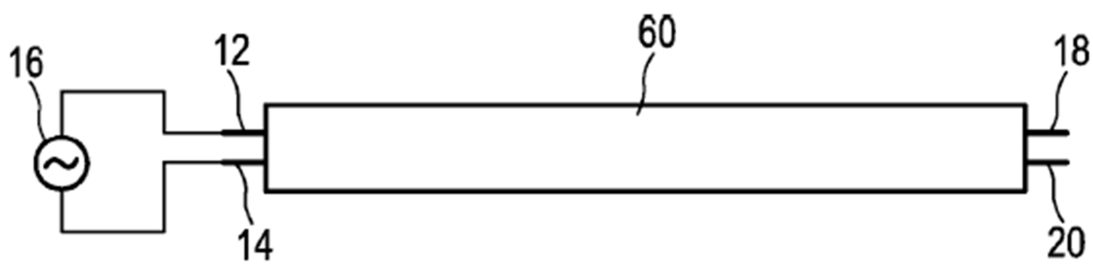
Id., FIG. 4. Tao discloses:

> [A] lighting unit 28 comprising more prefer[ably] one or more LEDs so that the connection circuit 10, the driver stage 26 and the lighting unit 28 form a light apparatus 60. The light apparatus 60 can replace a fluorescent lamp as a retrofit lamp, wherein the input terminals 12, 14,

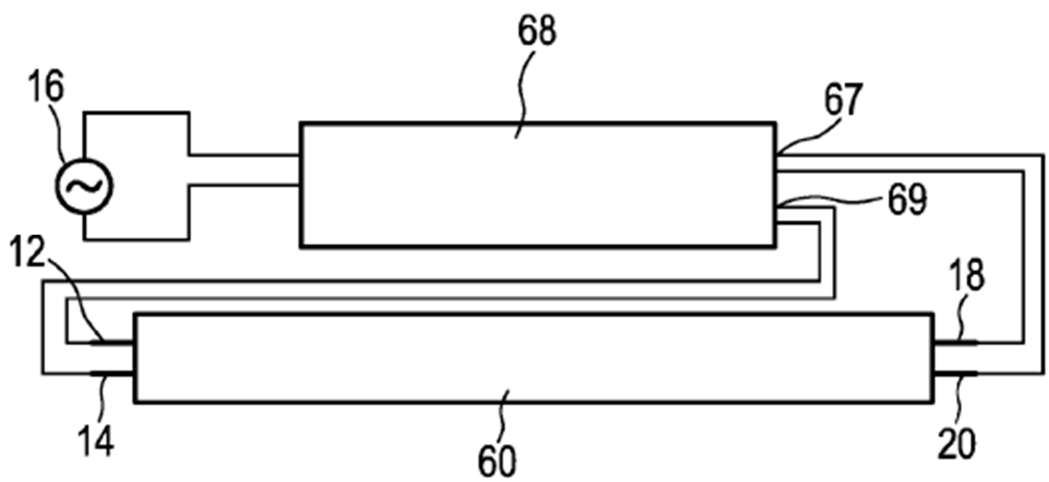
18, 20 can be flexibly connected to either mains 16 or a high frequency ballast so that a rewiring of the fluorescent lamp can be omitted.

Id., [0041].

Tao illustrates light apparatus 60 connected directly to a mains 16 (Figure 2a) and connected to a programmed start high frequency ballast 68 (Figure 2c). *Id.*, [0043], [0045].



Id., FIG. 2a.

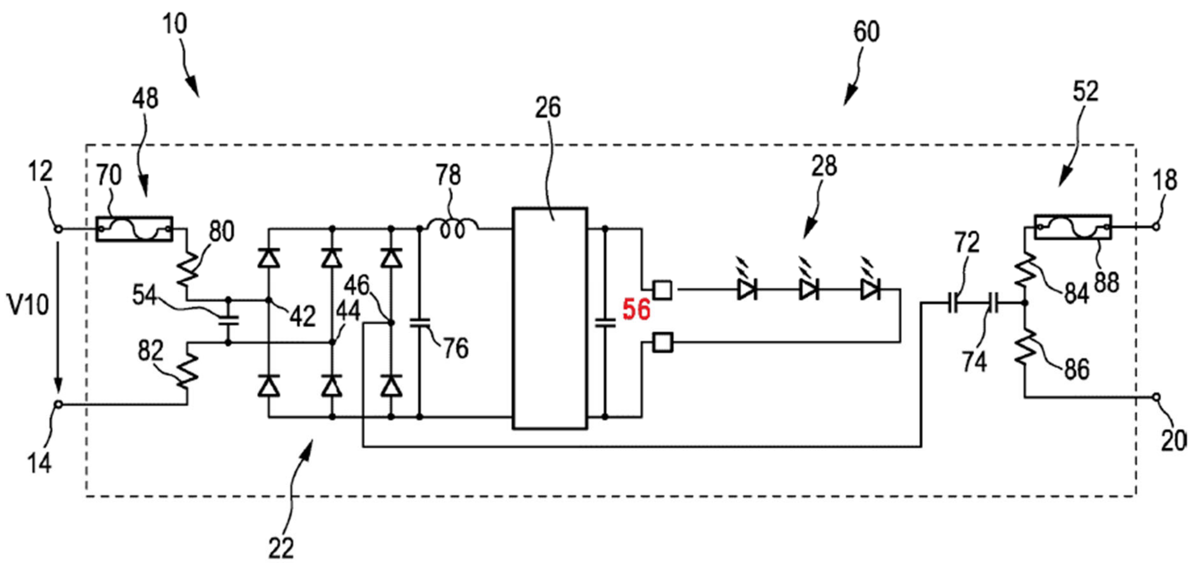


Id., FIG. 2c.

2. *Element by Element Analysis*

(a) *Limitation 1[p]*

To the extent it is limiting, Tao discloses the preamble. EX1002, ¶119. A POSITA would have recognized that Tao's light apparatus 60 includes a power source module that includes input circuitry 48 and 52, input capacitor 54, filter capacitors 72 and 74, rectifier unit 22, capacitor 76, inductance 78, driver stage 26, and filter capacitor 56. *Id.*; EX1005, [0035], [0037]-[0040], [0048], [0049], FIG. 4[5] (reproduced below).



These components comprise a power source module because they form a circuit in light apparatus 60 that connects lighting unit 28 to an external power supply and provides power from that external power supply to the lighting unit. *See* EX1005,

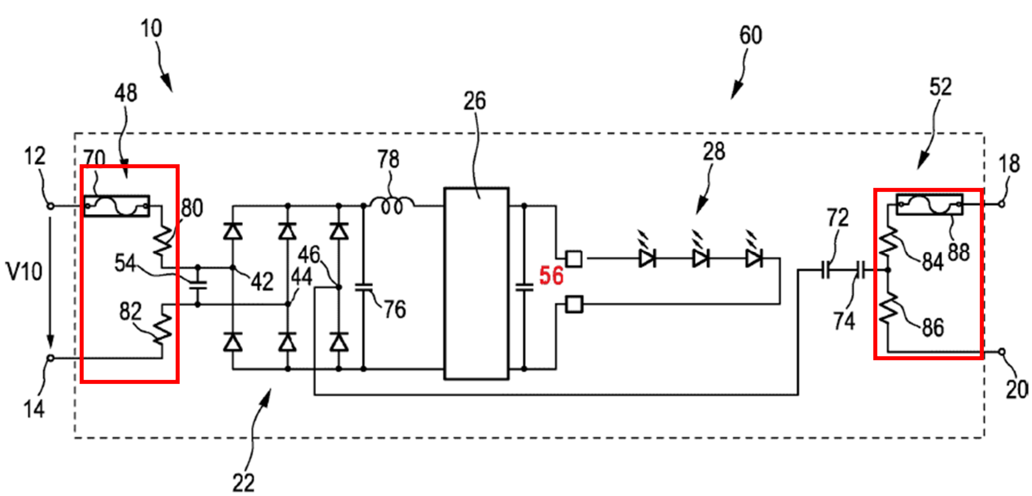
[5] Numeral "56" added to FIG. 4.

[0009] (disclosing "a connection circuit … for connecting a driver device to an external power supply for driving … an LED unit comprising one or more LEDs"); EX1001, 3:29-31 ("The power source module 1 may also be described as a power source circuit, or a power supply circuit.")

"Light apparatus 60" is also an LED lamp, given that it includes a "lighting unit 28" having "one or more LEDs." EX1005, [0041]; *see also id.*, [0002] ("Various LEDs [sic] tubes (TLED) are used to replace fluorescent (TL) lamps as a retrofit lamp."). EX1002, ¶120. Being part of that LED lamp, the above-described power source module is "for an LED lamp." *Id.*

(b) *Limitation 1[a]*

The power source module of Tao's light apparatus 60 meets this limitation. EX1002, ¶121. Shown below in the red rectangles, input circuitry 48 and 52 are a filament-simulating circuit. *Id.*



EX1005, FIG. 4. "The input circuitry 48 comprises the fuse 70 and two resistors 80, 82." *Id.*, [0052]. And "[t]he input circuitry 52 comprises two resistors 84, 86 and a fuse 88…." *Id.*, [0053]. Tao teaches that "the input circuitry comprises a plurality of resistors," and "[b]y means of the resistors, the filament resistance of the lamp to be replaced by the connection circuit can be emulated." *Id.*, [0020]; *see also id.*, [0052] ("The resistors 80, 82 of the input circuitry 48 have a resistance value similar to the filament resistance of the fluorescent lamp…."), [0053] ("The resistance values of the resistors 84, 86 are similar to the filament resistance of the fluorescent lamp….").

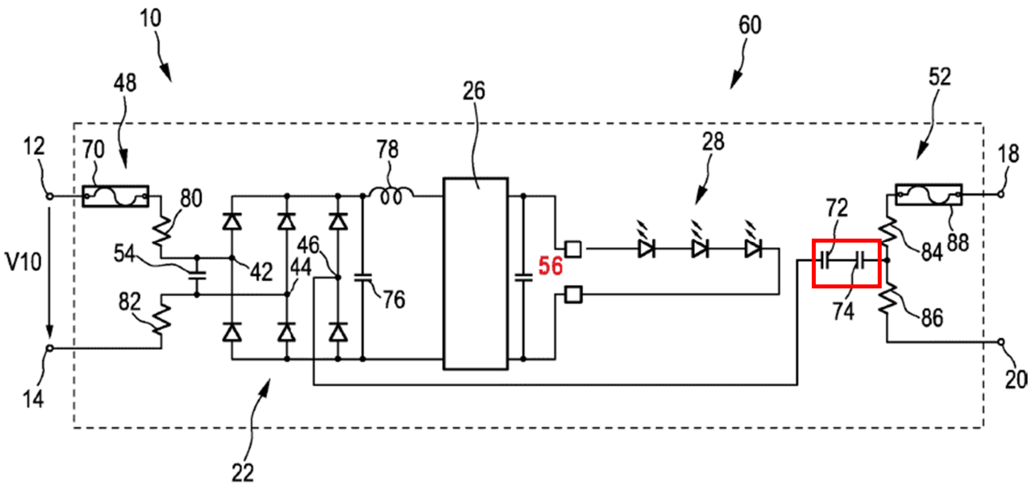
Tao discloses that input circuitry 48 and 52 are electrically connected to a first bi-pin terminal and a second bi-pin terminal of the LED lamp, respectively. EX1002, ¶122. A POSITA would have understood that first input terminals 12 and 14 comprise a first bi-pin terminal and second input terminals 18 and 20 comprise a second bi-pin terminal. *Id.* Tao discloses that "[t]he light apparatus 60 can replace a fluorescent lamp as a retrofit lamp, wherein the input terminals 12, 14, 18, 20 can be flexibly connected to either mains 16 or a high frequency ballast so that a rewiring of the fluorescent lamp can be omitted." EX1005, [0041]. A POSITA would have recognized that fluorescent lamps comprise bi-pin terminals, *see* Section VII.A, above, and as a retrofit lamp, Tao's light apparatus 60 likewise comprises bi-pin terminals. EX1002, ¶122. As such, a POSITA would have further understood that

Tao's input terminals 12, 14, 18, and 20 comprise pins. *Id.*; *see* EX1005, [0017] (disclosing that "the low mains frequency can be blocked for ***pin safety***"). And as shown above, input circuitry 48 is electrically connected to input terminals 12 and 14, and input circuitry 52 is electrically connected to input terminals 18 and 20. EX1002, ¶122; EX1005, [0037] ("The first input terminals 12, 14 are connected via an input circuitry 48 to the rectifier unit 22…."), [0038] ("The second input terminals 18, 20 are connected via an input circuitry 52 to the filter capacitor 50….").

A POSITA would have understood that a current flows from input terminal 12 to 14 and from input terminal 18 to 20 via input circuitry 48 and 52 during a pre-heat process executed by a ballast. EX1002, ¶123. Tao explains that "program start ballasts preheat the filament before ignit[ing] the lamp" by "provid[ing] a heating current." EX1005, [0002], [0045]; *see* EX1042, 5:29-34 ("During the preheat phase the fluorescent tube lighting fixture … appl[ies] a current between a first pair of contact pins at a first end of the fluorescent tube and between a second pair of contact pins at a second end of the fluorescent tube. The current is applied … to heat a corresponding filament connected between said first and second pair of contact pins, respectively, so that electrons are emitted."). And a POSITA would have further recognized that the only path from input terminal 12 to input terminal 14 in light apparatus 60 is through input circuitry 48. EX1002, ¶123. The same is true of input circuitry 52 coupled to input terminals 18 and 20. *Id.*

(c) *Limitation 1[b]*

The power source module of Tao's light apparatus 60 meets this limitation. EX1002, ¶124. Shown below in the red rectangle, filter capacitors 72 and 74 comprise a current limiting circuit. *Id.*



EX1005, FIG. 4.

Filter capacitors 72 and 74 are directly connected to input circuitry 52 and thus to the filament-simulating circuit. EX1002, ¶125; *see* EX1005, [0053] ("The input circuitry 52 comprises two resistors 84, 86 and a fuse 88 for connecting the second input terminals 18, 20 … to the filter capacitors 72, 74."), FIG. 4. And filter capacitors 72 and 74 are electrically connected to input circuitry 48 via input capacitor 54, rectifier unit 22, capacitor 76, inductance 78, driver stage 26, and filter capacitor 56. EX1002, ¶125; *see* EX1005, FIG. 4.

PO's *Current* Action infringement contentions suggest a broad read for "electrically connected" for this claim limitation. EX1002, ¶126. For Limitation 1[a], PO identifies two separate circuits as "a filament simulating circuit ":

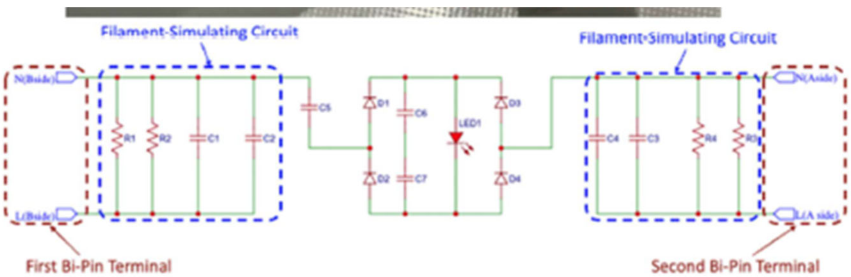


Figure 4. Photo (Top) and circuit schematic (Bottom) for the GE LED14ET8/G/4/840 showing a filament simulating circuit electrically connected to a first and second bi-pin terminal.

EX1016, 15/61. And for "current limiting circuit," PO identifies capacitor C5:

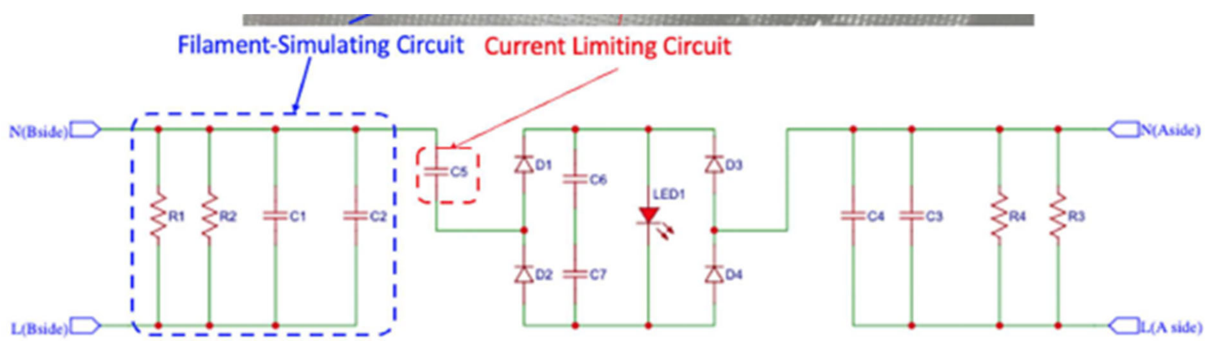


Figure 8. Photo (Top) and circuit schematic (Bottom) for GE LED14ET8/G/4/840 showing a current limiting circuit.

EX1016, 19/51. For capacitor C5 to be "electrically connected" to the second half of the alleged filament-simulating circuit (C3, C4, R3, and R4), PO must contend that a connection through diodes D1-D4, capacitors C6 and C7, and LED1 is "electrically connected." EX1002, ¶126. To the extent that PO's contention is correct, Tao likewise discloses filter capacitors 72 and 74 electrically connected to input circuitry 48. *Id.*

Filter capacitors 72 and 74 are ***first*** a current limiting circuit for limiting a current from input circuitry 52 generated by connected ballast 62 or 68. EX1002, ¶127; *see* EX1005, FIGS. 2b and 2c.

Regarding filter capacitor 50, shown in Tao's Figure 1 below, Tao discloses that "[t]he filter capacitor 50 has a capacity of 0.5 n[F] -10 nF and serves as a high pass filter." EX1005, [0037]. "The filter capacitor 50 has a low impedance for high frequency voltages typically >25 kHz provided by the second external power supply 21" and "a large impedance at mains frequency (50/60 Hz) … so that the leakage current from mains and the risk of electrical shocks at the second input terminals is reduced." *Id.*

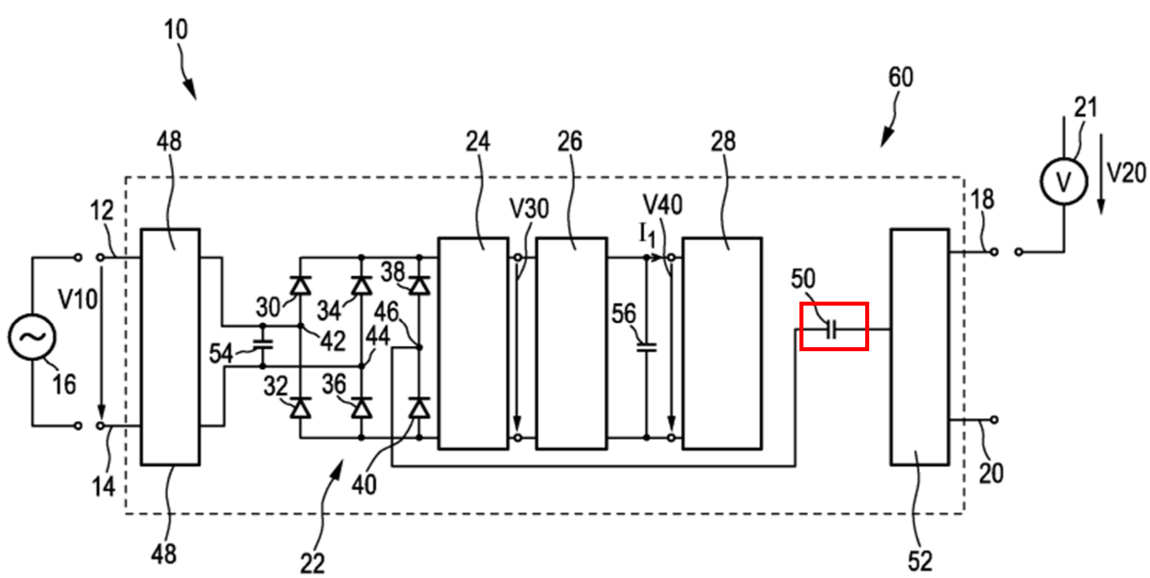


FIG. 1

EX1005, FIG. 1.

A POSITA would have understood that filter capacitors 72 and 74 provide the same function as filter capacitor 50 in Figure 1; after all, Tao explains as much. EX1002, ¶128; *see* EX1005, [0048] (stating that filter capacitors 72, 74 "protect the second input terminal from mains voltage V10 as mentioned above," and "are connected in series to each other in order to provide an improved safety if one of the two filter capacitors 72, 74 fails.").

Tao does not disclose the capacitance values of filter capacitors 72 and 74. A POSITA would have been motivated by the disclosure of filter capacitor 50 to select a total capacitance of filter capacitors 72 and 74 of 0.5 nF -10 nF. EX1002, ¶128; *see* EX1005, [0037].

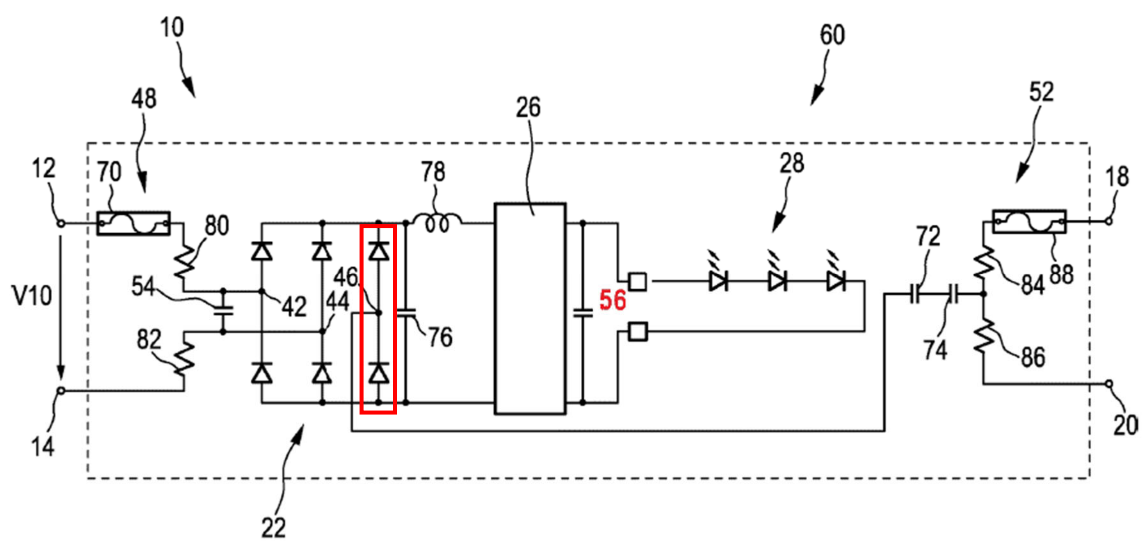
A POSITA would have known that the formula for the impedance provided by a capacitor is $Z = 1/(2\pi fC)$, where Z is the impedance, f is frequency, and C is the capacitance. EX1002, ¶129; EX1037, [0242]. Assuming a high frequency ballast input signal of 45 kHz, filter capacitors 72 and 74 provide an impedance in the range of 354 to 7,074Ω, which overlaps the calculated 442 to 14,737Ω range of the '662 Patent's current limiting circuit 32. EX1002, ¶129; *see* Section VIII.C.2 above.

With or without the above impedance analysis, a POSITA would have understood that the impedance necessarily provided by filter capacitors 72 and 74 would limit the current from input circuitry 52 generated by a connected ballast. EX1002, ¶129.

Second, filter capacitors 72 and 74 comprise a current limiting circuit for limiting a current from input circuitry 48 generated by connected mains 16, as described above. EX1002, ¶130; EX1005, [0017] (stating that "the low mains frequency can be blocked for pin safety"), [0037] (explaining the filter capacitor's purpose is "so that the leakage current from mains and the risk of electrical shocks at the second input terminals is reduced").

(d) *Limitation 1[c]*

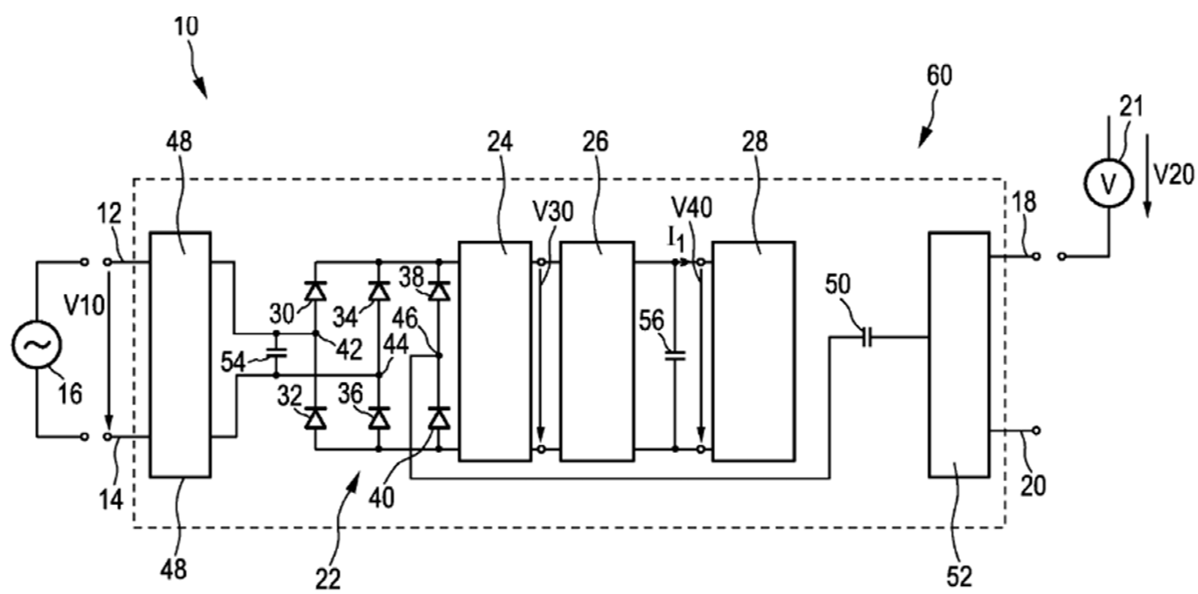
The power source module of Tao's light apparatus 60 meets this limitation. EX1002, ¶131. Shown below in the red rectangle, that power source module includes what Tao describes as a third rectifier path, which a POSITA would have understood to be a rectifier—i.e., the "first rectifier." *Id.*



EX1005, FIG. 4. As shown, this rectifier is electrically connected to filter capacitors 72 and 74—the "current limiting circuit" (*see* Limitation 1[b], Section IX.B.2(c))—

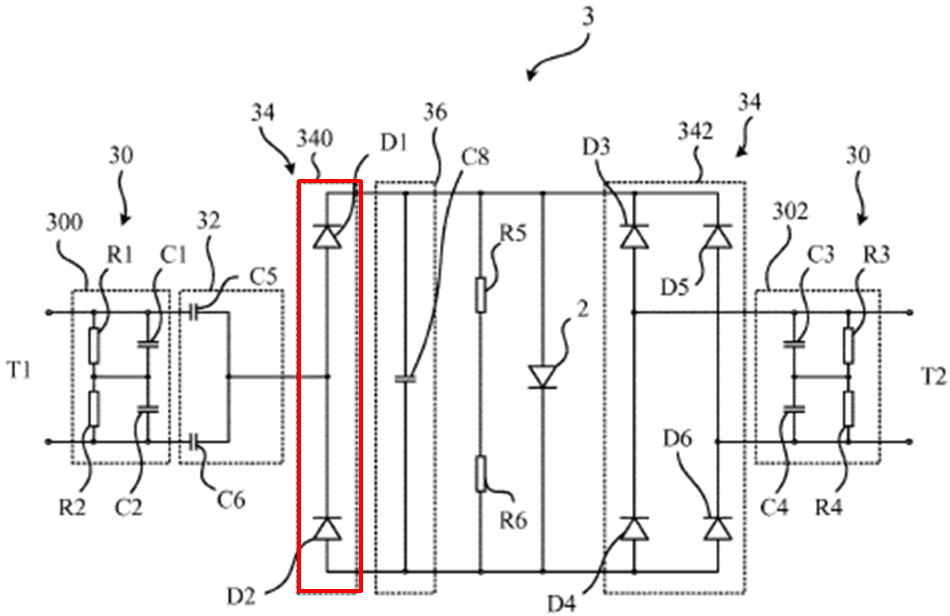
and therefore is configured to rectify current from that current limiting circuit. EX1002, ¶131; EX1005, [0053] ("The second input terminals 18, 20 are connected via the input circuitry 52 and via the filter capacitors 72, 74 to the node 46.").

Tao describes the third rectifier path in more detail with respect to FIG. 1's circuit (reproduced below), and such description is applicable to FIG. 4's circuit, given that FIG. 4's circuit is simply an implementation of FIG. 1's circuit (EX1005, [0033] ("FIG. 4 shows a further embodiment ***of the connection circuitry shown in FIG. 1***" (emphasis added)), and, per Tao, the circuits of FIGs. 1 and 4 are the same with respect to rectifying circuit 22 (*id.*, [0051]-[0054] (describing only "differences" between the circuits of FIGs. 1 and 4, none of which relate to rectifying circuit 22)). EX1002, ¶132.



According to Tao, "[t]he rectifier unit 22 is a complex rectifier comprising three parallel rectifying paths," and "the second input terminals 18, 20 are connected to a third of the rectifying path." EX1005, [0036]. Tao explains that "two of the rectifying paths ***each*** form a rectifier depending on which of the input terminals … are connected to an external power supply" (EX1005, [0036] (emphasis added)), meaning each of the rectifying paths serves as a rectifier. EX1002, ¶133. This is also consistent with a POSITA's understanding. *Id.*, ¶134. In the use cases illustrated in Tao's FIGS. 2b and 2c, for example, first input terminals 12 and 14 and second terminals 18 and 20 are connected to the outputs of ballast 62 (FIG. 2b) or ballast 68 (FIG. 2c). *Id.* For those ballast-connected uses of light apparatus 60, when input terminals 18 and 20 had a higher voltage than input terminals 12 and 14, diode 38 and diodes 32 and 36 would turn on to ***rectify*** the AC signal output by the ballast. *Id.* And when input terminals 18 and 20 had a lower voltage than input terminals 12 and 14, diode 40 and diodes 30 and 34 would turn on to ***rectify*** the AC signal output by the ballast. *Id.* Thus, this third rectifying path, comprising diodes 38 and 40, is used when the lamp is connected to a ballast (use cases in FIGS. 2b and 2c) and there is a connection to input terminals 18 and 20. *Id.*

The '662 Patent also refers to element 340, which has an identical structure as Tao's third rectifying path, as a "first rectifier." EX1002, ¶135; EX1001, 5:16-20.



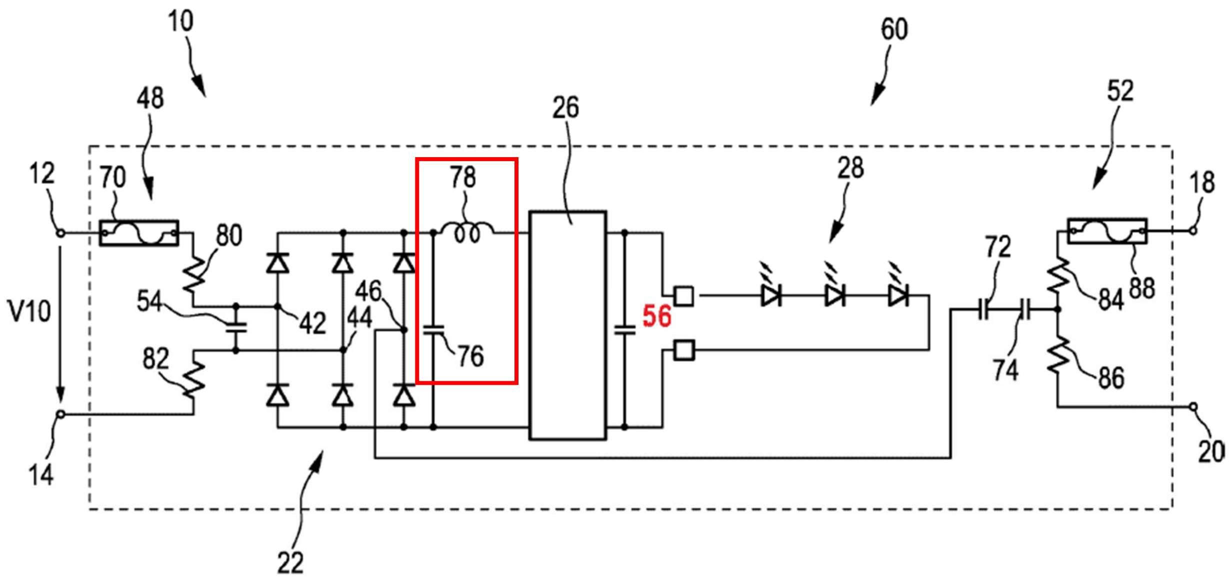
EX1001, FIG. 2.

(e) *Limitation 1[d]*

The power source module of Tao's light apparatus 60 meets this limitation. EX1002, ¶136.

First Alternative

Shown below in the red rectangle, capacitor 76 and inductance 78 are a filter. EX1002, ¶137.

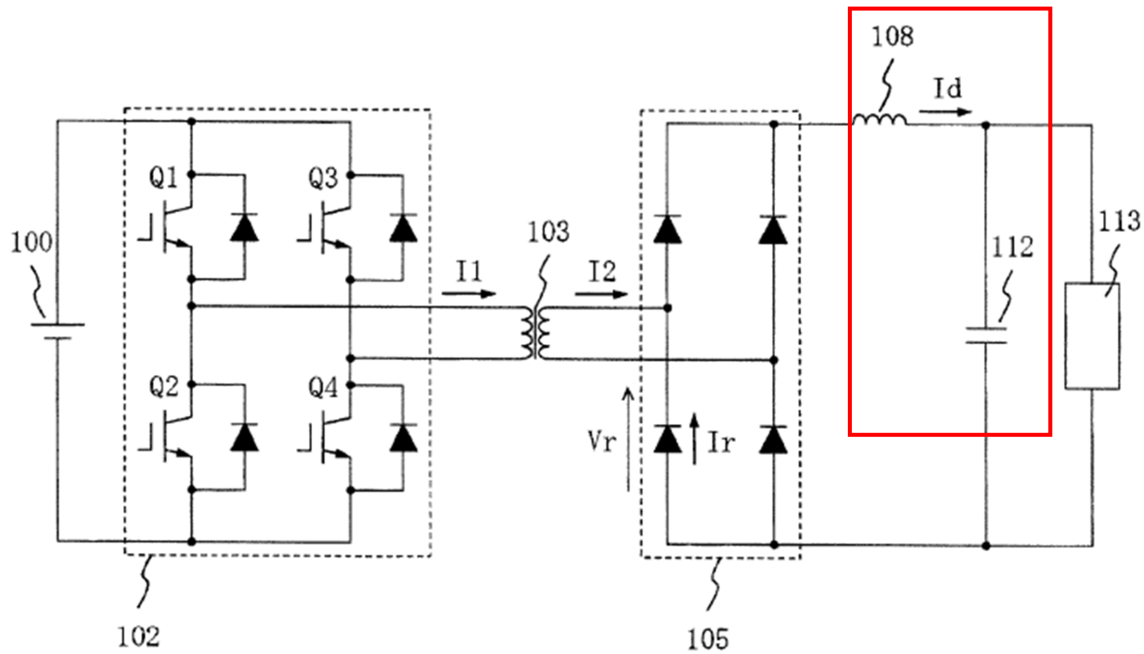


EX1005, FIG. 4.

Tao discloses that capacitor 76 and inductance 78 are electrically connected between the third rectifier path—the "first rectifier" (*see* Section IX.B.2(d))—and lighting unit 28, which includes at least one LED (*see* EX1005, [0041] (disclosing "a lighting unit 28 comprising more preferred [sic] one or more LEDs.")). EX1002, ¶138. Specifically, as shown above, capacitor 76 and inductance 78 are directly connected to the third rectifying path. *Id.* And capacitor 76 and inductance 78 are electrically connected to lighting unit 28 via driver stage 26 and filter capacitor 56. *Id.*; *see* EX1005, FIG. 4.

A POSITA would have understood that capacitor 76 and inductance 78 comprise a filter that is configured to smooth the current from the third rectifier path. EX1002, ¶139. The figure below shows a "a ***filter*** reactor 108 and ***filter*** capacitor

112 for ***smoothing*** the DC power outputted from the rectifier circuit 105." EX1038, [0006].

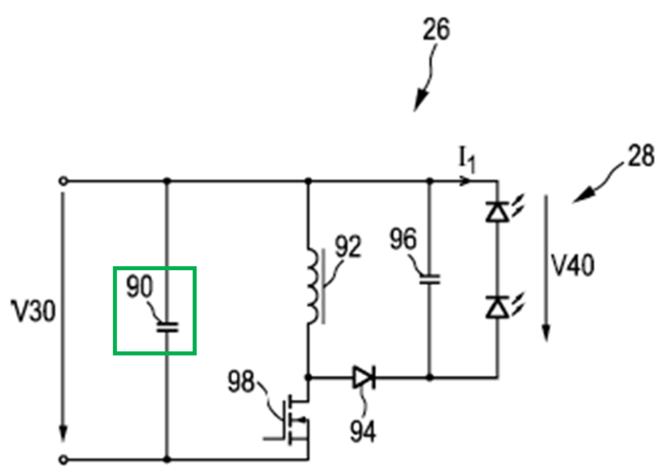


EX1038, FIG. 8. Like filter reactor [inductor] 108 and filter capacitor 112 above, Tao's capacitor 76 is connected in parallel to the output of a rectifier, and Tao's inductance 78 is connected in series to the output of a rectifier. EX1002, ¶139. Thus, capacitor 76 and inductance 78 filter and smooth the third rectifier's output. *Id.*

To the extent that PO argues otherwise, it would have been obvious to configure capacitor 76 and inductance 78 as a filter for smoothing the current from the third rectifier path. *Id.*, ¶140. This is because doing so would have addressed the known need to filter and smooth the current supplied to a DC-DC converter, such as driver stage 26. *Id.* A POSITA would have recognized that a buck-boost DC-DC converter converts a DC input signal having some voltage (V_s) into a DC output signal (V_o) having a different voltage according to the following formula: $V_o = -D * V_s / (1 – D)$, (EX1043, 6:8-27), where D is the duty cycle of the driver stage 26's controllable switch 98. EX1002, ¶140; EX1005, [0055]. A POSITA would have understood that variations in V_s would have necessarily resulted in variations in V_o, which would vary the LEDs' voltage and generate unwanted flicker. EX1002, ¶140. Capacitor 76 and inductor 78 filter out variations in the rectifier output to provide an ideally constant input signal to the DC-DC converter. *Id.*; *see* EX1039, [0044] ("Between the DC source and the DC/DC converter 62 is a capacitor 64, used to filter the input current switching ripple of the DC/DC converter 62.").

Second Alternative

Shown below in the green rectangle, input capacitor 90 is a filter. EX1002, ¶141.



EX1005, FIG. 5. "FIG. 5 shows a preferred embodiment of the driver stage 26," which is illustrated in FIG. 4. EX1005, [0055]. "The driver stage 26 comprises an input capacitor 90" (*id.*), which is not a component of the buck-boost converter, comprising "an inductance 92, a diode 94, an output capacitor 96 and a controllable switch 98" (*id.*). EX1002, ¶141.

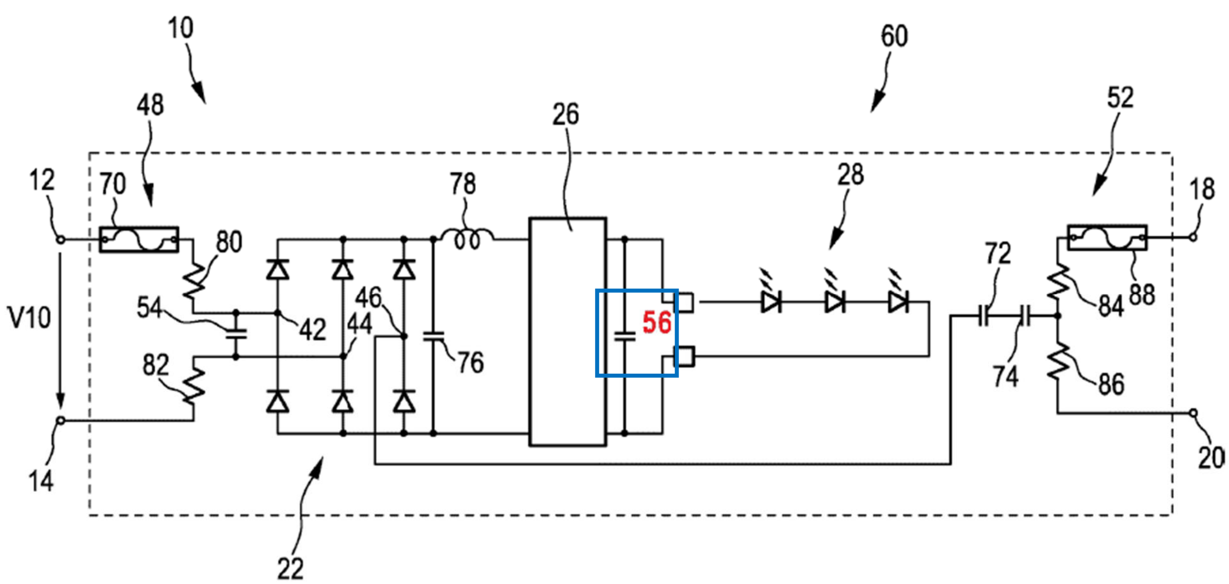
Tao discloses that input capacitor 90 is electrically connected between the third rectifier path—the "first rectifier" (*see* Limitation 1[c], Section IX.B.2(d))—and lighting unit 28, which includes at least one LED (*see* EX1005, [0041]). EX1002, ¶142. Specifically, input capacitor 90 is electrically connected to the third rectifying path via capacitor 76 and inductance 78. *Id.* And input capacitor 90 is electrically connected to lighting unit 28 via an inductance 92, a diode 94, an output capacitor 96, a controllable switch 98, and filter capacitor 56. *Id.*; *see* EX1005, FIGS. 4 & 5.

A POSITA would have understood that input capacitor 90 comprises a filter that is configured to smooth the current from the third rectifier path. *See* EX1021, 4:66-5:2 (claiming "a ***filter*** capacitor connected in parallel with the diode bridge and configured to ***remove ripple voltages*** from the unfiltered direct current voltage to produce a steady direct current voltage"); EX1002, ¶143. Tao's input capacitor 90 is connected in parallel to the output of a rectifier and is thus configured to filter and smooth the rectifier's output. *See* EX1002, ¶143.

And to the extent that PO argues otherwise, it would have been obvious to configure input capacitor 90 as a filter for smoothing the current from the third rectifier path. *See* First Alternative; EX1002, ¶144.

Third Alternative

Shown below in the blue rectangle, filter capacitor 76 is a filter. EX1002, ¶145.



EX1005, FIG. 4.

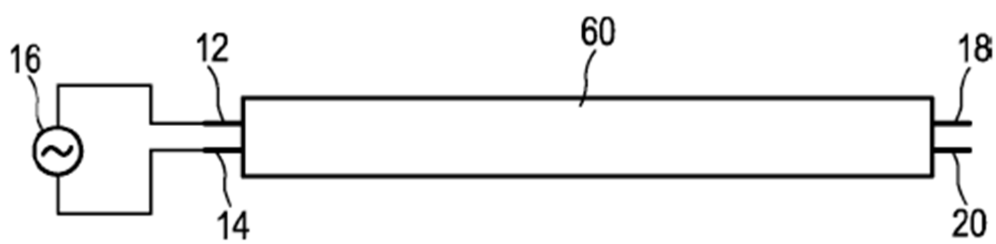
Tao discloses that filter capacitor 56 is electrically connected between the third rectifier path—the "first rectifier" (*see* Section IX.B.2(d))—and lighting unit 28, which includes at least one LED (*see* EX1005, [0041] (disclosing "a lighting unit 28 comprising more preferred [sic] one or more LEDs."). EX1002, ¶146. Specifically, as shown above, filter capacitor 56 is connected to the third rectifying path via capacitor 76, inductance 78, and driver stage 26. *Id.* And filter capacitor 56 is directly connected to lighting unit 28. *Id.*; *see* EX1005, FIG. 4.

A POSITA would have understood that filter capacitor 56 comprises a filter that is configured to smooth the current from the third rectifier path. EX1002, ¶147. Tao discloses that filter capacitor 56 "filter[s] the output voltage V40 and [] reduce[s] a ripple of the load current I_1." EX1005, [0040]. A POSITA would have understood that load current I_1 is from the first rectifier—the third rectifier path. EX1002, ¶147.

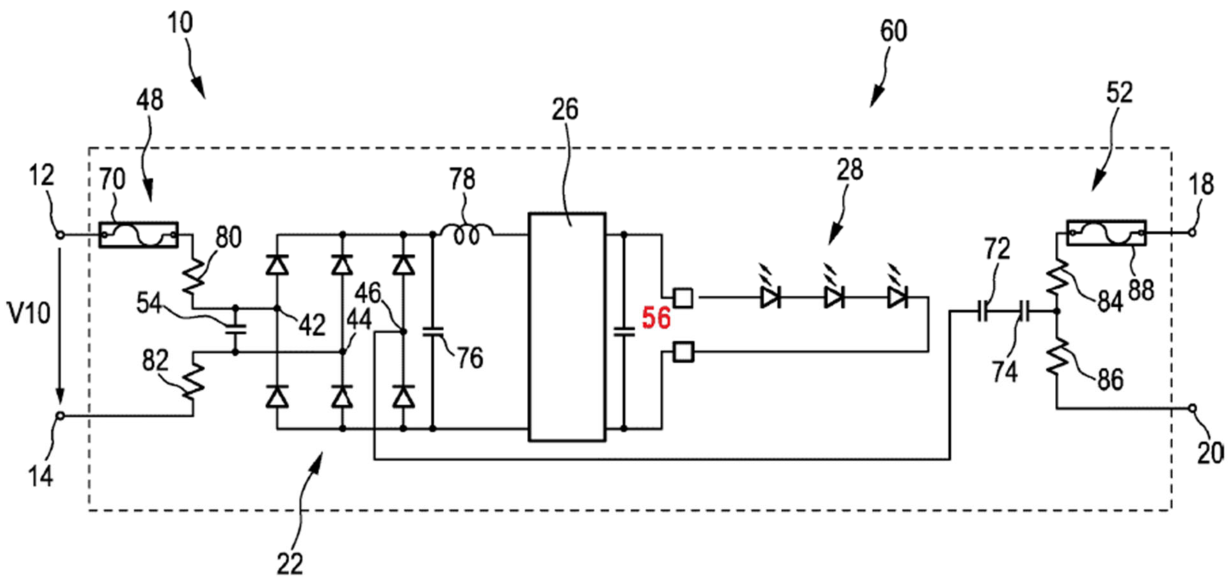
(f) *Claim 9*

The power source module of Tao's light apparatus 60 meets this limitation. EX1002, ¶148; *see* Limitation 1[p], Section IX.B.2(a).

Light apparatus 60 comprises an LED tube lamp. EX1002, ¶149; *see* Limitation 1[p], Section IX.B.2(a); EX1005, ("Various LEDs [sic] tubes (TLED) are used to replace fluorescent (TL) lamps as a retrofit lamp.").



EX1005, FIG. 2a. And a POSITA would have understood that an LED tube is a casing. EX1002, ¶149; *see* EX1041, Abstract ("A light tube with an LED light source includes a casing" and "an LED circuit board inside the casing"). As illustrated below, Tao's input circuitry 48 and 52, input capacitor 54, filter capacitors 72 and 74, rectifier unit 22, capacitor 76, inductance 78, driver stage 26, and filter capacitor 56, which together comprise the power source module, are disposed within light apparatus 60, and thus within its tube. EX1002, ¶149; EX1005, [0035], [0037]-[0040], [0048], [0049].



EX1005, FIG. 4.

Should PO argue otherwise, it would have been obvious to place Tao's power source module inside of Tao's tube. EX1002, ¶150. The tube would help protect the power source module from damage and the environment and prevent accidental contact of the power source module by a human installer. *Id.*

(g) *Claim 15*

First Alternative

Capacitor 76 of Tao's power source module is a capacitor that is electrically connected to at least one of Tao's LEDs and is or obviously would have been configured as a filtering capacitor. EX1002, ¶151; *see* Limitation 1[d], Section IX.B.2(e).

Second Alternative

Input capacitor 90 of Tao's power source module is a capacitor that is electrically connected to at least one of Tao's LEDs and is or obviously would have been configured as a filtering capacitor. EX1002, ¶152; *see* Limitation 1[d], Section IX.B.2(e).

Third Alternative

Filter capacitor 56 of Tao's power source module is a capacitor that is electrically connected to at least one of Tao's LEDs and is a filtering capacitor. EX1002, ¶153; *see* Limitation 1[d], Section IX.B.2(e).

(h) *Limitation 23[p]*

See Limitation 1[p] and Claim 9, Sections IX.B.2(a), IX.B.2(f); EX1002, ¶154.

(i) *Limitation 23[a]*

See Limitation 1[b], Section IX.B.2(c); EX1002, ¶155.

(j) *Limitation 23[b]*

See Limitation 1[c], Section IX.B.2(d); EX1002, ¶156.

(k) *Limitation 23[c]*

See Limitation 1[d], Section IX.B.2(e); EX1002, ¶157.

(l) *Limitation 23[d]*

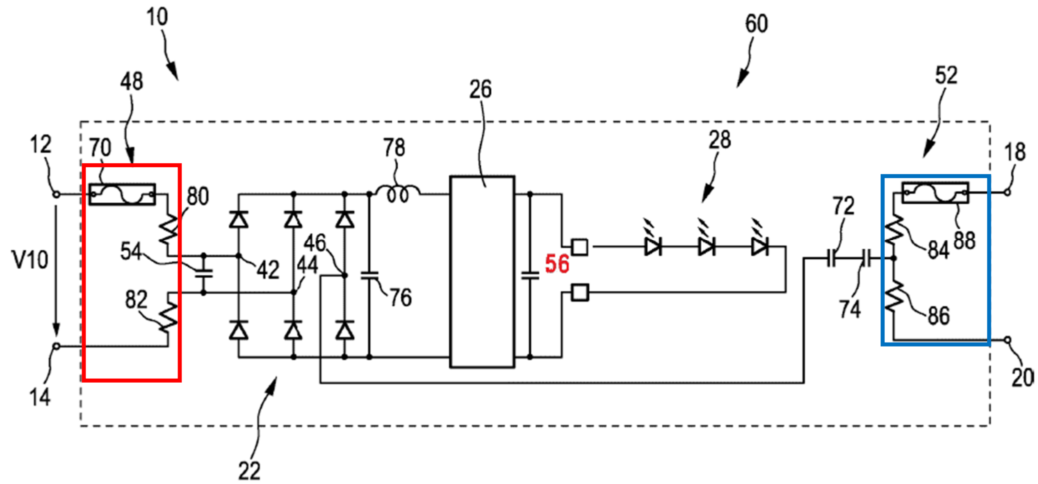
See Limitation 1[a], Section IX.B.2(b); EX1002, ¶158.

(m) *Claim 31*

The power source module of Tao's light apparatus 60 meets this limitation. EX1002, ¶159. That power source module's current limiting circuit—filter capacitors 72 and 74—comprises a capacitor. *Id.*; *See* Limitation 1[b], Section IX.B.2(c).

(n) *Limitation 32[a]*

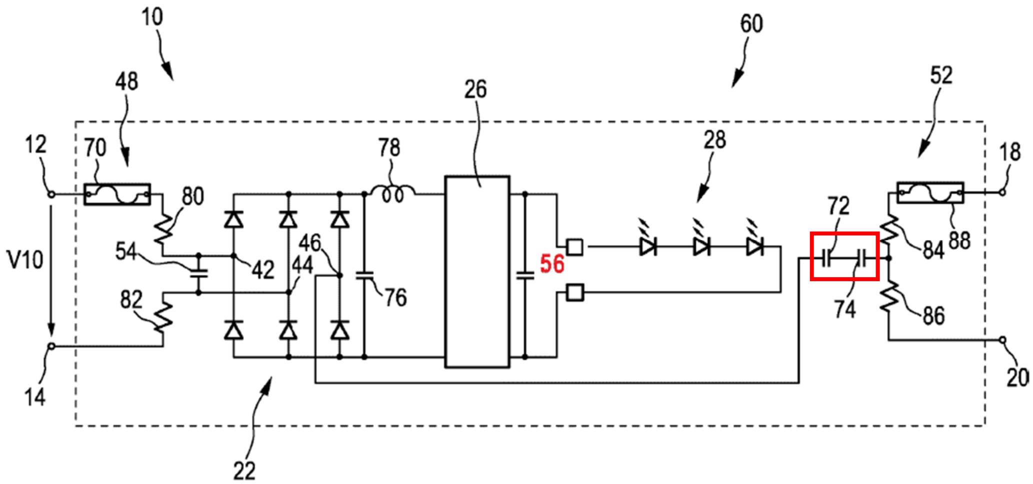
The power source module of Tao's light apparatus 60 meets this limitation. EX1002, ¶160. Shown below in the blue rectangle, input circuitry 52 comprises a first filament-simulating circuit electrically connected between input terminals 18 and 20. *Id.* And as shown below in the red rectangle, input circuitry 48 comprises a second filament-simulating circuit electrically connected between input terminals 12 and 14. *Id.*



EX1005, FIG. 4; *see* Limitation 1[a], Section IX.B.2(b) (explaining that Tao's input terminals 12 and 14 and input terminals 18 and 20 each comprise a bi-pin terminal).

(o) *Limitation 32[b]*

The power source module of Tao's light apparatus 60 meets this limitation. EX1002, ¶161. Filter capacitors 72 and 74 comprise capacitors. *Id.*; *see* Claim 31, Section IX.B.2(m). As illustrated below, capacitor 74 is directly connected to input circuit 52—the first filament-simulating circuit (*see* Limitation 32[a], Section IX.B.2(n))—and capacitor 72 is electrically connected to input circuit 48—the second filament-simulating circuit—via rectifier unit 22. EX1002, ¶161.



EX1005, FIG. 4.

(p) *Limitation 33[a]*

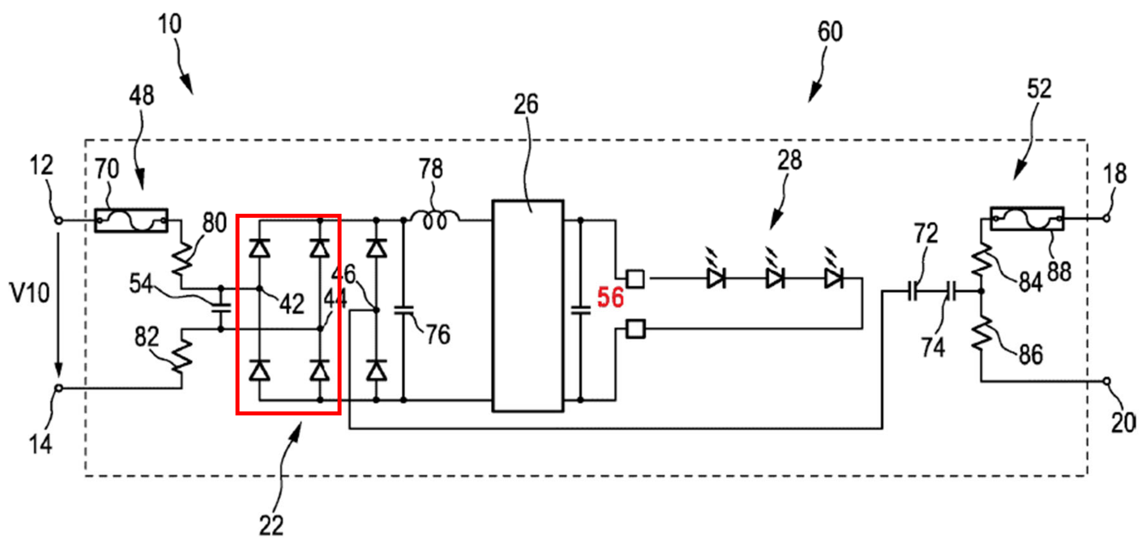
Tao's light apparatus 60 meets this limitation. EX1002, ¶162. Tao discloses that the lighting apparatus 60 has a "lighting unit 28," which is a lighting module and comprises "one or more LEDs." *Id.*; EX1005, [0041]; *see* Limitation 1[p], Section IX.B.2(a).

(q) *Limitation 33[b]*

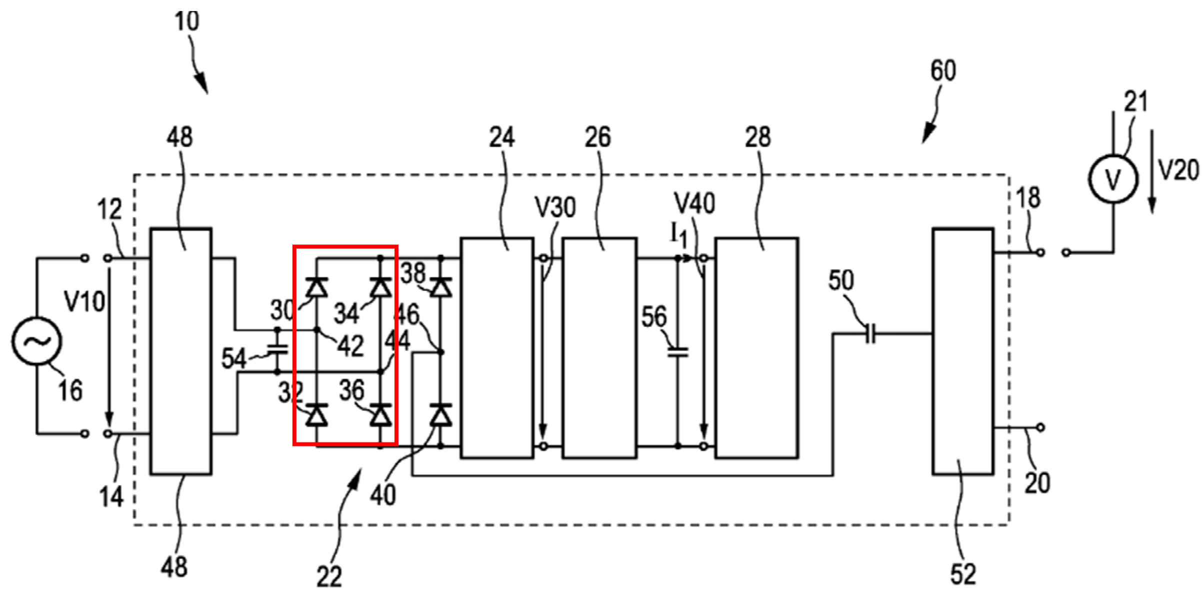
The power source module of Tao's light apparatus 60 meets this limitation, given that each portion of Tao's filament-simulating circuit (*see* Limitation 32[a], Section IX.B.2(n)) comprises two resistors connected between the pins of their respective bi-pin terminals: resistors 80 and 82 for the second filament-simulating circuit, and resistors 84 and 86 for the first filament-simulating circuit. EX1002, ¶163. A POSITA would have understood that each of resistors 80, 82, 84, and 86 is an impedance element. *Id.*; *see* EX1020, 15:40-42 (referring to "resistive impedance (resistor 202)").

(r) *Limitation 33[c]*

The power source module of Tao's light apparatus 60 meets this limitation. EX1002, ¶164. Shown below in the red rectangle, the first and second rectifying paths (diodes 30, 32, 34, and 36 (EX1005, FIG. 1)) comprise a second rectifier. EX1002, ¶161.



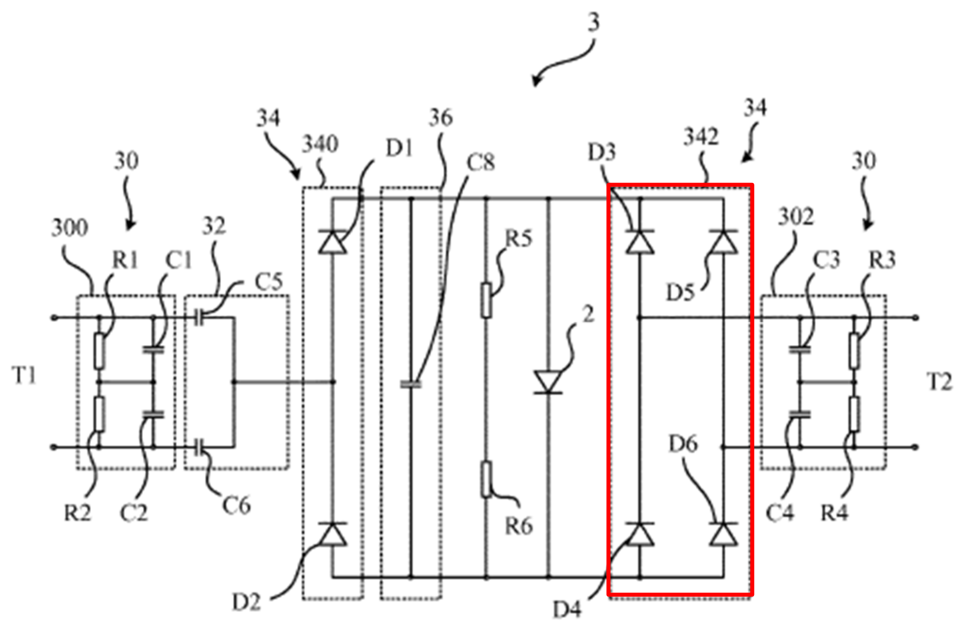
EX1005, FIG. 4.



EX1005, FIG. 1.

A POSITA would have understood that the first and second rectifying paths comprise a full-bridge rectifier. EX1002, ¶165. When powered by a ballast 62 or 68 (Figs. 2b or 2c), where input terminals 18 and 20 had a higher voltage than input terminals 12 and 14, diode 38 and diodes 32 and 36 would turn on to ***rectify*** the AC signal output by the ballast. *Id.* And when input terminals 18 and 20 had a lower voltage than input terminals 12 and 14, the diode 40 and diodes 30 and 34 would turn on to ***rectify*** the AC signal output by the ballast. *Id.* Thus, these first and second rectifying paths, comprising diodes 30, 32, 34, and 36, are a rectifier when the lamp is connected to a ballast and there is a connection to input terminals 18 and 20, e.g., use-cases of light apparatus 60 in FIGS. 2b and 2c. *Id.* In addition, when the lamp is powered by directly by mains voltage 16, when input terminal 12 had a higher voltage than input terminal 14, diodes 30 and 36 would turn on to ***rectify*** the mains AC signal. *Id.* And when input terminal 12 had a lower voltage than input terminals 14, the diodes 32 and 34 turn on to ***rectify*** the mains AC signal. *Id.*

The ’662 Patent also refers to element 342, which has an identical structure to Tao’s first and second rectifying paths, as a “second rectifier.” EX1002, ¶166; EX1001, 5:16-20.



EX1001, FIG. 2.

First and second rectifying paths are coupled between input circuitry 48—the “second filament simulating circuit” (*see* Limitation 32[a], Section IX.B.2(n))—and lighting unit 28—the “LED module”—as shown in Tao’s Figure 4 above. EX1002, ¶167. And each of those couplings is a parallel electrical connection. *Id.* As to the second filament simulating circuit, in the first rectifying path, the anode of diode 30, the cathode of diode 32, and input terminal 12 are each electrically connected to node 42, and in the second rectifying path, the anode of diode 34, the cathode of diode 36, and input terminal 14 are each electrically connected to node 44. *Id.* And as to the LED module, the cathodes of diodes 30 and 34 are electrically connected to lighting unit 28 via inductance 78 and driver stage 26, and the anodes of diodes 32 and 36 are electrically connected to the lighting unit via driver stage 26. *Id.*

(s) *Claim 38*

See Claim 31, Section IX.B.2(m); EX1002, ¶168.

(t) *Claim 39*

See Limitation 32[a], Section IX.B.2(n); EX1002, ¶169.

(u) *Limitation 40[a]*

See Limitations 33[a], 33[b], Sections IX.B.2(p) and IX.B.2(q); EX1002, ¶170.

(v) *Limitation 40[b]*

See Limitation 33[c], Section IX.B.2(r); EX1002, ¶171.

(w) *Limitation 41[p]*

See Limitation 23[p], Section IX.B.2(h); EX1002, ¶172.

(x) *Limitation 41[a]*

See Limitation 1[b], Section IX.B.2(c); EX1002, ¶173.

(y) *Limitation 41[b]*

See Limitation 1[c], Section IX.B.2(d); EX1002, ¶174.

(z) *Limitation 41[c]*

See Limitation 1[d], Section IX.B.2(e); EX1002, ¶175.

(aa) *Limitation 41[d]*

See Limitations 1[a], 32[a], Sections IX.B.2(b) and IX.B.2(n); EX1002, ¶176.

(bb) *Limitation 42[p]*

See Limitation 23[p], Section IX.B.2(h); EX1002, ¶177.

(cc) *Limitation 42[a]*

See Limitation 1[b], Section IX.B.2(c); EX1002, ¶178.

(dd) *Limitation 42[b]*

See Limitation 1[c], Section IX.B.2(d); EX1002, ¶179.

(ee) *Limitation 42[c]*

See Limitation 1[d], Section IX.B.2(e); EX1002, ¶180.

(ff) *Limitation 42[d]*

See Limitations 1[a], 32[a], Sections IX.B.2(b), IX.B.2(n). A POSITA would have understood that each of the first input terminals 12, 14 and the second input terminals 18, 20 are arranged to have a current flowing from one pin to the other pin of the respective bi-pin terminal via input circuitries 48 and 52 after the LED lamp is connected to a ballast and before a normal operation state of the LED lamp. EX1002, ¶181; *see* EX1005, [0045] ("The programmed start high frequency ballast 68 provides a heating current to preheat the light apparatus 60 ***before*** ignition of the high voltage…."); Section VII.B above.

(gg) *Limitation 43[a]*

See Limitations 33[a], 33[b], Sections IX.B.2(p), IX.B.2(q); EX1002, ¶182.

(hh) *Limitation 43[b]*

See Limitation 33[c], Section IX.B.2(r); EX1002, ¶183.

C. Ground 3 – Tao-Langovsky Renders Obvious Claims 1, 9, 15, 23, 31-33, and 38-43

1. Langovsky Overview

Langovsky is titled "Electronic Circuit for DC Conversion of Fluorescent Lighting Ballast." EX1006, Cover. Langovsky discloses "an illumination device including LEDs for connection to an existing fluorescent lamp fixture including a conventional ballast, the ballast configured to provide a current signal." EX1006, 1:47-50. Langovsky teaches a "means for receiving a current signal from the conventional ballast and means for protecting the illumination device from the received current signal." *Id.*, 2:6-9.

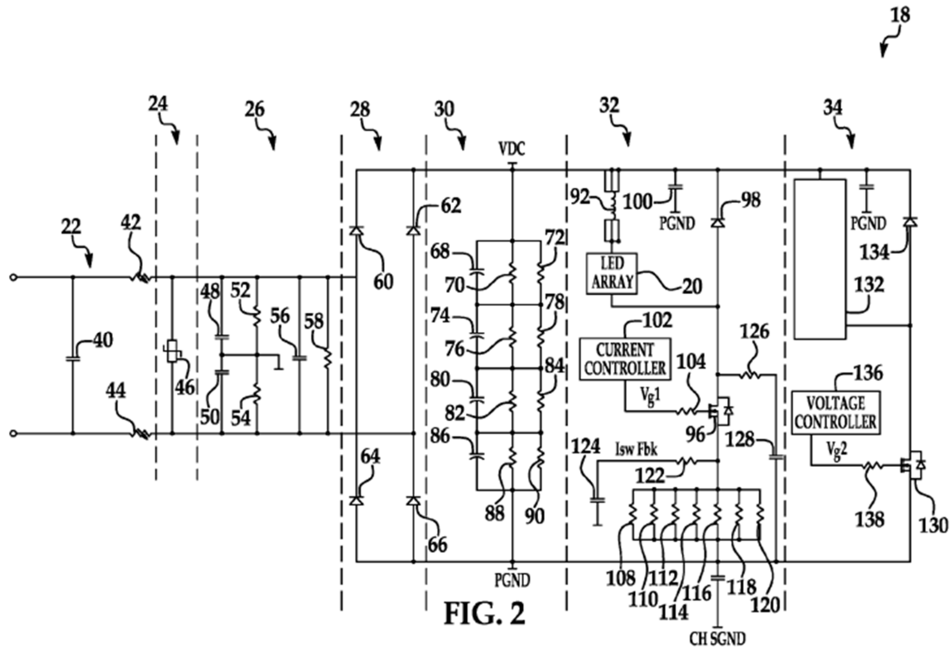


FIG. 2

Id., FIG. 2. Inrush protection circuit 22 comprises "protection circuitry configured to protect the illumination device from the ballast current signal." *Id.*, Abstract. "Inrush protection circuit 22 can be realized by inrush current limiters 42 and 44." *Id.*, 3:51-52. "High inrush currents may be moderated by placing inrush current limiters 42 and 44 in series with the current flow." *Id.*, 3:65-67. Langovsky teaches the following regarding inrush current limiters 42 and 44:

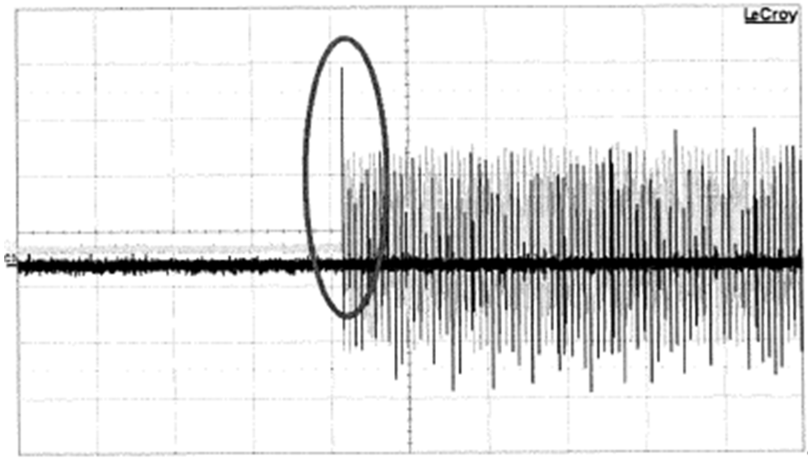
> Inrush current limiters 42 and 44 can be negative temperature coefficient (NTC) resistors. When signal source 14 is first connected, for example, NTC resistors can be cool and have a high resistance value thereby limiting inrush current. After a period of operation, NTC resistors can be warmed by current flowing therein, which in turn, can lower its resistance value.

Id., 3:67 – 4:6.

2. Motivation to Combine

A POSITA would have been motivated to implement Langovsky's inrush protection circuit 22 in Tao's connection circuit 10. EX1002, ¶49; *see* EX1005, [0037], [0038]; EX1006, 3:49-50.

A POSITA would have understood that an LED lamp power supply module may "include energy storage components that draw large currents," "referred to as inrush currents," "when power is first applied to them." EX1002, ¶50; EX1040, 5:30-33; *see* EX1032, [0061] (stating that "the rectifier 40 may include the capacitor 420, such as an electrolytic capacitor, and…an inrush current may be generated by an initial charge current of the electrolytic capacitor"); EX1035, [0114] (stating that when "a capacitor [] [is] charged by the high voltage at the time of opening state, the excessive current (inrush current) flows toward the LED module"). In particular, Tao's filter capacitors 72, 74, capacitor 76, input capacitor 90, output capacitor 96, (*see* EX1005, [0055]), and filter capacitor 56 will cause an inrush current when power is first applied and the capacitors are charged. EX1002, ¶50. This inrush current may damage, for example, the rectifier diodes or the ballast. *Id.* The following figure illustrates an example of an inrush current in an LED lamp. *Id.*



EX1030, FIG. 6A.

A POSITA would have recognized the problem of surge and inrush currents damaging LED lighting. EX1002, ¶51; *see* EX1029, [0033] (explaining that "LED devices used for illumination [] are extremely sensitive to the surge current"); EX1030, [0027] ("Due to inrush current," the LED lamp's "internal elements may be damaged."); EX1033, 5:33-35 ("Inrush currents may be of a magnitude that exceed safe operating limits of various components and thus may reduce the lifespan of a lamp unit []."); EX1032, [0061] ("[A]n inrush current may damage the ballast 20…of the LED lighting apparatus 1.").

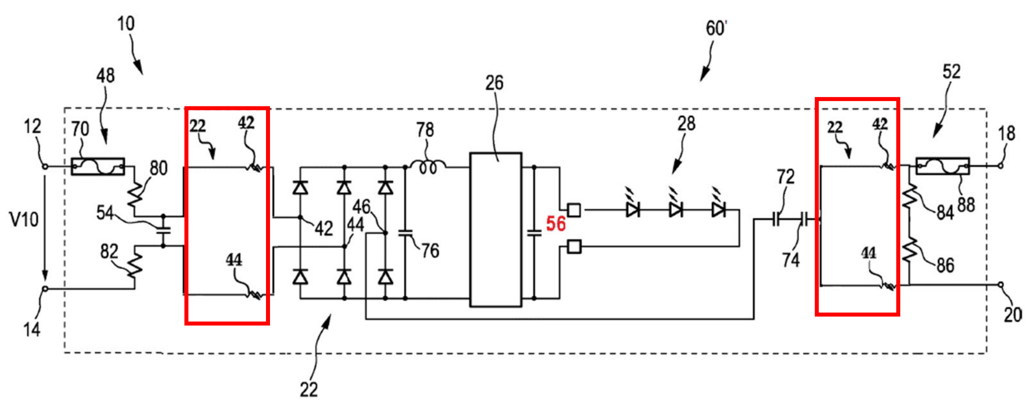
A POSITA would have understood that the ballast and Tao's light apparatus 60 could likewise be damaged by an inrush current. EX1002, ¶52. Although Tao discloses filter capacitor(s) to reduce "leakage current from mains and the risk of electrical shocks at the second input terminals," (EX1005, [0037]), Tao does not teach protection against current spikes due to inrush currents. EX1002, ¶52.

Based upon the teaching of Langovsky and several other references, a POSITA would have been motivated to include an inrush current protection circuit, such as Langovsky's inrush protection circuit 22, in Tao's connection circuit 10. EX1002, ¶53. Langovsky discloses that the "protection circuitry [is] configured to protect the illumination device from the ballast current signal," and "the resistance of the inrush current limiter can be of a value such that components of rectifier circuit [] are not stressed." EX1006, 1:50-58, 4:23-25; *see* EX1036, Abstract (disclosing "a current limiting resistor to prevent the first and second rectifiers from being damaged"); EX1030, [0029] ("The thermistor 10 prevents an instantaneous overcurrent by limiting an inrush current when an initial voltage is applied. Thus, the circuit elements can be protected …."); EX1033, 5:26-30 ("[A]n inrush limiter 310 [] is designed to protect internal components of the lamp unit 306 from damage by controlling and limiting the amount of current flowing into the power supply 308."); EX1034, [0035] ("A signal conditioning circuit 30 may include one or more input resistors that limit inrush current through the circuit."). Tao's filter capacitors 72 and 74 serve the purpose of protecting against electric shock from mains during installation, (EX1005, [0037,] [0048]), while Langovsky's inrush protection circuit 22 serves the purpose of limiting high inrush current when power is first applied to the lamp (EX1006, 3:63-67). EX1002, ¶53.

3. Modification of Tao in View of Langovsky

As discussed in the section above, a POSITA would have been motivated to implement Tao's connection circuit 10 using Langovsky's inrush protection circuit 22. EX1002, ¶54; *see* EX1005, [0037], [0038]; EX1006, 3:49-50. Langovsky discloses that "[i]nrush protection circuit 22 can be realized by inrush current limiters 42 and 44." EX1006, 3:51-52.

In the combined Tao-Langovsky lighting apparatus, Langovsky's inrush protection circuit 22 would have been inserted in between Tao's input capacitor 54 and nodes 42 and 44 to protect components, such as rectifier unit 22, from current pulses. EX1002, ¶55. And Langovsky's inrush protection circuit 22 would also have been inserted in between Tao's resistors 84, 86 and filter capacitor 74. *Id.* Shown below, the combination of Langovsky's inrush protection circuit 22 with Tao's connection circuit 10 forms modified light apparatus 60'. *Id.*



EX1005, FIG. 4; EX1006, FIG. 2.

4. Element by Element Analysis

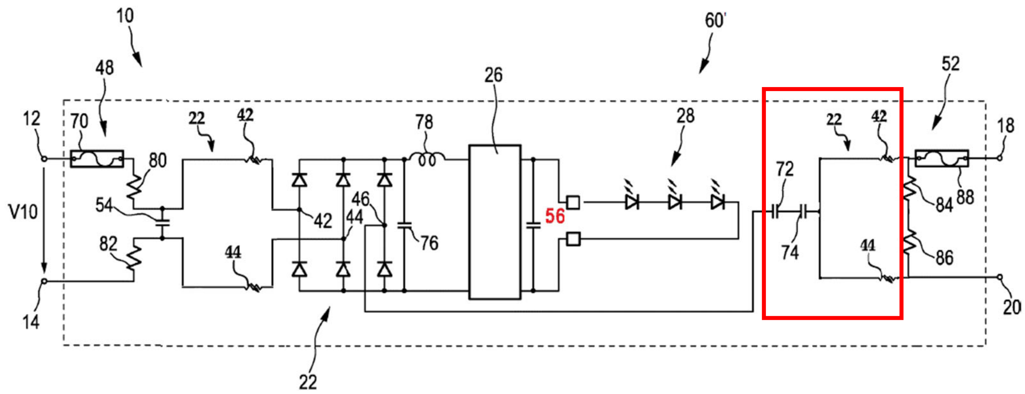
Ground 3 is the same as Ground 2 (*see* Section IX.B) with the exceptions identified below. EX1002, ¶¶186, 192-199, 201, 203-221.

(a) *Limitation 1[p]*

Tao discloses a power source module, which comprises input circuitry 48 and 52, input capacitor 54, filter capacitors 72 and 74, rectifier unit 22, capacitor 76, inductance 78, driver stage 26, and filter capacitor 56. EX1002, ¶184; *see* Ground 2 Limitation 1[p], Section IX.B.2(a). Langovsky's inrush protection circuit 22, being obviously positioned between input circuitry 52 and filter capacitor 74 and between rectifier 22 and capacitor 54, would be included in that power source module. EX1002, ¶185.

(b) *Limitation 1[b]*

The power source module of Tao-Langovsky's modified light apparatus 60' meets this limitation. EX1002, ¶187. Shown below in the red rectangle, inrush protection circuit 22 and filter capacitors 72 and 74 comprise a current limiting circuit. *Id.*



EX1005, FIG. 4; EX1006, FIG. 2. Inrush protection circuit 22 comprises inrush current limiters 42 and 44, such as "negative temperature coefficient (NTC) resistors." EX1006, 3:51-52, 3:67 – 4:2.

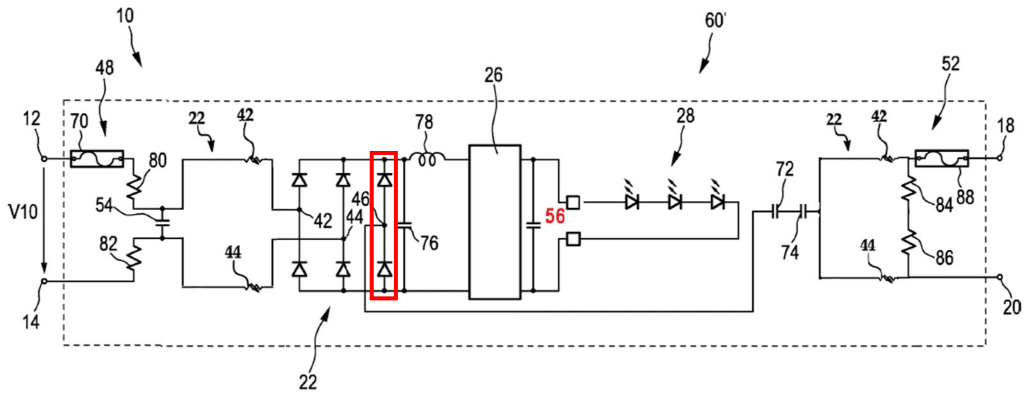
Inrush protection circuit 22 and filter capacitors 72 and 74 are directly connected to input circuitry 52. EX1002, ¶188; EX1005, FIG. 4; EX1006, FIG. 2. And inrush protection circuit 22 and filter capacitors 72 and 74 are electrically connected to input circuitry 48 via rectifier 22 and capacitor 54. EX1002, ¶188; EX1005, FIG. 4; EX1006, FIG. 2.

Inrush protection circuit 22 and filter capacitors 72 and 74 limit the current from input circuitry 52. EX1002, ¶189. Langovsky discloses the following: "When signal source 14 is initially connected, high inrush current can pass from the output of ballast 16 to components of power converter 18. High inrush currents may be moderated by placing inrush current limiters 42 and 44 in series with the current flow." EX1006, 3:63-67; *see also id.*, 4:2-4 ("When signal source 14 is first connected, for example, NTC resistors can be cool and have a high resistance value thereby limiting inrush current.”). And filter capacitors 72 and 74 provide an impedance and thus limit the current from input circuitry 52. EX1002, ¶189; *see* Ground 2 Limitation 1[b], Section IX.B.2(c).

And inrush protection circuit 22 and filter capacitors 72 and 74 similarly limit the current from input circuitry 48. EX1002, ¶190. As explained in the paragraph above, inrush protection circuit 22 provides an impedance and thus limits inrush current. *Id.* And filter capacitors 72 and 74 provide an impedance and thus limit the current from input circuitry 48. *Id.*; *see* Ground 2 Limitation 1[b], Section IX.B.2(c).

(c) ***Limitation 1[c]***

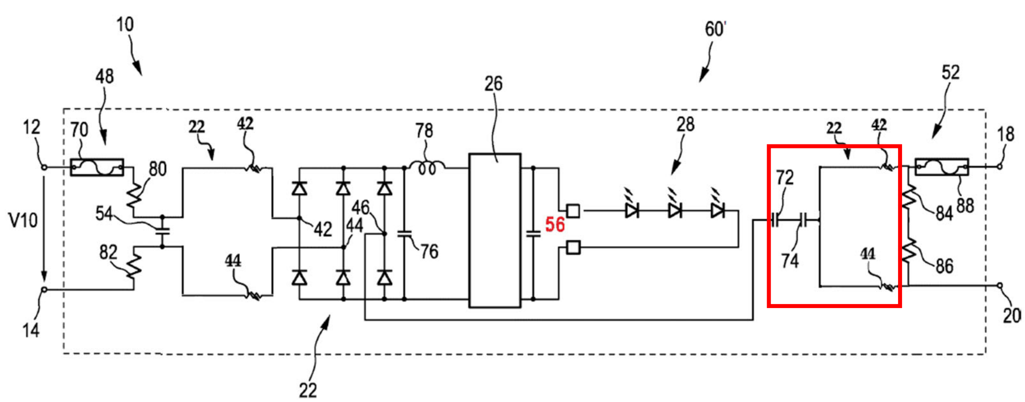
The power source module of Tao-Langovsky’s modified light apparatus 60’ meets this limitation. EX1002, ¶191; *see* Ground 2 Limitation 1[c], Section IX.B.2(d). Shown below in the red rectangle, that power source module includes what Tao describes as a third rectifier path, which a POSITA would have understood to be the “first rectifier.” EX1002, ¶191.



EX1005, FIG. 4; EX1006, FIG. 2. Shown in the figure above, diodes 38 and 40, i.e., the third rectifying path, are directly connected to filter capacitors 72, 74 and inrush protection circuit 22 on the right. EX1002, ¶191.

(d) *Claim 31*

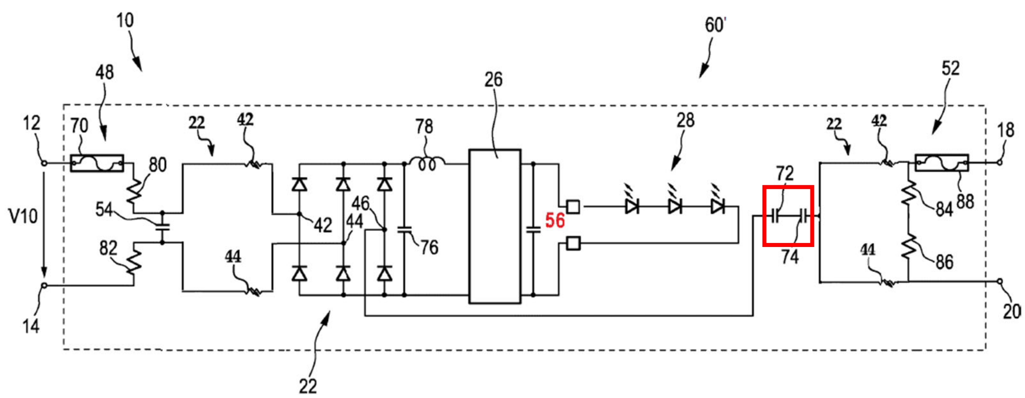
The power source module of Tao-Langovsky's modified light apparatus 60' meets this limitation. EX1002, ¶200. That power source module's current limiting circuit comprises a capacitor: filter capacitors 72 and 74. *Id.*



EX1005, FIG. 4; EX1006, FIG. 2.

(e) *Limitation 32[b]*

The power source module of Tao-Langovsky's modified light apparatus 60' meets this limitation. EX1002, ¶202. Filter capacitors 72 and 74 comprise capacitors. *Id.*; *see* Claim 31, Section IX.C.4(d). Shown below, capacitor 74 is directly connected to input circuit 52—the first filament-simulating circuit—and capacitor 72 is electrically connected to input circuit 48—the second filament-simulating circuit—via rectifier unit 22, inrush protection circuit 22, and capacitor 54. EX1002, ¶202; *see* Ground 2 Limitation 32[b], Section IX.B.2(o).



EX1005, FIG. 4; EX1006, FIG. 2.

X. *FINTIV* FACTORS WEIGH AGAINST DISCRETIONARY DENIAL

Factor 1 is neutral. A stay has not been requested or denied.

Factor 2 weighs in favor of institution. Trial is currently scheduled for April 17, 2024. EX1010. However, the *Current* Action involves 11 patents and the median time-to-trial for the Western District of Texas is 28.3 months,[6] meaning trial likely will not occur until at least October 2024—about four months ***after*** a decision here.

Factor 3 weighs in favor of institution**.** The *Current* Action is in its early stages. PO filed its original complaint on May 24, 2022, and amended its complaint in September to add patents. *Markman* is not scheduled to occur until April 19, 2023, and fact discovery does not open until April 20, 2023. EX1010.

Factor 4 weighs in favor of institution**.** If the IPR is instituted, Petitioner will stipulate not to rely on the same grounds in the *Current* Litigation. EX1014.

Factor 5. The parties are the same.

Factor 6 weighs in favor of institution. This petition is promptly filed well-within the 12-month statutory period and, for the reasons explained above, the merits of the proposed grounds are meritorious and compelling.[7]

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6 https://www.uscourts.gov/statistics/table/na/federal-court-management-statistics/2022/06/30-2

7 Available at: https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf

XI. CONCLUSION

For the above reasons, the Challenged Claims are invalid, and institution is appropriate.

Dated: December 19, 2022

Respectfully submitted,

/Eagle H. Robinson/
Eagle H. Robinson
Reg. No. 61,361

Lead Counsel for Petitioner

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(a)(i), the undersigned certifies that this Paper—exclusive of the table of contents, mandatory notices under § 42.8, certificate of service, and this certificate of word count—includes 13,997 words.

/Eagle H. Robinson/
Eagle H. Robinson (Reg. No. 61,361)

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e) and 37 C.F.R. § 42.105(a), the undersigned certifies that on December 19, 2022, a complete copy of this Petition for *Inter Partes* Review, Petitioner's power of attorney, and all exhibits were served on Patent Owner at the correspondence addresses of record listed below by USPS Priority Mail Express:

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