

Xu Peicheng (Hong Kong) v. Semisilicon Technology Corp.

Patent Owner's Demonstratives

IPR2024-00156

U.S. Patent No. 8,884,546

Semisilicon Technology Corp.

February 24, 2025

SEMISILICON EXHIBIT 2006
XU PEICHENG v. SEMISILICON
IPR2024-00156

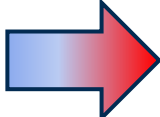
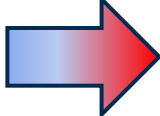
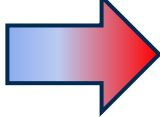
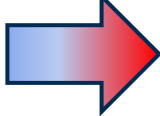
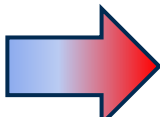
Grounds as Originally Petitioned

Ground No.	Petition Ground	Claim(s)	Institution Decision Finding
1	<i>Kuang + Knowledge of a POSITA</i>	<u>1</u> , 2	Institution granted, briefing requested on meaning of “synchronous signals”
2	<i>Kuang + Debevec</i>	3	Not addressed
3	<i>Lys + Knowledge of a POSITA</i>	<u>1</u> , 2, <u>8</u>	Not addressed
4	<i>Lys + Debevec</i>	3	Not addressed
5	<i>Hiroyuki + Knowledge of a POSITA</i>	<u>4</u>	Petition found deficient
6	<i>Hiroyuki + Kuang</i>	5, 6, <u>8</u>	Petition found deficient for claim 8 Claims 5 and 6 not addressed

POR at 1

Institution Decision at 16-17, 45,52, 55-56

Petitioner Modified Its Grounds

Ground No.	Petition Ground	Claim(s)		Petitioner Reply Ground
1	<i>Kuang</i> + Knowledge of a POSITA	<u>1</u> , 2		<i>Kuang</i> + __?__
2	<i>Kuang</i> + <i>Debevec</i>	3		<i>Kuang</i> alone
3	<i>Lys</i> + Knowledge of a POSITA	<u>1</u> , 2, <u>8</u>		<i>Lys</i> + __?__
4	<i>Lys</i> + <i>Debevec</i>	3		<i>Lys</i> alone
5	<i>Hiroiyuki</i> + Knowledge of a POSITA	<u>4</u>		<i>Hiroiyuki</i> + __?__
6	<i>Hiroiyuki</i> + <i>Kuang</i>	5, 6, <u>8</u>		<i>Hiroiyuki</i> + <i>Kuang</i>

POR at 1, 52-54

Each Ground Fails For Multiple Reasons

Reference:	Fatal Deficiency:	Dispositive of Challenged Claim(s):
<i>Kuang</i>	No “synchronous signals”	<u>1</u> , 2, 3
	No “curtain lamp”	<u>1</u> , 2, 3
	No reason to add a transistor	3
<i>Lys</i>	No “synchronous signals”	<u>1</u> , 2, 3
	No “curtain lamp” or “second curtain lamp”	<u>1</u> , 2, 3, <u>8</u>
	No reason to add a transistor	3
	No “master control unit”	<u>1</u> , 2, 3, <u>8</u>
<i>Hiroyuki</i>	No “pins”	<u>4</u> , 5, 6
	No “signal processor”	<u>8</u>
	No reason to add a microcontroller	5, 6, <u>8</u>

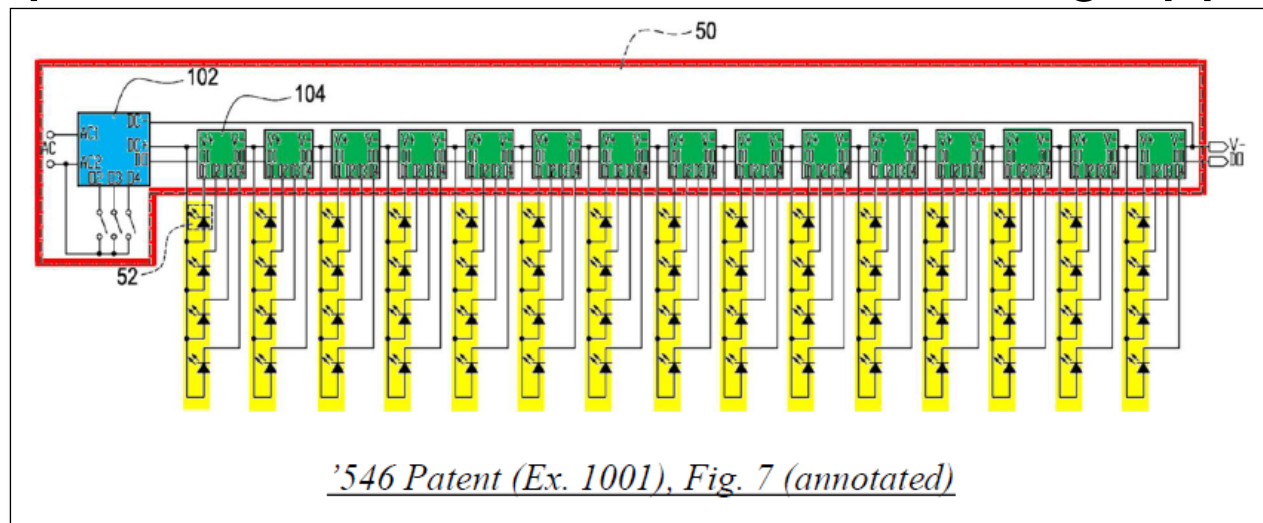
Each Obviousness Ground Lacks the Required Analysis

Ground No.	Petition Ground	Differences between claims and prior art	"Reasonable Expectation of Success"
1	<i>Kuang</i> + Knowledge of a POSITA	Failure to identify	None
2	<i>Kuang</i> + <i>Debevec</i>	Admission of missing "transistor"	Bare assertion
3	<i>Lys</i> + Knowledge of a POSITA	Failure to identify	None
4	<i>Lys</i> + <i>Debevec</i>	Admission of missing "transistor"	Bare assertion
5	<i>Hiroyuki</i> + Knowledge of a POSITA	Failure to identify	None
6	<i>Hiroyuki</i> + <i>Kuang</i>	Admission of missing "microcontroller"	Bare assertion

POR at 51-61

Overview of '546 Patent

- Directed to LED curtain lamps
- Conventional curtain lamps:
 - Lack a microcontroller → simple on/off → dull lighting 👎
 - Microcontroller with 3-4 circuit loops for entire lamp → dull lighting 👎
- '546 patent solution: master-slave driving apparatus → vivid lighting ✓



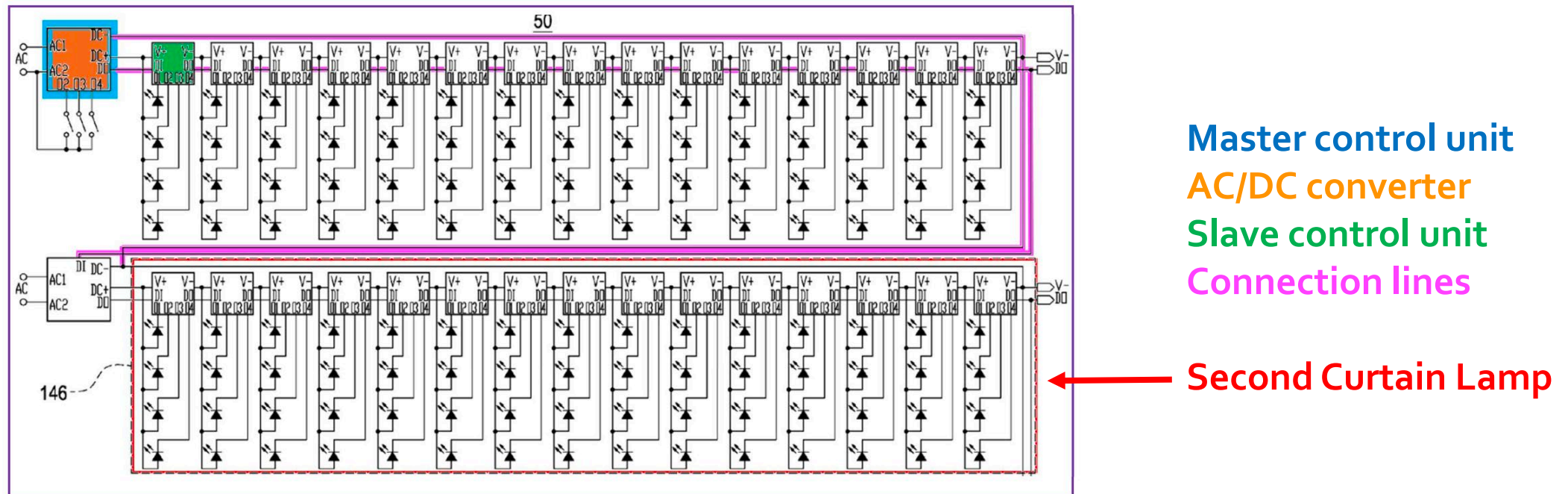
Driving apparatus:
Master control unit
Slave control units
Transmission line

Strings of **LEDs**

POR at 3-7, Ex. 1001 at 1:10-21. 7:19-20, 23-24; 7:35-8:7; 8:39-44; and Fig. 1, 2, 6, and 7.

Overview of '546 Patent

- Disclosed embodiments can have multiple curtain lamps:



'546 Patent (Ex. 1001), portion of Fig. 8 (annotated)

- Master-slave configuration with control and synchronous signals = light patterns, moving / animated lights, and other decorative types of illumination.

POR at 3-7, Ex. 1001 at 8:39-44 and Fig. 8; Ex. 2001, ¶ 57.

Each Ground Fails For Multiple Reasons

Reference:	Fatal Deficiency:	Dispositive of Challenged Claim(s):
Kuang	No “synchronous signals”	<u>1</u> , 2, 3
	No “curtain lamp”	<u>1</u> , 2, 3
	No reason to add a transistor	3
Lys	No “synchronous signals”	<u>1</u> , 2, 3
	No “curtain lamp” or “second curtain lamp”	<u>1</u> , 2, 3, <u>8</u>
	No reason to add a transistor	3
	No “master control unit”	<u>1</u> , 2, 3, <u>8</u>
Hiroyuki	No “pins”	<u>4</u> , 5, 6
	No “signal processor”	<u>8</u>
	No reason to add a microcontroller	5, 6, <u>8</u>

POR at 12-51; PO Sur-Reply at 2

KUANG AND *LYS* EACH LACKS “SYNCHRONOUS SIGNALS”

Ground 1: *Kuang* lacks “synchronous signals”

Ground 3: *Lys* lacks “synchronous signals”

Construction of “Synchronous Signals”

Board's Preliminary* Construction (Institution Decision)	Patent Owner Response	Petitioner's Reply
“signals related to an activity(ies) occurring at the same time” *The Board requested Parties' briefing	“synchronous signals” are distinct from “control signals” “signals related to activities governed by synchronized timing”	[No construction proposed] Operated under Board's construction without supporting briefing

Institution Decision, 43-44;
POR at 9-11;
Petitioner Reply, 1-2;
PO Sur Reply, 2-4

Construction of “Synchronous Signals”

Patent Owner

“synchronous signals” are distinct from
“control signals”

“signals related to activities governed by
synchronized timing”

Claim 1:

1[D]: wherein the slave control unit is controlled by the master control unit to drive the light-emitting diode light string; the transmission line is used to transit control signals and synchronous signals.

“Where a claim lists elements separately , ‘the clear implication of the claim language’ is that those elements are ‘distinct component[s]’ of the patented invention.”

Dickinson & Co. v. Tyco Healthcare Grp., LP, 616 F.3d 1249, 1254 (Fed. Cir. 2010) (citing *Gaus v. Conair Corp.*, 363 F.3d 1284, 1288 (Fed. Cir. 2004)).

POR at 9-11, Ex. 3001
PO Sur Reply at 4.

Construction of “Synchronous Signals”

Patent Owner

“synchronous signals” are distinct from
“control signals”

“signals related to activities **governed by
synchronized timing**”

Claim 1:

1[C]: a transmission line **electrically connected to the master
control unit and the slave control unit,**

1[D]: wherein the slave control unit is controlled by the master
control unit to drive the light-emitting diode light string;
the **transmission line is used to transit** control signals
and **synchronous signals.**

Ex. 3001, 506 – Microsoft Computer Dictionary

synchronous *adj.* Occurring at the same time. **In com-
puter transmissions,** a reference to activity **governed by a
clock or by synchronized timing.**

**Claim 1 involves
transmissions between
control units**

POR at 9-11, Ex. 3001
PO Sur Reply at 4.

Kuang lacks “synchronous signals”

- The Petition points to a “**master light shutoff command**” in *Kuang*.
- The Petition does not identify “synchronous signals” separate from *Kuang*’s “control signals.”

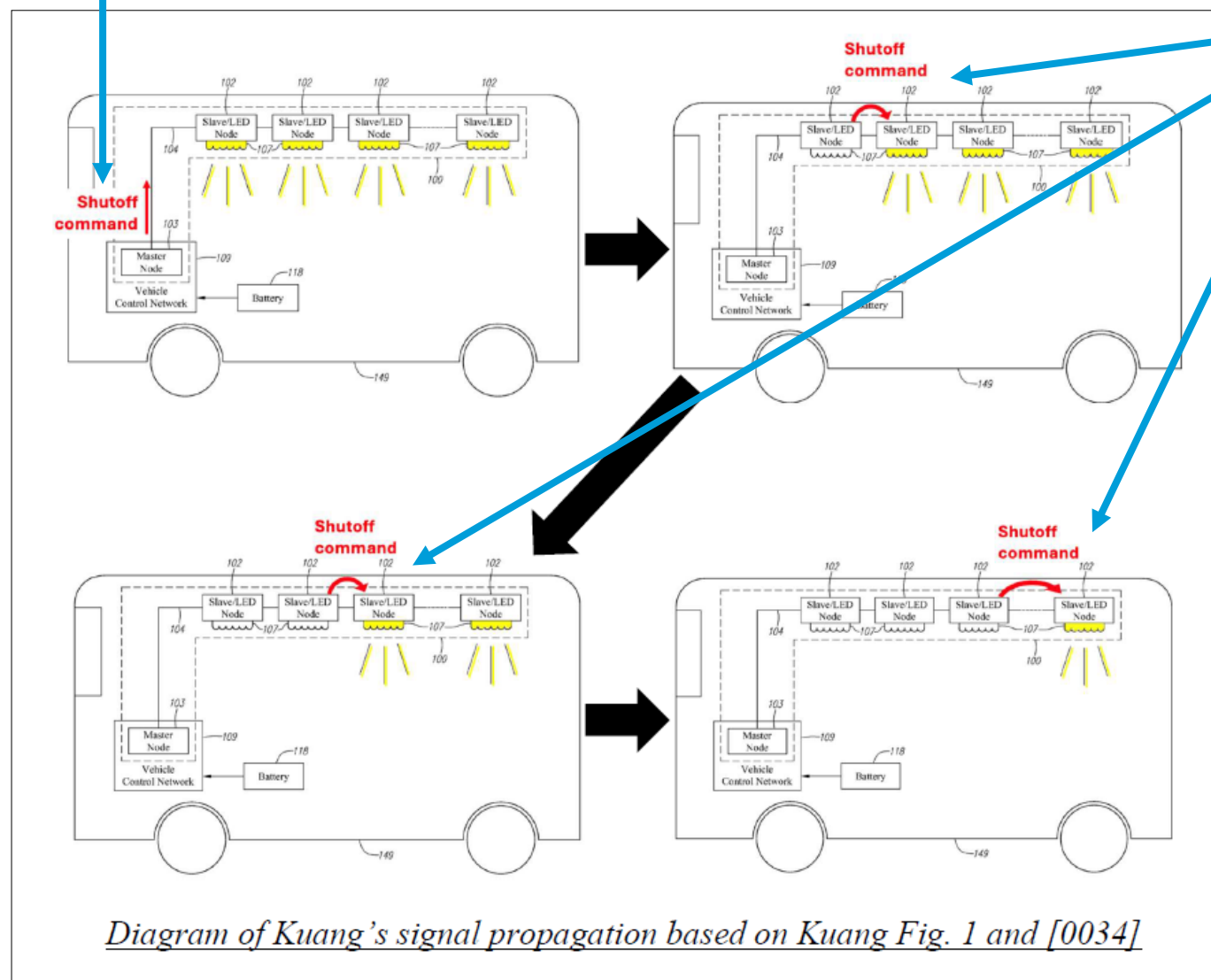
All signals identified in *Kuang* are **control signals**, at best.

With respect to the claimed “control signals,” *Kuang* explains that the master node sends “commands or queries” to the slave nodes: “The master node 203 may ... *control* the various LED-based lighting fixtures 202, and slave nodes 223 thereof, through commands or queries transmitted over the command/data bus 212.” *Id.* at [0034] (emphasis added). EX1003, ¶ 49.

Kuang also discloses a master node that sends **synchronous signals** to all slave nodes, and in turn, all LEDs. In this context, a POSITA would have understood the term “synchronous signals” to mean signals that are sent to the slave nodes to control their corresponding LED strings at the same time. As explained in *Kuang*, “[a] **master light shutoff command** may also be sent from the master node 203 instructing *all* LED/slave nodes to turn off. The micro-controller 420 may also respond to **commands from the master node 203** to dim the LEDs 442 *on all or selected ones of the LED units 424*, in which case the micro-controller 420 may instruct the current control circuitry 421 to reduce the PWM duty cycle for the affected LED units 424 by an appropriate amount.” *Id.* at [0054] (emphasis added). EX1003, ¶ 50.

Kuang's "master shutoff" command is not a "synchronous signal"

Master shutoff command



"Master shutoff" command propagates from node to node

Commands or inquiries may be transmitted from the master node 203 over the command/data bus 212 to the first slave node 223 (Slave Node 1), which then propagates the commands or inquiries over the command/data bus 212 to the next slave node 223 (Slave Node 2) in the chain, and so on in sequence until the command or inquiry reaches the last slave node 223 (Slave Node N) if necessary. Commands or inquiries need not be propagated if the targeted slave node 223 receives the command or inquiry and responds thereto; however, it may nonetheless be desirable in some configurations to propagate all commands and inquiries, or certain subsets thereof, to all of the slave nodes 223 in the lighting control network 200.

Ex. 1004, [0034] (emphases added)

Time delays due to propagation

POR at 20-25

Kuang lacks “synchronous signals”

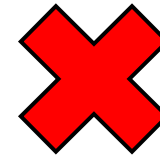
- *Kuang*'s master shutoff command does not meet any construction of “synchronous signals”
 1. *Kuang*'s slave nodes do not turn off lights **at the same time** (preliminary construction)
 - Shut off is **sequential** with **time delays** due to command propagating from one slave node to the next.
 2. *Kuang* says nothing about light shutoff being **governed by synchronized timing** (Patent Owner's construction)

Lys lacks “synchronous signals”

- In addressing “control signals” and “synchronous signals,” the Petition raised three theories:

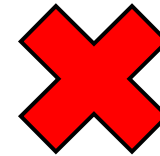
(1) *Lys* discloses sending a “mode” signal and an “option” signal to a light source 24.

(Pet. 32)



(2) *Lys* discloses controlling light sources in a “coordinated fashion” with respect to other pool devices such as heaters or filters.

(Pet. 33)



(3) *Lys* discloses sending signals via four data paths.

(Pet. 33-35)



- Petitioner’s theories fail to show how *Lys* meets both the “control signals” and “synchronous signals” of 1[D].

POR at 25-29

The Petitioner's Reply Confirms Petitioner's Flawed Claim Interpretation

cannot also be a “synchronous signal” must be rejected. As such, Dr. Lebby’s critique that “the Petition does not articulate precisely which signals in Lys are mapped to the ‘control signals’ of 1[D], and which signals in Lys are mapped to the ‘synchronous signals’ of 1[D]” (EX2001, ¶ 82) is irrelevant. The claimed “control signals” may be “synchronous signals.” EX1010, ¶ 40.

Petitioner’s Reply at 13

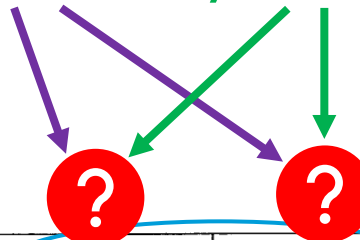
- *Lys’s* pool light signals do not meet both the “control signals” *and* the “synchronous signals” of claim 1.

POR at 25-29
PO Sur-Reply, at 9-11

The First *Lys* Theory Fails: “Mode” and “Option” Signals

- No mapping of *Lys*’s “mode” and “option” signals to the claimed “control signals” or “synchronous signals.”

Claim 1[D]: the transmission line is used to transit
control signals and **synchronous signals**



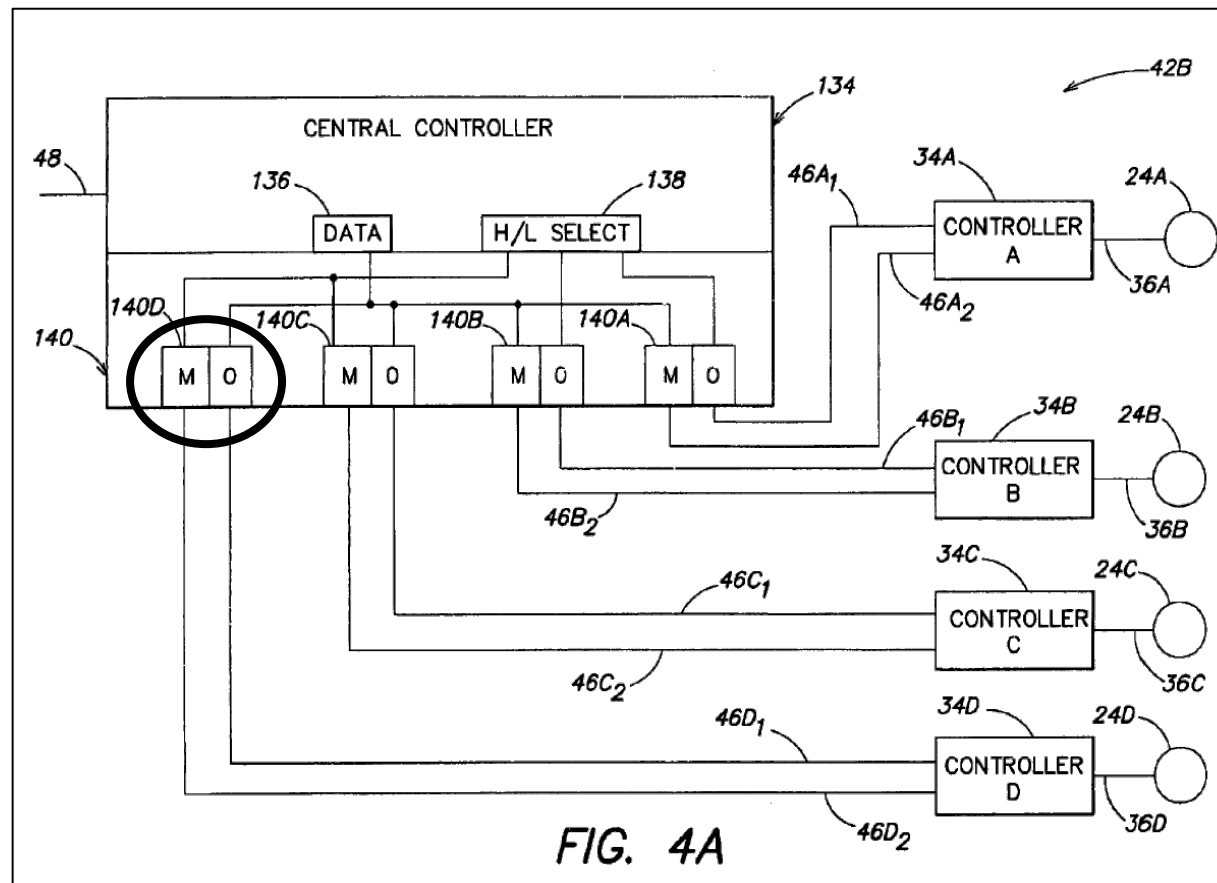
CONTROLLER	MODE (M)	OPTION (O)
A	DATA	LOGIC HIGH
B	DATA	LOGIC LOW
C	LOGIC HIGH	DATA
D	LOGIC LOW	DATA

FIG. 4B

Lys (Ex. 1008), Fig. 4B
POR at 26-27

The First *Lys* Theory Fails: “Mode” and “Option” Signals

- No showing that “mode” and “option” signals are sent to multiple light sources *at the same time*.
- No showing of synchronized timing.



Ex. 1008, Fig. 4A
POR at 26-27

The Second *Lys* Theory Fails: Controlling Light Sources in a “Coordinated Fashion”

**Lys quote
taken out of
context:**

Furthermore, Lys discloses “[i]n one embodiment of the invention, one or more of the light sources 24A-24I are controlled in a *coordinated fashion*[.]” Lys at 10:3-5 (emphasis added). A POSITA would have understood that “coordinated

Petition at 33

**Full disclosure
in Lys:**

accessories may enhance enjoyment of the pool or spa environment by heating the liquid 22 and/or creating various soothing or invigorating flows of the liquid 22. In one embodiment of the invention, one or more of the light sources 24A-24I are controlled in a coordinated fashion with one or more other accessories (e.g., heaters, blowers, filtration and circulation systems, etc.) in the pool or spa environment. In particular, according to one embodiment, one or more accessories provide control signals to one or more light sources; alternatively, in another embodiment, one or more light sources may provide control signals to one or more accessories, as discussed further below in connection with FIG. 4.

Ex. 1008, 10:3-8

POR at 27-28
PO Sur Reply at 9-11

The Second *Lys* Theory Fails: Controlling Light Sources in a “Coordinated Fashion”

Full disclosure
in *Lys*:

accessories may enhance enjoyment of the pool or spa environment by heating the liquid 22 and/or creating various soothing or invigorating flows of the liquid 22. In one embodiment of the invention, one or more of the light sources 24A–24I are controlled in a coordinated fashion with one or more other accessories (e.g., heaters, blowers, filtration and circulation systems, etc.) in the pool or spa environment. In particular, according to one embodiment, one or more accessories provide control signals to one or more light sources; alternatively, in another embodiment, one or more light sources may provide control signals to one or more accessories, as discussed further below in connection with FIG. 4.

Ex. 1008, 10:3-8

- No showing that “coordinated fashion” means controlling light source activities to occur [at the same time](#) as one another (Petitioner’s definition of “synchronous signals”)
- No showing that “coordinated fashion” involves activities [governed by synchronous timing](#) (Patent Owner’s construction).

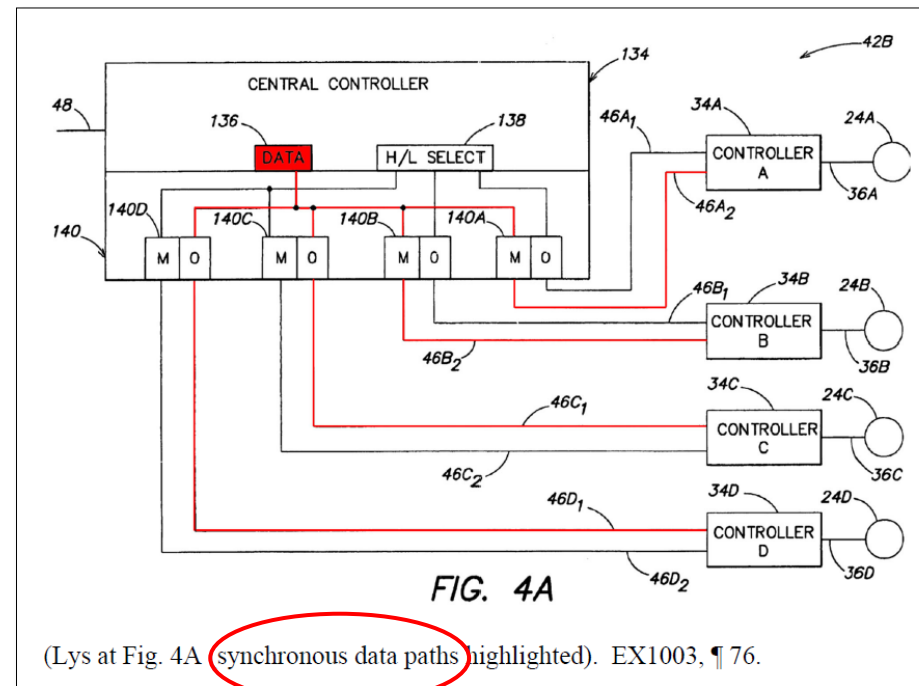
Petition at 33
POR at 27-28

The Third *Lys* Theory Fails: Multiple Data Paths

- No showing of activities **occurring at the same time** or activities **governed by synchronized timing**

A POSITA would further understand that, as illustrated in FIG. 4A, the remote user interface 36 can transmit a synchronous signal to each controller 34A-D. In FIG. 4A, “a central controller 134 coupled to the network 48 is adapted to control four light sources 24A-24D respectively associated with four controllers 34A-34D.” Lys at 17:64-66. The central controller 134 transmits “a data signal 136” and a “logic high/low (H/L) select signal 138” to the controllers 34A-34D. Designated “M” and “O” in FIG. 4A, each of the four controllers 34A-34D receive two signals: A “mode” signal (designated “M”) and an “options” signal (designated “O”). See *id.* at 18:2-8. The table in FIG. 4B shows possible combinations of “mode” and “option” signals where data signal 136 is outputted to all of the controllers 34A-34D:

Petition, 33



Petition, 35

POR at 28-29

Each Ground Fails For Multiple Reasons

Reference:	Fatal Deficiency:	Dispositive of Challenged Claim(s):
Kuang	No “synchronous signals”	<u>1</u> , 2, 3
	No “curtain lamp”	<u>1</u> , 2, 3
	No reason to add a transistor	3
Lys	No “synchronous signals”	<u>1</u> , 2, 3
	No “curtain lamp” or “second curtain lamp”	<u>1</u> , 2, 3, <u>8</u>
	No reason to add a transistor	3
	No “master control unit”	<u>1</u> , 2, 3, <u>8</u>
Hiroyuki	No “pins”	<u>4</u> , 5, 6
	No “signal processor”	<u>8</u>
	No reason to add a microcontroller	5, 6, <u>8</u>

KUANG AND *LYS* EACH LACK A “CURTAIN LAMP”

Ground 1: *Kuang* lacks a “curtain lamp”

Ground 3: *Lys* lacks a “curtain lamp” or “second curtain lamp”

Kuang lacks a “curtain lamp”

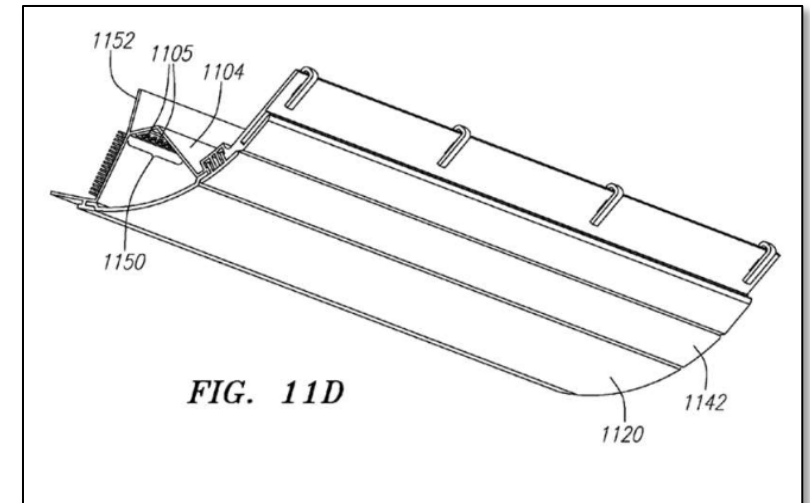
- Petition interpretation: “curtain lamp” = “one or more light strings”
- The Petition maps “lighting fixture 400” with “modules 424” to the “curtain lamp”

Moreover, a POSITA would have understood *Kuang* to disclose a “curtain lamp,” which is commonly understood to be one or more light strings: “the LED-based lighting fixture 400 may include five LED units or modules 424 each having, e.g., eight LEDs, for a total of 40 LEDs on a single LED-based lighting fixture 400.” *Id.* at [0045]. See also, e.g., the ’546 patent at 2:34-40 (describing

Petition at 8

- *Kuang* discloses bus ceiling lights:

fashion. Each of the slave/LED nodes 102 may include a plurality of LEDs 107 arranged on a lighting panel or other fixture to provide illumination for a particular interior region of the transit vehicle 149.

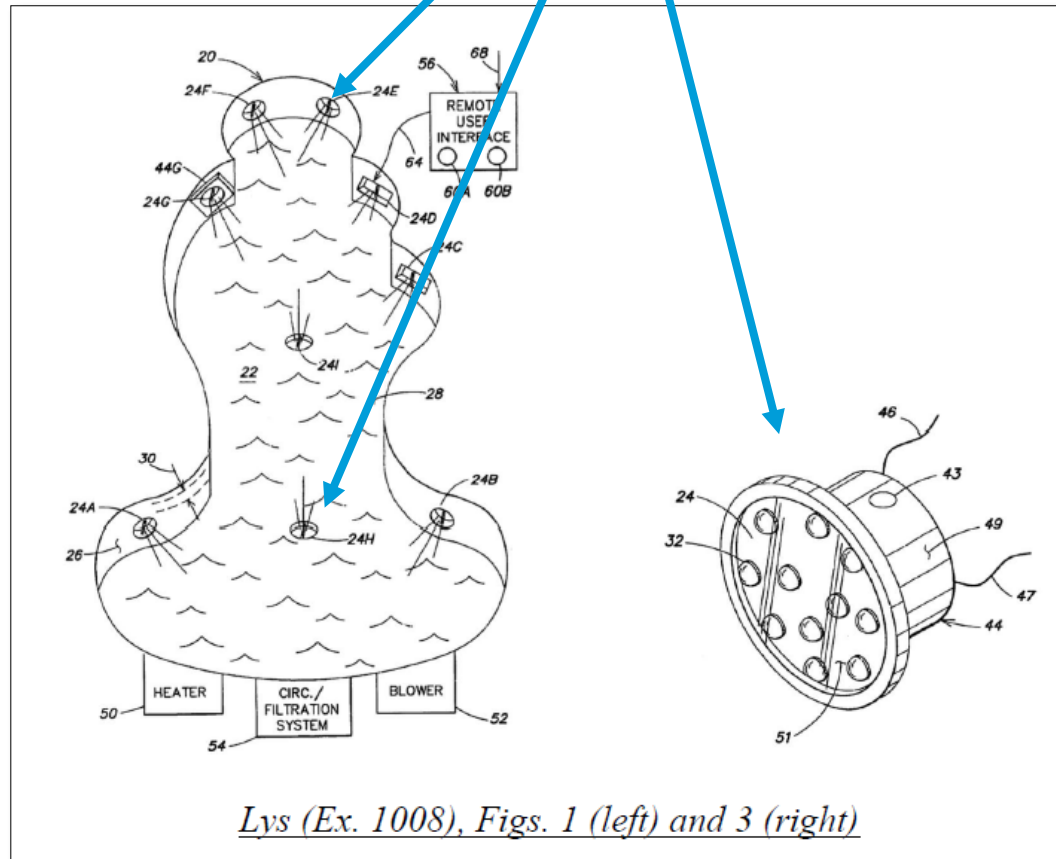


Ex. 1004, Fig. 11D

Petition at 8;
POR at 15-17; Ex. 1001, col. 2, lines 34-40
Ex. 1004, 11D, [0032]

Lys lacks a “curtain lamp” (Claims 1 & 8) or “second curtain lamp” (Claim 8)

- *Lys* discloses **light sources** in a wall or floor of a pool or spa:



- Petition interpretation: “curtain lamp” = “**one or more light strings**”
- Each pool light in *Lys* is not “one or more light strings”

Lys (Ex. 1008), Figs. 1 (left) and 3 (right)

POR at 17-19; 32-33
Ex. 1008, 3:64-4:2, Figs 1, 3

Petitioner's 11th Hour Attempt to Broaden “Curtain Lamp”



- Petition and Dr. Schubert's original declaration: **curtain lamp = one or more light strings**

Moreover, a POSITA would have understood Kuang to disclose a “curtain lamp,” which is commonly understood to be one or more light strings: “the LED-

Petition at 8, 25, 38, 51, 72, EX1003, ¶¶ 37, 61, 79, 96, 122.



- Patent Owner: *Kuang* and *Lys* fail to meet Petitioner's own interpretation.



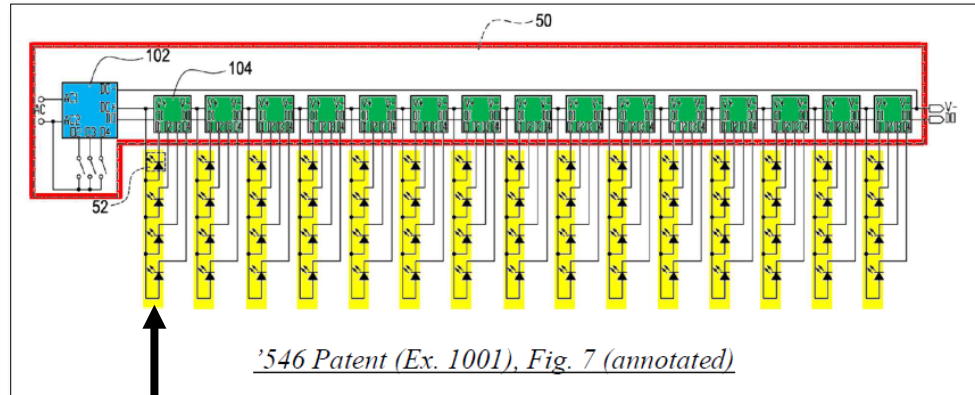
- Petitioner's Reply: **curtain lamp = one LED**

EX1001 at 6:15-20. The minimum configuration for a “curtain lamp” according to the '546 specification is one LED. Therefore, the reverse must be true as well: one LED constitutes the claimed LED “curtain lamp.” EX1010, ¶ 13.

Petitioner's Reply, 3

PO Sur-Reply at 12-14

No Disclosure of a Single-LED “Curtain Lamp” in ‘546 Patent



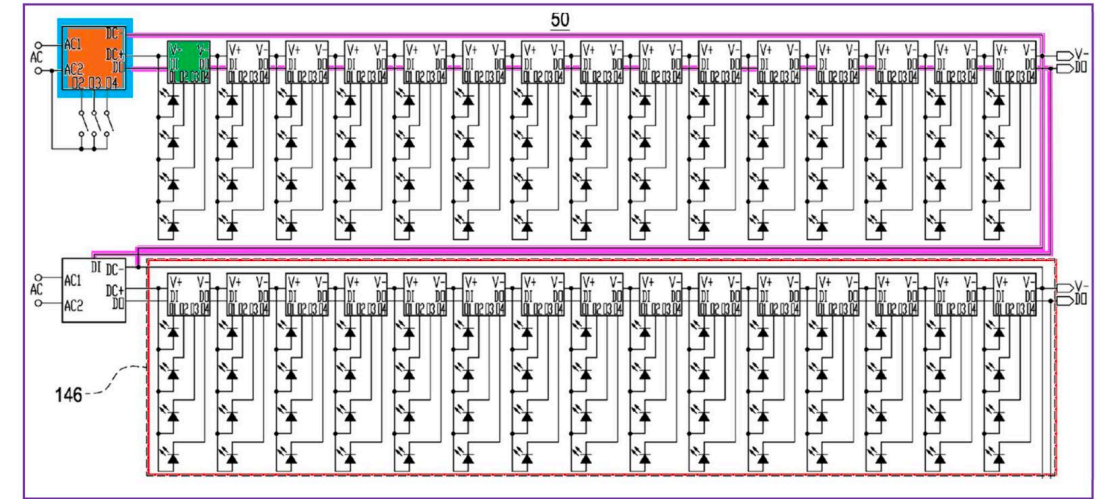
'546 Patent (Ex. 1001), Fig. 7 (annotated)

A string of the curtain lamp could have one LED

The light-emitting diode light string 30 mentioned above includes a plurality of light-emitting diodes. However, the light-emitting diode light string 30 could include single light-emitting diode. It is called the driving apparatus for light-emitting diode curtain lamp with single light-emitting diode in one light-emitting diode string of the present invention.

Ex. 1001, 6:15-20.

'546 Patent (Ex. 1001), portion of Fig. 8 (annotated)



First cited in
Petitioner's Reply



- No basis for Petitioner or Dr. Schubert to assert that a single LED constitutes the claimed “curtain lamp,” even if the assertion were timely.

POR at 3-7, 12-14

Each Ground Fails For Multiple Reasons

Reference:	Fatal Deficiency:	Dispositive of Challenged Claim(s):
Kuang	No “synchronous signals”	<u>1</u> , 2, 3
	No “curtain lamp”	<u>1</u> , 2, 3
	No reason to add a transistor	3
Lys	No “synchronous signals”	<u>1</u> , 2, 3
	No “curtain lamp” or “second curtain lamp”	<u>1</u> , 2, 3, <u>8</u>
	No reason to add a transistor	3
	No “master control unit”	<u>1</u> , 2, 3, <u>8</u>
Hiroyuki	No “pins”	<u>4</u> , 5, 6
	No “signal processor”	<u>8</u>
	No reason to add a microcontroller	5, 6, <u>8</u>

POR at 12-51; PO Sur-Reply at 2

NO REASON TO ADD A TRANSISTOR TO *KUANG* OR *LYS*

Ground 2: *Kuang* in view of *Debevec*

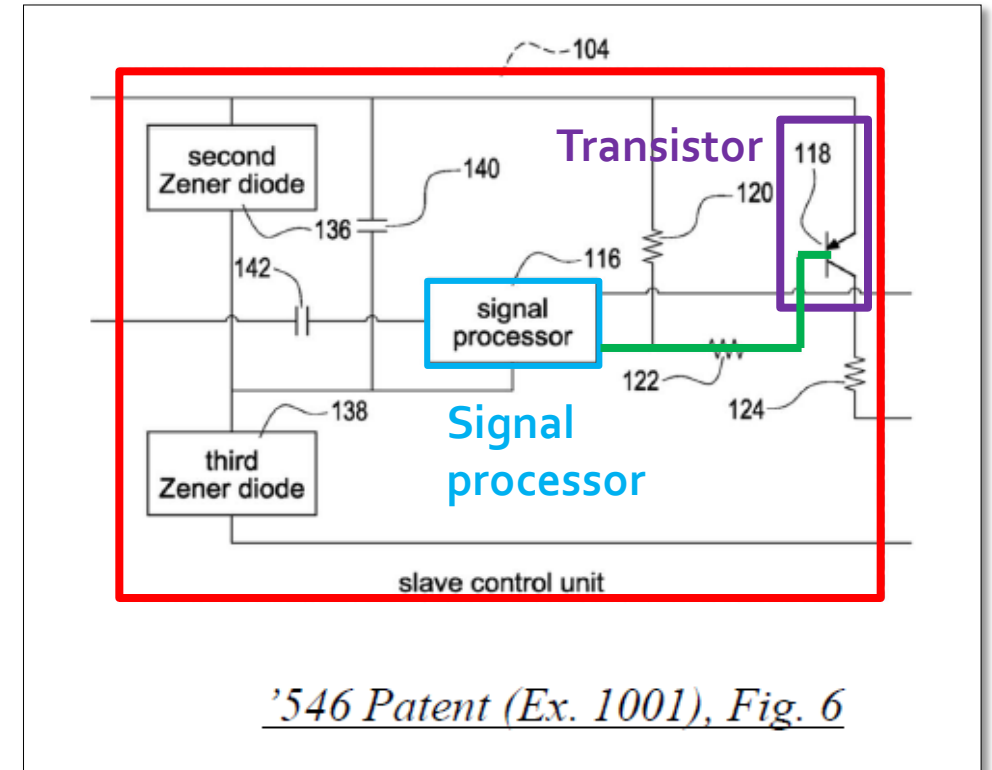
Ground 4: *Lys* in view of *Debevec*

Petitioner Admits that *Kuang* and *Lys* Each Lack the “Transistor” of Claim 3

Claim 3. The driving apparatus for light-emitting diode curtain lamp in claim 2, wherein the **slave control unit** includes a **transistor electrically connected to the signal processor**.

Although *Kuang* does not explicitly disclose a “slave control unit” that includes “a transistor electrically connected to the signal processor,” Debevec does. EX1003, ¶ 55.

Although *Lys* does not explicitly disclose a “slave control unit” that includes “a transistor electrically connected to the signal processor,” Debevec does. See *supra* at Section V.A.1.a; EX1003, ¶ 93.



The Patent Office Allowed Claim 3 Over *Debevec*

4. (Original) The driving apparatus for light-emitting diode curtain lamp in claim 3, wherein the slave control unit includes a transistor electrically connected to the signal processor.

Claim 3 of the '546 patent was claim 4 during examination

Allowable Subject Matter

Claims **5-10** are allowed.

Claims **2-4** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.



Claims 2-4 Allowed over Debevec

Claim **1** is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Debevec (U.S. Pub. 2012/0050606 A1).

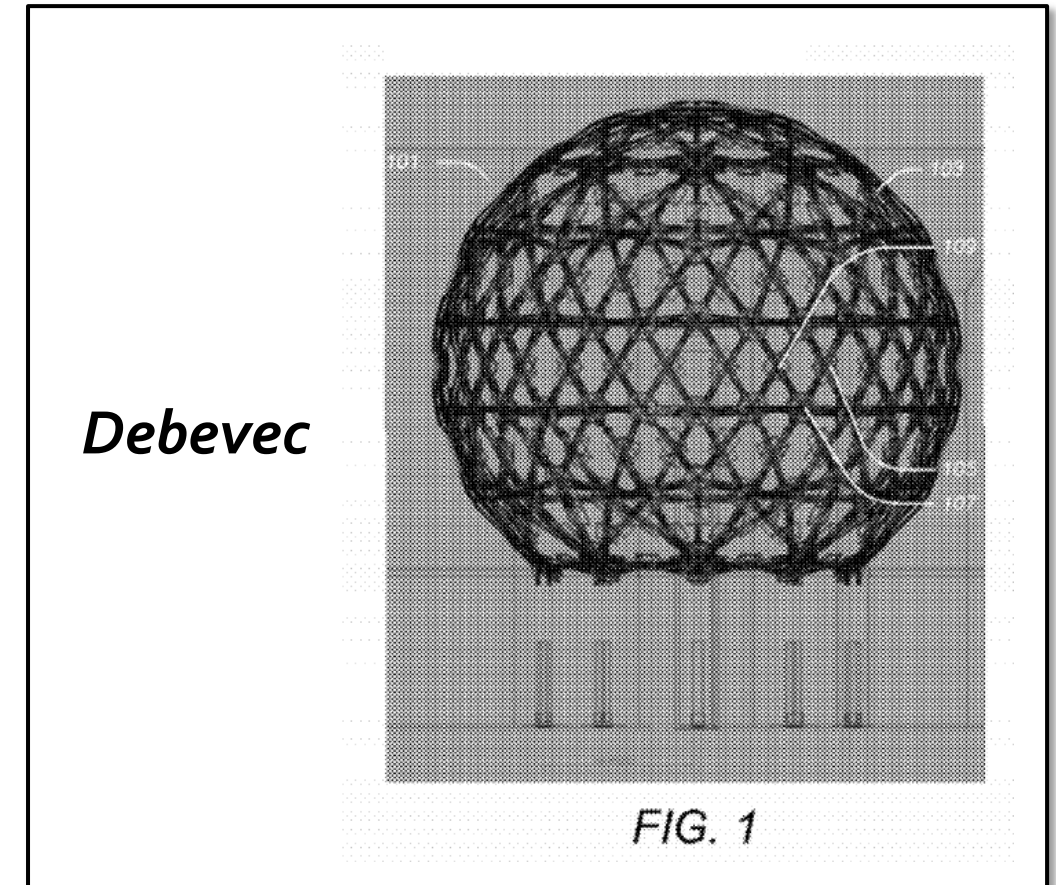
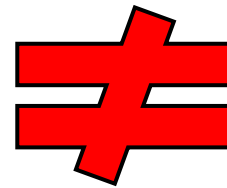
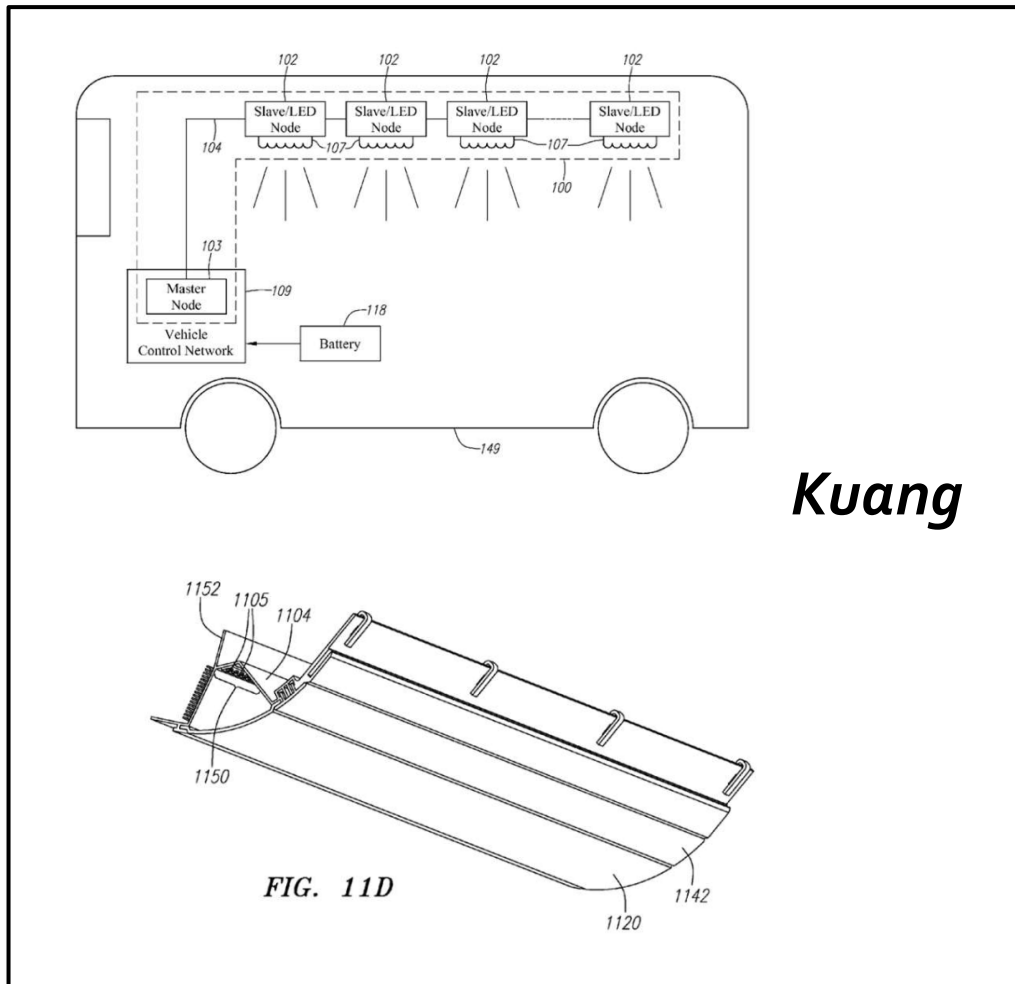
Only claim 1 Rejected by Debevec

Ex. 1002, 70-71; 80

POR at 7, 34; PO Sur-Reply at 21-22

There is no reason to add a transistor to *Kuang* or *Lys*

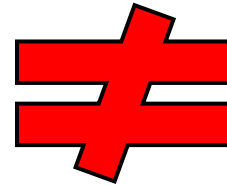
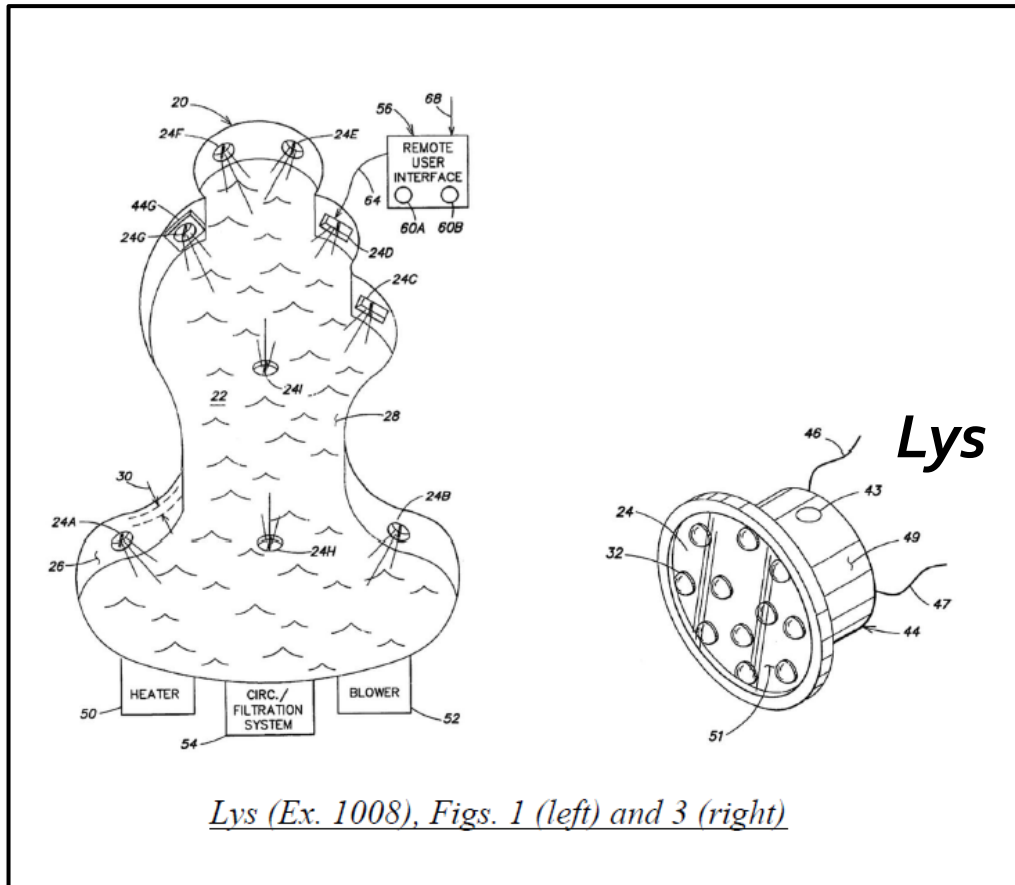
- *Debevec* isn't relevant to *Kuang* and *Lys*



Ex. 1004; Ex. 1005; POR at 34-40; PO Sur-Reply at 21-22

There is no reason to add a transistor to *Kuang* or *Lys*

- *Debevec* isn't relevant to *Kuang* and *Lys*



Debevec

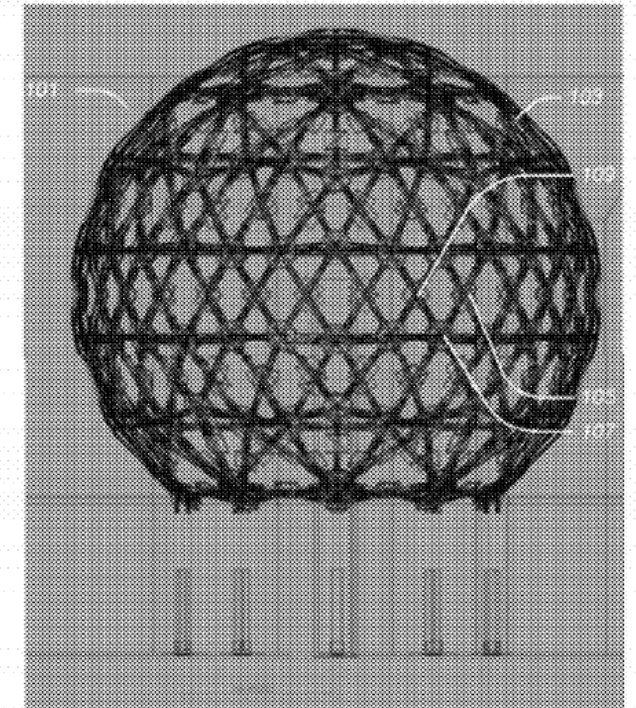


FIG. 1

Ex. 1004; Ex. 1005; POR at 34-40; PO Sur-Reply at 21-22

There is no reason to add a transistor to *Kuang* or *Lys*

- *Debevec*: Use transistor for calibrating brightness:

Debevec discloses using a transistor as part of a “brightness feedback circuit” in a group controller, to calibrate the brightness of each light source based on temperature. Ex. 1005 [0078]; *see also* Pet. 21. Petitioner alleges that it would have

POR at 35.

- Petitioner’s reason for adding *Debevec*’s transistor = Add a switch/valve to control LED brightness:



color, and temporal dynamics. In order to adjust the brightness of LEDs, or to switch them ON or OFF, an electric switch or valve is needed. A transistor is a common electrical switch or valve used in electrical circuits. A POSITA would be

Petition, 21-22, 48

POR at 34-40; PO Sur-Reply at 21-22

There is no reason to add a transistor to *Kuang*

- *Kuang* already discloses brightness control → does not need *Debevec*'s transistor:

LED intensity
control via pulse
width modulation

“on” LEDs at a given time. Likewise, the intensity of light may be increased by increasing the percentage of time that the LEDs are turned on using pulse width modulation, and/or by turning on additional selected LEDs which are initially in an “off” state. The master node 203 may convey commands to

Adjust LEDs based
on temperature

[0052] In one aspect, temperature feedback is used (via temperature sensor 430) in order to adjust the LED current if necessary via current control circuitry 421, in a manner which can advantageously extend the lifetime of the LEDs by minimizing the risk of over-current conditions. Other control

Ex. 1004, [0035], [0052]

- No deficiency in *Kuang* → no modification necessary 

There is no reason to add a transistor to *Lys*

- *Lys* already discloses brightness control → does not need *Debevec*'s transistor:

Control LEDs using
PWM

In particular, according to one aspect of this embodiment, the controller 34 of FIG. 2 outputs one or more control signals 36 to the light source 24, wherein the control signal(s) may include one or more pulse width modulated signals. Pulse-width-modulated signal control of LEDs is

Adjust LED
intensity using
PWM or variable
analog signals

source, without human perceptible flicker. In this technique, the duty cycle of a pulse width modulated signal serving as the control signal 36 (intended for one or more LEDs of a particular color) is adjusted based on the desired intensity of the radiation output by the particularly colored LED(s). In an alternative method of LED control according to another embodiment, one or more control signals 36 output by the controller 34 to the light source 24 may include one or more variable analog signals to adjust the relative intensities of differently colored LEDs of the light source 24.

Ex. 1008, 11:29-33, 43-52

- No deficiency in *Lys* → no modification necessary



POR at 36-37; PO Sur-Reply at 21-22

Petitioner Abandoned Grounds 2 and 4

Petition:

Kuang + Debevec

Although Kuang does not explicitly disclose a “slave control unit” that includes “a transistor electrically connected to the signal processor,” Debevec does. EX1003, ¶ 55.

Petition at 20

Lys + Debevec

Although Lys does not explicitly disclose a “slave control unit” that includes “a transistor electrically connected to the signal processor,” Debevec does. *See supra* at Section V.A.1.a; EX1003, ¶ 93.

Petition at 48

Petitioner’s Reply:

Kuang + Debevec
Lys + Debevec

In the alternative and in response to Dr. Lebby’s admissions, Dr. Schubert agrees with Dr. Lebby that “Kuang’s system already has the capabilities of ‘an electronic switch or valve.’” and “Lys already has a type of ‘electric switch or valve.’” EX1010, ¶ 54. As such, Kuang and Lys each independently disclose the “transistor” limitation without combining with Debevec. *Id.*

Petitioner’s Reply at 19

Does not demonstrate “slave control unit [that] includes a transistor electrically connected to the signal processor” of claim 3.

POR at 34-40, PO Sur-Reply at 21

Each Ground Fails For Multiple Reasons

Reference:	Fatal Deficiency:	Dispositive of Challenged Claim(s):
Kuang	No “synchronous signals”	<u>1</u> , 2, 3
	No “curtain lamp”	<u>1</u> , 2, 3
	No reason to add a transistor	3
Lys	No “synchronous signals”	<u>1</u> , 2, 3
	No “curtain lamp” or “second curtain lamp”	<u>1</u> , 2, 3, <u>8</u>
	No reason to add a transistor	3
	No “master control unit”	<u>1</u> , 2, 3, <u>8</u>
Hiroyuki	No “pins”	<u>4</u> , 5, 6
	No “signal processor”	<u>8</u>
	No reason to add a microcontroller	5, 6, <u>8</u>

POR at 12-51; PO Sur-Reply at 2

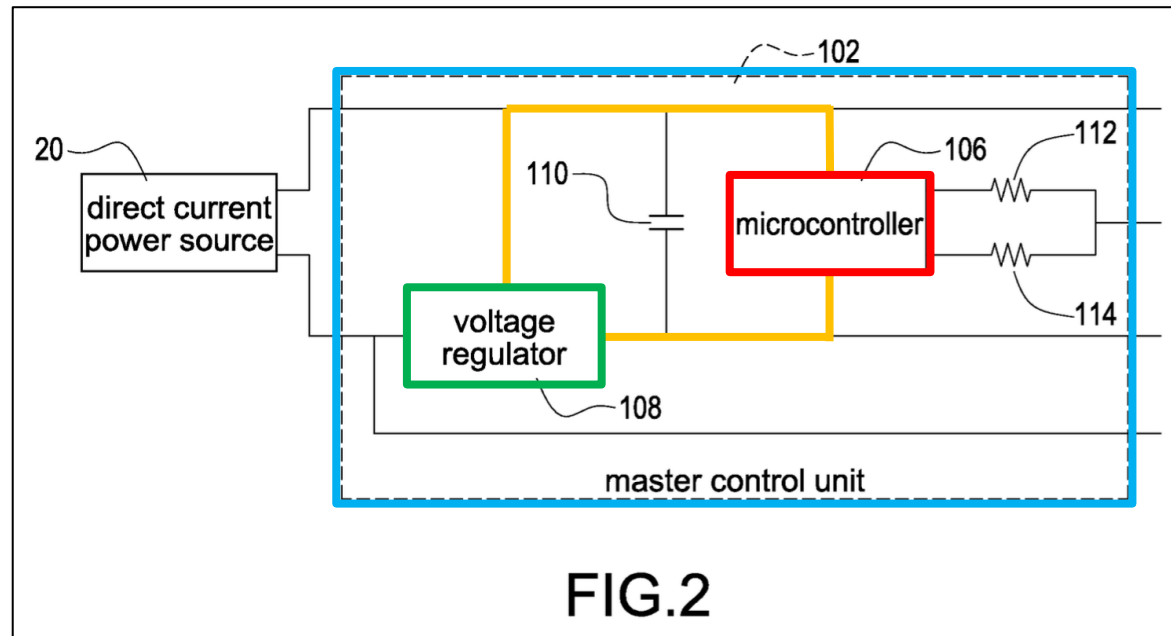
LYS LACKS A “MASTER CONTROL UNIT”

Ground 3

1[A] Requires a Master Control Unit Including a Microcontroller + Voltage Regulator

1[A] a master control unit electrically connected to the direct current power source, including a microcontroller and a voltage regulator electrically connected to the microcontroller

Example:



Ex. 1001, Fig. 2

POR at 29-32;
PO Sur-Reply at 18-20

8[B] Recites a Master Control Unit Including a Microcontroller

8[B] wherein the master control unit includes a microcontroller; the slave control unit includes a signal processor;

Example:

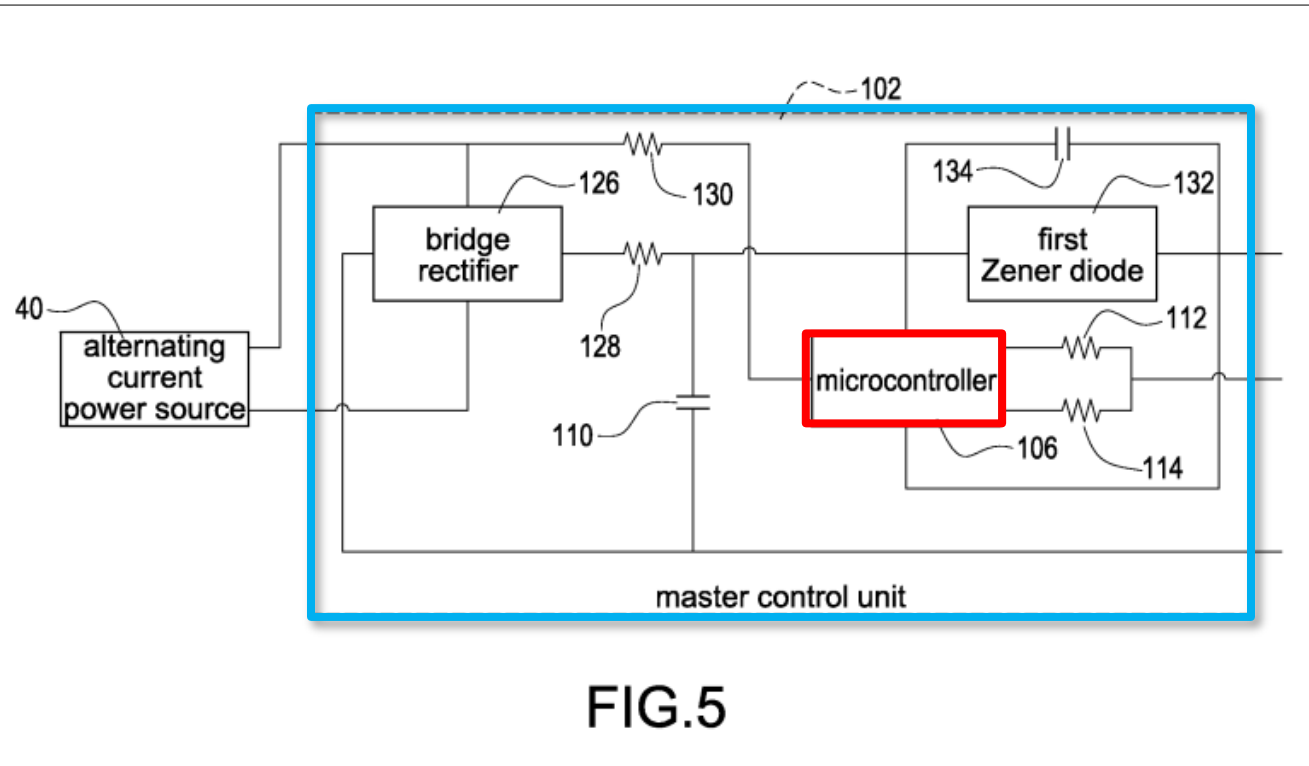


FIG.5

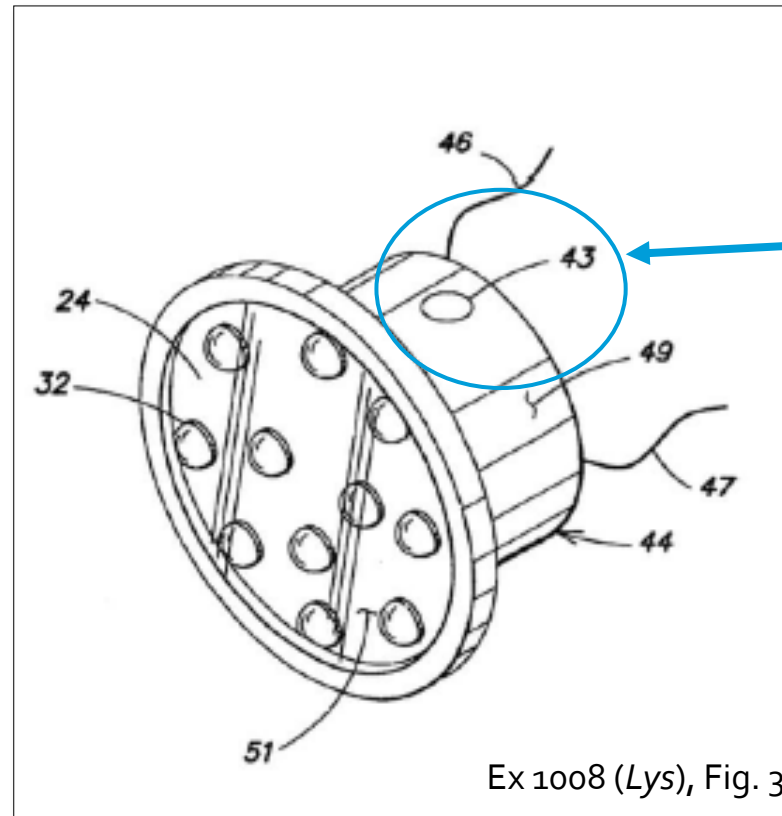
Ex. 1001, Fig. 5

POR at 48-51;
PO Sur-Reply at 24-25

The Petition's Flawed Mappings of *Lys*

1[A] a **master control unit** electrically connected to the direct current power source, including a **microcontroller** and a **voltage regulator** electrically connected to the **microcontroller**

First Mapping: Local User Interface 43



A button, switch, or dial.
Pet. 25, citing *Lys* at 14:17-29.

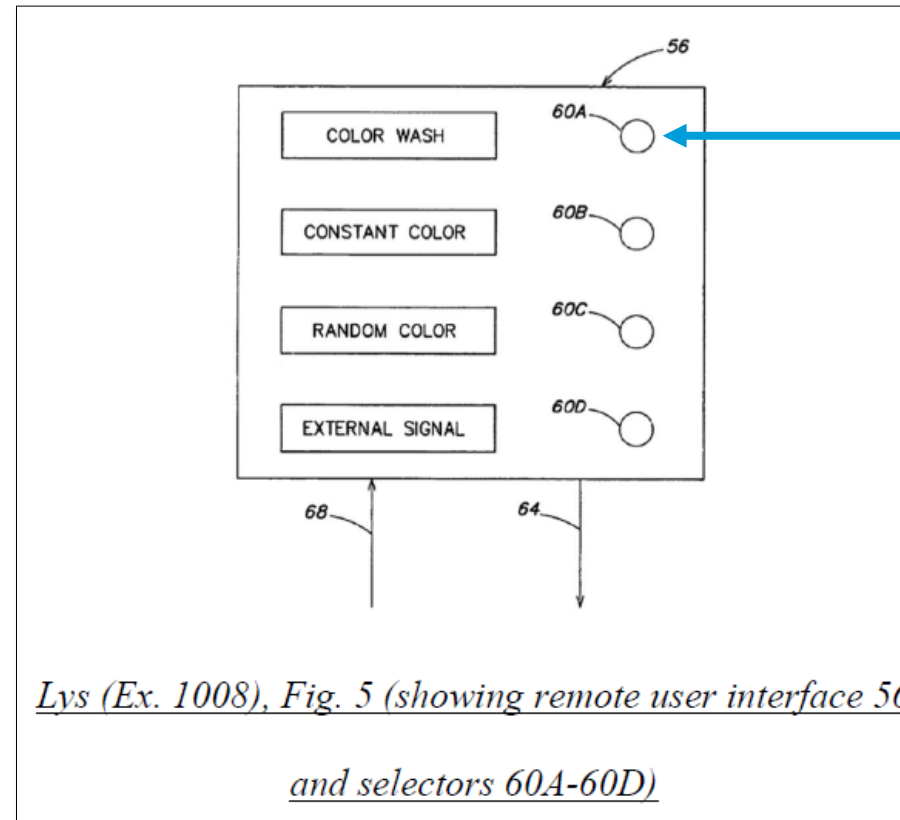
No **microcontroller**
or **voltage regulator**

Pet. 25, citing *Lys* at 14:17-29.
POR at 29-32; PO Sur-Reply at 18-20

The Petition's Flawed Mappings of *Lys*

1[A] a **master control unit** electrically connected to the direct current power source, including a **microcontroller** and a **voltage regulator** electrically connected to the **microcontroller**

Second Mapping: Remote Interface 56



Selectors 60A-60D

No **voltage regulator**



Selectors 60A-60D in *Lys* Are Not Voltage Regulators

Dr. Schubert: selectors 60A-60D are voltage regulators because they select colors.



Lys: any voltage regulation is by the controller 34 or light source 24, not selectors 60A-60D

Selectors 60A-60D of remote user interface select parameters; **no voltage regulation**

form a networked lighting system. In the embodiment shown in FIG. 5, the remote user interface 56 may include

one or more selectors, shown in FIG. 5 as the selectors 60A-60D, to allow a user to remotely control at least one parameter associated with variable color radiation generated by one or more light sources. According to various embodi-

Ex. 1008, 19:61-20:4

Any possible voltage regulation occurs in controller 34 or light source 24

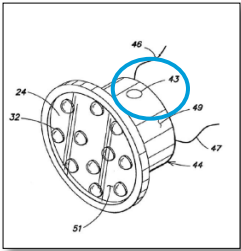
FIG. 2. Upon activation by a user of one of the selectors 60A-60C associated with the respective pre-programmed illumination programs indicated on the remote user interface 56 shown in FIG. 5, one or more control signals 64 is output by the remote user interface 56 and received as one or more external signals 46 at the input 45 of the controller 34 shown in FIG. 2. Upon receiving the one or more external signals 46, the controller 34 selects the appropriate pre-programmed illumination program from the storage device 38 and executes the program, thereby generating one or more control signals 36 to control the light source 24 in a predetermined manner.

Ex. 1008, 20:31-42

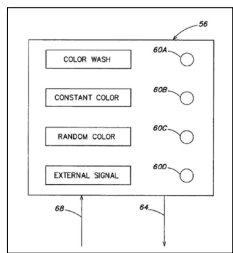
POR at 29-32; PO Sur-Reply at 18-20

Petitioner's Reply Transformed The Mappings of Lys to "Master Control Unit" (1[A])

Petition:

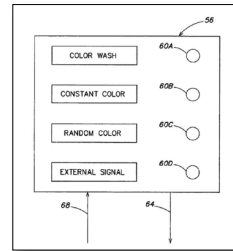
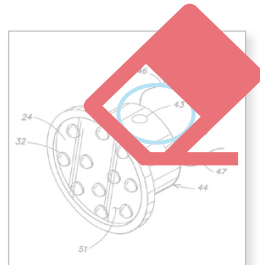


(1) Local User Interface 43



(2) Remote Interface 56

Patent
Owner's
Response

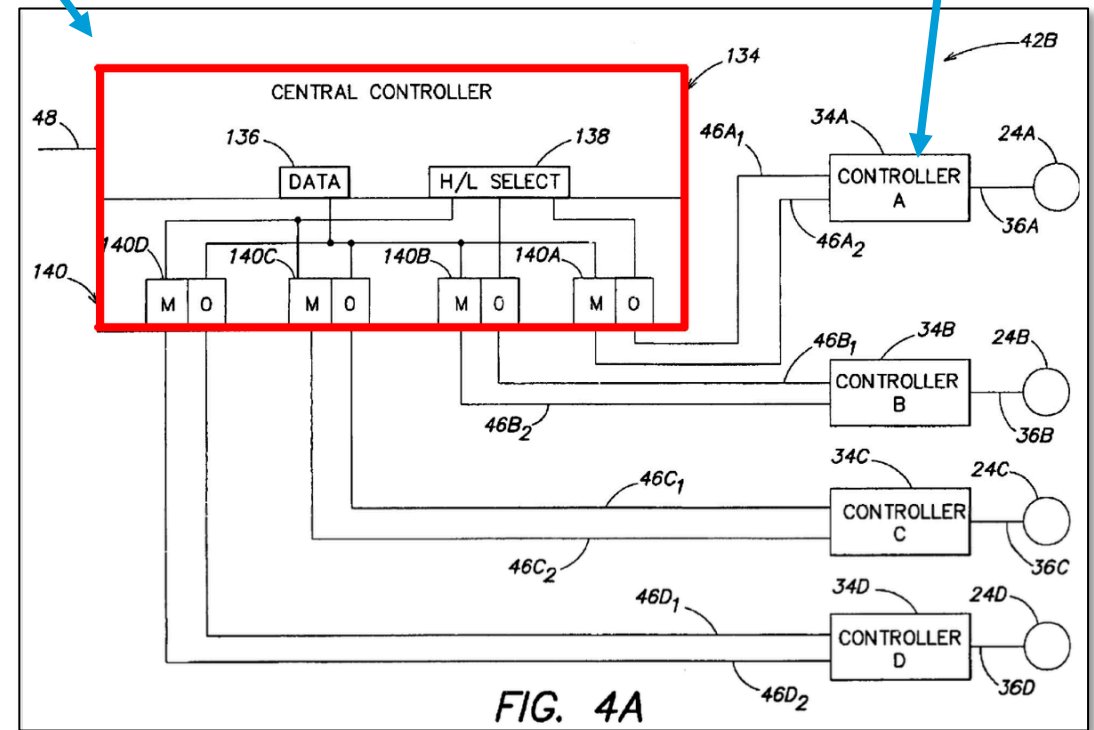


(1) Remote Interface 56

Petitioner's Reply:

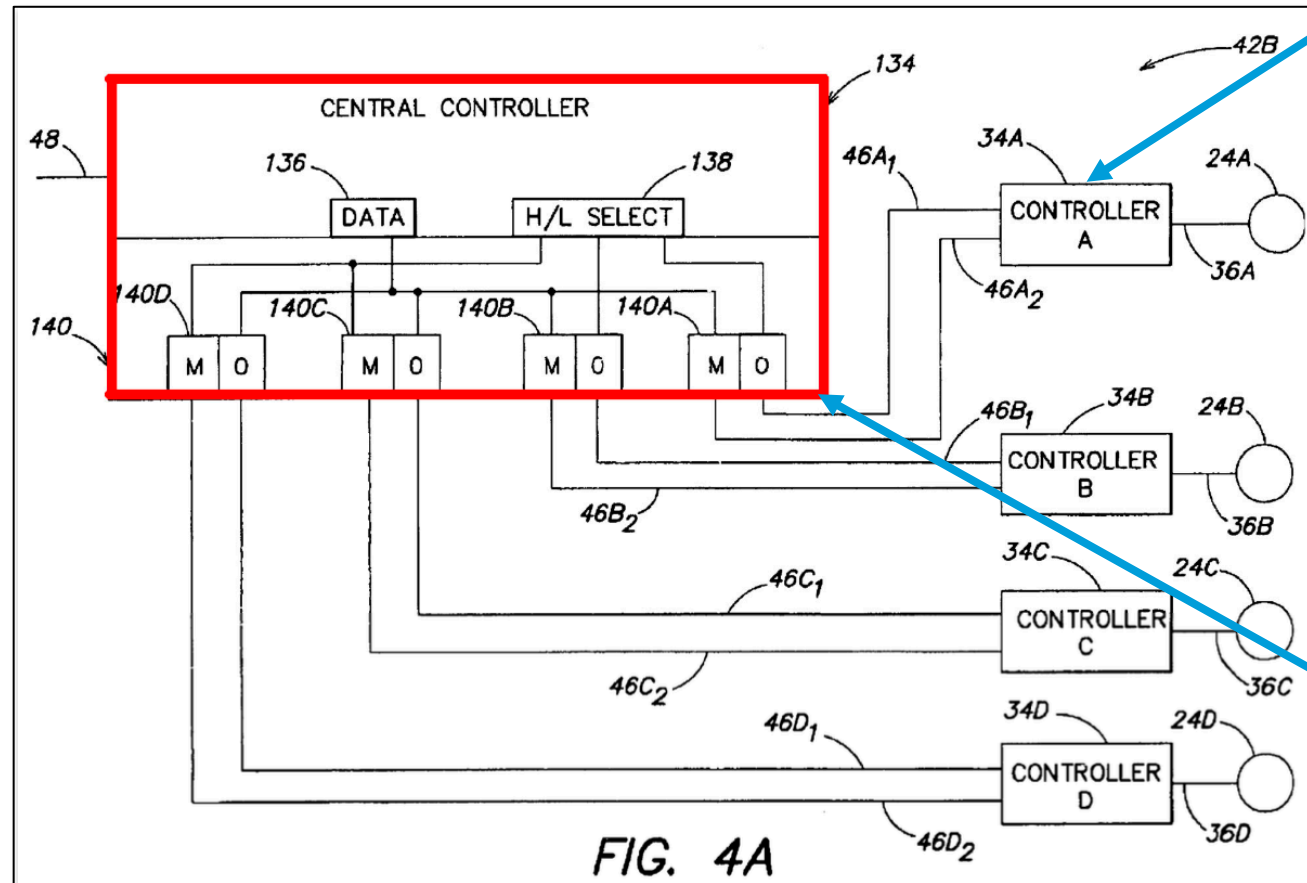
(2) Central Controller 134

(3) Controller 34



Ex. 1008, Fig. 4A (as annotated in Petitioner's Reply at 16)

New Mappings In Petitioner's Reply Are Deficient

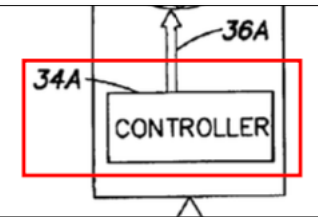


Ex. 1008, Fig. 4A (as annotated in Petitioner's Reply at 16)

New mapping : **Controller 34**

- Already mapped to the "slave control unit" of 1[B]:

controllers 34A-34D
function as claimed
"slave control units"



Petition at 29

- New mapping upends **Petition Ground 3**

New mapping: **Central Controller 134**

- Late, and incomplete – no explanation of entirety of 1[A]

Each Ground Fails For Multiple Reasons

Reference:	Fatal Deficiency:	Dispositive of Challenged Claim(s):
Kuang	No “synchronous signals”	<u>1</u> , 2, 3
	No “curtain lamp”	<u>1</u> , 2, 3
	No reason to add a transistor	3
Lys	No “synchronous signals”	<u>1</u> , 2, 3
	No “curtain lamp” or “second curtain lamp”	<u>1</u> , 2, 3, <u>8</u>
	No reason to add a transistor	3
	No “master control unit”	<u>1</u> , 2, 3, <u>8</u>
Hiroyuki	No “pins”	<u>4</u> , 5, 6
	No “signal processor”	<u>8</u>
	No reason to add a microcontroller	5, 6, <u>8</u>

POR at 12-51; PO Sur-Reply at 2

HIROYUKI LACKS “PINS”

Ground 5: *Hiroyuki* in view of the Knowledge of a POSITA

Independent Claim 4 Recites Multiple “Pins”

Claim 4 of the '546 patent:

4. A driving apparatus for light-emitting diode curtain lamp applied to an alternating current power source and at least a light-emitting diode light string, the driving apparatus for light-emitting diode curtain lamp including:

- a master control unit including a **power negative terminal pin** of master control unit and a **signal output pin** of master control unit, the master control unit being electrically connected to the alternating current power source; and
- at least a slave control unit including a **signal input pin** of slave control unit, a **signal output pin** of slave control unit, a **power positive terminal pin** of slave control unit, and a **power negative terminal pin** of slave control unit, the slave control unit being electrically connected to the master control unit and the light-emitting diode light string,

wherein the slave control unit is controlled by the master control unit to drive the light-emitting diode light string; the **signal output pin** of master control unit is electrically connected to the **signal input pin** of slave control unit; the **power negative terminal pin** of master control unit is electrically connected to the **power positive terminal pin** of slave control unit.

Ex. 1001, col. 7, line 31- col. 8 line 7

- Independent claim 4 recites “**terminal**” and “**pin**” → presumed to have **different meanings**

POR at 40-44; PO Sur-Reply at 22-23

Mere Mention of “Terminals” in *Hiroyuki* Does Not Meet the Claimed “Pins”

- Petitioner and Dr. Schubert: “pin” = pointed

Dr. Schubert: “pin” can be understood as a “**pointed terminal**.”

100. Finally, a POSITA would have understood Hiroyuki’s “terminal” notation to correspond to “terminal pin” or “output pin” as claimed. For example, a POSITA would have understood a “pin” to be “[a] *terminal* on a connector, plug, or tube base.” EX1009 at 566 (definition of “pin”). The words “terminal” and “pin” typically imply an electrical end point at which an electrical connection is made to another unit. A “pin” can be understood as a pointed terminal, indicating that “terminal” encompasses a “pin.”

Ex. 1003, ¶ 100

Petitioner cites a dictionary definition of “pin” as “a **short, pointed wire**.”

pin [DES ENG] 1. A cylindrical fastener made of wood, metal, or other material used to join two members or parts with freedom of angular movement at the joint. 2. A short, pointed wire with a head used for fastening fabrics, paper, or similar materials. [ELECTR] A terminal on an electron tube, semiconductor, integrated circuit, plug, or connector. Also known as base pin; prong. { pin }

Ex. 1017 at 1600.

- Petitioner never establishes that *Hiroyuki*’s “terminals” are “pointed” or “short, pointed wires.”

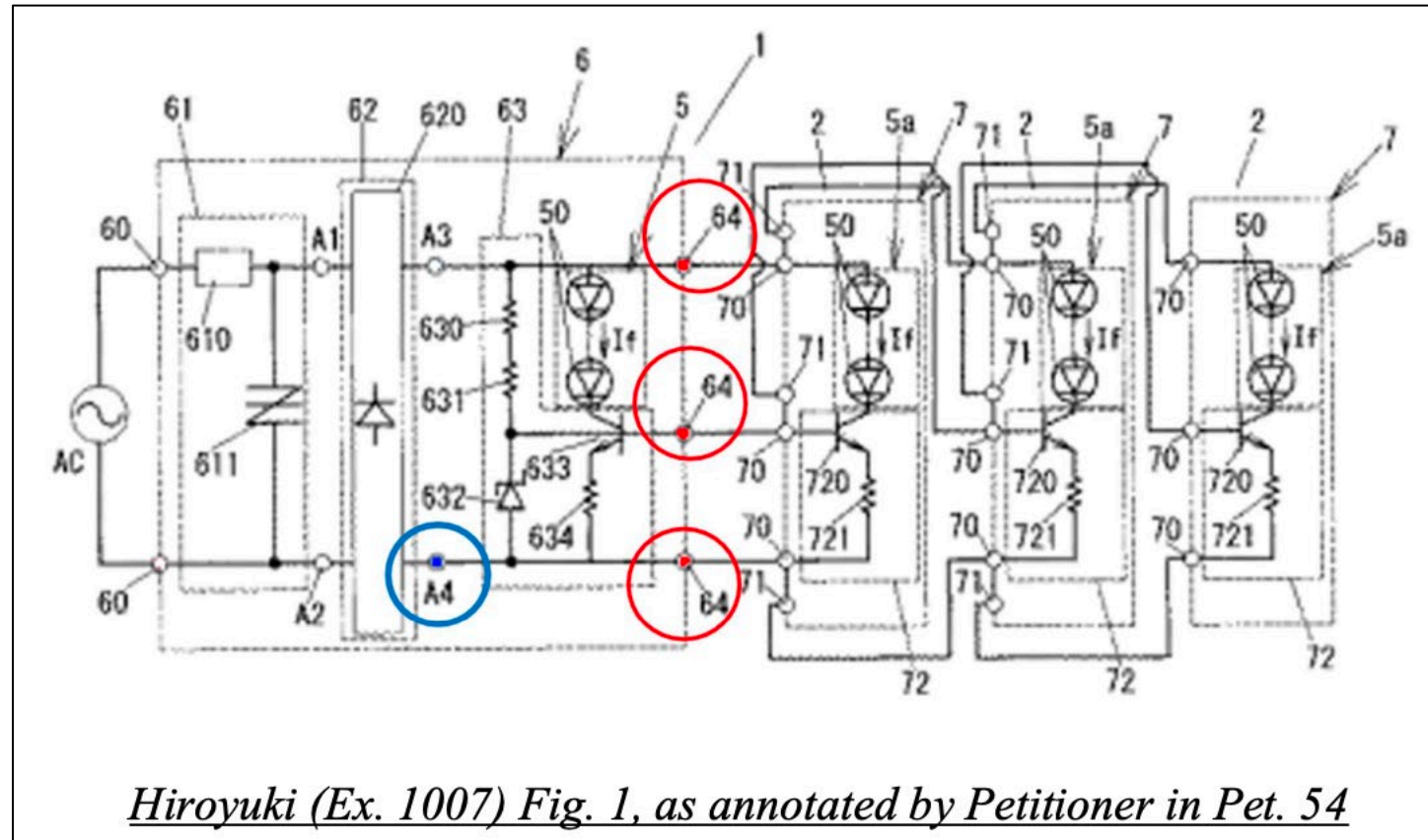
POR at 40-44

PO Sur-Reply at 22-23

Hiroyuki Does Not Show or Disclose the Claimed “Pins”

- No basis for the “terminals” in *Hiroyuki* to meet the “pins” in claim 4

Hiroyuki circuit diagram



Does not show that
“terminals” 64 are
“pins,” let alone
“pointed terminals” or
“pointed wires.”

Hiroyuki (Ex. 1007) Fig. 1, as annotated by Petitioner in Pet. 54

POR at 40-44
PO Sur-Reply at 22-23

HIROYUKI LACKS “A SIGNAL PROCESSOR”

Ground 6: *Hiroyuki* in view of *Kuang*

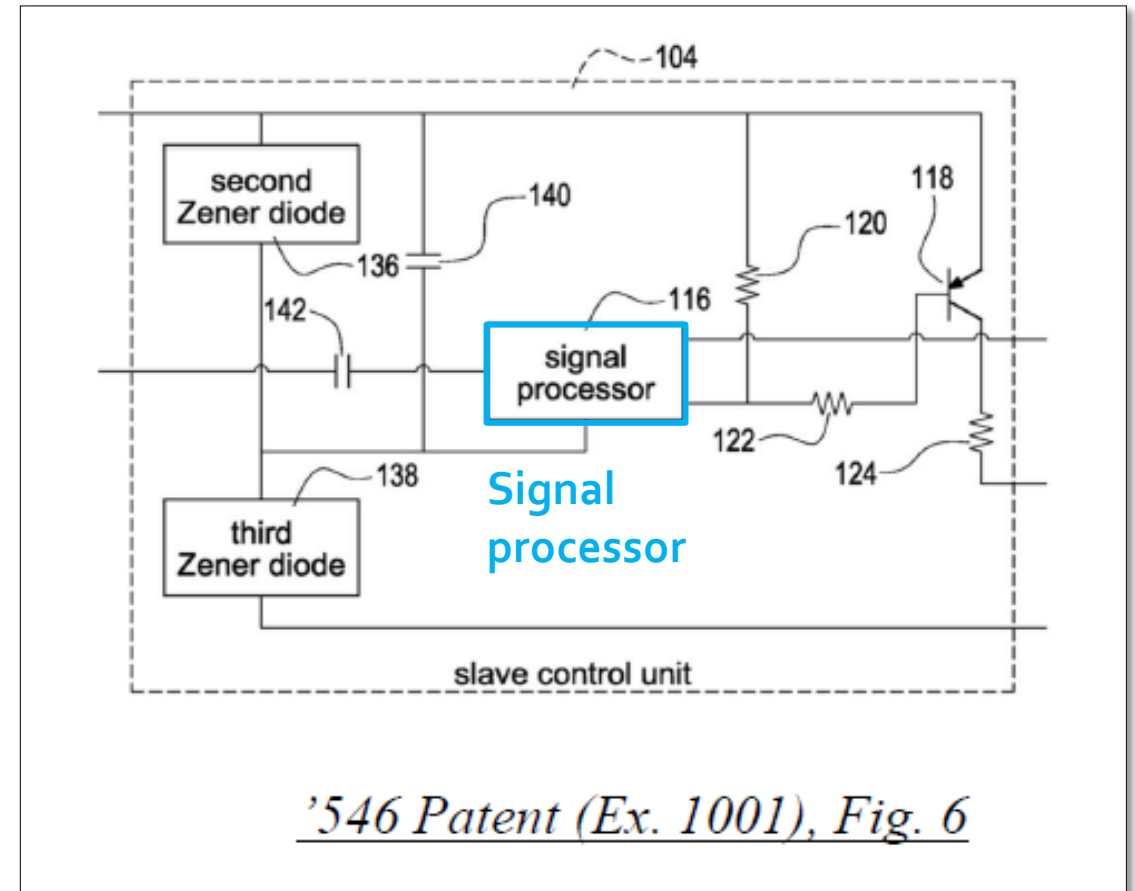
“Signal processor” in the '546 Patent

8[B]: wherein the master control unit includes a microcontroller; the slave control unit includes a **signal processor**

- “Signals” in the '546 patent transmit information related to operation of the LED lights.
- Control signals and synchronous signals.

signal *n.* **1.** Any electrical quantity, such as voltage, current, or frequency, that can be used to transmit information. **2.** A beep or tone from a computer’s speaker or a prompt displayed on screen that tells a user that the computer is ready to receive input.

Microsoft Computer Dictionary (Ex. 2002), 480.



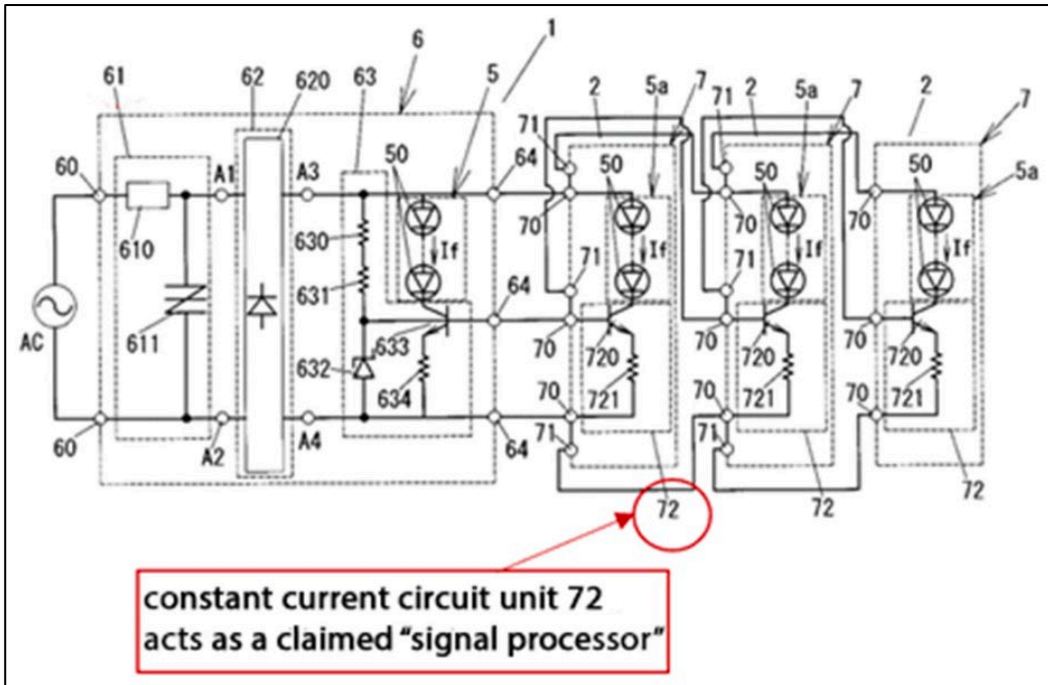
- “Signal” is more than just power.

POR at 46-48; Sur-Reply at 23-24

Hiroyuki's Transistor-Resistor is Not a “Signal Processor”

- The Petition points to a “constant power circuit” in *Hiroyuki* and says it “acts as a signal processor.”
- The Board already found this mapping deficient:

Petition at 76:



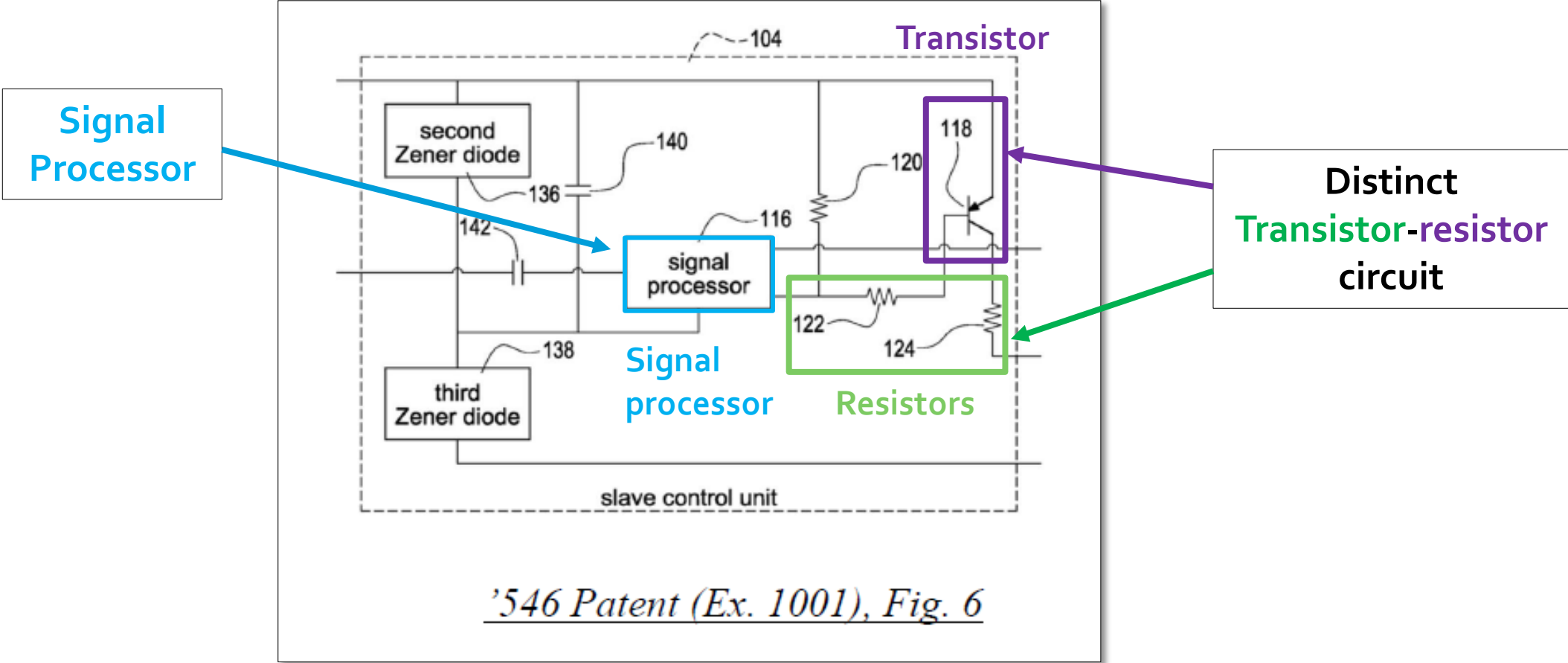
Ex. 1007, Fig. 1 (as annotated in Pet. at 76)

Institution Decision at 55:

We have considered the parties' arguments with respect to *Hiroyuki* and limitation 8[B]. As noted above, Petitioner does not offer an interpretation of “signal processor.” It is therefore not clear, at this juncture, why, according to the Schubert Declaration at paragraph 127, “a POSITA would have understood the constant current circuit unit 72 in *Hiroyuki* to meet the ‘signal processor’ limitation as claimed because it regulates the power supply to keep its output current constant in spite of changes in load, line, or temperature.” See Ex. 1003 ¶ 127; see also Prelim. Resp. 33–35.

- The Petition failed to explain why a transistor-resistor that regulates power supply meets the “signal processor” of claim 8
- The Board should maintain its preliminary finding

The '546 Patent Distinguishes a “Signal Processor” From a Transistor-Resistor Circuit



POR at 46-48; Sur-Reply at 23-24

NO MOTIVATION TO ADD A “MICROCONTROLLER” TO *HIROYUKI*

Ground 6: *Hiroyuki* in view of *Kuang*

No Dispute that Hiroyuki Lacks a Microcontroller of Claims 5 and 8[B]

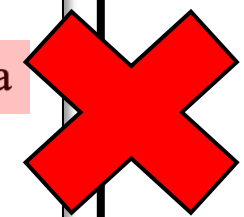
Claim 5: The driving apparatus for light-emitting diode curtain lamp in claim 4, wherein the **master control unit includes: a microcontroller**; and a bridge rectifier electrically connected to the microcontroller.

8[B]: wherein the **master control unit includes a microcontroller**; the slave control unit includes a signal processor;

Petition at 68:

Although there is no explicit disclosure of a microcontroller in Hiroyuki, a POSITA would have been aware of, and would have found it obvious, to include a microcontroller in Hiroyuki's illumination apparatus such as the microcontroller disclosed in Kuang. *See supra* at Section IV.A.1.b (claim element 1[A]). Hiroyuki

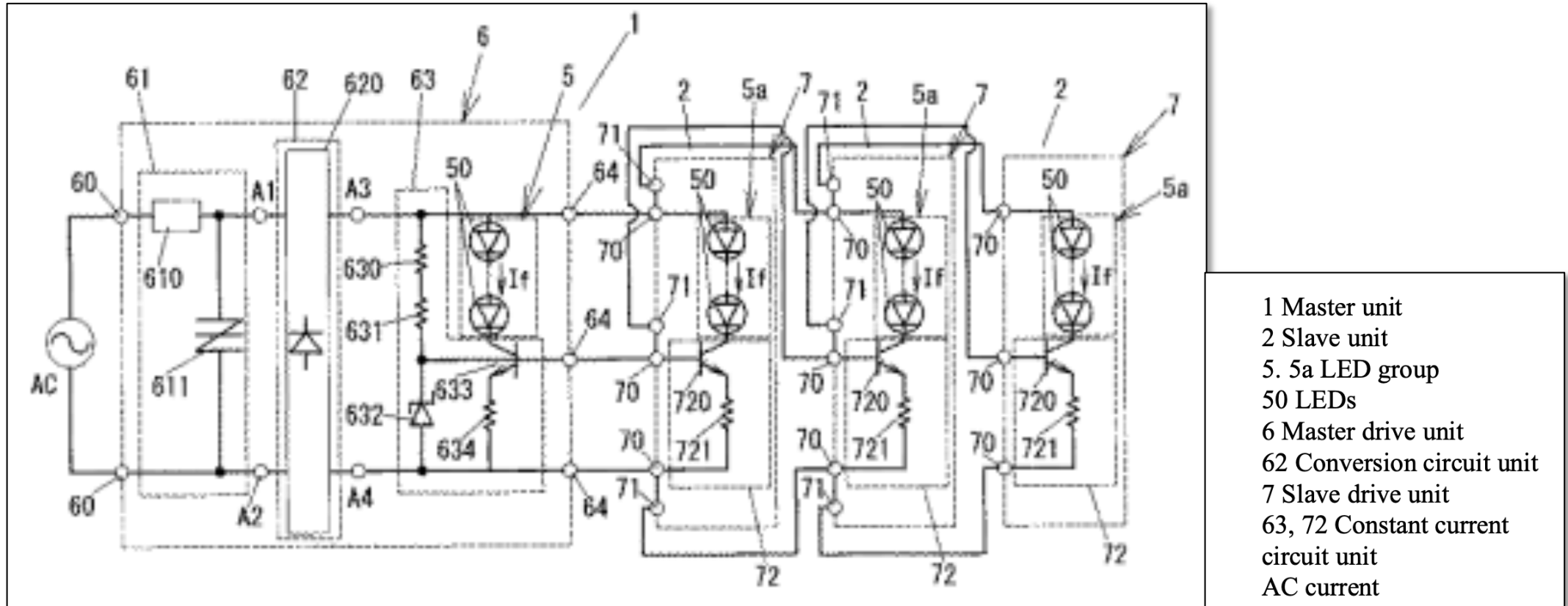
Pet. at 68



POR at 48-51; PO Sur-Reply at 24-25

No Motivation to Add a Microcontroller to *Hiroyuki*

- *Hiroyuki* discloses a lighting device with a completed circuit:



Ex. 1007, Fig. 1

- Where / how would a POSITA add a microcontroller?
- How would the rest of the circuit change?



POR at 48-51; PO Sur-Reply at 24-25

No Motivation to Add a Microcontroller to *Hiroyuki*

Hiroyuki's
lighting device is
designed to be:

Low-cost

Miniature

Thin

A “simple circuit
structure.”

(57) [Abstract]

[Problem] To achieve smaller size, thinner and lower cost.

[0009]

The present invention is made in view of the above points, and the purpose is to provide illumination apparatuses that can realize miniaturization, thinness, and low cost.

[0011]

In this configuration, the conversion circuits of the first lighting unit can be shared by one or more second lighting units, so that miniaturization, thinness, and low cost can be realized.

[0014]

According to the present invention, miniaturization, thinness and low costs can be realized.

[0020]

The LED groups 5, and 5a each comprises of a plurality of LEDs 50 connected in series (see 18 in FIG. 2) on an LED substrate (not shown). Each LED 50 is, for example, a white LED or the like, and has a forward voltage of 3 to 4V. As described above, since a plurality of LEDs 50 are connected in series, there is no need to step down the AC voltage (for example 100V) of the AC power supply (see FIG. 1) to the above forward voltage, and lighting can be achieved with a simple circuit structure.

No Motivation to Add a Microcontroller to *Hiroyuki*

Hiroyuki's
lighting device is
designed to be:

Low-cost

Miniature

Thin

A "simple circuit
structure."

Adding a
microcontroller to
Hiroyuki would:

Increase cost

Potentially
increase size

Add complexity

Petitioner does not
dispute these drawbacks.

Dr. Schubert: adding a
microcontroller would
require "programming"
and "tuning"

POR at 49-51; Sur-Reply at 24-25.

All Challenged Claims Should Be Upheld as Patentable

Ground No.	Petition Ground	Institution Decision Finding	Patent Owner's Requested Relief
1	<i>Kuang</i> + Knowledge of a POSITA (Claims <u>1</u> , <u>2</u>)	Institution granted	Reverse preliminary findings on institution
2	<i>Kuang</i> + <i>Debevec</i> (Claim 3)	Not addressed	Find claim patentable
3	<i>Lys</i> + Knowledge of a POSITA (Claims <u>1</u> , <u>2</u> , <u>8</u>)	Not addressed	Find all claims patentable
4	<i>Lys</i> + <i>Debevec</i> . (Claim 3)	Not addressed	Find claim patentable
5	<i>Hiroyuki</i> + Knowledge of a POSITA (Claim 4)	Petition found deficient	Uphold preliminary findings and find claim patentable
6	<i>Hiroyuki</i> + <i>Kuang</i> Claims 5, 6, <u>8</u>)	Petition found deficient for claim 8 Claims 5 and 6 not addressed	Uphold preliminary findings and find claim patentable

POR at 1-3; PO Sur Reply at 25

Summary of Untimely Theories First Raised in Petitioner's Reply

Petitioner's Reply sets forth new theories that should not be considered

Ground	Prior Art	Claim(s)	Petitioner's new theories for:	See Petitioner's Reply
1	<i>Kuang</i> in view of Knowledge of a POSITA	<u>1</u> , 2	the "curtain lamp"	Paper 17 at 3-4
3	<i>Lys</i> in view of Knowledge of a POSITA	<u>1</u> , 2, <u>8</u>	the "curtain lamp" the "synchronous signals" the "master control unit"	Paper 17 at 3 Paper 17 at 14 Paper 17 at 16
2, 4	<i>Kuang</i> or <i>Lys</i> in view of <i>Debevec</i>	3	the "transistor"	Paper 17 at 18-20

PO Sur-Reply at 11-21

Petitioner Reply - New mapping of Kuang for “curtain lamp”

Petition mapping: LED units 424:

Moreover, a POSITA would have understood Kuang to disclose a “curtain lamp,” which is commonly understood to be one or more light strings: “the LED-based lighting fixture 400 may include five LED units or modules 424 each having, e.g., eight LEDs, for a total of 40 LEDs on a single LED-based lighting fixture 400.” *Id.* at [0045]. See also, e.g., the ’546 patent at 2:34-40 (describing Figures 7 and 8 in the ’546 patent as illustrating circuit diagrams for curtain lamps with a single LED string and a plurality of LED strings, respectively). Kuang

Petition, 8

New mapping **absent from Petition**: LED units 274:

Petitioner’s Reply abandons the Petition’s application of *Kuang*. Petitioner now asserts that various LED units 274 constitute a “string of LEDs,” Paper 17 at 3-4, but the newly-cited Figure 2A of *Kuang* illustrates LED units that are individually connected to slave nodes, and does not illustrate a *string of LEDs* as Petitioner asserts. Aside from this new theory, Petitioner relies heavily on Dr. Schubert’s tardy interpretation of “light string” as being a single LED. Paper 17 at 2-3, citing Ex.

PO Sur-Reply at 15

PO Sur-Reply at 14-17

Lys Does Not Disclose “Synchronous Signals”: Late Theory Based on “Independently Controllable Light Sources”

Other disclosures in *Lys* support Petitioner’s understanding. For example, “[i]n another embodiment of the invention, two or more independently controllable light sources of the pool or spa environment shown in FIG. 1 may be synchronized without necessarily being coupled to a network[.]” EX1008 at 19:29-32. The

Paper 17, 14

- This “other embodiment” in *Lys* was first cited in Petitioner Reply: Late theory.
- No explanation of how this embodiment would meet the claimed master-slave control unit claim elements, or the “transmission line” element.

Challenged Claims of the '546 Patent

Independent Claim 1

1. A driving apparatus for light-emitting diode curtain lamp applied to a direct current power source and at least a light-emitting diode light string, the driving apparatus for light-emitting diode curtain lamp including:
 - a master control unit electrically connected to the direct current power source, including:
 - a microcontroller; and
 - a voltage regulator electrically connected to the microcontroller;
 - at least a slave control unit electrically connected to the master control unit and the light-emitting diode light string; and
 - a transmission line electrically connected to the master control unit and the slave control unit, wherein the slave control unit is controlled by the master control unit to drive the light-emitting diode light string; the transmission line is used to transit control signals and synchronous signals.

Ex. 1001, col. 7, lines 7-24

Challenged Claims of the '546 Patent

2. The driving apparatus for light-emitting diode curtain lamp in claim 1, wherein the slave control unit includes a signal processor.
3. The driving apparatus for light-emitting diode curtain lamp in claim 2, wherein the slave control unit includes a transistor electrically connected to the signal processor.

Ex. 1001, col. 7, lines 25-30

Challenged Claims of the '546 Patent

Independent Claim 4

4. A driving apparatus for light-emitting diode curtain lamp applied to an alternating current power source and at least a light-emitting diode light string, the driving apparatus for light-emitting diode curtain lamp including:
- a master control unit including a power negative terminal pin of master control unit and a signal output pin of master control unit, the master control unit being electrically connected to the alternating current power source; and
 - at least a slave control unit including a signal input pin of slave control unit, a signal output pin of slave control unit, a power positive terminal pin of slave control unit, and a power negative terminal pin of slave control unit, the slave control unit being electrically connected to the master control unit and the light-emitting diode light string,
- wherein the slave control unit is controlled by the master control unit to drive the light-emitting diode light string; the signal output pin of master control unit is electrically connected to the signal input pin of slave control unit; the power negative terminal pin of master control unit is electrically connected to the power positive terminal pin of slave control unit.

Ex. 1001, col. 7, line 31 to col. 8, line 7

Challenged Claims of the '546 Patent

5. The driving apparatus for light-emitting diode curtain lamp in claim 4, wherein the master control unit includes:
a microcontroller; and
a bridge rectifier electrically connected to the microcontroller.
6. The driving apparatus for light-emitting diode curtain lamp in claim 5, wherein the master control unit includes a first Zener diode electrically connected to the bridge rectifier.

Ex. 1001, col. 8, lines 8-14

Challenged Claims of the '546 Patent

Independent Claim 8

8. A driving apparatus for light-emitting diode curtain lamp with single light-emitting diode in one light-emitting diode string applied to at least a light-emitting diode, the driving apparatus for light-emitting diode curtain lamp with single light-emitting diode in one light-emitting diode string including:

- a master control unit; and
- at least a slave control unit electrically connected to the master control unit and the light-emitting diode,

wherein the master control unit includes a microcontroller; the slave control unit includes a signal processor; the driving apparatus for light-emitting diode curtain lamp with single light-emitting diode in one light-emitting diode string further including:

- an alternating current voltage transferring to direct current voltage circuit electrically connected to the slave control unit; and
- a second curtain lamp electrically connected to the alternating current voltage transferring to direct current voltage circuit.

Ex. 1001, col. 8, lines 25-44