

# Oral Hearing Patent Owner's Demonstrative Exhibits

IPR2025-00698, Patent No. 8,614,539

July 16, 2026

Demonstrative Only – Not Evidence

Feit Electric Co., Inc., Ex. 2042  
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# Roadmap

- U.S. Patent No. 8,614,539 Claims and Solution
- Ground 1: Krummacher, Stokes, and Shimizu
- Ground 2: Hussell, Krummacher, Stokes, and Van Woudenberg
- Secondary Indicia of Non-Obviousness

**U.S. Patent No. 8,614,539**

# U.S. Patent No. 8,614,539

**United States Patent**  
Dai et al.

(10) Patent No.: US 8,614,539 B2  
(45) Date of Patent: \*Dec. 24, 2013

## WAVELENGTH CONVERSION COMPONENT WITH SCATTERING PARTICLES

Appl. No.: 13/273,215

Filed: Oct. 13, 2011

### Prior Publication Data

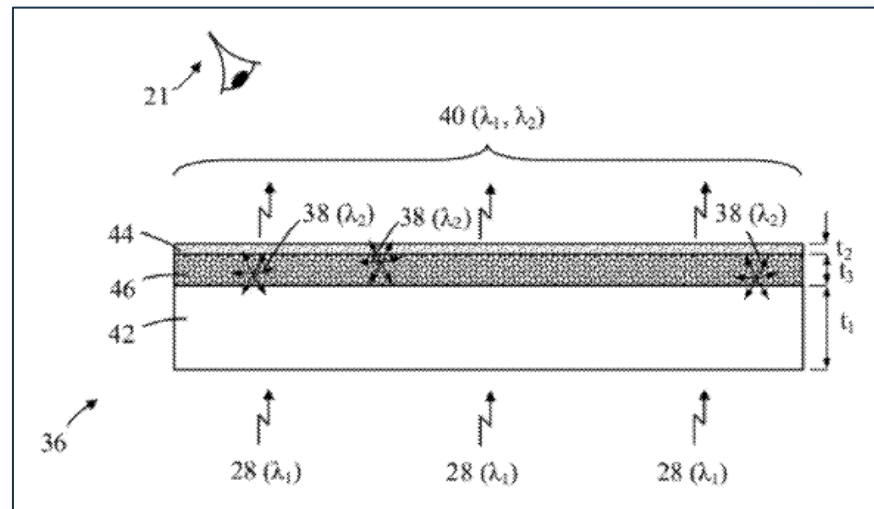
US 2012/0087104 A1 Apr. 12, 2012

### Related U.S. Application Data

Continuation-in-part of application No. 13/253,031,  
filed on Oct. 4, 2011.

Provisional application No. 61/427,411, filed on Dec.  
27, 2010, provisional application No. 61/390,091,  
filed on Oct. 5, 2010.

Therefore, there is a need for improved approaches to implement LED lighting apparatuses that maintains the desired color properties of the devices, but without requiring the large quantities of photoluminescent materials (e.g. phosphor materials) that are required in the prior approaches. In addition, there is a need for an improved approach to implement LED lighting apparatuses which addresses perceptible variations in color of emitted light with emission angle, and which also addresses the non-white color appearance of the LED lighting apparatuses while in an OFF state.



# U.S. Patent No. 8,614,539

1. A wavelength conversion component for a light emitting device comprising:

at least one photoluminescence material; and  
a light scattering material, wherein the light scattering material has an average particle size that is selected such that the light scattering material will scatter excitation light from a radiation source relatively more than the light scattering material will scatter light generated by the at least one photoluminescence material,

wherein the wavelength conversion component is configured such that in operation a portion of the excitation light comprising blue light having a wavelength of greater than or equal to 440 nm is emitted through the wavelength conversion component to contribute to a final visible emission product;

wherein the light scattering material scatters the blue light at least twice as much as light generated by the at least one photoluminescence material.

## Key Features

- Average particle size
- Blue light wavelength  $\geq 440$  nm
- Blue light scattered at least twice as much

## Takeaway

- The claims require a specific average particle size that produces differential scattering—not merely any scattering layer.

# U.S. Patent No. 8,614,539

The '539 Patent solves real problems in the phosphors of LED devices

## Off-State Appearance

- Yellow/orange appearance → white appearance through claimed diffusion layer

## Color Nonuniformity

- Angular color variation → improved uniformity via particle-size-dependent scattering

## Cost Reduction

- Reduces phosphor usage by up to 40% while maintaining performance

# **Challenged Grounds**

# Challenged Grounds

| Ground | Challenged Claims  | Basis          | References                                                                                    |
|--------|--------------------|----------------|-----------------------------------------------------------------------------------------------|
| 1      | 1-11, 18-20, 23-25 | 35 U.S.C. §103 | Krummacher (EX1107) in view of Stokes (EX1108) and Shimizu (EX1109, EX1110)                   |
| 2      | 18 and 28          | 35 U.S.C. §103 | Hussell (EX1111) in view of Krummacher (EX1107), Stokes (EX1108), and Van Woudenberg (EX1120) |

# Petitioner's Burden After Institution

## Institution is not a final determination

- The Board's institution decision applied only the “reasonable likelihood” standard and is not binding at trial.
- Petitioners retain the burden to prove unpatentability by a preponderance of the evidence.

The Board “must assess all of the evidence, including evidence that was not before it at institution.”

*Trivascular, Inc. v. Samuels*, 812 F.3d 1056, 1068 (Fed. Cir. 2016)



# Average Particle Size

**Petitioners never clearly identified whether they rely on Krummacher or Stokes for the claimed “average particle size”**

- The Petition repeatedly states “Krummacher in view of Stokes discloses” without making clear its theory.
- Neither reference individually teaches the claimed average particle size.

“[I]t is the petitioner’s burden to make clear when alternative arguments are being presented and to sufficiently expound on each one.”

*Netflix, Inc. v. DivX, LLC*, 84 F.4th 1371, 1380 (Fed. Cir. 2023)



# Krummacher Does Not Teach the Claimed Average Particle Size

- Krummacher ¶39: TiO<sub>2</sub> or Al<sub>2</sub>O<sub>3</sub> particles with radius between 50 nm and 1000 nm (diameter 100–2000 nm).
- This enormous range does not identify a specific average particle size or a beneficial subrange.
- Much of Krummacher's range (diameters >300 nm) would **not** preferentially scatter blue over red/green per the '539 Patent's Figure 10.
- No motivation to select the narrow 100–150 nm range.

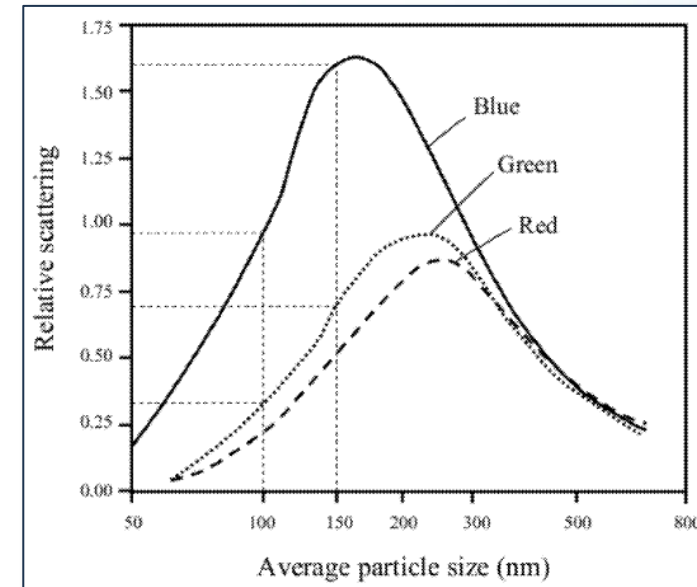


FIGURE 10

100–150 nm: blue scattered ~3× more than green/red  
200 nm: blue scattered >2×  
>300 nm: differential scattering diminishes

# The Petition's Discussion of Stokes is Deficient

## Petition identifies only two cites from Stokes

Paper 5 (Petition), 26-27

To the extent that the claim language “an average particle size that is selected such that [it preferentially scatters blue light]” requires an average particle size selected for that reason (rather than an average particle size that leads to that outcome), this claim element is rendered obvious by Stokes. (EX1102, ¶125.)

Stokes explicitly discloses the selection of an average particle size “such that the particles preferentially scatter blue ... LED light as compared to yellow ... light from the luminescent material.” (EX1108, 7:1-4.)

A POSA would have had reason to use such a basis for selecting average particle size as taught by Stokes. (EX1102, ¶¶126-28.) For example, Stokes discloses:

[The relevant] particle size range is advantageous because it enhances the scattering of the radiation source radiation while it decreases the amount of scattering of the luminescent material radiation. Therefore, the lamp radiation output is rendered more uniform because a greater amount of radiation source radiation is scattered toward the luminescent material, while a lesser amount of the luminescent material radiation that is emitted downward toward the radiation source is scattered back toward the luminescent material.

(EX1108, 7:17-26.)

## Both cites are deficient; Neither teaches an average particle size

In one preferred embodiment, the radiation scattering particles have a size such that the particles preferentially scatter blue or UV LED light as compared to yellow, green, red or white light from the luminescent material. Preferably,

Ex. 1108 (Stokes), 7:1-4

such as that emitted by the phosphor or dye). This particle size range is advantageous because it enhances the scattering of the radiation source radiation while it decreases the amount of scattering of the luminescent material radiation. Therefore, the lamp radiation output is rendered more uniform because a greater amount of radiation source radiation is scattered toward the luminescent material, while a lesser amount of the luminescent material radiation that is emitted downward toward the radiation source is scattered back toward the luminescent material.

Ex. 1108 (Stokes), 7:17-26

# Ground 1: Motivation to Combine Fails

- Petitioners rely exclusively on Prof. Doolittle's conclusory testimony.
- Krummacher is focused on OFF-state obscuring of electronics, not ON-state uniformity—Prof. Doolittle does not explain why Krummacher would care about ON-state uniformity.
- No explanation of why a POSITA would selectively combine three references from different fields.

128. Thus, a POSA would have been motivated to apply this principle to Krummacher, because it would increase the conversion of blue light to yellow light and improve the uniformity of the light source. Conversion of blue light to yellow light is improved by maximizing the scattering of blue light. Uniformity is improved by preferentially scattering the concentrated light from the blue-light LED chip instead of the disperse light emitted by the phosphor.

Ex. 1102 (Doolittle Decl.), ¶128

# Ground 1: Different Applications Defeat Combination

## Krummacher

Vertical chip configuration;  
Large-area lighting panels

## Shimizu

DIP/lead-frame SMD LEDs;  
Displays, backlights, traffic signals

## Stokes

DIP/SMD LEDs;  
Automotive, display, safety/emergency

### **These references require different packaging considerations**

Petitioners provide only “simple substitution” without addressing how a POSITA would overcome packaging and application differences

# Petitioners' Shifting Arguments

## Petition

A POSA would have been motivated to use a blue-light LED chip like that disclosed by Stokes and Shimizu in a conventional white-light LED light source called for by Krummacher. (EX1102, ¶135.) Shimizu, in particular, is cited by both

\* \* \*

light LED disclosed in the prior art as directed by Krummacher. In other words, not only does Krummacher suggest the use of an LED like that disclosed in Stokes and Shimizu, doing so would have been the simple substitution of one known element for another to obtain predictable results and well within the skill of a POSA. (EX1102, ¶¶135-36.)

Paper 5 (Petition), 31

## Reply

PO's "different applications" argument rests on the premise that obviousness requires importing an LED chip from Shimizu or Stokes into Krummacher. POR at 33 ("Petitioners fail to explain why a POSITA would want to import a blue-light LED chip from Stokes or Shimizu into Krummacher"). But no one is "importing" an LED chip. Krummacher already discloses a blue LED (EX1107 ¶¶ 31-32, 36)

Paper 21 (Reply), 7

## Ground 2: Stitching of Four References Fails

Petitioners' Ground 2 stitches together four references with no coherent reason to combine

### Hussell

conventional incandescent replacement

### Krummacher

vertical chip / large-area lighting

### Stokes

DIP/SMD LEDs  
(automotive, display, safety)

### Van Woudenberg

pc-LED auxiliary lights in  
mobile phones/downlights

A patent claim “is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.”

*KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007)



# Ground 2: Motivation to Combine is Absent

Ground 2, Limitations 18[c] and 28[c]:  
No reason to combine Hussell and Krummacher

[c] at least one photoluminescence material; and

The combination of Hussell and Krummacher discloses these limitations. As noted above, Hussell discloses a wavelength conversion tube. The wavelength conversion tube includes a “tube wall having wavelength conversion material, such as phosphor, disposed therein.” (EX1111, Abstract.) Phosphor is a photoluminescence material because it converts light from one wavelength to

Paper 5 (Petition) at 59-61

No motivation to combine features  
*across all four references*

# Ground 2: Attempted Motivation Falls Short

At best, Petitioners assert a motivation to combine only two references at a time

“It does not suffice to simply be known. A reason for combining must exist.”

*Virtek Vision Int’l ULC v. Assembly Guidance Sys., Inc.*,  
97 F.4th 882, 888 (Fed. Cir. 2024)



Ground 2, Limitations 18[e] and 28[e]:  
No discussion of Hussell at all

[e] wherein the light scattering material has an average particle size that is selected such that the light scattering material will scatter excitation light from a radiation source relatively more than the light scattering material will scatter light generated by the at least one photoluminescence material

Krummacher in view of Stokes discloses that the light scattering material has an average particle size that is selected such that the light scattering material will scatter excitation light from a radiation source relatively more than the light scattering material will scatter light generated by the at least one photoluminescence material.

Paper 5 (Petition) at 65-69

# **Secondary Indicia of Non-Obviousness**

## Secondary Indicia of Non-Obviousness



Ex. 2034

**Long-felt need:** Industry need for LED lighting with white OFF-state, color uniformity, and reduced phosphor

**Commercial success:** Feit White Filament LED—price premium (\$29.97 vs. \$21.97 yellow filament)

**Industry praise:** Home Depot 2024 Innovation Award; consumer praise for white appearance

**Copying:** Competitors' white filament products post-date Feit's design

**Nexus:** Success/praise attributable to claimed invention (white OFF-state, uniform ON-state); Petitioners identify no other unclaimed feature driving success