Trials@uspto.gov
571-272-7822

Paper 31
Date: October 18, 2019

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FEIT ELECTRIC COMPANY, INC.,
Petitioner

v.

SIGNIFY HOLDING B.V. f/k/a PHILIPS LIGHTING HOLDING B.V.,
Patent Owner

Case IPR2018-00921
Patent 6,586,890 B2

Before TREVOR M. JEFFERSON, MIRIAM L. QUINN, and
JASON M. REPKO, Administrative Patent Judges.

REPKO, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining Some Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

In this *inter partes* review, Petitioner, Feit Electric Company, Inc., challenges the patentability of claims 1, 7, 14, 22, and 30 of U.S. Patent No. 6,586,890 B2 (Ex. 1001, "the '890 patent") owned by Signify Holding B.V. (f/k/a Philips Lighting Holding B.V.). We have jurisdiction under 35 U.S.C. § 6(b). Petitioner must prove that the claims are unpatentable by a preponderance of the evidence. We determine that Petitioner has proven that claims 1, 22, and 30 are unpatentable but has not proven that claims 7 and 14 are unpatentable.

A. Procedural History

The Petition contained challenges to claims 1, 7, 14, 22, and 30 as shown below. Paper 1 ("Pet.").

Reference(s)	Basis	Claim(s) Challenged
Biebl	35 U.S.C. § 103	1, 22, 30
Biebl, TI Book, and Hamp	35 U.S.C. § 103	7, 14
Hamp and LT1613	35 U.S.C. § 103	7
Hamp, LT1613, and Biebl	35 U.S.C. § 103	14

Patent Owner filed a Preliminary Response. Paper 6 ("Prelim. Resp."). We instituted trial. Paper 9 ("Inst. Dec."). After institution, Patent Owner filed a Response. Paper 15 ("PO Resp."). Petitioner filed a Reply. Paper 20 ("Pet. Reply").

The Petition is supported by the Declaration of Dr. Shackle. Ex. 1003. Patent Owner took cross-examination testimony of Dr. Shackle. Ex. 2016.

Patent Owner submitted the declaration of Dr. Regan A. Zane with its Patent Owner response. Ex. 2014. Petitioner took cross-examination testimony of Dr. Zane. Ex. 1020.

An oral hearing was held on July 24, 2019, and a transcript of the oral hearing is available in the record. Paper 27.

B. The '890 Patent

The '890 patent is entitled "LED Driver Circuit with PWM Output," and was issued on July 1, 2003, from Application No. 10/012,000, which was filed on December 5, 2001. Ex. 1001, (21), (22), (45), (54).

The invention is a driver circuit for light emitting diodes (LEDs) that use pulse-width modulation (PWM). *Id*., Abstract. The '890 patent's driver circuit purports to overcome the disadvantages of other designs. *See id.* at 1:12–36.

In particular, LEDs have a long operating life, high efficiency, and a low profile. *Id.* at 1:14–17. This makes them useful light sources for automobiles. *Id.* But small changes in the voltage applied to the LED lamp will cause appreciable current changes. *Id.* at 1:18–20.

According to the '890 patent, current source is the preferred driving method because LED-light output is proportional to current. *Id.* at 1:20–22. LED drivers in vehicles can use circuits with voltage-source outputs and current-limiting resistors or linear-current regulators. *Id.* at 1:22–25. Current-limiting resistors, however, cause power loss. *Id.* at 1:25–26. This makes such driver circuits inefficient. *Id.* at 1:25–26.

Also, driving an LED above or below nominal current can reduce its life and produce unpredictable light output. *Id.* at 1:27–29. These driver circuits perform unacceptably in higher-power applications, such as rear-combination vehicle lights—i.e., stop, turn, or tail lights. *Id.* at 1:29–34.

According to the ’890 patent, the disclosed driver circuit provides good regulation and efficiency and maintains operation at the LEDs’ nominal current, among other advantages. *Id.* at 1:39–43. Specifically, the disclosed driver circuit uses current feedback to adjust power to the LEDs. *Id.* at 1:65–67. Figure 1 of the ’890 patent shows a block diagram of the driver circuit, which is reproduced below. *Id.* at 1:54–55.

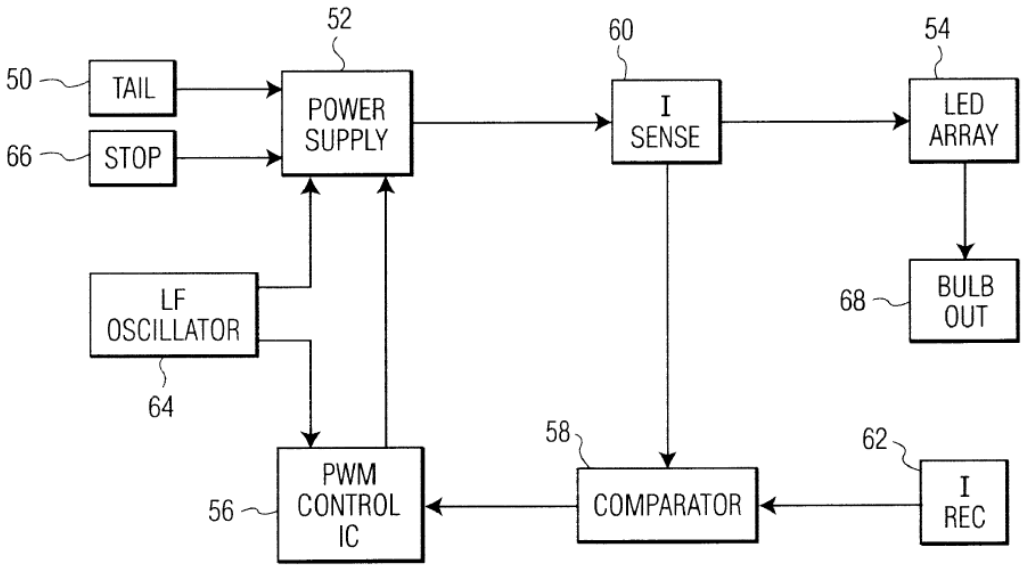

Figure 1 of the ’890 patent is a block diagram of an LED driver circuit.

As shown above in Figure 1, at block 50, a tail-lamp input signal is supplied to power supply 52. *Id.* at 2:2–4. Power supply 52 can be a DC/DC converter. *Id.* at 2:4–6. Power supply 52 supplies power for LED array 54. *Id.* at 2:6–8. PWM control IC 56 controls power supply 52 and provides a high-frequency periodic drive signal of varying pulse width. *Id.* at 2:6–11. This directs power supply 52 to supply the required power in response to a feedback signal. *Id.* In one embodiment, the drive signal is a square-wave. *Id.* at 2:11–13. Comparator 58 compares the sensed current signal from current sensor 60 to the reference signal from reference current source 62

and provides the feedback signal. *Id.* at 2:14–16. The system's feedback mechanism maintains constant LED current while meeting demand, which preserves the life of the LEDs and produces predictable light output. *Id.* at 3:27–31.

Also, power supply 52 provides a full-light mode and a dim mode. *Id.* at 1:65–67. Low-frequency oscillator 64 is involved in placing the driver circuit in dim mode. *See id.* at 2:17–48. For example, oscillator 64 provides a low-frequency oscillating signal to power supply 52 and PWM control IC 56. *Id.* at 2:17–19. When the low-frequency oscillating signal is in a low state, it (1) blocks the power to the LED array 54 from power supply 52 and (2) holds PWM control IC 56 low. *Id.* at 2:31–35. When the low-frequency oscillating signal changes from low to high, PWM control IC 56's output is synchronized to the transition. *Id.* at 2:35–37. With this feature, a lower operating frequency can be used with the dim mode while maintaining stable LED current. *Id.* at 2:37–39.

In another feature, a bulb-out signal indicates that LED array 54 has burned out or become disconnected. *Id.* at 2:57–60. Other features and purported advantages are disclosed in various embodiments. *See generally id.* at 2:61–5:15.

C. The Independent Claims

Of the challenged claims, claims 1 and 7 are independent and reproduced below.

> 1. A system for supplying power for an LED array, said system comprising:
>
> an oscillator generating an oscillating signal, the oscillating signal having a first state and a second state; and

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