

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SEMICONDUCTOR COMPONENTS INDUSTRIES, LLC d/b/a
ON SEMICONDUCTOR,
Petitioner,

v.

POWER INTEGRATIONS, INC.,
Patent Owner.

Case IPR2018-00160
Patent 7,239,119 B2

Before THOMAS L. GIANNETTI, BRIAN J. McNAMARA, and
LYNNE E. PETTIGREW, *Administrative Patent Judges*.

McNAMARA, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and
37 C.F.R. § 42.73

BACKGROUND

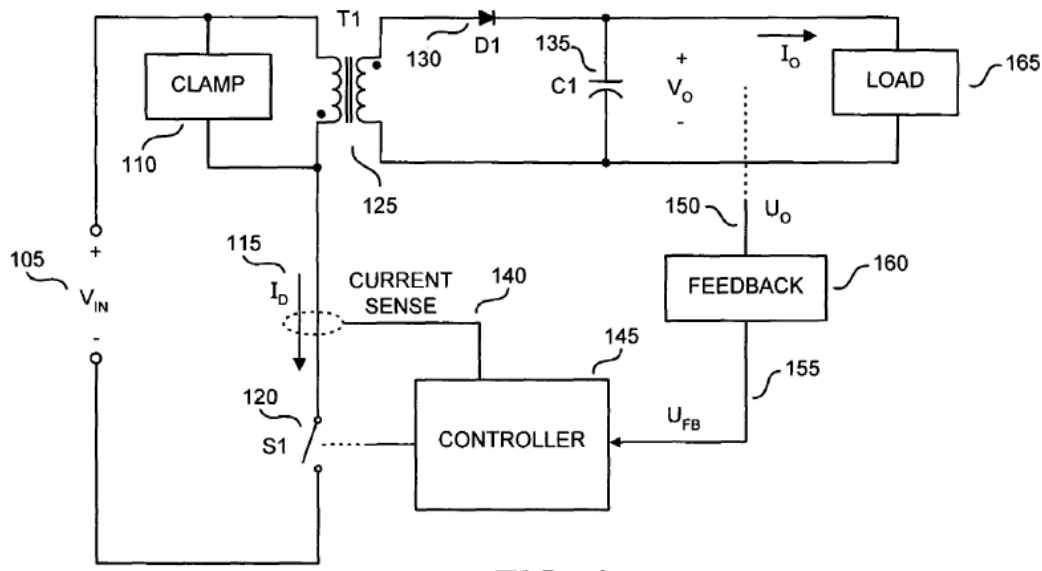
On May 22, 2018, we instituted an *inter partes* review of claims 26, 27, and 32 of U.S. Patent No. 7,239,119 B2 (“the ’119 patent”). Paper 7 (“Dec. to Inst.”). Power Integrations, Inc., (“Patent Owner”) filed a Patent Owner Response (Paper 9, “PO Resp.”), Semiconductor Components Industries, LLC d/b/a ON Semiconductor (“Petitioner”) filed a Petitioner Reply (Paper 12, “Pet. Reply”), Patent Owner filed a Sur-reply (Paper 15, “PO Sur-reply”), and a transcript of an oral hearing held on February 13, 2019 (Paper 17, “H’rg. Tr.”) has been entered into the record.

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a). We base our decision on the preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d).

Having reviewed the arguments of the parties and the supporting evidence, we conclude that Petitioner has demonstrated by a preponderance of the evidence that the challenged claims are unpatentable.

THE ’119 PATENT (EXHIBIT 1001)

The ’119 patent concerns power supplies subject to moderate continuous power demand for long durations and peak output power demand for infrequent and relatively short durations. Ex. 1001, 1:11–38. Figure 1 of the ’119 patent is shown below.



In the exemplary flyback power supply of Figure 1, energy transfer element 125 (T1) is coupled between an input and an output of the power supply, and unregulated input voltage 105 (V_{IN}) is coupled to T1 and transistor switch 120 (S1). *Id.* at 2:30–44. Transistor switch S1 produces pulsating current in rectifier 130 (D1) that is filtered by capacitor 135 (C1) to produce substantially constant output current or voltage to load 165. *Id.* at 2:47–57. Feedback circuit 160 couples the regulated current or voltage output 150 (U_O) to controller 145, which also receives current sense signal 140 that senses current 115 (I_D) in switch S1, using any known current sensing approach. *Id.* at 2:59–3:3. Controller 145 operates switch S1 to regulate output U_O by controlling the conduction time of switch S1 within a switching period. *Id.* at 3:4–9. Controller 145 includes an oscillator that “defines substantially regular switching periods” and “is configured to switch temporarily at a higher frequency to accommodate temporary peak load conditions.” *Id.* at 3:11–15.

Figure 4 shows that “higher switching frequency gives higher output power,” although such higher switching frequencies produce higher losses, as the switching cycle consumes power. Ex. 1001, 4:53–56. Therefore, the “switching regulator operates at the lowest switching frequency necessary to deliver the required output power up to a maximum frequency, where the maximum frequency is varied depending on the output power demand.” *Id.* at 4:56–61. The regulator has a first maximum switching frequency when the output power is less than a moderate power P_M and a substantially higher second maximum frequency when the output power is higher than P_M . *Id.* at 4:62–66. Figures 5 and 6 illustrate power demand and corresponding switching frequency for alternate embodiments. *Id.* at 1:57–64. In Figure 5, the shift in maximum frequency is in discrete steps; in Figure 6 the maximum frequency changes continuously to meet power demand. *Id.* at 5:5–8.

Many different techniques, e.g., counting the number of current limited switching periods, can be used to distinguish peak load from moderate load. *Id.* at 6:57–65. However, “[t]he change in switching frequency adjusts only the maximum power capability of the regulator and regulation of the output is accomplished by adjustment of a different variable, such as the conduction time of the switch.” *Id.* at 5:11–15. Figure 8, for example, includes an optional time limit circuit to restrict the duration of peak power output, in order to reduce the possibility of regulator damage resulting from a fault that demands a high load for an excessive time. *Id.* at 7:1–14.

As the duration of peak power (P_{PEAK}) demand is usually much less than one second, i.e., well below the thermal time constants of the electrical

components in the switching regulator, the regulator's peak power is limited by the maximum current of the components and by the switching frequency. *Id.* at 3:55–63. Shifting to higher maximum frequency for infrequent and short durations provides the required output power capability without the penalty of increased switching loss at moderate output power, and without the need to use larger components that are capable of higher currents. *Id.* at 5:39–43.

ILLUSTRATIVE CLAIM

Independent claim 26, reproduced below, is illustrative:

26. A method for regulating a power supply output, comprising:
receiving a feedback signal representative of an output level of
a power supply output;
switching a switch on and off at a switching frequency in
response to the feedback signal to regulate the flow of
energy from an input of the power supply to the power
supply output;
detecting when a load is greater than a power level threshold
value at the power supply output; and
temporarily increasing a maximum switching frequency of the
switching frequency of the switch when the load is greater
than the power level threshold value.

GROUND OF INSTITUTION

In our Decision to Institute, we instituted trial on the following challenges to patentability:

Claims 26 and 27 as anticipated under 35 U.S.C. § 102 by Hosoya;¹

¹ Japanese Unexamined Patent Application Publication JPA 2002–354801 (Ex. 1004); English Translation (Ex. 1005).

Claim 32 as obvious under 35 U.S.C. § 103(a) over the combination of Hosoya and King;²

Claims 26 and 27 as anticipated under 35 U.S.C. § 102 by Hirst;³

Claim 32 as obvious under 35 U.S.C. § 103(a) over the combination of Hirst and King; and

Claims 26 and 27 as anticipated under 35 U.S.C. § 102 by Cates.⁴

CLAIM CONSTRUCTION

In our Decision to Institute, we applied the ordinary and customary meaning to the terms not construed. We applied the broadest reasonable interpretation to *temporarily increasing a maximum switching frequency*. At institution, we construed this term to mean “the maximum switching frequency is increased for a limited period of time (i.e., non-permanently).” Dec. to Inst. 14. Petitioner agrees with our construction. Pet 10; Pet. Reply 2. As discussed below, Patent Owner proposes a different construction. Although the construction Patent Owner now proposes in the Patent Owner Response differs from that proposed in its Preliminary Response, its effect is the same.

In its Preliminary Response, Patent Owner proposed we construe *temporarily increasing a maximum switching frequency* to mean “increasing for a duration that is limited by the internal circuitry of the power supply without regard to external load demand.” Prelim. Resp. 12. Patent Owner now proposes “a new construction to refocus the discussion around the noted deficiencies of the prior art” by deleting from its previously proposed

² U.S. Patent No. 5,694,305 (Ex. 1008).

³ U.S. Patent No. 6,294,904 (Ex. 1006).

⁴ U.S. Patent No. 4,479,174 (Ex. 1007).

construction an explicit reference to internal circuitry, proposing that we construe this term to mean “increasing for a duration without regard to external load demand.” *See* PO Resp. 13. Notwithstanding proposing a construction that does not refer explicitly to internal circuitry, Patent Owner states “a POSITA would have understood ‘temporarily increasing a maximum switching frequency’ to mean increasing the switching frequency in response to increased load demand for a duration *limited by the circuitry*, and not by the peak load demand, which could persist for an arbitrarily long period and damage the circuitry.” PO Resp. 1–2 (emphasis added). Petitioner also notes that Patent Owner’s proposed construction inserts the power supply’s internal circuitry into method claim 26 as a structural limitation not recited in the claim. Pet. Reply 7 (emphasis added by Petitioner) (quoting PO Resp. 21 (“[T]he power supply’s **circuitry** must control the duration of increase rather than having the circuitry simply responding to whatever arbitrary load demand is present at the power supply output.”)).

We agree that Patent Owner’s newly proposed construction replaces its previous explicit reference to internal circuitry with an implied one because Patent Owner’s current proposal still asserts that the increase in the frequency is “without regard to external load demand.” If the maximum switching frequency increase persists without regard to the external load, the maximum switching frequency increase must depend on the internal circuitry. Indeed, Patent Owner explicitly states

The focus of the ’119 patent (with regard to the challenged claims) is “to provide increased power when required by the changing load, but to do so in a circuit limited (as opposed to load-limited) manner so as not to damage the circuitry. As a

result, a power supply regulation circuit . . . meets peak power demands but avoids drawbacks in prior art circuits, which required ‘over-rated’ components and tended to be ‘larger, heavier, and more costly.[’]”

PO Sur-reply 2–3 (quoting PO Resp. 1 (citing Ex. 1001, 1:29–38, 7:3–14)).

Claim 26 does not recite any circuit limitations.

The Specification states “one embodiment . . . is configured to switch temporarily at a higher frequency to accommodate temporary peak load conditions in accordance with the teachings of the present invention.”

Ex. 1001, 3:12–15. The ’119 patent provides context to “temporary peak load conditions,” stating:

Embodiments of a power supply in accordance with the teachings of the present invention are therefore designed to provide this moderate output power continuously, the various power supply components not exceeding their thermal ratings . . . The duration of the peak power, P_{PEAK} , demand is usually much less than one second, and well below the thermal time constants of the electrical components.

Id. at 3:29–33, 55–58. Thus, the ’119 patent is directed to temporarily increasing the maximum switching frequency (and hence the power generation capability) of the power supply for the duration of the peak power demand.

Patent Owner argues that “[f]irst and foremost the Board’s assertions are incorrect because they rely solely on Figures 5 and 6 of the ’119 patent, and their associated descriptions,” and our claim construction “ignores the discussions of the temporary nature of the increase, including its underlying purpose.” PO Resp. 14–15. As discussed further below, every embodiment discussed in the ’119 patent, including the embodiment in Figure 8 that includes “optional” time limit circuit 865, contemplates the maximum

switching frequency increasing based on temporary load conditions (the embodiment in Figure 8 does not receive an external load demand signal, but senses the current in a switch to determine load demand, *see* Ex. 1001, 6:27–31).

As we discussed in our Decision on Institution, both parties acknowledge similar definitions of “temporarily” as meaning for a limited period of time. *See* Dec. to Inst. 10. The parties’ real dispute centers on the meaning of “when the load is greater than the power level threshold value.” *Id.* Patent Owner argues that the claim language recites “temporarily increasing [the] switching frequency . . . **when** the load **is** greater than [the threshold],” as distinguished from “**while** . . . the load is greater than the threshold.” PO Resp. 19 (emphases added by Patent Owner). Patent Owner’s distinction between “when the load is greater” and “while the load is greater” is not clear on its face. In any event, we are not tasked to determine whether such a distinction exists or to re-write claim 26 to distinguish it. Our objective is to determine the meaning of the claim before us.

Patent Owner argues that in the context of claim 26 of the ’119 patent, “when” is a “trigger” to increase the maximum switching frequency of the power supply temporarily. H’rg Tr. 16:15–18. Patent Owner emphasizes its proposed construction of the claim language contemplates a “temporary” increase, i.e., one that is limited in duration, even if the peak load demand persists at the expiration of the limited time frame. *Id.*; PO Resp. 14. Petitioner agrees that “temporarily” means of limited duration, but disagrees that the claim requires Patent Owner’s additional limitation “without regard to external load demand.” Pet. Reply 1.

If, as urged by Patent Owner, we were to interpret “when” to mean a trigger, such that the power supply’s maximum switching frequency increases for some undefined temporary period without regard to the external load demand, the maximum switching frequency would remain elevated for that undefined temporary period even if the temporary load increase vanishes before the temporary period expires. Patent Owner does not point to any such description in the ’119 Specification, nor does Patent Owner point to any reference in the ’119 Specification to a “trigger.” Thus, Patent Owner’s proposed construction imports a circuitry limitation that is not recited in claim 26 that would perform a function that is not described in the ’119 patent, i.e., increasing the maximum switching frequency for a period of time longer than the increased load demand.

The circumstance Patent Owner points out, i.e., where a load above the threshold level persists after the expiration of a limited time frame, is explicitly recited in dependent claim 32 and described as an “optional” feature shown in Figure 8. Ex. 1001, 7:1–3. Unlike claim 32, claim 26 is not limited to any particular circumstance. Thus, claim differentiation also weighs against Patent Owner’s proposed construction of the phrase in claim 26.

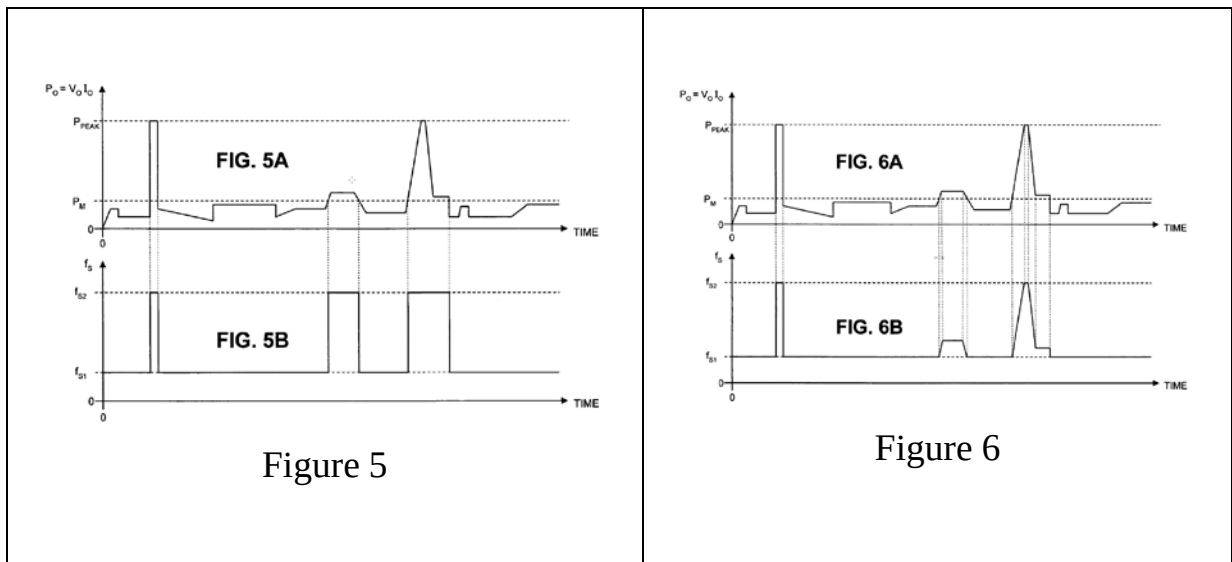
As we discussed in the Decision to Institute, claim 26 recites “increasing a maximum switching frequency of the switching frequency of the switch,” i.e., the claim requires increasing the output power capability of the power supply by increasing the switch’s maximum switching frequency. Dec. to Inst. 14. Our construction states that the maximum frequency increase persists for a limited period of time. *Id.*

Our construction covers at least the following conditions:

(i) increasing the maximum switching frequency for the entire duration of the load increase (i.e., “when the load is greater than the power level threshold value”), and (ii) increasing the maximum switching frequency for a time less than the entire duration of the load increase to reduce the possibility of regulator damage from a fault that demands a high load for an excessive time, e.g., using a time limiting circuit (Ex. 1001, 7:1–6). As noted above, claim 32 explicitly recites the further limitation imposed by the second condition, i.e., “limiting a time duration that the switch may be switched at up to the increased maximum switching frequency.”

As our construction is independent of whether the increase in maximum switching frequency depends on either the load or the internal circuitry, our construction also encompasses both the static load and dynamic load conditions the parties argued were addressed in the district court. PO Sur-reply 5 (describing the district court’s construction under a static load scenario as “increasing [the switching frequency] for a period of time that is **limited by internal circuit** in the absence of any load changes,” and under a dynamic load scenario as “increasing for a period of time that is **limited by the internal circuit** or external load changes” (emphasis in Patent Owner Sur-reply)).

Our construction is consistent with the embodiments described in the Specification. Figures 5 and 6 and their accompanying descriptions in the ’119 patent demonstrate that “when,” at least as used in the context of the invention described in Figures 5 and 6, means for the duration of time that the load exceeds the threshold. Figures 5 and 6 of the ’119 patent are shown side by side below, with Figure 5 on the left and Figure 6 on the right



Figures 5 and 6 are graphs of power demand (Figures 5A and 6A) and corresponding switching frequency (Figures 5B and 6B) over time. Ex. 1001, 1:57–64. The accompanying text of the Specification states

a switching regulator has a first maximum switching frequency *when* the output power is less than a moderate power P_M , and has a substantially higher second maximum frequency *when* the output power is higher than P_M .

Ex. 1001, 4:62–66 (emphases added). In Figure 5, the switching frequency is increased for the entire time that the moderate power level P_M is above the threshold. The same is true in Figure 6, where the frequency follows the level of P_M . Thus, Figures 5 and 6 of the '119 patent demonstrate the maximum switching frequency is increased for the entire duration of the increased power load.

Patent Owner argues that Figures 5 and 6 are not intended to illustrate the temporary nature of the increased frequency, but to show the increase can be a gradual change or a step change. PO Sur-reply 2. Patent Owner cites nothing in the '119 patent that indicates the increases in maximum

switching frequency shown in Figures 5 and 6 terminate at any point in time. Even if they did, however, our construction still applies, as the maximum switching frequency increase still would be for a limited period of time.

As discussed above, claim 32 recites a further limitation on claim 26, that “temporarily increasing the maximum switching frequency of the switch when the load is greater than the power level threshold value includes limiting a time duration that the switch may be switched up to the increased maximum frequency.” The ’119 patent discloses an optional time limit circuit can be used to restrict or limit the time of peak power output to reduce the possibility of damage to the regulator from a fault that demands a high load for an excessive time. Pet. 11 (citing Ex. 1001, 7:1–14, Fig. 8). This optional self-protection addresses precisely the conditions Patent Owner discusses that can occur when a load exceeds the rating of a power supply for a length of time that could endanger the power supply components. PO Resp. 17.

Patent Owner contends that the time limit circuit is optional only in the sense that the time limit circuit represents one option for achieving circuit-limited temporary increases in maximum switching frequency. PO Sur-reply 3. Patent Owner points to the text at column 7, lines 12–14, of the ’119 patent, stating that other circuits may be employed to perform the time limit circuit in accordance with the teaching of the present invention, and emphasizing that other options, such as counting switching cycles, could be employed to circuit-limit the temporary increase. *Id.* at 3–4.

The claim differentiation issue turns on the language of claims 26 and 32. Claim 32 further limits claim 26. Patent Owner argues that “[i]n claim 26, the particular mechanism or technique used to circuit-limit the temporary

increase is optional, the function of circuit-limiting the duration of the temporary increase is not.” PO Sur-reply 4. As discussed above, however, claim 26 does not recite any circuit limiting the temporary nature of the increase in maximum frequency. As distinguished from claim 26, claim 32 further limits “temporarily increasing the maximum switching frequency of the switch when the load is greater than the power level threshold value” to “include[] limiting a time duration that the switch may be switched at up to the increased maximum switching frequency.” Claim 32 is not limited to the use of any particular timing circuit, and does not exclude any frequency cycle counting technique that facilitates limiting the time duration as claimed. Thus, we are persuaded that claim 26, which is broader than claim 32, is not limited to a circuit implementation that operates to provide a temporary increase in maximum switching frequency without regard to the increased load.

In consideration of the above, we maintain our claim construction of the phrase “temporarily increasing a maximum switching frequency” in claim 26, and for purposes of this Decision, construe the term to mean “the maximum switching frequency is increased for a limited period of time (i.e., non-permanently).”

ANALYSIS OF PRIOR ART CHALLENGES

Introduction

Hosoya (Ex. 1005)

Hosoya discloses a switching power supply that can “increase the operation frequency when at a high load, such as when a transformer or the like reaches its limit.” Ex. 1005, Abstract, ¶ 12. Hosoya detects a heavy load based on a current measurement detected through the primary switching

transistor exceeding a predetermined threshold. *Id.* ¶ 8; Ex. 1002, Declaration of Dr. R. Jacob Baker (“Baker Decl.”) ¶ 39. Hosoya varies the frequency of the drive signal by superimposing current based on the output of a current detection circuit on a charge or discharge current of a capacitor in the switching power supply. *Id.* ¶ 13.

King (Ex. 1008)

King discloses a load detection circuit useful for protecting switching type power supplies where oscillator pulses periodically switch power to an energy storage component, typically an inductor, for short intervals. Ex. 1008, 2:50–53. A first timing circuit that determines when a signal representative of potentially damaging current or voltage persists for a first period triggers a second timer that reduces or terminates the power output for a second time period. *Id.* at 2:61–3:6. The process repeats if the condition persists beyond the expiration of the second time period. *Id.* at 3:7–10.

Hirst (Ex. 1006)

Hirst discloses a multiple frequency switching power supply with a pulse width modulator circuit. Ex. 1006, 2:44–46. The power supply includes a voltage sensing circuit coupled to the power supply output and having an output coupled to the pulse width modulation circuit input and also includes a switch coupled to the clock input of the pulse width modulation circuit. The switch supplies a first clock signal having a first frequency to the pulse width modulation circuit when the power supply is in a normal mode of operation and supplies a second clock signal having a second frequency more than order of magnitude lower than the first frequency to the pulse width modulation circuit when the power supply is in a standby mode of operation.

Id. at 2:55–65. The Petition notes that the exemplary 10 Watt power level for the “standby mode” in Hirst is identical to the level the ’119 patent describes as typical for the “continuous moderate output power requirement” for a DVD player and is well above the standby output power requirement of 0.5 Watts. Pet. 8–9 (citing Ex. 1006, 4:52–55; Ex. 1001, 3:46–49; Ex. 1002, Baker Decl. ¶ 41).

Cates (Ex. 1007)

Cates discloses a switching power supply that detects load level by monitoring input and output current and, in response, increases or decreases the switching frequency by dropping out switching pulses as shown in Figure 2. Ex. 1007, 1:39–45, 3:58–4:16, Figs. 1, 2.

Claims 26 and 27 As Anticipated by Hosoya

Petitioner identifies as claim element 26(a) the limitation that recites “receiving a feedback signal representative of an output level of a power supply output.” Pet. 13. Petitioner cites Hosoya as disclosing current mode control that regulates the duty cycle of the switching signal using a feedback signal representative of the output voltage and another feedback signal representative of the output current. *Id.* (citing Ex. 1005, Figs 1, 4; Ex. 1002, Baker Decl. ¶ 54). Citing Figure 1 of Hosoya, Petitioner notes that when output voltage *W* exceeds a predetermined value output detection, circuit 15 emits light causing phototransistor PC1b to conduct current through resistor R21 establishing feedback voltage FB at input Vb to control IC 17. *Id.* at 14. Second feedback signal Vg based on the resistor R17 is proportional to the current through switch Q1 and primary winding L1 of transformer L3. *Id.* at 15. Voltage Vg is also proportional to secondary

winding L5 that flows to output W based on the number of turns in the windings of transformer 13. *Id.* at 15–16.

Patent Owner does not respond explicitly to Petitioner’s contentions concerning Hosoya’s disclosure of claim element 26(a). Having considered the evidence and arguments, we are persuaded that Petitioner has demonstrated Hosoya discloses claim element 26(a).

Petitioner identifies as claim element 26(b) the limitation that recites “switching a switch on and off at a switching frequency in response to the feedback signal to regulate the flow of energy from an input of the power supply to the power supply output.” Pet. 17. In Hosoya, flip-flop FF1 is set when Vd output from COMP3 goes high based on oscillation signal Va (the voltage on capacitor C13) and reset by COMP5 when the voltage Vc at terminal IS exceeds voltage Vb at feedback terminal FB. *Id.* at 18 (citing Ex. 1005 ¶¶ 6–8). Output Qb1 of flip-flop FF1 coupled to drive circuit 19 through NOR1 provides a high or low signal Ve to switch Q1, thereby regulating the flow of energy from the power supply input to output based on feedback signals representative of output voltage and output current. *Id.* at 18 (citing Ex. 1005 ¶ 9; Ex. 1002, Baker Decl. ¶ 57).

Petitioner notes that the switching frequency of Q1 is determined by oscillating voltage Va resulting from current charging capacitor C13. *Id.* at 19 (citing Ex. 1005 ¶ 22). When the power supply is lightly loaded, capacitor C13 charges and discharges at a steady rate; when a heavy load is detected, as determined by Vg rising above the threshold to turn on transistor Q5, the base voltage on transistor Q7 is driven toward ground through resistor R55 turning Q7 on, thereby increasing the charging current to capacitor C13 through R57, causing C13 to charge more quickly, in turn

increasing the frequency at which flip-flop FF1 is set and switch Q1 is turned on. *Id.* at 19–21 (citing Ex. 1005 ¶¶ 5, 14, 17–19, 20–21, and Figs. 1–3; Ex. 1002, Baker Decl. ¶ 58). Thus, Q1 switches on and off at a switching frequency in response to feedback signal Vg to regulate the flow of energy from the power supply input to the power supply output.

Patent Owner does not respond explicitly to Petitioner’s contentions concerning Hosoya’s disclosure of claim element 26(b). Having considered the evidence and arguments, we are persuaded that Petitioner has demonstrated Hosoya discloses claim element 26(b).

Petitioner identifies as claim element 26(c) the limitation that recites “detecting when a load is greater than a power level threshold value at the power supply output.” Hosoya describes that “when the load of the switching power supply device becomes larger, the operation frequency rapidly increases.” Ex. 1005 ¶ 25. This rapid increase in the operation frequency is triggered when current detection circuitry 21 detects that voltage Vg, i.e., a feedback voltage proportional to the current through switch Q1, exceeds a detection level indicating that the load is greater than a power level threshold value required to turn on transistor Q5, thereby increasing the current charging C13. *Id.* ¶ 20; Ex. 1002, Baker Decl. ¶ 60. Petitioner notes that Hosoya’s approach is similar to that of the circuit disclosed in Figures 1 and 8 of the ’119 patent, in which the current in switch 815 (S1) is used to determine load demand. Pet. 23.

Patent Owner does not respond explicitly to Petitioner’s contentions concerning Hosoya’s disclosure of claim element 26(c). Having considered the evidence and arguments, we are persuaded that Petitioner has demonstrated Hosoya discloses claim element 26(c).

Petitioner identifies as claim element 26(d) the limitation that recites “temporarily increasing a maximum switching frequency of the switching frequency of the switch when the load is greater than the power level threshold value.” Pet. 25. Petitioner’s annotated version of Figure 3 of Hosoya is shown below.

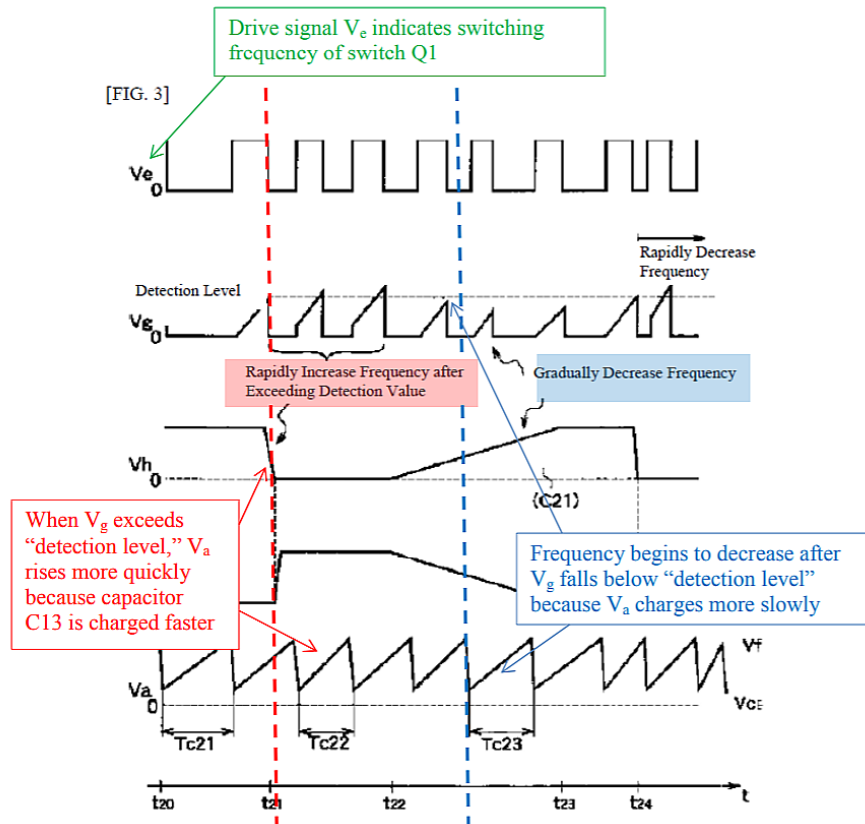


Figure 3 of Hosoya As Annotated By Petitioner

Petitioner cites the annotated version of Figure 3 of Hosoya, which depicts a timing chart for describing the characteristic operation of the switching power supply device, as illustrative of the timing of the temporary increase in switching frequency of Q1 when the power supply is under heavy load. Pet. 27. As discussed above, Petitioner argues that Hosoya detects when a load exceeds a threshold value, and in response alters the charging current in capacitor C13 to increase the frequency of the oscillator

and the switching frequency of Q1 during periods of heavy load. *Id.* at 26–28.

Patent Owner contends that Petitioner has not demonstrated Hosoya discloses claim element 26(d) because Hosoya does not disclose or suggest increasing frequency for a duration that is limited without regard to external load demand. PO Resp. 30. According to Patent Owner, “Hosoya does not disclose a mechanism for limiting a duration of the increase, nor does Hosoya teach that the increases in operating frequency correspond to ***temporarily*** increasing a maximum switching frequency of switch Q1, *e.g.*, so that the maximum output power is provided to the load for a short controlled duration.” *Id.* at 34. Patent Owner’s arguments are based on a narrow construction of claim 26 that we have declined to adopt, i.e., that the claim is limited to a construction that requires “increasing the switching frequency for a duration that is limited without regard to the external load demand.” *Id.* at 32.

The essence of Patent Owner’s argument is that Hosoya discloses increasing the frequency for the duration of the load increase. PO Resp. 31. In the context of claim 26, and consistent with our construction and with the embodiments in Figures 5 and 6 of the ’119 patent, we are persuaded that Hosoya discloses claim element 26(d).

In consideration of the evidence and arguments of record, we conclude that Petitioner has demonstrated by a preponderance of the evidence that claim 26 is unpatentable as anticipated by Hosoya.

Claim 27 recites the further limitation that “switching the switch in response to the feedback signal to regulate the flow of energy from the power supply input to the power supply output comprises pulse width

modulating a control signal driving the switch.” Patent Owner does not respond specifically to Petitioner’s challenge to claim 27 as anticipated by Hosoya. Having considered the evidence and arguments of record, we are persuaded that Petitioner has demonstrated by a preponderance of the evidence that Hosoya discloses this limitation and therefore anticipates claim 27. *See* Pet. 29–30.

Claim 32 As Obvious Over Hosoya and King

Claim 32 depends from claim 26 and recites that “temporarily increasing the maximum switching frequency of the switch when the load is greater than the power level threshold value includes limiting a time duration that the switch may be switched at up to the increased maximum switching frequency.” Petitioner contends that the combination of Hosoya, as discussed above, and King discloses this limitation.

King discloses power supply protection circuitry in which a first timer that detects the presence of an abnormal load for more than a specified period of time triggers a second timer that reduces the output of the power supply for a second period of time. Ex. 1008, Abstract, 2:61–3:6. Factors considered in determining the lengths of the first and second time periods include the ability of the power supply to dissipate heat, the nature of the load, and the nature of the source. *Id.* at 3:29–33. Noting that in a switching power supply, an error amplifier produces an output proportional to the difference between a reference signal and a feedback signal, and that an oscillator varies the switching frequency in response to the error amplifier output (*id.* at 3:39–46), King discloses “[a]n integrated circuit oscillator that generates pulses . . . by varying the frequency of the pulses, and that incorporates detection, first timer and second timer circuitry” (*id.* at 5:6–11).

Petitioner argues that when used in combination with the power supply disclosed in Hosoya, the protection circuitry of King would detect peak load and terminate the switching signal after a predetermined time has passed, thereby limiting the duration that the switch in Hosoya switches at up to the maximum switching frequency. Pet. 34–45. As a basis for combining the teachings of Hosoya and King, Petitioner notes that Hosoya is directed to a switching power supply and quotes from King’s disclosure that the protection circuitry is “particularly useful in protecting switching-type power supplies, wherein oscillator pulses periodically switch power to an energy storage component, typically an inductor, for short intervals.” Pet. 32–33 (citing Ex. 1008, 2:50–53; Ex. 1002, Baker Decl. ¶ 67).

Patent Owner acknowledges that King discloses timing circuits for protecting a power supply from damage due to excessive voltages and currents. PO Resp. 37–38. Patent Owner argues that Hosoya seeks to improve efficiency during light load conditions by rapidly increasing and gradually decreasing the switching speed of switch Q1. *Id.* at 39. According to Patent Owner, Petitioner has not demonstrated that a person of ordinary skill would have been motivated to combine Hosoya’s teaching concerning light load efficiency and avoiding transformer saturation with King’s teaching about protecting circuits from damage due to excessive voltages and currents. PO Resp. 36.

Patent Owner contends that Hosoya makes no mention of limiting a duration of the operation frequency and has no need for time limiting capability because this switching power supply can provide peak power for as long as peak load demand exists. *Id.* at 40 (citing Ex. 1005 ¶¶ 7–15; Ex. 2004, Declaration of William Bohannon (“Bohannon Decl.”) ¶ 78).

According to Patent Owner, because Hosoya includes “over-rated” components, there would be no need to import a mechanism to terminate the switching signal after some predetermined time. *Id.* at 40–41 (citing Ex. 2004, Bohannon Decl. ¶ 79).

Patent Owner further argues that the Petition fails to present any argument that explains how a person of ordinary skill would combine King’s protective circuitry with the circuit of Hosoya, or a rationale for the combination other than that most electronic devices would benefit from a protection circuit that mitigates occurrences of excessive current or voltage. *Id.* at 42.

Petitioner responds that Patent Owner’s characterization of Hosoya as containing over-rated components that can supply peak demand for as long as the peak load demand persists is unsupported and conclusory, and is contrary to the fact that Hosoya, like King, is aimed explicitly at miniaturization. Pet. Reply 17. We agree with Petitioner that Patent Owner has not identified any specific over-rated components in Hosoya. Petitioner further observes that Patent Owner’s argument contradicts its own assertion that most electronic devices would benefit from such a protective circuit. *Id.*

Patent Owner describes Petitioner’s combination of Hosoya and King as “peculiar,” and “an arbitrary design choice.” PO Resp. 43. According to Patent Owner, there is no reason a person of ordinary skill would have carved out the protection circuitry of King and undertaken the complex task of dissecting the intricate circuitry described in Hosoya to integrate error detection and timing features that protect against damage from excessive voltages and currents. *Id.* Patent Owner speculates that the combination of Hosoya and King “could likely render Hosoya’s circuitry inoperative for its

intended purpose of rapidly increasing the operation frequency.” *Id.* at 44. Patent Owner provides no support for this position other than its characterization of Hosoya’s current detection circuit as “intricate” and its observation that Hosoya interacts with oscillation circuits to rapidly increase the operational frequency, and that King describes its oscillator as varying the pulses in response to the error amplifier output, which is representative of the power delivered to the load. *Id.*

Noting that Patent Owner does not argue that any elements of claim 32 are missing from the combination of Hosoya and King, Petitioner cites the Petition’s assertion that the switching power supply of Hosoya is “quite similar” to the exemplary power supply described in King because both references describe a switching power supply converter using a flyback topology. Pet. Reply 15 (citing Pet. 33–34). Petitioner also notes that the Petition explains King’s protection circuitry is designed to be used in the same type of variable load conditions as the circuitry of Hosoya. *Id.* (citing Pet. 33– 34). Patent Owner argues that Petitioner’s contentions concerning the similarities between Hosoya and King provide no meaningful rationale for a motivation to combine the references and are silent as to how the alleged protections of King would function or what modifications would be implemented. PO Sur-reply 11–12.

We are not persuaded by Patent Owner’s arguments that Petitioner has failed to adequately explain how one of ordinary skill would have incorporated the structures of Hosoya and King into each other. PO Resp. 41– 42.

[T]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed

invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art.

MCM Portfolio LLC v. Hewlett-Packard Co., 812 F.3d 1284, 1294 (Fed. Cir. 2015) (alteration in original) (citing *In re Keller*, 642 F.2d 413, 425 (CCPA 1981)). Given the apparent similarities between the topologies of flyback switching power supplies of Hosoya and King, and King's use of a timer to protect against excessive voltages and currents, we are persuaded that a person of ordinary skill would have recognized the protection circuit of King would improve the Hosoya switching power supply in the same way that it improves the King switching power supply. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007) ("If a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill."). Thus, we are persuaded that Petitioner has articulated sufficient reasoning with rational underpinning to support a legal conclusion of obviousness as to claim 32. *See In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006).

In consideration of the above, we are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claim 32 is unpatentable over the combined teachings of Hosoya and King.

Claims 26 and 27 As Anticipated by Hirst

Petitioner cites Hirst as disclosing a method for regulating a power supply output as recited in the preamble of claim 26. Pet. 35–36. Hirst discloses a multiple frequency switching power supply in which a voltage sensing circuit coupled to the power supply output is coupled to a pulse

width modulation circuit input. Ex. 1006, Abstract. As noted above, a switch coupled to the clock input of the pulse width modulation circuit provides a “first clock signal having a first frequency when the power supply is in a normal mode of operation and supplies a second clock signal having a second frequency more than order of magnitude lower than the first frequency when the power supply is in a standby mode of operation.” *Id.* at Abstract, 3:1–4.

Petitioner argues that in Figure 2 of Hirst, a voltage at the junction of R1 and R2 derived from output voltage Vo is fed back to pulse width modulator 42 and ripple monitor 49, thereby disclosing the feedback signal representative of a power supply output level as recited in claim element 26(a). Pet. 36–37. Petitioner also cites the output of operational amplifier 57 in current sensing circuit 56, shown in Figure 3, as representative of current drawn from power supply output 38. *Id.* at 38.

Claim element 26(b) recites “switching a switch on and off at a switching frequency in response to the feedback signal to regulate the flow of energy from an input of the power supply to the power supply output.” Petitioner cites Hirst’s disclosure that the switching power supply 30 operates by turning switching transistor 34 ON and OFF to supply electrical charge from power input port 32 to filtering circuit 36. Pet. 42 (citing Ex. 1006, 6:1–14). Petitioner notes that in Hirst, the gate of switching transistor 34 is coupled to an output of pulse width modulation (PWM) circuit 40 such that the pulse width of the ON portion of the duty cycle of transistor 34 is varied in a conventional manner by PWM circuit 40 in response to voltages sensed by voltage divider 37. *Id.* This arrangement

regulates the amount of charge transferred per cycle for power input port 32 to filtering circuit 36, thus maintaining the voltage output V_{OUT} at output 38.

Claim element 26(c) recites the switch operating at a switching frequency in response to the feedback signal to regulate the flow of energy from the power supply input to output. Petitioner notes that in the embodiments of Figures 1–5, transistor switch 34 is switched on and off by pulse width modulation (PWM) circuit 40 to regulate the flow of energy from input port 32 through filtering circuit 36 to output port 38, and that PWM circuit 40 is responsive to feedback signals discussed above. *Id.* at 40. Petitioner further notes that in one embodiment of Hirst, the switching frequency is determined by ripple monitor 49 that couples first oscillator 46 or second oscillator 48 to PWM circuit 40 via switch 44. *Pet.* 40–41. *Ex.* 1006, Fig. 2, 6:1–14. In the embodiment of Figure 3, the switching frequency is determined by the output of amplifier 59 based on the output of operational amplifier 57 that receives a feedback signal representative of the power supply output. *Id.* at 41–43.

Claim element 26(d) recites temporarily increasing the maximum switching frequency of the switching frequency of the switch when the load is greater than the power level threshold. As previously discussed, “increasing the maximum switching frequency of the switching frequency of the switch” provides the power supply the capability to drive a heavier load. This increased capability is temporary, lasting for the duration of time when the load exceeds the power threshold. Petitioner argues that in each of the embodiments of Hirst, the power supply responds to an increase in load demand above a power level by increasing the switching frequency of switching transistor 34. *Pet.* 47–50.

Patent Owner contends that Hirst does not disclose “temporarily” reducing the switching frequency because its “high” switching frequency state is its normal mode of operation and can persist indefinitely, i.e., as long as is required by external load demand. PO Resp. 46. Patent Owner notes that “Hirst’s reduced energy consumption occurs based on the power supply switching from a first higher frequency, f_{HI} , to a second lower switching frequency, f_{LO} , when a load device transitions from its normal operating mode to a standby operating mode.” *Id.* at 48. According to Patent Owner, Petitioner reads out of claim 26 the limitation that the maximum switching is temporarily increased because Hirst’s higher frequency clock signal is the “normal” mode. *Id.* at 48–49 (citing Ex. 2004, Bohannon Decl. ¶¶ 89–91). According to Patent Owner, “sections of Hirst describing selection of frequency f_{HI} as ‘normal’ are directly contrary to Petitioner’s assertion that such a transition be considered ‘temporary’ as contemplated by the claim language.” *Id.* at 50 (citing Ex. 2004, Bohannon Decl. ¶ 93). Patent Owner further argues that because Hirst describes the high frequency mode is used in a continuous fashion, it is not a temporary or transient, but a steady state that is not time restricted. *Id.* at 51–52.

Patent Owner also argues that there is no teaching in Hirst that the first frequency used during Hirst’s normal mode of operation is a maximum switching frequency as claimed. *Id.* at 49. However, Patent Owner provides no basis for this assertion. As Petitioner notes, Hirst discloses increasing the switching frequency from f_{LO} to f_{HI} when the power consumption monitor detects increased power consumption. Pet. Sur-reply 20 (citing Ex. 1006, 5:46–53).

Petitioner responds that, because Hirst describes a circuit with changing load demands (the dynamic-load scenario), it also discloses the step of temporarily increasing a maximum switching frequency. Pet. Reply 19. According to Petitioner, Patent Owner's arguments seek to introduce another limitation not recited in claim 26 by disqualifying as temporary an increase in the maximum switching frequency that occurs as a result of "normal" loading. *Id.* Petitioner emphasizes that claim 26 recites only detecting when a load exceeds a threshold level and temporarily increasing the maximum switching frequency when the load exceeds the threshold. *Id.* at 19–20.

Patent Owner's argument that Hirst does not disclose reducing the switching frequency of the power supply after a limited duration without regard to load demand (PO Resp. 46) is premised on a claim construction that we have not adopted. Patent Owner points out that Hirst focuses on conserving energy in low power standby modes of operation, and recognizes that Hirst increases the frequency when the device powered by the power supply is in operation. Thus, Hirst discloses both high and low power levels existing for limited periods of time. Claim 26 is not limited to any particular ratio of high power to low power or to any particular ratio of time that the maximum switching frequency is increased relative to the maximum switching frequency not being increased. Claim 26 recites temporarily increasing the maximum switching frequency (and therefore, the power generation capability of the power supply) when the load exceeds a threshold value.

Patent Owner reads far too much into Hirst's use of the term "normal operating mode." Patent Owner describes the device claimed in the '119

patent as operating in three modes: (i) a no-load mode, e.g., a DVD player waiting for a wake-up signal; (ii) a continuous moderate power mode, e.g., a printer head moving across a page; and (iii) a mode that requires temporarily engaging maximum or peak power, e.g., reversing the direction of a moving printer head or spinning a disk from startup to rated speed. PO Resp. 53 (citing Ex. 1001, 3:17–63). Hirst not only discloses that the switching frequency increases from f_{LO} in a standby condition to f_{HI} during operation in a normal mode—Hirst also discloses that the frequency f_{HI} may be varied in order to operate a multiple frequency switching power supply at high efficiency using multiple frequencies over a range of loads. Ex. 1006, 5:32–45, 5:55–58. For example, Hirst states that a “VCO may be used for the first oscillator 46 to allow the clock frequency f_{HI} to increase as the current output from the multiple frequency switching power supply 12 is increased.” *Id.* at 5:59–61. Thus, Hirst recognizes that discrete levels of load demand exist temporarily and that the maximum switching frequency can be increased temporarily to accommodate the changing load.

Hirst also discloses a method in terms similar to those discussed in the ’119 patent and recited in claim 26. Hirst states:

The method includes determining when an output current from the power supply is above a threshold and supplying a first switching signal having a first frequency to a switching transistor in the power supply when the output current is above the threshold. The method also includes determining when the output current from the power supply is below the threshold and supplying a second switching signal having a second frequency to the switching transistor in the power supply when the output current is below the threshold. The second frequency is less than one tenth of the first frequency.

Ex. 1006, 3:6–16. Thus, Hirst teaches a threshold power level, as represented by output current, above which power level the switching transistor is switched at a first frequency that is higher than the second frequency, determining when the load drops below a threshold value, and when the load demand is below the threshold value, switching the switching transistor at a lower frequency, i.e., one-tenth the first frequency.

Based on the evidence and arguments of record, we conclude that Petitioner has demonstrated by a preponderance of the evidence that Hirst anticipates challenged claim 26.

Claim 27 recites the further limitation that “switching the switch in response to the feedback signal to regulate the flow of energy from the power supply input to the power supply output comprises pulse width modulating a control signal driving the switch.” Patent Owner does not respond specifically to Petitioner’s challenge to claim 27 as anticipated by Hirst. Having considered the evidence and arguments of record, we are persuaded that Petitioner has demonstrated by a preponderance of the evidence that Hirst discloses this limitation and therefore anticipates claim 27. *See* Pet. 50–51.

Claim 32 As Obvious Over Hirst and King

As discussed above, King discloses power supply protection circuitry in which a first timer that detects the presence of an abnormal load for more than a specified period of time triggers a second timer that reduces the output of the power supply for a second period of time. Ex. 1008, Abstract, 2:61–3:6. King states its protection circuitry is “particularly useful in protecting switching-type power supplies, wherein oscillator pulses periodically switch power to an energy storage component, typically an

inductor, for short intervals.” Ex. 1008, 2:50–53. Petitioner notes that “the switching power supply of Hirst is quite similar to the exemplary switching power supply disclosed in King, and it is designed to be used in the type of variable load conditions (e.g., activating a print engine) that King’s protection technique is designed to accommodate.” Pet. 55 (citing Ex. 1006, 2:37–41; Ex. 1008, Abstract, 2:42–48; Ex. 1002, Baker Decl. ¶ 91).

Petitioner contends that a person of ordinary skill would have been motivated to combine King’s teachings with those of Hirst to provide King’s protection advantages to Hirst’s switching power supplies that may operate for long periods of time at low power consumption, but need to be capable of “switching very rapidly to full power operation on demand (such as when a print engine is active).” Pet. 54–55 (citing Ex. 1006, 2:37–41, 4:32–55).

Noting that Hirst is concerned primarily with improving power supply efficiency and King is concerned with protecting a power supply from damage due to excessive voltages and currents, Patent Owner argues that Petitioner has not demonstrated a person of ordinary skill would have been motivated to combine the teachings of these references. PO Resp. 54–60. According to Patent Owner, Petitioner’s obviousness based challenges are grounded in “impermissible hindsight to cherry-pick incompatible elements (e.g., King’s protection circuit) from dissimilar references.” *Id.* at 59.

Patent Owner contends “Hirst fails to disclose the limitation of ‘temporarily increasing’ because operating in the normal mode is not temporary or transient, but rather a steady state condition.” *Id.* Arguing that Hirst is not concerned with providing maximum power beyond that needed to meet normal power demand, Patent Owner contends Hirst does not implicate conditions where a person of ordinary skill would have contemplated using

King's protection circuitry. *Id.* Patent Owner also argues that King's protection circuitry would limit arbitrarily the duration of Hirst's output power during normal operating modes, thereby degrading the operation of Hirst's power supply. *Id.* at 60. However, Patent Owner does not mention that at the end of the second time-out, King restores the increased frequency, thereby restoring full power to the load and repeating the protection process. Ex. 1008, 3:1–18.

Petitioner emphasizes that Hirst's and King's power supplies are similar and King's protection circuitry is designed to be used in the same type of power supply as that disclosed by Hirst. Pet. Reply 21. Petitioner also contends a person of ordinary skill would have been motivated to combine the teachings of Hirst and King because both references disclose a flyback topology designed for usage with variable loads. *Id.* at 22.

As discussed above, Patent Owner's arguments that Hirst does not disclose temporarily increasing the maximum switching frequency from f_{LO} to f_{HI} when the load increases are not persuasive. As with Hosoya, Petitioner argues persuasively that a person of ordinary skill would have recognized that the protection circuitry of King would improve the Hirst power supply in the same way it improves the King power supply. Pet. Reply 22 (citing *KSR*, 127 S. Ct. at 1731).

In view of the topology similarities in Hirst and King, and King's assertion that its protection is "particularly useful in protecting switching-type power supplies, wherein oscillator pulses periodically switch power to an energy storage component, typically an inductor for short intervals" (Ex. 1008, 2:50–53), we are persuaded that Petitioner has demonstrated that a person of ordinary skill would have been motivated to combine the

teachings of Hirst with those of King to protect the power supply from overload conditions.

Having reviewed the evidence and arguments of record, we are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claim 32 is unpatentable over the combination of Hirst and King.

Claims 26 and 27 As Anticipated by Cates

Cates concerns a d-c to d-c switching power supply with a conventional switching converter that regulates power across a load using well-known pulse width modulation techniques to drive a power switching transistor. Ex. 1007, 2:13–17. A pulsed waveform whose width increases as the supply approaches full load drives the switching transistor to couple the voltage from a transformer at the collector of the transistor to a rectifying diode and a capacitor to provide the regulated voltage to the load. *Id.* at 2:59–3:2. Recognizing that the power supply is less efficient at low power levels, Cates discloses power level detecting circuit 30 and frequency shifting circuit 40 that eliminates every other drive pulse, such that only half of the pulses that would ordinarily appear at the base of the switching transistor actually reach the base. *Id.* at 3:22–39, 4:45–5:2. To meet the low power requirements of the load, the width of the pulses is increased to compensate for pulses that are eliminated. *Id.* at 5:3–19. Cates also discloses that other combinations of pulses, e.g., every third pulse, may be eliminated and that “it is the elimination of the drive pulses in a predetermined manner for low power levels and the attendant increase in width of the remaining pulses which increases the efficiency of the converter at such power levels.” *Id.* at 5:36–47.

As to the preamble and claim elements 26(a) through 26(c), Petitioner cites specific disclosure in Cates supporting its contentions that Cates discloses these elements. Pet. 56–65. Patent Owner does not dispute explicitly Petitioner’s contentions as to claim elements 26(a)–26(c).

As to claim element 26(d), Petitioner contends that Cates responds to low power output levels by reducing the switching frequency to half of the frequency of the square wave, and conversely increasing the maximum switching frequency when a power level above the threshold is detected. *Id.* at 66–67. Petitioner argues that “[t]his increase in maximum switching frequency is temporary because it is responsive to the fluctuating power level of the load.” *Id.* at 67 (citing Ex. 1007, 4:45–5:2, Fig 2(E)).

Patent Owner’s arguments in response to Petitioner’s challenge based on Cates rely upon Patent Owner’s assertion that “Cates fails to describe temporarily increasing a maximum switching frequency of switch Q1 for a period of time that is limited in duration without regard to external load demand.” PO Resp. 63. Patent Owner also asserts that Cates fails to describe any mechanism or internal circuitry that functions to limit the duration of a temporary increase in the maximum switching frequency. *Id.* As discussed above, we have not adopted Patent Owner’s construction requiring that the temporary nature of the increase in maximum switching frequency be independent of the load, and Patent Owner’s contention regarding internal circuitry is premised on a limitation not found in the claim.

Patent Owner also argues that Cates does not contemplate a mode of operation in which the load might demand maximum or peak power because Cates focuses on efficiency rather than on providing power beyond that

required to meet normal power demands. *Id.* at 64 (citing Ex. 1007, 1:20–36; Ex. 2004, Bohannon Decl. ¶ 113). Patent Owner contends that the peak power demand in Cates is actually the normal steady state power demand, as opposed to a transient or temporary demand, and that nothing in Cates suggests the switching frequency of switch Q1 during normal full load operation corresponds to the maximum switching frequency. *Id.* at 65.

Petitioner emphasizes that Patent Owner’s arguments concerning Cates do not apply the claim construction we have adopted in this proceeding. Pet. Reply 23. Petitioner also argues that “Patent Owner is attempting disqualify temporary increases in the maximum switching frequency that occur during ‘normal’ loading. But the challenged claims include no such limitation.” *Id.*

Noting that Patent Owner’s arguments concerning Cates are similar to Patent Owner’s arguments concerning Hirst, Petitioner responds that Patent Owner actually does not dispute that Cates temporarily increases the maximum switching frequency. *Id.* at 22 (citing PO Resp. 63 as acknowledging that the duration of the frequency increase in Cases is “dependent solely on load demand”). Patent Owner disputes Petitioner’s characterization of Patent Owner’s position, arguing that Cates does not describe a temporary increase in maximum switching frequency during full load operation because Cates does not disclose that its reduced switching frequency at low loads corresponds to a maximum switching frequency of switch 31. PO Sur-reply 26.

Petitioner emphasizes that there is no basis for Patent Owner’s assertion that the frequency at full load in Cates is not the maximum switching frequency. Pet. Reply 24. Petitioner argues that Cates discloses

two distinct maximum switching frequencies and shows that when a power level above a threshold is detected, the maximum switching frequency of Q1 increases to match the frequency of square wave A. *Id.* (citing Ex. 1007, 4:45–56, Fig. 2); *see* Ex. 1002, Baker Decl. ¶ 101.

We agree that there is no support for Patent Owner’s assertion that Cates does not show a maximum switching frequency at full load. We also agree that the increased maximum frequency in Cates during full load conditions is temporary because the frequency is responsive to the fluctuating power level of the load. Ex. 1002, Baker Decl. ¶ 102. As there are no further requirements for claim element 26(d), we conclude that Petitioner has demonstrated that Cates discloses claim element 26(d).

Having reviewed the evidence and arguments of record, we conclude that Petitioner has demonstrated by a preponderance of the evidence that claim 26 is anticipated by Cates.

As to claim 27, Petitioner notes that Cates discloses a “conventional switching converter 20 which uses the well-known pulse width modulation (p.w.m.) technique to drive power switching transistor Q1 to thereby provide from a d-c input voltage a regulated d-c output voltage across a load.” Pet. 69 (citing Ex. 1007, 2:15–19). Patent Owner does not dispute explicitly Petitioner’s contentions as to the added limitation in claim 27. In consideration of the above, we are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claim 27 is anticipated by Cates.

CONCLUSION

Having reviewed the evidence and arguments of record, we conclude that Petitioner has demonstrated by a preponderance of the evidence that:

Claims 26 and 27 are unpatentable as anticipated by Hosoya;

Claims 26 and 27 are unpatentable as anticipated by Hirst;

Claims 26 and 27 are unpatentable as anticipated by Cates;

Claim 32 is unpatentable as obvious over the combination of Hosoya and King; and

Claim 32 is unpatentable as obvious over the combination of Hirst and King.

ORDER

In consideration of the above, it is

ORDERED that claims 26, 27, and 32 of the '119 patent are unpatentable; and

FURTHER ORDERED that, because this is a final written decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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Patent 7,239,119 B2

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