

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE, LLC

Petitioner

v.

VALTRUS INNOVATIONS LIMITED

(record) Patent Owner

IPR2025-01157
Patent No. 7,939,967

DECLARATION OF R. JACOB BAKER, PH.D., P.E.

TABLE OF CONTENTS

I.	ENGAGEMENT AND COMPENSATION	5
II.	QUALIFICATIONS	5
III.	MY UNDERSTANDING OF THE RELEVANT LAW	7
A.	Claim Construction.....	7
B.	Anticipation	7
C.	Obviousness.....	8
IV.	PERSON HAVING ORDINARY SKILL IN THE ART	11
V.	DOCUMENTS RELIED UPON	12
VI.	TECHNICAL INTRODUCTION	13
A.	The '967 Patent Disclosure	13
VII.	TIME THE INVENTION WAS MADE	16
VIII.	CLAIM CONSTRUCTION	17
IX.	DETAILED EXPLANATION OF THE REASONS FOR UNPATENTABILITY	17
Ground 1.	Claims 1-3, 8, and 14-15 are anticipated by Zak	17
A.	Overview of Zak.....	17
B.	Claim Mapping.....	21
Ground 2.	Claims 1-7 and 9-15 are rendered obvious by Susong.....	34
A.	Overview of Susong	35
B.	Overview of the Obviousness Contention	38
C.	Rationale (Motivation) Supporting Obviousness.....	38
D.	Reasonable Expectation of Success	40

E.	Graham Factors	40
F.	Analogous Art	41
G.	Claim Mapping.....	41
Ground 3.	Claims 2, 8, 11, and 14-15 are rendered obvious over Susong and Zak	65
A.	Overview of the Obviousness Contention.....	65
B.	Rationale (Motivation) Supporting Obviousness.....	66
C.	Reasonable Expectation of Success	69
D.	Analogous Art	70
E.	Claim Mapping.....	70
Ground 4.	Claims 1, 4-7, 9-10, and 13 are rendered obvious over Chang.....	72
A.	Overview of Chang	72
B.	Overview of the Obviousness Contention.....	74
C.	Rationale (Motivation) Supporting Obviousness.....	74
D.	Reasonable Expectation of Success	75
E.	Analogous Art	76
F.	Claim Mapping.....	76
Ground 5.	Claims 1-15 are rendered obvious over Chang in view of Edelen	91
A.	Overview of the Obviousness Contention.....	92
B.	Overview of Edelen.....	94
C.	Rationale (Motivation) Supporting Obviousness.....	101
D.	Reasonable Expectation of Success	104
E.	Analogous Art	104

F.	Claim Mapping.....	105
X.	OATH	113

I, Dr. R. Jacob Baker, hereby declare as follows:

I. ENGAGEMENT AND COMPENSATION

1. I have been retained by Google, LLC (“Petitioner”) as an expert in the *inter partes* review proceeding described above. I have been asked to provide my technical review, analysis, insights, and opinions regarding the references that form the basis for the alleged grounds of unpatentability set forth in the Petition for *inter partes* review of US 7,939,967 (the ’967 Patent). For this service, my billing rate is an hourly consulting fee of \$765 / hour, and I am reimbursed for actual expenses. My compensation in no way depends on the outcome of this matter.

2. This declaration sets forth my analyses and opinions based on the materials I have considered thus far and the bases for my opinions. I understand that this declaration will be used in the above mentioned *inter partes* review.

II. QUALIFICATIONS

3. I am currently an Emeritus Professor in the Department of Electrical and Computer Engineering at the University of Nevada, Las Vegas (“UNLV”).

4. I hold a Ph.D. degree in Electrical Engineering from the University of Nevada, Reno (UNR), awarded in 1993. My doctoral dissertation was in the field of power electronics, and was entitled “Applying Power MOSFETs to the Design of Electronic and Electro-Optic Instrumentation”. I received B.S. and M.S. degrees in

Patent No. 7,939,967

Electrical Engineering from the University of Nevada, Las Vegas (UNLV), in 1986 and 1988.

5. Prior to joining UNLV as a tenured Professor, I was an adjunct faculty member in the departments of electrical engineering at UNLV and UNR from 1991 to 1993. From 1993 to 2000 I served on the faculty in the Department of Electrical Engineering at the University of Idaho (UI), first as an untenured Assistant Professor, and then from 1998 as a tenured Associate Professor. In 2000 I joined a new Electrical and Computer Engineering (ECE) program at Boise State University (BSU), where I was promoted to Full Professor in 2002. I then served as the ECE department chair at BSU from 2004 to 2007.

6. At both UNLV and Boise State, I have taught courses in Power Electronics (EE 442/ECG 642 Power Electronics [Fall, 2022] at UNLV and ECE 472/572 Power Electronics [Fall, 2011 and 2010] at BSU). I have taught numerous courses at both institutions relating to circuit design and analysis.

7. I am attaching a copy of my C.V. to this declaration. As shown therein, I have published a large number of peer-reviewed articles relating to the field of power electronics and I am a named inventor on around 200 patents worldwide.

III. MY UNDERSTANDING OF THE RELEVANT LAW

A. Claim Construction

8. I understand that a claim term in an *inter partes* review is to be interpreted according to standards applied by district courts. First, the language of the claims themselves is of primary importance in the effort to determine precisely what it is that is patented. The terms used in a claim are generally given the ordinary and customary meaning that the terms would have to a person of ordinary skill in the art in question at the time of the alleged invention, unless the term is expressly defined in the patent. The person of ordinary skill in the art reads the claim in the context of the entire patent, including the specification. Next to the language of the claims, the specification of the patent is the single best source for interpreting the claim terms. The claims may also be interpreted using the record of correspondence between the patent applicant and the Patent Office, and also with reference to other sources of evidence that can help to define the meaning of terms to a person of ordinary skill in the relevant time frame. My understanding of the relevant time frame is discussed in ¶72, below.

B. Anticipation

9. I understand that a claim in an issued patent can be invalid if it is anticipated. In this case, “anticipation” means that there is a single prior art reference that discloses every element of the claim, arranged in the way required by the claim.

10. I understand that an anticipating prior art reference must disclose each of the claim elements expressly or inherently. I understand that “inherent” disclosure means that the claim element, although not expressly described by the prior art reference, must necessarily be present based on the disclosure. I understand that a mere probability that the element is present is not sufficient to qualify as “inherent disclosure”.

C. Obviousness

11. I understand that a claim in an issued patent can be invalid if it is obvious. Unlike anticipation, obviousness does not require that every element of the claim be in a single prior art reference. Instead, it is possible for claim elements to be described in different prior art references, so long as there is motivation or sufficient reasoning to combine the references, and a reasonable likelihood of success.

12. I understand that a claim is invalid for obviousness if the differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious at the time the alleged invention was made to a person having ordinary skill in the art to which said subject matter pertains.

13. I understand, therefore, that when evaluating obviousness, one must consider obviousness of the claim “as a whole”. This consideration must be from

the perspective of the person of ordinary skill in the relevant art, and that such perspective must be considered as of the “time the invention was made”.

14. The level of ordinary skill in the art is discussed in ¶73 below.

15. The relevant time frame for obviousness, the “time the invention was made”, is discussed in ¶72, below.

16. I understand that in considering the obviousness of a claim, one must consider four things. These include the scope and content of the prior art, the level of ordinary skill in the art at the relevant time, the differences between the prior art and the claim, and any “secondary considerations”. I understand that these four things were specified by the U.S. Supreme Court in a case called *Graham v. John Deere*, and are therefore called the “*Graham* factors”.

17. I understand that “secondary considerations” include real-world evidence that can tend to make a conclusion of obviousness either more probable or less probable. For example, the commercial success of a product embodying a claim of the patent could provide evidence tending to show that the claimed invention is not obvious. In order to understand the strength of the evidence, one would want to know whether the commercial success is traceable to a certain aspect of the claim not disclosed in a single prior art reference (*i.e.*, whether there is a causal “nexus” to the claim language). One would also want to know how the market reacted to disclosure of the invention, and whether commercial success might be traceable to

things other than innovation, for example the market power of the seller, an advertising campaign, or the existence of a complex system having many features beyond the claims that might be desirable to a consumer. One would also want to know how the product compared to similar products not embodying the claim. I understand that commercial success evidence should be reasonably commensurate with the scope of the claim, but that it is not necessary for a commercial product to embody the full scope of the claim.

18. Other kinds of secondary considerations are possible. For example, evidence that the relevant field had a long-established, unsolved problem or need that was later provided by the claimed invention could be indicative of non-obviousness. Evidence that others had tried, but failed to make an aspect of the claim might indicate that the art lacked the requisite skill to do so. Evidence of copying of the patent owner's products before the patent was published might also indicate that its approach to solving a particular problem was not obvious. Evidence that the art recognized the value of products embodying a claim, for example, by praising the named inventors' work, might tend to show that the claim was non-obvious.

19. I further understand that prior art references can be combined where there is an express or implied rationale to do so. Such a rationale might include an expected advantage to be obtained, or might be implied under the circumstances.

For example, a claim is likely obvious if design needs or market pressures existing in the prior art make it natural for one or more known components to be combined, where each component continues to function in the expected manner when combined (*i.e.*, when there are no unpredictable results). A claim is also likely invalid where it is the combination of a known base system with a known technique that can be applied to the base system without an unpredictable result. In these cases, the combination must be within the capabilities of a person of ordinary skill in the art.

20. I understand that when considering obviousness, one must not refer to teachings in the specification of the patent itself. One can, however, refer to portions of the specification admitted to be prior art, including the “Background” section. Furthermore, a lack of discussion in the patent specification concerning how to implement a disclosed technique can support an inference that the ability to implement the technique was within the ordinary skill in the prior art.

IV. PERSON HAVING ORDINARY SKILL IN THE ART

21. I have considered what the level of ordinary skill in the art of the '967 patent was in the relevant timeframe. In considering the level of ordinary skill, I have taken into account the levels of education and experience of persons working in the field, the types of problems encountered in the field, and the sophistication of the technology. I understand that a person of ordinary skill in the art is a hypothetical person that is deemed to be aware of the content of all analogous prior art. In the

relevant timeframe, the level of ordinary skill in the art was equal to a bachelor's degree in electrical engineering or a similar field and two years of related professional experience, where additional education can substitute for experience or vice versa. I believe that I have at least that level of skill and that I can opine as to the perspective of a person of ordinary skill in the art in the relevant time frame.

V. DOCUMENTS RELIED UPON

22. In forming my opinions, I have relied on the following documents, as well as my knowledge and experience as applied from the perspective of a PHOSITA (see ¶21, above) in the relevant timeframe, which is June 25, 2009 (see ¶27, below) or somewhat before then:

Exhibit No.	Description
1001	U.S. Patent No. 7,939,967 B2 (“ the ’967 patent ”).
1004	File History of Pat. App. Ser. No. 12/491,773 (file history of the ’967 patent).
1005	U.S. Pat. No. 5,631,814 (“ Zak ”).
1006	U.S. Pat. App. Pub. 2005/0281057 A1 (“ Jung ”).
1007	US Pat. App. Pub. 2009/0243391 A1 (“ Susong ”).
1008	U.S. Pat. App. Pub. 2003/0042798 (“ Chang ”).
1009	U.S. Pat. App. Pub. 2006/0226706 (“ Edelen ”).

VI. TECHNICAL INTRODUCTION

23. The following Technical Introduction is intended to describe concepts necessary to understand the '967 patent, and is not necessarily directed to any particular timeframe.

A. The '967 Patent Disclosure

24. The '967 patent, filed in 2009, is directed to the (abstract) idea of redundant power supplies for alerting and handling of power failures. (Ex. 1001, 1:32-42). For certain loads, it is important to ensure the continuous availability of electrical power, even if a source of power (like a wall outlet) fails. To address this issue, the '967 patent purports to describe a system where two different sources of power energize two “power supplies”, and where either power supply can be used to supply power to the load. Such a system is shown in Fig. 1, reproduced here:

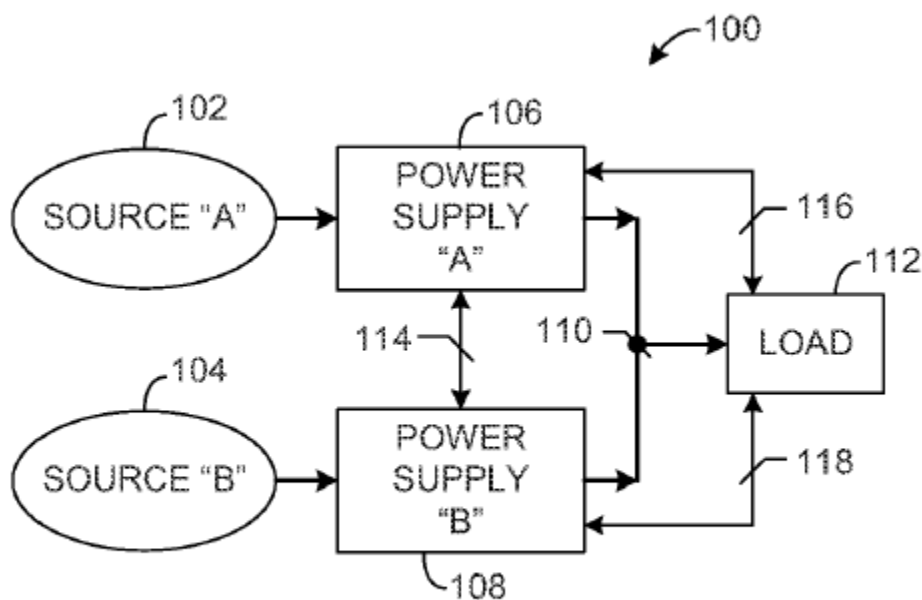


FIG. 1

(Ex. 1001, Fig. 1). In Fig. 1, two “independent power sources” 102 and 104 each supply power to a respective power supply 106 or 108, both of which are coupled to a load 112. (Ex. 1001, 2:15-48). A “power supply” in the ’967 patent “can respectively include any circuitry, processor(s) or other resources as needed in order to perform in accordance with the present teachings”, and can include “voltage or current sensing elements, etc.”. (Ex. 1001, 2:62-3:6).

25. In operation, if a power failure occurs at power source A, the power supply 106 detects it and sends out a signal (called an “alert signal”). (Ex. 1001, 3:30-36, 2:18-61). In turn, the *second power supply* receives an “activation signal”, which can be “defined by the ‘alert signal’”. (Ex. 1001, claim 3). The activation signal causes the second power supply to increase its output of power to take over the supply of the load before the first power source fails completely. (*Id.*). An example operation method is purportedly shown in Fig. 2, reproduced here:

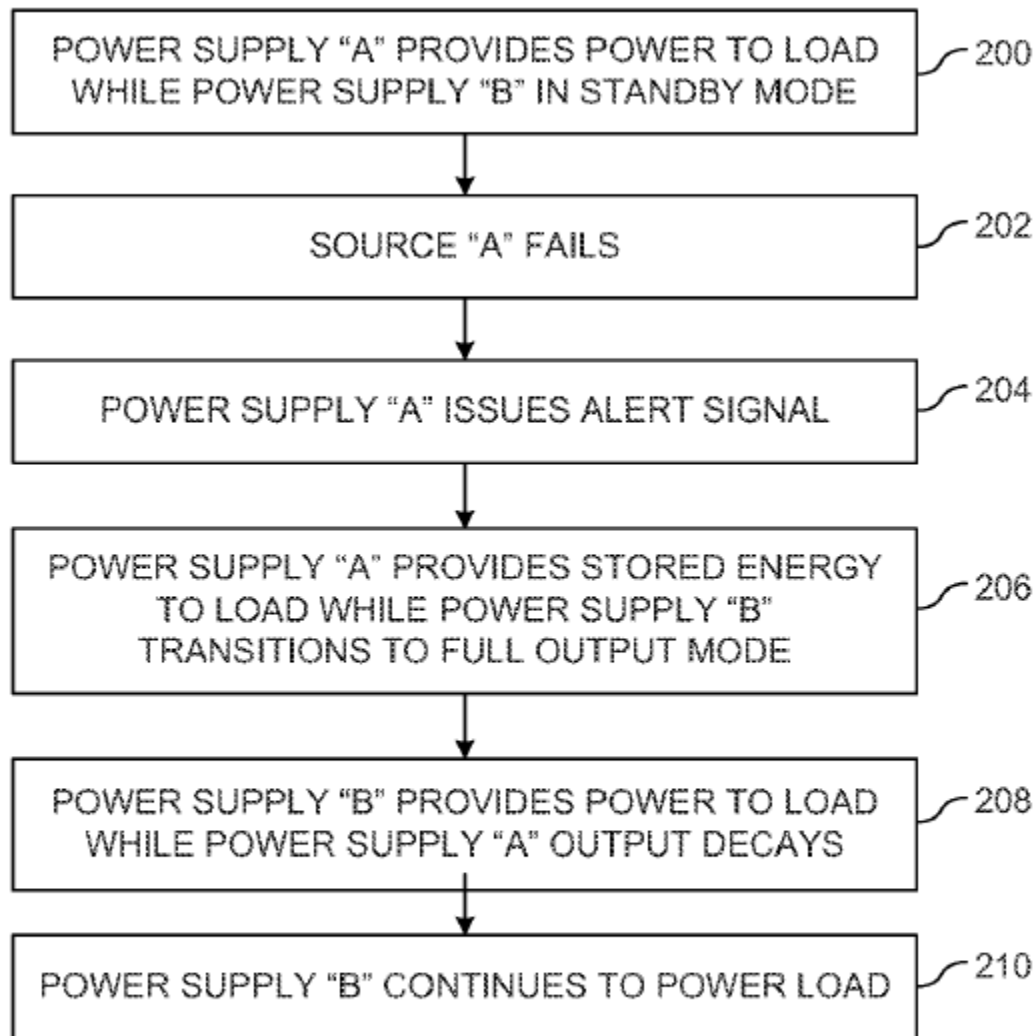


FIG. 2

(Ex. 1001, 3:7-61).

26. Claim 1 of the '967 patent reads as follows:

“[1a] An apparatus, comprising: a first power supply coupled to an electrical load and a first source of electrical energy, [1b] the first power supply configured to issue an alert signal indicative of a failure condition of the first source of electrical energy; and

[1c] a second power supply coupled to the electrical load and a second source of electrical energy,

[1d] the second power supply configured to transition from a lesser output level to a greater output level in response to an activation signal.”

VII. TIME THE INVENTION WAS MADE

27. From the first page of the '967 patent, I can see that it issued from application number 12/491,773, filed on June 25, 2009, as shown at the bottom of the image at right. I will therefore treat the “time the invention was made” for the purpose of the obviousness analysis to be June 25, 2009, including the time period of time somewhat before June 25, 2009. My analysis in this declaration is directed to the perspective of a PHOSITA in that timeframe, which I will refer to as the “relevant timeframe”. This is true unless I state otherwise, and even if I do not use a past tense.

(12) **United States Patent
Humphrey et al.**

(54) **MULTIPLE POWER SUPPLY CONTROL**

(75) Inventors: **Daniel Humphrey**, Houston, TX (US);
Amin Bemat, Cypress, TX (US);
Reynaldo Domingo, Spring, TX (US)

(73) Assignee: **Hewlett-Packard Development
Company, L.P.**, Houston, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 208 days.

(21) Appl. No.: **12/491,773**

(22) Filed: **Jun. 25, 2009**

VIII. CLAIM CONSTRUCTION

28. My understanding of the legal requirements for claim construction is provided beginning at ¶8 above. I do not believe that any terms need to be construed to apply the prior art I list above to the claim terms.

IX. DETAILED EXPLANATION OF THE REASONS FOR UNPATENTABILITY

29. My opinions relate to the following grounds of unpatentability:

Ground 1: Claims 1-3, 8, and 14-15 are anticipated by Zak.

Ground 2: Claims 1-7, and 9-15 are obvious over Susong.

Ground 3: Claims 2, 8, 11, and 14-15 are obvious over Susong and Zak.

Ground 4: Claims 1, 4-7, 9-10, and 13 are obvious over Chang.

Ground 5: Claims 1-15 are obvious over Chang and Edelen.

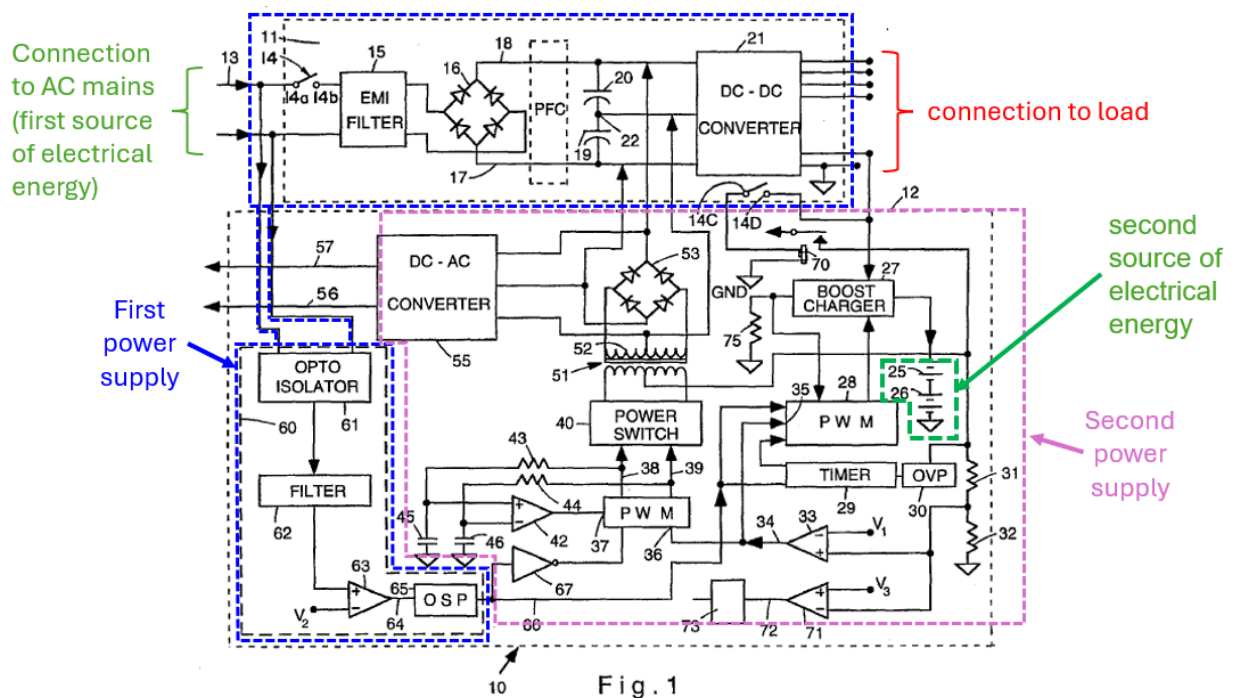
Ground 1. Claims 1-3, 8, and 14-15 are anticipated by Zak

30. It is my opinion that claims 1-3, 8, and 14-15 are anticipated by U.S. Pat. No. 5,631,814 (“**Zak**”) (Ex. 1005).

A. Overview of Zak

31. Zak teaches an Uninterruptible Power Supply (“UPS”) with two independent sources of power (“AC mains” and batteries). The sources are independent, at least because one can provide power when the other cannot. Zak teaches switching from AC mains to backup batteries to supply a load if the AC mains fail. (Ex. 1005, 7:8-33).

32. With Zak's UPS it is possible to identify the principal elements of the claims of the '967 patent, namely: a first power supply (shown in blue in the reproduction of Fig. 1 below), a second power supply (purple), a first independent source of electricity (AC mains, green, left side), a second independent source of electricity (batteries, green, right side), and a connection to a load (red):



(Ex. 1005, Fig. 1).

33. Zak's UPS takes in AC power at terminals 13 from the "AC mains", by which Zak means an AC power source that is provided by a utility or generator. (Ex. 1005, Abstract). Power is routed through EMI filter 15, and then through a rectifier 16. (Ex. 1005, 4:65-5:3). The purpose of the rectifier is to convert AC power to DC power at 300 V. (Ex. 1005, 4:65-5:3). The DC power on lines 18 and 17 has

holdover capacitors 19 and 20. (Ex. 1005, 5:4-8). The holdover capacitors are charged, as long as the AC mains are active, and have the effect of maintaining the DC voltage between lines 18 and 17. (Ex. 1005, 5:4-8, 6:35-43). This maintaining of the voltage filters out variation in the DC voltage that can occur because of unusual variations in the AC mains or as an artifact of the rectification process. The holdover capacitors can also maintain the DC voltage near the nominal level for some time after failure of the AC mains, because they store charge.

34. The lines 18 and 17 are input to a DC/DC converter 21, which has the job of changing the DC voltage from the input level to an often lower output level used to power logic circuitry, at or near the same total power level. (Ex. 1005, 5:8-16). The output DC voltage is provided at the output of DC/DC converter 21. (Ex. 1005, 5:8-16). During normal operation of the AC mains, one of the DC outputs of the DC/DC converter 21 is connected through boost charger 27 to charge batteries 25 and 26. (Ex. 1005, 5:25-30).

35. The batteries 25 and 26 provide backup power if the AC mains fail. (Ex. 1005, 5:25-30, 7:18-44). The AC mains are monitored by a detector circuit 60, shown in the lower left of Fig. 1, above. (Ex. 1005, 5:66-6:7). Zak refers to a power supply 11 and power supply 12 (Ex. 1005, 4:58-63), but a PHOSITA would understand that the circuitry in 11 and detector circuit 60 also form a “power supply” as that term is understood in the ’967 patent, because the collective circuitry of 11

and 60 process power and contain detection circuitry related to the handling of power. (*Compare* Ex. 1001, 2:62-3:6).

36. In the event of a failure of the AC mains, the detector circuit 60 will issue a signal on output 66 of OSP 65. (Ex. 1005, 5:66-6:7, 7:18-44). This signal is routed to an inverter 67 that in turn enables a PWM 37. (Ex. 1005, 7:11-14). The PWM 37 drives a power switch 40, which produces a time-varying signal to drive a transformer 51. (Ex. 1005, 5:41-42, 5:47-50, 7:18-28). The transformer 51 is center-tapped with the battery output. (Ex. 1005, 5:47-57) (“A center-tapped primary winding 50 of an isolating transformer 51 is connected to an output of the power switch 40 with its center tap connected to the 24 volt terminal of the batteries 25 and 26.”). This means that there is a connection at the 24-volt terminal of the battery 25 with the line connected to the center tap of the primary winding of transformer 51.

37. The connection of the battery output to the transformer will not provide power at its secondary side with merely the batteries’ DC output. This is because transformers will generally only induce a voltage in the secondary-side winding when there is a time-varying voltage and current in the primary-side winding. Thus, when the PWM and power switch 40 are not activated, the primary winding of the transformer does not transfer power to the secondary winding. When the PWM and power switch 40 are active, however, the time-varying waveform applied to the transformer will cause AC power to be induced in the secondary winding. When

this occurs, the AC power is rectified by rectifier 53 to produce DC power, and coupled to DC voltage lines 17 and 18. (Ex. 1005, 7:4-28). These voltage lines, in turn, are fed to the DC-DC converter, which applies output terminals at desired voltages, to which the loads are connected. When this happens, both power supplies are capable of providing power to the load, because both the holdover capacitors 19, 20 and the batteries 25, 26 are connected to the load.

B. Claim Mapping

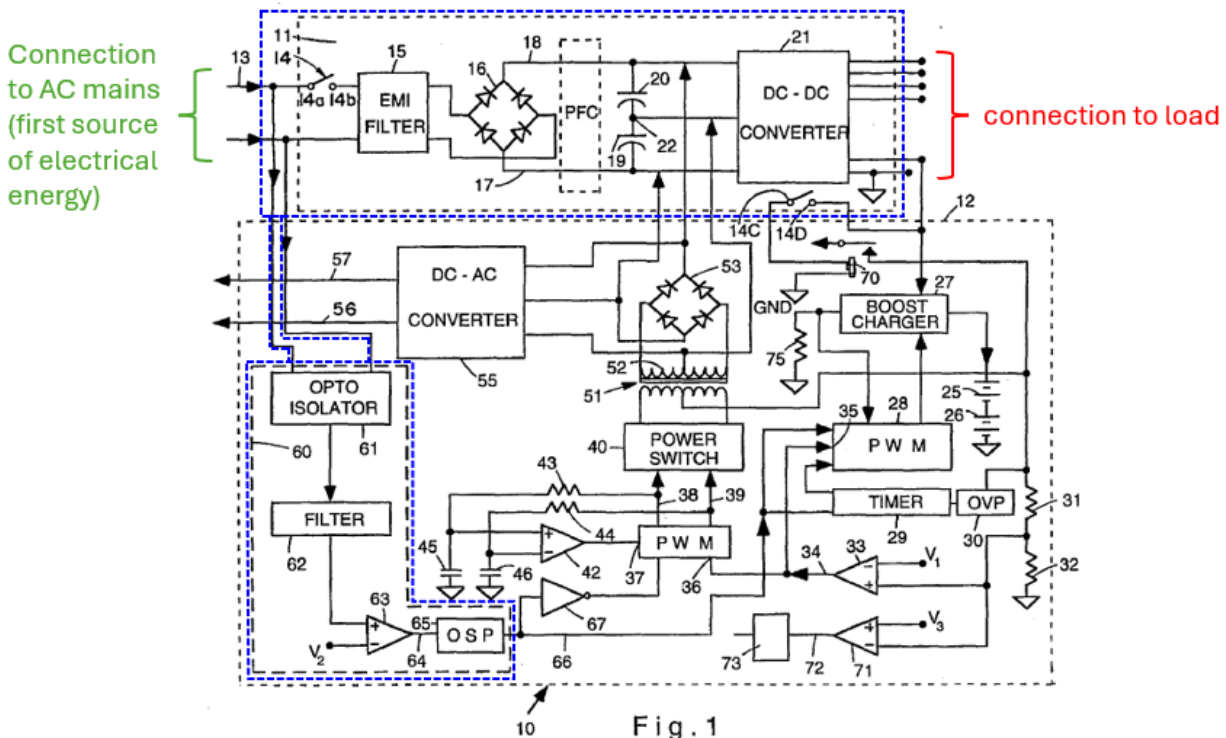
38. In this section I show how the challenged claims map to the relevant disclosure of Zak, where the claim text appears in bold-italics, and the relevant mapping follows the claim text.

CLAIM 1

“[1a] An apparatus, comprising: a first power supply coupled to an electrical load and a first source of electrical energy,”

39. Zak clearly teaches an **apparatus**, in the form of an uninterruptible power supply (“UPS”). (Ex. 1005, Abstract, Fig. 1).

40. Zak’s UPS has **a first power supply coupled to an electrical load and a first source of electrical energy**. A circuit diagram of Zak’s UPS is shown in Fig. 1, with green annotations to show the first source of electrical energy (main AC utility power line 13), red annotations to show the connection to the load, and blue annotations to show the first power supply:



(Ex. 1005, Fig. 1). The **first power supply** of claim 1 is met by Zak's main power supply 11, detector circuit 60, and the lines connecting them. (Ex. 1005, 4:62-67, 5:66-6:7). That is, the first power supply that meets the claims is what Zak calls the main power supply with an additional detector circuit, and in this respect, I note that the '967 patent states that a power supply "can respectively include any circuitry, processor(s) or other resources as needed in order to perform in accordance with the present teachings", and can include "voltage or current sensing elements, etc.", such as circuit 60 of Zak. (Ex. 1001, 2:62-3:6). A PHOSITA would have understood that the main power supply 11, detector circuit 60 (which is effectively a "voltage or current sensing element" as discussed in the '967 patent 2:62-3:6), and the lines

connecting them, also constitute a power supply within the meaning of the '967 patent.

41. The first power supply is **coupled to a first source of electrical energy**, specifically “a main AC utility power line 13”, which energizes the first power supply. (Ex. 1005, 4:58-67, Fig. 1). The first power supply is also **coupled to an electrical load**. (Ex. 1005, 3:53-56) (“an uninterruptible power supply including a main power supply and a backup power supply for supplying at least DC electrical power to a load”). The load can be, for example, components of a computer, and is connected between the output terminals of the DC – DC converter 21. (Ex. 1005, 5:9-18, 1:29-30, 1:14-16, 3:62-63). DC – DC converter 21 is part of the first power supply identified above, and its output terminals are effectively output terminals of the first power supply.

“[1b] the first power supply configured to issue an alert signal indicative of a failure condition of the first source of electrical energy; and”

42. The first power supply is **configured to issue an alert signal indicative of a failure condition of the first source of electrical energy**. The alert signal is the output signal 66 issued from overswitch protection circuit (OSP) 65 in the

detector circuit 60 when the first source of electrical energy (main AC supply 13) fails.¹ (Ex. 1005, 7:8-14, 5:66-6:7). Zak explains:

“In order to detect the presence or absence of voltage across the main AC power line, there is provided a detector circuit 60 comprising an opto isolator 61 coupled, via a filter 62, to the non-inverting input of a comparator 63 whose inverting input is connected to a voltage reference V_2 . An output 64 of the comparator 63 is connected to an overswitch protection circuit (OSP) 65 having an output 66 which is fed to the timer 29 and to the PWM 28 and, via an inverter 67, to the second PWM 37.”

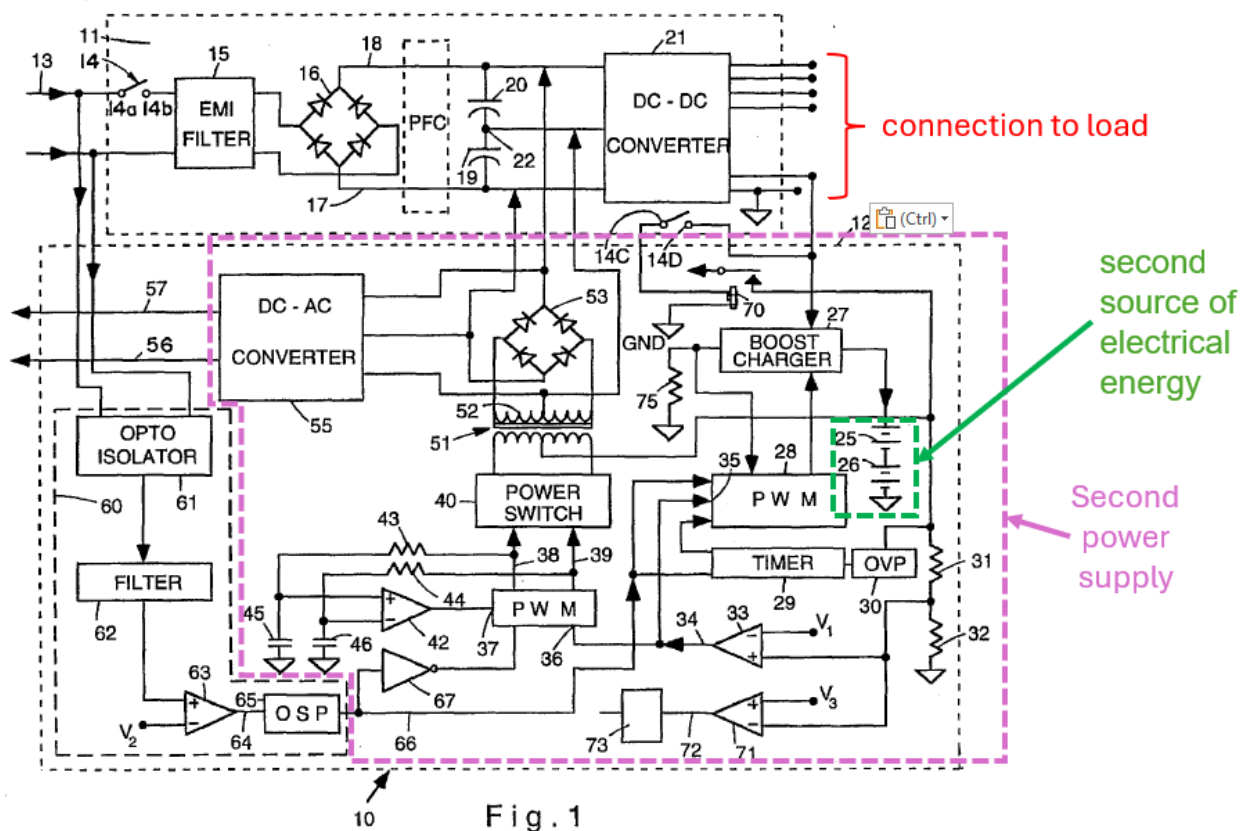
(Ex. 1005, 5:66-6:7) (Emphasis added) (*see also* Ex. 1005, 6:62-7:18, 7:8-14, 9:19-42) (*compare* Ex. 1001, 2:51-53). The output 66 is an electrical voltage on a line that communicates information. Specifically, the output 66 will be a low voltage upon failure of the AC main power supply, but will change to a high voltage (at a speed that filters transient high voltage pulses) if main AC power is operating normally. (Ex. 1005, 9:28-42). The output 66 is thus **an alert signal indicative of a failure condition.**

“[1c] a second power supply coupled to the electrical load and a

¹ The metes and bounds of “failure condition” are unclear, but Zak’s “absence of voltage” certainly meets the concept. (*Compare* Ex. 1001, 3:25-28).

second source of electrical energy,”

43. Zak teaches a **second power supply coupled to the electrical load and a second source of electrical energy**. The **second power supply** is shown with an added purple-dashed box in the reproduction of Fig. 1, below, excluding the second source of electrical energy (batteries 25 and 26, shown in green):



The second power supply is **coupled to**, and energized by, a **second source of electrical energy**, in the form of batteries 25 and 26. (Ex. 1005, 5:25-50). These are a second source of electrical energy, as demonstrated at least by the fact that the batteries can provide power when the main AC power fails. (Ex. 1005, 6:62-7:28).

The second power supply is also coupled to the **electrical load**, because the batteries are coupled, via transformer 51 and bridge rectifier 53 to the input rails 17 and 18 of DC-DC converter 21, which in turn provides the output terminals that are connected to loads. (Ex. 1005, 5:47-58, 3:53-4:26). I discuss this operation in ¶¶36-37, above.

“[1d] the second power supply configured to transition from a lesser output level to a greater output level in response to an activation signal.”

44. The second power supply is configured to transition from a lesser output level to a greater output level in response to an activation signal. Specifically, the second power supply transitions in response to two signals that meet the claimed activation signal.

45. **First**, Zak’s first power supply provides a signal at the output 66 (**activation signal**) of OSP 65, as explained above under element [1b] (Ex. 1005, 5:66-6:7) (*see also* Ex. 1005, 6:62-7:18, 7:8-14, 9:19-42) (*compare* Ex. 1001, 2:51-53). The output 66 of Zak maps to both the claimed **alert signal** (discussed under element [1b] and the claimed **activation signal**). *See* claim 3 (“the activation signal is defined by the alert signal”).

46. **Second**, the claimed **activation signal** *also* reads on Zak’s “actuation signal” (the output of inverter 67). I note to avoid confusion that the claim term “activation signal” is similar to the term in Zak “actuation signal”, and that Zak’s actuation signal meets the claims activation signal. Zak’s actuation signal is

produced by inverter 67 upon receiving the low-voltage output 66 of OSP 65 that indicates AC mains failure, and is **received** by the PWM 37 in the second power supply. (Ex. 1005, 7:8-33, 5:66-6:7, 9:28-40).

47. In Zak, output 66 and the resulting actuation signal each cause the second power supply to connect the batteries (via the transformer) to the input terminals of the DC – DC converter 21, and thereby to the output (as I explain in ¶¶36-37, above), thus providing backup battery power. (Ex. 1005, 7:8-33). Zak explains:

“[I]n the **event of a main AC supply power failure**, the output voltage of the filter 62 drops below the reference voltage V_2 , causing the comparator 63 to go low thus disabling the PWM 28. At the same time, the output of the inverter 67 goes high, providing an **actuation signal** via the over-switching protection circuit 65 so as to enable the PWM 37....When the PWM 37 is enabled, the 24 volt output of the backup batteries 25 and 26 is converted by the power switch 40, the isolating transformer 51 and the bridge rectifier 53 to a pair of high voltage DC levels having magnitudes of + 150 V and -150 V with respect to the center tap of the transformer secondary winding 52. These DC voltage levels are fed to the respective holdover capacitors 19 and 20 so that the overall voltage across the low and high DC voltage rails 17 and 18 is 300 V, corresponding to the high voltage DC level supplied by the bridge rectifier 16 in the switch power supply 11. **For so long as there is power loss on the main AC power line 13, power is supplied to the DC to DC converter 21 in**

the switch power supply 11 by the power switch 40 **until the batteries 25 and 26 become discharged....**”

(Ex. 1005, 7:8-33) (Emphases added). The output of the DC-DC converter 21, which is part of the claimed first power supply, is connected to the load. (Ex. 1005, Fig. 1, 5:9-17, 1:29-30, 1:14-16, 3:53-64).

48. The action of the second power supply, in response to either of the two activation signals identified above, is a **transition from a lesser output level to a greater output level**. Specifically, when the main AC lines are providing power, the output 66 causes the actuation signal to not allow activation of the PWM 37, which in turn causes the transformer 51 to be inactive (have zero output power), as I explain in ¶¶36-37, above. (Ex. 1005, 7:64-8:2) (*compare* Ex. 1001, 1:37-42, 3:18-24, 3:37-43, Fig. 2). When the AC mains are not providing power, however, the output 66 changes, causing the actuation signal to change, causing the PWM 37 to become active, driving transformer 51 to produce a greater output level from the rectifier and ultimately from the second (backup) power supply. (Ex. 1005, 7:8-33). When Zak’s actuation signal is active, both the first and second power supplies can simultaneously supply power to the load. Specifically, the first power supply can supply power from the holdover capacitors 19, 20 (as I explain in ¶50), while the second power supply supplies power from the batteries 25, 26.

49. The transition to a greater output level is **in response to an activation signal**, because it is caused by receiving the output 66 from OSP 65 that indicates failure of the AC mains (an **activation signal**), which in turn changes the output of inverter 67, causing Zak's actuation signal (another **activation signal**). (Ex. 1005, 7:8-33, 5:66-6:7). That is, the output 66 of OSP 65 causes the actuation signal (output of inverter 67), which in turn causes the claimed transition. The claimed transition is thus "in response to" each of the activation signals. (Ex. 1005, 7:8-33).

CLAIM 2

"2. The apparatus according to claim 1, the first power supply further configured to provide operating power to the electrical load while the second power supply transitions from the lesser output level to the greater output level."

50. Zak teaches that the first power supply has holdover capacitors 19 and 20 connected in parallel to the DC – DC converter 21. (Ex. 1005, Fig. 1, 5:4-8, 6:35-44, 7:23-28). As was well understood in the art, the term "holdover capacitor" describes a capacitor used to maintain a voltage temporarily in the event of a power failure. (e.g., Ex. 1006, ¶0003). The holdover capacitors in the circuit of Fig. 1 have the effect of maintaining the input voltage to the DC – DC converter 21, and thus also the output voltage and operating power, for a time when power from the AC mains 13 fails. This is also visible to a PHOSITA from the circuit connection of the capacitors 19 and 20, which are connected in parallel to the DC power source (the rectified output of the AC mains) and the input to the DC/DC converter 21. This

causes the holdover capacitors to store charge when the DC power source is providing power (Ex. 1005, 3:61-62), such that they tend to maintain the voltage between lines 17 and 18. (Ex. 1005, 5:4-8, 6:36-44). If the DC power source fails, and for some reason the battery backup is not available or takes a short period of time to engage, the holdover capacitors will hold the full operating voltage (*e.g.* 300 V, Ex. 1005, 7:18-23) between lines 17 and 18 approximately constant for a time, but begin to discharge at a rate dependent on the current draw of the load. The current drawn by the load is the operating current of the load, while 300 V (*e.g.*) is the operating voltage. The product of these two gives the operating power ($P=VI$). After the load begins to draw current from the holdover capacitors, the decrease in charge held by the capacitors will eventually cause a significant fall in the voltage between lines 17 and 18. The holdover capacitors thus cause the **first power supply** to be **configured to provide operating power to the electrical load while the second power supply transitions from the lesser output level to the greater output level**, because the holdover capacitors provide power to the output of the first power supply while the actuation signal from OSP circuit 65 is causing the second power supply to transition to a greater output level.

CLAIM 3

“3. The apparatus according to claim 1, the first and second power supplies being coupled such that the activation signal is defined by the alert signal.”

51. As explained above under claim 1, elements [1b] and [1d], the signal issued on output 66 from OSP 65 is both the alert signal and an activation signal, such that the **activation signal is defined by the alert signal**. Furthermore, Zak's actuation signal (the output of inverter 67) is a direct transformation, by the inverter circuit 67, of the output 66 of OSP 65, and is thus also an **activation signal** that is **defined by the alert signal**. (Ex. 1005, 7:8-33, 5:66-6:7).

CLAIM 8

"8. The apparatus according to claim 1, the first power supply further configured to provide operating level power from internal energy storage to an electrical load while the second power supply transitions from the lesser output level to the greater output level in response to the activation signal."

52. See above, discussion under claim 2. The holdover capacitors 19 and 20 provide **operating level power** when fully charged (as they are at the moment the AC mains fail) and for some time thereafter. (Ex. 1005, Fig. 1, 5:4-8, 6:35-48, 7:23-28). The holdover capacitors 19 and 20 are within the first power supply, and are thus **internal energy storage**.

53. As I discussed in connection with claim 2, Zak teaches that the first power supply is configured to provide operating power to the electrical load while the second power supply transitions from the lesser output level to the greater output level. For those same reasons, Zak teaches claim 8, which requires that the first power supply is configured to provide **operating level power from internal energy**

storage to an electrical load while the second power supply transitions from the lesser output level to the greater output level **in response to the activation signal**.

CLAIM 14

“[14a]. A method, comprising: asserting a signal responsive to an anomalous condition of a first independent source of electrical energy,”

54. See above, discussion under claim elements [1a] and [1b]. The **first independent source of electrical energy** is the AC mains 13, and the **signal** is the signal issued from OSP 65 upon failure (**anomalous condition**) of the AC mains. (Ex. 1005, 7:8-33) (*compare* Ex. 1001, 3:25-29 (failure is an anomalous condition)). The AC mains are an **independent source of electrical energy** because they are independent from the batteries, *e.g.*, an anomalous condition (*e.g.*, failure) in one does not imply an anomalous condition in the other. Indeed, the purpose of Zak is to provide the batteries as a backup source of power in the event of a failure of the AC mains. (Ex. 1005, 4:11-16).

“[14b] the first independent source of electrical energy coupled to energize a first power supply;”

55. See above, discussion under claim element [1a].

“[14c] transitioning a second power supply from a standby output level to a normal output level responsive to the signal,”

56. See above, discussion under claim element [1d]. The second power supply is at a **standby** output level prior to transitioning because it is outputting no power. (Ex. 1005, 7:64-8:2). The transitioning is **responsive to the signal**, because it occurs as a consequence of the assertion of the output signal 66, as discussed above under claim element [1d].

“[14d] the second power supply energized by a second independent source of electrical energy; and”

57. See above, discussion under claim element [1c]. The batteries are an independent source of electrical energy for the reasons discussed under element [14a]. (Ex. 1005, 4:11-16).

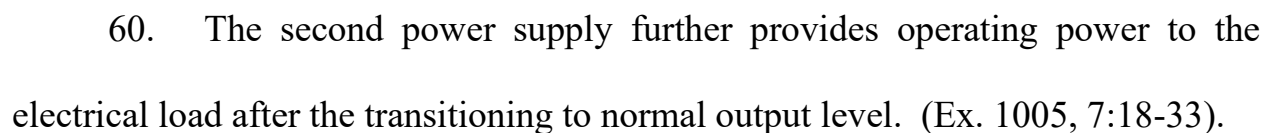
“[14e] providing operating power from the first power supply to an electrical load during the transitioning.”

58. See above, discussion under claim 2.

CLAIM 15

“15. The method according to claim 14 further comprising communicating the signal from the first power supply to the second power supply, the second power supply providing operating power to the electrical load after the transitioning to normal output level.”

59. See above, discussion under claim element [1b] (discussing **communicating the signal**). The signal is communicated **from the first power supply to the second power supply**, because it originates in the detector circuit 60



61. In my opinion, claims 1-7 and 9-15 would have been obvious over U.S. Pat. App. Pub. No. US 2009/0243391 A1 (“**Susong**”) (Ex. 1007).

A. Overview of Susong

62. Susong teaches “a multi-functional power supply” that is “advantageously suitable for distributed networking environments”. Susong’s power supply 100 is shown in Fig. 1, reproduced here:

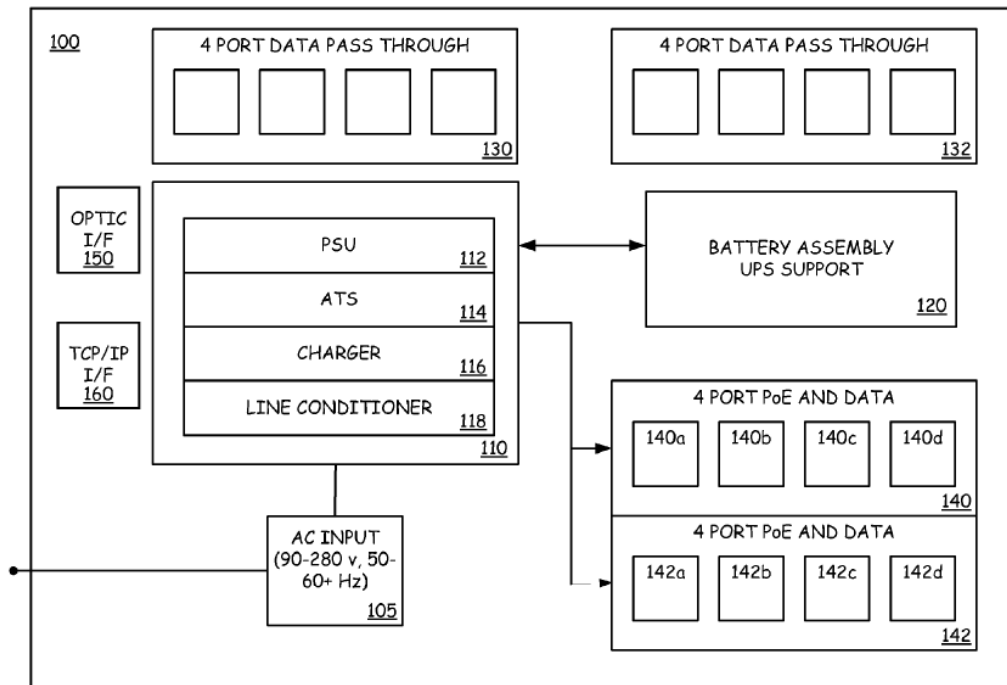


FIG. 1

(Ex. 1007, Fig. 1, ¶¶0028-0037).

63. The power supply 100 receives AC power at interface 105 (lower left). (Ex. 1007, ¶¶0028-0029). The interface 105 in turn provides power to the power supply module 110, which conditions the power using power supply unit 112. (Ex. 1007, ¶¶0028-0030). The power supply unit then provides DC power to ports 140 and 142 to supply loads. (Ex. 1007, ¶0035). The power supply 100 has an associated

battery assembly 120 (right side), having one or more batteries. (Ex. 1007, ¶¶0033-0035).

64. Susong also teaches a *system* with a redundant configuration of power supplies in Fig. 2, reproduced here:

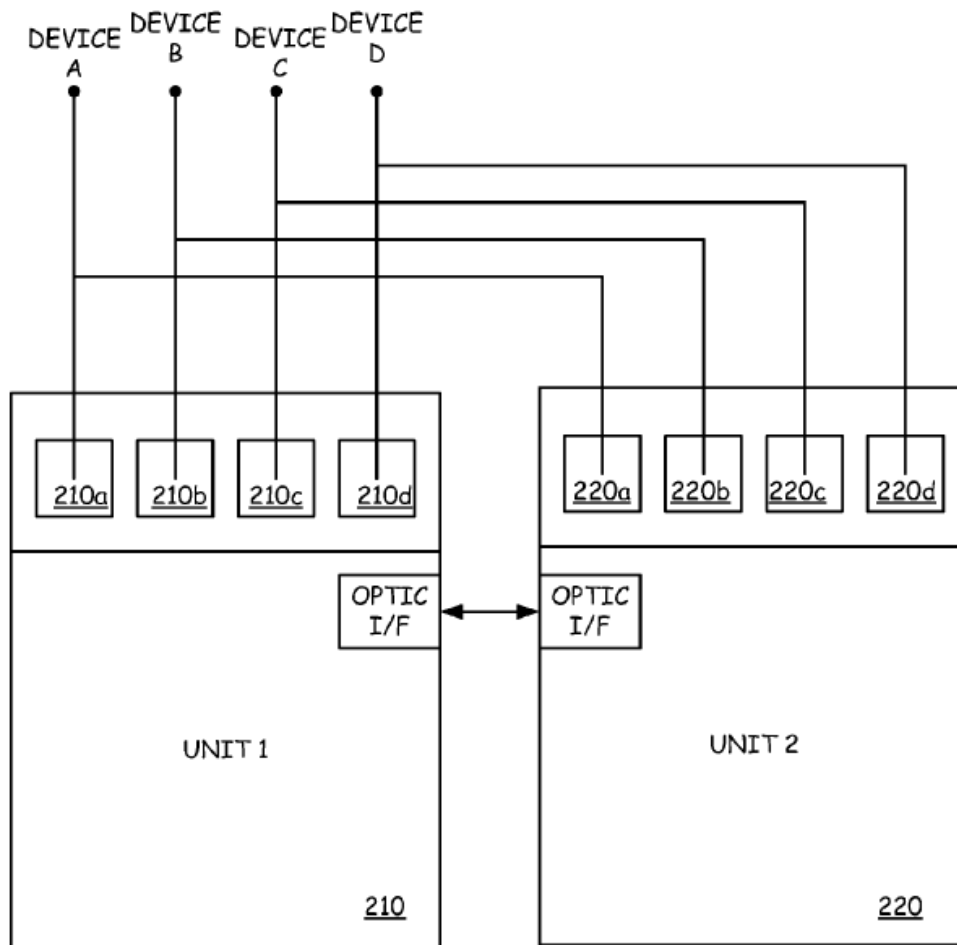


FIG. 2

(Ex. 1007, Fig. 2, ¶¶0037-0038).

65. In such a configuration, the two power supplies 210 and 220 (labeled UNIT 1 and UNIT 2) communicate with each other to achieve “failover” operation. In failover operation, the online power supply (the one currently supplying power to

the load devices A-D) detects an anomaly in its own operation, and signals to the other supply that it should take over. (Ex. 1007, ¶¶0038, 0041-0047, 0019-0020, Figs. 4A, 4B). Susong recites one method of failover control in its claim 20:

“[a] power supply system comprising:
a failover communication interface enabling the power supply to be communicatively coupled with at least one backup power supply operating in an off-line mode; and
a failover module operative to: detect a failure in the power supply unit;
request a backup power supply to change to an on-line mode for providing power to devices current attached to the PoE ports of the power supply system; and
switching the power supply unit to an off-line mode after receiving a response from the backup power supply indicating that the backup power supply can change to an on-line mode”

(Ex. 1007, ¶¶0034, 0019, 0016, claim 20).

66. The failover functionality—resulting in transfer of a load to another power supply—can be triggered by detecting a failure in the batteries. (Ex. 1007, ¶¶0037-0038, 0042, 0020, 0041-0047, Figs. 4A-4B). When a failure of batteries is detected, the AC power can be active, or may already have failed in both power supplies. (Ex. 1007, ¶¶0033-0034, 0019).

B. Overview of the Obviousness Contention

67. In my opinion, Susong is close to anticipating numerous claims. This Ground is nonetheless presented as one of obviousness for two reasons.

68. First, in my opinion, it was obvious that Susong intended its power supply of Fig. 1 to be used in conjunction with the remaining disclosure.

69. Second, the independent claims generally require a power supply “coupled to” a power source. In this Ground, the power sources are the batteries associated with each of Susong’s power supplies. Susong teaches that the batteries can be modular and are replaceable. To the extent the claim language requires that the thing “coupled to” to the power supply must be separate from the power supply, and I do not think it would, it would have been obvious to make the batteries separable and replaceable.

C. Rationale (Motivation) Supporting Obviousness

70. In my opinion, Susong teaches that it would have been obvious to use the device of Fig. 1 of Susong as the UPSs (*e.g.*, UNIT 1 and UNIT 2 in Figs. 2-3) with respect to the rest of Susong’s disclosure. Before describing Fig. 1, Susong states that “[t]he present invention is directed towards a **universal power supply** that is ideally suitable in a distributed network design with limited access to power sources.” (Ex. 1007, ¶0019) (Emphasis added). The power supply of Fig. 1 is a “functional block diagram illustrating various components of functions incorporated

into **an exemplary embodiment of the present invention.**” (Ex. 1007, ¶0028) (Emphasis added). The power supply 100 of Fig. 1 is also expressly tied to Figs. 4A and 4B. (Ex. 1007, ¶0041). With respect to Figs. 2 and 3, it would have been obvious to a PHOSITA that Susong is using identical power supplies 100 as UNIT 1 and UNIT 2 (elements 210, 220, 310, and 320). Immediately prior to describing Fig. 2, Susong states “[a]nother aspect of the present invention that can be incorporated into various embodiments is the failover functionality”, and then references the operation of the battery assembly “as previously described”, before describing the failover functionality with respect to Figs. 2 and 3. (Ex. 1007, ¶¶0037-0039). The power supplies shown in Fig. 2 and Fig. 3, moreover, are clearly intended to encompass the power supplies of Fig. 1, because they have PoE ports and an optical communications interface (“Optic I/F”) for failover communications (just like Fig. 1). (Ex. 1007, Figs. 1-3, ¶¶0030, 0038, 0049, 0020). Given these disclosures of Susong, it would have been obvious to use the power supply 100 of Fig. 1 for each of the units in Figs. 2-3, 4A, and 4B.

71. It further would have been obvious to have the batteries be separable, modular components. First, Susong generally states that components of Fig. 1 do not need to be physically part of power supply 100. (Ex. 1007, ¶0030, *see also* ¶¶0054-0055, 0019). Susong further teaches that new batteries can be installed. (Ex. 1007, ¶0051) (describing an alert “notifying the system 100 that a new battery has

been installed”). Based on these disclosures, a PHOSITA would have been motivated to make the batteries a separable modular component from the first power supply so that they can be easily replaced, much as many battery-operated appliances in the relevant timeframe allowed batteries to be installed and easily replaced.

D. Reasonable Expectation of Success

72. A PHOSITA in the relevant timeframe would have had a reasonable expectation of success using Susong’s teachings as set forth in the manner proposed in the present Ground, and to achieve the benefits described above. The art in the relevant timeframe was predictable. Specifically, in the relevant timeframe (no earlier than 2009), the basic components that made up power-supplies had been well-known in the art. In particular, the ’967 patent’s general and high-level disclosures support this understanding of the relevant art.

E. Graham Factors

73. As I discuss above in ¶21, in the relevant timeframe, the **level of ordinary skill** in the art was equal to a bachelor’s degree in electrical engineering or a similar field and two years of related professional experience, where additional education can substitute for experience or vice versa. My testimony is from the perspective of a PHOSITA in the relevant timeframe (which is June 25, 2009, including the time period of time somewhat before June 25, 2009, *see* ¶27, above).

74. The **scope and content of the prior art** are discussed throughout the Ground.

75. The **differences between the prior art and the claims** are discussed throughout the Ground.

76. I am not aware of any **secondary considerations** that would make an inference of non-obviousness more likely.

77. This discussion of ¶¶73-76 applies to all Grounds of obviousness.

F. Analogous Art

78. Susong is analogous art because it is in the same field as the '967 patent ("the electrical arts", Ex. 1001, 3:2-3, 3:44-48), and specifically is related to power supplies. (Ex. 1007, Title, Abstract). Susong is also reasonably pertinent to a problem facing the named inventors, namely that of "providing redundant power supplies" (Ex. 1001, 1:32-33), because Susong provides power supplies that have redundant independent energy sources. (Ex. 1007, ¶¶0033-0037, Figs. 2-4).

G. Claim Mapping

CLAIM 1

"[1a] An apparatus, comprising: a first power supply coupled to an electrical load and a first source of electrical energy,"

79. Susong teaches **a first power supply coupled to an electrical load and a first source of electrical energy**. The overall arrangement of Susong is shown in Fig. 2, reproduced here:

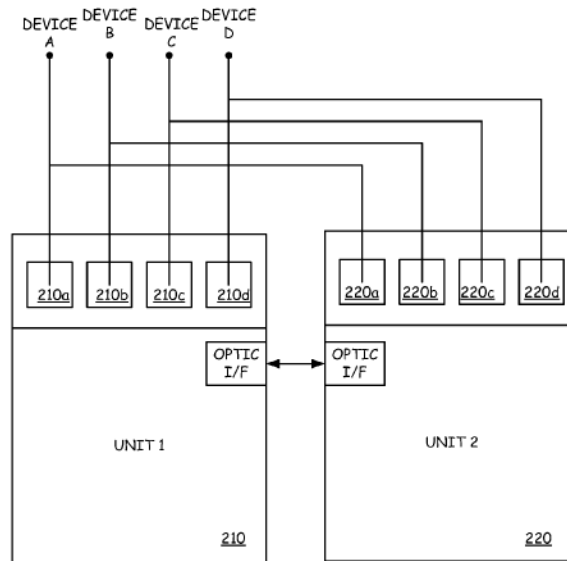


FIG. 2

(Ex. 1007, Fig. 2). In Fig. 2, the **first power supply** is unit 210 (also labeled UNIT 1). (Ex. 1007, ¶0038). The first power supply is **coupled to an electrical load**, which can be any of devices A – D. (Ex. 1007, ¶¶0038, 0004, 0019-0020, 0026, 0034, claim 3).

80. Regarding the first power supply being **coupled to a first source of electrical energy**, this is rendered obvious by Susong. Specifically, it would have been obvious (*see* ¶¶68-72 above) that the units 210 and 220 shown in Fig. 2 are examples of the power supply 100 shown in Fig. 1 of Susong. Figure 1 of Susong is reproduced here:

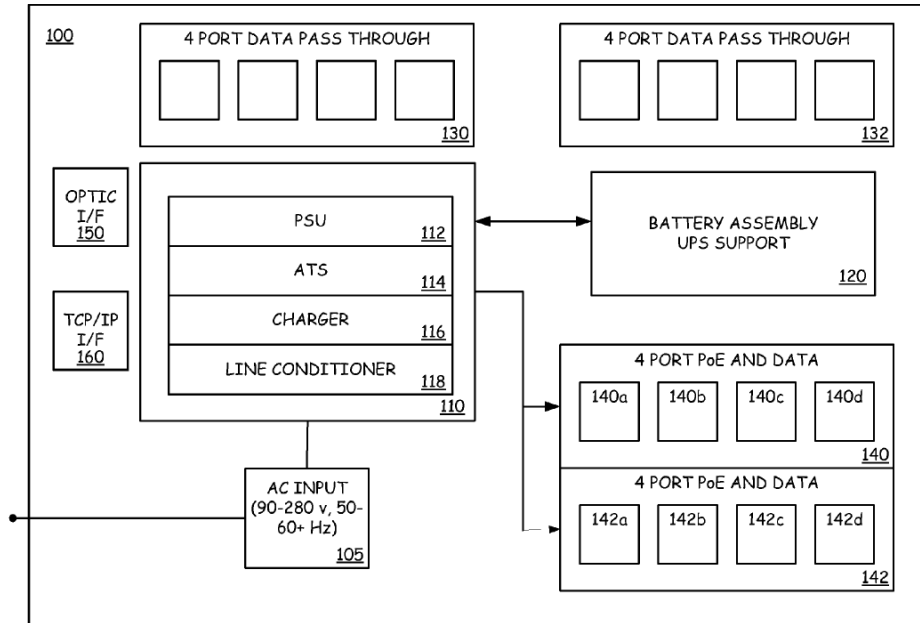


FIG. 1

(Ex. 1007, Fig. 1). As shown in Fig. 1, each unit 100 has a power supply module 110, coupled to battery assembly 120, which contains batteries. (Ex. 1007, ¶¶0033, 0028-0030). The batteries are a **first source of electrical energy**, to which the first power supply is **coupled**. (Ex. 1007, ¶¶0033) (“The power supply module 100 interfaces to the battery assembly 120 through a charger 116.”) (*see also* Ex. 1007, ¶¶0028-0030).

81. To the extent the claim phrase “coupled to” requires the **first source of electrical energy** to be separate from the **first power supply**, it would have been obvious to provide modular batteries that could be removed, and was thus not part of the first power supply, for the reasons discussed above in the section entitled “Rationale (Motivation) Supporting Obviousness”, beginning on ¶71, above.

“[1b] the first power supply configured to issue an alert signal indicative of a failure condition of the first source of electrical energy; and”

82. Susong teaches that **the first power supply is configured to issue an alert signal indicative of a failure condition of the first source of electrical energy**. Specifically, each power supply (including first power supply 210) tests its own battery. (Ex. 1007, ¶0020) (“The power supply module is further able to test the chargeable battery to ensure that it can handle a load”) (*see also* ¶¶0033, 0040-0041, 0043, claims 1, 20). Then, “[i]f the battery assembly is not operating in accordance with the required standard” (Ex. 1007, ¶0042), the power supply will poll other power supplies to determine if their battery assemblies are working properly. (Ex. 1007, ¶0044). In Susong, one form of not being able to “handle a load” or not “operating in accordance with the required standard” is total failure. (Ex. 1007, ¶0020, claims 3, 16, 20). If another power supply responds that it is ready, then the first power supply will issue a surrender request. (Ex. 1007, ¶0045).

In Susong’s words:

“If the active unit receives a ready status from the polled partner unit 408, the active unit sends a surrender request to the ready unit 410. **The surrender request basically informs the partner unit that the active unit needs to relinquish control** and pass control to the partner.”

(Ex. 1007, ¶0044) (Emphasis added).

83. Upon receipt of a surrender request, the second power supply will issue a shutdown command to the first power supply. (Ex. 1007, ¶0045). Upon shutdown, the first power supply will send a shutdown confirmation to the second power supply, at which point the second power supply becomes the active power supply, providing power to the loads. (Ex. 1007, ¶¶0046-0047).

84. Susong thus teaches that the **first power supply**, when it detects that a battery (**first source of electrical energy**) is not operating in accordance with the required standard (*i.e.*, a **failure condition**), will issue a surrender request and then a shutdown confirmation, either of which qualifies as **an alert signal indicative of a failure condition of the first source of electrical energy**. The surrender request and shutdown confirmation each **indicate a failure condition** because they are both signals that follow detection of a failure condition of the battery. (Ex. 1007, ¶¶0045-0047, Figs. 4A, 4B). The surrender request and shutdown confirmation are each a “**signal**” because they are communicated by the optical or electrical communications interfaces of the power supplies. (Ex. 1007, ¶0049).

“[1c] a second power supply coupled to the electrical load and a second source of electrical energy,”

85. In connection with Fig. 2, Susong teaches a **second power supply** (unit 220) coupled to the electrical load (any of devices A-D) and a **second source of electrical energy** (batteries of the second power supply), for similar reasons to those

discussed above under element [1a]. Because unit 220 is connected in parallel with unit 210 to devices a-d (as indicated by the lines in Fig. 2 connected the outputs of Unit 220 to the output lines of Unit 210, Ex. 1007, ¶¶0038) and is an example of a power supply of Fig. 1 of Susong, as explained above in ¶¶67-71, the discussion under element [1a] applies similarly to unit 220 as the second power supply.

“[1d] the second power supply configured to transition from a lesser output level to a greater output level in response to an activation signal.”

86. Susong teaches that **in response to** either the surrender request and/or shutdown confirmation (either of which can be the **activation signal**), the **second power supply** (unit 220) **is configured to transition from a lesser output level to a greater output level**. (Ex. 1007, ¶¶0038, 0043-0047, Figs. 4A, 4B).

87. Specifically, at the time a surrender request is sent from the first power supply to the second power supply, the first power supply is actively supplying power to the loads, and the second power supply is not. (Ex. 1007, ¶¶0038). Susong explains:

“Thus, when Unit 1 is active, the PoE ports 210a-d are driven by Unit 1 210. If it is determined that Unit 2 is to take over, the two units can communicate with each other over the optic interfaces and decide to make the switch. When the switch occurs, the ports 210a-d become isolated while the ports 220a-d become active for driving the DEVICES A-D.”

(Ex. 1007, ¶¶0038). Thus, the second power supply **transitions from a lower level** (no output power) **to a greater level** (full operating power). (Ex. 1007, ¶¶0038, 0047).

88. The transitioning **is in response** to the surrender request or shutdown confirmation (either of which can be the **activation signal**) because these signals occur in a chain of events leading to the transition of the second power supply. (Ex. 1007, ¶¶0045-0047, Figs. 4A, 4B).

89. The alert signal can be the same as the activation signal (*see, e.g.*, claim 3). However, to the extent that the alert signal and activation signal must be different signals, the alert signal in Susong would be the surrender request and the activation signal would be the shutdown confirmation.

CLAIM 2

“2. The apparatus according to claim 1, the first power supply further configured to provide operating power to the electrical load while the second power supply transitions from the lesser output level to the greater output level.”

90. Susong teaches and renders obvious that unit 210 (the first power supply) is configured to provide operating power to the external device (the electrical load) while unit 220 (the second power supply) transitions from the lesser output level to the greater output level in response to the activation signal.

91. First, Susong teaches and renders obvious that the active power supply unit provides power to the external device while the power supply unit that is to take

over (the “take-over unit”, Ex. 1007, ¶0041) transitions from the lesser output level to the greater output level in response to the surrender request. In Figures 4A-4B: (1) the active unit sends a surrender request to the take-over unit (step 410); (2) the take-over unit receives the surrender request and responds with a shutdown command “indicat[ing] that the [take-over] unit is ready and able to become the active unit” (steps 458-460); and (3) the active unit receives the shutdown command and shuts down (steps 412-414). (Ex. 1007, ¶¶0044-0047). This teaches and renders obvious that the active unit is providing power until it shuts down (step 414), including while the take-over unit is receiving the surrender request (**activation signal**) and in response readying itself to become the active unit (steps 458-460). (Ex. 1007, ¶¶0045-0046). I note that Susong will switch active units “[i]f the operation of the battery assembly is not within a desired standard”. (Ex. 1007, ¶¶0037-0038). In this sense, the battery assembly will fail if it is operating outside the standard, which can mean that the battery would provide operating-level power during the small amount of time it takes to transition from one unit to another, even if the battery assembly does not meet the standard. Susong teaches and renders obvious that the active unit can be either unit 210 or unit 220, and the take-over unit can be the respective other unit. (Ex. 1007 ¶0038, ¶0041).

92. Second, it would have been obvious to implement Susong so that the active unit provides power while the take-over unit transitions to a greater output

level in response to the activation signal (surrender request and/or shutdown command). At step 410, the active unit is supplying power to the external devices and the take-over unit is not (as explained in element [1d]), and at the end of the operation shown in Figures 4A-4B, the take-over unit supplies power (Ex. 1007, ¶¶0044-0047). A PHOSITA would have found obvious that the take-over unit would not transition from a lower output level to a greater one instantaneously. (see Ex. 1007, ¶¶0042-0047, Figs. 4A-4B). Also, a PHOSITA would have found obvious that interruptions in operating power were undesirable. (Ex. 1007, ¶0033 (explaining that battery assembly 120 in power supply 100 “provide[s], at a minimum, sufficient power source to allow for an orderly shutdown of the system in the event of a loss of primary power”))(Ex. 1008, ¶0004 (“When the power source is abnormal, (such as that power is not supplied ...), loads may not work or objects of loads are damaged.”)). Thus, a PHOSITA would have been motivated to implement Susong such that the active unit provides operating power to the external devices while the take-over unit transitions from a lesser to greater output level, so that the external devices continue to receive normal operating power during that transition.

CLAIM 3

“3. The apparatus according to claim 1, the first and second power supplies being coupled such that the activation signal is defined by the alert signal.”

93. Susong teaches that the first and second power supplies are **coupled such that the activation signal is defined by the alert signal**. Because the first power supply is transmitting signals directly to the second power supply, any signal sent from the first power supply (e.g. an **alert signal**) is the same as a signal received by the second power supply (e.g. an **activation signal**). (Ex. 1007, ¶¶0044-0047). This is because the physical medium (e.g. a wire or optical transfer medium) transfers signals directly between the two units, so a signal (e.g. a modulation of voltage or light) sent by one unit (a signal placed on the physical medium) arrives at the receiving unit with the same information content, and in approximately the same form (discounting noise) as when it left the sending unit. Thus, whether it is the surrender request or the shutdown notification, **the activation signal will be defined by the alert signal**. Furthermore, if the surrender request is the alert signal and the shutdown confirmation is the activation signal (see discussion above under element [1d]), then the shutdown confirmation is **defined by** the surrender request, because the surrender request is a necessary pre-condition for the shutdown confirmation, and sets the parameters for the shutdown confirmation (e.g., which unit will confirm shutdown). (Ex. 1007, ¶¶0044-0047, Figs. 4A and 4B, reference numerals 410, 458-462).

CLAIM 4

“4. The apparatus according to claim 1, the electrical load being configured to provide the activation signal to the second power

supply in response to the alert signal from the first power supply.”

94. In my opinion, Susong renders claim 4 obvious. Although the principal embodiment of the Susong disclosure provides for direct communication between power supplies 210 and 220, Susong also teaches that the intelligence controlling its power supplies can be incorporated into other devices external to the power supplies. (Ex. 1007, ¶0050-0052, claims 6-7). Susong states, for example, that:

“In other embodiments, the intelligence may reside in an external program that can send commands to the system 100. The power supply module 110 can receive the commands, interpret the command and then respond accordingly. Alternatively, certain status and control functions can be actuated by providing access to specific memory locations through the TCP/IP interface 160 and thus, all intelligence would reside in an external device.”

(Ex. 1007, ¶0050). Here, Susong teaches that the governing intelligence of Susong’s device could reside in an external program or external device, which amounts to the same thing, because an external program would need an external device (a processor) on which to execute.

95. Because the second power supply, per Susong’s express teaching, “receive[s] the commands” from an external device, and then “interpret[s] the command and then respond accordingly”, it would have been obvious for an external device to serve as a hub for communications between power supplies, and to provide

the controlling intelligence, by receiving an alert signal from the first power supply and sending an activation signal to the second power supply when appropriate. (Ex. 1007, ¶0050). In such a situation, the power supplies would send messages as discussed in Susong at ¶¶0041-0047 and Figs. 4A and 4B, except that the messages would first be sent to the device running the external program, which then relays messages to the ultimate recipient power supply.

96. Furthermore, it would have been obvious for that external device to be a load device. Susong teaches that the external device can communicate with the power supplies over TCP/IP, and Susong teaches that its load devices are devices that use Ethernet data connections (and TCP/IP over Ethernet), such as network access points like wireless access points. (Ex. 1007, ¶¶0010, 0005-0006, 0050-0051). Susong also expressly teaches that aspects of its power supplies can be incorporated into such devices. (Ex. 1007, ¶0036). Susong states:

“In other embodiments, the power supply aspects of the inventions can be incorporated into a variety of settings, devices, and applications including as non-limiting examples, routers, wireless routers, hubs, switches, PBX systems, wireless access points, etc.”

(Ex. 1007, ¶0036).

97. A PHOSITA further would have been motivated to adopt this arrangement, in order to allow for the flexibility of network devices to manage their own power supplies. By building the guiding intelligence for the power supplies

into the network devices themselves, the manufacturers of these devices, who have a superior understanding of the power requirements of the devices (such as the ability to tolerate short outages), can better provide for the overall power management. For example, it would have been obvious based on Susong to execute a program for power management in one of “routers, wireless routers, hubs, switches, PBX systems, wireless access points”, because the manufacturer of such a piece of equipment will understand the length of time the equipment can operate with no incoming power, or at power levels that do not meet its specifications.

98. Because Susong expressly teaches that the controlling intelligence of the power supply can reside in external devices, including network devices such as access points, and because Susong’s power supplies have, as loads, network devices such as access points, it would have been obvious based on Susong to have **the electrical load be configured to provide the activation signal to the second power supply in response to the alert signal from the first power supply.**

CLAIM 5

“5. The apparatus according to claim 1, the first power supply further configured to transition from a lesser output level to a greater output level in response to a signal indicative of an anomaly in the second source of electrical energy.”

99. As I discuss in ¶70, it was obvious that the second power supply 220 is of the same type as the first power supply (namely power supply 100 of Fig. 1, *see* ¶70, above). The operation of the two identical power supplies is identical and their

communication is reciprocal, such that the description under claim 1 of the configuration and operation of the first power supply applies equally to the second power supply. (Ex. 1007, ¶¶0041-0048, Figs. 4A, 4B). By “reciprocal”, I mean that the power supplies are identical, but each can change roles (from active to inactive) by switching responsibility for supplying the load to the respective other power supply, such that when one power supply is active, the other is inactive (except during brief transition intervals, when the roles can be concurrent). Thus, when the second power supply is active, it tests its own battery (the **second source of electrical energy**). (Ex. 1007, ¶¶0040-0041, 0033, 0020). If the test indicates an abnormal operation (Ex. 1007, ¶0042), the second power supply is configured to issue **signals indicative of an anomaly** (the surrender request and the shutdown confirmation, either of which teaches the signal) **in the second source of electrical energy** (the batteries of the second power supply) that **cause the first power supply to transition from a lesser output level to a greater output level**. (Ex. 1007, ¶¶0041-0048, 0038, Figs. 4A, 4B).

CLAIM 6

“[6a]. The apparatus according to claim 1, at least the first or second power supply configured to operate at a lesser output level in response to a standby signal,”

100. Susong teaches that when the active power supply issues a surrender request, its partner power supply will issue a shutdown command (**standby signal**). (Ex. 1007, ¶0045). Susong explains:

“If the active unit receives the shut down command 412, the active unit performs a shut down sequence and sends a confirmation command 414 to the partner unit that shut down is complete. This confirmation completes the handoff of the active status.”

(Ex. 1007, ¶0046). When shut down is complete, the device that has shut down becomes inactive (does not supply power to the loads), and thus **operates at a lesser output level in response to the standby signal** (shutdown command). (Ex. 1007, ¶0046).

101. As discussed above under claim 5, either the **first or second power supply** can be the active power supply (actively supplying power to the loads), while the respective other power supply is not active (not supplying power to the loads). (Ex. 1007, ¶¶0041-0048, Figs. 4A, 4B). This means that both power supplies can receive a shut down command (standby signal), and both are **configured to operate at a lesser output level in response to a standby signal**.

“[6b] the first power supply further configured to transition from the lesser output level to a greater output level in response to a respective activation signal.”

102. As explained above under claim 1, element [1d], the Susong power supplies are **configured to transition from the lesser output level to a greater output level in response to an activation signal**. Under element [1d], I discussed the second power supply transitioning, but the analysis applies to both the first power supply and the second power supply, when the respective first or second power supply is transitioning from inactive to active status. (Ex. 1007, ¶¶0041-0048, Figs. 4A, 4B). The activation signal is a **respective** activation signal, because it applies to activate the first power supply, whereas the activation signal in claim 1 applied to activate the second power supply. Although not required by the claim, the respective activation signal would also obviously cause a **transition from the lesser output level to a greater output level** after a shut down command, if the anomalous condition of the battery had been resolved in the meantime, for example, by replacement of the battery. (Ex. 1007, ¶0051).

CLAIM 7

“7. The apparatus according to claim 1 further comprising a third power supply configured to transition from a lesser output level to a greater output level in response to an activation signal.”

103. Susong teaches that the embodiment of Fig. 2 may have more than two units, stating:

“FIG. 2 is a conceptual diagram of one embodiment of the failover aspect of the present invention. Two units 210 and 220 are illustrated, although it will be appreciated that more units may also be

employed.”

(Ex. 1007, ¶0038). If more than two units are employed, that means there will be obviously at least a third unit (**third power supply**), connected in the same manner as the first two units. By this, I mean that the outputs a, b, c, d, (that is, the outputs of a third Unit that correspond to the outputs labeled 201a, 210b, 210c, and 210d in Unit 1) would be coupled to loads of Device A, Device B, Device C and Device D in parallel with Units 1 and 2, and all three Units would be in communication with each other, *e.g.*, over the optical I/F interface. In this scenario, because the third power supply is obviously an example of power supply 100 of Fig. 1, as discussed above in ¶70, the third power supply is configured in an identical manner to the first and second power supplies, and thus is **configured to transition from a lesser output level to a greater output level in response to an activation signal**, as explained under claim 1, element [1d]. (Ex. 1007, ¶¶0041-0048, Figs. 4A-4B).

CLAIM 9

“[9a]. A system, comprising: an electrical load;”

104. See discussion above under claim 1, element [1a]. Fig. 2 of Susong shows a system. (Ex. 1007, Fig. 2, ¶0038).

“[9b] a first power supply coupled to a first independent source of electricity and to the electrical load,”

105. *See* discussion above under claim 1, element [1a]. Claim 1, element [1a] recites “a first source of electrical energy”, whereas the present claim element [9b] recites “a first *independent* source of *electricity*”. However, electricity *is* electrical energy. With respect to the first source of electrical energy being **independent**, the first power supply is coupled to the battery assembly 120 (and batteries themselves). The batteries coupled to the first power supply are **independent** from the batteries coupled to the second power supply, because an anomalous condition (*e.g.*, failure) affecting one of the battery-based sources of power does not imply a similar anomalous condition affecting the other. (Ex. 1007, ¶¶0038, 0020, 0041-0048, Figs. 4A, 4B). Indeed, facilitating a “failover” transition from a power supply with a failing battery assembly to a different power supply with a working battery assembly is a primary purpose of Susong. (Ex. 1007, ¶¶0020, 0038).

“[9c] the first power supply configured to provide a first alert signal indicative of an anomalous condition of the first independent source of electricity; and”

106. *See* discussion above under claim 1, element [1b]. Claim 1 requires a “failure condition”, whereas the present element requires “an anomalous condition”. The condition of the batteries themselves that triggers a first alert signal is an **anomalous** condition, because a failure condition qualifies as an anomalous condition (*compare* Ex. 1001, 3:25-29), and because the alert signal occurs “[i]f the

battery assembly is not operating in accordance with the required standard”, which can include total failure. (EX1007, ¶¶0042, 0020, claims 3, 16, 20).

“[9d] a second power supply coupled to a second independent source of electricity and to the electrical load,”

107. See discussion above under claim 1, element [1c]. The second source of electrical energy discussed under claim 1, element [1c] is a **second independent source of electricity** for the same reasons discussed above under claim element [9b] for the first independent source of electricity.

“[9e] the second power supply configured to provide a second alert signal indicative of an anomalous condition of the second independent source of electricity,”

108. This element is similar to element [9c], except that it applies to the second power supply, issuing a second alert, based on anomalous condition of the second independent source of electricity. The reasoning presented under element [9c] is applicable here, because the second power supply is identical to the first and is configured in the same manner, as discussed above in ¶¶70 and 99.

“[9f] the first power supply further configured to transition from a lesser output level to a greater output level in response to a first activation signal,”

109. See discussion above under claim 1, element [1d], and the discussion above in ¶¶70 and 99. Although the discussion under claim 1, element [1d] relates

to the *second* power supply, the first power supply is an identical unit, and are both configured in the same manner. Here, the **first activation signal** is a surrender request or shutdown confirmation from the second power supply. (Ex. 1007, ¶¶0044-0047).

“[9g] the second power supply further configured to transition from a lesser output level to a greater output level in response to a second activation signal.”

110. See discussion above under claim 1, element [1d]. Here, the **second activation signal** is a surrender request or shutdown confirmation from the first power supply. (Ex. 1007, ¶¶0044-0047).

CLAIM 10

“10. The system according to claim 9, at least the first or second power supply further configured to operate at a lesser output level in response to a standby signal.”

111. See above, discussion under claim 6, element [6a]. Because both power supplies are identical, as discussed above in ¶¶70 and 99, above, the discussion under claim 6 applies to both power supplies.

CLAIM 11

“11. The system according to claim 9, the first and second power supplies respectively configured to provide operating level power to the electrical load for an amount of time sufficient for the other of the first and second power supplies to transition from the lesser output level to the greater output level.”

112. See discussion above under claim 2. As explained when discussing claim 5, this discussion applies equally to both the first and second power supplies.

CLAIM 12

“12. The system according to claim 9, the second activation signal defined by the first alert signal, the first activation signal defined by the second alert signal.”

113. See discussion above under claim 3. Because the first and second power supplies communicate with each other directly, the alert signal issued from one is received directly by, and becomes the activation signal for, the respective other power supply.

CLAIM 13

“13. The system according to claim 9, the electrical load configured to provide the second activation signal in response to the first alert signal, the electrical load further configured to provide the first activation signal in response to the second alert signal.”

114. See discussion above under claim 4. Claim 13 adds that the electrical load is **further configured to provide the first activation signal in response to the second alert signal**. Because the operation of the power supplies is identical (see ¶¶70 and 99, above), the discussion under claim 4 applies equally to the first activation signal and second alert signal when coordinated by a load device.

CLAIM 14

“[14a]. A method, comprising: asserting a signal responsive to an anomalous condition of a first independent source of electrical

energy,”

115. See discussion under elements [1a] and [1b]. See discussion of element [9b] for an explanation of why the first power supply’s battery is an “independent” source of energy, and see discussion of element [9c] for an explanation of why a “failure condition” qualifies as an “anomalous condition.” The signal is **responsive to the anomalous condition**, as shown in Susong’s Figs. 4A and 4B.

“[14b] the first independent source of electrical energy coupled to energize a first power supply;”

116. See discussion under element [1a]. The batteries are **coupled to energize a first power supply** because they provide power when there is an AC power outage. (Ex. 1007, ¶0034).

“[14c] transitioning a second power supply from a standby output level to a normal output level responsive to the signal,”

117. See discussion under element [1d] and claim 3. Susong teaches that, when an anomalous condition is detected in the batteries of the first power supply, it will cause a second power supply to take over the supply of power, thereby **transitioning a second power supply from a standby output level to a normal output level responsive to the signal**. Susong explains:

“FIG. 2 is a conceptual diagram of one embodiment of the failover aspect of the present invention. Two units 210 and 220 are illustrated,

although it will be appreciated that more units may also be employed. For purposes of illustration, Unit 1 210 is assumed to be on-line and driving ports 210a-d for support DEVICES A-D respectively and Unit 2 is off-line. In this embodiment, Unit 2 220, having ports 220a-d would include a means for isolating the ports 220a-d from the cables extending from 210a-d to DEVICES A-D. Thus, when Unit 1 is active, the PoE ports 210a-d are driven by Unit 1 210. If it is determined that Unit 2 is to take over, the two units can communicate with each other over the optic interfaces and decide to make the switch. When the switch occurs, the ports 210a-d become isolated while the ports 220a-d become active for driving the DEVICES A-D. It will be appreciated that this aspect of the invention can be employed in different manners.”

(Ex. 1007, ¶0038). Thus, Unit 2 220 is first “offline”, and then changes such that its “ports 220a-d become active for driving the devices A-D”. (Ex. 1007, ¶0038). When a power supply is offline its pots can be isolated from the loads, they are still within the load circuit, but will no longer supply power (**a standby output level**), whereas when they are active, they are supplying **normal operating power**. (Ex. 1007, ¶¶0038, 0047).

“[14d] the second power supply energized by a second independent source of electrical energy; and”

118. See discussion under element [1c]. See discussion of elements [9b] and [9d] for an explanation of why the second power supply’s battery is an

“independent” source of energy. The batteries are coupled to energize a second power supply because they provide power when there is an AC power outage. (Ex. 1007, ¶0034).

“[14e] providing operating power from the first power supply to an electrical load during the transitioning.”

119. See discussion under claim 2.

CLAIM 15

“15. The method according to claim 14 further comprising communicating the signal from the first power supply to the second power supply, the second power supply providing operating power to the electrical load after the transitioning to normal output level.”

120. Susong teaches claim 15. As discussed under element [1b], a Susong power supply provides both a surrender request and a shutdown confirmation, either one of which can be the claimed **signal**. The signals are communicated by the optical or electrical communications interfaces of the power supplies directly to the respective other power supplies. (Ex. 1007, ¶¶0049, 0038, 0044-0047). When the second power supply is in receipt of these signals from the first power supply, it provides operating power to the electrical load after the transitioning to normal output level. (Ex. 1007, ¶0047). Susong states:

“When the partner unit receives the confirmation of the shut down from the active unit 462, the partner unit then becomes the active unit and processing continues for the new active unit at step 402. The

process of becoming the active unit includes performing all the actions necessary to ensure that power to the PoE ports, or to devices connected to the PoE ports is now provided by the new active unit.”

(Ex. 1007, ¶0047).

Ground 3. Claims 2, 8, 11, and 14-15 are rendered obvious over Susong and Zak

121. Claims 2, 8, 11, and 14-15 would have been obvious under pre-AIA 35 U.S.C. §103 over **Susong** (discussed in Ground 2) and **Zak** (discussed in Ground 1). Susong and Zak are prior art as discussed in Grounds 2 and 1, respectively.

A. Overview of the Obviousness Contention

122. Dependent claims 2, 8, 11, and independent claim 14, each recite limitations requiring one power supply to temporarily provide power during a transition period of another power supply from a lower to a greater output level. Claim 15 is dependent from claim 14 but does not itself contain such a limitation. To the extent Susong does not expressly address providing power during a transition period of another power supply, this concept would have been obvious based, for example, on the combined teachings of Susong and Zak. As discussed above under Ground 1, Zak teaches the use of holdover capacitors connected in parallel to the load to provide power at a DC voltage for a period of time. (Ex. 1005, Fig. 1, 5:4-8, 6:35-44, 7:23-28). It would have been obvious to use the concept of a holdover capacitance in Susong’s power supplies in order to temporarily provide power in the

event of a battery failure. During a battery failure, the backup batteries of Susong would not be expected to bridge a gap in power supply during a transition from one power supply to another. Claims 14 and 15 are rendered obvious as discussed under Ground 2, except that the reference under claim element 14[e] to the discussion under claim 2 is replaced with the discussion under claim 2 in this Ground.

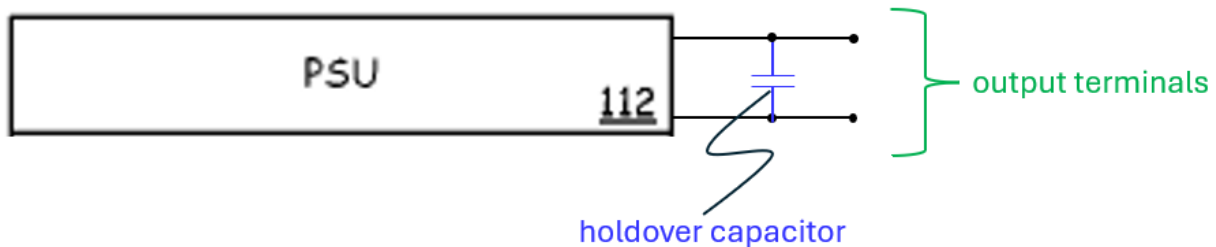
B. Rationale (Motivation) Supporting Obviousness

123. The proposed use of holdover capacitance in Susong's power supplies would have been obvious. First, both Susong and Zak state the need to provide uninterrupted power to load devices, providing a motivation to limit the interruption of power to the extent possible. (EX1007, ¶¶0016, 0004, 0033) (Ex. 1005, Abstract, 3:45-52, 5:50-62). A PHOSITA would have been motivated to include holdover capacitance sufficient to provide operating power during the brief period after identifying a battery failure, between the issuance of a shutdown command issued to one power supply of Susong and a respective other power supply becoming active in providing operating power to loads, because otherwise there might be an interruption of power when the batteries have failed, if only for a few milliseconds. (Ex. 1007, ¶¶0044-0047, Figs. 4A, 4B). As I discussed above in ¶50, the length of time for which a holdover capacitor will hold output power approximately constant at the operating power level depends in part on the current draw of the load (where current is the change in the charge of the capacitor with respect to time, or dQ/dt),

and in particular, how long it takes the load to significantly discharge the capacitors. A PHOSITA would obviously have adjusted the time for which the holdover capacitors provide approximate operating power by changing the capacitance of the capacitors. In general, higher capacitance capacitors will provide for more stored charge, (and thus approximately full operating power for a longer period of time) than smaller capacitance capacitors, according to the equation $Q=CV$, where Q is an amount of charge held by the capacitor, C is the capacitance of the capacitor, and V is the voltage across the capacitor. By changing the capacitance C of a holdover capacitor, a PHOSITA would have been able to change the length of time for which holdover capacitors support operating-level power, and would have been motivated to do so to ensure no interruption of power during the length of time it would take to transfer responsibility for powering the load from one power supply to another.

124. Adding holdover capacitance of an appropriate size could have been done simply, *e.g.*, by being arranged in parallel with an output or in parallel with the inputs of a DC/DC converter that supplies an output, as in Zak. (Ex. 1005, Fig. 1, reference numerals 19 or 20). For example, it would have been obvious to place a sufficient capacitance at the output of power supply unit 112, which supplies AC/DC conversion. (Ex. 1007, ¶¶0031-0032). Simply positioning an appropriately-sized

capacitor between each pair of output terminals of the PSU (as illustrated below) would result in holdover capacitance.



125. A PHOSITA would have understood that there were a variety of ways to add holdover capacitance, and given the widespread usage of such capacitance, would have had a reasonable expectation of success in designing and implementing such a capacitance.

126. Furthermore, the use of holdover capacitance to store energy that can be used to temporarily provide output power was well-known in the art. (Ex. 1005, Fig. 1, 5:4-8, 6:35-44, 7:23-28) (Ex. 1006, ¶0003). Indeed, the '967 patent itself explains that:

“For purposes of the example, it is assumed that the power supply 106 includes capacitors or other internal storage (not shown) sufficient to provide conditioned power 110 to the load 112, while the power supply 108 transitions from standby (i.e., no output) to full power output mode. One of ordinary skill in the electrical arts will appreciate that the use of output filtering, buffering or energy storage capacitors within power supplies is a common practice, and no additional elaboration is required in this regard.”

(Ex. 1001, 3:39-48). Similarly, Jung states that:

“the power supply might also be required to provide normal output power even if the input voltage falls to zero for a period of time, for example, up to 5 ms. Such uninterruptible operation with no or very little input voltage is often referred to as ‘holdover,’ and usually requires the addition of capacitors of significant size to the circuit to provide the necessary holdover energy.”

(Ex. 1006, ¶0003).

127. The use of a holdover capacitance to provide temporary power during the transition of a partner power supply was therefore both desirable (to avoid even momentary interruptions in power) and a well-known and predictable technique that could be used (and likely was used) to improve Susong’s power supply devices.

C. Reasonable Expectation of Success

128. A PHOSITA would have had a reasonable expectation of success for the reasons discussed above in Ground 2. Additionally, a PHOSITA would have understood how to apply holdover capacitance within power supplies of Susong. The output of the power over Ethernet power supplies of Susong are 48 V DC (Ex. 1007, ¶0010), and capacitors can provide DC power in a simple manner, *e.g.*, (*e.g.* parallel to the output of PSU 112, as I explain above in ¶124). (Ex. 1005, Fig. 1, reference numerals 19 or 20). This could have been done predictably.

D. Analogous Art

129. **Susong** is analogous art as discussed under Ground 2. **Zak** is analogous art because it is in the same field as the '967 patent ("the electrical arts", Ex. 1001, 3:2-3, 3:44-48), and specifically is related to power supplies. (Ex. 1005, Title, Abstract). Zak is also reasonably pertinent to a problem facing the named inventors, namely that of "providing redundant power supplies" (Ex. 1001, 1:32-33), because Zak provides power supplies that have redundant independent energy sources. (Ex. 1005, Abstract).

E. Claim Mapping

CLAIM 2

"2. The apparatus according to claim 1, the first power supply further configured to provide operating power to the electrical load while the second power supply transitions from the lesser output level to the greater output level."

130. See the discussion above in ¶¶122-128. In the combination, holdover capacitance provided in Susong's devices would cause them to be **configured to provide operating power to the electrical load while the second power supply transitions from the lesser output level to the greater output level.**

CLAIM 8

"8. The apparatus according to claim 1, the first power supply further configured to provide operating level power from internal energy storage to an electrical load while the second power supply transitions from the lesser output level to the greater output level in response to the activation signal."

131. See discussion above under claim 2. Claim 8 further requires that operating level power come from **internal energy storage**, which is met by the fact that operating level power comes from added holdover capacitance provided in Susong's power supplies in the combination. Claim 8 also requires that the second power supply transitions **in response to the activation signal**. This is met by Susong's second power supply as discussed above under claim 1, element [1d].

CLAIM 11

“11. The system according to claim 9, the first and second power supplies respectively configured to provide operating level power to the electrical load for an amount of time sufficient for the other of the first and second power supplies to transition from the lesser output level to the greater output level.”

132. See discussion above under claims 2 and 8. These discussions apply equally to both the first and second power supplies, for the reasons discussed above in ¶¶70 and 99. It further was obvious to configure a holdover capacitance to **provide operating level power to the electrical load for an amount of time sufficient** for a respective other power supply to transition to a greater output level in order to avoid any (even if brief) interruption in output power during such a transition, because the purpose of a holdover capacitance is to “hold” output power at a level that can sustain operation of the load “over” the timeframe of a brief interruption. (Ex. 1006, ¶0003) (“the power supply might also be required to provide normal output power even if the input voltage falls to zero for a period of time, for

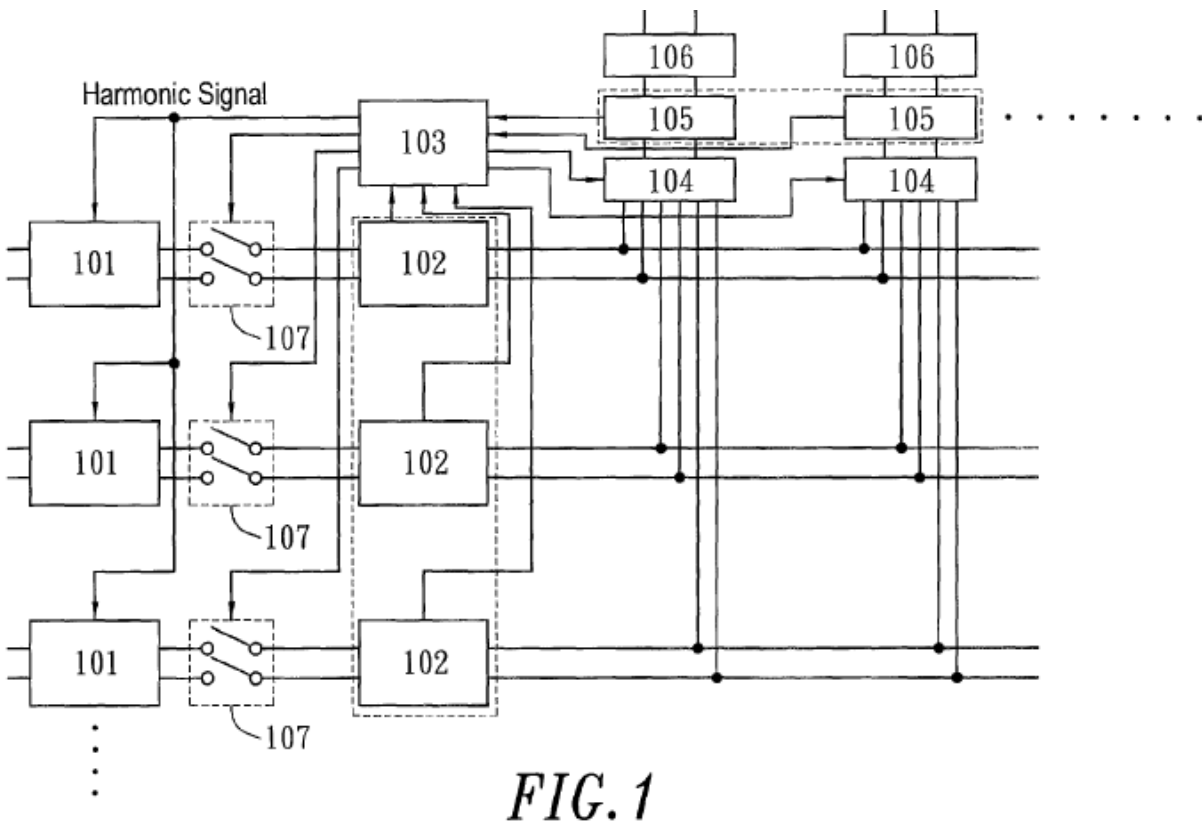
example, up to 5 ms. Such uninterruptible operation with no or very little input voltage is often referred to as ‘holdover,’ and usually requires the addition of capacitors of significant size to the circuit to provide the necessary holdover energy.”).

Ground 4. Claims 1, 4-7, 9-10, and 13 are rendered obvious over Chang

133. It is my opinion that claims 1, 4-7, 9-10, and 13 would have been obvious over U.S. Pat. App. Pub. 2003/0042798 (“**Chang**”) (Ex. 1008).

A. Overview of Chang

134. Chang teaches a “multiple power sources control system”. (Ex. 1008, Title, Abstract). One example of Chang’s system is shown in Fig. 1, reproduced here:



(Ex. 1008, Fig. 1). In Fig. 1 of Chang, independent AC power sources are connected to respective power inputs 101 (left side), which are connected to control switches 107, which are in turn connected to voltage and current detecting modules 102. (Ex. 1008, ¶0041). At the output of modules 102, the power is routed to loads (connected at outputs 106).

135. The system of Chang monitors power at the input side 101 with voltage and current detecting modules 102. (Ex. 1008, ¶0042). If an abnormality is detected “such as no power supply, too low or high voltage and abnormal frequency, etc.” (Ex. 1008, Abstract), the respective module 102 informs a control module 103. (Ex. 1008, ¶0042). The control module 103 then controls control switches 107 to

disconnect an active power source and connect a previously-inactive power source, thus switching the load from one power source to another. (Ex. 1008, ¶¶0044, 0041, 0011). Chang explains:

“When one of independent input power source is in an abnormal state, the voltage and current detecting module will inform the control module of the state, and then the control module controls the power source switching module immediately to switch the power source supplying to power output sides to other normal independent power sources of the power input sides such that loads can keep on obtaining required power.”

(Ex. 1008, ¶0011).

B. Overview of the Obviousness Contention

136. Chang, like Susong, nearly anticipates the challenged claims. The present Ground is one of obviousness because, while Chang teaches notifying of a failure of a first power source, Chang arguably does not expressly teach such notification by a “signal”. Such signals would, however, have been obvious.

137. This Ground also provides minor obviousness contentions as I discuss below.

C. Rationale (Motivation) Supporting Obviousness

138. It would have been obvious in Chang’s system to use “signals” (alert and activation signals) to implement switching between power sources. Chang already teaches that voltage and current detecting modules 102 detect abnormalities

(such as lack of power) in the power input sides 101, and “inform the control module 103 of detected state”. (Ex. 1008, ¶0042). Chang is an electrical system, and Fig. 1 shows electrical connections between the voltage and current detecting modules 102 and the control module 103. Furthermore, Chang expressly states that control module 103 uses “signals” to turn the control switches 107 ON and OFF. (Ex. 1008, ¶0041). From these disclosures, it would have been immediately apparent and obvious to a PHOSITA that Chang’s control module 103 communicates with power supplies (elements 101, 107, and 102), and in particular with voltage and current detecting modules 102 and control switches 107 using electrical signals, *e.g.* when a module 102 informs module 103 of an abnormality and when the module 103 turns a respective control switch 107 ON, thus connecting the respective input side power source to an output. At a minimum, it would have been obvious to use electrical signals from these disclosures.

D. Reasonable Expectation of Success

139. There would have been a reasonable expectation of success for the reasons provided above under Ground 2, and additionally because the use of electrical signals to communicate between devices in an electrical system was commonplace and predictable by 2009.

E. Analogous Art

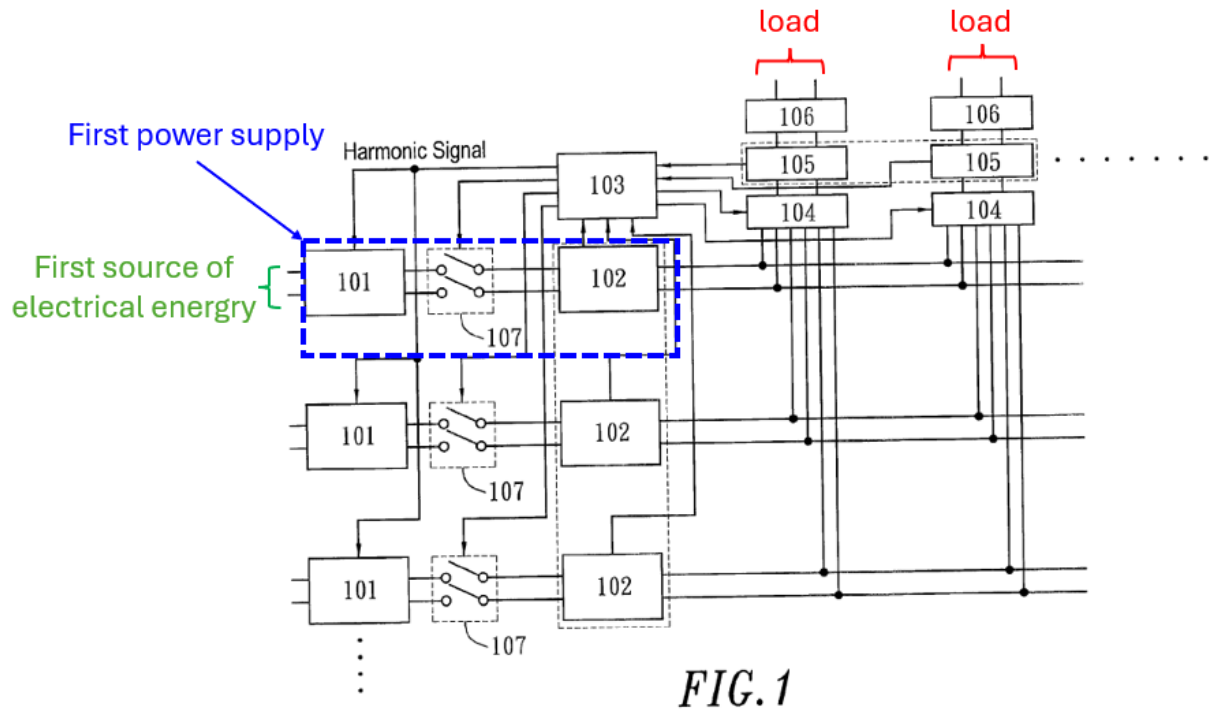
140. **Chang** is analogous art because it is in the same field as the '967 patent ("the electrical arts", Ex. 1001, 3:2-3, 3:44-48), and specifically is related to power supplies. (Ex. 1008, Title, Abstract). Chang is also reasonably pertinent to a problem facing the named inventors, namely that of "providing redundant power supplies" (Ex. 1001, 1:32-33), because Chang provides for switching between power supplies upon detection of an abnormality. (Ex. 1008, ¶0011).

F. Claim Mapping

CLAIM 1

"[1a] An apparatus, comprising: a first power supply coupled to an electrical load and a first source of electrical energy,"

141. Chang teaches an **apparatus comprising a first power supply**. The apparatus is shown in Fig. 1, and has three parallel power supplies (elements 101, 107 and 102), the top-most of which is the **first power supply**. Fig. 1 is reproduced below with annotations identifying the first power supply (blue), the first source of electrical energy (green), and electrical loads (red):



(Ex. 1008, Fig. 1, ¶¶0041-0046).

142. The **first power supply** (units 101, 107 and 102 of the top-most power supply shown by the blue-dashed box in Fig. 1, above) is **coupled to a first source of electrical energy**, because it has a power input (unit 101 in Fig. 1), that can receive an independent power source, such as a generator. (Ex. 1008, ¶¶0041, 0011, 0046, claims 1, 2, 6).

143. The **first power supply** is also **coupled to an electrical load**, because its unit 102 provides two output terminals that are connected, via switches 104 and detecting modules 105, to each power output side 106, each of which is in turn connected to a load. (Ex. 1008, ¶¶0045, 0011, claims 1-7, Fig. 1). Chang explains:

“The multiple power sources control system which can achieve the

purposes described above comprises: **power input sides**, voltage and current detecting modules, a control module, power source switching module, and **power output sides**; the **power input sides can receive at least two independent input power sources** (such as a common power source, an UPS, and a generator, etc.). When one of independent input power source is in an abnormal state, the voltage and current detecting module will inform the control module of the state, and then the control module controls the power source switching module immediately to **switch the power source supplying to power output sides to other normal independent power sources of the power input sides** such that **loads** can keep on **obtaining required power.**”

(Ex. 1008, ¶0011) (Emphases added). Chang notes that there can be one power output side and one load or more than one of each. (Ex. 1008, ¶0045).

“[1b] the first power supply configured to issue an alert signal indicative of a failure condition of the first source of electrical energy; and”

144. Chang teaches that **the first power supply is configured to issue an alert signal indicative of a failure condition of the first source of electrical energy.** The **alert signal** is an electrical signal issued from voltage and current detecting module 102 when it detects an abnormality (**failure condition**) in the **first source of electrical energy.** (Ex. 1008, ¶¶0042, 0011, 0004, Abstract). Chang explains:

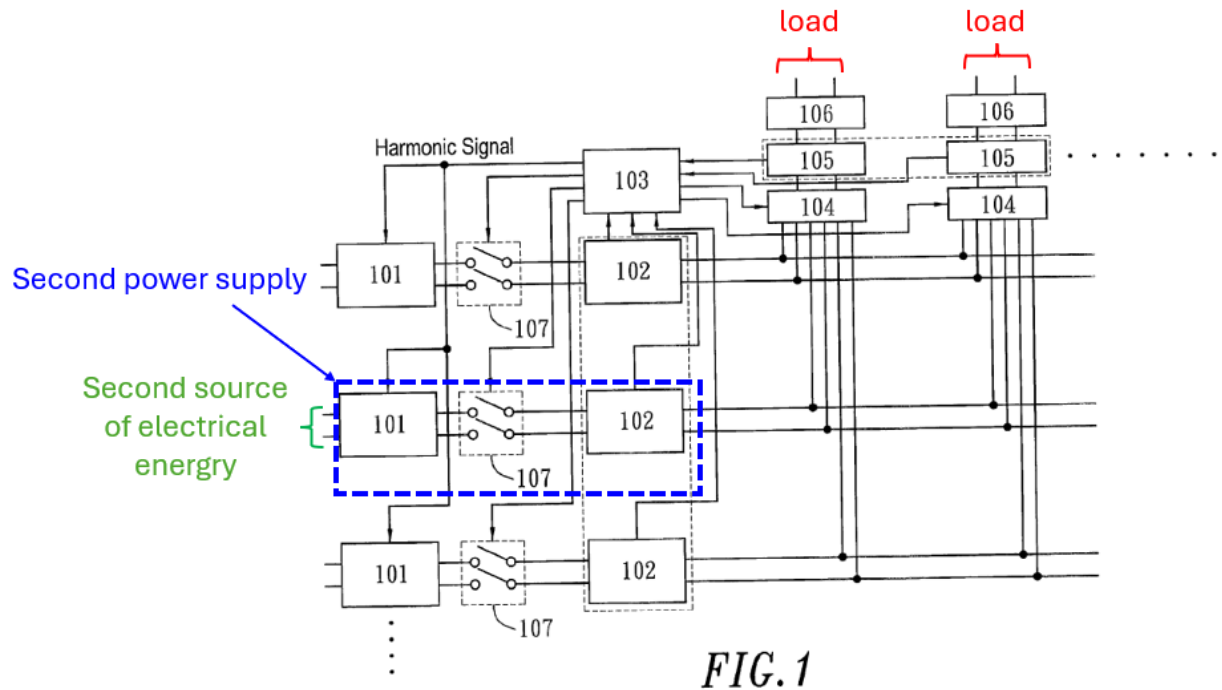
“The first voltage and current detecting module 102 is to detect if the power of the power input sides 101 are abnormal, and inform the control module 103 of detected state....”

(Ex. 1008, ¶0042). An abnormal state can include complete failure. (Ex. 1004, Abstract, ¶0004).

145. To the extent Chang does not expressly disclose use of a signal when module 102 “inform[s] the control module 103 of detected state”, this would have been obvious to accomplish with a **signal** for the reasons provided above in ¶138. The signal is an **alert** signal, because it informs module 103 of a failure condition. (Ex. 1008, ¶¶0042, 0011, 0004, Abstract).

“[1c] a second power supply coupled to the electrical load and a second source of electrical energy,”

146. Chang teaches a **second power supply coupled to the electrical load and a second source of electrical energy**. The second power supply is the second set of modules 101, 107 and 102, identified with blue in Chang’s Fig. 1, reproduced again with annotations here:



(Ex. 1008, Fig. 1, ¶¶0041-0047). The second power supply is coupled to the same loads as the first power supply, and is thus **coupled to the electrical load**. (Ex. 1008, ¶¶0045, 0011, claims 1-7). Specifically, the output of module 102 supplies power that is coupled to each load at the output of the modules 106. (Ex. 1008, ¶¶0045, 0011, claims 1-7).

147. The **second power supply** is also **coupled** to the **second source of electrical energy**, because it has a power input (unit 101 of the second power supply in Fig. 1, above), that can receive an independent power source, such as a generator. (Ex. 1008, ¶¶0041, 0011, 0046, claims 1, 2, 6).

“[1d] the second power supply configured to transition from a lesser output level to a greater output level in response to an activation signal.”

148. Chang teaches that **the second power supply is configured to transition from a lesser output level to a greater output level in response to an activation signal**. Specifically, Chang teaches that its controller 103 operates control switches 107 (including control switch 107 in the second power supply, as identified under claim element [1c] above). Chang states:

“there are at least two power input sides, which can receive two or more than two independent power sources; the **control switches 107 are in ON or OFF state controlled by the signal of the control module 103.**”

(Ex. 1008, ¶0041) (Emphasis added). The “signal of the control module” that turns control switches 107 ON is the **activation signal**. When the activation signal operates to turn switches 107 in the second power supply ON, it is causing **the second power supply ... to transition from a lesser output level to a greater output level**. (Ex. 1008, ¶¶0041, 0011, Fig. 1). This is because the switches 107 are connected in series with the power input side 101 in each of the power supplies, thus effectively controlling whether the power supply supplies power at the output of module 102. The switching (and thus the transitioning from a lesser to a greater output level) is **in response to** the activation signal, because the activation signal controls the switches 107 directly. (Ex. 1008, ¶0041).

149. The claim does not require that the transition of the second power supply from a lesser output level to a greater output level be in response to a failure

condition in the first power supply, but even so, Chang would render this obvious.

Specifically, Chang teaches that:

“The control module 103 is used to control the **control switches 107** and power the source switching modules 104 **due to the state infirmed** [sic: informed] **from the first voltage and current modules 102** and the second voltage and current detecting modules 105....”

(Ex. 1008, ¶0044) (Emphases added).

150. Chang thus teaches that the control switches 107 are switched to an ON or OFF state (Ex. 1008, ¶0041) and that they are switched based in part on information from the first voltage and current detecting modules 102 (¶0044). The first voltage and current detecting modules 102 detect whether the power on respective input side 101 is abnormal, where abnormal can mean “no power supply, too low or too high voltage and abnormal frequency, etc.”. (Ex. 1008, Abstract, ¶¶0008-0009, 0011, 0042). Chang also teaches that a purpose of its system is to “switch a power source to other power sources of power input sides as original power source of one of power input sides has an abnormal phenomenon....” (Ex. 1008, Abstract, *see also* ¶¶0002, 0008-0009, 0011, 0044-0046). From these disclosures, it would have been obvious to a PHOSITA to operate Chang’s system such that a first voltage and current detecting module 102 in a first power supply provides an alert signal to the controller 103, which then sends signals to turn control switch 107 in

the first power supply OFF and control switch 107 in the second power supply ON, in order to implement the purpose of Chang.

CLAIM 4

“4. The apparatus according to claim 1, the electrical load being configured to provide the activation signal to the second power supply in response to the alert signal from the first power supply.”

151. Chang renders claim 4 obvious. Chang teaches that:

“The control module 103 is used to control the **control switches 107** and power the source switching modules 104 **due to the state infirmed** [sic: informed] **from the first voltage and current modules 102** and the second voltage and current detecting modules 105....”

(Ex. 1008, ¶0044) (Emphasis added).

152. Chang thus teaches that the control switches 107 are switched to an ON or OFF state (Ex. 1008, ¶0041) and that they are switched based in part on information from the first voltage and current detecting modules 102 (¶0044). The first voltage and current detecting modules 102 detect whether the power on respective input side 101 is abnormal, where abnormal can mean “no power supply, too low or too high voltage and abnormal frequency, etc.”. (Ex. 1008, Abstract, ¶¶0008-0009, 0011, 0042). Chang also teaches that a purpose of its system is to “switch a power source to other power sources of power input sides as original power source of one of power input sides has an abnormal phenomenon....” (Ex. 1008,

Abstract, *see also* ¶¶0002, 0008-0009, 0011, 0044-0046). From these disclosures, it would have been obvious to a PHOSITA to operate Chang's system such that a first voltage and current detecting module 102 in a first power supply provides an alert signal to the controller 103, which then in response sends signals to turn control switch 107 in the first power supply OFF and control switch 107 in the second power supply ON, in order to implement the purpose of Chang. A PHOSITA would have had a reasonable expectation of success for the same reasons I discuss above in ¶¶139.

153. Furthermore, it would have been obvious to have the control module 103 receive power from the power supplies of the system. To the extent the control module 103 requires DC power, it would have been obvious to use an AC/DC power converter, such as a transformer to change the voltage level and a rectifier. These are well-known techniques that have been well understood for decades. Because the control module 103 needs power to operate, and the power sources received by the input sides are the only apparent sources of power in the system. Thus, it would have immediately occurred to a PHOSITA that control module 103 uses power from Chang's system (*e.g.* from an output side 106) such that it is a "load" in the sense of the claims. A PHOSITA would have found it advantageous to configure or modify Chang such that control module 103 is one of the loads, in order to provide more reliable power to control module 103 and to avoid having to provide for an additional

power supply system, and could have implemented this with a reasonable expectation of success as a matter of routine power engineering. It would thus have been obvious for the **load to be configured to provide the activation signal to the second power supply in response to the alert signal from the first power supply.**

CLAIM 5

“5. The apparatus according to claim 1, the first power supply further configured to transition from a lesser output level to a greater output level in response to a signal indicative of an anomaly in the second source of electrical energy.”

154. As discussed under claim 1, element [1a], the second power supply (101, 107, 102) is of the same type as the first power supply. The first and second power supplies in Fig. 1 of Chang are identical, and the description under claim 1 of the configuration and operation of the first power supply applies equally to the second power supply. (Ex. 1008, ¶¶0041-0047, Fig. 1). Thus, when the second power supply is active (its switch 107 is ON and its power source is connected to the output), and its voltage and current detecting module 102 detects an abnormality (¶0042), it will inform the control module 103, which will control the control switch 107 in the second power supply to turn it OFF, thereby disconnecting the second power source from the output of the second power supply and thus have the second power supply produce zero output power, while controlling the switch 107 in the first power supply ON, causing the first power source to be connected to the output of the first power supply, and thus causing the transition the load from the second

power supply to the first power supply, as explained reciprocally under claim 1, element [1d] for the second power supply. The **signal indicative of an anomaly in the second source of electrical energy** can be either Chang's "signal of the control module" that turns control switches 107 ON, or the signal that is obviously entailed when detecting module 102 informs control module 103 of an abnormality in the corresponding power input (which can be a failure of power, e.g.). (Ex. 1008, ¶¶0041-0047, 0011, Fig. 1).

CLAIM 6

"[6a]. The apparatus according to claim 1, at least the first or second power supply configured to operate at a lesser output level in response to a standby signal,"

155. Chang renders this element obvious. As discussed above under claim 1, element [1d], it would have been obvious to a PHOSITA to operate Chang's system such that a first voltage and current detecting module 102 in a first power supply provides an alert signal to the controller 103, which then sends a signal to turn control switch 107 in the first power supply OFF and control switch 107 in the second power supply ON, in order to implement the purpose of Chang.

156. The control signal from controller 103 that acts to turn OFF control switches 107 in the first power supply (Ex. 1008, ¶¶0041, 0044) is a **standby signal**. This signal operates to disconnect power from the output of the first power supply, thus causing it to **operate at a lesser output level (no output) in response to a**

standby signal. (Ex. 1008, ¶¶0041, 0044, 0046, 0011). Because both power supplies are identical (as discussed under claim 5), the second power supply is likewise configured to operate at a lesser output level (e.g. no output) in response to a standby signal.

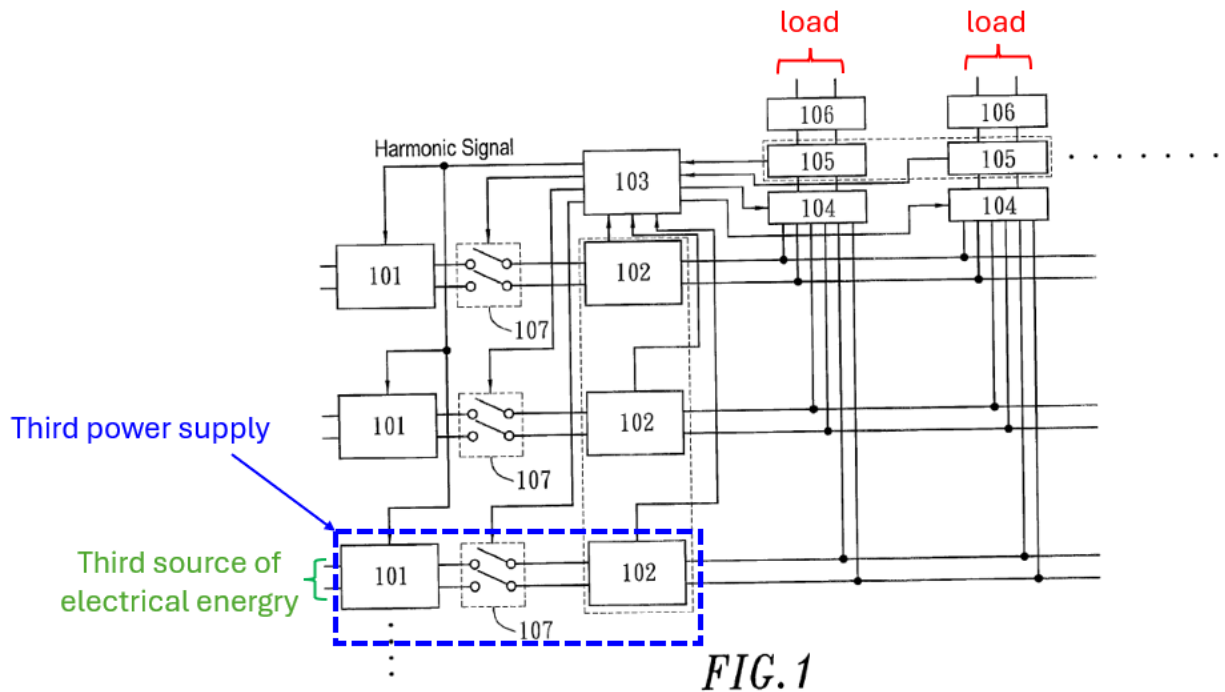
“[6b] the first power supply further configured to transition from the lesser output level to a greater output level in response to a respective activation signal.”

157. See above, discussion under claim 1, element [1d] (discussing the second power supply transitioning to a greater output level based on an activation signal). Because the first and second power supplies in Fig. 1 of Chang are identical (see ¶154, above), the discussion with respect to the second power supply also applies to the first power supply.

CLAIM 7

“7. The apparatus according to claim 1 further comprising a third power supply configured to transition from a lesser output level to a greater output level in response to an activation signal.”

158. In the embodiment of Fig. 1 of Chang, there is a third power supply, as shown in the following annotated version of Fig. 1:



159. With respect to the third power supply being **configured to transition from a lesser output level to a greater output level in response to an activation signal**, *see* the discussion above under claim 1, element [1d], which applies to the third power supply because each of the power supplies is identical (*see* ¶154, above).

CLAIM 9

“[9a]. A system, comprising: an electrical load;”

160. See discussion above under claim 1, element [1a]. Fig. 1 of Chang shows a **system**. (Ex. 1008, Fig. 1, ¶¶0013, 0041).

“[9b] a first power supply coupled to a first independent source of electricity and to the electrical load,”

161. *See* discussion above under claim 1, element [1a]. Claim 1, element [1a] recites “a first source of electrical energy”, whereas the present claim element [9b] recites “a first *independent* source of *electricity*”. However, electricity *is* electrical energy. With respect to the first source of electrical energy being **independent**, Chang teaches this. (Ex. 1008, ¶0041) (“at least two power input sides, which can receive two or more than two **independent** power sources”) (Emphasis added) (*see also* Ex. 1008, ¶¶0010, 0011, 0046, claims 1, 2, 6).

“[9c] the first power supply configured to provide a first alert signal indicative of an anomalous condition of the first independent source of electricity; and”

162. *See* discussion above under claim 1, element [1b]. Claim 1 requires a “failure condition”, whereas the present element requires “an anomalous condition”. Chang teaches detecting an **anomalous** condition, because it teaches detecting an “abnormal” condition. (Ex. 1008, Abstract, ¶¶0004, 0008, 0011, 0042).

“[9d] a second power supply coupled to a second independent source of electricity and to the electrical load,”

163. *See* discussion above under claim 1, element [1c]. The second source of electrical energy discussed under claim 1, element [1c] is a **second independent source of electricity** for the same reasons discussed above under claim element [9b] for the first independent source of electricity.

“[9e] the second power supply configured to provide a second alert signal indicative of an anomalous condition of the second independent source of electricity,”

164. This element is similar to element [9c], except that it applies to the second power supply, issuing a second alert, based on an anomalous condition of the second independent source of electricity. The reasoning presented under element [9c] is applicable here, because the second power supply is identical to the first, as discussed above under claims 5 and 6.

“[9f] the first power supply further configured to transition from a lesser output level to a greater output level in response to a first activation signal,”

165. See discussion above under claim 1, element [1d], and the discussion above in ¶154. Although the discussion under claim 1, element [1d] relates to the *second* power supply, the first power supply is an identical unit. Here, the **first activation signal** is a signal from the controller 103 to turn control switch 107 in the first power supply ON. (Ex. 1008, ¶¶0044, 0041).

“[9g] the second power supply further configured to transition from a lesser output level to a greater output level in response to a second activation signal.”

166. See discussion above under claim 1, element [1d]. Here, the **second activation signal** is a signal from the controller 103 to turn control switch 107 in the second power supply ON. (Ex. 1008, ¶¶0044, 0041).

CLAIM 10

“10. The system according to claim 9, at least the first or second power supply further configured to operate at a lesser output level in response to a standby signal.”

167. See above, discussion under claim 6, element [6a]. Because both power supplies are identical, as discussed above in ¶154, the discussion under claim 6 applies to both power supplies.

CLAIM 13

“13. The system according to claim 9, the electrical load configured to provide the second activation signal in response to the first alert signal, the electrical load further configured to provide the first activation signal in response to the second alert signal.”

168. See discussion above under claim 4. Claim 13 adds that the electrical load is further configured to provide the first activation signal in response to the second alert signal. As explained for claim 5, the first and second power supplies are identical, such that the configuration and operation of the first power supply applies equally to the second power supply. As a result, in Chang, the control module 103 (load) is configured to issue signals to control the switches 107 (the activation signal) in response to receiving the alert signal. (Ex. 1008, ¶¶0041, 0044).

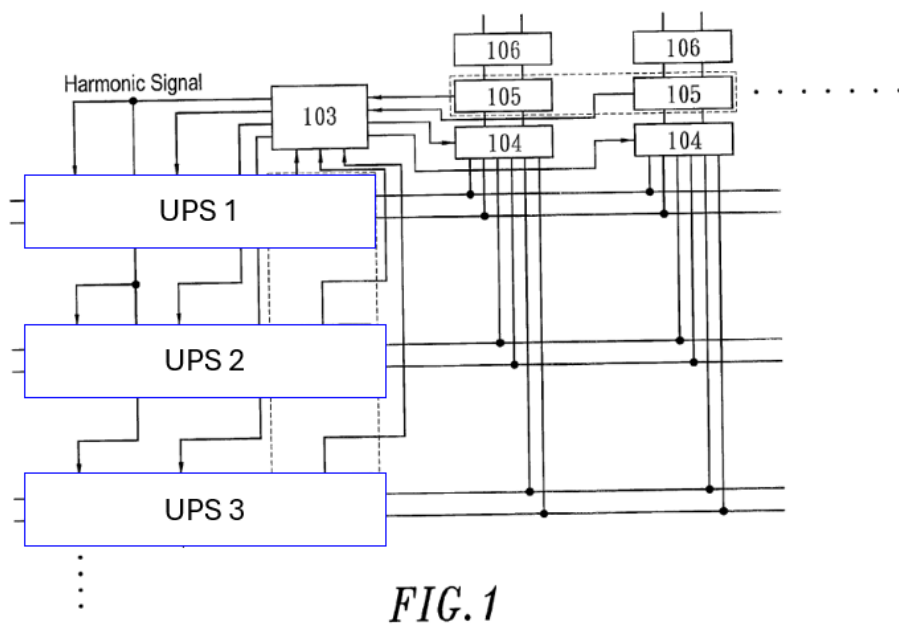
Ground 5. Claims 1-15 are rendered obvious over Chang in view of Edelen

169. In my opinion, claims 1-15 would have been obvious over **Chang** (as discussed in Ground 4) in view of U.S. Pat. App. Pub. 2006/0226706 (“**Edelen**”) (Ex. 1009).

A. Overview of the Obviousness Contention

170. Chang alone renders claims 1, 4-7, 9-10, 12, and 14 obvious as discussed under Ground 4, above.

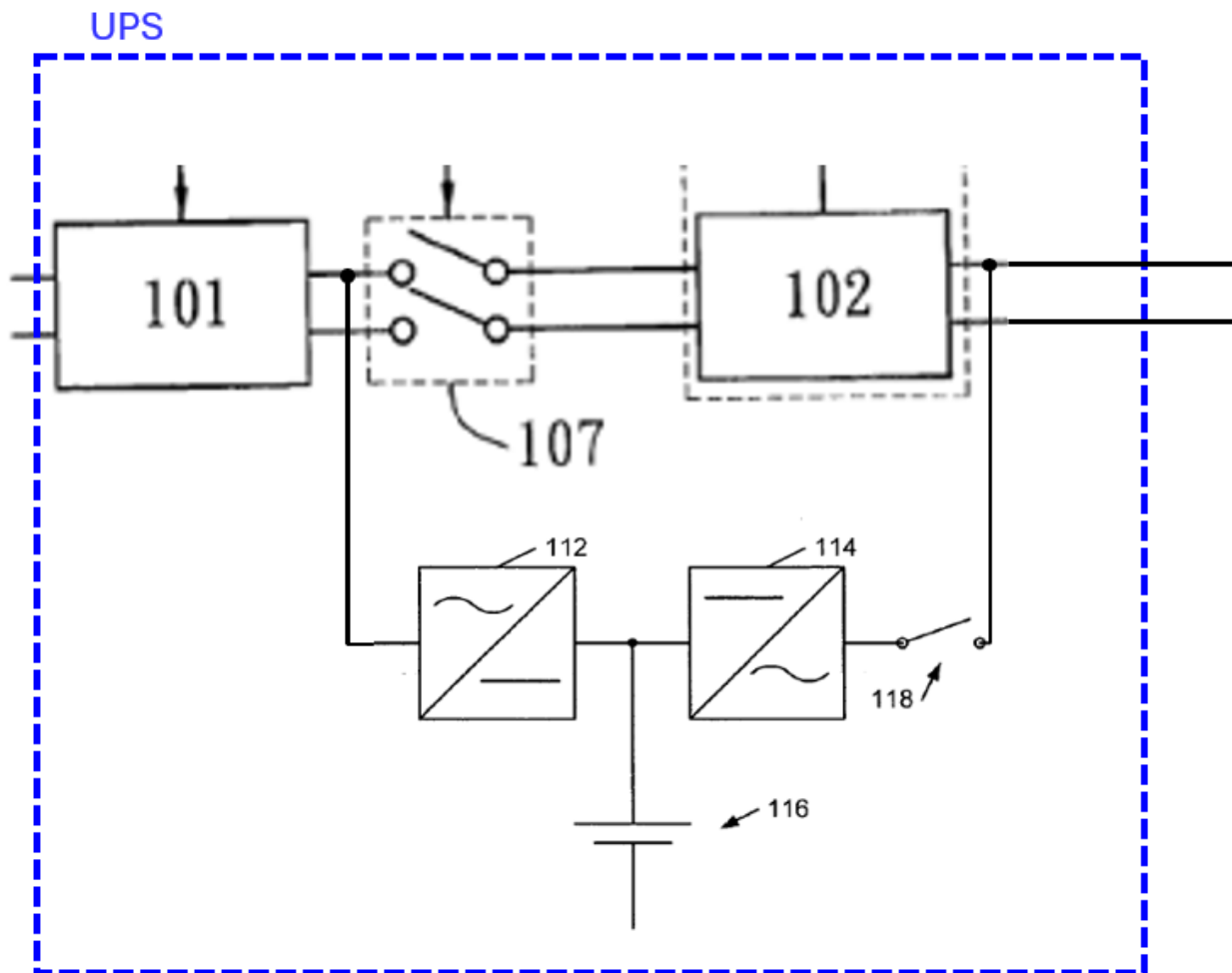
171. I am further of the opinion that it would have been obvious to modify the system of Chang to combine units 101, 107, and 102 with a parallel battery backup in an uninterruptible power supply, as conceptually depicted in the following modified Fig. 1 of Chang:



(Ex. 1008, Fig. 1 (modified)). The battery backup could have been implemented with a reasonable expectation of success in parallel with modules 107 and 102, for

example, as shown here (combining Chang's modules 101, 107, and 102 with Edelen's battery backup:

172. In this manner, claims 1, 4-7, 9-10, and 13 are obvious as in Ground 4, with the primary exception that modules 101, 107 and 102 in Chang are formed with a parallel battery backup as part of a single Uninterruptible Power Supply, as suggested by Edelen, as shown in the following modified figure:



173. In the modified figure above, a battery backup from Edelen's Fig. 1 (which is essentially the same as the battery backup for Figs. 2 and 4 of Edelen) has

been added in parallel to the switch 107 and detecting module 102. Although Edelen's battery backup shows one connecting wire and Chang's modules have two, it would have been apparent to a PHOSITA that the single line in Edelen's figures represents at least two lines, between which there is a voltage difference. The two lines would connect respectively to the two lines in Chang's power supply. By connecting the battery backup in this manner, the AC input from input side 101 in Chang would be rectified in rectifier 112 to produce DC power. The battery 116 would provide a DC voltage after rectifier 112 (one side of battery 116 is connected to the node between rectifier 112 and inverter 114, while the other side is connected, e.g., to ground). When switch 118 is closed (ON), the battery branch of the circuit is connected to the output, and the battery provides power even if the input power source (connected to input side 101) fails. The switch 118 would obviously be open (OFF) when the battery is not needed. Chang also helpfully provides a harmonic signal to input side 101 (Ex. 1008, ¶¶0044-0046, Fig. 1), which would also have been to apply to the inverter 114, such that the AC output of the inverter is advantageously provided in phase with AC power from other power supplies.

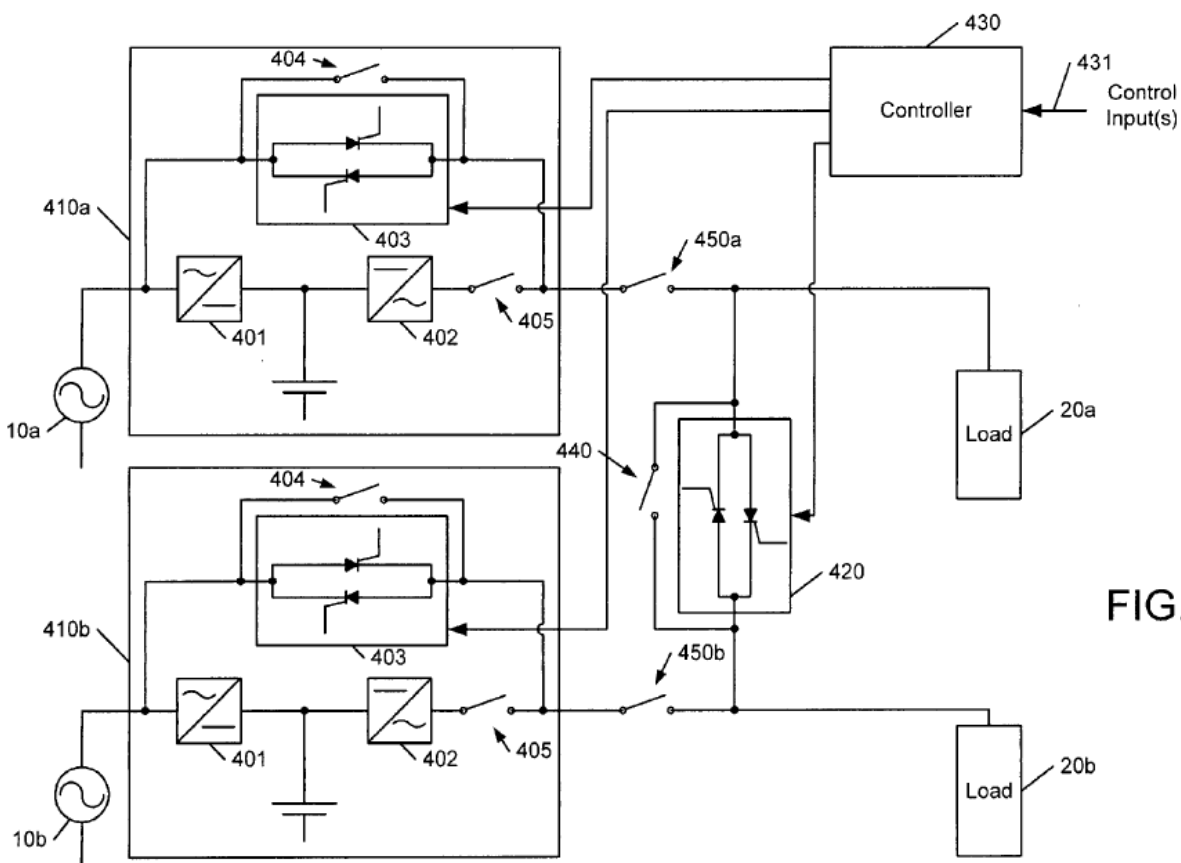
B. Overview of Edelen

174. Similar to Chang, Edelen teaches a power supply system that can switch between multiple independent sources of power to ensure continuous supply of power to a load. Edelen states:

“The present invention relates to power supply apparatus and methods and, more particularly, to apparatus and methods for transferring loads among multiple power sources.”

(Ex. 1009, ¶0001).

175. Edelen teaches a form of Uninterruptible Power Supply (UPS), two of which (410a and 410b) are shown in Fig. 4 of Edelen:



(Ex. 1009, Fig. 4, ¶¶0023-0024).

176. In Fig. 4, two different power sources (10a and 10b, left side) respectively energize two UPSs (410a and 410b), which then provide power to loads

20a and 20b (right side). (Ex. 1009, ¶0023). Within each power supply (*e.g.*, 410a), there is a high-speed static switch 403 that, when ON, allows the power source (*e.g.*, 10a) to be connected to the output of the power supply. (Ex. 1009, ¶¶0002, 0023). In this state, the power source is providing output power. When the static switch 403 is OFF, a certain amount of power can be provided to the output by the battery branch (together with the inverter 401 and rectifier 402) connected in parallel. (Ex. 1009, ¶0024 (switch off), ¶0002 (function of battery in the UPS)). Each UPS also contains mechanical switches 404, which are slower than the static switches, and are typically used to bypass or isolate the static switch. (Ex. 1009, ¶0002). I note that Edelen, after introducing “static switches 403” and “switches/breakers 404” in ¶0023, sometimes thereafter refers to “static switch 404”. However, it is clear that these references are typos, and that Edelen means static switch 403, because element 404 is not static. The “static switch” is named such because it is mechanically static, *e.g.* it uses transistors for switching. (Ex. 1009, ¶0019). This is in contrast to the mechanical switch / breakers 404.

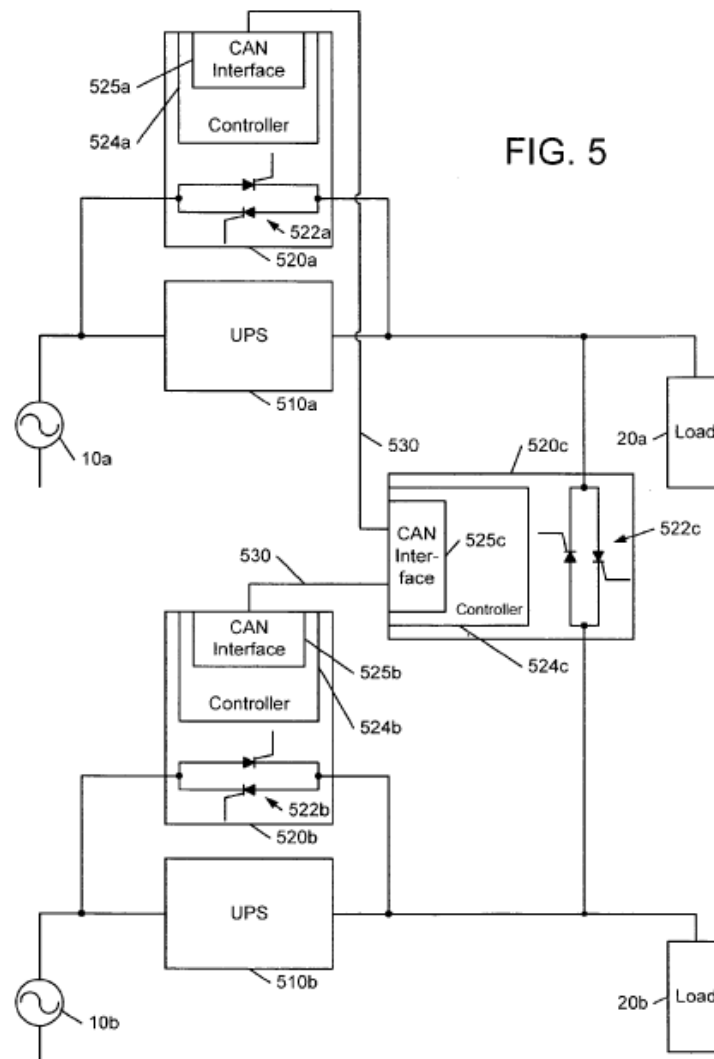
177. Edelen teaches switching power from one UPS to another in the event of a failure, by opening (turning OFF) the first static switch of the first UPS and closing (turning ON) the second static switch of the second UPS. Edelen states:

“The controller circuit may be operative to transition the load from a first state wherein the load receives power from the first power source via the first static switch to a second state wherein the load

receives power from the second power source while isolated from the first power source. In particular, the controller circuit may be configured to cooperatively **open the first static switch and close the second static switch to transition the load** from the first state to the second state.”

(Ex. 1009, ¶0005) (Emphasis added) (see also Ex. 1009, ¶¶0008-0009, claim 22).

178. Another arrangement of Edelen is shown in Fig. 5, reproduced here:



(Ex. 1009, Fig. 5, ¶¶0025-0027). In Fig. 5, two sources of electrical energy (10a and

10b, left side) are coupled to two loads (20a and 20b, right side). (Ex. 1009, ¶0025). The two loads receive power via two power supplies, shown as Uninterruptible Power Supply (“UPS”) 510a (and its static switch 520a) and UPS 510b (and its static switch 520b). (Ex. 1009, ¶0025). Edelen makes clear that each UPS can be integrated into a single unit with its respective switch (*e.g.*, UPS 510a can form a single integrated unit with element 520a). (Ex. 1009, ¶0027) (“the first and second static switches 520a, 520b may be integrated with the respective first and second UPSs 510a, 510b....”).

179. Edelen teaches that its power supplies in Fig. 5 can communicate with an external controller (like controller 103 of Chang) to control the switches 522a and b via communication interfaces, shown in Fig. 5 as CAN interfaces (elements 525a, 525b, and 525c in Fig. 5). Edelen explains:

“The first, second and third static switches 520a, 520b, 520c include respective static switch elements 522a, 522b, 522c and respective first, second and third static switch controllers 524a, 524b, 524c, each of which includes **a communications interface**, here shown as Controller Area Network (CAN) interfaces 525a, 525b, 525c. CAN is a serial bus system developed by Robert Bosch GmbH and is the subject of the ISO 11898 international standard. [¶][0026] The first, second and third **static switch controllers 524a, 524b, 524c may include**, for example, drive circuitry and other **electronics that control the first, second and third static switch elements 522a, 522b, 522c responsive to messages received** via the CAN interfaces

525a, 525b, 525c and/or other signal inputs, such as sensor signal inputs.”

(Ex. 1009, ¶¶0025-0026) (Emphases added).

180. Edelen further teaches that the UPSs of Fig. 5 can have built-in monitoring and control circuitry. (Ex. 1009, ¶¶0026-0027). In this regard, Edelen first teaches that the static switch controllers can have circuitry to control the static switches (like switches 107 in Chang):

“The first, second and third static switch controllers 524a, 524b, 524c may include, for example, drive circuitry and other electronics that control the first, second and third static switch elements 522a, 522b, 522c responsive to messages received via the CAN interfaces 525a, 525b, 525c and/or other signal inputs, such as sensor signal inputs.”

(Ex. 1009, ¶0026).

181. Edelen next teaches that the static switch controllers (in this case a third static switch controller) can have circuitry that performs functions similar to Chang’s voltage and current detecting module 102, namely monitoring the power produced by a power source, and issuing signals that control switches in order to transfer a load to a different power supply:

“[T]he third static switch controller 524c may [sic: may] sense voltages or other conditions that warrant load transfer, and may responsively issue command messages to the first static switch controller 524a and/or the second static switch controller 524c via

communications busses 530 to control the first static switch 520a and/or the second static switch 520b in cooperation with the third static switch 520c to achieve uninterrupted transfer of the first load 20a and/or the second load 20b between the first and second power sources 10a, 10b.”

(Ex. 1009, ¶0026) (*see also* ¶0027).

182. Although the paragraph above refers to a third static switch controller, Edelen also makes clear that this functionality can reside in any other static switch controller:

“It will be appreciated, however, that other control configurations fall within the scope of the present invention. For example, instead of having a static switch controller 524c associated with the inter-bus static switch 520c act as a monitor/master device as discussed above, **one of the first static switch controller 524a or the second static switch controller 524b could serve in the monitor/master role.**”

(Ex. 1009, ¶0027) (Emphases added).

183. Edelen also teaches that the static switches (which include both switches and switch controllers, see Fig. 5) can be integrated with the respective UPSs:

“It will be understood that static switch control circuitry in various embodiments of the present invention may be configured in various different ways. In some embodiments, for example, the **first and**

second static switches 520a, 520b may be integrated with the respective first and second UPSs 510a, 510b....”

(Ex. 1009, ¶0027) (Emphasis added).

C. Rationale (Motivation) Supporting Obviousness

184. It would have been obvious to provide the functionality of modules 101, 107, and 102 in the system of Fig. 1 of Chang as Uninterruptible Power Supplies (UPSs) with battery backup in such UPSs, as also taught by Edelen.

185. Chang and Edelen are broadly similar, because they both use multiple power sources to power one or more loads, with the intent of switching the power source that supplies power to a load when there is a problem with the supplied power. (Ex. 1008, ¶¶0041-0047, 0011) (Ex. 1009, ¶¶0023-0027, ¶¶0008-0009). Each reference uses a controller (controller 103 in Chang and static switch controller, *e.g.*, 430, 524c in Edelen) to disconnect one power source from a load while connecting a second power source to the load. (Ex. 1008, ¶¶0011, 0047) (Ex. 1009, ¶¶0005, 0008-0009, 0024). To do this, both references use switches (switches 107 in Chang and static switches (*e.g.*, 522a and 522b) in Edelen) to connect or disconnect power sources to a load. (Ex. 1008, ¶0044) (Ex. 1009, ¶¶0005, 0008-0009, 0026-0027). Both references will switch to a second power source if a failure in a first power source is detected. (Ex. 1008, ¶¶0042-0044, 0011, Abstract) (Ex. 1009, ¶¶0024, 0005, 0008-0009).

186. Furthermore, the UPSs of Edelen Fig. 5 can have built-in functionalities required by the power supplies of Chang (modules 101, 107, and 102), such that a PHOSITA would have found them similar to Chang's modules 101, 107, and 102. Specifically, the UPSs of Edelen receive power (like the power input 101 of Chang), provide a controllable switch (*e.g.*, static switch 522a) that can connect or disconnect the power source from the output (like switch 107 of Chang), provide voltage-monitoring ability (like module 102 of Chang), and provide the ability to notify a controller of the state of the power source (again like module 102 of Chang). (Ex. 1009, ¶¶0025, 0021, 0005, 0008-0009 (Edelen's switches), ¶¶0027, 0004 (integrated voltage monitoring), ¶¶0025-0027, 0015, 0007, Fig. 5, claims 7, 8 (communications interface)).

187. A PHOSITA, in view of Chang and Edelen, would have found it obvious to integrate modules 101, 107, and 102 into a single UPS device. First, Chang describes the numbered boxes 101, 107, and 102 (and others) in Fig. 1 in terms of their functions, and not in terms of whether they represent separate physical devices or components of physical devices that combine multiple such components. (Ex. 1008, ¶¶0041-0047). Chang thus leaves open the extent to which the components of Fig. 1 are integrated into single devices or merely in functionally and physically *interconnected* devices. Moreover, Chang expressly states that “[m]any changes and modifications in the above described embodiment of the invention can,

of course, be carried out without departing from the scope thereof.” (Ex. 1008, ¶0054). Edelen, in a similar context, teaches UPS devices that can be integrated into single device structures and have similar capabilities to modules 101, 107, and 102 of Chang, as explained above. Edelen expressly suggests that separate functional modules be integrated into single devices having battery backup, controlled switching, communication, and power monitoring capabilities. (Ex. 1009, ¶¶0025-0027, 0002). A PHOSITA would have known independently, but also understood from Edelen that the arrangement of various functionalities into a unit with a single housing or into several units was, in 2009, a simple matter of design choice, and a predictable variation among well-known equivalents. Furthermore, a PHOSITA would have understood that integrating input, monitoring, switching, control and communication functionality into a single device would have provided space-saving advantages, particularly in contexts where space is at a premium, for example, when redundant power supplies are needed in smaller products or remote or mobile systems, such as aircraft.

188. A PHOSITA would also have perceived advantages in using a parallel battery backup, as suggested by Edelen, which (via an inverter) can maintain AC power at the output for some time after failure of a respective power source. (Ex. 1009, ¶0002, Fig. 1, Fig. 4). A PHOSITA would have found this advantageous for Chang’s system, which attempts to maintain power at all times to loads, since

otherwise “loads may not work or objects of loads are damaged.” (Ex. 1008, ¶¶0004, *see also* ¶¶0001-0003, 0011). Chang’s system is also directed to switching loads between power sources quickly, such that the battery backup of a UPS is not exhausted prior to load switching (Ex. 1008, ¶¶0004-0009), and Chang expressly contemplates UPS systems as power sources (Ex. 1008, ¶0011). A PHOSITA would have understood that battery backup would have protected against any small delay in the power transfer contemplated by Chang, and would have sized the batteries (both in terms of voltage and ability to supply current) to provide operating-level power output to cover an expected interval of time between a first power supply shutting down and a second power supply taking over the supply of power.

D. Reasonable Expectation of Success

189. There would have been a reasonable expectation of success for the reasons provided above under Ground 2, and additionally because the UPSs with parallel battery backup and integrated controls were commonplace and predictable by 2009, as shown by the prior art cited herein, e.g. Chang and Edelen, but also Zak and Susong. (Ex. 1005, Abstract) (Ex. 1007, ¶¶0003, 0016)

E. Analogous Art

190. **Chang** is analogous art as discussed in Ground 4. **Edelen** is analogous art because it is in the same field as the ’967 patent (“the electrical arts”, Ex. 1001, 3:2-3, 3:44-48), and specifically is related to power supplies. (Ex. 1009, Title,

Abstract). Edelen is also reasonably pertinent to a problem facing the named inventors, namely that of “providing redundant power supplies” (Ex. 1001, 1:32-33), because Edelen provides for switching between power supplies upon detection of an abnormality. (Ex. 1009, Abstract, ¶¶0023-0025). *See Wyers*, 616 F.3d at 1238.

F. Claim Mapping

CLAIMS 1, 4-7, 9-10, and 13

191. The mapping for claims 1, 4-7, 9-10, and 13 is the same as in Ground 4, except that the functional boxes 101, 107 and 102 depicted in Fig. 1 of Chang are, in the combination, integrated into a single UPS device with battery backup, and the so-modified UPS devices are the “first power supply” and “second power supply” of the independent claims, as well as the “third power supply” of claim 7.

CLAIM 2

“2. The apparatus according to claim 1, the first power supply further configured to provide operating power to the electrical load while the second power supply transitions from the lesser output level to the greater output level.”

192. The combination renders obvious claim 2. In the combination, a battery backup in each UPS provides power in the event that the main power source energizing that UPS fails. (Ex. 1009, ¶0002, Fig. 1, Fig. 4). As I note above, the battery backup circuit branch in Fig. 1 of Edelen, which is labeled “prior art”, is essentially the same as the battery backup circuit branch in Fig. 4 of Edelen. The battery backup of a UPS will provide power in the combination when the first power

supply receives a signal to turn the switch 107 OFF, disconnecting the first source of power from the output, allowing the parallel battery backup to provide power (the switch 118 will be ON in that case). A PHOSITA would obviously configure the batteries to provide operating power for the brief interval during which the Chang system switches the responsibility for providing power from a first power supply to a second power supply. Thus, when there is a failure condition reported by the first power supply, the first power supply is configured to provide operating power to the electrical load during the brief interval while the second power supply transitions from the lesser output level to the greater output level (as discussed under Ground 4, element [1d]).

CLAIM 3

“3. The apparatus according to claim 1, the first and second power supplies being coupled such that the activation signal is defined by the alert signal.”

193. The combination renders claim 3 obvious. Specifically, it would have been obvious based on Edelen to incorporate Chang’s controller 103 into any of the combination’s UPSs, based on Edelen’s express teachings. Specifically, Edelen teaches having a switch controller, integrated with a UPS, “serve in the monitor/master role” (Ex. 1009, ¶0027), in which case it will:

“sense voltages or other conditions that warrant load transfer, and may responsively issue command messages to the first static switch controller 524a and/or the second static switch controller 524c via

communications busses 530 to control the first static switch 520a and/or the second static switch 520b....”

(Ex. 1009, ¶0026). It would have been obvious based on this teaching to have the first power supply (UPS 1) serve in the monitor/master role and issue a command message (alert signal) that is received by the second UPS to switch its switches (and thus transition to a greater output level). When the first UPS has an integrated controller and is serving in the monitor/master role, it will send messages directly to the other UPSs, and any message sent by the first UPS will be received directly by the second. The command message would thus be both the alert signal and the activation signal, and thus the **activation signal** would be **defined by the alert signal**. A PHOSITA would have been motivated to do this based on the express suggestion of Edelen, and in order to facilitate faster direct communications between power supplies. A PHOSITA could have done this with a reasonable expectation of success.

CLAIM 8

“8. The apparatus according to claim 1, the first power supply further configured to provide operating level power from internal energy storage to an electrical load while the second power supply transitions from the lesser output level to the greater output level in response to the activation signal.”

194. See discussion above under claim 2. Claim 8 further requires that operating level power come from **internal energy storage**, which is met by the fact

that operating level power during the transition of the second power supply comes from the parallel battery system internal to each UPS. (Ex. 1009, ¶0002, Fig. 1, Fig. 4).

CLAIM 11

“11. The system according to claim 9, the first and second power supplies respectively configured to provide operating level power to the electrical load for an amount of time sufficient for the other of the first and second power supplies to transition from the lesser output level to the greater output level.”

195. See discussion above under claims 2 and 8. This discussion applies equally to both the first and second power supplies, for the reasons discussed above in ¶154. It further was obvious to configure a battery backup in a UPS to provide operating level power to the electrical load for an amount of time sufficient for a respective other power supply to transition to a greater output level in order to avoid any (even if brief) interruption in output power during such a transition.

CLAIM 12

“12. The system according to claim 9, the second activation signal defined by the first alert signal, the first activation signal defined by the second alert signal.”

196. See claim 3. The configuration described under claim 3 also results in the **first activation signal** being **defined by the second alert signal**, because the second alert signal (sent by the second UPS indicating an anomalous condition of the second independent source of electricity) is received by the master controller in

the first UPS, and it “control[s] the first, second and third static switch elements 522a, 522b, 522c responsive to messages received via the CAN interfaces 525a, 525b, 525c and/or other signal inputs, such as sensor signal inputs.” (Ex. 1009, ¶0026). The first power supply, when it receives a message from the second power supply (the **second alert signal**) is configured to control the switch internal to the first power supply (Ex. 1009, ¶p0026-0027), and thus cause the first power supply transition from a lesser output level (no power) to a greater output level (full operating power) in response to the second alert signal. Because the message from the second power supply is received by the first power supply, it is both the second alert signal and the first activation signal, and the **first activation signal is defined by the second alert signal**.

CLAIM 14

“[14a]. A method, comprising: asserting a signal responsive to an anomalous condition of a first independent source of electrical energy,”

197. See Ground 4, claim 1, elements [1a] and [1b]. The asserted signal is the signal that is obviously present when the module 102 of Chang informs the control module 103 of an abnormal condition with the first power supply. (Ex. 1008, ¶¶0042-0046, 0011, claim 1). The discussion under elements [9b] and [9c] in Ground 4 for the terms “independent” and “anomalous” also applies here.

“[14b] the first independent source of electrical energy coupled to energize a first power supply;”

198. See Ground 4, claim 1, element [1a]. The first independent source of electrical energy is **coupled to energize a first power supply** because it provides the power that appears at the output terminals of module 102. (Ex. 1008, ¶0041).

“[14c] transitioning a second power supply from a standby output level to a normal output level responsive to the signal,”

199. See discussion above under Ground 4, claim 1, element [1d], discussing the transition of a second power supply from a lesser to a greater output level. Chang renders obvious that, when an abnormal condition is detected by the first power supply, it will inform control module 103 (**the signal**), and in response control module 103 will transition a second power supply **from a standby output level to a normal output level**. Specifically, when the power supplies are isolated from the loads (because control switches 107 are OFF), they are supplying no power (**a standby output level**), whereas when they are active because control switches 107 are ON, they are supplying **normal operating power**. (EX1008, ¶¶0041, 0044).“[14d] the second power supply energized by a second independent source of electrical energy; and”

200. See discussion under Ground 4, claim 1, element [1c] and elements [14a] and [14b]. The discussion in these sections applies to the second power supply

and second independent source of electrical energy because the power supplies are identical, and each energized by a separate (independent) power source. (Ex. 1008, ¶¶0011, 0041, 0046).

“[14e] providing operating power from the first power supply to an electrical load during the transitioning.”

201. See this Ground’s discussion under claim 2, above. In Chang, the control module 103 (load) is configured to issue signals to control the switches 107 (the activation signal) in response to receiving the alert signal. (Ex. 1008, ¶¶0041, 0044).

CLAIM 15

“15. The method according to claim 14 further comprising communicating the signal from the first power supply to the second power supply, the second power supply providing operating power to the electrical load after the transitioning to normal output level.”

202. The combination renders claim 15 obvious. The “signal” in claim 14 is “a signal responsive to an anomalous condition of a first independent source of electrical energy”. Under claim 3, above, it is explained why Chang in view of Edelen renders obvious sending an alert signal from one UPS (directly) to another UPS, which is **communicating the signal from the first power supply to the second power supply**. Furthermore, Chang teaches that its system

“control[s] the power source switching module to switch the power source supplying power output sides to other normal independent

power sources of the power input sides such that the loads can keep obtaining **required power.**”

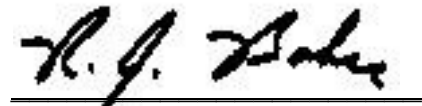
(Ex. 1008, ¶0011) (Emphasis added)(*see also* Ex. 1008, ¶¶0011, 0051-0052, 0008).

203. Thus, I am of the opinion that the transfer from the first power supply to the second power supply causes **the second power supply to provid[e] operating power to the electrical load** as soon as the switch 107 is turned ON at the second power supply, *i.e.*, **after the transitioning to normal output level.** (Ex. 1008, ¶¶0009, 0052).

X. OATH

204. This declaration and my opinions herein are made to the best of my knowledge and understanding, and based on the material available to me, at the time of signing this declaration. I declare under penalty of perjury under the laws of the United States of America that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I understand that willful false statements and the like are punishable by fine or imprisonment, or both (18 U.S.C. 1001) and may jeopardize the validity of the application or any patent issuing thereon.

Date: June 12, 2025


R. Jacob Baker, Ph.D., P.E.