

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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**ADC SOLUTIONS AUTO LLC,**  
*Petitioner*

v.

**THE NOCO COMPANY,**  
*Patent Owner.*

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Case IPR2024-00577  
U.S. Patent No. 11,447,023

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**PATENT OWNER'S RESPONSE**

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**EXHIBIT LIST**

| <b>Exhibit No.</b> | <b>Description</b>                                                                                                                                                                                     |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ex. 2001           | U.S. Pat. No. 9,506,446 (“Xinfang”)                                                                                                                                                                    |
| Ex. 2002           | U.S. Pat. App. Pub. No. 2011/0175461 (“Tinaphong”)                                                                                                                                                     |
| Ex. 2003           | U.S. Pat. App. Pub. No. 2012/0187897 (“Lenk”)                                                                                                                                                          |
| Ex. 2004           | U.S. Pat. No. 7,017,055 (“Ho”)                                                                                                                                                                         |
| Ex. 2005           | U.S. Pat. No. 8,786,247 (“Ishino”)                                                                                                                                                                     |
| Ex. 2006           | WIPO Pub. No. 2015/195321                                                                                                                                                                              |
| Ex. 2007           | U.S. Pat. App. Pub. No. 2008/0157732                                                                                                                                                                   |
| Ex. 2008           | G.B. Pat. App. No. 2,265,267                                                                                                                                                                           |
| Ex. 2009           | Respondent’s Opening Claim Construction Brief (Public Version), <i>Certain Portable Battery Jump Starters and Components Thereof (II)</i> , Inv. No. 337-TA-1359 (U.S. International Trade Commission) |
| Ex. 2010           | Deposition Transcript of the deposition of C. Arthur MacCarley, taken on October 29, 2024                                                                                                              |
| Ex. 2011           | Expert Declaration of Dr. Ayman Fayed                                                                                                                                                                  |
| Ex. 2012           | <i>Curriculum Vitae</i> for Dr. Ayman Fayed                                                                                                                                                            |

## **I. INTRODUCTION**

The NOCO Company (“Patent Owner” or “NOCO” or “Applicant”) is a first mover in the research, design, and performance of lithium-ion portable jump starters and accessories. Historically, consumers essentially had two choices to jump start a vehicle: (1) traditional jumper cables that required the battery to be connected to another vehicle, and (2) semi-portable jump starters that did not require another vehicle but used heavy lead-acid batteries. Following years of research and design to develop a safe and convenient jump starter, NOCO launched its NOCO BOOST® line of jump starters in 2014 with safety features and charging technologies that revolutionized the industry.

A unique feature of the NOCO BOOST® line of jump starters was their ability to be charged via USB. During the development of this product line, NOCO’s engineers originally objected to the idea of using a USB charger on such a large-capacity battery device. A typical barrel charger or other proprietary charger would have allowed for much faster charging and would not have required a circuit design incorporating a DC/DC boost converter. Despite these objections, the inventors had the foresight to recognize that the advantages of USB charging would make this counterintuitive design choice the right decision in the long run. It is apparent now that the NOCO inventors were ahead of their time. Since the launch of this product line, NOCO has become a market leader in the portable jump starter market, and its

products continue to be refined, developed, engineered, and sold in the U.S. today. The unfortunate byproduct of this success is that the market has followed suit, and there are now a spate of copycats and knockoffs that have benefited unfairly from NOCO's innovations in the space.

U.S. Patent No. 11,447,023 (the "'023 Patent") covers NOCO's USB charging innovations for jump starters and discloses a portable vehicle jump starter having a battery pack that can be charged via a 5 volt USB input. Unlike small consumer electronics devices (*e.g.*, cellular phones, tablets, digital cameras), a jump starter must generate a massive amount of current for a very short period of time in order to jump start a commercial vehicle. This requires a high-capacity rechargeable battery that is much larger than those used in a typical consumer electronic device. Yet, Petitioner argues that because it was known to boost a 5V USB voltage to charge a higher-voltage battery in a small consumer electronics device, a PHOSITA would have been somehow motivated to do the same for the high-capacity battery in a jump starter. By treating a high-powered jump starter the same as a small consumer electronic device, Petitioner ignores that a jump starter requires a very high capacity battery. A PHOSITA would have understood that the power limitations associated with traditional USB made charging the battery of a high-powered tool, such as a jump starter, counterintuitive in July of 2014 (the priority date of the '023 Patent).

For these reasons, it is unsurprising that Petitioner was not able to identify any prior art that teaches or suggests charging a jump starter device, or even a device having a comparable battery capacity, via USB. Instead, Petitioner was forced to rely on prior art jump starters that use traditional charging means and separate prior art references that discuss USB voltage conversion in small electronics devices. But combining these two types of references without addressing the significant differences in battery capacities between vehicle jump starters and small electronic devices is a classic example of impermissible hindsight reconstruction. Moreover, the reasoning behind Petitioner's alleged motivation to combine wrongly focuses on a hypothetical jump starter system, rather than the actual prior-art vehicle jump starters of Richardson and Yu, which are particularly ill-suited to be modified to rely on USB charging.

A determination that claims 1, 32, 38, 39, 47, 52, and 54 are not unpatentable is respectfully requested.

## **II. THE '023 PATENT**

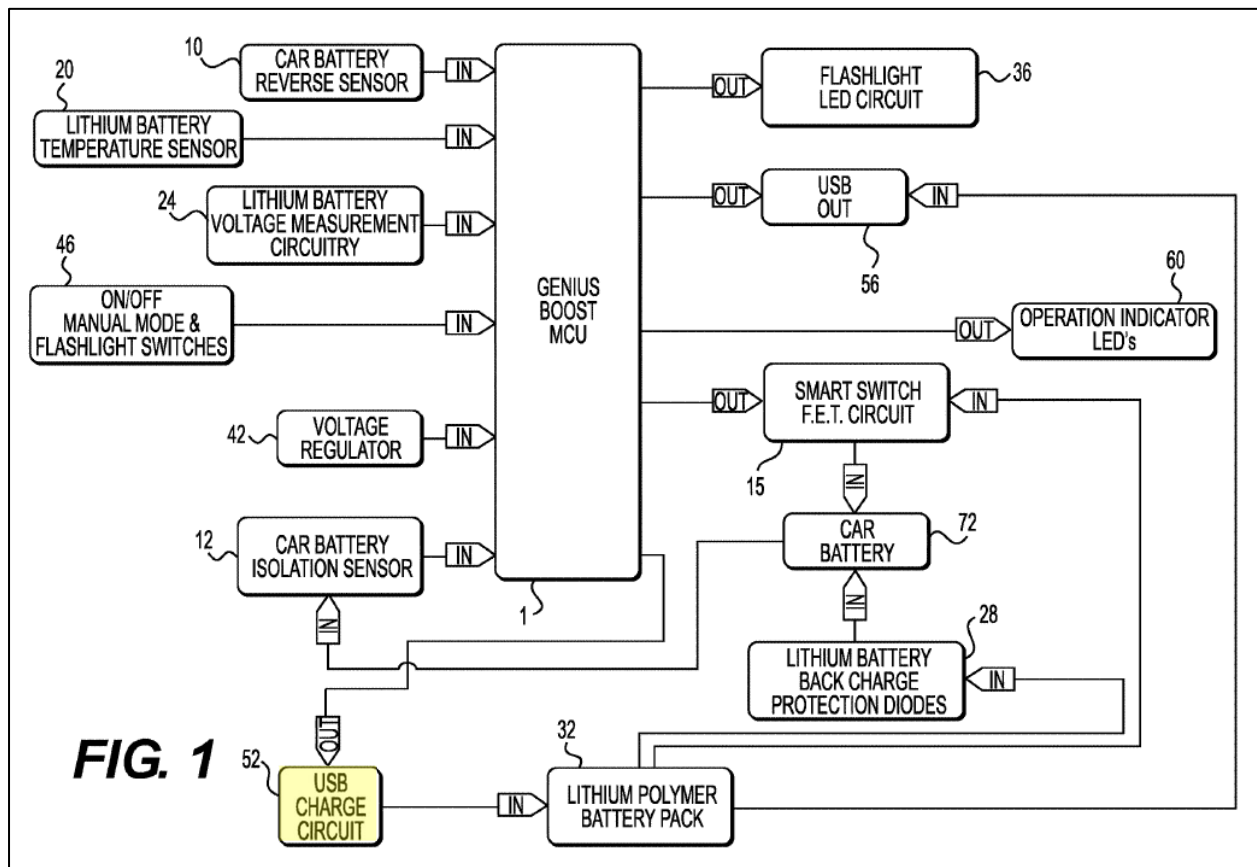
### **A. Overview Of The State Of The Art**

As explained in the '023 Patent, portable booster devices, often referred to as jump start devices or jump starters, include a high-discharge rechargeable battery that can be connected in circuit with a vehicle's battery through a pair of cables in order to jump start the vehicle. *See* Ex. 1001, 1:13-16. Previously, recharging a

jump starter powerful enough to jump start a 12-volt car battery relied on a high-power charger through a specialized 12-volt plug connector, such as a barrel charger, as confirmed by Patent Owner's expert, Dr. Ayman Fayed. Ex. 2011, ¶ 23. While various attempts were made to address problems associated with traditional jump starters (*e.g.*, safety concerns due to improper usage) before the '023 Patent, "each of the prior art solutions suffer[ed] from other shortcomings, either in complexity, cost or potential for malfunction." *Id.*, 3:12-15. Thus, at the time of filing, there remained a need for further improvements to vehicle jump start devices. *Id.*, 1:41-45; Ex. 2011, ¶ 23.

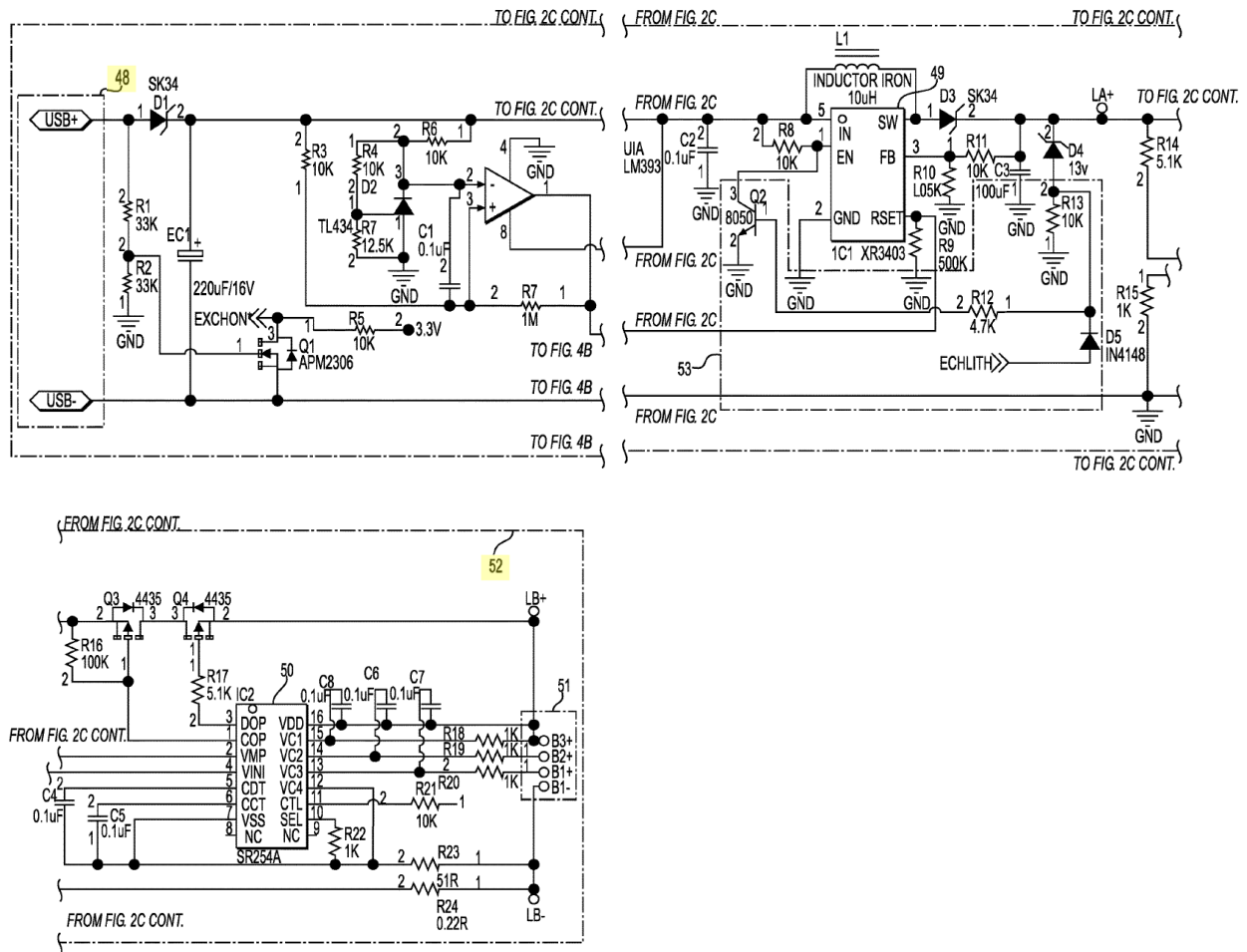
**B. The Invention Claimed In The '023 Patent**

Recognizing the need for improved jump starter devices, NOCO developed a "Portable Vehicle Battery Jump Start Apparatus" that greatly reduced the complexity and potential for malfunction associated with its usage through a variety of included advancements. Ex. 1001, Title; Ex. 2011, ¶ 24. The '023 Patent discloses techniques that, for example, "prevent[] the lithium battery pack from being connected to the vehicle battery 72 when the terminals of the battery 72 are connected to the wrong terminals of the booster device." *Id.*, 4:30-33. As shown in Figure 1 below, the '023 Patent also discloses that a "USB charge circuit 52 converts power from any USB charger power source, charge voltage and current for charging the lithium battery pack 32," (*id.*, 5:16-17):



*Id.*, Fig. 1 (color annotation added).

Beneficially, “[t]he USB charge circuit 52 allows the internal lithium battery pack 32 to be charged using a standard USB charger.” *Id.*, 7:21-23. In other words, in order to further simplify the user experience, the “charge input uses a standard micro-USB connector 48 allowing standard cables to be used.” *Id.*, 7:23-25; Ex. 2011, ¶ 25. The micro-USB connector (item 48) described in the ’023 Patent for charging the lithium polymer battery pack is included in the USB charge circuit (item 52) depicted by Figure 2C:



*Id.*, Fig. 2C (color annotations added); Ex. 2011, ¶ 25.

The jump starter of the '023 Patent relies on the limited charging capabilities of a standard USB charger even though, “[a]t the heart of the handheld battery booster is a lithium polymer battery pack 32, which stores sufficient energy to jump start a vehicle engine served by a conventional 12 volt lead-acid or valve regulated lead-acid battery.” *Id.*, 4:5-9; Ex. 2011, ¶ 26. The '023 Patent even illustrates the large size of the battery pack by providing an example configuration: “three 3.7V, 2666 mAh lithium polymer batteries in a 3S1P configuration.” *Id.*, 4:11-12. In order

to permit the jump starter to be charged using a USB cable, “[t]he 5V potential provided from standard USB chargers is up-converted to the 12.4 VDC voltage required for charging the internal lithium battery pack using a DC-DC converter 49.” *Id.*, 7:21-23. The advancement of using a USB type connector to charge a portable jump start device, as well as various components like the DC-DC converter that make this solution possible, are captured in the claims of the ’023 Patent. Ex. 2011, ¶ 26.

### **C. The Challenged Claims**

The Petition challenges claims 1, 32, 38, 39, 47, 52, and 54 of the ’023 Patent.

Petition, p. 7. Claim 1 recites:

1. A jump starting apparatus configured for boosting or charging a depleted or discharged battery having a positive polarity battery terminal and a negative polarity battery terminal, the jump starting apparatus comprising:

a power supply;

a positive polarity battery terminal connector configured for connecting the jump starting apparatus to the positive polarity battery terminal of the depleted or discharged battery;

a negative polarity battery terminal connector configured for connecting the jump starting apparatus to the negative polarity battery terminal of the depleted or discharged battery;

a power switch or circuit configured to turn on power from the power supply to the positive and negative polarity battery terminal connectors;

a control system or circuit connected to and controlling the power switch, the control system or circuit configured to detect whether the positive and negative polarity battery terminal connectors have a

correct polarity connection with the positive and negative polarity battery terminals of the depleted or discharged battery prior to turning on the power switch or circuit;

a USB input circuit connected to the power supply, the USB input circuit comprising a DC/DC converter, the USB input circuit configured for converting power from a USB power source to increase power voltage to the power supply; and

a USB input connector connected to the USB input circuit, the USB input connector configured for connecting to the USB power source and providing power input from the USB power source through the USB input connector and the USB input circuit to the power supply.

Ex. 1001, 8:39-9:6.

All challenged claims are independent claims with the exception of claim 32, which depends directly from claim 1. *Id.*, 11:4-6. Each independent claim captures a jump starting apparatus or device that, similar to claim 1 above, includes a USB input connector and a USB input circuit configured to increase/up-convert the voltage from the USB input connector to the power supply. *See id.*, 8:39-15:12; Ex. 2011, ¶¶ 22-27.

### **III. THE ALLEGED GROUNDS OF UNPATENTABILITY**

The alleged grounds of unpatentability for this trial are:

- Ground 1: Claims 1, 32, 38, 39, 47, 52, and 54 are unpatentable under 35 U.S.C. § 103(a) over U.S. Patent Publication No. 2013/0154543 A1 (“Richardson”) (Ex. 1005) in view of U.S. Patent No. 9,391,467 B2 (“Zhao”) (Ex. 1006).
- Ground 2: Claims 1, 32, 38, 39, 47, 52, and 54 are unpatentable under 35

U.S.C. § 103(a) over Chinese Utility Model Patent No. CN 203211234 U (“Yu”) (Ex. 1007; Ex. 1008) and U.S. Patent No. 9,219,372 B2 (“Paparrizos”).

As further detailed below, none of these references teach or suggest a method or apparatus for charging a jump starter using a USB connection. *See* Ex. 2011, ¶¶ 28-29.

## **A. Overview of the Asserted Prior Art**

### **1. Richardson**

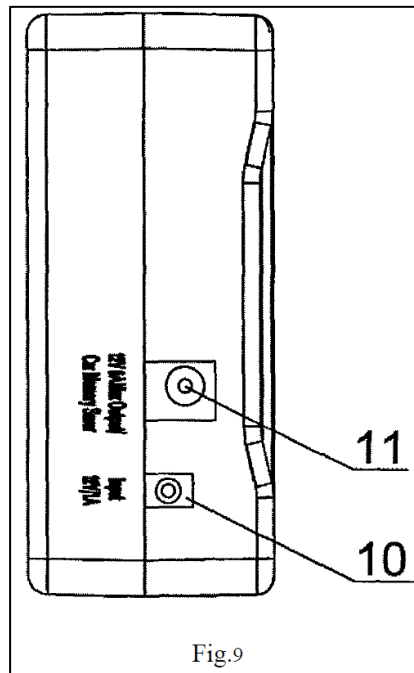
Richardson is titled “Method And Apparatus For Providing Supplemental Power To An Engine.” Ex. 1005, p. 1. Richardson was cited and relied upon by the Patent Office as the primary reference in numerous rejections during the prosecution of the ’023 Patent. *See, e.g.*, Ex. 1002, pp. 438-463. Richardson discloses a large “supplemental power source (jump starter)” for use in commercial applications. Ex. 1005, ¶ [0014]; Ex. 2011, ¶ 32. Richardson’s jump starter is “useful when starting fleets of vehicles with dead batteries” since the device may be “rapidly recharged to start many vehicles in a row.” *Id.*, ¶ [0055]. While the Petition relies on Richardson to teach numerous elements of claim 1, as recognized numerous times by the Office during prosecution (*see* Ex. 1002, p. 440), Richardson fails to disclose either the use of a USB input charger or boost conversion of an input charge. *See* Ex. 1005; Ex. 2011, ¶¶ 31-32.

## 2. Zhao

Zhao (Ex. 1006) is titled “Step-Up Battery Charging Management System And Control Method Thereof.” Ex. 1006, p. 1. Zhao discloses “a step-up battery charging management system,” (*id.*, 1:14-15), that may “receive DC input voltage  $V_{in}$  and may generate an output signal by boosting DC input voltage  $V_{in}$ .” *Id.*, 3:1-3. Zhao states that the “DC input voltage  $V_{in}$  can be provided to the step-up converter by a universal serial bus (USB) charger, or any other suitable low voltage power supply system.” *Id.*, 3:8-10. Zhao does not teach or suggest applying its techniques to charge a vehicle jump starter or comparable high-power device. *See* Ex. 1006; Ex. 2011, ¶¶ 33-34.

## 3. Yu

Yu (Ex. 1007; Ex. 1008) is titled “Automotive Emergency Starting Device.” Ex. 1008, p. 1. Yu was considered by the Patent Office during prosecution and published on the face of the '023 Patent. Ex. 1001, p. 5. Yu discloses “an emergency automotive starting device” having various components, including “an internal battery, a charging input interface, a display module, a control module, a relay, input buttons and an output terminal.” Ex. 1008, Abstract. Similar to Richardson, Yu fails to teach or suggest the use of a USB input charging, and instead depicts the use a traditional barrel charger (item 10):



Ex. 1008, Fig. 9. In addition to the barrel charger, Yu discloses a “19V output terminal 9” and a USB port that it describes as “a 5V output terminal 8.” Ex. 1008, ¶ [0028]; *see id.*, Fig. 7 (items 8 and 9); Ex. 2011, ¶¶ 35-57.

#### 4. Paparrizos

Paparrizos (Ex. 1009) is titled “Buck Boost Charging For Batteries.” Ex. 1009, p. 1. Paparrizos seeks to solve the problem that “[c]omputer tablets and other mobile devices, such as mobile phones, digital SLR cameras, video recorders, audio devices, and so on are moving to battery packs with two (or more) Li-ion cells in series” but “since a large majority of USB devices are defined at 5V, it may not be possible to charge high voltage (>5V) 2S or 3S battery packs using a typically [sic] USB power source.” *Id.*, 1:9-26. In order to address this issue, Paparrizos discloses

that a “buck boost circuit 212 may be operated as a forward boost converter to increase the voltage level that is received at input terminal 102 to produce a suitable voltage level at charging terminal 104 or system terminal 106.” *Id.*, 3:67-4:4. Paparrizos further discloses that the charged device “may be a smartphone, personal data assistant, portable computer, computing tablet, digital imaging devices, audio devices, and so on.” *Id.*, 2:26-29. Paparrizos does not disclose applying its techniques to charge a vehicle jump starter or comparable high-power device. *See* Ex. 1009; Ex. 2011, ¶¶ 38-39.

#### **IV. THE PROSECUTION HISTORY OF THE '023 PATENT**

The Petition provides a limited overview of the prosecution history, dismissing the care taken by the Patent Office and misrepresenting the proceedings in IPR2020-00944, which previously challenged issued claims of a parent application to the '023 Patent. Ex. 2011, ¶ 41, *see* Petition, pp. 12-19.

##### **A. The Parent Application's Claim Related To USB Charging Features Was Held Not Unpatentable In IPR2020-00944**

The '023 Patent is a continuation application that claims priority back to, among other applications, U.S. Patent Application No. 14/325,938, which issued as U.S. Patent No. 9,007,015 (“'015 Patent”). During the prosecution of the '023 Patent, all claims of the '015 Patent were previously challenged in IPR2020-00944, which resulted in a Final Written Decision (“'015-FWD”) finding all claims

unpatentable (Ex. 1014, p. 2), with the exception of claim 11:

The apparatus of claim 1, further comprising a USB charging port configured to provide charging power from an external power source to said internal power supply.

Ex. 1013, 9:1-3; Ex. 2011, ¶ 42. Specifically, while the secondary references of the prior art applied (which were combined with Richardson) did not include USB charging features and instead used non-USB, 14V 1A input ports, Petitioner still argued that:

It would be *readily apparent* from the references that a USB port, which is simply a different physical plug and socket combination from the round plug and socket used in the Epower-20 and 21 products, *could also be incorporated* into portable jump starters in place of or in addition to the 14V 1 A input port to charge the internal batteries of jump starter devices. *A PHOSITA would be motivated to provide such a USB charging port to provide the added convenience to users of using another commonly used power input for charging the jump starter device.*

Ex. 1014, p. 92 (emphasis in original); Ex. 2011, ¶ 43.

The Board rejected this argument, finding that “Petitioner’s articulation of a motivation for one with ordinary skill in the art to incorporate a USB input charging port in Richardson based on Epower-20’s or Epower-21’s disclosure is conclusory.”

Ex. 1014, p. 92. In particular, the ’015-FWD stated that Petitioner’s expert did “not

identify any jump starter device having a USB input charging port.” *Id.*, p. 93. The ’015-FWD continued to explain:

The matter is much more complicated than what Petitioner’s argument makes it out to be. There is insufficient accounting by Petitioner of the expectation at the time of one with ordinary skill in the art about the ease or difficulty in locating a usable source to provide input charge to a USB port on a jump starter.

*Id.* Although Patent Owner had submitted “reasons why it would not have been obvious to one with ordinary skill in the art to include in a jump starter a USB input charging port,” the board found that it “need not discuss Patent Owner’s showings with regard to claim 11, because, . . . Petitioner has not established obviousness of claim 11 over the applied references.” *Id.*, p. 94; Ex. 2011, ¶ 44.

The ’015-FWD, including its findings with respect to the USB charging features of claim 11, were subsequently affirmed as patentable by the Federal Circuit. *The NOCO Company, Inc. v. Shenzhen Carku Technology Co., Ltd.*, Appeal Nos. 2022-1646, 2022-1741, 2024 U.S. App. LEXIS 3221 (Fed. Cir. Feb. 12, 2024) (Ex. 1015); Ex. 2011, ¶ 45.

**B. The Patent Office Considered Prior Art Related To USB Charging Of Small Electronics Devices Before Allowing The ’023 Patent**

The prosecution of the ’023 Patent was thorough and searching. The Patent Office considered numerous prior-art references and applied many of them to the

claims throughout the lengthy prosecution history. In fact, the file history for the '023 Patent is so extensive—*spanning 2,200+ pages*—that Petitioner was forced to break it up into eight separate files for filing with the Board. Ex. 2011, ¶ 46.

The '023 Patent issued from U.S. Patent Application No. 16/450,422, which was filed on June 24, 2019. Ex. 1001, p. 1. Dependent claim 11 of the originally-filed application required “a USB charging port configured to provide charging power from an external power source to said internal power supply.” Ex. 1002, p. 41. Multiple preliminary amendments were made to the application (*see id.*, pp. 87-97, 110-127) prior to issuance of the first Office Action on August 12, 2020. *Id.*, pp. 151-186. As part of the first Office Action, dependent claim 11 was rejected by the Patent Office based on a combination of Richardson and U.S. Pat. No. 9,506,446 (Ex. 2001, “Xinfang”).

In response to this Office Action, Applicant amended all independent claims to include both a “USB charge circuit” and a “USB connector . . . configured for providing charge input.” Ex. 1002, pp. 255-284. While the Petition implies that this choice to amend the claims to add in USB charging features was a reaction to the Board’s findings in the '015-FWD (*see* Petition, pp. 12-16), it neglects to point out that this amendment occurred on January 12, 2021, more than nine full months *before* the '015-FWD issued on November 3, 2021, which upheld the patentability of claim 11 of the '015 Patent. *See* Ex. 1014. In other words, Applicant could not

have made the choice to incorporate USB charging features into the claims based on the board's decision in IPR2020-00944.

The Patent Office responded to the amendment incorporating the USB charging features by issuing a final Office Action based on the same combination of Richardson and Xinfang. *See* Ex. 1002, pp. 287-319. In particular, the Patent Office stated:

It would have been obvious to one having ordinary skill in the art before the effective filing date of the claimed invention to have incorporate[d] the teachings of Xinfang into the apparatus of Richardson *so as to provide additional convenience to users of using another commonly used power input for charging the jump starter device.*

*Id.*, p. 293 (emphasis added).

Following the final rejection, Applicant submitted an after-final amendment as part of the After-Final Consideration Pilot Program, revising the independent claims to require a “USB input charge circuit” and a “USB input connector.” *Id.*, pp. 359-387.

On June 25, 2021, the Patent Office issued a second non-final Office Action, rejecting the independent claims over a combination of Richardson, Xinfang, and Tinaphong. *Id.*, pp. 435-466. Specifically, the Office relied on the teachings of Tinaphong to allegedly cure the deficiencies of Richardson and Xinfang regarding the “USB input charge circuit.” *Id.*, pp. 441-442.

In response to this Office Action, Applicant amended the claims to further distinguish Tinaphong by requiring that the USB input converter “increase” or “up-convert[]” the charge voltage received from a USB charger. *See id.*, pp. 477-507. Applicant explained that Tinaphong cannot practically be used as a jump starter device and that the reference is nonanalogous art:

The apparatus of Tinaphong is an energy harvesting apparatus, and not disclosed as being a jump starter or for use as a jump starting apparatus. Further, the apparatus of Tinaphong cannot be practically used as a jump starting device due to the low voltage output (i.e. 5 volts) of the apparatus (see paragraph [0042]), which is too low to effectively provide power to a depleted or discharged 12V battery (e.g. ***the charging rate would be too slow to charge the 12V vehicle battery to jump start a vehicle***). Thus, Tinaphong is clearly non-analogous prior art, and one skilled in the art would not turn to Tinaphong to attempt to modify and/or improve the jump starter of Richardson.

*Id.*, p. 499 (emphasis added). Applicant also explained that Tinaphong teaches away from the proposed combination with Richardson, because its input voltage is down converted (*i.e.*, changed from 5 volts to 3.7 volts, which is even less suitable for charging a 12 volt battery). *See id.*, p. 499.

Following an Applicant-initiated interview, and based on the arguments presented against the combination of Richardson and Tinaphong, the Patent Office issued a Notice of Allowance. *Id.*, pp. 517-522. Additional information disclosure

statements, a request for continued examination, and minor claim amendments were submitted and considered by the Patent Office following the initial notice of allowance. The Office continued to diligently examine the claims in light of the additional information disclosure statements that were provided after the first notice of allowance. No other prior-art rejections were made by the Office after the second non-final Office Action and prior to the '023 Patent issuing on September 20, 2022. *Id.*, p. 2233; *see* Ex. 2011, ¶¶ 46-53.

## **V. CLAIM CONSTRUCTION**

In this IPR, claim terms are to be construed in accordance with the standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). But “[o]nly terms which are in controversy need to be construed, and then only to the extent necessary to resolve the controversy and material to the decision.” *Facebook, Inc. v. Sound View Innovations, LLC*, IPR2017-01005, Paper No. 13 at 6 (P.T.A.B. Sept. 1, 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)). NOCO does not propose any terms need to be construed, but reserves its right to put forth constructions for any claim terms, including terms for which Petitioner formally or otherwise relies on a construction of a term.

## **VI. PERSON OF ORDINARY SKILL IN THE ART**

Petitioner states that a person having ordinary skill in the art (“PHOSITA”) as of the claimed priority date would have been “a person with at least a bachelor’s

degree in electrical engineering or its equivalent and at least two years of experience in the field of electrical engineering including some experience with DC power supply or battery charger design” and that “[l]ess work experience could be compensated for by a higher level of education, such as a master’s degree, and vice versa.” Petition, p. 22. NOCO does not propose a different level of skill in the art, but reserves the right to propose a level of ordinary skill in the art in other proceedings.

## **VII. ARGUMENT**

“The genius of invention is often a combination of known elements which in hindsight seems preordained.” *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1351 (Fed. Cir. 2001). Moreover, “[w]hen the art in question is relatively simple, as is the case here, the opportunity to judge by hindsight is particularly tempting.” *Id.* By arguing that a skilled artisan would be motivated to apply the USB charging techniques of small electronics devices to vehicle jump starters without addressing the substantial differences in battery capacity between the two, the Petition has fallen prey to impermissible hindsight reconstruction. In actuality, a PHOSITA would have been dissuaded from modifying a generic jump starter to include a USB charger at the time, and they certainly would not have modified the particular systems of Richardson and Yu—one of which has a very large capacity battery that relies on rapid recharging from a vehicle’s electrical system and the other already implements

a USB port but still chose not to rely on it for charging.

Given that the grounds of the Petition are incurably infected with hindsight bias, mischaracterizations of the state of the art, and references that do not adequately support the proposed unpatentability grounds, Petitioner has failed to meet its burden of proving unpatentability.

**A. The Petition Misrepresents How A PHOSITA Would Have Viewed Jump Starter Devices And USB Charging Techniques At the Time Of Filing**

When addressing the motivation to combine the references in Grounds 1 and 2, the Petition repeatedly argues that “charging a pack rated above 5V with a 5V USB input . . . is a known technique that a PHOSITA would have been motivated to implement in a predictable manner to charge 12V batteries.” Petition, p. 31; *see* Petition, p. 60. But this reasoning oversimplifies the combination and is not how a PHOSITA would have actually considered jump starter devices and charging techniques at the time. Ex. 2011, ¶ 80.

Vehicle jump starter devices are high-power tools used to jump start the engines of automobiles and other commercial vehicles. Ex. 2011, ¶ 80. Given this purpose, a key performance metric of a jump starter is the peak current it can supply for the duration needed to jump start an engine (approximately 20-50 ms). Ex. 2011, ¶ 81; *see id.*, ¶¶ 70-73. The peak current of a jump starter determines the largest engine displacement or the largest depleted battery of a vehicle that the jump starter

can successfully jump start. Ex. 2011, ¶¶ 81, 70. Given the size of typical vehicle engines, jump starters are required to provide a massive peak current in order to properly function, typically between 1000 and 4000 amperes. Ex. 2011, ¶¶ 81, 70. As confirmed by Petitioner's expert, for larger vehicles and those having diesel engines, the required peak current for a successful engine jump start will be even higher. Ex. 2010, 30:20-31:7 (recognizing that his own diesel truck requires "[t]wo batteries in parallel" to start, since such an arrangement "can provide twice the current of one battery"); Ex. 2011, ¶ 81.

A PHOSITA would have understood that the peak current needed to jump start a typical vehicle engine or battery requires jump starter devices to have large-capacity internal battery cells. Ex. 2011, ¶ 82; *see id.*, ¶¶ 74-77. The peak current of a jump starter is limited by the peak current that its internal battery pack can provide. Ex. 2011, ¶¶ 82, 74. And for a typical series-connected battery pack, each individual battery cell in a jump starter must have a large enough capacity to provide the necessary peak current while keeping the total voltage of the battery pack above the minimum required level for the time period needed to successfully jump start a vehicle engine or battery. Ex. 2011, ¶ 82. As a result, the massive peak current requirement needed for vehicle jump starters to properly function requires internal battery cells that have very large individual capacities. Ex. 2011, ¶ 82.

Because of the high capacity batteries required in a jump starter, a PHOSITA

would not have considered 2014-era USB to be a viable charging solution. Ex. 2011, ¶ 83. Unlike barrel chargers, a PHOSITA would have known that USB charging had a limited, specified power output. Ex. 2011, ¶ 83; *see id.*, ¶¶ 78-79. It was also understood that higher nominal battery cell capacity, larger number of cells in the pack, and lower power rating of the charging energy source will all result in longer charging times of a battery pack. Ex. 2011, ¶¶ 83, 69. Therefore, in order to maintain a typical charging time, a PHOSITA would have recognized that jump starters needed to rely on a high-power charging energy source. Ex. 2011, ¶ 83. Moreover, the inefficiencies associated with boost converting a low voltage would have only added to the discrepancies in charging power between USB and barrel chargers. *See* Ex. 2010, pp. 83:23-84:2 (recognizing that a high-quality DC-DC converter is only “about eighty percent efficient”); Ex. 2011, ¶¶ 83, 67.

As discussed above, unlike digital multimeters, pocket calculators, cellphones, or other small consumer electronic devices that Petitioner uses in its prior art examples, the high-power functionality of jump starters requires such devices to have large-capacity battery packs. Because of this, vehicle jump starters are more equivalent to those of electric lawnmowers, snowblowers, and other high-power cordless tools. Ex. 2011, ¶ 84. This distinction continues to be well understood by many craftsmen and home owners. Even with the advancements of USB charging capabilities, if one walks into any garage in the U.S. today, they are

likely to find a barrel charger or proprietary charging unit for one of these high-power electric devices. Ex. 2011, ¶ 84. The use of such “non-standard” chargers, even to this day, is not because of a limited understanding of how to boost convert a low-voltage USB input to charge these high-power devices, but rather because of the power limitations historically associated with USB charging. Ex. 2011, ¶¶ 84, 78-79. Thus, while capable of charging most devices if boosted to a sufficient voltage, a PHOSITA would have recognized that USB is not suitable for charging every battery pack. Ex. 2011, ¶ 84.

When discussing the motivation to combine the references in Grounds 1 and 2, the Petition never even addresses the fact that jump starter battery packs are required to have larger-capacity battery packs than common consumer electronic devices. Instead, the Petition wrongly narrows its discussion to addressing only charging voltage differences; namely, the desirability of charging higher voltage batteries with a 5V input. *See* Petition, pp. 31, 60. In doing so, Petitioner has fallen prey to hindsight bias by wrongly assuming that a boosted USB charge would be suitable to charge any 12 volt battery pack, regardless of its size. But again, overcoming the voltage difference between a USB charger and a jump starter battery pack is not the reason why a PHOSITA would not have applied USB charging techniques to these devices. Ex. 2011, ¶ 85. Indeed, Patent Owner does not dispute that DC-DC boost conversion was known in the art at the time. But the relevant

question, and what the Petition fails to address, is whether a PHOSITA would have chosen to charge the large, high-capacity battery pack of a jump starter using the limited power output capabilities of USB at the time. One would not have done so. Ex. 2011, ¶ 85; *see id.*, ¶¶ 58-85. And more importantly, they certainly would not have modified the specific vehicle jump starter systems of Richardson and Yu to include USB. Ex. 2011, ¶ 85.

**B. Richardson And Zhao Do Not Render Claims 1, 32, 38, 39, 47, 52, And 54 Obvious (Ground 1)**

**1. A PHOSITA Would Not Have Been Motivated To Modify The Particular System Of Richardson To Have A USB Input Circuit**

“In an IPR, the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016). As part of this burden, when an obviousness ground in a petition asserts a combination of identified prior art, it “must demonstrate that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention . . . .” *Netflix, Inc. v. DivX, LLC*, No. 2022-1083, 2023 U.S. App. LEXIS 4926, at \*9 (Fed. Cir. Mar. 1, 2023) (citation omitted). Indeed, when a case involves simple art that is at a high risk of hindsight bias, such as this one, the Federal Circuit has stressed that “the tests of whether to combine references need to be applied rigorously.”

*McGinley*, 262 F.3d at 1351; *see also Polaris Indus. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1068 (Fed. Cir. 2018). Here, Petitioner has failed to demonstrate that a PHOSITA would have combined the teachings of Richardson and Zhao.

**(a) Petitioner’s Motivation To Combine Richardson And Zhao Is Deficient**

The reasoning provided in the Petition is insufficient to support modifying a jump starter to include a USB input, much less the specific vehicle jump starter of Richardson. Ex. 2011, ¶ 89. The Petition argues that:

A PHOSITA therefore would have been motivated to modify Richardson in view of Zhao because Zhao is directed to the *known technique of charging a multicell battery pack of series-connected cells of a battery-powered device*—which is the same battery architecture in Richardson’s jump starter—by using a DC-DC booster converter in accordance with its established function of converting a lower voltage input to a higher voltage output. EX1003, ¶ 66. Additionally, Zhao specifically teaches the desirable feature of charging a pack rated above 5V with a 5V USB input, which is a known technique that a PHOSITA would have been motivated to implement in a predictable manner to charge 12V batteries such as those disclosed by Richardson. *Id.*

Petition, p. 31 (emphasis added). This reasoning follows a typical obviousness rationale outlined in *KSR Int’l Co. v. Teleflex Inc.*: the use of a “known technique” to improve “similar devices in the same way.” 550 U.S. 398, 417 (2007).

Specifically, the Petition argues that “charging a pack rated above 5V with a 5V USB input” was a known technique, and that the systems of Richardson and Zhao related to similar devices since they share the “same battery architecture” of a “multicell battery pack of series-connected cells.” Petition, p. 31. By Petitioner’s logic, it would have been obvious to charge a full-size electric vehicle battery (*e.g.*, a Tesla Model 3’s battery) using USB, since it is similarly formed of modules of “multicell battery pack[s] of series-connected cells.” But this is not the case, and one cannot simply ignore the capacity of the battery pack being charged. Ex. 2011, ¶ 89.

As discussed above, a PHOSITA would not understand the small battery systems contemplated by Zhao and the vehicle jump starter described by Richardson to be “similar devices.” Ex. 2011, ¶ 90. Zhao discloses a step-up battery charging management system that uses a step-up converter to boost a DC input charging voltage. *See* Ex. 1006, Abstract. But Zhao does not teach or suggest applying its techniques at voltages above 8.4V or to devices having large-capacity batteries. *See, e.g.*, Ex. 1006, 4:39-41 (disclosing how an example “final voltage  $V_{CV}$  can be about 8.4V if two lithium batteries”). While the Petition also provides a host of additional references to demonstrate that boosting a 5V USB input to charge higher voltage batteries was known in the art (*see* Petition, pp. 47-50, citing Exs. 1016-1021), these additional references all similarly relate to small electronics devices with low-

capacity batteries. *See* Ex. 1019, ¶ [0002] (disclosing a “digital multimeter” device and noting that the batteries for such devices are “usually disposable”); Ex. 1021, p. 1 (addressing the charging of “various electronic devices” connected a “computer’s USB interface”); Ex. 1016 (discussing boosting input power to devices such as “a smart phone, a cell phone, a personal digital assistant (PDA), a tablet, a laptop, a desktop, a portable music player . . .”); Ex. 1017 (“[T]he aforementioned charge circuit is used for mobile electronic devices such as a digital still camera, a digital video camera, digital audio, and portable navigation.”). When considering charging techniques, a PHOSITA would have understood that none of these devices are similar to a vehicle jump starter. Ex. 2011, ¶ 90.

The Petition discloses no prior art examples of USB being used to charge a battery with a comparable capacity to that required for a vehicle jump starter. Moreover, the Petition never even discusses why a PHOSITA would have applied the low-power charging technique of traditional USB to an electronic system with a battery having a high capacity. As explained above, charging such a large-capacity battery with USB was counterintuitive, not because boost converting an input voltage was not understood in the art, but instead because it was well understood that the limited charging current that traditional USB provided was not capable of quickly charging high-capacity battery systems. Ex. 2011, ¶ 91. By failing to even address the primary reason—battery capacity, not voltage—that a PHOSITA would

not have applied a USB charging circuit to a jump starter system like that of Richardson, Petitioner has fallen short of its burden of demonstrating that a skilled artisan would have made the proposed combination.

**(b) Richardson's Commercial Jump Starter System  
Requires A Larger Internal Battery Capacity Than A  
Typical Vehicle Jump Starter And Would Therefore  
Greatly Suffer From A Switch To USB Charging**

In addition to the above, the Petition fails to consider the actual system of Richardson that it sought to modify in light of Zhao's teachings. For instance, the Petition states that:

A PHOSITA would understand Zhao's system is suitable for use with a variety of pack configurations and battery chemistries, such as a 3S pack of lithium-ion cells rated at 11.1V or a 4S pack of lithium-ion cells rated at 14.8V (*both of which would be well-suited for starting a traditional lead-acid vehicle starter battery rated at 12V*). See, e.g., EX1006, 3:6-11. Thus, the disclosure of Zhao provides an explicit teaching, suggestion, or motivation to implement Zhao's USB input circuit *with a system like Richardson's jump starter*.

Petition, pp. 44-45 (emphases added). But the system of Richardson is not a traditional portable jump starter, but rather a heavy-duty jump starter with very powerful internal batteries that, despite their large charge capacity demands, can be recharged in a short period of time and then used to jump a fleet of vehicles, such as a commercial truck fleet. See Ex. 1005, ¶¶ [0007], [0055]; Ex. 2011, ¶ 92. As

evidence, Richardson states that “[n]ormal vehicle charging voltages fall within certain ranges for 12, 18, 24, 30, 36, 42 and **48 volts systems.**” *Id.*, ¶ [0054] (emphasis added). And Richardson further explains how its jump starter has to be powerful enough to accommodate the demands of batteries up to 48 volts by appropriately configuring the batteries in the jump starter and selecting voltage outputs. *Id.*, ¶¶ [0034]-[0035], [0054]. Therefore, the system of Richardson differs dramatically in design, configuration, purpose, and performance relative to the vehicle jump starter recited in the challenged ’023 Patent. Ex. 2011, ¶ 92.

A 48 volt battery pack would require four times the number of series-connected battery cells of a typical 12V vehicle charger, assuming peak current is maintained. Ex. 2011, ¶ 93; *see* Ex. 2010, 66:24-67:4 (confirming there would be “four times [the] energy storage capacity”). As a result, and because the current in a series-connected battery pack is equal to the current in every battery cell in the pack, Richardson contemplates a battery pack with a capacity that is at least four times larger than that of a standard 12 volt vehicle charger. Ex. 2011, ¶ 93; *see id.* (recognizing that “the commercial embodiment of Richardson is roughly the size of a suitcase and had wheels so that a user could roll it from vehicle to vehicle.”). Charging Richardson’s system would therefore take at least four times longer than a jump starter designed to jump start only 12 volt vehicle batteries, assuming the same peak current requirements. Ex. 2011, ¶ 93.

The high power requirements that would be needed to charge Richardson's jump starter in a reasonable amount of time is the main reason why Richardson relies on charging its jump starter directly through the vehicle's electrical system (the vehicle's battery or alternator). Ex. 2011, ¶ 94. Commercial vehicle alternators at the time would have generated between 720 and 960 watts of power, exceeding the power output of a common USB charger many times over. Ex. 2011, ¶ 94; *see* Ex. 2010, 35:21-36:5 (confirming that vehicle a alternator "generally produces 60 to 80 amps"). A PHOSITA would have recognized that it would have been nonsensical to charge Richardson's massive internal battery with USB, as it would have drastically increased the charging time of the device. Ex. 2011, ¶ 94. In fact, Petitioner's expert confirmed that the current that USB could have provided would be reduced proportionally when boosted from 5 volts to 48 volts (*see* Ex. 2010, 84:3-13), which would entail reducing the current by more than 9 times from its already-limited value.

Based solely on the size of Richardson's jump starter battery, a PHOSITA would not have modified its device to include a USB input circuit. Ex. 2011, ¶ 95.

**(c) Richardson's System Is Focused On Rapid Recharging**

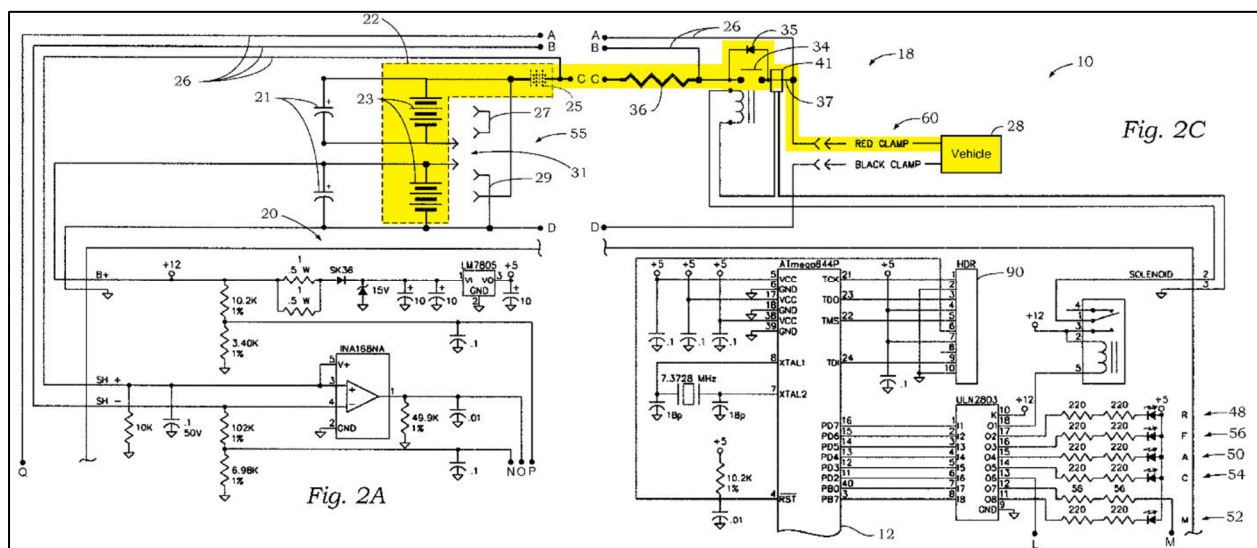
Even though Richardson's system includes a huge battery pack, a main focus of the disclosure is to provide a jump starter that may be rapidly recharged. Ex.

2011, ¶ 96. By permitting rapid recharging of its large-capacity batteries from a vehicle charging system (*i.e.*, a vehicle alternator), Richardson states that its system would be “useful when starting fleets of vehicles with dead batteries,” since the device may be “rapidly recharged to start many vehicles in a row.” Ex. 1005, ¶ [0055]. Richardson emphasizes the importance of rapidly recharging the device in such a situation, stating that this functionality “allows the capacitors 21 and jump starter batteries 22 to be fully recharged in about *1 to 5 minutes* and can therefore start many vehicles in a row without becoming discharged.” *Id.* (emphasis added). Petitioner’s expert confirmed that the 1 to 5 minute charging time was a goal of Richardson and that it is “very useful when starting fleets of vehicles.” Ex. 2010, 36:24-37:5. Moreover, Richardson notes that “[t]he jump starter batteries 22 only need to reach a 50% charge in order for the system to attempt to start the vehicle,” thereby further emphasizing the importance that Richardson places on fast recharging of its system. *Id.*, ¶ [0029].

Given the focus of Richardson on rapid recharging, the Petition fails to demonstrate that a PHOSITA would have modified Richardson’s jump starter to include a traditional USB charger which, again, had much lower power capabilities than other charging options available at the time. Ex. 2011, ¶ 97.

#### (d) Richardson Has No Existing Charging Input Circuitry

In addition to overlooking the nature of Richardson, the Petition also mistakenly interprets Richardson’s disclosed system as having existing charging input circuitry. Petition, p. 45 (“A PHOSITA would have been motivated to modify the design of Richardson’s jump starter to either (1) *replace the existing charging circuitry* with Zhao’s step-up charging system . . . .”). See Ex. 1005, ¶ [0029]. But Richardson’s only disclosed method for recharging the internal batteries involves using its red and black shunt cable ports. Ex. 2011, ¶ 98. Richardson’s schematics do not show any other way to charge the batteries 22 other than the highlighted path from the vehicle 28 through the jumper cables 60:



Ex. 1005, Figures 2A, 2C (color annotations added). There is no charging port of any kind described or depicted in Richardson's device, nor does the Petition point to

any. Therefore, Petitioner's first proposed modification of "replacing the existing charging circuitry" of Richardson simply does not make any sense. Ex. 2011, ¶ 98.

As to Petitioner's second proposed modification of "add[ing] Zhao's step-up charging system . . . as an additional and alternative pathway for charging the jump starter batteries" (Petition, p. 45), such an alteration would add additional cost and complexity to the device. Ex. 2011, ¶ 99. Indeed, while any electronic device (*e.g.*, cell phone) may theoretically benefit from having multiple different kinds of charging ports, it would have been a less-common design choice, and one that would have required additional circuitry to address the safety risk of a user plugging in two chargers at the same time. Ex. 2011, ¶ 99. The Petition provides no discussion or examples of jump starters or any other devices configured to have multiple input charging ports. The system of Richardson is already capable of being recharged either by connecting its red and black shunt cable ports to a vehicle battery or to a battery charger. *See* Ex. 1005, ¶¶ [0055], [0028]. This existence of an existing charging path weakens the reasoning provided for this proposed combination. *See In re NTP, Inc.*, 654 F.3d 1279, 1299 (Fed. Cir. 2011) (finding impermissible hindsight bias where a proposed modification adding "an RF network to element #2 in the figure would render the [existing] RF network connecting the portable PCs in figure 1 superfluous.").

More importantly, even if a PHOSITA decided to add a separate charging

circuit, the Petition still fails to address why they would have chosen a USB port over other much-faster charging arrangements, especially given the large-capacity battery of Richardson and the reference's focus on quick recharging, as explained above. Ex. 2011, ¶ 101, *see id.*, ¶¶ 88-102.

\* \* \*

Thus, the combination of Richardson with Zhao is detached from the actual prior-art system being relied on, and the motivation to make the asserted combination is deficient. Consistent with this, a recent ITC decision involving the '023 Patent considered a comparable obviousness ground brought by Petitioner that likewise combined Richardson with a reference disclosing a USB input charging circuit, and that proceeding found that a PHOSITA would not have been motivated to modify Richardson to include such a circuit. *See Certain Portable Battery Jump Starters and Components Thereof (II)*; Inv. No. 337-TA-1359; Final Initial Determination at 267 (Oct. 22, 2024) (“Respondents have not introduced sufficiently persuasive evidence that one of skill in the art would have reason to add Zhou’s additional charging path at a different input voltage that required power conversion to Richardson.”). Similarly here, Petitioner has ignored Richardson’s teachings and has failed to meet its burden to demonstrate that a PHOSITA would have modified Richardson to include a USB input circuit.

**2. The Petition Fails To Meet Its Burden To Show, With Particularity, How A PHOSITA Would Have Combined Richardson and Zhao**

“[T]he petitioner continues to bear the burden of proving unpatentability after institution, and must do so by a preponderance of the evidence at trial.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1376-77 (Fed. Cir. 2016). “To satisfy its burden of proving obviousness, a petitioner cannot employ mere conclusory statements. The petition must instead articulate specific reasoning, based on evidence of record, to support the legal conclusion of obviousness.” *Corephotonics, Ltd. v. Apple Inc.*, 84 F.4th 990, 1004 (Fed. Cir. 2023). As part of this burden, “[t]he IPR petition, thus, must provide an understandable explanation of the element-by-element specifics of the patentability challenges, including the identification of particular portions of prior art on which the petitioner is relying.” *Id.* at 1001. Indeed, “[i]t is of the utmost importance that petitioners in the IPR proceedings adhere to the requirement that the initial petition identify ‘with particularity’ the ‘evidence that supports the grounds for the challenge to each claim.’” *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016) (quoting 35 U.S.C. § 312(a)(3)).

In addition to the deficiencies in the motivation to combine Richardson and Zhao, Petitioner fails to demonstrate **how** the step-up converter of Zhao would allegedly be incorporated into the Richardson’s jump starter. Ex. 2011, ¶ 103.

**(a) Ground 1 Fails To Explain How Zhao's Teachings Would Have been Incorporated Into Richardson's Jump Starter, Which Describes No Input Charging Circuitry Outside Of Its Shunt Cable Ports**

The Petition provides no explanation as to how a PHOSITA would have actually incorporated Zhao's step-up charging system into Richardson's jump starter.

Instead, Petitioner superficially states that:

A PHOSITA would have been motivated to modify the design of Richardson's jump starter to either (1) replace the existing charging circuitry with Zhao's step-up charging system and connect the output to Richardson's jump starter batteries, or (2) add Zhao's step-up charging system and connect the output to Richardson's jump starter batteries as an additional and alternatively [sic] pathway for charging the jump starter batteries.

Petition, p. 45.

As detailed above, Richardson's schematics do not show any other way to charge the batteries 22 other than the path through the jumper cables 60. *See* Ex. 1005, Figures 2A, 2C; Ex. 2011, ¶ 105. Because there is no charging port of any kind described or depicted in Richardson's device, the first proposed modification makes little sense and fails to satisfy Petitioner's burden of providing an understandable explanation of the element-by-element specifics of the patentability challenge of Ground 1.

As to Petitioner's second proposed modification of adding Zhao's step-up

charging system as an “additional and alternative pathway,” the Petition fails to explain *how* Zhao’s step-up converter would have been specifically incorporated into Richardson’s jump starter device. Ex. 2011, ¶ 106. It is unclear where Petitioner is proposing that the step-up charging system be added to Richardson’s circuitry. Additionally, it is unclear whether Ground 1 is using Zhao’s step-up charging system to charge each of Richardson’s internal batteries simultaneously, or individually. *See* Ex. 1005, Figures 2A (depicting two distinct battery packs). These considerations matter, since the required capabilities of the added step-up converter are directly related to the battery pack to be charged. Ex. 2011, ¶ 106. Because of Petitioner’s cursory attempt at describing the proposed combination, Patent Owner has been denied the ability to fully address the patentability challenge of Ground 1.

**(b) Ground 1 Fails To Demonstrate That Zhao’s Step-up Converter Could Be Used To Charge Richardson’s Jump Starter**

In addition to providing no explanation as to how Zhao’s step-up converter would be implemented in Richardson’s jump starter, the Petition provides no evidence demonstrating that Zhao’s system could be successfully implemented into Richardson’s specific jump starter system. Ex. 2011, ¶ 107. Richardson’s large internal battery pack enables jump starting of vehicle batteries up to 48 volts, and therefore contemplates an internal battery pack with at least 48 volts in some configurations. *See* Ex. 1005, ¶¶ [0034]-[0035]. The Petition fails to address

whether Zhao's boost convert could have boosted a 5V input voltage to a voltage suitable to charge a 48 volt battery. Petitioner cannot simply meet its burden of proof by stating, without evidence, that Zhao's step-up converter is capable of being implemented into Richardson's device.

In fact, the only relevant evidence that Petitioner provides shows that boost converters had limited output voltage capabilities. Ex. 2011, ¶ 108. Specifically, the Petition points to the example XR3403 identified in the '023 Patent, but that boost converter is only "capable of providing an output voltage up to 26V." Ex. 1012, p. 1. Given this restriction, and given that Zhao only describes boosting an input voltage up to "8.4 volts," it was unreasonable for Petitioner to simply assume that Zhao's step-up converter could properly function in Richardson's jump starter. Without an explanation of how Zhao's teachings are being incorporated into Richardson's device, and without any evidence demonstrating the boost conversion capabilities of Zhao's circuit, Petitioner has not articulated sufficiently-specific reasoning to support the legal conclusion of obviousness for the proposed combination. *See* Ex. 2011, ¶¶ 103-109.

Thus, Petitioner has failed to meet its burden to show, with particularity, how a PHOSITA would have made the proposed combination of Ground 1.

**C. Yu And Paparrizos Do Not Render Claims 1, 32, 38, 39, 47, 52, And 54 Obvious (Ground 2)**

**1. A PHOSITA Would Not Have Been Motivated To Modify The Particular System Of Yu To Have A USB Input Circuit**

Similar to Ground 1 discussed above, the Petition fails to address why a PHOSITA would have modified a jump starter system having a large-capacity battery to include a USB charging input. Petitioner also completely ignores teachings in Yu that weaken the proposed combination. In doing so, Petitioner has failed to meet its burden to demonstrate that a PHOSITA would have combined the specific teachings of Yu and Paparrizos. Ex. 2011, ¶ 111.

**(a) Petitioner's Motivation To Combine Yu And Paparrizos Is Deficient**

The reasoning provided in the Petition is insufficient to support modifying Yu's jump starter to include a USB. The Petition argues that:

A PHOSITA therefore would have been motivated to combine Yu and Paparrizos with predictable results because Paparrizos is directed to the *known technique* of charging a 12V battery from a 5V USB source using a DC-DC boost converter in accordance with its established function of converting a lower voltage input to a higher voltage output. EX1003, ¶ 151. Additionally, Paparrizos specifically teaches the desirability of charging higher voltage batteries with a 5V input, which is a known technique a PHOSITA would have been motivated to implement predictably to charge Yu's battery. EX1003, ¶ 151.

Petition, p. 60 (emphasis added). Just like for Ground 1, this reasoning follows a typical obviousness rationale of a “known technique” to improve “similar devices in the same way.” *KSR*, 550 U.S. at 417. Specifically, the Petition argues that a PHOSITA would have applied the “*known technique* of charging a 12V battery from a 5V USB source using a DC-DC boost converter” to Yu’s system.

But as discussed above, a PHOSITA would not understand the small battery systems contemplated by Paparrizos and the vehicle jump starter described by Yu to be “similar devices.” *KSR*, 550 U.S. at 417. Paparrizos discloses a battery charging circuit that can operate in a boost mode to step up a DC input charging voltage. *See* Ex. 1009, 1:30-39. But just like Zhao, Paparrizos does not teach or suggest applying its techniques beyond small electronics devices known to have low-capacity batteries. *See* Ex. 1009, 2:26-29. Paparrizos’ techniques relate to charging of “[c]omputer tablets and other mobile devices, such as mobile phones, digital SLR cameras, video recorders, audio devices” (*id.*, 2:26-29), with battery packs that “typically range from 3.0V to 8.4V,” not to charging jump starters or comparable devices. *Id.*, 1:13-15. In fact, Paparrizos expressly notes that “the USB specification imposes current limits for various devices that can be connected to the battery charging circuit,” which further confirms that its charging circuit is not intended for charging large-capacity battery systems. *Id.*, 4:48-58. When considering charging techniques, a PHOSITA would understand that these small electronics devices are

not similar to a vehicle jump starter. Ex. 2011, ¶ 113.

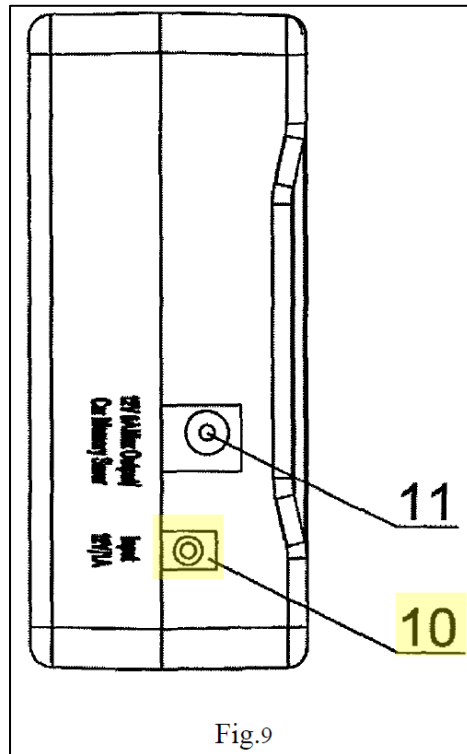
Suffering from the same deficiency as Ground 1, the Petition never discusses why a PHOSITA would have applied the low current charging technique of traditional USB to an electronic system with a battery having a high battery capacity. As explained above, it was well understood that the limited charging current that traditional USB provided was not capable of quickly charging high-capacity battery systems like those of jump starters. Ex. 2011, ¶ 114. By failing to recognize that a PHOSITA would not have added a USB charging circuit to a jump starter system like that of Yu, Petitioner has fallen short of its burden of demonstrating that a skilled artisan would have made the proposed combination.

**(b) Yu Already Contemplated USB Charging And Boost Conversion, Yet Still Chose To Rely On A Barrel Charger**

Yu itself is perhaps the best evidence that Petitioner's Grounds have fallen prey to impermissible hindsight reconstruction. The Petition essentially argues that, had a PHOSITA known about Yu's systems and the USB boost conversion techniques of Paparrizos, then they would have naturally arrived at the claimed invention. The problem with this reasoning, however, and what the Petition fails to mention, is that Yu already contemplates and incorporates both USB output charging and DC-DC boost conversion. Specifically, Yu's system already contains both a USB port and a DC-DC boost converter. Ex. 2011, ¶ 115. Despite this, and likely

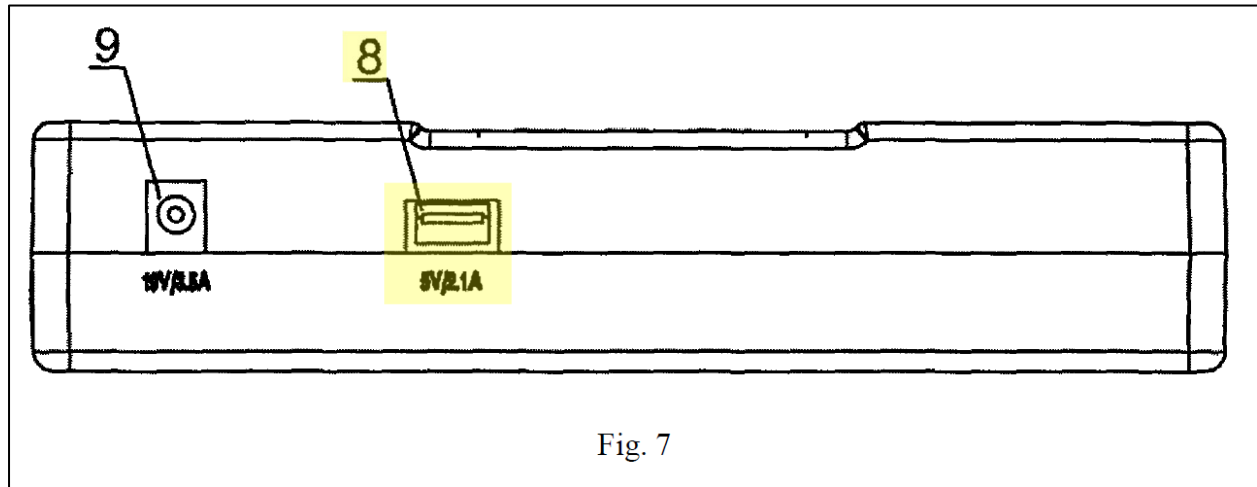
for the disadvantages associated with charging jump starters via USB discussed above, Yu's inventors chose to include a separate barrel charger and incorporated USB only as an output port to charge other smaller devices from the jump starter battery. This choice is strong evidence that a PHOSITA would not, in fact, have made the proposed combination suggested in Ground 2. Ex. 2011, ¶ 115.

Yu discloses a female barrel charging port for use with a traditional barrel charger (item 10):

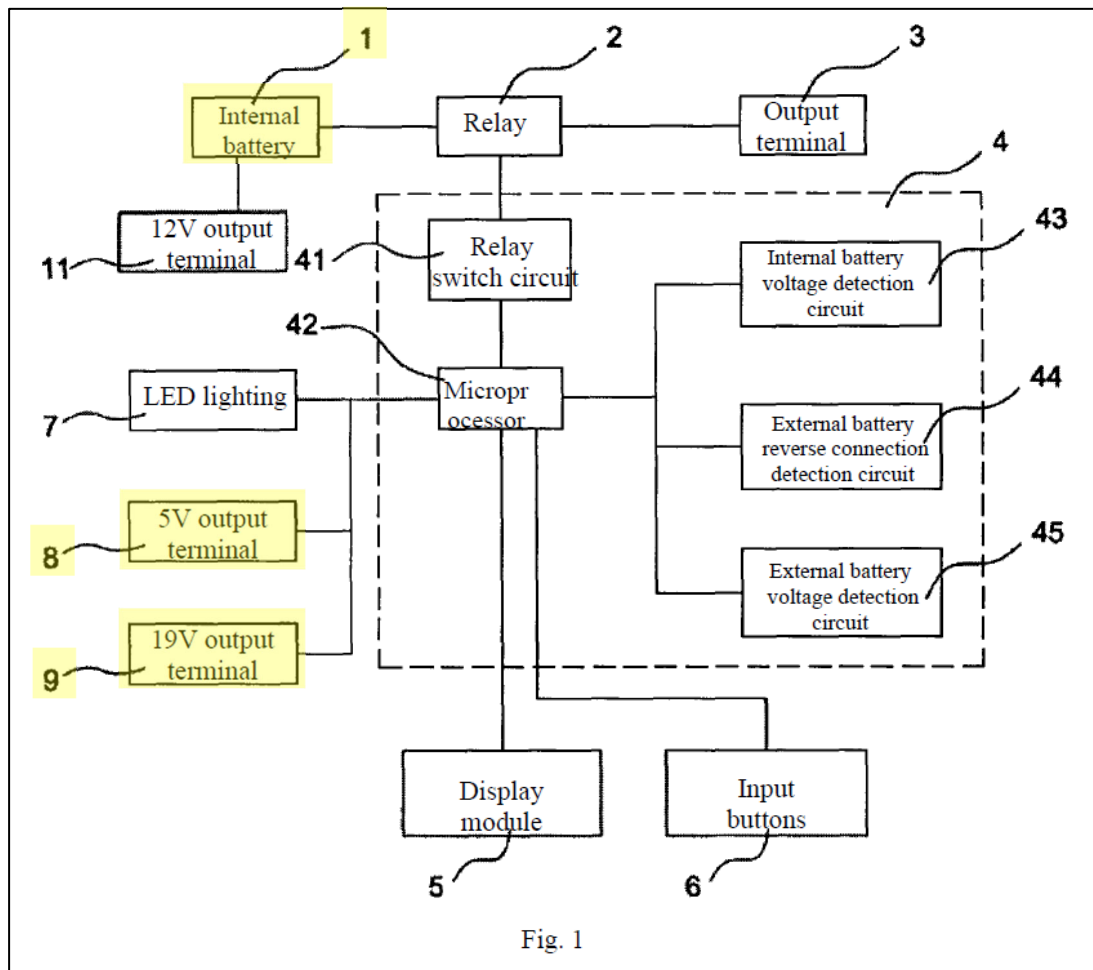


Ex. 1008, Fig. 9; *see* Ex. 2011, ¶ 116. Petitioner's expert stated that Yu's input charging port "appears to be a barrel connector" or a similar type of power input port. Ex. 2010, 68:20-69:1.

Yu also discloses a USB port which it describes as a “5V output terminal 8” (Ex. 1008, ¶ [0025]):



*Id.*, Fig. 7 (color annotations added). This 5V terminal of Yu is depicted as a USB Type A port configured to receive a USB cable connected to an external device or power source, as confirmed by Petitioner’s expert. Ex. 2011, ¶ 117; Ex. 2010, 69:16-18 (“Yes, that’s a USB-A port.”). The “19V output terminal 9” also shown above in Figure 7 (*see id.*, ¶ [0025]) and the 5V USB terminal of Yu are both connected to a 12V “internal battery 1”:



*Id.*, Fig. 1 (color annotations added). As shown, the internal battery 1 may directly supply output power to a “12V output terminal 11” (*see id.*, ¶ [0025]) and may also indirectly provide output power to the USB output terminal and the 19V output terminal through a relay switch circuit and a microprocessor. *See id.*, Fig. 1. A PHOSITA would have understood that, in order to provide an output voltage of 19 volts, any charge provided by Yu’s 12 volt internal battery would have to be boost converted from 12 volts up to 19 volts. Ex. 2011, ¶ 117. So, in addition to disclosing the 5V USB port, Yu inherently discloses a DC-DC boost converter as well. Ex.

2011, ¶ 117.

Therefore, the authors of Yu’s disclosure were already contemplating USB output charging and boost conversion techniques at the time, and still chose to rely on a separate barrel charger over a USB outlet for its input charging. This choice, even when possessing the knowledge of Zhao’s teachings, is strong evidence that a PHOSITA would not have modified Yu’s system to rely on USB input charging. Ex. 2011, ¶ 118; *see Apple Inc. v. Samsung Elecs. Co., Ltd.*, 839 F.3d 1034, 1051 n.15 (Fed. Cir. 2016) (noting that, even if a reference “does not teach away, its statements regarding users preferring other forms of switches are relevant to a finding regarding whether a skilled artisan would be motivated to combine the slider toggle in” that reference with the invention of a second reference).

Indeed, in IPR2020-00944 challenging the related ’015 Patent, the petitioner likewise relied on prior art that disclosed devices having both a traditional barrel charger and a USB output port. *See* Ex. 1014, p. 92. That petitioner also provided analogous reasoning for the motivation to combine; namely, that “[a] POSITA would be motivated to provide such a USB charging port to provide the added convenience to users of using another commonly used power input for charging the jump starter device.” *Id.* (italicization omitted). But the Board rejected that argument, recognizing that “[t]he matter is much more complicated than what [p]etitioner’s argument makes it out to be,” and rejected the alleged motivation to

combine as “conclusory.” *Id.*, at p. 93. Similarly here, Petitioner has oversimplified the analysis and ignored the specific teachings of the prior art being relied upon. *See* Ex. 2011, ¶¶ 111-119.

\* \* \*

Thus, Ground 2 of the petition fails to appreciate how a PHOSITA would have viewed the actual system of Yu, including recognizing how its already-existing USB port and DC-DC boost converter weaken the proposed combination. For these reasons, and in addition to the above, a PHOSITA would not have added a USB charging circuit to Yu’s specific jump starter device.

**2. The Petition Fails To Meet Its Burden To Show, With Particularity, How A PHOSITA Would Have Combined Yu and Paparrizos**

In addition to the deficiencies in the motivation to combine Yu and Paparrizos, Petitioner also fails to demonstrate *how* the battery charging circuit of Paparrizos would allegedly be incorporated into the system of Yu.

Yu does not specify its internal battery type, and provides very limited disclosure of its charging input circuit, beyond the use of a barrel charger. *See*, Ex. 1008, Fig. 8, ¶ [0028]. Similar to the deficiencies associated with Ground 1, nowhere does Petitioner attempt to show how Yu’s system, depicted in the circuit diagrams of Figures 1-5, would have been modified to include Paparrizos’ complex charging circuit. Ex. 2011, ¶ 121. In fact, Paparrizos’ charging circuit includes

numerous operating modes—many of which would be useless to the system of Yu (*e.g.*, reverse boost mode, forward buck mode)—and relies on a “configuration detector 216 [to] generate suitable signals 222 that are used to configure the buck boost circuit 212 to operate accordingly.” Ex. 1009, 4:42-47.

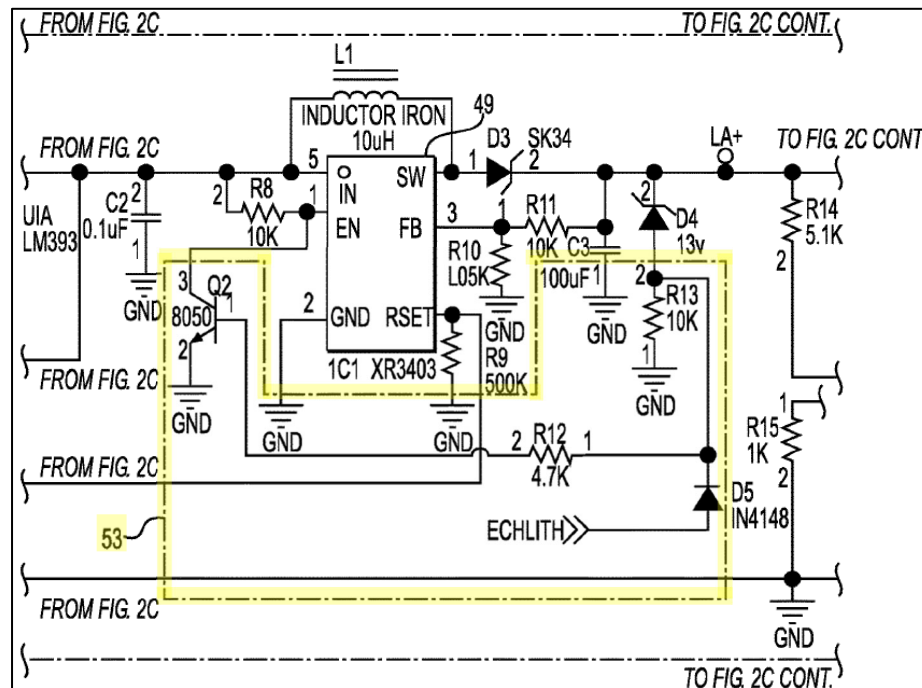
The Petition provides no explanation for how the PHOSITA allegedly would have integrated Paparrizos’ configuration detector into Yu’s circuit to ensure that the correct operating mode (*i.e.*, forward boost mode) is applied. Ex. 2011, ¶ 122. Moreover, for the situation where Paparrizos’ charging circuit is added as an additional input circuit, Petitioner fails to address the added complexity and the safety risks associated with adding a second input charging circuit, including the modifications that would need to be made to Paparrizos’ system to account for the possibility that a user attempts to hook up multiple chargers simultaneously. Ex. 2011, ¶ 122.

Petitioner’s conclusory attempt to combine these two prior-art systems therefore falls short of its burden to show unpatentability with particularity. *See* Ex. 2011, ¶¶ 120-123.

**3. Ground 2 Fails To Render Claims 32 And 52 Obvious Since Neither Yu Nor Paparrizos Disclose A DC-DC Converter Being Turned On And Off By A Microprocessor**

In addition to the deficiencies surrounding Ground 2 discussed above, the Petition’s flawed attempts to show the obviousness of claims 32 and 52 are

particularly erroneous. Both of these claims require the additional limitation wherein “the DC-DC converter can be turned on and off” by a microprocessor or microcontroller, and independent claim 52 further specifies that it be an “output from the microcontroller” that produces this ON/OFF functionality. Ex. 1001, 11:4-6, 14:11-45. The specification of the ’023 Patent relatedly explains how “[t]he DC-DC converter 49 can be turned on and off via circuit 53 by an output from the microcontroller” (*id.*, 7:28-29):



*Id.*, Fig. 2C (color annotations added). Similar to how the ’023 Patent allows its output circuit “to be turned on and off by software control to prevent the internal lithium battery getting too low in capacity,” turning off the DC-DC converter via circuit 53 prevents overcharging of the jump starter battery. *Id.*, ¶ [0028]; Ex. 2011,

¶ 124. This important safety feature helps to prevent the overheating, fires, and explosions that may result from overcharging an internal battery, such as a lithium-ion battery. Ex. 2011, ¶ 124.

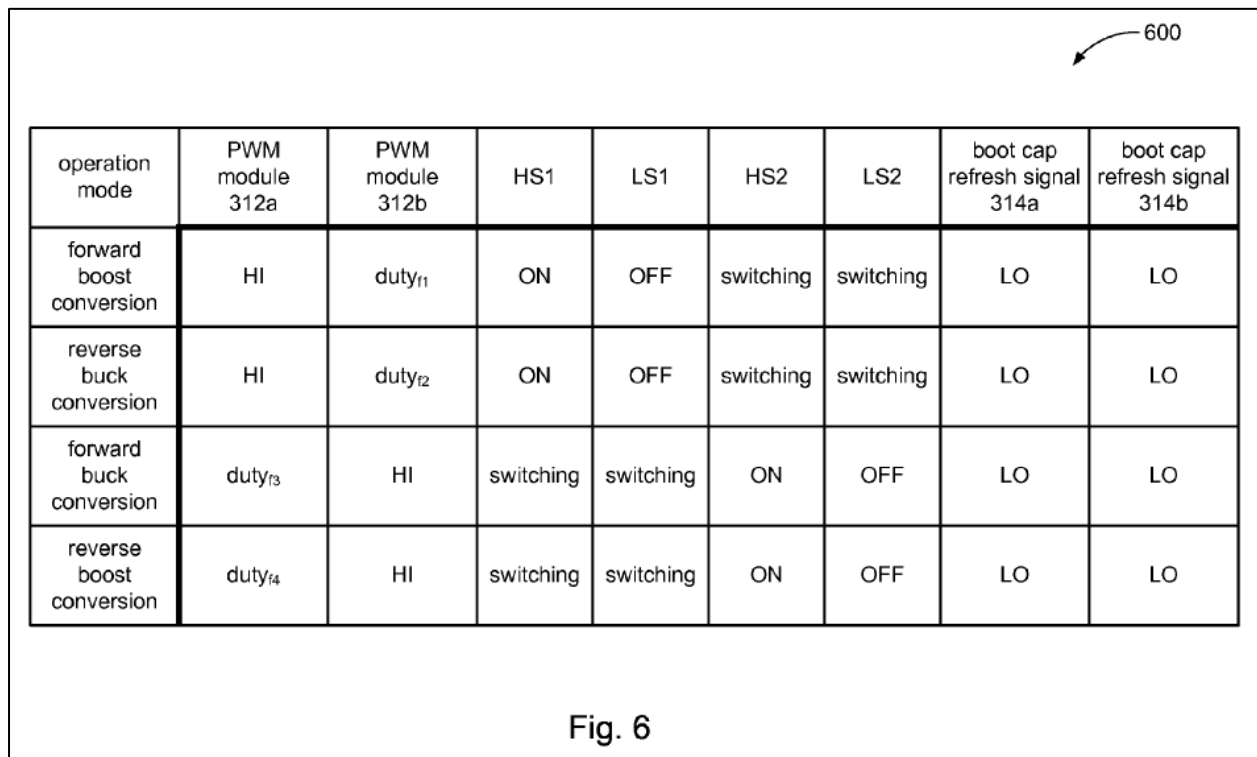
When addressing this limitation in Ground 2, the Petition argues that the ON/OFF controller limitation of claims 32 and 52 is taught by Paparrizos:

Figure 5 of *Paparrizos* discloses a “workflow” which a *PHOSITA* would understand to be best implemented by a microprocessor. EX1009, FIG. 5; EX1003, ¶ 167. Otherwise, a PHOSITA would need to implement various configurations in hardware which are not explicitly described in Paparrizos for performing the workflow of Figure 5. EX1003, ¶ 167. Additionally, *a PHOSITA would understand a microprocessor would be one of the most effective, reliable, and cost-effective choice for implementing control of the ON/OFF state of the buck boost circuit 212*. EX1009, FIG. 6; EX1003, ¶ 167. Accordingly, Paparrizos teaches or renders obvious the use of a buck-boost step-up converter that can be turned on and off by a microprocessor or microcontroller. EX1003, ¶ 167.

Petition, pp. 69-70. In other words, Petitioner admits that Paparrizos does not describe using any microprocessor at all, but argues that a PHOSITA would understand that one of its workflows would be “best implemented by a microprocessor.” *Id.* However, Petitioner fails to provide sufficient evidence supporting the notion that a PHOSITA would have arrived at such an understanding.

Petitioner's expert declaration merely repeats the Petition's language verbatim, without any additional analysis or evidence as to why any microprocessor would be implemented in Paparrizos system. *See* Ex. 1003, ¶ 167. These conclusory statements by Petitioner's expert should therefore be given little weight. *See, e.g., Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 12 at 5 (P.T.A.B. Feb. 10, 2023) ("I determine that the Board was correct in giving little weight to Petitioner's expert because the expert declaration merely offered conclusory assertions without underlying factual support and repeated, verbatim, Petitioner's conclusory arguments.").

More importantly, beyond failing to adequately demonstrate that one would have implemented Paparrizos' techniques on a microprocessor, Petitioner never demonstrates that Paparrizos actually teaches or suggests controllably turning its buck boost converter between on and off states. Petitioner's statement that "a microprocessor would be one of the most effective, reliable, and cost-effective choice for implementing control of the ON/OFF state of the buck boost circuit 212" is plain hindsight reasoning. Nowhere does the Petition point to where Paparrizos actually teaches or suggests controllably turning its buck boost converter on and off. While the Petition cites to Figure 6 of Paparrizos, that drawing depicts only "different *operational* configurations of a buck boost circuit," (Ex. 1009, 2:6-7 (emphasis added)):



| operation mode           | PWM module 312a    | PWM module 312b    | HS1       | LS1       | HS2       | LS2       | boot cap refresh signal 314a | boot cap refresh signal 314b |
|--------------------------|--------------------|--------------------|-----------|-----------|-----------|-----------|------------------------------|------------------------------|
| forward boost conversion | HI                 | duty <sub>r1</sub> | ON        | OFF       | switching | switching | LO                           | LO                           |
| reverse buck conversion  | HI                 | duty <sub>r2</sub> | ON        | OFF       | switching | switching | LO                           | LO                           |
| forward buck conversion  | duty <sub>r3</sub> | HI                 | switching | switching | ON        | OFF       | LO                           | LO                           |
| reverse boost conversion | duty <sub>r4</sub> | HI                 | switching | switching | ON        | OFF       | LO                           | LO                           |

Fig. 6

Ex. 1009, Fig. 6. While some of the transistors (HS1, LS1, HS2, and LS2) in Figure 6 are identified as “OFF” in certain operational modes, all four of the rows in this table are identifying different modes where the buck boost converter of Paparrizos is functioning in an “ON” state. Ex. 2011, ¶ 126. In other words, in none of these operation modes would the DC-DC converter be “turned off.” Ex. 2011, ¶ 126. Nor does the Petition assert that Paparrizos elsewhere discloses controllably turning its circuit on and off by, for example, turning off both HS1 and LS1 simultaneously. Thus, Petitioner’s assertion that “Paparrizos teaches or renders obvious” this claim limitation is completely unsupported by Paparrizos itself. Petition, p. 70.

Petitioner has taken a reference that does not disclose either: (1) a

microprocessor, or (2) controlling the ON/OFF state of a DC-DC converter, and has somehow relied on that reference to teach a “DC-DC converter [that] can be turned on and off by an output from the microcontroller.” Ex. 1001, 14:44-45. Petitioner’s conclusory statements about Paparrizos are not sufficient to satisfy its burden to show that the limitations of claims 32 and 52 were taught by the prior art combination of Ground 2. *See* Ex. 2011, ¶¶ 124-127.

## VIII. CONCLUSION

For the reasons set forth above, challenged claims 1, 32, 38, 39, 47, 52, and 54 of the ’023 Patent are not unpatentable.

Respectfully submitted,

Dated: November 22, 2024

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**CERTIFICATE OF WORD COUNT**

Pursuant to Rule 37 C.F.R. 42.24(d), the undersigned hereby certifies that, based upon the word count of the word-processing system used to prepare this response, the number of words in this Patent Owner Response is 11,271.

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**CERTIFICATE OF SERVICE**

Pursuant to 37 C.F.R. § 42.6(e), the undersigned certifies that on November 22, 2024, complete and entire copies of the **PATENT OWNER'S RESPONSE** and supporting exhibits have been served in their entirety by e-mail on the following counsel of record for Petitioner:

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