

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ADC SOLUTIONS AUTO LLC
Petitioner

v.

THE NOCO COMPANY
Patent Owner

Patent No. 11,447,023
Issue Date: September 20, 2022

Title: PORTABLE VEHICLE BATTERY JUMP START APPARATUS WITH
SAFETY PROTECTION AND JUMPER CABLE DEVICE THEREOF

Inter Partes Review No. IPR2024-00577

PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE

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1002	Prosecution History of the ’023 patent
1003	Expert Declaration of C. Arthur MacCarley
1004	<i>Curriculum Vitae</i> for C. Arthur MacCarley
1005	U.S. Patent Publication No. 2013/0154543 A1 to Richardson et al. (“Richardson”)
1006	U.S. Patent No. 9,391,467 B2 to Zhao et al. (“Zhao”)
1007	Chinese Utility Model Patent No. CN 203211234 U to Yu (“Yu”)
1008	Certified English Translation of Yu
1009	U.S. Patent No. 9,219,372 B2 to Paparrizos et al. (“Paparrizos”)
1010	Complaint filed against Defendants in the Central District of California (ECF No. 1), filed on February 14, 2023
1011	Proof of Service upon ADC Solutions Auto LLC, Winplus North America, Inc., and Winplus NA LLC (ECF Nos. 14, 15, 16), dated February 16, 2023
1012	XR3403 Datasheet by XySemi Inc., Rev. 0.5
1013	U.S. Patent No. 9,007,015 to Nook et al. (“the ’015 Patent”)
1014	Final Written Decision in IPR2020-00944 (Paper 73) as to the ’015 Patent, dated November 3, 2021
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1016	U.S. Patent Publication No. 2013/0285596 A1 to Zhou et al. (“Zhou”)
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1019	Certified English Translation of CN 202512152 U
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1024	Declaration of Jeffrey L. Ravencraft of USB Implementers Forum, Inc., dated October 28, 2023 (“Ravencraft Decl.”)
1025	Battery Charging Specification, Revision 1.0, Mar. 8, 2007 from the Universal Serial Bus Implementers Forum (“USB-IF”), Ex. D to Ravencraft Decl.
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1028	Defendants’ Stipulation of Invalidity Contentions
1029	Brents, Barry, “Automotive Electronics Drive The Need For Circuit Protection,” Electronic Design (May 7, 2014), accessed via https://www.electronicdesign.com/technologies/power/article/21799679/automotive-electronics-drive-the-need-for-circuit-protection
1030	Healey, James R., “Newest VW lacks USB, only iPhones welcome,” USA Today (July 8, 2014), accessed via https://www.usatoday.com/story/money/cars/2014/07/08/vw-gti-2015-usb-iphone/12378577/
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I. INTRODUCTION

The Petition presents ample evidence demonstrating the desirability of USB charging of series-connected batteries, the same battery architecture utilized in jump starters. The Petition also demonstrates the ease with which a PHOSITA would have incorporated USB technology to charge jump starter batteries via well-known boost conversion, and why a PHOSITA would have been motivated to do so. In response, Patent Owner (“NOCO”) criticizes the Petition for not identifying prior art jump starters charged via USB, but the Petition presents grounds of *obviousness*, not anticipation. NOCO also contrives a new theory of patentability based on an alleged problem of “drastically” increased charging times of “high capacity” batteries using USB technology—a problem that is not even suggested in the ’023 patent or its file history. Tellingly, NOCO never quantifies these “high” capacities, calculates the supposedly unreasonable charging times, or explains how the ’023 patent purportedly solves this alleged problem.

Not only is the ’023 patent silent about charging times, reasonable or not, the ’023 patent admittedly uses standard USB technology and an off-the-shelf DC-DC converter, the latter of which NOCO now admits was known in the art despite distinguishing this feature from the prior art during prosecution. While NOCO leans on its *post hoc* characterizations of a single potential trade-off associated with USB charging, it never acknowledges or denies the many known benefits of

USB charging set forth in the Petition. NOCO also attempts to distinguish the claims from the prior art based on unclaimed features—battery capacity and charging times—and by improperly focusing on only certain embodiments of the prior art while ignoring others. NOCO’s attempt to monopolize the use of well-known USB charging techniques and DC-DC conversion in conventional ways to achieve predictable results should be denied.

II. REBUTTAL FACTUAL BACKGROUND

A. The Petition Cures the Failure of Proof Regarding Obviousness of USB Charging in IPR2020-00944

NOCO ignores critical distinctions between Petitioner’s arguments and evidence and those of Petitioner Shenzhen Carku Technology Co., Ltd. (“Carku”) in IPR2020-00944. In IPR2020-00944, the Board determined that Carku failed to establish a “prima facie case of obviousness based on the applied references” based in large part on Carku’s failure to present prior art teaching “a USB charging port providing charging power from an external power source to an internal power supply.” EX1014, pp. 91-92. Instead, Carku relied on “a non-USB ‘14V 1A’ input port for charging the jump starter” and a USB *output* to charge other devices from the jump starter. *Id.* In contrast, the Petition relies upon Zhao and Paparrizos, which both teach “USB input connector[s]” and “USB input circuit[s]” that increase voltage as claimed by the ’023 patent. Decision Granting Institution

(“ID”), p. 28.

The Board further found that Carku’s articulation of motivation to combine was “conclusory and not adequately supported by the evidence submitted with the Petition” and that it did not sufficiently account for “the ease or difficulty in locating a usable source to provide input charge to a USB port on a jump starter.” EX1014, pp. 92-93. Here, however, the Petition presents ample evidence showing why a PHOSITA would have been motivated to implement a standard 5V USB input with a standard DC-DC boost converter to charge higher voltage jump starter battery packs, including, for example, the testimony of Dr. MacCarley, Zhao, Paparrizos, and USB specifications. EX1003, ¶¶ 89-90; EX1006, 3:1-11; EX1009, 1:18-23; EX1025, p. 6. NOCO does not dispute, or address at all, any of the known benefits of USB set forth in the Petition.

B. The Examiner Did Not Consider Prior Art Combinations Involving USB and DC-DC Boost Conversion

Although the Board has already correctly determined the asserted grounds do not present “the same or substantially the same art or arguments previously presented to the Office” (ID, pp. 19-20), NOCO’s summary is rife with mischaracterizations warranting correction. For example, NOCO argues that “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.” POR, p. 23. But this argument directly contradicts NOCO’s arguments during prosecution, adopted by the Examiner as the reason for allowance, distinguishing the prior art on the basis that “[d]ropping down the voltage as taught by *Tinaphong* is the exact opposite and wrong direction to the requirement of stepping up or increasing the charging voltage to charge the internal lithium polymer battery of 18 *Tinaphong* to at least 12 V ...” Petition, pp. 17-18 (quoting EX1002, pp. 500, 642) (emphasis in original).

NOCO also claims the Petition “implies” that NOCO amended all claims to recite USB charging limitations in response to the ’015-FWD. POR, p. 15. While the basis for NOCO’s accusation is unclear, it cannot be disputed that the USB charging limitations only became the focus of NOCO’s prosecution efforts after the Examiner and Board determined it was reasonably likely the claimed “safety features” were anticipated by Richardson. EX1002, pp. 151-182; EX1014, p. 2. NOCO also emphasizes the ’023 patent’s “extensive” prosecution history, “*spanning 2,200+ pages*” (POR, p. 15), but a majority of these pages are foreign references. EX1002, pp. 613-629, 690-1049, 1085-2041. Regardless, the Board already found the prior art and arguments presented in the Petition are materially different than that considered by the Examiner.

C. NOCO Misrepresents Jump Starter Battery Capacity and Charging Times

NOCO argues that jump starting a typical engine requires a peak current “typically between 1000 and 4000 amperes.” POR, p. 21. While the ’023 patent’s claims do not require or even reference peak current requirements, this range overstates the requirements for most applications.¹ A normal consumer vehicle would require a jump start peak current of 400A-500A. EX1044, ¶¶ 3-5. Only larger, commercial vehicles (e.g., semi-trucks) would require peak current above 1000A (but far less than 4000A). *Id.*, ¶ 4.

To determine how long it would take to recharge jump starter batteries, an estimate of the energy discharged for one jump start—based upon output voltage, peak current, and duration—would first be determined. *Id.*, ¶ 9; EX1045, 23:3-24:5. Elaborating on the ’023 patent’s example of a 400A peak current (EX1001, 4:13-15), a routine jump start lasting 5 seconds² at 12V would discharge approximately 6.67 Wh of energy, as shown below:

- Equation 1: Output voltage (Volts) x Output current (Amps) x Duration (Hours) = Energy discharged (Watt-hours)
- Calculation 1: 12 V x 400 A x (5 ÷ 3,600) h = **6.67 Wh**

¹ Dr. Fayed admits his opinion is derived from marketing specifications for jump starters sold today (EX1045, 27:5-29:3), which are usually advertised with capabilities far exceeding their typical applications. EX1044, ¶ 5.

² Dr. Fayed testified that a typical jump start takes 20-50 milliseconds, which would result in at least 100 times less energy discharge and recharge time. EX2011, ¶ 70; EX1045, 22:8-14; EX1044, ¶ 10.

EX1044, ¶ 9, Appendix A (Example 5).³ To replenish this discharged energy, a 5V USB input at 1.5A (as specified in the 2007 Battery Charging Specification, EX1025) would provide 7.5W, resulting in a recharge time of approximately 53.4 minutes (0.89 hours), as shown below:

- Equation 2: Energy discharged (Watt-hours) ÷ Charging power (Watts) = Charging time (Hours)
- Calculation 2: 6.67 Wh ÷ 7.5 W = **0.89 h**

EX1044, ¶ 9, Appendix A (Example 5). And, even factoring in a generous 20% power loss during the charging process (reducing charging power to 6W), the recharge time would be approximately 66.6 minutes (1.11 hours).

Advancements in USB technology from 2007 to 2012 (before the '023 patent's 2014 priority date) included an increase of the maximum amp rating from 1.8A to 5A. *Compare* EX1025, p. 29 (Table 5-2) *with* EX1046, p. 64 (Table 5-2).⁴ The increased amp rating in turn increased charging power from 7.5W to 25W, which decreased estimated recharge time by over 300%. EX1044, ¶ 8. For example, the 53.4-minutes charging time calculated above would decrease to 16.02 minutes (6.67 Wh ÷ 25 W = 0.267 h). EX1044, ¶ 9, Appendix A (Example 5).

³ In Calculation 1, 5 seconds was converted to hours by dividing by 3,600 (the amount of seconds per hour).

⁴ NOCO submitted the 2012 specification with a declaration of one of the named inventors of the '015 patent (and '023 patent) in IPR2020-00944. EX1046, p. 5.

In other words, jump starters do not require “very large individual capacities” or unreasonable charging times as NOCO asserts. Notably, NOCO does not provide any examples of “reasonable” or “typical” charge times or otherwise describe any factors that would have been considered by a PHOSITA in making this determination. EX1044, ¶ 6. These conclusory and overgeneralized assertions should be rejected, particularly where the ’023 patent does not claim or otherwise teach any improvement to USB charging times.

III. ARGUMENT

A. Ground 1: A PHOSITA Would Have Been Motivated to Modify Richardson in View of Zhao

NOCO argues that USB would not be suitable for charging Richardson’s jump starter because it would take too long to charge its “high capacity” batteries. NOCO’s argument is incorrect for several reasons. First, the ’023 patent does not claim or otherwise teach improvements to the rate at which a USB power source charges a battery, “high capacity” or not. Second, Richardson’s jump starter is not limited to “rapid recharging” of “high capacity” batteries, but instead broadly discloses “a portable power source for a motor vehicle”, including several non-limiting “examples” of various battery configurations and voltages that may be utilized in its system. Third, even if Richardson were limited to “high capacity” batteries capable of outputting up to 48V, the Petition nevertheless explains, with

supporting evidence, why a PHOSITA would have been motivated to utilize USB for its known benefits notwithstanding potentially longer charging times than other power inputs.

1. The '023 Patent Does Not Claim or Disclose Any Improvement to USB Charging

Although most of the POR focuses on the alleged undesirability of charging “high capacity” batteries with standard USB technology, the claims of the '023 patent merely recite a “power supply” without regard to capacity and NOCO did not otherwise claim any improvement to USB charging rates. *Smith & Nephew, Inc. v. Rea*, 721 F.3d 1371, 1381 (Fed. Cir. 2013) (“[U]nclaimed and undisclosed feature ... cannot be the basis for finding [patent owner]’s patent to be non-obvious over the prior art”); *Janssen Pharms., Inc. v. Teva Pharms. USA, Inc.*, 97 F.4th 915, 926 (Fed. Cir. 2024) (rejecting patentee’s non-obviousness positions premised on elements outside the claims). The Board already found the claim language does not require “increasing to a particular power *voltage*” (ID, p. 30, emphasis added), and NOCO’s new argument suggesting the claims require a particular battery *capacity* is similarly misplaced.

The written description is similarly bereft of any reference to disadvantages associated with USB charging of batteries of any capacity. In fact, the '023 patent does not reference charging times whatsoever. EX1001, 5:15-17, 7:21-29. And the

claimed “USB input connector” and “USB input circuit” are discussed in minimal detail because the ’023 patent utilizes admittedly “standard” USB technology in a conventional way. *Id.* Specifically, the specification describes “USB charge circuit 52 converts power from any USB charger power source, charge voltage and current for charging the lithium battery pack 32.” EX1001, 5:15-17. It further describes:

The USB charge circuit 52 allows the internal lithium battery pack 32 to be charged using a **standard USB charger**. This charge input uses a **standard micro-USB connector** 48 allowing **standard cables** to be used. The 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., pp. 7:21-28 (emphasis added). And like the “standard” USB charger, connector, and cables, the only “DC-DC converter 49” described in the specification is the XR3403 chip depicted in Figure 2C—a commercial, off-the-shelf, integrated circuit that boosts USB’s 5V to higher voltages. Petition, pp. 9-10. This is the entirety of the ’023 patent’s description of the claimed USB input connector and circuitry. Yet, NOCO criticizes the Petition’s obviousness grounds for not solving the alleged problem of USB’s longer charging times. NOCO cannot demand a greater level of detail from the prior art than that taught in the ’023 patent. *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1570 (Fed. Cir. 1997).

2. NOCO Mischaracterizes Richardson

NOCO mischaracterizes Richardson’s teachings as limited to “heavy-duty jump starters” with “large charge capacity” batteries capable of outputting 48V. POR, p. 28. NOCO relies exclusively on select embodiments while ignoring others, but “[a] reference must be considered for everything that it teaches, not simply the described invention or a preferred embodiment.” *In re Applied Materials, Inc.*, 692 F.3d 1289, 1298 (Fed. Cir. 2012). Richardson broadly discloses “an apparatus and method for temporarily delivering supplemental power to the electrical system of a vehicle” and its independent claims are not limited to any particular battery capacity or voltage. EX1005, ¶ [0006], claims 1, 26.

Richardson teaches “[t]he jump starter 10 may be configured for 12, 18, 24, 30, 36, 42 or 48 volts, for example, using a selector jumper 55.” *Id.*, ¶ [0034]. It then provides examples of various battery configurations, none of which produce more than 30V—“if the batteries 23 are both 12-volt batteries, the system may be configured for 12- or 24-volt operation.” *Id.* Or, “[i]f the batteries 23 are 12-volt batteries and a battery 25 is a 6-volt battery, 18- or 30-volt configurations may be provided.” *Id.* After providing these lower voltage examples, Richardson teaches that any number of batteries of various voltage levels may be utilized in its system: “[i]t should be understood that two or more batteries of the same or different voltage levels may be used to meet the voltage requirements of the vehicle to be

started.” *Id.* Similarly, Richardson’s only other discussion of various voltages relates to monitoring the vehicle system *after* a completed jump start, merely noting that “[n]ormal vehicle charging voltages fall within certain ranges for 12, 18, 24, 30, 36, 42 and 48 volts systems.” *Id.* at ¶ [0054].^{5, 6}

NOCO further mischaracterizes Richardson as having a “main focus” of “rapid recharging” of the jump starter’s batteries from a vehicle’s charging system. POR, pp. 30-34. Not only does Richardson teach this as an optional feature (EX1005, ¶ [0055]), earlier in the specification Richardson teaches the jump starter “batteries 22” may be charged using a “battery charger” (EX1005, ¶ [0028]). While NOCO attempts to draw negative inferences from Richardson’s figures, Richardson’s description states the battery charger is “not shown.” EX1005, ¶ [0028]. It was unnecessary for Richardson to describe or show the “battery charger” because it was well within a PHOSITA’s level of skill to implement a charging pathway from a typical battery charger to the batteries. EX2010, 52:17-54:5; EX1044, ¶ 13.

⁵ Dr. Fayed’s testimony claiming Richardson is limited to jump starters capable of charging 48V systems (EX2011, ¶¶ 92-93, 107) should be disregarded for contradicting the express disclosure of Richardson. *Ericsson Inc. v. Intellectual Ventures I LLC*, 890 F.3d 1336, 1346 (Fed. Cir. 2018).

⁶ Dr. Fayed opines about a commercial product purportedly sold by the assignee of Richardson, without any showing this product practices a single embodiment of Richardson. POR, p. 29. This testimony is irrelevant. *Galderma Labs., L.P. v. Tolmar, Inc.*, 737 F.3d 731, 737 (Fed. Cir. 2013).

NOCO further assumes, without explanation or evidence, that the referenced “battery charger” charges the “batteries 22” via the “red and black shunt cable ports.” POR, p. 33. A PHOSITA, however, would have understood a “battery charger”, in contrast to “vehicle charging system”, broadly refers to power sources commonly used to charge jump starter batteries when a vehicle battery is not available. EX2011, ¶ 23 (explaining prior art jump starters “relied on a high-power charger through a specialized 12-volt plug connector, such as a barrel charger”); Petition, p. 50 (noting “Richardson is not explicit regarding the type of input connector utilized for charging the jump starter batteries”). A PHOSITA would have further understood that a typical “battery charger” does not usually charge via cable shunt ports but rather through traditional input connectors, e.g. “barrel” ports. EX2011, ¶ 23; Petition, p. 45; EX1044, ¶ 13. Regardless, even if NOCO’s argument was correct, it does not account for the Petitioner’s argument and evidence that a PHOSITA would have been motivated to *add* USB charging to Richardson’s jump starter. Petition, pp. 45-47.

Finally, even if Richardson’s teachings were limited to certain “high capacity” embodiments, Richardson’s capacitors would avoid the need for “massive” batteries because, as Richardson teaches, a PHOSITA would have understood that the capacitors would be rapidly recharged and jump start a vehicle without energy from the batteries. EX1044, ¶ 14. Indeed, Richardson teaches

precisely that—“the capacitors may be rapidly recharged to start many vehicles in a row.” EX1005, ¶ [0055].

3. The Petition Provides Ample Evidence Demonstrating Motivation to Combine Richardson and Zhao

The Petition demonstrates why a PHOSITA would have been motivated to implement Zhao’s USB charging and boost conversion in Richardson’s jump starter. While NOCO focuses on a single potential drawback acknowledged in the Petition—increased charging times—there are many desirable trade-offs that remain ignored and unrebutted by NOCO. *See id*, pp. 45-50; ID, pp. 27-28, 36-37. NOCO’s position invites violation of the well-settled principle that “[i]t’s not necessary to show that a combination is ‘the best option, only that it be a suitable option.’” *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 800 (Fed. Cir. 2021).

a. Zhao is not limited to USB charging of “small battery systems”

Like Richardson, NOCO argues that Zhao is limited to certain embodiments—“small battery systems”—even though Zhao is broadly directed to “a step-up battery charging management system” and the claims and specification are not limited to particular voltages or battery capacities. In fact, while Zhao discusses an embodiment where a USB input voltage is boosted to about “8.4V if two lithium batteries are connected in series” (EX1006, 4:40-41), Zhao teaches charging higher voltage packs of three (or more) series-connected lithium cells.

EX1006, 3:6-7 (“The output of charging control circuit 201 can charge a plurality of series connected (e.g., lithium) batteries”); 1:25-27. Figure 1 shows the output of Charging Control Circuit 201 connected to symbols reflecting at least three battery cells, with an ellipsis indicating optionally more cells. EX1006, Fig. 1.

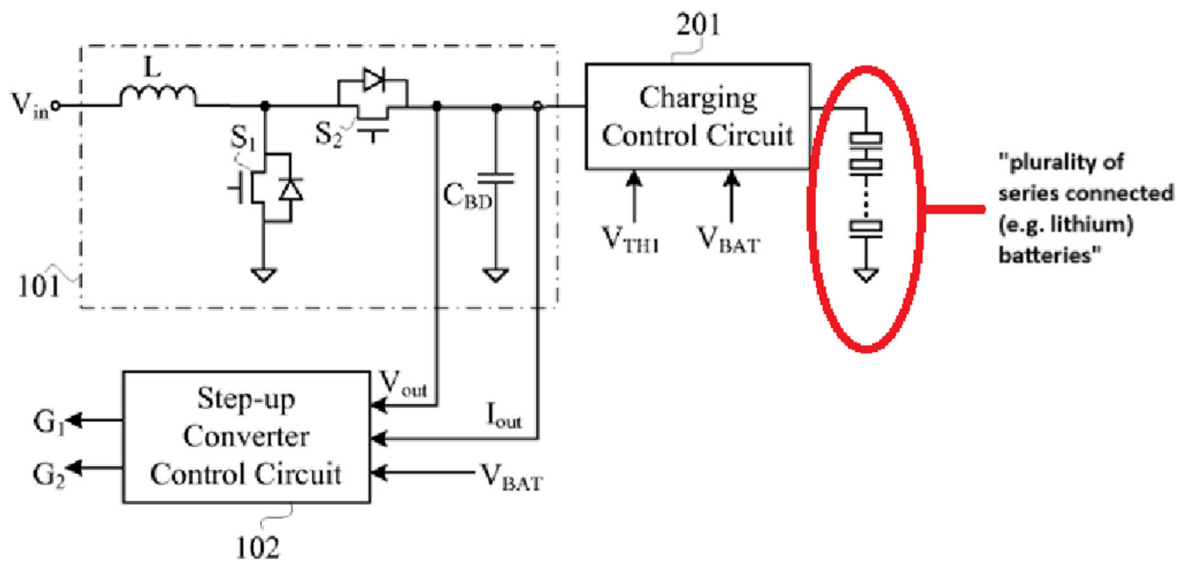


FIG. 1

Id. (annotation added). A PHOSITA would have known Zhao’s DC-DC boosting technique increases voltage from 5V to 8.4V (two lithium cells), 5V to 12.6V (three lithium cells), or higher voltage configurations, as confirmed by Dr. Fayed. EX1045, 46:14-48:9.

NOCO mischaracterizes the Petition as applying Zhao only under a “known technique” rationale. POR, pp. 25-26. NOCO’s argument is premised on two faulty

assumptions—that Richardson is limited to high-capacity batteries and Zhao is limited to charging low-capacity batteries. As discussed above, neither assumption is true. Further, the Petition explains how and why a PHOSITA would have modified the jump starter of Richardson—which teaches higher voltage batteries, including 12V batteries like those taught in the '023 patent—with the USB charging technology of Zhao, which expressly contemplates USB charging of at least 12.6V batteries. Petition, p. 31. EX1006, 1:19-27. Ultimately, “[a]ny need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.” *Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1379 (Fed. Cir. 2023).

b. A PHOSITA would have been motivated to modify Richardson in view of Zhao

A linchpin of NOCO’s argument against the combination of Richardson and Zhao is that USB charging times would not be “reasonable.” Not only does this argument singularly focus on one potential disadvantage of USB charging to the exclusion of numerous benefits set forth in the Petition (e.g., convenience, universal compatibility, ease of use, durability, etc. (Petition, pp. 45-47)), but it is also incorrect. Notably, neither NOCO nor its expert identify any factors for determining whether a PHOSITA would consider a charging time reasonable or

provide a single example of an estimated charging time, reasonable or not. Indeed, straightforward calculations of estimated charging times for typical, and even atypical situations, reveal that they are, in fact, not unreasonable at all. EX1044, ¶¶ 6-9, 11-12, Appendix A.

As discussed above, the average recharging time of a 12V battery after one jump start of a standard 12V car battery with 400 peak amps would have ranged from about 16 minutes (5V/5A) to about 53 minutes (5V/1.5A). Section II.C, *supra*. If this 12V/400A example (the most common consumer application) is changed to 48V/1000A (an uncommon commercial application), the charging time increases to 2.67 hours (5V/5A) and 8.89 hours (5V/1.5A). EX1044, ¶ 9, Appendix A (Example 15). Ultimately, while NOCO provides no evidence that charging times would be the sole and determining factor driving the decision to implement USB charging, even if it were, the exemplary charging times calculated by Dr. MacCarley are suitable for a jump starter device that might only be needed a few times a year. EX1044, ¶ 7.

c. A PHOSITA would have had a reasonable expectation of success modifying Richardson in view of Zhao

The Petition also provides ample evidence that a PHOSITA would have had a reasonable expectation of success using Zhao's USB charging techniques in Richardson's jump starter. Contrary to NOCO's argument, the Petition adequately

explains how Zhao's teachings would be implemented in Richardson's jump starter. Both Zhao and Richardson contemplate connection of battery charging circuitry to battery packs, which involved minimal engineering effort to connect wiring to the pack. EX1005, ¶ [0028] (describing "battery charger (not shown)" connected to internal batteries); EX1006, 3:6-8 (explaining "[t]he output of charging control circuit 201 can charge a plurality of series connected (e.g., lithium) batteries, as shown"); Fig. 1 (showing output of charging control circuit 201 connected to pack of cells by wire). A PHOSITA would have understood how to connect and match the capabilities of a step-up converter to ensure the output corresponds to the voltage of the pack to be charged, as taught by Zhao and known in the art. EX1005, 3:1-11, 3:25-39. Indeed, datasheets for commercially available boost converters, such as the XR3403 chip taught in the '023 patent, would commonly include specifications and reference circuits which would allow implementation with relative ease. EX1045, 54:16-58:6; EX1012, p. 1.

Relying on the faulty premise that Richardson's embodiments must provide up to 48V output, NOCO argues there is no evidence that a boost converter could boost up to 48V. POR, pp. 37-38. This argument should also be rejected because, as the Board already correctly determined, the claims do not require "increasing to a particular power voltage". ID, p. 30. Similarly, Zhao's teachings are not limited to a specific output voltage, and a PHOSITA would have been motivated to select

commercially-available components with appropriate voltage ratings and switching capabilities to achieve a 48V output if the application so required. EX1044, ¶ 15; EX1047, 4:3-32 (teaching “3V to 48V” boost converter utilizing “conventional” components); EX1045, 45:18-48:9; EX2011, ¶ 108.

NOCO further argues that adding an alternative charging pathway to Richardson “would have required additional circuitry to address the safety risk of a user plugging in two chargers at the same time.” POR, p. 33. As admitted by Dr. Fayed, however, a PHOSITA would have known this “safety risk” would be prevented through well-known, off-the-shelf components, such as switches, diodes, sensors, and control circuitry. EX2011, ¶ 99; EX1044, ¶ 16. While Dr. Fayed suggests such components are expensive, a blocking diode interposed along each charging pathway would provide safety for less than one dollar.⁷ *Id.*

B. Ground 2: A PHOSITA Would Have Been Motivated to Modify Yu in View of Paparrizos

Like NOCO’s arguments against Ground 1, its arguments against Ground 2 are equally unsupported and contradicted by the intrinsic record and express disclosures of the prior art. First, like the ’023 patent, Yu teaches a 12V jump

⁷ NOCO also raises an ITC proceeding involving the ’023 patent, but the ITC’s non-binding determination involved a different combination of references, rendering the determination “of little relevance to the trial” in this proceeding. *3Shape A/s and 3Shape Inc. v. Align Tech., Inc.*, IPR2020-00222, Paper 16, p. 4.

starter and Paparrizos teaches boosting a 5V input to 12V. Second, Yu’s disclosure of a separate USB *output* would not discourage a PHOSITA from utilizing the known benefits of a USB *input*. Third, the teachings of Paparrizos are not limited to a “complex” circuit that would require every exemplary operational mode as NOCO suggests, nor did the Petition propose such a combination. For claims 32 and 52, the ’023 patent only provides a perfunctory disclosure regarding microprocessor control of a DC-DC converter, yet NOCO improperly demands significantly more from the prior art than that taught by the ’023 patent.

1. Paparrizos’s Teachings Are Not Limited to “Small Battery Systems”

The Board correctly found NOCO’s argument regarding the undesirability of USB charging was contradicted by the objectives of Paparrizos. ID, p. 38. The Board also correctly rejected NOCO’s argument that Paparrizos’s techniques are inapplicable to jump starters because it was not tied to the claim language and because Paparrizos teaches “outputting voltages higher than 8.4V—including in the 12V range.” *Id.*, pp. 38-39 (citing EX1009, 2:32-38, 8:18-31). NOCO now admits that overcoming voltage differences and DC-DC boost conversion techniques were well known (POR, p. 23), but reasserts the unsupported argument that Paparrizos is limited to “small” devices (*id.*, p. 40).

NOCO ignores the express teachings of Paparrizos. Not only does

Paparrizos expressly disclose boosting 5V to 12V, it also explains its techniques apply to “mobile devices” having “battery packs with two (or more) Li-ion cells in series (so-called ‘2S or ‘3S’ stacks or cells).” EX1009, 1:9-12; 8:22-26; Petition, p. 67. NOCO does not deny that portable jump starters are mobile devices or that the ’023 patent’s only embodiment utilizes a battery architecture contemplated by Paparrizos, *i.e.* a 12V, 3-cell, series-connected battery pack. EX1001, 4:9-12.

Nor does Paparrizos establish that USB is not intended for “large-capacity battery systems” due to certain “current limits” imposed by USB specifications, as NOCO suggests. POR, p. 40 (citing EX1009, 4:48-58). In fact, NOCO cites portions of Paparrizos that do not discuss battery capacity or charging times at all, and the remainder of NOCO’s argument relies exclusively on Dr. Fayed’s conclusory opinions. POR, pp. 40-41. NOCO is wrong to suggest that charging times would be the sole determining consideration regarding implementation of USB charging, particularly where the considerations in favor of USB charging remain un rebutted. Moreover, as set forth above with respect to Ground 1, NOCO did not invent an improvement to the alleged charging time problem or provide any examples or factors a PHOSITA would have considered in determining whether charge times are unreasonable.

2. Yu’s Separate USB Output Feature Does Not Detract From the Known Benefits of USB Charging

There is no dispute that Yu discloses a charging input interface (labeled “10”) with an exemplary depiction of a barrel port. EX1008, ¶ [0021], Fig. 9.

There is also no dispute that Yu discloses a separate *output* interface, the “5V output terminal” (labeled “8”), depicted as a USB port. EX1008, Figs. 1, 4, 7. And while NOCO accuses the Petition of failing to “mention” that Yu discloses a USB output,⁸ Yu’s disclosure of USB output is distinct from its input in a manner that would not undermine the proposed reasons for combining Yu and Paparrizos. *See* ID, p. 37.

NOCO fails to rebut the many reasons a PHOSITA would have been motivated to modify Yu’s jump starter with the USB input feature of Paparrizos, including the popularity of USB, known benefits, and demand. Petition, pp. 46-50, 68-69. Instead, NOCO speculates that Yu’s inventors “likely” selected USB only for output due to “disadvantages associated with charging jump starters via USB.” POR, pp. 41-42. But, like the ’023 patent, these alleged “disadvantages” are not recited anywhere in Yu’s disclosure. And NOCO has not established that USB output and USB input would have been mutually exclusive. Although Yu’s

⁸ This fact was expressly addressed in Petitioner’s separate Petition for related U.S. Patent No. 11,584,243. IPR2024-00671, Paper 1, p. 64.

inventors may not have pursued the benefits of USB input charging, that is not evidence a PHOSITA would not have been motivated to do so. NOCO further speculates that the “authors of Yu’s disclosure” made a deliberate choice against USB input charging, claiming it “is strong evidence that a PHOSITA would not have modified Yu’s system to rely on USB input charging.” POR, p. 45. But NOCO’s only evidence is Dr. Fayed’s conjecture that Yu’s authors make this conscious choice. *Id.*; EX2011, ¶ 118.

NOCO’s argument is, in effect, a teaching away theory, although NOCO does not label it as such or attempt to satisfy its demanding requirements. POR, p. 45 (citing *Apple* decision). Indeed, NOCO extrapolates that the presence of USB output and absence of USB input in Yu establishes that a PHOSITA would have been led away from USB input charging in all circumstances, regardless of countervailing considerations in favor of USB. POR, p. 45. But it is improper to “read into a reference a teaching away from a process where no such language exists.” *DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1364 (Fed. Cir. 2006). And NOCO’s citation to the *Apple* decision is inapt, as the prior art there was *not* silent and instead expressly addressed user preferences relevant to motivations to combine. *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1052 n.15 (Fed. Cir. 2016). No such preferences are recited in Yu.

NOCO mischaracterizes the Petition as providing “analogous reasoning for

the motivation to combine” as compared to the petitioner in IPR2020-00944. POR, p. 45. But Carku relied upon secondary references that did not disclose USB input ports. EX1014, p. 92. Here, in contrast, the Petition relies upon Paparrizos’s undisputed disclosure teaching the claimed USB input charging. And notably, the convenience of USB was not rejected by the Board *per se* but rather dismissed due to an “absence of sufficient explanation and supporting evidence.” EX1014, p. 93. The Petition, however, presents substantial evidence supporting the proposed combination of Ground 2. *Compare* EX1014, pp. 93-94 *with* ID, pp. 36-37.

3. Patent Owner Mischaracterizes the Petition’s Combination of Yu and Paparrizos

The Petition proposes modifying Yu’s jump starter to include a USB input connector and boost converter circuitry as taught by Paparrizos. Petition, pp. 65-68. NOCO mischaracterizes the combination by asserting that every feature of Paparrizos, including buck and reverse modes, must necessarily be utilized and described in the combination. But it is of little relevance that other features are taught by Paparrizos, as there is no requirement for the prior art’s teachings to “meet the claim limitations in all modes of operation.” *ParkerVision, Inc. v. Qualcomm Inc.*, 903 F.3d 1354, 1361 (Fed. Cir. 2018).

4. Patent Owner Demands More Detail About DC-DC Circuitry From the Prior Art Than That Disclosed in the '023 Patent

The '023 patent's disclosure relating to DC-DC boosting consists of a single sentence describing an off-the-shelf DC-DC converter 49, depicted as a box labeled "XR3403" in Figure 2C. EX1001, 7:25-28, Fig. 2C. Despite this, NOCO faults the Petition for failing to describe the inner circuitry of its proposed combination in detail. POR, p. 47. The prior art provides comparable—if not more—detail as the '023 patent regarding the operation of DC-DC boost converters. EX1009, 3:58-4:4, 7:7-17, 8:10-31, 9:17-46, Figs. 1B, 7A, 8A. NOCO also faults the combination for "safety risks", but a PHOSITA would have readily known how to prevent these alleged risks using conventional technology. *See* Section III.A.3.c, *supra*. Ultimately, it would have taken relatively basic engineering effort to wire circuitry containing an off-the-shelf DC-DC boost converter between a power input interface and batteries for purposes of charging. *Id.*

5. It Would Have Been Obvious to Control the On/Off State of a DC-DC Converter via Microprocessor Control

NOCO argues that Ground 2 provides insufficient evidence that a PHOSITA would have been motivated to use a microcontroller for turning a boost converter on and off (POR, pp. 51-52), but the Petition explains that a PHOSITA would have

understood Paparrizos's teachings encompass microprocessor control of a DC-DC converter. Petition, pp. 69-70 (citing EX1009, 4:45-46, 7:7-10, 8:10-31, 9:10-46, Fig. 5; EX1003, ¶ 167). Dr. MacCarley was not questioned about the obviousness of microprocessor control in deposition, and NOCO does not present rebuttal testimony from Dr. Fayed on this topic. Instead, NOCO offers attorney argument interpreting Paparrizos. Where Dr. Fayed does offer testimony, his analysis is limited to Figure 6, concluding that "in none of these operation modes would the DC-DC converter be 'turned off.'" POR, p. 51. Dr. Fayed's testimony should be disregarded as contrary to the express disclosure of Paparrizos, which contemplates signal control of a boost converter. EX1009, 7:7-10. In fact, Paparrizos's discussion of Figure 6 contemplates that "the battery charging circuit may activate the PWM modules 312a, 312b, and boot cap refresh circuit 314", which is an indication that the DC-DC conversion circuitry is activated and deactivated (e.g., turned on and off). EX1009, 9:10-16. EX1044, ¶ 17.

IV. CONCLUSION

For the reasons above and in the Petition, all challenged claims of the '023 patent are unpatentable.

Case No. IPR2024-00577
US Patent No. 11,447,023

Respectfully submitted,

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CERTIFICATE OF WORD COUNT

The undersigned certifies pursuant to 37 C.F.R. § 42.24(d) that the foregoing document includes, as indicated by the word count of the word-processing system used to prepare the document (excluding the Cover, Table of Contents, Table of Authorities, Table of Exhibits, signatures, and Certificates of Service and Word Count), fewer than 5,600 words and specifically includes 5,534 words.

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CERTIFICATE OF SERVICE

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