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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte BRUCE HACTMANN,
SHEFALI JAISWAL, DAVID PEARCE,
WILLIAM SANDERS, and BEN TARBELL

Appeal 2019-005019
Application 11/451,604
Technology Center 1700

Before JEFFREY T. SMITH, GEORGE C. BEST, and
JEFFREY R. SNAY, *Administrative Patent Judges*.

SMITH, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant¹ appeals from the Examiner's decision to reject claims 1, 2, 4, 27, 29, 30, 45, and 47, which constitute all the claims pending in this application. Claims 3, 5–26, 28, 31–

¹ We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as Beijing Apollo Ding rong Solar Technology Co., Ltd. Appeal Br. 3.

44, and 46 have been cancelled. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

The following rejections are presented for appeal:

I. Claims 1, 2, 4, 27, 30, 45, and 47 are rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Lebrun (US 3,553,030, Jan. 5, 1971) and Cull (US 4,574,160, Mar. 4, 1986).

II. Claim 29 is rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Lebrun and Cull, and further in view of Kuchinski (US 2005/0072461 A1, Apr. 7, 2005).

Appellant's invention relates to photovoltaic modules having an integrated current collection and interconnection configuration. (Spec. ¶ 1.) Claim 1 is illustrative of the subject matter on appeal and is reproduced from Appellant's Brief below:

1. A photovoltaic module, comprising:
 - a first photovoltaic cell having a first polarity electrode on a front side and a second polarity electrode on a back side;
 - a second photovoltaic cell having a first polarity electrode on a front side and a second polarity electrode on a back side;
 - a third photovoltaic cell having a first polarity electrode on a front side and a second polarity electrode on a back side;
 - a first interconnect comprising a first part of an electrically insulating carrier and a first flexible, electrically conductive wire comprising a metal and supported by the first part of the electrically insulating carrier; and
 - a second interconnect comprising a second part of the electrically insulating carrier and
 - a second flexible, electrically conductive wire comprising the metal and supported by the second part of the electrically insulating carrier,wherein:

the first flexible, electrically conductive wire comprises the metal wire which has:

a first part that is located on a bottom side of, and underlies, a first portion of the first part of the electrically insulating carrier and faces, extends over, and directly contacts the first polarity electrode on the front side of the first photovoltaic cell,

a second part that is located on an opposite top side of, and overlies, a second portion of the first part of the electrically insulating carrier and faces, extends under, and directly contacts, the second polarity electrode on the back side of the second photovoltaic cell, and

a connecting part that connects the first part and the second part of the first flexible, electrically conductive wire and is embedded within the first part of the electrically insulating carrier;

the first flexible, electrically conductive wire is absent under the bottom side of the first part of the electrically insulating carrier in an entire area of the second portion of the first part of the electrically insulating carrier located under the back side of the second photovoltaic cell;

the first flexible, electrically conductive wire transitions from the bottom side of the first part of the electrically insulating carrier to the opposite top side of the first part of the electrically insulating carrier through the first part of the electrically insulating carrier to avoid a shunt path at an edge of at least one of the first photovoltaic cell and the second photovoltaic cell;

the first portion of the first part of the electrically insulating carrier is located over the front side of the first photovoltaic cell such that the first part of the first flexible, electrically conductive wire electrically contacts the first polarity electrode on the front side of the first photovoltaic cell to collect current from the first polarity electrode on the front side of the first photovoltaic cell;

the second portion of the first part of the electrically insulating carrier extends over the back side of the second photovoltaic cell, such that the connecting part of the first flexible, electrically conductive wire electrically transitions through the first part of the electrically insulating carrier and the second part of the first flexible, electrically conductive wire contacts the second polarity electrode on the back side of the

second photovoltaic cell to electrically connect the first polarity electrode on the front side of the first photovoltaic cell to the second polarity electrode on the back side of the second photovoltaic cell; and

the second photovoltaic cell passes through a slot in the insulating carrier between the first part and the second part of the electrically insulating carrier.

OPINION

After review of the respective positions provided by Appellant and the Examiner, we AFFIRM the Examiner's rejections under 35 U.S.C.

§ 103(a).²

We consider the record to determine whether Appellant has identified reversible error in the Examiner's rejection. *See In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011) (“[I]t has long been the Board's practice to require an applicant to identify the alleged error in the examiner's rejections,” (citing *Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential))).

Appellant argues for reversal of all of the rejected claims as an undifferentiated group. *See generally* (Appeal Br. 13–34.) We, therefore, select claim 1 as representative of the claims on appeal. 37 C.F.R. § 41.37(c)(1)(iv) (2018).

Because we discern no reversible error in the Examiner's factual findings, analysis, and conclusion, we adopt them as our own. We add the following for emphasis only.

The Examiner finds Lebrun discloses photovoltaic modules comprising a wire transiting through the opening (29) to make contact with

² The complete statement of the rejection on appeal appears in the Final Office Action. (Final Act. 4–8.)

back side of the second photovoltaic cell. The Examiner finds Lebrun does not teach the second part of the first wire extending under and in direct contact on the back side of the second photovoltaic cell such that the conductive wire is absent under the bottom side of the first part of the insulating carrier. (Final Act. 4–5; Lebrun figs. 8–10.) The Examiner finds Cull teaches an electrical conductor for an interconnect that comprises at least one flexible electrically conductive wire to provide mechanical and electrical advantages. (Final Act. 5; Cull col. 7 ll. 11–57.) The Examiner determines it would have been obvious to form the connection of the solar cell modules of Lebrun from flexible, electrically conductive wire to obtain the advantages taught by Cull. (Final Act. 5–6.) The Examiner further determines it would have been obvious to form the connection of wire extending under and direct contact with the second cell as taught by Cull by rearranging opening for the wire to go through the insulating carrier between the cells. (Final Act. 5–6.)

Appellant argues the combined teachings of Lebrun and Cull fails to disclose all of the claimed features of claim 1. (App. Br. 15–34.) Appellant argues relocating the hole in tag 30 modifies the principle of operation of tag 30 and hole 29 of Lebrun. (App. Br. 19–23.) Appellant argues Cull does not teach that filament 20 transitions through any component, much less that it transitions through an insulating support member such as tag 30 of Lebrun. (App. Br. 23–25.) Appellant argues it would not have been obvious to incorporate the conductive wire of Cull into the structure of Lebrun to arrive at the configuration of claim 1 without relying on impermissible hindsight. (App. Br. 29.) Appellant specifically argues Lebrun’s material of elements 23 and 26 must be deposited on a surface to provide an electrical connection

and Lebrun provides no reason to replace this conductive material with a free standing wire. (App. Br. 30.)

Appellant's arguments are not persuasive. The use of electrically conductive wires for connecting opposite surfaces of photovoltaic cells such as described by Lebrun is merely substituting one known element for another to yield predictable results. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 401 (2007). "Express suggestion to substitute one equivalent for another need not be present to render such substitution obvious." *In re Fout*, 675 F.2d 297, 301 (CCPA 1982). The Examiner's explanation of the reasons a person of ordinary skill in the art would have combined the teachings of Lebrun and Cull is sufficient when an allowance is made for "the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR*, 550 U.S. at 418.

Lebrun's teachings regarding suitable electrical connections are not limited to the scope of Appellant's argument. Lebrun teaches the electrical connection on opposite sides of the substrate is achieved by a variety of techniques. (Lebrun cols. 5–6, Figs. 7–10.) Lebrun teaches the embodiment depicted in figure 7 is one method of combining two opposite tags with different metal zones for connecting a radiation-sensitive element whereas figures 8–10 depict a different arrangement. (Lebrun col. 5 l. 10– col.6 l. 14.) A person of ordinary skill would have reasonably expected that other well-known techniques for making an electrical connection between photovoltaic cells would have been suitable for the invention of Lebrun.

Appellant's arguments do not recognize that Lebrun envisages the use of various techniques for the electrical connection between photovoltaic cells. (Lebrun generally.) A person of ordinary skill in the art would have

recognized the suitability of electrically connecting photovoltaic cells from opposite sides of the substrate as described by Lebrun utilizing recognized techniques. (*See Cull*). A person of ordinary skill in the art would have recognized that wires are suitable for connecting electrically photovoltaic cells from opposite sides of a substrate as described by Cull. The cited references establish a person of ordinary skill in the art would have had sufficient skill to determine the appropriate routing of electrically connecting wires for photovoltaic cells. Appellant has not disputed that the use of electrically connecting wires were known to persons of ordinary skill in the art.

Appellant argues the combination of Lebrun and Cull does not teach all claim elements because the combined device of Lebrun and Cull would not have the feature of “the first flexible, electrically conductive wire is absent under the bottom side of the first part of the electrically insulating carrier in an entire area of the second portion of the first part of the electrically insulating carrier located under the back side of second photovoltaic cell,” as in claim 1. (App. Br. 16–17.)

Appellant’s argument lacks persuasive merit. Lebrun teaches that the electrical connection is absent under the bottom surface of the electrically insulating carrier in an entire area of the second part of the electrically insulating carrier. (Lebrun Figs. 8–10.) As discussed above, a person of ordinary skill in the art would have recognized the suitability of using known wires appropriately routed for connecting electrically the opposite surfaces of photovoltaic cells. This would have included not routing wires under only portions of the insulating carrier. Appellant has not explained

that the exclusion of wires under a portion of the insulating carrier provides unexpected results.

Appellant argues the Examiner's modification of Lebrun to incorporate an unsupported metal strip fails to show at least a connecting part that is "embedded" within the electrically insulating carrier as required by the claimed invention. (App. Br. 17–19.) Appellant specifically argues Specification paragraph 29 and figure 6C disclose how the wire 15 is embedded within carrier 13. (App. Br. 17.)

Appellant's argument is not persuasive of reversible error. The term embedded does not appear in the Specification. Thus we look to descriptions relied upon by Appellant for guidance on how the term is utilized in the claimed invention. The present Specification paragraph 29 provides for description of figure 6A–6C and states the following:

The electrical connection can be configured as shown in Figures 6A-6C, where the traces 15a, 15b are printed on both sides of the carrier film 13. The traces 15a and 15b are electrically contiguous from front to back of the carrier film 13 in region 64 (i.e., the conductor extends through the carrier 13 or around the edge of the carrier to connect traces 15a and 15b). The back side of the portion of the cell 3b that is inserted in the slot 63 makes contact with trace 15b there only.

(Spec. ¶ 29.)

The Specification describes the conductor as extending through the carrier or around the edge of the carrier as depicted in figure 6A–6C. Appellant has not directed us to descriptions in the Specification that illustrate the significance and the size of the opening but allows the conductor to extend from one side of the carrier to the other. The illustrations in the figures depict a wire/conductor that is electrically contiguous from front to back of the carrier film. Appellant has not

persuasively argued that the combination of Lebrun and Cull would not have suggested to a person of ordinary skill in the art a conductor that is electrically continuous from one side of the carrier to the other. Appellant has not persuasively established that the electrically continuous conductor from claimed invention is patentably distinct from the combination of Lebrun and Cull.

Appellant argues the device of claim 1 provides an unexpected advantage over the devices of Lebrun and Cull because it decreases the chance of short circuit between the p side and the n side of the same solar cell. (App. Br. 32–33.)

We do not find Appellant’s arguments convincing because they are not supported by persuasive evidence. Unexpected results must be established by factual evidence, and attorney statements are insufficient to establish unexpected results. *See In re Geisler*, 116 F.3d 1465, 1470–71 (Fed. Cir. 1997). As set forth above, Appellant has not persuasively argued that the combination of Lebrun and Cull would not have suggested to a person of ordinary skill in the art a conductor that is electrically continuous from one side of the carrier to the other.

For the foregoing reasons and those the Examiner presents, we sustain the appealed rejections.

CONCLUSION

In summary:

| Claims Rejected | 35 U.S.C. § | Reference(s)/Basis | Affirmed | Reversed |
|-------------------------|--------------------|---------------------------|-------------------------|-----------------|
| 1, 2, 4, 27, 30, 45, 47 | 103(a) | Lebrun, Cull | 1, 2, 4, 27, 30, 45, 47 | |

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| Claims Rejected | 35 U.S.C. § | Reference(s)/Basis | Affirmed | Reversed |
|------------------------|--------------------|----------------------------|-----------------------------------|-----------------|
| 29 | 103(a) | Lebrun, Cull, Kuchinski | 29 | |
| Overall Outcome | | | 1, 2, 4, 27, 29, 30, 45, 47 | |

No period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED