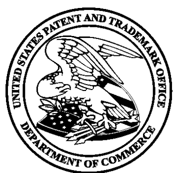

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JOHANN R. SCHUMACHER

Appeal 2020-000099
Application 15/099,715
Technology Center 1700

Before CATHERINE Q. TIMM, BEVERLY A. FRANKLIN, and JEFFREY B. ROBERTSON, *Administrative Patent Judges*.

ROBERTSON, *Administrative Patent Judge*.

DECISION ON APPEAL[1]

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[1] This Decision includes citations to the following documents: Specification filed April 15, 2016 ("Spec."); Final Office Action mailed April 17, 2018 ("Final Act."); Appeal Brief filed December 18, 2018 ("Appeal Br."); Examiner's Answer mailed February 5, 2019 ("Ans."); and Reply Brief filed April 5, 2019 ("Reply Br.").

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant[2] appeals from the Examiner's decision to reject claims 1–14, 16–18, and 20.[3] Appeal Br. 5. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

CLAIMED SUBJECT MATTER

Appellant states the invention concerns resin film products that are useful in the manufacture of layups used to manufacture printed circuit boards. Spec. 2. Claim 1, reproduced below, is illustrative of the claimed subject matter (Appeal Br., Claims Appendix 17):

> 1. A method comprising:
>
> providing a resin film product having a width dimension and a length dimension comprising:
>
> a solidified b-staged resin base layer having a first planar surface and a second planar surface; and
>
> a protective layer disposed on the first planar surface of the base layer, wherein the base layer has a thickness from about 0.1 to about 1 mil;
>
> heating an exposed innerlayer material surface of a printed circuit board substrate having a width dimension and a length dimension;
>
> cutting the width dimension and length dimension of the resin film product to have substantially the same width dimension and

[2] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42(a). Appellant identifies ISOLA USA CORP. as the real party in interest. Appeal Br. 2.

[3] Claim 19 was rejected under 35 U.S.C. §§ 112(b) and (d), but this rejection was withdrawn as a result of the cancellation of claim 19. *See* Ans. 12; Appeal Br. 5.

length dimension of the heated exposed innerlayer material surface;

applying the unprotected second planar surface of the base layer against the heated exposed innerlayer material surface of the printed circuit board substrate to liquefy the solidified b-staged resin base layer and form a printed circuit board layup; and

cooling the printed circuit board layup to form a re-solidified b-staged resin base layer comprising the protective layer disposed on the first planar surface.

Independent claim 10 also stands rejected, and is directed to a similar method as recited in claim 1. *Id.* at 18–19.

REFERENCES

The prior art relied upon by the Examiner is:

Name	Reference	Date
Dunsche	US 3,717,523	February 20, 1973
Colburn	US 3,721,597	March 20, 1973
Del	US 4,180,608	December 25, 1979
Lemons	US 5,879,498	March 9, 1999
Tani et al. hereinafter "Tani"	US 2003/0145458 A1	August 7, 2003
Jo et al. hereinafter "Jo"	US 2006/0248712 A1	November 9, 2006

REJECTIONS

1. The Examiner rejected claims 1–5 and 7–9 under 35 U.S.C. § 103 as unpatentable over Del, optionally in view of Lemons, and Tani, Colburn and/or Dunsche. Final Act. 5–9.

2. The Examiner rejected claim 6 under 35 U.S.C. § 103 as unpatentable over Del, optionally in view of Lemons, and Tani, Colburn and/or Dunsche, further in view of Jo. Final Act. 9–10.
3. The Examiner rejected claims 10–14 and 16–18 under 35 U.S.C. § 103 as unpatentable over Del, optionally in view of Lemons, and Colburn and/or Dunsche, and Jo. Final Act. 10–14.
4. The Examiner rejected claim 20 under 35 U.S.C. § 103 as unpatentable over Del, optionally in view of Lemons, and Colburn and/or Dunsche, and Jo, further in view of Tani. Final Act. 14–15.

OPINION

Rejection 1

Appellant does not present separate arguments with respect to the claims subject to this rejection. *See* Appeal Br. 10–13. Thus, we select claim 1 as representative for disposition of this rejection. 37 C.F.R. § 41.37(c)(1)(iv).

The Examiner's Rejection

At the outset, in view of the discussion below and the Examiner's position that Dunsche and Lemons are not strictly necessary to the rejection, we find it unnecessary to reach the Examiner's alternative positions with respect to Dunsche and Lemons and Appellant's arguments related thereto. *See* Final Act. 7–8; Ans. 17, 21; Appeal Br. 13, 15–16, 20–21; Reply Br. 4–5.

In rejecting claim 1 as unpatentable over Del, Tani, and Colburn, the Examiner found Del discloses a method including the steps of providing a

resin film product as recited in claim 1. Final Act. 5–6. In particular, the Examiner found Del discloses a b-staged resin base layer having a first and a second planar surface, protective layers on each of the planar surfaces, removing the protective layer from the second planar surface, and applying the unprotected second planar surface to a printed circuit board (PCB) substrate to form a PCB layup. *Id.*

The Examiner found Del discloses the b-staged resin base layer is meant to encapsulate the electrical components, but fails to specifically teach a thickness of 0.1 to 1 mil as recited in claim 1. *Id.* at 6. The Examiner found that the thickness of the encapsulant may be thicker or thinner relative to the size of the components to be encapsulated, such that any thickness capable of encapsulating the components would have been acceptable. *Id.* The Examiner found Tani discloses epoxy encapsulants similar to those in Del, and Tani further discloses various thicknesses in the examples including a thickness of 25 microns, which is slightly less than 1 mil. *Id.* Thus, the Examiner determined the thickness in claim 1 would have been obvious because such thicknesses are known to be suitable to encapsulate similar components known in the art and using thinner layers when suitable would have reduced the materials needed, and reduce costs. *Id*.

The Examiner found Del does not explicitly disclose the resin film is cut to meet the exposed layer of the printed circuit board, but because Del discloses a discrete product, where the resin film product and the PCB have matching shapes, Del implies that the film was cut to the shape of the PCB. *Id.* at 7. The Examiner found Del is silent on the timing of the cutting, but it would have been apparent that the cutting could have been reasonably performed at any time after the PCB size is known. *Id.* The Examiner

determined that such cutting would have predictably allowed for the final shape of the b-staged resin and PCB to match as desired while not restricting the dimensions when the casted film is originally formed. *Id.*

The Examiner found Del discloses the resin is heated via nip rollers upon application to flow and bond the resin to the PCB, but Del fails to disclose the exposed surface of the innerlayer is heated as recited in claim 1. *Id.* The Examiner found it was well known that when heat-bonding laminates to resin layers via softening/melting of the resin, the laminate layers to which the resin may be bonded may be pre-heated in order to provide some or all of the heat required for bonding. *Id.* at 8, citing Colburn, col. 3, ll. 2–15. Thus, the Examiner determined it would have been obvious to preheat the PCB of Del as a suitable way to provide some or all of the heat necessary to soften/melt the resin during lamination as required to achieve flow and create the desired bond. *Id.*

Appellant's contentions

Appellant contends Tani does not disclose encapsulating wire patterns with various thicknesses, but rather discloses wiring patterns formed on the surface of core substrate, and the examples pointed to by the Examiner bear no relation to a thickness of the resin that is required for encapsulation. Appeal Br. 11. Appellant contends Colburn does not disclose pre-heating laminate layers in order to provide some or all of the heat required for bonding, rather, Colburn discloses heat may be applied to the entire metal laminae prior to lamination with a structured film. *Id.* at 12. Appellant contends the Examiner did not cite any portions of Del that indicated the b-staged film conforms to the shape of the PCB, and that cutting a continuous

film as in Del is not the same feature as at issue, because cutting would occur after the b-staged film was already applied to the PCB. *Id.* at 12–13.

Issue

Did Appellant demonstrate reversible error in the Examiner's determination that the method recited in claim 1 would have been obvious over the cited prior art of record?

Discussion

We are not persuaded by Appellant's argument that the base layer thickness of from about 0.1 to about 1 mil recited in claim 1 would not have been obvious over Del and Tani. We observe that Del does not disclose any particular criticality to the thickness of the solid cast resin layer (base layer), stating that it is "preferably formed with a uniform thickness of between about 3–6 mil." Del, col. 3, ll. 1–2. As the Examiner points out, Appellant has not provided any specific arguments against the Examiner's position that the thickness could be varied based on the particular size of components to be encapsulated. Ans. 14–15.

We are of the view that the Examiner's position that it would have been obvious to have adjusted the thickness of the solid cast resin layer as needed and including the range recited in claim 1 is reasonably supported. In this regard, Tani's disclosure of insulating layers including epoxy resin (Fig. 3c, 20) is not inconsistent with the Examiner's position as such are similar to the epoxy resin composite disclosed in Del, which both encapsulate wiring patterns. Tani ¶ 49, Fig. 3c (20, 11); Del Fig. 5 (10, 42). Tani discloses several examples where the thickness of the insulating layer is

different (Tani ¶¶ 72–89), which support the Examiner's position that the thicknesses of such layers may be varied. *See* Ans. 13–14.

We are also not persuaded by Appellant's arguments that the Examiner has not provided sufficient support that the step of heating the exposed innerlayer material surface of the PCB in Del would have been obvious at least over Colburn. That is, Colburn discloses "heat can be applied to the metal laminate before they are passed between laminating rolls." Colburn, col. 3, ll. 7–12. This disclosure provides support for the Examiner's position that it is a well-known technique in forming laminates that a metal surface to be laminated may be heated in order to cause the resin material to flow and bond the laminate layers. Appellant's arguments with respect to Colburn unduly focus on the specific disclosure in Colburn alone, rather than what one of ordinary skill in the art would have understood from the combination of art as a whole.

In this regard, Appellant's position that Colburn discloses that heat is only applied to a laminate layer after contact is made between the laminate layer and the resin layer (Reply Br. 2–4) is plainly inconsistent with the actual disclosure in Colburn. In particular, as discussed above, Colburn discloses heat is applied to the metal laminae prior to passing through the laminating rolls, and Figure 1 of Colburn depicts metal laminae 2 and 3 coming in contact with adhesive layers 4, 6, and 7 at rollers 8 and 9. Accordingly, heat applied to the metal laminae 2 and 3 would occur prior to contact with the adhesive layer. To the extent Appellant's position that Colburn's disclosure that heat is applied "to the entire metal laminae" does not suggest heating only "an exposed innerlayer material surface" as recited in claim 1, we are of the view that this argument is not commensurate in

scope with the claims as the claims do not exclude heating the entire printed circuit board in order to provide the necessary heat to the exposed innerlayer material surface.

Thus, we are of the view that one of ordinary skill in the art would have understood from Colburn that an alternative to heating resin material used for bonding in laminates would be to preheat a metal layer (in Del, an innerlayer metal structure) in order to obtain the desired flowability for the resin material. *In re McLaughlin*, 443 F.2d 1392, 1395 (CCPA 1971) ("[T]he test for combining references is not what the individual references themselves suggest but rather what the combination of disclosures taken as a whole would suggest to one of ordinary skill in the art."). In *KSR*, the Supreme Court explained, "[w]hen a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability." *KSR Int'l Co. v. Teleflex Inc*., 550 U.S. 398, 417 (2007). "A person of ordinary skill is also a person of ordinary creativity, not an automaton." *Id*. at 421.

We are also not persuaded by Appellant's arguments that cutting the width dimension and length dimension of the resin film product such that it is substantially the same as the width and length dimension of the exposed innerlayer material surface would not have been obvious. As the Examiner explains, the claims do not require the cutting to take place at any particular time of the method recited in claim 1. Ans. 17. As pointed out by the Examiner, Del discloses a discrete product that includes a PCB laminate where the resin film product has substantially the same width and length dimension as the exposed inner layer material surface, which indicates that

the resin layer had been cut. Del, Figs. 2, 5, 6. Thus, we are unpersuaded the cutting step as recited in claim 1 would not have been obvious over Del.

As a result, we affirm the Examiner's rejection of claim 1.

Rejection 2

Claim 6 depends from claim 1 and recites "wherein the innerlayer material surface of the printed circuit board substrate is heated to a temperature ranging from about 50 °C to about 60 °C."

The Examiner's Rejection

In rejecting claim 6 over Del, Tani, Colburn, and further in view of Jo,[4] the Examiner found the combination of Del, Tani, and Colburn fails to specifically disclose heating between 50 °C to about 60 °C. Final Act. 9. The Examiner found Jo discloses the initial heating of an epoxy layer to be applied to a circuit board is low as 50 °C in a step that is implicitly to soften the epoxy for bonding prior to curing, the same goal as in Del. *Id.* citing Jo, ¶ 40. The Examiner determined it would have been obvious to heat the PCB in Del to between 50 and 60 °C because such temperatures are known to cause softening of epoxy for similar purposes and would have predictably assisted with preventing heat loss without overheating or over-curing the epoxy in Del. *Id.* at 9–10.

[4] As discussed above, we find it unnecessary to reach the Examiner's alternative positions with respect to Dunsche and Lemons.

Appellant's contentions

Appellant contends Jo discloses the application of heat and pressure after the resin layer and electromagnetic shield layer are already in contact, which is not the feature at issue. Appeal Br. 14. Appellant argues Jo does not disclose the use of heat to liquefy the resin layer. *Id.*

Discussion

We are not persuaded by Appellant's arguments. As the Examiner explains, Jo is relied upon to demonstrate the claimed temperature range is a known temperature range for heating laminating epoxy, the b-staged resin taught in Del. Ans. 18–19. The Examiner further explains that Del teaches epoxy liquefies during laminating, and Jo discloses laminating temperatures within the claimed range is suitable for epoxy, such that it at least would have been obvious to have heated the interlayer between 50 to 60 °C, because doing so would have predictably assisted with providing the epoxy the heat as needed for facilitating laminating in Del. *Id.* at 19.

The Examiner's reasoning is supported by Del, which discloses epoxy resin system flows around and encapsulates the circuitry of the PCB. Del, col. 3, ll. 10–19. In addition, Del discloses that the temperature range for lamination is "preferred," which does not exclude other temperatures that are suitable for lamination (Del, col. 5, ll. 54–56) including those temperatures disclosed in Jo of from 50 to 150 °C (Jo ¶ 40). Thus, Appellant's arguments do not address the Examiner's rejection as a whole.

Accordingly, we affirm the Examiner's rejection of claim 6.

Rejections 3–4

For claims 10–14 and 16–18, the subject of Rejection 3, and claim 20, the subject of Rejection 4, Appellant relies on similar arguments as discussed above for claims 1 and 6. Appeal Br. 14–15.

Accordingly, we affirm the Examiner's rejections of claims 10–14, 16–18, and 20 for similar reasons as discussed above for claims 1 and 6.

DECISION SUMMARY

In summary:

Claims Rejected	**35 U.S.C. §**	**Reference(s)/Basis**	**Affirmed**	**Reversed**
1–5, 7–9	103	Del, Lemons, Tani, Colburn, Dunsche	1–5, 7–9	
6	103	Del, Lemons, Tani, Colburn, Dunsche, Jo	6	
10–14, 16–18	103	Del, Lemons, Colburn, Dunsche, Jo	10–14, 16–18	
20	103	Del, Lemons, Colburn, Dunsche, Jo, Tani	20	
Overall Outcome			1–14, 16–18, 20	

TIME PERIOD FOR RESPONSE

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

AFFIRMED