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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte KAY Y. BLOHOWIAK, TYLER J. ZIMMERMAN, JAMES H. MABE, FREDERICK T. CALKINS, and MATTHEW A DILLIGAN[1]

Appeal 2015-002915
Application 12/917,740
Technology Center 1700

Before CHUNG K. PAK, WESLEY B. DERRICK, and AVELYN M. ROSS, *Administrative Patent Judges*.

DERRICK, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on an appeal under 35 U.S.C. § 134 from the Examiner's maintained rejection of claims 13–21. We have jurisdiction pursuant to 35 U.S.C. § 6.

We AFFIRM.

BACKGROUND

Appellants' claimed invention relates to composite structures that include a plurality of carbon fiber prepreg plies interleaved with a plurality

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[1] Appellants state that the real party of interest is "The Boeing Company of Chicago, Illinois." Appeal Br. 2.

of shape memory alloy. Spec. Abstract. Independent claim 13 sets forth a method of fabricating a shape memory alloy/fiber reinforced polymeric composite structure. Independent claim 17 sets forth a method for morphing a composite structure that includes fabricating a shape memory alloy/fiber reinforced polymer composite structure and heating the composite. Claim 13 recites "providing an interface having a gradient layer transitioning from each of said second plurality of shape memory alloy sheets to each of said adhesive coatings, said gradient layer substantially devoid of fibers." Claim 17 recites the same only omitting "coatings."

Independent claim 13 is illustrative:

> 13. A method for fabricating a shape memory alloy/fiber reinforced polymeric composite structure comprising the steps of:
>
> providing a first plurality of fiber reinforced polymeric plies;
>
> providing a second plurality of sheets of shape memory alloy;
>
> coating at least one of a top and a bottom surface of one of said second plurality of sheets of shape memory alloy with an adhesive primer layer;
>
> coating a layer of an adhesive on said adhesive primer coated sheets of shape memory alloy;
>
> interleaving said coated sheets of shape memory alloy using a first ply and a second ply of said first plurality of fiber reinforced polymeric plies forming a laminate, wherein the first ply includes first fibers oriented substantially in a first direction, wherein the second ply includes second fibers oriented substantially in a second direction, and wherein interleaving is performed such that the first direction is about perpendicular to the second direction;
>
> providing an interface having a gradient layer transitioning from each of said second plurality of shape memory alloy sheets to each of said adhesive coatings, said gradient layer substantially devoid of fibers; and

curing said laminate and forming said shape memory alloy fiber reinforced polymeric composite structure.

Appeal Br. (Claims Appendix) 23.

THE REJECTIONS

The claims stand rejected under 35 U.S.C. § 103(a) as follows:

I. Claims 13–15 and 17–21 over Turner[2] in view of Ogisu 1[3];

II. Claim 16 over Turner in view of Ogisu 1 and either Lach[4] or Cagle[5];

III. Claims 13–19 over Ogisu 2[6] in view of Westre[7];

IV. Claims 13–19 over Ogisu 2 in view of Westre and Blohowiak[8];

V. Claims 20–21 over Ogisu 2 in view of Westre and Julien[9];

VI. Claims 20–21 over Ogisu 2 in view of Westre, Blohowiak, and Julien.

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[2] Turner et al., *Design, fabrication, and testing of SMA enabled adaptive chevrons for jet noise reduction*, Proceedings of SPIE Vol. 5390, Paper No. 36, (March 2004).
[3] Ogisu et al., *Development of damage suppression system using embedded SMA foil sensor and actuator*, Proceedings of SPIE Vol. 3991 (2000).
[4] Turner et al., *Fabrication and characterization of SMA hybrid composites*, SPIE Vol. 4333, Paper No. 4333–60, March 2001.
[5] Cagle et al., WO 2008/014058 A2, published January 31, 2008.
[6] Ogisu et al., US 2004/0050171 A1, published March 18, 2004.
[7] Westre et al., US 6,114,050, issued September 5, 2000.
[8] Blohowiak et al., US 5,869,141, issued February 9, 1999.
[9] Julien et al., US 4,932,210, issued June 12, 1990.

DISCUSSION[10]

Upon consideration of the record, we are not persuaded that the Examiner erred in determining that one of ordinary skill in the art, armed with the knowledge of Ogisu 2, Westre, Blohowiak, and Julien, would have been led to the subject matter of the claims within the meaning of 35 U.S.C. § 103(a). Accordingly, we affirm the Examiner's decision on those grounds based on Ogisu 2, Westre, Blohowiak, and Julien—Rejections IV and VI. However, we decline to otherwise reach the merits of Rejections I–III and V as these are cumulative over Rejections IV and VI. *See In re Gleave*, 560 F.3d 1331, 1338 (Fed. Cir. 2009) (holding that obviousness rejections need not be reached upon affirming a rejection of all claims as anticipated); *cf. Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984) (having decided a single dispositive issue, the ITC was not required to review other matters decided by the presiding officer). We add the following.

Ogisu 2 discloses a composite with a laminated structure of fiber-reinforced resin layers and films of a shape memory alloy that can be used in aircraft. The Examiner relies on Ogisu 2 for its disclosure of a method of forming the composite by interleaving a plurality of fiber reinforced resin plies and a plurality of sheets of shape memory alloy which have been coated with an adhesive primer layer, e.g., a sol-gel primer to form a laminate, and curing the laminate to form the composite structure. Ans. 5 (citing Ogisu 2, Figs. 1, 2, and 5, ¶¶ 19, 39–56). The Examiner further relies on Ogisu 2 for its disclosure of heating the laminate to morph the shape of

[10] We refer to the Final Office Action mailed February 5, 2014, the Appeal Brief filed July 7, 2014, the Examiner's Answer mailed October 23, 2014, and the Reply Brief filed December 15, 2014.

the composite including the shape memory alloy. Ans. 8 (citing Ogisu ¶¶ 40, 42–43, 46).

To account for some of the recited features missing in Ogisu 2, the Examiner relies on Westre which discloses hybrid laminates of metal foil and composite plies suitable for aircraft. The Examiner relies on Westre for its disclosure that it was well known in the art to use an additional adhesive layer between the composite ply and the sheet of titanium that has been coated with an adhesive bond primer at the time of the invention. Ans. 5–6 (citing Westre col. 5, ll. 12–51). The Examiner also relies on Westre for its disclosure that it was well-known in the art to orient the fiber reinforced polymeric plies in such composite structure so that the fibers of adjacent plies separated by metal sheets were oriented in directions perpendicular to each other. Ans. 6 (citing Westre Abstract, Fig. 1, col. 5, ll. 61–64, col. 7, ll. 12–36). The Examiner also relies on Westre for its disclosure that it was well-known to use a polymeric resin such as a thermosetting resin that was cured to form an aircraft laminate formed of metal sheets and composite plies. Ans. 8 (citing Westre col. 5, ll. 55–63, col. 13, ll. 2–4).

The Examiner concludes it would have been obvious to one of ordinary skill in the art at the time of the invention to have used the additional adhesive layer to facilitate and enhance bonding between the sheets and plies, in each instance, and to have oriented adjacent plies with unidirectionally oriented fibers perpendicularly for the known structural benefits. Ans. 6–7. The Examiner further concludes it would have been obvious to use a thermosetting resin for use in forming the laminate in Ogisu 2. Ans. 8.

While maintaining that Ogisu 2 teaches that "the sheets of shape memory alloy undergo a sol-gel process, i.e., a wet-chemical technique of forming a layer of metal oxide devoid of fibers on the shape memory alloy" and reasoning that this meets the limitations as to "an interface having a gradient layer substantially devoid of fibers transitioning form the shape memory alloy sheet to the adhesive coating" (Ans. 7), the Examiner also relies on the prior art—specifically citing to Blohowiak—for explicitly teaching the use of such a sol-gel to provide such an interface (Ans. 9).

Blohowiak discloses surface treatment of metal alloys to form a sol-gel firm covalently bonded on the metal to form strong durable bonds between the metal and an organic adhesive. Blohowiak Abstract. The Examiner relies on Blohowiak for its disclosure that a sol-gel process can be used to provide "an interface having a gradient layer transitioning from a metal, e.g., titanium, sheet to a resin, e.g., adhesive, which layer is devoid of fibers and improves the adhesion between the metal and resin" (Ans. 9, citing Blohowiak col. 1, ll. 5–10, col. 2, ll. 62–66, col. 3, ll. 14–15, col. 4, ll. 56–67, Fig. 15).

The Examiner concludes it would have been obvious to one of ordinary skill in the art at the time of the invention to have performed the sol-gel process taught by Ogisu as modified by Westre in a conventional manner "as shown by Blohowiak to provide an interface having a gradient layer transitioning from the shape memory alloy to the layer of adhesive which layer is devoid of fibers and improves the adhesion therebetween." Ans. 9; *see also* 15.

Appellants' main contention as to all grounds of rejection is that, contrary to the Examiner's position, the presence of a sol-gel layer does not

inherently provide a gradient layer and the Examiner's reasoning is, accordingly, conclusory and incorrect. Appeal Br. 5–6.

As to the rejection over the combination of Ogisu 2, Westre, and Blohowiak, Appellants contend one of ordinary skill in the art would have no reason to believe that Ogisu 2 could or would create a gradient simply because it uses a sol-gel process. Appeal Br. 19 (citing Ogisu ¶ 52). This contention is apparently grounded, at least in part, on the proffer of evidence that sol-gel processes do not necessarily produce gradients (Appeal Br. 10–11) that the Examiner found untimely and did not consider (Ans. 10–11). Appellants' argument is without persuasive merit where, as explained above, the rejection is grounded on performing the sol-gel process in a manner so as to obtain the gradient layer, not on the process inherently providing such a gradient layer.

As to Appellants' contentions that Blohowiak does not contemplate the "use of the sol-gel process with shaped metal alloys . . . [and that these] present unique technical challenges . . . such as increased stress and strain caused by movement of the SMA" (Appeal Br. 19), they ignore that "[o]bviousness does not require an absolute predictability of success" (*In re O'Farrell*, 853 F.2d 894, 903904 (Fed. Cir. 1988)) and that a proper obviousness inquiry focuses on the collective teachings of the applied prior art references, rather than an individual reference (*In re Keller*, 642 F.2d 413, 425 (CCPA 1981)). Further, Appellants direct us to no evidence or persuasive argument as to why the teaching of Blohowiak would not be recognized as fully applicable to composites formed of shaped metal alloys. *In re Pearson*, 494 F.2d 1399, 1405 (CCPA 1974) ("Attorney's argument . . . cannot take the place of evidence."). Still further, Appellants' arguments

fail to properly "take account of the inferences and creative steps that a person of ordinary skill would employ" in overcoming difficulties in combining the teachings of the cited references. *KSR Int'l. Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

In the Reply Brief, Appellants reproduce relevant portions of the Examiner's Answer and state that "[t]hese arguments are addressed above, or are analogous to the above arguments and thus addressed above" in reference to the arguments made as to the rejections over Turner and Ogisu 1.[11] Reply Br. 7–8.

Having considered the record, we find no persuasive argument as to this ground of rejection in the Reply Brief, and further note that it is not the duty of the Board to ascertain what arguments, if any, might have been applicable to this ground of rejection or to scour the record for evidence to support such arguments. *See* 37 C.F.R. § 41.37(c)(1)(iv) (requiring citation to the portions of the record relied upon); *Gross v. Town of Cicero, Ill.*, 619 F.3d 697, 702 (7th Cir. 2010).

For these reasons, we are unpersuaded of reversible error in the Examiner's determination that claims 13–19 are unpatentable over Ogisu 2 in view of Westre and Blohowiak.

Further, as Appellants proffer no further substantive arguments as to the rejection of claims 20 and 21 in further view of Julien, but rely on the

[11] We note that the Reply Brief includes a teaching away argument as to the combination of Turner and Ogisu 1 (Reply Br. 5–7) that was not raised in the Appeal Brief (*generally* Appeal Br.), which we would have deemed waived if we were to have reached this ground of rejection as Appellants fail to show good cause for why it was not raised earlier (*see* 37 C.F.R. § 41.41(b)(2)).

arguments as to the base claims (Appeal Br. 20–21), we are likewise unpersuaded of reversible error in the Examiner's rejection of these claims.

Accordingly, we sustain the Examiner's rejection of claims 13–21 on these grounds.

CONCLUSION

The Examiner's decision rejecting claims 13–21 is AFFIRMED

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

AFFIRMED