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EXAMINER
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JOHN O. HALLQUIST

Appeal 2016-002751
Application 13/482,872
Technology Center 2100

Before MAHSHID D. SAADAT, CARL L. SILVERMAN, and ALEX S. YAP, *Administrative Patent Judges*.

YAP, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant[1] appeals under 35 U.S.C. § 134(a) from the final rejection of claims 1–11 and 13–15,[2] which are all the claims pending in this application. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

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[1] According to Appellant, the real party in interest is Livermore Software Technology Corporation. (App. Br. 1.)

[2] Claim 12 was cancelled previously. (*See* Final Office Action (mailed Jan. 16, 2015) ("Final Act.") 2.)

STATEMENT OF THE CASE

Introduction

Appellant's disclosed invention relates "to computer aided engineering analysis, more particularly to methods and systems for conducting a numerical simulation of a structure having heat-affected zone, which is located in the vicinity of heat sources (e.g., welding)." (May 29, 2012 Specification ("Spec.") ¶ 1.) Claim 1 is illustrative, and is reproduced below:

> 1. A method of conducting numerical simulation of a structure containing heat-affected zone (HAZ) using a finite element analysis (FEA) model, said method comprising:
>
> receiving, in a computer system having a FEA application module installed thereon, a FEA model having at least a group of finite elements configured for representing a welded part that encompasses a HAZ and each of said group of finite elements being configured with at least one integration point for numerical integration in FEA, wherein the HAZ is located near at least one heat source location;
>
> associating a set of HAZ material properties to said group of finite elements, wherein said set of HAZ material properties represents the welded part's structural behavior inside and outside of the HAZ;
>
> determining corresponding numerical material properties at each integration point by interpolating the associated set of HAZ material properties using shortest heat-propagation distance between said each integration point and the at least one heat source location with an automated procedure that requires no additional input after the HAZ material properties have been defined, the shortest heat-propagation distance being measured along a path on a surface including the surface's curvature effect, wherein the path connects said each integration point and the at least one heat source; and

> conducting a numerical simulation of the structure using the FEA model in the computer system with said corresponding numerical material properties determined at said each integration point.

Prior Art and Rejections on Appeal

The following table lists the prior art relied upon by the Examiner as evidence in rejecting the claims on appeal:

Zhao et al. ("Zhao")	*Finite element analysis of tailor-welded blanks*, 37 FINITE ELEMENTS IN ANALYSIS AND DESIGN 117–30 (2001)
Hou et al. ("Hou")	*Finite element analysis for the mechanical features of resistance spot welding process*, 185 JOURNAL OF MATERIALS PROCESSING TECHNOLOGY 160–65 (2007)
Yoshida et al. ("Yoshida")	US 2007/0199924 A1; Aug. 30, 2007
Dorum et al. ("Dorum")	*Finite element analysis of plastic failure in heat-affected zone of welded aluminum connections*, 88 COMPUTERS AND STRUCTURES 519–28 (2010)

Claims 1–5, 8–11, and 13–15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Dorum, in view of Yoshida, and further in view of Hou. (*See* Final Act. 2–20.)

Claims 6 and 7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Dorum and Yoshida, in view of Hou, and further in view of Zhao. (*See* Final Act. 20–24.)

ANALYSIS

We have reviewed the Examiner's rejections in light of Appellant's arguments that the Examiner has erred. We disagree with Appellant's

conclusions. We adopt as our own the findings and reasons set forth by the Examiner in the action from which this appeal is taken and the reasons set forth by the Examiner in the Final Office Action and the Examiner's Answer in response to Appellant's Appeal Brief and Reply Brief. (Final Act. 2–24; Ans. 28–39.) However, we highlight and address specific findings and arguments for emphasis as follows.

With respect to claim 1, the Examiner finds that:

> *Dorum and Yoshida do not expressly teach the shortest heat-propagation distance being measured along a path on a surface including the surface's curvature effect[,] wherein the path connects said each integration point and the at least one heat source*;
>
> *However Hou teaches* the shortest heat-propagation distance being measured along a path on a surface including the surface's curvature effect[,] wherein the path connects said each integration point and the at least one heat source . . . . *The heat propagation distance is necessarily through the elements in the model and thus takes on the effects of the curvature caused by the warping.*
>
> *As is well known to those having ordinary skill in the art, the heat moving through the finite elements is governed by the well-known laws of thermodynamics. According to these laws, the largest amount of heat flows through the heat conductors via the shortest conductive path between the hottest and coldest points (the sources and sinks of heat).* Finite element analysis accurately reflects these rules. Note that the heat flows through the heat conductors, and follows the shapes of the conductors, but the flow is through the shortest paths in these conductors. Thus Hou teaches predicting that heat will follow the shortest heat-propagation distance measured along a path on a surface including the surface's curvature effect, where the path connects each integration point and heat sources and sinks.

(Final Act. 7–8, original emphasis omitted, italics added.) Appellant disagrees and contends that the cited references neither teach nor suggest the underlined claim language:

> the collective disclosure of Dorum, Yoshida and Hou fails to teach or suggest a specific requirement to determine numerical material properties at a particular integration point of a finite element by interpolating the associated set of HAZ (Heat Affected Zone) material properties using shortest heat-propagation distance between the particular integration point and the heat source, the shortest heat-propagation distance being measured along a path on a surface including the surface's curvature effect.

(App. Br. 5–7, emphasis in original.) According to Appellant,

> Hou merely discloses the deformation would affect the properties of the welded joint. **Nowhere** does Hou teach or suggest how to determine the material properties at each integration point of a finite element located within HAZ in the specific manner recited in the underlined limitations set forth in claims l, 14 and 15.

(*Id.* at 6, emphasis in original.) Appellant further contends that the Examiner's

> assertions[, regarding the laws of thermodynamics,] appear to be personal opinions instead of conclusions derived from evidence[,] . . . which is not derived from the cited references [and that n]one of the alleged reasons in the OA is based on Hou, because Hou does NOT teach or suggest the underlined limitations of claims 1, 14 and 15.

(*Id.*) According to Appellant, this is because "the present invention as claimed in [c]laims 1, 14 and 15 is NOT related to heat flow or thermodynamics [and] . . . that any teaching in an Electrical Engineering textbook would not be related to limitation at issue whatsoever." (*Id.* at 7.)

In other words, Appellant is contending that the Examiner erred in using the laws of thermodynamics to explain the teachings of Hou.

Appellant has not persuaded us the Examiner erred. We find the Examiner's explanation that one of ordinary skill in the art would understand that "heat moving through the finite elements is governed by the well-known laws of thermodynamics" to be reasonable. We further agree with the Examiner's finding that Hou, and in particular Figure 10 of Hou, teaches or suggests the limitation at issue. Appellant does not explain why "the present invention as claimed in [c]laims 1, 14 and 15 is NOT related to heat flow or thermodynamics" when the claims themselves recite terms such as "shortest heat-propagation distance," etc. (*Id.* at 7–8.) Further, the Specification also discusses the effects of heat-propagation from a heat source. (*See, e.g.*, Spec. ¶¶ 4, 5, 38; Fig. 3.)

Appellant further contends that "Hou offers no indication of how the heat-propagation distance is measured *to determine which of the material properties to be used*." (Reply 3, emphasis added.) This is a new argument that is raised in reply and is deemed waived. *See In re Hyatt*, 211 F.3d 1367, 1373 (Fed. Cir. 2000) (noting that an argument not first raised in the brief to the Board is waived on appeal); *Ex parte Nakashima*, 93 USPQ2d 1834, 1837 (BPAI 2010) (informative) (explaining that arguments and evidence not timely presented in the principal Brief, will not be considered when filed in a Reply Brief, absent a showing of good cause explaining why the argument could not have been presented in the Principal Brief); *Ex parte Borden*, 93 USPQ2d 1473, 1477 (BPAI 2010) (informative) ("[p]roperly interpreted, the Rules do not require the Board to take up a belated argument that has not been addressed by the Examiner, absent a showing of good

cause."). Even if we consider this new argument, "one cannot show non-obviousness by attacking references individually where, as here, the rejections are based on combinations of references." *See In re Keller*, 642 F.2d 413, 426 (CCPA 1981). Specifically, the Examiner relies on Dorum for the "determining corresponding numerical material properties" portion of the limitation. (Final Act. 4–5.)

For the foregoing reasons, we are not persuaded the Examiner erred in rejecting claim 1, and thus we sustain the 35 U.S.C. § 103 rejection of claim 1. Appellant does not make any separate, substantive patentability arguments regarding independent claims 14 and 15 and dependent claims 2–11 and 13, but instead rely solely on the arguments raised with respect to claim 1. (App. Br. 7.) Therefore, we also sustain the 35 U.S.C. § 103(a) rejections of claims 2–11 and 13–15.

DECISION

We affirm the decision of the Examiner to reject claims 1–11 and 13–15.

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). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED