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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte TOFAIL ANSAR SYED, JAMES M. CARLSON,
SHANE CARR, PAUL DEVEREUX, DONNCHA HAVERTY,
SHAY J. LAVELLE and TIM MCGLOUGHLIN

Appeal 2011-012908
Application 11/899,420
Technology Center 1700

Before CHUNG K. PAK, CHARLES F. WARREN, and
DEBORAH KATZ, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

DECISION ON APPEAL

Applicants appeal to the Board from the final rejection of claims 1-17. We have jurisdiction. 35 U.S.C. §§ 6 and 134(a) (2002); 37 C.F.R. § 41.31(a) (2010).

An oral hearing was held January 25, 2013.

We affirm the decision of the Primary Examiner.

Claim 1 illustrates Appellants' invention of a nickel-titanium alloy (claim 1) which can be used to manufacture medical devices (claim 11), and

is representative of the claims on appeal:

1. A nickel-titanium alloy comprising:

nickel at a concentration of from about 34 at.% to about 60 at.%;

titanium at a concentration of from about 34 at.% to about 60 at.%;

at least one rare earth element at a concentration of from about 0.1 at.% to about 15 at.%,

wherein the at least one rare earth element is selected from the group consisting of La, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Ac, Th, Pa, and U.

Appellants request review of the grounds of rejection under 35 U.S.C. § 103(a) advanced on appeal by the Examiner: claims 1-10 over Kaneko (EP 0 783 040 A1), and claims 11-17 over Solingen (US 2003/0193314 A1) and Kaneko. App. Br. 10; Ans. 4, 6.

Appellants rely on Chan-Yeol Seo et al. (Seo), *Effect of Ti and Zr additions on the characteristics of AB_5-type hydride electrode for Ni-MH secondary battery*, INT'L J. HYDROGEN ENERGY 28 (2003) 317-327.

Appellants do not argue any particular claim with respect to the first ground of rejection and rely on the same arguments with respect to the second ground of rejection. App. Br. 11-18, 18-19. Thus, we decide this appeal based on representative claim 1. 37 C.F.R. § 41.37(c)(1)(vii) (2010).

OPINION

We are of the opinion Appellants have not established that the Examiner erred in concluding that one of ordinary skill in the art would have been led by Kaneko to nickel-titanium alloys falling within claim 1. Ans. 4-5, 8-12; App. Br. 11-18; Reply Br. 1-7.

We determine representative claim 1 specifies any nickel-titanium alloy comprising at least nickel (Ni) in the range of about 34 to 60 at.%;

titanium (Ti) in the range of about 34 to 60 at.%; and at least one or a mixture of rare earth elements in the range of about 0.1 to 15 at.%, wherein the rare earth elements within that range are selected from the specified group of rare earth elements. We determine that the transitional term "comprising" opens claim 1 to include alloys containing at least the specified elements and any additional elements, including additional rare earth elements, in the range of 0 to 35.9 at.% based on the specified at.% ranges of Ni, Ti, and rare earth(s) in the composition. *See* Spec., e.g., ¶¶ 0069, 0080. *See*, *e.g.*, *In re Crish*, 393 F.3d 1253, 1257 (Fed. Cir. 2004)("[I]t is well-established that "'[c]omprising' is a term of art used in claim language which means that the named elements are essential, but other elements may be added and still form a construct within the scope of the claim.'" (quoting *Genentech, Inc. v. Chiron Corp.*, 112 F.3d 495, 501 (Fed. Cir. 1997)); *Exxon Chem. Patents, Inc. v. Lubrizol Corp.*, 64 F.3d 1553, 1555 (Fed. Cir. 1995) ("The claimed composition is defined as comprising - meaning containing at least - five specific ingredients."); *In re Baxter*, 656 F.2d 679, 686 (CCPA 1981) ("As long as one of the monomers in the reaction is propylene, any other monomer may be present, because the term 'comprises' permits the *inclusion* of other steps, elements, or materials.").

We find that Kaneko would have disclosed to one of ordinary skill in the art a rare earth metal-nickel-base hydrogen absorbing alloy having the composition specified by the formula $(R_{1-x}L_x)(Ni_{1-y}M_y)_z$, wherein R is specified as one of the rare earth elements La, Ce, Pr or Nd, or mixtures thereof; L is specified as one of the rare earth elements Gd, Tb, Dy, Ho, Er,

Tm, Yb, Lu, Y and Sc,[1] and the alkaline earth elements Mg or Ca, or mixtures thereof; M is specified as one of 17 elements, including Al, Co, Mn and Ti, or mixtures of the 17 elements; and the atomic ratios of the elements, including Ni, in $(R_{1-x}L_x)$ and $(Ni_{1-y}M_y)_z$ are specified by the ranges $0.05 \leq x \leq 0.4$, $0 \leq y \leq 0.5$, $3.0 \leq z < 4.5$. Kaneko abstract, 3:34-42, 4:40 to 5:3.

Kaneko would have disclosed that an alloy of any combination of elements as specified by the formula and processed by the disclosed method to have the specified crystalline structure, would function as a rare earth metal-nickel-base hydrogen absorbing alloy, which can be used in, among other things, compositions for preparing anodes for nickel-hydrogen rechargeable batteries. Kaneko abstract, 2:5-7, 3:1-54, 7:33 to 8:7. Kaneko would have disclosed that the method of producing the alloy includes particular heat treatment conditions using a roll casting device which imparts a certain surface roughness. Kaneko 3:47-52.

Kaneko would have disclosed that each of R, L and M can be a single element or a mixture of elements, disclosing preferences for elements and amounts thereof. Kaneko 4:40 to 5:34. Kaneko would have disclosed that the 4 rare earth element(s) R can preferably be used in certain amounts, and "[a]lternatively, misch metal may be used." Kaneko 4:48-51. Kaneko would have further disclosed that the M elements can be mixed in a "combination of more than one element. The combination of more than one element may suitably be made depending on the properties of each metal."

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[1] *See*, *e.g.*, **Lanthanides**, 14 KIRK-OTHMER ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY 1091 (4th ed., John Wiley & Sons. 1995) ("The rare earths comprise lanthanides, yttrium, . . . and scandium.").

Kaneko 5:4-5. Kaneko would have disclosed the specific properties imparted by each of the M elements, including Ti, and the preferred atomic "mixing ratio" of that M element "represented by y, i.e. the atomic ratio of M when (Ni+M) is 1," when two or more M elements are mixed in an alloy composition of the specified formula and the alloy is prepared by the disclosed method. Kaneko 5:5-34.

Kaneko would have disclosed specific compositions which have mixtures of each of the 4 R rare earth elements, mixtures of the M elements Al, Co, Mn and Fe along with the M elements B, Mo, W and Cu, and a single element for L which is either a rare earth element or an alkaline earth element. Kaneko 5:37-6:22, Tables 1-1, 2-1, 3-1.

The Examiner determines that one of ordinary skill in the art routinely following the teachings of Kaneko would have reasonably selected an alloy composition in which elements R and L are rare elements and mixtures of rare-earth elements as specified, and element M is specifically Ti. The Examiner finds that the at.% ranges of rare earth elements R and L, the element Ni and the M element Ti in the atomic ratios of $(R_{1-x}L_x)$ and $(Ni_{1-y}M_y)_z$ as specified by ranges $0.05 \leq x \leq 0.4$, $0 \leq y \leq 0.5$, $3.0 \leq z < 4.5$ in Kaneko's formula, overlap with the at.% ranges of the same elements specified in claim 1. Ans. 4-5, 8-11. The Examiner submits the findings in tables in the Answer, wherein "REE" denotes L elements (table at note 1, page 4, and pages 8-9) and the rare earth elements R and L are combined (table at 4-5 and 9).

We cannot agree with Appellants that the express teachings of Kaneko would have dissuaded one of ordinary skill in the art from selecting Ti from the elements specified for formula member M and using this element in the

disclosed alloys in the at.% range specified in claim 1, as the Examiner contends. App. Br. 11-16. We fail to find that one of ordinary skill in the art would have found that Kaneko's disclosure of specific elements for each of R, L and M, combined in at.% ranges based on the specific ranges $0.05 \leq x \leq 0.4$, $0 \leq y \leq 0.5$, $3.0 \leq z < 4.5$ in Kaneko's formula is so broad that alloys having the properties disclosed by Kaneko would have been arrived at only by undue experimentation, as Appellants contend. App. Br. 11-12, 14-15.

Indeed, we find one of ordinary skill in the art would have recognized that all of the R elements and almost all of the L elements are rare earth elements. *See above* pp. 3-4. Thus, in order to arrive at a rare earth metal-nickel-base hydrogen absorbing alloy following the teachings of Kaneko, one of ordinary skill in the art would have had to select only at least one of the 17 M elements, each of which are disclosed by Kaneko to form an alloy with rare earth elements and Ni in the specified at.% by the disclosed method that has the disclosed properties.

Appellants' contention respecting Kaneko's preferences for selecting the amount "y" of each of the M elements, including Ti, misconstrues Kaneko's disclosure at page 5, lines 5-34. App. Br. 12-13. Indeed, Kaneko's guidance is directed to "[t]he combination of more than one element . . . depending on the properties" of each of the M elements, and the disclosed preferred atomic "mixing ratio" of each M element applies when used in "combination" with other M elements. *See above* p. 4. Thus, Kaneko would have reasonably taught that the full range of $0 \leq y \leq 0.5$ applies when only one M element is used in the alloy.

We are also unconvinced by Appellants' contention that Kaneko does

not exemplify an alloy containing Ti because Kaneko's teachings are not limited to preferred embodiments. App. Br. 16. *See*, *e.g.*, *In re Lamberti*, 545 F.2d 747, 750 (CCPA 1976) ("The fact that neither of the references expressly discloses asymmetric dialkyl moieties is not controlling; the question under 35 U.S.C. 103 is not merely what the references expressly teach, but what they would have suggested to one of ordinary skill in the art at the time the invention was made.").

We are of the view that the format used by Kaneko to describe the disclosed rare earth metal-nickel-base hydrogen absorbing alloy is the same format used by Appellants in the Specification and claim 1 to describe the claimed nickel-titanium alloy (*see above* p. 3), and we find that Seo uses the same format to describe alloys. Seo abstract. Thus, contrary to Appellants' position, Kaneko's art-recognized format describes a finite set of alloys by specifying the elements in at.% ranges without requiring further modification for selection of an alloy or alloys having the disclosed properties. We note that this art-recognized format has also been consistently recognized in this respect by our reviewing court and one of its predecessor courts. Indeed, we know of no authority to the contrary and none has been cited by Appellants. *See*, *e.g.*, *In re Harris*, 409 F.3d 1339, 1341-44 (Fed. Cir. 2005), and cases cited therein; *In re Peterson*, 315 F.3d 1325, 1329-30 (Fed. Cir. 2003), and cases cited therein ("The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages."); *In re Boesch*, 617 F.2d 272, 276 (CCPA 1980); *Titanium Metals Corp. of Am. v. Banner*, 778 F.2d 775, 783 (Fed. Cir. 1985) ("proportions [of metal content in alloys] are so

close that prima facie one skilled in the art would have expected them to have the same properties); *cf.*, *e.g.*, *Takeda Chem. Indus., Ltd. v. Alphapharm Party, Ltd.*, 492 F.3d 1350, 1356-357 (Fed. Cir. 2007) (The "test for prima facie obviousness for chemical compounds[, requiring 'a showing that the 'prior art would have suggested making the specific molecular modifications necessary to achieve the claimed invention,'] is consistent with the legal principles enunciated in *KSR*.") (quoting *In re Deuel*, 51 F.3d 1552, 1558 (Fed Cir. 1995).

Accordingly, we are of the opinion that Kaneko's disclosure of specific elements in specific at.% ranges which result in alloys having the disclosed properties is not analogous to the disclosure of a very broad genus of substances in a reference that provides no teachings which would have directed one of ordinary skill in the art to select particular moieties necessary to arrive at the claimed compounds, as was the case in *In re Baird*, 16 F.3d 380, 382-83 (Fed. Cir. 1994), on which Appellants rely. App. Br. 12, 15-16.

We are also unconvinced that Appellants have carried the burden of establishing that the evidence in Seo based on Seo's LM-Ni-Al-Co-Mn-M system alloys, wherein M in this system AB_5-type alloy is Ti or Zr, would have been recognized by one of ordinary skill in the art as pertinent to Kaneko's alloys such that one of ordinary skill in the art would have been led away from Kaneko's alloys containing the M element Ti at an at.% of y = 0.5, as Appellants contend. App. Br. 16-17; Reply Br. 5-6. Indeed, we find that Seo's tested AB_5-type LM-Ni-Al-Co-Mn-M system alloys differ at least from the alloys of Kaneko in that Kaneko's alloys can have different rare earth elements R, have the *additional* rare earth element(s) L, and the M element is solely Ti as relied on by the Examiner, that is, the M elements Al,

Co, and Mn are *not* present.

In this respect, we find that Seo would have disclosed to one of ordinary skill in the art that the tested AB_5-type LM-Ni-Al-Co-Mn-M system alloys are "AB_5-type intermetallic compounds . . . prepared by arc-melting in an argon atmosphere," and "[t]he composition of a stoichiometric compound $(LMNi_{3.6}Al_{0.4}Co_{0.7}Mn_{0.3})M_y$ (LM = La-rich mischmetal, M = Ti, Zr; y = 0.0, 0.02, 0.05, 0.1, 0.2, 0.3) with a hexagonal $CaCu_5$ structure was varied by stoichiometric and nonstoichiometric addition of Ti or Zr," but would not have disclosed the amount of "LM." Seo abstract, 318-19 (2. Experimental procedure 1st¶), 326 (right col. 1st¶). *See* Ans. 11-12. We find that Seo does not reference Kaneko. Seo 327.

We find that "mischmetal" is well known in the art as a mixture of the rare earth elements Ce, La, Nd and Pr in various amounts that can contain small amounts of other rare earth metals. We find Seo describes "LM" as "La-rich mischmetal" but does not disclose the composition thereof. Seo abstract.

We find Kaneko would have disclosed to one of ordinary skill in the art that a known "anode for a nickel-hydrogen rechargeable battery which is currently produced . . . is mainly produced with an AB_5 type alloy which has a light rare earth elements such as La, Ce, Pr, Nd, or a mixture of these elements (Mm (misch metal)) in A-site, and Ni, Co, Mn, and/or Al in B-site," and has certain drawbacks. Kaneko 2:8-17. Kaneko would have distinguished the disclosed rare earth metal-nickel-base hydrogen absorbing alloys from the known AB_5 type alloys. Kaneko 3:8-33

Indeed, we, like the Examiner, found Kaneko would have disclosed that rare earth element R in the formula is one or more of La, Ce, Pr and Nd

in the at.% in combination with rare earth and alkaline earth metal element(s) L in the relationship ($R_{1-x}L_x$) specified by the range $0.05 \leq x \leq 0.4$, and that the element M can be solely Ti. We found that Kaneko would have disclosed that the alloy is prepared by a particular method using a roll casting deice with certain heat treatment conditions using a roll casting deice,. *See above* pp. 3-5.

Thus, Seo's AB_5-type LM-Ni-Al-Co-Mn-M system alloys prepared by an arc-melting process are materially different from Kaneko's rare earth metal-nickel-base hydrogen absorbing alloys relied on by the Examiner which contain additional rare earth element(s) L, the M element Ti and not the mixture of Al, Co and Mn, and are prepared by a different process.

On this record, we find that Appellants have not established that one of ordinary skill in the art would have considered that Seo's tested AB_5-type LM-Ni-Al-Co-Mn-M system alloys prepared by an arc-melting process are sufficiently similar to Kaneko's rare earth metal-nickel-base hydrogen absorbing alloys which contain at least one additional rare earth element L and different element(s) M, and are prepared by certain heat treatment conditions using a roll casting deice, and particularly the alloys which contain Ti as the sole element M as relied on by the Examiner, for the results of Seo's experiments to teach away from the claimed alloys within Kaneko's disclosure. App. Br. 16-17; Reply Br. 5-7. Indeed, in response to the Examiner's position that Seo's disclosure is based in part on "a very specific set of compositions [($LMNi_{3.6}Al_{0.4}Co_{0.7}Mn_{0.3}Ti_y$ wherein y = 0.0, 0.02, 0.05, 0.1, 0.2, 0.3)]," Appellants contend that "[a]ll of the alloys disclosed by both Kaneko and Seo are AB_5-type alloys that require [Ni] and one or more rare earth elements, where [Ti] is an optional dopant," without submitting

evidence or argument which support the contention in view of the evidence in Kaneko and Seo, the latter not referencing the former. Advisory action mailed December 28, 2010, at 3 (*see* Ans. 11-12); App. Br. 17 (original emphasis omitted). We find no teaching in Seo which specifically criticizes the teachings of Kaneko. *Cf. In re Young*, 927 F.2d 588, 591-92 (Fed. Cir. 1991) (citing *In re Keller*, 642 F.2d 413, 425 (CCPA 1981)) (specific evaluation of teachings of one reference in another reference must be considered for what the combined teachings of the references would have suggested to one of ordinary skill in the art).

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in Kaneko with Appellants' countervailing evidence of and argument for nonobviousness, including reliance on Seo, and conclude, by a preponderance of the evidence and weight of argument, that the claimed invention encompassed by appealed claims 1-10 would have been obvious as a matter of law under 35 U.S.C. § 103(a).

Turning now to the ground of rejection of claims 11-17 over Solingen and Kaneko, Appellants rely on the same position with respect to Kaneko, pointing out that Solingen "does not remedy the deficiencies of Kaneko." App. Br. 18. Accordingly, we affirm the ground of rejection of claims 11-17 under 35 U.S.C. § 103(a) over Solingen and Kaneko for the reasons we set forth with respect to Kaneko.

The Primary Examiner's decision 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)(iv).

AFFIRMED

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