The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

Paper No. 29

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte TSUNETOSHI GOTOU and NOBUO ABE

Appeal No. 2003-2136
Application No. 09/562,952

HEARD: March 17, 2004

Before HAIRSTON, MARTIN, and BARRY, *Administrative Patent Judges*.

BARRY, *Administrative Patent Judge*.

DECISION ON APPEAL

A patent examiner rejected claims 7-17. The appellants appeal therefrom under 35 U.S.C. § 134(a). We affirm-in-part.

BACKGROUND

The invention at issue on appeal is a method for manufacturing a spark plug for an internal combustion engine; the spark plug includes a noble metal chip bonded on the tip of a center electrode. (Spec. at 1.) Laser welding is used to bond the noble metal chip to the center electrode. More specifically, a laser beam having a high energy density is focused on a junction of the chip and the electrode. The noble metal of the

chip and the metal of the electrode are thereby melted into a molten bond at the junction.

According to the appellants, because the ratio of the noble metal to the electrode's metal in the molten bond depends on the energy of the laser beam, the durability of a spark plug, in turn, depends on the energy of the laser beam. If the chip is made of iridium ("Ir"), and the electrode is made of nickel ("Ni"), for example, the ratio of Ir to Ni in the molten bond will be small because the melting point of Ir, viz., 2450°C, is much higher than that of Ni, viz., 1450°C. (*Id.* at 2.) Such a ratio, they explain, cannot alleviate thermal stress at the junction of the chip and the electrode. If the laser's energy is increased to melt more Ir in a higher ratio, because the melting point of Ir, *infra*, and the boiling point of Ni, viz., 2700°C, are not far apart, (*id.* at 2-3), they add, the Ni evaporates and makes voids in the molten bond and a large depression is formed on the periphery of the bond.

In contrast, the appellants form a chip made from an Ir-alloy; the alloy contains a noble metal such as rhodium ("Rh") that features a lower melting point than Ir. A laser beam is radiated on a junction of the chip and a Ni electrode to form a molten bond. The Rh contained in the noble metal chip is melted into the molten bond, forming an alloy containing Ni, Rh, and Ir. (*Id.* at 3.) According to the appellants, the molten bond

thus made features "a high bonding strength and a small thermal stress, and thereby durability of the spark plug is improved." (*Id.* at 19.)

A further understanding of the invention can be achieved by reading the following claim.

> 7. A method of manufacturing a spark plug for an internal combustion engine, the spark plug including an insulator having a through-hole formed therein, a center electrode made of a nickel-based alloy disposed at one end of the through-hole, a metal housing holding the insulator therein, and a ground electrode connected to the metal housing and disposed to face the center electrode, forming a spark gap therebetween, the manufacturing method comprising steps of:
>
> attaching a noble metal chip directly on a flat end surface of the center electrode, the noble metal chip being made of an iridium alloy containing iridium and a noble metal having a melting point in a range from 1,500 to 2,100 °C and a linear expansion coefficient in a range from 8×10^{-6} to 11×10^{-6}/°C, the iridium alloy having a melting point equal to or higher than 2,200 °C, a surface area of the flat end surface of the center electrode, to which the noble metal chip is directly attached, being larger than a surface area of the noble area [sic; metal] chip which is directly attached to the flat end surface of the center electrode; and
>
> radiating a laser beam on the noble metal chip in a direction substantially perpendicular to an axial direction of the center electrode, thereby forming a molten bond containing more than 1-weight-percent noble metal having a melting point in a range from 1,500 to 2,100 °C and a linear expansion coefficient in a range from 8×10^{-6} to 11×10^{-6}/°C between the center electrode and the noble metal chip.

Claims 7-15 and 17 stand rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 5,440,198 ("Oshima '198"); U.S. Patent No. 6,094,000 ("Osamura");

and U.S. Patent No. 5,320,569 ("Oshima '569"). Claim 16 stands rejected under § 103(a) as obvious over Oshima '198; Osamura; Oshima '569; and U.S. Patent No. 5,395,273 ("Matsutani").

OPINION

Our opinion addresses the rejection of the claims in the following order:

- claims 7-15 and 17
- claim 16.

A. CLAIMS 7-15 AND 17

"[T]o assure separate review by the Board of individual claims within each group of claims subject to a common ground of rejection, an appellant's brief to the Board must contain a clear statement for each rejection: (a) asserting that the patentability of claims within the group of claims subject to this rejection do not stand or fall together, and (b) identifying which individual claim or claims within the group are separately patentable and the reasons why the examiner's rejection should not be sustained." *In re McDaniel*, 293 F.3d 1379, 1383, 63 USPQ2d 1462, 1465 (Fed. Cir. 2002) (citing 37 C.F.R. §1.192(c)(7) (2001)). "Merely pointing out differences in what the claims cover is not an argument as to why the claims are separately patentable." 37 C.F.R. § 1.192(c)(7) (2002). "If the brief fails to meet either requirement, the Board is free to select a single claim from each group of claims subject to a common ground of rejection

as representative of all claims in that group and to decide the appeal of that rejection based solely on the selected representative claim." *McDaniel*, 293 F.3d at 1383, 63 USPQ2d at 1465.

Here, the appellants stipulate, "[c]laims 7, 9, 15 and 17 stand or fall together." (Appeal Br. at 5.) Although they allege that "[c]laims 8 . . . [and] 11-14 . . . each stands or falls alone," (*id.*), they fail to satisfy the second requirement. The appellants offer no arguments specific to claims 8, 11, and 14. Their arguments allegedly "[r]egarding claims 12 and 13," (*id.* at 12), moreover, address limitations of claim 7. Therefore, claims 8-15 and 17 stand or fall with representative claim 7.

With this representation in mind, rather than reiterate the positions of the examiner or the appellants *in toto*, we address the following points of contention therebetween:

- combining Oshima '198 and Osamura
- chip area vis-á-vis electrode area
- properties of molten bond.

1. Combining Oshima '198 and Osamura

The examiner asserts, "Osamura . . . teaches one of ordinary skill in the art to add up to 10 percent of one of Pt, Pd or Rh to the Ir or Ir alloy chips containing rare earth metal oxides in order to obtain a longer spark plug life." (Examiner's Answer at 8.) The appellants argue, "even though Osamura mentions an Ir-Rh alloy in column 3, line 32, without the benefit of applicant's disclosure, the skilled artisan would not be taught by the art of record that there would be any use or advantage to forming the chip of Oshima from an Ir-Rh alloy. . . ." (Appeal Br. at 11.)

"The presence or absence of a motivation to combine references in an obviousness determination is a pure question of fact." *In re Gartside*, 203 F3d 1305, 1316, 53 USPQ2d 1769, 1776 (Fed. Cir. 2000) (citing *In re Dembiczak*, 175 F.3d 994, 1000, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999). "'[T]he question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination.'" *In re Beattie*, 974 F.2d 1309, 1311-12, 24 USPQ2d 1040, 1042 (Fed. Cir. 1992) (quoting *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1462, 221 USPQ 481, 488 (Fed. Cir. 1984)). "[E]vidence of a suggestion, teaching, or motivation to combine may flow from the prior art references themselves, the knowledge of one of ordinary skill in the art, or, in some cases, from the nature of the problem to be solved. . . ." *Dembiczak*, 175 F.3d at 999, 50 USPQ2d at 1617 (citing *Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc.*, 75

F.3d 1568, 1573, 37 USPQ2d 1626, 1630 (Fed. Cir. 1996); *Para-Ordnance Mfg. v. SGS Imports Int'l, Inc.*, 73 F.3d 1085, 1088, 37 USPQ2d 1237, 1240 (Fed. Cir. 1995)).

Here, we find that evidence to combine flows from the references themselves. Oshima '198 "provide[s] a spark plug in which a noble metal firing tip is positively bonded to a front end of a center electrode by means of a laser beam welding. . . ." Col. 1, ll. 43-45. The reference "discloses, as the [firing tip] chip to be bonded, an iridium alloy. . . ." (Appeal Br. at 8.) More specifically, the "firing tip [chip] 6 is . . . made of . . . Pt-Ir alloy or iridium-based alloy including oxides of rare earth metals." Col. 4, ll. 58-61. Although Oshima '198 does not specifically mention that the Ir-based alloy could include Rh, the reference invites "various modifications and additions to the specific embodiments [to] be made by [a] skilled artisan. . . ." Col. 6, ll. 65-66.

For its part, Osamura "provide[s] a noble metal chip for a spark plug, the chip having an improved heat resistance and consumption resistance at high temperatures." Col. 1, ll. 49-52. "The most important feature of the [reference's] invention resides in the alloy material of the noble metal chips . . . composed of an Ir-Rh alloy based on Ir (iridium), which has a high melting point and good consumption resistance, and containing Rh (rhodium) for preventing Ir from volatilizing at high temperatures." Col. 3, ll. 29-34. Although "the addition of any of less volatilizable noble metals of Pd, Pt, and

Rh prevents the volatilization consumption of Ir," col. 3, l. 66 - col. 4, l. 1, "[t]he addition of Rh is most effective, mostly because Rh has a melting point of 1960°C. . . ." Col. 4, ll. 1-2. Because Oshima '198 invites modifications and additions to the Ir-based alloy of its chip, and Osamura discloses that an Ir-Rh alloy improves heat resistance and consumption resistance, offers a high melting point, and prevents volatilizing, we are persuaded that the references would have suggested forming a spark plug's firing tip chip from an Ir-Rh alloy and using laser beam welding to bond the chip to a front end of a center electrode.

2. Chip Area vis-á-vis Electrode Area

The examiner finds, "Oshima '98, figure 11, teaches a spark plug having a noble metal chip welded on a flat end surface of the center electrode wherein . . . the center electrode has a larger diameter than the noble metal chip" (Examiner's Answer at 3.) The appellants argue, "[o]n the other hand, Oshima '69 mentions at column 8, lines 30-34 that it is preferable *not* to provide a diameter difference, in order to attain a better penetration of laser beams. " (Appeal Br. at 11.)

In addressing the point of contention, the Board conducts a two-step analysis. First, we construe the representative claim to determine its scope. Second, we determine whether the construed claim would have been obvious.

a. Claim Construction

"Analysis begins with a key legal question -- *what* is the invention *claimed*?" *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1567, 1 USPQ2d 1593, 1597 (Fed. Cir. 1987). In answering the question, "the Board must give claims their broadest reasonable construction. . . ." *In re Hyatt*, 211 F.3d 1367, 1372, 54 USPQ2d 1664, 1668 (Fed. Cir. 2000).

Here, claim 7 recites in pertinent part the following limitations: "a surface area of the flat end surface of the center electrode, to which the noble metal chip is directly attached, being larger than a surface area of the noble area chip which is directly attached to the flat end surface of the center electrode. . . ." Giving the representative claim its broadest, reasonable construction, the limitations require that the surface area of a noble metal chip be smaller than the surface area of an electrode to which it is attached.

b. Obviousness Determination

Having determined what subject matter is being claimed, the next inquiry is whether the subject matter would have been obvious. The question of obviousness is "based on underlying factual determinations including . . . what th[e] prior art teaches explicitly and inherently. . . ." *In re Zurko*, 258 F.3d 1379, 1386, 59 USPQ2d 1693,

1697(Fed. Cir. 2001) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966); *In re Dembiczak*, 175 F.3d 994, 998, 50 USPQ 1614, 1616 (Fed. Cir. 1999); *In re Napier*, 55 F.3d 610, 613, 34 USPQ2d 1782, 1784 (Fed. Cir. 1995)).

Here, the appellants admit, "Figure 11 of Oshima '98 shows a chip 6 having a smaller diameter connected to a constricted end 4A [of a center electrode] having a larger diameter." (Appeal Br. at 11.) Because the reference teaches that "the diameter (D) of the firing [chip] tip 6 is smaller than a diameter (Do) of the constricted end 4A," col. 6, ll. 44-46, of a center electrode (4), we find that the surface area of the chip is smaller that the surface area of the electrode to which it is attached. Contrary to the appellants' argument, Oshima '569 permits, if not prefers, a difference between the diameter (D) of a noble metal chip and the diameter (d) of an electrode to which it is attached. Specifically, "[t]he dimension (d-D)/2 is preferably in the range of 0.1 mm~ 0.15 mm." Col. 8, ll. 40-41. Figure 9b of the reference shows, moreover, that the surface area of its noble metal chip (2) is smaller than that of the electrode (1) to which it is attached.

3. Properties of Molten Bond

The examiner asserts, "one can not [sic] weld such noble metal chips [of Osamura] to the center electrode as disclosed by Oshima '98 and Oshima '69 and

obtain a 'firm and durable' bond and not obtain the invention recited in the rejected claims." (Examiner's Answer at 8.) The appellants argue, "there is no suggestion as to properties of the molten bond or its constituents, such as the melting point and the linear expansion coefficient, disclosed in Oshima '98 or Oshima '69 nor discoverable from routine experimentation based on their teachings." (Appeal Br. at 9.)

a. Claim Construction

Claim 7 recites in pertinent part the following limitations: "radiating a laser beam on the noble metal chip in a direction substantially perpendicular to an axial direction of the center electrode, thereby forming a molten bond containing more than 1-weight-percent noble metal having a melting point in a range from 1,500 to 2,100 °C and a linear expansion coefficient in a range from 8×10^{-6} to 11×10^{-6}/°C between the center electrode and the noble metal chip." Giving the representative claim its broadest, reasonable construction, the limitations require that the molten bond formed by laser welding the noble metal chip to the electrode feature a melting point in a range from 1,500 to 2,100 °C and a linear expansion coefficient in a range from 8×10^{-6} to 11×10^{-6}/°C.

b. Obviousness Determination

"[I]t is elementary that the mere recitation of a newly discovered function or property, inherently possessed by things in the prior art, does not cause a claim drawn to those things to distinguish over the prior art." *In re Swinehart*, 439 F.2d 210, 212-13, 169 USPQ 226, 229 (CCPA 1971). Furthermore, "'where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristic relied on.'" *In re Schreiber*, 128 F.3d 1473, 1478, 44 USPQ2d 1429, 1432 (Fed. Cir. 1997) (quoting *Swinehart*, 439 F.2d at 213, 169 USPQ at 229).

Here, the combined teachings of the references would have suggested forming a firing tip chip from the same alloy that the appellants use. Because "rhodium . . . has a lower melting point than iridium," (Spec. at 3), the appellants form their chip from an Ir-Rh alloy. (*Id.*) As explained regarding the first point of contention, the references would have suggested such an Ir-Rh alloy. The appellants explain that a sufficient "bonding strength well over 100 N is secured when more than 2% wt Rh is contained in noble metal chip. . . ." (Spec. at 8-9.) Osamura's Ir-Rh alloy, which "contains Rh in an

amount . . . preferably from 3 wt % to 30 wt %," col. 2, ll. 33-35, would have satisfied the appellants' requirement for more than 2% wt Rh.

The combined teachings of the references also would have suggested forming a central electrode from the same alloy that the claim recites. Specifically, the claimed "center electrode [is] made of a nickel-based alloy. . . ." Similarly, Oshima '198 teaches a "nickel-alloyed center electrode. . . ." Abs., l. 1.

The combined teachings of the references further would have suggested using the same type of laser to weld the Ir-Rh alloy chip to the center electrode. Specifically, a "YAG laser is used," (Spec. at 7), for the appellants' welding. Likewise, "[t]he laser beam welding [of Oshima '198] is carried out by using YAG (yttrium, aluminum and garnet) laser beams (Lb). . . ." Col. 3, ll. 66-67.

Because the combined teachings of the references would have suggested forming a chip from the same Ir-Rh alloy that the appellants use, forming a central electrode from the same alloy that the claim recites, and using the same type of laser to weld the alloy chip to the center electrode, we have reason to believe that the molten bond formed by the welding would have inherently featured a melting point in a range from 1,500 to 2,100 °C and a linear expansion coefficient in a range from 8×10^{-6} to

11 x 10^{-6}/°C. The appellants failed to prove to the contrary. At the oral hearing, the appellants' attorney admitted not knowing whether the resultant bond suggested by the references would have featured the claimed ranges of melting points and linear expansion coefficients. Therefore, we affirm the rejection of claim 7 and of claims 8-15 and 17, which fall therewith.

B. CLAIM 16

The examiner admits that "[n]either Oshima '98 nor Osamura specify the specific welding parameters for welding iridium alloy tips to a flat surface of a center electrode." (Examiner's Answer at 7.) Attempting to remedy the omission, the examiner asserts, "since Matsutani, column 2, line 43, states welding energies of from 5 to 7.5 Joules for welding a platinum-iridium alloy, a slightly higher welding energy for welding the iridium-rhodium chip to a flat surface of the center electrode of Oshima '98 as above modified would have been expected since the chip alloy has a higher melting point." (*Id.* at 7.) The appellants argue, "Matsutani relates to an assembly that differs structurally from the combination claimed by applicant and therefore the skilled artisan would not 'obviously' adopt the parameters taught in Matsutani in the Oshima/Oshima/Osamura combination." (Appeal Br. at 13.)

1. Claim Construction

Claim 16 recites in pertinent part the following limitations: "the Yag laser energy is in a range of 5.0 J -10.0 J." Giving the representative claim its broadest, reasonable construction, the limitations require that the laser welding be carried out in an energy range of 5.0 - 10.0 Joules (J).

2. Obviousness Determination

"In rejecting claims under 35 U.S.C. Section 103, the examiner bears the initial burden of presenting a *prima facie* case of obviousness." *In re Rijckaert*, 9 F.3d 1531, 1532, 28 USPQ2d 1955, 1956 (Fed. Cir. 1993) (citing *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992)). "'A *prima facie* case of obviousness is established when the teachings from the prior art itself would . . . have suggested the claimed subject matter to a person of ordinary skill in the art.'" *In re Bell*, 991 F.2d 781, 783, 26 USPQ2d 1529, 1531 (Fed. Cir. 1993) (quoting *In re Rinehart*, 531 F.2d 1048, 1051, 189 USPQ 143, 147 (CCPA 1976)).

Here, Oshima '198 discloses that its "laser beam welding is carried out by using YAG (yttrium, aluminum and garnet) laser beams (Lb) with one shot energy as **2 Joules**." Col. 3, ll. 66-68 (emphasis added). For its part, Matsutani describes how "[a] ring-shaped noble metal material 60 is laser-welded to an outer side wall 42 of a

front end of the center electrode 4 so as to provide a noble metal portion 6." Col. 3, ll. 36-39. More specifically, the latter reference includes the following disclosure.

> In this instance, the laser beam welding is carried out by using YAG (yttrium, aluminum and garnet) laser beams (L) emitting forty-eight shots at 11 mm underfocus (5 pps) with one shot energy and pulse duration as **7.5 Joules** and 2.0 milliseconds, respectively, emitting forty-eight shots at 11 mm underfocus (5 pps) with one shot energy and pulse duration as **7.5 Joules** and 2.0 millseconds, [sic] respectively, emitting thirty-six shots at 2 mm center electrode diameter and just focus (12 pps) with one shot energy and pulse duration as **5 to 6 Joules** and 2.0 milliseconds respectively, and emitting forty-eight shots at 2.5 mm center electrode diameter and just focus (14 pps) with one shot energy and pulse duration as **5.5 to 6.5 Joules** and 2.0 milliseconds respectively.

Col. 3, l. 59 - col. 4, l. 4 (emphases added). In summary, Matsutani carries out its laser welding in an energy range of 5 - 7.5 J. We are not persuaded that it would have been desirable to have substituted the energy range used by the latter reference, which does not involve an iridium-rhodium alloy, for the energy used by Oshima '198 when the iridium-based alloy disclosed therein takes the form of an iridium-rhodium alloy, as suggested by Osamura. The examiner does not allege, let alone show, that the addition of Oshima '569 would have suggested the desirability. Therefore, we reverse the rejection of claim 16.

CONCLUSION

In summary, the rejection of claims 7-15 and 17 under § 103(a) is affirmed. The rejection of claim 16 under § 103(a), however, is reversed. "Any arguments or

authorities not included in the brief will be refused consideration by the Board of Patent Appeals and Interferences. . . ." 37 C.F.R. § 1.192(a). Accordingly, our affirmance is based only on the arguments made in the brief. Any arguments or authorities not included therein are neither before us nor at issue but are considered waived. *Cf. In re Watts*, 354 F.3d 1362, 1368, 69 USPQ2d 1453, 1457 (Fed. Cir. 2004) ("[I]t is important that the applicant challenging a decision not be permitted to raise arguments on appeal that were not presented to the Board.") No time for taking any action connected with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED-IN-PART

KENNETH W. HAIRSTON Administrative Patent Judge	)	
JOHN C. MARTIN Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
LANCE LEONARD BARRY Administrative Patent Judge	)	

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