UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

THE AMERICAN TORCH TIP CO.
Respondent, Requester

v.

Patent of KOMATSU LTD.
Appellant, Patent Owner

Appeal 2015-004987
Inter partes Reexamination Control 95/002,300
Patent US 6,320,156 B1[1]
Technology Center 3900

Before JOHN C. KERINS, STEVEN D.A. McCARTHY and DANIEL S. SONG, *Administrative Patent Judges*.

Opinion of the Board filed by McCARTHY, *Administrative Patent Judge*.

Opinion dissenting-in-part, filed by SONG, *Administrative Patent Judge*.

McCARTHY, *Administrative Patent Judge*.

DECISION ON APPEAL

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[1] Issued November 20, 2001 to Yoshihiro Yamaguchi and Kazuhiro Kuraoka (the "'156 patent"). The '156 patent issued from Appl. 09/567,064, filed May 8, 2000. The parties have not identified any related proceedings involving the '156 patent.

STATEMENT OF THE CASE

The claims of the '156 patent are directed to consumable electrodes and nozzles for plasma torches. The Patent Owner appeals the Examiner's decision rejecting:

Ground 1: newly-added, independent claims 25–27, 38, 45 and 50, along with newly-added, dependent claims 29, 31–33, 39–42, 46 and 51, under pre-AIA 35 U.S.C. § 112, second paragraph, as being indefinite (*see* Right of Appeal Notice, mailed April 16, 2014 ("RAN") at 12–21);

Ground 2: independent claim 45 and its dependent claim 46 under pre-AIA 35 U.S.C. § 102(b) as being anticipated by Couch '126 (US 5,317,126, issued May 31, 1994) (*see* RAN 22 & 23);

Ground 3: amended, independent claim 13 and newly-added, dependent claim 34 under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Sperling (US 5,473,131, issued Dec. 5, 1995), Sobr (US 5,624,586, issued Apr. 29, 1977) and Luo (US 5,856,647, issued Jan. 5, 1999) *(see* RAN 23 & 24);

Ground 4: independent claim 13 and its dependent claim 34; independent claim 25 and its dependent claim 29; and independent claim 27 under § 103(a) as being unpatentable over Couch '126, Sobr, Luo and Reed (US 5,308,949, issued May 3, 1994) (*see* RAN 24–27);

Ground 5: independent claim 45 and its dependent claim 46 under § 103(a) as being unpatentable over Couch '126 and Couch '308 (US 3,641,308, issued Feb. 8, 1972) (*see* RAN 27 & 28);

Ground 6: independent claim 50 and its dependent claim 51 under § 103(a) as being unpatentable over Couch '126, Couch '308, Sobr, Luo and Reed (*see* RAN 29–31);

Ground 7: newly-added, independent claim 48 under § 103(a) as being unpatentable over Tsurumaki and Couch '126 (*see* RAN 31–34); and

Ground 8: newly-added claims 25–27, 29, 31–33, 38–42, 45, 46, 50 and 51 under pre-AIA 35 U.S.C. § 314(a) as enlarging the scope of the claims of the patent undergoing reexamination (*see* RAN 34 & 35).

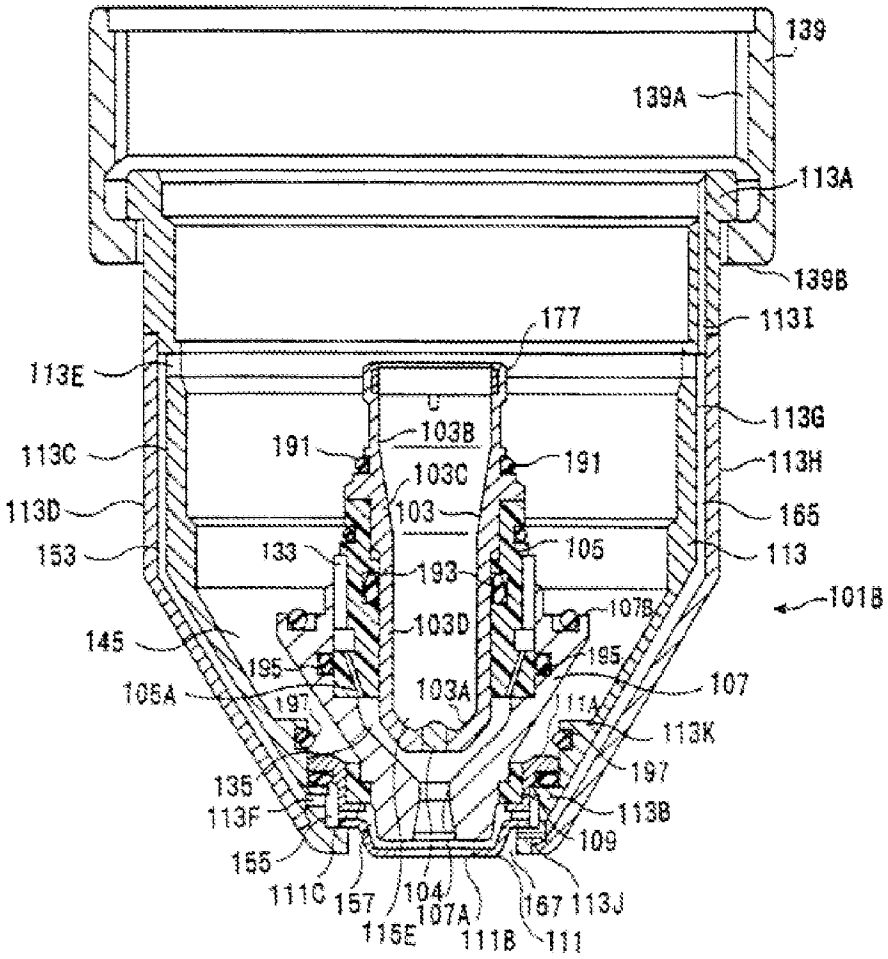
Claims 1–8 are not subject to reexamination. Original claims 9–12 and 14–24, as well as newly-added claims 28, 30, 35–37, 43, 44, 47, 49, 52 and 53, are cancelled. (*See* RAN, cover page).

The Patent Owner has withdrawn the appeal with respect to claim 48. (*See* "Appeal Brief by Patent Owner," dated July 11, 2014 ("Appeal Brief" or "App. Br. PO"), at 1 (omitting claim 48 from the list of appealed claims) & 13 ("Claim 48 is not subject to this appeal."); *see also* "Examiner's Answer," mailed November 4, 2014 ("Answer" or "Ans."), at 2). Therefore, we summarily AFFIRM the Examiner's rejection of claim 48. *See* MANUAL OF PATENT EXAMINING PROCEDURE § 1215.03.

We have jurisdiction under pre-AIA 35 U.S.C. § 134(b) and 35 U.S.C. § 315(a). We AFFIRM the Examiner's decision adopting Grounds 4 and 6 (Ground 7 being summarily affirmed as to claim 48). We REVERSE the Examiner's decision to adopt Grounds 1, 2, 5 and 8. Because our affirmance of the Examiner's decision to adopt Ground 4 as to claims 13 and 34 is dispositive of the appeal as to those claims, we do not reach Ground 3.

THE '156 PATENT

Figure 3 of the '156 patent, reproduced below with some reference numerals moved, is a side sectional view of a detachable unit *101B* for a plasma torch.



The detachable unit as depicted in Figure 3 includes an electrode *103*, an insulating guide *105* and a nozzle *107* received inside a retainer cap *113*. (*See* '156 patent, col. 16, ll. 17–19). An internally threaded rotating ring *139* couples the retainer cap *113* to the torch main unit *101A*. (*See* '156 patent, col. 12, ll. 20–37; & Figs. 1 & 3).

The electrode *103* fits into a hollow in the insulating guide *105* and is held in place by frictional contact with an elastic O-ring seal *193*. The insulating guide *105* fits into a hollow in the nozzle *107* and is held in place by frictional contact with an elastic O-ring seal *195*. (*See* '156 patent, col. 16, ll. 23–31; & Figs. 3–5). The retainer cap *113* receives the nozzle *107*,

which is held in place in the retainer cap by an elastic O-ring seal *197*. (*See* '156 patent, col. 16, ll. 31–35 & 47–56; & Fig. 3).

As a consequence, the electrode *103*, the insulating guide *105* and the nozzle *107* may be received into the retaining cap *113* as a unit. (*See* '156 patent, col. 16, ll. 19–23; & Fig. 4). Once the rotating ring *139* is unscrewed from the torch main unit *101A*, the entire detachable unit *101B* may be pulled off the torch main unit *101A* as a unit. (*See* '156 patent, col. 17, ll. 7–12). The insulating guide *105* and the nozzle *107* may be pulled apart and independently replaced once the detachable unit *101B* is separated from the torch main unit *101A*. (*See* '156 patent, col. 16, ll. 19–23).

Figure 9 of the '156 patent, reproduced on the next page, is a side sectional view of the electrode *103*. Figure 11, reproduced on the next page, is a side sectional view of the electrode *103* received in an electrically conductive inner sleeve *117* of the torch main unit; and fitted over and around a water pipe *115*.

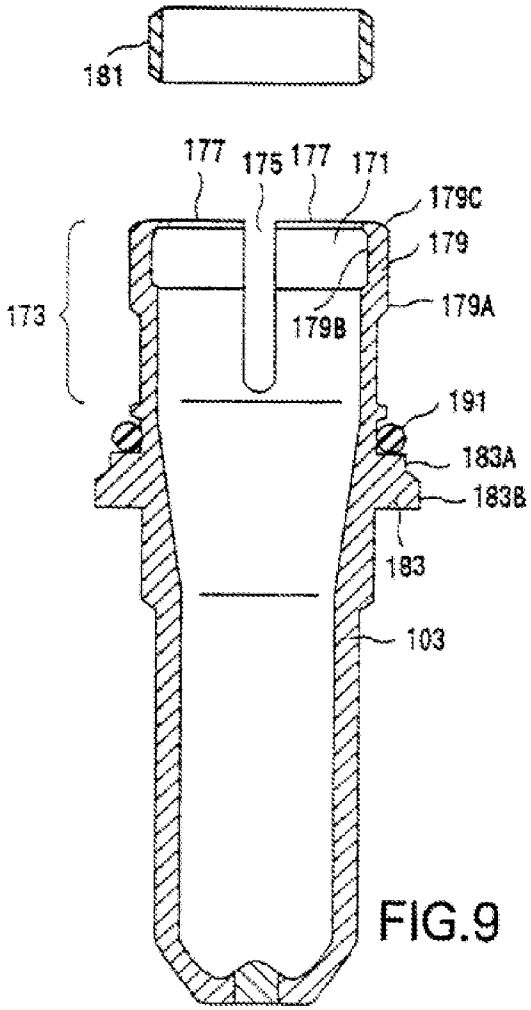


FIG.9

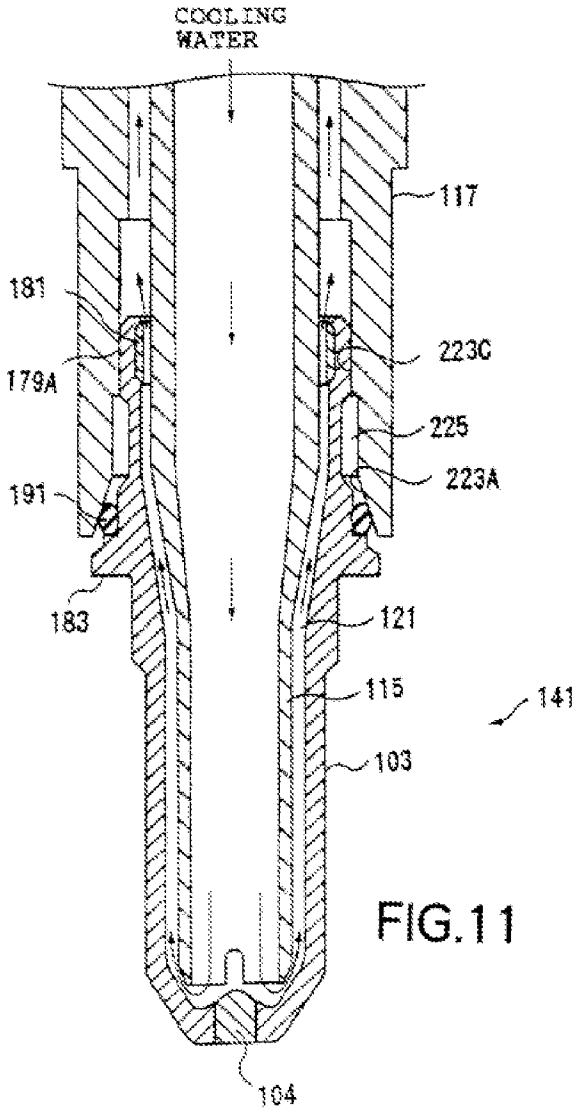


FIG.11

Figure 9 depicts the electrode *103*. The '156 patent teaches that the electrode *103* is fabricated from copper. (*See* '156 patent, col. 20, l. 66 – col. 21, l. 5). The electrode *103* is cylindrical in shape and hollow. A closed front end section *103A* of the electrode *103* receives an insert *104* of a heat-resistant material such as hafnium. (*See* '156 patent, col. 10, ll. 37–43). A skirt section *173* near the axially opposite, open end of the electrode *103* includes a large diameter section *179*. The large diameter section *179* has an inner diameter greater than the outer diameter of the portion of the electrode near the front end section *103A*. The large diameter section *179* also

includes a plurality of slits *175* defining a plurality of elastic, inwardly compressible tongues *177*. (*See* '156 patent, col. 20, l. 66 – col. 21, l. 15).

Figure 11 depicts the electrode *103* received in the electrically conductive inner sleeve *117* of the torch main unit; and fitted over and around the water pipe *115*. When the detachable unit *101B* is positioned on the torch main unit *101A*; and when the rotating ring *139* is threaded onto the torch main unit and tightened, an electrically conductive inner sleeve *117* of the torch main unit receives and captures the skirt section *173* of the electrode. The inwardly-compressible tongues *177* of the electrode *103* flex inwardly to fit into the inner sleeve *117*. The elasticity of the compressible tongues *177*, reinforced by a spring ring *181*, presses the large diameter section *173* of the electrode *103* into contact with the inner, circumferential surface *223* of the inner sleeve *117*. The '156 patent teaches that the outer, circumferential surface *179A* of the large diameter section *173* defines an electrical connection surface. The electrode *103* receives electrical power by way of the inner sleeve *117* through its electrical connection surface. (*See* '156 patent, col. 21, ll. 15–31 & 48–50; & Figs. 1 & 9–11).

The water pipe *115*, which is a part of the torch main unit *101A*, projects coaxially into the hollow of the electrode *103* within the inner sleeve *117* when the electrode is captured in the inner sleeve. (*See* '156 patent, col. 10, ll. 32–51; & Figs. 1 & 11). When the detachable unit *101B* is coupled to the torch main unit *110A*, cooling water flows through a passage *119* within the water pipe *115* into the interior of the electrode *103*. The cooling water flowing through a passage *119* contacts and cools the electrode *103* and the insert *104*. As depicted in Figure 11, the water then turns and flows in the opposite axial direction through an annular passage *121* between the outer, circumferential surface of the electrode *103* and the

inner, circumferential surface *223* of the inner sleeve *117*. The cooling water exits this annular passage *121* through the slits *175* in the skirt section *173* of the electrode *103*. The cooling water then flows through a series of connected passageways toward the exterior surface of the nozzle *107*. (*See* col. 11, ll. 15–22; col. 13, ll. 3–8 & 25–31; col. 22, ll. 49–65; & Figs. 1 & 11).

Claim 13 is illustrative:

> 13. An electrode for a plasma torch which is retained by coupling detachably with an electrode seating of the plasma torch, and which receives a supply of arc current by being connected electrically to said electrode seating, said electrode having an approximately cylindrical shape, and comprising:
>
> an electrical connection surface which contacts an electrical connection surface on said electrode seating, thereby forming an electrical connection between said electrode and said electrode seating, when the electrode is coupled to said electrode seating;
>
> an elastic member which presses the electrical connection surface of said electrode against the electrical connection surface of said electrode seating by elastic force generated by elastic deformation, when the electrode is coupled to said electrode seating;
>
> a heat resistant insert forming an arc generating point at the front end portion thereof; and
>
> a skirt section which is inserted into said electrode seating at the base end portion thereof, said skirt section being divided by a plurality of slits into a plurality of said elastic members which are tongue-shaped and capable of elastic deformation in the inward direction, and these tongue-shaped elastic members having said electrical connection surface on the outer circumference thereof.

(App. Br. PO 31 (Claims App'x)).

THE RECORD

The Examiner's findings, conclusions and reasoning are explained primarily in the RAN. The Examiner uses the Answer to respond to the Patent Owner's arguments addressing Grounds 1 and 8. (*See* Ans. 2). The Patent Owner's contentions appear in the Appeal Brief and the "Rebuttal Brief by Patent Owner," dated December 3, 2014 ("Reb. Br. PO"). The Requester's position appears in the "Third Party Requester's Response to Patent Owner's Appeal Brief," dated August 11, 2014 ("Respondent Brief" or "Resp. Br. Req'r"). Neither party appears to rely on any affidavits or other evidence extrinsic to the patent under reexamination and the teachings of the cited references.

Only those arguments actually made by the Patent Owner have been considered. We address the various arguments of the Patent Owner *infra* in an order that differs from the order presented. Arguments that the Patent Owner could have made but chose not to make have not been considered and are deemed to be waived. *See* 37 C.F.R. § 41.67(c)(1)(vii) (2011); *In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011). The record supports all findings of fact by a preponderance of the evidence. *See Rambus Inc. v. Rea*, 731 F.3d 1248, 1255 (Fed. Cir. 2013); *Ethicon, Inc. v. Quigg*, 849 F.2d 1422, 1427 (Fed. Cir. 1988).

GROUND 1: INDEFINITENESS

In Ground 1, the Examiner rejects claims 25–27, 29, 31–33, 38–42, 45, 46, 50 and 51 under pre-AIA 35 U.S.C. § 112, second paragraph, as indefinite. The second paragraph of § 112 requires that the specification of a patent "conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the [patent owner] regards as the invention." Our reviewing court instructs us that "how much clarity is required necessarily invokes some standard of reasonable precision in the use of language in the context of the circumstances." *In re Packard*, 751 F.3d 1307, 1312 (Fed. Cir. 2014).

In *Orthokinetics Inc. v. Safety Travel Chairs Inc.*, 806 F.2d 1565, (Fed. Cir. 1986), the patent undergoing litigation claimed a wheel chair having a front portion "so dimensioned as to be insertable through the space between the doorframe of an automobile and one of the seats thereof." *Id*. at 1568. Our reviewing court reversed a district court's conclusion that the claim was indefinite, observing that:

> It is undisputed that the claims require that one desiring to build and use a travel chair must measure the space between the selected automobile's doorframe and its seat and then dimension the front legs of the travel chair so that they will fit in that particular space in that particular automobile. Orthokinetics' witnesses, who were skilled in the art, testified that such a task is evident from the specification and that one of ordinary skill in the art would easily have been able to determine the appropriate dimensions.

Orthokinetics at 1576. Our reviewing court also concluded that the "phrase 'so dimensioned' is as accurate as the subject matter permits, automobiles being of various sizes." *Id*. Although *Orthokinetics* arose out of a litigation context, where a presumption of validity applies, rather than out of a

reexamination, its holding provides some guidance for applying § 112 in the context of the present reexamination.

"Circumference Surface"

The Examiner rejects claims 25–27, 38, 45 and 50 on the basis that the term "circumference surface" as used in those claims is indefinite. (*See* Ans. 2 & 3; RAN 12–14 & 35–37). In addition, the Examiner rejects claims 25 and 50 on the basis that the relationship between the "outer circumference surface of the electrode" and the "one of [the] outer circumference surfaces of the tongue-shaped elastic members," as recited in claim 25, is unclear. (*See* RAN 14 & 15; *see also* RAN 21).

The Examiner concludes that the ordinary meaning of the term "circumference surface" is a "continuous" surface (by which the Examiner appears to imply a surface that is, loosely speaking, convex in a topological sense) that coincides with the external boundary or periphery of an object. (*See* RAN 35 & 36 ("Indeed, according to Merriam-Webster.com, the word 'circumference' is defined as 'the external boundary or surface of a figure or object: PERIPHERY'. However, [this dictionary definition] would appear to require at least a continuous structure, which is entirely consistent with the geometric meaning of 'circumference'."); *see also id.* at 12). While traversing the rejection of claim 25 under the second paragraph of § 112, the Patent Owner asserted before the Examiner that "a surface [could] be divided into several sections by slits, but [could] still be considered one surface since these sections [were] connected at the base portions thereof, and, thus, form[ed] a continuous surface." ("Patent Owner's Response to Non-Final Office Action in *Inter partes* Reexamination," dated Oct. 18, 2013 ("October 2013 Amendment"), at 24). The Examiner interprets this

argument as advocating a broader definition of the term "circumference surface," inconsistent with the Examiner's conclusion as to the term's ordinary meaning. (*See* RAN 13).

The Patent Owner correctly argues that "one of ordinary skill in the art . . . reasonably [would have ascertained] that the term 'circumference' is used throughout the specification of the '156 patent to mean 'peripheral surface' or, in some context[s], 'a portion of the peripheral surface.'" (App. Br. PO 7; *see also* Reb. Br. PO 2). This interpretation is demanded at least by the claim language itself. For example, claim 25 recites:

> a skirt section divided by a plurality of slits into a plurality of said elastic members which are tongue-shaped and capable of elastic deformation in the inward direction . . . , and one of [the] outer circumference surfaces of the tongue-shaped elastic members defining the at least one electrical connection surface.

Claim 50 similarly recites an electrode "comprising: . . . a skirt section divided by a plurality of slits into a plurality of tongue-shaped members capable of plastic deformation in the inward direction, with one of [the] outer circumference surfaces of the tongue-shaped members defining the at least one electrical connection surface." In these cases, the tongue-shaped elastic members do not have any surface that extends continuously around the entire outer periphery of the electrode. One of ordinary skill in the art would have recognized that the words "circumference surface" as used in these limitations referred to portions of the outer peripheral surface of the electrode rather than to the entire peripheral surface of the electrode. In other words, one of ordinary skill could have ascertained with reasonable precision whether the words "circumference surface" in context read on an entire peripheral surface or only a part of such a surface. The Examiner has

not shown that the words "circumference surface" render the rejected claims indefinite.

"Provided on" and "Located on"

In the RAN, the Examiner also rejects claims 25, 26 and 50 on the basis that the words "located on" and "provided on" as used in those claims are indefinite. (*See* Ans. 3 & 4; RAN 14). For example, claim 25 and claim 50 each recites an electrode, "the at least one electrical connection surface of the electrode being located on an outer circumference surface of the electrode." Claim 26 also recites an electrode, "the electrical connection surface of the electrode being located on an outer circumference surface of the electrode." In the RAN, the Examiner concludes that it "is unclear as to how the 'electrical connection surface' . . . can be 'located on' an outer circumference surface of the electrode . . . , when the electrical surface is actually defined by the electrode outer circumference." (RAN 14 (citations omitted), citing '156 patent, Fig. 9). For similar reasons, the Examiner also concludes in the RAN that the limitation "a flange located on the outer circumference surface of the electrode" as recited in claims 27 and 32; and the limitations, "a second elastic member installing section provided on the outer circumference surface of the guide" and "a plurality of grooves located on the outer circumferential surface of the guide," as recited in claim 38, are indefinite. (*See* RAN 18).

On the other hand, on page 4 of the Answer, the Examiner "does not necessarily disagree" with the Patent Owner's assertion that one of ordinary skill in the art would have understood the words "located on" to be synonymous with "defined by" (*see* App. Br. PO 8). This statement indicates that the Examiner no longer relies on the words "located on" or

"provided on" as a basis for concluding that these claims are indefinite. (*See* Reb. Br. PO 2 & 3).

Claim 38 recites a cylindrical guide including "a first elastic member installing section provided on the inner circumference surface of the guide." The Examiner concludes that:

> Claim 38 is unclear as to how the first elastic member installing section can be "provided on" the inner circumference of the guide . . ., when the installing section is actually defined by an inner circumference surface of the guide which does not appear to confront an outer circumference surface of the electrode due to the O-ring 193.

(RAN 17 & 18 (citations to line numbers in claim 38 omitted), citing '156 patent, Figs. 3 & 4). Claim 45 recites a nozzle including "an elastic member contacting section provided on the inner circumference surface of the nozzle, and configured to contact an elastic member." The Examiner concludes with respect to the first of these limitations that:

> Claim 45 is unclear as to how the elastic member contacting section can be "provided on" the inner circumference surface of the nozzle, when the contacting section is actually defined by three inner nozzle surfaces, none of which appear to confront an outer circumference surface of the guide due to relative orientations and the O-ring 195.

(RAN 19, citing '156 patent, Figs. 3 & 4).

The Examiner has not persuasively explained why one of ordinary skill in the art might have understood the words "inner circumference surface," read in context, to be limited to a smooth surface rather than to encompass a surface having grooves or facets. Neither has the Examiner identified anything in the claim language or the written description of the '156 patent limiting the words "circumference surface" in such a fashion. The first elastic member installing section of the insulating guide *105* as

depicted in Figures 3 and 4 of the '156 patent, as well as the elastic member contacting section of the nozzle *107* as depicted in those drawing figures, take the form of grooves of rectangular cross-section bounded on three sides by facets extending circumferentially with respect to the insulating guide and the nozzle, respectively. The Examiner has not explained in a persuasive manner why the claim language would have been understood to be limited to a smooth surface so as to exclude these preferred embodiments.

The Examiner's statements that the first elastic member installing section recited in claim 38 does not "appear to confront an outer circumference surface of the electrode guide" (RAN 17 & 18); and that the elastic member contacting section recited in claim 45 does not "appear to confront an outer circumference surface of the guide" (RAN 19), are not commensurate with the language of the claims. Both quoted limitations specify the function of the respective sections in terms of their interactions with elastic members such as O-rings. Neither quoted limitation specifies that the recited section "confronts" the outer circumference surface of any other component of a plasma torch. In short, the Examiner has not explained persuasively why the quoted limitations from claim 38 and 45 render those claims indefinite.

"The Inner Circumference Surface Tapering in Accordance with a Changing Diameter of the Water Pipe"

Claims 26 and 31 recite electrodes. The Examiner rejects the two claims on the basis that the limitation, "the inner circumference surface [of the electrode] tapering in accordance with a changing diameter of the water pipe," as used in those claims is indefinite. The Examiner concludes that this language is indefinite because it is unclear whether the claim is sufficiently broad to include an electrode alone or whether the claim is limited to the combination of the electrode with a water pipe having a tapered shape. (*See* RAN 15, 38 & 39). In addition, the Examiner concludes that the limitation "tapering in accordance with a changing diameter of the water pipe" fails to define the relationship between the inner surface of the electrode and the outer surface of the water pipe with reasonable precision. (*See* RAN 15, 16 & 38).

Neither claim 26 nor claim 31 recites an electrode in combination with a water pipe. Instead, claim 26 recites an electrode having "an inner circumference surface configured to surround a water pipe . . . when the electrode is coupled to the electrode seating and the water pipe is inserted into the electrode." Claim 31 recites an electrode "wherein the inner circumference surface of the electrode is configured to surround a water pipe . . . when the electrode is coupled to the electrode seating and the water pipe is inserted into the electrode." (*See* App. Br. PO 10). The words "is configured to" imply that the water pipe is part of the environment or background against which the structural properties of the claimed electrodes are defined.

The '156 patent describes electrodes as consumable parts that are subject to wear over time and that may be replaced several times during a

day's processing work. ('156 patent, col. 1, ll. 25–29). Just as in the case of the wheel chairs at issue in *Orthokinetics*, one of ordinary skill in the art seeking to interpret the limitations imposed on the dimensions of the electrodes could have determined those dimensions based on the geometry of the plasma torches onto which the electrodes were to be installed. (*See* App. Br. PO 9). The Examiner has not shown that the limitation, "the inner circumference surface [of the electrode] tapering in accordance with a changing diameter of the water pipe," renders claims 26 and 31 indefinite.

"An O-Ring Contacting Section Provided on the Outer Circumference Surface of the Electrode . . ."

Claims 27 and 32 likewise recite electrodes. The Examiner rejects the two claims on the basis that the limitation, "an O-ring contacting section provided on the outer circumferential surface of the electrode and configured to contact an O-ring, which is interposed between an inner circumference surface of a cylindrical guide and the outer circumference surface of the electrode," as used in those claims is indefinite. The Examiner concludes that this language is indefinite because it is unclear whether the claim is sufficiently broad to include an electrode alone or whether the claim is limited to the combination of the electrode with an O-ring or a cylindrical guide, or both. (*See* RAN 16). The Examiner also concludes that the phrase "an inner circumference surface of a cylindrical guide" lacks "antecedent basis" because "a 'cylindrical structure does not inherently exhibit an inner circumference surface" (RAN 17; *see also* Ans. 5) and "a cylindrical structure with an inner circumference surface could relate to a cavity rather than a tubular structure" (RAN 39).

Much the same thing may be said here as of the contested language of claim 26. Neither claim 27 nor claim 32 recites an electrode in combination with either an O-ring or a cylindrical guide. Each claim recites an electrode including "an O-ring contacting section . . . configured to contact an O-ring." This language limits the structure of the electrode in terms of the electrode's contact with an O-ring, or the electrode's capacity to contact such an O-ring. (*See* App. Br. PO 10 & 11). Such a recitation may be satisfied by a suitable electrode alone even without an associated O-ring or cylindrical guide.

The MANUAL OF PATENT EXAMINING PROCEDURE ("MPEP") provides an example indicating that claim language is indefinite due to a lack of antecedent basis:

> where the claim refers to "said lever" or "the lever," where the claim contains no earlier recitation or limitation of a lever and where it would be unclear as to what element the limitation was making reference. Similarly, if two different levers are recited earlier in the claim, the recitation of "said lever" in the same or subsequent claim would be unclear where it is uncertain which of the two levers was intended. A claim which refers to "said aluminum lever," but recites only "a lever" earlier in the claim, is indefinite because it is uncertain as to the lever to which reference is made.

MPEP § 2173.05(e). The phrase "an inner circumference surface of a cylindrical guide" does not introduce either the inner circumference surface or the cylindrical guide with a definite article such as "the" or "said." As such, any defect in the phrase is not due to lack of antecedent basis.

Claims 27 and 32 recite an electrode including "an O-ring contacting section provided on the outer circumferential surface of the electrode and configured to contact an O-ring, which is interposed between an inner circumference surface of a cylindrical guide and the outer circumference

surface of the electrode." In the context of claims 27 and 32, the phrase "an inner circumference surface of a cylindrical guide" implies that the cylindrical guide has an inner circumference surface. (*See* App. Br. 11). Trying to "fix" this language, such as by reciting that "the cylindrical guide has an inner circumferential surface," could suggest that the cylindrical guide is an element of the claimed combination, thereby changing the scope of the claim. The Examiner has not shown that the limitation, "an O-ring contacting section provided on the outer circumferential surface of the electrode and configured to contact an O-ring, which is interposed between an inner circumference surface of a cylindrical guide and the outer circumference surface of the electrode," renders claims 27 and 32 indefinite.

"A First Elastic Member Installing Section Provided on the Inner Circumference Surface of the Guide and Configured to Accommodate a First Elastic Member"

The Examiner rejects claim 38 on the basis that the following limitations are indefinite:

> a first elastic member installing section provided on the inner circumference surface of the guide and configured to accommodate a first elastic member, which is interposed between the inner circumference surface of the guide and the outer circumference surface of the electrode . . . ; [and]
>
> a second elastic member installing section provided on the outer circumference surface of the guide and configured to accommodate a second elastic member, which is interposed between the outer circumference surface of the guide and the inner circumference surface of the nozzle.

The Examiner concludes that the words "configured to accommodate" are indefinite, reasoning that a "surface would appear to be insufficient structure to 'accommodate' an O-ring/elastic member, because a surface, as opposed

to a groove, would not 'make room for' an O-ring." (RAN 18, citing Merriam-Webster.com).

The Examiner correctly concludes that the word "accommodate" is sufficiently broad to encompass "mak[ing] room for" the elastic member. (*See* Ans. 5 & 6; RAN 18; *see also* App. Br. PO 12; Reb. Br. PO 5). The recitation that the first and second elastic member installing sections are "provided on" the inner and outer circumference surfaces of the guide limit the relationship between the first and second elastic member installing sections and the guide; and the recitation that each of the first and second elastic member installing sections is "configured to accommodate" an elastic member limits the structure of the elastic member installing section, for example, dimensionally. The Examiner has not shown that claim 38 is indefinite.

"The Elastic Member Contacting Section being Configured to be Disposed at a Position Overlapping the Part of the Cooling Water Passage as Viewed Along an Arbitrary Radial Cut Plane Extending Perpendicular to a Central Axis of the Nozzle"

Claim 45 recites a nozzle including:

> an outer circumference surface, with a part of the outer circumference surface being configured to define a part of a cooling water passage when the nozzle is disposed inside the plasma torch,
>
> the elastic member contacting section being configured to be disposed at a position overlapping the part of the cooling water passage as viewed along an arbitrary radial cut plane extending perpendicular to a central axis of the nozzle and passing through both of the elastic member contacting section and the part of the cooling water passage.

The Examiner concludes that the phrase, "the part of the cooling water passage" recited at the end of the second indented limitation lacks antecedent basis. (*See* RAN 20, 39 & 40). The phrase has its antecedent basis in the phrase "a part of a cooling water passage" appearing in the first indented limitation. (*See* App. Br. PO 12). In other words, both "part[s] of the cooling water passage" recited in the second indented limitation reproduced above are the same "part of a cooling water passage" recited in the second indented limitation. The language "as viewed along an arbitrary radial cut plane extending perpendicular to a central axis of the nozzle" modifies the participle "overlapping." The language does not imply, as the Examiner suggests (*see* RAN 41), that "the part of the cooling water passage" recited in the last indented limitation of claim 45 is a part different from that recited in the previous indented limitation.

The Examiner also concludes that the phrase "the elastic member contacting section being configured to be disposed at a position overlapping the part of the cooling water passage" is indefinite because it is unclear how the elastic member contacting section, which is physically separated from the cooling water passage, can "overlap" that passage. (*See* Ans. 7; RAN 20 & 40). Claim 45, in fact, defines the position in which the elastic member contacting section is configured to be disposed in terms of the geometry of nozzle and of the structure of the plasma torch that surrounds the nozzle when the nozzle is installed in the torch. More specifically, claim 45 recites that the elastic member contacting section overlaps the part of the cooling water passage "as viewed along an arbitrary radial cut plane extending perpendicular to a central axis of the nozzle and passing through both of the elastic member contacting section and the part of the cooling water passage." The elastic member contacting section and the cooling water

passage will "overlap" if such an arbitrary radial cut plane intersects both. (*See* App. Br. PO 13; *see also* Resp. Br. Req'r 4).[2] The Examiner has not shown that claim 45 is indefinite.

Conclusion

The Examiner has not shown that claims 25–27, 29, 31–33, 38–42, 45, 46, 50, and 51 are indefinite under the second paragraph of § 112. We do not sustain Ground 1 as applied to those claims.

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[2] We recognize that this interpretation renders the word "overlapping" somewhat superfluous, since similar positioning is conveyed by the recitation that the arbitrary radial cut plane "pass[es] through both of the elastic member contacting section and the part of the cooling water passage." Although claims ordinarily are interpreted so as to give meaning to every limitation, *see Stumbo v. Eastman Outdoors, Inc.*, 508 F.3d 1358, 1362 (Fed. Cir. 2007), "no canon of construction is absolute in its application," *Renishaw PLC v. Marposs S.p.A.*, 158 F.3d 1243, 1248 (Fed. Cir. 1998).

GROUND 8: ENLARGEMENT OF THE SCOPE OF THE ORIGINAL PATENT CLAIMS

In Ground 8, the Examiner rejects claims 25–27, 29, 31–33, 38–42, 45, 46, 50 and 51 under pre-AIA 35 U.S.C. § 314(a), as enlarging the scope of the claims of the patent undergoing reexamination. "A claim is enlarged if it includes within its scope any subject matter that would not have infringed the original patent." *In re Freeman*, 30 F.3d 1459, 1464 (Fed. Cir. 1994). The Examiner concludes as follows:

> All of original claims 12, 18, 21 and 24 reasonably required the elements of the "plasma torch" (antecedently recited in claim preambles) as part of the claimed combinations, because the language of the claim bodies necessarily relied upon those elements. However, all of new claims 25–27, 38, 45, 48 and 50 now [recite] (or appear to [recite]) those required plasma torch elements either functionally or futuristically ("adapted to", "configured to", "when", etc.). Thus, the new claims are considered to be broader in scope than the original forms, because functional/futuristic claim limitations are less restrictive than structural limitations.

(RAN 34 & 35; *see also* Ans. 8).

Claims 25–27 and 50 claim electrodes for plasma torches. Claim 38 claims a cylindrical guide. Claims 45 claims a nozzle. Independent claims 12, 18, 21 and 24, as issued in the '156 patent, differ from appealed, independent claims 25–27, 38, 45 and 50 in that issued claims 12, 18, 21 and 24 recite interactions between the claimed components and other components of plasma torches; whereas appealed claims 25–27, 38, 45 and 50 recite that the claimed components are "adapted to," "configured to" or "capable of" interacting with such other components.

For example, independent claim 12, as issued in the '156 patent, recites, with italics added for emphasis:

> 12. An electrode for a plasma torch, *which is retained* by coupling detachably with an electrode seating of a plasma torch, and *which receives* a supply of arc current by being connected electrically to said electrode seating, comprising:
>
> an electrical connection surface *which contacts* an electrical connection surface on said electrode seating, thereby forming an electrical connection between said electrode and said electrode seating, when the electrode is coupled to the electrode seating; and
>
> an elastic member *which presses* the electrical connection surface of said electrode against the electrical connection surface of said electrode seating by elastic forces generated by elastic deformation, when the electrode is coupled to said electrode seating.

('156 patent, col. 29, ll. 1–14). Appealed, independent claim 25 recites, also with italics added for emphasis:

> 25. An electrode for a plasma torch, *which is adapted to be retained* by coupling detachably with an electrode seating of the plasma torch, and *which is adapted to receive* a supply of arc current by being connected electrically to said electrode seating, the electrode comprising:
>
> at least one electrical connection surface *configured to contact* an electrical connection surface on the electrode seating, thereby forming an electrical connection between the electrode and the electrode seating, when the electrode is coupled to the electrode seating, . . . ; and
>
> a skirt section divided by a plurality of slits into a plurality of said elastic members *which are . . . capable of elastic deformation in the inward direction to press* the at least one electrical connection surface of the electrode against the electrical connection surface of the electrode seating by elastic force generated by the elastic deformation, when the electrode is coupled to the electrode seating, ...

The two claims differ in that claim 12, as issued in the '156 patent, recites interactions between the claimed electrode and an electrode seating of a plasma torch; whereas appealed claim 25 recites that the claimed electrode is "adapted to," "configured to" or "capable of" interacting with such an electrode seating. This distinction provides some support for the Examiner's conclusion that "the new claims are considered to be broader in scope than the original forms, because functional/futuristic claim limitations are less restrictive than structural limitations." (RAN 34 & 35).

Nevertheless, the Patent Owner correctly points out that issued claims 12 and 24 each recite an "electrode;" claim 18 recites a "cylindrical guide;" and claim 21 recited a "nozzle." The body of each of claims 12, 18, 21 and 24 recites only elements of the claimed electrode, cylindrical guide or nozzle as the subject of each indented limitation. Components of a plasma torch other than those claimed are introduced in the preamble and serve only as objects with which the claimed electrode interacts. (*See* App. Br. PO 28 & 29). Considering the structure of issued claims 12, 18, 21 and 24 in the context of the particular circumstances of this appeal as a whole, issued claim 12 claims an electrode capable of interacting with an electrode seating of a plasma torch, rather than an electrode in combination with the electrode seating. Issued claim 18 claims a cylindrical guide capable of fitting between a nozzle and an electrode; and installing first and second elastic members, rather than a cylindrical guide in combination with either a nozzle and an electrode; or first and second elastic members. Issued claim 21 claims a nozzle capable of covering an electrode by means of a cylindrical guide, rather than a nozzle in combination with an electrode and a cylindrical guide. Finally, issued claim 24 claims an electrode capable of

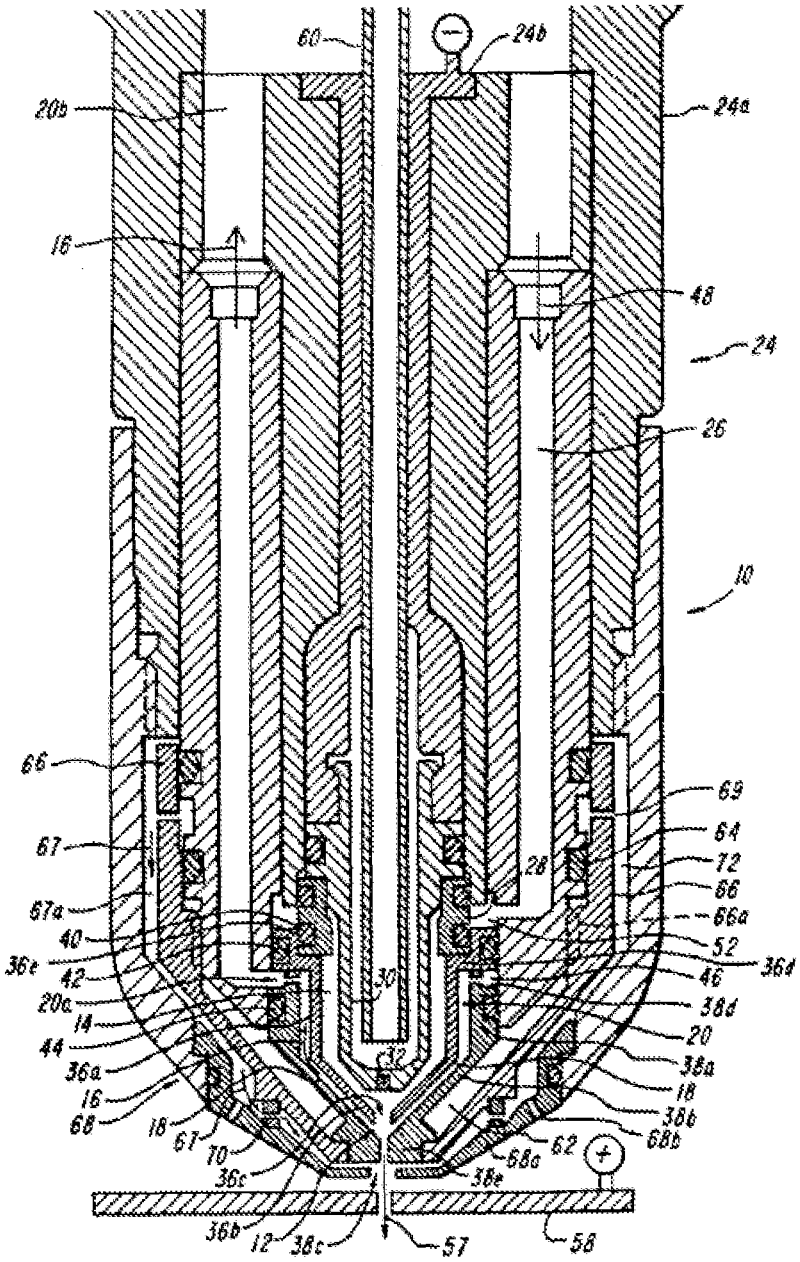
being covered by a nozzle by means of a cylindrical guide, rather than an electrode in combination with a nozzle and a cylindrical guide.

As such, the Examiner has not shown that appealed claims 25–27, 29, 31–33, 38, 39, 45, 46, 50 and 51 are broader than issued claims 12, 18, 21 and 24. We do not sustain Ground 8 as applied to appealed claims 25–27, 29, 31–33, 38, 39, 45, 46, 50 and 51. Because we have not sustained either Ground 1 or Ground 8, we REVERSE the Examiner's decision rejecting claims 26, 31–33, 38 and 39.

GROUNDS 2 AND 4–6: FINDINGS OF FACT

Couch '126

1. The primary reference in Grounds 2 and 4–6 is Couch '126. Figure 5 of Couch '126, reproduced in part below, is a side sectional view of a plasma cutting torch 10.



The torch *10* as depicted in Figure 5 includes a body *24* supporting an electrode *30* and a two piece nozzle *34* (not enumerated; *see* Fig. 7). (Couch '126, col. 4, ll. 17–24; *see also* Fig. 7).

2. Inner and outer nozzle pieces *36*, *38* of the two piece nozzle *34* have upper portions *36a*, *38a* that are generally tubular. The inner nozzle piece *36* includes an annular mounting flange *36d* located at its upper end. The mounting flange *36d* defines a stepped recess *36e* on the inner

circumference surface. Lower, generally conical portions *36b*, *38b* of the nozzle pieces *36*, *38* converge to a pre orifice *36c* and a nozzle exit orifice *38c*, respectively. (Couch '126, col. 4, ll. 24–35 & Figs. 5 & 7). As depicted in Figure 5 of Couch '126, the outer surface of the outer nozzle piece *38* defines the outer circumference surface of the nozzle *34*. The inner surface of the inner nozzle piece *36* defines the inner circumference surface of the nozzle.

3. The electrode *30* described by Couch '126 is hollow. As depicted in Figures 4, 5 and 7, the electrode *30* includes a flange situated between an upper end portion that engages the a cathode body *24b* of the torch body *24*; and a substantially cylindrical lower portion (identified by the reference numeral *30a* in Figure 7) terminating in a chamfered lower end (identified by the reference numeral *30a* in Figure 7) and a lower end face (identified by reference numeral *30c* in Figure 7) extending transversely to an axis of the electrode. A halfnium insert *32* is press fit into the lower end face *30c*. (Couch '126, col. 4, ll. 17–20 & 58–61).

4. The electrode *30* threadedly engages the cathode body *24b* of the plasma torch *10* so as to bias the electrode to a negative voltage. (Couch '126, col. 6, ll. 16–19 & Fig. 5; *see also* App. Br. PO 20). As depicted in Figures 4 and 5 of Couch '126, the flange of the electrode *30* defines a stepped recess on the outer circumference surface of the electrode that faces toward the nozzle *34* after the electrode and the nozzle are installed on the plasma torch *10*. It appears from Figure 5 that an axial socket or bore in a lower end of the cathode body *24b* receives an upper end of the electrode *30* above the flange; and that an external thread on an upper end of the electrode engages an internal thread in the socket or bore of the cathode body to position the electrode relative to the torch body *24* and the nozzle.

5. Couch '126 teaches biasing the nozzle *34* to a positive voltage, at least during an arc-formation phase. (*See* Couch '126, col. 6, ll. 19–22). The Examiner correctly finds that one of ordinary skill in the art would have recognized that the electrode *30* must be electrically insulated from the nozzle *34*. (*See* RAN 28).

6. As also depicted in Figures 4 and 5 of Couch '126, a cylindrical swirl ring *28* fits into the stepped recess on the outer circumference surface the electrode *30* and into a stepped recess *36e* on the inner circumference surface of the nozzle *34*. (*See* Couch '126, col. 4, ll. 17–20). As depicted in Figure 4, the swirl ring *28* acts as a cylindrical guide, spacing the inner circumference surface of the nozzle *34* from the outer circumference surface of the electrode *30* to define a plasma chamber *14*. The plasma chamber *14* conducts a plasma gas flow *48* within the inner nozzle piece *36*. Because one of ordinary skill in the art would have recognized that the electrode *30* must be electrically insulated from the nozzle *34*, one of ordinary skill in the art would have had reason fabricate the swirl ring from an electrically insulative material.

7. More specifically, the plasma gas flow *48* enters the plasma chamber *14* from a gas inlet chamber *52* through canted holes *28a* in the swirl ring *28*. The canted holes *28a* impart a vortex motion to the gas to help stabilize the arc formed by the plasma torch *10*. The plasma gas flows between the inner circumference surface of the nozzle *34* from the outer circumference surface of the electrode *30*; and exits the plasma chamber *14* through the pre-orifice *36c*. (*See* Couch '126, col. 4, ll. 46–64; *see also id.*, col. 2, ll. 8–17).

8. As depicted in Figure 5, the swirl ring *28* defines an annular channel on its outer circumference surface for receiving an O-ring *40*. The

O-ring presses against a portion of the inner circumference surface of the nozzle *34* to seal the interface between the swirl ring *28* and the nozzle. (*See* Couch '126, col. 4, ll. 33 & 34). Likewise, the flange on the electrode *30* defines an annular channel on its outer circumference surface for receiving an O-ring. This O-ring, which has no reference numeral in Figure 5, presses against an inner circumference surface defined by the torch body *24*.

9. The space between the inner and outer nozzle pieces *36*, *38* defines a bypass channel *18* that vents a portion of the swirling plasma gas near the pre orifice *36c*. The vented gas flow *16* enters the bypass channel *18* through vent holes *20a*; flows over the inner nozzle piece *36*; and exits the bypass channel through a second gas outlet positioned between the pre orifice *36c* and the nozzle exit orifice *38c*. The venting of the plasma gas increases the flow of gas near the electrode *30* and helps to stabilize the cutting arc. (Couch '126, col. 4, ll. 12–17; col. 4, l. 65 – col. 5, l. 13; & Figs. 5 & 7).

10. Annular channels on the outer surfaces of the inner and outer nozzle portions *36*, *38* mount O-rings *42*, *44* press against facing surfaces of the body *24* on opposite sides of the vent holes *20a*. The O-rings *42*, *44* help to isolate an outlet gas chamber *46* from which the vent holes draw vent gas into the bypass channel *18*. (*See* Couch '126, col. 4, ll. 37–40).

11. The torch *10* described by Couch '126 includes a cooling pipe received concentrically within the electrode *30* to circulate cooling water within the electrode and thence to the nozzle *34*. (Couch '126, col. 5, ll. 47–49). More specifically, as depicted in Figures 5 and 7, water flows into the interior of the electrode *30* through the cooling pipe *60* and then flows upwardly through an annular passageway defined between the inner circumference surface of the electrode and the outer circumference surface

of the cooling pipe. "The cooling water circulates through the torch via internal passages to a water cooling chamber **62** where the water flows over the lower portion **38b** of the nozzle to cool the nozzle, particularly the walls of the nozzle orifice **38c**." (Couch '126, col. 5, ll. 49–54). Couch '126 teaches that it is desirable to maintain a cool nozzle wall near the pre orifice *36c* and the nozzle exit orifice *38c* in order to constrict the thickness of the arc and control gouging of the wall of the nozzle. (Couch '126, col. 1, ll. 22–35).

Couch '308

12. Couch '308 describes a plasma arc cutting torch including a cathode *15* mounted on the end of a heavy copper tube *17*; and a two-piece nozzle *31*, *33*. The heavy copper tube *17* is surrounded by a sleeve *21* of an electrically insulative material which, in turn, fits into an insulative body member *25*. (*See* Couch '308, col. 1, ll. 61–67; col. 1, l. 72 – col. 2, l. 3; & Figs. 1–3).

Sobr

13. Sobr describes a high definition plasma arc torch system *10*. The system *10* includes a torch *24*, *158*. (*See* Sobr, col. 3, ll. 37–42 and Fig. 1). The front end *26* of the torch *24* described by Sobr is similar in construction to the front end of the plasma cutting torch *10* described by Couch '126. (*See*, *e.g.*, Sobr, col. 4, ll. 1–3 (referring the reader to Couch '126 for a further description of the two piece nozzle *34* in Sobr's torch *24*)). Sobr does not describe in detail how the copper electrode *28* is affixed in the front end *26* of the torch *24*.

Luo

14. Luo describes a plasma arc torch *10* including body portion *12* supporting a nozzle *34* and an electrode *48*. (*See* Luo, col. 3, ll. 2–6, 28–31 & 43–45; & Figs. 1 & 2). Luo's torch *10* also includes a drag cap *124* removably mounted on the sleeve member *36* to assist an operator in maintaining sufficient spacing between the distal end of the nozzle *34* and the workpiece. (*See* Luo, col. 1, ll. 26–30; col. 5, ll. 29–32 & col. 7, l. 11–17). The drag cap *124* is fabricated from copper or copper alloy; and has a plurality of slots *150* defining resilient, spaced tabs *156*. (*See* Luo, col. 5, l 61 – col. 6, l. 11 & Figs. 1, 3 & 4). When the torch *10* is assembled, the drag cap *124* fits over a conical surface *166* of the sleeve member *36*. The tabs *156* of the drag cap *124* deflect outwardly so as to fit over, and resiliently engage, the cylindrical surface *164* of the sleeve member *36*. In doing so, the tabs *156* removably attach the drag cap *124* to the sleeve member *36*. The slots *150* in the drag cap *124* fit around projections *170* extending from the surface *164* of the sleeve member *36* to restrict the drag cap from rotating on the sleeve member *36*. (*See* Luo, col. 8, ll. 47–60 and Fig. 2).

Reed

15. Reed describes a nozzle assembly *10* designed to surround an electrode *12* in a plasma jet cutting torch. (*See* Reed, col. 3, ll. 40–52; & Fig. 1). The nozzle assembly *10* includes a nozzle base *18* and an insulator *20*. (*See* Reed, col. 3, ll. 65–68). The insulator *20* reduces the likelihood of "double arcing," a condition in which the plasma arc originating at the electrode deflects to the nozzle wall before reaching the workpiece. In addition, the space between the nozzle base *18* and the insulator *20* can provide a chamber for conducting shield gas or a cooling fluid along the outer circumference surface of the nozzle toward the nozzle orifice. (*See* Reed, col. 1, ll. 28–38; & Figs. 1 & 7).

16. Reed teaches that it is important both that the insulator *20* be positioned coaxially with the nozzle base *18*; and that the gap between the insulator and the nozzle base be maintained within close tolerances, in order to assure a good quality cut and to extend the lives of consumable components. (*See* Reed, col. 1, ll. 47–53). Nevertheless, the electrode *12* and the nozzle base *18* are consumable parts. In order to facilitate the replacement of these parts without sacrificing the close tolerances between the nozzle base *18* and the insulator *20*, Reed teaches providing the nozzle base with resilient fingers *54* for insertion into a bore *51* in the insulator. (*See* Reed, col. 2, ll. 64–67).

17. More specifically, Figures 11a and 11b of Reed depict a generally cylindrical nozzle assembly in which the nozzle base includes a disc-like shoulder section and a neck section projecting from one side of the shoulder section. The nozzle base also includes a cylindrical shroud *75* that projects from the shoulder section and surrounds the neck section. Key-hole like slits *76* divide the shroud into a plurality of resilient (that is, inwardly-

deflectable) fingers. (*Compare* Reed, col. 4, ll. 61–63 (describing an "embodiment similar to that of FIG. 5") *with* col. 4, ll. 26–36).

18. The insulator includes a bore coaxial with an insulator orifice. When the neck portion of the nozzle base is pressed into the bore, the resilient fingers deflect inwardly to create a resilient interference fit between the nozzle base and the insulator. (*Compare* Reed, Figs. 11a & 11b *with* Reed, col. 4, ll. 33–36).

19. The lengths of the resilient fingers as depicted in Figure 11a are such as to limit how far the neck portion of the nozzle base may be pressed into the bore in the insulator. In this manner, the resilient fingers serve to precisely determine the gap between the nozzle base and the insulator. The gap between the outer circumference surface of the neck portion and the inner circumference surface of the bore defines a plenum for conducting a coolant *C* over the nozzle base toward the insulator orifice. In particular, the coolant *C* flows between the resilient fingers so as not to obstruct its movement through the plenum. (*Compare* Reed, Figs. 11a & 11b *with* Reed, col. 4, ll. 36–42).

GROUNDS 2 & 5 AS APPLIED TO CLAIMS 45 AND 46: ANTICIPATION AND OBVIOUSNESS

In Grounds 2 and 5, the Examiner rejects claims 45 and 46 under § 102(b) as being anticipated by Couch '126 or, in the alternative, under § 103(a) as being unpatentable over Couch '126 and Couch '308. We do not agree with the Examiner's finding that Couch '126 anticipates these claims; or the Examiner's conclusion that the subject matter of these claims would have been obvious from the combined teachings of Couch '126 and Couch '308.

As discussed earlier, claim 45 recites a nozzle including:

> an outer circumference surface, with a part of the outer circumference surface being configured to define *a part of a cooling water passage* when the nozzle is disposed inside the plasma torch,
>
> the elastic member contacting section being configured to be disposed at a position overlapping *the part of the cooling water passage* as viewed along an arbitrary radial cut plane extending perpendicular to a central axis of the nozzle and passing through both of the elastic member contacting section and *the part of the cooling water passage*.

(Italics added for emphasis.) Despite the Examiner's conclusion, and the Requester's argument, to the contrary (*see* RAN 20; Resp. Br. Req'r 3), the phrase "the part of the cooling water passage" appearing twice in the second quoted indented limitation refers to the same "part of a cooling water passage" recited in the first indented limitation. As discussed earlier, the definite article "the" indicates that "the part of the cooling water passage" has an antecedent basis in the "part of a cooling water passage" recited earlier in the claim. (*See* App. Br. PO 15).

The Patent Owner includes a marked up copy of the lower portion of Figure 5 on page 14 of its Appeal Brief. The marked-up drawing shows that one cannot draw an arbitrary radial cut plane that extends perpendicularly to a central axis of the nozzle *34*; and that passes through both the elastic member contacting section (that is, the stepped section *36e*) and the part of the cooling water passage defined by (that is, adjacent to) the nozzle.

The Examiner finds that the step section *36e* of the nozzle *34* of the plasma torch *10* described in Couch '126 corresponds to the elastic member contacting section recited in claim 45. (*See* RAN 23; Resp. Br. Req'r 3; *see also* FF 6). Couch '126 describes cooling water passages leading from the

interior of the electrode *30* to the water cooling chamber *62*; as well as the passage of cooling water through the water cooling chamber itself. (*See* FF 11). The Requester correctly points out that additional water passages, not shown in the particular sectional view of Figure 5, must be present in the plasma torch *10* in order to drain the water cooling chamber *62*. (*See* Resp. Br. Req'r 3–5; *see also* Couch '126, col. 6, ll. 24–28). Nevertheless, the Requester has not shown by a preponderance of the evidence that the outer circumference surface of the nozzle *34* is configured to define any part of any such internal passage. In other words, the Requester has not shown that any part of any such internal passage corresponds to "the part of the cooling water passage" recited in claim 45.

The Examiner finds that:

> the nozzle 34 disclosed by Couch '126 is capable of being used with a differently structured torch, . . . such that a non-threaded part of the water chamber 62 would be disposed in a common radial plane with O-ring 40. In this regard, the function of the inventive two-piece nozzle 34 of Couch '126 is not dependent upon the axial location of the thread 66a.

(RAN 42). The Examiner has not proven this finding by a preponderance of the evidence. As the Patent Owner points out on page 14 of its Appeal Brief, the outer circumference surfaces of the upper portions *36a*, *38a* of the inner and outer nozzle pieces *36*, *38* as depicted in Figure 5 abut against the body *24*. The upper portions *36a*, *38a* also mount the O-rings *42*, *44* that seal the outlet gas chamber *46*. (*See* FF 8 & 9). The Examiner has not shown that one of ordinary skill in the art would have had reason to install the nozzle *34* described by Couch '126 in a plasma torch in which a part of a cooling water passage would have been defined by the outer circumference surface of the mounting flange *36d* that defines a stepped recess *36e*. (*See*

FF 2). To have attempted to do so might have compromised the bypass gas flow *16* that Couch '126 describes as "the main thrust of [its] invention." (*See* Reb. Br. PO 13 & 14; *see also* Couch '126, col. 4, l. 65 – col. 5, l. 3).

Neither the Examiner nor the Requester has proven that Couch '126 describes a nozzle satisfying every limitation of claims 45 and 46. Couch '126 does not anticipate claims 45 and 46 under § 102(b). Therefore, we do not sustain Ground 2 as applied to appealed claims 45 and 46.

In Ground 5, the Examiner cites Couch '308 for the teaching to fabricate the cylindrical guide from an electrically insulative material. (*See* RAN 28; *see also* FF 12). This teaching does not remedy the deficiencies in the disclosure of Couch '126 as applied to claims 45 and 46. Thus, the Examiner has not established that the subject matter of claims 45 and 46 would not have been obvious under § 103(a) from the teachings of Couch '126 and Couch '308. Therefore, we do not sustain Ground 5 as applied to claims 45 and 46.

GROUNDS 4 AND 6: OBVIOUSNESS

In Ground 4, the Examiner rejects claims 13, 25, 27, 29 and 34 under § 103(a) as being unpatentable Couch '126, Sobr, Luo and Reed. In Ground 6, the Examiner rejects claims 50 and 51 under § 103(a) as being unpatentable over Couch '126, Couch '308, Sobr, Luo and Reed. We agree with the Examiner's conclusion that the subject matter of these claims would have been obvious.

Claims 13 and 34

Claim 13 recites an electrode including:

> an elastic member which presses the electrical connection surface of said electrode against the electrical connection surface of said electrode seating by elastic force generated by elastic deformation, when the electrode is coupled to said electrode seating; . . . and
>
> a skirt section which is inserted into said electrode seating at the base end portion thereof, said skirt section being divided by a plurality of slits into a plurality of said elastic members which are tongue-shaped and capable of elastic deformation in the inward direction, and these tongue-shaped elastic members having said electrical connection surface on the outer circumference thereof.

The Examiner finds that Couch '126 describes an electrode satisfying each limitation of claim 13 except those quoted. (*See* RAN 25 ("Couch '126 teaches all claimed elements except for the electrical connection surface being a plurality of elastic tongue-shaped members."). The Examiner correctly concludes that it would have been obvious to substitute tongue-shaped elastic members capable of deflecting inwardly in a manner disclosed in Reed to create a resilient fit in the bore of the cathode body *24b*, in place of the threaded connection described by Couch '126, to detachably connect the electrode to the cathode body. *See KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 416 (2007)("when a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result.").[3]

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[3] Our holding is not dependent on finding that it would have been obvious to fabricate the electrode from copper; or that copper is inherently resilient. (*See* RAN 25; App. Br. PO 20). Reed teaches a type of connection using inwardly-deflectable, resilient fingers. (*See* FF 16–18). The Patent Owner does not dispute that one of ordinary skill in the art familiar with the teachings of Reed had sufficient skill to fabricate an electrode having resilient fingers.

The Examiner concludes that this substitution would have been obvious because one of ordinary skill in the art would have recognized that these two types of connection were interchangeable. (*See* RAN 26). The Examiner correctly finds that a resilient fit effected by inserting resilient fingers extending from one component into a bore in another component was a type of connection known, if not common, in the pertinent art. Reed teaches this, at least in the context of connecting a nozzle base to an insulator in a nozzle assembly. (*See* FF 16–18). The Examiner also correctly finds that one of ordinary skill in the art would have recognized that a type of connection using a resilient fit effected by means of tongue-shape elastic members or fingers, as taught by Reed, was interchangeable with a type of connection using mating threads, as described in Couch '126.

The type of connection taught by Reed is similar to the threaded connection described in Couch '126. Structurally, Couch '126 teaches a connection in which an upper portion of the electrode *30* is retained in a bore in the cathode body *24b*, albeit by means of mating threads. Reed teaches a connection in which a portion of a nozzle body is retained in a bore in an insulator. Functionally, there appears to be no dispute that the threaded connection described by Couch '126 is detachable so as to permit the removal and replacement of spent electrodes. Reed says that a nozzle assembly including a resilient fit type of connection it teaches "can be quickly disassembled and assembled manually by a simple pulling, pushing or twisting motion." (Reed, col. 2, ll.
40–43). The Patent Owner asserts that it was "common knowledge among [those] skilled in the plasma torch field that the threaded connection between the electrode 30 and the electrode seating (i.e., the cathode body 24b) as disclosed by Couch '126 ensures proper alignment between the center axis

of the electrode 30 and the center axis of the electrode seating." (App. Br. PO 22 & 23). Reed teaches that the resilient fit connection it teaches provides for "orifice concentricity," among other forms of alignment, between the nozzle base and the insulator into which the nozzle base is inserted (*see* Reed, col. 5, ll. 20–24), even if other structure in the plasma torch assures axial alignment of the nozzle orifices with the torch. Facts such as these support the Examiner's finding that the two types of connection are interchangeable.

The Patent Owner argues that one of ordinary skill in the art would not have had reason to substitute the resilient fit taught by Reed for the threaded connection described in Couch '126 because Reed's teaching to use resilient fingers was intended to address the problem of maintaining a predetermined gap between a nozzle base and a surrounding insulator. The Patent Owner contends that a solution to this problem would not have been relevant to the design of an electrode. (*See* App. Br. 20 & 21; Reb. Br. 11 & 12). As the Supreme Court instructs us, "[c]ommon sense teaches . . . that familiar items may have obvious uses beyond their primary purposes." *KSR Int'l* at 420. One having sufficient skill to understand the teachings of Couch '126 and Reed would have understood that the resilient fit taught by Reed would have provided axial alignment between a nozzle base *18* and an insulator *20* of a nozzle in a manner similar to that in which the threaded connection provided axial alignment between an electrode *30* and the cathode body *24b*, while also providing the additional function of maintaining a predetermined gap. In both cases, a cylindrical bore in one body would have received and aligned a portion of the other body. Neither the substitution of tongue-like elastic members for an external thread on the upper end of the electrode, nor the substitution of a smooth bore wall for the

internal thread described by Couch '126, would have proven unduly difficult for one of ordinary skill to carry out.

In accordance with the teachings of Reed, the proposed substitution would have provided at least some degree of axial alignment between the electrode and the cathode body. Other structure in the torch described in Couch '126, such as the swirl ring *28* (*see* FF 6) and the O-ring mounted on the flange of the electrode *30* (*see* RAN 43 & 44; *see also* FF 8) would have cooperated to provide concentric axial alignment between the electrode and the nozzle. As the Requester points out (*see* Resp. Br. Req'r 7), only an ordinary level of skill would have been required to recognize that the resilient fit taught by Reed could be applied to the electrode *30* and the cathode body *24b* described in Couch '126, as opposed to the nozzle body and an insulator described in Reed. *See KSR Int'l* at 421 ("A person of ordinary skill is also a person of ordinary creativity, not an automaton.").

The Patent Owner also argues that the resilient fit taught by Reed is inferior to the threaded connection described in Couch '126 because the resilient fit may not align the electrode as precisely along the axis of the electrode seating as the threaded connection would; and because the resilient fit might result in greater electrical impedance between the electrode and the electrode seat than would the threaded connection. (*See* App. Br. 22–24). The Patent Owner makes no representation regarding the degree to which the resilient fit taught by Reed might be inferior. Despite the Patent Owner's arguments, we note that the resilient fit taught by Reed could be connected or disconnected by merely pushing or pulling the electrode, as opposed to the need to turn the threads of the connection described in Couch '126. (*See* Reed, col. 2, ll. 40–43; *see also id.*, col. 5, ll. 20–24). "[A] given course of action often has simultaneous advantages and disadvantages, and

this does not necessarily obviate motivation to combine." *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006). Here, one of ordinary skill in the art might have chosen to replace the threaded connection described in Couch '126 with the resilient fit taught by Reed in order to secure faster and easier independent replacement of the electrode, despite the possible detrimental effect on the axial alignment between the electrode and the electrode seating; and the possible increase in electrical impedance that might result.

Claims 25 and 29

Claim 25 recites an electrode in which "the slits defining a part of a cooling water passage so that the at least one electrical connection surface is located in the vicinity of the cooling water passage." The plasma torch described by Couch '126 includes a cooling water passage defined by the inner circumference surface of the electrode and an outer circumference surface of a cooling pipe received inside the electrode. (*See* FF 11). Slits dividing tongue-shaped elastic members substituted for the external thread described in Couch '126 would define, at least partially, an upper portion of the inner circumference surface of the electrode *30*. These facts affirmatively prove, by a preponderance of the evidence, that those slits would define a part of the annular cooling water passage between the inner circumference surface of the electrode and the outer circumference surface of a cooling pipe. (*See* RAN 26; Resp. Br. PO 8). The electrical connection surfaces, that is, the outer circumference surface of each tongue-shaped elastic member, would be in the vicinity of these slits that collectively define a part of the cooling water passage. Despite the Patent Owner's argument to

the contrary (*see* App. Br. PO 25), the proposed substitution would satisfy the limitation.

Claim 27

Most pertinently, claim 27 recites an electrode including "an O-ring contacting section provided on the outer circumference surface of the electrode and configured to contact an O-ring, which is interposed between an inner circumference surface of a cylindrical guide and the outer circumference surface of the electrode." The claim further recites "the O-ring contacting section being disposed between the flange and a front end portion of the electrode with respect to an axial direction of the electrode." The Requester correctly argues that Couch '126 describes an electrode satisfying these limitations. Therefore, we sustain the Examiner's conclusion that the subject matter of claim 27 would have been obvious.

The Requester correctly interprets the recitation "O-ring contacting section" as sufficiently broad to encompass "nothing more than a cylindrically machined section" of the electrode. (Resp. Br. Req'r 8). A cylindrically machined section of the electrode would be configured to contact an O-ring because its cross-section, like that of the inner circumference surface of an O-ring, is circular. This interpretation is consistent with the embodiments depicted in Figures 3 and 9 of the '156 patent. In these embodiments, the electrode *103* includes a flange *183* extending radially from its outer circumference surface. The lower surface of the flange *183* defines a stepped recess for engagement with the cylindrical guide *105*. The portion of the outer circumference surface of the electrode *103* beneath the stepped recess is cylindrical. When the electrode *103* is assembled into a detachable unit *101B*, the O-ring *193* presses against

this cylindrical surface. In order for the recitation "O-ring contacting section" to read on the embodiment described in the '156 patent, the recitation must be sufficiently broad to encompass a cylindrical outer surface of the electrode.

The electrode *30* depicted in Figures 5 and 7 of Couch '126 includes a lower portion *30a* stretching from a flange having a stepped recess for receiving the swirl ring, at an upper end of the lower portion, to a chamfered lower end portion *30b*. This lower portion *30* has a cylindrical outer circumference surface. (*See* FF 3). The depiction of this cylindrical lower portion *30a* in Figures 5 and 7 affirmatively proves by a preponderance of the evidence that the electrode *30* has "an O-ring contacting section provided on the outer circumference surface of the electrode and configured to contact an O-ring, . . . the O-ring contacting section being disposed between the flange and a front end portion of the electrode with respect to an axial direction of the electrode." This finding is based on the disclosure of Couch '126 and does not rely on inherency. Nothing in the Examiner's proposed substitution of tongue-shaped elastic members for the threaded connection described in Couch '126 would have suggested eliminating the O-ring contacting section of the electrode *30* as depicted in Figures 5 and 7.

The subject matter of claim 27 is an electrode. Claim 27 limits the electrode to one having an O-ring contacting surface "configured to contact an O-ring." Claim 27 does not positively recite an O-ring; that is, the claim is not limited to a combination of the recited electrode and an O-ring. Therefore, the subject matter of claim 27 would have been obvious from the disclosure of Couch '126, as modified in view of the teachings of Reed, even though Couch '126 fails to disclose an O-ring interposed between the electrode *30* and a cylindrical guide such as the swirl ring *28*. The fact that

Couch '126 describes an electrode *30* having an O-ring contacting surface as recited in claim 27 is sufficient to satisfy the limitation.

Conclusion

Therefore, the Examiner correctly rejects claims 13, 25, 27, 29 and 34 under § 103(a) as being unpatentable over the combined teachings of Couch '126, Sobr, Luo and Reed. We sustain Ground 4 as applied to those claims. The Patent Owner argues the patentability of claims 50 and 51 under §103(a) over the combined teachings of Couch '126, Couch '308, Sobr, Luo and Reed on the basis of the same arguments adduced in opposition to Ground 4. Being unpersuaded by those arguments, we also sustain Ground 6 as applied to claims 50 and 51.

DECISION

We AFFIRM the Examiner's decision adopting Grounds 4 and 6 (Ground 7 being summarily affirmed); and REVERSE the Examiner's decision as to Grounds 1, 2, 5 and 8. Because these seven grounds are determinative of the appeal, we do not reach Ground 3.

Therefore, we AFFIRM the Examiner's decision rejecting claims 13, 25, 27, 29, 34, 48, 50 and 51. We REVERSE the Examiner's decision rejecting claims 26, 31–33, 38–42, 45 and 46.

Requests for extensions of time in this *inter partes* reexamination proceeding are governed by 37 C.F.R. §§ 1.956 and 41.77(g). No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

In accordance with 37 C.F.R. § 41.79(a)(1), the "[p]arties to the appeal may file a request for rehearing of the decision within one month of the date of: . . . [t]he original decision of the Board under § 41.77(a)." A

request for rehearing must be in compliance with 37 C.F.R. § 41.79(b). Comments in opposition to the request and additional requests for rehearing must be in accordance with 37 C.F.R. § 41.79(c)–(d), respectively. Under 37 C.F.R. § 41.79(e), the times for requesting rehearing under paragraph (a) of this section; for requesting further rehearing under paragraph (d) of this section; and for submitting comments under paragraph (c) of this section, may not be extended.

An appeal to the United States Court of Appeals for the Federal Circuit under 35 U.S.C. §§ 141–144 and 315 and 37 C.F.R. § 1.983 for an *inter partes* reexamination proceeding "commenced" on or after November 2, 2002 may not be taken "until all parties' rights to request rehearing have been exhausted, at which time the decision of the Board is final and appealable by any party to the appeal to the Board." 37 C.F.R. § 41.81; *see also* MANUAL OF PATENT EXAMINING PROCEDURE § 2682. In the event neither party files a request for rehearing within the time provided in 37 C.F.R. § 41.79, and this decision becomes final and appealable under 37 C.F.R. § 41.81, a party seeking judicial review must timely serve notice on the Director of the United States Patent and Trademark Office. *See* 37 C.F.R. §§ 90.1 and 1.983.

AFFIRMED-IN-PART

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

THE AMERICAN TORCH TIP CO.
Respondent, Requester

v.

Patent of KOMATSU LTD.
Appellant, Patent Owner

Appeal 2015-004987
Inter partes Reexamination Control 95/002,300
Patent US 6,320,156 B1
Technology Center 3900

Before JOHN C. KERINS, STEVEN D.A. McCARTHY and DANIEL S. SONG, *Administrative Patent Judges*.

SONG, *Administrative Patent Judge*, dissenting-in-part.

I concur with my colleagues and join in the majority's Decision in all respects except for the disposition of Ground 8, and write separately to respectfully dissent as to its disposition.

The Examiner rejected claims 25–27, 29, 31–33, 38–42, 45, 46, 50, and 51 as enlarging the scope of the claims of the '156 patent, which is prohibited under 35 U.S.C. § 314(a) (RAN 34). The majority focused on original claim 12, and new claim 25 in its analysis, and concluded that "[c]onsidering the structure of issued claims 12, 18, 21, and 24 in the context

of the particular circumstances of this appeal as a whole, issued claim 12 claims an electrode capable of interacting with an electrode seating of a plasma torch, rather than an electrode in combination with the electrode seating." (Decision 25; *see also* Decision 23–24). Similar conclusions are reached with respect to the other new claims that are directed to a cylindrical guide or a nozzle (Decision 25).

I do not agree with the majority, and generally agree with the Examiner. In view of the majority's Decision, the discussion below also generally focuses on claim 12. However, similar considerations are also applicable to the other new claims at issue in Ground 8.

It is not clear to me that claim 12 does not include an electrode seating as a limitation as the majority concludes, because the claim language indicates the contrary. Claim 12 explicitly recites that the electrode: "is retained by coupling detachably with an electrode seating"; "receives a supply of arc current by being connected to said electrode seating"; includes a connection surface that "contacts an electrical connection surface on said electrode seating"; and "presses the electrical connection surface of said electrode against the electrical connection surface of said electrode seating." The Specification of the '156 patent provides adequate description for the recitations in claim 12, including the components of the plasma torch and the electrode retained therein (*see* Figs. 1–5 & 9–11 and disclosure in the Specification related thereto). In my view, claim 12 should be interpreted to give more weight to such claim language, and to require the explicitly recited electrode seating, instead of being interpreted to merely require "capability of interacting."

In further support of concluding that the electrode seating should be considered to be part of claim 12, I observe that the electrode recited in claim 24 also referenced by the majority, must include the electrode seating. Specifically, similar to claim 12, claim 24 recites "[a]n electrode for a plasma torch, disposed inside the plasma torch." However, claim 24 further specifically recites that the electrode "[has] a clearance between the inner circumference of said guide and the outer circumference of said electrode," thereby positively reciting "a clearance" as an element of the electrode. It is unclear to me how "a clearance" can be claimed as an element of an electrode, without also requiring the very structure that defines the recited clearance.

I also observe that some other claims, which are directed to a specific apparatus, positively recite elements that appear to be beyond what a person of ordinary skill would consider to be part of the apparatus to which the claim is directed (*see*, *e.g.*, claim 1: "A plasma cutting device comprising: … a working table, and a movement mechanism"; claim 4: "A plasma torch provided with a torch main unit having cooling water piping and plasma gas piping.").

As the majority opinion notes, "[a] claim is enlarged if it includes within its scope any subject matter that would not have infringed the original patent." *In re Freeman*, 30 F.3d 1459, 1464 (Fed. Cir. 1994). In this regard, a claim is "broader in scope than the original claims if it contains within its scope any conceivable apparatus or process which would not have infringed the original patent." *Medtronic, Inc. v. Guidant Corp.*, 465 F.3d 1360, 1374 (Fed. Cir. 2006); *see also In re Freeman*, 30 F.3d 1459, 1464 (Fed. Cir. 1994)(same test for broadening in reexamination as in reissue).

Hence, in order to infringe claim 12, the explicitly recited electrode seating is required in order to attain the actual interaction (or interface), and the corresponding functional result also explicitly recited, such as "thereby forming an electrical connection between said electrode and said electrode seating." In contrast, because new claim 25 recites that the claimed components are "adapted to," "configured to," or "capable of," interacting (or interfacing) with the other recited components, such recited components, the recited interaction, and the cited corresponding functional result, need not actually be present in order to establish infringement, as long as the capability is present. Similar considerations are applicable to the other claims at issue in Ground 8. Thus, I agree with the Examiner's conclusion that the new claims revise the language of the original claims of the '156 patent in a manner that makes them broader, which is prohibited. 35 U.S.C. § 314(a).

I understand the majority's reasoning for concluding that the original claim 12 does not require the recited electrode seating, and that other claims at issue do not require the structural components of the plasma torch recited therein (Decision 25–26). Indeed, as to the elements recited, claim 12 includes the equivocating language "when the electrode is coupled to the electrode seating," which appears to support the majority's reasoning. However, in my view, such language is not dispositive as to claim broadening, because even if claim 12 does not require the recited electrode seating as concluded by the majority, claim 12 nonetheless recites that "when the electrode is coupled to the electrode seating," a particular interaction and a corresponding functional result is attained. Specifically, claim 12 states that the electrode "receives a supply of arc current by being

connected electrically to said electrode seating," and when coupled to the electrode seating, that "an electrical connection surface [of the electrode] [] contacts . . . said electrode seating thereby forming an electrical connection between said electrode and said electrode seating." Thus, in order for an electrode to infringe claim 12, this recited interaction, and the corresponding functional result must occur "when the electrode is coupled to the electrode seating," even if the structure of the recited electrode seating is not required by claim 12.

As noted, a claim is "broader in scope than the original claims if it contains within its scope any conceivable apparatus or process which would not have infringed the original patent." *Medtronic*, 465 F.3d at 1374. In my view, this test favors concluding that the new claim 25 is broader than original claim 12. As discussed above, in contrast to claim 12, new claim 25 does not require actual interface/interaction and the corresponding functional result, but rather, claims an electrode that is generally adapted to, or capable of, such an interaction. Thus, new claim 25 not only encompasses an electrode that, when coupled to the electrode seating, attains the recited interaction and the corresponding functional result, but also encompasses an electrode that does not attain them, as long as the electrode *is capable* of attaining them.

For instance, in accordance with the test for broadening, it can be conceived that an improved electrode may be designed for use with more than one model of plasma torches. In this regard, it can be conceived that an improved electrode may be designed for use with an improved plasma torch in which the arc current is received through an electrical connection established, not through the electrode seating, but through another structure

elsewhere on the electrode. However, it can be conceived that for economic reasons, such an improved electrode may also be further designed to allow the electrode to alternatively receive the arc current through the electrode seating in a certain model of a plasma torch, for example, an earlier, unimproved model.

In such a scenario, even when the improved electrode is retained and coupled in the improved plasma torch, such an improved electrode would not infringe original claim 12 because the recited interaction and the recited corresponding functional result are not attained. However, such an improved electrode would infringe newly added claim 25 because the improved electrode is still capable of being used with the unimproved plasma torch, even though in the context of the improved plasma torch, none of the recited interface/interaction or the corresponding functional result would be attained, even "when the electrode is coupled to the electrode seating."[4]

While the Specification of the '156 patent may have provided adequate descriptive support for the new claims, that does not give the Patent Owner the latitude to subsequently broaden the original claims during reexamination to ensnare additional potential infringers. Such new claims are prohibited by 35 U.S.C. § 314(a). Therefore, for the above reasons, I would have affirmed the Examiner's rejection set forth in Ground 8.
I respectfully dissent as to the disposition of Ground 8.

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[4] While indirect infringement theories may be applicable to the improved electrode scenario conceived to establish infringement, I would consider any amendments to the claims or new claims that would shift indirect infringement to direct infringement as being indicative of claim broadening.

Appeal 2015-004987
Reexamination Control 95/002,300
Patent US 6,320,156 B1

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8. Claims Appendix

13. (Amended) [The] An electrode for a plasma torch [according to claim 12], which is retained by coupling detachably with an electrode seating of the plasma torch, and which receives a supply of arc current by being connected electrically to said electrode seating, said electrode having an approximately cylindrical shape, and comprising:

an electrical connection surface which contacts an electrical connection surface on said electrode seating, thereby forming an electrical connection between said electrode and said electrode seating, when the electrode is coupled to said electrode seating;

an elastic member which presses the electrical connection surface of said electrode against the electrical connection surface of said electrode seating by elastic force generated by elastic deformation, when the electrode is coupled to said electrode seating;

a heat-resistant insert forming an arc generating point at the front end portion thereof; and

a skirt section which is inserted into said electrode seating at the base end portion thereof, said skirt section being divided by a plurality of slits into a plurality of said elastic members which are tongue-shaped and capable of elastic deformation in the inward direction, and these tongue-shaped elastic members having said electrical connection surface on the outer circumference thereof.

25. (Amended) An electrode for a plasma torch, which is adapted to be retained by coupling detachably with an electrode seating of the plasma torch, and which is adapted to receive a supply of arc current by being connected electrically to the electrode seating, the electrode comprising:

at least one electrical connection surface configured to contact an electrical connection surface on the electrode seating, thereby forming an electrical connection between the electrode and the electrode seating, when the electrode is coupled to the electrode seating, the at least one electrical connection surface of the electrode being located on an outer circumference surface of the electrode; and

a skirt section divided by a plurality of slits into a plurality of elastic members which are tongue-shaped and capable of elastic deformation in the inward direction to press the at least one electrical connection surface of the electrode against the electrical connection surface of the electrode seating by elastic force generated by the elastic deformation, when the electrode is coupled to the electrode seating, and one of outer circumference surfaces of the tongue-shaped elastic members defining the at least one electrical connection surface,

the slits defining a part of a cooling water passage so that the at least one electrical connection surface is located in the vicinity of the cooling water passage.

26. (Amended) An electrode for a plasma torch, which is adapted to be retained by coupling detachably with an electrode seating of the plasma torch, and which is adapted to receive a supply of arc current by being connected electrically to the electrode seating, the electrode comprising:

an electrical connection surface configured to contact an electrical connection surface on the electrode seating, thereby forming an electrical connection between the electrode and the electrode seating, when the electrode is coupled to the electrode seating, the electrical connection surface of the electrode being located on an outer circumference surface of the electrode;

an elastic member configured to press the electrical connection surface of the electrode against the electrical connection surface of the electrode seating by elastic force generated by elastic deformation, when the electrode is coupled to the electrode seating; and

an inner circumference surface configured to surround a water pipe, which has a large diameter section and a small diameter section, when the electrode is coupled to the electrode seating and the water pipe is inserted into the electrode, the inner circumference surface tapering in accordance with a changing diameter of the water pipe so that an internal diameter of the electrode is wide in a base end portion relative to a front end portion to accommodate the large diameter section of the water pipe and the internal diameter of the electrode is narrow in the front end portion relative to the base end portion to accommodate the small diameter section of the water pipe.

27. (Amended) An electrode for a plasma torch, which is adapted to be retained by coupling detachably with an electrode seating of the plasma torch, and which is adapted to receive a supply of arc current by being connected electrically to the electrode seating, the electrode comprising:

an electrical connection surface configured to contact an electrical connection surface on the electrode seating, thereby forming an electrical connection between the electrode and the electrode seating, when the electrode is coupled to the electrode seating, the electrical connection surface of the electrode being located on an outer circumference surface of the electrode;

an elastic member configured to press the electrical connection surface of the electrode against the electrical connection surface of the electrode seating by elastic force generated by elastic deformation, when the electrode is coupled to the electrode seating;

an O-ring contacting section provided on the outer circumference surface of the electrode and configured to contact an O-ring, which is interposed between an inner circumference surface of a cylindrical guide and the outer circumference surface of the electrode and positions the guide and the electrode in the radial direction by means of elastic expansion and contraction when the electrode is coupled to the electrode seating, and

a flange located on the outer circumference surface of the electrode and configured to press a base end face of the guide,

the O-ring contacting section being disposed between the flange and a front end portion of the electrode with respect to an axial direction of the electrode.

29. (Amended) The electrode according to claim 25, wherein

an inner circumference surface of the electrode defines another part of the cooling water passage.

31. (Amended) The electrode according to claim 29, wherein

the inner circumference surface of the electrode is configured to surround a water pipe, which has a large diameter section and a small diameter section, when the electrode is coupled to the electrode seating and the water pipe is inserted into the electrode, the inner circumference surface tapering in accordance with a changing diameter of the water pipe so that an internal diameter of the electrode is wide in a base end portion relative to a front end portion to accommodate the large diameter section of the water pipe and the internal diameter of the electrode is narrow in the front end portion relative to the base end portion to accommodate the small diameter section of the water pipe.

32. (Amended) The electrode according to claim 31, further comprising

an O-ring contacting section provided on the outer circumference surface of the electrode and configured to contact an O-ring, which is interposed between an inner circumference surface of a cylindrical guide and the outer circumference surface of the electrode and positions the guide and the electrode in the radial direction by means of elastic expansion and contraction when the electrode is coupled to the electrode seating, and

a flange located on the outer circumference surface of the electrode and configured to press a base end face of the guide,

the O-ring contacting section being disposed between the flange and the front end portion of the electrode with respect to an axial direction of the electrode.

33. (Previously Presented) The electrode according to claim 32, wherein

the flange is disposed between the at least one electrical connection surface and the front end portion of the electrode with respect to the axial direction of the electrode.

34. (Amended) The electrode according to claim 13, wherein

the electrode is a one-piece member except for the heat-resistant insert.

38. (Amended) A cylindrical guide made from insulating material which is adapted to fit between a nozzle and an electrode of a plasma torch, comprising:

an inner circumference surface configured to confront an outer circumference surface of the electrode; and

an outer circumference surface configured to confront an inner circumference surface of the nozzle;

a first elastic member installing section provided on the inner circumference surface of the guide and configured to accommodate a first elastic member, which is interposed between the inner circumference surface of the guide and the outer circumference surface of the electrode and positions the electrode and the guide in the radial direction by means of elastic expansion and contraction when the guide fits between the nozzle and the electrode;

a second elastic member installing section provided on the outer circumference surface of the guide and configured to accommodate a second elastic member, which is interposed between the outer

circumference surface of the guide and the inner circumference surface of the nozzle and positions the guide and the nozzle in the radial direction by means of elastic expansion and contraction when the guide fits between the nozzle and the electrode;

a plurality of plasma gas swirler holes provided in the guide at regular intervals so that plasma gas forms a swirling current from the plasma gas swirler holes; and

a plurality of grooves located on the outer circumference surface of the guide and extending in a direction parallel to a central axis of the guide to serve as plasma gas passages,

the grooves being mutually connected to the plasma gas swirler holes.

39. (Amended) The cylindrical guide according to claim 38, wherein

the second elastic member installing section is disposed between a front end of the guide and the grooves with respect to the direction parallel to the central axis of the guide.

40. (Amended) The cylindrical guide according to claim 38, wherein

the second elastic member installing section is disposed between a front end of the guide and openings of the plasma gas swirler holes on an outer circumference surface side of the guide with respect to the direction parallel to the central axis of the guide.

41. (Amended) The cylindrical guide according to claim 40, wherein

the first elastic member installing section includes an annular groove located on the inner circumference surface of the guide.

42. (Amended) The cylindrical guide according to claim 41, wherein

the second elastic member installing section is disposed between the front end of the guide and the grooves with respect to the direction parallel to the central axis of the guide.

45. (Amended) A nozzle for a plasma torch, adapted to be disposed inside the plasma torch in such a manner that it covers an electrode by means of a cylindrical guide made from insulating material, comprising:

an inner circumference surface configured to confront an outer circumference surface of the guide;

an elastic member contacting section provided on the inner circumference surface of the nozzle, and configured to contact an elastic member, which is interposed between the outer circumference surface of the guide and the inner circumference surface of the nozzle and positions the guide and the nozzle in the radial direction by means of elastic expansion and contraction when the nozzle is disposed inside the plasma torch;

a step section located on the inner circumference surface of the nozzle, the step section being configured to confront a front end face of the guide, the elastic member contacting section being disposed adjacent to the step section, and

an outer circumference surface, with a part of the outer circumference surface being configured to define a part of a cooling water passage when the nozzle is disposed inside the plasma torch,

the elastic member contacting section being configured to be disposed at a position overlapping the part of the cooling water passage as viewed along an arbitrary radial cut plane extending perpendicular to a central axis of the nozzle and passing through both of the elastic member contacting section and the part of the cooling water passage.

46. (Amended) The nozzle according to claim 45, further comprising

a nozzle orifice disposed at a front end of the nozzle,

the nozzle being a one-piece member.

50. (Amended) An electrode for a plasma torch, adapted to be disposed inside the plasma torch in such a manner that it is covered by a nozzle by means of a cylindrical guide made from insulating material, comprising:

an outer circumference surface configured to confront an inner circumference surface of the guide; and

having a clearance between the inner circumference surface of the guide and the outer circumference surface of the electrode, in order that positioning of the guide and the electrode in the radial direction can be performed by means of elastic expansion and contraction of an O-ring inserted therebetween when the electrode is disposed inside the plasma torch,

the electrode being hollow from a base end portion to a front end portion so that an inner circumference surface of the electrode defines a part of a cooling water passage that extends from the base end portion to the front end portion of the electrode,

at least one electrical connection surface configured to contact an electrical connection surface on the plasma torch, thereby forming an electrical connection between the electrode and the plasma torch when the electrode is disposed inside the plasma torch, the at least one electrical connection surface being located on the outer circumference surface of the electrode;

a skirt section divided by a plurality of slits into a plurality of tongue-shaped members capable of elastic deformation in the inward direction, with one of outer circumference surfaces of the tongue-shaped members defining the at least one electrical connection surface.

51. (Amended) The electrode according to claim 50, wherein

the slits define another part of the cooling water passage so that the at least one electrical connection surface is located in the vicinity of the cooling water passage.

Attorney Docket No. KL-US125421

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re *Inter Partes* Reexamination Application of	:	Appeal No.: 2015-004987
U.S. Patent No. 6,320,156	:	Patent Art Unit: 3993
Inventors: Yoshihiro Yamaguchi et al.	:	Examiner Robert M. Fetsuga
Control No. 95/002,300	:	
Filed: September 14, 2012	:	
For: PLASMA PROCESSING DEVICE, PLASMA TORCH AND METHOD FOR REPLACING COMPONENTS OF SAME	:	

CERTIFICATE OF SERVICE

I, David L. Tarnoff, state that I served a copy of Patent Owner's Notice of Appeal to the United States Court of Appeals for the Federal Circuit in its entirety by first class mail to Mr. Sergey Vernyuk, Emerson Thomson Bennett, 1914 Akron-Peninsula Rd. Akron, OH 44313 on February 23, 2017.

Respectfully Submitted,

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