The opinion in support of the decision being entered today is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte JENNIFER LU, NICOLAS J. MOLL, and THOMAS E. KOPLEY

Appeal 2007-1893
Application 10/946,753
Technology Center 2800

Decided: September 5, 2007

Before JEAN R. HOMERE, JAY P. LUCAS, and JOHN A. JEFFERY, *Administrative Patent Judges*.

JEFFERY, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 from the Examiner's rejection of claims 1, 3-16, 25-37, and 39-43. We have jurisdiction under 35 U.S.C. § 6(b). We affirm-in-part. Also, we enter new grounds of rejection under 37 C.F.R. § 41.50(b) for claims 7 and 30-32.

STATEMENT OF THE CASE

Appellants invented a method for controlling the growth of carbon nanotubes.[1] Specifically, topological structures are provided on the substrate which mechanically control the length and/or orientation of nanotubes via physical contact between the nanotubes and the topological structures.[2] Claim 1 is illustrative:

1. A method comprising:

patterning a surface of a substrate to form a topological structure; and

growing nanostructures along the surface, wherein the topological structure controls at least one of the length and orientation of the nanostructures growing along the surface in at least one region of the substrate.

The Examiner relies on the following prior art references to show unpatentability:

Shin US 2002/0014667 A1 Feb. 7, 2002

Zhang, Y., et al., *Electric-Field-Directed Growth of Aligned Single-Walled Carbon Nanotubes*, App. Phys. Ltrs., Vol. 79, No. 19, Am. Inst. of Phys., Nov. 5, 2001 ("Zhang").

1. Claims 1, 3-6, 9-16, 25-37, and 39-43 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Shin.[3]
2. Claims 1 and 5-8 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Zhang.

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[1] Carbon nanotubes are elongated tubular bodies which are typically only a few atoms in circumference (Specification ¶ 0001).
[2] *See generally* Specification ¶¶ 0005-0008 and all Figures.
[3] Although the Examiner includes claim 2 in this rejection (Answer 3), claim 2 has been cancelled. *See* Br. 2.

Rather than repeat the arguments of Appellants or the Examiner, we refer to the Briefs and the Answer for their respective details. In this decision, we have considered only those arguments actually made by Appellants. Arguments which Appellants could have made but did not make in the Briefs have not been considered and are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(vii).

OPINION

I. The Anticipation Rejection Based on Shin

We first consider the Examiner's rejection of claims 1, 3-6, 9-16, 25-37, and 39-43 under 35 U.S.C. § 102(b) as being anticipated by Shin. Anticipation is established only when a single prior art reference discloses, expressly or under the principles of inherency, each and every element of a claimed invention as well as disclosing structure which is capable of performing the recited functional limitations. *RCA Corp. v. Applied Digital Data Systems, Inc.*, 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir. 1984); *W.L. Gore and Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1554, 220 USPQ 303, 313 (Fed. Cir. 1983).

Claims 1, 5, 6, 15, and 16

The Examiner has indicated how the claimed invention is deemed to be fully met by Shin (Answer 3-12). Regarding representative claim 1,[4] Appellants argue that Shin's aperture 16 does not control the length or

[4] Appellants argue claims 1, 5, 6, 15, and 16 together as a group. *See* Br. 7 and 11. Accordingly, we select claim 1 as representative. *See* 37 C.F.R. § 41.37(c)(1)(vii).

orientation of nanostructure 20. First, Appellants contend that Shin is "misleading" in that it assumes that nanotubes grow straight and in a desired direction, yet the reference fails to explain how to achieve such growth. According to Appellants, carbon nanotubes generally do not grow in a predetermined direction or in a straight line, but rather in a random direction and often curve during growth (Br. 8-10; Reply Br. 3-4).

Second, Appellants contend that even if other factors (e.g., electric or magnetic fields) are present in Shin to influence the direction of nanotube growth, the aperture 16 (i.e., the "topological structure") would not control the orientation of the nanotubes. In fact, Appellant argues, without some other force present, the nanotubes may grow in any orientation within the aperture (Br. 10; Reply Br. 5).

Appellants also argue that not only does Shin's aperture 16 fail to control the nanostructures' *orientation*, the aperture likewise fails to control the nanostructures' *length* as claimed. In this regard, Appellants emphasize that a nanostructure's length can vary greatly depending on the direction at which it grows in the aperture (*Id.*). Appellants add that the length of a nanotube is also dependent on its growth rate. Therefore, Appellants contend, if one of the two nanotubes that meet each other within aperture 16 grew faster than the other nanotube, the faster-growing nanotube would be longer (Br. 10; Reply Br. 6).

Appellants further contend that Shin is not enabling for the elements in claim 1. According to Appellants, absent some "directed growth" mechanism, Shin's oriented growth ostensibly cannot be produced without undue experimentation (Br. 11).

The Examiner notes that Shin's topological structures control orientation. In this regard, the Examiner indicates that nanotubes in Shin only grow from exposed catalyst structures. As such, these nanotubes will grow in specific patterns depending on the specific orientation and placement of the catalysts and the topological structures. The Examiner adds that Shin only grows horizontal nanotubes and therefore prevents vertical growth (Answer 14). The Examiner further indicates that topological structure also controls the length of the nanotubes since they can only be as long as the aperture's opening. *Id.*

We will sustain the Examiner's rejection of representative claim 1. At the outset, we address Appellants' contention regarding the alleged lack of enablement of the Shin reference.

We recognize that a claimed invention cannot be anticipated by a prior art reference if the allegedly anticipatory reference is not enabled. *Amgen, Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1354, 65 USPQ2d 1385, 1416 (Fed. Cir. 2003). But we presume that the relevant disclosures of a prior art reference are enabled. *Id.* at 1355, 65 USPQ2d at 1416.[5] Accordingly, the burden then shifts to Appellants to prove otherwise by a preponderance of the evidence. *Id.*

On this record, Appellants have hardly met their burden of rebutting the presumption of enablement of the Shin reference. It is well settled that determining the level of experimentation that would be "undue" so as to render a disclosure non-enabling is made from the viewpoint of artisans experienced in the field of invention. *Elan Pharmaceuticals, Inc. v. Mayo Found. for Med. Educ. & Res.*, 346 F.3d 1051, 1055 (Fed. Cir. 2003). In

[5] *See also* MPEP § 2121.

this determination, we apply a standard of reasonableness, with due regard for the nature of the invention and the state of the art. *Id.* (internal citations and quotation marks omitted).

Even assuming, without deciding, that it would be impossible to control the orientation of the respective nanotubes that are disposed on opposite sides of the aperture such that they meet within the aperture absent some directed growth mechanism as Appellants suggest, we conclude that using such directed growth mechanisms (e.g., electric or magnetic fields, etc.) to ensure this alignment would hardly require undue experimentation.

In short, the fact that such "directed growth" techniques exist and are well known in the art -- a fact that Appellants readily admit[6] -- is itself dispositive. Although Shin does not expressly disclose the technique used to achieve the straight nanotube growth within the aperture,[7] the skilled artisan would have reasonably recognized that known techniques could be utilized in Shin to achieve such directed growth.

Significantly, Appellants have not disputed that these well-known techniques would not be at least capable of achieving such directed growth (i.e., in a substantially straight line). Rather, Appellants' argument is premised on Shin's failure to disclose any such technique. Such an argument, however, hardly persuasively rebuts Shin's presumption of

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[6] *See* Br., at 10 ("[C]ertain techniques have been proposed in the art for influencing the direction of nanotube growth, such as the application of electric or magnetic fields…."); *see also* Br., at 9-10 and Ev. App. (citing articles to illustrate recognition of "the random growth of nanotubes *absent some mechanism for influencing the directionality of their growth*") (emphasis added).

[7] *See, e.g.,* Shin, Figs. 6A-7D.

enablement – a presumption based on the state of the art and the nature of the invention.

Since the skilled artisan, in our view, would have reasonably employed conventional techniques to direct the nanotube growth in Shin, we need not address the question of whether, absent such known techniques, Shin's directed growth would be possible without experimentation, let alone undue experimentation.

Turning now to the merits of the rejection, we find that Shin amply discloses the limitations of representative claim 1. At the outset, we note that claim merely calls for the topological structure to control at least *one* of the length and orientation of the nanostructures. That is, the claim does not require both length and orientation to be controlled, but rather just one such characteristic. In any event, we find the topological structure in Shin reasonably discloses controlling *both* length and orientation.

First, we agree with the Examiner that the sidewall of aperture 16 in Shin reasonably constitutes a "topological structure" – an interpretation that is indeed undisputed.[8] Also, given the scope and breadth of the term "orientation," we find that the topological structure, at least in part, controls the orientation of the grown nanostructures.[9]

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[8] *See, e.g.,* Br. at 10 (arguing that "the *topological structure (e.g., aperture 16)* of Shin fails to control the orientation of the nanotubes") (emphasis added).

[9] We further note that Appellants apparently recognize that the nanotube orientations are controlled in Shin. *See, e.g.,* Reply Br., at 7 ("[E]ven assuming that the nanotube orientations are sufficiently controlled so as to meet each other as illustrated by Shin….").

"Orientation" is defined, in pertinent part, as "a relative position."[10] As shown in Figs. 5A-7D, not only does the structure of the aperture itself influence, at least in part, the relative positions of the nanostructures, the disposition of the catalyst with respect to the aperture also has such an influence. Furthermore, the vertical growth preventing layer in conjunction with the aperture and catalyst likewise influences growth in the horizontal direction – a direction that fully meets a "relative position" or orientation. In sum, the aperture 16 and its associated structure is a *substantial factor* in influencing the relative positions, or orientations, of the nanostructures. The aperture therefore controls, at least in part, the orientation of the nanostructures as claimed. For this reason alone, claim 1 is fully met by Shin.

Shin also fully meets claim 1 for an additional reason: the aperture not only controls the orientation of the nanostructures, but also their length—at least in part. As the Examiner indicates, the nanostructures' length is dictated primarily by the size of the aperture.[11] In this regard, Figures 6A-7D clearly show that the nanostructures span the entire extent of the aperture (i.e., the diameter of a circular aperture as shown in Figs. 6A-7C or the width of a polygonal aperture in Fig. 7D).

Even if we assume, without deciding, that one nanotube could somehow grow faster than the other as Appellants argue (and therefore meet at a point not precisely at the center of the aperture), the limitation regarding

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[10] The Compact Oxford English Dictionary of Current English, *available at* http://www.askoxford.com/concise_oed/orientation?view=uk (last visited Aug. 23, 2007).

[11] *See* Answer, at 14 ("[T]he nanotubes can only be as long as the opening will allow.").

the topological structure's ability to control the nanostructures' length would still be fully met. The claim language simply does not preclude controlling the length of the *united* nanostructures (i.e., the resulting union of oppositely-extending nanostructures that meet within the aperture). That is, even if one nanostructure is longer than the other, the length of the *united* nanostructures is nonetheless dictated by the size of the aperture as shown in Figures 6A-7D. Therefore, Shin fully meets claim 1 for this additional reason.

For at least these reasons, we will sustain the Examiner's anticipation rejection of representative claim 1. Likewise, we will sustain the Examiner's rejection of claims 5, 6, 15, and 16 which fall with claim 1.

Claims 3 and 4

We will also sustain the Examiner's rejection of representative claim 3. Even if we assume, without deciding, that the individual nanotubes that comprise a united nanotube do not extend the entire distance across the aperture, the claim does not preclude the length of the *united* nanostructures is nonetheless dictated by the size of the aperture as noted above. Furthermore, at least the exposed catalyst surface from which the nanotubes originate physically contacts the aperture sidewall – an aperture structure which likewise influences, at least in part, the orientation of the nanotubes as indicated previously.

Since claim 3 is fully met by Shin, we will therefore sustain the Examiner's rejection of that claim and claim 4 which falls with claim 3.

Claim 9

We will also sustain the Examiner's rejection of claim 9. As shown in Fig. 3D and described in ¶ 0051, Shin forms a number of apertures (topological structures) in the substrate – a formation process that fully meets "patterning" the substrate's surface giving the term "patterning" its broadest reasonable interpretation. Although Appellants argue that layer 14 appears to be deposited on substrate 10 rather than patterned (Br. 13; Reply Br. 8), nothing in the claim precludes "patterning" the substrate's surface by forming apertures therein.

In addition, we find nothing in the claim that precludes the Examiner's interpretation of multiple topological structures such as those shown in Fig. 5B comprising (1) the vertical sidewalls of an aperture, and (2) the "bottom" substrate layer 10. These distinct structures, at least generally, define a "growth path" for the nanostructures (i.e., at least the aperture sidewalls, the area between the aperture sidewalls, and above the bottom substrate layer). For this reason alone, Shin anticipates claim 9.

Furthermore, claim 9 is anticipated under an alternative interpretation of Shin. Since each of Shin's multiple apertures can be considered a "topological structure," two such apertures each define a "grow path" at least within each respective aperture. In short, the claim does not preclude independent and distinct grow paths within two respective apertures. Claim 9 is therefore fully met by Shin for this additional reason. The Examiner's rejection is therefore sustained.

Claim 10

We will also sustain the Examiner's rejection of claim 10. As we indicated previously, the aperture structure, including the sidewalls, forms part of the growth path that influences, at least in part, the orientation of the nanotubes. We add that, contrary to Appellants' argument (Reply Br. 9), defining the location of the exposed catalyst likewise influences, at least in part, the relative position of the resulting nanostructures and therefore their orientation. The claim is fully met by Shin and the Examiner's rejection is therefore sustained.

Claim 11

Claim 11 is also fully met by Shin. Nothing in the claim precludes the "multiple group paths" to be defined by different apertures respectively. That is, a first group path would be defined in an aperture in a first substrate region, and a second group path would be defined in another aperture in a second substrate region. Moreover, the claim does not preclude the multiple diverse arrays of nanostructures which extend in multiple directions as shown in Figures 7A-9. Even if each aperture contained nanostructures extending only in two directions (e.g., Fig. 7A, 7B, etc.), the respective group paths would extend in different directions as claimed. The claim is fully met and the rejection therefore sustained.

Claims 12-14, 25-29, 39, and 40

We will also sustain the Examiner's rejection of claims 12-14, 25-29, 39, and 40. Our previous discussion regarding the topological structure in

Shin reasonably disclosing controlling *both* length and orientation applies equally here and we incorporate that discussion by reference.[12] Claims 12 and 39 are fully met for those reasons alone.

Regarding claim 14, we add that the multiple growth paths illustrated in Figures 7A-9 in Shin are certainly oriented relative to each other (e.g., parallel, perpendicular, etc.). For the foregoing reasons, claim 14 is fully met.

Regarding claims 25-29 and 40, we reiterate that at least the exposed catalyst surface from which the nanotubes originate in Shin physically contacts the aperture sidewalls – an aperture structure which likewise influences, at least in part, the orientation of the nanotubes as indicated previously.

Furthermore, the nanostructures' length is dictated primarily by the size of the aperture as shown in Figures 6A-7D (illustrating that the nanostructures span the entire extent of the aperture (i.e., the diameter of a circular aperture as shown in Figs. 6A-7C or the width of a polygonal aperture in Fig. 7D)). Claims 25-29 and 40 are likewise fully met by Shin.

Claims 30 and 31

We will not sustain the Examiner's rejection of claim 30. The Examiner refers to Paragraphs 0055-56 of Shin (Answer 18-19). These passages, however, merely refer to exposing the catalyst pattern to source gas (¶ 0055) or various deposition methods to synthesize the carbon nanotubes (¶ 0056). While these techniques may spawn the growth of the

[12] *See* p. 7-9, *supra*, of this opinion.

nanostructures, we fail to see how these techniques necessarily influence the *direction* of growth as claimed.

Although Appellants indicate that such direction-influencing techniques are well-known in the art (e.g., using electric or magnetic fields),[13] we simply cannot say that such techniques are *necessarily* present in Shin – an essential requirement for anticipation. Therefore, we are constrained by the record before us to reverse the Examiner's anticipation rejection of claim 30 and claim 31 dependent thereon.[14]

Claim 32

We will also not sustain the Examiner's rejection of claim 32 for reasons similar to those we noted with respect to claims 30 and 31. While techniques other than physical contact with the topological structure may be well known in the art, such a consideration is germane to obviousness—not anticipation. In short, while such non-contact techniques (e.g., magnetic fields or fluid flow) *may* in fact be used in Shin -- a possibility that Appellants readily acknowledge -- nothing in the reference indicates that these techniques are *necessarily* present. In short, mere possibilities (or even probabilities) alone cannot justify anticipation. For that reason alone, we cannot sustain the Examiner's rejection of claim 32.[15]

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[13] *See id.* at 6.

[14] Notwithstanding our conclusion regarding anticipation, we nevertheless address the question of whether it would have been obvious to one of ordinary skill in the art at the time of the invention to provide such direction-influencing techniques in Shin in a new grounds of rejection. *See* p. 17-19, *infra,* of this opinion.

[15] However, like the limitations of claims 30 and 31, we address the obviousness of this limitation in a new grounds of rejection. *See id.*

Claims 33-35 and 41

We will sustain the Examiner's rejection of claims 33-35 and 41. Our previous discussion regarding the topological structure in Shin reasonably disclosing controlling both length and orientation applies equally here and we incorporate that discussion by reference.[16] We add that forming the aperture in Shin certainly adapts the terrain of the substrate's surface as claimed. Regarding claim 34, since the topological structure itself controls, at least in part, length and orientation of the nanostructures during growth, it therefore mechanically controls such growth.

Regarding claim 35, our previous discussion regarding the nanostructures' physical contact with the topological structure in Shin applies equally here and we incorporate that discussion by reference.[17]

For the foregoing reasons, claims 33-35 and 41 are fully met by Shin and the Examiner's rejection is therefore sustained.

Claims 36, 37, 42, and 43

We will also sustain the Examiner's rejection of claims 36, 37, 42, and 43. At the outset, our previous discussion pertaining to physical contact with the topological structure in Shin reasonably controlling both length and orientation applies equally here and we incorporate that discussion by reference.[18] We add that Shin forms multiple apertures 16 (topological structures) for nanostructure growth as best seen in Figure 3D. As such,

[16] *See id.* at 7-9.
[17] *See id.* at 9.
[18] *See id.*

each respective aperture is formed in a different substrate region and has corresponding nanostructures which grow within that particular aperture. In short, the multiple apertures and associated nanostructure growth within each aperture fully meets claims 36, 42, and 43. The Examiner's rejection of those claims is therefore sustained.

Regarding claim 37, since the nanostructures in Shin can grow in at least two directions as shown in Figures 7A-8, distinct nanostructure growth paths in different directions are obtained within each aperture. Therefore, different apertures (i.e., in different substrate regions) would likewise provide different growth paths in different directions. The claim is therefore fully met by Shin.

II. The Anticipation Rejection Based on Zhang

Claims 1, 5, and 6

We now consider the Examiner's rejection of claims 1 and 5-8 under 35 U.S.C. § 102(b) as being anticipated by Zhang. The Examiner has indicated how the claimed invention is deemed to be fully met by Zhang (Answer 12-13). Specifically, the Examiner considers the electrode shown in Figure 1(d) to correspond to the recited topological structure (Answer 12, 24). Appellants, however, contend that even if the electrodes could be considered topological structures, it is the *electric field* generated by the electrodes – not the electrodes themselves – which controls the orientation of the nanostructures (Br. 25; Reply Br. 18).

We will sustain the Examiner's rejection of claims 1, 5, and 6. At the outset, we agree with the Examiner that the electrode structure in Figure 1(d)

of Zhang reasonably constitutes a "topological structure" – an interpretation Appellants apparently acknowledge.[19]

Even assuming that the electric field solely controls orientation of the nanostructure in Zhang, claim 1 is still fully met. The electrode (topological structure) generates the electric field which in turn controls orientation. That is, *but for* the existence of the topological structures (electrodes), the electric field would not be generated and, consequently, the nanostructures' orientation would not be controlled. Simply put, the electrodes cause orientation to be controlled.

Claim 1 is therefore fully met by Zhang. Accordingly, we will therefore sustain the Examiner's rejection of claim 1 and claims 5 and 6 which fall with claim 1.

Claims 7 and 8

We will not, however, sustain the Examiner's rejection of claims 7 and 8. Claim 7 calls for the topological structure to *surround* the catalyst. The electrodes in Zhang, however, are located on either side of the catalyst. The term "surrounding" is defined, in pertinent part, as "[to] be all round; encircle."[20] Merely flanking the catalyst on either side hardly disposes the topological structure "all round" or encircles the catalyst in accordance with

[19] *See* Reply Br., at 18 ("[I]t is the electric field, rather than the *topological structure (electrode)*, that controls the orientation of the nanostructures.") (emphasis added).
[20] *See* Compact Oxford English Dictionary, AskOxford.com, *available at* http://www.askoxford.com/concise_oed/surround?view=uk (last visited Aug. 29, 2007).

the plain meaning of the term "surrounding." For these reasons, we will not sustain the Examiner's rejection of claim 7.

Similarly, with respect to claim 8, we do not see how the catalyst shown in Figure 1(c) can be equidistant from the perimeter of the growth field in all directions as claimed. Not only does the electrode not surround the catalysts as discussed above, the respective catalyst structures shown in Figure 1(c) have unequal intervals. In view of this unequal spacing, we fail to see how the catalysts can be *equidistant* from the perimeter of the growth field – a perimeter that the Examiner has not clearly identified, but which we assume is the area between the electrodes.

For the foregoing reasons, we will also not sustain the Examiner's rejection of claim 8.

III. New Grounds of Rejection Under 37 C.F.R. § 41.50(b)

Claims 30-32 are Unpatentable Under 35 U.S.C. § 103(a)

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for the obviousness rejections set forth in this opinion:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 30-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shin in view of Zhang or, alternatively, Appellants'

admitted prior art. Shin discloses all of the claimed subject matter including controlling length and orientation of nanostructures utilizing physical contact with the topological structures. *See* P. 7-9, *supra*, of this opinion, hereby incorporated by reference. Shin, however, does not explicitly state that techniques other than physical contact with the topological structure (e.g., force-field or fluid flow techniques) are used to influence the direction of growth.

These techniques, however, are well known in the art. Zhang, for example, uses an electric field to align growth of nanostructures along the electric-field direction. *See, e.g.,* Zhang, paragraph bridging pages 3155 and 3156, and first full paragraph of page 3156 (noting that nanotubes grown using applied electric field are well aligned along the electric-field direction); *see also id.*, at p. 3155, ¶ 1 ("Electric fields have been used to manipulate the growth direction of [multiwalled carbon nanotubes] previously….").

Furthermore, Appellants readily admit that such techniques are well known in the art. *See* ¶ 0019 of Appellants' Specification (contrasting influencing nanotube growth with topological structures with "*such known techniques* as application of electric fields (either external to or arranged locally on the substrate), application of magnetic fields, blowing gas in a certain direction, a directed ion stream, control of carbon gas density gradient during growth") (emphasis added); *see also* Br., at 10.

In view of either Zhang or Appellants' admission in the Specification, it would have been obvious to one of ordinary skill in the art at the time of the invention to utilize such techniques in conjunction with the system of Shin to provide additional control over the direction of nanostructure

growth. Such additional control of direction could employ devices that can be automatically controlled, thus augmenting the mechanical orientation/length control with automatically-controlled devices.

Shin Anticipates Claim 7

Claim 7 is rejected under 35 USC 102(b) as being anticipated by Shin. The scope and breadth of the claim does not preclude the catalyst 18 which is surrounded by the topological structure (sidewall of aperture 16) as best seen in Figure 4 of Shin. As shown in that figure, the sidewall structure encompasses or surrounds the catalyst 18 (i.e., the rectangle in the enlarged detail figure below) at least in the plane of the sidewall at the exposed portion.

For clarity, the aperture of Figure 4 of Shin has been enlarged as shown below.

Enlarged Detail View of the Aperture of Figure 4 of Shin

DECISION

We have sustained the Examiner's rejections with respect to claims 1, 3-6, 9-16, 25-29, 33-37, and 39-43. We have not, however, sustained the Examiner's rejections of claims 7, 8, and 30-32. Furthermore, we have entered new grounds of rejection for claims 7 and 30-32. Therefore, the Examiner's decision rejecting claims 1, 3-16, 25-37, and 39-43 is affirmed-in-part.

This decision contains new grounds of rejection pursuant to 37 C.F.R. § 41.50(b). Section 41.50(b) provides that "[a] new ground of rejection . . . shall not be considered final for judicial review." Section 41.50(b) also provides that the Appellants, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of the appeal as to the rejected claims:

> (1) *Reopen prosecution*. Submit an appropriate amendment of the claims so rejected or new evidence relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the proceeding will be remanded to the examiner. . . .
>
> (2) *Request rehearing*. Request that the proceeding be reheard under § 41.52 by the Board upon the same record. . . .

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

AFFIRMED-IN-PART
37 C.F.R. § 41.50(b)

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