UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte SETH A. MILLER

Appeal 2008-3350
Application 10/241,999
Technology Center 1700

Decided: July 14, 2008

Before LINDA M. GAUDETTE, MICHAEL P. COLAIANNI, and JEFFREY B. ROBERTSON, *Administrative Patent Judges*.

ROBERTSON, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellant appeals under 35 U.S.C. § 134(a) (2002) from the Examiner's rejection of claims 1-16.[1] (Examiner's Answer entered,

[1] Claims 17-20 have been cancelled. (Appeal Brief filed Apr. 16, 2007, hereinafter "App. Br.," 2).

hereinafter "Ans."). We have jurisdiction pursuant to 35 U.S.C. § 6(b) (2002).

We AFFIRM.

THE INVENTION

Appellant's claimed invention is directed to a method of coating at least one surface of a micro-mechanical device, where the coating material is dissolved in carbon dioxide (CO_2) and the dissolved material is deposited on at least one exposed surface of the device. (Spec. 3). Appellant's Specification states that an advantage of the invention is that the use of CO_2 as a solvent and carrier has minimal environmental impact. (Spec. 3).

Claims 1 and 16, reproduced below, are representative of the subject matter on appeal.

> 1. A method of coating at least one surface of a micro-mechanical device, comprising the steps of:
>
> dissolving a coating material in CO2; and
>
> depositing the dissolved material on at least one exposed surface of the device.
>
> 16. The method of Claim 1, wherein the coating material is a perfluorodecanoic acid (PFDA).

THE REJECTIONS

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Hornbeck	5,331,454	Jul. 19, 1994
Wallace	5,512,374	Apr. 30, 1996
McClain	6,165,559	Dec. 26, 2000

There are two rejections before us on appeal: (1) claims 1-15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Wallace in combination with McClain; and (2) claim 16 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Wallace in combination with McClain, further in combination with Hornbeck.

The Examiner rejected claims 1-15 under 35 U.S.C. § 103(a) as being unpatentable over Wallace in combination with McClain. The Examiner found that Wallace teaches all of the limitations of the claims except that the coating material is dissolved in CO_2 for application to the surface of the device. (Ans. 3 and 4). The Examiner found that McClain teaches a method of coating a metal substrate by immersing the substrate in CO_2 and a surface treatment component. (Ans. 4). The Examiner determined that it would have been obvious to modify Wallace using the CO_2 solvent taught in McClain to achieve the advantages detailed in McClain. (Ans. 4).

The Examiner also rejected claim 16 under 35 U.S.C. § 103(a) as being unpatentable over Wallace in combination with McClain, further in combination with Hornbeck. The Examiner found that Wallace in combination with McClain teaches all of the limitations of the claims except for the use of perfluorodecanoic acid (PFDA) as the coating material. (Ans. 4). The Examiner found that Hornbeck teaches monolayers applied to micro-mechanical devices, where the monolayer is PFDA. (Ans. 5). The Examiner concluded that it would have been obvious to substitute PFDA for the coating materials disclosed in Wallace in combination with McClain, because both are known anti-stiction materials. (Ans. 5).

Appellant contends that Wallace does not teach dissolving a coating material in CO_2 and that Wallace represents a conventional method that

employs a fluorocarbon as a carrier solvent. (App. Br. 4 and 5). Appellant argues that if Wallace does not teach the first claim 1 step of dissolving a coating material in carbon dioxide, then Wallace cannot teach the second claim 1 step of depositing the dissolved material; i.e., Wallace does not disclose any of the claim 1 limitations. (App. Br. 5 and 6). Appellant additionally argues that there is no evidence on the record that supports an assertion that Wallace discloses the method as recited in claim 1. (App. Br. 6). Appellant also contends that the Examiner has not satisfied his burden of proof because the Examiner allegedly does not specifically identify how McClain teaches the limitations of claim 1. (App. Br. 7). Appellant argues that there is no clear indication of what is being construed as the coating material and that McClain does not teach coating a micro-mechanical device. (App. Br. 8). Appellant then argues that Wallace and McClain do not jointly disclose the limitations of claim 1 because each reference individually does not disclose any of the limitations of claim 1. (App. Br. 8).

Appellant also argues that there is no basis for combining Wallace and McClain because it is unclear to Appellant what advantages in McClain the Examiner is relying on to support a conclusion of obviousness. (App. Br. 9). Appellant argues that there is a great technological difference between micromechanical devices of Wallace and the fabric industry of McClain such that there is no logical reason to combine the references. (App. Br. 4, 6, 7, 9). Appellant argues that there is no motivation to combine Wallace and McClain because the only advantage taught in McClain is for applications of the surface treatment to medical devices, implants, and marine fishing equipment. (App. Br. 10). Appellant states that it is unclear

how coating a substrate to enhance barrier properties relates to the subject matter of the claimed invention. (Reply Brief filed Sep. 24, 2007, hereinafter "Reply Br.," 4 and 5).

Appellant further contends that there is no reasonable expectation of success even if the references are combined because micromechanical devices are different than industrial and mechanical devices and the problem in the present application is unique to the small parts of a micromechanical device. (App. Br. 10). Appellant argues there is no reason for one of ordinary skill in the art to think that industrial applications set forth in McClain can serve as a viable solution for a micromechanical device, when considering the unique properties of liquids and micromechanical devices. (App. Br. 10). Appellant also alleges that the record is silent with respect to a reasonable expectation of success. (App. Br. 11). Appellant contends that McClain teaches away from the combination, because according to the Examiner, Wallace is a spraying application patent where McClain distinguishes spraying applications. (App. Br. 11 and 12).

Regarding claim 16, Appellant argues that this claim is not obvious for the same reasons as discussed above with respect to the combination of Wallace and McClain. (App. Br. 12 and 13).

ISSUE

Have Appellants shown that the Examiner erred in rejecting the appealed claims as being obvious to one of ordinary skill in the art over the cited prior art of record?

FINDINGS OF FACT

The record supports the following findings of fact (FF) by a preponderance of the evidence.

1. Appellant's Specification states:

> One aspect of the invention is a method of coating surfaces of a micro-mechanical device. The material from which the coating is made is dissolved in carbon dioxide (CO2). Using the CO2 as a carrier solvent, dissolved material is then deposited on at least one exposed surface of the device. The dissolved material may be applied with the CO2 in liquid form or with the CO2 in a supercritical state.
>
> An advantage of the invention is that the use of CO2 as a solvent and carrier has minimal environmental impact. CO2 solvents are low cost, and minimize solvent residue and the need for solvent recapture. (Spec. 3).

2. Wallace states:

> A common reliability problem is adhesion or sticking, which occurs when relatively movable elements contact each other. If these elements stick or adhere together, the device may cease to operate properly. (Col. 2, ll. 2-5).

3. Wallace states:

> Sticking or adhesion in DMD's [deformable mirror device] has been theorized to be caused, inter alia, by intermetallic bonding between mirrors and their landing electrodes and/or by the high surface energy of the contacting members due to the material thereof or to contaminants sorbed by or otherwise resident on their surfaces. (Col. 2, ll. 8-13).

4. Wallace states:

> PFPE [perfluoropolyether] may be deposited as a vapor by vapor deposition at low pressure or by thermal evaporative techniques, as a fine mist or an aerosol or other sol produced by

an appropriate mechanism such as a nebulizer or atomizer, or as a liquid film resulting from dipping or spinning[.] Deposition of the PFPE results in a PFPE film 31 on all exposed surfaces of the DMD 10, including the portions of the mirrors 11 and the landing electrodes 17 which contact or engage during operation of the DMD 10. (Col. 5, ll. 49-58).

5. Wallace states:

When the PFPE film 31 is deposited by dipping the DMD 10 into PFPE, the PFPE may be dissolved or dispersed in a low surface energy solvent or carrier to obviate damage to the delicate DMD elements which might otherwise be caused by large drops or masses of dense PFPE moving relatively thereto. (Col. 6, ll. 31-36).

6. McClain teaches entraining a surface treatment component in CO_2, which includes dissolving, and subsequently contacting a metal substrate.

In this instance, the "entrainment of the surface treatment component in the fluid" refers to a surface treatment component which may be solubilized, dissolved, emulsified, or dispersed in the bulk fluid during transport of the fluid to the substrate surface and also upon the interaction of the fluid with the substrate surface. (Col. 2, ll. 44-50).

7. McClain states:

In one, aspect, the invention provides a method of treating a substrate. The method comprises contacting, preferably by immersing, a surface of the substrate with a pressurized fluid comprising carbon dioxide and a surface treatment component. (Col. 2, ll. 8-12).

8. McClain states:

Various substrates may be treated in the process of the invention. Such substrates include, but are not limited to, fabrics/textiles, porous and non-porous solid substrates such as

metals (e.g., metal parts), glass, ceramics, synthetic and natural organic polymers, synthetic and natural inorganic polymers, other natural materials, and composite mixtures thereof. (Col. 7, ll. 42-48).

9. McClain states:

The term "treat" refers to the coating or impregnating of the substrate or substrate surface with the surface treatment component, with the surface treatment component tenaciously or permanently adhering to the surface after removal from the fluid, so that it serves as a protective coating thereon for the useful life of the coated substrate (e.g., is able to withstand multiple wash cycles when the substrate is a fabric or garment; is able to withstand a corrosive environment when the substrate is a part such as a metal part), until the substrate is discarded or must be re-treated. (Col. 4, ll. 47-56).

10. McClain states:

For the most part, organic solvents such as hydrocarbons, chlorinated solvents, and chlorofluorocarbons (CFCs) have been employed in treating various substrates. Recently, however, the use of these solvents has been increasingly disfavored due to heightened environmental concerns. As one alternative, aqueous-based systems have been proposed for treating various articles. The use of the aqueous-based systems, however, also suffers from possible drawbacks. For example, contacting an article with water often adversely affects the physical properties of the article. For example, the texture and drape of a textile can be negatively impacted, or flash rusting of metal parts may occur due to water contact. Additionally, many low surface energy materials are largely insoluble in water, and must be formulated into emulsions or suspensions (an inherent disadvantage of aqueous systems). Moreover, water of suitable quality for use in coating and impregnation is becoming less available and more expensive. (Col. 1, ll. 40-57).

In view of the above, it is an object of the present invention to provide a method of treating and/or impregnating a substrate

which does not require the use of organic solvents or water. (Col. 1, l. 66 – col. 2, l. 2.).

11. McClain states :

In a number of industrial applications, it is often desirable to treat the surface of an article or substrate in order to protect the substrate from contaminants. This typically includes controlling and enhancing the barrier properties of a surface to, for example, oils, grease, lipophilic materials, water, hydrophilic solutions, and dirt. (Col. 1, ll. 23-25).

12. McClain states:

Examples of such applications include SCOTCH GUARD® and STAIN MASTER® surface coating materials for textile articles such as furniture, clothing, and carpets to impart resistance to staining, and also treating articles formed from metal such as precision parts. (Col. 1, ll. 28-34).

PRINCIPLES OF LAW

"Section 103 forbids issuance of a patent when '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.'" *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1734 (2007). In *KSR*, the Court reaffirmed the elements of an obviousness analysis set out in *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1 (1966), namely: (1) determining the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; and (3) resolving the level of ordinary skill in the pertinent art. *KSR*, 127 S. Ct. at 1734. Secondary considerations such as commercial success, long felt but unsolved needs or failure of others "'might be utilized to give light to the

circumstances surrounding the origin of the subject matter sought to be patented.'" *Id.* (quoting Graham, 383 U.S. at 17-18).

In responding to a *prima facie* case of obviousness, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. *In re Keller*, 642 F.2d 413 (CCPA 1981); *In re Merck & Co., Inc.*, 800 F.2d 1091 (Fed. Cir. 1986).

ANALYSIS

Appellant relies on the same arguments for both grounds of rejection. Accordingly, we confine our discussion to appealed claim 1, which is representative of the arguments made by Appellant pursuant to 37 C.F.R. § 41.37(c)(1)(vii).

We are unpersuaded by Appellant's argument that neither Wallace nor McClain teach any of the limitations of claim 1. Appellant improperly attacks each reference individually to support this argument, rather than the combination of the references. *See Keller*, 642 F.2d 413; *Merck & Co., Inc.*, 800 F.2d 1091. In addition, Appellant's contention that the Examiner has not satisfied his burden to establish a *prima facie* case of obviousness is without merit. The Examiner made specific findings with respect to each of the references sufficient to establish a *prima facie* case of obviousness as detailed above and discussed below.

In order to establish a *prima facie* case of obviousness, prior art is evaluated based on what it, as a whole, conveys to one of ordinary skill in the art, rather than the specific teaching of each reference. *In re McLaughlin*, 443 F.2d 1392 (CCPA 1971); *In re Simon*, 461 F.2d 1387 (CCPA 1972). Appellant's argument that Wallace fails to teach any of the

limitations of claim 1 ignores the teachings of Wallace as a whole. We agree with the Examiner's findings that Wallace teaches all the limitations of claim 1, except for the use of CO_2 as a solvent. (Ans. 3 and 4). That is, Wallace teaches a method of coating at least one surface of a micro-mechanical device comprising dissolving a coating material in a solvent, and depositing the dissolved material on at least one exposed surface of the device. (Ans. 3, FF 4 and 5). In contrast to Appellant's argument, coating at least one surface of a micro-mechanical device, dissolving a coating material in a solvent, and depositing the dissolved material on at least one exposed surface of the device are all limitations of claim 1. The only difference between Wallace and claim 1 is the particular solvent used. The Examiner relies on McClain in order to resolve this difference. (Ans. 4).

Appellant contends that McClain does not teach any of the limitations of claim 1. However, McClain teaches all the limitations of claim 1, except that the substrate is a micromechanical device. Indeed, as acknowledged by Appellant, McClain teaches entraining a surface treatment component in CO_2, which includes dissolving, and subsequently contacting a substrate. (App. Br. 7 and 8, FF 6). Thus, McClain teaches a method of coating a metal substrate by dissolving a coating material in CO_2 and depositing the dissolved material on the substrate. (Ans. 4, FF 6-9). Moreover, Appellant's argument that it is unclear what is being construed as the coating material ignores the Examiner's specific findings that surface treatment refers to coating and the treatment component includes fluorine containing monomers and polymers. (*See* Ans. 4). We are therefore unpersuaded by Appellant's arguments.

We are also unpersuaded by Appellant's argument that there is no basis for combining Wallace and McClain. Appellant's argument that there is only one advantage presented in McClain again ignores what McClain as a whole would convey to one of ordinary skill in the art. (App. Br. 10). As pointed out by the Examiner, McClain teaches the environmental advantage of CO_2 as a carrier, over conventional solvents. (Ans. 7). This advantage is also readily apparent from the disclosure of McClain. (FF 10).

Regarding Appellant's argument as to how the enhancement of barrier properties discussed in McClain relates to the claimed invention, in the section cited by the Examiner, McClain states that the enhancement in barrier properties protects the substrate from contaminants. (Ans. 6, FF 11). In addition, Wallace states that sticking and adhesion in micro-mechanical devices is at least partially caused by contaminants sorbed by or otherwise present on the surfaces of the devices. (FF 3). Appellant has not rebutted the Examiner's finding that the surfaces of micro-mechanical devices are exposed to grease, oils, and foreign matter, for example. (Ans. 6). Thus, enhanced barrier properties relate to the ability of the coatings to protect the surface of the micro-mechanical devices from contaminants that cause sticking. Therefore, the benefits set forth in McClain also relate to the devices disclosed in Wallace.

We are unpersuaded by Appellant's contention that there would be no reasonable expectation of success in applying the solutions disclosed in McClain to micro-mechanical devices. (App. Br. 10, Reply Br. 5). Although Appellant argues that there is "no evidence on the record that refutes this" (App. Br. 11), it is Appellant who has not presented sufficient evidence to rebut the Examiner's determinations that one of ordinary skill in

the art would have reasonably expected to successfully achieve the advantages set forth in McClain by using CO_2 as a solvent for the coatings of Wallace. (Ans. 4-6).

Appellant points to page 2 of the Specification and emphasizes the "small" and "tiny" nature of micro-mechanical devices as support for the position that there is no reasonable expectation of success in combining McClain's solvent with Wallace's method. (App. Br. 10). However, Appellant has not adequately explained how the disclosed "small" and "tiny" nature of micro-mechanical devices distinguishes McClain's disclosure that the articles to be treated include "metals such as precision parts" or "metals (e.g., metal parts)". (FF 8 and 12). Appellant's position is based on mere attorney argument, which is not sufficient to rebut the Examiner's findings. *See In re Schulze*, 346 F.2d 600, 602, (CCPA 1965).

Further, Appellant argues that the problem of friction addressed by the invention is "unique to small parts of a micromechanical device." (App. Br. 10, Reply Br. 5). However, Appellant fails to address the fact that Wallace's coatings address this same problem. (FF. 2). In addition, Appellant's Specification identifies an advantage of the invention as minimizing environmental impact. (FF 1). This advantage is certainly not specific to micro-mechanical devices as evidenced by McClain. (*See* FF 8). Thus, we agree with the Examiner that one of ordinary skill in the art would have had a reasonable expectation of success in combining Wallace and McClain.

Appellant's argument that McClain distinguishes spraying applications from the application process disclosed therein teaches away from combining Wallace and McClain is not persuasive. To support this position, Appellant relies on the Examiner's alleged characterization that

Wallace is limited to spraying application, instead of Wallace's disclosure itself. Indeed, even Appellant appears to distinguish the Examiner's characterization of Wallace's application techniques from what is actually disclosed in Wallace: "the Examiner asserts that the Wallace Patent discloses 'the application of the PFPE is performed by vapor deposition, thermal evaporation, dipping, spinning, with a fine mist utilizing a nebulizer or atomizer.' According to this characterization, the Wallace Patent is a spraying application." (App. Br. 11) (emphasis in original). However, the Examiner's statement does not expressly characterize Wallace as only limited to spraying applications. Wallace discloses that the liquid film may also be deposited by dipping. (FF 4 and 5). Therefore, Appellant's argument that McClain teaches away from Wallace is not persuasive.

Regarding claim 16, Appellant relies on the arguments made with respect to Wallace and McClain to address this rejection. These arguments are not persuasive as discussed above.

CONCLUSION

In light of the above discussion, Appellant failed to demonstrate that the Examiner erred in rejecting claims 1-15 under 35 U.S.C. § 103(a) as being unpatentable over Wallace in combination with McClain. Appellant also failed to demonstrate that the Examiner erred in rejecting claim 16 under 35 U.S.C. § 103(a) as being unpatentable over Wallace in combination with McClain and further in combination with Hornbeck.

ORDER

The Examiner's decision rejecting claims 1-16 is affirmed.

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

AFFIRMED

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