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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte DAVID K. CINADER JR., BILL H. DODGE, and BRADLEY W. EATON

Appeal 2017-011676
Application 14/007,033[1]
Technology Center 3700

Before DONALD E. ADAMS, ERIC B. GRIMES, and RYAN H. FLAX, *Administrative Patent Judges*.

ADAMS, *Administrative Patent Judge*.

DECISION ON APPEAL

This Appeal under 35 U.S.C. § 134(a) involves claims 2–6, 9–11, 13, 16, 17, 19–22, and 35–39 (Final Act.[2] 1). Examiner entered rejections under 35 U.S.C. § 103(a). We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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[1] Appellants identify "3M Innovative Properties Co., . . . which is a subsidiary of 3M Co.," as the real party in interest (App. Br. 3).
[2] Examiner's August 12, 2016 Final Office Action.

STATEMENT OF THE CASE

Appellants' disclosure relates to "[c]omposite materials and related methods useful in the field of dentistry" (Spec. 1:7–8). Claims 2, 5, and 6 are representative and reproduced below:

> 2. A dental assembly comprising:
>
> a dental article having an outer surface for attachment to a tooth; and
>
> an adhesive in contact with the outer surface, the adhesive comprising:
>
> a compressible material carrier having interior surfaces that are hidden from view;
>
> and
>
> a conformal coating disposed on at least a portion of the compressible material, wherein the coating has a substantially uniform thickness and is disposed on interior surfaces of the compressible material that are hidden from view, and wherein the thickness of the conformal coating is in the range of 2 to 20 nanometers.
>
> 5. The assembly of claim 2, wherein the compressible material comprises meltblown nonwoven microfibers.
>
> 6. The assembly of claim 5, wherein the microfibers have an average effective fiber diameter ranging from 0.1 to 20 micrometers.

(App. Br. 16.)

Grounds of rejection before this Panel for review:

Claims 2–5, 10, 11, 13, 16, 17, 19–22, 35, and 37–39 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Cinader[3] and Parsons.[4]

Claims 6, 9, and 36 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Cinader, Parsons, and Weisman.[5]

ISSUE

Does the preponderance of evidence relied upon by Examiner support a conclusion of obviousness?

FACTUAL FINDINGS (FF)

FF 1. Cinader discloses

> an assembly including: a dental article (e.g., an orthodontic appliance) for bonding to tooth structure, the article having an outer surface; and a compressible material attached to the surface of the article. Preferably, the compressible material is mechanically bonded to the surface of the article, chemically bonded to the surface of the article, or a combination thereof. In certain embodiments, the compressible material includes a hardenable or partially hardened dental composition (e.g., a foamed dental composition).

(Cinader ¶ 5; *see also id.* ¶ 34–35; *see* Final Act. 3.)

FF 2. Cinader defines the term "dental composition" as "a material (e.g., a dental or orthodontic material) capable of adhering (e.g., bonding) to a tooth structure. Dental compositions include, for example, adhesives (e.g., dental and/or orthodontic adhesives)" (Cinader ¶ 9; *see* Final Act. 3).

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[3] Cinader, Jr., US 2009/0233252 A1, published Sept. 17, 2009.
[4] Parsons et al., US 2009/0137043 A1, published May 28, 2009.
[5] Weisman et al., US 4,865,596, issued Sept. 12, 1989.

FF 3. Cinader discloses:

> As used herein, "mechanically bonded" means bonded or attached through physical means (e.g., using hooks, loops, protrusions, van der Waals interactions, ionic bonds, and the like, including combinations thereof), and in certain embodiments utilizing the undercuts provided by mesh (e.g., on Victory Series brackets) and glass grit (e.g., on ceramic brackets). As used herein, "chemically bonded" means bonded or attached through chemical means (e.g., via shared electron pairs such as covalent bonding, coordinate covalent bonding, acid-base interactions such as Brønsted-Lowry reactions, and the like, including combinations thereof). For example, a hardenable dental composition (e.g., a hardenable resin, glass ionomer, resin-modified glass ionomer, and/or epoxy) can be hardened to chemically bond the compressible material [] to surface [] of dental article []. In certain embodiments, compressible material [] can be surface treated (e.g., with a silane coupling agent) to enhance the bond to surface [] of dental article []. In some embodiments, the compressible material [] can be bonded to surface [] of dental article [] by melting or softening the compressible material.

(Cinader ¶ 58; *see* Final Act. 3.)

FF 4. Cinader discloses that "[a] wide variety of compressible materials can be used in [its] assemblies . . . including, for example, porous materials" (Cinader ¶ 38; *see* Final Act. 3).

FF 5. Cinader discloses: "Exemplary porous materials include foams (e.g., polymeric foams including, for example, cellulose foams, glass foams, polymeric foams, and combinations thereof), sponges, nonwoven fabrics, glass fibers (e.g., glass wool), ceramic fibers, cotton fibers, cellulose fibers, woven mats, nonwoven mats, scrims, and combinations thereof" (Cinader ¶ 42; *see* Final Act. 3).

FF 6. Cinader discloses:

> For embodiments in which the compressible material includes fibers, the fibers can optionally be tied together (e.g., using a reactive silane, a curable resin, or a colloidal silica) to form a mat or scrim. In certain embodiments, mats can be prepared, for example, using short chopped glass or other fiber loosely bound. Optionally, the fibers can be temporarily encapsulated into a sheet or web to aid in cutting and handling using, for example, a water soluble or dispersible encapsulant (e.g., polyvinyl alcohol). In such embodiments, the mat can be cut into a desired shape and attached to an outer surface of a bracket, and the temporary encapsulant can then be washed away. In certain embodiments, nonwoven structures can be used as carriers for loading a reinforcing material (e.g., short chopped fibers) to enhance the strength of the composite formed upon curing.

(Cinader ¶ 43; *see* Final Act. 3.)

FF 7. Cinader discloses:

> A dental article (e.g., an orthodontic appliance) can be bonded to a tooth structure using compressible materials and hardenable dental compositions . . . using direct and/or indirect methods. For [example a] . . . compressible material [] and a hardenable dental composition is contacted with tooth structure [] and base [] of [an] orthodontic appliance []; and the hardenable dental composition is hardened. During this procedure, the orthodontic appliance is applied to the tooth structure with sufficient pressure to substantially fill any gaps between the appliance and tooth structure. . . . Because the contour of the tooth structure surface may not precisely match the contour of the outer surface of the base [], compressible material [] can be essentially completely compressed (e.g., at most 10% original pore volume remaining) in some areas, and essentially uncompressed (e.g., at least 90% of original pore volume remaining), or somewhat compressed in other areas. In certain embodiments, compressing compressible material [] as completely as possible to minimize the distance between [the]

> appliance [] and tooth structure [] can be advantageous for accurately expressing the prescription of the appliance.

(Cinader ¶ 152; *see* Final Act. 3–4.)

FF 8. Examiner found that Cinader "does not teach [] a conformal coating [] disposed on at least a portion of the compressible material/polymeric component as required" by Appellants' claimed invention, and relies on Parsons to make up for this deficiency in Cinader (Final Act. 4).

FF 9. Parsons discloses:

> Coatings of inorganic materials, . . . allow the creation of multifunctional textiles. Multifunctional textiles are materials that possess a combination of many different properties such as flame retardancy, water repellency, and antibacterial activity. These multifunctional textiles can be used for a number of different tasks, for example in such industries as medical, geotextiles and construction, upholstery, and filtration, to name a few. It is still desirable, however, for these coated textiles to still meet consumer demand in regards to comfort, ease of care, and health issues. Also, modified textile materials can protect against mechanical, thermal, chemical, and biological attacks, and at the same time offer improved durability and performance.

(Parsons ¶ 8.)

FF 10. Parsons relates "to a process for the modification of the surface and bulk properties of fiber and textile media, including synthetic polymeric and natural fibers and yarns in woven, knit, and non-woven form by low-temperature ALD [Atomic Layer Deposition]" (Parsons ¶ 3; *see id.* ¶ 40 ("The terms 'fiber' and 'fiber-based substrate' as used herein, are meant in their broadest sense to encompass all materials having a fibrous structure"); ¶ 67; Final Act. 4).

FF 11. Parsons' "ALD technique can permit the controlled deposition of thin films of up to about 0.5 nm per cycle, providing a method for precise control over coating thickness" (Parson ¶ 47; *see id.* ¶ 43 ("film thickness is directly controlled by the number of reactant exposure cycles used"); *see* ¶ 46; *see also id.* ¶ 92 (exemplifying the deposition of Al_2O_3 onto a substrate in ten ALD cycles); Final Act. 4).

FF 12. Parsons discloses:

> Coatings that are of particular interest are those which (1) improve stability of a material for mechanical, chemical, photo-chemical, or thermal destruction, (2) improve water, oil, and soil repellency properties of a material, (3) exhibit unique light absorption and emission properties in the UV and IR regions, (4) change the electrical conductivity of a material, (5) control release or immobilization of various active species. In addition, fibers and textile materials that are modified by such films can exhibit increased yield strength, reduced strain at yield stress, increased elastic modulus, increased fiber toughness, as well as increased wettability. It will be recognized that many materials are useful for more than one of these applications and that inorganic thin films will be useful for other applications not described here.

(Parsons ¶ 56.)

FF 13. Parsons discloses that "Aluminum oxide is [a] good example of a coating material that can be deposited using ALD. Aluminum oxide has many favorable traits including strong adhesion to different substrate surfaces, good dielectric properties, and good chemical and thermal stability (Parsons ¶ 57; *see also id.* ¶ 48; Final Act. 4.)

FF 14. Examiner finds that the combination of Cinader and Parsons "does not explicitly teach that the fibers have an average effective fiber diameter ranging from 0.1-20 or 2.5-6 microns" and relies on Weisman to make up for this deficiency in the combination of Cinader and Parsons (Final Act. 5).

ANALYSIS

The combination of Cinader and Parsons:

Based on the combination of Cinader and Parsons, Examiner concludes that, at the time Appellants' invention was made, it would have been prima facie obvious to coat the compressible fibrous material of Cinader's device with Parsons' aluminum oxide conformal coating to enhance the properties of Cinader's fibrous material (*see* FF 1–13; *see generally* Final Act. 4). As Examiner explains, the combination of Cinader and Parsons would result in a device wherein "the hardenable composition would be in contact with the coating" (*id.* at 4–5).

Appellants' claim 2 does not require the conformal coating to provide increased bond strength and/or reduce bond variability between the compressible material and the surrounding adhesive matrix (*see* App. Br. 16). Therefore, we are not persuaded by Appellants' contention that "[t]he present specification provides a number of examples illustrating how the conformal coating can provide increased bond strength and reduce bond variability between the compressible material and the surrounding adhesive matrix" (*id.* at 6; *see also id.* at 5–7; Reply Br. 2 ("The conformal coating provides increased bond strength and reduced bond variability <u>between the compressible material and the surrounding adhesive matrix</u>")).

Appellants' claim 2 does not require a coating that enhances bonding to an adhesive matrix or "a conformal coating to modify the adhesion between the fibers in the compressible material carrier and the surrounding adhesive" (*see* App. Br. 8; *see also id.* at 10–11; Reply Br. 3–6). Therefore, we are not persuaded by Appellants' contentions that neither Cinader nor Parsons suggest modifying fibers to include a coating to enhance bonding to an adhesive matrix (App. Br. 8; *see also id.* at 9 ("conspicuous by its absence is any disclosure in Parsons that the coatings can be applied to fibers to enhance adhesion of the coated fibers to a surrounding adhesive matrix")).

For the foregoing reasons, we are not persuaded by Appellants' contention that Parsons disclosed "benefits of ALD coatings on fiber and textile materials . . . [that] are far afield from adhesive bonding in an oral environment" (*see* App. Br. 9; *see also id.* at 12 ("Parsons fails to recognize or appreciate that a conformal coating can enhance bonding between a fiber and an adhesive matrix material"); Reply Br. 2–5; *cf.* FF 9–13). Therefore, we are not persuaded by Appellants' contention that Examiner "failed to show that either Cinader nor Parsons recognize or appreciate the need to improve properties of the fibers in the compressible materials such as bond strength to the adhesive matrix," which is not required by Appellants' claim 2 (App. Br. 9).

Parsons discloses improving fibrous materials, such as those disclosed by Cinader, for use in medical applications (FF 1–13). Therefore, we are not persuaded by Appellants' contentions relating to the rationale for combining Parsons with Cinader (*see* App. Br. 10). *See In re Beattie*, 974 F.2d 1309, 1312 (Fed. Cir. 1992) ("As long as some motivation or suggestion to combine the references is provided by the prior art taken as a whole, the law does not require that the references be combined for the reasons contemplated by the inventor.").

Parsons discloses that the ALD method provides precise control over coating thickness and exemplifies the deposition of Al_2O_3 onto a substrate in ten ALD cycles, wherein thin films of up to about 0.5 nm thickness are added per cycle, resulting in a coating thickness of about 5 nm (FF 11).

Therefore, we are not persuaded by Appellants' contention that the combination of Cinader and Parsons fails to suggest a conformal coating thickness in the range of 2 to 20 nanometers as required by Appellants' claim 2 or that Examiner failed to establish "that modifying Parsons' processes to reach the claimed thickness range would only involve routine experimentation, as Parsons fails to recognize or appreciate the criticality of the thickness of the conformal coating" (*see* App. Br. 11–12).

To be complete, we recognize that Examiner makes reference to Cinader's paragraph 58, which discloses, *inter alia*, that Cinader's "compressible material [] can be surface treated . . . to enhance the bond to [the] surface [] of [a] dental article" (*see* Final Act. 3; FF 3). Therefore, we are not persuaded by Appellants' contention that Examiner provided no support for the proposition that "Cinader 'discloses that treatments can be provided to improve the bonding of the material, teaching to one of ordinary skill in the art that weak bonding may be of concern" (App. Br. 8 (footnote omitted); *see also* Reply Br. 2).

The combination of Cinader, Parsons, and Weisman:

Based on the combination of Cinader, Parsons, and Weisman, Examiner concludes that, at the time Appellants' invention was made, it would have been prima facie obvious to modify the device suggested by the combination of Cinader and Parsons with Weisman because Cinader discloses "that the materials disclosed in Weisman are exemplary for the device of Cinader" (Final Act. 5 (citing Cinader ¶ 42)).

Having found no deficiency in the combination of Cinader and Parsons, we are not persuaded by Appellants' contention that Weisman fails to "cure[] the deficiencies of Cinader and Parsons" (App. Br. 14).

CONCLUSION

The preponderance of evidence relied upon by Examiner supports a conclusion of obviousness.

The rejection of claim 2 under 35 U.S.C. § 103(a) as unpatentable over the combination of Cinader and Parsons is affirmed. Claims 3–5, 10, 11, 13, 16, 17, 19–22, 35, and 37–39 are not separately argued and fall with claim 2.

The rejection of claim 6 under 35 U.S.C. § 103(a) as unpatentable over the combination of Cinader, Parsons, and Weisman is affirmed. Claims 9 and 36 are not separately argued and fall with claim 6.

TIME PERIOD FOR RESPONSE

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

AFFIRMED