Merchant & Gould

VF OUTDOOR, LLC,
Petitioner,
v.
COCONA, INC.,
Patent Owner.

Case No.: IPR2018-00190

Patent No.: 8,945,287

All Challenged Claims of the '287 Patent are Unpatentable as Anticipated or Obvious

- *Ground 1*:
  - Claims 27, 28, 30, 32, and 36-37 of the '287 Patent are anticipated under 35 U.S.C. §102(b) by *Dutta*.
- *Ground 2*:
  - Claims 27, 28, 30, 32, and 35-39 of the '287 Patent are obvious under 35 U.S.C. §103(a) over *Dutta* in view of *Haggquist*.
- *Ground 3:*
  - Claims 27, 28, 30, 32, 33, and 35-37 of the '287 Patent are anticipated under 35 U.S.C. §102(b) by *Halley*.
- *Ground 4:*
  - Claims 38-39 of the '287 Patent are obvious under 35 U.S.C. §103(a) over *Halley* in view of *Haggquist*.

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Claim Construction

First Thickness

- '287 Patent File History

larger than the second thickness. Support for these claim amendments may be found at, for example, Paragraph 0049, which states that the Example 1 membrane comprises a thickness of about 1mil, or about 25.4 microns (the first thickness) and Paragraph 0050, which states that the activated carbon used in such a membrane comprises Asbury5564™ powdered coconut activated carbon As seen in the attached Product Data Sheet for Asbury 5564™ powdered coconut activated carbon, the particle size for the Asbury 5564™ powdered coconut activated carbon comprises about 10 microns (the second thickness). Therefore, the first thickness is less than an order of magnitude larger than the second thickness.

Ex. 1007, at 17; *see also* Paper 1, at 18; Ex. 1005, ¶ 90.

First Thickness

- '287 Patent support for first thickness amendment (Example 1, including active particles)

Membranes were also produced by drawing down the mixture on release paper. These membranes were cured and dried in an oven and then removed from the release paper yielding a self supporting membrane. This membrane was one mil thick.

Ex. 1001, 9:14-18; *see also* Paper 1, at 10-11; Ex. 1005, ¶¶ 90, 94-96.

EXAMPLE 1

Polyurethane solutions were combined with protected activated carbon. The protected activated carbon was suspended in the polyurethane solution and the mixture was applied to a nylon woven fabric. The mixture was dried and cured in an oven, where at least a portion of the protective substance was removed (e.g., evaporated off), resulting in a membrane coated on a substrate, the membrane having a thickness of one mil. The resultant membranes were then tested for butane adsorbance, dry time, moisture vapor transmission rate (MVTR), hydrostatic head, IR reflectance, and volume resistivity.

Ex. 1001, 8:54-64 (Example 1); *see also* Paper 1, at 10-11; Ex. 1005, ¶¶ 90, 94-96.

First Thickness

- Institution Decision

"[W]e construe 'first thickness' to mean 'the thickness of a base material,' which base material may include active particles."

Paper 14, at 12.

Second Thickness

- '287 Patent File History

larger than the second thickness. Support for these claim amendments may be found at, for example, Paragraph 0049, which states that the Example 1 membrane comprises a thickness of about 1mil, or about 25.4 microns (the first thickness) and Paragraph 0050, which states that the activated carbon used in such a membrane comprises Asbury5564™ powdered coconut activated carbon As seen in the attached Product Data Sheet for Asbury 5564™ powdered coconut activated carbon, the particle size for the Asbury 5564™ powdered coconut activated carbon comprises about 10 microns (the second thickness). Therefore, the first thickness is less than an order of magnitude larger than the second thickness.

Ex. 1007, at 17; *see also* Paper 1, at 18; Ex. 1005, ¶ 90.

Second Thickness

- Institution Decision

"[W]e construe 'second thickness' to mean 'the thickness of a plurality of active particles,' which may be the particle size of the active particles."

Paper 14, at 13.

Active Particles

- '287 Patent

These particles may provide such properties because they are "active." That is, the surface of these particles may be active. Surface active particles are active because they have the capacity to cause chemical reactions at the surface or physical reactions, such as, adsorb or trap substances, including substances that may themselves be a solid, liquid, gas or any combination thereof. Examples of substances that may be

Ex. 1001, col. 4:4-10.

Active particles may include, but are not limited to, activated carbon, aluminum oxide (activated alumina), silica gel, soda ash, aluminum trihydrate, baking soda, p-methoxy-2-ethoxyethyl ester Cinnamic acid (cinoxate), zinc oxide, zeolites, titanium dioxide, molecular filter type materials, and other suitable materials.

Ex. 1001, col. 4:22-27.

Active Particles

- *Haggquist* (incorporated by reference)

[0004] These particles can provide such properties because they are "active". Active particles are active because they have the capacity to adsorb or trap substances, including substances that may themselves be a solid, liquid, and/or gas, for example, pollen, water, butane, and ambient air. Active particles have an adsorptive property because each particle has a multitude of pores (e.g., pores on the order of thousands, tens of thousand, or hundreds of thousands per particle). It is these pores that provide the active particle with its capacity to adsorb. For example, an active particle such as activated carbon can adsorb a substance (e.g., butane) by trapping the substance in the pores of the activated carbon.

Ex. 1004, ¶ 4;
Paper 1, at 12;
Ex. 1005, ¶ 98.

Active Particles

- Institution Decision

"[W]e construe 'active particles' as 'particles that have the capacity to cause chemical reactions at the surface or physical reactions, such as, adsorb or trap substances.'"

Paper 14, at 10.

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Ground 1

Dutta

- *Dutta* discloses "a liquid-impermeable breathable cured base material comprising a first thickness" (claim 27).
- Cast and Dried Film from Polyurethane Solution

Example 1B

To 36.8 grams of the hydrophilic polyurethane solution SOLUCOTE TOP 932, 1.55 grams (10 phr) of cross-linked dextran particles (Sephadex G-200-50 from Sigma Chemical Co., with a particle size of 20-50 micrometers, and an absorption capacity of about 24 gm./gm.) was added and stirred to uniformly disperse the particles into the solution. A film was then cast from this mixture on a release paper using a 10 mil drawdown bar and dried under ambient conditions. The dried film was then heated in an oven at 155°C for 5 minutes to post-cure the film before peeling it off from the release paper for testing. The test results are provided in Table 1.

Ex. 1002, at 18:10-21; *see also* Ex. 1002, at 11:9-14; Paper 1, at 21, 33; Ex. 1005, at ¶¶ 63, 114-15.

Dutta

- First Thickness (0.0030 in./76.2 µm)

TABLE 1

Polymer Resin:Hydrophilic polyurethane (SOLUCOTE TOP 932)

Physical Form Used:Solution

(about 42% by weight in toluene/dimethylformamide mixture)

Example	Absorbent Particle	Amount of Particle (phr)	Film Thickness (inches)	Average WVTR Of Three Test Areas	Air Permeability	Waterproofness, (WP2)
Comparative Example 1	——	0.0	0.0027	5583	Impermeable	Pass
Example 1A	Nalco® 1181	5.0	0.0032	7194	Impermeable	Pass
Example 1B	Sephadex G-200-50	10.0	0.0030	6730	Impermeable	Pass

Ex. 1002, Table 1, 23:1-8; *see also* Paper 1, at 22, 24, 33; Ex. 1005, ¶¶ 64, 116.

Dutta

- *Dutta* discloses "a plurality of active particles in contact with the liquid-impermeable breathable cured base material . . . comprising a second thickness" (claim 27).
- Sephadex (20-50 µm particle size)

Example 1B

To 36.8 grams of the hydrophilic polyurethane solution SOLUCOTE TOP 932, 1.55 grams (10 phr) of cross-linked dextran particles (Sephadex G-200-50 from Sigma Chemical Co., with a particle size of 20-50 micrometers, and an absorption capacity of about 24 gm./gm.) was added and stirred to uniformly disperse the particles into the solution. A film was then cast from this mixture on a release paper using a 10 mil drawdown bar and dried under ambient conditions. The dried film was then heated in an oven at 155°C for 5 minutes to post-cure the film before peeling it off from the release paper for testing. The test results are provided in Table 1.

Ex. 1002, 18:10-21; *see also* Ex. 1002, 11:9-14; Paper 1, at 21, 34; Ex. 1005, ¶¶ 63, 117, 127-28.

Dutta

- *Dutta* discloses "a plurality of active particles" (claim 27).
- As shown in the Petition, Dr. Oelker's declaration and supporting exhibits, Sephadex demonstrates the following characteristics of "active particles" (*See* Paper 1, at 34):
  - Sephadex is a molecular filter. (Ex. 1005, ¶¶ 119-20, 124; Ex. 1024 (*Sato*), 1:66-68; Ex. 1004, ¶ 30.)
  - Sephadex is porous. (Ex. 1005, ¶ 122; Ex. 1023 (*Sherma*), at 1286; Ex. 1027 (*Pharmacia*), at 7.)
  - Sephadex is adsorbent. (Ex. 1005, ¶ 121; Ex. 1023 (*Sherma*), at 143.)
  - Sephadex is absorbent. (Ex. 1005, ¶ 123; Ex. 1002, 4:20-28, 9:15-18; 18:10-21.)
  - Sephadex is capable of trapping water and other substances. (Ex. 1005, ¶¶ 117-125; Ex. 1023 (*Sherma*), at 143; Ex. 1002, 18:10-21, 23:3-10.)

Dutta

- Sephadex particles are active particles because they "have the capacity to . . . adsorb or trap substances." (*See* Paper 14, at 10.) (Board construction of active particles).
- Sephadex adsorbs or traps water (*Sherma*).

Table 7 Types of Sephadex® Used in Thin-Layer Chromatography and Their Properties

Type	Capacity for adsorption of water (mL/g)	Fractionating range for dextrans: molecular weight (Da)
G-25	2.5±0.2	100–5,000
G-50	5.0±0.3	500–10,000
G-75	7.5±0.5	1,000–50,000
G-100	10.0±1.0	5,000–100,000
G-200	20.0±2.0	5,000–200,000

Source: Pharmacia, Uppsala, Sweden.

Ex. 1023, at 143; *see also* Paper 1, at 34; Ex. 1005, at ¶ 121.

Dutta

- Sephadex also meets Cocona's narrow construction: Cocona's expert Dr. Daniels testifies that the surface of Sephadex includes both the "exterior and interior" and that water adheres to Sephadex by "start[ing] on the outside and mov[ing] to the inside."

See Ex. 1044, at ¶44; *see also* Paper 1, at 34; Ex. 1005, ¶ 122; Ex. 1023 (*Sherma*), at 1286; Ex. 1027 (Pharmacia), at 7.

Q Like a Sephadex bead. What is the surface of a Sephadex individual bead?

A Well, it's the chemical itself. It's the chemical itself.

Q So both the exterior and the interior?

A Yes. When it starts out, it's probably fairly homogenous and the bead contains the chemistry of whatever the Sephadex composition is.

Q So water with respect to Sephadex is adhering both to the outside and the inside?

A Well, it will start on the outside and move to the inside and various chemical groups will reorient themselves in order to interact with the water.

Ex. 1047, at 22:11-24.

Dutta

- Sephadex traps substances, e.g., water.

  Paper 1 (Petition), at 34; Ex. 1005 (1st Oelker Decl.), ¶¶ 117-25; Ex. 1023 (*Sherma*), at 143; Ex. 1002, 18:10-21; Ex. 1044 (2d Oelker Decl.), ¶ 44.

- Sephadex also traps water on its surface meeting Cocona's construction (*Marenco*).

> Sephadex G-50 beads are commonly used for desalting and gel exclusion chromatography. In solution, these beads swell and trap water both within the bead, and on the surface of the bead in a microfilm, when placed in liquid (Figure 1-21). We theorized that the affinity for, and the trapping of water on and within the beads may help reduce evaporation and maintain effective local reagent concentrations during PCR thermocycling and improve overall PCR efficiency.

Ex. 1055, at 59.

Dutta

- Cocona expert Mr. Callan admits that Sephadex traps water. *See* Ex. 1044, at ¶ 41.

Q (By Mr. Gergely) Well, sir, certainly, you'll agree with me that Sephadex traps water; correct?
A Yes.

Ex. 1048, 157:5-8.

Dutta

- Sephadex particles are molecular filters (or sieves),(described as "active particles.")

  See Paper 1 (Petition), at 34, 37; Ex. 1001 ('287 patent), 4:22-27; Ex. 1005 (1st Oelker Decl.), at ¶¶ 120-21; Ex. 1024 (*Sato*), 1:66-68.

- *Texter* describes Sephadex as a molecular sieve that adsorbs water.

We report herein the results of near-infrared and water-vapor adsorption (desorption) studies on the state of adsorbed water in a model carbohydrate system, a dextran gel (Sephadex® type G-15 gel, Pharmacia Fine Chemicals, Inc.) This swelling molecular sieve has found wide usage over the past fifteen years in many biochemical purification and chromatographic procedures[19] In addition to structural

Ex. 1049, at 192.

Dutta

- Cocona experts Daniels and Callan testify that Sephadex is a molecular sieve or filter.
  See Ex. 1044 (2d Oelker Decl.), ¶ 41.

24 Q And then molecular filter type materials, what
25 molecular filter type materials beyond this

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1 list are considered active?
2 A In chromatography they use something called
3 molecular sieves, and those are used to remove
4 impurities from substances, things that are
5 colored that you want to get rid of the color
6 from. And they consist of a variety of
7 materials, all of which I don't recall their
8 chemical makeup. But they're widely available.
9 Q Is Sephadex a molecular sieve?
10 A It could be.

Ex. 1047 (Daniels), at 58:24-59:10.

6 Q Okay. And do you see where the authors then
7 refer to Sephadex as a swelling molecular sieve?
8 A I do.
9 Q And we know that zeolites are molecular
10 sieves; correct?
11 A Yes.
12 Q And you'll agree with me that Sephadex is a
13 molecular sieve; correct?
14 A It can be used as that.

Ex. 1048 (Callan), at 171:6-14.

Dutta

- *Pavia* describes Sephadex as a molecular sieve that adsorbs water "on the polymer."

  See Ex. 1044 (2d Oelker Decl.), ¶ 42.

Equivalent terms used by chemists for the gel-chromatography technique are **gel filtration** (biochemistry term), **gel-permeation chromatography** (polymer chemistry term), and **molecular sieve chromatography. Size-exclusion chromatography** is a general term for the technique, and it is perhaps the most descriptive term for what occurs on a molecular level.

Ex. 1050, at 717.

Sephadex is one of the most popular materials for gel chromatography. It is widely used by biochemists for separating proteins, nucleic acids, enzymes, and carbohydrates. Most often water or aqueous solutions of buffers are used as the moving phase. Chemically, Sephadex is a polymeric carbohydrate that has been cross-linked. The degree of cross-linking determines the size of the "holes" in the polymer matrix. In addition, the hydroxyl groups on the polymer can adsorb water, which causes the material to swell. As it expands, "holes" are created in the matrix. Several different

Ex. 1050, at 718.

Dutta

- *Texter* describes hydrogen bonding as the mechanism by which Sephadex adsorbs water. *See*; Ex. 1044, at ¶ 43.

acceptor attachments can probably be ruled out The $-107\ cm^{-1}$ vibrational shift is attributed simply to the "skeletal field" of the gel and it is proposed that the adsorbed water molecules participate in two (or more) "hydrogen bonds" (involving gel hydroxyl groups and/or ether linkages) The vibrational restriction is, on the average,

Ex. 1049, at 206.

Dutta

- *Pavia* provides that admittedly active particles, such as alumina and silica gel, also adsorb by hydrogen bonding.

  See Ex. 1044, at ¶ 43.

If powdered or finely ground alumina (or silica gel) is added to a solution containing an organic compound, some of the organic compound will **adsorb** onto or adhere to the fine particles of alumina. Many kinds of intermolecular forces cause organic molecules to bind to alumina. These forces vary in strength according to their type. Non-polar compounds bind to the alumina using only van der Waals forces. These are weak forces, and nonpolar molecules do not bind strongly unless they have extremely high molecular weights. The most important interactions are those typical of polar organic compounds. Either these forces are of the dipole-dipole type or they involve some direct interaction (coordination, hydrogen-bonding, or salt formation). These types of

Ex. 1050, at 697.

Dutta

- Dr. Daniels agrees that hydrogen bonding is the mechanism of action for Sephadex and a number of other active particles.

9	Q	Sir, I had asked you about activated carbon,
10		silica gel, and zeolites, and you postulated
11		that all of those materials contain some sort
12		of polarity in the pores and through hydrogen
13		bonding or some other similar mechanism the
14		water is attaching to those pores. Is that
15		correct?
16	A	That's what I said.
17	Q	Okay. I'm asking you: Do you know how
18		Sephadex works in terms of how -- what kind of
19		bonding is occurring between the water vapor
20		and the Matrix?
21	A	Again, if Sephadex is in fact a
22		polysaccharide-like molecule, it certainly does
23		have functional groups which are both oxygen
24		containing and OH containing. So certainly
25		hydrogen bonding is one of the driving forces

1		for the absorption of the fluid.

Ex. 1047, 38:9-39:1; *see also* 37:3-39:1; 88:22-89:22.

Dutta

- Particles that adsorb can also absorb.

  See Ex. 1044, at ¶ 16.

- For example, Dr. Daniels describes admittedly "active particle" silica gel as an "absorbing substance."

the base material does not change chemically. Contrastingly, an absorbing substance such as silica gel or a crosslinked polyacrylic acid substance imbibes a liquid such as water, causing the particles to swell microscopically to macroscopically. A

Ex. 2006 (Daniels Decl.), ¶ 43.

Dutta

- Sephadex is an adsorptive particle, according to Dr. Daniels' criteria. *See* Ex. 2006, ¶¶ 39-40, 42, 47; Ex. 1044, ¶¶ 46-48.
  - Under Cocona's narrow construction, Sephadex also exhibits surface-based adsorption. *See* Ex. 1050 (*Pavia*), at 717-18; Ex. 1049 (*Texter*), at 192, 206; Ex. 1055 (*Marenco*), at 59.
  - Sephadex has a limited (as opposed to unlimited) capacity to adsorb water. Ex. 1023 (*Sherma*), at 143 (20 ml/g).
  - Sephadex adsorbs water by an exothermic process. Ex. 1049 (*Texter*), Fig. 7, at 204.
  - Sephadex reaches an adsorption-desorption equilibrium. Ex. 1049 (*Texter*), Fig. 7, and 203.
  - Sephadex is readily regenerated to its original form through dehydration. Ex. 1027 (*Pharmacia*), at 31.

Dutta

- *Dutta* discloses "the first thickness comprises a thickness at least 2.5 times larger than the second thickness but less than an order of magnitude larger than the second thickness" (claim 27).

130. As discussed above, the first thickness, based on the thickness of the film in Example 1B, is 0.0030 inches (76.2 microns) and the second thickness, based on the Sephadex particle size, is from 20-50 microns. As such, any particles sized from 20-30 microns within the 20-50 micron range meet the claimed thickness ratio. For example, 76.2 microns is more than 2.5 times 20-30 µm (50-75 µm) and less than 10 times larger than 20-30 µm (200-300 µm).

Ex. 1005, ¶ 130; *see also* Paper 1, at 23-24; Ex. 1002, Table 1, 23:1-8, 18:10-21.

Dutta

- *Dutta* discloses the element: "the active particles improve the moisture vapor transport capacity of the composition, and a moisture vapor transmission rate of the water-proof composition comprises from about 600 g/m^2/day to about 11000 g/m^2/day." (claim 27).

- *Dutta* teaches Sephadex (Example 1B) shows an MVTR of 6730 g/m^2/day.

Ex. 1002, 4:20-28, Table 3; *see also* Paper 1, at 24-25; Ex. 1005, at ¶¶ 131-32.

TABLE 1

Polymer Resin:Hydrophilic polyurethane (SOLUCOTE TOP 932)
Physical Form Used:Solution
(about 42% by weight in toluene/dimethylformamide mixture)

Example	Absorbent Particle	Amount of Particle (phr)	Film Thickness (inches)	Average WVTR Of Three Test Areas	Air Permeability	Waterproofness, (WP2)
Comparative Example 1	——	0.0	0.0027	5583	Impermeable	Pass
Example 1A	Nalco® 1181	5.0	0.0032	7194	Impermeable	Pass
Example 1B	Sephadex G-200-50	10.0	0.0030	6730	Impermeable	Pass

Dutta

- *Dutta* discloses the limitations of claims 28, 30, 32, and 36-37.
  - Claim 28: Ex. 1002, 18:10-17; Paper 1, at 26; Ex. 1005, ¶ 133.
  - Claim 30: Ex. 1002, 18:10-17; Paper 1, at 27; Ex. 1005, ¶ 134.
  - Claim 32: Ex. 1002, 18:10-17; Paper 1, at 28; Ex. 1005, ¶ 135.
  - Claim 36: Ex. 1002, Table 1; Paper 1, at 29-30; Ex. 1005, ¶ 136.
  - Claim 37: Ex. 1002, 18:10-17; Paper 1, at 30; Ex. 1005, ¶ 137.

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Ground 2

Haggquist

- *Haggquist* discloses "a plurality of active particles . . . comprising a second thickness" (claim 27).
- Activated carbon particles less than 10 µm.

[0004] These particles can provide such properties because they are "active". Active particles are active because they have the capacity to adsorb or trap substances, including substances that may themselves be a solid, liquid, and/or gas, for example, pollen, water, butane, and ambient air. Active particles have an adsorptive property because each particle has a multitude of pores (e.g., pores on the order of thousands, tens of thousand, or hundreds of thousands per particle). It is these pores that provide the active particle with its capacity to adsorb. For example, an active particle such as activated carbon can adsorb a substance (e.g., butane) by trapping the substance in the pores of the activated carbon.

[0085] The activated carbon used in this example is sold as model number SA-30 by CarboChem Corporation, of Ardmore, Pa. The SA-30 was further jet milled and classified such that 97% of the carbon particles had a mean size less than 10 microns in diameter. Thus, 97% of the SA-30 used in this example had a diameter of less than 10 microns.

Ex. 1004, at ¶¶ [0004], [0085]; *see also* Paper 1, at 23-24,; Ex. 1005, at ¶¶ 141-42.

Dutta/Haggquist

- *Dutta/Haggquist* disclose the limitations of claims 28, 30, 32, and 35-39.
  - Claim 28: Ex. 1002, 18:10-17; Ex. 1004, Fig. 6, ¶ 91; Paper 1, at 26-27; Ex. 1005, ¶¶ 133, 159-61.
  - Claim 30: Ex. 1002, 18:10-17; Ex. 1004, Figs. 6, 7, ¶ 91; Paper 1, at 27-28; Ex. 1005, ¶¶ 134, 162-64.
  - Claim 32: Ex. 1002, 18:10-17; Ex. 1004, Figs. 6, 7, ¶ 91; Paper 1, at 28-29; Ex. 1005, ¶¶ 135, 165-67.
  - Claim 35: Ex. 1004, ¶¶ 19, 30; Paper 1, at 29; Ex. 1005, ¶¶ 168-70.
  - Claim 36: Ex. 1002, Table 1; Ex. 1004, ¶¶ 30, 84-85; Paper 1, at 30; Ex. 1005, ¶¶ 136, 171-74.
  - Claim 37: Ex. 1002, 18:10-17; Ex. 1004, ¶ 30; Paper 1, at 30; Ex. 1005, ¶¶ 137, 175-77.
  - Claim 38: Ex. 1004, Abstract, ¶¶ 13, 30; Paper 1, at 31; Ex. 1005, ¶¶ 178-83.
  - Claim 39: Ex. 1004, ¶ 33; Paper 1, at 32; Ex. 1005, ¶¶ 184-88.

Reasons to Combine (Dutta/Haggquist)

- A POSITA would have had several reasons to substitute the Sephadex particles disclosed in Example 1B of *Dutta* with the admittedly active particles disclosed in *Haggquist* to arrive at the composition of the challenged claims with a reasonable expectation of success. (Paper 1, at 43-50; Ex. 1005, ¶¶ 145-58; Paper 33, at 15-17; Ex. 1044, ¶¶59-65.)
  - Both references use porous particles with the ability trap water to add performance enhancing characteristics to garments. (Ex. 1023 (*Sherma*), at p. 143, 1286; Ex. 1002, 4:20-28, 18:10-17, 23:1-10; Ex. 1004 at ¶¶ 4-5.)
  - *Dutta* discloses that Sephadex can be substituted for similar-type particles. (Ex. 1002, at 17-18, 23.)
  - *Haggquist* discloses that "molecular filter-type materials" are active particles, and Sephadex is a molecular filter-type material. (Ex. 1002, at 18, 23; Ex. 1024, 1:66-68; Ex. 1004, ¶ 30.)

Reasons to Combine (cont.)

- To protect the performance enhancing properties of Sephadex, a POSITA would have looked to *Haggquist*'s removable encapsulants. (Ex. 1002, Abstract; Ex. 1004, ¶ 3.)
- *Dutta* and *Haggquist* are analogous art. (Paper 1, at 43).
- Under *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398 (2007), Haggquist's active particles and *Dutta*'s Sephadex perform the same function (adsorption and/or trapping) to obtain the same result (moisture management). (Paper 1, 44-45; Ex. 1002, Abstract, 23:3-10.; Ex. 1023 (*Sherma*), at 143, 1286; Ex. 1024 (*Sato*), 1:66-68; Ex. 1004, ¶¶ 3, 30.)

Reasonable Expectation of Success (Dutta/Haggquist)

- A POSITA would have had a reasonable expectation of successfully substituting Sephadex particles disclosed in Example 1B of *Dutta* with the admittedly active particles disclosed in *Haggquist* to arrive at the composition of the challenged claims with a reasonable expectation of success. (Paper 1, at 43-50; Ex. 1005, ¶¶ 145-58; Paper 33, at 15-17; Ex. 1044, ¶¶59-65.)
  - Both references disclose the use of porous particles that trap and/or adsorb water. (Ex. 1004, Abstract, ¶¶ 3-4, 30; Ex. 1002, 23:3-10; Ex. 1023 (*Sherma*) at 143, 1286; Ex. 1005, ¶¶ 155-157,181-182.)
  - *Haggquist* discloses that its active particles, e.g., activated carbon particles, are porous particles that chemically and/or physically react with and/or trap water in their pores to provide moisture management properties. (Ex. 1004, ¶¶ 3-4, 30.)

Reasonable Expectation of Success (Dutta/Haggquist) (cont.)

- Whether acting through adsorptive or absorptive mechanisms of action, the porous Sephadex particles physically react with and/or trap water (Ex. 1002, Abstract, 23:3-10; Ex. 1023 (Sherma) at 143, 1286; Ex. 1024 (Sato), 1:66-68), this is the same function performed by the porous, activated particles disclosed in *Haggquist* (Ex. 1004 at ¶¶ 3-4, 30).
- Thus, both *Dutta* and *Haggquist* disclose use of the same types of particles to provide similar performance enhancing characteristics to a garment and a POSITA would therefore reasonably expect the active particles listed in *Haggquist* to be successful when substituted for the Sephadex particles utilized in Example 1B of *Dutta*. (Ex. 1005, ¶¶ 155-157.)

Reasonable Expectation of Success (Dutta/Haggquist)

- Regarding claims 38-39, a POSITA would have had a reasonable expectation of successfully substituting the Sephadex particles disclosed in Example 1B of *Dutta* with the admittedly active particles disclosed in *Haggquist* to arrive at the composition of the challenged claims with a reasonable expectation of success.
  - A POSITA would have a reasonable expectation that the combination of the encapsulant method disclosed in *Haggquist* with the Sephadex particles utilized in *Dutta* would succeed because *Haggquist* recites that this encapsulant method works on active particles (which include adsorbent, absorbent, and molecular filter particles). (*Id*. at Abstract and ¶ 30.)
  - Since both *Dutta* and *Haggquist* disclose the use of the active particles with similar properties (molecular filter-type materials that are porous, adsorptive, and/or absorptive particles that trap water), there is a reasonable expectation that use of a removable encapsulant from *Haggquist* would succeed to improve the performance characteristics of the active particles disclosed in *Dutta* and/or in *Haggquist*. (Ex. 1002 at p. 23:3-10; Ex. 1004 at Abstract and ¶ 30.)

Reply to PO (Dutta/Haggquist)

- In contrast to PO's arguments, a POSITA would not have been deterred from combining *Dutta* and *Haggquist* and would have had a reasonable expectation of success.
  - *Dutta*'s combination of Sephadex with a number of "inert" diluent particles (active particles according to *Haggquist*) encourages rather than discourages substitution of Sephadex for *Haggquist*'s active particles. (Ex. 1002, Abstract, 23:3-10.; Ex. 1023, at 143, 1286; Ex. 1024, 1:66-68; Ex. 1004, ¶¶ 3, 30; Paper 33, at 15-16; Ex. 1044, ¶¶ 60-62.)
  - *Dutta*'s addition of *Haggquist* active particles (silica, titanium dioxide) to the Sephadex membrane undermines PO's argument regarding increased membrane thickness. And, substitution of *Dutta*'s Sephadex particles (20-50 µm) for Haggquist's active particles (about 10 µm) would not increase membrane thickness. (Paper 33, at 16; Ex. 1044, ¶ 63.)
  - *Dutta* does not require a completely smooth membrane, but merely suggests that one surface be substantially smooth by being free of particles. (Ex. 1002, 11:1-4; Ex. 1044, ¶ 64.).

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Ground 3

Halley

- *Halley* discloses "a liquid-impermeable breathable cured base material comprising a first thickness" (claim 27).
- Polyurethane coating

> The polymer applied as a continuous coating to the substrate is generally a water-vapour-permeable hydrophilic polymeric material which allows the passage of water vapour therethrough without being permeable to liquid water. Suitable polymers include hydrophilic polyurethanes, polyesters,

Ex. 1003, 2:24-27; *see also* Paper 1, at 50-51, 33; Ex. 1005, at ¶¶ 194-98; Ex. 1025 (*Gore*), 8:7-31.

Halley

- First thickness of coating (5-100 µm)

Generally, the coating has a thickness of 5 to 100 microns.

Ex. 1003, 2:35; *see also* Paper 1, at 51; Ex. 1005, at ¶ 200.

- Or, First thickness as dot height (~70-140 µm)

In a still further preferred embodiment of the present invention, a discontinuous pattern of abrasion-resisting polymeric material may be provided on the coating, much in the manner disclosed in our patent specification

. . .

especially 400-900 microns. Each dot generally has a height in the range 10-200 microns, preferably 70-140 microns and particularly 80-100 microns. The

Ex. 1003, 5:5-7, 19-20; *see also* Paper 1, at 51; Ex. 1005, at ¶ 200.

Halley

- *Halley* discloses "a plurality of active particles . . . comprising a second thickness" (claim 27).

According to the present invention, a particulate solid is incorporated into the water-vapour-permeable polymer, generally before the polymer coating is applied onto the substrate. A preferred particulate solid is carbon particles. Other particulate solids include inorganic particulate materials, pigments, metal oxides, metal salts or metal particles. Further particulate solids include particles of titanium dioxide, zinc oxide, iron oxide, aluminium oxide, silica, talc, mica, tin or silver.

Ex. 1003, 3:1-7; *see also* Paper 1, at 51, 59; Ex. 1005, at ¶¶ 201, 203.

- Active Particles (Black Pearls 2000)

In each case, the water-vapour-permeable material was a polyurethane containing 0% (control), 0.3%, 0.65% and 1.5% by weight of a fine carbon (Black Pearls 2000 Carbon Black, Cabot Corporation, Billerica, USA) of typical mean particle size 13 nanometers. The carbon particles were intimately mixed into the polyurethane prepolymer mixture of material (1) using a paint mixer, and then a Ross mixer emulsifier or high speed dispersor for about 20mins. The mixture was then coated onto the expanded PTFE membrane.

Ex. 1003, Example 1, 7:17-23; *see also* Ex. 1005, at ¶ 203.

Halley

- Active Particles (Black Pearls 2000 shows improved MVTR)

TABLE 3 (fabric & membrane & dots)

Sample	Particle % wt	MVTR (mean) g/m²/d	Wash to leak hr	Abrasion to leak cycles	Handle (mean)
Control	-	6344	504-672	87500 (1500)	46.8 (2.69)
1	0.3	7736	504-864	140,000 (23094)	47.9 (1.25)
2	0.65	7736	672-864	120,000 (23094)	45.0 (1.18)
3	1.5	6924	504-672	110,000 (47610)	42.3 (2.32)

Bracketted figures are standard deviations.

Ex. 1003, 9:1-5; *see also* Paper 1, at 52-53, 59; Ex. 1005, ¶ 203.

Halley

- *Halley* discloses "a plurality of active particles . . . comprising a second thickness" (claim 27).
- Second Thickness (1-100 µm)

The primary particle size of the particulate solid has been found to be of particular significance in the present invention. The primary particle size is generally less than 50,000nm, particularly less than 5,000nm, especially less than 500nm, more especially less than 200nm and most especially less than 50nm. The particle size of the primary particle may be determined as set out herein. The primary particle size is the particle size of the smallest discreet particle, it being understood that primary particles may cluster together to form aggregates (typically 1 to 100, 1 to 20 or 1 to 5 microns median particle size).

Ex. 1003, 3:8-15; *see also* Paper 1, at 51-52; Ex. 1005, ¶¶ 204-06.

Halley

- Black Pearls 2000 "have the capacity to . . . adsorb or trap substances." (Paper 14, at 10.)
- *Wang I* (Ex. 1028) teaches that Black Pearls 2000 adsorbs water.

From the viewpoint of tailoring surface properties, BP powder in possession of high surface area and capability to adsorb water offers a better contact with electrolyte ionomer than does VC, helping VC carbon retain sufficient water to enhance the ionic conductivity of the electrode. The

Ex. 1028, at 284; Ex. 1005, ¶ 203 ("BP" is Black Pearls 2000).

Halley

- *Wang II* (Ex. 1051) teaches that porosity of carbon black increases its adsorption capability.

The physical properties of carbon powders chosen for investigation are summarized in Table 2. The surface area varies greatly from 62.0 $m^2 g^{-1}$ for Acetylene Black to 1501.8 $m^2 g^{-1}$ for Black Pearls 2000. This can be explained by the tremendous difference in pore volume and pore size distribution. The Black Pearls 2000 reveals smaller particle size and larger pore volume as compared to Acetylene Black, from which we can deduce that the MPL made of Black Pearls 2000 involves more micro-pores than that of Acetylene Black. Note that the definition of pore

...

characteristics of the desired carbon powders. It is obvious that the surface layer using Black Pearls 2000 with contact angle of 53° is more hydrophilic and the surface using Acetylene Black with contact angle of 153° shows stronger hydrophobicity. One reason for the phenomenon might be the more pores for Black Pearls 2000 which is in possession of high surface area and capability to adsorb water [15] relative to Acetylene Black. Another

Ex. 1051, at 4911; *see also* Paper 33, at 18; Ex. 1044, ¶ 71.

Halley

- *Halley* discloses "the first thickness comprises a thickness at least 2.5 times larger than the second thickness but less than an order of magnitude larger than the second thickness" (claim 27).

209. Given the range of particle sizes and polymeric material thickness ranges, several different particle sizes and polymeric material thicknesses are provided that meet claimed size relationships between two thicknesses. For example, a polymeric film thickness of 70-140 microns or 80-100 microns, which are two of the four disclosed ranges in *Halley*, meets the claimed thickness relationship of being 2.5 times greater, but less than an order of magnitude greater than a particle size of, for example, 20 μm, which falls within two of the three different particle size ranges disclosed in *Halley*.

Ex. 1005, ¶ 209; *see also* Paper 1, at 58; Ex. 1003, Table 3, 2:35, 3:8-15, 5:5-7, 19-20.

Halley

- *Halley* discloses "the active particles improve the moisture vapor transport capacity of the composition, and a moisture vapor transmission rate of the water-proof composition comprises from about 600 g/m^2/day to about 11000 g/m^2/day." (claim 27).

- *Halley* teaches Examples 1-3 show MVTRs of 6924, 7736 g/m^2/day.

Ex. 1003, 9:1-5, Table 3; *see also* Paper 1, at 53; Ex. 1005, ¶¶ 210-11.

TABLE 3 (fabric & membrane & dots)

Sample	Particle % wt	MVTR (mean) g/m^2/d	Wash to leak hr	Abrasion to leak cycles	Handle (mean)
Control	-	6344	504-672	87500 (1500)	46.8 (2.69)
1	0.3	7736	504-864	140,000 (23094)	47.9 (1.25)
2	0.65	7736	672-864	120,000 (23094)	45.0 (1.18)
3	1.5	6924	504-672	110,000 (47610)	42.3 (2.32)

Bracketted figures are standard deviations.

Halley

- *Halley* discloses the limitations of claims 28, 30, 32, 33, and 35-37.
  - Claim 28: Ex. 1003, Table 3; Paper 1, at 53; Ex. 1005, ¶ 212.
  - Claim 30: Ex. 1003, Table 3; Paper 1, at 53-54; Ex. 1005, ¶ 213.
  - Claim 32: Ex. 1003, Table 3; Paper 1, at 54; Ex. 1005, ¶ 214.
  - Claim 33: Ex. 1003, 3:31-34, 5:27-29; Paper 1, at 54-55; Ex. 1005, ¶ 215.
  - Claim 35: Ex. 1003, 3:1-7; Paper 1, at 55; Ex. 1005, ¶ 216.
  - Claim 36: Ex. 1003, Table 3; 3:1-7; Paper 1, at 55-56; Ex. 1005, ¶ 217.
  - Claim 37: Ex. 1003, 3:1-7; Paper 1, at 56; Ex. 1005, ¶ 218.

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Ground 4

Halley/Haggquist

- *Halley/Haggquist* disclose the limitations of claims 38-39.
  - Claim 38: Ex. 1004, Abstract, ¶¶ 3, 30, 81; Paper 1, at 60-65; Ex. 1005, ¶¶ 219-30.
  - Claim 39: Ex. 1004, ¶ 33; Paper 1, at 61-65; Ex. 1005, ¶¶ 231-33.

Reasons to Combine (Halley/Haggquist)

- A POSITA would have had several reasons to substitute the Black Pearls 2000 of *Halley* with the admittedly active particles disclosed in *Haggquist* to arrive at the composition of claims 38, 39.

  Paper 1, at 62-64; Ex. 1005, ¶¶ 220-228, 232; Paper 33, at 20-21; Ex. 1044, ¶¶76-80.

  - *Halley* and *Haggquist* are analogous art. Both references teach adding particles to a membrane to add performance enhancing characteristics, such as moisture management, to garments. (Ex. 1003, Abstract, 2:1-5, 8:1-10; Ex. 1004, ¶¶ 3, 81; Ex. 1005, ¶¶ 221-23; Paper 1, at 62-63.)
  - Both references disclose the same types of particles, including activated carbon, aluminum oxide, silica gel, zinc oxide, and titanium dioxide particles to add performance enhancing characteristics to garments. (Ex. 1003, 2:1-5, 3:1-7; Ex. 1004, ¶¶ 3, 30; Ex. 1005, ¶¶ 221, 224; Paper 1, at 62-64.)
  - Based on the disclosure of *Haggquist*, a POSITA would have known that *Halley*'s disclosed particles were "active particles," suitable for moisture management. (Ex. 1004, ¶¶ 3, 30; Ex. 1003, 3:1-7; Paper 1, at 63; Ex. 1005, ¶¶ 225-26.)

Reasons to Combine (cont.)

- *Haggquist* discloses systems and methods for protecting the performance enhancing characteristics of the active particles specifically listed in *Halley* from premature deactivation. (Ex. 1003, Abstract, 2:1-5, 3:1-7; Ex. 1004, Abstract, ¶¶ 13, 30; Ex. 1005, ¶¶ 220-228; Paper 1, at 62.)
- A POSITA would have been motivated to utilize the removable encapsulants from Haggquist with the active particles utilized in *Halley*, because *Haggquist* discloses that the encapsulant protects the performance enhancing characteristics of the active particles from premature deactivation, and lists several of the exact same particles that are utilized in *Halley*. (Ex. 1004, Abstract, ¶¶ 13, 30; Ex. 1005, ¶ 227; Paper 1, at 64.)
- A POSITA would want to protect the performance enhancing characteristics of active particles with known methods. As such, a POSITA would have been motivated to combine *Halley* with *Haggquist* to provide clothing with protected performance enhancing characteristics. (Ex. 1004, Abstract, ¶¶ 13, 30; Ex. 1005, ¶ 228; Paper, at 64.)

Reasonable Expectation of Success (Halley/Haggquist)

- A POSITA would have had a reasonable expectation of successfully substituting the Black Pearls 2000 of *Halley* with the admittedly active particles disclosed in *Haggquist* to arrive at the composition of claims 38, 39. (Paper 1, at 64-65; Ex. 1005, ¶¶ 229-30, 233; Paper 33, at 20-21; Ex. 1044, ¶¶76-80.)
  - A POSITA before May 9, 2006 understood the importance of protecting active particles from premature deactivation. (*See, e.g.*, Ex. 1004, Abstract, ¶ 30; Ex. 1005, at ¶ 230; Paper 1, at 64.)
  - The combination of the encapsulant method disclosed in *Haggquist* with the carbon, titanium dioxide, zinc oxide, iron oxide, aluminum oxide, and/or silica particles utilized in *Halley* would work, because *Haggquist* recites these exact same particles as active particles. (Ex. 1004, at ¶¶ 13, 30; Ex. 1005, at ¶ 230; Paper 1, at 64-65.)

Reasonable Expectation of Success (Dutta/Haggquist)

- When a patent "simply arranges old elements," i.e., adding an encapsulant to known active particles, "with each [element] performing the same function it had been known to perform," i.e., capable of protecting the activating particles and reactivating them upon removal of the encapsulant, "and yields no more than one would expect from such an arrangement," i.e., the effective reactivation of active particles to improve the WVTR, "the combination is obvious." (*KSR*, 550 U.S. at 417; Paper 1, at 65.)

Reply to PO

- In contrast to PO's arguments, a POSITA would not have been deterred from combining *Halley* and *Haggquist* and would have had a reasonable expectation of success.
  - *Halley* does not require "solely absorptive particles," but rather discloses a number of explicitly "active particles" according to *Haggquist*. (Ex. 1003, 3:1-7; Ex. 1004, ¶ 30; Ex. 1005 at ¶ 221, 224; Ex. 1044, ¶ 77.)
  - *Halley*'s particulate solids are not "inert" insofar as water vapor transmission. Rather, Black Pearls 2000 improved MVTR of *Halley*'s polymeric films and is known to adsorb water. (Ex. 1003, Tables 1, 3; Ex. 1005, ¶ 203; Ex. 1051, at 4909, 4911; Ex. 1044, ¶¶ 77-78.) Table 3 further shows an improved MVTR within the claimed range. (Ex. 1003, Table 3.)
  - Since Black Pearls 2000 was known to be a porous substance capable of adsorbing water, a POSITA would be motivated to encapsulate the particles for protection benefits disclosed in *Haggquist*. (Ex. 1003, Tables 1, 3; Ex. 1005, ¶ 203; Ex. 1051, at 4909, 4911; Ex. 1044, ¶ 78.)

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Secondary Considerations

The Board should reject PO's secondary considerations

- Evidence of secondary considerations of non-obviousness should be considered in evaluating patent validity only when there is a "nexus" between the evidence and the patented invention.
  - The asserted evidence of non-obviousness must be tied to a specific product, which must embody "the invention disclosed and claimed in the patent." (*WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1329 (Fed. Cir. 2016).)
  - The commercial success of the product must derive from the claimed invention and be attributable to something disclosed in the patent that was not readily available in the prior art. (*Richdel, Inc. v. Sunspool Corp.*, 714 F.2d 1573, 1580 (Fed.Cir.1983); EX1044, ¶81.)

The Board should reject PO's secondary considerations

- Dr. Daniels Failed to Conduct Appropriate Tests to Support the Conclusion that the TNF samples met the claimed limitations. See Paper 33, at 25; Ex. 1044, at 91-99.)
  - Figure 1 of the first sample illustrates black dots on a lighter-colored material, but there is absolutely no evidence that the lighter-colored material is "cured," e.g., as opposed to extruded. (Paper 33, at 23; EX1044, ¶¶ 91-92.)
  - The SEM images do not reveal which portions of the observed features are particles, polymeric binder, particles coated with binder, holes between particles, or pores, a POSITA cannot confirm that the particles are porous. (Paper 33, at 24; EX1044, ¶93.)
  - The SEM images show no evidence that the "raised features" are a distinct layer on top of another layer of material – much less a layer of "active" particles on top of a separate layer of "cured" base material. (Paper 33, at 24; EX1044, ¶94.)

The Board should reject PO's secondary considerations

- [cont.] Dr. Daniels Failed to Conduct Appropriate Tests to Support the Conclusion that the TNF samples met the claimed limitations. *See* Paper 33, at 25; Ex. 1044, at ¶¶ 91-101.)
  - The EDS shows evidence of carbon and oxygen, but this alone is insufficient to prove that the print layer contains activated charcoal particles rather than other components (e.g., polymer binder, pigments) that also contain carbon and oxygen. (Paper 33, at 24; EX1044, ¶96.)
  - Dr. Daniels failed to perform any measurements of the thicknesses of the purported layers – or the claimed ratio between them. (Paper 33, at 24; EX1047, 194:8-196:1; 204:15-25; EX1044, ¶95.)
  - Dr. Daniels failed to test particle activity or determine any increase in MVTR based on the particles – much less show the claimed MVTR range – but merely labeled the particles as "active." (EX1044, ¶101.)

The Board should reject PO's secondary considerations

- Dr. Daniels failed to show any evidence that the TNF samples met at least the following emphasized claim limitations (Paper 33, at 25; Ex. 1044, ¶ 100):
  - "**cured** base material comprising a **first thickness**"
  - "plurality of **active** particles comprising a **second thickness**"
  - "first thickness … **at least 2.5 times larger** than the second thickness **but less than an order of magnitude** larger than the second thickness"
  - "active particles **improve the moisture vapor transport capacity** of the composition"
  - "**moisture vapor transmission rate** … comprises **from about 600 g/m2/day to about 11000 g/m2/day**"

The Board should reject PO's secondary considerations

- In deposition, Dr. Daniels admitted the "infringement" analysis of the accused product was deficient, including:
  - The analysis does not demonstrate the particles are active;
  - Picking a single thickness (rather than averaging multiple measurements) is not representative for establishing thickness (which Cocona did);
  - No data show an improved MVTR over a control (which "should" have been done). (See EX1047, 212:20-215:8; EX1044, ¶¶81-86.)
- Thus, Dr. Daniels failed to show that the accused product met at least the following emphasized claim limitations:
  - "plurality of **active** particles comprising a **second thickness**"
  - "first thickness … **at least 2.5 times larger** than the second thickness **but less than an order of magnitude** larger than the second thickness
  - "active particles **improve the moisture vapor transport capacity** of the composition"

The Board should reject PO's secondary considerations

- PO failed to show any nexus between a specific product (TNF samples or accused product) and the claimed invention (Paper 33, at 22, 26; Ex. 1044, ¶ 85, 101-02):
  - As Dr. Daniels failed to conduct appropriate or conclusive tests to determine whether the claimed limitations were met, Dr. Daniels failed to show the requisite nexus between the samples (specific product) and the claimed invention (recited by claim 27).
  - PO admitted as much in litigation in its interrogatory responses, stating or implying that neither PO nor its licensees practice the claims of the '287 patent. (EX1052, at 21-22 (Pl.'s Resps. to Interrogs. 13, 14).)
  - Cocona gave only a trademark license (as opposed to a patent license) to The North Face ("TNF"). (EX1045, at 16:10-17; Paper 33, at 22 n.2.)
- As no nexus between a specific product and the claimed invention has been made, the Board should not consider PO's evidence of secondary considerations.

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Conclusion

All Challenged Claims of the '287 Patent are Unpatentable as Anticipated or Obvious

- *Ground 1*:
  - Claims 27, 28, 30, 32, and 36-37 of the '287 Patent are anticipated under 35 U.S.C. §102(b) by *Dutta*.
- *Ground 2*:
  - Claims 27, 28, 30, 32, and 35-39 of the '287 Patent are obvious under 35 U.S.C. §103(a) over *Dutta* in view of *Haggquist*.
- *Ground 3:*
  - Claims 27, 28, 30, 32, 33, and 35-37 of the '287 Patent are anticipated under 35 U.S.C. §102(b) by *Halley*.
- *Ground 4:*
  - Claims 38-39 of the '287 Patent are obvious under 35 U.S.C. §103(a) over *Halley* in view of *Haggquist*.