

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FITESA SIMPSONVILLE, INC.,
Petitioners

v.

THE PROCTER & GAMBLE COMPANY,
Patent Owner.

U.S. Patent No. 11,326,276

Inter Partes Review No.:

DECLARATION OF GAJANAN S. BHAT, Ph.D.

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I Gajanan S. Bhat, declare:

I. Retention as an expert witness

1. I have been retained by Petitioner Fitesa Simpsonville, Inc. to provide opinions on certain issues relating to a Petition for *inter partes* review of the '276 Patent, which I understand Fitesa is filing with the Patent Trial and Appeal Board ("PTAB"). My declaration provides analysis and expert opinions on the state of the art related to the subject matter disclosed in U.S. Patent No. 11,326,276 ("the '276 Patent"), as well as the invalidity of Claims 1-24 of the '276 Patent ("the challenged claims"). My invalidity analysis addresses both "anticipation" and "obviousness," including the factors that would have motivated a person of ordinary skill in the art to develop a product like that claimed in the challenged claims, and the combinations of prior art references that a person of ordinary skill would have been motivated to use in designing such a product.

II. Compensation

2. I am being compensated as follows: \$375 per hour for analysis, review, preparation of reports/declaration, and testimony.

III. Experience and Qualifications

3. I received my Bachelor of Technology in Textile Sciences from Bangalore University (India) in 1981. I received my Master of Technology in Fiber Science & Technology from the Indian Institutes of Technology, Delhi in

1984. I received my Master of Science in Textile Engineering from the Georgia Institute of Technology in 1987, and my Doctor of Philosophy (Ph.D.) in Textile Engineering from the Georgia Institute of Technology in 1990.

4. I am currently the Department Head for Textiles Merchandising & Interiors at the University of Georgia in Athens. My research endeavors at the University of Georgia include fiber and nonwoven technologies including meltblown fibers, meltblown nonwovens, and associated meltblown processes.

5. Prior to joining the University of Georgia, I was associated with the University of Tennessee in Knoxville (UTK) from 1990 to 2016 in various professorship, research, and leadership positions. From 1990 to 1996, I served as an Assistant Professor in the Department of Textile, Retailing, and Interior Design. In 1996, I was promoted to Associate Professor, and subsequently to a full Professor in 2001. During this time, my duties included teaching and research.

6. From 2002 to 2016, I was a Professor of Material Science and Engineering at UTK. I also served as the Associate Director of the Textiles and Nonwovens Development Center (TANDEC) at UTK (2006-2007), and in 2008, I was promoted to the position of Director of the University of Tennessee Nonwovens Materials Research Laboratory (UTNRL) where I remained until leaving for my current position at the University of Georgia.

7. During my association with UTK, my research included polymer processing, nonwoven technologies including meltblown and spunbond related processes, biodegradable nonwovens including cellulosic fibers, nanofibers, high performance fibers, and various applications of the foregoing mentioned fibers. In particular, as Director of UTNRL, my research included the production of nanofibers from thermoplastic polymers by meltblowing.

8. I have received numerous awards for accomplishments in these roles, including: the Distinguish Achievement Award from the Fiber Society; being named a Fellow of the Textile Institute; the Best Paper Award from the Association of the Nonwovens Fabric Industry; the TechniTex India Research Achievement Award; and the Technical Association of the Pulp and Paper Industry-Nonwovens, Engineers, and Technologist (TAPPI-NET) division Technical Achievement Award. I previously served as the President of the Fiber Society, and currently serve as an Editorial Board Member for the International Journal of Textile Engineering and Processes; the Journal of Nanomaterials and Molecular Nanotechnology; and Journal of Materials Science and Chemical Engineering.

9. My work in the classroom consists of both teaching and mentoring. I teach (and have taught) classes relating to the following subjects: nonwovens science and technology, high performance fibers, polymer processing and plastics

recycling. I have also overseen, supervised, and mentored students in multiple senior and graduate projects.

10. Additionally, I am named inventor on four issued U.S. patents, have authored and co-authored numerous publications in the field of fibers, textiles and nonwovens, and have worked, consulted, and testified in several patent cases.

Exhibit 1021 provides a copy of my curriculum vitae, which lists all publications I have authored within the preceding ten years and the cases in which I testified in the last four years as an expert at trial or by deposition. I reviewed the following materials in providing the opinions in this declaration and the other materials referenced in this Declaration and the Petition.

Exhibit Number	Document
1001	U.S. Patent No. 11,326,276
1002	U.S. Patent No. 6,013,223 – Schwarz
1003	PCT Application Publication No. WO 00/29658 – McDowall
1004	U.S. Patent Application Publication No. 2003/0211802 – Keck
1005	U.S. Patent No. 5,476,616 – Schwarz
1006	U.S. Patent No. 6,738,854 – Bond
1007	U.S. Patent No. 4,100,324 – Anderson
1008	U.S. Patent No. 4,923,454 – Seymour
1009	U.S. Patent No. 5,508,102 – Georger
1010	<i>The History of the Development of Melt Blowing Technology</i> , INJ 1999 – McCulloch
1011	<i>Melt Blown Dies: A Hot Innovation Spot</i> , INJ Winter 2002, 37-38 – Zhao
1012	Intentionally left blank
1013	File History U.S. Patent No. 8,852,474
1014	Intentionally left blank
1015	Intentionally left blank

1016	U.S. Patent No. 3,825,379 – Lohkamp
1017	U.S. Patent No. 4,380,570 – Schwarz
1018	U.S. Patent No. 6,114,017 – Fabbicante
1019	U.S. Patent No. 6,200,120 – Fish
1020	Assignment Record for U.S. Patent No. 5,476,616
1021	CV of Dr. Gajanan Bhat
1022	<i>Handbook of Nonwovens</i> , edited by S.J. Russel, Woodhead Publishing Limited, (2007), 149-150
1023	U.S. Patent No. 7,947,359 – Suzuka
1024	<i>ITMA 2007 Review: Implications for the Nonwovens Industry,”</i> J. of Engineered Fibers and Fabrics, Vol. 3, Issue 1 (2008), 38-47, 46 – Pourdeyhimi
1025	<i>Influence of Processing Conditions on Melt Blown Web Structure: Part 1 – DCD</i> , INJ Spring 2004, 49-55 - Bresee et al.
1026	<i>Influence of Processing Conditions on Melt Blown Web Structure: Part 2 – Primary Airflow Rate</i> , INJ Summer 2005, 11-18 - Bresee et al.
1027	<i>Effects of Melt-Blowing Process Conditions on Morphological and Mechanical Properties of Polypropylene Webs</i> , POLYMER 1992, Vol. 3, No. 6, 1200-1209 - Lee et al.
1028	File History U.S. Patent No. 11,326,276
1029	U.S. Patent Application Publication No. 2007/0202766-Ouellette

IV. Level of Ordinary Skill in the Art

11. In determining the characteristics of a person of ordinary skill in the art of the '276 Patent at the time of the claimed invention, I considered several things, including the prior art and the type of problems encountered in the art. I also considered the sophistication of the technology involved, and the educational background and experience of those actively working in the field. Finally, I placed myself back in 2007 and considered the engineers/scientists whom I had worked with in the nonwovens industry. I conclude that a person of ordinary skill in the art

at the time of the effective filing date of the application that led to the '276 Patent would have been a person with a Bachelor of Science degree in Engineering (or a substantively related engineering or science degree) or equivalent work experience, and/or at least 3 to 5 years of experience in the field of nonwovens. Such experience could include, but is not necessarily required to include, knowledge about the design and operation of meltspun systems, such as meltblown and spunbond systems. Extraordinary training or experience in one aspect of the definition above may make up for an apparent deficiency in training or experience in another aspect. In forming the opinions discussed herein, I have applied the perspective of a person of ordinary skill in the art at the time of the effective filing date of the application that lead to the '276 Patent.

12. In preparing this Declaration, I have consulted the '276 Patent and its prosecution history as well as each of the documents cited herein in light of the general knowledge in the state of the art as of July 2007. In arriving at my opinions, I have relied on my experience in the relevant art and have considered the point of view of a person of ordinary skill in the art ("POSA").

V. Statement of Controlling Law

13. I have been instructed by Petitioner's attorneys and, as a result, understand that 35 U.S.C. § 102 ("§ 102") provides the standards for determining whether a claim in a patent is invalid as anticipated by prior art. I also understand

that, for purposes of my declaration here, “prior art” consists of patents or other types of printed publications that were publicly available before the ’276 Patent’s priority date. I have been informed that ’276 Patent’s earliest possible priority date is July 17, 2007. I understand that a claim in a patent is invalid as anticipated under §102 if each and every element of the claim is found expressly or inherently in a single prior art reference.

14. I understand that, when determining whether the single item of prior art anticipates the claims, one must consider not only what is expressly disclosed in that prior art, but also what is inherently present in that prior art. I understand that claim limitations that are not expressly found in a prior art reference are inherent if the prior art necessarily functions in accordance with, or includes, the claim limitations, or if the missing element or feature would be the natural result of following what the prior art teaches to persons of ordinary skill in the art. I also understand that it is acceptable to examine evidence outside the prior art reference, often referred to as extrinsic evidence, in determining whether a feature, while not expressly discussed in the reference, is necessarily present in the reference. I understand, however, that mere probabilities that an element is present are not enough, but it is not required that persons of ordinary skill actually recognized the inherent disclosure at the time the prior art was first known or used.

15. I understand that 35 U.S.C. § 103 (“§ 103”) provides the standard for determining whether a claim in a patent is invalid as “obvious.” I understand that a claim in a patent is invalid as obvious under § 103 when the differences between the claimed subject matter and the prior art are such that the claimed subject matter as a whole would have been obvious to a person of ordinary skill in the art at the time the invention was made. I understand that, similar to anticipation, the only grounds for obviousness that may be presented in a petition for IPR are those based on patents and/or printed publications. I understand that the relevant inquiry for assessing obviousness consists of the following four factors: (a) the scope and content of the prior art; (b) the differences between the prior art and the claims at issue; (c) the level of ordinary skill in the pertinent art at the time of the invention; and (d) objective factors indicating obviousness or non-obviousness – sometimes referred to as secondary considerations or indicia.

16. I understand that a prior art reference may be considered in assessing a patent claim’s obviousness if the reference discloses solving any problem or addressing any need addressed by the patent, or if the reference discloses information having obvious uses beyond its primary purpose that a person of ordinary skill in the art would reasonably examine to solve a problem or address a need addressed by the patent. I understand that a claimed combination of familiar elements according to known methods is likely obvious when it does no more than

yield predictable results. I understand that when a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. I understand that if a person of ordinary skill in the art can implement a predictable variation of claimed subject matter and have a reasonable expectation of success in doing so, § 103 likely renders the claim invalid.

17. I understand that an obviousness analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, and the PTAB can take account of the inferences and creative steps, or even the routine steps, that a person of ordinary skill in the art would have employed at the time of the alleged invention. I understand that it is often necessary to look to interrelated teachings of multiple prior art references; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person of ordinary skill in the art, all to determine whether there was an apparent reason for the person of ordinary skill in the art to have combined elements in the manner claimed. I understand that any need or problem known in the field of endeavor at the time of the alleged invention or addressed by the '276 Patent can provide a reason for the person of ordinary skill in the art to have combined elements in the manner claimed. I understand that one way in which a patent's subject matter can be proved obvious is by showing that there existed at

the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims. I understand that a person of ordinary skill attempting to solve a problem will not be led only to those elements of prior art designed to solve the same problem, but also apply common sense teachings. I understand that common sense teaches that familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill in the art will be able to fit the teachings of multiple prior references together like pieces of a puzzle. I understand that when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill in the art has good reason to pursue the known options within his or her technical grasp. I further understand that, if this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense and, as such, likely is obvious.

18. I understand that for a reference to be used in an obviousness combination, it must be analogous art to the claimed invention. There are two ways to determine whether prior art is analogous. First, the art can be from the same field of endeavor as the claimed invention. Second, if the reference is not within the same field of endeavor, the reference can still be analogous if it is reasonably pertinent to the particular problem faced by the inventor of the claimed invention such that a person of ordinary skill would reasonably have sought a

solution to the problem in that outside field. This problem is not limited to the specific problem the patentee was trying to solve. Instead, any need or problem known in the field and addressed by the patent can provide a reason for combining the elements in the manner claimed.

19. I understand that someone assessing obviousness should be aware of and avoid the potential for distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning. I understand that, before assessing the issue of obviousness, one must also consider certain objective factors – sometimes referred to as secondary considerations or indicia – that, if established, may indicate that the claimed invention may not have been obvious. Such secondary considerations include: (a) Were products covered by the claim commercially successful due to the merits of the claimed invention rather than due to other, unrelated factors, such as, for example, advertising, promotion or marketing, salesmanship, or unclaimed features of the product?; (b) Was there a long-felt but unresolved need for a solution to the problem facing the inventors, which was resolved by the claimed invention?; (c) Did others try, but fail, to solve the problem solved by the claimed invention?; (d) Did others copy the claimed invention?; (e) Did the claimed invention achieve unexpectedly superior results over the closest prior art?; (f) Did others in the field praise the claimed invention or express surprise at the making of the claimed invention?; and (g) Did others accept

licenses under the patent-at-issue because of the merits of the claimed invention? I understand that these factors are only relevant to obviousness if there is a connection, or nexus, between each of them and the claimed subject matter. I understand that, even if one could conclude that some of the above factors have been established, those factors should be considered along with all other available evidence when determining whether the claimed invention would have been obvious to the person of ordinary skill in the art at the time of the alleged invention.

20. As of the date of this declaration, I am not aware of any documents or information that relate to the “secondary consideration” factors I outlined above.

21. I also understand that, in an IPR, the PTAB will construe a claim using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. 37 C.F.R. § 42.100(b)

22. I also understand, however, that the PTAB could find that the inventor specifically defined a particular claim term (which I understand is referred to as “lexicography”), in which case that definition would control. Finally, I understand that the PTAB could find that an inventor gave up (*i.e.*, “disavowed” or

“disclaimed”) the scope that a claim term would otherwise have had if there are specific statements made in the patent or depending on what happened when the application was being prosecuted before it became an issued patent.

VI. Summary of the '276 Patent

23. I have reviewed and considered the '276 Patent in view of general knowledge in the relevant field measured from the time of the earliest possible priority date for the '276 Patent, which I understand to be July 17, 2007.

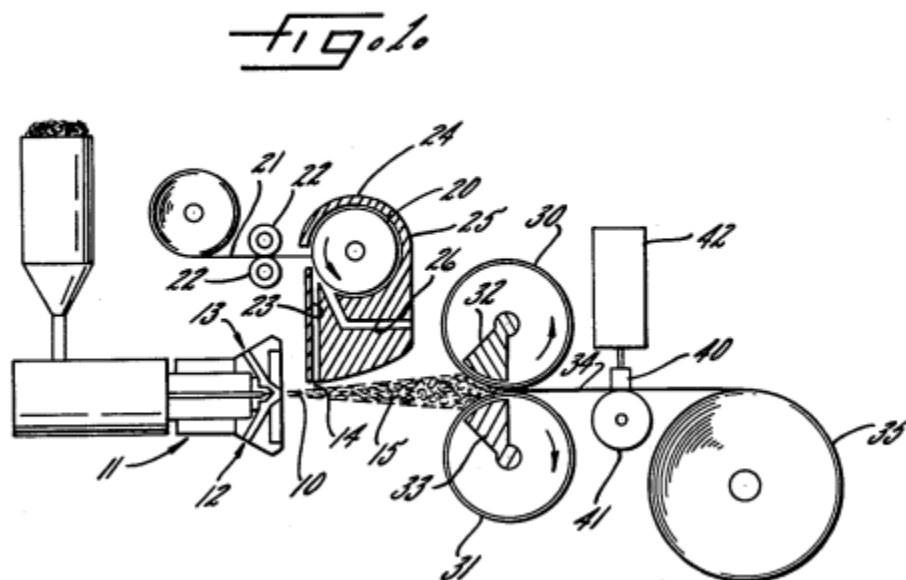
24. The challenged claims of the '276 Patent are directed to methods for preparing a fibrous structure that comprises a blend of polymeric filaments and solid additives (commonly referred to as a coform nonwoven). More specifically, in the coform process filaments are extruded from a die to form a filament stream to which a solid additive containing stream (for example, comprising a mixture of a gas, such as air, and wood pulp), is comingled with the filament stream prior to being deposited on a collection surface.

A. Background of Technology of the '276 Patent

25. A coform nonwoven is a fibrous structure comprising a blend of filaments and a solid additive, such as pulp. The '276 Patent defines a coform fibrous structure as “compris[ing] a mixture of at least two different materials wherein at least one of the materials comprises a filament ...and at least one other material, different from the first material, comprises a solid additive, such as a

fiber and/or particulate. Ex. 1001, column 3, lines 50-56. Wood pulp fibers are an example of a solid additive provided in the '276 Patent. Ex. 1001, column 4, lines 5-6.

26. U.S. Patent No. 4,100,324 to Anderson et al. (Ex. 1007) is one of the earliest patents to describe a process of preparing a coform nonwoven. As described in Anderson and with reference to figure 1, below, a primary gas stream 10 of meltblown fibers is prepared from a die head 11 having at least one row of extrusion apertures *Id.*, column 2, lines 44-45; figure 1. The primary gas stream comprising the meltblown fibers is merged with a secondary gas stream 14 containing wood pulp fibers. *Id.*, column 2, lines 55-58.



In the figure, die head 11 provides the primary gas stream 10 comprising a mixture of air and fibers. The secondary gas stream 14 comprising wood pulp fibers and

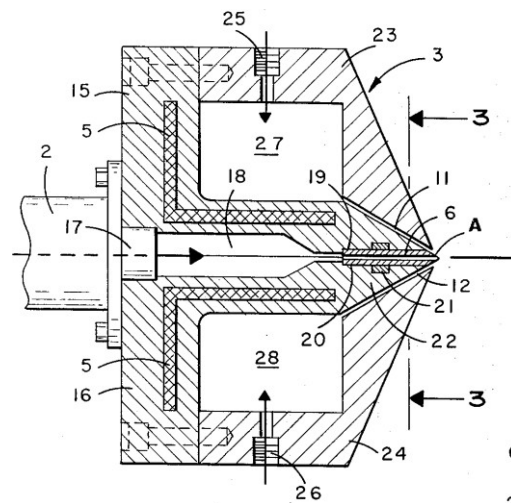
air is provided by picker roll 20, which removes individual fibers from pulp sheet 21. *Id.*, column 3, lines 1-8. The removed wood pulp fibers and a stream of air are introduced into a forming duct 23 that maintains fiber separation and is maintained to avoid fiber flocking. *Id.*, column 3, lines 10-22. The primary and secondary gas streams are merged to produce an integrated stream 15, which is introduced in between cooperating vacuum rolls 30, 31, and then subsequently wound on roll 35. *Id.*, column 6, lines 29-42.

27. The process described in Anderson uses meltblown fibers as the fibers of the primary gas stream. In a meltblown process, polymers (typically thermoplastics), are heated and extruded through die openings into thin, fine fibers and are attenuated by a fluid (air) to produce fibers having diameters typically ranging from 1 to 10 microns. *Id.*, column 2, lines 44-52; *see also* Ex. 1004 ¶ 35.

28. While Anderson states that the meltblown fibers used in his coform process were discontinuous (*Id.*, column 2, lines 1-4), it is well known that meltblown fibers can be discontinuous or continuous. For example, U.S. Patent Publication No. 2003/0211802 to Keck et al. (Ex. 1004) describes a process of preparing a coform in which the meltblown fibers may be continuous or discontinuous. Ex. 1004, ¶ 35. PCT Application Publication No. WO 00/29658 to McDowall (Ex. 1003) describes an absorbent article prepared with the coform

process in which continuous meltblown filaments or continuous spunbond filaments are comingled with pulp fibers. Ex. 1003, page 8, lines 1-2.

29. The meltblown die head described in Anderson is well-known and is often referred to as a “knife-edge” die. Figure 2 of U.S. Patent No. 3,825,379 to Lohkamp et al. (Ex. 1016) provides a sectional view of a typical knife-edge meltblown die head.



30. The knife-edge meltblown die head generally includes a die nose 22 having a triangular cross section defining a tapered die tip. Ex. 1016, column 3, lines 5-60. In the Figure, A is noted as a sharp-angled point where capillary tubes 6 terminate, with the angle of the point being within the range of 30° to 60°, preferably 55° to 60°, most preferably 60°. *Id.* Molten resin is fed into chamber 18 and forced through a plurality of capillary tubes 6 (die openings) having outlets at the apex A of the die tip. *Id.* A pair of gas cover plates 23, 24 are disposed on opposite sides of the die nose and collectively define a pair of converging gas slots

11, 12, which extend along the length of the die tip. *Id.* The pair of gas slots 11, 12 provide a pair of converging gas streams that attenuates the individual streams of polymer as they are extruded from the die openings to form microfibers. *Id.*

31. The requirement to have gas streams that converge to attenuate the filaments as they exit the die openings has generally limited knife-edge meltblown dies to a single row of die openings. As a consequence, polymer throughput, and hence, production capacity, of knife-edge die heads has been limited.

32. Coform nonwovens have been used for decades in single-use, disposable consumer products, including and most prevalently in baby wipes. A single-use article, such as a paper towel or a baby wipe, must be relatively low-cost. For example, a typical baby wipe price point is 2 to 3-cents per unit (wipe) on the consumer retail shelf. In the nonwoven industry, the importance of reducing cost per unit, and hence, providing a competitive product, cannot be overstated.

33. An important factor to reaching a tolerable consumer price point for a wipe substrate is manufacturing cost. Total manufacturing cost is the sum of three categories: material (feedstock), direct labor, and manufacturing overhead. All of these three cost factors are directly or indirectly affected by the productivity of the process.

34. In general, productivity is a measurement of product output over time. Process throughput is an important element of productivity; simply stated, a

process that produces more output over a given time is more efficient and thereby more productive. Productive processes provide more output over time while consuming less resources which directly reduce manufacturing costs, such as, associated labor, energy requirements, associated manufacturing space, and asset depreciation. Higher productivity reduces all these cost factors directly improving the ROI (Return of Investment) on capital of a given manufacturing process.

35. Accordingly, it is desirable to optimize these factors to improve the manufacturing process and thereby reduce associated costs.

36. One method of reducing costs, is to improve the product throughput of the product being manufactured. That is, increasing productivity will result in decreased costs per unit for a given period of time. Decreasing the costs associated with manufacturing a coform nonwoven per unit will improve the manufacturer's competitiveness in the market and potentially provide a greater return on investment.

37. In general, the throughput of the meltblown fibers with a knife-edge die has been a limiting factor in process in the production of coform nonwovens. More specifically, the use of the knife-edge meltblown die having a single row of die openings has inherently limited productivity rate.

38. In the 1990s, the capacity limitation of knife-edge meltblown dies was solved by the arrival of multirow meltblown dies.

39. U.S. Patent No. 4,380,570 to Schwarz (hereinafter “Schwarz ’570”)(Ex. 1017), which issued in 1993, is one of the earliest patents directed to a multirow meltblown die. Schwarz ’570 describes a multirow meltblown die in which the meltblown die has multiple rows of filament nozzles, and in which each row comprises a plurality of filament nozzles (resin orifice). Schwarz ’570 states that an object of the invention is to “provide a novel apparatus and process for melt-blowing fiberforming thermoplastic polymers to form fine fibers with improved economics.” Ex. 1017, column 1, lines 56-60.

40. As can best be seen with reference to figure 1, below, the multirow meltblown die head includes a pair of spaced apart plates 2, 5, which collectively define an air manifold 4 between the plates. *Id.*, column 3, lines 29-58. Both plates 2, 5 include corresponding holes through which an individual filament nozzle 3 is inserted. *Id.* As shown in figures 2 and 3, the holes in the plate 5 define the air orifices 6, and may be square or triangular. *Id.* The filament nozzles 3 are centered in the holes.

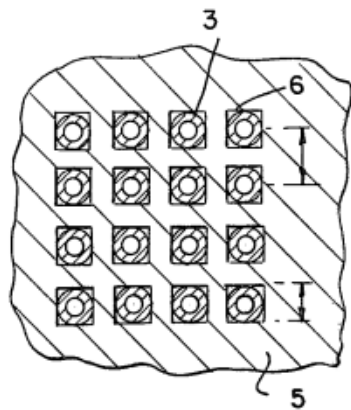
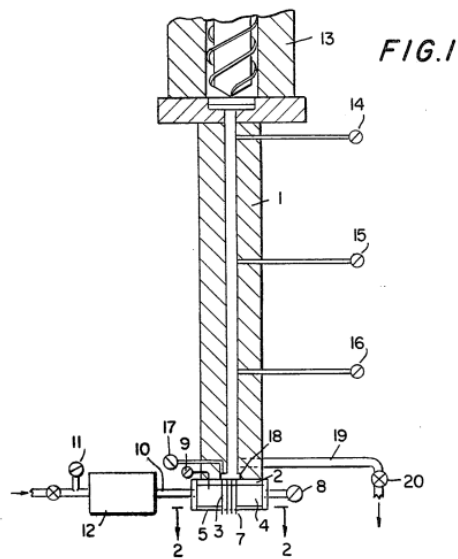
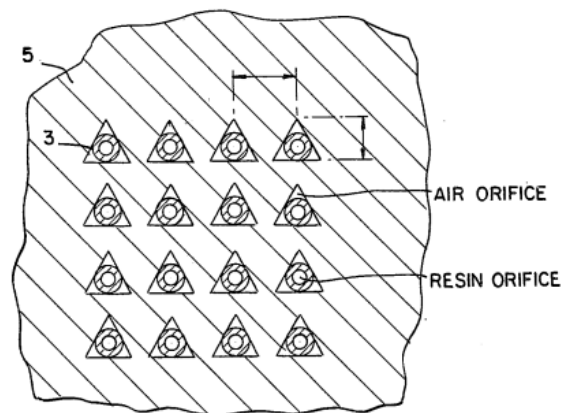


FIG. 2

FIG. 3



41. Pressurized air is introduced into the air manifold 4 via air supply line 10. *Id.* The air then flows parallel to the main axis of the filament nozzles and exits the air manifold through the air orifices in plate 5. In discussing figure 2, Schwarz '570 states that the “four corners of the square 6 around the tubes 3 [filament

nozzles] are the orifices through which air is blown approximately parallel to the fibers exiting tubes 3. *Id.*, column 3, lines 35-38.

42. In contrast to knife-edge dies that use converging gas streams, the multirow meltblown dies use streams of attenuating gas in which each gas stream flows parallel to the main axis of a corresponding filament nozzle. Each filament nozzle is associated with a stream of parallel flowing attenuating gas, which, consequently, removes the limitation of requiring each row of filament nozzles to be disposed between the pair of converging gas streams.

43. The multirow meltblown dies developed by Schwarz significantly improved productivity of meltblown nonwovens.

44. The innovation of multirow meltblown dies has been recognized in the nonwoven field as breaking the limitation of requiring air from each side of the tapered die tip, which allows the number of rows of filament nozzles present on the die head to be increased without a tremendous capital expense. *See Zhao, Melt Blown Dies: A Hot Innovation Spot*, INJ Winter (2002) (Ex. 1011).

45. In addition to Schwarz '570, additional patents were filed in the 1990s directed to multirow meltblown dies including U.S. Patent No. 5,476,616 to Schwarz (hereinafter "Schwarz '616")(Ex. 1005) (which is described as an improvement of the multirow meltblown die of Schwarz '570); U.S. Patent No. 6,013,223 to Schwarz (hereinafter "Schwarz '223")(Ex. 1002) (described as further

improvement on the meltblown apparatus described in Schwarz '616); U.S. Patent No. 6,114,017 to Fabbriante et al. (hereinafter "Fabbriante")(Ex. 1018) (describing a modular multirow meltblown die providing parallel air flow for preparing continuous filaments having improved strength and also providing improved meltblown production capacity); and U.S. Patent No. 6,200,120 to Fish et al. (hereinafter "Fish")(Ex. 1019) (describing a meltblown die having greater throughput and production rate).

46. There are a wide variety of different types of filaments that can be used to prepare a coform nonwoven including meltblown and spunbond filaments. For example, PCT Application Publication No. WO 00/29658 to McDowall (Ex. 1003) describes a coform comprising a blend of thermoplastic filaments and pulp fibers prepared from continuous spunbond filaments or continuous meltblown filaments. Ex. 1003, page 8, lines 1-2 and page 10, lines 1-2.

47. The concept of spunbond fabric production developed in the late 1950s, but it was not until the mid-1960s to the early 1970s that the full commercial potential of the spunbond technology was fully recognized. *See* G S Bhat et al., Polymer-laid web Formation, *Handbook of Nonwovens*, edited by S.J. Russel, Woodhead Publishing Limited, (2007), 149-150 (Ex. 1022). In the spunbond process, a molten thermoplastic material is extruded as filaments from a plurality of fine, usually circular, capillaries (filament forming holes) of a

spinnerette, with the filaments then being attenuated and drawn mechanically or pneumatically. The filaments are deposited on a collecting surface to form a web of randomly arranged substantially continuous filaments which can thereafter be bonded together to form a coherent nonwoven fabric. Generally, the spunbond spinneret die includes a plurality of rows of spinning capillaries with each row typically comprising from 50 to 500 spinning capillaries. Spunbond filaments typically have diameters ranging from 15 to 35 μm .

48. In general, spunbond webs are recognized as having greater strength than meltblown webs. One reason for this difference in strength results from the meltblown webs comprising microfibers having average filament diameters less than 10 μm , whereas spunbond webs comprise filaments having diameters greater than 10 μm . As noted in U.S. Patent No. to 7,947,359 to Suzuka et al. (Ex. 1023), fabrics prepared from melt blow spinning exhibit poor mechanical tenacity, such as tensile strength, because the meltblown microfibers have diameters of 5 μm or less. *See* Ex. 1023, column 1, line 65-column 2, line 9.

49. In view of the differences in strength between meltblown webs and spunbond webs, there was a desire to provide stronger meltblown webs. In the case of a wipe prepared from a coform nonwoven, having higher strength filaments is particularly desirable. Higher strength filaments reduce the possibility of “poke-through,” which refers to the tendency of the users finger to poke through the wipe

during use. In addition, higher strength filaments allow the basis weight of the nonwoven to be reduced, which provides further cost savings.

B. Claims of the '276 Patent

50. The '276 Patent has two independent claims (Claims 1 and 24).

Independent Claim 1 is directed to a process of making a fibrous structure. Claim 1 includes 6 steps (steps a.-e.). Step a. requires providing a die having three or more rows of three or more filament-forming holes. Step b. recites supplying a first polymer to the die, and step c. recites producing a plurality of filaments comprising the first polymer from the die. In step d., the filaments are combined with a solid additive to form a mixture, and in step e., the mixture is collected on a belt to produce a fibrous structure.

51. Claim 24 is substantially identical to Claim 1, with the exception that the first polymer is specified to be a polyolefin, and the solid additive is specified to be wood pulp fibers. Ex. 1001, column 22, lines 50-59.

52. The dependent claims add elements such as reciting that at least one of the three or more rows comprises ten or more filament-forming holes (*Id.*, Claim 2, column 21, lines 48-50); one or more of the fluid-releasing holes is concentrically positioned around a filament-forming hole; (*Id.*, Claim 5, column 21, lines 57-59); types of polymers (*Id.*, Claims 7-12, column 22, lines 1-19); types

of solid additives (*Id.*, Claims 13-14, column 22, lines 20-23); and additional processing steps (*Id.*, Claims 15-19 and 22-24, column 22, lines 23-37).

VII. Claim Construction

53. I understand that, for purposes of my analysis in this *inter partes* review proceeding, the terms appearing in the patent claims should be interpreted using the same claim construction standard that would be used to construe the claim in the federal courts (as set out in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005)), including construing the claim terms in accordance with the ordinary and customary meaning of such claim terms as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. 37 C.F.R. § 42.100(b). The following terms should be construed:

A. Polypropylene

54. The term “polypropylene” as used in the ’276 Patent, must be a polyolefin because Claim 9 of the ’276 Patent claims a polyolefin that comprises polypropylene. Ex. 1001, Claim 9. Moreover, polypropylene is a particular type of polyolefin.

B. Synthetic Polymer

55. The term “synthetic polymer” as used in the ’276 Patent must include polyolefins, polyesters, and polylactic acids because Claim 7 of the ’276 Patent claims a synthetic polymer selected from the group including polyolefins,

polyesters, and polylactic acids. Ex. 1001, Claim 7. Moreover, polyolefins, such as polypropylene, are considered synthetic polymers.

C. Natural Polymer

56. The term “natural polymer” as used in the '276 Patent (Claims 11-12) must include starch, starch derivatives, cellulose, cellulose derivatives, hemicellulose, hemicellulose derivatives, and mixtures thereof because Claim 12 of the '276 Patent claims a natural polymer selected from the group consisting of starch, starch derivatives, cellulose, cellulose derivatives, hemicellulose, hemicellulose derivatives, and mixtures thereof. Ex. 1001, Claim 12. Moreover, starches and cellulose are natural polymers.

D. Post Processing Operation

57. Claims 22 and 23 include a “post processing operation.” The specification of the '276 Patent does not define “post processing operation,” but gives examples:

The fibrous structures of the present invention and/or any sanitary tissue products comprising such fibrous structures may be subjected to any post-processing operations such as embossing operations, printing operations, tuft-generating operations, thermal bonding operations, ultrasonic bonding operations, perforating operations, surface treatment operations such as application of lotions, silicones and/or other materials and mixtures thereof.

Ex. 1001, column 9, lines 44-51. “Post processing operation” must, therefore, be defined to include tuft-generating operations, thermal bonding operations, and the application of lotions, materials, and mixtures.

E. Second Polymer

58. The definition of “second polymer” must include the second polymer being the same as the first polymer because Claim 18 of the ’276 Patent, which depends on Claim 16, recites that the first and second polymer are the same. Ex. 1001, Claim 18.

F. Solid Additive Spreader

59. The ’276 Patent defines the term “solid additive spreader” as a device that comingles air with pulp or other solid additives and injects the mixture into the stream of meltblown filaments. Ex. 1001, column 16, lines 9-60.

G. Belt

60. The ’276 Patent does not provide a definition of the term “belt.” In the nonwoven industry, the term “belt” generally refers to a moving foraminous collection surface that is permeable and continuous, and onto which a nonwoven web is deposited following filament extrusion.

VIII. Introduction to the Prior Art

61. In this section, I will provide an introduction to each prior art reference.

A. U.S. Patent No. 5,476,616 (“Schwarz ’616”) (Ex. 1005)

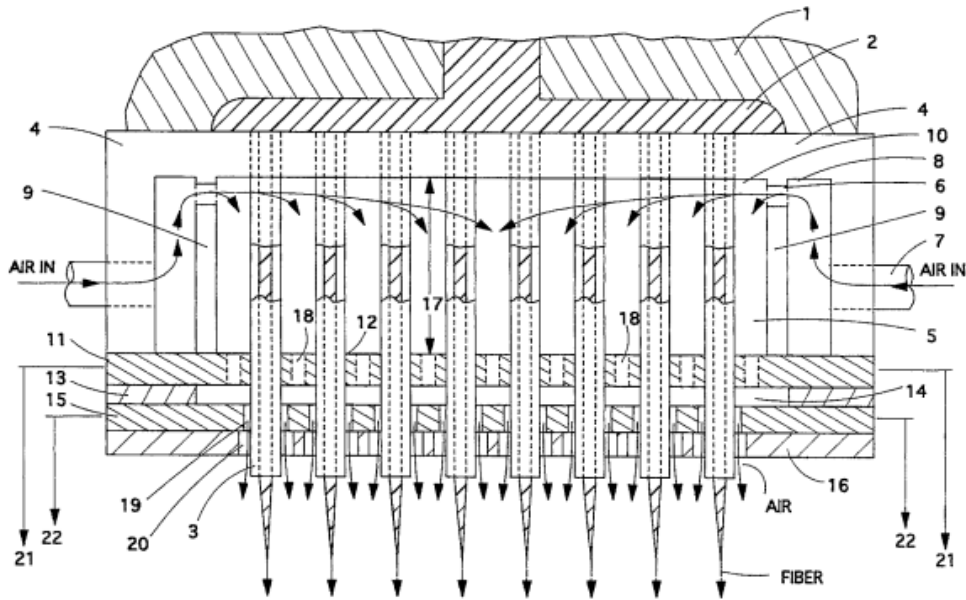
62. United States Patent No. 5,476,616 to Schwarz (“Schwarz ’616”) (Ex. 1005), entitled “Apparatus and Process for Uniformly Melt-Blowing a Fiberforming Thermoplastic Polymer in a Spinnerette Assembly of Multiple Rows of Spinning Orifices,” Schwarz ’616 issued on December 19, 1995.

63. Schwarz ’616 is directed to an apparatus and method for preparing meltblown fibers and nonwovens comprising meltblown fibers. As such, Schwarz ’616 is in the same field of the endeavor or the ’276 Patent.

64. Schwarz ’616 is directed to an improvement of the meltblown die head and the process described in Schwarz ’570. Ex. 1005, column 1, lines 9-12.

65. Schwarz ’616 describes a multirow meltblown die in which each filament nozzle is concentrically surround by an air orifice. *Id.*, abstract.

66. The meltblown die of Schwarz ’616 includes one or more gas cover plates having round holes in which a corresponding filament nozzle is centered. This arrangement can best be seen in figure 1 of Schwarz ’616, below.

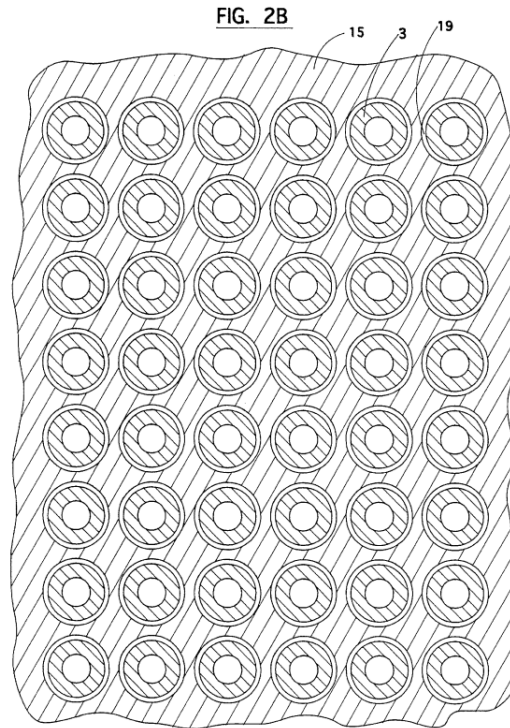


Id., figure 1.

67. In figure 1, the filament nozzles 3 extend through a gas cavity 5, and then through a series of gas cover plates (e.g., plate 11, plate 15, and optional plate 16). *Id.*, column 2, lines 15-52. Each cover plate includes a plurality round holes that are aligned with a corresponding hole in the other cover plates. *Id.* In figure 1, the round holes in gas plate 15 are identified by reference character 19, and the round holes in gas plate 16 are identified by reference character 20. The round holes in gas plate 15 define the air orifices through which air flows parallel to the main axis of the filament nozzles. *Id.*, abstract and column 2, lines 41-46.

68. Figure 2B shows a partial bottom view of gas cover plate 15 in which each individual filament nozzle 3 is positioned in a round hole 19. An annular space is present between the outer surface of the filament nozzle and the inner

surface of the round hole 19. This space defines an annular shaped gas outlet concentrically surrounding each filament nozzle. *Id.*,



69. During fiber extrusion, a molten polymeric resin is fed via an extruder to supply cavity 2, which in turns supplies the molten polymeric resin to the plurality of filament nozzles 3. *Id.*, column 2, lines 15-19. Gas enters the gas cavity 5 via the air inlet 7 and then flows through gas holes 18 in plate 11 into a second gas cavity 14 and then around the nozzles 3 through holes 19 and 20 in which the nozzles are centered. *Id.*, column 2, lines 41-46. As the gas exits holes 19 and 20, it is flowing parallel to the main axis of the filament nozzles. That is, as the gas exits the holes in the cover plates, the gas is flowing parallel to the filaments as they are extruded from filament nozzles 3. Consequently, the gas

(e.g., air) contacts the surfaces of the filaments as they exit the filament nozzles at an angle that is less than 10°.

70. In the examples disclosed in Schwarz '616, meltblown fibers were prepared comprising polypropylene. *Id.*, column 2, lines 63-67. Polypropylene is a polyolefin and is also considered to be a synthetic polymer.

71. Schwarz '616 states that an object of the invention is to increase productivity and also provide a uniform stream of attenuating gas around each spinning nozzle. *Id.*, column 1, lines 20-28. As discussed previously with respect to Schwarz '570, the multirow meltblown dies have been recognized as breaking the limitation of requiring air from each side of the tapered die tip, and as such, providing increased polymer throughput and productivity without a tremendous capital expense. *See also* Ex. 1011, Zhao.

72. Advantageously, the multirow meltblown die of Schwarz '616 promises higher productivity in comparison to knife-edge meltblown dies having a single row of die openings.

73. Table 1 of Schwarz '616 highlights the improvements obtained with the multirow meltblown die of Schwarz '616. More specifically, the examples of Schwarz '616 shows that higher throughput is achieved by increasing the number of filament nozzles in a given spinneret die by increasing the number of rows of filament nozzles. *Id.*, Table 1.

74. Using the multirow meltblown die parameters set forth in example 3 of Table 1, the production capacity of the meltblown die of Schwarz '616 can be extrapolated to provide an estimated meltblown production capacity of 189 Kg/M_{width}/Hour. In addition, the multirow meltblown die of Schwarz '616 having 8 rows of filament nozzles would have approximately 3,937 filament nozzles per meter width.

75. These values for the multirow meltblown die of Schwarz '616 can be compared to a typical single row meltblown die available in 2007. In 2007, the typical single row meltblown die had 30 Holes Per Inch (HPI), which is equivalent to approximately 1,181 filament nozzles for a die with a width of one meter. (See Ex. 1024, *ITMA 2007 Review: Implications for the Nonwovens Industry*," J. of Engineered Fibers and Fabrics, Vol. 3, Issue 1 (2008), 38-47, 46 – Pourdeyhimi). This would provide an estimated meltblown production capacity of approximately 57 Kg/M_{width}/Hour (based on a polymer throughput of 0.8 grams per hole (gph) per minute as specified in Table 1 of Schwarz '616).

76. Based on these values, the multirow meltblown die of Schwarz '616 is expected to provide more than a 233 percent increase in the number of filament nozzles for the same cross directional die width, and to produce nearly three times the polymer throughput per die in comparison to a single row meltblown die having a filament nozzle density of 30 HPI.

77. Such increases in productivity with a single row meltblown die would have been unachievable given the requirement of converging gas streams for each row of filament nozzles. However, Schwarz '616 solves this problem by providing individual parallel streams of blown air to each filament nozzle. Consequently, the increased number of nozzle filaments per die significantly increases production capacity of the multirow meltblown die of Schwarz '616 in comparison to a typical single row meltblown die.

B. PCT Published Application No. WO 00/29658 (“McDowall”) (Ex. 1003)

78. Entitled “Pulp-Modified Bicomponent Continuous Filament Nonwoven Webs,” McDowall was published May 25, 2000. Ex. 1003, p. 1.

79. McDowall is directed to a coform nonwoven and processes of preparing the same. Accordingly, McDowall is in the same field of the endeavor or the '276 Patent.

80. McDowall describes a process of preparing an absorbent nonwoven web comprising a combination of substantially continuous bicomponent thermoplastic filaments and pulp fibers. Ex. 1003, abstract. McDowall states that the continuous filaments may be combined with pulp fibers using a coform process. *Id.*, page 10, lines 1-6. As discussed previously, in the coform process, a solid additive, such as pulp fibers, are comingled with a stream of thermoplastic filaments prior to the mixture of filaments and pulp fibers being deposited on a

collection surface. More specifically, a plurality of filaments are extruded from a die head having multiple die openings (e.g., filament nozzles) to form a filament stream. A stream comprising a gas and a solid additive, such as wood pulp, is introduced into the filament stream at which point the solid additives comingle and merge with the filaments in the filament stream. The resulting integrated stream is then deposited onto a collection surface. McDowall describes that the integrated stream of continuous filaments and pulp fibers are deposited onto a web forming conveyor and then subsequently subjected to a step of through-air bonding. *Id.*, page 16, lines 2-6.

81. As described in Anderson, the coform process typically includes entailing the individual pulp fibers in a stream of air which travels through a duct that maintains separation of the individual wood pulp fibers prior to merger of the filaments and pulp fibers. *See*. Ex. 1007, column 3, lines 18-33.

82. In addition, McDowall discloses “thermal point bonding” and teaches that it means passing a fabric or web of fibers to be bonded between a heated calender roll and an anvil roll in order to hold the laminate layers together and impart integrity to each individual layer by bonding filaments and/or fibers within each layer. Ex. 1003, pages 6-7.

83. Notably, McDowall states that the continuous filaments may be, without limitation, spunbonded or meltblown fibers. *Id.*, page 6, lines 1-3. More

specifically, McDowall in defining suitable continuous filaments includes the following definition:

The term “substantially continuous filaments of fibers” refers to filaments or fibers prepared by extrusion from a spinnerette, including without limitation spunbonded and meltblown fibers, which are not cut from their original length prior to being formed into a nonwoven web or fabric. Substantially continuous filaments or fibers may have average lengths ranging from greater than about 15 cm to more than one meter, and up to the length of the nonwoven web or fabric being formed. The definition of "substantially continuous filaments or fibers" includes those which are not cut prior to being formed into a nonwoven web or fabric, but which are later cut when the nonwoven web or fabric is cut.

Id., page 6, lines 1-8. In addition, McDowall states that “meltblown fibers used in the present invention are substantially continuous in length. *Id.*, page 4 lines 19-20.

84. Accordingly, McDowall teaches that both meltblown continuous filaments and spunbond continuous filaments may be used interchangeably to prepare McDowall’s absorbent nonwoven. In addition, it is clear that McDowall is not limited to only using spunbond or meltblown filaments, but rather embraces other methods of preparing filaments by extrusion from a spinnerette.

85. McDowall further describes that the thermoplastic continuous filaments may include a wide variety of polymers including polypropylene, such as polypropylene homopolymers and polypropylene copolymers. *Id.*, page 8, lines

20-23; page 18, Claim 4. Polypropylene is a polyolefin and is also considered a synthetic polymer.

86. McDowall further defines pulp fibers to include fibers from natural sources such as woody and non-woody plants. *Id.*, page 4, lines 21-24. McDowall also describes that the pulp fibers may be of high average fiber length (e.g., lengths greater than 1.5 mm), low average fiber length (e.g., lengths less than about 1.5 mm), and mixtures thereof. *Id.*, page 10, lines 10-21.

87. On pages 15-16, McDowall includes an example that explicitly describes a process of preparing an absorbent nonwoven web comprising a combination of continuous spunbond bicomponent filaments, pulp, and a superabsorbent. *Id.*, page 15, lines 21-22. As McDowall describes extruding the filaments, the described process necessarily includes supplying at least one polymer to a die. *Id.*, lines 30-31. One of the components of the bicomponent filaments includes polypropylene, which as noted earlier, is a polyolefin. *Id.*, lines 27-30. McDowall describes that after extrusion of the filaments, the pulp fibers and superabsorbent were injected into the filament stream using air assist. *Id.*, page 16, lines 2-4. The mixture of the filaments, pulp and superabsorbent was then deposited onto a web forming conveyor (i.e., a continuous moving belt). *Id.* The nonwoven web was then thermally bonded by being subjected to through-air bonding. *Id.*, lines 4-6. Such bonding typically occurs during manufacture of the

absorbent nonwoven composite and is therefore considered a “directly coupled” post processing operation.

88. McDowall further describes that the absorbent nonwoven composites can be used in various medical products, which contain alcohol or other disinfectants. *Id.*, page 15, lines 16-18. The conversion of the absorbent nonwoven composite of McDowall into such medical products is normally completed at a separate facility from the manufacturing site and is therefore considered a “closely coupled” post processing operation.

C. U.S. Patent App. Publication No. 2003/0211802 A1 (“Keck”) (Ex. 1004)

89. Entitled Three-Dimensional Coform Nonwoven Web,” Keck was published November 13, 2003. Ex. 1003, page 1.

90. Keck is directed to a coform nonwoven and processes of preparing the same. Accordingly, Keck is in the same field of the endeavor or the ’276 Patent.

91. Keck describes a process of preparing a coform nonwoven (a “fibrous structure”) prepared from meltblown filaments and a secondary additive. *Id.*, abstract. Keck describes that the coform nonwoven may be used to form “a presaturated or absorbent cleaning sheet used as a wiper,...” *Id.*, ¶ 0135. More specifically, Keck states that “[c]oform nonwoven webs have been used in applications such as disposable absorbent articles, absorbent dry wipes, wet wipes, wet mops and absorbent dry mops.” *Id.*, ¶ 0006.

92. At paragraph 0036, Keck defines a coform nonwoven as follows:

The term “coform nonwoven web” or “coform material” means composite materials comprising a mixture or stabilized matrix of thermoplastic filaments and at least one additional material, usually called the “second material” or the “secondary material”. As an example, coform materials may be made by a process in which at least one meltblown die head is arranged near a chute through which the second material is added to the web while it is forming. The second material may be, for example, an absorbent material such as fibrous organic materials such as woody and non-wood pulp such as cotton, rayon, recycled paper, pulp fluff; superabsorbent materials such as superabsorbent particles and fibers; inorganic absorbent materials and treated polymeric staple fibers and the like; or a non-absorbent material, such as non-absorbent staple fibers or non-absorbent particles. Exemplary coform materials are disclosed in commonly assigned U.S. Pat. No. 5,350,624 to Georger et al.; U.S. Pat. No. 4,100,324 to Anderson et al.; and U.S. Pat. No. 4,818,464 to Lau et al.; the entire contents of each is hereby incorporated by reference.

Id., ¶ 0036.

93. With reference to figure 3 of Keck, a pair of extruders 14, 14' feed molten polymer into a pair of corresponding meltblowing dies 16, 18, respectively.

Id., ¶ 0084. Each meltblowing die produces a stream of gas that attenuates the filaments as they exit small holes or orifices of the meltblowing die to form a filament containing stream. *Id.*, ¶ 0085. Keck discloses that the stream of gas may comprise air. *Id.*, ¶ 0035.

94. The pair of meltblowing dies are configured so that their respective filament streams 26, 28 merge to form a single filament stream at an impingement zone 30. *Id.*, ¶ 0085. A secondary gas stream containing secondary fibers, such as

pulp fibers, is directed between the two filament streams at the impingement zone 30. *Id.*, ¶ 0093. The resulting composite stream 56 comprising the merged filament streams and gas stream containing secondary fibers is deposited on a collecting device, such as an endless forming surface 58. *Id.*, ¶ 0097. Keck states that the forming surface may be any type of plate, drum, belt or wire. *Id.*, ¶ 0063.

95. Keck further discloses that the secondary fibers (solid additives) are conveyed toward the stream of thermoplastic polymer fibers through a nozzle, with a housing that encloses the picker roll and provides a passageway or gap between the housing and the picker roll and that a gas (i.e., air) is supplied to the passageway or gap between the surface of the picker roll and the housing by way of a gas duct. *Id.*, ¶ 0088. The gas is supplied by any conventional arrangement including a blower and is supplied in sufficient quantity to serve as a medium for conveying the secondary fibers through the nozzle. *Id.* Keck further discloses that it is contemplated that additives and/or other materials may be added to or entrained in the gas stream to treat secondary fibers. *Id.* Keck further discloses a “conventional particulate injection system” (solid additive spreader). *Id.*, ¶¶ 0092, 0108.

96. In addition, Keck defines terms “fibers” to include fibers that are not continuous as well as continuous fibers. *Id.*, ¶ 0033. Keck defines the term

“filaments” to be synonymous with the term “substantially continuous filaments.”

Id.

97. Keck defines the term “meltblown fibers” to mean the following:

fibers formed by extruding a molten thermoplastic material through a plurality of fine, usually circular, die capillaries as molten threads or filaments into converging high velocity, usually hot, gas (e.g. air) streams which attenuate the filaments of molten thermoplastic material to reduce their diameter, which may be to microfiber diameter. Thereafter, the meltblown fibers are carried by the high velocity gas stream and are deposited on a collecting surface to form a web of randomly dispersed meltblown fibers.

Id., ¶ 0034. Notably, Keck further states that “[t]he term “meltblown” is also intended to cover other processes in which a high velocity gas (generally air) is used to aid in the formation of the filaments, such as melt spraying or centrifugal spinning.” *Id.* (emphasis added).

98. Accordingly, Keck teaches a process of preparing a coform nonwoven comprising continuous thermoplastic filaments, and that such filaments can be prepared with any process that uses high velocity gas to attenuate the continuous filaments.

99. Keck discloses that thermoplastic meltblown filaments comprise a polymer selected from the group consisting of polyolefins, polyesters, polyamides, polycarbonates, polyurethanes, polyvinylchloride, polytetrafluoroethylene, polystyrene, polyethylene terephthalate, polylactic acid and copolymers and blends thereof. *Id.*, ¶ 0052, Claim 8. More specifically, Keck teaches that the meltblown

filaments may comprise polyolefins, such as polypropylene. *Id.*, ¶ 0052.

Polypropylene is considered a synthetic polymer.

100. In addition to polyolefins, Keck teaches that the meltblown filaments may comprise biodegradable filaments, such as polylactic acids. *Id.*, ¶ 0052.

101. Keck discloses that the secondary material (solid additives) includes fibrous organic materials (fibers) and superabsorbent particles and fibers. *Id.*, ¶ 0003. In particular, Keck teaches that the secondary material (i.e., secondary fibers) of the coform nonwoven may be an absorbent material, such as absorbent fibers. *Id.*, ¶ 0056. Examples of such secondary fibers include cellulosic derived fibers, such as wood pulp fibers. *Id.*

102. Keck also teaches that the meltblown filaments may be monocomponent or multicomponent. *Id.*, ¶ 0055. In particular, Keck discloses “multicomponent fibers” which have been formed from at least two polymers and that the “polymers are usually different from each other, although conjugate fibers may be prepared from the same polymer.” *Id.*, ¶ 0039.

103. Keck teaches that the coform nonwoven may be subject to a post-processing operation directly following formation of the coform nonwoven. More particularly, Keck discloses that the coform nonwoven may be “pattern bonded,” which is a process of bonding a nonwoven web in a pattern by the application of heat and pressure or other methods, such as ultrasonic bonding. Keck discloses that

thermal pattern bonding typically is carried out at a temperature in a range of from about 80 C. to about 180° C. *Id.*, ¶ 0047.

104. Keck also describes additional steps (post-processing operations) of depositing the second composite stream onto the deposited layer as a matrix of meltblown filaments and a secondary material to form a two-layer tufted coform nonwoven web. *Id.*, ¶¶ 0015-0018. For example, figure 4 of Keck provides a schematic of an apparatus a system in which a first coform layer is formed on a collection surface from a first composite stream 156, and then a second coform layer formed from a second composite stream 156' is deposited onto the first coform layer. *Id.*, ¶¶ 0100-0110, FIG. 4. In Example 5 of Keck, a two-layer coform nonwoven (fibrous structure) is described in which the meltblown filaments of both coform nonwoven layers comprise the same polymer. *Id.*, ¶ 0150. In the example, the first coform nonwoven layer was formed and then the second coform nonwoven layer was formed on the surface of the first coform nonwoven layer. *Id.* As a consequence, the meltblown filaments of the second coform layer contacted the surface of the first coform layer.

105. The first coform nonwoven layer is formed of meltblown filaments comprising polypropylene resin grade PF-015 available from Basell. *Id.* The second coform nonwoven layer, which was directly deposited on the surface of the

first coform layer, was formed of meltblown filaments comprising the same polypropylene grade resin as the meltblown filaments in the first coform layer. *Id.*

D. United States Patent No. 6,013,223 to Schwarz (“Schwarz ’223”) (Ex. 1002)

106. United States Patent No. 6,013,223 to Schwarz (“Schwarz ’223”) (Ex. 1002), entitled “Process and Apparatus For Producing Non-Woven Webs of Strong Filaments,” issued on January 11, 2000.

107. Schwarz ’223 is directed to an apparatus and method for preparing meltblown fibers and meltblown nonwoven webs. Accordingly, Schwarz ’223 is in the same field of the endeavor or the ’276 Patent.

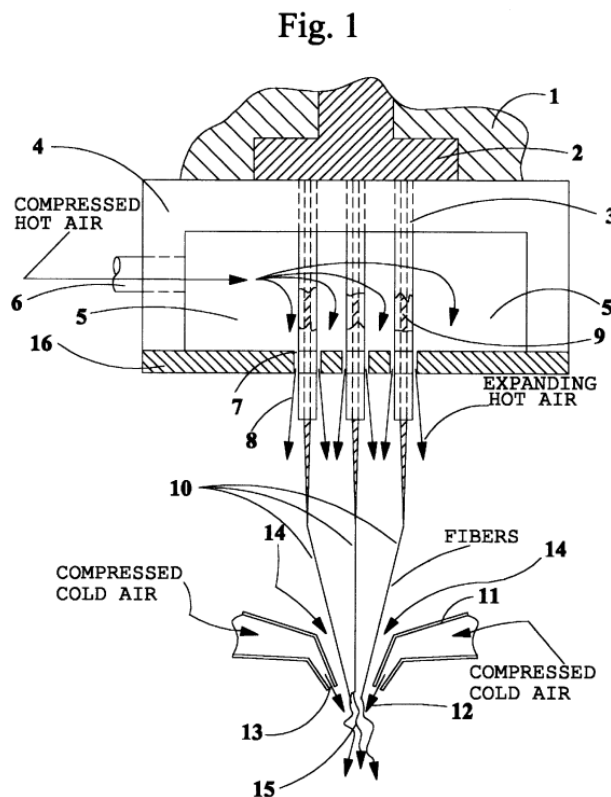
108. Schwarz ’223 patent describes itself as an improvement of the meltblown die system described in Schwarz ’616. Ex. 1002, column 1, lines 7-10.

109. Schwarz ’223 further states that objects of the invention provide fibers of high tenacity and to also to provide “unusually high production capacities.” *Id.*, column 1, lines 19-24. As the meltblown die of Schwarz ’223 is similar to that of Schwarz ’616, it would be expected that the meltblown die would have equivalent meltblown filament throughput as taught in Schwarz ’616. As discussed previously, the advantages obtained with a multirow meltblown die of the Schwarz ’223 Patent in comparison to a single row meltblown die were well known to POSA prior to 2007 and were explicitly recognized by others in the nonwovens field. *See Zhao*, Ex. 1011.

110. Schwarz '223 teaches an apparatus and method for preparing filaments in which the spinning nozzles are arranged in a plurality of rows with each row containing multiple filament nozzles per row. *Id.*, figure 2, column 2, lines 29-35, 52-54; Claim 1, lines 39-45.

111. Schwarz '223 includes a multirow meltblown die similar to what is described in Schwarz '616, and further includes a draw jet positioned below the filament nozzles. The draw jet, which provides quenching air, is described as being more similar to the spunbond process. *Id.*, column 1, lines 7-12.

112. With reference to figure 1 of Schwarz '223, below, the meltblown die and spinnerette assembly is illustrated.



113. The spinnerette assembly is mounted on die body 1 and includes a polymer supply cavity 2, which feeds molten polymer to a plurality of filament nozzles 3 that are arranged in rows. *Id.*, column 2, lines 29-51. The filament nozzles extend from the die body through gas cavity 5 and protrude through circular holes 7 in which a corresponding filament nozzle is associated. This spinnerette assembly is similar to the meltblown die described in Schwarz '616.

114. Figure 2, which is a partial bottom view of the cover plate 16, shows that the meltblown die includes three or more rows of filament nozzles in which each row includes three or more filament nozzles. Figure 2, column 2, lines 29-35, 52-54; Claim 1, lines 39-45. Indeed, figure 2 of Schwarz '223 explicitly shows multiple rows of filament nozzles with each row containing multiple filament nozzles per row. *Id.*, figure 2.

115. As the filaments are extruded from the filament nozzles, heated gas introduced into gas cavity 5 concentrically surrounds the nozzles and expands outwardly at a high velocity parallel to the nozzles and fiber stream. *Id.*, column 2, lines 39-44. The filaments 10 are then drawn into the draw jet 11 where they are subjected to a high degree of molecular orientation resulting in filaments of high tenacity *Id.*, column 2, lines 45-46; column 1, lines 19-21. The resulting fibers are

deposited on a receiver surface to form a nonwoven mat. *Id.*, Claim 5, column 5, lines 34-36.

116. In the Examples of Schwarz '223, meltblown fibers were prepared comprising polypropylene. *Id.*, column 2, lines 65-68. Polypropylene is a polyolefin and is also considered to be a synthetic polymer. Notably, the polypropylene resin used in the examples, had a melt flow rate (MFR) of 400 g/ 10 minutes, which is typical of a meltblown grade polypropylene resin. *Id.*, Table II.

117. The resulting fibers evaluated in Table III exhibited diameters ranging from 5 to 9 micrometers, which is within the typical range of meltblown fiber diameters. *Id.*, Table III.

118. Notably, Schwarz '223 emphasizes that an object of the invention is to provide fibers of high tenacity in addition to the object of achieving high production capacities. *Id.*, column 1, lines 16-21. As discussed previously, fine fibers, such as meltblown fibers, are recognized as having poor strength. *See*, Ex. 1023, column 1, line 65 through column 2, line 9.

E. United States Patent No. 6,783,854 to Bond (“Bond”) (Ex. 1006)

119. United States Patent No. 6,738,854 to Bond (“Bond”) (Ex. 1006), entitled “Bicomponent Fibers Comprising A Thermoplastic Polymer Surrounding a Starch Rich Core” issued on August 31, 2004.

120. Bond is directed to continuous bicomponent fibers that may be used in the preparation of meltblown and spunbond nonwoven fabrics. Accordingly, Bond is in the same field of the endeavor or the '276 Patent.

121. Bond describes bicomponent fibers having a sheath/core configuration in which a non-starch thermoplastic polymer (defining the sheath) surrounds a thermoplastic starch (defining the core). *Id.*, abstract.

122. Bond teaches that the non-starch thermoplastic polymer may be a polyolefin, such as polyethylene or polypropylene. *Id.*, column 3, lines 39-45.

123. Bond states that the thermoplastic starch is a naturally occurring biopolymer. *Id.*, column 4, lines 58-60.

124. Bond provides the following statement with respect to suitable starches:

Suitable naturally occurring starches can include, but are not limited to, corn starch (including, for example, waxy maize starch), potato starch, sweet potato starch, wheat starch, sago palm starch, tapioca starch, rice starch, soybean starch, arrow root starch, bracken starch, lotus starch, cassava starch, high amylose corn starch, and commercial amylose powder. Blends of starch may also be used. Though all starches are useful herein, the present invention is most commonly practiced with natural starches derived from agricultural sources, which offer the advantages of being abundant in supply, easily replenishable and inexpensive in price. Naturally occurring starches, particularly corn starch (including, for example, waxy maize starch), and wheat starch, are starch polymers of choice due to their economy and availability. Modified starch may also be used. Modified starch is defined as non-substituted, or substituted, starch that has had its native molecular weight characteristics changed (i.e. the molecular weight is changed but no other changes are necessarily made to the starch).

Molecular weight can be modified, preferably reduced, by any technique numerous of which are well known in the art. These include, for example, chemical modifications of starch by, for example, acid or alkali hydrolysis, acid reduction, oxidative reduction, enzymatic reduction, physical/mechanical degradation (e.g., via the thermomechanical energy input of the processing equipment), or combinations thereof. The thermomechanical method and the oxidation method offer an additional advantage when carried out in situ. The exact chemical nature of the starch and molecular weight reduction method is not critical as long as the average molecular weight is provided at the desired level or range. Such techniques can also reduce molecular weight distribution.

Id., column 5, line 51-column 6, line 15.

125. Bond teaches that the bicomponent filaments may be made with melt spinning processes, and may be used to produce continuous filaments through spunbond methods or meltblowing processes. *Id.*, column 12, line 61-column 13, line 4.

126. Bond further teaches that the nonwovens prepared from the bicomponent fibers may be used in hygiene applications, which includes wipes and diapers. *Id.*, column 14, lines 30-45. In addition, Bond teaches that the nonwovens comprising the thermoplastic starch may be environmentally degradable, and thus flushable. *Id.*, column 10, lines 23-42.

F. United States Patent No. 6,114,017 to Fabbriante (“Fabbriante”) (Ex. 1018)

127. United States Patent No. 6,114,017 to Fabbriante (“Fabbriante”) (Ex. 1018), entitled “Micro-Denier Nonwoven Materials Made Using Modular Die Units” issued on September 5, 2000.

128. Fabbriante is directed to nonwoven webs and processes for their production. Accordingly, Fabbriante is in the same field of the endeavor or the ’276 Patent.

129. Fabbriante describes a modular multirow meltblown die for preparing continuous meltblown filaments. Ex.1018, abstract. Fabbriante teaches that the modular multirow meltblown die produces meltblown webs having equal or superior strength properties to nonwoven fabrics prepared with spunbond processes. *Id.*, abstract, column 2, lines 7-10. Fabbriante further teaches that the meltblown webs prepared with the modular multirow die also exhibit significantly higher unbonded strength than a typical meltblown web. *Id.*, column 4, lines 1-10.

130. Fabbriante also discloses that the modular multirow meltblown die provides economic advantages. Fabbriante teaches that it is well known in the nonwoven industry that in order to be competitive in meltblowing polymers, a minimum polymer flow rate per die hole must be maintained. *Id.*, column 1, lines 63-67. To meet this minimum polymer flow rate requirement, it may be necessary to use additional dies or beam to produce the nonwovens at a commercially

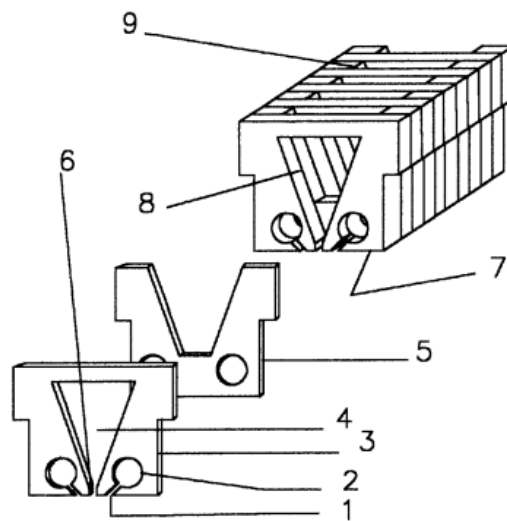
acceptable rate. *Id.*, column 2, lines 1-2. However, traditional meltblown beams are very expensive to produce. *Id.*, column 2, lines 2-7.

131. The multirow meltblown die of Fabbicante provides a solution to this problem. In particular, Fabbicante teaches that because of the “inherent economies of manufacture,” the modular meltblown die allows multiple rows of die holes without high capital costs. *Id.*, column 3, lines 11-14. Notably, Fabbicante discloses that the cost of manufacture of the modular meltblown die is about 10 to 20% of the cost of an equivalent die, in which the die block is traditionally machined. *Id.*, column 3, lines 6-9.

132. In other words, Fabbicante’s modular meltblown die provides for higher polymer throughputs without the significant capital expense typically associated with machining a traditional meltblown die.

133. As shown in figure 1, below, the modular meltblown die comprises a series of alternating primary plates 3 and secondary plates 5. *Id.*

Fig. 1



Id., figure. 1. Both the primary plates 3 and secondary plates 5 include a central cut-out portion 4 that, when the modular meltblown die is assembled, defines a central cavity 8 that extends laterally along the length of the meltblown die. *Id.* In addition, both the primary and secondary plates also include a pair of circular gas cut-outs 2 formed on opposite sides of the plates. When assembled, the cut-outs 2 are in fluid communication with the cut-outs of adjacent plates and thereby define a pair of gas cavities that extend laterally along the length of the die. *Id.*

134. The primary plate 3 further includes a polymer orifice 6 (filament die holes) on the bottom of the primary plate that is in fluid communication with the central cut-out portion 4 of the plate. A pair of air nozzles 1 are disposed in a flanking position on opposite sides of each of the polymer orifices 6 and extend

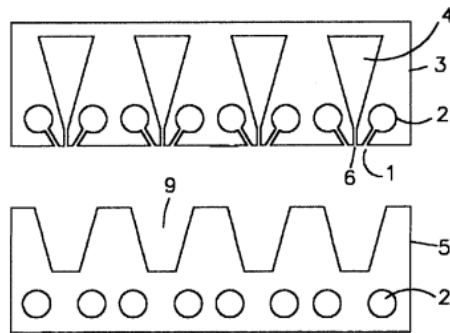
from the gas cut-outs to the bottom of the primary plate 3. *Id.*, column 5, lines 24-48.

135. The air nozzles are capable of producing a stream of high velocity air. The angle formed between the axis of the polymer orifices and the air nozzles varies between 0° and 60°. *Id.*, column 3, lines 58-62. When the angle is 0°, the air flows parallel to the filaments as they are extruded from the polymer orifices. The resulting filaments are continuous and have diameters ranging in the 0.6 to 8 micron range. *Id.*, column 3, lines 36-42.

136. In operation, molten polymeric resin is forced into central cavity 8 from which it flows outwardly from polymer orifices 6 to form fibers. Pressurized air is fed into the pair of gas cavities and then exits the air nozzles at which point the air, which is travelling at high velocities, attenuates the polymer streams exiting from the polymer orifices 6 to form continuous filaments. *Id.*, column 5, lines 24-48.

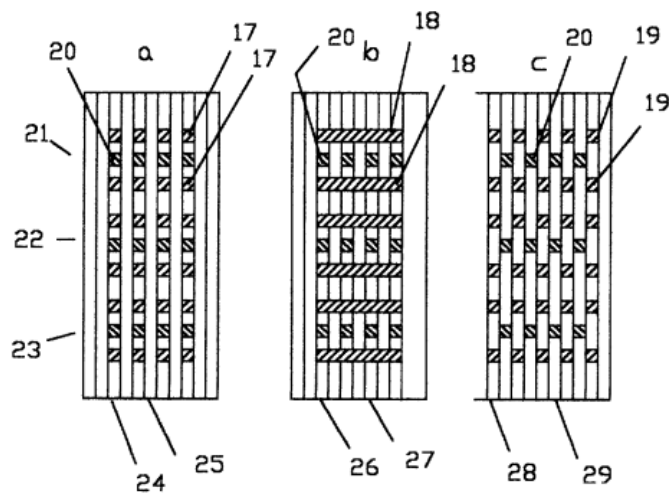
137. The modular die of figure 1 includes a single row of polymer orifices (filament-forming holes). However, figure 2 shows a primary plate 3 and secondary plate 5 that when assembled provides a modular multirow meltblown die having at least four rows of polymer orifices 6. *Id.*, figure 2, column 5, lines 49-51.

Fig. 2



Id., figure 2. Figure 3, below, is a plan view that depicts three different assembled die bodies comprising a plurality of primary plates and secondary plates in an assembled state.

Fig. 3



Id., figure 3. In the assembled die body a, the assembled die includes 3 rows of polymer orifices 20 in which each row includes at least 4 polymer orifices, and in

which each individual polymer orifice is flanked on opposing sides by a pair of the air nozzles 17. *Id.*, figure 3, column 5, lines 53-65.

138. Fabbriante further describes an embodiment in which the air nozzles are positioned adjacent to the polymer orifices and that the air nozzles produce a curtain of air on both sides of, and parallel, to the polymer fibers as they are extruded from the polymer orifices. *Id.*, Claim 15. In addition, Fabbriante teaches that the high-speed air curtains attenuate the fibers to form a plurality of continuous filaments from each row on the die. *Id.* The resulting filaments are deposited on a collecting means. *Id.* For example, Fabbriante describes that the filaments may be collected on a collection device, such as a porous cylinder or a continuous screen. *Id.*, column 7, lines 10-12.

139. Fabbriante also teaches that the high-speed air curtains may be separated from high-speed curtains of adjacent polymer orifices by plates positioned perpendicular to the surface of the die and parallel to the rows of fiber outlets. *Id.*, Claim 16, column 12, lines 19-24. In other words, the plates isolate individual polymer orifices from high-speed air curtains created by the air nozzles on adjacent plates. In this way, each individual fiber outlet is associated with only a single pair of air nozzles.

140. Fabbriante further teaches that the web of meltblown filaments may be thermally bonded, such as with hot calendaring techniques. *Id.*, column 3, lines 20-24.

141. In the examples, Fabbriante prepared meltblown nonwoven webs using polypropylene resin. *Id.*, column 8, lines 12-14. Polypropylene is a polyolefin and is also considered a synthetic polymer.

142. Fabbriante does describe that liquid barrier properties are an important feature of the web produced using the modular meltblown dies as evidenced by the hydrohead values provided in the examples. *Id.*, column 4, lines 13-17, tables 1 and 2. It should be recognized that a nonwoven web comprising polypropylene meltblown fibers would be inherently hydrophobic and exhibit water barrier properties as polypropylene is hydrophobic. However, Fabbriante further teaches that the meltblown webs prepared with the modular meltblown die may also be used in products, such as diapers, feminine hygiene products, wipers, and other related products that are considered absorbent in nature. *Id.*, abstract.

143. Fabbriante further teaches that the meltblown web may be used in combination with cellulose fibers. *Id.*, column 7, lines 60-66. In particular, Fabbriante teaches that the meltblown layer may be a single layer or may be combined with other layers to form:

a multi-layer laminate wherein the layers are composed of any combination of the instant invention plus films, woven fabrics,

metallic foils, unbonded webs, cellulose fibers, paper webs both bonded and debonded, various other nonwovens, and similar suitable webs suitable for laminating.

Id., column 7, lines 60-66. Fabbicante further teaches that the layers of the multi-layer laminate may include cellulose fibers, which means that the cellulose fibers may be mixed with the meltblown filaments of Fabbicante's meltblown web, in the layers that are in addition to Fabbicante's meltblown web, or in both.

144. As Fabbicante describes that the meltblown web may be used in wiper applications, and that it may be used in combination with cellulose fibers, it would be desirable to use cellulose fibers in combination with Fabbicante's meltblown filaments in order for the resulting article to function effectively as a wiper.

G. United States Patent Application Publication No. 2007/0202766 to Ouellette et al. ("Ouellette") (Ex. 1029)

145. United States Patent Application Publication No. 2007/0202766 to Ouellette et al. ("Ouellette") (Ex. 1029), entitled "Low Density Cleaning Substrate" published on August 30, 2007, and was filed on February 24, 2006. Ouellette qualifies as pre-AIA prior art to the '801 Patent under 35 U.S.C. § 102(e)(1).

146. Ouellette is directed to a cleaning substrate comprising a nonwoven material, such as a meltblown or coform. Accordingly, Ouellette is in the same field of the endeavor or the '276 Patent.

147. Ouellette discloses a nonwoven substrate that is particularly useful as a cleaning wipe. Ex. 1029, ¶¶ 0017, 0020. The nonwoven substrate has an optimized pore volume distribution in which at least 50 percent of the cumulative volume within the pores have a radius size of about 110 to 250 microns. *Id.*, abstract. Ouellette teaches that the optimized pore volume distribution of the substrate enables it to controllably release a fluid composition effectively onto a surface. *Id.*

148. Ouellette teaches that the substrate is a nonwoven material which may comprise a spunbond, meltblown, or coform nonwoven among others. *Id.*, ¶ 0019. Ouellette further teaches that the meltblown fibers may be continuous or discontinuous. *Id.*, ¶ 0041. Ouelette teaches that “the fibrous web or substrate may comprise natural fibers, synthetic fibers, polypropylene, polyethylene, polyester, PET, wood pulp, regenerated cellulose nylon, cotton, bicomponent fibers, continuous fibers, and combinations thereof...”. *Id.*, ¶ 0058.

IX. Elements of the '276 Patent in the Prior Art

149. In this section, I will discuss each ground of invalidity and how each of the prior art references that I introduced above exemplifies elements of the '276 Patent claims.

Ground 1: Claims 1-2, 6-9, 13-14, and 21-24 are anticipated under 35 U.S.C. §102(b) as being identically disclosed in PCT Published Application No. WO 00/29658 ("McDowall") (Ex. 1003)

Independent Claims 1 and 24

150. McDowall discloses each and every element of independent Claims 1 and 24 of the '276 Patent. Independent Claims 1 and 24 are so broad that any process of mixing continuous filaments with a solid additive, such as pulp fibers, in which the continuous filaments are prepared with a spinnerette die having three or more rows of filaments with the three or more rows including at least three filament-forming holes reads on the claims. As explained below, each and every element of Independent Claims 1 and 24 is taught in McDowall.

Element 1a: providing a die comprising three or more rows of three or more filament-forming holes

151. McDowall describes a process of preparing a coform nonwoven using continuous meltblown or continuous spunbond filaments. Ex. 1003, page, lines 1-3. It is well known that a spunbond spinnerette die comprises multiple rows (e.g., more than three) of spinning capillaries (filament-forming holes) with each row typically comprising from 50 to 500 spinning capillaries.

152. Accordingly, McDowall teaches providing a die comprising three or more rows of filament-forming holes, and in which the rows include three or more filament-forming holes.

153. Thus, McDowall teaches this element of Claims 1 and 24.

Element 1b (Claim 1): supplying at least a first polymer to the die

Element 1b (Claim 24): supplying a polyolefin polymer to the die

154. McDowall teaches preparing spunbond continuous filaments. More specifically, McDowall teaches that spunbond filaments are formed by extruding molten thermoplastic material from a plurality of capillaries of a spinnerette. *Id.*, page 3 line 30 through page 4, line 1. That is, in order to prepare a spunbond web, a polymer (a first polymer) is supplied to a spinnerette die from which it is extruded as a plurality of continuous filaments that are drawn and then collected on a collection surface. Thus, in order to form a spunbond web, it is necessary to supply at least a first polymer to a die

155. Accordingly, McDowall teaches the step of supplying at least a first polymer to the die as recited in Claim 1.

156. McDowall further teaches preparing a spunbond web comprising continuous filaments comprised of polypropylene, which is a polyolefin. *Id.*, page 15, lines 27-29. Accordingly, McDowall teaches the step of supplying a polyolefin to the die as recited in Claim 24.

157. Thus, McDowall teaches this element of Claims 1 and 24.

Element 1c (Claim 1): producing a plurality of filaments comprising the first polymer from the die.

Element 1c (Claim 24): producing a plurality of filaments comprising the polyolefin from the die.

158. Again, McDowall describes preparing the spunbond continuous filaments by extruding the filaments from the spinnerette die. McDowall further states that immediately after extrusion, and prior to deposition of the filaments on a collection surface, the filaments were exposed to a charge. *Id.*, page 15, line 30 through page 16, line 5. In other words, McDowall teaches extruding a plurality of spunbond filaments comprising a polymer from a die.

159. Accordingly, McDowall teaches producing a plurality of filaments comprising a first polymer from a die.

160. As noted above, McDowall also teaches preparing a spunbond web comprising a plurality of continuous filaments comprised of polypropylene, which is a polyolefin. *Id.*, page 15, lines 27-29. Accordingly, McDowall teaches the step of supplying a polyolefin to the die as recited in Claim 24.

161. Therefore, McDowall teaches this element of Claims 1 and 24.

Element 1d (Claim 1): combining the filaments with solid additives to form a mixture

Element 1d (Claim 24): combining the filaments with wood pulp fibers to form a mixture

162. McDowall teaches mixing the filaments with pulp fibers prior to depositing the mixture of filaments and pulp fibers on a web forming conveyer (e.g., a belt). *Id.*, page 16, lines 2-4. Pulp fibers fall within the '276 Patent's definition of a solid additive because it provides pulp fibers as an example of a solid additive. Ex. 1001, column 3, lines 56-58.

Element 1e: collecting the mixture on a belt to produce a fibrous structure

163. McDowall teaches that the mixture of the continuous filaments and wood pulp are deposited onto a web forming conveyor. *Id.*, page 16, lines 2-4.

164. A web forming conveyor is a moving continuous surface and is therefore synonymous with the term "belt." Accordingly, McDowall teaches this element of Claims 1 and 24.

Claim 2

The process according to Claim 1, wherein at least one row of the three or more rows comprises ten or more filament-forming holes

165. McDowall describes a process of preparing a coform nonwoven comprising continuous spunbond filaments. It is well known that a spunbond spinnerette includes multiple rows (e.g., more than three) of spinning capillaries (filament-forming holes) with each row typically comprising from 50 to 500 spinning capillaries. As such, the process of McDowall teaches a process in which at least one of the rows of spinnerettes (filament-forming holes) includes ten or more spinnerettes.

166. Accordingly, McDowall teaches each and every element of Claim 2.

Claim 6

The process according to claim 1 wherein the first polymer comprises a synthetic polymer.

167. McDowall explicitly discloses synthetic polymers including polyolefins and polyesters and other high tensile materials. *Id.*, page 8.

168. Accordingly, McDowall teaches each and every element of Claim 6.

Claim 7

The process according to claim 6 wherein the synthetic polymer is selected from the group consisting of: polyvinyl alcohol, polyvinyl alcohol derivatives, polyesters, nylons, polyolefins, polylactic acids, polyhydroxyalkanoates, polycaprolactones and mixtures thereof

169. McDowall explicitly discloses synthetic polymers including polypropylene and polyesters and other high tensile materials. *Id.*, page 8.

170. Accordingly, McDowall teaches each and every element of Claim 7.

Claim 8

The process according to claim 7 wherein the synthetic polymer comprises a polyolefin

171. McDowall explicitly discloses synthetic polymers including polypropylene (*Id.*, page 8), which is a polyolefin by definition because Claim 9 of the '276 Patent claims a synthetic polymer that is a polyolefin comprised of polypropylene. Ex. 1001, Claim 9.

172. Accordingly, McDowall teaches each and every element of Claim 8.

Claim 9

The process according to claim 8 wherein the polyolefin comprises polypropylene

173. McDowall explicitly discloses synthetic polymers including polypropylene. *Id.*, page 8, lines 27-29.

174. Accordingly, McDowall teaches each and every element of Claim 9.

Claim 13

The process according to claim 1 wherein the solid additives comprise fibers

175. McDowall discloses that pulp fibers (solid additives) refers to fibers from natural sources such as woody and non-woody plants. *Id.*, page 4.

176. Accordingly, McDowall teaches each and every element of Claim 13.

Claim 14

The process according to claim 14 wherein the fibers comprise wood pulp fibers

177. McDowall discloses that pulp fibers (solid additives) refers to fibers from natural sources such as woody and non-woody plants. *Id.*, page 4.

178. Accordingly, McDowall teaches each and every element of Claim 14.

Claim 21

The process according to claim 1 wherein the process further comprises the step of subjecting the fibrous structure to a thermal bonding operation

179. McDowall discloses “thermal point bonding” and teaches that it means passing a fabric or web of fibers to be bonded between a heated calender

roll and an anvil roll in order to hold the laminate layers together and impart integrity to each individual layer by bonding filaments and/or fibers within each layer. *Id.*, pages, 6-7. In addition, the absorbent nonwoven webs prepared in the examples of McDowall were subjected to a step of through-air bonding. *Id.*, page 16.

180. Accordingly, McDowall teaches each and every element of Claim 21.

Claim 22

The process according to claim 1 wherein the process is directly coupled to a post-processing operation

181. McDowall discloses “thermal point bonding” and teaches that it means passing a fabric or web of fibers to be bonded between a heated calender roll and an anvil roll in order to hold the laminate layers together and impart integrity to each individual layer by bonding filaments and/or fibers within each layer. *Id.*, pages, 6-7. Further, McDowall describes depositing the nonwoven web of a conveyor and then subjecting the composite to through-air-bonding. *Id.*, page 10, lines 4-6. Such a bonding step immediately following deposition on the conveyor is considered as being “directly coupled to a post-processing operation” as recited in Claim 22 of the ’276 Patent.

182. Accordingly, McDowall teaches each and every element of Claim 22.

Claim 23

The process according to claim 1 wherein the process is closely coupled to a post-processing operation

183. McDowall describes that the absorbent nonwoven composites can be used in various medical products, which contain alcohol or other disinfectants. *Id.*, page 15, lines 16-18. The conversion of the absorbent nonwoven composite of McDowall into such medical products is normally completed at a separate facility from the manufacturing site and is therefore be considered a “closely coupled” post processing operation.

184. Accordingly, McDowall teaches each and every element of Claim 23.

Ground 2: Claims 1-3, 5-10, and 13-24 are obvious under 35 U.S.C. §103 based on the teachings of U.S. Patent No. 6,013,223 to Schwarz (“Schwarz ’223”) (Ex. 1002) and U.S. Patent App. Publication No. 2003/0211802 A1 to Keck (“Keck”) (Ex. 1004).

Independent claims 1 and 24

185. Schwarz ’223 explicitly discloses all but one element of independent Claims 1 and 24 of the ’276 Patent. The remaining element – combining the filaments with solid additives (wood pulp) to form a mixture – was well known in the art and would have been obvious to a POSA based on Schwarz’s disclosures in light of the teachings of Keck. An element-by-element analysis follows:

Preamble: A process for making a fibrous structure, the process comprising the steps of:

186. Schwarz '223 teaches a process for making a fibrous structure. Ex. 1002, abstract, Claim 1.

Element 1a: providing a die comprising three or more rows of three or more filament-forming holes

187. Schwarz '223 discloses a die body (Ex. 1002, column 2, line 31) through which pressurized hot air is blown out of holes (fluid releasing holes) around each spinning nozzle (filament-forming hole). Ex. 1002, column 1, lines 58-60; column 2, lines 30-35; figures 1, 2. Figure 2 is a partial view of the bottom cover plate of the die of Schwarz '223. The partial view shows that the die includes at least 6 rows of filament forming holes (identified by referenced character 3) with each row comprising a plurality of individual filament nozzles 3 (filament-forming holes). Here, the partial view of the bottom of the cover plate includes 6 rows with each row having 8 filament nozzles 3 (filament-forming holes). As figure 2 is only a partial view, the die of Schwarz '223 would have a significantly greater amount of filament nozzles per row than what is shown in figure 2.

188. Schwarz '223 describes itself as an improvement on the meltblown die of Schwarz '616, and incorporates the teachings of Schwarz '616. *Id.*, column 1, lines 7-10. As such, the teachings of Schwarz '616 form part of the disclosure of Schwarz '223.

189. The examples of Schwarz '616 describes a die having 8 rows of filament nozzles with the total number of filament nozzles being 500. Ex. 1006, Table 1, Example 3. Based on these values, the average filament nozzles per row is 62.5.

190. Thus, Schwarz '223 discloses providing a die having three or more rows of three or more filament-forming holes.

Element 1b (Claim 1): supplying at least a first polymer to the die

Element 1b (Claim 24): supplying a polyolefin polymer to the die

191. Schwarz '223 discloses both these elements of Claims 1 and 24. Schwarz '223 discloses supplying thermoplastic fiber-forming polymer melt (first polymer) to a supply cavity in a die body (die). Ex. 1002, column 2, lines 30-32. More particularly, Schwarz '223 discloses supplying polypropylene (first polymer) to the die body (die). Ex. 1002, column 2, line 65. Polypropylene is a particular type of polyolefin. This must be true because dependent Claim 9 of the '276 Patent claims a polyolefin that comprises polypropylene.

192. Accordingly, Schwarz '223 teaches both these elements of Claims 1 and 24.

Element 1c (Claim 1): producing a plurality of filaments comprising the first polymer from the die

Element 1c (Claim 24): producing a plurality of filaments comprising the polyolefin polymer from the die

193. Schwarz '223 discloses producing strong filaments (Ex. 1002, column 1, lines 10-12) by supplying thermoplastic fiber-forming polymer (first polymer) to a supply cavity on a die body (die). Ex. 1002, column 2, lines 30-39.

194. In addition, Schwarz '223 discloses supplying polypropylene (first polymer) to the die body (die). Ex. 1002, column 2, line 65. Polypropylene is a particular type of polyolefin.

195. Thus, Schwarz '223 also teaches this element of Claims 1 and 24.

196. ***Element 1e: collecting the mixture on a belt to produce a fibrous structure.***

Schwarz '223 discloses collecting said fibers on a receiver surface to form a nonwoven mat (fibrous structure). Ex. 1002, Claim 1, column 5, lines 34-36. Schwarz '223 also describes that it is known in the prior art to typically collect the fibers on a moving belt or screen. *Id.*, column 1, lines 48-50.

197. Thus, Schwarz '223 teaches the step of collecting the mixture on a collection device, such as a moving belt, and therefore discloses this element.

Element 1d (Claim 1): combining the filaments with solid additives to form a mixture

Element 1d (Claim 24): combining the filaments with wood pulp fibers to form a mixture

198. This is the only element of independent claims 1 and 24 that is not explicitly disclosed in Schwarz '223. But adding solid additives, or specifically

wood pulp fibers, to polymer filaments to form a mixture has been long known in the art (referred to as coform), and is explicitly disclosed in Keck (and many other prior art references known at the time).

a. Motivation to Combine

199. Prior to the patent owner's earliest possible priority date (July 17, 2007), a POSA would have been motivated to modify Schwarz '223 in view of Keck in order to provide a coform nonwoven having lower costs and exhibiting improved strength.

200. More specifically, a POSA would have known that the multirow meltblown die taught in Schwarz '223 provides significant improvements with respect to throughput, and hence, productivity. As a consequence, the costs associated with manufacturing the coform nonwoven per unit would be decreased, which would improve the manufacturer's competitiveness in the market and potentially provide a greater return on investment.

201. In addition, a POSA would be motivated to modify Schwarz '223 in view of Keck in order to improve the strength of the coform nonwoven. Schwarz '223 explicitly states that the fibers prepared therein have improved tenacity. As such, a POSA would have been motivated to modify Schwarz '223 in view of Keck to provide a coform nonwoven having improved strength.

202. Accordingly, the combination of Schwarz '223 and Keck teaches each and every element of independent Claims 1 and 25.

b. Reasonable Expectation of Success

203. A POSA would have had a reasonable expectation of success in modifying Schwarz '223 in use in a coform process as described in Keck. The simple substitution of a multirow meltblown die in lieu of a knife-edge meltblown die in the coform process would be within the routine skill of the POSA and such a substitution would not result in the coform process of Keck being inoperable.

Claim 2

The process according to Claim 1, wherein at least one row of the three or more rows comprises ten or more filament-forming holes

204. As can explicitly be seen in figure 2 of Schwarz '223, the die body includes multiple rows of nozzle (filament-forming holes) in which each row comprises a plurality of nozzles. Ex. 1002, column 2, lines 29-35, 52-54; figure 2; Claim 1 (column 5, lines 39-45)(“multiplicity of nozzles arranged in at least two rows”).

205. As figure 2 is only a partial view, the die of Schwarz '223 would have a significantly greater amount of filament nozzles per row than what is shown in figure 2.

206. As discussed above, Schwarz '223 describes itself as an improvement on the meltblown die of Schwarz '616, and incorporates the teachings of Schwarz

'616. *Id.*, column 1, lines 7-10. As such, the teachings of Schwarz '616 form part of the disclosure of Schwarz '223.

207. The examples of Schwarz '616 describes a die having 8 rows of filament nozzles with the total number of filament nozzles being 500. Ex. 1005, Table 1, Example 3. Based on these values, the average filament nozzles per row is 62.5.

208. Thus, Schwarz '223 discloses providing a die having three or more rows of three or more filament-forming holes.

209. Thus, Schwarz '223 in combination with Keck discloses each and every element of Claim 2.

Claim 3

The process according to Claim 1 wherein one or more fluid-releasing holes are associated with a filament-forming hole.

210. Figure 2 of Schwarz '223 shows that the die body includes multiple rows of filament nozzles (filament-forming holes) in which each filament nozzle 3 is concentrically positioned within an associated round hole 7 (fluid-releasing hole). Ex. 1002, column 2, lines 29-51; figure 2.

211. Thus, Schwarz '223 in combination with Keck discloses each and every element of Claim 3.

Claim 5

The process according to Claim 1 wherein at least one of the one or more fluid-releasing holes is concentrically positioned around one filament-forming hole

212. Schwarz '223 discloses multiple rows of nozzles (filament-forming holes) sticking through the round holes (which are concentrically positioned around fluid-releasing holes). Ex 1002, column 2, lines 51-54. Further, figure 2 of Schwarz '223 shows that the filament nozzle is centered in the round holes, which means that the round hole concentrically surrounds the filament nozzle.

213. Thus, Schwarz '223 in combination with Keck discloses each and every element of Claim 5.

Claim 6

The process according to Claim 1 wherein the first polymer comprises a synthetic polymer

214. Schwarz '223 explicitly discloses using polypropylene. Ex. 1002, column 2, line 65. Further, Keck also discloses that the continuous filaments may comprise a polyolefin, such as polypropylene, Ex. 1004, ¶ 0052.

215. Polypropylene is a synthetic polymer.

216. Accordingly, Schwarz '223 in combination with Keck discloses each and every element of Claim 6.

Claim 7

The process according to claim 6 wherein the synthetic polymer is selected from the group consisting of: polyvinyl alcohol, polyvinyl alcohol

derivatives, polyesters, nylons, polyolefins, polylactic acids, polyhydroxyalkanoates, polycaprolactones and mixtures thereof

217. Schwarz '223 explicitly discloses using polypropylene. Ex. 1002, column 2, line 65. Polypropylene is a polyolefin. Further, Keck also discloses that the continuous filaments may comprise a polyolefin, such as polypropylene, Ex. 1004, ¶ 0052.

218. Accordingly, Schwarz '223 in combination with Keck discloses each and every element of Claim 7.

Claim 8

The process according to claim 7 wherein the synthetic polymer comprises a polyolefin

219. Schwarz '223 explicitly discloses using polypropylene. Ex. 1002, column 2, lines 65. Polypropylene is a polyolefin. Further, Keck also discloses that the continuous filaments may comprise a polyolefin, such as polypropylene, Ex. 1004, ¶ 0052.

220. Thus, combination of Schwarz '223 and Keck discloses each and every element of Claim 8.

Claim 9

The process according to claim 8 wherein the polyolefin comprises polypropylene

221. Schwarz '223 explicitly discloses using polypropylene. Ex. 1002, column 2, lines 65. Polypropylene is a polyolefin. Further, Keck also discloses

that the continuous filaments may comprise a polyolefin, such as polypropylene, Ex. 1004, ¶ 0052.

222. Accordingly, the combination of Schwarz '223 and Keck discloses each and every element of Claim 9.

Claim 10

The process according to claim 7 wherein the synthetic polymer is selected from the group consisting of: polylactic acids, polyhydroxyalkanoates, polycaprolactones and mixtures thereof

223. Again, Keck discloses that thermoplastic meltblown filaments comprise a polymer selected from the group consisting of polyolefins, polyesters, polyamides, polycarbonates, polyurethanes, polyvinylchloride, polytetrafluoroethylene, polystyrene, polyethylene terephthalate, polylactic acid and copolymers and blends thereof. Ex. 1004, Claim 8.

224. Accordingly, the combination of Schwarz '223 and Keck teaches each and every element of Claim 10.

Claim 13

The process according to claim 1 wherein the solid additives comprise fibers

225. Keck discloses that the secondary material (solid additives) includes fibrous organic materials (fibers) and superabsorbent particles and fibers. Ex. 1004, ¶ 0003.

226. Accordingly, the combination of Schwarz '223 and Keck teaches every element of Claim 13.

Claim 14

The process according to claim 13 wherein the fibers comprise wood pulp fibers

227. Keck discloses that the secondary material (solid additives) includes fibrous organic materials such as woody and non-wood pulp. Ex. 1004, ¶ 0003.

228. Accordingly, the combination of Schwarz '223 and Keck teaches every element of Claim 14.

Claim 15

The process according to claim 1 wherein the solid additives are combined with the plurality of filaments by a solid additive spreader

229. Keck teaches that the secondary fibers (solid additives) are introduced into a secondary gas stream via an apparatus having a housing that encloses a picker roll and is in communication with a nozzle, in which the stream of secondary fibers are entrained and subsequently introduced into the filament containing streams. Ex. 1004, ¶¶ 0088-0089. More specifically, Keck discloses that the secondary fibers (solid additives) are conveyed toward the stream of thermoplastic polymer fibers through a nozzle, with a housing that encloses the picker roll and provides a passageway or gap between the housing and the picker roll and that a gas (i.e. air) is supplied to the passage way or gap between the

surface of the picker roll and the housing by way of a gas duct. Ex. 1004, ¶ 0088. The gas is supplied by any conventional arrangement including a blower and is supplied in sufficient quantity to serve as a medium for conveying the secondary fibers through the nozzle. *Id.* Keck further discloses that it is contemplated that additives and/or other materials may be added to or entrained in the gas stream to treat secondary fibers. *Id.* Keck further discloses a “conventional particulate injection system” (solid additive spreader). Ex. 1004, ¶¶ 0092, 0108.

230. Accordingly, the combination of Schwarz '223 and Keck teaches every element of Claim 15.

Claim 16

The process according to claim 1 wherein the process further comprises the step of: [17f] contacting a surface of the fibrous structure with a plurality of filaments comprising a second polymer

231. Keck discloses preparing a two-layer coform structure (two layered fibrous structure) in which a second coform layer is formed directly on the first coform layer. Ex. 1004, ¶ 0150. This would necessarily result in the filaments of the second coform layer contacting a surface of the first coform layer (fibrous structure). Keck further describes that the meltblown filaments of both coform layers comprise the same polypropylene resin. *Id.* The definition of “second polymer” must include the second polymer being the same as the first polymer

because Claim 18 of the '276 Patent, which depends on Claim 16, recites that the first and second polymer are the same. Ex. 1001, Claim 18.

232. Accordingly, the combination of Schwarz '223 and Keck teaches every element of Claim 16.

Claim 17

The process according to claim 16 wherein the plurality of filaments comprising the second polymer are in the form of a fibrous structure

233. Keck discloses that the second layer is a coform nonwoven (fibrous structure) comprised of a mixture of thermoplastic filaments and wood pulp fibers (solid additive). Ex. 1004, ¶ 0150.

234. Accordingly, the combination of Schwarz '223 and Keck teaches every element of Claim 17.

Claim 18

The process according to claim 16 wherein the second polymer is the same as the first polymer

235. Keck discloses in example 5 that the filaments of the first coform layer and the filaments of the second coform layer both comprise the same grade polypropylene resin. As such, the filaments of the first coform layer and the second coform layer comprise the same polymer (i.e., the second polymer is the same as the first polymer).

236. Accordingly, the combination of Schwarz '223 and Keck teaches every element of Claim 18.

Claim 19

The process according to claim 3 wherein a fluid released by the fluid-releasing holes comprises air

237. Schwarz '223 discloses that the gas released through the holes (fluid releasing holes) in the cover plate is air. Ex. 1002, column 2, lines 29-51. Keck further discloses “fibers formed by extruding a molten thermoplastic material through a plurality of fine, usually circular, die capillaries as molten threads or filaments into converging high velocity, usually hot, gas (e.g. air) streams which attenuate the filaments of molten thermoplastic material to reduce their diameter, which may be to microfiber diameter.” Ex. 1004, ¶ 0035.

238. Accordingly, the combination of Schwarz '223 and Keck teaches every element of Claim 19.

Claim 20

The process according to claim 1 wherein the fibrous structure exhibits a pore volume distribution such that greater than about 40% of the total pore volume present in the fibrous structure exists in pores of radii of from about 121 um to about 200 um

239. The '276 Patent discloses that the spinnerette used in the examples of preparing the claimed fibrous structure was obtained from Biax-Fiberfilm

Corporation (“Biax”). Ex. 1001, column 16, lines 3-5. Notably, Schwarz ’223 was assigned to Biax-Fiberfilm Corporation. Ex. 1002, page 1.

240. Thus, it appears that the examples in the ’276 Patent were prepared with the same or similar meltblown die described in Schwarz ’223. Given the similarities between the Biax meltblown die described in the ’276 Patent and that of Schwarz ’616, it is reasonable to expect that a coform nonwoven prepared based on the combination of Schwarz ’223 and Keck would have the same properties. That is, it would be expected that a process of preparing a coform nonwoven using the meltblown die of Schwarz ’223 in combination with the solid additive process of Keck would produce a coform nonwoven having a pore volume distribution such that greater than about 40% of the total pore volume present in the fibrous structure exists in pores of radii of from about 121 μm to about 200 μm .

241. Moreover, it is well known that pore size, and hence pore size distribution, in meltblown webs varies depending on process conditions, such as processing temperatures, increasing air flow rate at the die, and decreasing the distance between the filament nozzles and the collection surface, and the speed of the collection surface. *See*, Bresee et al., *Influence of Processing Conditions on Melt Blown Web Structure: Part 1 – DCD*, INJ Spring 2004, 49-55 (Ex. 1025); Bresee et al., *Influence of Processing Conditions on Melt Blown Web Structure: Part 2 – Primary Airflow Rate*, INJ Summer 2005, 11-18 (Ex. 1026); and Lee et al.

Effects of Melt-Blowing Process Conditions on Morphological and Mechanical Properties of Polypropylene Webs, POLYMER 1992, Vol. 3, No. 6, 1200-1209

(Ex. 1027). For example, changing one or more of the process parameters by increasing the air flow rate, decreasing the distance between the collection surface and filament nozzles, or increasing the speed of the collection surface is well known to decrease pore size in the meltblown web. Similarly, decreasing air flow rate, increasing the distance between the collection surface and filament nozzles, or decreasing the speed of the collection surface is well known to increase pore size in the meltblown web. As such, it is reasonable to expect that obtaining a coform nonwoven having the recited pore distribution is well within the routine skill of a POSA, and that doing such is merely an optimization of known parameters that affect pore size distribution.

242. Accordingly, the combination of Schwarz '223 and Keck teaches every element of Claim 20.

Claim 21

The process according to claim 1 wherein the process further comprises the step of subjecting the fibrous structure to a thermal bonding operation

243. Keck discloses “pattern bonded” which is a process of thermal bonding a nonwoven web in a pattern by the application of heat and pressure or other methods, such as ultrasonic bonding. Keck discloses that thermal pattern bonding typically is carried out at a temperature in a range of from about 80 C. to

about 180° C. Ex. 1004, ¶ 0047. Keck also discloses that due to the fact that thermoplastic polymer fibers are usually semi-molten and tacky at the time of incorporation of the secondary fibers, the secondary fibers are thermally bonded or joined to the thermoplastic polymer fibers. Ex. 1004, ¶ 0109.

244. Accordingly, the combination of Schwarz '223 and Keck teaches every element of Claim 21.

Claim 22

The process according to claim 1 wherein the process is directly coupled to a post-processing operation

245. Keck discloses “pattern bonded” which is a process of bonding a nonwoven web in a pattern by the application of heat and pressure or other methods, such as ultrasonic bonding. Keck discloses that thermal pattern bonding typically is carried out at a temperature in a range of from about 80 C. to about 180° C. Ex. 1004, ¶ 0047. The '276 Patent expressly discloses that post-processing operations as that term is used in the '276 Patent includes thermal bonding operations. Ex. 1001, column 9, lines 44-51. Keck also describes additional steps (post-processing operations) of depositing the second composite stream onto the deposited layer as a matrix of meltblown filaments and a secondary material to form a two layer tufted coform nonwoven web. Ex. 1004, ¶ 0015-0018. The '276 Patent expressly discloses that post-processing operations as that term is used in the '276 Patent includes tuft-generating operations. Ex. 1001, column 9, lines 44-51.

246. Thermal bonding, such as the “pattern bonded” process described in Keck and the tufting-generating operations are typically performed during the manufacturing process of the nonwoven web, and are therefore considered as being “directly coupled to a post-processing operation.”

247. Accordingly, the combination of Schwarz '223 and Keck teaches every element of Claim 22.

Claim 23

The process according to claim 1 wherein the process is closely coupled to a post-processing operation

248. Keck discloses “pattern bonded” which is a process of bonding a nonwoven web in a pattern by the application of heat and pressure or other methods, such as ultrasonic bonding. Keck discloses that thermal pattern bonding typically is carried out at a temperature in a range of from about 80 C. to about 180° C. Ex. 1004, ¶ 0047. The '276 Patent expressly discloses that post-processing operations as that term is used in the '276 Patent includes thermal bonding operations. Ex. 1001, column 9, lines 44-51. Keck also describes additional steps (post-processing operations) of depositing the second composite stream onto the deposited layer as a matrix of meltblown filaments and a secondary material to form a two layer tufted coform nonwoven web. Ex. 1004, ¶ 0015-0018. The '276 Patent expressly discloses that post-processing operations as that term is used in the '276

Patent includes application of lotions and mixtures. Ex. 1001, column 9, lines 44-51.

249. In addition, Keck describes preparation of cleaning sheets using the nonwoven web. Such cleaning sheets may include treatment with a liquid or other materials Ex. 1004, ¶¶ 0137-0140. The conversion of Keck's nonwoven web into such treated cleaning sheets typically occurs at a separate facility from that of manufacture of the nonwoven web and is therefore considered a "closely coupled" post processing operation.

250. Accordingly, the combination of Schwarz '223 and Keck teaches every element of Claim 23.

Ground 3: Claims 1-3, 5-10, and 13-24 are obvious under 35 U.S.C. §103 based on the teachings of U.S. Patent No. 5,476,616 to Schwarz ("Schwarz '616") (Ex. 1002) and U.S. Patent App. Publication No. 2003/0211802 A1 to Keck ("Keck") (Ex. 1004).

Independent claims 1 and 24

251. Schwarz '616 teaches an apparatus and process for meltblowing fiberforming thermoplastic polymers to form fine fibers by extruding through spinning nozzles arranged in four or more rows. Ex. 1005, abstract. The molten fibers are accelerated to high velocity by gas being blown in parallel flow through small circular gas orifices surrounding each nozzle. *Id.* The air orifices are formed by a family of plates which affect the perfect centering of each nozzle in each of the circular air orifices. *Id.*

252. Schwarz '616 explicitly discloses all but one element of independent claims 1 and 24 of the '276 Patent. The remaining element – combining the filaments with solid additives (wood pulp) to form a mixture – would have been obvious to a POSA based on Schwarz '616's disclosures in light of the teachings of Keck. An element-by-element analysis follows:

Preamble: A process for making a fibrous structure, the process comprising the steps of:

253. Schwarz '616 teaches a process for making a fibrous structure. Ex. 1005, abstract, Claim 5.

Element 1a: providing a die comprising three or more rows of three or more filament-forming holes

254. Schwarz '616 discloses this element, providing a die body 1 (die) comprising spinning nozzles 3 (filament-forming holes), wherein gas cavity 5 (fluid-releasing holes) are associated with spinning nozzles 3 (filament-forming holes). Ex. 1005, column 2, lines 15-52, Claim 5, figure 1, figure 2A, figure 2B.

255. Figure 2B is a partial view of the bottom cover plate of the die of Schwarz '616. The partial view shows that the die includes at least 6 rows of filament forming holes (identified by referenced character 3) with each row comprising a plurality of individual filament nozzles 3 (filament-forming holes). Here, the partial view of the bottom of the cover plate includes 6 rows with each row having 8 filament nozzles 3 (filament-forming holes). *Id.* As figure 2B is only

a partial view, the die of Schwarz '616 would have a significantly greater amount of filament nozzles per row than what is shown in figure 2B.

256. The examples of Schwarz '616 describe a die having 8 rows of filament nozzles with the total number of filament nozzles being 500. Ex. 1005, Table 1, Example 3. Based on these values, the average filament nozzles per row is 62.5.

257. Thus, Schwarz '616 discloses providing a die having three or more rows of three or more filament-forming holes.

Element 1b (Claim 1): supplying at least a first polymer to the die

Element 1b (Claim 24): supplying a polyolefin polymer to the die

258. Schwarz '616 discloses both these elements of Claims 1 and 24. Schwarz '616 discloses supplying thermoplastic fiber-forming polymer melt (first polymer) to a supply cavity in a die body (die). Ex. 1005, column 2, lines 30-32, 63-66. More particularly, Schwarz '616 discloses supplying polypropylene (first polymer) to the die body (die). Ex. 1005, column 2, lines 63-66. Polypropylene is a particular type of polyolefin.

259. Accordingly, Schwarz '616 teaches both these elements of Claims 1 and 24.

Element 1c (Claim 1): producing a plurality of filaments comprising the first polymer from the die

Element 1c (Claim 24): producing a plurality of filaments comprising the polyolefin polymer from the die

260. Schwarz '616 discloses producing a plurality of filaments comprising the polypropylene (first polymer) from the die body 1 (die). Ex. 1005, Claim 5, figure 1, figure 2A, figure 2B.

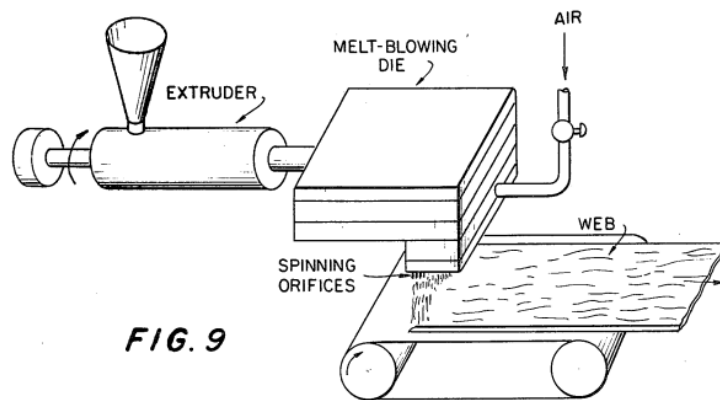
261. In addition, Schwarz '616 discloses supplying polypropylene (first polymer) to the die body (die). *Id.*, column 2, lines 63-66. Polypropylene is a particular type of polyolefin.

262. Thus, Schwarz '616 also teaches this element of Claims 1 and 24.

Element 1e: collecting the mixture on a belt to produce a fibrous structure.

263. Schwarz '616 discloses collecting the mixture on a receiver (e.g., to produce a fibrous structure). Ex. 1005, Claim 5. Schwarz '616 describes itself as an improvement on the meltblown die of Schwarz '570, and incorporates the teachings of Schwarz '570. *Id.*, column 1, lines 9-12. As such, the teachings of Schwarz '570 form part of the disclosure of Schwarz '616.

264. Figure 9, below, of Schwarz '570 is a schematic illustration of the system of Schwarz '570. Ex. 1017, column 2, lines 34-35.



In figure 9, the meltblown web is deposited onto a moving endless belt.

265. Thus, Schwarz '616 teaches the step of collecting the mixture on a belt, and therefore discloses this element of Claims 1 and 24.

Element 1d (Claim 1): combining the filaments with solid additives to form a mixture

Element 1d (Claim 24): combining the filaments with wood pulp fibers to form a mixture

266. This is the only element of independent claims 1 and 24 that is not explicitly disclosed in Schwarz '616. But adding solid additives, or specifically wood pulp fibers, to polymer filaments to form a mixture has been long known in the art (referred to as coform), and is explicitly disclosed in Keck (and many other prior art references known at the time).

a. Motivation to Combine

267. Prior to the patent owner's earliest possible priority date (July 17, 2007), a POSA would have been motivated to modify Schwarz '616 in view of Keck in order to provide a coform nonwoven having lower manufacturing costs.

268. More specifically, a POSA would have known that the multirow meltblown die taught in Schwarz '616 provides significant improvements with respect to throughput, and hence, productivity. As a consequence, the costs associated with manufacturing the coform nonwoven per unit would be decreased, which would improve the manufacturer's competitiveness in the market and potentially provide a greater return on investment.

269. Accordingly, the combination of Schwarz '616 and Keck teaches each and every element of independent Claims 1 and 25.

b. Reasonable Expectation of Success

270. A POSA would have had a reasonable expectation of success in modifying Schwarz '616 in use in a coform process as described in Keck. The relatively simple substitution of a multirow meltblown die of Schwarz '616 in lieu of a knife-edge meltblown die in the coform process is well within the routine skill of the POSA and such a substitution would not result in either the coform process of McDowall or the meltblown process of Schwarz '616 being inoperable.

Claim 2

The process according to claim 1 wherein at least one row of the three or more rows comprises ten or more filament-forming holes

271. Schwarz '616 in combination with Keck discloses the elements of Claim 2.

272. Schwarz '616 discloses a die comprised of multiple rows of spinning orifices or nozzles (filament-forming holes). Ex. 1005, column 1, lines 20-28; 49-51; figure 2A; Claim 1 (“a multiplicity of nozzles arranged in at least four rows”). As can explicitly be seen in figure 2B of Schwarz '616, the die body includes multiple rows of nozzle (filament-forming holes) in which each row comprises a plurality of nozzles.

273. As figure 2B is only a partial view, the die of Schwarz '616 would have a significantly greater amount of filament nozzles per row than what is shown in figure 2B. In addition, the examples of Schwarz '616 describes a die having 8 rows of filament nozzles with the total number of filament nozzles being 500. Ex. 1005, Table 1, Example 3. Based on these values, the average filament nozzles per row is 62.5.

274. Thus, Schwarz '616 discloses providing a die having three or more rows of three or more filament-forming holes.

275. Thus, Schwarz '616 in combination with Keck discloses each and every element of Claim 2.

Claim 3

The process according to claim 1 wherein one or more fluid-releasing holes are associated with a filament-forming hole.

276. Schwarz '616 discloses the elements of Claim 3.

277. Figure 2B of Schwarz '616 shows that the die body includes multiple rows of filament nozzles (filament-forming holes) in which each filament nozzle 3 is concentrically positioned within an associated round hole 7 (fluid-releasing hole). Ex. 1005, column 2, lines 15-38; figure 2B.

278. Thus, Schwarz '616 in combination with Keck discloses each and every element of Claim 3.

Claim 5

The process according to claim 1 wherein at least one of the one or more fluid-releasing holes is concentrically positioned around one filament-forming hole

279. Schwarz '616 discloses multiple rows of nozzles (filament-forming holes) sticking through the round holes (which are concentrically positioned around fluid-releasing holes). Ex 1005, column 2, lines 51-54. Further, figure 2B of Schwarz '616 shows that each individual filament nozzle is centered in the round holes, which means that the round hole concentrically surrounds the filament nozzle.

280. Thus, Schwarz '616 in combination with Keck discloses each and every element of Claim 5.

Claim 6

The process according to claim 1 wherein the first polymer comprises a synthetic polymer

281. Schwarz '616 explicitly discloses using polypropylene. Ex. 1005, column 2, lines 63-65. Further, Keck also discloses that the continuous filaments may comprise a polyolefin, such as polypropylene, Ex. 1004, ¶ 0052.

282. Polypropylene is a synthetic polymer.

283. Accordingly, Schwarz '616 in combination with Keck discloses each and every element of claim 6.

Claim 7

The process according to claim 6 wherein the synthetic polymer is selected from the group consisting of: polyvinyl alcohol, polyvinyl alcohol derivatives, polyesters, nylons, polyolefins, polylactic acids, polyhydroxyalkanoates, polycaprolactones and mixtures thereof

284. Schwarz '616 explicitly discloses using polypropylene. Ex. 1005, column 2, lines 63-65. Further, Keck also discloses that the continuous filaments may comprise a polyolefin, such as polypropylene, Ex. 1004, ¶ 0052.

285. Polypropylene is a polyolefin.

286. Accordingly, Schwarz '616 in combination with Keck discloses each and every element of Claim 7.

Claim 8

The process according to claim 7 wherein the synthetic polymer comprises a polyolefin

287. Schwarz '616 explicitly discloses using polypropylene. Ex. 1005, column 2, lines 63-65. Polypropylene is a polyolefin. Further, Keck also discloses that the continuous filaments may comprise a polyolefin, such as polypropylene, Ex. 1004, ¶ 0052.

288. Thus, combination of Schwarz '616 and Keck discloses each and every element of Claim 8.

Claim 9

The process according to claim 8 wherein the polyolefin comprises polypropylene

289. Schwarz '616 explicitly discloses using polypropylene. Ex. 1005, column 2, lines 63-65. Polypropylene is a polyolefin. Further, Keck also discloses that the continuous filaments may comprise a polyolefin, such as polypropylene, Ex. 1004, ¶ 0052.

290. Accordingly, the combination of Schwarz '616 and Keck discloses each and every element of Claim 9.

Claim 10

The process according to claim 10 wherein the synthetic polymer is selected from the group consisting of: polylactic acids, polyhydroxyalkanoates, polycaprolactones and mixtures thereof

291. Again, Keck discloses that thermoplastic meltblown filaments comprise a polymer selected from the group consisting of polyolefins, polyesters, polyamides, polycarbonates, polyurethanes, polyvinylchloride,

polytetrafluoroethylene, polystyrene, polyethylene terephthalate, polylactic acid and copolymers and blends thereof. Ex. 1004, Claim 8.

292. Accordingly, the combination of Schwarz '616 and Keck teaches each and every element of Claim 10.

Claim 13

The process according to claim 1 wherein the solid additives comprise fibers

293. Keck discloses that the secondary material (solid additives) includes fibrous organic materials (fibers) and superabsorbent particles and fibers. Ex. 1004, ¶ 0003.

294. Accordingly, the combination of Schwarz '616 and Keck teaches every element of Claim 13.

Claim 14

The process according to claim 13 wherein the fibers comprise wood pulp fibers

295. Keck discloses that the secondary material (solid additives) includes fibrous organic materials such as woody and non-wood pulp. Ex. 1004, ¶ 0003.

296. Accordingly, the combination of Schwarz '616 and Keck teaches every element of Claim 14.

Claim 15

The process according to claim 1 wherein the solid additives are combined with the plurality of filaments by a solid additive spreader

297. Keck teaches that the secondary fibers (solid additives) are introduced into a secondary gas stream via an apparatus having a housing that encloses a picker roll and is in communication with a nozzle, in which the stream of secondary fibers are entrained and subsequently introduced into the filament containing streams. Ex. 1004, ¶¶ 0088-0089. More specifically, Keck discloses that the secondary fibers (solid additives) are conveyed toward the stream of thermoplastic polymer fibers through a nozzle, with a housing that encloses the picker roll and provides a passageway or gap between the housing and the picker roll and that a gas (i.e. air) is supplied to the passage way or gap between the surface of the picker roll and the housing by way of a gas duct. Ex. 1004, ¶ 0088. The gas is supplied by any conventional arrangement including a blower and is supplied in sufficient quantity to serve as a medium for conveying the secondary fibers through the nozzle. *Id.* Keck further discloses that it is contemplated that additives and/or other materials may be added to or entrained in the gas stream to treat secondary fibers. *Id.* Keck further discloses a “conventional particulate injection system” (solid additive spreader). Ex. 1004, ¶¶ 0092, 0108.

298. Accordingly, the combination of Schwarz '616 and Keck teaches every element of Claim 15.

Claim 16

The process according to claim 1 wherein the process further comprises the step of: [17f] contacting a surface of the fibrous structure with a plurality of filaments comprising a second polymer

299. Keck discloses preparing a two-layer coform structure (two layered fibrous structure) in which a second coform layer is formed directly on the first coform layer. Ex. 1004, ¶ 0150. This would necessarily result in the filaments of the second coform layer contacting a surface of the first coform layer (fibrous structure). Keck further describes that the meltblown filaments of both coform layers comprise the same polypropylene resin. *Id.* The definition of “second polymer” must include the second polymer being the same as the first polymer because Claim 18 of the ’276 Patent, which depends on Claim 6, recites that the first and second polymer are the same. Ex. 1001, Claim 18.

300. Accordingly, the combination of Schwarz ’616 and Keck teaches every element of Claim 16.

Claim 17

The process according to claim 16 wherein the plurality of filaments comprising the second polymer are in the form of a fibrous structure

301. Keck discloses that the second layer is also a coform nonwoven (fibrous structure) comprised of a mixture of thermoplastic filaments and wood pulp fibers (solid additive). Ex. 1004, ¶ 150.

302. Accordingly, the combination of Schwarz '616 and Keck teaches every element of Claim 17.

Claim 18

The process according to claim 16 wherein the second polymer is the same as the first polymer

303. Keck discloses in example 5 that the filaments of the first coform layer and the filaments of the second coform layer both comprise the same grade polypropylene resin. As such, the first polymer and the second polymer are the same.

304. Accordingly, the combination of Schwarz '616 and Keck teaches every element of Claim 18.

Claim 19

The process according to claim 1 wherein a fluid released by the fluid-releasing holes comprises air

305. Schwarz '616 discloses that the gas released through the holes (fluid releasing holes) in the cover plate is air. Ex. 1005, column 2, lines 21-23. Keck further discloses “fibers formed by extruding a molten thermoplastic material through a plurality of fine, usually circular, die capillaries as molten threads or filaments into converging high velocity, usually hot, gas (e.g. air) Streams which attenuate the filaments of molten thermoplastic material to reduce their diameter, which may be to microfiber diameter.” Ex. 1004, ¶ 0035.

306. Accordingly, the combination of Schwarz '616 and Keck teaches every element of Claim 19.

Claim 20

The process according to claim 1 wherein the fibrous structure exhibits a pore volume distribution such that greater than about 40% of the total pore volume present in the fibrous structure exists in pores of radii of from about 121 um to about 200 um

307. The '276 Patent discloses that the spinnerette used in the examples of preparing the claimed fibrous structure was obtained from Biax-Fiberfilm Corporation ("Biax"). Ex. 1001, column 16, lines 3-5. Notably, Schwarz '616 was assigned to Biax-Fiberfilm Corporation between July 23, 2001 and January 28, 2010. Ex. 1020, page 1.

308. Thus, it appears that the examples in the '276 Patent were prepared with the same or similar meltblown die described in Schwarz '616. Given the similarities between the Biax meltblown die described in the '276 Patent and that of Schwarz '616, it is reasonable to expect that a coform nonwoven prepared based on the combination of Schwarz '616 and Keck would have the same pore volume distribution properties as recited in Claim 20. That is, it would be expected that a process of preparing a coform nonwoven using the meltblown die of Schwarz '616 as modified with the solid additive process of Keck would produce a coform nonwoven having a pore volume distribution such that greater than about 40% of

the total pore volume present in the fibrous structure exists in pores of radii of from about 121 um to about 200 um.

309. Moreover, it is well known that pore size, and hence pore size distribution, in meltblown webs varies depending on process conditions, such as processing temperatures, increasing air flow rate at the die, and decreasing the distance between the filament nozzles and the collection surface, and the speed of the collection surface. See, Bresee et al., *Influence of Processing Conditions on Melt Blown Web Structure: Part 1 – DCD*, INJ Spring 2004, 49-55 (Ex. 1025); Bresee et al., *Influence of Processing Conditions on Melt Blown Web Structure: Part 2 – Primary Airflow Rate*, INJ Summer 2005, 11-18 (Ex. 1026); and Lee et al. *Effects of Melt-Blowing Process Conditions on Morphological and Mechanical Properties of Polypropylene Webs*, POLYMER 1992, Vol. 3, No. 6, 1200-1209 (Ex. 1027). For example, changing one or more of the process parameters by increasing the air flow rate, decreasing the distance between the collection surface and filament nozzles, or increasing the speed of the collection surface is well known to decrease pore size in the meltblown web. Similarly, decreasing air flow rate, increasing the distance between the collection surface and filament nozzles, or decreasing the speed of the collection surface is well known to increase pore size in the meltblown web. As such, it is reasonable to expect that obtaining a coform nonwoven having the recited pore distribution is well within the routine skill of a

POSA, and that doing such is merely an optimization of known parameters that affect pore size distribution.

310. Accordingly, the combination of Schwarz '616 and Keck teaches every element of Claim 20.

Claim 21

The process according to claim 1 wherein the process further comprises the step of subjecting the fibrous structure to a thermal bonding operation

311. Keck discloses that the coform (fibrous structure) may be “pattern bonded,” which is a process of thermal bonding a nonwoven web in a pattern by the application of heat and pressure or other methods, such as ultrasonic bonding. Keck discloses that thermal pattern bonding typically is carried out at a temperature in a range of from about 80 C. to about 180° C. Ex. 1004, ¶ 0047. Keck also discloses that due to the fact that thermoplastic polymer fibers are usually semi-molten and tacky at the time of incorporation of the secondary fibers, the secondary fibers are thermally bonded or joined to the thermoplastic polymer fibers. Ex. 1004, ¶ 0109.

312. Accordingly, the combination of Schwarz '616 and Keck teaches every element of Claim 22.

Claim 22

The process according to claim 1 wherein the process is directly coupled to a post-processing operation

313. Keck discloses “pattern bonded” which is a process of bonding a nonwoven web in a pattern by the application of heat and pressure or other methods, such as ultrasonic bonding. Keck discloses that thermal pattern bonding typically is carried out at a temperature in a range of from about 80 C. to about 180° C. Ex. 1004, ¶ 0047. The ’276 Patent expressly discloses that post-processing operations as that term is used in the ’276 Patent includes thermal bonding operations. Ex. 1001, column 9, line 44-51. Keck also describes additional steps (post-processing operations) of depositing the second composite stream onto the deposited layer as a matrix of meltblown filaments and a secondary material to form a two layer tufted coform nonwoven web. Ex. 1004, ¶ 0015-0018. The ’276 Patent expressly discloses that post-processing operations as that term is used in the ’276 Patent includes tuft-generating operations. Ex. 1001, column 9, lines 44-51.

314. Thermal bonding, such as the “pattern bonded” process described in Keck and the tufting operations are typically performed during the manufacturing process of the nonwoven web, and are therefore considered as being “directly coupled to a post-processing operation.”

315. Accordingly, the combination of Schwarz ’616 and Keck teaches every element of Claim 22.

Claim 23

The process according to claim 1 wherein the process is closely coupled to a post-processing operation

316. Again, Keck discloses “pattern bonded” which is a process of bonding a nonwoven web in a pattern by the application of heat and pressure or other methods, such as ultrasonic bonding. Keck discloses that thermal pattern bonding typically is carried out at a temperature in a range of from about 80 C. to about 180° C. Ex. 1004, ¶ 0047. The ’276 Patent expressly discloses that post-processing operations as that term is used in the ’276 Patent includes thermal bonding operations. Ex. 1001, column 9, lines 31-38. Keck also describes additional steps (post-processing operations) of depositing the second composite stream onto the deposited layer as a matrix of meltblown filaments and a secondary material to form a two layer tufted coform nonwoven web. Ex. 1004, ¶ 0015-0018. The ’276 Patent expressly discloses that post-processing operations as that term is used in the ’276 Patent includes applications of lotions and mixtures. Ex. 1001, column 9, lines 44-51.

317. In addition, Keck describes preparation of cleaning sheets using the nonwoven web. Such cleaning sheets may include treatment with a liquid or other materials Ex. 1004, ¶¶ 0137-0140. The conversion of Keck’s nonwoven web into such treated cleaning sheets typically occurs at a separate facility from that of

manufacture of the nonwoven web and is therefore considered a “closely coupled” post processing operation.

318. Accordingly, the combination of Schwarz ’616 and Keck teaches every element of Claim 23.

Ground 4: Claims 1-3, 5-9, 13-14, and 19-24 are obvious under 35 U.S.C. §103 based on the teachings of U.S. Patent No. 6,013,223 to Schwarz (“Schwarz ’223”) (Ex. 1002) and PCT Published Application No. WO 00/29658 (“McDowall”) (Ex. 1003)

Independent Claims 1 and 24

319. As discussed above, Schwarz ’223 explicitly discloses all but one element of independent claims 1 and 24 of the ’276 Patent. The remaining element – combining the filaments with solid additives (wood pulp) to form a mixture – would have been obvious to a POSA based on Schwarz’s disclosures in light of the teachings of McDowall. An element-by-element analysis follows:

Preamble: A process for making a fibrous structure, the process comprising the steps of:

320. Schwarz ’223 teaches a process for making a fibrous structure. Ex. 1002, abstract, Claim 1.

Element 1a: providing a die comprising three or more rows of three or more filament-forming holes

321. Schwarz ’223 discloses a die body (Ex. 1002, column 2, line 31) through which pressurized hot air is blown out of holes (fluid releasing holes) around each spinning nozzle (filament-forming hole). Ex. 1002, column 1, lines

58-60; column 2, lines 30-35; figures 1, 2. Figure 2 is a partial view of the bottom cover plate of the die of Schwarz '223. The partial view shows that the die include at least 6 rows of filament forming holes (identified by referenced character 3) with each row comprising a plurality of individual filament nozzles 3 (filament-forming holes). Here, the partial view of the bottom of the cover plate includes 6 rows with each row having 8 filament nozzles 3 (filament-forming holes). As figure 2 is only a partial view, the die of Schwarz '223 would have a significantly greater amount of filament nozzles per row than what is shown in figure 2.

322. Schwarz '223 describes itself as an improvement on the meltblown die of Schwarz''616, and incorporates the teachings of Schwarz '616. *Id.*, column 1, lines 7-10. As such, the teachings of Schwarz '616 form part of the disclosure of Schwarz '223.

323. The examples of Schwarz '616 describes a die having 8 rows of filament nozzles with the total number of filament nozzles being 500. Ex. 1006, Table 1, Example 3. Based on these values, the average filament nozzles per row is 62.5.

324. Thus, Schwarz '223 discloses providing a die having three or more rows of three or more filament-forming holes.

Element 1b (Claim 1): supplying at least a first polymer to the die

Element 1b (Claim 24): supplying a polyolefin polymer to the die

325. Schwarz '223 discloses both these elements of Claims 1 and 24.

Schwarz '223 discloses supplying thermoplastic fiber-forming polymer melt (first polymer) to a supply cavity in a die body (die). Ex. 1002, column 2, lines 30-32.

More particularly, Schwarz '223 discloses supplying polypropylene (first polymer) to the die body (die). Ex. 1002, column 2, line 65. Polypropylene is a particular type of polyolefin. This must be true because dependent Claim 9 of the '276 Patent claims a polyolefin that comprises polypropylene.

326. Accordingly, Schwarz '223 teaches both these elements of Claims 1 and 24.

Element 1c (Claim 1): producing a plurality of filaments comprising the first polymer from the die

Element 1c (Claim 24): producing a plurality of filaments comprising the polyolefin polymer from the die

327. Schwarz '223 discloses producing strong filaments (Ex. 1002, column 1, lines 10-12) by supplying thermoplastic fiber-forming polymer (first polymer) to a supply cavity on a die body (die). Ex. 1002, column 2, lines 30-39.

328. In addition, Schwarz '223 discloses supplying polypropylene (first polymer) to the die body (die). Ex. 1002, column 2, line 65. Polypropylene is a particular type of polyolefin.

Element 1e: collecting the mixture on a belt to produce a fibrous structure.

329. Thus, Schwarz '223 also teaches this element of Claims 1 and 24.

330. Schwarz '223 discloses collecting said fibers on a receiver surface to form a nonwoven mat (fibrous structure). Ex. 1002, Claim 1, column 5, lines 34-36. Schwarz '223 also describes that it is known in the prior art to typically collect the fibers on a moving belt or screen. *Id.*, column 1, lines 48-50.

331. Thus, Schwarz '223 teaches the step of collecting the mixture on a collection device, such as a moving belt, and therefore discloses this element.

Element 1d (Claim 1): combining the filaments with solid additives to form a mixture

Element 1d (Claim 24): combining the filaments with wood pulp fibers to form a mixture

332. This is the only element of independent claims 1 and 24 that is not explicitly disclosed in Schwarz '223. But adding solid additives, or specifically wood pulp fibers, to polymer filaments to form a mixture has been long known in the art (referred to as coform), and is explicitly disclosed in McDowall (and many other prior art references known at the time).

a. Motivation to Combine

333. Prior to the patent owner's earliest possible priority date (July 17, 2007), a POSA would have been motivated to modify Schwarz '223 in view of McDowall in order to provide a coform nonwoven having lower manufacturing costs and exhibiting improved strength.

334. More specifically, a POSA would have known that the multirow meltblown die taught in Schwarz '223 provides significant improvements with respect to throughput, and hence, productivity. As a consequence, the costs associated with manufacturing the coform nonwoven per unit would be decreased, which would improve the manufacturer competitiveness in the market and potentially provide a greater return on investment.

335. In addition, a POSA would be motivated to modify Schwarz '223 in view of McDowall in order to improve the strength of the coform nonwoven. Schwarz '223 explicitly states that the fibers prepared therein have improved tenacity. As such, a POSA would have been motivated to modify Schwarz '223 in view of McDowall to provide a coform nonwoven having improved strength.

336. Accordingly, the combination of Schwarz '223 and McDowall teaches each and every element of independent Claims 1 and 24.

b. Reasonable Expectation of Success

337. A POSA would have had a reasonable expectation of success in modifying Schwarz '223 in use in a coform process as described in McDowall. The relatively simple substitution of a multirow meltblown die of Schwarz '223 in lieu of a knife-edge meltblown die in the coform process is well within the routine skill of the POSA and such a substitution would not result in either the coform process of McDowall or the meltblown process of Schwarz '223 being inoperable.

Claim 2

The process according to Claim 1, wherein at least one row of the three or more rows comprises ten or more filament-forming holes

338. As can explicitly be seen in figure 2 of Schwarz '223, the die body includes multiple rows of nozzle (filament-forming holes) in which each row comprises a plurality of nozzles. Ex. 1002, column 2, lines 29-35 52-54; figure 2; Claim 1 (column 5, lines 39-45)(“multiplicity of nozzles arranged in at least two rows”).

339. As figure 2 is only a partial view, the die of Schwarz '223 would have a significantly greater amount of filament nozzles per row than what is shown in figure 2.

340. As discussed above, Schwarz '223 describes itself as an improvement on the meltblown die of Schwarz '616, and incorporates the teachings of Schwarz '616. *Id.*, column 1, lines 7-10. As such, the teachings of Schwarz '616 form part of the disclosure of Schwarz '223.

341. The examples of Schwarz '616 describes a die having 8 rows of filament nozzles with the total number of filament nozzles being 500. Ex. 1005, Table 1, Example 3. Based on these values, the average filament nozzles per row is 62.5.

342. Thus, Schwarz '223 discloses providing a die having three or more rows of three or more filament-forming holes.

343. Therefore, Schwarz '223 in combination with Keck discloses each and every element of Claim 2.

Claim 3

The process according to claim 1 wherein one or more fluid-releasing holes are associated with a filament-forming hole.

344. Figure 2 of Schwarz '223 shows that the die body includes multiple rows of filament nozzles (filament-forming holes) in which each filament nozzle 3 is concentrically positioned within an associated round hole 7 (fluid-releasing hole). Ex. 1002, column 2, lines 29-51; figure 2. In other words, each fluid-releasing hole is associated with a filament-forming hole.

345. Thus, Schwarz '223 in combination with Keck discloses each and every element of Claim 3.

Claim 5

The process according to claim 1 wherein at least one of the one or more fluid-releasing holes is concentrically positioned around one filament-forming hole

346. Schwarz '223 discloses multiple rows of nozzles (filament-forming holes) sticking through the round holes (which are concentrically positioned around fluid-releasing holes). Ex 1002, column 2, lines 51-54. Further, figure 2 of Schwarz '223 shows that the filament nozzle is centered in the round holes, which means that the round hole concentrically surrounds the filament nozzle.

347. Thus, Schwarz '223 in combination with McDowall discloses each and every element of Claim 5.

Claim 6

The process according to claim 1 wherein the first polymer comprises a synthetic polymer

348. Schwarz '223 explicitly discloses using polypropylene. Ex. 1002, column 2, line 65. Further, McDowall explicitly discloses synthetic polymers including polyolefins and polyesters and other high tensile materials. Ex. 1003, page 8.

349. Polypropylene is a synthetic polymer.

350. Accordingly, Schwarz '223 in combination with McDowall discloses each and every element of Claim 6.

Claim 7

The process according to claim 6 wherein the synthetic polymer is selected from the group consisting of: polyvinyl alcohol, polyvinyl alcohol derivatives, polyesters, nylons, polyolefins, polylactic acids, polyhydroxyalkanoates, polycaprolactones and mixtures thereof

351. Schwarz '223 explicitly discloses using polypropylene. Ex. 1002, column 2, line 65. Polypropylene is a polyolefin.

352. McDowall also explicitly discloses synthetic polymers including polypropylene, polyesters, and other high tensile materials. Ex. 1003, page 8.

353. Accordingly, Schwarz '223 in combination with McDowall discloses each and every element of Claim 7.

Claim 8

The process according to claim 7 wherein the synthetic polymer comprises a polyolefin

354. Schwarz '223 explicitly discloses using polypropylene. Ex. 1002, column 2, lines 65. Polypropylene is a polyolefin.

355. McDowall also explicitly discloses synthetic polymers including polypropylene (Ex. 1003, page 8), which is a polyolefin by definition because Claim 9 of the '801 Patent claims a synthetic polymer that is a polyolefin comprised of polypropylene. Ex. 1001, Claim 9.

356. Thus, combination of Schwarz '223 and McDowall discloses each and every element of Claim 8.

Claim 9

The process according to claim 8 wherein the polyolefin comprises polypropylene

357. Schwarz '223 explicitly discloses using polypropylene. Ex. 1002, column 2, lines 65. Polypropylene is a polyolefin. McDowall also explicitly discloses synthetic polymers including polypropylene. Ex. 1003, page 8.

358. Accordingly, the combination of Schwarz '223 and McDowall discloses each and every element of Claim 9.

Claim 13

The process according to claim 1 wherein the solid additives comprise fibers

359. McDowall discloses that pulp fibers (solid additives) refers to fibers from natural sources such as woody and non-woody plants. *Id.*, page 4.

360. Accordingly, the combination of Schwarz '223 and McDowall teaches each and every element of Claim 13.

Claim 14

The process according to claim 14 wherein the fibers comprise wood pulp fibers

361. McDowall discloses that pulp fibers (solid additives) refers to fibers from natural sources such as woody and non-woody plants. *Id.*, page 4.

362. Accordingly, the combination of Schwarz '223 and McDowall teaches each and every element of Claim 14.

Claim 19

The process according to claim 3 wherein a fluid released by the fluid-releasing holes comprises air

363. Schwarz '223 discloses that the gas released through the holes (fluid releasing holes) in the cover plate is air. Ex. 1002, column 2, lines 29-51.

364. McDowall also discloses extruding filaments from die capillaries (fluid-releasing holes) with “converging high velocity heated gas (e.g., air)” streams. Ex. 1003, page 4.

365. Accordingly, the combination of Schwarz '223 and McDowall teaches each and every element of Claim 19.

Claim 20

The process according to claim 1 wherein the fibrous structure exhibits a pore volume distribution such that greater than about 40% of the total pore volume present in the fibrous structure exists in pores of radii of from about 121 um to about 200 um

366. The '276 Patent discloses that the spinnerette used in the examples of preparing the claimed fibrous structure was obtained from Biax-Fiberfilm Corporation ("Biax"). Ex. 1001, column 16, lines 3-5. Notably, Schwarz '223 was assigned to Biax-Fiberfilm Corporation. Ex. 1002, page 1.

367. Thus, it appears that the examples in the '276 Patent were prepared with the same or similar meltblown die described in Schwarz '223. Given the similarities between the Biax meltblown die described in the '276 Patent and that of Schwarz '616, it is reasonable to expect that a coform nonwoven prepared based on the combination of Schwarz '223 and Keck would have the same properties. That is, it would be expected that a process of preparing a coform nonwoven using the meltblown die of Schwarz '223 in combination with the solid additive process of Keck would produce a coform nonwoven having a pore volume distribution such that greater than about 40% of the total pore volume present in the fibrous structure exists in pores of radii of from about 121 um to about 200 um.

368. Moreover, it is well known that pore size, and hence pore size distribution, in meltblown webs varies depending on process conditions, such as processing temperatures, increasing air flow rate at the die, and decreasing the distance between the filament nozzles and the collection surface, and the speed of the collection surface. See, Bresee et al., *Influence of Processing Conditions on Melt Blown Web Structure: Part 1 – DCD*, INJ Spring 2004, 49-55 (Ex. 1025); Bresee et al., *Influence of Processing Conditions on Melt Blown Web Structure: Part 2 – Primary Airflow Rate*, INJ Summer 2005, 11-18 (Ex. 1026); and Lee et al. *Effects of Melt-Blowing Process Conditions on Morphological and Mechanical Properties of Polypropylene Webs*, POLYMER 1992, Vol. 3, No. 6, 1200-1209 (Ex. 1027). For example, changing one or more of the process parameters by increasing the air flow rate, decreasing the distance between the collection surface and filament nozzles, or increasing the speed of the collection surface is well known to decrease pore size in the meltblown web. Similarly, decreasing air flow rate, increasing the distance between the collection surface and filament nozzles, or decreasing the speed of the collection surface is well known to increase pore size in the meltblown web. As such, it is reasonable to expect that obtaining a coform nonwoven having the recited pore distribution is well within the routine skill of a POSA, and that doing such is merely an optimization of known parameters that affect pore size distribution.

369. Accordingly, the combination of Schwarz '223 and Keck teaches every element of Claim 20.

Claim 21

The process according to claim 1 wherein the process further comprises the step of subjecting the fibrous structure to a thermal bonding operation

370. McDowall discloses “thermal point bonding” and teaches that it means passing a fabric or web of fibers to be bonded between a heated calender roll and an anvil roll in order to hold the laminate layers together and impart integrity to each individual layer by bonding filaments and/or fibers within each layer. Ex. 1003, pages, 6-7.

371. Accordingly, the combination of Schwarz '223 and Keck teaches every element of Claim 20.

Claim 22

The process according to claim 1 wherein the process is directly coupled to a post-processing operation

372. McDowall discloses “thermal point bonding” and teaches that it means passing a fabric or web of fibers to be bonded between a heated calender roll and an anvil roll in order to hold the laminate layers together and impart integrity to each individual layer by bonding filaments and/or fibers within each layer. *Id.*, pages, 6-7. Further, McDowall describes depositing the nonwoven web of a conveyor and then subjecting the composite to through-air-bonding. *Id.*, page

10, lines 4-6. Such a bonding step immediately following deposition on the conveyor is considered as being “directly coupled to a post-processing operation” as recited in Claim 22 of the ’276 Patent.

373. Accordingly, the combination of Schwarz ’223 and McDowall teaches each and every element of Claim 22.

Claim 23

The process according to claim 1 wherein the process is closely coupled to a post-processing operation

374. McDowall describes that the absorbent nonwoven composites can be used in various medical products, which contain alcohol or other disinfectants. *Id.*, page 15, lines 16-18. The conversion of the absorbent nonwoven composite of McDowall into such medical products is normally completed at a separate facility from the manufacturing site and is therefore be considered a “closely coupled” post processing operation.

375. Accordingly, the combination of Schwarz ’223 and McDowall teaches each and every element of Claim 23.

Ground 5: Claims 11-12 are obvious under 35 U.S.C. §103 based on the teachings of U.S. Patent No. 6,013,223 to Schwarz (“Schwarz ’223”) in view of U.S. Patent App. Publication No. 2003/0211802 A1 to Keck (“Keck”) (Ex. 1004) (or PCT Published Application No. WO 00/29658 (“McDowall”) (Ex. 1003)), and in further view of United States Patent No. 6,783,854 to Bond (“Bond”) (Ex. 1006)

376. As discussed previously, Schwarz '223 discloses each element of Claim 1 except the step of combining the filaments with solid additives to form a mixture, which is disclosed by both Keck and McDowall.

377. Dependent Claim 11 of the '276 Patent, further claims where the polymer disclosed in Claim 1 is a natural polymer, and Claim 12 claims a specific type of natural polymer. U.S. Patent No. 6,783,854 to Bond explicitly discloses such natural polymers, and it would have been obvious to a POSA to combine the teachings of Schwarz '223 with Keck (or McDowall) and Bond.

378. Bond is directed to continuous bicomponent fibers that may be used in the preparation of meltblown and spunbond nonwoven fabrics. Bond teaches that the bicomponent filaments may be made with melt spinning processes, and may be used to produce continuous filaments through spunbond methods or meltblowing processes. *Id.*, column 12, line 61-column 13, line 4. Bond further teaches that the nonwovens prepared from the bicomponent fibers may be used in hygiene applications, which includes wipes and diapers. *Id.*, column 14, lines 30-45. Accordingly, Bond is in the same field of the endeavor or the '276 Patent.

379. Prior to the patent owner's earliest possible priority date (July 17, 2007), a POSA would have been motivated to modify the process of Schwarz '223 as modified by Keck or McDowall to include a thermoplastic starch (natural polymer) as taught by Bond in order to provide a coform nonwoven that is

environmentally degradable and thus flushable. Combining Schwarz '223 with Keck or McDowall along with Bond would not make any of them inoperable.

Claim 11

The process according to claim 1 wherein the first polymer comprises a natural polymer

380. Bond describes bicomponent fibers having a sheath/core configuration in which a non-starch thermoplastic polymer (defining the sheath) surrounds a thermoplastic starch (defining the core). *Id.*, Abstract. Bond teaches that the non-starch thermoplastic polymer may be a polyolefin, such as polyethylene or polypropylene. *Id.*, column 3, lines 39-45. Bond states that the thermoplastic starch is a naturally occurring biopolymer. *Id.*, column 4, lines 58-60.

381. Accordingly, Bond teaches a process of preparing filaments in which the filaments comprises a natural polymer, and therefore the combination of Schwarz '223, one of Keck or McDowall, and in further view of Bond teaches the elements of Claim 11.

Claim 12

The process according to claim 11 wherein the natural polymer is selected from the group consisting of: starch, starch derivatives, cellulose, cellulose derivatives, hemicellulose, hemicellulose derivatives, and mixtures thereof

382. Bond provides the following statement with respect to suitable starches:

Suitable naturally occurring starches can include, but are not limited to, corn starch (including, for example, waxy maize starch), potato starch, sweet potato starch, wheat starch, sago palm starch, tapioca starch, rice starch, soybean starch, arrow root starch, bracken starch, lotus starch, cassava starch, high amylose corn starch, and commercial amylose powder. Blends of starch may also be used. Though all starches are useful herein, the present invention is most commonly practiced with natural starches derived from agricultural sources, which offer the advantages of being abundant in supply, easily replenishable and inexpensive in price. Naturally occurring starches, particularly corn starch (including, for example, waxy maize starch), and wheat starch, are starch polymers of choice due to their economy and availability. Modified starch may also be used. Modified starch is defined as non-substituted, or substituted, starch that has had its native molecular weight characteristics changed (i.e. the molecular weight is changed but no other changes are necessarily made to the starch). Molecular weight can be modified, preferably reduced, by any technique numerous of which are well known in the art. These include, for example, chemical modifications of starch by, for example, acid or alkali hydrolysis, acid reduction, oxidative reduction, enzymatic reduction, physical/mechanical degradation (e.g., via the thermomechanical energy input of the processing equipment), or combinations thereof. The thermomechanical method and the oxidation method offer an additional advantage when carried out in situ. The exact chemical nature of the starch and molecular weight reduction method is not critical as long as the average molecular weight is provided at the desired level or range. Such techniques can also reduce molecular weight distribution.

Id., column 5, line 51-column 6, line 15.

383. Prior to the patent owner's earliest possible priority date (July 17, 2007), a POSA would have been motivated to modify the process of Schwarz '223 as modified by Keck or McDowall to include a thermoplastic starch (natural polymer) as taught by Bond in order to provide a coform nonwoven that is environmentally degradable and thus flushable.

384. Accordingly, Bond teaches that the natural polymer is a starch, which is recited in Claim 11. Therefore, the combination of Schwarz '223 with one of Keck or McDowall, and in further view of Bond teaches the elements of Claim 11.

Ground 6: Claims 1-4, 6-10, and 13-24 are obvious under 35 U.S.C. §103 based on the teachings of U.S. Patent No. 6,114,017 to Fabbriante ("Fabbriante") (Ex. 1018) and U.S. Patent App. Publication No. 2003/0211802 A1 to Keck ("Keck") (Ex. 1004)

Independent claims 1 and 24

385. Keck is directed to a coform nonwoven and processes of preparing the same. Ex. 1004, abstract, Claims 1, 34. Keck describes a process of preparing a coform nonwoven (a "fibrous structure") prepared from meltblown filaments and a secondary additive. *Id.*, abstract. Keck describes that the coform nonwoven may be used to form "a presaturated or absorbent cleaning sheet used as a wiper,..." *Id.*, ¶ 0135. More specifically, Keck states that "[c]oform nonwoven webs have been used in applications such as disposable absorbent articles, absorbent dry wipes, wet wipes, wet mops and absorbent dry mops." *Id.*, ¶ 0006.

386. Keck explicitly discloses all but one element of independent Claims 1 and 24 of the '276 Patent. The remaining element – providing a die comprising three or more rows of three or more filament-forming holes – was well known in the art and would have been obvious to a POSA based on Keck's disclosures in light of the teachings of Fabbriante. An element-by-element analysis follows:

Preamble: A process for making a fibrous structure, the process comprising the steps of:

387. Keck teaches a process for making a fibrous structure. Ex. 1004, abstract, Claim 34.

Element 1a: providing a die comprising three or more rows of three or more filament-forming holes

388. As shown in figure 3, Keck discloses a pair of extruders 14, 14' that feed molten polymer into a pair of corresponding meltblowing dies 16, 18, respectively, that contain “small holes or orifices 24 and 24'” (filament forming holes). Ex. 1004, ¶¶ 0084, 0085. Each meltblowing die produces a stream of gas (from one or more fluid releasing holes) that contacts and attenuates the filaments as they exit small holes or orifices of the meltblowing die to form a filament containing stream. *Id.*, ¶ 0085.

389. Keck does not explicitly disclose a die comprising three or more rows of three or more filament-forming holes, but Fabbicante teaches providing a meltblown die having at least three rows of filament nozzles (filament-forming holes) in which the rows include three or more filament nozzles. Ex. 1018, column 5, lines 58-62; figure 2; figure 3a.

390. Moreover, Keck further states that “[t]he term “meltblown” is also intended to cover other processes in which a high velocity gas (generally air) is used to aid in the formation of the filaments, such as melt spraying or centrifugal

spinning.” *Id.* ¶ 0034. Such “other processes” would include the meltblown process described in Fabbicante, which uses a multirow meltblown die.

391. In addition, Fabbicante discloses a multirow meltblown die having a primary plate that includes a polymer orifice (filament-forming hole) in which the polymer orifice is flanked on opposing sides by a pair of air nozzles (fluid-releasing holes). Ex. 1018, column 5, lines 24-48. Accordingly, Fabbicante discloses a die comprising one or more filament-forming holes, wherein one or more fluid-releasing holes are associated with one filament-forming hole.

392. Therefore, the combination of Keck and Fabbicante teaches this element of Claims 1 and 24.

Element 1b (Claim 1): supplying at least a first polymer to the die

Element 1b (Claim 24): supplying a polyolefin polymer to the die

393. Keck discloses that thermoplastic meltblown filaments comprise a polymer selected from the group consisting of polyolefins, polyesters, polyamides, polycarbonates, polyurethanes, polyvinylchloride, polytetrafluoroethylene, polystyrene, polyethylene terephthalate, polylactic acid and copolymers and blends thereof. *Id.*, ¶ 0052, Claim 8. More specifically, Keck teaches that the meltblown filaments may comprise polyolefins, such as polypropylene. *Id.*, ¶ 0052. In addition to polyolefins, Keck teaches that the meltblown filaments may comprise biodegradable filaments, such as polylactic acids. *Id.* Further, Fabbicante also

teaches preparing continuous meltblown filaments comprising a polypropylene, which is a polyolefin. Ex. 1018, column 8, lines 61-63.

394. Thus, the combination of Keck and Fabbricante teaches these elements of Claim 1 and Claim 25.

Element 1c (Claim 1): producing a plurality of filaments comprising the first polymer from the die

Element 1c (Claim 24): producing a plurality of filaments comprising the polyolefin polymer from the die

395. Keck discloses that thermoplastic continuous meltblown filaments comprise a polymer. *Id.*, ¶ 0052, Claim 8. Fabbricante also teaches producing a plurality of filaments comprising a polymer, and in particular, polypropylene, which is a polyolefin. Ex. 1018, column 8, lines 38-41.

396. Accordingly, the combination of Keck and Fabbricante teaches this element of Claims 1 and 24.

Element 1d (Claim 1): combining the filaments with solid additives to form a mixture

Element 1d (Claim 24): combining the filaments with wood pulp fibers to form a mixture

397. Keck discloses that a secondary gas stream containing secondary fibers (solid additives), such as pulp fibers, is directed between the two filament streams at the impingement zone 30. Ex. 1004, ¶ 0093. The resulting composite stream 56 comprising the merged filament streams and gas stream containing

secondary fibers is deposited on a collecting device, such as an endless forming surface 58. *Id.*, ¶ 0097.

398. Keck discloses that the secondary material (solid additives) includes fibrous organic materials (fibers) and superabsorbent particles and fibers. Ex. 1004, ¶ 0003. In particular, Keck teaches that the secondary material (i.e., secondary fibers) of the coform nonwoven may be an absorbent material, such as absorbent fibers. *Id.*, ¶ 0056. Examples of such secondary fibers include cellulosic derived fibers, such as wood pulp fibers. *Id.*

399. In addition, Fabbriante contemplates use of the meltblown web in combination with cellulose fibers. Ex.1018, column 7, lines 60-66. In particular, Fabbriante teaches that the meltblown layer may be a single layer or may be combined with other layers to form:

a multi-layer laminate wherein the layers are composed of any combination of the instant invention plus films, woven fabrics, metallic foils, unbonded webs, cellulose fibers, paper webs both bonded and debonded, various other nonwovens, and similar suitable webs suitable for laminating.

Id., column 7, lines 60-66. Fabbriante further teaches that the layers of the multi-layer laminate may include cellulose fibers, which means that the cellulose fibers may be mixed with the meltblown filaments of Fabbriante's meltblown web, in the layers that are in addition to Fabbriante's meltblown web, or in both.

400. As Fabbicante describes that the meltblown web may be used in wiper applications, and that it may be used in combination with cellulose fibers, it would be desirable to use cellulose fibers in combination with Fabbicante's meltblown web in order for the resulting article to function effectively as a wiper.

Element 1e: collecting the mixture on a belt to produce a fibrous structure.

401. Keck discloses that the resulting composite stream 56 comprising the merged filament streams and gas stream containing secondary fibers is deposited on a collecting device, such as an endless forming surface 58. Ex. 1004, ¶ 0097. In particular, Keck teaches that the forming surface may be any type of plate, drum, belt or wire. *Id.*, ¶ 0063. Therefore, the combination of Keck and Fabbicante teaches this element of Claims 1 and 24.

a. Motivation to Combine

402. Prior to the patent owner's earliest possible priority date (July 17, 2007), a POSA would have been motivated to modify Keck in view of Fabbicante in order to provide a coform nonwoven exhibiting significantly improved strength.

403. More specifically, a POSA would have known that the modular multirow meltblown die taught in Fabbicante provides significant improvements with respect to strength in comparison to typical meltblown webs (prepared with a single row knife edge meltblown die). As noted in Fabbicante,

[t]he instant invention is based on the discovery that using the modular die design, in a melt blowing configuration at low pressure

and low polymer flows per hole, continuous fibers of extremely uniform size distribution are created, which fibers and their resultant unbonded webs exhibit significant strength compared to typical unbonded melt blown or spunbond webs.

Ex. 1018, column 2, lines 41-48.

404. Accordingly, a POSA would have been motivated to modify Keck in view of Fabbriante to provide a process of preparing a fibrous structure (e.g., coform) that exhibits significant improvements in strength. As discussed previously, Fabbriante teaches that the modular meltblown die described therein produces a meltblown web having “higher unbonded strength than a typical meltblown web.” Ex, 1018, column 4, lines 7-8. In view of the known desire to improve the strength of meltblown webs, a POSA would have been motivated to use the multirow meltblown die of Fabbriante in the coform process of Keck in order to provide a higher strength coform nonwoven.

405. In addition, the POSA would be motivated to combine Keck with Fabbriante to provide higher polymer throughputs without the significant capital expense typically associated with machining a traditional meltblown die.

406. Finally, Fabbriante contemplates that the meltblown web may be used in combination with cellulose fibers, and also contemplates use of the meltblown web in a wiper application. In view of this suggestion, a POSA would be motivated to use Fabbriante’s multirow meltblown die in a process to prepare a coform nonwoven, such as the coform process disclosed in Keck.

407. Therefore, the combination of Keck and Fabbriante teaches each and every element of independent Claims 1 and 24.

b. Reasonable Expectation of Success

408. A POSA would have had a reasonable expectation of success in modifying the coform process in Keck with the multrow meltblown die of Fabbriante. The relatively simple substitution of a multirow meltblown die of Fabbriante in lieu of a knife-edge meltblown die in the coform process is well within the routine skill of the POSA and such a substitution would not result in either the coform process of Keck or the meltblown process of Fabbriante being inoperable.

409. In addition, Fabbriante contemplates the use of cellulose fibers in combination with a meltblown web prepared with Fabbriante's multirow meltblown die.

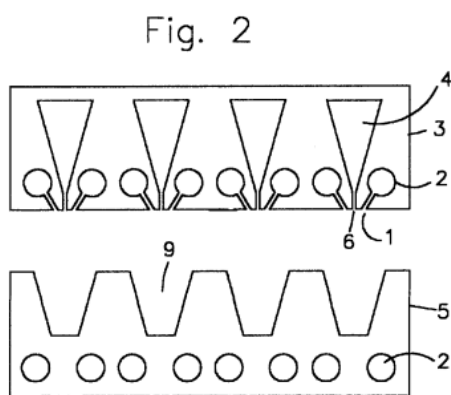
410. Accordingly, modifying Keck to include the multirow meltblown die of Fabbriante is well within the routine skill of a POSA, and therefore, a POSA would have a reasonable expectation of success in making the modification.

411. Accordingly, the combination of Fabbriante and Keck teaches each and every element of independent Claims 1 and 25.

Claim 2

The process according to claim 1, wherein at least one row of the three or more rows comprises ten or more filament-forming holes

412. Fabbicante discloses in figure 2 a primary plate 3 and secondary plate 5 when assembled provides a modular multirow meltblown die having at least four rows of polymer orifices 6. Ex. 1018, figure 2, column 5, lines 49-51.



Id., figure 2. Although Fabbicante does not explicitly disclose that at least one of the rows would include ten or more die holes (filament-forming holes), the presence of ten or more die holes per row would be obvious. In 2007, the typical single row meltblown die include 30 HPI, which is equivalent to approximately 1,181 filament nozzles for a die with a width of one meter. Ex. 1024, page 46. Thus, in order to provide a commercially viable meltblown die, it is a necessity that Fabbicante's meltblown die include significantly more die holes per row than 10.

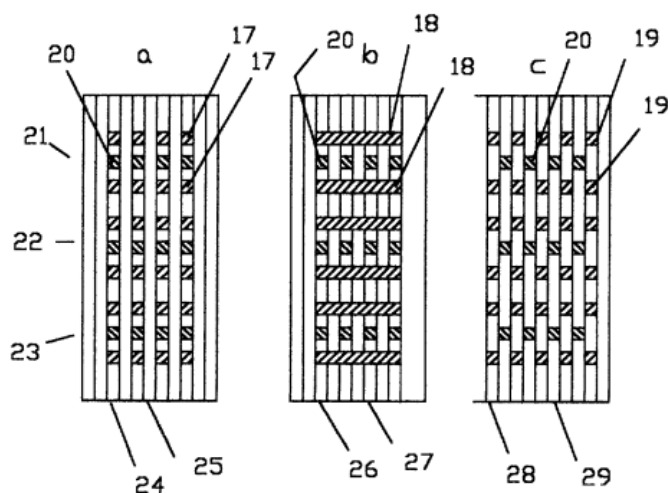
413. Accordingly, the combination of Keck and Fabbriante teaches and/or suggest each and every element of Claim 2.

Claim 3

The process according to claim 1 wherein one or more fluid-releasing holes associated with a filament-forming hole

414. Fabbriante discloses in figure 3, below, a plan view that depicts three different assembled die bodies comprising a plurality of primary plates and secondary plates in an assembled state.

Fig. 3



Ex. 1018., figure 3. In the assembled die body a, the assembled die includes 3 rows of polymer orifices 20 in which each row includes at least 4 polymer orifices, and in which each individual polymer orifice is flanked on opposing sides by a pair of air nozzles 17. *Id.*, figure 3, column 5, lines 53-65.

415. Thus, figure 3a shows a meltblown die in which a one or more fluid-releasing holes are associated with a filament-forming hole

416. Accordingly, the combination of Keck and Fabbriante teaches each and every element of Claim 3.

Claim 4

The process according to claim 3 wherein more than one fluid-releasing holes is associated with a filament-forming hole

417. Fabbriante discloses in figure 3, the assembled die includes 3 rows of polymer orifices 20 in which each row includes at least 4 polymer orifices, and in which each individual polymer orifice is flanked on opposing sides by a pair of air nozzles 17. *Id.*, figure 3, column 5, lines 53-65. The pair of air nozzles are associated with the individual polymer orifice that is disposed between the pair of air nozzles.

418. Thus, the combination of Keck and Fabbriante teaches the elements of Claim 4.

Claim 6

The process according to claim 1 wherein the first polymer comprises a synthetic polymer

419. Keck discloses that thermoplastic meltblown filaments comprise a polymer selected from the group consisting of polyolefins, polyesters, polyamides, polycarbonates, polyurethanes, polyvinylchloride, polytetrafluoroethylene,

polystyrene, polyethylene terephthalate, polylactic acid and copolymers and blends thereof. *Id.*, ¶ 0052, Claim 8. More specifically, Keck teaches that the meltblown filaments may comprise polyolefins, such as polypropylene. *Id.*, ¶ 0052.

420. Fabbicante also teaches producing a plurality of filaments comprising a polymer, and in particular, polypropylene, which is a polyolefin. Ex. 1018, column 8, lines 38-41.

421. Polypropylene is considered a synthetic polymer.

422. Thus, the combination of Keck and Fabbicante teaches the elements of Claim 6.

Claim 7

The process according to claim 6 wherein the synthetic polymer is selected from the group consisting of: polyvinyl alcohol, polyvinyl alcohol derivatives, polyesters, nylons, polyolefins, polylactic acids, polyhydroxyalkanoates, polycaprolactones and mixtures thereof

423. Keck discloses that thermoplastic meltblown filaments comprise a polymer selected from the group consisting of polyolefins, polyesters, polyamides, polycarbonates, polyurethanes, polyvinylchloride, polytetrafluoroethylene, polystyrene, polyethylene terephthalate, polylactic acid and copolymers and blends thereof. Ex. 1004, ¶ 0052, Claim 8.

424. Fabbicante also teaches producing a plurality of filaments comprising a polymer, and in particular, polypropylene, which is a polyolefin. Ex. 1018, column 8, lines 38-41.

425. Therefore, the combination of Keck and Fabbicante teaches the elements of Claim 7.

Claim 8

The process according to claim 7 wherein the synthetic polymer comprises a polyolefin

426. Keck discloses that thermoplastic meltblown filaments comprise a polymer selected from the group consisting of polyolefins, polyesters, polyamides, polycarbonates, polyurethanes, polyvinylchloride, polytetrafluoroethylene, polystyrene, polyethylene terephthalate, polylactic acid and copolymers and blends thereof. Ex. 1004, ¶ 0052, Claim 8.

427. Fabbicante also teaches producing a plurality of filaments comprising a polymer, and in particular, polypropylene, which is a polyolefin. Ex. 1018, column 8, lines 38-41.

428. Therefore, the combination of Keck and Fabbicante teaches the elements of Claim 8.

Claim 9

The process according to claim 8 wherein the polyolefin comprises polypropylene

429. More specifically, Keck teaches that the meltblown filaments may comprise polyolefins, such as polypropylene. Ex. 1004, ¶ 0052.

430. Fabbicante also teaches producing a plurality of filaments comprising a polymer, and in particular, polypropylene, which is a polyolefin. Ex. 1018, column 8, lines 38-41.

431. Accordingly, the combination of Keck and Fabbicante teaches the elements of Claim 9.

Claim 10

The process according to claim 7 wherein the synthetic polymer is selected from the group consisting of: polylactic acids, polyhydroxyalkanoates, polycaprolactones and mixtures thereof

432. Keck discloses that thermoplastic meltblown filaments comprise a polymer selected from the group consisting of polyolefins, polyesters, polyamides, polycarbonates, polyurethanes, polyvinylchloride, polytetrafluoroethylene, polystyrene, polyethylene terephthalate, polylactic acid and copolymers and blends thereof. Ex. 1004, Claim 8 (emphasis added).

433. Accordingly, the combination of Keck and Fabbicante teaches the elements of Claim 10.

Claim 13

The process according to claim 1 wherein the solid additives comprise fibers

434. Keck discloses that the secondary material (solid additives) includes fibrous organic materials (fibers) and superabsorbent particles and fibers. Ex. 1004, ¶ 0003.

435. Thus, the combination of Keck and Fabbicante teaches the elements of Claim 13.

Claim 14

The process according to claim 13 wherein the fibers comprise wood pulp fibers

436. Keck discloses that the secondary material (solid additives) includes fibrous organic materials such as woody and non-wood pulp. Ex. 1004, ¶ 0003.

437. Therefore, the combination of Keck and Fabbicante teaches the elements of Claim 14.

Claim 15

The process according to claim 1 wherein the solid additives are combined with the plurality of filaments by a solid additive spreader

438. Keck discloses that the secondary fibers (solid additives) are conveyed toward the stream of thermoplastic polymer fibers through a nozzle, with a housing that encloses the picker roll and provides a passageway or gap between the housing and the picker roll and that a gas (i.e., air) is supplied to the passage way or gap between the surface of the picker roll and the housing by way of a gas duct. Ex. 1004, ¶ 0088. The gas is supplied by any conventional arrangement including a blower and is supplied in sufficient quantity to serve as a medium for conveying the secondary fibers through the nozzle. *Id.* Keck further discloses that it is contemplated that additives and/or other materials may be added to or

entrained in the gas stream to treat secondary fibers. *Id.* Keck further discloses a “conventional particulate injection system” (solid additive spreader). Ex. 1004, ¶¶ 0092, 0108.

439. Accordingly, the combination of Keck and Fabbriante discloses the elements of Claim 15.

Claim 16

The process according to claim 1 wherein the process further comprises the step of: [17f] contacting a surface of the fibrous structure with a plurality of filaments comprising a second polymer

440. Keck discloses preparing a two-layer coform structure in which a second coform layer is formed directly on the first coform layer. Ex. 1004, ¶ 0150. This would necessarily result in the filaments of the second coform layer contacting a surface of the first coform layer (fibrous structure). Keck further describes that the meltblown filaments of both coform layers comprise the same polypropylene resin. *Id.* The definition of “second polymer” must include the second polymer being the same as the first polymer because Claim 18 of the ’276 Patent, which depends on Claim 16, recites that the first and second polymer are the same. Ex. 1001, Claim 18.

441. Thus, the combination of Keck and Fabbriante discloses the elements of Claim 16.

Claim 17

The process according to claim 16 wherein the plurality of filaments comprising the second polymer are in the form of a fibrous structure

442. Keck discloses that the second layer is a coform nonwoven (fibrous structure) comprised of a mixture of thermoplastic filaments and wood pulp fibers (solid additive). Ex. 1004, ¶ 0150.

443. Thus, the combination of Keck and Fabbicante discloses the elements of Claim 17.

Claim 18

The process according to claim 16 wherein the second polymer is the same as the first polymer

444. In example 5 of Keck, the filaments of the first coform layer and the filaments of the second coform layer both comprise the same grade polypropylene resin. Ex. 1004, ¶0150.

445. Thus, the combination of Keck and Fabbicante discloses the elements of Claim 18.

Claim 19

The process according to claim 3 wherein the fluid released by the fluid-releasing holes comprises air

446. Keck discloses “fibers formed by extruding a molten thermoplastic material through a plurality of fine, usually circular, die capillaries as molten threads or filaments into converging high velocity, usually hot, gas (e.g. air)

streams which attenuate the filaments of molten thermoplastic material to reduce their diameter, which may be to microfiber diameter.” Ex. 1004, ¶ 0035.

447. In addition, Fabbicante teaches that the meltblown die uses high velocity air to attenuate the filaments. Ex. 1018, column 5, lines 24-48.

448. Thus, the combination of Keck and Fabbicante discloses the elements of Claim 20.

Claim 20

The process according to claim 1 wherein the fibrous structure exhibits a pore volume distribution such that greater than about 40% of the total pore volume present in the fibrous structure exists in pores of radii of from about 121 μm to about 200 μm

449. Preparing a meltblown web having a pore volume distribution such that greater than about 40% of the total pore volume present in the fibrous structure exists in pores of radii of from about 121 μm to about 200 μm as recited in Claim 21 is within the routine skill of a POSA. Accordingly, Claim 20 is obvious in view of the combination of Keck and Fabbicante.

450. More specifically, it is well known that pore size, and hence pore size distribution, in meltblown webs varies depending on process conditions, such as processing temperatures, increasing air flow rate at the die, and decreasing the distance between the filament nozzles and the collection surface, and the speed of the collection surface. See, Bresee et al., *Influence of Processing Conditions on Melt Blown Web Structure: Part 1 – DCD*, INJ Spring 2004, 49-55 (Ex. 1025);

Bresee et al., *Influence of Processing Conditions on Melt Blown Web Structure: Part 2 – Primary Airflow Rate*, INJ Summer 2005, 11-18 (Ex. 1026); and Lee et al. *Effects of Melt-Blowing Process Conditions on Morphological and Mechanical Properties of Polypropylene Webs*, POLYMER 1992, Vol. 3, No. 6, 1200-1209 (Ex. 1027). For example, it is known that changing one or more of the process parameters by increasing the air flow rate, decreasing the distance between the collection surface and filament nozzles, or increasing the speed of the collection surface is well known to decrease pore size in the meltblown web. Similarly, decreasing air flow rate, increasing the distance between the collection surface and filament nozzles, or decreasing the speed of the collection surface is also well known to increase pore size in the meltblown web. As such, it is reasonable to expect that obtaining a coform nonwoven having the recited pore size distribution is well within the routine skill of a POSA, and that doing such is merely an optimization of known parameters that affect pore size distribution.

451. Accordingly, the combination of Keck and Fabbriante discloses the elements of Claim 20.

Claim 21

The process according to claim 1 wherein the process further comprises the step of subjecting the fibrous structure to a thermal bonding operation

452. Keck discloses “pattern bonded” which is a process of bonding a nonwoven web in a pattern by the application of heat and pressure or other

methods, such as ultrasonic bonding. Keck discloses that thermal pattern bonding typically is carried out at a temperature in a range of from about 80 C. to about 180° C. Ex. 1004, ¶ 0047. Keck also discloses that due to the fact that thermoplastic polymer fibers are usually semi-molten and tacky at the time of incorporation of the secondary fibers, the secondary fibers are thermally bonded or joined to the thermoplastic polymer fibers. Ex. 1004, ¶ 0109.

453. Fabbicante also teaches that the meltblown web may be thermally bonding using a heated calender. Ex. 1018, column 7, lines 42-44.

454. Accordingly, the combination of Keck and Fabbicante discloses the elements of Claim 21.

Claim 22

The process according to claim 1 wherein the process is directly coupled to a post-processing operation

455. Keck discloses “pattern bonded” which is a process of bonding a nonwoven web in a pattern by the application of heat and pressure or other methods, such as ultrasonic bonding. Keck discloses that thermal pattern bonding typically is carried out at a temperature in a range of from about 80 C. to about 180° C. Ex. 1004, ¶ 0047. The ’276 Patent expressly discloses that post-processing operations as that term is used in the ’276 Patent includes thermal bonding operations. Ex. 1001, column 9, line 44-51. Keck also describes additional steps (post-processing operations) of depositing the second composite stream onto the

deposited layer as a matrix of meltblown filaments and a secondary material to form a two layer tufted coform nonwoven web. Ex. 1004, ¶ 0015-0018. The '276 Patent expressly discloses that post-processing operations as that term is used in the '276 Patent includes tuft-generating operations. Ex. 1001, column 9, lines 44-51.

456. Thermal bonding, such as the “pattern bonded” process described in Keck and the tufting-generating operations are typically performed during the manufacturing process of the nonwoven web, and are therefore considered as being “directly coupled to a post-processing operation.”

457. Accordingly, the combination of Keck and Fabbriante discloses the elements of Claim 22.

Claim 23

The process according to claim 1 wherein the process is closely coupled to a post-processing operation

458. Keck discloses “pattern bonded” which is a process of bonding a nonwoven web in a pattern by the application of heat and pressure or other methods, such as ultrasonic bonding. Keck discloses that thermal pattern bonding typically is carried out at a temperature in a range of from about 80 C. to about 180° C. Ex. 1004, ¶ 0047. The '276 Patent expressly discloses that post-processing operations as that term is used in the '276 Patent includes thermal bonding operations. Ex. 1001, column 9, lines 44-51. Keck also describes additional steps (post-processing operations) of depositing the second composite stream onto the

deposited layer as a matrix of meltblown filaments and a secondary material to form a two layer tufted coform nonwoven web. Ex. 1004, ¶ 0015-0018. The '276 Patent expressly discloses that post-processing operations as that term is used in the '276 Patent includes application of lotions and mixtures. Ex. 1001, column 9, lines 44-51.

459. In addition, Keck describes preparation of cleaning sheets using the nonwoven web. Such cleaning sheets may include treatment with a liquid or other materials Ex. 1004, ¶¶ 0137-0140. The conversion of Keck's nonwoven web into such treated cleaning sheets typically occurs at a separate facility from that of manufacture of the nonwoven web and is therefore considered a "closely coupled" post processing operation.

460. Accordingly, the combination of Keck and Fabbriante teaches every element of Claim 23.

Ground 7: Claim 20 is obvious under 35 U.S.C. §103 based on the teachings of PCT Published Application No. WO 00/29658 ("McDowall") in view of United States Patent Application Publication No. 2007/0202766 to Ouellette et al. ("Ouellette") (Ex. 1028)

Claim 20

The process according to claim 1 wherein the fibrous structure exhibits a pore volume distribution such that greater than about 40% of the total pore volume present in the fibrous structure exists in pores of radii of from about 121 um to about 200 um

461. As discussed previously, it is well known that pore size, and hence pore size distribution, in meltblown webs varies depending on process conditions, such as processing temperatures, increasing air flow rate at the die, and decreasing the distance between the filament nozzles and the collection surface, and the speed of the collection surface. Accordingly, providing a coform nonwoven having the recited pore size distribution is well within the routine skill of a POSA.

462. In addition, Ouellette explicitly discloses a nonwoven material for use as a wipe having a pore size distribution that overlaps with that recited in Claim 20 of the '276 Patent. Ex. 1029, abstract. More specifically, Ouellette teaches a nonwoven material having an optimized pore volume distribution in which at least 50 percent of its cumulative volume within pores as a radius size of about 110 to 250 microns. *Id.* Ouellette further teaches that the nonwoven material may be a spunbond, meltblown or coform, and may include polypropylene and wood pulp fibers. *Id.*, ¶¶ 0019, 0058.

463. Ouellette explains that the “optimized pore volume distribution of the substrate enables it to controllably release a fluid composition effectively onto a surface.” *Id.*, abstract.

464. Accordingly, the combination of McDowall in further view of Ouellette teaches each and every element of Claim 20.

465. In addition, it is also clear that the combinations of 1) Schwarz '616 with either Keck or McDowall and in further view of Ouellette, 2) Schwarz '223 with either Keck or McDowall and in further view of Ouellette and 3) Keck and Fabbriante in further view of Ouellette teaches each and every element of Claim 20. As such, Claim 20 is also obvious in view of these additional grounds of invalidity.

466. A POSA would be motivated to modify any one of McDowall, Schwarz '223, Schwarz '616, and Fabbriante in view of Keck or McDowall and in further view of Ouellette to have the recited pore volume distribution in order to provide a wipe that controllably releases a fluid composition onto a surface. That is, a POSA would be motivated to modify the combination of references in order to provide a more effective wipe.

X. Motivations to Combine the Prior Art

a. Motivations to Combine Schwarz '223 or Schwarz '616 with Keck or McDowall

467. A POSA would have been motivated to combine Schwarz '223 or Schwarz '616 (collectively “the Schwarz patents”) with Keck or McDowall because the Schwarz patents teach that the meltblown die provides “unusually high production capacities.” Ex. 1002, column 1, lines 20-21. As discussed previously, the use of single row knife-edge dies has been a limiting factor in the production of meltblown nonwovens. This limitation has necessarily resulted in increased

productions costs in terms of labor, energy, manufacturing space, and asset depreciation.

468. The advantages obtained with a multirow meltblown die of the Schwarz patents in comparison to a single row meltblown die were well known to the POSA prior to the earliest priority date of the '276 Patent. Indeed, these advantages are explicitly recognized by others in the nonwovens field. More specifically, in the Zhao publication the author recognized that the Schwarz multirow meltblown die breaks the limitation of requiring air from each side of the tapered die tip, which allows the number of rows of filament nozzles present on the die head to be increased without a tremendous capital expense. Ex. 1011.

469. In view of the obvious advantages of multirow meltblown dies of the Schwarz patents, the POSA would be motivated to modify the meltblown systems described therein in view of Keck or McDowall to provide a coform nonwoven having significantly improved throughput. The POSA would be additionally be motivated by the potential reduction in costs associated with increases in productivity, which consequently would deliver superior economics in the production of a coform nonwoven in comparison to a coform process using a single row meltblown die. The costs associated with manufacturing the coform nonwoven per unit would be decreased, which would consequently improve the manufacturer's competitiveness in the market and potentially provide a greater

return on investment. For these reasons alone, the POSA would be motivated to combine the Schwarz patents with either Keck or McDowall.

470. Accordingly, there were strong economic motivations to further increase the productivity of prior art meltblown dies for use in the preparation of coform nonwovens.

471. Moreover, Schwarz '223 also teaches that the multirow meltblown die described therein provides improvements in fiber tenacity. The POSA would be motivated to modify Schwarz '223 in view of Keck or McDowall to provide a coform nonwoven having improved strength.

b. Motivations to Combine Keck and Fabbriante

472. A POSA would have been motivated to modify Keck in view of Fabbriante in order to provide a coform nonwoven exhibiting significantly improved strength.

473. More specifically, a POSA would have known that the multirow meltblown die taught in Fabbriante provides significant improvements with respect to strength in comparison to typical meltblown webs (prepared with a single row knife edge meltblown die). As noted in Fabbriante,

[t]he instant invention is based on the discovery that using the modular die design, in a melt blowing configuration at low pressure and low polymer flows per hole, continuous fibers of extremely uniform size distribution are created, which fibers and their resultant unbonded webs exhibit significant strength compared to typical unbonded melt blown or spunbond webs.

Ex. 1018, column 2, lines 41-48.

474. Accordingly, a POSA would have been motivated to modify Keck in view of Fabbicante to provide a process of preparing a fibrous structure (e.g., coform) that exhibits significant improvements in strength.

475. In addition, the POSA would be motivated to combine Keck with Fabbicante to provide higher polymer throughputs without the significant capital expense typically associated with machining a traditional meltblown die.

476. Finally, Fabbicante contemplates that the meltblown web may be used in combination with cellulose fibers, and also contemplates use of the meltblown web in a wiper application. In view of this suggestion, a POSA would be motivated to use Fabbicante's multirow meltblown die in a process to prepare a coform nonwoven, such as the coform process disclosed in Keck.

XI. Secondary Considerations of Non-Obviousness

477. The '276 Patent does not claim any unexpected results, because the results of combining a known process of preparing meltblown filaments using a multirow die with the well known coform process of adding wood pulp fibers to continuous meltblown or spunbond filaments was well known in the prior art prior to the earliest priority date of the '276 Patent.

XII. Conclusion

For foregoing reasons, it is my opinion that the claims of the '276 Patent are invalid for at least the following grounds:

Ground 1: Claims 1-2, 6-9, 13-14, and 21-24 of the '276 Patent are anticipated by McDowall;

Ground 2: Claims 1-3, 5-10, and 13-24 of the '276 Patent are unpatentable as being obvious over Schwarz '223 in view of Keck;

Ground 3: Claims 1-3, 5-10, and 13-24 of the '276 Patent are unpatentable as being obvious over Schwarz '616 in view of Keck;

Ground 4: Claims 1-3, 5-9, 13-14, and 19-24 of the '276 Patent are unpatentable as being obvious over Schwarz '223 in view of McDowall;

Ground 5: Claims 11-12 of the '276 Patent are unpatentable as being obvious over Schwarz '223 in view of Keck or McDowall and in further view of Bond; and

Ground 6: Claims 1-4, 6-10, and 13-24 of the '276 Patent are unpatentable as being obvious over Keck in view of Fabbricante.

Ground 7: Claim 20 of the '276 Patent is unpatentable as being obvious over the combination of any one of McDowall, Schwarz '223, Schwarz '616, Fabrricante with Keck or McDowall and in further view of Ouellette.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true.

I further declare that I made these statements with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Executed on: 9/21/2023


Gajanan S. Bhat Ph.D.