

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NEW BALANCE ATHLETICS, INC.,
Petitioner,

v.

NIKE, INC.,
Patent Owner.

Case No. IPR2025-00020

Patent 8,898,932

DECLARATION OF JAAP SCHUT, Ph.D.

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EXHIBIT LIST

Exhibit No.	Description
1001	U.S. Patent No. 8,898,932 to Woodman, et al.
1002	Excerpts of Prosecution History for U.S. Patent No. 8,898,932
1003	Declaration of Ann Williams
1004	Curriculum Vitae of Ann Williams
1005	Declaration of Jaap Schut, Ph.D.
1006	Curriculum Vitae of Jaap Schut, Ph.D.
1007	U.S. Patent Application Publication 2010/0313447 to Becker, et al.
1008	U.S. Patent No. 170,332 to Bibbins
1009	U.S. Patent No. 2,213,545 to Chace, et al.
1010	U.S. Patent Application Publication No. 2011/0088285A1 to Dojan, et al.
1011	U.S. Patent No. 6,862,820 to Farys, et al.
1012	U.S. Patent No. 3,319,360 to Nadler
1013	World Intellectual Property Organization Publication WO 2004/012544 to Wildeman
1014	Not Used
1015	Not Used
1016	Clarks Limited, MANUAL OF SHOEMAKING (5th ed. 1980)
1017	Youn Hee Jeon, et al., <i>The Mechanical Properties and Abrasion Behavior of Warp Knitted Fabrics for Footwear</i> , 4 FIBERS AND POLYMERS 4, 151-155 (Dec. 5, 2003).
1018	Nirupama Pundir, FASHION TECHNOLOGY: TODAY AND TOMORROW (2008)
1019	Wiah Wardiningsih, Study of Comfort Properties of Natural and Synthetic Knitted Fabrics in Different Blend Ratios for Winter Active Sportswear (2009) (Masters thesis, RMIT University, Melbourne)
1020	C. Prakash et al., <i>Establishing the effect of loop length on dimensional stability of single jersey knitted fabric made from</i>

EXHIBIT LIST

Exhibit No.	Description
	<i>cotton/lycra core spun yarn</i> , 3 INDIAN JOURNAL OF SCIENCE AND TECHNOLOGY 3, 287-289 (March 2010)
1021	Elena Onofrei, <i>The Properties of Knitted Fabrics for Bio-Functional Textiles</i> , BUL. INST. POLIT. IAȘI, t. LVI (LX) f.2, (2010)
1022	Weihua Shi, <i>Mechanisms of Ultrasonic Joining of Textile Materials</i> (2000)
1023	Stephen Michielsens, Review of Thermally Point-Bonded Nonwovens <i>Materials, Processes, and Properties</i> , 99 JOURNAL OF APPLIED POLYMER SCIENCE, 2489-2496 (2006)
1024	Raghavendra R. Hedge, <i>Thermal Bonding of Polypropylene Films and Fibers</i> , 110 JOURNAL OF APPLIED POLYMER SCIENCE, 3047-3058 (2008)
1025	Subhas Ghosh, et al., <i>Ultrasonic Sealing of Polyester and Spectra Fabrics Using Thermoplastics</i> , 113 JOURNAL OF APPLIED POLYMER SCIENCE, 1082-1089 (2009)
1026	Charles A. Harper, et al., PLASTICS MATERIALS AND PROCESSES, A CONCISE ENCYCLOPEDIA (2003)
1027	In the Matter of Certain Knitted Footwear, Investigation No. 337-TA-1289, Updated Joint Claim Construction Chart (ITC, May 24, 2022)
1028	Excerpts of M.L. Berins, SPI PLASTICS ENGINEERING HANDBOOK OF THE SOCIETY OF THE PLASTICS INDUSTRY, INC. (1991)
1029	American & Efird, <i>Footwear Glossary Shoe Styles</i> , available at https://www.amefird.com/wp-content/uploads/2010/01/1Footwear-Glossary-Shoe-Styles-06-13-08.pdf (2008)
1030	U.S. Courts, Statistics and Reports, Table C-5, U.S. District Courts–Civil Federal Judicial Caseload Statistics, March 31, 2023
1031	U.S. Patent No. 2,147,197 to Glidden
1032	U.S. Patent Application Publication 2005/0262739 to McDonald et al.

I, Jaap Schut, Ph.D., declare as follows:

1. I have been retained on behalf of New Balance Athletics, Inc. (“Petitioner”) in connection with its petition for *inter partes* review (“IPR”) of U.S. Patent No. 8,898,932 “Article of footwear incorporating a knitted component” (“the ’932 patent”). The patent discloses knitted uppers with a skin layer secured to the knitted component via thermal bonding. *See generally* EX1001. I understand that Petitioner is challenging claims 11-15 of the ’932 patent.

2. Petitioner has asked me to provide an opinion on the state of the art of securing layers of material in footwear, in particular the use of thermal bonding. All of the materials that I considered and relied upon are discussed explicitly in this declaration. These materials are listed on p. 24 herein.

I. BACKGROUND AND QUALIFICATIONS

3. I am CEO and Founder of 4E Innovation Consulting where I have been working since March 2023. In this role, I assist a broad range of companies from startups to large multinationals companies with their innovation strategy and new product development. Since November 2023, I have also served as a consultant and project manager on roster at University-Industry Demonstration Partnership (*UIDP*) and its for-profit consultancy branch *UI Collab*. Both organizations assist universities and corporations in navigating and implementing best practices related

to academic-corporate partnerships regarding innovation and commercialization of research projects.

4. In 1997, I was awarded a master's degree in Polymer Chemistry from the University of Groningen in The Netherlands. From 1997 to 2000, I served as a Coatings Technology researcher at the Eindhoven University of Technology in The Netherlands. In 2003, I obtained my Ph.D. degree in Polymeric Materials and Composites from the National Institute of Applied Sciences in Lyon France. From 2003-2004, I served as a post-doctoral researcher working on Polymer Blends and Composite Materials at the Leibniz Institute for Polymer Research in Dresden, Germany. From 2004 to 2006, I was a post-doctoral researcher at the Kohn Lab in the New Jersey Center for Biomaterials at Rutgers University.

5. I have over 21 years of experience in innovation consulting: eight years as a global innovation consultant, eight years as a new business developer/strategic marketer in the chemical industry, and five years as polymer materials researcher. I have primarily dealt with: materials science of polymers, plastics, and specialty chemicals (biobased and biodegradable, thermoplastics and thermosets, fibers and composites, bulk and engineering plastics, additives, monomers), chemical industry, plastics waste and recycling, sustainability, circular economy, paints and coatings, textiles and nonwovens, functional films (multilayer, barrier, smart), functionalized polyolefins, packaging, healthcare, oil and gas. I hold two patents and (co-)authored

thirteen publications in the fields of: bioresorbable polymer for medical devices and drug delivery systems, thermoset-thermoplastic polymer blends, organic coating primers, and fiber reinforced composites.

6. I am currently serving as an adjunct full professor at North Carolina State University (Wilson College of Textiles) where I routinely give guest lectures on innovation strategy, new product development, technology scouting and selection, the circular economy, and bioplastics. I also assist students as a dissertation advisory committee member where I review and critique draft doctoral thesis. I also serve as an adjunct assistant professor at the University of North Carolina's Kenan-Flagler Business School, where I am faculty advisor to MBA student teams, most recently related to a client in the chemicals/polymer materials space. I also lecture in business-technology analysis of clean tech startups at the University of North Carolina's Environment, Ecology, and Energy Program (often involving polymer science inventions), and serve as the Entrepreneur-in-Residence for the University of North Carolina's Kickstart Ventures services, where I leverage my deep material science knowledge, in combination with my commercial new product development experience, to assist startups in their commercialization efforts. My curriculum vitae is attached as Exhibit 1006.

II. LEGAL PRINCIPLES

7. Because I am not an attorney or patent agent, counsel for the Petitioner has provided me an understanding of the relevant parts of U.S. patent law that govern my analysis.

A. Prior Art

8. I have been informed by counsel that Nike asserts that the '932 patent's priority date is November 15, 2012. I have been informed that the prior art includes the knowledge in the relevant field(s) that predates the priority date of the '932 patent.

B. Person of Ordinary Skill in the Art

9. I have been informed by counsel that the validity of claims of a patent is assessed through the eyes of a person of ordinary skill in the art ("POSA"). I understand that the POSA is a hypothetical person who is presumed to know all the relevant prior art and have an ordinary level of creativity.

C. Level Of Ordinary Skill in The Art

10. I have been asked to assume that a POSA for purposes of my analysis would have had a bachelor's degree in design, footwear design, textile design and technology or similar technical degree and at least 3 years of experience working with knitted textiles for use in fabric-based articles, including apparel such as footwear. The POSA would have access to a team which would include at least one

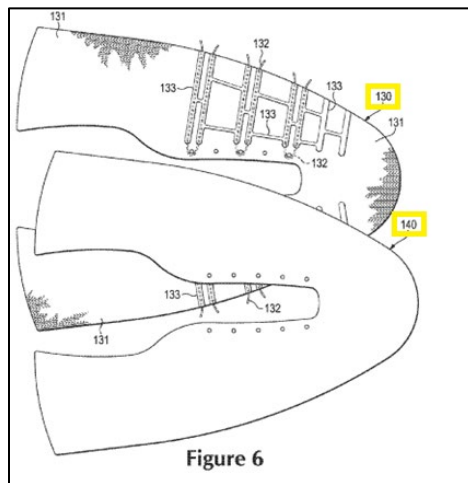
member with expertise in various aspects of garment and/or footwear manufacturing. This would include individuals with a bachelor's degree in chemical engineering, textile engineering, mechanical engineering, or a similar degree and at least 3 years of experience working with different methods of applications for securing material to knitted textiles, including footwear. For individuals with different educational backgrounds, a person could still be of ordinary skill in the art provided that person's additional experience compensates for any differences in that person's education. This education and background provide the necessary training and understanding of the manufacture of the knitted elements described and claimed in '932 patent. All of my opinions set forth herein are provided from the perspective of a person having the above education and training.

11. As of November 2012, I had an Ph.D. in Polymeric Materials and Composites from the National Institute of Applied Sciences in Lyon, France. As of 2012, I had almost a decade of experience ranging from researcher to Global Market Development Manager. Thus, in November 2012, I would qualify as part of the team that would inform a POSA regarding the manufacturing of footwear.

III. THE '932 PATENT

A. Overview of the '932 Patent

12. The '932 patent discloses an article of footwear with an upper formed of a knitted component 130 and a skin layer 140, wherein the skin layer is joined to the knitted component (*see* Figure 6).



13. The “[s]kin layer 140 lays adjacent to knitted component 130 and is secured to an exterior of knitted component 130, thereby forming a majority or a relatively large portion of exterior surface 121.” EX1001, 5:63-66, Fig. 6. The adjacent skin layer overlaps with the knitted component, which may “hav[e] regions with different thicknesses.” *Id.*, 2:26-27, Fig. 6.

14. The '932 patent discloses that “[a] variety of processes may be utilized to join knitted component 130 and skin layer 140.” *Id.*, 11:51-53. The skin layer and knitted component may be compressed between the two surfaces “to join the skin layer to the knitted component.” *Id.*, 2:32-34; Fig. 11C. “In some

configurations, skin layer 140 may be formed from a thermoplastic polymer material, which may be welded or thermal bonded to knitted component 130.” *Id.*, 11:52-54.

15. The ’932 patent discloses that when a “thermoplastic polymer material” is used as a skin layer and heat is applied, the material melts and returns to a solid state when cooled sufficiently. *Id.*, 11:55-64. The ’932 patent also discloses that because of this property of thermoplastic polymer materials, thermal bonding may be utilized to join the skin layer 140 to knitted component 130. *Id.* The ’932 patent specifically defines thermal bonding or variants thereof as “a securing technique between two elements that involves a softening or melting of a thermoplastic polymer material within at least one of the elements such that the materials of the elements are secured to each other when cooled.” *Id.*

16. The ’932 patent provides two examples of thermal bonding a skin layer to a knitted component. The first involves “the melting or softening of skin layer 140 such that the thermoplastic polymer material intermingles with materials of knitted component 130 and are secured together when cooled.” *Id.*, 12:4-13. The second involves “the melting or softening of a skin layer 140 such that the thermoplastic polymer material extends into or infiltrates the structure of knitted component 130 (e.g., extends around or bonds with filaments or fibers in knitted component 130) to secure the elements together when cooled.” EX1001, 12:4-13.

17. The '932 patent discloses that “each section of skin layer 140 may have different properties [and] may be spaced from each other to expose a portion of knitted component 130.” *Id.*, 18:13-14, 20-22. These sections may also be composed of differing materials “and positioned in separate areas of knitted component 130.” *Id.*, 9:39-41. “That is, a portion of skin layer 140 formed from one material may be bonded to one area of knitted component 130, and another portion of skin layer 140 formed from another material may be bonded to a different area of knitted component 130.” *Id.*, 9:41-45; *see id.*, Fig. 12. The '932 patent discloses that the “[s]kin layer 140 may also be utilized to reinforce areas of upper 120” by inhibiting stretch, enhancing the wear-resistance or abrasion resistance of upper 120, or even imparting water resistance. *Id.*, 6:18-23.

IV. CLAIM CONSTRUCTION

18. I understand from Counsel that in an action brought by Nike, Inc. against adidas AG, adidas North America, Inc., adidas America, Inc., and adidas International Trading AG (collectively, “adidas”) (hereinafter “adidas ITC”) the construction of certain claim terms of the '932 patent were agreed to by Nike.

19. The phrase “thermally bonded” appears in independent claim 11 and dependent claims 12-15. In the adidas ITC, Nike agreed the construction of this phrase to be “a securing technique between two elements that involves a softening or melting of a thermoplastic polymer material within at least one of the elements

such that the materials of the elements are secured to each other when cooled,” which is supported by the specification of the ’932 patent. *See* EX1001 at 11:60-65 (“As utilized herein, the term ‘thermal bonding’ or variants thereof is defined as a securing technique between two elements that involves a softening or melting of a thermoplastic polymer material within at least one of the elements such that the materials of the elements are secured to each other when cooled.”); *see* also EX1027, 2. I have applied this definition in my analysis.

V. METHODS OF JOINING MATERIALS

20. As of 2012, there were a number of methods of attaching or joining layers of materials in garments. These methods most typically included adhesive and solvent bonding, sewing, and thermal bonding. EX1022, 331-332. I discuss these methods in more detail below.

A. Adhesive and Solvent Bonding

21. Adhesive and solvent are two types of typical bonding methods. “Adhesive bonding is the process of joining two substrates [together] with a third substance”—typically an organic resin or inorganic component. EX1026, 18. The resin (or adhesive) can be applied in the liquid state and hardens after application and the joining of the two substrates. *Id.* Adhesive bonding has several disadvantages including that environmental, health, and safety considerations must be addressed when using adhesive bonding. *Id.*, 19. Adhesive bonding also involves

the possible susceptibility to moisture, heat, and the presence of contaminants which degrades the strength of the bond. *Id.*

22. Solvent bonding (also referred to as solvent welding) involves applying a solvent to dissolve the joining surfaces. After the solvent partially evaporates, the parts are assembled by applying small pressure on the joint area. EX1026 at 516; EX1028 at 698. Solvent bonding provides high-strength bonds quickly because of the rapid evaporation rates. EX1026 at 516.

B. Sewing

23. Sewing is the most well-known method of securing layers of material. Sewing uses another textile element (thread) to join two materials and “provides adequate strength, elasticity, and aesthetic properties.” EX1022, 331. However, it also creates “discontinuous joints and perforated seams.” *Id.*; EX1025, 1082.

C. Welding

24. It was known as of 2012 that in order to produce strong, continuous, and non-perforated seams, methods of assembly such as welding—which “involve melting and cooling of thermoplastics at the joining interface”—should be used. EX1022 at 332. Thermal welding does not have the same environmental and health concerns as adhesive and solvent bonding.

25. Plastics welding is a method of joining thermoplastics by one of several processes which includes thermal welding (or bonding). EX1026, 554. Thermal

welding involves the application of heat to a thermoplastic substrate. *Id.* Thermoplastic substrates include polyester, nylon, polypropylene, acrylics, TPEs, ionomers (e.g., Surlyn, a MAA-Ethylene copolymer), and EVA foam (ethylene vinyl acetate, sometimes referred to as Phylon). *Id.*, xiv-xv. Thermal welding “provides an advantageous method of joining many thermoplastics that do not degrade rapidly at their melt temperature.” *Id.*, 554 Characteristics of a thermoplastic typically include a relatively low melting point. *Id.*, xiii-xv. When a thermoplastic is heated they soften and can be molded but will harden and retain their molecular structure when cooled. *Id.*

26. Thermal welding can involve one of two kinds of heat: indirect and direct. *Id.*, 554.

1. Indirect Heating: High Frequency Sealing

27. Indirect thermal welding “occurs when some form of energy *other than thermal* is applied.” EX1026 at 554. “The applied energy, which causes heating at the interface or in the plastic as a whole, is generally in the form of friction, high-frequency electrical fields, electromagnetic fields, or ultrasonic vibration.” *Id.* The heat causes a softening or melting of a thermoplastic material which then causes the materials of the elements to be secured to each other when cooled. *Id.* The indirect process is energy efficient and results in bonds that are formed stress free and of higher strength than those made by direct welding methods. *Id.*

28. The use of radio-frequency (RF) welding is also known as dielectric welding or high-frequency welding/sealing. EX1026 at 135 (describing RF welding as used in footwear manufacturing). The radio waves heat the thermoplastic material at the joint interface, causing the materials to melt, and producing a weld on cooling. *Id.* High frequency heating was known in the footwear industry as a method of assembling shoes. EX1016 at 157. Indeed, high-frequency heat was used to weld—i.e., the fusing together of two pieces of material. *Id.* In particular, U.S. Patent No. 6,862,820 (“Farys”), EX1011, describes the use of “high frequency sealing” to assemble an outer layer tightening system to an upper of shoe. *Id.*, 3:24-29. Farys explains that the advantage of the high frequency sealing is that it can be done without any glue. *Id.*

2. Direct Heating: Thermal Bonding

29. Direct thermal welding is when the heat is applied “directly to the substrate in the form of either a heated tool, hot gas,” or radiant/infrared heat. EX1026, 554. The application of heat directly to at least the substrate surface(s) (i.e., a thermoplastic) allows the surfaces to soften sufficiently to produce a bond. *See* EX1028, Table 24.1; EX1026, 554. The surfaces are then clamped together while the bond sets. EX1028, Table 24.1. Heat sources can include simple soldering guns, hot irons, or hot plates. *Id.* Thermal bonding was known to provide “fast,

relatively easy, and economical bonds that are generally 80-100 percent the strength of the parent plastic.” EX1026, 554.

30. As of 2005, thermal bonding was described as “one of the most widely used bonding technologies in the nonwovens industry.” EX1023, 2489. The use of thermal bonding was known to be advantageous as it required lower energy consumption and has a higher production rate and is also known for being environmentally benign. EX1024, 3047.

VI. THERMAL BONDING IN FOOTWEAR

31. As of early 2011, welding, or the softening of thermoplastic materials, had been used in the footwear industry to assemble layers of material of an upper:

A. Dojan

32. U.S. Patent Application Publication 2011/0088285A1 (“Dojan”), EX1010, which was published on April 21, 2011, discloses several different methods of attaching a shoe upper to an external “skin layer.” EX1010, Abstract. One of those methods includes the use of a skin material made of thermoplastic polyurethane. *Id.*, [0004], [0043] (“In at least some embodiments, the skin material is a thermoplastic polyurethane (TPU) or other appropriate material.”). Dojan discloses that when a thermoplastic material is used as either the skin layer or the substrate, one could “rely on melting of the skin and/or substrate layers themselves to achieve bonding.” *Id.*, [0035].

33. Dojan teaches a way to secure layers of material *without* the application of hot melt bonding material. In particular, Dojan discloses that “[i]n some embodiments, a separate panel of hot melt bonding material may not be placed between a skin layer panel and [the upper].” *Id.*, [0035]; [0054] (“In still other embodiments, one or more skin material panels are bonded to other layers by melting of the skin material during a hot press operation (described below) and subsequent solidification during cool, and no separate bonding material is interposed between those skin material panels and other inwardly-located layers.”). Dojan teaches that “[i]nstead the skin layer panel is bonded to the other layer(s) solely through the melting of the skin layer panel so as to fuse the skin layer to one or more other layers.” *Id.*, [0035]. Dojan describes that this can be achieved in two ways. In the first way, a skin layer is pretreated with a thermoplastic polyurethane. *Id.*, [0035]. In the second way, a thermoplastic is used as the skin layer. *Id.* In each disclosed embodiment the thermoplastic is melted to adhere the skin layer (or the outer lining) to the substrate material (the upper).

34. Dojan also describes how thermal bonding may be used with a material that is not thermoplastic itself but is pretreated with a thermoplastic. In that instance, Dojan describes in detail that when a skin layer is pretreated, “a substrate layer [] may comprise a laminate that includes a first material layer (e.g., artificial leather) and a second material layer (e.g., a thermoplastic polyurethane) prelaminated to a

face of the first material layer by the substrate material manufacturer. Panels of that two-layer substrate material can then be cut to shape by a shoe manufacturer and used as substrate layer.” *Id.*, [0035]. In such an embodiment, the separate layer of bonding material could be omitted as “the second material layer would be oriented to face [the] mesh layer [] and would melt during pressing so as to fuse to the mesh layer (and to the skin layer(s)).” *Id.*

35. Dojan discloses certain embodiments where the skin material comprises a multilayer material having an outer heat-resistant layer for abrasion resistance and an inner lining for hot melt bonding. *Id.*, [0043]. Dojan includes an example wherein the outer lining is a thermoset polyurethane (PU) *or a* TPU with a high melt temperature, and the inner lining is a TPU having a lower melt temperature for hot melt bonding and production temperatures. *Id.*

36. Dojan discloses at least the following exemplary materials that could be used for the skin material including:

1. TPU Film: FW film (Daewon Chemical Company, Ltd. Korea)
2. Dual (H/L) TPU film having 0.1 mm high melting temp. aliphatic film layer and 0.2 mm low melting temp. aromatic polyester film FS8080 layer:
FD26K series (Ding Zing Chemical Products Co., Ltd., Taiwan)

Id., Table 3.

37. Dojan also discloses that during the application of the skin material over the mesh material (the inner lining) there is a conformal nature of the contact between the skin material and the mesh. *Id.*, [0038]. As Dojan explains, this conformal nature promotes contact between the skin layer with the mesh and substrate layers. This increase in bonded surface area increases the overall strength of the layered material. *Id.*

B. Wildeman

38. World Intellectual Property Organization Publication No. WO2004/012544 (“Wildeman”), EX1013, was published on February 12, 2004.

39. Wildeman discloses that “[d]uring the shoe manufacturing process it is often necessary to affix a textile material to a second surface such as foam, leather, or another textile thereby giving rise to a multi-layer composite construction. Typically, the textile is held to the second surface by stitching or other substantially permanent attachment techniques.” EX1013, 2:4-7. Wildeman discloses “textile materials incorporating heat activated coating for use in shoe assembly, equipment and related techniques adapted to facilitate attachment of such textile materials to other materials during shoe assembly[.]” *Id.*, 1:12-15.

40. Wildeman’s invention “provides advantages and alternatives over the prior art by providing materials, equipment and processes which permit the

replacement of the pressure sensitive adhesive coating with a hot melt (thermoplastic) coating such as a co-polyester[.]” *Id.*, 2:30-33.

41. Wildeman discloses that “[t]he coating is present in an amount and is of a composition, such that upon application of heat and pressure such as a in a hot press or the like, the hot melt coating may be melt bonded to a second surface material thereby establishing a bond between the base textile and second surface [] material.” *Id.*, 2:6-10.

VII. A POSA WOULD HAVE BEEN MOTIVATED TO USE THERMAL BONDING IN FOOTWEAR

42. As described above, a POSA would have known that thermal bonding was a known technique of joining materials as it produced strong bonds in a fast and relatively easy manner. *See* EX1022, 331-332. As far as methods of joining materials, the use of thermal bonding was in 2012, and is today, a preferred method as it does not use any toxic chemicals, making it more environmentally benign than methods such as adhesive bonding.

A. A POSA Would Have Been Motivated to Use Thermal Bonding to Make the Shoes of Becker

43. I understand Becker discloses an article of footwear. Becker discloses a preferred embodiment wherein the upper of the article of footwear includes an outer lining and inner lining. EX1007, [0080]-[0081]. Becker explains that the outer lining may be made of “phylon.” *Id.*, [0081]. Phylon, which is ethylene vinyl acetate

(EVA), is a thermoplastic commonly used in shoe manufacturing. Becker discloses affixing the outer lining to the outer member, or sole, using a glue or adhesive. *Id.*, [0085].

44.A POSA would have known thermal bonding to be an alternative to adhesive bonding. Thermal bonding was known to have several advantages including “[l]ow energy consumption, a high production rate, environmentally benign, and superior properties of resultant fabrics.” EX1024, 3047. A POSA would have been aware of these benefits of thermal bonding over adhesive bonding. A POSA looking to implement Becker’s preferred embodiment would have understood that it would have been preferable, to use thermal bonding to attach the outer lining to the inner lining, than the adhesive disclosed for attaching the outer lining to the sole, particularly because a thermoplastic (phylon/EVA) was already being used as the outer lining.

45. A POSA would have been motivated to use the thermal bonding disclosed in Dojan to attach the outer lining in Becker. As disclosed in Dojan, using the thermoplastic as the skin layer requires less material and is generally more efficient. EX1010, [0035]. Dojan also specifically describes using a thermoplastic as the skin layer. *Id.*, [0043] (“In at least some embodiments, the skin material is a thermoplastic polyurethane (TPU) or other appropriate material.”). It would have been within the skill of a POSA to use the thermal bonding described in Dojan to

attach the layers Becker and a POSA would have a reasonable expectation of success in doing so.

46. Similarly, a POSA would also have been motivated to use the thermal bonding disclosed in Wildeman to attach the outer lining in Becker. Wildeman discloses the use of heat activated thermoplastic coatings. EX1013, 1:10-16. (describes “heat activated coatings for use in shoe assembly”); *id.*, 2:30-3:2 (disclosing “materials, equipment, and processes which permit [use of] a hot melt (thermoplastic) coating” to attach layers of textile material). Wildeman further discloses that “one aspect of the invention [comprises] a system of polymeric fibrous base textile with a chemically compatible hot melt [(thermoplastic)] coating disposed in a disperse arrangement across the base textile”). *Id.*, 3:4-6. Wildeman then explains that “the hot melt coating may be melt bonded to a second surface material thereby establishing a bond between the base textile and second surface material.” *Id.*, 3:6-10. As discussed above, a POSA would have understood that the thermal bonding described in Wildeman would have been more efficient than the adhesive bonding in Becker. *See supra* ¶¶ 27, 44; *see also* EX1013, 2:30-3:2 (describing the invention as the “replacement of pressure sensitive adhesive coatings” with a thermoplastic heat activated coating). Wildeman further explains that use of heat activated thermoplastic coatings “permit[s] unused portions of the coated textile to be recycled back into a useable fiber without substantial treatment.”

EX1013, 2:30-3:2. A POSA would have understood recycling unused material to be a significant benefit. As a result, and for the same reasons discussed above regarding the thermal bonding described in Dojan, a POSA would have been motivated to use the thermal bonding described in Wildeman to attach the outer lining to the inner lining in Becker.

47. As explained above, Becker states that the outer lining may be made of “phylon,” a thermoplastic commonly used in shoe manufacturing. EX1007, [0081]. Given the widespread use of thermal bonding, a POSA would have had a reasonable expectation of success in using it to affix Becker’s outer lining to its inner lining particularly because a thermoplastic (phylon/EVA) was already being used as the outer lining.

B. A POSA Would Have Understood that Farys Uses Thermal Bonding to Attach Its Layers

48. A POSA would have understood that Farys uses thermal bonding to attach the layers of the shoe. Farys generally describes that the multiple layers of material can be attached via several means including “sealing.” EX1011, 3:24-27. Farys continues to describe a method of sealing known as “high frequency sealing.” *Id.* A POSA would have known that high frequency sealing is a form of thermal bonding “when some form of energy other than thermal is applied” to soften or melt a thermoplastic polymer material within at least one of the elements such that the materials of the elements are secured to each other when cooled. EX1026, 554; *see*

also EX1016, 157. High frequency sealing has been known for many decades and used for the thermal bonding and assembly of products such as raingear and inflatable rafts, flexible packaging, and medical devices, especially when materials such as polyurethane, EVA, PVC, and nylon are used. EX1028, 718. As a subset of thermal bonding, high frequency sealing has the same advantages over alternative methods of assembly including improved environmental impact, a faster process speed, and the ease of use in automated assembly. EX1026, 554; EX1024, 3048. Furthermore, high frequency sealing is known to create good weld appearance and bond strength. EX1026, 554. All of these advantages make it a known method of thermal bonding. EX1016 at 157.

49. Farys describes “high frequency sealing” as a preferred method of attaching an outer lining to the knitted upper component. EX1011, 3:17-30 (“The assembly can also be made by a high frequency sealing.”) Farys teaches that the disclosed method of using high frequency sealing “offers the advantage that transparent rubber can be used for the tightening system . . . since the assembly is done without glue.” *Id.*, 3:25-30. Farys’ description of attaching the tightening system “without glue” underscores that Farys used thermal bonding to make this attachment. As explained above, the applied energy causes heating of the (thermoplastic) substrate material which softens the material and a bond is formed as the material cools. *See supra* ¶ 27. Therefore, a POSA would have recognized

that the layers of the shoe described in Farys are attached through thermal bonding. A POSA would have also been motivated to use high frequency sealing to affix the elastic tightening system to the upper in Farys, as a POSA would have been aware of its benefits, including efficiency and lower environmental burden.

VIII. CONCLUSION

50. By signing this Declaration, I recognize that it will be filed as evidence in a case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

51. I declare that all statements made herein on my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made 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.

Dated: 1st November 2024

By:

A handwritten signature in black ink, appearing to read 'J. A. Schut', with a long horizontal stroke extending to the right.

J. A. Schut

MATERIALS CONSIDERED

Books and Manuals:

Clarks Limited, MANUAL OF SHOEMAKING (5th ed. 1980)

Weihua Shi, *Mechanisms of Ultrasonic Joining of Textile Materials* (2000)

Stephen Michielsen, Review of Thermally Point-Bonded Nonwovens *Materials, Processes, and Properties*, 99 JOURNAL OF APPLIED POLYMER SCIENCE, 2489-2496 (2006)

Raghavendra R. Hedge, *Thermal Bonding of Polypropylene Films and Fibers*, 110 JOURNAL OF APPLIED POLYMER SCIENCE, 3047-3058 (2008)

Subhas Ghosh, et al., *Ultrasonic Sealing of Polyester and Spectra Fabrics Using Thermoplastics*, 113 JOURNAL OF APPLIED POLYMER SCIENCE, 1082-1089 (2009)

Excerpts of Charles A. Harper, et al., PLASTICS MATERIALS AND PROCESSES, A CONCISE ENCYCLOPEDIA (2003)

Excerpts of M.L. Berins, SPI PLASTICS ENGINEERING HANDBOOK OF THE SOCIETY OF THE PLASTICS INDUSTRY, INC. (1991)

Proceedings:

In the Matter of Certain Knitted Footwear, Investigation No. 337-TA-1289, Updated Joint Claim Construction Chart (ITC, May 24, 2022)

Patents and Prosecution History:

U.S. Patent No. 8,898,932 to Woodman, et al.

U.S. Patent Application Publication 2010/0313447 to Becker, et al.

U.S. Patent Application Publication No. 2011/0088285A1 to Dojan, et al.

U.S. Patent No. 6,862,820 to Farys, et al.

World Intellectual Property Organization Publication WO 2004/012544 to Wildeman